Final Report – Pre Feasibility Study for Proposed Economic Zone at Bhola, Bangladesh

25 February 2021

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Bangladesh Economic Zones Authority

pwc

February 25, 2021

To
Project Director
Support to Capacity Building
Bangladesh Economic Zones Authority

Sub: Pre-feasibility study of 12 Economic Zones in Bangladesh- Submission of Final Report for the proposed Economic Zone at Bhola

Dear Sir,

Greetings from PricewaterhouseCoopers Private Limited.

We are glad to submit the Final Report for the proposed Economic Zone at Bhola. Please find enclosed herewith the report for your kind reference.

We have captured the following details in this report-

- Executive summary on this report outlining key findings and recommendations
- Introduction to the project and location assessment of the proposed EZ with maps
- Benchmarking of the proposed EZ with respect internationally selected economic zones and similar developments– parametric comparison of the proposed EZ against its competing developments
- Industry assessment to suggest the best fit sectors for the proposed EZ
- Demand projection to forecast the industrial space uptake and estimate utility requirements
- Transport assessment elucidating the multimodal connectivity surrounding the proposed EZ
- Onsite and Offsite Infrastructure assessment, and Master Planning
- Environmental and Social Review
- Financial modelling and Economic modelling

We request you to kindly acknowledge the receipt of the same.

We assure you of our best service at all times.

Thank you.

Yours sincerely,

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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 twelve selected economic zones in Bangladesh. PwC would be undertaking the commercial aspects of the scope of work with assistance from Infrastructure Investment Facilitation Company (IIFC) and the technical aspects have been subcontracted 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.

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Context of the Study

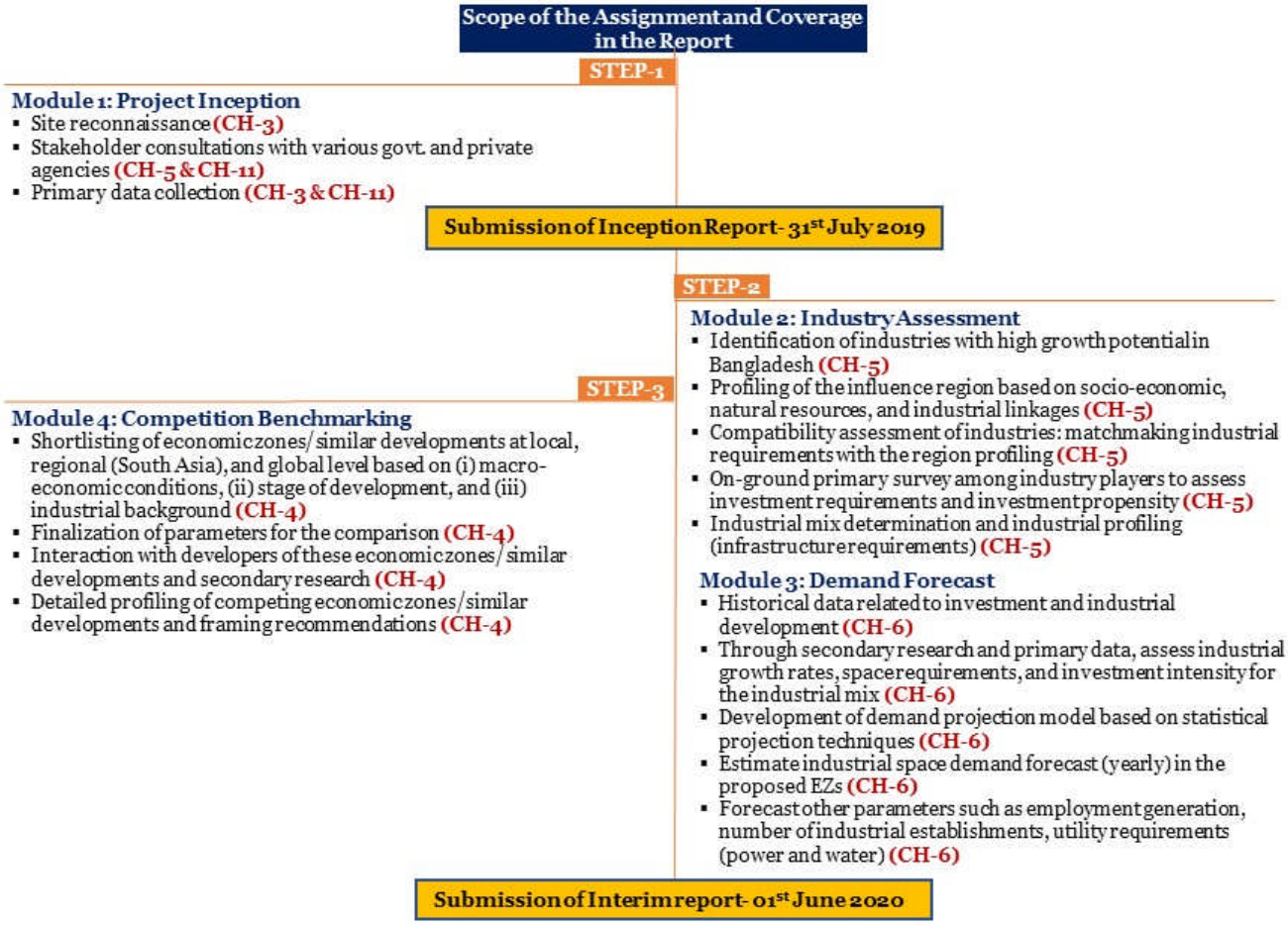
Bangladesh has recorded steady growth over the last decade with Gross Domestic Product (GDP) growth rate ranging over 6%.[1] The steady growth has been assisted by presence of strong labour force (58.3 million in 2011). However, this has also created a unique challenge to create productive employment for the future labour force (nearly 2 million a year) entering the market.

Government of Bangladesh provided planned industrial infrastructure through its Export Processing Zone (EPZ) program to create a conducive environment to attract private sector investment. EPZs assisted in attracting Foreign Direct Investment and generate potential jobs. Since 1993 EPZs have assisted in development of RMG sector in Bangladesh and have boosted exports to nearly US$ 2.9 billion by FY 10 and generated significant employment. However, EPZs had its own shortcomings in terms of contribution to domestic economy and linkages and integration to domestic industries.

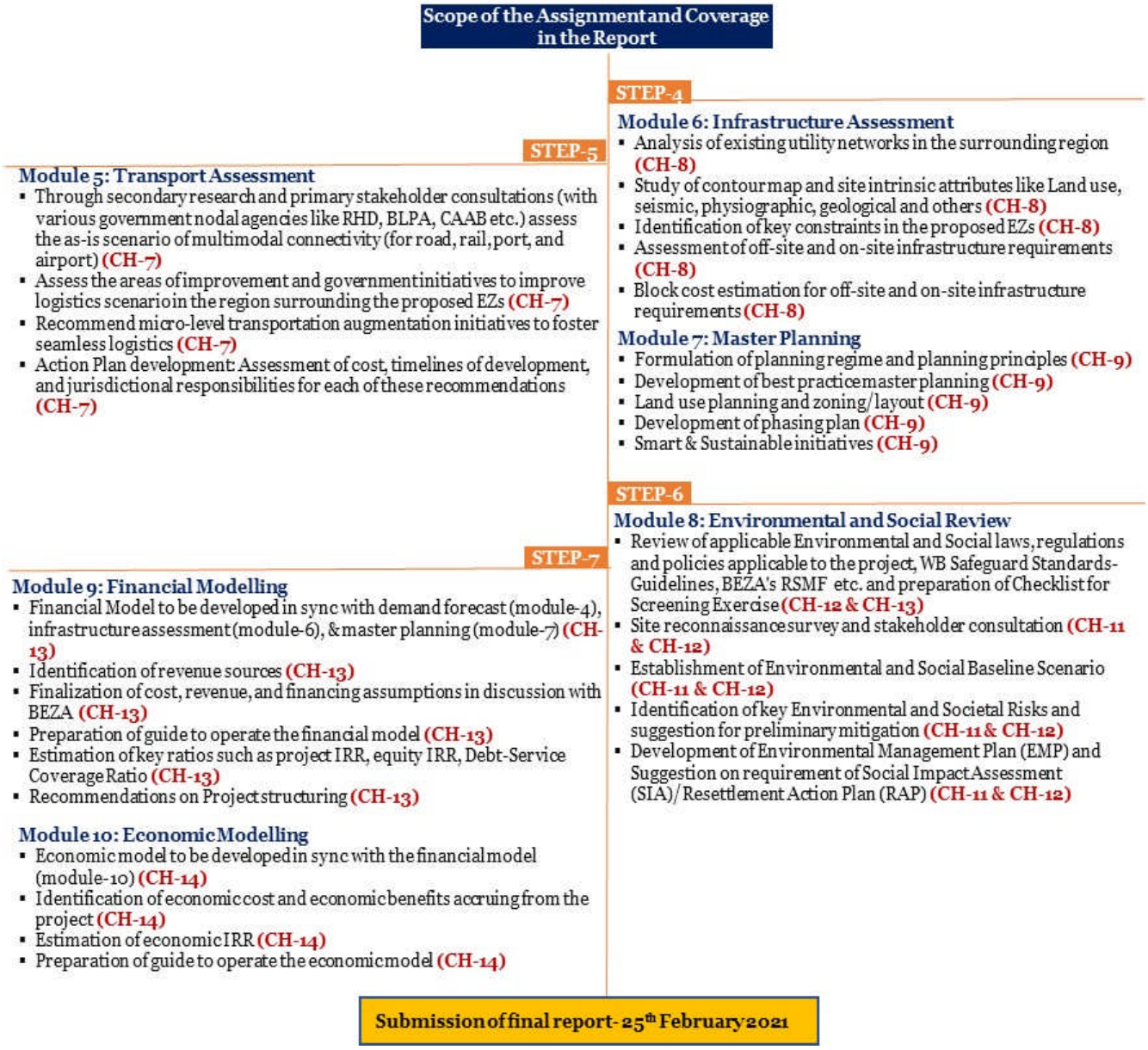
Govt. of Bangladesh planned the development of Economic Zones (EZ) to address this issue. The Economic Zones provide flexibility in terms of management and investment. The EZs would be less reliant on government subsidies and would be able to leverage private sector capability. The Economic Zone Act was passed in 2010 and Bangladesh Economic Zones Authority was established under the Prime Minister's Office (PMO) for development of Economic Zones across Bangladesh.

Bangladesh Economic Zones Authority with support from World Bank has implemented the Private Sector Development Support Project (PSDSP) to support development of economic zones under the new EZ model. This study is being undertaken as part of the PSDSP to carry out independent pre-feasibility study of 12 Economic Zones. The scope of work under the study for each Economic Zones along with chapters covering the scope have been mapped below.

Scope of the assignment and report coverage



[1] *As per World Bank data (constant price GDP data)*



Scope Limitations

- The study team has identified the source from where sand can be dredged for land filling. However, to identify the extact area from where sand has to be dredged would require detailed study and should be carried out as part of the master planning of the Economic Zone.
- The study team has identified the broad estimate for resettlement plan in line with scope of the assignment. The actual cost for resttlement plan due to offsite infrastructure should be carried out at masterplan stage when the offsite infrastructure alignment would be finalised.
- The Environmental Management Plan cost has been provided based on scope of the assignment. Detailed EMP cost study needs to be carried out as part of the masterplan study.

List of Abbreviations

Abbreviation	Full Form
AADT	Annual average daily traffic
AC	Air Conditioner
AI	Artificial Intelligence
APC	Automated Process Control
API	Active Pharmaceutical Ingredients
BAPA	Bangladesh Agro-Processors' Association
BBS	Bangladesh Bureau of Statistics
BCMEA	Bangladesh Ceramics Manufacturers and Exporters Association
BCR	Benefit Cost Ratio
BDI	Baltic Dry Index
BDT	Bangladeshi Taka
BEPZA	Bangladesh Export Processing Zone Authority
BIDA	Bangladesh Investment Development Authority
BEZA	Bangladesh Economic Zones Authority
BGMEA	Bangladesh Garments Manufacturers and Exporters Association
BIWTA	Bangladesh Inland Water Transport Authority
BLPA	Bangladesh Land Port Authority
BRRI	Bangladesh Rice Research Institute
BOI	Board of Investment
BSCIC	Bangladesh Small and Cottage Industries Corporation
CAGR	Compound Annual Growth Rate
CETP	Central Effluent Treatment Plant
CKD	Completely Knocked Down
COVID	Coronavirus Disease
DDT	Dividend Distribution Tax
DME	Distance Measuring Equipment
DSCR	Debt Service Coverage Ratio
EIRR	Economic Internal Rate of Return
EPF	Employee Provident Fund
EPZ	Export Processing Zones
ETP	Effluent Treatment Plant
EU	European Union
EXIM	Export & Import
EZ	Economic Zone
F&B	Food and Beverages
FCL	Full Container Load
FDI	Foreign Direct Investment
FMCG	Fast Moving Consumer Goods
FY	Financial Year
G2G	Government to Government

Abbreviation	Full Form
GDP	Gross Domestic Product
GNI	Gross National Income
GoB	Government of Bangladesh
GST	Goods and Services Tax
GVA	Gross Value Added
GVC	Gross Value Chain
HBR	Harvard Business Review
HCCB	Hindustan Coca Cola Beverages
HEIP	Hermosa Ecozone Industrial Park
HYV	High Yielding Variety
IIFC	Infrastructure Investment Facilitation Company
IOT	Internet of Things
IT	Information Technology
ITC	International Trade Centre
IWT	Inland Water Transport
KL	Kilo Liter
Km	Kilometer
KV	Kilovolt
KVA	Kilo Volt-ampere
KWH	Kilo-Watt Hour
LDC	Least Developed Country
LGED	Local Government Engineering Department
LFMEAB	Leather goods And Footwear Manufacturers & Exporters Association of Bangladesh
LLP	Limited Liability Partnership
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MAC	Middle and Affluent Class
MACE	Mahindra Consulting Engineers Limited
MLD	Million Liters per Day
MSME	Micro, Small and Medium Enterprises
MT	Metric Ton
MVA	Mega Volt Ampere
NBBL	Nutan Bidyut Bangladesh Limited
NSSF	National Social Security Fund
OD	Origin Destination
P&L	Profit and Loss
PBF	Pre-Built Factory
PIRR	Project Internal Rate of Return
PIWTT	Protocol on Inland Water Transit and Trade
PPM	Parts Per Million
PPP	Public Private Partnership
PSDSP	Private Sector Development Support Project

Abbreviation	Full Form
PVC	Polyvinyl Chloride
PwC	PricewaterhouseCoopers
QIIP	Quantum Index of Industrial Production
R&D	Research & Development
REB	Rural Electricity Board
RHD	Roads and Highways Department
RMG	Readymade Garments
SASEC	South Asia Sub regional Economic Cooperation
SCADA	Supervisory Control and Data Acquisition
SDF	Standard Design Factory
SERF	Shadow Exchange Rate Factor
SEZ	Special Economic Zone
SME	Small and Medium-sized Enterprises
SMI	Survey of Manufacturing Industries
STP	Sewage Treatment Plant
SWRF	Shadow Wage Rate Factor
TCF	Trillion Cubic Feet
TEU	Twenty-Foot Equivalent Unit
ToR	Terms of Reference
TV	Television
TVET	Technical and Vocational Education and Training
UN	United Nations
UNO	Upazila Nirbahi Officer
USA	United States of America
USD	United States Dollar
VAT	Value Added Tax
WB	World Bank
WEPZ	Wathupitiwela Export Processing Zone
WTO	World Trade Organisation
YOY	Year on Year

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1. Executive Summary

Changing global dynamics depict the growth prospect in Bangladesh and how this country has been shaping up as an attractive investment destination. Country's specialisation in RMG sector is a success story for which Bangladesh has been able to effectively leverage on its demographic dividend. However, the country has been over dependent on this sector and is not being able to diversify its export basket. Moreover, with the advent of the global Corona virus (COVID-19) pandemic, which has adversely affected the Textiles & RMG due to its labour-intensive nature, Bangladesh should look towards diversification now even more than ever. In a prescience move GoB had already envisaged that organized industrialization in the country will be able to improve the country's competitiveness thereby attracting more investments from manufacturers globally and help in the diversification process. In lieu of this, the emergence of the EZ model, is expected to foster organized industrialization in the country, which in turn shall promote investment inflow and employment generation.

In tandem with this initiative, economic zone (EZ) regime ushered in, and BEZA was conceptualized. BEZA is the nodal agency mandated for economic zone development in the country. BEZA in support with World Bank is implementing PSDSP to upkeep pilot multi-product EZ projects under the new EZ regime.

As part of this endeavour, BEZA and the World Bank intend to undertake pre-feasibility studies of twelve economic zone locations spread across the country. This report captures location assessment, competitive benchmarking and demand assessment modules of the pre-feasibility assessment of economic zone location at Bhola, Bhola district.

Proposed EZ is spread across an area of 304.07 acres on private land located in Bhola Sadar Upazila, Bhola district of Barisal division. Proposed EZ has no direct road connectivity to other parts of Bangladesh. It is connected to other parts of Bangladesh via Ferry and IWT. Proposed EZ is adjacent to zila road (LGED road) and it does not require a separate access. Nearest highway connectivity is Bhola-Barisal highway (N809) which is ~30 km from the proposed EZ. N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). Currently there is no rail network in the vicinity of the proposed EZ. The nearest seaport at Mongla is at a distance of ~206 km from the proposed EZ. Chittagong seaport is at distance of ~215 km from the proposed EZ. Barisal river port is the nearest river port which is located at a distance of ~53 km from the proposed EZ.

River Ganeshpura is located at a distance of 2 km from the proposed EZ which could act as source of surface water for the proposed EZ. The groundwater depth in the region of the proposed EZ varies from 200 to 300 ft. The nearest power source is Bangla bazar sub-station (~18 km) with total capacity of 20 MvA and surplus capacity of ~4 MvA. Nearest gas station is Bhola gas station which is located at a distance of ~10 km from the proposed EZ.

Basic social infrastructure (medical, residential, and academic) are available in this region to cater to the requirements of unskilled and semi-skilled manpower. Quality social infrastructure (medical, residential, and academic facilities suitable for expats, executives and skilled human resources) is available in Barisal (~53 km) and Dhaka (~194 km).

In order to incorporate the best prevalent practices in development of industrial infrastructure, it is imperative that the proposed zone is evaluated against similar developments in comparable neighbouring and global economies. In this regard, the competitive benchmarking exercise is taken into cognizance so that the developer becomes oblivious with the drivers of an EZ and assess the proposed zone vis a vis similar development taking place globally. The benchmarking exercise assesses various parameters such as commercial terms, infrastructure availability, labour cost, distance from trade gateways, etc. for similar developments across the globe. Once completed, this analysis not only provides the relative competitiveness of the proposed economic zone vis a vis the other zones but also synthesises the key learnings from each of these zones. Since, this report captures only the location analysis, and the industry and demand assessment of the proposed economic zone apart from competition benchmarking, certain sections in the comparative analysis section are kept to be updated as we further proceed to the relevant modules (like master planning, infrastructure assessment, and financial modelling) on course during the pre-feasibility study.

In line with the identified features of the proposed EZ and its competitiveness, a framework of industry assessment has been formulated. The industry assessment framework is based on a stepwise approach to finalise the industrial sectors which are best fit for the proposed EZ. In summary, it emphasizes on the trade potential of each sector, their participation in the Global Value Chain and the priority sectors of the GoB to highlight an initial set of industrial sectors best suited for development in the country. In doing so, the impact of COVID-19 pandemic on these sectors has also been assessed to understand its underlining effect on the demand side. Our assessment depicted that Textiles & RMG, Leather, Chemicals etc. would be amongst the most adversely affected sectors due to ongoing lockdown protocols whereas certain sectors such as Food & Beverages, Agro-based products could be immune against the impact of the pandemic.

Through amalgamation of the national industrial landscape with the regional landscape and site intrinsic features, suitability of various industrial sectors to the proposed EZ has been assessed with additional validation of this desk-based study through primary survey's amongst domestic and foreign investors. Basis this hypothesis, the following industrial sectors emerged out as the potential industrial mix for the proposed EZ:

Primary set of industries:

- Food and Beverages
- Agro based products
- Non-Metallic Minerals

Secondary set of industries:

- Chemicals

Desk based study in synthesis with primary survey indicates that the economy of Bhola district and the surrounding region is predominantly agriculture and aquaculture based. Hence, Food & Beverages and Agro-based sectors emerge as the one of the foremost choices of sectors for the proposed EZ. Voice on ground also captured that the investors are require certain pre-requisites in order to relocate to the proposed economic zone in terms of availability of cheap source of labor, proximity to the source of raw materials, access to CETP/STP, uninterrupted power supply for continual industrial production, warehousing facilities, subsidized land tariffs etc. among others. They also pointed out certain challenges such as high duty on customs, complicated clearance processes, shortage of power, high utility tariffs, social security as some of the issues acting as hindrances to investment.

Based on the above-mentioned industrial mix, land demand forecasting in light of 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 proposed EZ have been varied as per the three scenarios. It has been assumed that in aggressive (conservative) case, higher (lower) infrastructure induced growth rate and higher (lower) investment inflow taking place to the proposed EZ. Base case considers the current scenario backed up by evidences and present trends. Similarly, the industrial growth rates assumed have been varied in order to factor in the impact of COVID-19 on their future growth.

Demand projection outlines that in the post-COVID scenario, complete industrial space uptake would take place in 14 years in conservative case. For base and aggressive cases, the same would be spread over 13 years and 11 years respectively. Corresponding to this land demand, the ultimate power and water demand for the proposed economic zone is 32.15 MVA and 8.82 MLD respectively (for Base case). The project would generate direct employment of approximately 49,359. (for Base case).

The cumulative land uptake for the proposed EZ across the three cases – Conservative, Base and Aggressive are as follows –

Table 1: Industrial space occupancy (in %) for the three scenarios (cumulative)

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	5%	10%	14%	18%	23%	26%	30%
Base	6%	13%	18%	25%	31%	36%	42%
Aggressive	8%	16%	23%	31%	40%	47%	56%

Source: Statistical projection technique; Demand Forecasting

Table 2: Industrial space occupancy (in %) for the three scenarios (cumulative)

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	33%	35%	46%	57%	67%	87%	100%
Base	47%	53%	66%	80%	94%	100%	100%
Aggressive	63%	72%	88%	100%	100%	100%	100%

Source: Statistical projection technique; Demand Forecasting

Master Plan, Off-site Infrastructure plan, and On-site infrastructure plan have been prepared for the EZ site in line with the industries proposed to be established within the proposed EZ, statistical demand forecasting, and prevalent best industry practices. Off-site infrastructure takes into consideration providing the external basic infrastructure facilities (such as site filling, power supply, water supply, and access road) to the doorstep of the proposed EZ. 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, sewage and effluent treatment facilities and other support amenities etc.). Development of on-site infrastructure is the responsibility of the private developer (in case BEZA opts for the PPP route).

There are totally 174 plots within EZ out of which 172 plots are earmarked for industrial usage, 1 plot for utilities and remaining 1 plot has been earmarked for public & support amenities.

The project is planned to be developed over 2 phases. It is proposed to develop 169 acres of land in phase I and 135 acres of land in phase II. The details of the phasing plan are shown in the next page.

The proposed Master Plan has segregated the proposed EZ into Industrial Zone, Zone specific infrastructure area, Public and support amenities, utilities and roads, green spaces and water channels.

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.

Further to develop the best practice Master Plan, Infrastructure plan has been developed for the proposed EZ in Bhola including the following –

Site filling – Based on the study of contour, it is found that the site needs to be filled for a depth of about 1.8 m (10 feet) on an average and the total estimated site filling quantity is about 2,214,440 cum. Dredged sand from River Ganeshpura is suggested as a source for site filling.

Road – The total length of the road planned within the proposed EZ is ~6.67 km. This comprises 4-lane and 2-lane road network. Internal road network provides access to the industrial plots apart from providing access to areas having support amenities.

Power – Assessment suggests that basis industrial assessment and demand forecasting for the proposed EZ, power demand for the proposed EZ would be about~36 MVA. During the initial phase of development, the 33/11 kV main receiving sub-station (MRSS) shall be established within the site and as suggested by the officials, power

to this sub-station shall be availed by establishing 33 kV overhead transmission line from the 33/11 kV Bangla Bazar sub-station of 10 mVA capacity located at an aerial distance of 16 km from the site (based on proposed tentative alignment). Based on the demand growth of EZ, the proposed 33/11 kV MRSS within EZ site shall be upgraded to 132/33 kV sub-station and incoming 132 kV overhead transmission line shall be established from 132/33 kV Borhanuddin grid sub-station of 225 mVA capacity located at an aerial distance of 30 km from the site.

Water – Based on the assessment, it is found that the total potable water demand for the proposed EZ would be about 4 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.

River Ganeshpura, a tributary of River Meghna is near the proposed site on the Western side at an aerial distance of 1.8 km (~2km). Based on the discussion had with UNO officials, it is understood that these rivers are perennial in nature and shall be relied to meet the water demand of the proposed EZ. It is proposed to provide suitable water intake system near the river basin at an approximate distance of 2 km from the site based on proposed tentative alignment. However, detailed study and hydrogeological investigations need to be carried out to determine the exact intake point and intake system. Hence, it is suggested that suitable intake system and intake point shall be proposed during detailed engineering stage.

Sewer System – Total sewage estimation of proposed EZ site is ~565.66 cum/day. Sewage Treatment Plant is proposed within the proposed EZ to treat the sewage water.

Solid Waste Management – The estimated total solid waste quantity for the proposed EZ is about 3 TPD.

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.

The development of the EZ is envisaged on land parcel of 304.07 acres which is contained in Bhola Sadar Upazila, all of the land area is private land. The land is used for agricultural activity and the proposed project will result in the loss of livelihood due to loss of farmlands. This requires the development of a comprehensive Resettlement Action Plan for the affected people. Based on site visits and stakeholder consultations, it can be surmised that the proposed are is predominantly used for agriculture purpose. Also, there are a number of household structures located within the proposed site. The project will affect approximately 230 PAHs (~ 1115 PAPs) in terms of households who'll be losing their land and other assets. There are 14 Household structures are located within the proposed EZ boundary.

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.

Environmental Review formulates Environment Management Plan (EMP) to mitigate adverse impact on the environment due to development of EZ. 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 ~42.94 million.

Basis the master planning and environmental management plan, the cost estimate of developing the EZ site is expected to be around BDT 8,836 million (without SFB). This is the total hard cost for development of infrastructure (off-site, on-site and EMP) 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 and expected revenue that would be generated from the proposed EZ a financial model has been developed in order to assess the feasibility of developing this EZ. In order to do so, two cases were analyzed, Case 1 where BEZA plays the role of developer of the project and Case 2 where BEZA assigns a PPP developer to develop the project.

Analysis of project returns when BEZA plays the role of the developer of the proposed EZ reveals that the projects exudes no return, which is not viable in nature. The project exudes return of 8.12% under tariff plan 1 and return of 16.59% under tariff plan 2, when BEZA develops the infrastructure with assistance from nodal agencies.

When a conventional approach of PPP structuring is followed where the PPP developer is selected based on certain bid parameters (through competitive bidding process) and it has to incur certain pay-outs to BEZA, the project is financially not attractive. The project shows improved financial returns when BEZA extends certain fiscal assistance in form of (i) waiver on the pay-outs, (ii) any nature of grant through VGF/ annuity.

On the contrary, the project financials in case of a PPP developer developing the project, indicates that the project return (7.31%) is not attractive for private investor when BEZA adopts the unconventional approach. On the other hand, in case of pay-outs being charged by BEZA in the form of upfront payment, annual land lease and revenue share, the project returns for the PPP developer further deteriorates and remain unattractive in nature (~5.66 %).

The project should only be pursued by BEZA (under developer mode) if BEZA is interested in boosting economic development in the region, otherwise the project is unviable in terms of financial feasibility.

In addition to the financial modelling, an economic modelling exercise has also been undertaken to evaluate the economic benefits accrued from this project. 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 and financial support.

The economic impact analysis infers that apart from natural capital, the project has progressively sustainable impact on the different capital of the micro market. It can be concluded that the envisaged EZ is sustainable and will help in uplifting the economic condition of the population in the area or residing in the project impact region.

In order to quantify this impact on the macro economic landscape of the country, Economic Internal Rate of Return (EIRR) is calculated. 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 20.96%, which indicates that the project is moderately attractive and would provide good returns.

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 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, Sri Lanka and Cambodia.

Benchmarking exercise highlights the fact that the proposed EZ at Bhola is competitive with respect to the benchmarked zones in terms of land lease rental, power tariff, and labour cost. Moreover, provision of facilities such as Water Treatment Plant and Sewage Treatment Plant within the stipulated area of the proposed zone also keeps it at par with the competing zones as most of these zones entail such facilities. Incentives offered by the GoB for investors in Bangladesh are also competitive as compared to most of the competing zones which may again prove to be advantageous for the proposed EZ. On the other hand, higher land lease premiums and utility tariff as compared to the competing zones may act as a catalyst in augmenting the project profitability as some of the benchmarked zones show such trend compared to the proposed EZ. Moreover, presence of ready-made social infrastructure in proximity to EZ could act as a catalyst to attract skilled human resources especially the expatriates. However, as stated in the Master Planning section, a land parcel has been earmarked for developing support amenities which can be used to establish vocational training centre, retail outlets and creche facility within the proposed EZ.

The demand assessment reveals that the demand for industrial land in the catchment will reach the level to support the development of EZ by FY'29 only. From the financial analysis it has been

observed that the project is financially feasible only when both offsite and onsite infrastructure is developed through assistance of the respective nodal agencies. BEZA should place the proposed EZ at Bhola under low priority[1] considering the low demand in the region and low financial return.

[1] Basis the demand assessment site which can commence operation after FY'27 are defined as low priority site for BEZA

2. Introduction

Bangladesh has been depicting sound growth with Gross Domestic Product (GDP) growth rate ranging over 6% in the last decade.[2] The country is taking rapid strides towards shaping up as a "developed economy" by 2041. Manufacturing sector outlook of Bangladesh is "factor driven" at present and the country specializes in production of basic products which are traditional and manpower oriented. The country aims to become efficiency driven economy in the future by focusing on efficient process and technology enablement to produce specialized products and to obviate the import dependency. Recent COVID-19 outbreak would have significant influence on this growth trajectory and in turn would cause slow-down in the short term.

So far, the growth trajectory of the country has been highly dependent on Ready Made Garments (RMG) and the export basket is not diversified. Govt. of Bangladesh (GoB) has realized that in order to shape up as developed economy, it is highly crucial to promote organized industrialization through diversification of manufacturing output. Economic Zone (EZ) development in the country is poised to promote inclusion of local supply chain, broadening the product portfolio, and increase export basket. This in turn shall enable a deeper rooted and inclusive growth for the economy in general.

Bangladesh Economic Zones Authority (BEZA) is the nodal agency and regulator of EZ development in the country. BEZA has embarked in an ambitious journey of proliferation of EZs within the country. To support the commitment of the government to develop EZs in Bangladesh, BEZA intends to undertake 12 independent pre-feasibility studies for setting up 12 Economic Zones in various locations.

Figure 1: Locations of the 12 Economic Zones

Name of EZ	Area (acres)
Araihazar	413.00
Bhola	**304.07**
Chandpur	3037.85
Gopalgonj	201.00
Jamalpur	402.66
Manikgonj	320.00
Nawabganj	874.0
Nilfamari	357.76
Panchagarh	580.00
Sitakundo	2369.00
Sylhet	255.83
Tangail	1761.85

Source: Contract agreement executed between PwC and BEZA dated 26th June 2019

This report captures pre-feasibility assessment of proposed EZ at Bhola.

As per the requirements of the terms of reference (ToR), details pertaining to team of consulting experts, project timelines (including list of deliverables), and broad outline of this engagement are furnished in the annexure.

[2] *As per World Bank data (constant price GDP data)*

3. Description of Site Location

Taking cues from similar EZs across the globe and basis opinions of various manufacturing sector players, it is imperative that a strategic EZ location should possess the following attributes-

- Good access to transport network to ensure smooth movement of input and finished goods
- Access to utilities (like Power, Water, and Natural Gas) to ensure continuous production activity
- Proximity to urban hubs ascertaining prevalence of social infrastructure

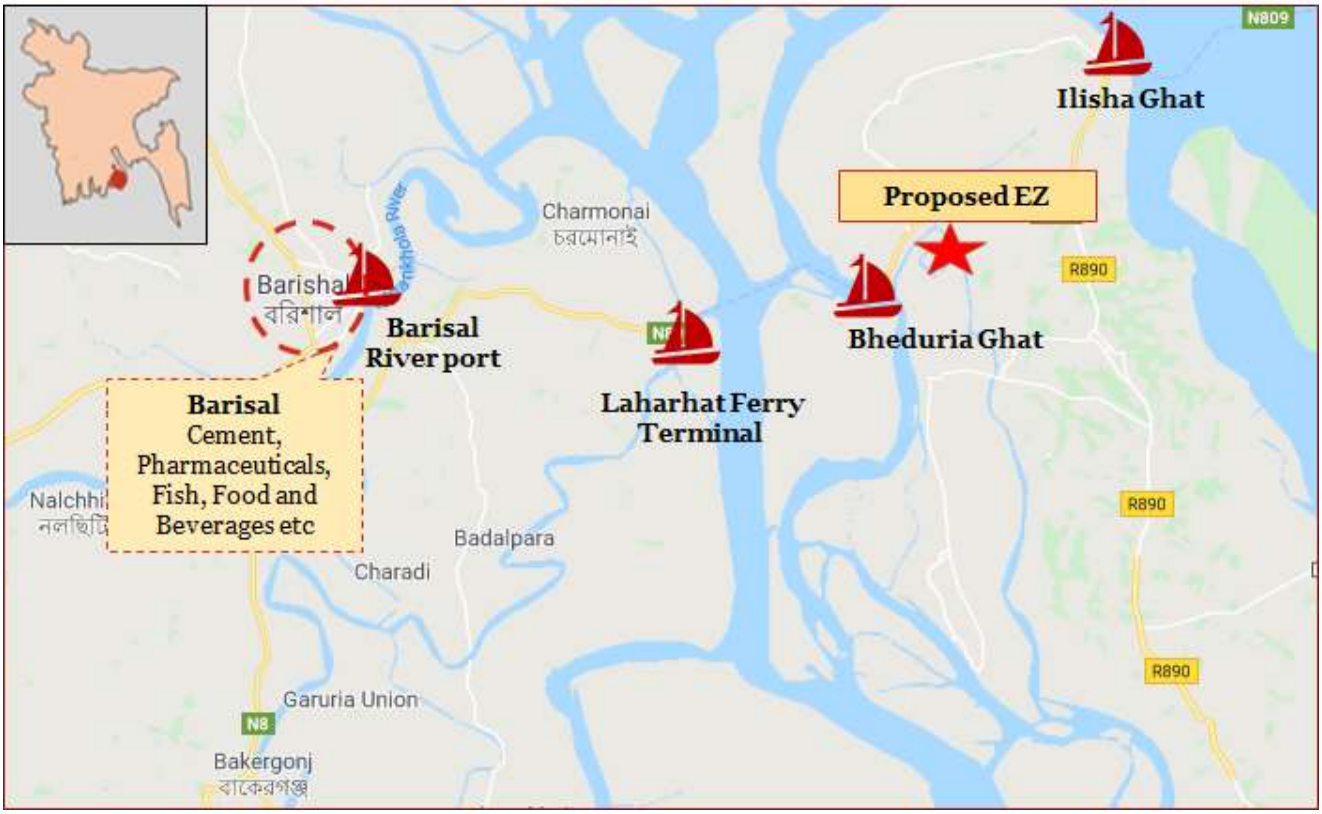
This chapter aims at assessing the key features of the proposed EZ to evaluate its adequacy to shape up as a prospective EZ location based on the above-mentioned aspects. This analysis is based on the information obtained through initial site reconnaissance and stakeholder consultation with various government departments.

3.1. Location of the Proposed EZ

Proposed EZ is located in Bhola Sadar Upazila of Bhola district in Barisal division. Bhola district is one of the biggest deltas in Bangladesh. It is located in the southern part of the country and three sides of the delta is surrounded by water. Regional landscape of Bhola district indicates that the economy is primarily dependent on agriculture and aquaculture.

Proposed EZ has no direct road connectivity to other parts of Bangladesh. It can be accessed only via IWT network. Proposed EZ is connected with multiple ferry ghats (such as Ilisha Ghat, Laharhat Ferry terminal, Bheduria ghat etc.) in the vicinity. This is a key feature of the proposed EZ as goods can be supplied to/ from the proposed EZ across the country through IWT network. Barisal (~53 km) is the nearest urban/industrial node from the proposed EZ which can provide steady demand and ready markets for the proposed EZ. Barisal river port is the second largest port and most important hub of steamer and motor launch services in southern Bangladesh.

Figure 2: Location of the Proposed EZ and Ferry/ IWT network in the vicinity



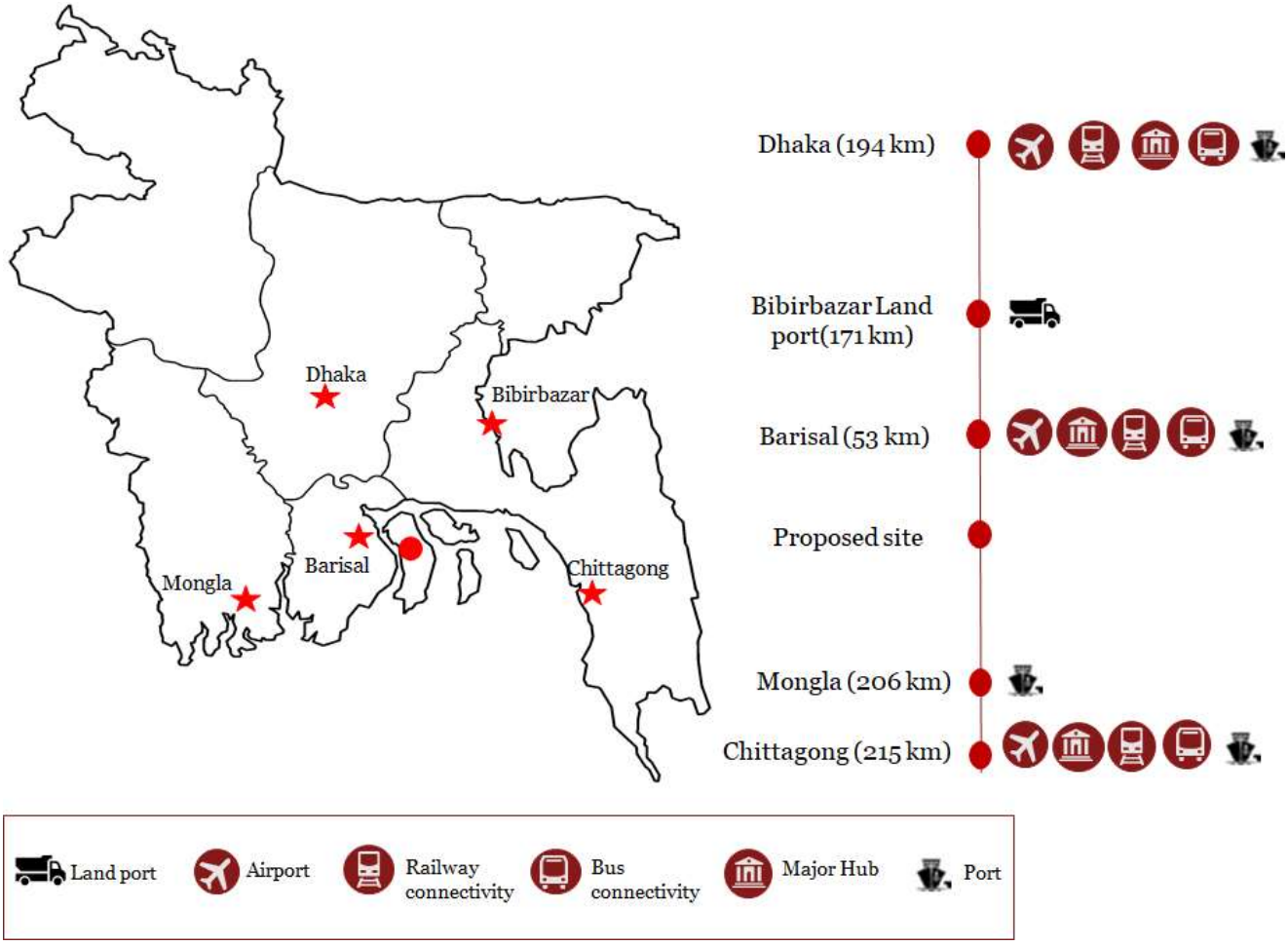
Source: Google Map and PwC Research

Bhola district is geographically different from other districts of Bangladesh. As a result, significant industrial development is yet to take place in this region. Lack of proper connectivity and adequate infrastructure are major constraints for industrial growth.[3] The region is rich in agricultural production such as rice, jute, potato, chili, cucumber, watermelon etc. Thus, development of food and beverages and agro-based industries is a possibility considering the agricultural resources available in the region. The same would be delved deeper in the industry assessment chapter. There is no organized industrial set up in this district. Some of the industries operating in the region are: rice mills, garments and textile, plastic, cold storage etc.

During the industry assessment, industries prevailing in the region would be further assessed to understand the possibility of forward and backward linkages.

Following figure captures the distance of the proposed EZ from various urban/ industrial nodes and EXIM gateways of the country.

Figure 3: Urban/ industrial nodes and EXIM gateways with respect to the proposed EZ



Source: Google Map and PwC Research

3.2. Context of the Region Surrounding Proposed EZ

As mentioned earlier, **the economy of Bhola district is primarily dependent on agriculture and aquaculture**. Major crops produced in this district are paddy, wheat, khesari, pulses, potato, sugarcane, onion and garlic. Betel leaf, betel nut and chilies are the main cash crops in this district. Major fruits such as mango, black berries, watermelon, amra, jackfruits, coconut, guava, palm, date palm and jambura are grown in this

[3] *http://www.bhola.gov.bd/node/112991/%E0%A6%AC%E0%A7%8D%E0%A6%AF%E0%A6%AC%E0%A6%B8%E0%A6%BE-%E0%A6%AC%E0%A6%BE%E0%A6%A3%E0%A6%BF%E0%A6%9C%E0%A7%8D%E0%A6%AF*

district. Fishing activities are undertaken in Meghna and Tetulia River. According to local inhabitants, around 30% of hilsa fish of Bangladesh is produced in Bhola. Dairy industry is predominant in this district and milk based products (such as ghee, paneer, curd etc.) are supplied to other parts of Bangladesh. Several small and medium scale industries are operating in this region. Some industries operating in this area are: rice mill, fish net, garments and textile, plastic, wax, shoes, hatchery, cold storage etc.

Details of the regional profiling including assessment of the local sourcing of input materials (thus the possibility of forward and backward linkages) have been captured in the industry assessment chapter.

3.3. Location Reconfirmation

Post site visit, based on primary data collected, location and demarcation details of the proposed EZ have been reconfirmed.

Table 3: Location reconfirmation for the proposed EZ

Parameters	Details
Site co-ordinates	22°40'25.09"N 90°35'36.44"E
Site boundaries on East	Settlements followed by agricultural land (single and double cropping), village road, and water channel
Site boundaries on West	Settlements followed by agricultural land (single and double cropping), village road, Banker Hat Co-operative College, market and Masjid.
Site boundaries on North	Zila road (connecting regional highway R890) followed by settlements and agricultural land.
Site boundaries on South	Settlements followed by agricultural land (single and double cropping)
Total area of the site	304.07 acres
Privately owned land	304.07 acres
Government Land/ Khas land	0.00 acres
Current land use pattern	Agricultural (single and double cropping pattern)
Resettlement within the site	There are settlements within the proposed EZ area; Suitable mitigation strategy for resettlement and rehabilitation is proposed in the social review section of this report.
Nearest administrative node/ town	Bhola Sadar
Expansion potential	• East: May not be possible as settlements and agricultural land (single and double cropping) is present • West: May not be possible as settlements and agricultural land (single and double cropping) is present; in addition, there is a Masjid located in the western side • North: Not possible due to the presence of Zila road • South: May not be possible as settlements and agricultural land (single and double cropping) is present Since the proposed EZ is immediately surrounded by Zila road on the North side and settlements on other three sides with agriculture land pockets present on all sides hence the expansion potential is very

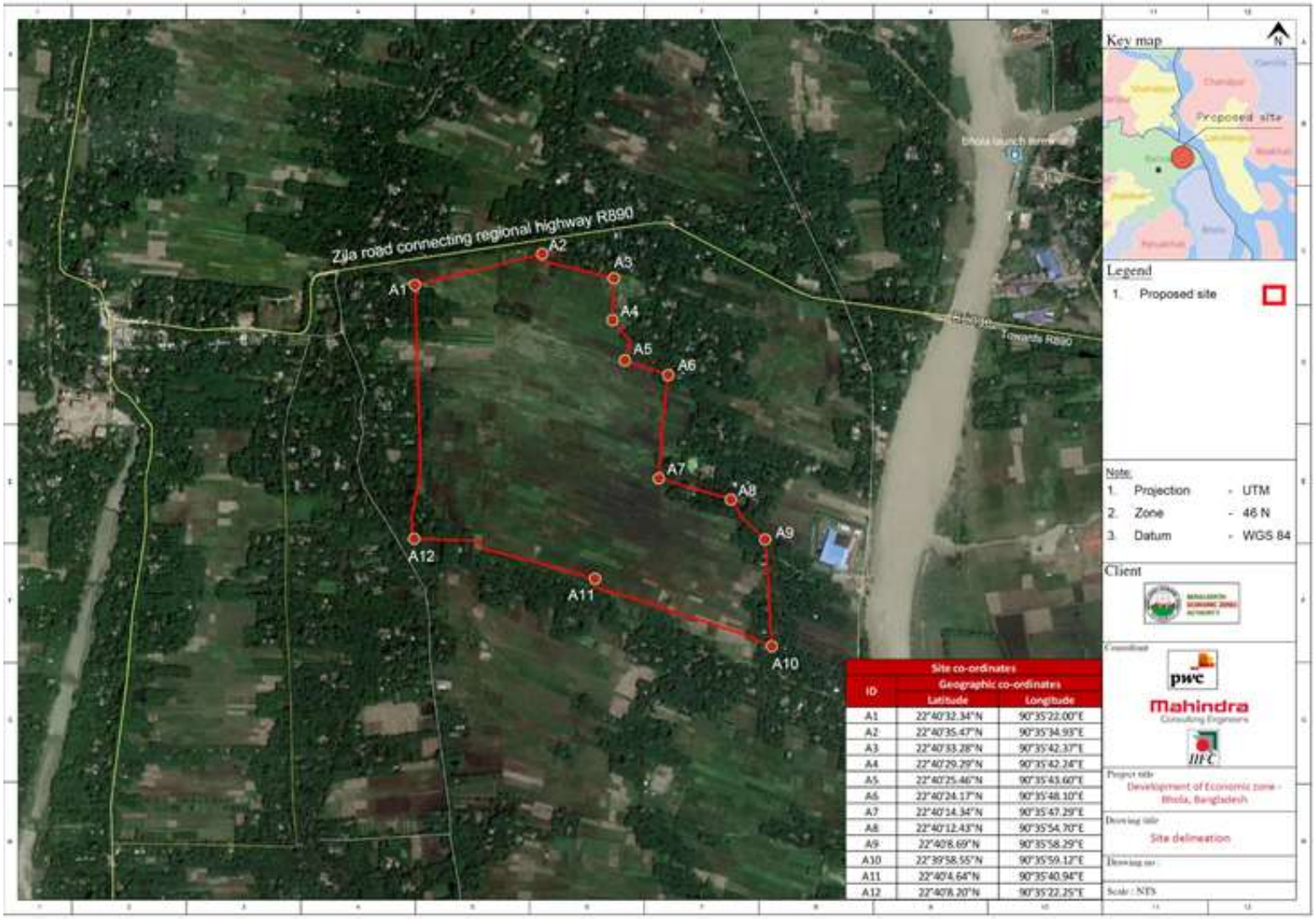
Parameters	Details
	minimal and is subjected to land survey, rehabilitation and retaining of major road network and the settlements in the region.
Site surrounding features	• Ganeshpura river (tributary of River Meghna) is located at ~2 km from the proposed EZ • Bheduria ghat (~ 5 km) • Ilisha ghat (~17 km) • Several small and medium scale industries (such as fish net, garments and textile, plastic, wax, shoes, hatchery, cold storage etc.) are operating in this region

Source: Information obtained from Site visit and MACE Analysis

Since majority of the land parcel is privately owned, significant cost and time would be consumed for land acquisition activities. Details of the same are captured in the social review section of this report.

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

Figure 4: Site boundary of the proposed EZ



Source: Information obtained from Site visit and MACE Analysis

3.4. Access to Transport Network

For any location to shape up as a potential EZ, access to multimodal connectivity is an important feature. In this report, a holistic review of the transport network has been undertaken; details of the same are captured in the transport assessment chapter of this report. Following table captures the details of various modes of transport with respect to the proposed EZ.

Table 4: Assessment of transport infrastructure

 **Highway connectivity**	• Currently, there is no direct road connectivity to the proposed EZ. It is connected to other parts of Bangladesh via Ferry and IWT. • Nearest highway connectivity is Bhola-Barisal highway (N809) which is ~30 km from the proposed EZ. It is connected via Bhola-Burhanuddin-Lalmohon-Char Fassion-Char Manika road (R890) which includes a ferry ride (~9 km) from Bheduria ghat (~20 km) to Laharhat ferry terminal. • N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). • The proposed EZ is connected to Chittagong (~215 km) via Laxmipur which includes ferry ride (~27 km) from Ilisha ghat (~17 km) to Moju Chowdhury Hat launch ghat.
 **Last mile connectivity with nearest highway**	• The northern side of proposed EZ is adjacent to zila road (LGED road) and it does not require a separate access. It is connected to Bheduria ghat via R890. • Adequacy of the zila road and R890 to cater to the increased traffic movement and the possibility of widening (once this EZ is operational) is evaluated in the transport assessment section.
 **Rail connectivity**	• Currently there is no rail network in the vicinity of the proposed EZ. • GoB is envisaging development of rail node in Barisal (~53 km) by connecting rail lines from Faridpur to Barisal through Padma Multipurpose Bridge.[4]
 **Air connectivity**	• Barisal Airport (~53 km) is the nearest airport to the proposed EZ. This airport can be accessed via Barisal-Bhola highway (N809) and Dhaka-Barisal highway (N8) including a ferry ride
 **Sea Port and IWT connectivity**	• Being an Island district, Bhola is connected with the rest of Bangladesh through IWT network. • Proposed EZ is connected to multiple ferry ghats (such as Ilisha, Laharhat, Lalmohan, Bheduria ghats etc.) in the vicinity. • This IWT network can be planned to develop in an organized manner to foster movement of goods to/ from the proposed EZ to the rest of the country. The same is analyzed in detail in the transport assessment section.

[4] *https://www.daily-sun.com/post/113605/Govt-moves-to-set-up-BhangaBarisal-rail-link*

		• Nearest river port is Barisal river port (~53 km) and is accessible from road via R890 and N809. Chandpur river port (~98 km) is accessible from road via R890 and Comilla-Chandpur-Begumganj Road (R140). • These river ports are port of call for the Protocol on Inland Water Transit and Trade (PIWTT) between India and Bangladesh which facilitates movement of passenger and cargo between the two countries. • Mongla Sea port (~206 km) can be accessed via N809, N8 and further through Dhaka-Khulna highway (N805) and Khulna-Mongla highway (N7). • Chittagong Sea Port (~215 km) can be accessed via N809, R140 and Dhaka-Chittagong highway (N1).
	Land Port Connectivity	• Bibirbazar land port (approx. 171 km) is the closest land port and can be accessed by R890, N809 followed by R140 and further through Comilla-Bibir bazar road. • This land port (although at a considerable distance from the proposed EZ) provides the proposed EZ with cross-border trade opportunities with India.

Source: Data collected during site visit and secondary research

3.5. Utility Linkages

Availability of utilities is most critical to support day to day 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 three baskets i.e. power, water, and gas. It is important for industries to have uninterrupted access to utility sources to facilitate manufacturing.

Table 5: Assessment of utility linkages

	Power availability	• During preliminary site assessment, it was observed that the nearest power source is Bangla bazar sub-station (~18 km). This sub-station has a total capacity of 20 MVA and surplus capacity of ~4 MVA • This can be relied as a source of power supply to meet the power requirements of the initial construction activities (approx. 4 MVA) for proposed EZ. • There is a 230 KV grid substation in Burhanuddin (~30 km) having a capacity of 225 MVA. • Total power demand during operation stage is around 26 MVA.
	Water availability	• River Ganeshpura (tributary of River Meghna) which is located at around 2 km can act as surface water for the proposed EZ. • The Groundwater depth in the region of the proposed EZ varies between 200 to 300 ft. • Estimated water demand is approx. 7 MLD
	Gas availability	• Nearest gas station is Bhola gas station (~10 km) in Bhola Sadar Upazila.

		• Assessment of gas requirement and adequacy of the gas sources is undertaken in the master planning section.
	Others	• Grameen Phone, Rabi & Banglalink provide telecom connectivity in this region • Presently, there is no wastewater treatment facility and solid waste management facility in the vicinity of the proposed EZ.

Source: Data collected during site visit and secondary research

3.6. 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. Access to of educational institutes determine the availability of skilled local manpower; quality of medical facilities determine whether skilled manpower can be brought in from outside to work at a place or not. Hence, it is important to understand social infrastructure available in Bhola district.

Table 6: Prevailing social infrastructure

	Educational facilities	• There are over 400 schools (primary, secondary) and 16 colleges in Bhola sadar upazila. • International quality educational facilities are not available in this upazila and in Bhola district. State of the art educational facilities are available in Barisal (~53 km) and Dhaka (~194 km). • There is a total of 71 Technical and Vocational Education and Training (TVET) institutes operational in the Bhola district. These institutes can help in sourcing semi-skilled human resources for the proposed EZ. • Industries in the proposed EZ may consider customizing the courses in the TVETs to suit to the industrial requirements, this shall facilitate in easy sourcing of human resources.
	Medical facilities	• There are 1 Upazila Govt. Hospital (100 Bed facility), 1 Khayerhat Health Centre (10 bed facility), 14 family planning centers in Bhola sadar upazila. • There are 7 Government health complex, 25 diagnostic centers and 9 private clinics in Bhola district. • Basic healthcare facilities are available in these medical units however state of the art medical facilities can be availed in Barisal (~53 km) and Dhaka (~194 km).

Source: Data collected during site visit and secondary research

3.6.1. Voice on Ground about the Location

Stakeholder consultations conducted as part of our mandate has captured the opinion formed by local (Bhola and regional level) and national (Bangladesh level) investors/ other stakeholders about the locational attributes of the proposed EZ.

Local agro based industry owner	"Since land parcels demarcating these EZ locations are mostly private owned land, significant lead time would be required to kick start this project."

Local Govt. stakeholder	"Bhola and the surrounding regions are connected to the mainland Bangladesh through IWT network, thus the Govt. should look at developing connectivity infrastructure in this region in order to develop industries here"
Local cold storage owner	"Agriculture and aquaculture are the two main occupation of the area thus industries in these two sectors has the potential to flourish here"
National ceramic industry player	"The region has access to gas which is an important pre-requisite for the ceramic and non-metallic industry, thus if land price is cheaper in the proposed EZ such kind of sectors may be interested to shift to the EZ; but connectivity remains an issue."

Source: Primary stakeholder consultations

Industry assessment chapter captures in detail the opinions shared by various industry players on the locational attractiveness of the proposed EZ.

3.7. Key Takeaways

- Proposed EZ is spread across an area of 304 acres, out of which 207.46 acres is privately-owned and the remaining is government land. This shall pose a significant challenge in terms of land acquisition. Further assessment on the same is undertaken in the social review section.
- Proposed EZ has no direct road connectivity to other parts of Bangladesh but it is well connected with the IWT network.
    - Barisal-Bhola highway (N809) is the nearest highway which is ~30 km from the proposed EZ which includes a ferry ride (~9 km) from Bheduria ghat.
    - Currently, there is no rail network in the vicinity of the proposed EZ.
    - Mongla and Chittagong seaports are located at ~206 km and ~215 km respectively and are connected via Ferry and IWT network.
- Proposed EZ has good access to power and water sources.
    - Bangla bazar substation (~18 km) can be used for sourcing initial power requirement during construction stage. There is 230 kV grid substation at Burhanuddin (~30 km) which can act as the sources of power during operation stage.
    - River Ganeshpura (~2 km) is the nearest surface water source and ground water is available at a depth of 200 to 300 feet.
    - Nearest gas station is Bhola gas station (~10 km) in Bhola Sadar Upazila.
- Basic social infrastructure is available in Bhola Sadar upazila and in Bhola district, which can cater to the needs of semi-skilled and unskilled labour. It is recommended that a vocational training center and medical facility be established in the non-processing area of the proposed EZ.

4. Competition Benchmarking

4.1. Key Objectives

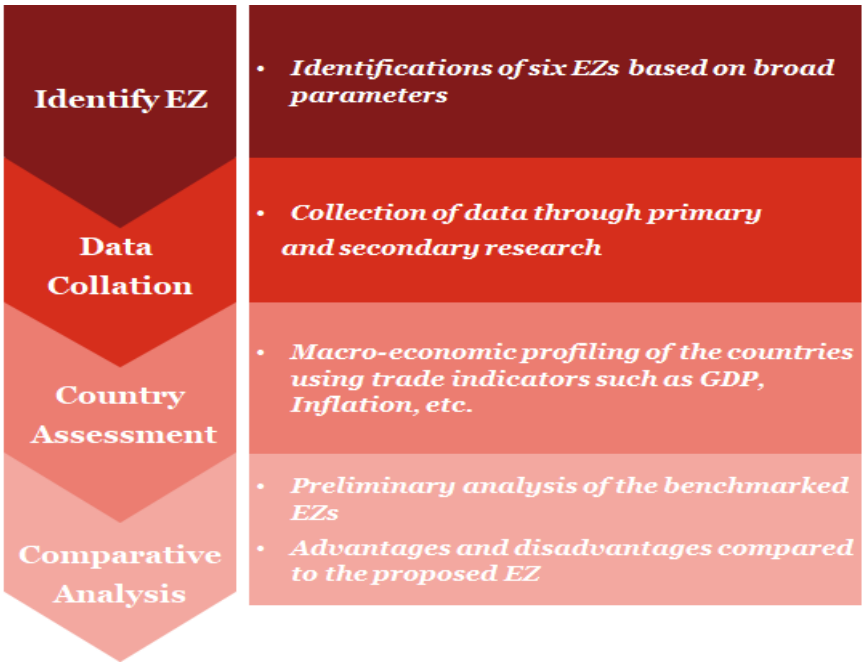
It is imperative for any economic development project across geographies to understand the prevalent best practices in a particular landscape. Thus, the success of an economic zone can often be co-related with similar developments across comparable economies around the globe. Moreover, at the inception stage, a developer, whether Government or private should be well acquainted with the best practices and key drivers of the economic zones that have been successfully fulfilling their potential across the world. In order to gain that knowledge, studying and understanding of the development strategies of other economic zones becomes crucial from the perspective of imbibing and applying 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.

4.2. Methodology of Benchmarking

The benchmarking exercise has been conducted through extensive research which entailed primary interactions with developers of economic zones supported by detailed secondary research, etc. An illustration for the flow of the benchmarking exercise has been depicted below:

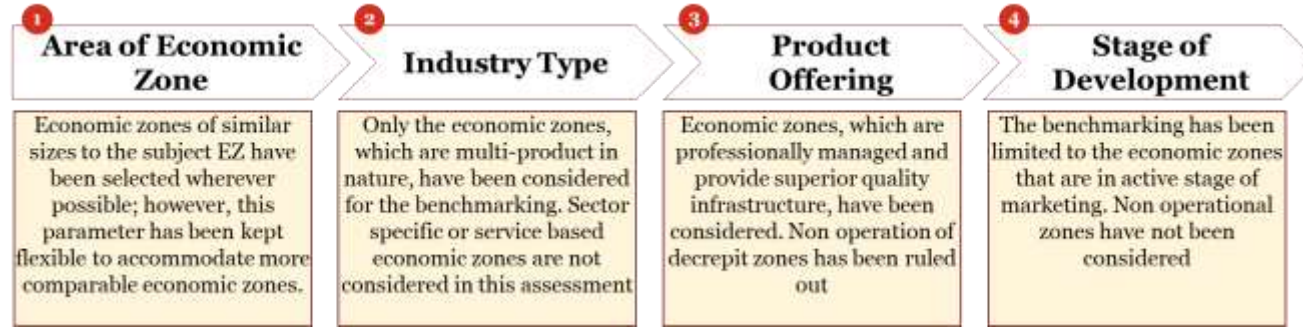
Figure 5: Benchmarking Methodology



Source: PwC Analysis

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

Figure 6: Selection criteria for economic zones for benchmarking



Source: PwC Analysis

The data obtained through primary interactions (telephonic, email correspondence etc.) have been further validated through detailed secondary research in order to ensure data adequacy and accuracy.

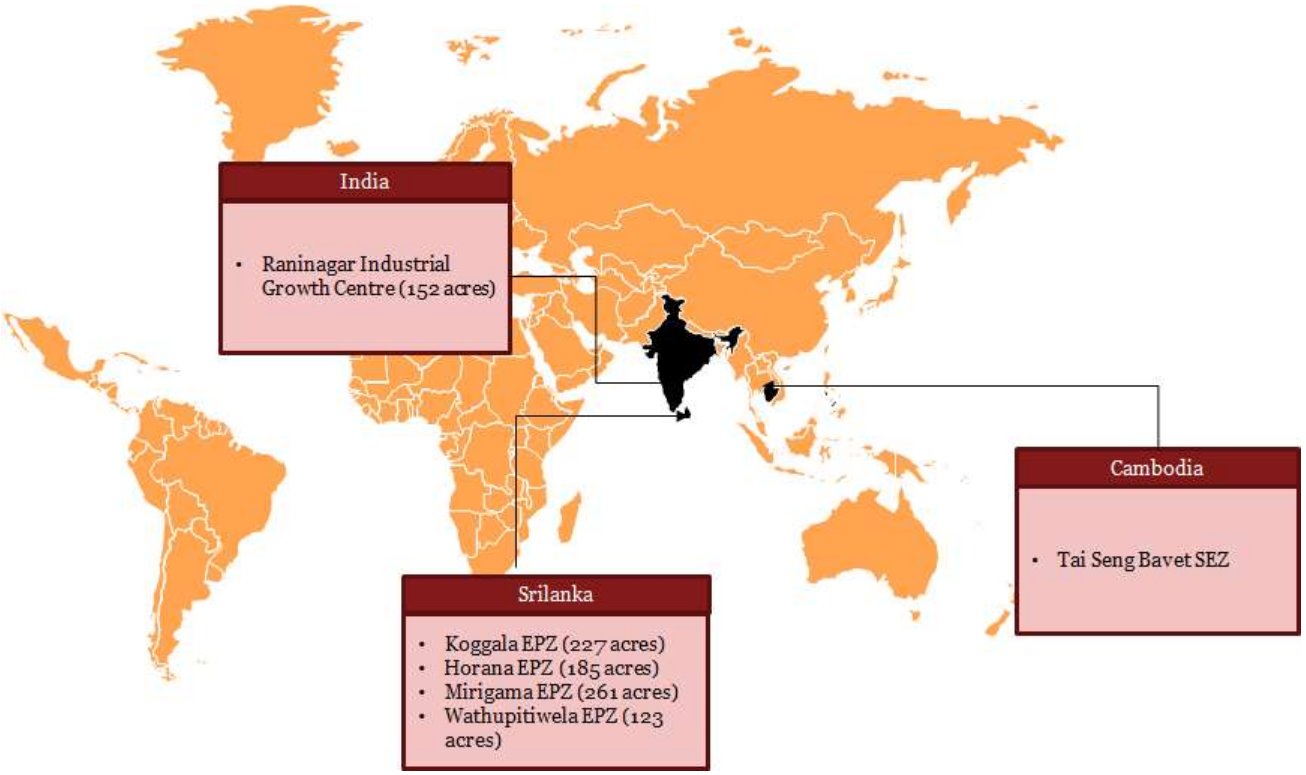
Post receipt of all data points a brief macro-economic profiling of the respective countries has been conducted to assess their economic landscapes.

Finally, a comparative assessment of all these EZs have been done keeping the proposed Bhola EZ in cognizance in order to pinpoint and understand the best practices.

4.3. Competitor Identification

The subject economic zone is located in Bhola, Bangladesh and is envisaged to cover a **land area of 304 acres.** Based on extensive research and the parameters as highlighted above, the following economic zones have been identified in the figure shown on next page.

Figure 7: Geographic Spread of Comparable EZ



Source: PwC Research

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

Table 7: Brief Overview of Shortlisted SEZ

Name of economic zone	Country	Type of industries	Business Model	Land Area	Rational
Raninagar Industrial Growth Center	India	Food & Beverages, Petroleum Products, Plastic Products, Poultry Feed	Government	152 acres	• Area(s) of these shortlisted EZs are smaller in size as the proposed EZ • All the shortlisted EZs are multi-product in nature and industrial mix is similar to the proposed EZ • All these shortlisted EZs are at active stage of marketing • Macro-economic conditions of the shortlisted countries are similar to that of Bangladesh
Koggala Export Processing Zone	Sri Lanka	Apparels, Textiles, Plastic and Rubber, Footwear, Light Engineering	Government	227 acres	
Horana Export Processing Zone	Sri Lanka	Apparels, Textiles, Chemicals, Furniture, FMCG	Government	185 acres	
Mirigama Export Processing Zone	Sri Lanka	Chemicals, Textiles & RMG, Machinery and Equipment, Plastics, Paper and Paper board articles, Gems	Government	261 acres	
Wathupitiwela Export Processing Zone	Sri Lanka	Knitting, Textiles & RMG, Food processing, Agro based products, Plastic and rubber, Light machinery, Fertilizers	Government	123 acres	
Tai Seng Bavet SEZ	Cambodia	Bicycle manufacturing, footwear manufacturing, garment manufacturing industries	PPP	~190 acres	

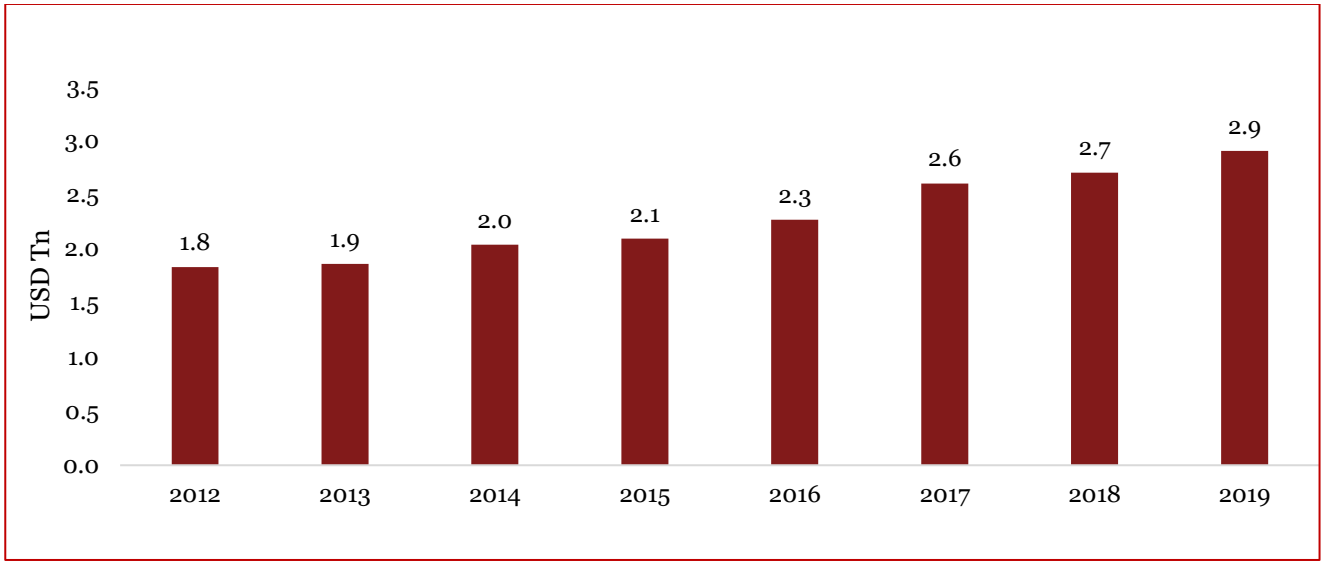
Source: PwC Research

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 to understand the best practices in similar economy and geography. Apart from shortlisted EZ/EPZ mentioned above detailed profiling of Adamjee EPZ has been done to understand existing regime in the country and micro market. The detailed case study has been furnished in annexure 3.

4.3.1. India

India is one of the largest and oldest trade partners of Bangladesh and shares longstanding trade and cultural relationships with the country. India also shares its longest internationals borders with Bangladesh. India has emerged as one of the fastest growing economies of the world and registered healthy GDP growth rates during the first decade of the 2000s. This has promoted the country towards the verge of being one of the strongest economies of South Asia. **Data used for the analysis is the latest data point available in the respective database.**

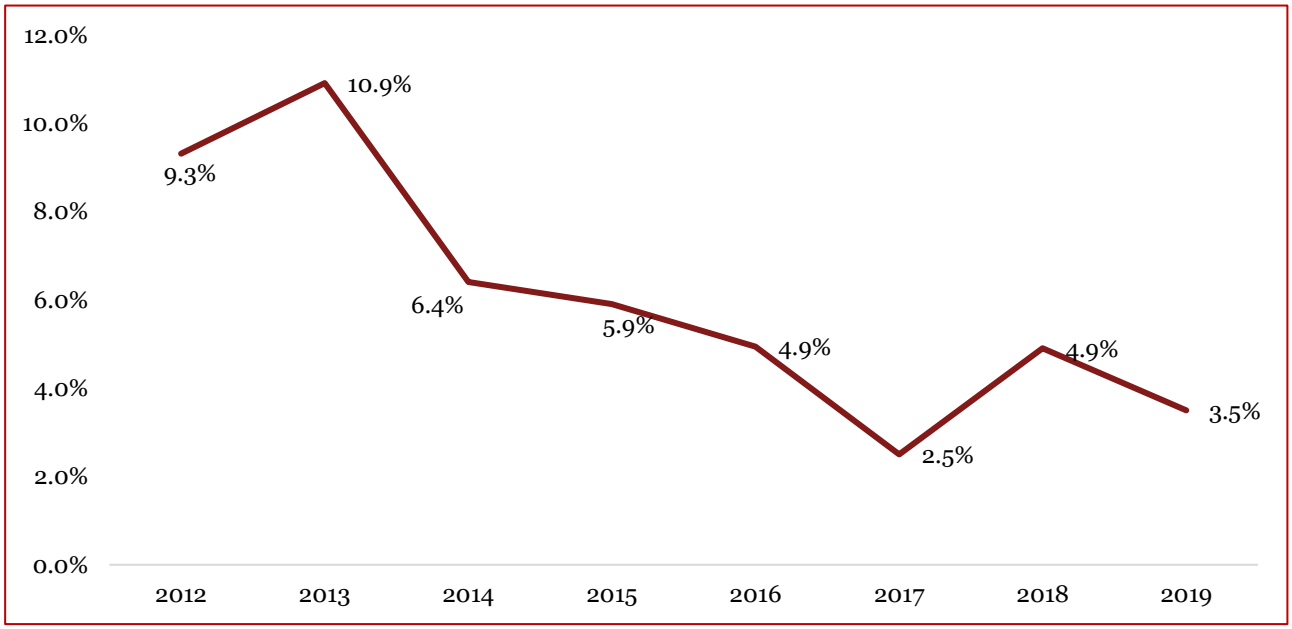
Figure 8: GDP Trend of India



Source: World Bank

Inflation rates in India have improved post a surge 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 9: Inflation Trend of India



Source: World Bank (https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?end=2018&locations=IN&start=2012)

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

Table 8: Macro-economic Parameter of India

Macroeconomic Indicator	Description	Data Source
Unemployment	2.6%	The Heritage Foundation
FDI Inflow	USD 42.12 Billion	The World Bank
Exports	USD 322.78 Billion in 2019	ITC Trade Map
Imports	USD 480 Billion in 2019	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	120	The Heritage Foundation 2019
Cato Institute's Human Freedom ranking	94	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	68	Global Competitiveness Index 2019 rankings
WB Doing Business ranking	63	Doing Business 2020

Source: PwC Research

India was a restricted economy pre-1990s. Economic liberalization measures like industrial deregulation, privatization of state-owned enterprises and reduced controls on foreign trade and investment began in the 1990s and liberated the economy from a longstanding regime of regulations. The country since then has gradually become a more open market economy from a largely regulated and restricted one. The introduction of Goods & Services Tax (GST) was a paradigm shift in its taxation regime. This is evident in the ease of doing business ranking where the country improved its standings from 100 in 2018 to 63 in 2020.

However, a push in infrastructure development together with increased public spending and initiatives such as "Make in India" has helped India gain significantly on the economic competitiveness front and become a leader amongst South Asian economies.

Post identification of the various macro-economic parameters of India, the subsequent section of the report intends to highlight the various attributes of Raninagar Industrial Growth Center.

4.3.1.1. Raninagar Industrial Growth Center

The Raninagar Industrial Growth Center is located in the state of West Bengal in the eastern part of India. It is promoted by the West Bengal Industrial Infrastructure Development Corporation which is the nodal agency for the state of West Bengal for industries. This growth center is home to a number of industries including reputed brands Hindustan Coca Cola Beverages (HCCB) and Indian Oil.

Figure 10: Raninagar Industrial Growth Center

Source: Google Images

A detailed profiling of the park has been provided below –

Table 9: Raninagar Industrial Growth Center

Factors	Raninagar industrial growth center
Site	
Year of establishment/Start year of operations	It was established in 1989
Land Size (acres)	152 acres
Number of Plots/Units/Firms	Currently there are 27 industrial units operating in the growth center; there is only 3 acres of land which is available for allotment[5]
No. of Development Phases	The developments have been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	Industrial land lease premium for 99 years is USD 32,394 /acre (BDT 2.75 Mn/acre) [6]
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 in the product mix
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone Power is supplied by WBSEDCL
Cost of Power (Taka/USD)	The cost of power is approx. USD 0.11 / KwH (BDT 9.34/KwH) for industries[7]

[5] *Source: https://www.wbiidc.org/raninagar.php*
[6] *Source: http://www.wbidc.com/industrial_parks/available_land.htm*
[7] *Source: https://www.wbsedcl.in/irj/go/km/docs/internet/new_website/pdf/Tariff_Volumn/PDFsam_mergetariff2.pdf*

Factors	Raninagar industrial growth center
Cost of Water (Taka/USD)	The cost of industrial water is approx. USD 0.28 /KL (BDT 23.79/KL)[8]
Onsite Wastewater Treatment Plant (Y/N)	There is no onsite water treatment plant since industries within the zone typically have their own treatment plant
Transport costs	
Cost of shipping 20-foot FCL container shipping to Kolkata[9]	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Kolkata → USD 1,644-1,817 • Rotterdam – Kolkata → USD 1,628-1,799 • Antwerp – Kolkata → USD 1,660-1,834 • New York – Kolkata → USD 1,770-1,956
Cost of Labour (Taka/USD)	
Management	The salary for a management professional in West Bengal is approx. USD 1,373 / month (BDT 116,632/month)[10]
Technicians	The average salary for a technician in West Bengal approx. USD 250 / month (BDT 21,237/month)[11]
Skilled	The minimum wage for a skilled labour in West Bengal approx. USD 147 / month (BDT 12,487/month)[12]
Unskilled	The minimum wage for an unskilled labour in West Bengal approx. USD 110 / month (BDT 9,344/month)[13]
Sectors	
Type of Sectors within the Zone	Beverages, Agro processing, plastic products, petroleum, LPG bottling plant
Special Regime	
Yes/No	**No**, there's no special regime for incentives
Fiscal Incentives	
Customs Duties	As per the Industrial policy of West Bengal, there are no incentives on custom duties. However, there could be sector specific incentives
Corporate Taxes / Indirect Taxes	As per the Industrial policy of West Bengal, there are no separate incentives on corporate taxes. However, there are a few sector specific incentives available.
Income Tax on Profits	There is no incentive on income taxes as per industrial policy. However, there could be incentives based on sector of industries.
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[14].
Others	• 100% of Electricity Duty subject to the maximum ceiling of INR 25 lakhs / year / INR 1.25 crores in 5 years (USD 38,450 / year to USD 192,250 in 5 years) • An eligible unit in the medium and large sector will be entitled to reimbursement to the extent of 80% of contribution towards Employee Provident Fund and Employees' State Insurance • Industries shall be eligible for 75% of refund of stamp duty

[8] *Source: Interactions with WBIIDC officials*
[9] *Source: https://worldfreightrates.com/freight*
[10] *Source: http://www.averagesalarysurvey.com/calcutta-india*
[11] *Source: https://www.payscale.com/research/IN*
[12] *Source: https://wblc.gov.in/sites/default/files/upload/min_wages/january-2020/300.pdf*
[13] *Source: https://wblc.gov.in/sites/default/files/upload/min_wages/january-2020/299.pdf*
[14] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

Factors	Raninagar industrial growth center
	• Anchor unit subsidy of INR 100 lakh (USD 153,800) shall be offered for the first two manufacturing enterprises with minimum employment of 100 members and minimum investment of INR 50 Crore (USD 7,690,000) • Industrial units will be encouraged for filing their successfully generated, registered and accepted patents based on their original work/research. The State Government will provide financial assistance of 50% of the expenditure incurred, up to a maximum of INR 2 lakh (USD 3,076), / patent. The expenditure incurred will include the amount spent on filing of patent, attorney fees, patent tracking etc. • 75% waiver of fees incurred towards land conversion charges
Non-Fiscal Incentives	
One Stop Shop Within the Zone	One stop shop is not available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no onsite convenience retail available within the zone
Onsite Housing	There is onsite housing available within the zone
Onsite Schools	There are no onsite schools available inside the zone
Onsite Community Facilities	There are no onsite community facilities available within the zone.
Onsite Security	There is onsite security available at the zone.
Quality of Life	
International Housing (Within 15 Km)	Quality housing facilities are available in the nearby town of Jalpaiguri
International Hospital/Clinic (Within 20km)	Quality healthcare facilities like Jalpaiguri District Hospital is available in proximity to the economic zone
International Schools (Within 20 Km)	Various upscale schools like Holy Child School, Techno India Public School etc. are present in proximity to the economic zone

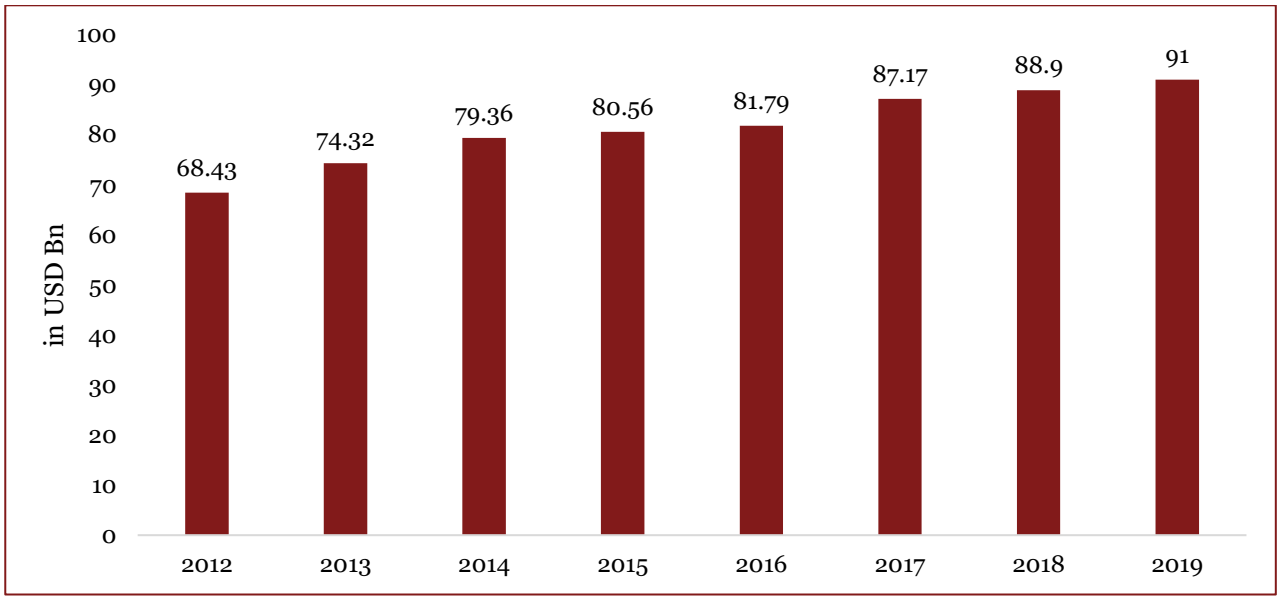
Source: PwC Research

The industrial park is an important Trade Centre due to its proximity with North-East states. Since the industries in the Growth Centre are majorly small to medium scale industries, they source their raw material from nearby locations and have their distribution centers in neighboring districts of North Bengal and other states in North East like Assam and Sikkim.

4.3.2. Sri Lanka

Sri Lanka is an island nation situated to the southern tip of India. The country is also an emerging economy like Bangladesh and has a thriving garments sector. Sri Lanka's economy had suffered for a prolonged period from civil unrest, however recent times have witnessed the economy reviving on the back of strong domestic demand and exports. The major exports of the country are tea, garments, fish, spices, etc. The Government of Sri Lanka in a bid to attract foreign investments have also developed Export Processing Zones in the country and are also providing prudent incentives. The GDP growth of Sri Lanka has been depicted below. **Data used for the analysis is the latest data point available in the respective database.**

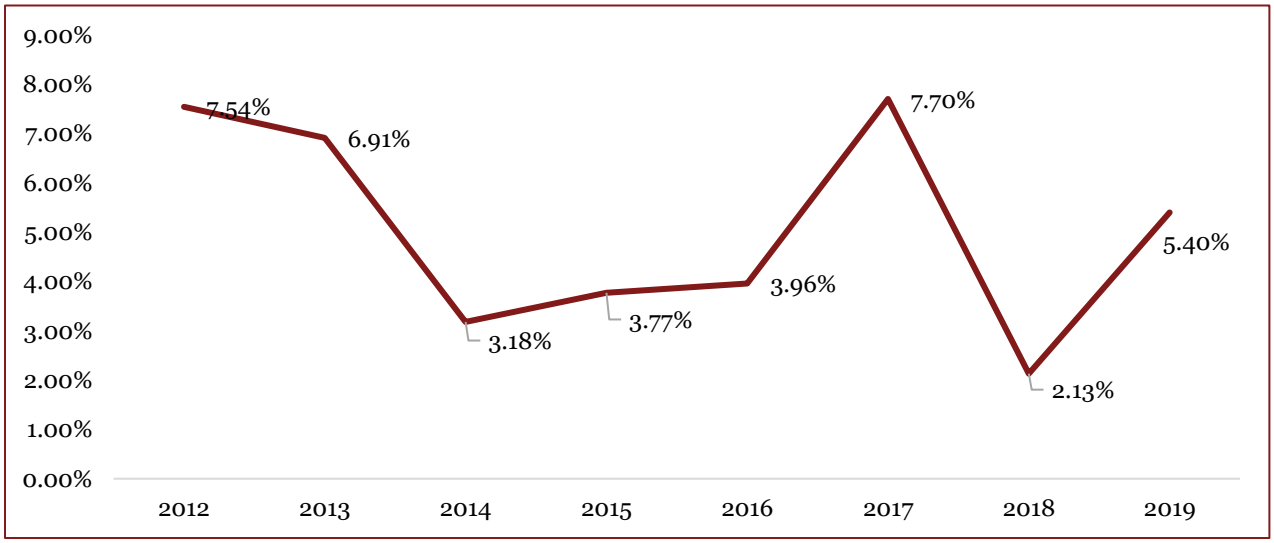
Figure 11: GDP of Sri Lanka



Source: World Bank

Post the political unrest in Sri Lanka, the inflation rates have experienced a sinusoidal curve of rise and decline steeply over the past one year on account of natural disasters like cyclone which resulted in escalation of food prices. The increase in charges like VAT has also adversely impacted the inflation trend adversely. **Data used for the analysis is the latest data point available in the respective database.**

Figure 12: Inflation Trend of Sri Lanka



Source: World Bank

The other broad level economic parameters of the country have been depicted below –

Table 10: Macro-economic Parameter of Sri Lanka

Macroeconomic Indicator	Description	Data Source
Unemployment	4.4%	The Heritage Foundation
FDI Inflow	USD 1.6 billion	The World Bank
Exports	USD 11.1 billion	ITC Trade Map
Imports	USD 15.8 billion	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings	112	The Heritage Foundation
Cato Institute's Human Freedom ranking	110	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	84	Global Competitiveness Index 2019 rankings
WB Doing Business ranking	168	Doing Business 2020

Source: PwC Research

The economy of Sri Lanka is transitioning from being predominantly rural-based to urban economy-oriented around manufacturing and services. The government is implementing fiscal reforms, improving public financial management, increasing public and private investments, addressing infrastructure constraints and improving competitiveness. Sri Lanka has made significant improvements in human development. The country's Social indicators rank among the highest in South Asia and compare favorably with those in middle-income countries. The national poverty headcount ratio declined from 15.3% in 2006/07 to 6.7% in 2012/13[15] although disparities still remain within the country.

Post analysis of the broad macro-economy of Sri Lanka, an analysis of the shortlisted EZs has been provided in the subsequent sections.

4.3.2.1. Koggala Export Processing Zone

Koggala Export Processing Zone is located in the Galle district in the Southern province of Sri Lanka, ~ 125 km away from Hambantota Port and ~ 13 km from Galle Port. It enjoys direct road connectivity with both these trade gateways of the country. Koggala EPZ was established in 1991 on a land area of 227 acres of which 195 acres are industrial land. The advantages of the Zone for enterprises are the security, lighting, excellent communication as well as power supply and the availability of ground water. In addition, there is a centralized administrative complex linked to the relevant departments of the BOI as well as other important facilities such as customs, banking, postal, medical and port cargo handling services.

[15] *Source: World Bank*

Figure 13: Koggala Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided below:

Table 11: Koggala Export Processing Zone, Sri Lanka

Factors	Koggala Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1991
Land Size (acres)	227 acres
Number of Plots/Units/Firms	According to the existing master plan there are approximately 60 industrial plots within the zone[16] There are 23 operational industrial units in the zone[17]
No. of Development Phases	The development has been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 5,130 / acre / annum (BDT ~0.44 Mn/acre/annum)[18]
Pre-Built Factories (PBF) (Y/N)	There are no PBF available 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 as a part of the product mix
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)	For Industries with demand less than or equal to 42 KVA the cost of power is as follows:

[16] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Koggala-Export-Processing-Zone.pdf*
[17] *Source: https://www.lankabusinessonline.com/sri-lankas-koggala-epz-earns-usd122-mn-in-2017/*
[18] *Source: http://investsrilanka.com/location/koggala-epz/*

Factors	Koggala Export Processing Zone
	• For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[19] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[20] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[21] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[22] • During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[23]
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.40/m3 (BDT 34/m3)[24]
Onsite Wastewater Treatment Plant (Y/N)	There are centralized wastewater treatment facilities available
Transport costs	
Cost of shipping 20-foot FCL container[25]	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Hambantota port → USD 650-1,050 • Rotterdam – Hambantota port → USD 650-1,160 • New York – Hambantota port → USD 800-1,914
Cost of Labour (Taka/USD)	
Management	The average salary for a manager is approx. USD 800/month (BDT 67,957/month)[26]
Technicians	The average salary for a technician is approx. USD 280/month (BDT 23,785/month)[27]
Skilled	The average salary for a skilled labour is approx. USD 112/month (BDT 9,514/month)[28]
Unskilled	The average salary for an un-skilled labour is approx. USD 80/month (BDT 6,796/month)[29]
Sectors	
Type of Sectors within the Zone	Apparels, Textiles, Plastic and Rubber, Footwear, Light Engineering
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	• Exemptions of Customs Duty on capital goods and raw materials. • Non-export-oriented companies are entitled to import project related capital goods free of Customs Duty.
Corporate Taxes / Indirect Taxes	• Exemption of tax on dividends. • Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.
Income Tax on Profits	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.
Social Security Tax	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of

[19] *Source: http://www.ceb.lk/for-your-business/*
[20] *Source: http://www.ceb.lk/for-your-business/*
[21] *Source: http://www.ceb.lk/for-your-business/*
[22] *Source: http://www.ceb.lk/for-your-business/*
[23] *Source: http://www.ceb.lk/for-your-business/*
[24] *Source: http://investsrilanka.com/location/koggala-epz/*
[25] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[26] *Source: http://investsrilanka.com/location/koggala-epz/*
[27] *Source: http://investsrilanka.com/location/koggala-epz/*
[28] *Source: http://investsrilanka.com/location/koggala-epz/*
[29] *Source: http://investsrilanka.com/location/koggala-epz/*

Factors	Koggala Export Processing Zone
	service are entitled to a gratuity at the time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.
No restrictions on Money Transfers	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.
Others	• Exemption of transfer charges on transfer of land
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, one stop shop is available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no onsite convenience retail available within the zone
Onsite Housing	There is no onsite housing available within the zone
Onsite Schools	There are no onsite schools available within the zone
Onsite Community Facilities	There are no onsite community facilities available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 km)	There are quality housing facilities available within 15 km from the export processing zone
International Hospital/Clinic (Within 20km)	There are quality hospitals near the zone such as Habaraduwa Hospital, Dr. G. R. A. De Silva Hospital etc.
International Schools (Within 20 km)	There are international quality schools available within 15 km from the export processing zone such as Salahiya International School

Source: PwC analysis and data collection

Koggala Export Processing Zone contributed USD 122 million worth of exports earnings in 2017, emerging as a major economic centre in South Sri Lanka and an important contributor to the economy. Its proximity to the port of Hambantota (~125 km) and Galle (~13 km) gives it an added advantage of access to Sri Lanka's major ports.

4.3.2.2. Horana Export Processing Zone

Horana Export Processing Zone is located in the Kalutara district in the Western province of Sri Lanka, ~ 80 km away from Bandaranaike International Airport and ~ 55 km from Colombo Port. Horana EPZ was established in 1999 on a land area of 395 acres of which 185 acres are industrial land. The infrastructure facilities at the zone include water, wastewater processing, and electricity, making it attractive to investors.

Figure 14: Horana Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided below:

Table 12: Horana Export Processing Zone, Sri Lanka

Factors	Horana Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1999
Land Size (acres)	185 acres
Number of Plots	According to the existing master plan there are approximately 55 industrial plots within the zone There are 23 operational industrial units in the zone[30]
No. of Development Phases	The development has been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 4,660 / acre / annum (BDT ~0.40 Mn/acre/annum)[31]
Pre-Built Factories (PBF) (Y/N)	There are no PBF available 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 as a part of the product mix
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone

[30] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Horana-Export-Processing-Zone.pdf*
[31] *Source: http://investsrilanka.com/location/horana-epz/*

Factors	Horana Export Processing Zone
Cost of Power (Taka/USD)	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[32] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[33] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[34] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[35] • During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[36]
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.21/m^3 (BDT 17.84/m^3)[37]
Onsite Wastewater Treatment Plant (Y/N)	There is a centralized wastewater treatment plant available
Transport costs	
Cost of shipping 20-foot FCL container shipping to Colombo[38]	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755 • Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156- 2,384
Cost of Labour (Taka/USD)	
Management	The average salary for a manager is approx. USD 1,000/month (BDT 84,947/month)[39]
Technicians	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[40]
Skilled	The average salary for a skilled labour is approx. USD 128/month (BDT 10,874/month)[41]
Unskilled	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[42]
Sectors	
Type of Sectors within the Zone	Apparels, Textiles, Chemicals, Furniture, FMCG
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	• Exemptions of Customs Duty on capital goods and raw materials. • Non-export-oriented companies are entitled to import project related capital goods free of Customs Duty.
Corporate Taxes / Indirect Taxes	• Exemption of tax on dividends. • Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.
Income Tax on Profits	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.

[32] *Source: http://www.ceb.lk/for-your-business/*
[33] *Source: http://www.ceb.lk/for-your-business/*
[34] *Source: http://www.ceb.lk/for-your-business/*
[35] *Source: http://www.ceb.lk/for-your-business/*
[36] *Source: http://www.ceb.lk/for-your-business/*
[37] *Source: http://www.waterboard.lk/web/index.php?option=com_content&view=article&id=46&Itemid=206&lang=en#details-of-schemes-within-the-area*
[38] *Source: https://worldfreightrates.com/freight*
[39] *Source: http://investsrilanka.com/location/horana-epz/*
[40] *Source: http://investsrilanka.com/location/horana-epz/*
[41] *Source: http://investsrilanka.com/location/horana-epz/*
[42] *Source: http://investsrilanka.com/location/horana-epz/*

Factors	Horana Export Processing Zone
Social Security Tax	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.
No restrictions on Money Transfers	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.
Others	• Exemption of transfer charges on transfer of land
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, one stop shop is available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no onsite convenience retail available within the zone
Onsite Housing	There is no onsite housing available within the zone
Onsite Schools	There are no onsite schools available within the zone
Onsite Community Facilities	There are no onsite community facilities available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 km)	There is no international quality housing available within 15 km from the export processing zone
International Hospital/Clinic (Within 20km)	The nearest hospital to the industrial park is Base Hospital Horana
International Schools (Within 20 km)	There are no international quality schools available within 15 km from the export processing zone

Source: PwC analysis and data collection

The Horana Export Processing Zone administered by the Board of Investment contributed US$ 31.8 million (Rs 5,796.7 million) in export revenue as at end of 2018.[43] Among the leading enterprises at the Horana EPZ are Unilever Sri Lanka Ltd which manufactures consumer products such as soaps, shampoos and toothpaste, Nature rub Export Intl. (Pvt) Ltd manufacture apparel accessories including yarn and lace, and Eco Spindles Pvt Ltd manufacture yarn by recycling plastic bottles. Its proximity to the port of Colombo (~55 km) gives it an added advantage of access to one of Sri Lanka's largest ports.

4.3.2.3. Mirigama Export Processing Zone

The Mirigama Export Processing Zone is located in the Western Province in the Gampaha District of Sri Lanka. It is an environmentally accredited zone accommodating international, local and joint venture enterprises cutting across a variety of manufacturing activities. It is situated 65 km in the north east of Colombo and 35 km from the Colombo International airport.

[43] *http://www.colombopage.com/archive_19A/Jan24_1548302926CH.php*

Figure 15: Mirigama Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided below –

Table 13: Mirigama Export Processing Zone

Factors	Mirigama Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1998
Land Size (acres)	261 acres
Number of Plots/Units/Firms	According to the existing master plan approx. 55 plots are present in zone There are 20 operational industrial units in the park[44]
No. of Development Phases	The development has been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 4,235 / acre / annum (BDT ~0.36 Mn/acre/annum)[45]
Pre-Built Factories (PBF) (Y/N)	There are no PBF available 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 as a part of the product mix
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)	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[46] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[47]

[44] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/mirigama-epz.pdf*
[45] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/mirigama-epz.pdf*
[46] *Source: http://www.ceb.lk/for-your-business/*
[47] *Source: http://www.ceb.lk/for-your-business/*

Factors	Mirigama Export Processing Zone
	For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[48] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[49] • During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[50]
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.40/m^3 (BDT 34/m^3)[51]
Onsite Wastewater Treatment Plant (Y/N)	There is a centralized wastewater treatment plant indicated in the master plan lay out
Transport costs	
Cost of shipping 20-foot FCL container shipping to Colombo[52]	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755 • Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156- 2,384
Cost of Labour (Taka/USD)	
Management	The average salary for a manager is approx. USD 1,000/month (BDT 84,947/month)[53]
Technicians	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[54]
Skilled	The average salary for a skilled labour is approx. USD 128/month (BDT 10,874/month)[55]
Unskilled	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[56]
Sectors	
Type of Sectors within the Zone	Chemicals, Textiles & RMG, Machinery and Equipment, Plastics, Paper and Paper board articles, Gems
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	• Exemptions of Customs Duty on capital goods and raw materials. • Non-export-oriented companies are entitled to import project related capital goods free of Customs Duty.
Corporate Taxes / Indirect Taxes	• Exemption of tax on dividends. • Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.
Income Tax on Profits	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.
Social Security Tax	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.

[48] *Source: http://www.ceb.lk/for-your-business/*
[49] *Source: http://www.ceb.lk/for-your-business/*
[50] *Source: http://www.ceb.lk/for-your-business/*
[51] *Source: http://investsrilanka.com/location/mirigama-epz/*
[52] *Source: https://worldfreightrates.com/freight*
[53] *Source: http://investsrilanka.com/location/mirigama-epz/*
[54] *Source: http://investsrilanka.com/location/mirigama-epz/*
[55] *Source: http://investsrilanka.com/location/mirigama-epz/*
[56] *Source: http://investsrilanka.com/location/mirigama-epz/*

Factors	Mirigama Export Processing Zone
No restrictions on Money Transfers	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.
Others	• Exemption of transfer charges on transfer of land
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, one stop shop is available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no onsite convenience retail available within the zone
Onsite Housing	There is no onsite housing available within the zone
Onsite Schools	There are no onsite schools available within the zone
Onsite Community Facilities	There are no onsite community facilities available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	There are housing facilities available in proximity to the zone; however international quality housing is not available
International Hospital/Clinic (Within 20km)	Superior quality hospital like Base Hospital, Sahanya Private Hospital etc. are present in proximity to the zone
International Schools (Within 20 kms)	Superior quality schools like D.S. Senanayake Central College, Oxford International School etc. are present in proximity to the zone

Source: PwC Research

The zone is well connected with the capital city of Colombo, which also houses one of the largest transshipment ports of Asia. The zone is also located in close proximity to the Bandarnayake International Airport which allows for seamless evacuation of time-sensitive goods and expatriates from the export processing zone. This has resulted in a number of investors setting up manufacturing units within the zone.

4.3.2.4. Wathupitiwela Export Processing Zone

The Wathupitiwela Export Processing Zone is located in the Western Province in the Gampaha District of Sri Lanka. It is an environmentally accredited zone accommodating low polluting industries. It is situated 42 km from Colombo under the jurisdiction of Attanagalla Divisional Secretariat.

Figure 16: Wathupitiwela Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided below –

Table 14: Wathupitiwela Export Processing Zone

Factors	Wathupitiwela Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1998
Land Size (acres)	123 acres
Number of Plots/Units/Firms	According to the existing master plan approx. 40 plots are present in zone There are about 24 operational industrial units in the park[57]
No. of Development Phases	The development has been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 50,000 (BDT 4.24 Mn) and the land lease charged is USD 4,660 / acre / annum (BDT ~0.39 Mn/acre/annum)[58]
Pre-Built Factories (PBF) (Y/N)	There are no PBF available 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 as a part of the product mix
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone. Power is supplied through a 8 MVA grid sub-station
Cost of Power (Taka/USD)	For Industries with demand less than or equal to 42 KVA the cost of power is as follows:

[57] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/wathupitiwela-epz.pdf*
[58] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/wathupitiwela -epz.pdf*

Factors	Wathupitiwela Export Processing Zone
	• For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[59] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[60] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[61] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[62] • During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[63]
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.40/m³ (BDT 34/m³)[64]
Onsite Wastewater Treatment Plant (Y/N)	There is a centralized wastewater treatment plant indicated in the master plan lay out
Transport costs	
Cost of shipping 20-foot FCL container shipping to Colombo[65]	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755 • Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156- 2,384
Cost of Labour (Taka/USD)	
Management	The average salary for a manager is approx. USD 1,000/month (BDT 84,947/month)[66]
Technicians	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[67]
Skilled	The average salary for a skilled labour is approx. USD 128/month (BDT 10,874/month)[68]
Unskilled	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[69]
Sectors	
Type of Sectors within the Zone	Knitting, Textiles & RMG, Food processing, Agro based products, Plastic and rubber, Light machinery, Fertilizers etc.
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	• Exemptions of Customs Duty on capital goods and raw materials. • Non-export-oriented companies are entitled to import project related capital goods free of Customs Duty.
Corporate Taxes / Indirect Taxes	• Exemption of tax on dividends. • Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.
Income Tax on Profits	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.
Social Security Tax	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees

[59] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/wathupitiwela-epz.pdf*
[60] *Source: http://www.ceb.lk/for-your-business/*
[61] *Source: http://www.ceb.lk/for-your-business/*
[62] *Source: http://www.ceb.lk/for-your-business/*
[63] *Source: http://www.ceb.lk/for-your-business/*
[64] *Source: http://investsrilanka.com/location/wathupitiwela-epz/*
[65] *Source: https://worldfreightrates.com/freight*
[66] *Source: http://investsrilanka.com/location/wathupitiwela -epz/*
[67] *Source: http://investsrilanka.com/location/wathupitiwela -epz/*
[68] *Source: http://investsrilanka.com/location/wathupitiwela-epz/*
[69] *Source: http://investsrilanka.com/location/wathupitiwela -epz/*

Factors	Wathupitiwela Export Processing Zone
	Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.
No restrictions on Money Transfers	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.
Others	• Exemption of transfer charges on transfer of land
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, one stop shop is available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no onsite convenience retail available within the zone
Onsite Housing	There is onsite housing available within the zone
Onsite Schools	There are no onsite schools available within the zone
Onsite Community Facilities	There are no onsite community facilities available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	There are housing facilities available within the zone; however international quality housing is not available
International Hospital/Clinic (Within 20km)	Superior quality hospital like District Base Hospital, Durdans Medical Center etc. are present in proximity to the zone
International Schools (Within 20 kms)	Superior quality schools like Thihariya International School, Negombo South International School, Islamic International School etc. are present in proximity to the zone

Source: PwC Research

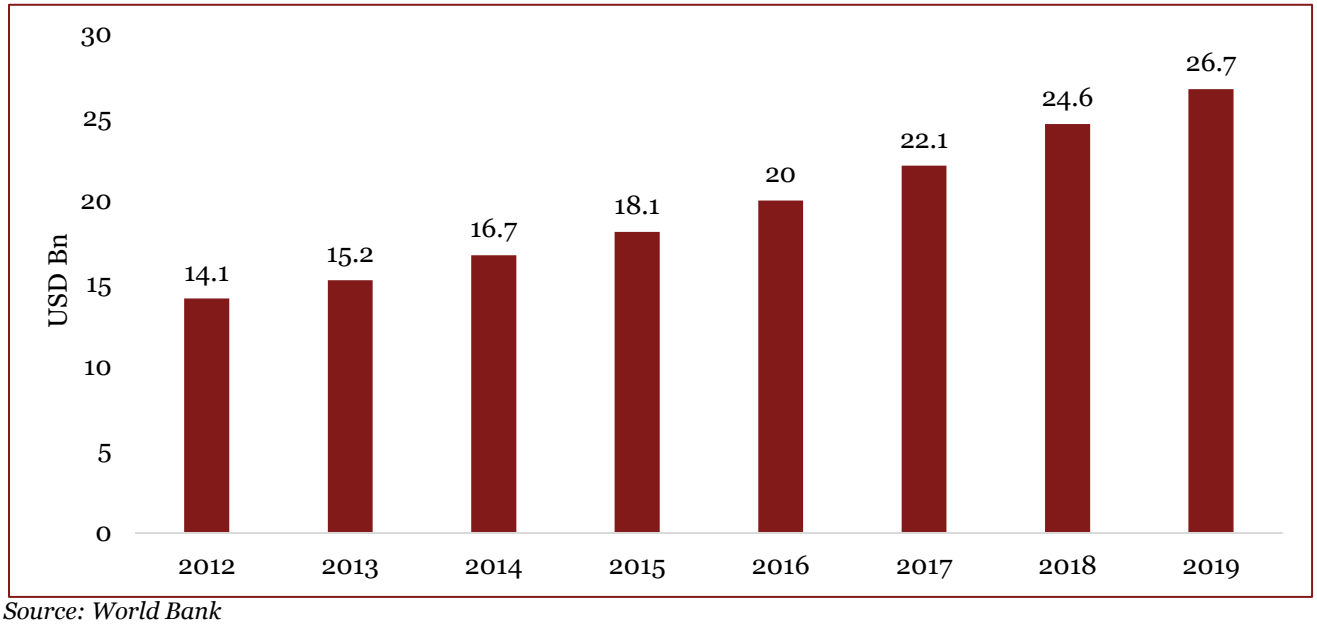
The zone is well connected with the capital city of Colombo, which also houses one of the largest transshipment ports of Asia. Wathupitiwela Export Processing Zone (WEPZ) has contributed US$ 25.6 Mn in export revenue as at end of March 2018. The zone's enterprises have a significant impact on the local economy as they provide employment to 9,689 staff. In addition, the zone creates possibly three times that number of indirect employment opportunities.[70]

4.3.3. Cambodia

Over the past two decades, Cambodia has undergone a significant transition, reaching lower middle-income status in 2015 and aspiring to attain upper middle-income status by 2030. Driven by garment exports and tourism, Cambodia's economy has sustained an average growth rate of 8% between 1998 and 2018, making it one of the fastest-growing economies in the world. But the country similar to Bangladesh is disproportionately dependent on the Textiles & RMG sector. Around 80% of the country's exports are apparel. The GDP growth trend in Cambodia is depicted below. **Data used for the analysis is the latest data point available in the respective database.**

[70] *Source: https://www.lankabusinessonline.com/usd25-6-million-contribution-from-wathupitiwela-epz-to-export-earnings/*

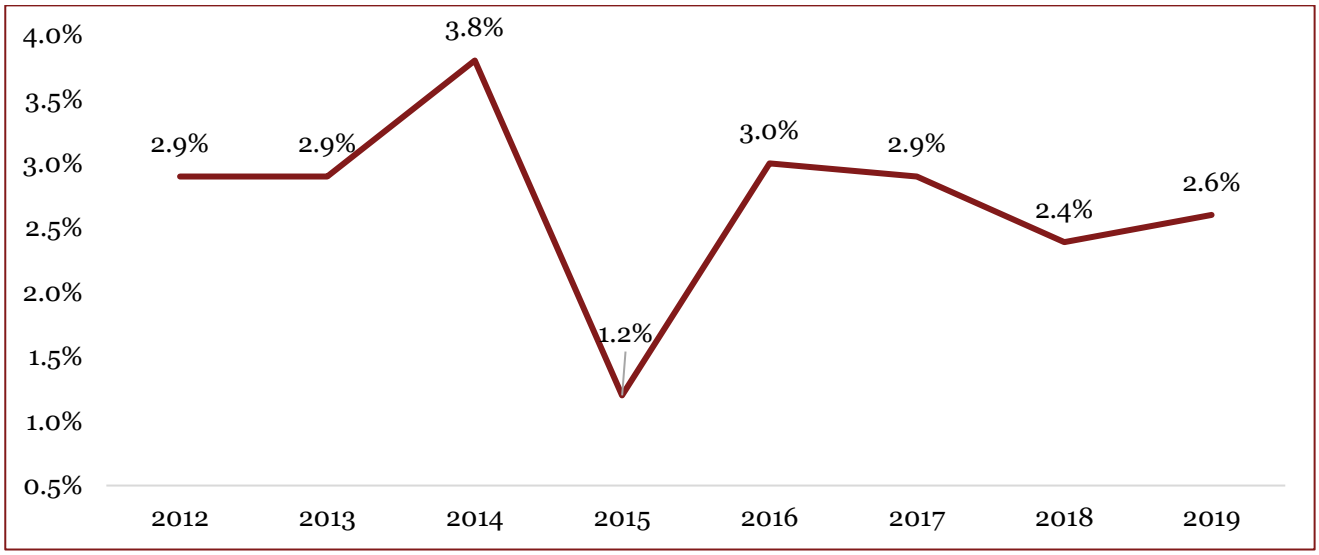
Figure 17: GDP Trend of Cambodia



Source: World Bank

The inflation rate has seen a substantial decrease after its peak of 3.8% in 2014. One of the reasons for the dipping inflation rate has been the fall in oil prices. The inflation trend of Cambodia is depicted below. **Data used for the analysis is the latest data point available in the respective database.**

Figure 18: Inflation Trend of Cambodia



Source: World Bank

Other macro-economic parameters of Cambodia are presented below –

Table 15: Macro-economic Parameter of Cambodia

Macroeconomic Indicator	Description	Data Source
Unemployment	1.0%[71]	The Heritage Foundation
FDI Inflow	USD 3.10 billion	The World Bank

[71] *Source: https://www.heritage.org/index/country/cambodia*

Exports	USD 25.10 billion[72] in 2019	ITC Trade Map
Imports	USD 23.13 billion[73] in 2019	ITC Trade Map
Heritage Foundation's Index of Economic Freedom Rankings.	113	The Heritage Foundation 2019
Cato Institute's Human Freedom ranking	63	Human Freedom Index | Cato Institute
World Economic Freedom's Global Competitive Index Rating	106	Global Competitiveness Index 2019 rankings
WB Doing Business ranking	144	Doing Business 2020

Source: PwC Research

According to the World Bank, the Cambodian economy grew by 7 % in 2019 with the export of garments, footwear and travel goods recording a five-year high rising by 17.6% in 2018, up from 8.3% in 2017. More than half of Cambodian labor force is engaged in subsistence farming.

Despite the rapid growth the country remains largely a poverty stricken one. However, the situation has started to change as poverty continues to fall in Cambodia. According to official estimates, the poverty rate in 2014 was 13.5% compared to 47.8% in 2007. But the global shock triggered by the COVID-19 pandemic has significantly impacted Cambodia's economy in 2020 at a time when Cambodia also faces the partial suspension of preferential access to the EU market under the "Everything but Arms" initiative. The outbreak caused sharp deceleration in most of Cambodia's main engines of growth in the first quarter of 2020, including weakened tourism and construction activity. Growth is projected to slow sharply to 2.5% in 2020 under the baseline scenario.[74]

Post analysis of the broad macro-economy of Cambodia, an analysis of the shortlisted EZ is provided below –

4.3.3.1. Tai Seng Bavet SEZ

The Tai Seng Bavet Economic Zone is located at Bavet City in the Svay Rieng province of Cambodia. The zone harbors industries from varied sectors like bicycle manufacturing, footwear manufacturing, garment manufacturing industries, etc. The zone has benefited from presence of quality infrastructure like internal roads, utility connections, well laid out internal roads, etc.

[72] *Source: https://www.trademap.org/Product_SelCountry_TS.aspx?nvpm=1%7c116%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c2%7c2%7c1%7c1%7c1%7c1*

[73] *Source: https://www.trademap.org/Product_SelCountry_TS.aspx?nvpm=1%7c116%7c%7c%7c%7cTOTAL%7c%7c%7c2%7c1%7c1%7c1%7c2%7c1%7c1%7c1%7c1*

[74] *World Bank*

Figure 19: Tai Seng Bavet SEZ

Source: Google Images

A detailed profiling of the park is provided below –

Table 16: Tai Seng Bavet SEZ

Factors	Tai Seng Bavet SEZ
Site	
Year of establishment/Start year of operations	It was established in 2006
Land Size (acres)	~190 acres
Number of Plots/Units/Firms	Plots of variable sizes are available; however, the exact number of plots have not been demarcated 28 firms are operational within the park
No. of Development Phases	The project is to be completed in 2 phases as proposed in master plan
Land Lease (+length) or Sale (Taka/USD)	Industrial land lease rent is USD 22 /m^2 (BDT 1,868.82 /m^2) and contract is for 50 years[75]
Pre-Built Factories (PBF) (Y/N)	Yes, pre-built factories are available
Lease Rate for PBF (Taka/USD)	Ground : USD 0.1/m^2 (BDT 8.49 /m^2) Factory : USD 1.6/m^2 (BDT 135.91 /m^2) Office : USD 2.8/m^2 (BDT 237.85 /m^2) (Building only)[76]
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	No onsite captive power plant available for the special economic zone

[75] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[76] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*

Factors	Tai Seng Bavet SEZ
	Power sourced from public transmission line both from Cambodia (Svay Rieng Province) and Vietnam[77]
Cost of Power (Taka/USD)	The cost of power within the economic zone is USD 0.15 / KwH[78] (BDT 12.74 /KwH)
Cost of Water (Taka/USD)	The water is available for free as EZ offers underground water as tenants set up underground well to draw water
Onsite Wastewater Treatment Plant (Y/N)	No, onsite wastewater treatment plant is not available[79]
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: • Hamburg – Sihanoukville Port → USD 739-817 • Rotterdam – Sihanoukville Port → USD 732-809 • Antwerp – Sihanoukville Port → USD 746-825 • New York – Sihanoukville Port → USD 2,308-2,551[80]
Cost of Labour (Taka/USD)	
Management	The average salary of management professional in Cambodia is approximately USD 2770/month[81] (BDT 235,302/month)
Technicians	The average salary of a technician is approx. USD 861/month (BDT 73,139/ month)
Skilled	The average salary of a skilled labourer in Cambodia is USD 498/month (BDT 42,304/ month)
Unskilled	The average salary of an unskilled labourer in Cambodia is USD 128.3/month (BDT 10,899/month)
Sectors	
Type of Sectors within the Zone	The EZ mainly accommodates bicycle manufacturing, footwear manufacturing, garment manufacturing industries[82]
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	Cambodian SEZs offer exemption from import duty on materials equipment used in production[83] Import duty exemptions for machinery, equipment, production inputs and raw materials[84]
Corporate Taxes / Indirect Taxes	Corporate income tax exemption of up to nine years
Income Tax on Profits	Exemption of the tax on profits shall be provided for a maximum period of 9 years in compliance with Article 14.1 of the law on the amendment to the law on investment of the Kingdom of Cambodia[85]
Social Security Tax	Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[86]

[77] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[78] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*
[79] *Source: http://open_jicareport.jica.go.jp/pdf/10000009832.pdf*
[80] *Source: https://worldfreightrates.com/freight*
[81] *Source: https://www.averagesalarysurvey.com/cambodia*
[82] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[83] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*
[84] *Source: https://www.jcci.or.jp/161104%20Cambodia,%20Tokyo%20Presentation%204%20Nov%202016.pdf*
[85] *Source: https://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06_chapter3.pdf*
[86] *Source: https://shieldgeo.com/payroll-and-tax-in-cambodia/*

Factors	Tai Seng Bavet SEZ
No restrictions on Money Transfers	No restriction on foreign currencies convertibility[87] Free remittance of foreign currency Unrestricted repatriation of profit
Others	VAT suspension for all exported oriented activities[88]
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, one stop shop is available within the zone.
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone[89]
Onsite Convenience Retail	There is no onsite convenient retail available within the zone
Onsite Housing	There is onsite housing available within the zone[90]
Onsite Schools	There are no onsite schools available within the zone
Onsite Community Facilities	There are onsite community facilities within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	There is no international housing facility available within 20 km radius of the EZ
International Hospital/Clinic (Within 20km)	There are no superior quality hospitals available in close proximity to the zone
International Schools (Within 20 kms)	There are quality schools like Motherland International School and Harford International School available within 20 kms from the zone

Source: PwC Research

It is located at 154km from Phnom Penh City through national highway route 1 of Cambodia and 86km from Ho Chi Minh Port through national highway route 22 of Vietnam. It is well-connected with the major nodes of both Cambodia and Vietnam which gives it an advantage in terms of access to major trade gateways of both these countries and also facilitates cross-border trade.

[87] *Source: https://www.boi.go.th/upload/Cambodia_Presentation_78898.pdf*
[88] *Source: http://www.bigconnectivity.org/beta/sites/default/files/2017-03/Cambodia%27s%20SEZ%20Policy%20in%20Shanghai%2017-22%20Oct%2016.pdf*
[89] *Source: http://www.cambodiainvestment.gov.kh/investment-scheme/the-special-economic-zones.html*
[90] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*

4.4. Comparative Analysis

This section tries to capture a comparative analysis of specific comparative parameters between the EZs elaborated above and the proposed EZ in Bhola. Tables below provide an insight into macro-economic performance indicators of the countries which are home to the industrial parks shortlisted as benchmarking options to the proposed EZ in Bhola, Bangladesh. This comparison is important from the perspective of both local and international investors as they 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 17: Macro-Economic indicators (2019)

Country	GDP (USD billion)	GDP annual growth rate (%)	GDP per capita (USD)	Inflation Rate (%)	Unemployment Rate (%)	Population (million)
India	2,935.6	6.1	2,036.2	3.5	2.6	1,334.2
Cambodia	26.7	7.0	1,508.8	2.6	1.0	16.3
Bangladesh	**317.5**	**7.8**	**1,744.5**	**5.6**	**4.3**	**164.9**
Sri Lanka	91.0	4.8	4,067.9	5.4	4.4	21.7

Source: World Economic Forum

Table 18: FDI indicators 2018

Country	FDI for 2018 (USD million)
India	42,117.5
Cambodia	3,102.6
Bangladesh	**2,940.2**
Sri Lanka	1,610.5

Source: World Bank

Table 19: Heritage Foundation Score 2020

Country	Heritage Foundation Rating (global)	Individual country score	Score change	Freedom group ranking	Competitor's ranking
India	120	56.5	+1.3	Mostly unfree	5
Cambodia	113	57.3	-0.5	Mostly unfree	4
Bangladesh	**122**	**56.4**	**+0.8**	**Mostly unfree**	**6**
Sri Lanka	112	57.4	+1.0	Mostly unfree	2

Source: The Heritage Foundation

Table 20: Global Competitiveness Ranking 2019

Country	Global Competitiveness Ranking 2019	Country Score	Global Competitiveness Ranking 2018	Rank Change from 2018 to 2019
India	68	61.4	58	-10
Cambodia	106	52.1	110	+4
Bangladesh	**105**	**52.1**	**103**	**-2**
Sri Lanka	84	57.1	85	+1

Source: World Bank

Table 21: Global Financial Market Development Ranking (World Economic Forum 2019)

Country	Financial Market Development Ranking
India	40
Cambodia	88
Bangladesh	**106**
Sri Lanka	87

Source: World Economic Forum

Table 22: World Bank Doing Business Ranking 2020

Country	Ease of Doing Business Ranking 2020	Ease of Doing Business Ranking 2019	Rank Change from 2019 to 2020
India	63	77	+14
Cambodia	144	138	-6
Bangladesh	**168**	**176**	**+8**
Sri Lanka	99	100	+1

Source: World Bank

Table 23: World Bank Doing Business Components 2019

Parameters	India	Cambodia	Bangladesh	Sri Lanka
Starting Business	137	185	**138**	83
Dealing with Construction Permits	52	179	**138**	65
Getting Electricity	24	141	**179**	84
Registering Property	166	124	**183**	140
Getting Credit	22	22	**161**	124
Protecting Minority Investors	7	110	**89**	38
Paying Taxes	121	137	**151**	141
Trading Across Borders	80	115	**176**	93
Enforcing Contracts	163	182	**189**	164
Resolving Insolvency	108	79	**153**	92

Source: World Bank

The comparative study done indicates that while Bangladesh is becoming more competitive at the global stage, it still lags behind the India and Sri Lanka, but fares better than Cambodia. Also, Bangladesh has recorded best GDP growth when compared to its peers. However, Bangladesh lags behind in terms of all other major macro-economic parameters like providing electricity and easy credit facility, registering of property, protecting minority investors and enforcing contracts.

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 168. 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 named "World Bank Doing Business Components 2019".

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 in Bhola in order to attract investments. A comparative study of competing economic zones have been done on the next page to understand competitiveness of the proposed EZ in Bhola with respect to the benchmarked zones.

Table 24: Comparative Analysis

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
Site							
Land Size (acres)	304 acres	152 acres	227 acres	185 acres	261 acres	123 acres	190 acres
Business Model	Government (proposed)	Government	Government	Government	Government	Government	PPP
Number of Plots/Units/Firms	There are provisions of 174 plots as per the Master Plan	Currently there are 27 industrial units operating in the growth center; there is only 3 acres of land which is available for allotment[91]	According to the existing master plan there are approximately 60 industrial plots within the zone[92] There are 23 operational industrial units in the zone[93]	According to the existing master plan there are approximately 55 industrial plots within the zone There are 23 operational industrial units in the zone[94]	According to the existing master plan approx. 55 plots are present in zone There are 20 operational industrial units in the park[95]	According to the existing master plan approx. 40 plots are present in zone There are about 24 operational industrial units in the park [96]	Plots of variable sizes are available; however, the exact number of plots have not been demarcated 28 firms are operational within the park

[91] *Source: https://www.wbiidc.org/raninagar.php*
[92] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Koggala-Export-Processing-Zone.pdf*
[93] *Source: https://www.lankabusinessonline.com/sri-lankas-koggala-epz-earns-usd122-mn-in-2017/*
[94] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Horana-Export-Processing-Zone.pdf*
[95] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/mirigama-epz.pdf*
[96] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/wathupitiwela-epz.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
No. of Development Phases	The project is planned to be developed in two phases	The developments have 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 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 in a single phase	The project is to be completed in 2 phases as proposed in master plan
Land Lease (+length) or Sale (Taka/USD)	Land lease rental is BDT 12/ sq. ft. per annum (for 50 years) when BEZA develops the project and BDT 15/sq. ft. per annum (for 50 years) when PPP developer develops the project	Industrial land lease premium for 99 years is USD 32,394 /acre (BDT 2.75 Mn/acre) [97]	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 5,130 / acre / annum (BDT ~0.44 Mn/acre/annum) [98]	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 4,660 / acre / annum (BDT ~0.40 Mn/acre/annum) [99]	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 30,000 (BDT 2.55 Mn) and the land lease charged is USD 4,235 / acre / annum (BDT ~0.36 Mn/acre/annum) [100]	The Board of Investment of Sri Lanka provides Land on lease basis, for lease period of 50 years. The upfront one-time land premium is USD 50,000 (BDT 4.24 Mn) and the land lease charged is USD 4,660 / acre / annum (BDT ~0.39 Mn/acre/annum) [101]	Industrial land lease rent is USD 22 /m² (BDT 1,868.82 /m²) and contract is for 50 years[102]

[97] *Source: http://www.wbidc.com/industrial_parks/available_land.htm*
[98] *Source: http://investsrilanka.com/location/koggala-epz/*
[99] *Source: http://investsrilanka.com/location/horana-epz/*
[100] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/mirigama-epz.pdf*
[101] *Source: http://www.investsrilanka.com/wp-content/uploads/2018/10/wathupitiwela-epz.pdf*
[102] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
Pre-Built Factories (PBF) (Y/N)	PFB is planned only in case of PPP developer developing the project	There are no Pre-Built Factories provided as a part of the product offering	There are no PBF available as a part of the product offering	There are no PBF available as a part of the product offering	There are no PBF available as a part of the product offering	There are no PBF available as a part of the product offering	Yes, pre-built factories are available
Lease Rate for PBF (Taka/USD)	Land lease rental for PFB is BDT 175/ sq. ft. per annum	There is no lease rate for PBF since PBF are not provided in the product mix	There is no lease rate for PBF since PBF are not provided as a part of the product mix	There is no lease rate for PBF since PBF are not provided as a part of the product mix	There is no lease rate for PBF since PBF are not provided as a part of the product mix	There is no lease rate for PBF since PBF are not provided as a part of the product mix	Ground : USD 0.1/m^2 (BDT 8.49 /m^2) Factory : USD 1.6/m^2 (BDT 135.91 /m^2) Office : USD 2.8/m^2 (BDT 237.85 /m^2) (Building only)[103]
Infrastructure/ Utilities							
Onsite Independent Power (Y/N and Type)	Yes, there is provision for onsite power distribution	There is no onsite captive power plant available for	There is no onsite captive power plant available for	There is no onsite captive power plant available for	There is no onsite captive power plant available for	There is no onsite captive power plant available for	No onsite captive power plant available

[103] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	through internal sub-stations of 33/11 KV and 132/33 KV	the special economic zone Power is supplied by WBSEDCL	the special economic zone	the special economic zone	the special economic zone	the special economic zone	for the special economic zone Power sourced from public transmission line both from Cambodia (Svay Rieng Province) and Vietnam[104]
Cost of Power (Taka/USD)	Cost of power is BDT 8.97/ KwH	The cost of power is approx. USD 0.11 / KwH (BDT 9.34/KwH) for industries[105]	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[116]	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption <301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[121]	The cost of power within the economic zone is USD 0.15 / KwH[126] (BDT 12.74 /KwH)

[104] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[105] *Source: https://www.wbsedcl.in/irj/go/km/docs/internet/new_website/pdf/Tariff_Volumn/PDFsam_mergetariff2.pdf*
[116] *Source: http://www.ceb.lk/for-your-business/*
[121] *Source: http://www.ceb.lk/for-your-business/*
[126] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
			(BDT 4.93/KwH)[106] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[107] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[108]	(BDT 4.93/KwH)[111] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[112] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH	• For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[117] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[118] • During daytime, the tariff is USD	• For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[122] For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.11/KwH (BDT 9.34/KwH)[123] • During daytime, the	

[106] *Source: http://www.ceb.lk/for-your-business/*
[107] *Source: http://www.ceb.lk/for-your-business/*
[108] *Source: http://www.ceb.lk/for-your-business/*
[111] *Source: http://www.ceb.lk/for-your-business/*
[112] *Source: http://www.ceb.lk/for-your-business/*
[117] *Source: http://www.ceb.lk/for-your-business/*
[118] *Source: http://www.ceb.lk/for-your-business/*
[122] *Source: http://www.ceb.lk/for-your-business/*
[123] *Source: http://www.ceb.lk/for-your-business/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
			• During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[109] During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[110]	(BDT 9.34/KwH)[113] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[114] During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[115]	0.059/KwH (BDT 5.01/KwH)[119] During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[120]	tariff is USD 0.059/KwH (BDT 5.01/KwH)[124] During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[125]	
Cost of Water (Taka/USD)	Cost of water is BDT 37.21/ m3	The cost of industrial water is approx. USD 0.28 /KL (BDT 23.79/KL)[127]	The charge of industrial water is USD 0.40/m3 (BDT 34/m3)[128]	The charge of industrial water is USD 0.21/m3 (BDT 17.84/m3)[129]	The charge of industrial water is USD 0.40/m3 (BDT 34/m3)[130]	The cost of industrial water is USD 0.40/m3 (BDT 34/m3)	The water is available for free as EZ offers underground water as tenants set up

[109] *Source: http://www.ceb.lk/for-your-business/*
[110] *Source: http://www.ceb.lk/for-your-business/*
[113] *Source: http://www.ceb.lk/for-your-business/*
[114] *Source: http://www.ceb.lk/for-your-business/*
[115] *Source: http://www.ceb.lk/for-your-business/*
[119] *Source: http://www.ceb.lk/for-your-business/*
[120] *Source: http://www.ceb.lk/for-your-business/*
[124] *Source: http://www.ceb.lk/for-your-business/*
[125] *Source: http://www.ceb.lk/for-your-business/*
[127] *Source: Interactions with WBIIDC officials*
[128] *Source: http://investsrilanka.com/location/koggala-epz/*
[129] *Source: http://www.waterboard.lk/web/index.php?option=com_content&view=article&id=46&Itemid=206&lang=en#details-of-schemes-within-the-area*
[130] *Source: http://investsrilanka.com/location/mirigama-epz/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
							underground well to draw water
Onsite Wastewater Treatment Plant (Y/N)	Yes, there is provision for wastewater treatment plan in the Master Plan of the proposed EZ	There is no onsite water treatment plant since industries within the zone typically have their own treatment plant	Yes, there is centralized wastewater treatment facilities available	Yes, there is centralized wastewater treatment facilities available	Yes, there is centralized wastewater treatment facilities available	Yes, there is onsite wastewater treatment plant available within the zone	No, onsite wastewater treatment plant is not available[131]
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 – Mongla →	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Kolkata → USD 1,644-1,817 • Rotterdam – Kolkata →	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Hambantota port → USD 650-1,050 • Rotterdam – Hambantota port → USD 650-1,160	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,604-1,774 • Rotterdam – Colombo port → USD 1,588-1,755	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Sihanoukville Port → USD 739-817

[131] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	USD 651-1159[132] • Hamburg – Mongla → USD 650-1050[133] • Antwerp – Mongla → USD 651-1159[134] • New York – Mongla → USD 1,585-3,264[135]	USD 1,628-1,799 • Antwerp – Kolkata → USD 1,660-1,834 New York – Kolkata → USD 1,770-1,956	• New York – Hambantota port → USD 800-1,914	• Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156-2,384	• Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156-2,384	• Antwerp – Colombo port → USD 1,619-1,789 • New York – Colombo port → USD 2,156-2,384	• Rotterdam – Sihanoukville Port → USD 732-809 • Antwerp – Sihanoukville Port → USD 746-825 • New York – Sihanoukville Port → USD 2,308-2,551[136]
Cost of Labor (Taka/USD)							
Management	The salary of a management professional is approximately USD 533/	The salary for a management professional in West Bengal is approx. USD 1,373	The average salary for a manager is approx. USD 800/month (BDT 67,957/month)[139]	The average salary for a manager is approx. USD 1,000/month	The average salary for a manager is approx. USD 1,000/month (BDT 84,947/month)[141]	The average salary for a manager is approx. USD 1,000/month	The average salary of management professional in Cambodia is

[132] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[133] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[134] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[135] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[136] *Source: https://worldfreightrates.com/freight*
[139] *Source: http://investsrilanka.com/location/koggala-epz/*
[141] *Source: http://investsrilanka.com/location/mirigama-epz/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	month[137] (BDT 45,277/month)	/ month (BDT 116,632/month)[138]		(BDT 84,947/month)[140]		(BDT 84,947/month)[142]	approximately USD 2770/month[143] (BDT 235,302/month)
Technicians	The salary of a technician is approx. USD 403 / month[144] (BDT 34,223/month)	The average salary for a technician in West Bengal approx. USD 250 / month (BDT 21,237/month)[145]	The average salary for a technician is approx. USD 280/month (BDT 23,785/month)[146]	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[147]	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[148]	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[149]	The average salary of a technician is approx. USD 861/month (BDT 73,139/ month)
Skilled	The salary of a skilled labourer is approximately	The minimum wage for a skilled labour in West Bengal approx.	The average salary for a skilled labour is approx. USD	The average salary for a skilled labour is approx. USD	The average salary for a skilled labour is approx. USD	The average salary for a skilled labour is approx. USD	The average salary of a skilled labourer in Cambodia is

[137] *Source: http://www.averagesalarysurvey.com/bangladesh*
[138] *Source: http://www.averagesalarysurvey.com/calcutta-india*
[140] *Source: http://investsrilanka.com/location/horana-epz/*
[142] *Source: http://investsrilanka.com/location/wathupitiwela -epz/*
[143] *Source: https://www.averagesalarysurvey.com/cambodia*
[144] *Source: http://www.averagesalarysurvey.com/bangladesh*
[145] *Source: https://www.payscale.com/research/IN*
[146] *Source: http://investsrilanka.com/location/koggala-epz/*
[147] *Source: http://investsrilanka.com/location/horana-epz/*
[148] *Source: http://investsrilanka.com/location/mirigama-epz/*
[149] *Source: http://investsrilanka.com/location/mirigama-epz/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	USD 107.25 / month[150] (BDT 9,110/month)	USD 147 / month (BDT 12,487/month)[151]	112/month (BDT 9,514/month)[152]	128/month (BDT 10,874/month)[153]	128/month (BDT 10,874/month)[154]	128/month (BDT 10,874/month)[155]	USD 498/month (BDT 42,304/ month)
Unskilled	The salary of an unskilled labourer is approx. USD 56/month[156] (BDT 4,757/month)	The minimum wage for an unskilled labour in West Bengal approx. USD 110 / month (BDT 9,344/month)[157]	The average salary for an un-skilled labour is approx. USD 80/month (BDT 6,796/month)[158]	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[159]	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[160]	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[161]	The average salary of an unskilled labourer in Cambodia is USD 128.3/month (BDT 10,899/month)
Sectors							

[150] *Source: http://www.averagesalarysurvey.com/bangladesh*
[151] *Source: https://wblc.gov.in/sites/default/files/upload/min_wages/january-2020/300.pdf*
[152] *Source: http://investsrilanka.com/location/koggala-epz/*
[153] *Source: http://investsrilanka.com/location/horana-epz/*
[154] *Source: http://investsrilanka.com/location/mirigama-epz/*
[155] *Source: http://investsrilanka.com/location/wathupitiwela-epz/*
[156] *Source: http://www.averagesalarysurvey.com/bangladesh*
[157] *Source: https://wblc.gov.in/sites/default/files/upload/min_wages/january-2020/299.pdf*
[158] *Source: http://investsrilanka.com/location/koggala-epz/*
[159] *Source: http://investsrilanka.com/location/horana-epz/*
[160] *Source: http://investsrilanka.com/location/mirigama-epz/*
[161] *Source: http://investsrilanka.com/location/wathupitiwela-epz/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
Type of Sectors within the Zone	Food & Beverage, Agro based Products, Chemicals, and Non-metallic minerals	Beverages, Agro processing, plastic products, petroleum, LPG bottling plant	Apparels, Textiles, Plastic and Rubber, Footwear, Light Engineering	Apparels, Textiles, Chemicals, Furniture, FMCG	Chemicals, Textiles & RMG, Machinery and Equipment, Plastics, Paper and Paper board articles, Gems	Knitting, Textiles & RMG, Food processing, Agro based products, Plastic and rubber, Light machinery, Fertilizers	The EZ mainly accommodates bicycle manufacturing, footwear manufacturing, garment manufacturing industries[162]
Special Regime							
Special Regime (Yes/No)	Yes, there's a special regime for incentives	No, there's no 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's a special regime for incentives
Fiscal Incentives							
Customs Duties	• Declaration of EZ as Ware housing Station- Duty free import & Export of Raw material etc.	As per the Industrial policy of West Bengal, there are no incentives on custom duties. However, there could be sector specific incentives	• Exemptions of Customs Duty on capital goods and raw materials. Non-export-oriented companies are entitled to import	• Exemptions of Customs Duty on capital goods and raw materials. Non-export-oriented companies are entitled to import	• Exemptions of Customs Duty on capital goods and raw materials. • Non-export-oriented companies are entitled to	• Exemptions of Customs Duty on capital goods and raw materials. Non-export-oriented companies are entitled to import	Cambodian SEZs offer exemption from import duty on materials equipment used in production[163]

[162] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[163] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	• 100% duty free Import of Vehicle (One Car, One Microbus- 2000 cc) • 100% VAT free Import of Machinery, Construction Materials		project related capital goods free of Customs Duty.	project related capital goods free of Customs Duty.	import project related capital goods free of Customs Duty.	project related capital goods free of Customs Duty.	Import duty exemptions for machinery, equipment, production inputs and raw materials[164]
Corporate Taxes / Indirect Taxes	• Corporate income tax waiver for 12 years for developer • Corporate income tax waiver for 10 years for unit investors	As per the Industrial policy of West Bengal, there are no separate incentives on corporate taxes. However, there are a few sector specific incentives available.	• Exemption of tax on dividends. Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.	• Exemption of tax on dividends. Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.	• Exemption of tax on dividends. Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.	• Exemption of tax on dividends. Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.	Corporate income tax exemption of up to nine years

[164] *Source: https://www.jcci.or.jp/161104%20Cambodia,%20Tokyo%20Presentation%204%20Nov%202016.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	Exemption of VAT on local purchase excluding petroleum products; and on electricity and all utility services						
Income Tax on Profits	Corporate income tax waiver for 10 years for unit investors	There is no incentive on income taxes as per industrial policy. However, there could be incentives based on sector of industries.	• Income tax exemption up to 5 years Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.	• Income tax exemption up to 5 years Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.	• Income tax exemption up to 5 years • Reduced rate after 5 years/ tax holiday is levied at 12% to 28% depending on the income.	• Exemption of the tax on profits shall be provided for a maximum period of 9 years in compliance with Article 14.1 of the law on the amendment to the law on investment of the

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
							Kingdom of Cambodia[165]
Social Security Tax	No social security tax is available in Bangladesh	No social security tax is available in India	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the time	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the Employees Provident Fund (EPF). The employer also contributes 3% of employee remuneration to the Employee Trust Fund. Employees that have completed 5 years of service are entitled to a gratuity at the time	• Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[166]

[165]Source: *https://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06_chapter3.pdf*
[166] Source: *https://shieldgeo.com/payroll-and-tax-in-cambodia/*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
			time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.	time of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.	of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.	of retirement at a rate of 50% of the last drawn salary multiplied by the number of years of service at the time of retirement.	
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	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,	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.	Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.	• Sri Lanka does not impose any restrictions on the repatriation of profits. The government allows 100% repatriation on earnings, fees and capital, and on foreign exchange transactions relating to current account payments.	No restriction on foreign currencies convertibility[168] Free remittance of foreign currency Unrestricted repatriation of profit

[168] *Source: https://www.boi.go.th/upload/Cambodia_Presentation_78898.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	reinvest their repatriable dividends and or retained earnings, those 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[167].					
Others	Exemption from income tax on salary	• 100% of Electricity Duty subject to the	Exemption of transfer charges on transfer of land	Exemption of transfer charges on transfer of land	• Exemption of transfer charges on	• Exemption of transfer charges on	VAT suspension for all

[167] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	of expatriates, dividend tax and royalty, technical fees, local govt. tax, land development tax	maximum ceiling of INR 25 lakhs / year / INR 1.25 crores in 5 years (USD 38,450 / year to USD 192,250 in 5 years) • An eligible unit in the medium and large sector will be entitled to reimbursement to the extent of 80% of contribution towards Employee Provident Fund and Employees' State Insurance • Industries shall be eligible for			transfer of land	transfer of land	exported oriented activities[169]

[169] *Source: http://www.bigconnectivity.org/beta/sites/default/files/2017-03/Cambodia%27s%20SEZ%20Policy%20in%20Shanghai%2017-22%20Oct%2016.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
		75% of refund of stamp duty • Anchor unit subsidy of INR 100 lakh (USD 153,800) shall be offered for the first two manufacturing enterprises with minimum employment of 100 members and minimum investment of INR 50 Crore (USD 7,690,000) • Industrial units will be encouraged for filing their successfully generated, registered and accepted patents based on their original work/research					

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
		. The State Government will provide financial assistance of 50% of the expenditure incurred, up to a maximum of INR 2 lakh (USD 3,076), / patent. The expenditure incurred will include the amount spent on filing of patent, attorney fees, patent tracking etc. 75% waiver of fees incurred towards land conversion charges					
Non-Fiscal Incentives							
One Stop Shop Within the Zone	Yes, there will be a one stop	One stop shop is not available within the zone.	Yes, there is one stop shop	Yes, there is one stop shop	Yes, there is a one stop shop available within the zone	Yes, there is a one stop shop available within the zone	Yes, there is one stop shop is

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	shop within the zone		available within the zone	available within the zone.			available within the zone
Support Amenities							
Onsite Administration office	Yes, there is provision for some of these elements in the Master Plan of the proposed EZ	There is onsite administration office available within the zone	There is onsite administration office available within the zone	There is onsite administration office available within the zone	There is onsite administration office available within the zone	There is onsite administration office available within the zone	There is onsite administration office available within the zone[170]
Onsite Convenience Retail		There is no onsite convenience retail available within the zone	There is no onsite convenience retail available within the zone	There is no onsite convenience retail available within the zone	There is no onsite convenience retail available within the zone	There is no onsite convenience retail available within the zone	There is no onsite convenient retail available within the zone
Onsite Housing		There is onsite housing available within the zone	There is no onsite housing available within the zone	There is no onsite housing available within the zone	There is no onsite housing available within the zone	There is onsite housing available within the zone	There is onsite housing available within the zone[171]
Onsite Schools		There are no onsite schools available inside the zone	There are no onsite schools available within the zone	There are no onsite schools available within the zone	There are no onsite schools available within the zone	There are no onsite schools available within the zone	There are no onsite schools available within the zone

[170] *Source: http://www.cambodiainvestment.gov.kh/investment-scheme/the-special-economic-zones.html*
[171] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
Onsite Community Facilities		There are no onsite community facilities available within the zone.	There are no onsite community facilities available within the zone	There are no onsite community facilities available within the zone	There are no onsite community facilities available within the zone	There are no onsite community facilities available within the zone	There are onsite community facilities within the zone
Onsite Security		There is onsite security available at the zone.	There is onsite security available within the zone	There is onsite security available within the zone	There is onsite security available within the zone	There is onsite security available within the zone	There is onsite security available within the zone
Quality of Life							
International Housing (Within 15 Km)	There is no international housing facility available within 15 km radius of the EZ	Quality housing facilities are available in the nearby town of Jalpaiguri	There are quality housing facilities available within 15 km from the export processing zone	There is no international quality housing available within 15 km from the export processing zone	There are housing facilities available in proximity to the zone; however international quality housing is not available	There are housing facilities available within the zone; however international quality housing is not available	There is no international housing facility available within 20 km radius of the EZ
International Hospital/Clinic (Within 20km)	There are basic healthcare facility available in the region which can be availed at various	Quality healthcare facilities like Jalpaiguri District Hospital is available in proximity to the economic zone	There are quality hospitals near the zone such as Habaraduwa Hospital, Dr. G. R. A. De Silva Hospital etc.	The nearest hospital to the industrial park is Base Hospital Horana	Superior quality hospital like Base Hospital, Sahanya Private Hospital etc. are present in proximity to the zone	Superior quality hospital like District Base Hospital, Durdans Medical Center etc. are present in proximity to the zone	There are no superior quality hospitals available in close proximity to the zone

Parameters	Bhola	Raninagar Industrial Growth Center (India)	Koggala Export Processing Zone (Sri Lanka)	Horana Export Processing Zone (Sri Lanka)	Mirigama Export Processing Zone (Sri Lanka)	Wathupitiwela Export Processing Zone (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)
	hospitals in Bhola district of Barisal divison.						
International Schools (Within 20 kms)	There are no international schools available within 20 km radius. But within 25 kms, popular colleges and institutes are available in Bhola district such as Bhola Government College, Bhola Polytechnic institute, Bhola Technical School and College etc.	Various upscale schools like Holy Child School, Techno India Public School etc. are present in proximity to the economic zone	There are international quality schools available within 15 km from the export processing zone such as Salahiya International School	There are no international quality schools available within 15 km from the export processing zone	Superior quality schools like D.S. Senanayaka Central College, Oxford International School etc. are present in proximity to the zone	Superior quality schools like Thihariya International School, Negombo South International School, Islamic International School etc. are present in proximity to the zone	There are quality schools like Motherland International School and Harford International School available within 20 kms from the zone

Source: PwC Analysis

4.5. Key Takeaways

Some important features and best practices that were present across the benchmarked EZs which helped remain competitive and attract industrial tenants are as follows:

Table 25: Key Takeaways

Location	• Location is one of the most important factors for any EZ. • The EZs used for benchmarking are successful EZs which are either located close to the capital city or major urban nodes or trade gateways which help in access to export/import opportunities, backward/forward linkages, major markets, social infrastructure and availability of human resources that will be employed. • Although there is no direct road connectivity, the proposed EZ is connected with multiple ferry ghats (such as Ilisha Ghat, Laharhat Ferry terminal, Bheduria ghat etc.) in the vicinity. This is a key feature of the proposed EZ as goods can be supplied to/ from the proposed EZ across the country through IWT network. • But lack of direct road connectivity with major hubs of the country may be detrimental for certain industrial sectors.
Multi-modal Connectivity	• The EZs site location is chosen such that it is well connected via roads, railways, airports, seaports etc. to other main locations for ease of business and trade. • The proposed EZ has no direct road or rail connectivity but it is well connected to other parts of Bangladesh via IWT network
Access to Utilities	• Presence of Infrastructure/ Utilities such as Onsite Independent Power (at a competitive price), availability of water (at a competitive price) adds to the attraction of EZ. • In case of the proposed EZ, the nearest power source is ~18 km and nearest water source Ganeshpura river is ~ 2 km from the proposed EZ. • Details of sourcing strategy for utilities is evaluated in the master planning section of this report.
Cost of Utilities	• Out of the competing EZs, cost of power is high in Philippines, whereas it is almost equal in Cambodia and India as compared to Bangladesh. • Cost of water is low in Cambodia and Sri Lanka, whereas it is high in India as compared to Bangladesh. • Lower cost of utility shall result in reduced cost of manufacturing.

	**Cost of Manpower**	• Cost of labor (management, technicians, skilled and unskilled) should be competitive. The cost of labor when compared to other global EZs is very low. • This shows that the proposed EZ has an edge and is very competitive when it comes to cost of labor.
	**Cost of Transportation**	• For an EZ to be competitive globally, cost of transportation should be low. • Comparison of cost of shipping a 20-foot FCL container from various locations indicates that transport cost to Bangladesh is higher as compared to the other competing EZs from Cambodia but lower when compared to Sri Lanka and India. • Higher cost of transportation means increased manufacturing cost.
	**Support Amenities**	• The benchmarking exercise demonstrates that EZs have support amenities such as Administration office, Convenience retail, Housing, Schools, Hospitals, Security etc. to support the people working and living in the EZ, and hence helps in attracting more investors. • Thus, presence of similar facilities could be evaluated for the proposed EZ.
	**Sustainability**	• Presence of an onsite wastewater treatment plant is a must-have for any EZ. • Majority of the EZs used for benchmarking globally had these plants.
	**Economic Competitiveness of Host Country**	• Out of the countries considered in this benchmarking exercise, India has fared well in terms of FDI inflow, global competitiveness ranking, financial market development ranking, and in ease of doing business. • Bangladesh is laggard in terms of these macro-economic and regulatory parameters. However, its robust growth in the recent years have outperformed most of its peers

Source: PwC Analysis

These notable best-practices and offerings can add to the potential of the proposed EZ from the perspective of attracting lucrative investments from reputed industrial houses and increase its demand. The same are kept in mind and incorporated in the master planning, and infrastructure assessment of the proposed EZ. **Basis the analysis done above, the proposed EZ is found to be competitive with respect to other EZs on majority of the comparative parameters.**

5. Industry Assessment

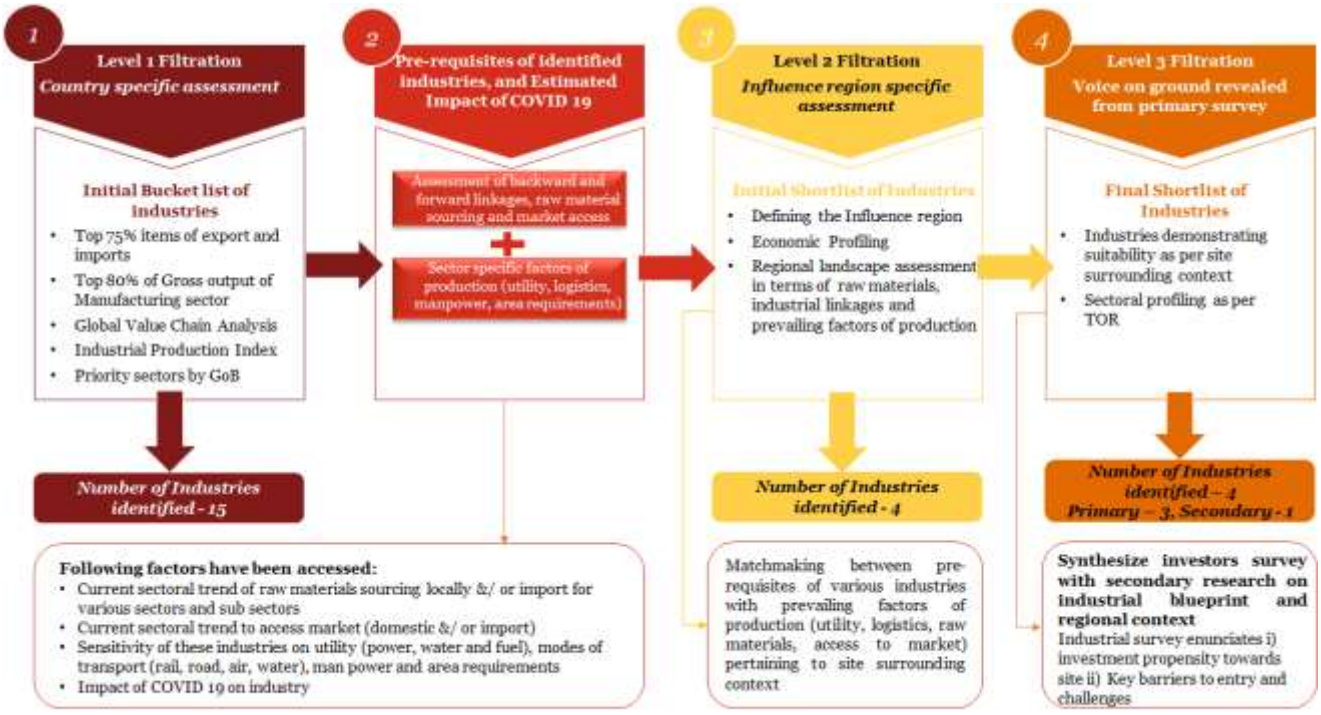
5.1. Key Objectives

Main objective of industry assessment is to identify site-specific best-fit industries which can be compatible with the local economy and existing supply chains of the region. Through this chapter, recent growth trends and policy support for various industries will be highlighted to draw attention to industry segments that are exhibiting significant development potential 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. Further the results obtained from both primary (bottom-up) and secondary (top-down) studies would be synthesized to arrive at the final shortlist of industries for the proposed EZ. A detailed industrial profile would be undertaken for these target industrial sectors, covering typical land, power and water requirements, as well as, typical employment requirements for these sectors.

5.2. Framework of Industry Assessment

The process to arrive at the best-fit industrial mix that would be compatible in the context of the proposed EZ is a four-pronged approach covering macro level assessment of the country, which funnels down to site level and regional specific assessment, with validation from current manufacturers and members of various industrial associations.

Figure 20: Industry assessment framework



Source: PwC analysis

Level-1 and Level-2 filtrations delve into top-down assessment and are based on secondary research, whereas the findings from these two levels of filtrations are validated in the level-3 filtration (bottom-up assessment).

5.3. Industrial Sector Outlook Assessment of Bangladesh

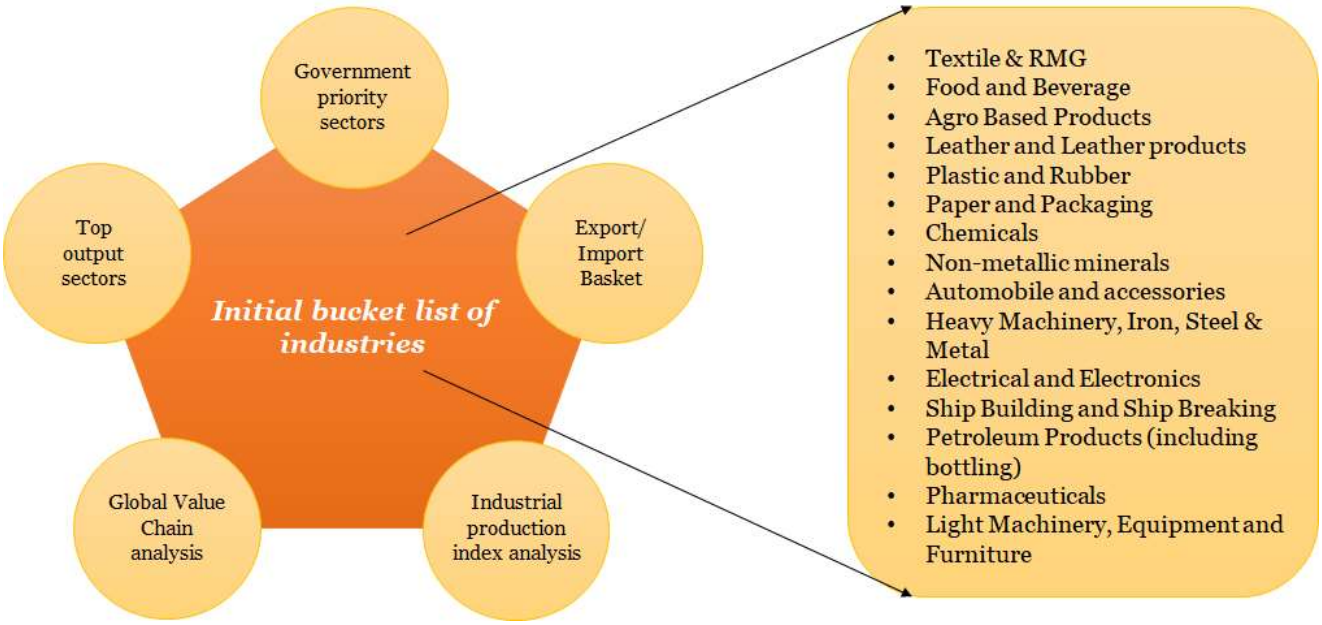
Bangladesh was world's seventh fastest growing economy and textile & RMG industry has always been the primary industrial sector in the country.[172] This sector formed 84.21% of the total export basket in 2018-19, providing employment to around 3.6 million people.[173] However, at the same time it also highlights the over reliance of Bangladesh's exports on a single sector as growth engine of the export economy. There is a need to improve its manufacturing competencies in other sectors in order to make its economy resilient to possible sector specific disruptions due to automation, policy changes and increasingly competitive global scenarios. Export diversification is one of the cornerstones of the Government's Seventh Five-Year Plan (FY 2016 to FY 2020).

For this engagement, in order to arrive at the potential industrial sectors which can be established at the proposed EZ, it is important to assess the following-

- Sectors contributing to top export and import basket of the country
- Traditionally dominant sectors in terms Gross Output of Manufacturing Sector
- Global Value Chain (GVC) analysis
- Index of Industrial Production analysis
- Priority sectors identified by the GoB

These parameters shall help understand at the country level, the dominant industries at present and the prospective industries which are going to come up in the future. Details of this assessment are provided in the annexure. Based on this assessment, an initial shortlist of industrial sectors was created by identifying those industries performing well across the parameters as highlighted above. The initial shortlist of industries is as mentioned below:

Figure 21: Initial shortlist of industries



Source: PwC analysis

All these sectors have either demonstrated sound growth or part of the priority sectors identified by the Government or are going to come up in the future.

[172] *International Monetary Fund*
[173] *Bangladesh Garments Manufacturers and Exporters Association*

5.4. Outlook of Industrial Landscape in the Future

As mentioned earlier, Bangladesh has set forth an ambitious growth target of shaping up as a developed economy by 2041. However, it is imperative to mention that in the recent times, due to the COVID-19 outbreak, various disruptions in global supply chain and industrial linkages are taking place. A deep recession has loomed across the globe and UN trade agency highlights that COVID-19 is likely to cost economy USD 1 trillion during 2020. Bangladesh is no exception, RMG sector has already witnessed cancellation of orders around USD 3 billion from 1,059 Bangladeshi suppliers. This could result in employment loss of more than 1.44 million workers and export loss in the range of USD 4 billion.[174]

5.4.1. Impact of COVID-19 on the Initial Shortlist of Industries

Harvard Business Review (HBR) indicates that the largest 1,000 companies or their suppliers own more than 12,000 facilities in COVID quarantine areas. Since the past decade, China (the epicenter of COVID-19) has gradually established itself as the hub of electronics, technology products, industrial, and automotive manufacturing. China has placed itself as the second largest importer (USD 1.674 trillion in 2019) accounting for ~9.1% of global imports and largest exporter (USD 2.524 trillion in 2019) accounting for ~13.7% of global exports. COVID-19 will hinder this EXIM relationship between China and rest of the world. Bangladesh, owing to its import dependency on China is expected to suffer a massive slowdown in its industrial growth.

Industrial slowdown will directly impact supply chain, logistics, and shipping sector. Worldwide COVID-19 has disrupted supply chain of all commodities. HBR reviews indicate that COVID-19 has disrupted supply chains for nearly 75% of US companies. Baltic Dry Index (BDI) is down by 52% since December 2019. This steep fall in the BDI indicates substantial idle bulk shipping capacity.

While global economy is expected to contract by 2.2% in 2020 and this contraction would be highest in the G-20 economies.[175] These G-20 nations are the primary market for the RMG sector of Bangladesh, which is the backbone of the economy. Anticipated landslide in RMG sector might create a cascading effect and as a result further creates impact on other industrial sectors. World Bank indices indicate that the regional growth of South Asia would decline to a range between 1.8% to 2.8% in 2020 (from 6.3% projected six months back). Although various fiscal stimulus has been declared to revive the economy, the growth forecast in the coming 2 years is bleak for the country. World Bank indices indicate that real GDP of Bangladesh is expected to grow at:

- 2% to 3% in 2020 (it was 8.2% in 2019)
- 1.2% to 2.9% in 2021
- 2.8% to 3.9% in 2022

World Bank also has estimated the industry growth rates for Bangladesh in between 2020, which are:

- ~2% in 2020 (from ~12.7% in 2019)
- ~3.5% in 2021
- ~6.1% in 2022

Recovery from this pandemic would take 3 to 4 years (at least) for the country. Bangladesh lacks indigenous production of raw materials and natural resources and the country is primarily import dependent on China and India. Apart from Textile & RMG and leather (constitute over 80% of export basket), all other sectors are domestic consumption oriented. Since the country is highly dependent on foreign trade, global slowdown will result in significant dip across the industrial sectors of the country.

[174] *PwC Research*
[175] *World Economic Forum*

In the following, a broad level assessment has been undertaken on the possible impact of COVID-19 across industrial sectors of the country.

Table 26: Industrial sector profiling and impact assessment due to COVID-19

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
Textile & RMG	• The major industry, and the largest employer of the country • Contributes more than 90% to the country's exports with exports worth ~41.5 billion USD in 2019. • Industry has depicted growth rate of ~8% in the past and estimated to grow ~7% in the coming decade.	• Decrease in demand in western market will result in decreasing export of the industry • More than 1 million jobs might be lost due to pandemic • May generate disruption in the country's positioning as one of the market leaders in the industry
	●	●
Food & Beverages/ Agro based products	• Majorly domestic consumption driven, with exports worth ~850 million USD (2019), and imports worth ~6.11 billion USD (2019). • Dairy sector has shown ~13% growth in the last five years, and in near future, the industry is estimated to grow between 12-14% each year. • Sea food industry is estimated to grow by ~5% in the coming five years. • Less import dependency; quality vegetables/ fruits and food items are imported- however, the trend is declining	• Less impact envisaged as most of the industry is domestic consumption driven • In short term, there might be impact due to decrease in consumption and declining spending propensity, and decline in exports (e.g. shrimp) • In long term, industry should gain momentum as it caters to the "essential" product segment
	◕	◔
Leather and Leather Products	• Another major industry in Bangladesh in addition to textile & RMG. • Recorded exports worth ~508 million USD in 2019 and has depicted growth of ~10% annually in exports. • The industry is rising rapidly and estimated to grow between 10-12% every year in the coming five years.	• Considerable impact considering the luxurious nature of leather products • Decrease in demand in western market might result in dip in exports •
	◕	◕
Plastic and Rubber	• Majorly import dependent, and low domestic production • Exports worth only ~125 million USD in 2019, while estimated domestic	• Medium impact, as industry acts as input to both essential and non-essential services industry (e.g. food as well as RMG)

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
	market size of ~1 billion USD (as of 2018) • Imports for 2019 were recorded at ~433 million USD, much higher than exports in the same industry • But exports are estimated to grow at 5-8% in the coming few years.	• Mostly consumption driven market, so domestic production will only be affected in short term. • Imports might be impacted due to possible disruption of global supply chains
	◔	◑
Paper and Packaging	• Domestic consumption driven industry. • Recorded export worth ~20 million USD in 2019, while imports were recorded at ~683 million USD. • Export of the product has demonstrated volatile growth rates in the past decade, and in short term exports will be impacted due to decrease in demand in downstream industries.	• Medium impact in short term due to decrease in demand from downstream industries. • In long term, demand for paper might decrease due to shift of consumer base to digital platforms • On the other side, packaging demand will likely to remain constant in long term
	◑	◔
Chemicals	• Domestic consumption driven industry, with significant import dependency • Domestic production is estimated to grow between 1-2% in the next five years. • Import of ~835 million USD worth organic chemicals in 2019, while ~392 million USD worth inorganic chemicals were imported in the same year.	• High impact in short term as imports are affected and industrial needs getting depleted • Low impact in long terms, as industrial production will continue once the pandemic recovers
	◑	◕
Non-metallic minerals	• Majorly domestic consumption market driven industry. • Exports are limited. Exports worth ~47 million USD in 2019, while imports were recorded at ~247 million USD in the same year. • Volatile nature of exports with few years depicting growth in exports while few years decrease. • Industry is estimated to grow north of ~10% in the coming five years.	• Low impact in long term due to nature of products, and demand for construction, real estate (major consumer industries) is likely to go back to normal in long term as pandemic recovers. • In short term, there is significant dip in the demand for industry products (e.g. cement, ceramics, and glass), and hence considerable impact

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
		• Disruption in recently rising exports from Bangladesh might impact in long term in international market.
	◑	◕
Automobiles and accessories	• Domestic market consumption-based industry. Most of the domestically consumed materials is imported. • Exports worth ~95 million USD in 2019, and it is estimated to grow north of 5% YOY in the coming five years. • Imports were recorded worth ~1075 billion USD in 2019	• Low impacts in long term considering the nascent stage of development of industry in the country. • Few assembly plants are closed amid lockdown, and hence decrease in domestic production in short term. • Possible impact on domestic consumption market, as global supply chains (and hence production lines) are likely to be disrupted
	◔	◕
Heavy Machinery, Iron, Steel and Metal	• Import dependency, and low exports in the sector • Domestic market is estimated to grow ~12-14% in the coming few years amid increase in demand in the sector. • Exports worth ~49 million USD for heavy machineries in 2019, while for iron and steel worth ~32 million USD in the same year. • Imports for heavy machinery recorded at 5.8 billion USD, while for steel and iron at 2.9 billion USD	• Low impacts in long term considering the nascent stage of development of heavy machinery industry in the country. • Possible supply chain disruption due to impact on imports • Decrease in domestic demand due to decrease in consumption power, lockdown and halt in infrastructure projects.
	◑	◕
Electrical and Electronics	• Majorly import dependent with imports worth ~3.24 billion USD in 2019, compared to exports worth only ~60 million USD • Domestic market estimated to grow by ~7% in the coming few years. • Presence majorly at manufacturing of cables, and less tech intensive electrical and electronics products.	• Decrease in consumption power in short term may impact the sales of electronics and electrical products. • Most of the channels of sales will remain affected even if lockdown conditions are withdrawn thus putting a negative effect on new batches of production • Disruption in supply chains will negatively impact the domestic

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
		• production through impact on export as well as import • In long term, the industry will likely to be very less impacted.
	◔	◕
Shipbuilding and Shipbreaking	• Domestic consumption market driven industry, with dependency on imports • Imports worth ~552 million USD in 2019 compared to exports worth only ~12 million USD. • Presence of industry in the coastal regions such as Khulna, Bagerhat, and Chittagong districts.	• Demand might decrease slightly as global shipping lines and/ or local shipping lines shall face slowdown • Since this sector is a traditional and saturated sector, much change might not happen • Order books of the shipyards in the country should decline
	◑	◔
Petroleum Products (Including bottling)	• Domestic market driven industry with currently dependent on majorly imports. • Import worth ~4.38 billion USD in 2019, compared to exports worth only ~21 million USD. • Industry estimated to grow between 6-8% in the coming few years.	• Decrease in domestic demand might impact on decrease in imports • Decreasing oil prices might benefit country positively, and help other sectors to save significant costs of fuel • Limited domestic refining capacity will impact the capacity of Bangladesh to take benefit from low oil prices, as it will have to import the refined oil from the international market.
	◑	◕
Pharmaceuticals	• Domestic market as well as export-oriented industry • Estimated to grow between ~13-15% in the coming five years. • Imports worth ~267 million USD compared to exports worth ~37 million USD.	• High demand for pharmaceutical products in short as well as long term • Development of local API park at Munshiganj will help Bangladesh to decrease imports of APIs and hence grow the domestic pharma industry due to increase in demand • Very less/no impact of pandemic on this sector as it is an “essential” product related sector
	◕	◔

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
Light Machinery, Equipment and Furniture	• Exports worth ~88 million USD compared to imports worth ~202 million USD in 2019 for furniture category. • Industry is estimated to grow at ~5% in the next coming years due to rising domestic market.	• Decrease in demand in short term due to decrease in new infrastructure development, stalled industrial manufacturing and MSME operations. • In long term, the industry will be less impacted, as demand is likely to come back to normal post the recovery from the pandemic.
	◑	◑
The details of Rating are as follows:		
○	Very Poor Condition	No/Minimal Impact
◔	Poor Condition	Little Impact
◑	Medium/Average Condition	Medium Impact
◕	Above Average Condition	High Impact
●	Good Condition	Very High Impact

Source: PwC Research

Owing to COVID-19, disruptions have taken place across the industrial sectors in Bangladesh; however, this may also bring out certain opportunities. It is imperative that the country has been scouting for foreign investors and the EZ regime is also targeted to attract the foreign manufacturing players to set up their units in Bangladesh. The onset of USA-China trade war prompted a lot of foreign companies to migrate from China and shift to other South Asian locations. In order to reduce higher tariffs imposed by USA, many Chinese players are also relocating. In the post COVID era, multiple foreign players shall move out from China; recent news articles indicate that Japanese companies are being incentivized to move from China.

Bangladesh as an investment destination offers low cost of operations and low cost of human resources. During these uncertain times, the companies have to choose between opting for automation to reduce cost or to relocate to such locations which offer lower cost of manufacturing- Bangladesh is right suited for the same. In order to attract these foreign investors, the EZ regime should open up by offering better and additional fiscal incentive packages (such as higher tenure for corporate tax exemption, import duty waiver on used machineries).

5.4.2. Evolution of Industrial Outlook in the Future

While the impact of COVID-19 is expected to last for the coming 3-5 years, post which the industrial outlook shall improve. Keeping cognizance of the ulterior objective of GoB in shaping up the country as developed economy by 2041, in the long-run, Bangladesh should focus on Industry 4.0. The term Industry 4.0 encompasses a promise of new industrial revolution. It is the digital transformation of industrial markets; specifically manufacturing industry driven by four disruptions: the astonishing rise in data volumes, computational power, connectivity and business intelligence capabilities.[176] It takes the automation of manufacturing processes to a new level by introducing customized and flexible mass production technologies.

According to recent research study by McKinsey Global Institute, industries with highest potential for automation are manufacturing, accommodation, food services, transportation and warehousing. Experts forecast that

176 McKinsey Publications

businesses will be able to increase their productivity by about 30% using Industry 4.0 by 2025.[177] Bangladesh being a developing economy depends on export of manufactured products to foreign countries. However, with the advent of industry 4.0 regime, manufacturing is becoming less labor intensive, which might create challenges for manufacturing industry in Bangladesh, which is majorly driven by cheap labor in the country. In light of Industry 4.0, it is pertinent for countries like Bangladesh, to do away with cheap labor being the primary driver of competitiveness and focus on infrastructure & logistics, research & development, and technology will be required to remain competitive in a changed industrial landscape. Therefore, it is imperative to develop the management of manufacturing and chain productions so that the efficiency would be substantially increased which is a strong indicator that Industry 4.0 is crucial for Bangladesh to move forward. Bangladesh needs the adaptation of Industry 4.0 not only to increase the industrial production but also to bolster the overall socio-economic growth.

Table 27: How Industry 4.0 shall change the outlook of industrial sectors by 2041

Industrial sectors	Solutions through Industry 4.0 (2041)
Textile & RMG	• Automation technologies such as use of robots in the textile & RMG sector to reduce the cost of outsourcing production and logistics cost and decrease the turnaround time. • Bangladesh needs to adapt to Industry 4.0 and need to focus on creating high value goods (from currently manpower oriented and focus on low value goods) through technology enablement.
Food & Beverages/ Agro based products	• To remain competitive and to increase the production capacity in this sector, new technologies such as use IOT and smart manufacturing needs to be implemented in order to boost the production without raising costs. • Although, Food & Beverages sector may not be completely ready to embrace the Industry 4.0, Bangladesh needs to invest in research and development of new technologies to differentiate a business amongst the competition.
Leather and Leather Products	• By adopting new technologies and processes in tanneries, it will help to recycle and reduce the effluent discharges. • Design of the leather products is a critical step in leather products manufacturing. Precision of the design of the leather products and quality of goods can be improved by adopting new technologies such as smart manufacturing in this sector to increase the export share of leather products.
Plastic and Rubber	• With the help of integrative production technologies, Bangladesh can improve the production capacity with minimal increase in costs and reduce waste with efficient and flexible production cycles.
Paper and Packaging	• Manufacturers in Bangladesh are investing in upgradation of technology to export quality papers in order export to global markets. • Due to changing policies pressures and competition, this sector is changing rapidly. So, to remain competitive, this sector must innovate not only the products but also the manufacturing processes with automation and digitization which will benefit in terms of productivity, efficiency and quality.

Industrial sectors	Solutions through Industry 4.0 (2041)
Chemicals	• Deployment of connected systems and analytical models for predictive asset management. • Bangladesh can get ready for export-oriented manufacturing by streamlining the operations. Technologies such as AI, Robotics and additive manufacturing can be efficiently integrated to digital transform the operations in the chemical industry. • Smart techniques introduced by industry 4.0 can help this sector in enhancing productivity and aligning manufacturing operations.
Non-metallic minerals	• Issues such as rising costs, enormous energy consumptions and overall complexity can be reduced with the help of 4.0 techniques such predictive analytics maintenance, end-to-end optimization thereby improving operational efficiency and reducing operational costs.
Automobiles and accessories	• Technologies such as Machine learning and Advanced analytics help with greater connectivity with their automobiles, pushing the industry to evolve. • Bangladesh needs to focus on promotion of more research and development in the automobile sector and through induction of new technologies in the production lines.
Heavy Machinery, Iron, Steel and Metal	• Manufacturing can be done efficiently through Industry 4.0 concepts and new developed manufacturing techniques such as Smart factories and Smart manufacturing.
Electrical and Electronics	• Analytics platform across its facilities to reveal the amounts of waste they generate across utilities (water, electricity etc.). • Azure machine learning techniques in smart factories to detect and predict defects in machinery. This allows for predictive maintenance that can cut down on unexpected delays, which in turn helps in reduction of costs.178 • Bangladesh needs to adapt to the global changes in Electrical and Electronics Industry as this field has a higher degree of digitization than any other industrial sector in the world. Investments in R&D, process developments and technology improvements to support the innovations in this sector to remain competitive in the market.
Shipbuilding and Shipbreaking	• Smart Ship building by introducing robotics, 3-D printing technology to increase the efficiency. • Bangladesh needs to focus on promotion of more research and development in this sector and through induction of new technologies in the production lines so as to reduce the production and operational cost and increase its production efficiency.

[178] *nordcloud.com*

Industrial sectors	Solutions through Industry 4.0 (2041)
Petroleum Products (Including bottling)	• Smart Sensors in the Oil refineries enhance the monitoring the safety and functionality of all processes. • Similar automation and digitization techniques in this sector such as Information Management systems etc. will play a crucial role in the upliftment of this sector.
Pharmaceuticals	• Implementing new industry 4.0 concepts in Pharma sector will provide in line and in-time control over the business, operations and quality.179 Developing nations are currently working on APC strategies to implement in Pharma sector to improve the quality and production. • Similarly, Bangladesh should look upon new manufacturing techniques in this sector and train the manpower to build and help operate adopted technologies so as to improve the production and reduce risk and waste.
Light Machinery, Equipment and Furniture	• Bangladesh can be competitive in this sector by customized production by introducing industry 4.0 concepts such as Smart manufacturing into the production to achieve efficient production targets and quality products.

Source: PwC Research

Above discussions bring out the popular industrial sectors in Bangladesh context and how the future would shape up for these sectors. Following section delves into the holistic assessment of the region surrounding the proposed EZ to understand the suitability of the initial shortlist of industries in site surrounding context.

5.4.3. Key Areas to Focus for Bangladesh

As established in the earlier sections, the effect of this pandemic would be prolonged in case of industrial manufacturing sector. Although, sectors such as Food & Beverages, Agro-based products, and Pharmaceuticals are somewhat immune against this but on a broader spectrum, overall industrial growth is expected to be lower than previously optimistic growth rates projected in the pre-COVID era. In order to cope and emerge stronger economically, Bangladesh should focus on certain areas and define its strategy in both short and long term. The table below tries to highlight certain tactics (short term) and strategies (long term) which could help Bangladesh minimize the ill-effects of this pandemic on its economy.

[179] *ispe.org*

Table 28: Some key Short term and Long-term focus areas for Bangladesh

 **Tactics: Short Term**	 **Strategy: Long Term**

• Banking on its low factor costs of production, Bangladesh could promote itself as an alternate investment destination for foreign firms exiting China; it has been already confirmed that a large contingent of Japanese firms are being incentivized for moving their facilities out of China
• In order to successfully lure these investors, Bangladesh has to upgrade its policies related to incentives, regulations etc. in lieu of becoming a more attractive investment destination as compared to India and other South east Asian economies
• Ensure strict protocols for re-operationalization of identified industries. Some measures could be –
  ○ Factory disinfection plan
  ○ Product hygiene authentication
  ○ Equipment usage and safe distance support
  ○ Mandatory OD mapping and reporting of migrant workforce
  ○ Person to equipment mapping
  ○ Additional protocols for materials receipt at trade gateways
• Developing a risk framework for opening up economy basis inherent nature of industries and COVID intensity in the region
	• In the long term, decision makers should evaluate impact of the pandemic on industries and sources of these impacts. For example, industries with high import dependence could look at alternate sources of supply which can even be domestic in nature
	• Re-evaluation of consumption dependence on manufacturing could also help in optimization of factors of production
	• Higher participation in Global Value Chain of high value products which could alleviate risks accrued due to sudden shocks such as the one at hand in future
	• Diversification of export basket and reduced dependency on the textile & RMG sector; it has already been realized that Bangladesh needs to reduce its disproportionate dependence on this sector, efforts towards achieving the same has also been started which should become more aggressive as the country emerges into the post-COVID era
	• Most importantly, a gradual shift from labor intensive production processes towards automation could hold the key for a bright future for the country as most developing economies are embracing such technologies to reduce human effort and improve production techniques.

Source: PwC Research

5.5. Regional Assessment

Regional assessment involves assessment of the region surrounding the proposed economic zone on various parameters which can supplement the development of an economic zone. Few of the such parameters are – agricultural and natural resources, human resource profiling in the region, industrial ecosystem in the region, and new key developments planned in the nearby areas.

The region here refers to the area which considers Bhola district (district in which a proposed EZ is located), and its nearby districts which can make direct impact on the EZ development. These districts are:

1. Barisal

2. Patuakhali
3. Jhalokati
4. Lakshmipur
5. Pirojpur

Of the above five districts, Barisal, Patuakhali, Jhalokati and Pirojpur are part of Barisal division, while Lakshmipur district is part of Chittagong division.

This section will attempt to understand the profile of the region and will assess the region for understanding the better industrial mix at the proposed economic zone. Few details about the districts in the influence region are as shown in Table 29:

Table 29: Key details about districts in the influence region

Sr. No	Name of the District	Area in Sq. Km	Population (2020, estimated) in Million	Per Capital GDP (Current USD) #	Average Consumption Expenditure (USD per Capita)
1	Barisal	2,785	2.58	1,715	920
2	Patuakhali	3,221	1.70	1,744	878
3	Jhalokati	707	0.76	1,375	1,010
4	Lakshmipur	1,440	1.92	1,395	763
5	Pirojpur	1,278	1.23	1,513	868
6	Bhola	3,403	1.97	1,674	920

#-Estimated for 2018, the country's per capita GDP is for year 2018
Source: Lagging District Survey (LGED), Bangladesh Bureau of Statistics, and World Bank Database

Barisal, and Bhola districts are observed to have higher population in the influence region, while the GDP per capital for the district is in the range of ~1350 USD to ~1750 USD per capita. The consumption expenditure is observed highest in Jhalokati district, while it is observed minimum in Lakshmipur district in the influence region.

5.5.1. Demographics of the Influence Region

Bhola district, located in Barisal division is estimated to have ~2 million population in the district by 2020, and its share in the national population is estimated to be slightly above 1%. The district has almost equitable population of both male and female, and considerable population of the district resides in the rural areas.

Graph depicted in Figure 22 tries to depict the gender wise population distribution in the district.

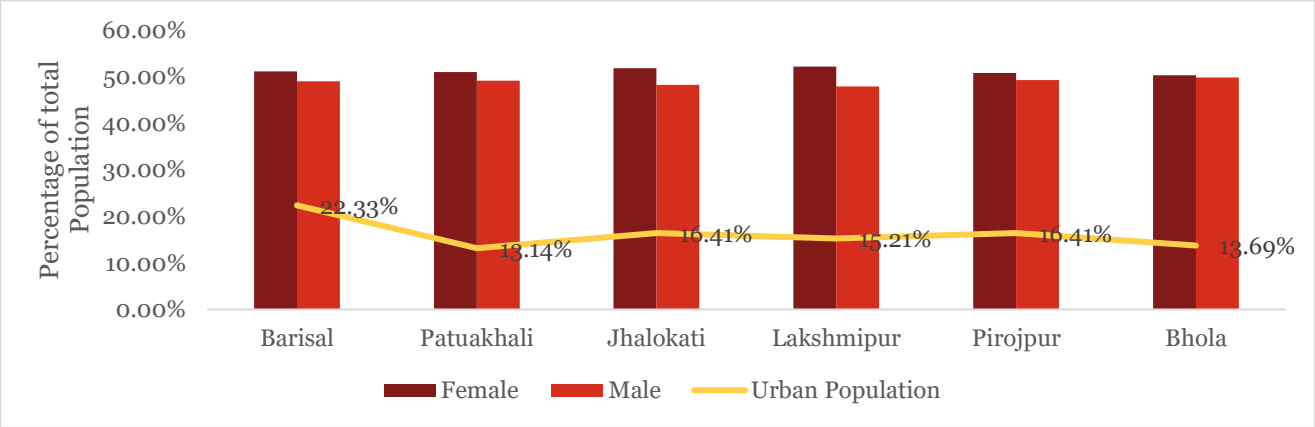
Figure 22: Gender wise Population Distribution in the District (2020 estimated)

Note: The ratio is calculated on the basis of population estimated for 2020
Source: Population and Housing Census, Bangladesh Bureau of Statistics

It may be noted from Figure 22 that, proportion of female population in the rural areas is higher compared to the male population, while in case of urban areas, the female population is lower slightly lower than the male population. The very low rate of urbanization in the district along with above makes female population at the district level slightly higher than male population by a small margin.

Graph in Figure 23 depicts the gender wise distribution of population as well as population distribution by urban rural divide for all the districts which are part of the influence area.

Figure 23: Gender wise and Urban-Rural Distribution for Districts in influence region (2020 estimated)



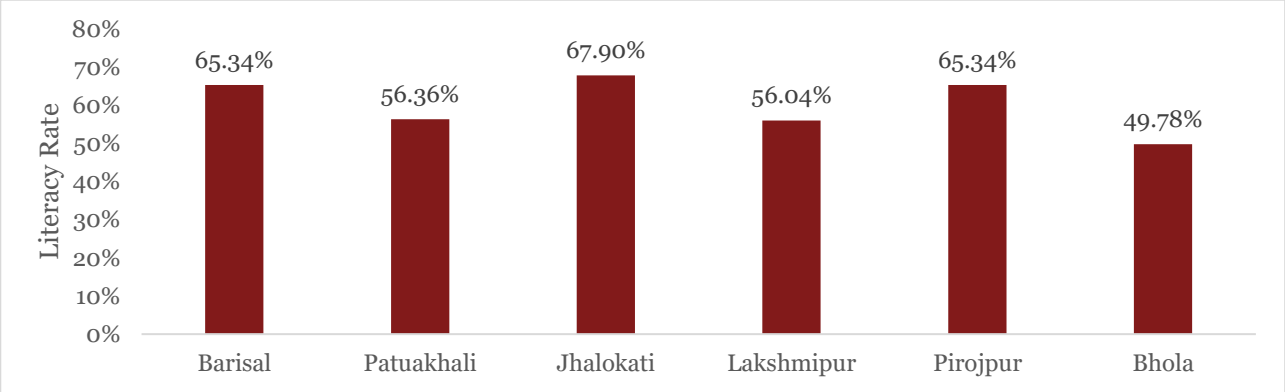
Note: The ratio is calculated on the basis of population estimated for 2020
Source: Population and Housing Census, Bangladesh Bureau of Statistics

It may be noted that, female population is marginally higher than the male population in all the districts in influence region. Almost equitable population of male and female in the influence region depicts the availability of both the type of labor (female as well as male), which can ensure the seamless supply of workforce to industries such as Textile & RMG (female workforce dominated), or heavy machineries (male workforce dominated).

Urbanization is limited in the influence region, as all the districts have share of population staying in the urban areas between ~13% to ~23%. Low rate of urbanization depicts the lack of adequate social infrastructure in the district, which may result in low migration of skilled labor from other part of the country to influence region and EZ location even if employment opportunities come up in the EZ in future.

The quality of manpower is generally determined by literacy rate. The literacy rate of the districts in the influence area is depicted in the Figure 24.

Figure 24: Literacy rate for population in the influence region (2020 estimated)



Note: The numbers are estimated for 2020, on the basis of latest results in 2011 census.
Source: Population and Housing Census, Bangladesh Bureau of Statistics

Except Bhola, all the districts in the influence region have literacy rate higher than 50%. Literacy rate is estimated to be highest in Jhalokati district followed by Pirojpur district (67.9% and 65.3% each), while it is lowest in Bhola district (~49.8%). The literacy rate in all the districts is lower than the national level average, which is ~74%.[180] Low level of literacy rate in Bhola and few other districts in the influence region depict the scarcity of educated and skilled labor in the region.

Most of the people residing in Bhola district are employed in wholesale and retail trade, followed by transportation and storage service, and accommodation services. The share of manufacturing services in employment offering is very lower in the district, and it is estimated to be only ~6% of the total employable population. Similar to Bhola district, other districts also have wholesale and retail trade as the major employment activity, while manufacturing is second best employment activity in these districts. The share of other activities such as education, accommodation, transport and storage services follows the employment numbers post the wholesale and retail trade, and manufacturing in these districts.

Sourcing of Human Resources

It is important to have adequate training and educational infrastructure in the district in order to train the manpower. There are total 71 technical and vocational educational training institutions in the district. The following table depicts the number of TVET institutions in the district and their distribution as per the type of institutions.

Table 30: TVET Institutes in Bhola district

Type of Institute	Number of establishments
Polytechnic Institutes	3
HSC (Business Management)	8
Training Institute (Basic skill development)	22
Vocational Secondary Education	2
General Secondary School (Attached vocational education)	16
Institute of Medical Technology	1
Nursing Institute	1
Agriculture Training Institute	1
Technical School and College	1
Office (Training)	3

[180] World Bank Database (literacy for 15 years and above)

Type of Institute	Number of establishments
Animal Health Institute	1
Technical Training Centre	1
General Madrasha (Attached Vocational Education)	3
Madrasha HSC (Attached BM)	1
General HSC	6
Sarkari Shishu Paribar	1
Total	**71**

Source: TVET Institution Census

The TVET institutions offer various trainings such as welding, plumbing, and carpentry, which can be directly used in the industry. These courses will help factories in proposed EZ to get workforce, while will also offer employment option to the local youth. Industries in the EZ can also collaborate with the TVET institutions for training purposes and new innovative and on demand courses may be started in these TVET institutions through industry-academia collaboration.

The unskilled labor can be easily sourced from Bhola district and nearby regions of the influence area. Generally, in Bangladesh, unskilled labor is not a big challenge, as migration of unskilled labor is quite prevalent and widespread in the country. The only challenge is for skilled or semi-skilled labor, which can also be sourced from various TVET institutions in the district, and from the districts in the influence region. Development of economic zone in the district will also restrict the trend of people migrating from the district to the urban areas close to Dhaka and Chittagong in search of employment.

Districts in the influence region depict the dearth of skilled labor, while the unskilled labor is available in abundance. Hence industries such as Textile & RMG, Food & Beverages, and leather and footwear are better posed for development in these districts. Skill intensive industries such as electrical and electronics, automotive, and pharmaceuticals can come up in the EZ given the special efforts taken for the upgradation of skill level of the domestic population in the influence region.

5.5.2. Access to Natural Resources

Natural resources are essential for the development of manufacturing industry, and hence access to them is one of the major criteria for the assessment of region and industry profile of the industrial hub.

5.5.2.1. Agricultural Resources

Bhola district is rich with agricultural produces, and has fertile land which can grow various agricultural resources such as vegetables and fruits. Few of the agricultural products produced in the district are mostly distributed to the domestic market, while few of these are also exported to the international market as well. Table 31 given below depicts the list of major crops grown in the influence region.

Table 31: Major crops in the influence region (fruits not included, 2018-19)

Sr. No.	Name of the District	Major Crops
1	Barisal	Rice, Wheat, Gram, Lentil, Green Gram, Kheshari, Sesame, Coconut, Red Chili, Sugarcane, Betel leaves
2	Patuakhali	Rice, Wheat, Gram, Lentil, Green Gram, Kheshari, Sesame, Groundnut, Sunflower, Rabi Chili, Garlic

Sr. No.	Name of the District	Major Crops
3	Jhalokati	Rice, Gram, Lentil, Green Gram, Kheshari, Sesame, Mustard, Rabi Chili, Betel nuts, Betel leaves
4	Lakshmipur	Rice, Lentil, Green Gram, Kheshari, Groundnut, Soya bean, Rabi Chili, Onion, Betel nuts
5	Pirojpur	Rice, Wheat, Lentil, Green Gram, Kheshari, Coconut, Sunflower, Rabi Chili, Sugarcane, Betel nuts, Betel leaves
6	Bhola	Rice, Wheat, Lentil, Green Gram, Kheshari, Groundnut, Soya bean, Rabi Chili, Onion, Garlic, Sugarcane, Coconuts, Mustard, Betel nuts

Source: Agricultural Yearbook 2019, Bangladesh Bureau of Statistics

As depicted in the above table, Bhola district is riche with crops such as Rice, Wheat, Lentil, Green Gram, Kheshari, Groundnut, Soya bean, Rabi Chili, Onion, Garlic, Sugarcane, Coconuts, Mustard and Betel nuts. Table 32 depicts the production of major crops in Bhola district.

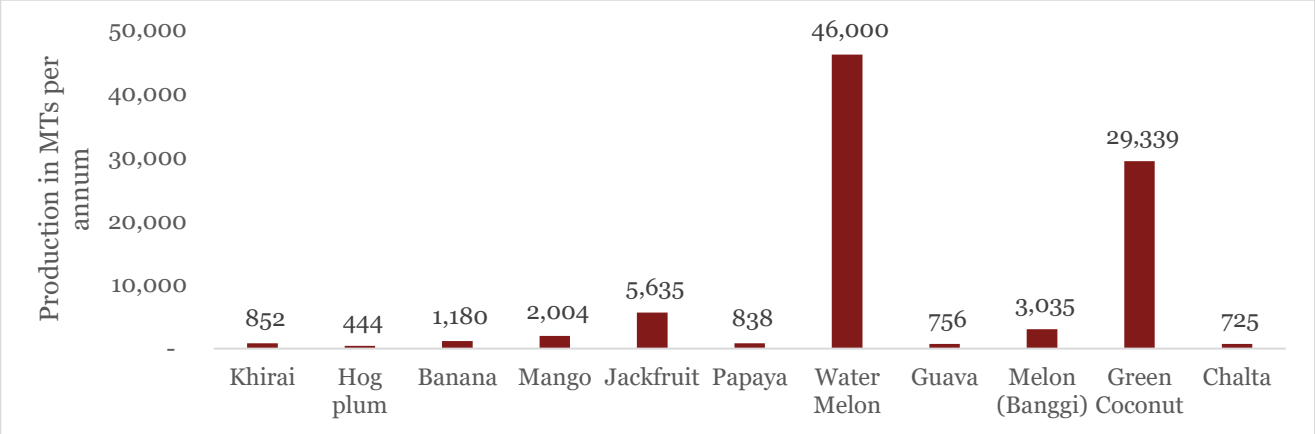
Table 32: Production of major crops in Bhola district (2018-19)

Sr. No.	Crop type	Area under cultivation in Acres	Production in MTs
1	Rice	300,267#	774,182
2	Green Gram	24,062	8,948
3	Kheshari	32,050	16,372
4	Rabi Chili	34,268	11,997
5	Coconut	13,135	29,339
6	Soya bean	5,719	4,022
7	Betel nuts	5,336	10,777
8	Groundnut	4,707	3,631
9	Mustard	2,114	1,100
10	Lentil	1,720	997
11	Onion	1,487	2,806
12	Wheat	1,458#	5,092
13	Garlic	1,330	1,340
14	Sugarcane	930	3,762

Source: Agricultural Yearbook 2019, Bangladesh Bureau of Statistics, data is for year 2018-19; # in Ha

Apart from the abovementioned crops, banana, watermelon, mango and jackfruit are the major fruits produced in the region. Production of major fruits in Bhola district is depicted in the graph given in Figure 25

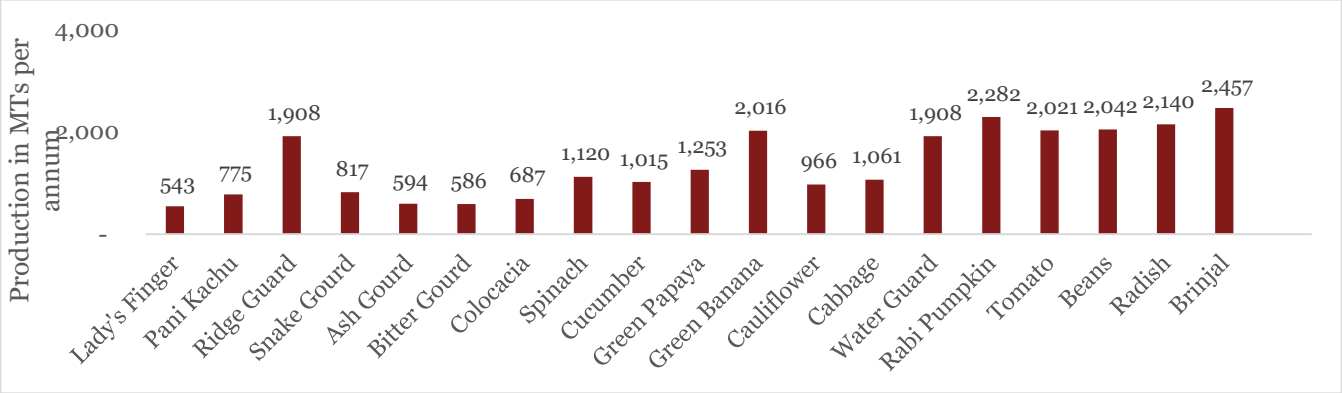
Figure 25: Production of fruits in Bhola district (2018-19)



Source: Agricultural Yearbook 2019, Bangladesh Bureau of Statistics, data is for year 2018-19

Similarly, the production of major vegetables in Bhola district is depicted in Figure 26.

Figure 26: Production of vegetables in Bhola district (2018-19)



Source: Agricultural Yearbook 2019, Bangladesh Bureau of Statistics, data is for year 2018-19

The rich production of vegetables, fruits and other agricultural produces in the district already act as source of input to the food industries in the nearby regions. Apart from the above-mentioned crops, Bhola district is famous for the production and export of potatoes. The district produced 97,566 MT of potatoes and 16,719 MT of sweet potatoes during the year 2018-19.

Other districts in the influence region such as Patuakhali, Jhalokati, Pirojpur, Lakshmipur and Barisal are also major producers of potato. Barisal witnessed the production of 17,223 MT of potatoes in 2018-19, while the same in case of Jhalokati, Patuakhali, Lakshmipur and Pirojpur was 6,298 MT, 11,750 MT, 4,293 MT and 17,917 MT respectively.

5.5.2.2. Aquaculture Resources

The region is also rich in production of fish. Table 33 given below depicts the production of fish in the influence area.

Table 33: Fish production in the influence area (2018-19)

Name of the District	Annual Fish Catch in Inland Waterbodies (MTs) for 2018	Annual Fish Catch in Meghna, Padma & Brahmaputra (MTs) for 2018	Annual Fish Catch in other Rivers (MTs) for 2018	Annual Fish Catch in Flood Plains (MTs) for 2018	Annual Gish Catch in Ponds (MTs) for 2018
Barisal	95,928	32,757	4,115	8,262	36,936
Patuakhali	57,281	-	25,703	9,909	18,580
Jhalokati	10,950	-	1,674	3,641	4,710
Lakshmipur	61,175	19,720	234	10,268	29,710
Pirojpur	16,956	-	3,809	3,637	7,210
Bhola	134,595	86,800	3,557	3,671	40,152

Source: Agricultural Yearbook 2019, Bangladesh Bureau of Statistics, data is for year 2018-19

The agro and fish based natural resources in the influence region may act as sources of input for the food and agri business industry in the economic zones, as well as industries located outside the district, and south and south east Bangladesh.

5.5.2.3. Mineral Resources

Bangladesh is not a mineral rich nation. Bhola district has limited gas available at gas field has been traced at Kachi Union under Burhanuddin Upazila which is near Bhola district. It has been named Shahbazpur Gas Field. Quantity of gas available is 0.594 TCF out of which 0.334 TCF gas is procurable.

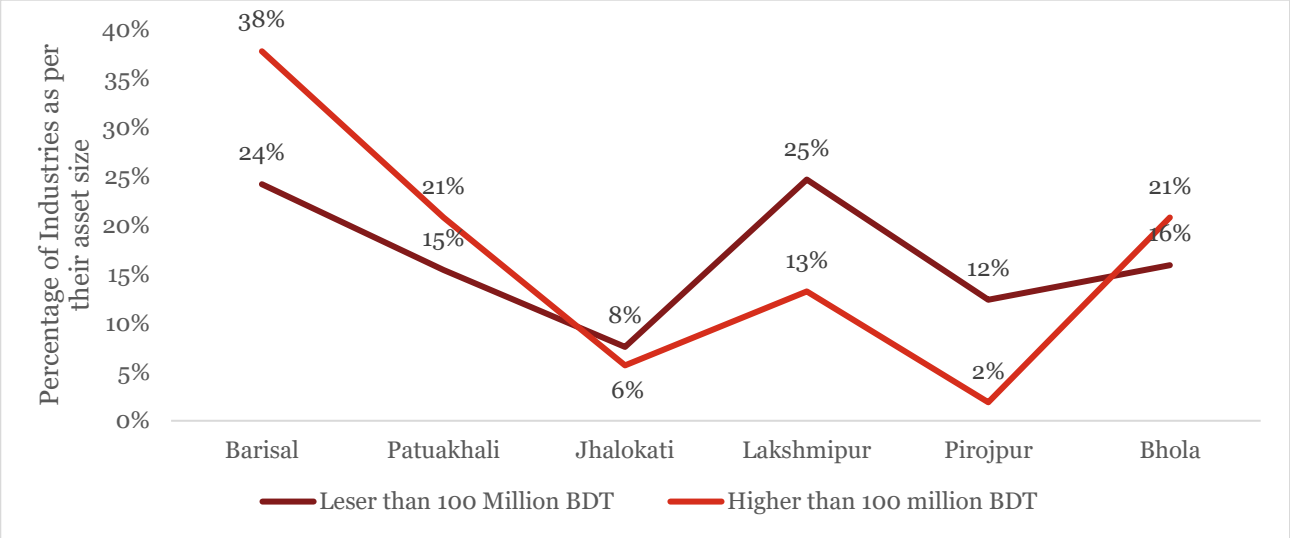
Development of food and agro processing industry might be better posed for the proposed economic zone considering the presence of vast natural resources in the region which may act as the sources of input. In addition, due to proximity of the proposed EZ to the gas fields of the region, industries such as ceramic and glass can also have potential in the proposed EZ

5.5.3. Industrial Ecosystem in the Region

Presence of industrial ecosystem promotes the development of new industries in the region. The existing industrial ecosystem may act as the part of inbound/outbound supply chain of new industries. Presence of industrial ecosystem also ensures the presence of adequate transport and logistics infrastructure, utilities infrastructure, social infrastructure in the region enough for the industry operation.

Most of the establishments in the influence region are small scaled. Graph in Figure 27 depicts the distribution of establishments (district wise) in the influence region.

Figure 27: Distribution of industries as per their asset size (2019 estimated)



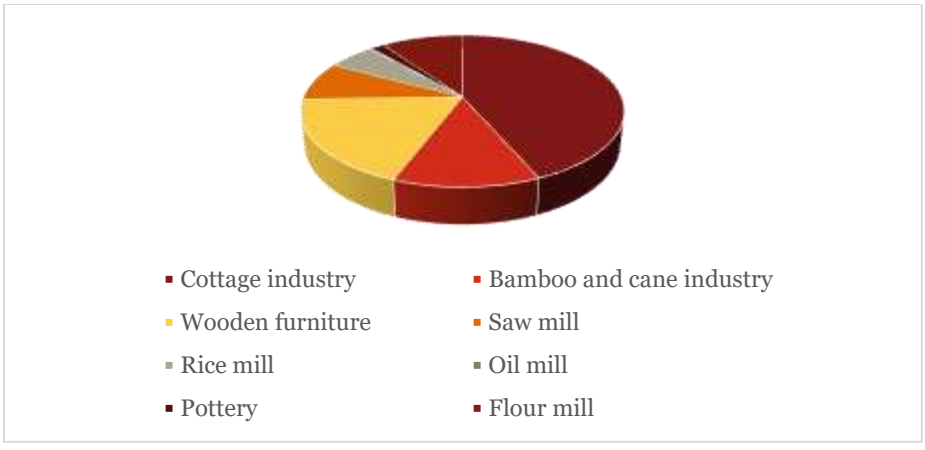
Source: Economic Survey, Bangladesh Bureau of Statistics

It is easily observable from Figure 27 that, Barisal district has largest share of establishments with asset size lower as well as above 100 million BDT. Bhola district holds almost 1/5th the share in the establishments above 100 million BDT asset size, while its share in establishments with size lower than 100 million BDT is only ~16%.

5.5.3.1. Bhola District

District has limited industrial development as of now, and most of the industries in the district are directly dependent on natural resources found in the district. The distribution of industries into different categories is done in the following diagram

Figure 28: Distribution of establishments in Bhola district as per their categories



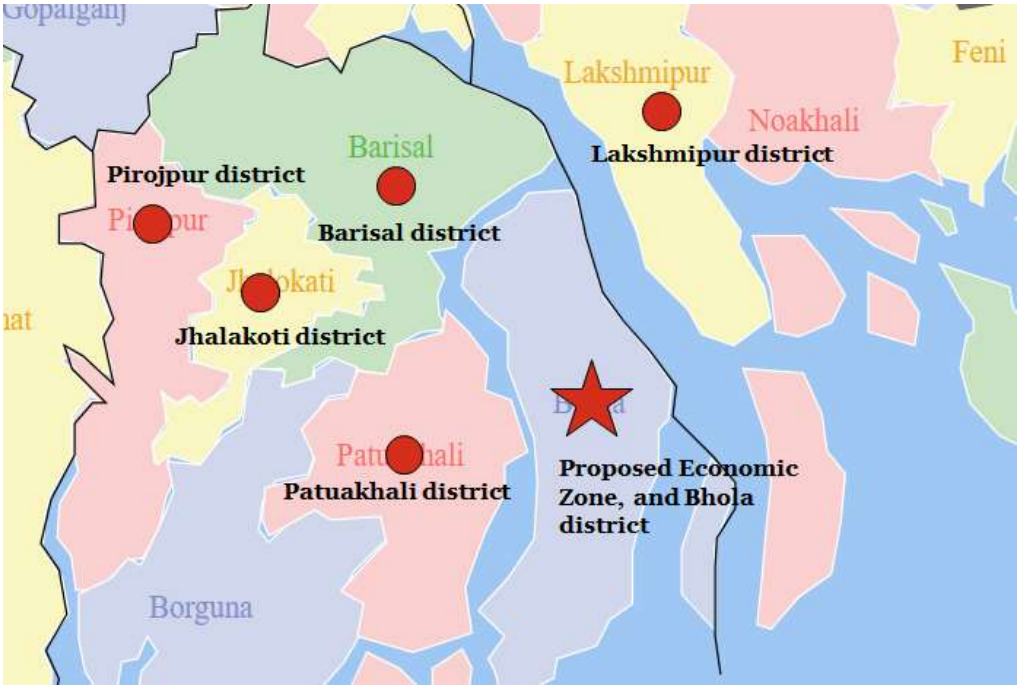
Source: Bangladesh Bureau of Statistics

Most of the establishments in the district are small scaled, with employees lesser than five per establishments, and are concentrated in sectors such as cottage industry, bamboo and cane industry, furniture, rice mill, pottery, oil and flour mill. These establishments can provide industrial ecosystem to the industries coming up in the proposed EZ by playing key role in inward supply chain.

5.5.3.2. Other Districts in Influence Region

Figure 29 depicts the five districts in the influence region around the proposed EZ. These districts are Barisal, Pirojpur, Jhalakoti, Patuakhali, and Lakshmipur. Industrial ecosystem in these five districts is assessed in the next parts of the section here.

Figure 29: Nearby districts to the proposed EZ



Source: PwC Analysis

All the districts in the influence region have limited presence of industries, and most of the industries in these districts are directly dependent on agricultural produces as the source of input. Major industries in the district are cottage, bamboo and cane, furniture, food and agro, and fishing. Apart from these, districts have also limited presence of other sectors/industries such as cement, pharmaceuticals, chemicals, Food & Beverages, shipbuilding and Textile & RMG. Major establishments in the district are - MJ industries, Opso Pharma, Bangal Biscuit, Olympic Cements, Barishal Old Shipyard, Sonargoan Textiles Ltd, Sugandha Industries, Danish Foods Ltd, Gazi Ice Plant, Bengal Shoe Industry Ltd, Fancy Thai Aluminum, Rubel Furniture to name few.

Economic Zones and Industrial Hubs in the Influence Region

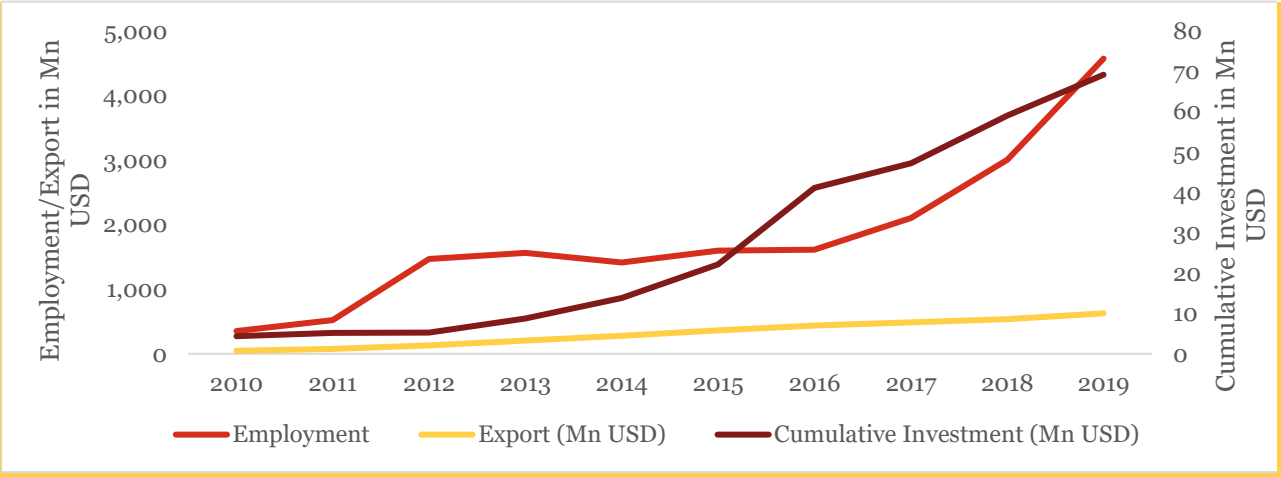
Along with the planned development of an economic zone, the influence region also hosts one another economic zone (Agoiljhara Economic Zone) at Barisal. This economic zone is currently under planning stage, and its construction is expected to start in the coming few years. Once operational, this economic zone will provide synergy for the development of the planned EZ at Bhola district as well, as both the economic zones can provide the required industrial ecosystem for each other.

Additionally, planned BSCIC park in Bagerhat district is also located in the proximity of the proposed economic zone in Bhola district. Additionally, Patuakhali district also hosts Payra port, the newly developing deep sea port in Bangladesh which can provide the EXIM trade gateway for the industries in the influence region. The example of how economic zone grows due to such trade gateway development can be observed from the development of Mongla EPZ which lies in the backyard of Mongla port in south west Bangladesh.

Case Study – Mongla Export Processing Zone

Bagerhat district also hosts Mongla economic zone, one of the few initial industrial zones in the country. Established in 1999, EPZ offers total 190 industrial plots, and spans across ~255 acres. It hosts industries such as metal production, agro and food production, electrical and electronics, garments, jute and leather. The investment received by Mongla EPZ in the last 10 years (cumulative) is depicted in Figure 30 along with the employment offered by the EPZ.

Figure 30: Investment, Export and Employment trend at Mongla EPZ



Source: Bangladesh Export Processing Zone Authority (BEPZA)

The high growth of Mongla EPZ is mainly because of its location being in the backyard of Mongla port.

In summary, even though the region is not very well developed today, the strategic location of the region depict the possibility of developing it as the major industrial hub of the region.

Considering the industrial ecosystem in the region, few of the industries such as food and agro processing, Textile & RMG, furniture, heavy machineries, shipbuilding and jute may be promoted in the proposed economic zone.

5.5.3.3. Strategic Assets for the Proposed Economic Zone

Following (Table 34) are some of the key infrastructure development projects that are being undertaken by the GoB towards the overall improvement of socio-economic condition of this region.

Table 34: Key Infrastructure Projects undertaken by GoB in the influence region

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
 **Construction of Bridge connecting Bhola and Barisal**	• The government is going to build the country's longest bridge over the Tetulia river to connect island district Bhola with Barisal. • The cost of the 10km bridge is estimated at Tk 9,922 crore, almost one-third that of the under-construction Padma bridge, which will be 6.15km long. However, the cost may escalate after the detailed design is finalized[181] • Once built, the bridge in the country's southern part will shorten the travel time between the two districts and facilitate gas supply from Bhola	The GoB has not issued any confirmed timeline for the project yet. However, the Feasibility Study for the project has been completed	Ministry of Road Transport and Bridges, Bridges Division, Bangladesh Bridge Authority
 **Rail connectivity between Barisal and Faridpur**	• The GoB has plan to setup rail line from Faridpur to Barisal • Under the proposed project, a 100-km railway track will be set up from Bhanga in Faridpur to Barisal • Once executed, rail connectivity will be available at ~53 km from the proposed EZ	The project was planned to be implemented from July 2016 to June 2021.[182]	Bangladesh Railways
 **Various Power Sector Projects**	• 225 MW gas-run Bhola-1 power Plant • 90 MW gas-run plant operated by Aggreko. • New 220 MW combined-cycle power plant, which is being built for NBBL • Development of Bhola IPP, a greenfield 220 MW combined cycle power plant project.	Varying timelines	Various Government and private agencies

[181] *https://www.thedailystar.net/frontpage/news/longest-bridge-link-bhola-barishal-1853794*
[182] *https://www.daily-sun.com/post/113605/Govt-moves-to-set-up-BhangaBarisal-rail-link*

5.5.4. Summary of Regional Assessment

The above discussions may be summarized as:

Demographics of the Influence Region

- Most of the population in the influence region resides in the rural region, while the population residing in the urban areas range within ~13% to ~23% among districts in the influence region
- More than 50% of the population in literate in almost all the districts, while literacy rate in districts such as Jhalokati district is estimated to be ~68% (highest in the influence region).
- Large number of people are employed in the wholesale and retail sector in the influence region, followed by transportation and storage sector.
- The influence region has abundance supply of unskilled labor, and hence unskilled labor is not a major challenge. But supply of skilled labor is limited and hence it needs to be procured from the nearby regions urban regions in Barisal and Dhaka division. The presence of TVET institutions may solve the issue of limited supply of skilled labor to certain extent, but special efforts are essential for bringing improvements in the same.

Access to Natural Resources

- Bhola district, and other districts in influence region are rich in agricultural production, and few of the major crops in the region are – rice, wheat, gram, lentil, green gram, Kheshari, sesame, groundnut, coconut, spines and pulses. Major fruits produced in the region are - jackfruit, water melon and mango. Few major vegetables produced in the region are – potato, cabbage, tomato, pumpkin, Brinjal, Radish, ridge guard, and water guard.
- As influence region lies in the river basin, fishing is one of the major livelihoods of the people in the region. The fish production along with agricultural produce may act as input the agro based industries in the region.
- There are no major minerals in the influence region, which may be useful in industrial production. But there is gas field in Bhola district at Katchi in Burhanuddin Upazila.

Industrial Ecosystem

- Most of the establishments in the influence region are either small or medium scale with assets size worth lesser than ~100 million BDT. ~38% of the large size establishments are in Barisal district, while Lakshmipur has highest number of small scaled establishments in the influence region.
- Most of the establishments in the influence region are linked to primary sector with primary sector as a source of input. Major industries in the region are handloom, Textile & RMG, bamboo and cane, furniture, jute, and shipbuilding.
- The influence region has one planned economic zone (Barisal district) in addition to the planned economic zone in Bhola district. Patuakhali district is also going to host the deep sea water port of Bangladesh (Payra port) in coming future, which is likely to promote the attractiveness and importance of influence region as one of the industrial hubs in the country.
- Completion of various planned infrastructure projects is expected to promote the pro-industry environment in the region further.

5.6. 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 at Bhola. 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 35: 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			Easily Accessible	Multiple modes of transport required	Moderately Easy to access	Sufficient power available	Water source available in vicinity	Not Available	Semi-skilled/ Unskilled available; Skilled unavailable	Not 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 rejection	• This is an export oriented industry, with already a high global market share. Bangladesh is also importing considering amount of fabric from India and China. Presence near the upcoming Payra port will enable smooth movement of raw material from India.									
	• This sector requires good access to sea ports in order to cater to global markets									
	• This sector requires good access to domestic markets also connectivity to EXIM gateways for exports.									
	• Currently, this sector is not suitable in the proposed EZ considering the lack of direct road connectivity to other parts of Bangladesh/									
Food & Beverages	High	High	Moderately High	Moderate	Moderately High	Moderate	Moderate	Moderate	Moderate	Moderately Low
Rationale for selection	• Proposed EZ holds a lot of growth potential for this industry as it has easy access to raw material locally in the form of watermelon, potato, paddy, wheat & pulses.									
	• Aquaculture being practiced in proximity to proposed EZ can provide raw material for fish processing. According to the local inhabitants, around 30% hilsa fish of Bangladesh is produced in Bhola									

	• Proposed EZ is located close to the upcoming deep sea Payra port from where exports of food items can be facilitated									
	• 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 can be made available at proposed EZ by developing suitable infrastructure									
	• Sector pre-requisites are met by the proposed EZ for all parameters including gas, water and power.									
	• FMCG products like bakery, ketchup, biscuits, juice, cake etc. can find good demand in local markets of Khulna, Barisal etc. Potato based chips manufacturing can be facilitated.									
	live stocking (buffalo) and products based on buffalo milk such as curd, paneer, ghee etc. are produced in abundance.									
	• Locational advantage of proposed EZ in terms of connectivity shall foster the possibility of supplying across the country, which is a pre-requisite for fast moving consumer goods (for F&B), especially after construction of Padma River Bridge									
Agro Based Products	High	High	Moderately High	Moderately Low	Moderate	Moderate	Moderate	Moderately Low	Moderately High	Moderate
Rationale for selection	• District of Barisal near proposed EZ is a major rice producing region in Bangladesh, proposed EZ can support rice mills									
	• Establishing an agro based industry in close proximity to the raw material will result in lesser wastage and better quality of products due to low lead time									
	• Sector pre-requisites are met by the proposed EZ for all parameters including gas, water and power.									
	• Thus this sector is recommended in the proposed EZ									
Leather and Leather Products	Moderately Low	Moderate	Moderately High	Low	Moderately High	Moderately Low	Moderately High	Moderately Low	Moderately High	Low
Rationale for rejection	• 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									
	• Proposed EZ location satisfies all the pre-requisites for the industry except for land connectivity and skilled manpower in this sector available near the EZ									
	• To produce high quality finished goods, this sector requires skilled employees									
	• Presently Leather industry is established near Dhaka and Chittagong region, this could create challenges in sourcing of skilled labor									

	• Majority of the tanneries in Bangladesh are located in Savar area near Dhaka, which could cause infrastructural bottlenecks in supply of raw material to the proposed EZ.									
	Though there is enough cattle in the region and shoe manufacturing is a profession it is not significant enough									
	• In order to establish industries that can manufacture finished leather products in the proposed EZ, pre-requisites will be establishing direct road connectivity to Dhaka through the creation of multiple bridges and developing social infrastructure in the region to incentivize skilled workers									
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;									
	• Plastic and Rubber products are mostly consumed in local markets, but the lack of direct road connectivity limits the potential of this sector in the proposed EZ									
	• Hence, this sector is not recommended in proposed EZ									
Paper and Packaging	Low	High	Moderate	Low	Moderately Low	High	High	Moderate	Low	Low
Rationale for rejection	• This sector is dependent on import of raw material like pulp, fiber and chemicals									
	• It also has a moderate requirement of gas, which is used as fuel during preparation of paper products									
	• This sector will be more suitable if it located near Chittagong port or Dhaka-Chittagong highway, from where it can have easy access to imported raw material and to foreign markets									
	• Thus this sector is not recommended in the proposed EZ									
Chemicals	Moderate	High	Moderate	Moderate	Moderately High	High	High	Moderate	Low	Moderately High
Rationale for selection	• There are different types of chemicals having varied utility requirements like fertilizers, adhesives, washing powder, paints, varnishes etc.									
	• Adhesives, paints and varnishes cater to domestic market, these industries would perform well if they are located in proximity to Dhaka									
	• Fertilizers have a high demand in proximity to proposed EZ region, due to widespread agriculture based economy									

	• Establishing of fertilizer industry at proposed EZ in Bhola can cater to the local demand due to proximity of proposed EZ.									
	• Hence this industry is recommended									
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. Tiles, ceramics and cement (Anchor cement) are already prevalent in the region									
	• 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									
	• These features are present at the proposed EZ									
	• It is thus recommended to establish non-metallic mineral industry in proposed EZ									
Automobile and Accessories	Low	Moderately High	Moderate	Moderately Low	Moderately Low	Moderate	Low	Moderately Low	Moderately High	Low
Rationale for rejection	• 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									
	• Presently the proposed EZ location does not have social infrastructure like residential, educational, recreational, medical facilities etc. for skilled employees and their families									
	• Automobile manufacturing industries operate in clusters with other ancillary units									
	• Small land parcel of proposed EZ might hinder development of automobile cluster									
	• Proposed EZ is ideally located to support development of automobile industries for which CKD units are being brought from India, however creating an automobile industry would require larger land parcel (400-500 acres) and development of social infrastructure in vicinity of proposed EZ									
Heavy Machinery, Iron, Steel and Metal	Low	Moderately High	Moderate	Low	High	High	Moderate	High	High	High

Rationale for rejection	• Bangladesh is highly import dependent for this sector, with majority of cargo coming through Chittagong Port									
	• This sector requires large quantities of power and fuel									
	• Post the development of Payra, deep sea port and laying down of gas pipeline till the proposed EZ, this industry can be developed in proposed EZ . Thus, this sector is currently not suitable in the proposed EZ									
Electrical and Electronics	Low	Moderately High	Moderately High	Moderately Low	Moderately Low	Low	Low	Low	Moderate	Low
Rationale for rejection	• 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									
	• Skilled labor can be available locally for this industry due to presence of local service centers catering to electrical and electronic items									
	• Consumption of electrical and electronic items is rapidly rising in rural Bangladesh leading to high demand									
	· Operationalization of Padma Bridge is expected to boost the economy of south west Bangladesh (region in which proposed EZ is located) by 2.5% resulting in higher disposable income									
	• Presently the region does not have any major electronics industry in vicinity due to the poor access by road.									
	• Proposed EZ is thus un-suitable for setting up industries pertaining to this sector unless direct land connectivity can be established									
Ship Building and Ship Breaking	Low	Moderate	Moderately Low	Low	High	High	Low	Moderately High	High	High
Rationale for rejection	• Access to water front is mandatory for setting up of this sector									
	• The nearby areas are known for ship-building activity. However, power and gas needs to be ensured for the development of this sector.									
	• Proposed EZ presently not suitable for setting of industries in this sector									
Petroleum Products (including Bottling)	Low	Moderately High	Moderate	Low	High	High	Low	Moderate	Moderate	High
	• Bangladesh is currently dependent on import of petroleum products via large sea faring tankers									

Rationale for rejection	• Access to water front is mandatory for setting up of this sector									
	• Proposed EZ does have access to water front however, the extremely high power demand cannot be met currently.									
	• Proposed EZ presently not suitable for setting of industries in this sector									
Pharmaceuticals	Moderately Low	High	Moderate	Moderately High	Moderately High	High	High	Moderately High	High	Moderate
Rationale for rejection	• This sector is dependent of availability of skilled employees									
	• Dearth of social infrastructure in proximity to proposed EZ area might hinder availability of skilled manpower for this industry									
	• Hence, this industry is not recommended									
Light Machinery, Equipment and Furniture	Moderately High	High	Moderately High	Moderately Low	Low	Moderately Low	Moderate	Moderate	Moderate	Low
Rationale for rejection	· There is no ready market available in the vicinity.									
	· Proposed EZ is thus not conducive for setting up light machinery, equipment and furniture products									

Source: PwC Analysis

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

1) Food & Beverages, 2) Chemicals, 3) Agro-based products, 4) Non-metallic minerals

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

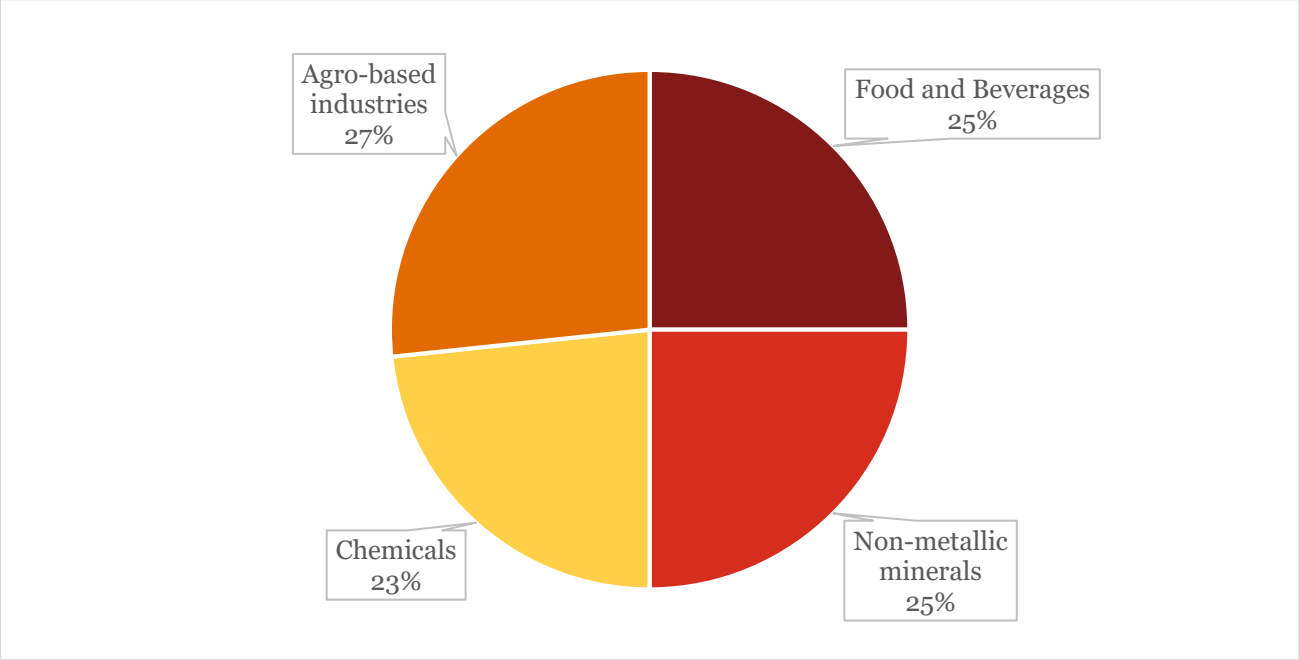
5.7. Analysis of Survey Results

Former sections delve into assessment of initial shortlist of industries based on top-down approach based on secondary research and insights obtained through interactions with various govt. departments and data collected from various sources during the site visit. This section delves into primary stakeholder consultations among industrial players within the country and from overseas. A total of 60 respondents from were interviewed (out of which 47 are Bangladeshi and rest are foreign) to validate the hypothesis formed during the top-down approach. A questionnaire (which was formed by leveraging our experience in line with the ToR) was used as an instrument to undertake this primary survey.

5.7.1. Profile of the Respondents

Respondents of this survey were selected from the four sectors shortlisted for the proposed EZ as per the analysis undertaken in the former sections. As per the ToR, at least 10 local respondents and 3-4 foreign respondents were surveyed. While the local respondents were interviewed physically, the foreign respondents were interviewed through telecom and video conference. Local respondents are based out of various locations of the country (such as Bhola, Barisal, and Dhaka).

Figure 31: Profile of the Respondents



Source: Primary Survey and PwC Analysis

The participants in the stakeholder consultations belonged to diverse set of industries, as indicated in the figure above. The final shortlist of industries was prepared after taking into consideration the responses received through these stakeholder consultations.

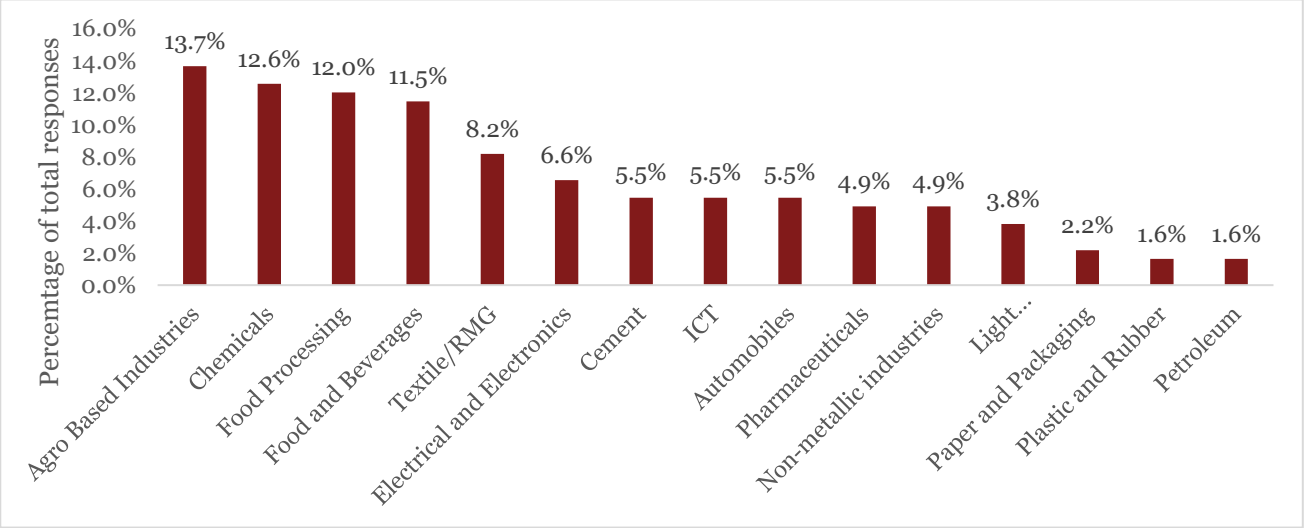
It is to be noted that the output of the primary survey is dependent on the sample size. If the sample size is changed, the output may change accordingly. The results obtained in this analysis may also vary during on-ground implementation of the project.

In the following various inputs would be analyzed as depicted in the primary survey.

5.7.2. Industry Trends in the Region

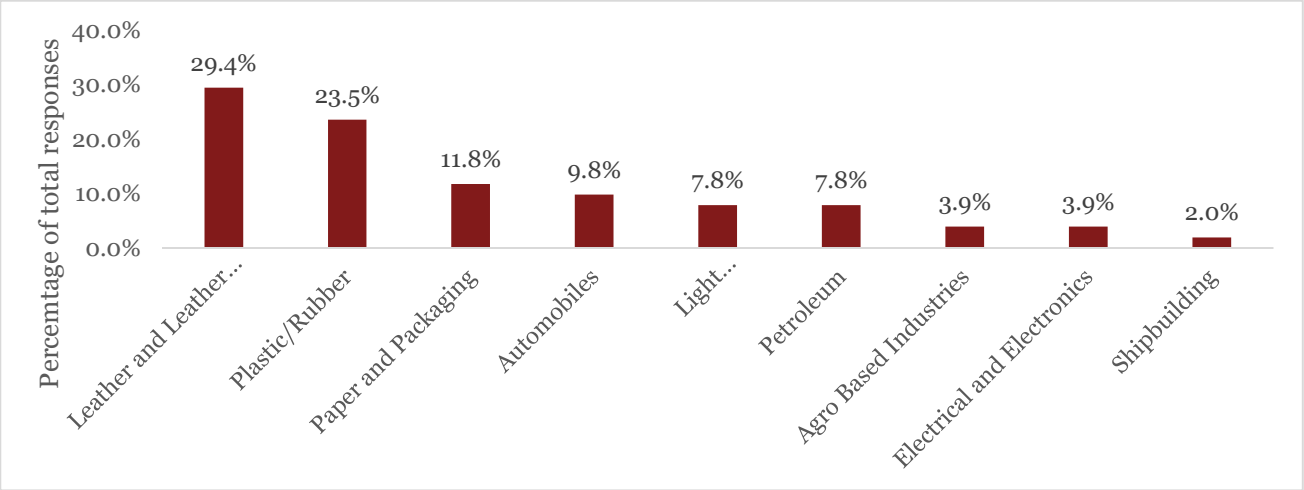
In order to understand the growth prospects of the industrial sectors in the region, the respondents were asked to specify the industries which have witnessed growth in the region and the industries which have relatively declined in the region.

Figure 32: Responses depicting growth



Source: Primary Survey

Figure 33: Responses depicting decline



Source: Primary Survey

Manufacturers from sectors like **Leather and Leather products, Plastic and Rubber, Paper and Packaging and Automobiles have majorly expressed negative opinion** about growth prospects of their sector in the region of proposed EZ.

However, manufacturers from **Agro based products, Chemicals, Food & Beverages and Food processing sectors majorly evinced positive interest** about the growth prospects of their sectors in the region of the proposed EZ.

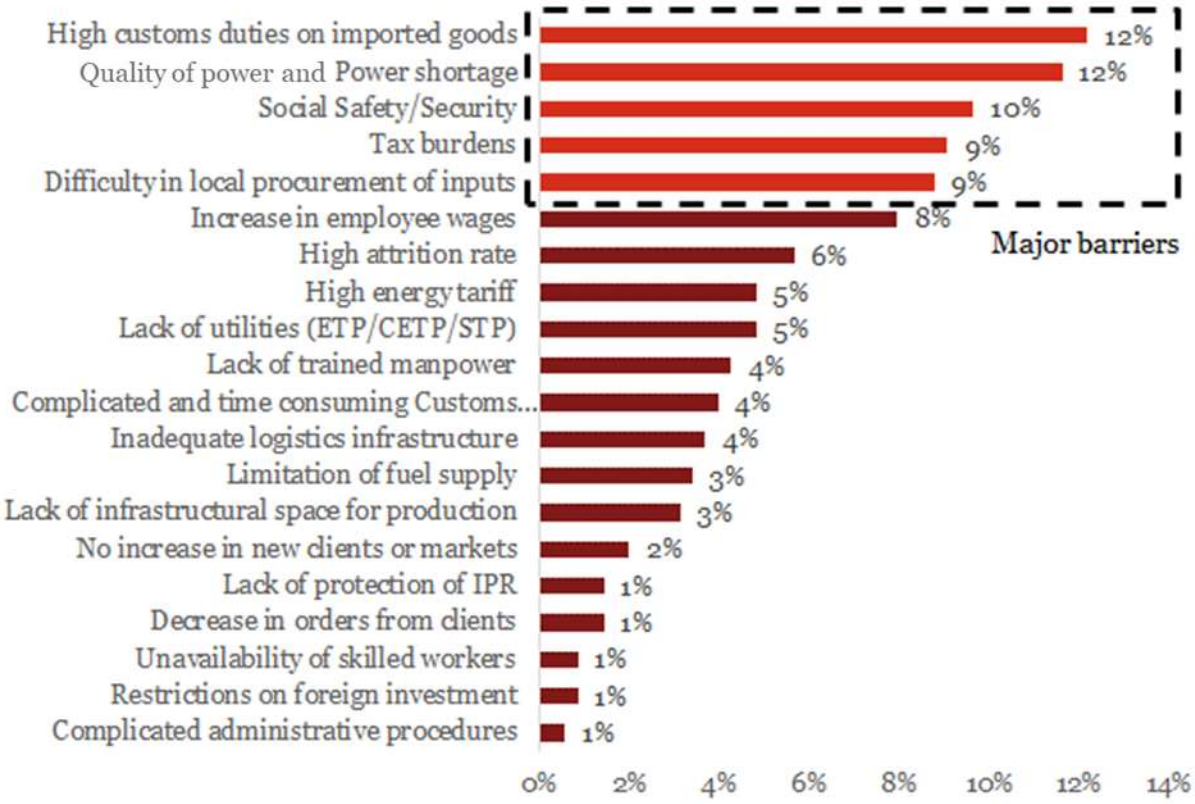
5.7.3. Barriers to Investment

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

5.7.3.1. Bangladesh Specific Barriers

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. Subsequent figure captures the barriers to investment as mentioned by the respondents.

Figure 34: Barriers to Investment in Bangladesh



Source: Primary Survey, the participants in the stakeholder consultations belonged to diverse set of industries, which are shortlisted specific to the proposed EZ.

Common problems faced by the manufacturers in running a business in the country (across industrial sectors) are listed in the following across two categories (major and minor). Table 36 below depicts few of the above-mentioned common problems faced by manufacturers in running a business in a country.

Table 36: Few major common problems faced by businesses in the country

Problem Name	Details
High customs duties on imported capital goods and intermediary goods	Manufacturing sector in Bangladesh is dependent on import of raw materials for their production to take place. All the investors surveyed expressed discontent regarding the high customs duties on imported capital goods and intermediary goods. Import duty on goods are levied on basis of their HS codes. Respondents

Problem Name	Details
	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
Power Shortage and quality of power	Investors surveyed in located in remote location expressed discontent with power availability and quality of power such as Voltage fluctuation. Many complained about the 3-4-hour power outages suffered on a daily basis, which had affected the capacity utilization of existing machineries. Among the respondents surveyed in remote location, 50% had to decide for their own source of power, which was either diesel or gas operated.
Social Safety/ security	Respondents in their feedback, have expressed concern about the Social safety/ security issues prevailing in Bangladesh.
Difficulty in local procurement of parts and raw materials	During interactions, investors also complained about the difficulty in procuring the raw materials from the local markets, particularly those who were interested in Food Processing sectors.
Tax burdens	During the stakeholder consultation exercise, most of the respondents expressed disappointment on the corporate taxes and transfer pricing taxes levied on them. This is a major hindrance to investment in Bangladesh.

Apart from the abovementioned barriers, few other barriers which investors or industrialists face are – Increase in employee wage rates, high attrition rate, high energy tariffs, lack of trained manpower and unavailability of utilities in adequate and seamless form.

5.7.3.2. Sector Specific Barriers

The respondents were also asked questions about their sectors in which they are operating to understand the challenges 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 –

Table 37: Industry specific barriers as expressed by the respondents

Industrial Sectors	Site specific barriers
Food & Beverages	Major challenge that industry players faced in this sector was from the unorganized and small-scale industries, which had localized operations and had a cost advantage over the organized sector through evasion of taxes.
Chemicals	This sector is mostly import dependent for its raw material. Respondents faced issues due to uncertainty with HS codes of the items of import and unpredictable rate of taxes being levied. Fertilizer manufacturers have robust demand in the country; however, lack of power and gas is hindering their production capacity.
Agro based products	Poor supporting infrastructure was resulting in high wastage of agro products and getting access to organic agricultural produces.
Non-Metallic Minerals	Respondents from this sector raised their concerns about high reliability on imports, this sector is dependent on global price markets as any fluctuations due

Industrial Sectors	Site specific barriers
	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.

5.7.3.3. Proposed EZ- Site Specific Barriers

As per the survey responses, major challenges in the proposed region include the following –

- 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 hinders investment decision for the proposed EZ.
- The proposed EZ does not have road connectivity which is a one of the major reasons for hindering investment.
- Several respondents were unsure as to how long it would take in order for the proposed EZ to be established. This prevented the manufacturers from making investment decisions with respect to the proposed EZ.
- Other site-specific factors that served as barrier to investment were – lack of social infrastructure in the region which is a major challenge to attract the skilled labour in the region.

5.7.4. Perception about Economic Zone Regime

One of the key objectives of primary stakeholder consultation 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. The key findings from the various sectors are as below:

Table 38: Voice on ground from stakeholder consultations

Sector	Opinion about EZ regime as obtained during the survey
Food & Beverages	Manufacturers from this industry were positively interested in the proposed EZ due to easy access of raw materials in the region such as watermelon, paddy, wheat, potato and pulses.
Agro-based products	Manufacturers from these sectors expressed that they were willing to relocate to an EZ due to the close proximity to agricultural produce available in the influence region.
Chemicals	Manufacturers are interested in taking up land in the Economic Zone since it would be easier for them to commence operations within the EZ as developer would be obtaining environmental clearances. Private land with less government control enables them to operate freely. Furthermore, common ETP at the proposed EZ would also be useful for them as presently they face issues in disposing their waste and effluent.
Non-metallic minerals (Ceramics)	Primary stakeholder consultation of manufacturers in this industry revealed the readiness of the players to expand into an EZ due to ease of utility support being provided by the developer letting them concentrate on the core manufacturing processes.

Source: PwC analysis

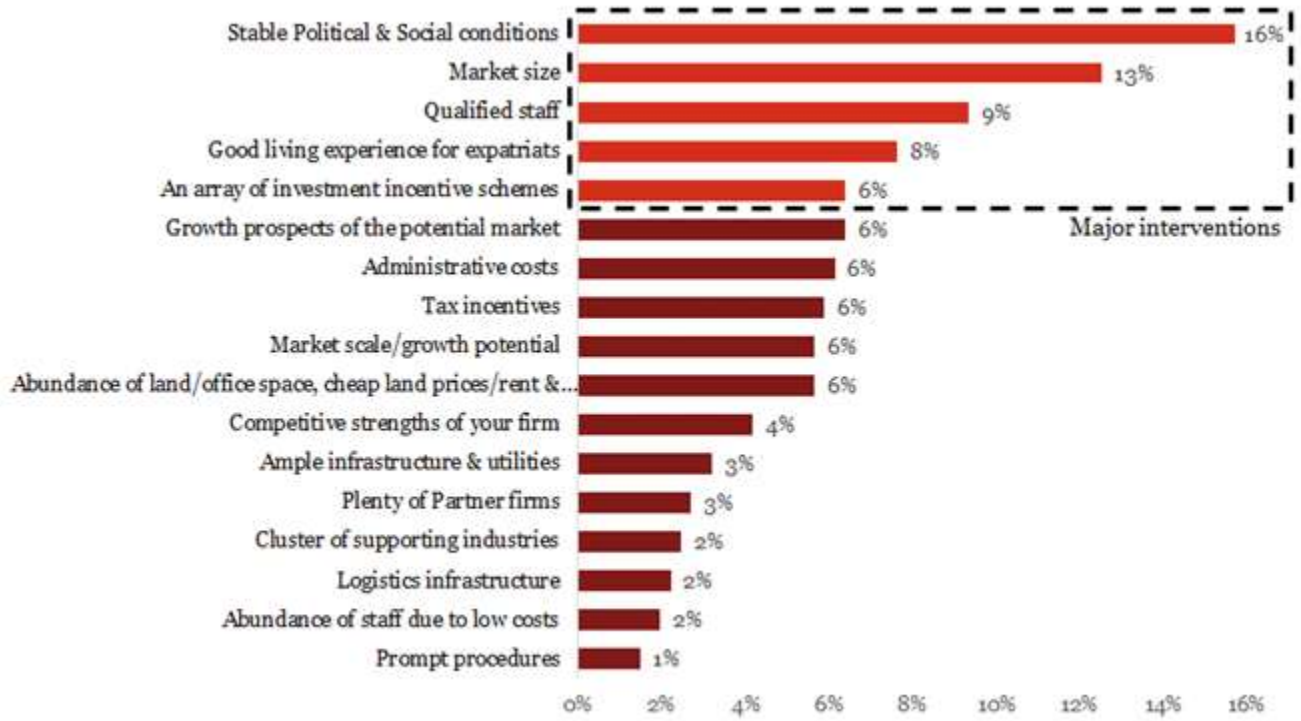
It should however be noted that some respondents were not so optimistic about the economic zone regime of the government and consider operating out of private land as a much easier option. They opined economic zone operations require too much documentation for movement of goods irrespective of the consignment size. In

addition, economic zones operation would entail fixed working hours for the workers, specific opening/closing time of factories, and many other restrictions, which they are not in favor of adhering to. These respondents were also asked for their requirements in order to relocate to the EZ and their responses are elaborated in the following section.

5.7.5. Voice on Ground- Interventions Solicited

In order to understand the enabling infrastructure required for investment in the proposed EZ, all the respondents were asked about their requirements for relocating their business in the proposed EZ. 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 their requirements for investing in the proposed EZ. Their response is captured below –

Figure 35: Voice on ground (Interventions)



Source: Primary Survey

Manufacturers have expressed their major requirements which influence their investment decision include stable political and social conditions, Market scale and growth potential, size of the market, Qualified staff, access to uninterrupted power supply (without voltage fluctuation), quality water availability (potable and fit for industrial consumption) and gas availability. Availability of labor near the proposed EZ is another important factor, which was highlighted during our interaction with manufacturers.

The requirements can be classified into i) Hard Interventions ii) Soft Interventions

5.7.5.1. Hard Interventions

Access to CETP/ ETP: Investors who were considering investment in plastic and rubber sector which involved release of effluents wanted to have access to waste treatment plants so as to not cause any adverse damage to the environment.

Labor availability: Availability of labor is the major requirement expressed by all the investors consulted during our interaction with them.

Availability of quality water: Investors have expressed that quality water availability for industrial and potable purposes is the major factor

Access to uninterrupted power supply: All the investors consulted expressed discontent with power availability across Bangladesh and mentioned that access to uninterrupted power supply is the major requirement for them. Many complained about the 2-3 hour power outages suffered on a daily basis, which had affected the capacity utilization of existing machineries.

Availability of gas: Most of the investors consulted expressed that their manufacturing units require piped gas to be used as fuel in their industries or a source for generating electricity as gas is cheaper than diesel.

Warehousing facility: Most of the investor consulted expressed that they require warehouse facility to store their goods in the dedicated warehouse facilities in the EZ.

Availability of raw materials: During interactions, investors also highlighted the need for availability of local raw materials, particularly those who were interested in Food Processing and Food & Beverages sectors.

The above-mentioned requirements are duly considered in the master planning section in order to address the requirements that manufacturers are looking for to relocate their business into EZ

5.7.5.2. Soft Interventions

The respondents were asked about the various fiscal and non-fiscal benefits that they require for considering relocating their business in the proposed EZ. The investors raised concerns about various incentives and their requirements are mentioned below:

Prompt procedures: During the stakeholder consultation exercise, most of the respondents expressed disappointment in complicated and time-consuming procedure. This is one of the major reasons hindering manufactures in Bangladesh from importing the goods from the foreign countries. 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 also major reason hindering manufacturers in Bangladesh from starting a new business. Manufacturers mentioned that the procedures should be prompt and fast tracked in order to operate their business at the proposed EZ

Low Administrative costs and Tax incentives: Respondents raised concerns about the various incentives required such as corporate tax subsidy, waiver on import and export duties. 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.

Cheap land prices: The investors who are willing to relocate to EZ are looking for Government owned EZ as the land tariff is 2x – 3x times less than the ones in private economic zones. Medium and small-scale investors mentioned that land prices play a major role in their investment decision in the economic zone.

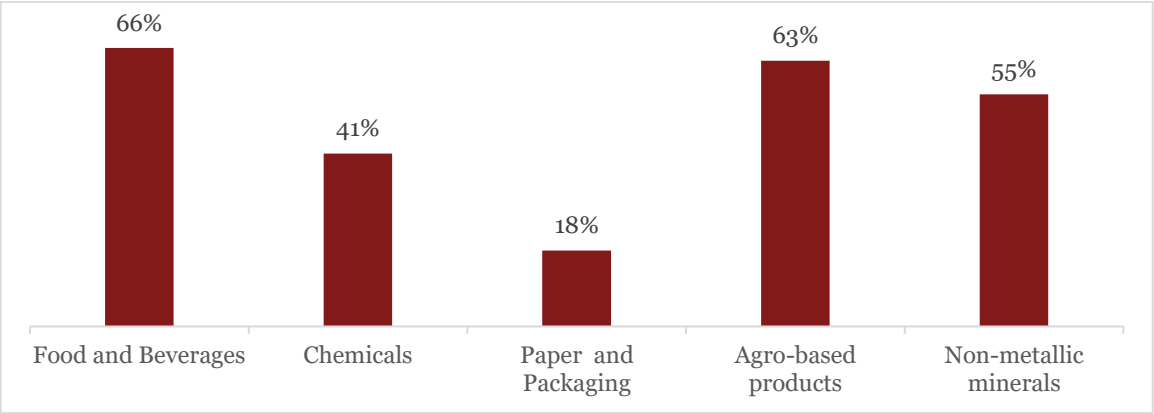
In the event of addressing the list of requirements that manufacturers are looking for to relocate their business into EZ, BEZA can expect several manufacturers to evince interest in the proposed EZ

5.7.6. Arriving at the Final Shortlist of Industries

In order to understand the popularity and attractiveness of the four shortlisted industrial sectors (i.e. initial shortlist of industries) among the industrial respondents, each of the respondents were asked to answer if the respective industrial sector is best-fit the proposed EZ (in terms of the suitability of the site conditions and regional attributes pertaining to that industrial sector). For example, the respondents from Food & Beverages sector were asked to answer if Food & Beverages sector is fit for the proposed EZ in Bhola (basis site conditions and regional attributes to host this sector) or not.

Responses obtained from the industry players are presented in Figure 36-

Figure 36: Responses from Industry Players



Source: Primary Survey

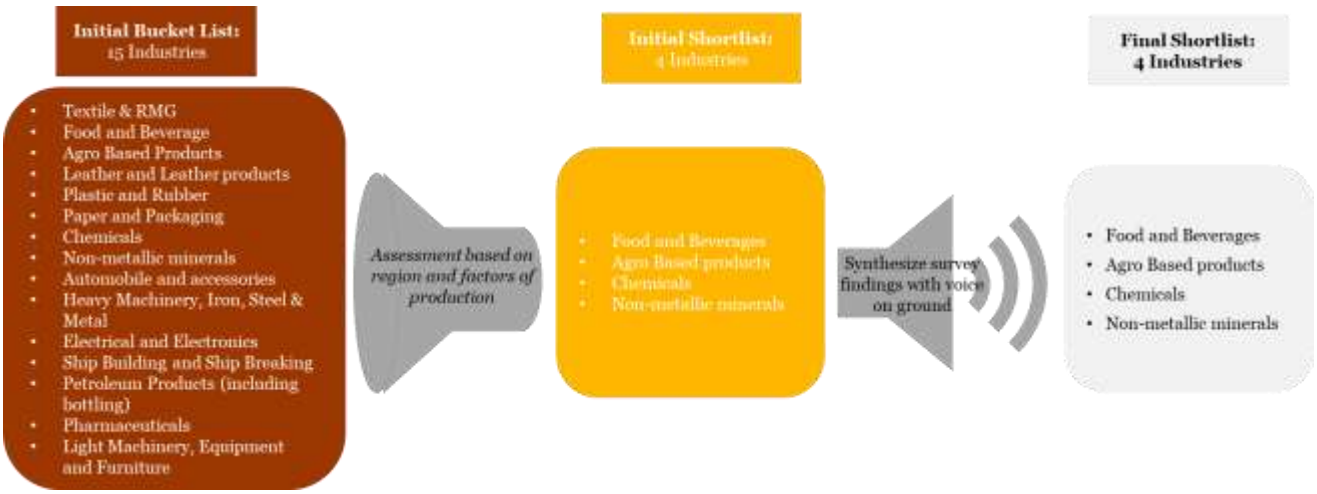
Figure 36 depicts that the following sectors have obtained most popularity from the investor community in the context of the proposed EZ:

- Food & Beverages
- Agro-based products
- Non-metallic minerals
- Chemicals

5.7.7. Final Shortlist of Site-Specific Industry Sectors

On basis of incorporating the feedback received during the survey, it can be safely deduced that from among the manufacturers contacted, out of the initial shortlisted sectors. The manufacturers from Food & Beverages, Agro-based products, Non-metallic minerals sectors have expressed positive interest in relocating their business to the proposed EZ in Bhola. The following figure below depicts the step wise approach followed to arrive at the final short list of industries.

Figure 37: Industry Shortlisting



Source: PwC Methodology

Considering the future prospects in the region and due to the fact that during on ground implementation the best fit may vary, therefore a holistic demand assessment exercise is performed on the four initial short list of sectors mentioned below

Food & Beverages, Agro-based products, Non-metallic minerals

&

Chemicals

The industrial mix proposed is indicative in nature and based on our analysis and findings from primary survey. The choice of industries might change during on-ground implementation based on the response received from market.

A demand forecast model will be prepared in the next chapter, for the above mentioned four industries to understand the land, utility and employment requirements for these industries over the years.

5.7.8. Sector Profiles

This section contains the profiles of all the four 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 39: Sector Profile - F&B Industry

Sector	**Food & Beverage Sector**
Sub-Categories Proposed	Fish and Shrimp Processing, Salt Processing, Fast Moving Consumer Goods (FMCG) like cake, biscuit, bread etc.
Sector Overview	Based on secondary research, sector overview detailing on the production, market demand, foreign trade, and growth projections has been captured in chapter 5.3 and 5.4 Based on responses received during primary survey, sector overview has been detailed out in the following- • Out of the various sub-categories, demand for (i) fish and shrimp processing, and (ii) biscuits have witnessed significant growth in the past • Bangladesh specializes in fish and shrimp export; Khulna and Chittagong are the two main hubs for shrimp production. Bangladesh exports shrimp and fish over 600 to 700 million USD every year • Biscuit industry in Bangladesh has depicted growth of 15% YOY in the last few years.[183] • Agriculture and aquaculture are the main pillars behind this industry in Bangladesh • FMCG constitutes major part of this industry and most of the FMCG oriented manufacturing plants are in proximity to Dhaka, Chittagong, Khulna, and Sylhet as these are the major consumption hubs • Water is one of the most critical ingredients for this sector • Major players: Pran, Meghna, Abdul Monem, Olympics; this sector has witnessed participation of a large number of medium scale players

[183] *Biscuits and Confectioneries Industry of Bangladesh, Lightcastle Partners*

Sector Trends	• Mostly domestic focused sector, but export is rising • Since this sector is less dependent on import and dependent on domestic for both sourcing of input and sell of output, this sector is poised to witness sound growth due to rising income levels and increasing affordability. • Demand for nutrient rich, high quality food products is increasing. • Fish and Shrimp is a major export commodity and the demand has been depicting an increasing trend • Bangladeshi food & beverage exporters are exporting processed food products to 104 countries (major destinations being Middle East, India, and other South Asian countries). • Since major consumption hub is centered around Dhaka, proximity of Dhaka serves the proposed EZ with immediate market access. • Pran is the most prominent Food & Beverages player in the country and it has footprints in Middle East and in India • Meghna Group and Abdul Monem Group are the other players, which are quickly capturing market share • Fish and shrimp processing sector have small to large players; whereas Food & Beverages sector is dominated by medium and large players (some being foreign)
Current Barriers to Investment	Please refer to chapter 5.7.3
Land Requirements	• Land requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • Basis primary survey, typically medium scale players require 3 to 7 acres and large players require 10 to 20 acres for a single food & beverage manufacturing facility. • For fish and shrimp processing facility, area is dependent on capacity as there is a pond/ shrimp cultivation facility (artificially cultured pond) attached with the processing facility. • Following chapter delves into forecasting of industrial land requirement for this sector
Power Requirements	• Power requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • For medium scale facility, power requirement can vary from 0.5 to 1.4 MVA; whereas, for a large-scale facility, power requirement may vary from 1.6 MVA to 4 MVA • Following chapter delves into forecasting of industrial power requirement for this sector

Water Requirements	• Water requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • Current practice in Bangladesh is to install deep tube-wells and extract groundwater for industrial consumption. Permission from GoB needs to be taken to install the pump, however, there is no monitoring mechanism in place to check the amount of water extracted • For medium scale facility, water requirement can vary from 90 to 350 Cum/ day; whereas, for a large-scale facility, water requirement may vary from 300 cum/ day to 600 cum/ day • Following chapter delves into forecasting of industrial water requirement for this sector
Employment per Factory	• Manpower requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • For medium scale facility, typically 60 to 180 number of manufacturing related employees are employed; whereas for a large facility, typically 200 to 500 number of manufacturing related employees are employed in a facility • Following chapter delves into forecasting of manpower requirement for this sector

Source: PwC Research and MACE Analysis

Table 40: Sector Profile – Non-Metallic Minerals

Sector	**Non-metallic minerals**
Sub-Categories Proposed	Ceramics, Cement, Glass etc.
Sector Overview	Based on secondary research, sector overview detailing on the production, market demand, foreign trade, and growth projections has been captured in chapter 5.3 and 5.4 Based on responses received during primary survey, sector overview has been detailed out in the following- • Ceramics industry is one the growing manufacturing sectors in Bangladesh due to the steady economic growth and urbanization. The core products of this sector are tiles, tableware and sanitary ware. • The ceramics industry caters to 85% of the local demand and also serves a major portion of the export market • More than 50,000 people are engaged in this sector in Bangladesh • Bangladesh Ceramic Manufacturers & Exporters Association (BCMEA) is the National trade Organization uniting the Ceramic Products Manufacturers and Exporters in Bangladesh.

	• Cement industry is booming sector in Bangladesh and the country is the world's 40th largest cement market.184 • The production capacity of cement stood at 58 million tons in 2018 while the demand has seen a rise to 31 million tons. • Out of the locally produced cement Government consumption is 35 percent, commercial developers' consumption is 35 percent and the remaining amount by the individuals and small buyers. • The per capita consumption of cement raised by 97 per cent to stand at 187 kg from 2011 to 2018. However, it still lags behind the global average of per capita consumption of 563 kg. • The major cement players in Bangladesh are Lafarge Holcim, Shah cement, Basundhara cement and Fresh cement.
Sector Trends	• Non-metallic sector in Bangladesh is estimated to grow up to ~10% in the coming five years. • Ceramic products are currently exported to more than 50 countries such as USA, Italy, New Zealand, Australia, Sweden, Spain and France. • The export demand for the ceramics is increasing due to the availability of variety of products at competitive prices meeting the international standards. • The growth of cement industry looks promising in terms of increasing demand due to rapid urbanization, real estate and government projects. • High growth in this sector is observed due to the fact that Bangladesh is one of the largest global importers of clinkers. • Bangladesh looks to be rapidly closing the gap between national per capital consumption and global average. • Currently, 14 cement manufacturers are involved in exporting their products to Nepal, Srilanka, Maldives and other foreign countries. • New technologies are being implemented in this industry in order to improve operational efficiencies and reduce wastage in the industry.
Current Barriers to Investment	Please refer to chapter 5.7.3
Land Requirements	• Land requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • Basis primary survey, typically medium scale players require 10 to 14 acres of land; whereas large scale players require 16 to 20 acres for setting up a single Non-metallic minerals sector manufacturing facility • Following chapter delves into forecasting of industrial land requirement for this sector

[184] https://tbsnews.net/economy/bangladeshs-cement-industry-booming

Power Requirements	• Power requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • For medium scale facility, power requirement can vary from 1.25 to 1.75 MVA for single facility; whereas, for a large-scale facility, power requirement may vary from 2.0 MVA to 2.5 MVA for single facility • Following chapter delves into forecasting of industrial power requirement for this sector
Water Requirements	• Water requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • For medium scale facility, water requirement can vary from 500 to 700 Cum/ day for single facility; whereas, for a large-scale facility, water requirement may vary from 800 cum/ day to 1000 cum/ day for single facility • Following chapter delves into forecasting of industrial water requirement for this sector
Employment per Factory	• Manpower requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • For medium scale facility, typically 6,000 to 8,500 number of manufacturing related employees are employed in a single facility; whereas for a large facility, typically 9,700 to 12,000 number of manufacturing related employees are employed in a facility • Following chapter delves into forecasting of manpower requirement for this sector

Source: PwC Research and MACE Analysis

Table 41: Sector Profile – Chemicals

Sector	**Chemicals**
Sub-Categories Proposed	Fertilizers
Sector Overview	Based on secondary research, sector overview detailing on the production, market demand, foreign trade, and growth projections has been captured in chapter 5.3 and 5.4. Based on responses received during primary survey, sector overview has been detailed out in the following- • Due to the rapid industrialization in the country, Chemicals sector in Bangladesh has triples in the last decade.

	• The Chemicals sector in Bangladesh is driven by domestic consumption with significant import dependency due to lack of integrated chemical manufacturing facilities. • Chemicals sector comprises various products viz. (i) fertilizer, (ii) adhesives & paints related products, and (iii) other chemicals. • Import of ~835 million USD worth organic chemicals in 2019, while ~392 million USD worth inorganic chemicals were imported in the same year. • Bangladesh is heavily dependent on import of Urea as well as finished product (Fertilizer), 68% of its total demand is met by imports. • Chemicals sector acts as the downstream sector for various sectors such as food processing, fertilizer and agro based, Appliance and foam industries, leather and plastic products, shipbuilding, and heavy machineries. • Currently Bangladesh imports chemicals from India, China, Germany, Japan, France etc.[185]
Sector Trends	• Bangladesh has a huge agricultural land; improvement of chemical sector may trigger agro and industrial revolution simultaneously. • Domestic production of chemicals is estimated to grow between 1-2% in the next five years. • High cropping intensity and decreasing soil intensity are the main demand drivers for this sector in the country. • Fertilizers will have high demand in proximity to the proposed EZ, due to the widespread agriculture-based economy in the influence region.
Current Barriers to Investment	Please refer to chapter 5.7.3
Land Requirements	• Land requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • Basis primary survey, typically medium scale players require 3 to 6 acres of land; whereas large scale players require 8 to 14 acres for setting up a single Chemicals sector manufacturing facility • Following chapter delves into forecasting of industrial land requirement for this sector
Power Requirements	• Power requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods). • For medium scale facility, power requirement can vary from 0.5 to 1.25 MVA for single facility; whereas, for a large-scale facility, power requirement may vary from 1.5 MVA to 2.6 MVA for single facility

[185] https://www.daily-sun.com/post/412886/2019/08/04/Potentiality-of-our-chemical-sector

	• Following chapter delves into forecasting of industrial power requirement for this sector
Water Requirements	• Water requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • For medium scale facility, water requirement can vary from 180 to 360 Cum/ day for single facility; whereas, for a large-scale facility, water requirement may vary from 480 cum/ day to 840 cum/ day for single facility • Following chapter delves into forecasting of industrial water requirement for this sector
Employment per Factory	• Manpower requirement depends on the capacity of the factory, type of technology and type of sub-sector (finished goods) • For medium scale facility, typically 500 to 1000 number of manufacturing related employees are employed in a single facility; whereas for a large facility, typically 1300 to 2500 number of manufacturing related employees are employed in a facility • Following chapter delves into forecasting of manpower requirement for this sector

Source: PwC Research and MACE Analysis

Table 42: Sector Profile – Agro Based Industries

Sector	**Agro based Industry**
Sub-Categories Proposed	Jute processing units, flour mills, rice mills, sugar mills, tobacco processing
Sector Overview	Based on secondary research, sector overview detailing on the production, market demand, foreign trade, and growth projections has been captured in chapter 5.3 and 5.4 Based on responses received during primary survey and secondary research, sector overview has been detailed out in the following- • Agriculture is one of the major occupations in Bangladesh, and it employs more than half the workers in Bangladesh contributing ~17% to the national GDP • Rice and Jute are major crops produced in the country, and wheat is also gaining importance in the country now a days. • Jute is grown in large quantity in the south west part of Bangladesh, and hence jute industry is dominant in the region, especially Khulna division. • Rice is the major crops, and grown in almost every corner of the country, while wheat is dominant in the western Bangladesh.

	• Jute industry records export of appx one billion USD every year, while most of the cereals generated are directed towards domestic consumption market. Cereals recoded export of only ~9.5 million USD in 2019. • Tobacco processing is another major subindustry in this sector, with ~145 thousand hectares area under tobacco production in 2018, and estimated production of ~150 thousand MTs of tobacco. • The major consumption market for the product is the urban areas such as Dhaka, Chittagong, Sylhet, Jessore or Khulna. • Major players: Janata Jute Mills, Akij Jute Mills, Raipur Auto Rice Mills, Razzak Group of Industries, British America Tobacco Bangladesh; this sector has witnessed participation of a large number of medium scale players
Sector Trends	• Mostly domestic focused sector. • Products of flour mills, rice mills and sugar mills form the part of essential needs of the human being, and hence are likely to continue with high domestic demand. • These products also act as input to the food processing industry, which is likely to grow with the rising income levels in rural and urban regions. • Jute industry is currently unable to make profit as per the expectations, hence government through Bangladesh Jute Corporation is inducing capital in the business. • Private sector is depicting interest in the sector due to demand for bio-degradable and sustainable nature of fabric demand.[186] • Technology induction in rice mill and flour milling industry is improving productivity. • Rice production in the country is rising, but its growth rate is very less (~1.37% CAGR between 2014-18)[187] • Sugarcane production has depicted decline in the last three years (2015-18) from ~4.20 million MTs to 3.64 million MTs, while sugar import has also shown decrease from 2.4 million MTs to 2.3 million MTs (~-1.3% CAGR) during the same time. [188] • Sugar is mostly imported in Bangladesh, as the domestic production of sugarcane in limited in the country. • Tobacco production in the country is increasing year on year, with increase of ~3.8% year on year from 2014 to 2018, and exports growing at CAGR of ~15% from 2015 to 2019.[189] • Agro based products is declared as the thrust sector by the GoB, and hence it is expected to grow in exports in the coming years.

[186] The Recarnation of Jute, The Daily Star, 15th May 2018
[187] Agricultural Yearbook 2018
[188] Agricultural Yearbook 2018, and ITC Trademap
[189] ITC Trademap, and Tobacco Asia

	• Development of Payra seaport, and Padma bridge, supplemented by access to whole west Bangladesh which is rich in agricultural production will promote the agro based industries in south west Bangladesh region.
Current Barriers to Investment	Please refer to chapter 5.7.3
Land Requirements	• Land requirement depends on the capacity of the factory, type of technology, type of sub-sector, and type of production method. • Basis primary survey, typically medium scale players require 3 to 7 acres and large players may require 8 to 15 acres for a single agro based product manufacturing facility. • Following chapter delves into forecasting of industrial land requirement for this sector
Power Requirements	• Power requirement depends on the capacity of the factory, type of technology, type of sub-sector, or type of production method • For medium scale facility, power requirement can vary from 0.4 to 1.1 MVA for single facility; whereas, for a large-scale facility, power requirement may vary from 1.1 MVA to 2.3 MVA for single facility • Following chapter delves into forecasting of industrial power requirement for this sector
Water Requirements	• Water requirement depends on the capacity of the factory, type of technology and type of sub-sector, or type of production method adopted. • For medium scale facility, water requirement can vary from 18 to 56 Cum/ day for single facility; whereas, for a large-scale facility, water requirement may vary from 50 cum/ day to 120 cum/ day for single facility • Following chapter delves into forecasting of industrial water requirement for this sector
Employment per Factory	• Manpower requirement depends on the capacity of the factory, type of technology and type of sub-sector, or type of production method adopted. • For medium scale facility, typically 300 to 900 number of manufacturing related employees are employed; whereas for a large facility, typically 800 to 2000 number of manufacturing related employees are employed in a facility • Following chapter delves into forecasting of manpower requirement for this sector

Source: PwC Research and MACE Analysis

Sectoral overview and the numbers mentioned in the sectoral profile are on the basis of primary surveys, while the sectoral trend is a blend of primary and secondary research. The detailed demand assessment of the above-mentioned industries will be taken up in demand assessment chapter based on the inputs of the primary survey.

5.8. Key Takeaways

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 was studied in detail 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.

Regional assessment depicts the suitability of the initial bucket list of industries in site surrounding and influence region context. **Four industries were initially shortlisted** ex post facto this regional landscape assessment. Primary set of industries are: (a) Food & Beverage, (b) Agro-based products, (c) Non-metallic minerals; secondary set of industries are: (a) Chemicals.

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 76 respondents (comprising of 59 Bangladeshi and rest foreign) were surveyed. Voice on ground also captured that the investors are facing challenges regarding high customs duties, time consuming customs clearance procedures, power shortage, unavailability of fuel (natural gas), and with overall logistics scenario in the country. These challenges (country specific, site specific, and sector specific) are causing hindrances to investment.

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

- Availability of labor
- Availability of raw materials
- Access to CETP/STP
- Subsidized industrial land space and utility tariffs
- Prompt administrative procedures
- Uninterrupted access to quality utility services (power, water, and gas)
- Warehousing facility
- Access to concessional loans
- Corporate income tax subsidy

Many fiscal and infrastructure related pre-requisites are already under implementation by BEZA as part of its EZ incentive package and operational guidelines. The section above identifies the prospective sectors which are most suitable for the proposed EZ and same will be considered while assessing the year on year land demand. The sub-sector level assessment to identify the most suitable product/sub-sector which EZ can target has been furnished in Annexure.

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

Primary set of industries	Secondary set of industries
• Food & Beverages • Agro-based products • Non-metallic minerals	• Chemicals

6. Demand Forecast

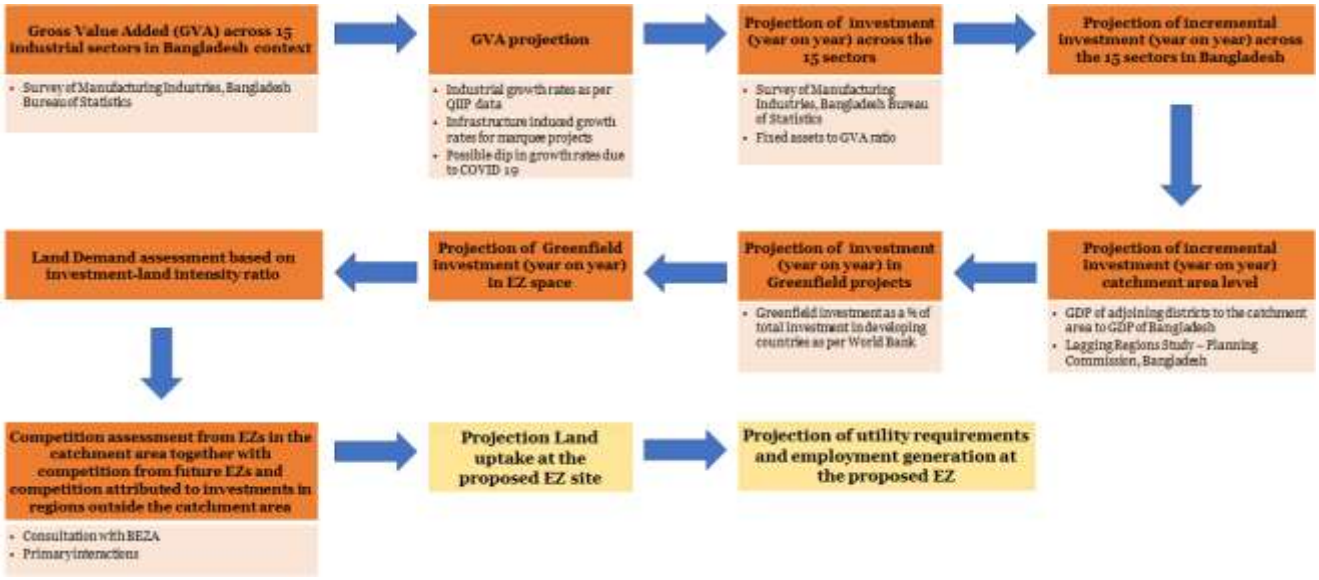
6.1. Purpose and Objective

The former chapter assessed various industrial sectors in the perspective of national and regional landscapes, and identifies the key sectors having potential to be developed in the proposed economic zone. As a next step, this chapter delves into estimating the year on year demand generated by these industries through a mathematical model prepared using statistics techniques. The model attempts to estimate the demand for land for the proposed economic zone for a span of 20 years. It also attempts to estimate the year on year demand for various utilities such as power, and water, and year on year employment generation. 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.

6.2. Methodology of Demand Forecast

For estimation of demand of various parameters for the proposed economic zone, up-down approach is used, where macroeconomic parameters are estimated initially at the national level, and then they are boiled down to the regional level in order to understand the potential demand at the proposed economic zone. Figure 38 given here depict the methodology for the demand forecast.

Figure 38: Overall approach for demand forecast



Source: PwC Analysis

Stepwise approach has been elucidated in the following-

1. As a first step in demand forecasting exercise, GVA (Gross Value Addition) of best performing 15 industrial sectors is taken from SMI 2012 database for further forecasting purpose.[190]
2. GVA for these 15 industrial sectors have been forecasted based on industrial growth rates. It has been considered that these growth rates are generating owing to the organic growth rate(s) of the respective industrial sector(s). The possible dip in growth rates due to COVID 19 pandemic is also taken into consideration for years between 2020 to 2025.

[190] *GVA stands for gross value addition for a given industry in a span of one year. The term is different from gross product, where gross value of final product is considered for calculation.*

QIIP published for the month of May 2019 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.

The decrease growth rates for different industries have been estimated in proportion to the decrease in growth rates of Bangladesh estimated by The World Bank in its report depicting the impact of COVID 19 on South Asia. The dips are taken after detailed assessment of possible impact of COVID 19 on various industries, which is further rated on a scale from one to five.

3. The year on year investment is calculated from the projected GVA values of the 15 industrial sectors using investment to GVA ratios (calculated from SMI 2012 data). Further GDP contribution of districts in the influence area is used to estimate the incremental investment in the influence region (defined in section 5.5 – "Regional Assessment").
4. The investment projections are discounted further to boil down to the investments that will be accrued to the Greenfield projects in the influence area of the proposed EZ. The resulting investment forecast in Greenfield projects in the afore-mentioned influence area is subsequently discounted further to ascertain the magnitude of investment (year on year) that would be accrued to the Economic Zone space.
5. Investment-land intensity ratio is assessed on the basis of secondary research, industry sector outlook, and primary interaction with industries, which is further used to estimate the year on year land uptake in the various economic zones in the influence area.
6. In addition to the proposed EZ, various other economic zones are planned within its influence area. In consultation with BEZA officials and past experience, land uptake in these proposed economic zones have been prepared. After considering competition from these economic zones within the influence area, land uptake projection at the proposed EZ is arrived at.
7. 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 have been used to formulate the best practice master planning and accordingly infrastructure requirements have been assessed.
8. 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 than this estimation.

6.3. Demand Scenarios and Associated Assumptions

6.3.1. 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.

All the three cases take into consideration the impact of COVID 19 pandemic on the country's economy.

6.3.2. Key Assumptions

1. Timing and related assumptions

Looking at the landscape of competing economic zones in the country, various economic zones are at an advanced stage of development. These economic zones are Mirsarai Bangabandhu Sheikh Mujib Industrial City[191], BEZA owned zones (like Dhaulghata in Maheshkhali, Jamalpur), 20[192] private EZs which have received final license & pre-qualification license, PPP EZ in Mongla, and G2G EZs (like Japanese EZ in Araihazar, Chinese EZ in Anowara, Indian EZ in Mongla). There also lies the possibility that new EZs may be launched in the short term (coming five years). Market intelligence and hypothesis formed based on input from BEZA indicates that in the coming five years, majority of the investment in these EZs (which are at advanced stages of development and the possible new entrants) could be directed towards these EZs (which are at an advanced stage of development) and in EZs which are located in proximity to Dhaka and Chittagong. Considering the same, uptake at Bhola EZ was assumed to start in the long term (i.e. after the next seven to eight years) and thus it had been previously assumed in the model that industrial space uptake should commence from 2028 onwards.

In the post-COVID era, investors could be more risk averse in choosing an investment destination within Bangladesh and may express interest in more commercially prosperous clusters of the country. The impact of the COVID pandemic could also prompt investors to re-think their investment plans which may impact demand of industrial space uptake in economic zones.

Keeping cognizance of the above, we re-visited our earlier analogy and further it has been assumed that regulatory activities and study on the proposed EZ would start from 2026 owing to competition from other EZ locations and also factoring in the expected long-term effect of the global pandemic situation. Thus, construction activities can begin from 2027. Taking cues from similar developments across the globe, and the area being 304 acres, construction timeline of 3 years (from 2027 to 2029) has been considered.

Basis above timelines, it has been assumed that land uptake in the proposed EZ to commence from 2029 and accordingly a demand model has been prepared for 20 years (i.e. from 2029 to 2048).

2. Industries considered for this assessment

As elaborated in earlier chapter, following industries have been identified for the demand projection framework.

Primary set of industries:

- Food and Beverages
- Agro based products
- Non-Metallic Minerals

Secondary set of industries:

- Chemicals

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. These growth rates are also revised for considering the possible impact of COVID 19 pandemic.

[191] This is an integrated industrial arcade comprising of industrial tenants, PPP developers (such as SBG), and other developers (like BEPZA, BGMEA, Indian EZ to name a few). Mirsarai Bangabandhu Shiekh Mujib Industrial City is spread over 30,000 acres and details about the land allotment has been obtained from BEZA officials

[192] As per the information obtained from BEZA, details are provided in the annexure.

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.

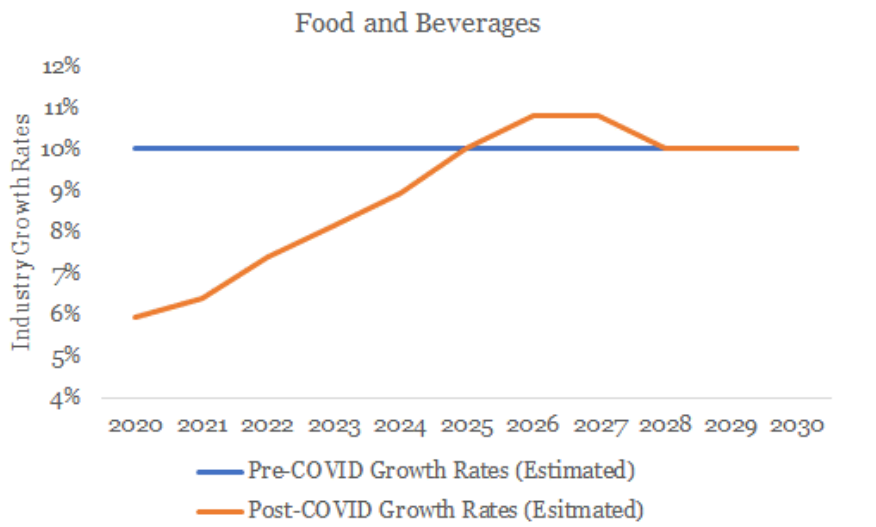
Table 43: Organic industrial growth rate related assumptions

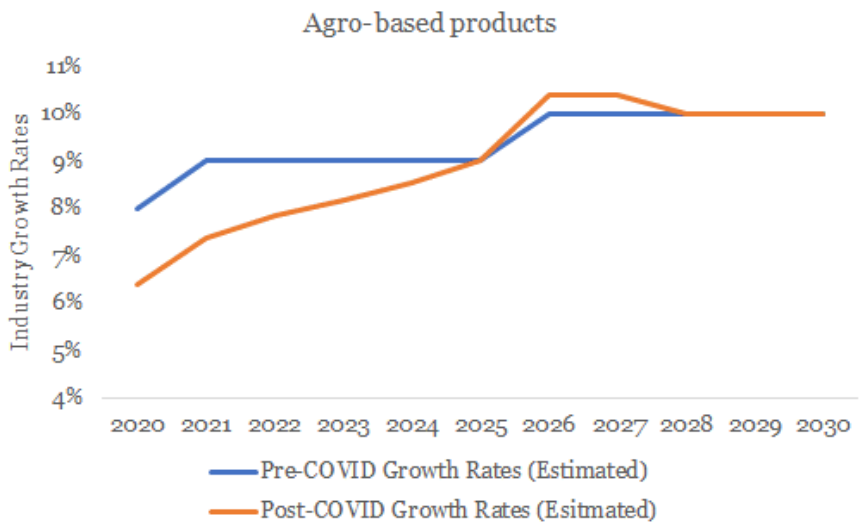
Industrial Sectors	Description of the Assumptions
Food & Beverages	• 8.5% annual growth from 2012 to 2019 • 10% annual growth from 2028 to 2030 • 9% annual growth from 2031 to 2048
Agro based products	• 8% annual growth from 2012 to 2019 • 10% annual growth from 2028 to 2030 • 8% annual growth from 2031 to 2048
Non-metallic minerals	• 11% annual growth from 2012 to 2019 • 12% annual growth from 2028 to 2035 • 11% annual growth from 2036 to 2048
Chemicals	• 7% annual growth from 2012 to 2016 • 8% annual growth from 2017 to 2019 • 8% annual growth from 2028 to 2048

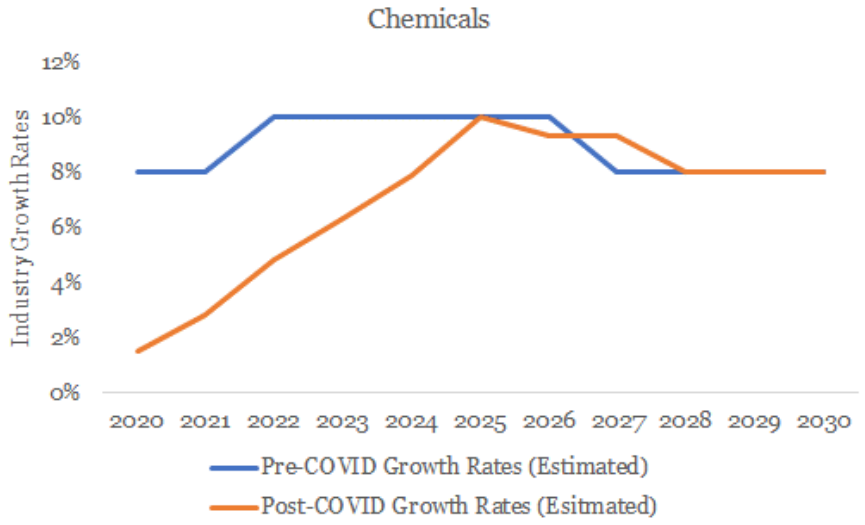
Note: For span between 2020 to 2027, the growth rates are impacted majorly due to COVID 19, and hence are estimated separately. Hence, they are not mentioned in the above table.
Source: QIIP May 2019 by Bangladesh Bureau of Statistics; Secondary Research and PwC Analysis

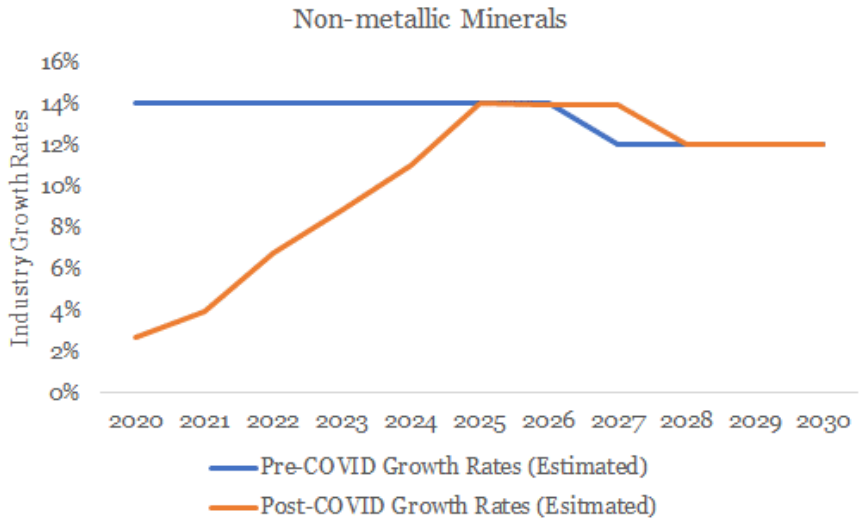
On the other side, the growth rates between 2020 and 2027 are majorly impacted due to COVID 19 outbreak started in 2020. Figure 39 depicted the impacted growth rates for the above industries due to COVID 19 during this period.

Figure 39: Revised Growth Rates of Industries due to COVID 19 pandemic









The Rationale behind the growth rates:

Due to the outbreak of COVID 19 pandemic in the country, and across the globe, the industry growth for various industrial sectors is expected to suffer in short term. In order to consider this, each industry is assessed in the perspective of COVID 19 pandemic impact, and revised growth rates are estimated based on the economic forecasts of the World Bank. These industrial growth rates are estimated to dip in the initial years (2020 to 2025), while they are expected to pick up due to low base effect along with possible economic boom for next couple of years. From Figure 39, the dip in growth rates between 2020 to 2025 can be observed, while the expected boom post the dip can also be seen for year 2026 and 2027.

4. Assumptions related to investment inflow in the influence area of the proposed EZ in Bhola

Out of the total investment forecasted at the country level, certain portion is expected to inflow at the influence area (refer to section 5.5 – "Regional Assessment") level for the proposed EZ. A part of this investment inflow is Greenfield in nature (involves setting up of new facilities). Out of the total Greenfield investment estimated at the influence area level, it has been assumed that a certain quantum would take place in the economic zones proposed within this area. Following table captures the assumptions related to investment inflow in economic zones of the influence area for the proposed EZ.

Table 44: Assumptions related to investment inflow in economic zones of Barisal division

Details	Conservative	Base	Aggressive
Investment in the EZ influence area as % of the total investment estimated for the country	**4.5%**	**5.0%**	**5.5%**
% of Greenfield investment	**49.5%**	**50.0%**	**50.5%**
Investment in economic zones (%) out of total Greenfield investment	**19.0%**	**20.0%**	**21.0%**

Source: Secondary research and PwC Analysis

Based on information availed from secondary research and PwC analysis, the districts constituting the influence area of the proposed EZ contributes to ~5.6% of GDP of the country. Thus, investment in this influence area has been assumed as 5% (in base case) of the total investment inflow in the country. Research articles suggest that in developing countries, % of Greenfield investment is ~57.85%.[193] Thus in base case, 50% of Greenfield investment has been assumed.

BEZA has embarked into an ambitious journey of setting up of 100 economic zones across Bangladesh by 2029. Keeping in cognizance of the same, it has been assumed that in base case, 20% investment in economic zones (out of total Greenfield investment) would flow in.

Detailed rationale behind these assumptions are placed as annexure.

5. 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 establishments 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.

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

While calculating the above, it has been assumed that the proposed EZ houses only small, medium, and large-scale industries.[194]

Table 45: 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)
Food and Beverages	36.76	2.00
Agro based products	52.87	1.00
Non-metallic minerals	58.82	5.00
Chemicals	223.17	1.00

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

6. Assumptions related to competition from other proposed EZs within influence division

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

Table 46: Competing economic zones within influence division

Sl. No.	Name of EZ	Location	District	Gross area in acres[195]	Remarks
1	Agailjhara Economic Zone	Barisal	Barisal	300	Govt. driven
2	Investments opting for other regions in the country & Future competition	-	-	255	Investments in the EZ space can also deviate towards other regions in the country owing to the prosperity of the Dhaka and Chittagong division. In order to factor that in our calculations and to factor the effect of future competitions that may creep

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

[195] *This indicates the total area of the competing EZs. Details of the same and the occupancy pattern (as per market intelligence and discussion with BEZA officials) are furnished in the annexure*

Sl. No.	Name of EZ	Location	District	Gross area in acres[195]	Remarks
					up in the form of more EZs in the same influence area, we have assumed that ~85% of the total land of the competing zones will be contributing to lost demand in the form of investments opting for other regions in the country & future competition

Source: BEZA website and discussion with BEZA officials

In line with the above information, industrial space uptake in the competing EZs have been assumed. Details of the same are placed in the annexure. Basis market intelligence and 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.

7. 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). Typically, 65% to 75% of the total land area is earmarked for industrial purposes. In small land parcels, this % is higher and it is lower for large land parcels. Considering the small size of this land parcel (304 acres), it has been assumed that 75% of the total land area would be earmarked for industrial purposes. However, this is tentative and based on development guidelines of BEZA & similar developments worldwide.

8. 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.

Following table captures these benchmark figures.

Table 47: 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)
Food and Beverages	185.00	40.00	23
Agro based products	145.00	40.00	119
Non-Metallic Minerals	125.00	50.00	603
Chemicals	185.00	60.00	164

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.

6.4. Demand Forecasting

6.4.1. Industrial Space Uptake

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

Table 48: Industrial space occupancy (in %) for the three scenarios (cumulative)

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	5%	10%	14%	18%	23%	26%	30%
Base	6%	13%	18%	25%	31%	36%	42%
Aggressive	8%	16%	23%	31%	40%	47%	56%

Source: Statistical projection technique; Demand Forecasting

Table 49: Industrial space occupancy (in %) for the three scenarios (cumulative)

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	33%	35%	46%	57%	67%	87%	100%
Base	47%	53%	66%	80%	94%	100%	100%
Aggressive	63%	72%	88%	100%	100%	100%	100%

Source: Statistical projection technique; Demand Forecasting

In the Pre-COVID scenario, our analysis indicated that across the three scenarios (i.e Conservative, Base and Aggressive), it is taking 11, 9 and 7 years respectively for the zone to achieve full occupancy (uptake year starting from 2028). In the post-COVID scenario, the uptake trend has changed due to slowdown in industrial growth which has affected the demand of industrial land, and as a result uptake has been shifted to start from 2029. Moreover, in the post-COVID scenario, it is taking 14, 13 and 11 years (in Conservative, Base and Aggressive scenarios respectively) for the zone to achieve full occupancy.

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

Table 50: Industrial space uptake- Conservative Scenario (figures in acres) - cumulative

Industries	2029	2030	2031	2032	2033	2034	2035
Food and Beverages	5	10	15	20	25	30	35
Agro based products	0	0	1	1	1	1	1
Chemicals	0	0	1	1	1	1	1
Non-Metallic Minerals	3	5	8	12	15	18	21
Total	**8**	**16**	**24**	**33**	**43**	**50**	**59**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

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

Industries	2036	2037	2038	2039	2040	2041	2042 to 2048
Food and Beverages	39	45	57	71	84	101	115
Agro based products	2	2	2	3	3	4	5
Chemicals	1	2	2	2	3	3	4
Non-Metallic Minerals	24	28	36	46	54	67	76
Total	**67**	**76**	**98**	**122**	**144**	**175**	**200**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

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

Industries	2029	2030	2031	2032	2033	2034	2035
Food and Beverages	6	13	19	26	33	39	46
Agro based products	0	1	1	1	1	2	2
Chemicals	0	0	1	1	1	1	2
Non-Metallic Minerals	3	7	11	15	20	24	28
Total	**10**	**21**	**31**	**43**	**55**	**66**	**78**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

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

Industries	2036	2037	2038	2039	2040	2041	2042 to 2048
Food and Beverages	53	61	76	92	108	116	116
Agro based products	2	3	3	4	4	5	5
Chemicals	2	2	3	3	4	4	4
Non-Metallic Minerals	33	38	48	59	70	75	75
Total	**90**	**104**	**130**	**158**	**186**	**200**	**200**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 54: Industrial space uptake- Aggressive Scenario (figures in acres) - cumulative

Industries	2029	2030	2031	2032	2033	2034	2035
Food and Beverages	8	16	23	32	41	49	58

Industries	2029	2030	2031	2032	2033	2034	2035
Agro based products	0	1	1	1	2	2	2
Chemicals	0	1	1	1	1	2	2
Non-Metallic Minerals	4	8	13	19	24	30	36
Total	**12**	**25**	**38**	**53**	**69**	**83**	**99**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 55: Industrial space uptake- Aggressive Scenario (figures in acres) - cumulative

Industries	2036	2037	2038	2039	2040	2041	2042 to 2048
Food and Beverages	68	78	96	116	116	116	116
Agro based products	3	3	4	5	5	5	5
Chemicals	2	3	3	4	4	4	4
Non-Metallic Minerals	42	49	61	74	75	75	75
Total	**115**	**133**	**164**	**199**	**200**	**200**	**200**

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

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.

Table 56: Estimation of Industrial Establishments- cumulative

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	3	7	10	14	18	21	24
Base	4	9	13	18	23	27	32

Scenarios	2029	2030	2031	2032	2033	2034	2035
Aggressive	5	11	16	22	29	34	41

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 57: Estimation of Industrial Establishments- cumulative

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	28	32	40	50	59	71	81
Base	37	43	53	65	76	81	81
Aggressive	47	55	68	81	82	82	82

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

6.4.2. 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 58: Power Requirements- Three Scenarios (figures in MVA) – cumulative

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	1.26	2.65	3.93	5.38	6.93	8.14	9.56
Base	1.61	3.37	5.05	6.93	8.95	10.67	12.67
Aggressive	1.99	4.17	6.28	8.63	11.17	13.46	16.08

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 59: Power Requirements- Three Scenarios (figures in MVA) – cumulative

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	10.83	12.39	15.84	19.69	23.26	28.22	32.15

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Base	14.54	16.77	20.96	25.61	30.05	32.21	32.21
Aggressive	18.63	21.59	26.58	32.11	32.25	32.25	32.25

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 60: Water Requirements- Three Scenarios (figures in MLD) – cumulative

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	0.34	0.71	1.05	1.45	1.87	2.20	2.60
Base	0.43	0.90	1.36	1.87	2.42	2.89	3.44
Aggressive	0.53	1.11	1.69	2.33	3.02	3.65	4.37

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 61: Water Requirements- Three Scenarios (figures in MLD) – cumulative

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	2.94	3.37	4.32	5.38	6.36	7.74	8.82
Base	3.95	4.56	5.71	6.99	8.22	8.82	8.82
Aggressive	5.07	5.88	7.25	8.77	8.81	8.81	8.81

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

The above stated utility consumption figures were taken at a conception and on basis on primary surveys undertaken among various industry sector players in Bangladesh. Actual demand estimation of utility has been undertaken in the Infrastructure Planning chapter, based on prevailing development guidelines in Bangladesh context.

6.4.3. Employment Generation

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

Table 62: Direct employment generation for the three scenarios

Scenarios	2029	2030	2031	2032	2033	2034	2035
Conservative	1,697	3,573	5,464	7,630	9,999	11,864	14,108
Base	2,162	4,382	6,484	8,826	11,434	13,413	15,750
Aggressive	2,162	4,558	7,025	9,834	12,921	15,588	18,730

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Table 63: Direct employment generation for the three scenarios

Scenarios	2036	2037	2038	2039	2040	2041	2042 to 2048
Conservative	16,034	18,428	23,803	29,855	35,526	43,518	49,911
Base	17,639	19,787	25,005	30,498	36,023	38,471	38,471
Aggressive	21,580	24,999	31,510	38,821	45,887	49,359	49,359

Source: Statistical projection technique; Demand Forecasting (kindly ignore the rounding off)

Detailed calculations are furnished in the annexure.

6.5. 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 bad (good) performance of economic and infrastructure indicators in regard to the country and the influence region.
- Previous assumptions related to industrial growth rates has been revised to factor in the effect of the COVID-19 pandemic. The effect of the same has been considered and it is observed that it has affected the land uptake projections. As a result, the time period for the proposed has been deferred as compared to pre-COVID.

- Our analysis indicates that in conservative case, complete land uptake would take place in 14 years. For base and aggressive cases, the same would be spread over 13 years and 11 years respectively in the Post-COVID scenario. In Pre-COVID scenario, the same was spread over 12, 11 and 9 years respectively across conservative, base and aggressive scenarios.
- Total number of industrial establishments (small, medium, and large) across Conservative scenario is 81. For Base and Aggressive scenario, it is 82.
- For conservative case, ultimate power and water demand have been estimated as 32.15 MVA and 8.82 MLD; For base case, ultimate power and water demand have been estimated as 32.21 MVA and 8.82 MLD; For aggressive case, ultimate power and water demand have been estimated as 32.25 MVA and 8.81 MLD.
- Proposed EZ is expected to generate direct employment of 39,012 in conservative case. In base and aggressive cases, employment generation figures could be 38,471 and 38,049. These figures are indicative and may vary during implementation.

7. Transport Assessment

7.1. Purpose and Objective

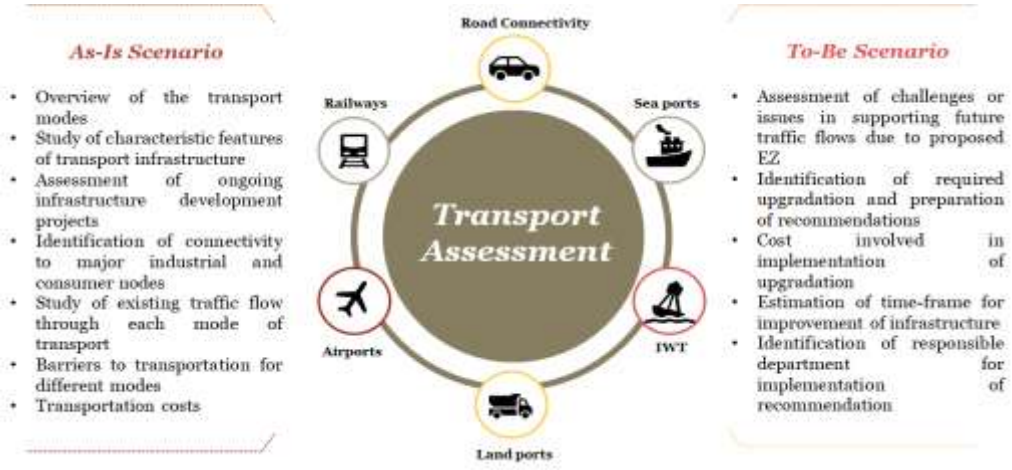
Transport Assessment is a systematic and comprehensive process that lists and analyzes current transport facilities (which includes Road connectivity, Land Ports, Sea Ports and Inland and Water Terminals, Airports and Railways), various issues and challenges related to such facilities and future plans linked to a proposed development. A well developed and linked transport infrastructure facilitates easy movement of people and material to and from a proposed development. In an increasingly globalized economy, industrial development of any region or sector needs to be linked to the development of areas that support the development of the same industry and sector. Hence, analysis and development of the current transport sector associated with the said development is very important as it ensures movement of traffic in and out to major international transit gateways and domestic centers.

This chapter will highlight and assess the current transport infrastructure available in the vicinity of proposed EZ site and existing connectivity with major international transit points. A comprehensive study of the transport infrastructure consisting of road, railway, IWT, port and airport will be performed to understand as-is scenario. 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 explained.

7.2. Methodology of Transport Assessment

The approach adopted to assess the 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 for upgradation and transportation costs involved. 2nd module contains recommended upgradations of different modes of transport infrastructure to support the future traffic flows due to the proposed EZ, cost implication of such upgradations, timeframe over which the upgradation should take place and the departments responsible for the concerned upgradation.

Figure 40: Transport Assessment Methodology

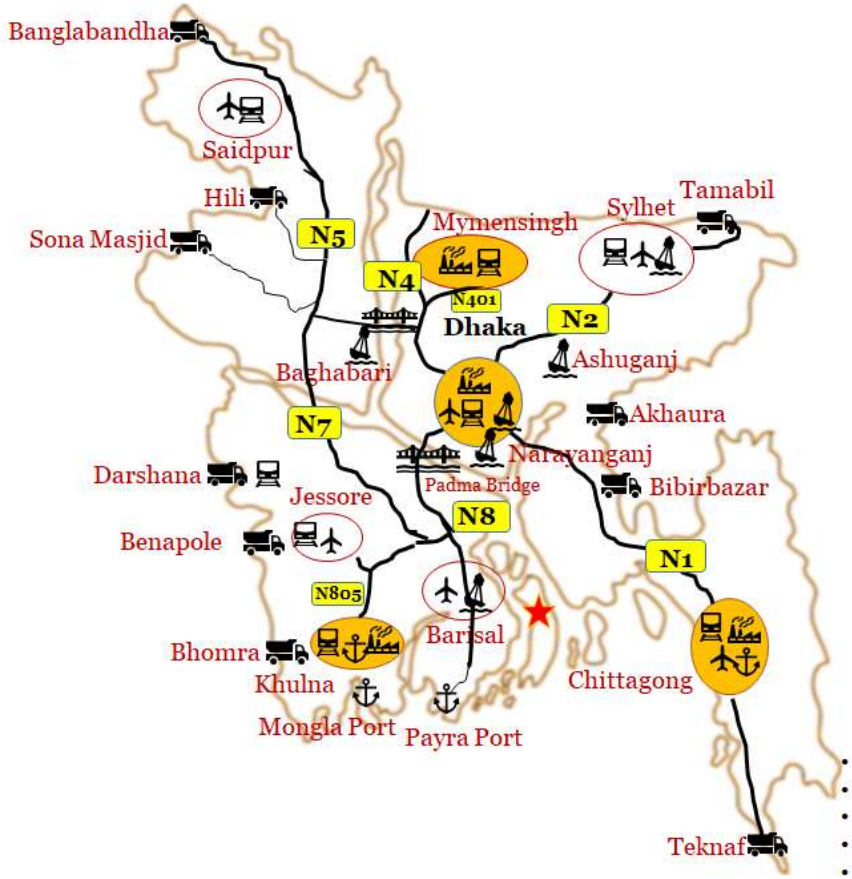


Source: PwC Analysis

7.3. 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 41: Bangladesh's major transport nodes with respect to Proposed EZ site



Legends:

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

Distance from the Major National Infrastructure Nodes:

Node	Distance (Km)	Node	Distance (Km)
Dhaka	194	Chittagong	215
Barisal	53	Khulna	162
Akhaura	217	Bibirbazar	171
Jessore	225	Mongla	206
Payra	130	Sylhet	396

Major Highways:

- **N4** – Joydebpur – Jamalpur Highway
- **N8** – Dhaka – Mawa Highway
- **N2** – Dhaka-Sylhet Highway
- **N6** – Dhaka – Rajshahi Highway
- **N5** – Dhaka-Rangpur Highway
- **N1** – Dhaka – Chittagong
- **N805** – Dhaka-Khulna Highway

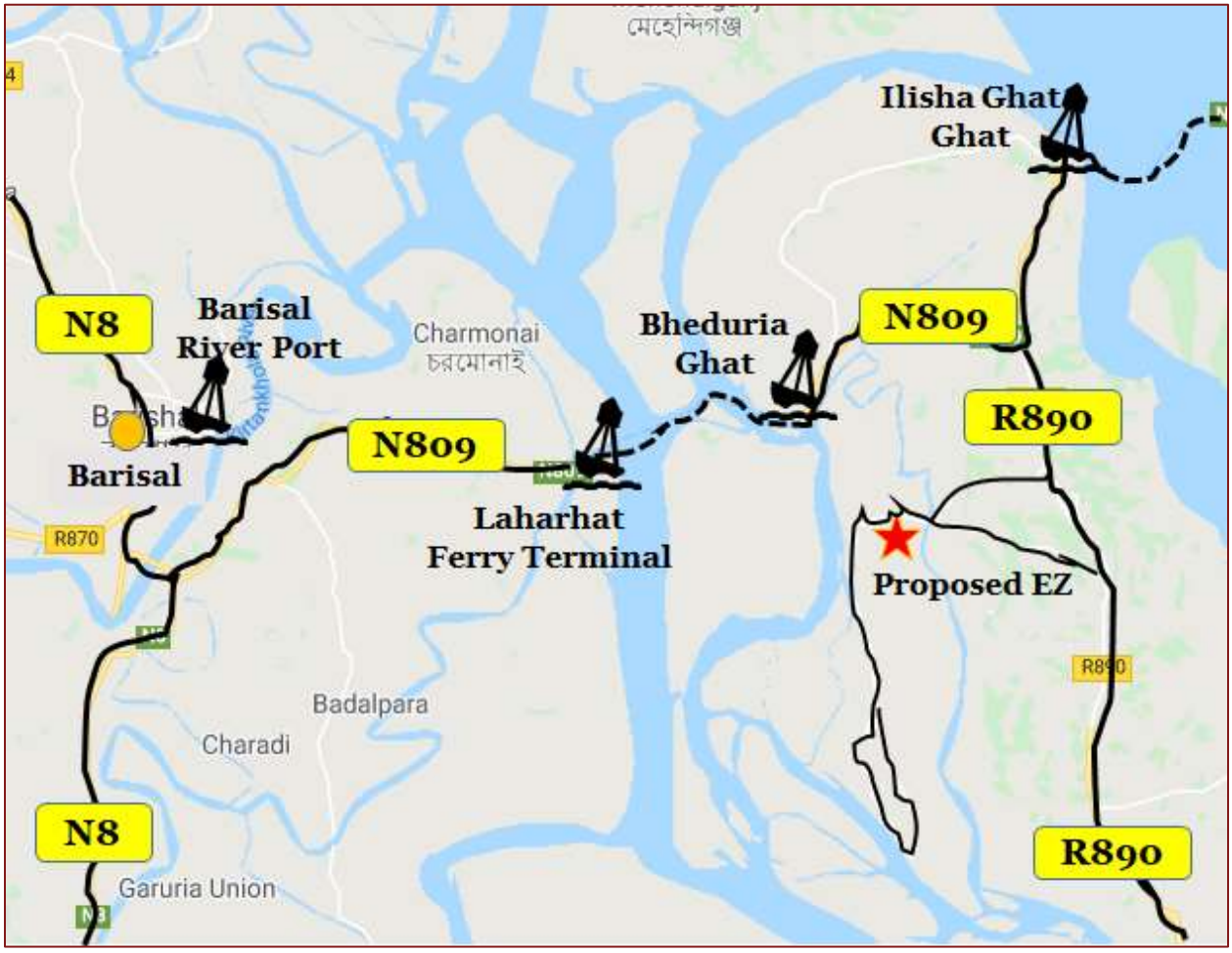
Source: PwC Analysis

7.3.1. Road connectivity

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 in the vicinity of the project site.

Figure 42: Road infrastructure in the vicinity of the proposed EZ



Source: Google Map and PwC Analysis

Separated by the Tentulia river, Bhola is on the eastern part of the Barishal division, the district does not have any direct road link to Barishal. Above figure indicates that the proposed EZ has no direct road connectivity to other parts of Bangladesh. Bhola being an island district, it can be accessed only via IWT network. Proposed EZ is connected with multiple ferry ghats (such as Ilisha Ghat, Laharhat Ferry terminal, Bheduria ghat etc.) in the vicinity. Proposed EZ is in close proximity to Barisal (~53 km) which has industries such as pharmaceuticals, cement, food and beverages. Travel time required to reach Barisal is approximately 2 hours (including ferry ride). Barisal river port is the second largest port and most important hub of steamer and motor launch services in southern Bangladesh. Close proximity to Barisal

will ensure steady demand and ready markets for the proposed EZ at Bhola. Thus, domestic market-oriented industries stand a good chance to flourish in the proposed EZ.

A bridge has been planned over Tentulia and Kalabadar rivers to connect island district Bhola with Barishal. The proposed bridge will connect Laharhat ferry ghat on Barishal side to Bheduria ghat on Bhola side.

Feasibility study of the proposed bridge has been completed and the bridge alignment is fixed at about a few hundred meters downstream from the Bheduria Ferry Ghat and the Laaharhat Ferry Ghat on the Barishal mainland side. It will also be downstream from the existing highway, which connects to the ferry terminals. The figure below shows the location of proposed bridge in respect of the proposed EZ.

Figure 43: Proposed bridge to connect Baishal and *Bhola*

Source: Google Map and PwC Analysis

7.3.1.1. Highways near the proposed EZ

The northern boundary of the proposed EZ is adjacent to zila road (LGED road). It is a single lane bituminous road which provides the last mile connectivity to the proposed EZ. The zila road (LGD road) connects the proposed EZ to Bhola-Burhanuddin-Lalmohon-Char Fassion-Char Manika road (R890) which further connects with the nearest highway which is Bhola-Barisal highway (N809). R890 is two-lane bituminous road having an average width of 5.51 m. The proposed EZ is connected to N809 (~30 km from the proposed EZ) via Bhola-Burhanuddin-Lalmohon-Char Fassion-Char Manika road (R890) which

includes a ferry ride (~9 km) from Bheduria ghat (~20 km) to Laharhat ferry terminal. N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). The proposed EZ is connected to Chittagong (~215 km) via Laxmipur which includes ferry ride (~27 km) from Ilisha ghat (~17 km) to Moju Chowdhury Hat launch ghat.

N809 and N8 are all black top roads which can support movement of heavy vehicles. Proposed augmentation of N8 would further smoothen the connectivity of the site with the Dhaka. N809 is a 2-lane road and has ferry points.

Vehicular Traffic

As per data available in Roads and Highways Department (RHD) database, Average Annual Daily Traffic (AADT) for R890 is 3,994 vehicles, out of which 3,344 are motorized, rest are non-motorized. Traffic volume of R890 is very less as compared to the traffic volume of busiest road links in the country.

Data from RHD reveals that AADT for N809 is 3,768 vehicles, out of which 3,190 is motorized, rest is non-motorized. AADT signifies the volume of vehicular traffic on a highway or road. With the above data, it can be inferred that the traffic or road volume utilization isn't maxed out, and hence in the initial years, investors in the EZ will not face congestion issues.

As per data available in Roads and Highways Department (RHD) database, Average Annual Daily Traffic (AADT) for N8 (Dhaka – Barisal Highway) is 9,127 vehicles, out of which 8,104 is motorized, rest are non-motorized. Traffic volume in N8 is very less as compared to the traffic volume of busiest road links in the country. Comparison of N8 with busiest road links of Bangladesh indicates that the AADT for N8 is approximately 33.7% of the AADT of the busiest road links in the country.

As per UNO officials, the existing Dhaka-Patuakhali highway (N8) is proposed to be augmented from 2-lane to 4-lane. This will further improve the connectivity of the site with Dhaka. Dhaka- Barisal highway (N8) is part of proposed Asian highway network.

The proposed EZ site is connected Bhola–Barisal highway via Bhola-Burhanuddin-Lalmohon-Char Fassion-Char Manika road (R890) which includes a ferry ride (~9 km) from Bheduria ghat (~20 km) to Laharhat ferry terminal.

Once the planned bridge to connect Barishal and Bhola will be operational it will drastically reduce travel time and improve the road connectivity of the Bhola district as well as of proposed EZ with Barisal and further with Dhaka. Completion of this project will bring enormous social and economic benefits to the people living in Bhola in particular and the southern part of the country in general. It will also ensure the seamless movement of industrial goods from the proposed EZ.

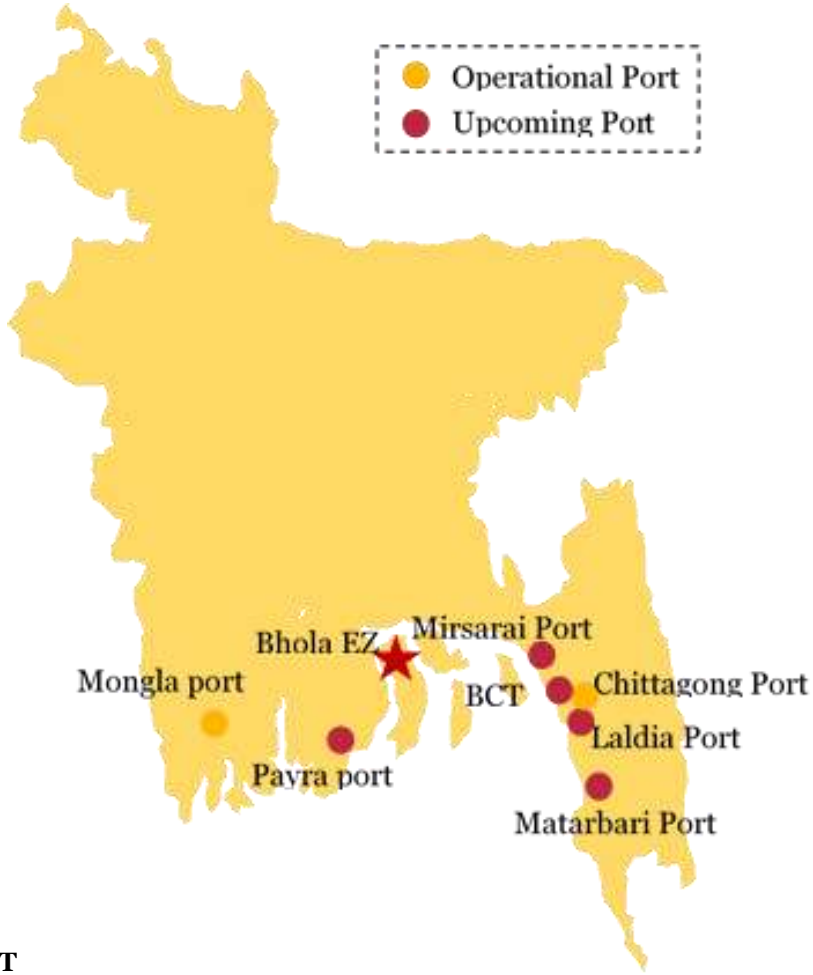
7.3.2. Sea Ports and Inland Water Terminals

Waterway transport is one of the most fuel efficient, environment friendly and cheapest mode of transportation. Cost of transporting one ton freight over a distance of one km by waterway is ~30-40% and 60-70% of the same transport done via road and rail respectively.[196] Bangladesh is blessed with a riverine geography, especially towards its south, where distributaries of large rivers like Padma and Meghna drain the region. There are around 700 rivers, streams and canals with a total length of about 24,000 km. The navigable length of waterway varies from 3,865 km in dry season to 5,923 km in monsoon. This creates a

[196] *https://www.thehindubusinessline.com/opinion/flowing-down-the-waterways/article23384237.ece*

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.[197] Currently, more than 75% of international trade in Bangladesh is done via sea-ports. This makes it vital to understand potential of waterways connectivity to support transportation in the proposed EZ region. The figure below shows the existing and upcoming port in the country.

Figure 44: Existing and upcoming ports



Access to IWT

Being an Island district, Bhola is connected with the rest of the country through IWT network. Proposed EZ has access to multiple ferry ghats (such as Ilisha Ghat, Lalmohan ghat, Bheduria ghat etc.) These ferry ghats are not equipped with cargo handling infrastructure.

The IWT network connectivity will turn out beneficial for industries only if these will be equipped with the adequate infrastructure required to handle the heavy cargo in efficient manner. Setting up of private jetty with priority access will ease the movement of raw material and finished goods for industries, this will also be helpful in attracting heavy industries such as Cement and Steel.

[197] BIWTA

Nearest river port to the site is at Barisal which is approximately 53 km from the proposed EZ and is accessible via Charfassion-Bhola (R890) road through the Barisal-Bhola Highway (N809). While the distance reduces to ~34 Km through river channel from the proposed site.

Figure 45: Inland waterway Terminals near the proposed EZ

Source: Google Maps and PwC Research

Discussions with the Bangladesh Inland Water Transport Authority (BIWTA) officials revealed that the river port is primarily used for passenger movement but there is also a provision for industries to use it for cargo movement. The permission to use the jetties for cargo movement is provided only upon the guarantee that the cargo movement transfer process should not hamper or pollute the existing facility. Near the passenger jetty, a captive jetty is located which is run by Bangladesh Agricultural Development Corporation (BADC) that supplies fertilizer to the farmers in the region. BADC and BIWTA jointly maintain the jetty. The river port serves five to six districts in proximity of Barishal region. Fertilizer, cement, coal and construction materials are the key commodities unloaded at this port. At present no commodities are loaded at Barishal port. The table below highlights the volume of cargo movement at the river port.

Table 64: Volume of commodity handled at Barishal port, in 2018

Particulars	Cement	Fertilizer	Coal	Construction Materials
Average annual quantity handled at the port (in MT)	96,000	95,583	122,607	477,568

Source: BIWTA, Primary Research

The prospect of using this port for cargo movement can be explored by incoming players at the proposed EZ upon due consultation and permission by BIWTA.

The Capacity augmentation at Ilish Ghat to handle cargo will improve direct connectivity with Chittagong and other upcoming ports in the region. As the river channel is perineal in nature navigable across the year, this will have positive impact on the trade of the region. This will open the new avenues of trade for the industries in the district with south east Asia.

The capacity building at Bedurai ghat to handle cargo will improve the connectivity with the Barisal river port and that will open gateway for domestic market.

The road connectivity with the Beduria ghat and Ilish ghat also needs to be improved to ensure the seamless movement of raw material and/end product to and from the EZ. As discussed in above road section bridge between Barishal and Bhola will be helpful in establishing road connectivity from EZ and Barisal river port.

Access to Sea Port

Mongla seaport is the nearest seaport connected through road to the proposed EZ, located at an approximate distance of 206 kms. The site is connected to the seaport via Barishal-Bhola highway (N809), Bhanga-Barisal highway (N8) and further through Dhaka-Khulna highway (N805) and Khulna-Mongla highway (N7) and takes just over 6 hours to reach (including a ferry ride). Mongla is located 48 km from the city of Khulna, which is a regional industrial center. Due to increasing congestion in Bangladesh's largest port in Chittagong, many international shipping companies have turned to Mongla as an alternative. The port also hosts the Mongla Export Processing Zone (Mongla EPZ). At present port is handling about 1.6 million tons of cargo. The Annual handling capacity is 6.5 million tons.

Chittagong Sea port is located at approximately 215 km of road distance from the proposed EZ. Access to Chittagong Port takes place through R890, which further gets connected to N809; N809 further gets connected with R140 and then with Dhaka Chittagong Highway (N1). This route involves ferry crossing through Ilisha ghat and travel time is approximately 6 hours. 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.[198]

Planned port at Payra is located at distance from ~115 Km from the subject site. Payra Port Authority (under Ministry of Shipping) has envisaged developing a coal/ bulk terminal at Payra Port through PPP route (design, build, finance, operate, and maintain the coal/ bulk terminal and further transfer the terminal to Payra Port Authority). Separate bulk terminal (dedicated) and a container terminal is being planned which is located adjacent to the coal terminal and near to the coal fired power plant at planning stage, further feasibility study and DPP approval from line ministry would be undertaken.

[198] *http://www.cpa.gov.bd/*

However, the site is located on an Island which is well connected with Bay of Bengal through mainstream of Meghan river which is perineal in nature and navigable in all seasons. If a jetty is developed with adequate infrastructure to cater the industrial needs, the distance from the EZ site to Chittagong port will be reduced to ~135km and similarly distance to Payra port will reduce to ~105 km. This will open the EXIM gateway for the tenants of the EZ.

Once the jetty facility with adequate infrastructure to support movement of industrial goods is established in the region a feeder service can cater the need of transporting goods to EXIM gateways.

Present Hindrance at macro level and Redressal by GoB

Bangladesh EXIM demand stood at ~102 MTPA in FY 18 with containers contributing ~26% of share. Total cargo traffic is estimated to grow at an effective growth rate of ~6.3% from FY 25 to FY 40 in line with GDP forecast and to reach ~274 MTPA for bulk and ~11 million TEUs by FY 40.

Existing infrastructure at the port infrastructure is inadequate in terms of handling rising cargo movement.

To cater the future EXIM traffic demand GoB has planned several green field deep seaports as well as extension of Chittagong port for smooth flow of cargo. Bangladesh has existing capacity of handling 2.7 million ton TEUSs and ~ 7 million TEUs additional handling capacity is estimated to come up by FY 30.

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. 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.

Additionally, to meet the increasing bulk cargo & container volumes and to improve performance of port operations, and in a bid to strengthen the country's trade handling infrastructure, GoB has prioritized the establishment of a dedicated facility called the Bay Terminal (~64 km) that would assist in easing the pressure on Chittagong Port. Bay terminal would accommodate larger vessels and with improved quality of services and adequate facilities, it would decrease the pressure on the Chittagong port.

Chittagong Port Authority has envisaged to develop a new port in Mirsarai port. Currently, this project is in conceptualization and planning stage.

Once the necessary steps for improvement have been taken to connect EZ with other seaport and riverports, it will ensure the seamless movement of goods to and from the EZ and district. Hence, it will promote trade and allow business to target newer markets.

7.3.3. Land ports

Bangladesh and India share a border line of 4,096 km, which is the fifth longest border in the world.[199] Such a long land border creates opportunity for mutually beneficial foreign trade. Land ports facilitates trade and commerce between two countries, since they provide secure gateways through which cargo can be transported. Facilities that can be developed at land ports include weighbridges, cargo handling stations,

[199] *http://www.thehindu.com/news/national/half-of-indiabangladesh-border-fenced/article17396794.ece*

warehouses, Inland Container Depots etc. Currently, India and Bangladesh have 23 land ports to facilitate trade between the two countries.[200]

Under the Bangladesh Sthala Bandar Kartipaksha Act, 2001, the Bangladesh Land Port Authority (BLPA) came into being to facilitate and improve between Bangladesh and neighboring countries. BLPA functions under the Ministry of Shipping.

One of the prime hurdles for the trade in region is lack of road connectivity with the existing land ports of the country. Business suffer losses due to increased logistics cost and time lag in import of raw material and export of finished goods to rest of the country and world.

The section below summarizes the capacity, drawback associated with the existing land port and the steps being taken by the GoB to cater the future demand

Bibirbazar land port on the south-eastern border of Bangladesh is the nearest land port which is situated at a distance of 171 km from the proposed EZ site, requiring a travel time of approximately 5.5 hours. The proposed EZ site is connected to the land port via Bhola (Paran Talukderhat)-Burhanuddin-Lalmohon-Char Fassion-Char Manika Road (R890), N809, Z1422 through Comilla-Chandpur (R140) road and further through Comilla-Bibir bazar road. It started its operations in April 23, 2009. It has a total handling capacity of 0.5 million MT and storage capacity of 500 MT, spread over an area of 10 acre. [201]This land port has good infrastructure facilities with 1 warehouse, 1 open stack yard, administrative building etc. The major items of import and export through this port has been listed in table below.

Table 65: Types of goods being traded through Bibirbazar Land Port

Major imports	Spices, sanitary ware, leather, machinery, fabric, fruit etc.
Major exports	Crashed stone, cement, drinks, PVC, furniture, knit fabrics, plastic door, ceramic tiles, cotton saree, plastic goods etc.

Source: Data from Bangladesh Land Port Authority Website

The following table depicts the quantity of exports and imports through Bibirbazar land port.

Table 66: Export and Import through Bibirbazar land Port (in MT)

Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Export	124,689	63,596	113,768	108,915	135,320	158,331	170,458
Import	0	24	28	231	455	317	479

Source: BLPA

The above table indicates that the cargo exports and imports have increased drastically over the years. Industries coming up within the EZ could source the raw materials and export the finished goods by leveraging this landport to India and other landlocked regions.

Akhaura land port is another land port on the eastern border of Bangladesh, which is located at a distance of 217 km from the proposed EZ site, requiring a travel time of approximately 7 hours. This land

[200] *Bangladesh Land Port Authority*
[201] BLPA

port is being operated by own management of BLPA. It has a capacity to handle 0.5 million Metric Tonnes (MT) of goods per year and storage capacity of 2,000 MT.[202] Access to Akhaura takes place via R890, N809, Hajiganj-Ramganj road (Z1422), Gauripur-Kachura Road (Z1044) onto Dhaka-Chittagong highway (N1) and further through Comilla-Sylhet Highway (N102). The major items of import and export through this port has been listed in table below.

Table 67: Types of goods being traded through Akhaura land port

Major imports	Bamboo, Turmeric, Watch, Ginger, Marble slab, 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 this port. This reveals that regional economy in vicinity of the land port 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 this land port. The following table depicts the quantity of exports and imports through Akhaura land port.

Table 68: Export and Import through Akhaura land Port (in MT)

Year	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Export	372,381	278,377	635,547	568,480	214,755	201,580	209,962
Import	60	251	60	11	2	60	99

Source: BLPA

The above table indicates that the cargo is mainly exported from these land port. Industries coming up within the EZ could source the raw materials and export the finished goods by leveraging this landport.

Bibirbazar and Akhaura land ports (although at a considerable distance from the proposed EZ) provide the proposed EZ with cross-border trade opportunities with India, one of the major trade partners of Bangladesh.

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 280 km away from the EZ site.

A issue faced by at Bibirbazar Land port initially was that the Indian authorities had not issued pass for loaded trucks and visible progress for the same was not visible. The highways connecting various industrial hubs to these land ports are being developed further. Works for the same has already begun in intermittent

[202] BLPA

stretches. This will improve the flow of goods and raw materials to and from the proposed EZ to the land ports.

The proposed land port at Belonia is located at a distance of ~149 km from the proposed EZ. It would be connected with the site through R890, N809, R140 onto Feni-Noakhali Highway (N104) and further through Feni- Parshuram road. This land port (once operational) will boost the commercial viability of the proposed zone.

At present the Bhola district is not directly connected through road network of Bangladesh which hinder the movement of raw material and finished goods to the existing land ports in the country. The proposed bridge on river Tetulia in between Barisal and Bhola will resolve the connectivity challenge with mainland Bangladesh. Good access to land ports shall ascertain trade relationship with India; Industries in the EZ can tap into Indian markets for their end products and have access to raw materials from the Indian side.

7.3.4. Airports

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.

Barisal Airport is the nearest airport to the proposed EZ, located at a distance of around 53 km. The airport can be accessed via Dhaka-Barisal highway (N8) and Barisal-Bhola Highway (N809). This route includes ferry ride from Laharhat ferry terminal to Ilisha ghat ferry terminal. Approximate distance of the ferry ride is 9km. It takes approximately 3 hours to reach the airport.

Nearest international airport to the proposed EZ is Hazrat Shah Jalal International Airport (HSIA) at Dhaka. This airport provides both international as well as domestic flight services. It is Bangladesh's largest and busiest airport. This airport is around 195 km away from EZ site and requires approximately 6.5 hours of travel time. The airport can be accessed via Barisal-Bhola highway (N809) and Dhaka-Chittagong Highway (N1), although this route includes a ferry. 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) pass through this airport annually. HSIA is anticipated to witness a passenger traffic of 12 million by 2022 and 22 million by 2035.[203] This airport also has a freight village (warehouse), terminal buildings, hangers and other modern equipment for aircraft handling.[204] Goods like RMG, vegetables, fruits, fish, dry fish and crabs are transported through HSIA.

The time required to reach the airport will significantly improve after the construction of the Padma bridge. However, lack of direct connectivity will still hinder the seamless movement. Once the proposed bridge to connect Barisal and Bhola is completed it will improve connectivity with other part of the country and similarily with the Hazrat Shah Jalal International Airport (HSIA) at Dhaka and Barisal airport.

[203] *https://www.airport-technology.com/projects/hazrat-shahjalal-international-airport-expansion-dhaka/*
[204] *http://www.shahjalalairport.com/*

Capacity augmentation for cargo handling is required at Barisal airport for faster movement of finished product from the EZ to EXIM gateways or consumer market.

7.3.5. Railways

It is cheaper to move goods through railways as compared to road. Railways can haul larger volumes of cargo over longer distances as compared to trucks and trailers, and is also better 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. However, the usage of railways in Bangladesh is currently restricted due to small size of consignments and the additional costs associated with multiple handling points in the value chain. This has deterred players from opting for rail wagon bookings for their inventory management.

Bhola district is accessible by road and water mode of transportation and there is no rail network present in the vicinity to the proposed EZ.

Present Hindrance and Redressal by GoB

The government is planning to bring rail network to the southern city of Barisal with the ultimate aim of connecting the upcoming Payra port with the capital. The government has taken a major initiative to set up railway lines from Faridpur to Barisal (~53 km) to establish rail connectivity with Barisal and Capital Dhaka through the Padma Multipurpose bridge.[205] Under this proposed project a 100-km railway track will be set up from Bhanga in Faridpur to Barisal. Once the railway connectivity is established, it will reduce the travel time to Dhaka by 3 hours.

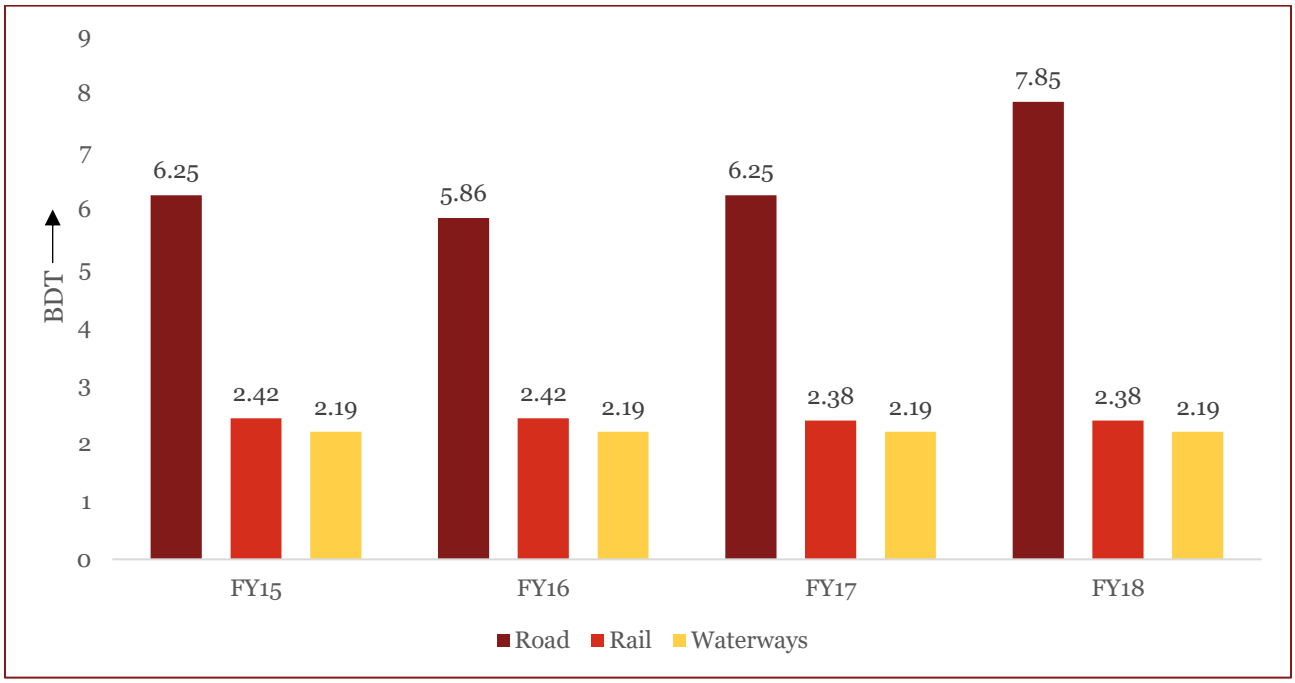
The upcoming infrastructure projects in the region will enhance the railway network for the transportation of raw materials/end products. Once the railway line from Dhaka to Barisal become operational the GoB can further extend the line to Bhola. The railway connectivity from Barisal will be helpful in long term growth and improving connectivity of the district.

7.4. Rate of freight for different modes of transport

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 site.

[205] *https://www.daily-sun.com/post/113605/Govt-moves-to-set-up-BhangaBarisal-rail-link*

Figure 46: Freight per tonne per km across different transit modes



Source: Bangladesh Bureau of Statistics 2018

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 road has shown an increasing trend over the past years due to rising demand from manufacturers and traders.

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

The high preference to the road-based logistics in the country compared to the other modes of transport is mainly because of following reasons:

- The total cost of logistics from one location to another via rail as well as IWT include the cost of first mile transport, cost of cargo loading into the vessel/rail, cost of transporting cargo to the nearest station close to destination via rail/IWT, cargo unloading from the vessel/rail, and last mile delivery via road transport. It may be noted that, the total cost for road-based logistics doesn't include all the above-mentioned parameters, and includes only cost of cargo loading, unloading and transportation cost. This makes road-based logistics cheaper compared to rail and IWT modes over short haul distances, while over long-haul distances, IWT and rail transport becomes less costly due to less transportation cost per km. As Bangladesh is a small country with cargo movement ranging few hundred km, the road transport is preferred over rail and IWT mode.
- Bangladesh has inadequate infrastructure for rail and IWT based logistics. As discussed previously, most of the rail routes in the country are meter gauge limiting the cargo transportation capacity. Additionally, the capacities of ICDs are limited which are further challenged by the inefficient operations in handling cargo. Consistent draft is major challenge across various IWT routes in the country, and IWT operations are also limited by limited number of barges, and inefficient handling of cargo at riverports.

- The rail and IWT transport are further challenged by lack of private sector participation. On the other side, road-based logistics involves significant participation from private sector, and hence it is bit more efficient compared to the rail and IWT based transport in Bangladesh. However, Bangladesh railways is addressing the infrastructure constraints to improve the capacity and increase the modal share of rail in EXIM evacuation by privatizing the CTO operations.

7.5. Potential Infrastructure Interventions to support proposed EZ

Proposed EZ site at Bhola has an advantage of being located in close proximity to many industrial hubs and urban centers such as Barisal (~ 54 kms), Khulna (~ 88 kms) and Jessore (~ 121 kms). While the EZ site is well connected through multiple modes of transport (road, rail, air and ports) there could be a few additional improvements needed to be undertaken by GoB to improve the attractiveness of the EZ site with respect to transport infrastructure. This could include and not be limited to the following table on the next page.

Logistics cost assessment exercise has been carried out to understand the most import connectivity node for the proposed EZ, basis which required infrastructure intervention has been proposed. Logistics cost assessment reveals the importance of jetty for the proposed site. The jetty will facilitate the flow to especially bulk cargo required by industries as raw material. Logistics cost assessment also reveals that Bibirbazar and Akhaura land port are equally important as EXIM gateway for the proposed EZ. The proposed infrastructure intervention shall ensure the smooth flow of raw material and finished goods. Logistics cost assessment table has been furnished in Annexure 18.

The table on the next page captures present and potential future hindrances for smooth movement of manufactured goods in the region and 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 consideration 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 69: Proposed Infrastructure Interventions

Key Asset	Existing Condition	Issues	Recommendation	Impact	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
Jetty with priority access for tenants within EZ	Being an island district, Bhola is connected to other parts of Bangladesh via IWT network.	This increases the travel time and results in decreased logistics efficiency.	A jetty with priority access is needed for procurement of raw material and supply of finished goods	Development of Jetty equipped with adequate facility to handle industrial cargo will improve movement of men and material to the proposed EZ, It will also reduce the logistics cost for the EZ	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement. The construction of jetty admeasuring 75*100 m. will cost approximately BDT 315 million approx.		BIWTA and BEZA
Direct connectivity with mainland Bangladesh	Currently the district do not have direct connectivity with mainland Bangladesh through road network	Lak of road connectivity increase the time commute time from Island to other parts of country	A bridge need to be constructed to connect the Island with rest of Bangladesh	The road access with mainland Bangladesh will ensure seamless movement of raw material and finished good to and from EZ	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Roads and Highways Department
Rail Network to Bhola	District is not connected with rail network	Absence of rail network hinder the in seamless movement of raw material and end product	The district needs to be connected through rail network. The ongoing project to Barisal can be further extended to connect the district	Rail network will reduce the logistics cost for the industries within EZ	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Ministry of Railway

Key Asset	Existing Condition	Issues	Recommendation	Impact	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
Augmentation of Barisal airport	The Barisal airport have lack cargo handling facility	Airport do not have cargo handling equipment and very limited passenger handling capacity	The Barisal airport require expansion in passenger handling capacity and needs to built capacity for cargo handling.	Augmentation of airport will help time sensitive sectors to establish production facility in EZ	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Civil Aviation authority of Bangladehs
Upgradation of existing Zila road (LGED road) adjacent to the proposed EZ	Currently, this road is a single lane bituminous road connecting the proposed EZ with Bheduria Ghat and R890	The present condition of the road would not be able to support increased traffic flow that would happen in future due to establishing of industries in the region	Expand the existing road both lane and width wise to support more movement of traffic and goods	This will improve the connectivity with the region	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Roads and Highways Department
Upgradation of existing regional highways R890	Currently this road is two lane bituminous road maintained by RHD. This road carries relatively light traffic but has not received any periodic maintenance. R890 has an average width of 5.51 m.	The present condition of the road would not be able to support increased traffic flow that would happen in	Expand the existing road both lane and width wise to support more movement of traffic and goods	This will improve the connectivity with mainland Bangladesh	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Roads and Highways Department

Key Asset	Existing Condition	Issues	Recommendation	Impact	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
		future due to establishing of industries in the region					
Upgradation of Akhaura and Bibirbazar land port	Equipment being used at the land port is outdated with most of the cargo being handled manually. Once traffic flow increases in these land ports, the need for mechanized cargo handling system would evoke.	Lack of modern surveillance system adversely affects cargo handling in the port.	• Mechanization of cargo handling facility at both the land port. • Quality check of export items can be shifted to Agartala to reduce delay.	Upgradation of land port will reduce the transit time for goods to India and reduce the logistics cost.	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Land Port Authority

8. Off-Site Infrastructure Assessment

8.1. 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, gas and access road to 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 off-site infrastructure components considered for proposed EZ are as follows –

Figure 47: Off-site infrastructure components

Source: MACE analysis

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 Bhola EZ. The location of the proposed site to establish Bhola EZ is shown below.

Figure 48: Location map of Bhola EZ

Source: MACE analysis

8.2. Methodology of Off-site Infrastructure Assessment

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

Step 1: Identification of possible sources

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

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

Step 2: Feasibility study

The feasibility of utilizing the identified infrastructure component depends upon several factors as outlined below

- **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 EZ and the possibility of bringing the feeder line to EZ from the source.
- **Water supply -**
    - Surface water: Availability of water to meet the estimated water demand, distance of source from site, 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 water from the proposed EZ area.

8.3. Review of Last Mile Off-site Infrastructure

Approach road connecting EZ

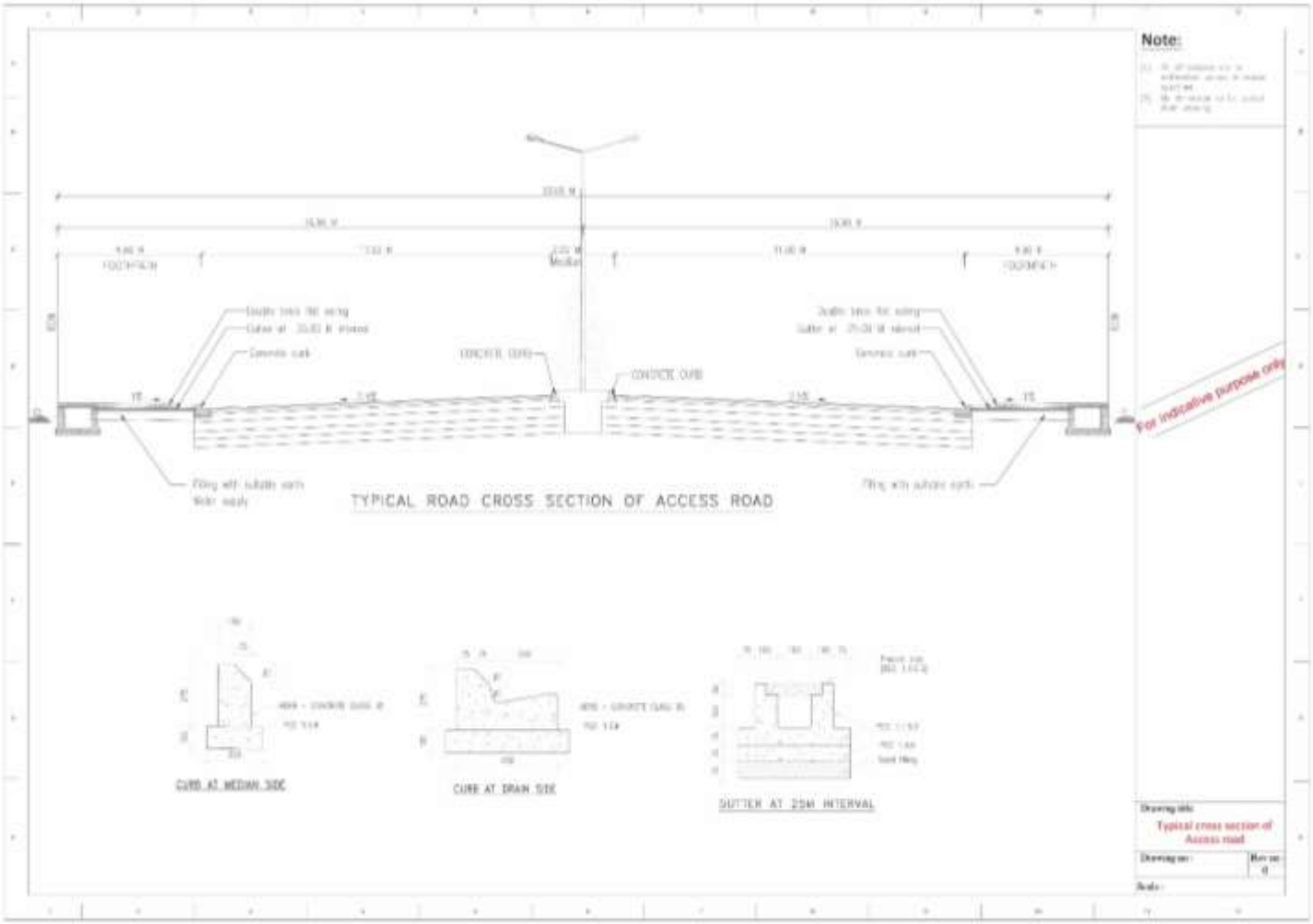
The existing approach connecting site is a 2-lane bitumen road which connects the site with Charfassion-Bhola Regional highway (R890) at 6 km. This Regional highway further connects the site with Barishal-Bola National highway (N809). It is proposed to upgrade the existing approach road to 30 m wide bitumen road for a length of about 6 km for the smooth movement of vehicles accessing EZ from R890. The internal spine road of EZ shall be connected with this approach road. There is an existing bridge across the water channel of River Ganeshpura, flowing across the approach road connecting EZ. Hence, it is proposed to widen the existing bridge for a length of about 200 m along the approach road to connect the EZ with R890.

The connectivity and linkages for the proposed EZ is shown on the next page

Figure 49: Map of last mile connectivity to proposed EZ

Source: MACE analysis

Figure 50: Typical cross-section of access road connecting site

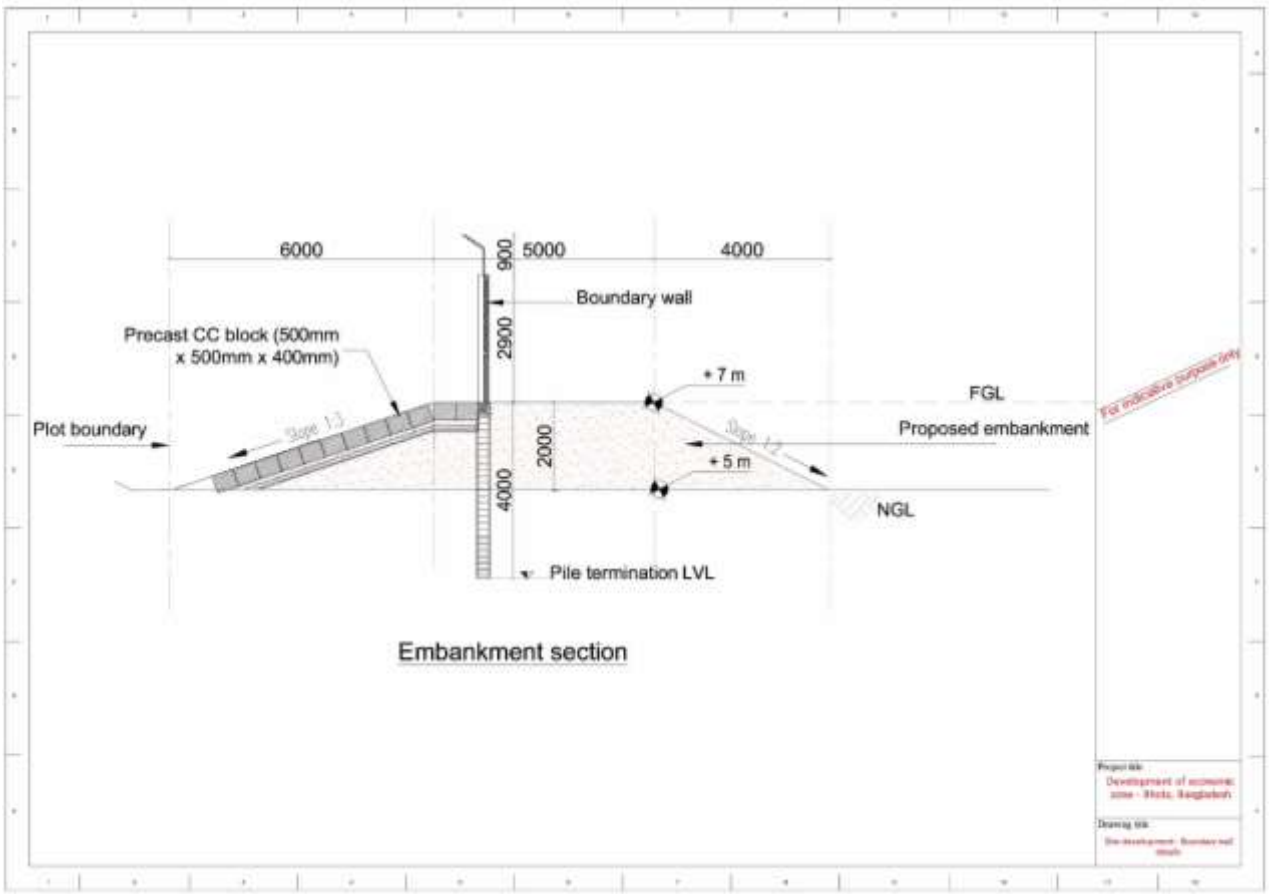


Source: MACE analysis

Boundary wall of EZ

Construction of a boundary wall is required to earmark the EZ site and prevent unauthorized access to the EZ area. Presently, there is no boundary wall at the EZ site, earmarking the EZ boundary. Based on discussion had with BEZA officials, it was decided that boundary wall would be developed by BEZA as a part of off-site infrastructure. Hence a boundary wall having brickwork with suitable height of barbed wire is recommended to be developed at the EZ site. The total length of the proposed boundary wall is about 4.0 km.

Figure 51: Details of boundary wall



Source: MACE analysis

Power supply to EZ

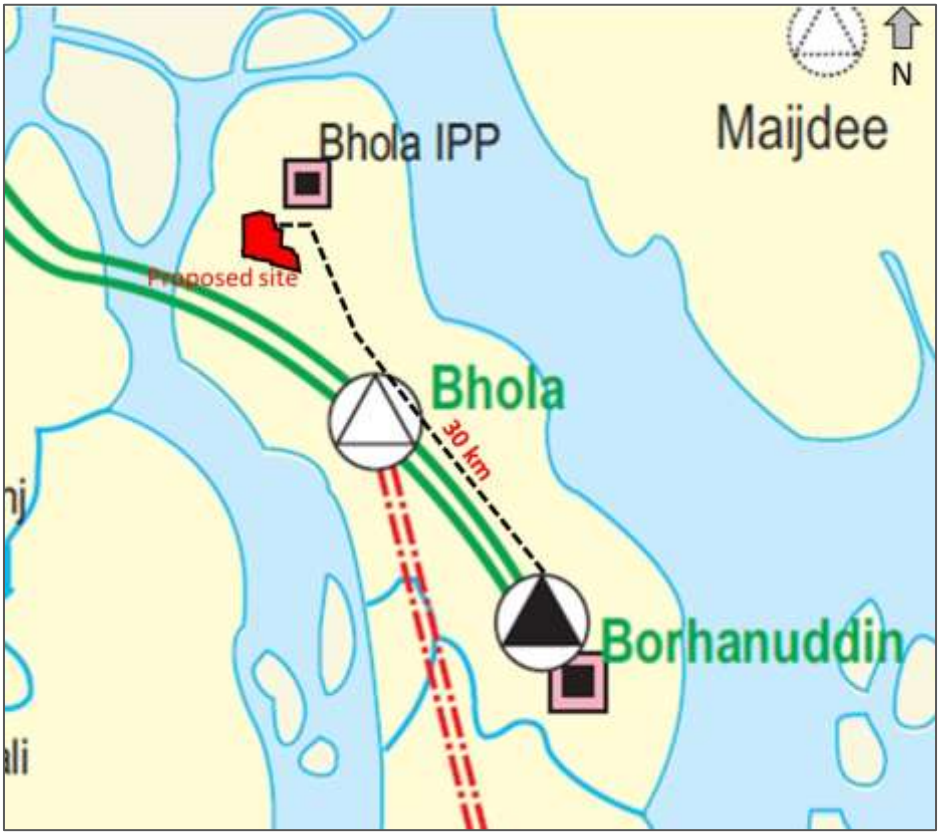
Based on the assessment, it is found that the power demand for the proposed EZ would be about 36 mVA. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

To cater this power demand, a main receiving 132/33/11 kV sub-station shall be established within the proposed site.

During the initial phase of development, the 33/11 kV main receiving sub-station (MRSS) shall be established within the site and as suggested by the officials, power to this sub-station shall be availed by establishing 33 kV overhead transmission line from the 33/11 kV Bangla Bazar sub-station of 10 mVA capacity located at an aerial distance of 16 km from the site (based on proposed tentative alignment). Based on the demand growth of EZ, the proposed 33/11 kV MRSS within EZ site shall be upgraded to 132/33 kV sub-station and incoming 132 kV overhead transmission line shall be established from 132/33 kV Borhanuddin grid sub-station of 225 mVA capacity located at an aerial distance of 30 km from the site (based on proposed tentative alignment).

The proposed tentative alignment of power transmission line and the location of sub-station are depicted in the figure on the next page.

Figure 52: Details of 132 kV external power supply system



Source: Power Grid Company of Bangladesh (PGCB)

Figure 53: Details of 33 kV external power supply system

Source: MACE analysis

Water supply to EZ

Based on the assessment, it is found that the total potable water demand for the proposed EZ would be about 4 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.

Based on the discussion had with officials and local, it is understood that the groundwater in the region is at a depth of 25-40 feet and is potable in nature. Lithology profile of the region is enclosed as Annexure 20. Hence, groundwater can be relied to meet the initial water demand of proposed EZ.

River Ganeshpura , a tributary of River Meghna is near the proposed site on the Western side at an aerial distance of 1.8 km (~2km). Based on the discussion had with UNO officials, it is understood that these rivers are perennial in nature and shall be relied to meet the water demand of the proposed EZ. It is proposed to provide suitable water intake system near the river basin at an approximate distance of 2 km from the site based on proposed tentative alignment. However, detailed study and hydrogeological investigations need to be carried out to determine the exact intake point and intake system. Hence, it is suggested that suitable intake system and intake point shall be proposed during detailed engineering stage.

Details regarding the external water supply source is depicted in the figure below.

Figure 60: Details of external water supply system

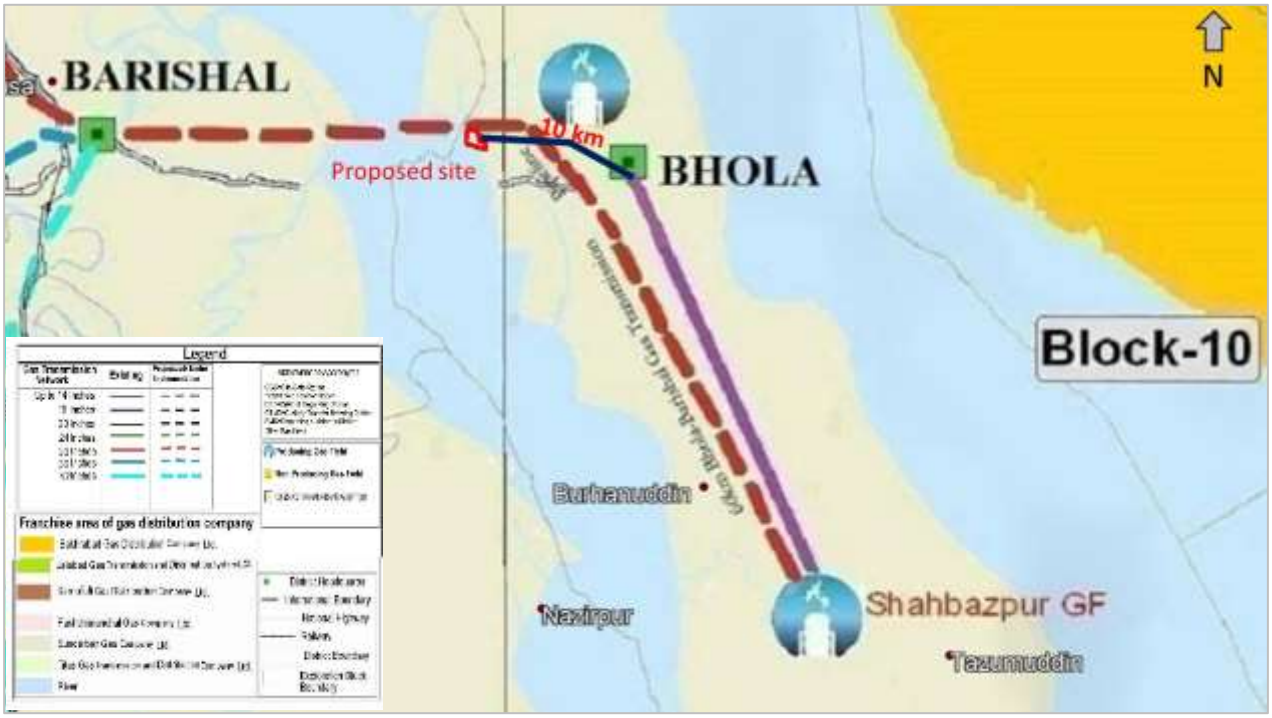
Source: MACE analysis

Gas supply to EZ

Based on the assessment, it is found that the total gas demand for the proposed EZ would be about 14550 m3/day. 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.

There is an existing 14 inches dia gas pipeline network available by Gas Transmission Company Limited (GTCL) connecting Shahbazpur gas station with Bhola gas station operating at an aerial distance of 10 km from the site from which an exclusive 8 inched dia gas pipe line shall be established connecting EZ site. Refer following figure depicting the location of existing gas station and proposed gas line network connecting EZ.

Figure 54: Gas line network



Source: Gas Transmission Company Limited (GTCL) and MACE analysis

Drainage

River Ganeshpura flows on the east side of the site at a distance of 1.8 km from the proposed site. It is recommended to connect the discharge from the drain to the river by identifying suitable drain discharge points.

In order to prevent the storm water entering from adjacent areas to the development area, a cut-off drain and embankment provided all along the periphery of the site. The surface water discharge is considered and connected to the River Ganeshpura to the east side of the site.

Figure 55: Details of External drainage network System

Source: MACE analysis

8.4. Required Improvements or Upgrades

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

Approach road

Existing 10 feet wide approach road of connecting the proposed EZ site with National highway (N1) needs to be upgraded to 30 m wide road for a length of about 6 km. While connecting the approach road with the Regional highway, necessary turning radius should be provided, and the junction of the highway should be provided with necessary traffic management measures to ensure safe movement

Power supply

No upgradation has been suggested in the existing system and is proposed to establish an exclusive 33 kV overhead transmission line from Bangla Bazar sub-station to meet the initial demand and 132 kV overhead transmission line from the Borhanuddin sub-station to the EZ site to meet the future power demand of EZ.

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. Instead, a nearby available source of River Ganeshpura has been considered as a water source for the proposed site and is proposed to develop an exclusive water supply system to EZ from the river with the main supply pipeline from the source for a length of about 2 km from the site. It is suggested that the suitable intake system and intake point shall be proposed during detailed engineering stage.

Drainage

Separate drain network with discharge points can be developed. A cut-off drain along the periphery of the site has been considered and are connected to the Ganeshpura river to the east side of the site. The internal drain network has been planned with the discharge to Ganeshpura river.

8.5. Last Mile Off-site Infrastructure Action Plan

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

Table 70: Off-site infrastructure action plan

Key assets	Existing condition	Issues	Recommendations	Cost implication	Timeframe for improvement	Jurisdictional responsibility
Access road	Existing 2-lane road connecting site acts as approach road for EZ.	Need upgradation to 30 m wide road. But there are settlements on both sides of the road.	Existing approach road to be upgraded to 30 m wide for a length of about 6 km along with widening existing bridge for a length of 200 m. The approach road is subjected to rehabilitation/resettlement.	1602.60 million BDT	12 months	BEZA
Boundary wall	Does not exist		Boundary wall having brickwork height of 2.9 m + 0.9 m height of barbed wire and width of 150 mm for a length of 4 km is recommended at the EZ site.	92.06 million BDT	12 months	BEZA
Power supply	132/33 kV Borhanuddin grid sub-station at an aerial distance of 30 km from the site has been suggested by officials to meet the increased power demand in future and for initial power demand, the 10 mVA capacity Bangla Bazar sub-station at an	No power supply connection nearby site for industrial usage	To build a new dedicate 33 kV overhead transmission line at initial stage from Bangla Bazar sub-station and 132 kV overhead transmission line from Borhanuddin grid sub-station. Streetlight along	759.55 million BDT	18 months	REB, PCGB and BEZA

	aerial distance of 16 km shall be relied.		the approach road has been considered.			
Water supply	The nearest perennial source of water is River Ganeshpura.	No water supply connection nearby site from river for industrial usage.	Draw external water supply network lines from Ganeshpura river for a length of 2 km with the provision of water intake system.	17.04 million BDT	12 months	DPHE
Gas line	There is an existing gas line connecting Bhola gas station at 10 km from site.	No gas supply connection nearby site for industrial usage	An exclusive tapping line shall be established connecting the site at 10 km from the site.	100 million BDT	12 months	GTCL

Source: SoR of PWDB, REB, BWDB, PCGB, GTCL & MACE analysis

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

Table 71: Off-site infrastructure cost estimates

Description of item	Quantity	Unit	Price without tax (In million Taka)	Responsibility
Road network				
Embankment for access road	6.00	km	176.54	BEZA
Road (30 m)	6.00	km	1024.90	BEZA
Connecting bridge of 30 m width and 200 m length	0.20	km	401.17	BEZA
Power network				
33 kV overhead transmission line	16.00	km	64.00	REB
132 kV overhead transmission line	30.00	km	660.00	PGCB
Streetlight for approach road	6.20	km	35.55	BEZA
Water supply network	2.00	km	17.04	DPHE
Boundary wall	4.00	km	92.06	BEZA
Gas supply	10.0	km	100.00	GTCL
Project sub-total			**2571.26**	

Source: SoR of PWDB, REB, BWDB, PCGB, GTCL & MACE analysis

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

8.6. Key Takeaways

Off-site infrastructure captures the external basic infrastructure facilities which need to be developed. BEZA is the responsible authority for developing off-site infrastructure. The major off-site infrastructure considered for the proposed EZ are boundary wall, water supply, power supply, access road, drainage etc. 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-

- Proposed site has good regional connectivity and an existing 2 lane approach road connects the site with Regional highway (R890) and National highway (N890). Proposed to upgrade this approach road to 30 m wide road for a length of 6 km. Also, an existing bridge along the approach road of length 200 m has been proposed to widen for a width of 30 m;
- Groundwater source can be relied to meet the initial water requirement of the project during construction stage. To meet the water requirement of EZ, River Ganeshpura which is perennial in nature has been proposed as a source and the proposed external water supply network length from the source connecting site based on tentative alignment is 2 km;
- Bangla Bazar sub-station (located at an aerial distance of 16 km from the proposed EZ) is suggested as source of power for the project at initial stage and Borhanuddin grid sub-station (located at an aerial distance of 30 km from the proposed EZ) as a source to meet the increased power demand in future;

- Boundary wall for a length of about 4 km has been proposed along the periphery of the EZ;
- The gas supply line for a length of about 10 km has been proposed to connect EZ and
- To ensure smooth collection and discharge of the surface runoff, River Ganeshpura on the eastern side of the site have been identified as the suitable discharge points.
- During later stage i.e. feasibility/detailed design stage, the alignment of proposed utilities like water pipelines, approach roads, Transmission line, gas pipeline etc. should be selected in a judicious way so that the impact on settlement is avoided to the maximum extent. A detailed SIA should also be conducted at that stage to identify the extent of impact and RAP/ARAP should be developed to ensure the compensation towards the losses likely to be caused by the project. The SIA should cover the EZ site as well off site infrastructures sites proposed for the project.

9. Master Planning

9.1. Purpose and Objective

The aim of setting up an EZ in Bhola is to develop multi-sectoral industries such as Textiles & RMG, Food and Beverages, Plastic and Rubber, Chemicals, Non-Metallic Minerals in the region with excellent state-of-the art infrastructure facilities and professional management to attract and support investments in industrial sectors.

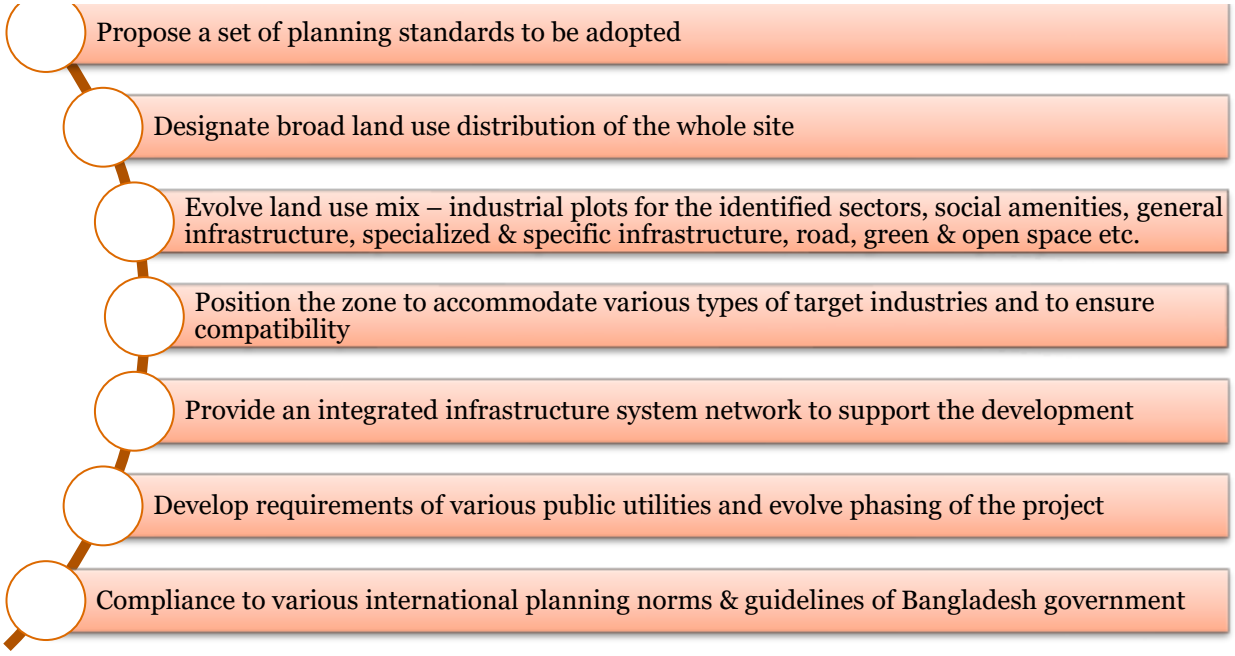
While short-listing the above industries, for master planning purpose, entire processing area has been considered as a single industrial zone having varied plot sizes. However, this zoning plan is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake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

Hence, Bhola EZ, in the form of prepared land, is planned 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 of industries, the proposed project will strengthen Barisal district's position in the industrial sector map of Bangladesh and will contribute to the economy. A careful planning exercise has been undertaken to position the project taking into account the geographic, demographic, raw material resources, industrial, economic and social characteristics of the region and it is in this context that master planning of the project assumes significance.

In order to implement this uniquely conceived EZ as a fully integrated and functional facility, as well as to develop confidence for foreign and local developers to undertake the development of the project and subsequent operation of their businesses, certain planning objectives/principles are envisioned as depicted in the figure below.

Figure 56: Principles adopted for master planning



Source: MACE analysis

9.2. Methodology of Master Planning

Based on industry assessment and demand forecast

The industries which would be envisaged for this EZ site were shortlisted after 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, has been 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 green field 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, existing features in and around the proposed EZ have been studied in detail to understand the beneficial features and constraints at the EZ site. It is also necessary to understand the site on basic factors such as existing connectivity, the predominant wind direction, general slope of the terrain etc.

Step 2: Preparation of master plan

As a preliminary step of preparing a land use plan, major road network inside the EZ site has been planned based on entry/exit points connecting all the zones within EZ. This has been followed by sub-zoning, land parcellation, planning of internal secondary access roads based on land parcellation, planning of utilities & amenities, green & open space and phasing.

The planning concepts considered for the proposed EZ is depicted on the next page. 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”.

Step 3: Zoning

During this zoning stage, entire site area would be divided into different zones.

9.3. Master Planning Consideration

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 has been 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.

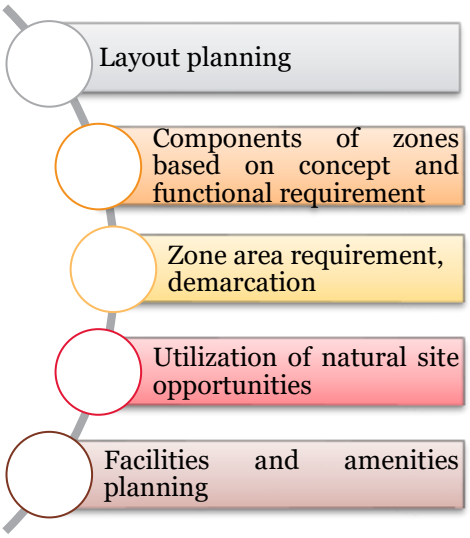
Social and commercial amenities are also planned to provide convenience to visitors as well as to the working population within the EZ. The project is planned to be housed in a lush green environment and accordingly, landscaping and greenery are planned.

- **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 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 considers planning for services and amenities;

- **Lack of enforcement/control on land use and growth of unapproved 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 generation, 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 incorporated in the EZ development program;
- **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; and
- **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.

The summary of considerations for master planning is depicted below.

Figure 57: Master planning considerations



Source: MACE analysis

9.4. Master Plan

A best practice master plan based on zoning exercise has been prepared. As a preliminary step of preparing a zoning-based master plan, major road network inside the EZ site has been planned based on entry/exit points connecting all the zones within EZ. This has been followed by sub-zoning, land parcellation, planning of internal secondary access roads based on land parcellation, planning of utilities & amenities, green & open space and phasing.

Detailed master planning is done on basis of a cluster wise approach covering the following components:

- Land use plan;
    - Detailing the locations and sizes of various land uses
- Land parcel plan;

    - Showing the subdivision of industrial land
- Micro level zoning;
- Phasing;
- Utilities mapping;
- Greenery and open space plan; and
- Road category.

The proposed master plan of EZ is given in the figure on next page.

Figure 58: Master plan of EZ

Land use pattern	Total area	
	acres	in %
Processing area		
Industrial plots	212.27	69.63%
Utility	14.83	4.86%
Road	38.80	12.76%
Green & open space	31.97	10.52%
Total processing zone	297.87	97.99%
Non-processing area		
Public & support amenity	4.94	1.63%
Road	1.19	0.39%
Total Non processing area	6.13	2.02%
Total area	304.00	100.00%

Source: MACE analysis

Various type of industries arrived from market demand analysis are as follows-

- Food & beverages;
- Agro- based industries;
- Plastic and Rubber;
- Chemicals;
- Non-Metallic Minerals;

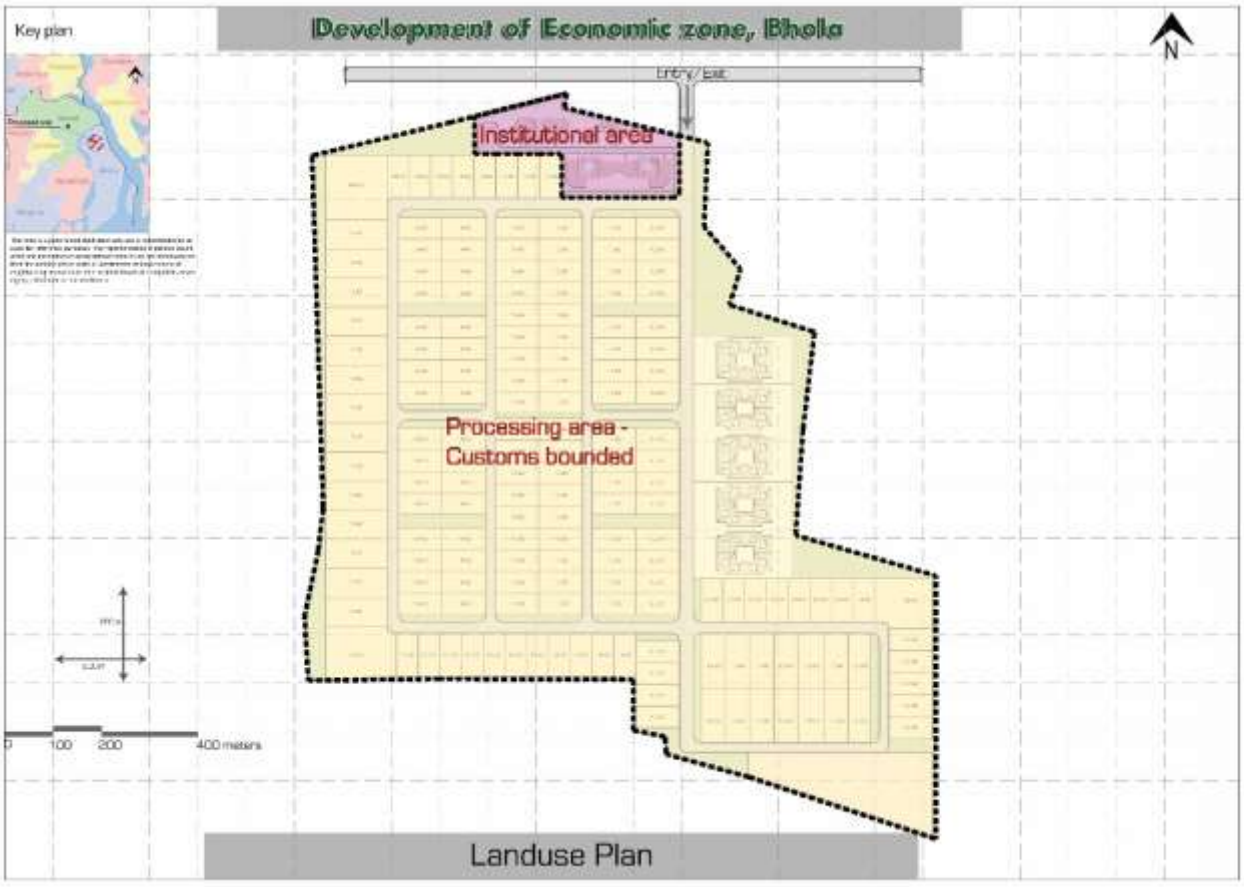
Within industrial zone, there should be a chance for establishing various type of industries according to the trend, and requirement of developer. In order to provide that flexibility during implementation stage, area for the industrial zone has been earmarked as whole. This will attract the developers towards EZ due to its high flexibility. Apart, area for utilities, amenities, green & open space and supporting facilities have been earmarked in the proposed master plan.

9.5. Land Use Plan

The land use pattern of the EZ is determined considering the land requirement for various processing units, public amenities etc.

The different land use proposed in the master plan is depicted in the figure below.

Figure 59: Land use plan of EZ



Source: MACE analysis

Table below provides the land use pattern of the proposed EZ.

Table 72: Land use pattern of the proposed EZ

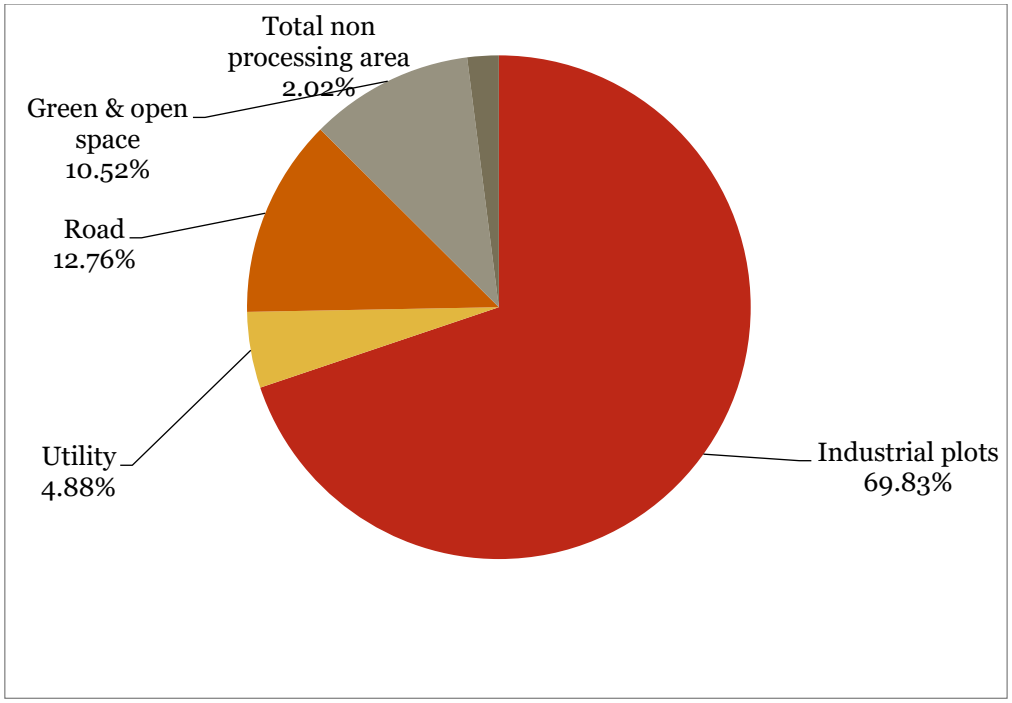
Land use pattern	Total area		Saleable area		Non-saleable area	
	acres	In %	acres	In %	acres	In %
Processing area						
Industrial plots	212.27	69.83%	212.27	69.83%		
Utility	14.83	4.88%			14.83	4.88%
Road	38.80	12.76%			38.80	12.76%
Green & buffer space	31.97	10.52%			31.97	10.52%
Total processing zone	**297.87**	**97.98%**	**212.27**	**69.83%**	**85.60**	**28.16%**
Non-processing area						
Public & support amenity	4.94	1.63%	2.47	0.81%	2.47	0.81%
Road	1.19	0.39%			1.19	0.39%
Total Non-processing area	**6.13**	**2.02%**	**2.47**	**0.81%**	**3.66**	**1.20%**
Total area	**304.00**	**100.00%**	**214.74**	**70.64%**	**89.26**	**29.36%**

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. Provision of Standard Factory Buildings (SFBs) over an area of 15 acres having 60% coverage that would be established for industries.

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 & customs blocks and supporting amenities.

Figure 60: Land use pattern – EZ site



Source: MACE analysis

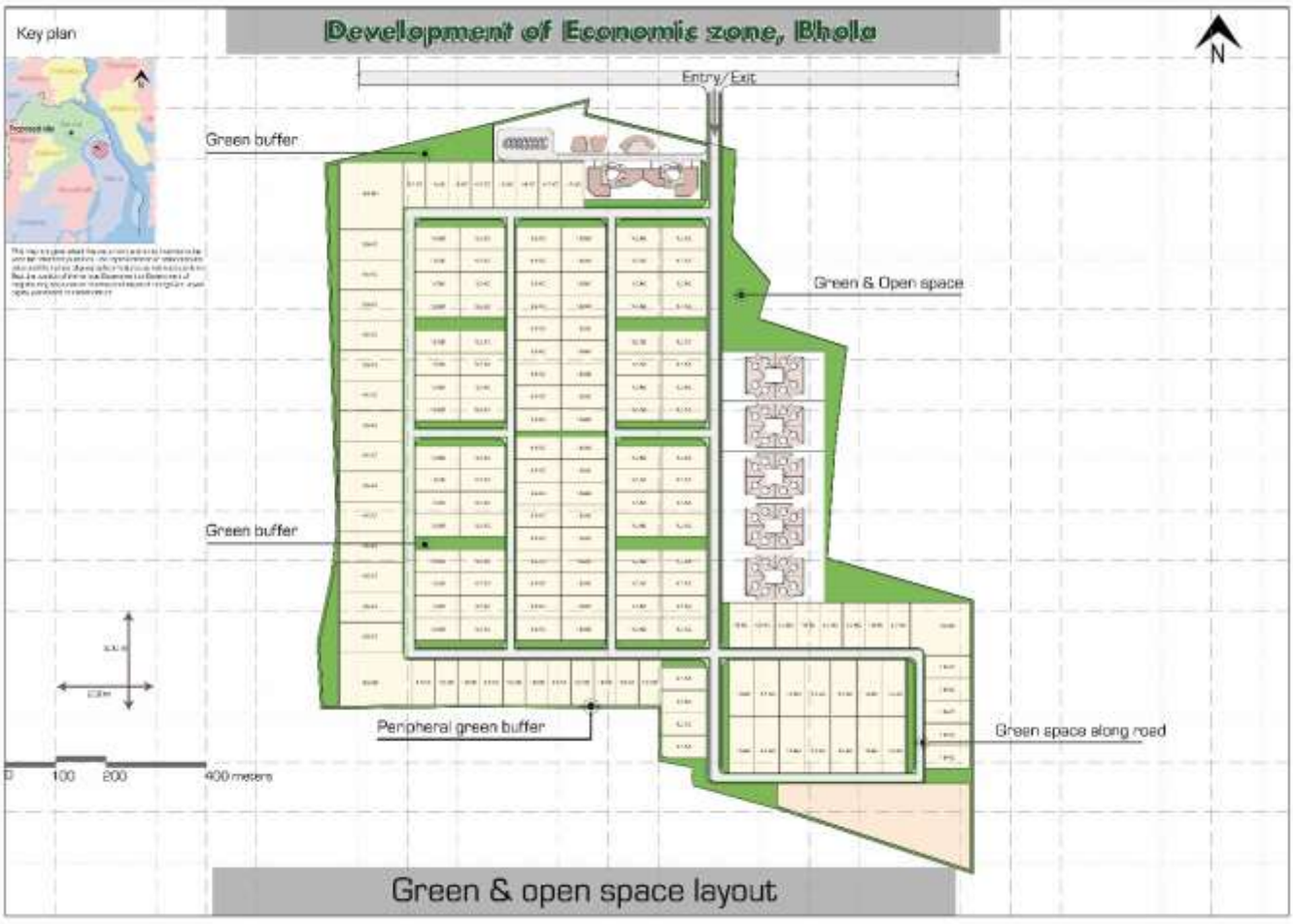
The above figure indicates a percentage wise breakup of land use pattern of the entire EZ site. An overview of this figure reveals that industrial area has been allocated as maximum area in the EZ site, given the fact that Bhola potential to establish industries with good access to raw materials.

Based on the land use pattern shown in the previous page, 70.64 % of land area accounts for saleable area and remaining 29.36% of land area accounts for non-saleable area. Out of 70.64% total saleable area, 69.83% accounts for industrial use of targeted sector. Remaining 0.81% of saleable land area is earmarked for supporting amenities. Zone specific and supporting amenities include all support infrastructure such as vocational training centres, R&D facilities, administration and customs block, commercial and retail, healthcare, childcare facilities, etc.

Green space required as per BEZA guidelines and international planning norms in practice has been 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 has been proposed all along the boundary of the site, at common public space and between each industrial zone.

The layout showing earmarked area for green/open space within the proposed EZ is shown in the next page:

Figure 61: Green and open space



Source: MACE analysis

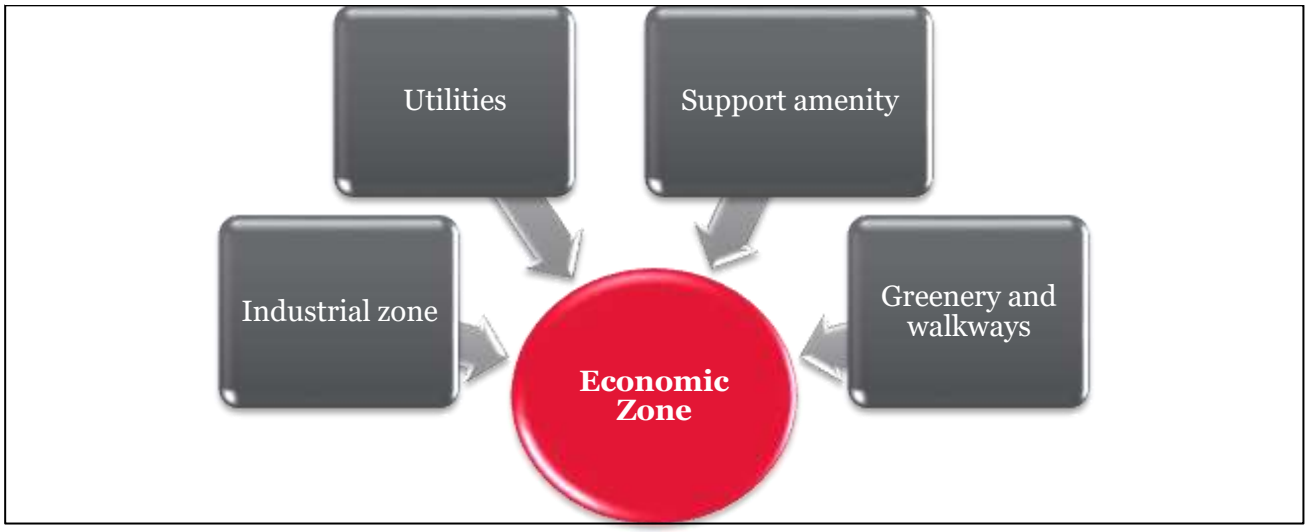
9.6. Zoning Plan

The zoning design has been done in order to have a smooth pedestrian circulation by simplifying the movement patterns and allowing the inter-zone movement.

Zoning, product mix and facility configuration

A well-balanced land use has been envisioned with a judicial mix of business, commercial and social zones as illustrated in the below figure.

Figure 62: Zoning, product mix and facility configuration



Source: MACE analysis

9.7. Zoning Principles

The development bound to occur within the EZ premises shall comply with competent local byelaws. 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 Bangladesh National Building Code). It shall be ensured that any tenant/occupant unit in the EZ shall comply with 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; and
- In construction of building, FAR shall be 6, provided that internal roads, open to sky driveway and parking area, tanks, Sewage Treatment Plant (STP), Effluent Treatment Plant (ETP) shall be excluded from FAR calculation.

Site coverage

In the construction site, the covered area shall be as follows:

- Maximum 50% of the total area shall be covered by factory building, powerhouse, storage, covered parking, ETP, overhead STP etc.;
- 30 % of the site shall be covered by the driveway, open parking, 50 sqm guard room, fire command centre, cycle stand, internal roads, underground water tank & septic tank; and
- 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

- A minimum front setback of 12 m shall apply to the primary street and a minimum setback of 4.5 m shall apply to the secondary street or unless otherwise determined by the Authority;
- Side and rear setbacks shall be 3.5 m;

- 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:
    - General streetscape;
    - Properties and buildings near and surrounding the site;
    - Fire separation distance;
    - Solar aspect and prevailing breezes; and
    - Bulk of the development.

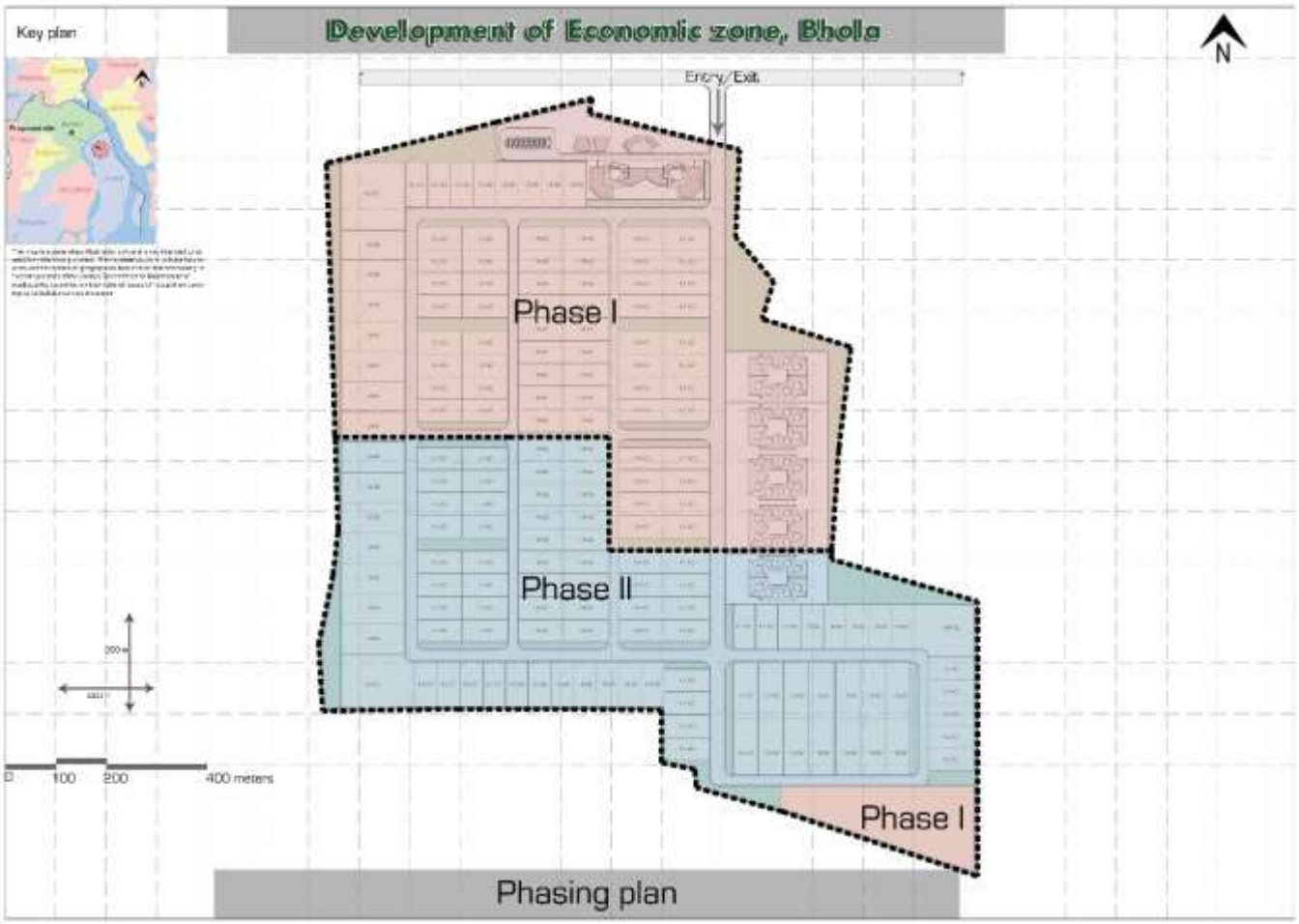
Community open space for industrial plots.

- 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; and
- The adjacent road network and the internal open space together shall be used for the assembly area during emergency.

9.8. Phasing Plan

The project is planned to be developed over 2 phases. It is proposed to develop 169 acres of land in phase I and 135 acres of land in phase II. The details of the phasing plan are shown in the next page.

Figure 63: Phasing plan of EZ



Source: MACE analysis

The details of the phase wise land use breakup are as shown in table below.

Table 73: Phase wise land use breakup

Land use pattern	Total area (in acres)	Phase I (in acres)	Phase II (in acres)
Industries	212.27	120.00	92.27
Utility	14.83	10.00	4.83
Road	38.80	20.00	18.80
Green and open spaces	31.97	15.98	15.98
Non-processing area	**6.13**	**3.13**	**3.00**
Total	**304.00**	**169.1**	**134.89**
	~ 304	**~169**	**~135**

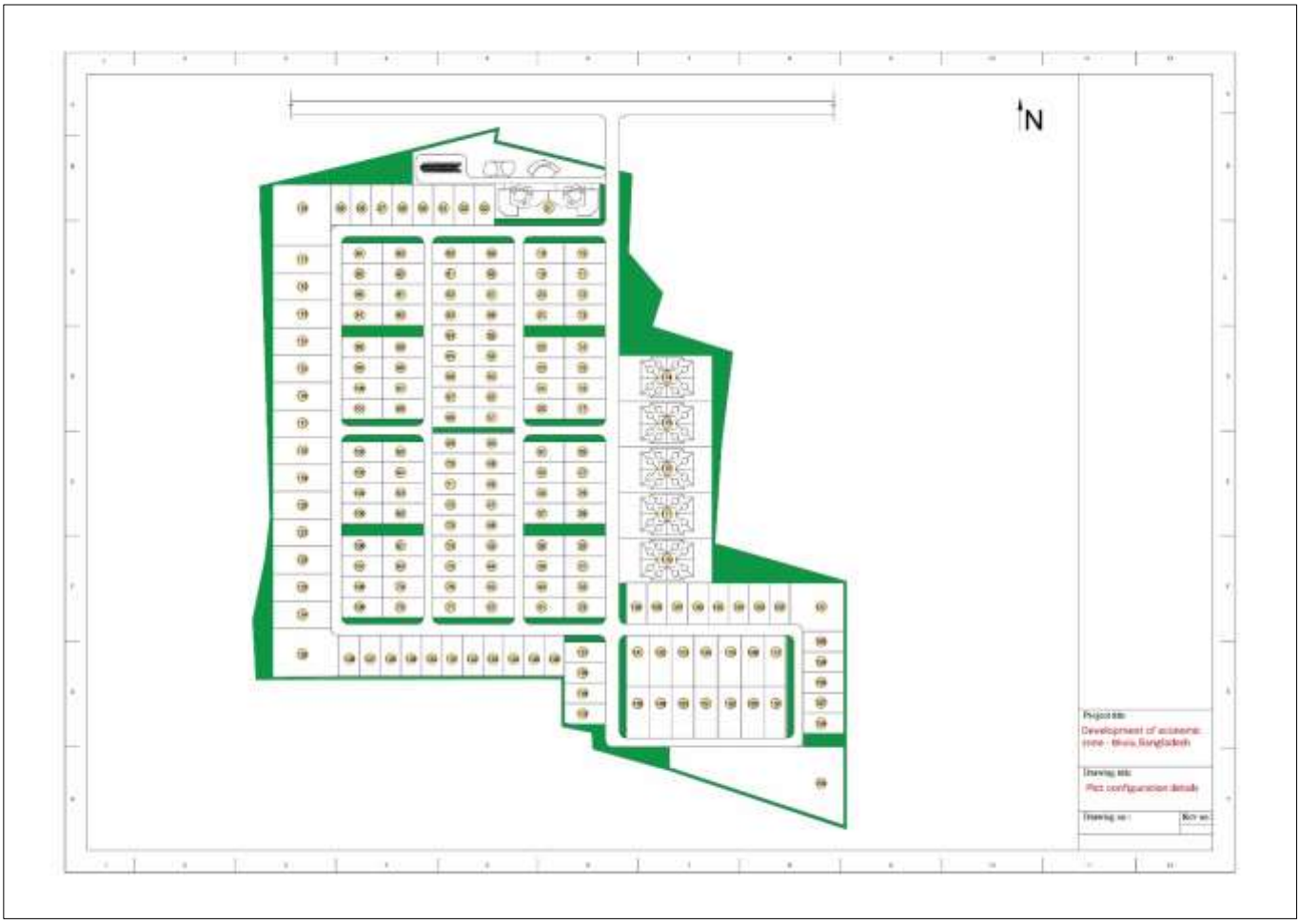
Source: MACE analysis

9.9. Plot Details

There are totally 174 plots within EZ out of which 172 plots are earmarked for industrial usage, 1 plot for utilities and remaining 1 plot has been earmarked for public & support amenities.

The number of plots and different configuration of plots provided in the master plan are shown on the next page.

Figure 64: Plot configuration of EZ



Source: MACE analysis

From the proposed land use distribution, it can be observed 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 with the aim of accommodating various type of industries according to the convenient of investors. 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. A variety of small and large plots are provided to meet the varied needs of industrialists. Breakup of the industrial area and plot details envisaged for the EZ site is given below.

Table 74: Break up of industrial area and plots

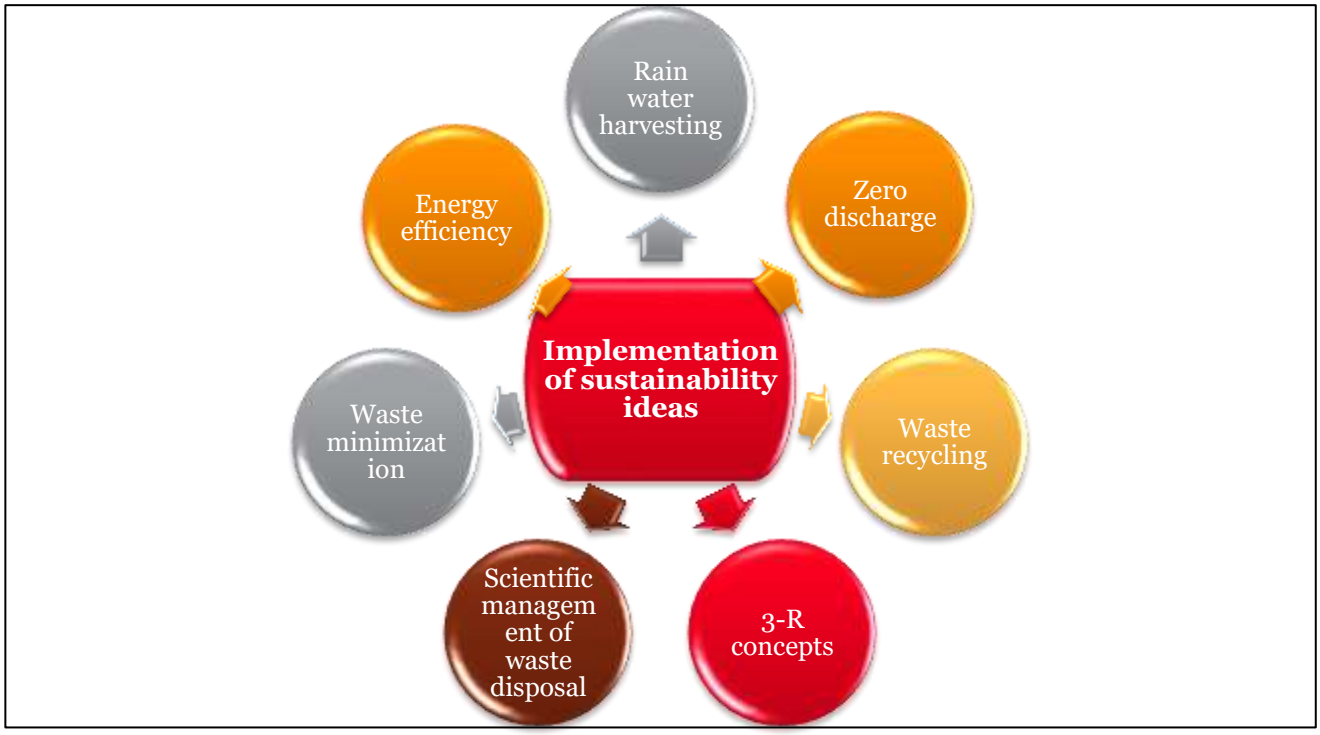
Description	Industrial area /plots	Phase I	Phase II
		industrial breakup	industrial breakup
Industrial area (in acres)	**212.27**	**120.00**	**92.27**
Number of industrial plots	**172**	**100**	**72**
1-acre plots	153	68	85
1-2-acre plots	14	8	6
> 2-acre plots - SFB	5	4	1

Source: MACE analysis

9.10. 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 65: Sustainability initiatives



Source: MACE analysis

Implementation of the above-suggested sustainability ideas inside the EZ 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.

9.11. Key Takeaways

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 comprise of zoning plan, road network plan, detailed land use and phasing plan.

Key recommendations formulated from this exercise are outlined below-

- During master plan, entry/exit has been planned from the approach road connecting the site. The whole site area has been divided into various zones such as industrial zone, institutional zone, amenities and utilities zones;
- Land parcellation, planning of utilities & amenities and phasing of proposed master plan;
- This project has been planned to be developed over 2 phases with each phase having a construction period of 2 years;
- Best practice master planning indicates that 70.64 % of land accounts for saleable area and remaining 29.36 % of land accounts for non-saleable area. Out of 70.64 % total saleable area, 69.83 % accounts for industrial use of targeted sector and remaining 0.81 % is for public and support amenities; and
- 174 plots have been earmarked in the proposed master plan for different usage out of which 172 plots are earmarked for industrial usage, 1 plot for utilities and remaining 1 plot has been earmarked for public & support amenities.

10. Infrastructure Plans

10.1. Purpose and Objective

The industrial, environmental, physical & social infrastructure objectives of EZ are described in figure below.

Figure 66: 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; and
3) External connectivity and off-site 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.

10.2. 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 75: Details of components covered under infrastructure plan

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Roads – general considerations**	○ Primary, secondary , collector roads are planned to give access to the industries within the EZ; and ○ In order to maximize land 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; and ○ The details are given in **Table-Hierarchy of roads.**
➢ **Roads – pedestrian walkways**	○ Routes and paths are provided for easy movement of visitors with enough care so that no transport system interrupt 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 suggested to be positioned at necessary locations, such as intersections and at various strategic locations in each zone; and ○ No access is planned to be allowed near the road junctions and it is recommended that ingress/egress points will be with a setback of 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; and • 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 2% and traffic in cumulative equivalent standard axles (ESA) (millions) is 30; ○ Wherever necessary, the unsuitable soil at sub-grade/below sub-grade level shall be replaced with suitable materials as per standard specifications; and ○ The 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 laying, road crossings, connections and settlement in the filled areas.
➢ **Surface drainage – general considerations**	○ Based on topography of the EZ, the drainage pattern has been decided.
➢ **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: - Q = C * I * A / 360 Where, Q = Quantity of runoff, m^3/s

Components	Detailing of utilities, infrastructure within proposed EZ
	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; and 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 runoff collection due to easy maintenance for the primary road. Stone pitching is considered for the side walls and plain cement concrete (PCC) for the base; ○ Covered rectangular brick masonry drain is considered for the remaining areas for optimization of area under drainage; ○ Reinforced cement concrete (RCC) box/pipe culverts of suitable sizes are considered for road crossings; and ○ Rainwater harvesting structures are envisaged all along the drain at every 100 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 used for processing, bathing and washing clothes, cooking, drinking and washing vessels; ○ Non- potable water has been used for gardening, cleaning, cooling and toilet flushing; and ○ 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: $Q_{FD} = 4000 \times (P)^{0.5} \times (1-0.01 \times (P)^{0.5})$ *Where P = Population in thousands per hectare* Q_{FD} = *866 lpm* = *48 cum/hr* ○ Considering two hours fire demand requirement, the total quantity of water required for fire protection is 96 cum; and ○ Demand for firefighting has not been considered under daily demand. One-time storage i.e. 2 hours of fire demand will be reserved and maintained at all time.
➢ **Average water demand**	○ Based on the computation and analysis, the total average water demand is estimated and presented in **Table-Summary of water demand;** and ○ 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. ○ ***Sump*** • The total storage capacity of the sump is based on 24 hours storage. Proposed storage capacity is shown in **Table- Sump storage capacity;** and • Two sumps have been proposed, one for potable water and other for non-potable water which includes fire demand. ○ ***Elevated level service reservoir (ELSR)*** • The total storage capacity of the ELSR is based on 2 hours storage. Storage requirement is shown in **Table – ELSR capacity;** • Two numbers of ELSR have been proposed, one for potable water and other for non-potable water to serve the processing and non-processing area; and • 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 agency.
➢ **Water pumping station**	○ Water pumping station for potable and non-potable water is required for pumping from the sump to ELSR; and ○ 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 computation based on the analysis; • Working hours per day – 24 hours; • Pipe material ▪ For pumping main - DI (K9); ▪ For distribution up to 200 mm diameter - HDPE (PE 100); ▪ For distribution above 200 mm diameter - DI (K7); ▪ Pipe roughness co-efficient - 140 for DI and 150 for HDPE; ▪ Formula used for friction loss - Hazen Williams; ▪ Minimum residual pressure at all tapping points - 7.0 m;

Components	Detailing of utilities, infrastructure within proposed EZ
	▪ ELSR staging height - as per design requirement. ○ The proposed pipe size and pumping capacity are given in **Table - Pipe sizing for processing area and Table-Pump capacity**
➢ **Effluent quantity estimation**	○ Total estimated effluent quantity= 4 MLD; ○ It is proposed to collect effluent through a collection network and shall be treated in respective zone specific CETPs. Effluent network and CETP shall be established by the project implementation agency considering the topography of the site; ○ The proposed CETP's shall treat the effluent to non-potable standard and shall be reused to meet the non-potable requirement of EZ; ○ Treated effluent available @85% = 3093 cum/day; ○ Non-potable water demand is 3567 cum/day; and ○ Entire treated effluent shall be utilized for non-potable usage.
➢ **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 several downstream problems related to transportation and disposal of the same. Solid waste (SW) generated in EZ can be broadly categorized as under: • 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, audio sets etc., • Hospital and biomedical waste. ○ The role of integrated SWM is to reduce the quantity of SW disposed 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 commercial 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 – 10.12 kg / hectare / day is considered for street sweeping; • Greenery – 30.36 kg / hectare / day is considered; and • Public and supporting amenities – 100 gm /per person/day. ○ Based on the above, MSW quantification has been carried out and depicted in **Table - Estimation of Municipal solid waste generation;** ○ Total estimated MSW quantity –3 TPD; ○ Source segregation should be made mandatory and due care has be taken while planning the collection, transportation of waste within the site area. Users will be required to segregate their waste in the following categories and put in colour coded bins.

Components	Detailing of utilities, infrastructure within proposed EZ
	• Industrial non-hazardous waste; • Industrial hazardous waste; • Bio-degradable waste; • Non-biodegradable waste; • E-waste like parts of computer, monitor, cartridges etc.; • Construction debris, street sweepings etc.; • Hospital and bio-medical waste. ○ From the above only bio-degradable waste can be treated in the SW treatment facility within the EZ; ○ 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; and ○ The entire MSW is planned to be collected , segregated and bio-degradable waste shall be treated in the composting plant within EZ and the rejects shall be disposed to suitable landfill outside the EZ.
➢ **Power supply & distribution**	○ The system parameters are as follows: • Transmission line – 132/33/11 kV; • Number of phases – 3; • System frequency - 50 Hz; • Consumer supply voltage 33 kV /11kV/415/240 volt. ○ 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; ○ A simultaneity factor of 40% - 80% is normally considered; ○ 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; ○ Estimated power demand is depicted in **Table-Estimation of power demand;** ○ Total estimated power demand is 36 mVA; ○ Distribution substation is proposed in a strategic location. Individual facilitation and all power reticulation are to be carried out at 33/11 kV; ○ The advantage with reticulation at 33/11 kV is that it is the standard voltage and therefore electrical reticulation equipment for 33/11 kV systems would be readily available including spares; ○ 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; ○ Power can be distributed by a network of overhead lines or underground cables and; ○ An overhead distribution system is adopted for much more flexible extension , for connection of new consumers and being less expensive than an underground cable system.
➢ **Street lighting**	○ Street lighting has been conceived in 2 different forms. • Streetlights for the road network; and • 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 energy efficient LED

Components	Detailing of utilities, infrastructure within proposed EZ
	○ streetlight 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.

10.3. Infrastructure Requirements and Concept Drawings

10.3.1. Roads

Hierarchy of roads

Primary, secondary, collector and local roads are planned to give access to the industries within EZ. These roads 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 76: Hierarchy of roads

Category	Road width (m)	Carriage way width (m)	Number of lanes	Length (m)	
				Processing area	Non- processing area
Primary road	30	7.5 + 7.5	4	1362	-
Secondary road	25	7.5 + 7.5	4	2498	-
Collector road	20	3.75+3.75	2	2811	400
Total				**6671**	**400**

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

The composition of pavement structure is provided in the table below.

Table 77: Composition of flexible pavement structure

Layer	Composition details
Wearing course	Dense bituminous surfacing wearing course of 40 mm thick laid with mechanical spreaders
Binding coat	Tack coat of 0.30 kg/ sqm of 60/70 grade bitumen
Binder course	Dense bituminous surfacing base course of 110 mm thick laid with mechanical spreaders in 2 layers
Binding coat	Prime and tack coat of 1.2 kg / sqm & 0.30 kg/sqm of 60/70 grade bitumen
Base course	Aggregate base, type - I of 250 mm thick (minimum soaked CBR 80%) Aggregate base, type - II of 300 mm thick (minimum soaked CBR 50%)
Sub-base	Granular sub-base of 250 mm thick (minimum soaked CBR 25%)
Improved sub-grade	Improved sub-grade of 250 mm thick (minimum soaked CBR 5%)

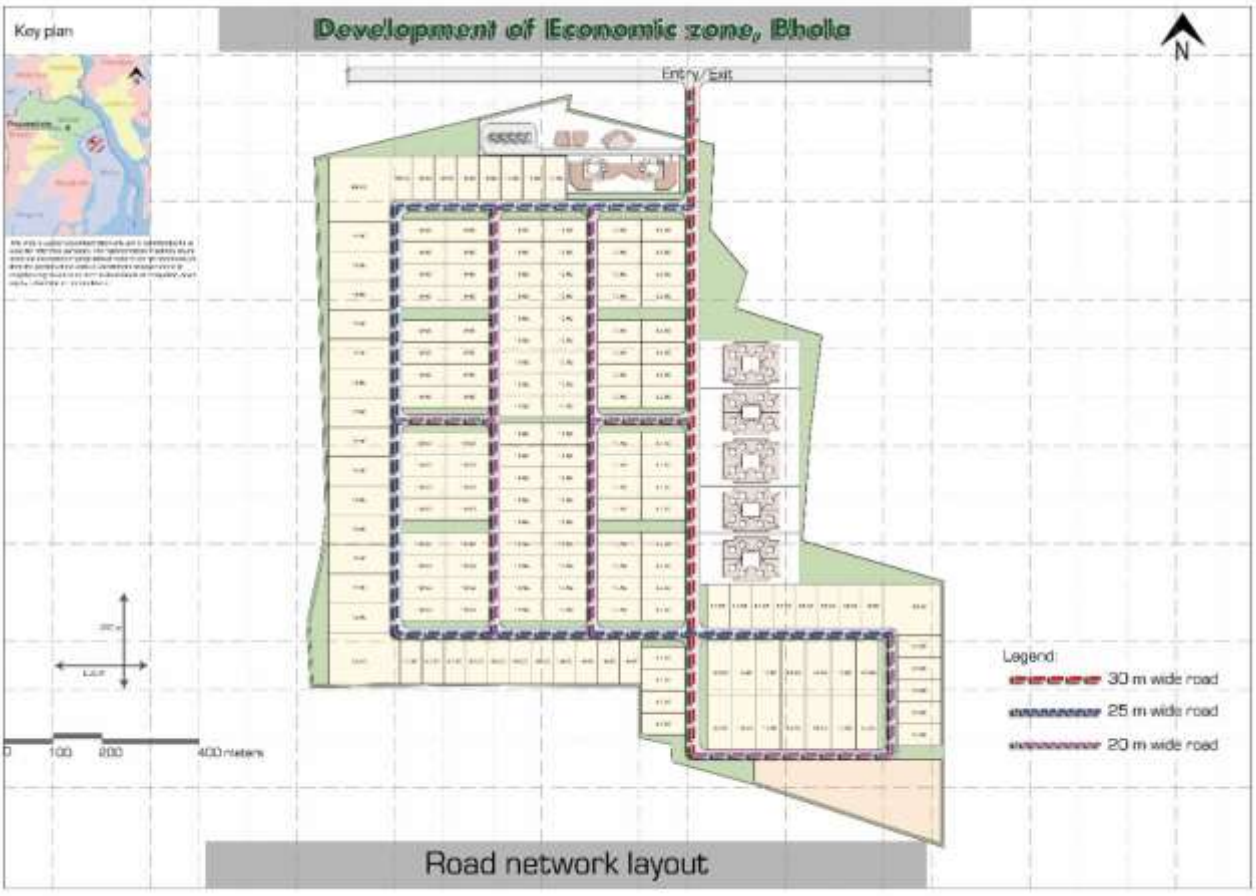
Source: MACE analysis

Adhering to the pavement structure outlined in the table above would ensure longevity of the road surface and minimize deterioration of road surface & need for frequent repair and maintenance works.

Road network drawing

The road network layout for the proposed EZ is shown below:

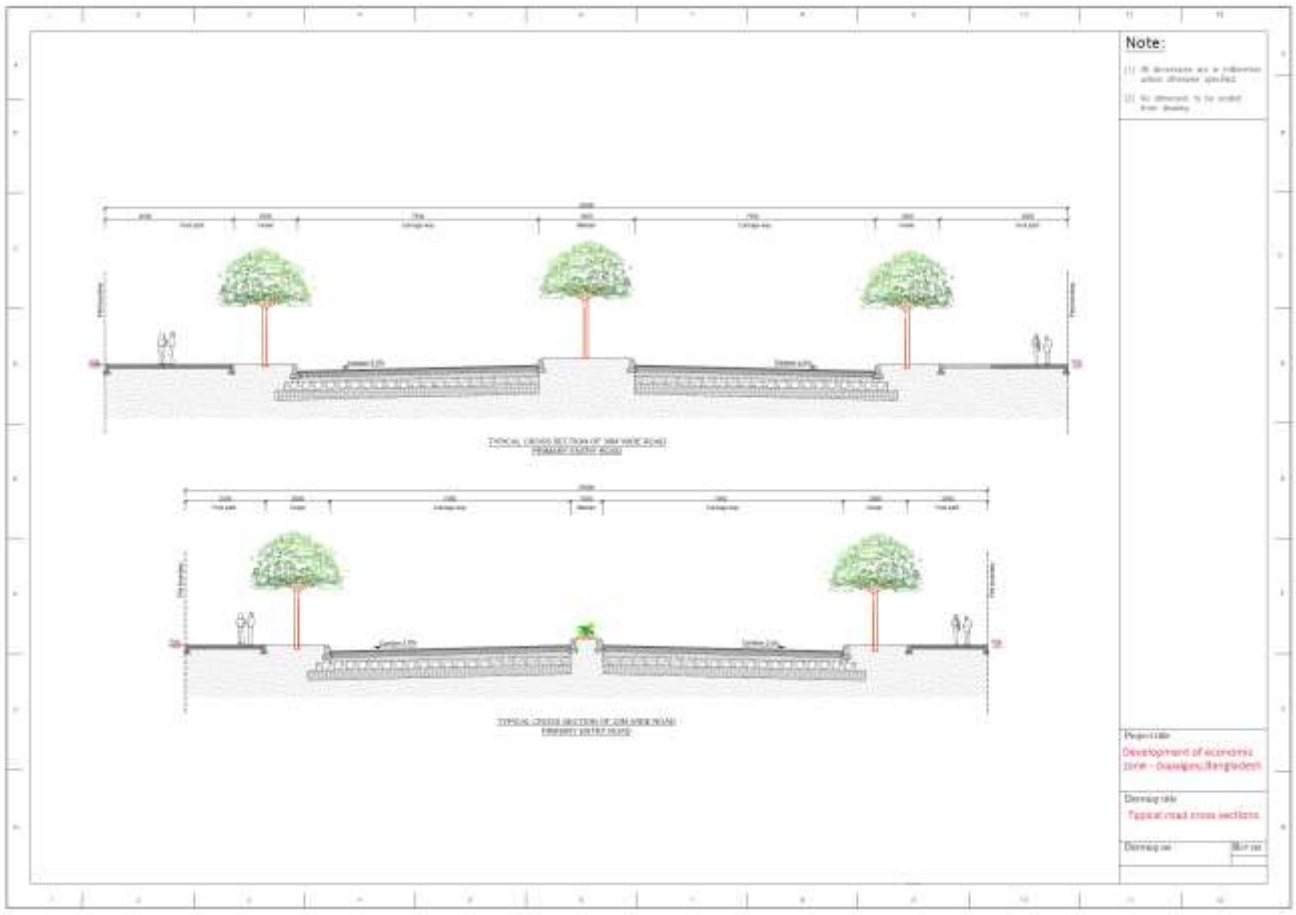
Figure 67: Road network diagram



Source: MACE analysis

The above figure outlines the top view of the road network diagram. As evident from the diagram above, road plan has been prepared to ensure last mile connectivity to all units inside the EZ site. Figure on next page outlines the cross-sectional view of the road structure.

Figure 68: Road cross section details



Source: MACE analysis

The typical cross-sectional view of the road structure is shown in the above figures. As elaborated in the figure, it is suggested to consider provision for riding surface, drainage and street lighting facilities.

10.3.2. Power

Design basis

- **Electrical system - EHV / HV supply**

Nominal voltage	:	132/33 kV ± 5%
Frequency	:	50 Hz ± 2.5 %
Number of phases	:	3 phases, 3 W
Fault level	:	26 kA

- **Distribution supply**

Nominal voltage	:	33/11 kV / 415 V/230 V ± 6%
Frequency	:	50 Hz ± 3%
Number of phases	:	3 phases, 3/4 W

Power demand basis

The power estimation carried out on the next page is at ultimate level and based on published standards, guidelines and best industry standards. However, this is indicative in nature and may vary on the on-ground implementation of the project.

Table 78: Power demand estimation – basis

Land use pattern	Load in kVA/acre & kVA/sqm of BUA	Simultaneity factor
Processing zone		
Industries	185.00	80%
Utility	105.00	40%
Road	14.00	40%
Green & open space	5.00	40%
Non-processing zone		
Public and support amenity	0.14	70%
Road	14.00	40%

Source: Published standards, guidelines and best industry standards

Note - BUA refers to built-up area.

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 simultaneity factor, which relates peak demand to rated load demand or calculated demand, is utilized in computation of maximum demand;
- A simultaneity factor ranging from 40-80% is considered based on the type of proposed components;
- 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 on next page.

Table 79: Summary of electrical load estimate

SI. No	Type of development	Load in kVA
1	Processing area	35552.00
2	Non-processing area	670.00
	Total estimated load in kVA	36222.00
	Total estimated load in mVA	36.22
	Total estimated load in mVA	**~ 36**

Source: MACE analysis(total figures might have minor aberrations due to rounding off the decimals)

The above table provides a summarized view of total electricity requirement of the EZ site. However, the total estimated load mentioned in the table above is indicative in nature and may vary based on on-ground implementation of the project. The land use wise estimated electrical demand for this facility is given in the table below.

Table 80: Power demand calculation

Land use pattern	Total area acres	Load in kVA/acre & kVA/sqm of BUA	Simultaneity factor	Loss factor	Load in kVA
Processing area					
Industrial plots	212.27	185.00	80%	1.10	34558.00
Utility	14.83	105.00	40%	1.10	685.00
Road	38.80	14.00	40%	1.10	239.00
Green & buffer space	31.97	5.00	40%	1.10	70.00
Total processing zone	**297.87**				**35552.00**
Non-processing area					
Public & support amenity	4.94	0.14	70%	1.10	663.00
Road	1.19	14.00	40%	1.10	7.00
Total Non-processing area	**6.13**				**670.00**
Total	**304.00**			**Load in kVA**	**36222.00**
				Load in mVA	**36.22**
Total Load in mVA					**~36**

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

Power supply to EZ

Based on the assessment, it is found that the power demand for the proposed EZ would be about 36 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 132/33/11 kV sub-station shall be established within the proposed site.

During the initial phase of development, the 33/11 kV main receiving sub-station (MRSS) shall be established within the site and as suggested by the officials, power to this sub-station shall be availed by establishing 33 kV overhead transmission line from the 33/11 kV Bangla Bazar sub-station of 10 mVA capacity located at an aerial distance of 16 km from the site (based on proposed tentative alignment). Based on the demand growth of EZ, the proposed 33/11 kV MRSS within EZ site shall be upgraded to 132/33 kV sub-station and incoming 132 kV overhead transmission line shall be established from 132/33 kV Borhanuddin grid sub-station of 225 mVA capacity located at an aerial distance of 30 km from the site (based on proposed tentative alignment).

Power supply network planned within EZ

The receiving sub-station is located within EZ near the incoming line from which an internal distribution network is planned along the proposed road network of EZ to feed the individual plots as shown in the next page.

Figure 69: Internal power supply network of EZ

Source: MACE analysis

10.3.3. Water

Demand estimation basis

The water demand estimation carried out on the next page is at ultimate level and based on published standards, guidelines and best industry standards. However, this is indicative in nature and may vary on the on-ground implementation of the project.

Table 81: Water demand estimation norms

Description	Reference – published standards, guidelines and best industry norms
Processing area	
Industries	70 cum / ha / day - process water demand & 45 litres per capita per day for domestic
Utilities	45 litres per capita per day
Road	1.8 cum / ha / day
Green	1.8 cum / ha / day
Non- processing area	
Public and support amenity	45 litres per capita per day

Description	Reference – published standards, guidelines and best industry norms
Road	1.8 cum/ha/day

Source: MACE analysis, published standards, guidelines and best industry norms

Table 82: Water consumption pattern

For industrial facilities	
Potable water	66.67%
Non- potable water	33.33%

Source: MACE analysis

Water demand calculation

The summary of water demand for EZ is given below

Table 83: Summary of water demand

S.No.	Description	Processing area	Non- processing area	Total	Unit
1	Total average demand	7211	78	7289	cum/day
2	Total potable water demand	3667	55	3722	cum/day
3	Total non-potable water demand	3544	23	3567	cum/day
4	Fire demand	93	2	95	cum

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

Table 84: Estimation of average daily water demand

Land use pattern	Total area	Water demand					
	acres	**Process water**	**Domestic water**	**Loss @ 10 percentage**	**Total**	**Potable**	**Non-potable**
		In cum/day					
Processing area							
Industrial plots	212.27	6016	483	650	7149	3663	3486
Utility	14.83		5	0	5	3	2
Road	38.80		28	3	31		31
Green & buffer space	31.97		23	2	26		26
Total processing area	**297.87**	**6016**	**539**	**656**	**7211**	**3667**	**3544**
Non processing area							
Public & support amenity	4.94		70.00	7.00	77.00	55.00	22.00
Road	1.19		0.86	0.09	0.95		0.95
Total non-processing area	**6.13**		**70.86**	**7.09**	**77.95**	**55.00**	**22.95**
Total	**304.00**	**6015.85**	**610.33**	**662.62**	**7288.80**	**3721.50**	**3567.29**

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

Water supply to EZ

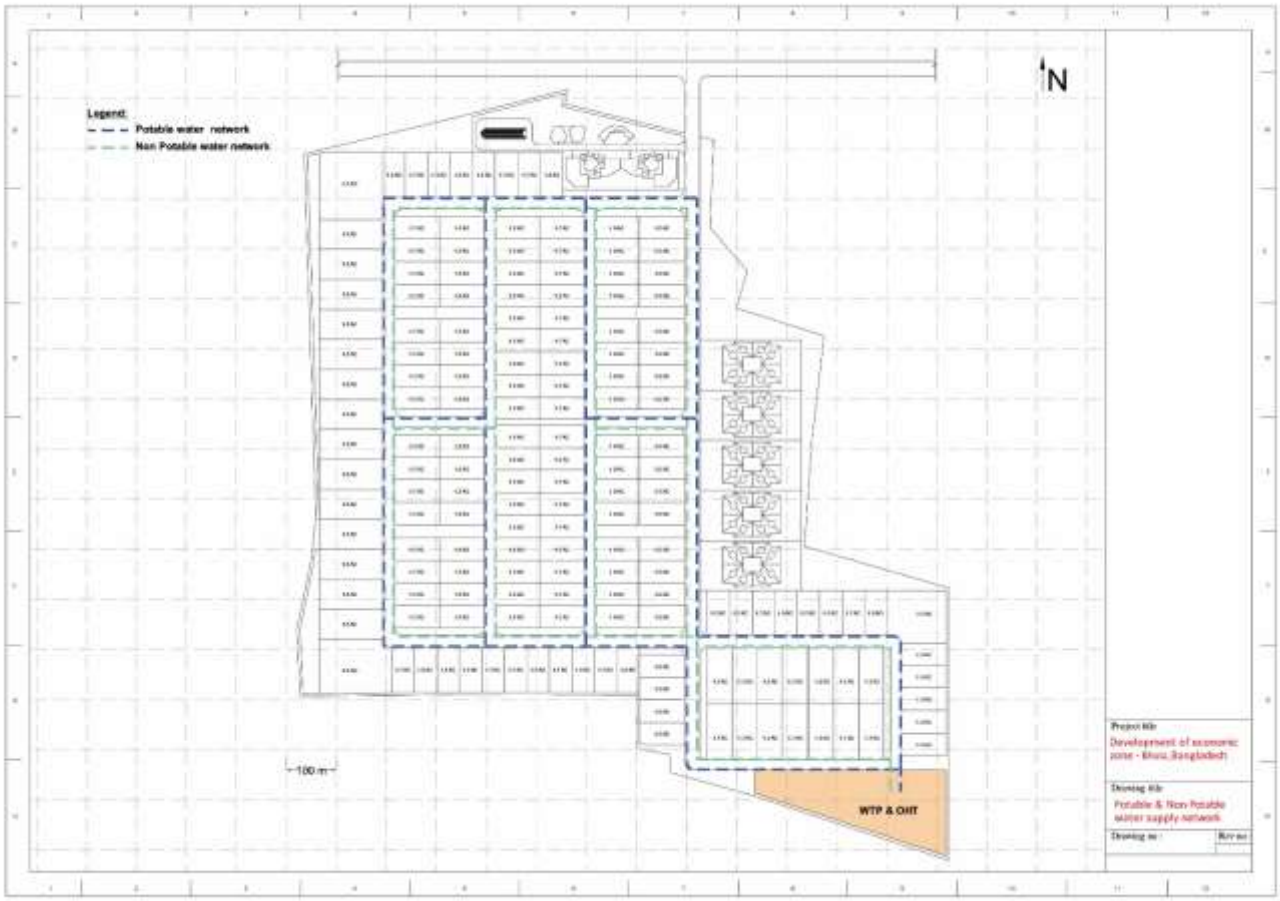
Based on the assessment, it is found that the total potable water demand for the proposed EZ would be about 4 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

Based on the discussion had with officials and local, it is understood that the groundwater in the region is at a depth of 25-40 feet and is potable in nature. Hence, groundwater can be relied to meet the initial water demand of proposed EZ.

River Ganeshpura, a tributary of River Meghna is near the proposed site on the Western side at an aerial distance of 1.8 km (~2km). Based on the discussion had with UNO officials, it is understood that these rivers are perennial in nature and shall be relied to meet the water demand of the proposed EZ. It is proposed to provide suitable water intake system near the river basin at an approximate distance of 2 km from the site based on proposed tentative alignment. However, detailed study and hydrogeological investigations need to be carried out to determine the exact intake point and intake system. Hence, it is suggested that suitable intake system and intake point shall be proposed during detailed engineering stage.

The potable water supply network is proposed along the proposed internal roads of EZ. The layout depicting proposed potable and non-potable water supply network is provided in next page.

Figure 70: 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 85: Sump storage capacity

S. No.	Description	Processing area	Non- processing area	Unit
1	Potable water	3667	55	cum
2	Non- potable water including fire demand	3637	25	cum
	Total	**7304**	**80**	**cum**

Source: MACE analysis(total figures might have minor aberrations due to rounding off the decimals)

Table 86: ELSR capacity

S. No.	Description	Processing area	Non- processing area	Unit
1	Potable water	306	5	cum
2	Non- potable water	295	2	cum
	Total	601	7	**cum**

Source: MACE analysis(total figures might have minor aberrations due to rounding off the decimals)

Above tables 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 sump storage capacity that would be required is 7384 cum and total ELSR storage capacity requirement is 608 cum.

Required pipe size and pump capacity

The required pipe size and pump capacity is provided in the following tables.

Table 87: Pipe size -water supply network

Pipe size in mm	Processing area length in m		Non -processing area length in m	
	Potable water	Non-potable water	Potable water	Non-potable water
40			400	400
110	3002	6671		
140	667			
160	667			
200	667			
250	667			
300	667			
350	334			
Total	**6671**	**6671**	**400**	**400**

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

Table 88: Pump capacity

Description		Processing area	Non-processing area	Unit
Potable water	Capacity	0.05	0.001	cum/sec
	Number of pumps	2 W+1S	2 W+1S	
	Power requirement of each pump	13.00	0.30	Kw
Non- potable water	Capacity	0.05	0.00057	cum/sec
	Number of pumps	2 W+1S	2 W+1S	
	Power requirement of each pump	13.00	0.10	Kw

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

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.

10.3.4. Effluent Generation

The basis for calculating the effluent quantity is provided in the below tables.

Table 89: Effluent generation pattern

Description	Percentage
From process water (potable)	70%
From process support water (non-potable)	30%
Total	100%

Source: MACE analysis, published standards, guidelines and best industry norms

The effluent generation quantity from process water of industries has been estimated and shown in the next page

Table 90: Effluent generation estimation

Land use pattern	Total area	Effluent generation	Sewage generation		Sullage generation	Total effluent, sewage and sullage generation	Infiltration @10%	Total sewage quantity
	acres	in cum/day	In %	In cum/day	In cum/day			
Processing area		**In Cum/day**						
Industrial plots	212.27	3639.59	0.72	115.00	296.56	411.56	53.17	464.73
Utility	14.83		0.72	1.07	2.76	3.83	0.50	4.33
Road	38.80				28.00	28.00	3.11	31.11
Green space	31.97						2.56	2.56
Total processing zone	**297.87**	**3639.59**		**116.07**	**327.32**	**443.38**	**59.34**	**502.73**
Non-processing area								
Public & support amenity	4.94		0.32	6.28	48.00	54.28	7.70	61.98
Road	1.19				0.86	0.86	0.10	0.95
Total Non-processing area	**6.13**			**6.28**	**48.85**	**55.14**	**7.80**	**62.93**
Total	**304.00**	**3639.59**		**122.35**	**376.17**	**498.52**	**67.14**	**565.66**

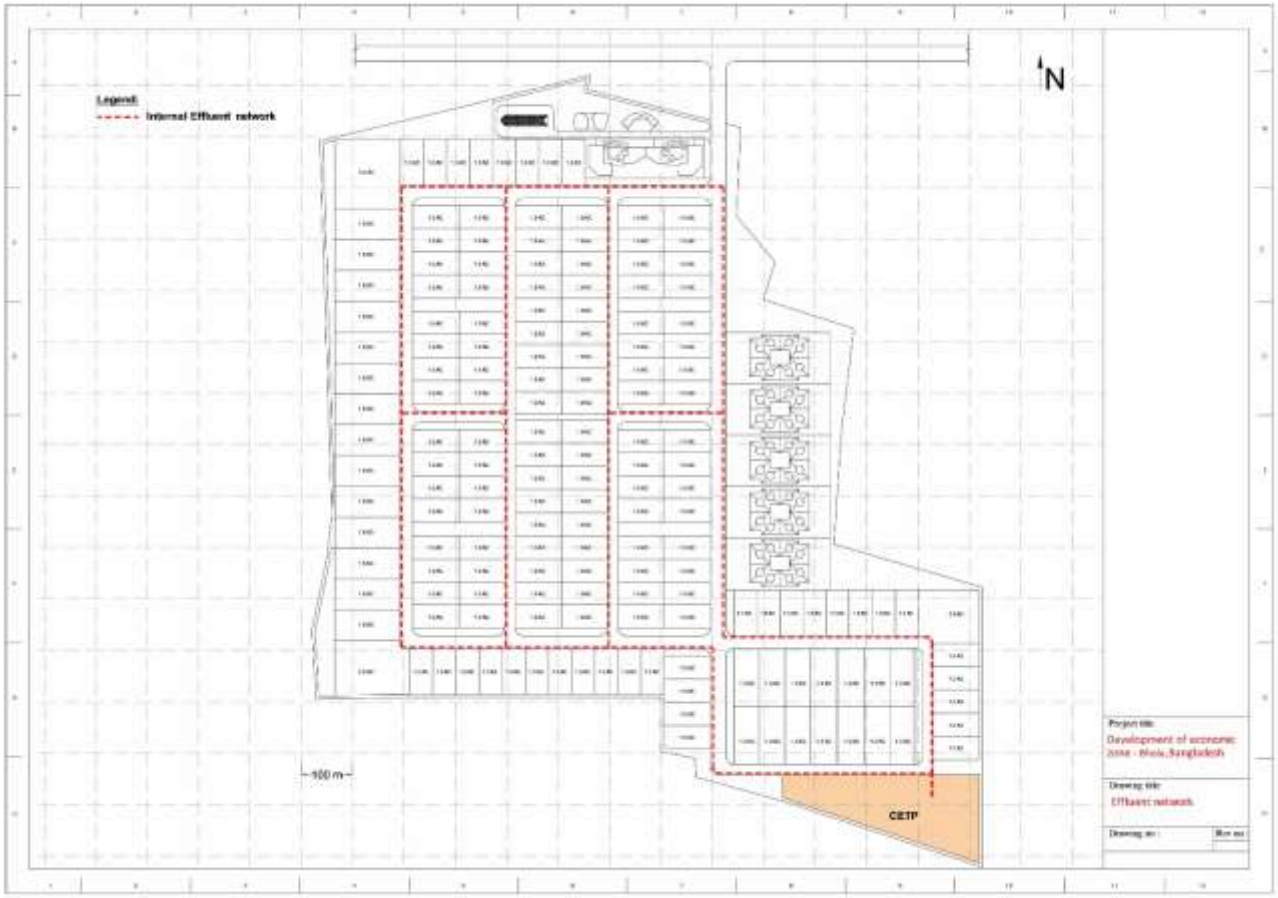
Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

From the assessment, the estimated effluent generation quantity works out to 4 MLD and is planned to treat the effluent to non-potable quality standard and shall be used to meet the non-potable water demand of EZ. Effluent collection network is considered along the roads connecting industrial units. During on ground implementation of the project, based on type of occupant industrial units and their effluent characteristics, required number of CETPs and techniques shall be decided. However, it has to be ensured that all the CETPs shall treat the effluent to non-potable water quality standard.

Effluent network

The entire effluent network is planned along the proposed internal roads of EZ in the processing area. The layout depicting effluent network and location of CETP is provided below.

Figure 71: Effluent network



Source: MACE analysis

Required pipe size

Table 91: Pipe size- effluent network

Pipe size in mm	Processing area length in m
150	3002
200	1668
300	1001
400	667
500	334
Total	**6672**

Source: MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

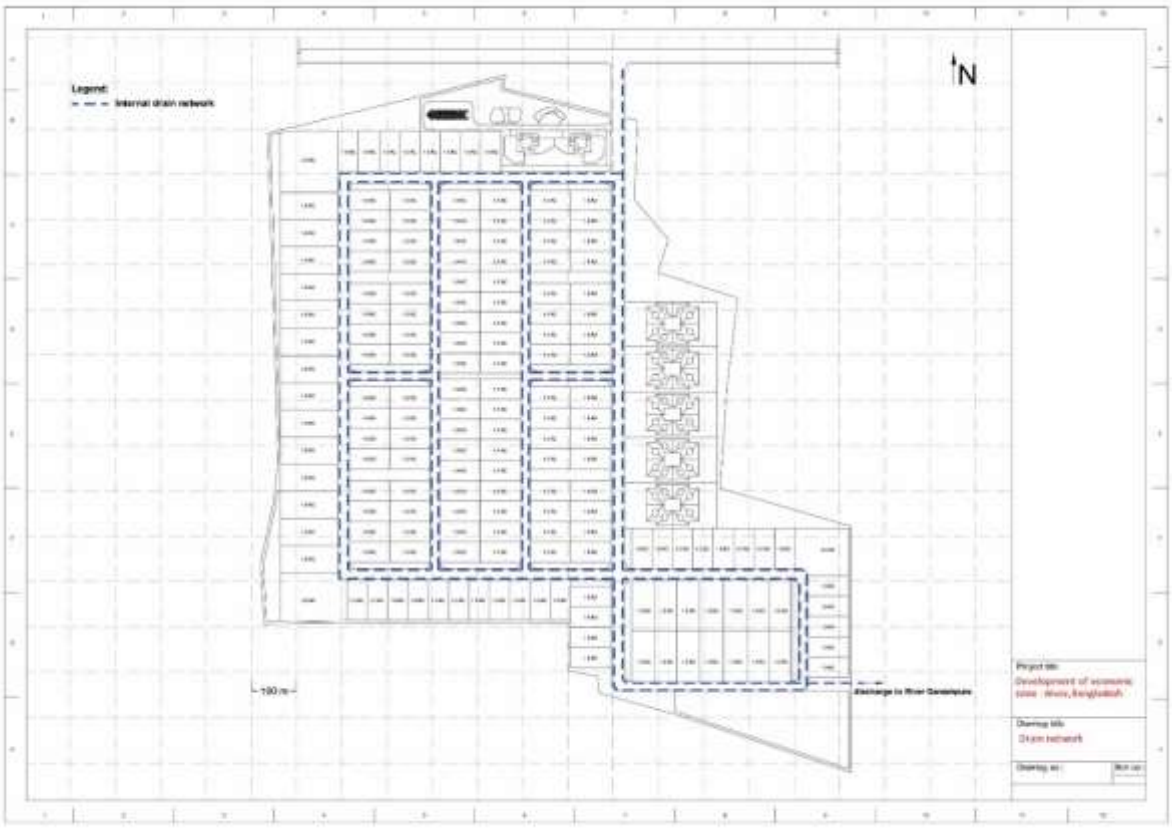
The above table mentions the length of pipe that would be required for collection of effluent from the EZ site.

10.3.5. 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 River Ganeshpura.

- 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; and
- Rainwater harvesting structures are envisaged all along the drain at every 100 m interval.

Figure 72: Internal storm water drain network



Source: MACE analysis

10.3.6. Solid Waste

The estimated solid waste quantity is provided in the following table. The estimated solid waste quantity is about 3 TPD. It is suggested to adopt bio-methanation process for treating the bio-degradable waste generated within EZ. The other waste such as non-bio-degradable and industrial waste etc., shall be transported outside EZ to landfill for recycling/further treatment.

Table 92: Estimation of MSW generation

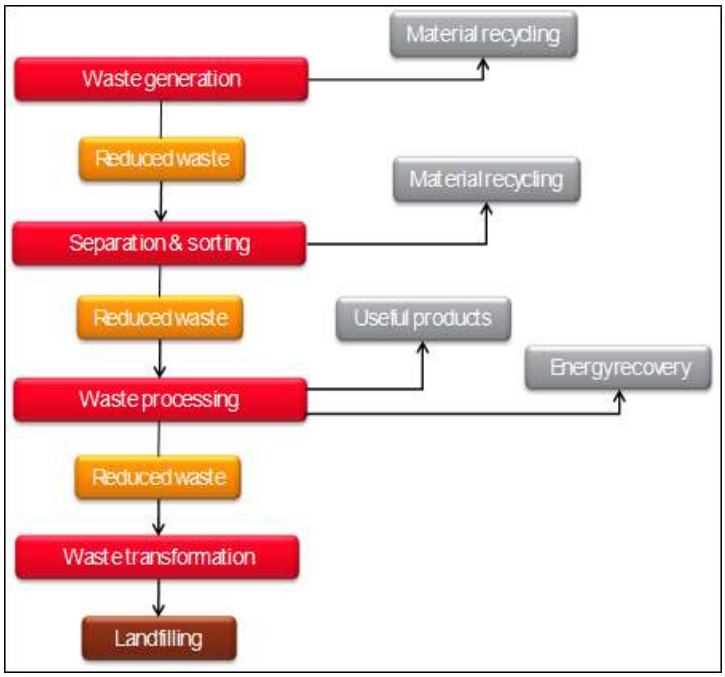
Land use pattern	acres	Population	Msw generation	Unit	Kg/day
Processing area					
Industrial plots	212.27	10742	200	gm/capita/day	2148.40
Utility	14.83	100	100	gm/capita/day	10.00
Road	38.80		10.12	kg/ha/day	158.99
Green & open space	31.97		30.36	kg/ha/day	392.94
Total processing zone	**297.87**	**10842**			**2710.32**
Public & support amenity	4.94	1000	100	gm/capita/day	100.00
Road	1.19	0	10.12	kg/ha/day	4.86
Total Non-processing area	**6.13**	**1000**			**104.86**

Total	**304.00**	**11842**			**2815.18**
Total solid waste generation in TPD					**~3**

Source: MACE analysis (total figures might have minor aberrations due to rounding off decimals)

Flow diagram depicting the waste reduction technique suggested for proposed EZ through integrated SWM is provided in below figure.

Figure 73: Waste reduction by integrated SWM



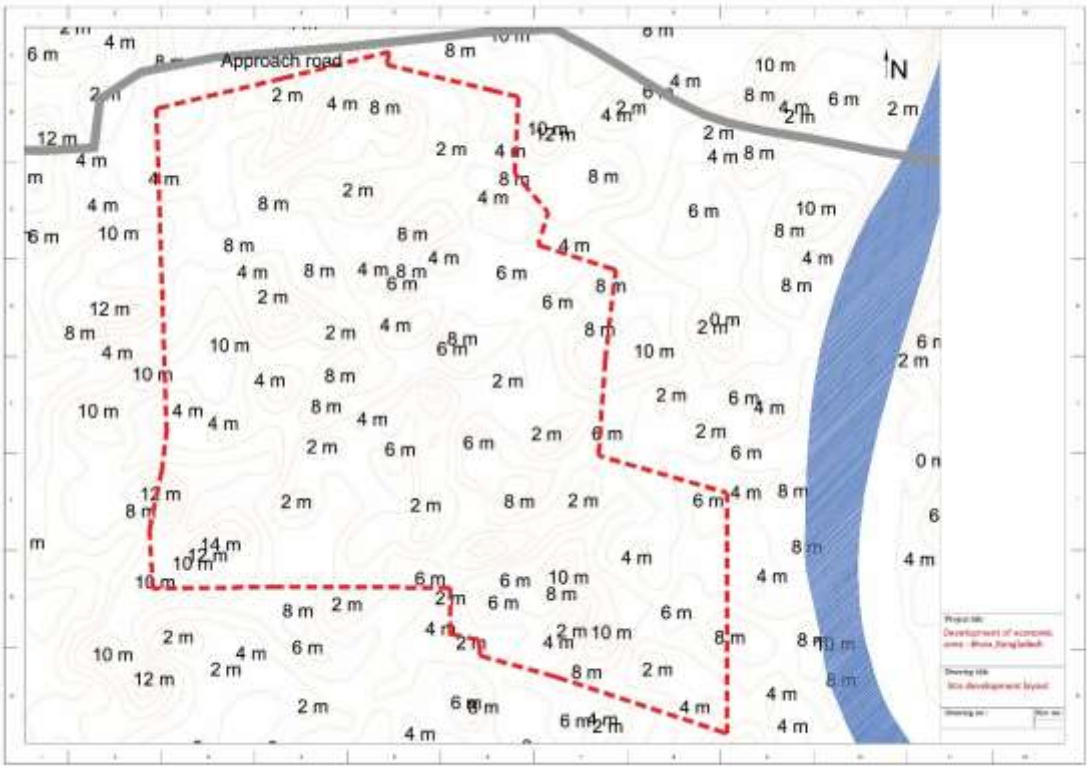
Source: MACE analysis

Site development for EZ

From the site visit, it is observed that the site is on an average level of 8 to 10 feet below adjacent approach road. Also, there are low lying areas within the site. To avoid the water inundation, it is required to develop embankment for the length of 5.9 km along the site with necessary slope protection works. This necessitates suitable level of site filling within EZ site for which contour study has been carried out.

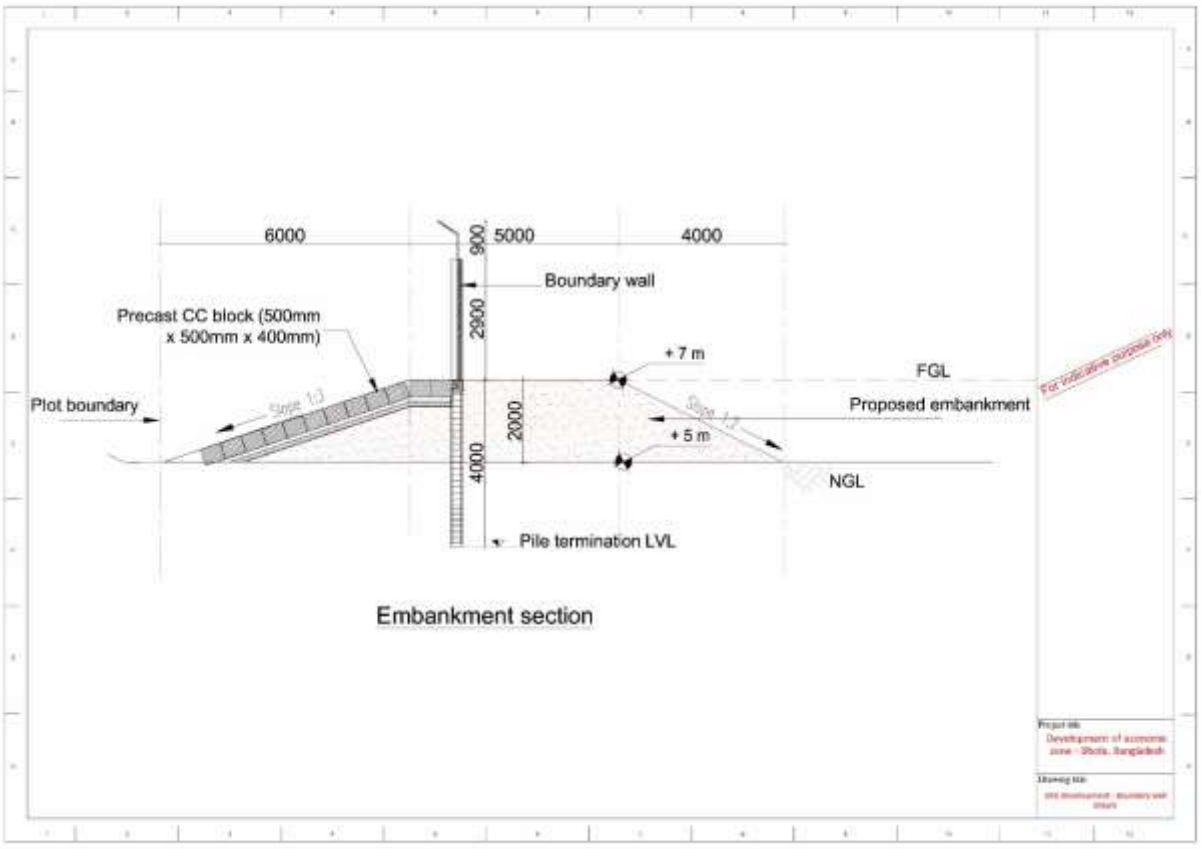
Based on the study of contour, it is found that the site needs to be filled for a depth of about 1.8 m on an average and the total estimated site filling quantity is about 2214440 cum. Dredged sand from River Ganeshpura is suggested as a source for site filling. However, detailed hydrostatic study has to be carried out for identifying the suitable point of dredging and necessary permission has to be obtained from Bangladesh Inland Water Transport Authority (BIWTA) authorities for dredging of sand from the river for site filling.

Figure 74: Site development layout



Source: MACE analysis

Figure 75: Embankment cross section

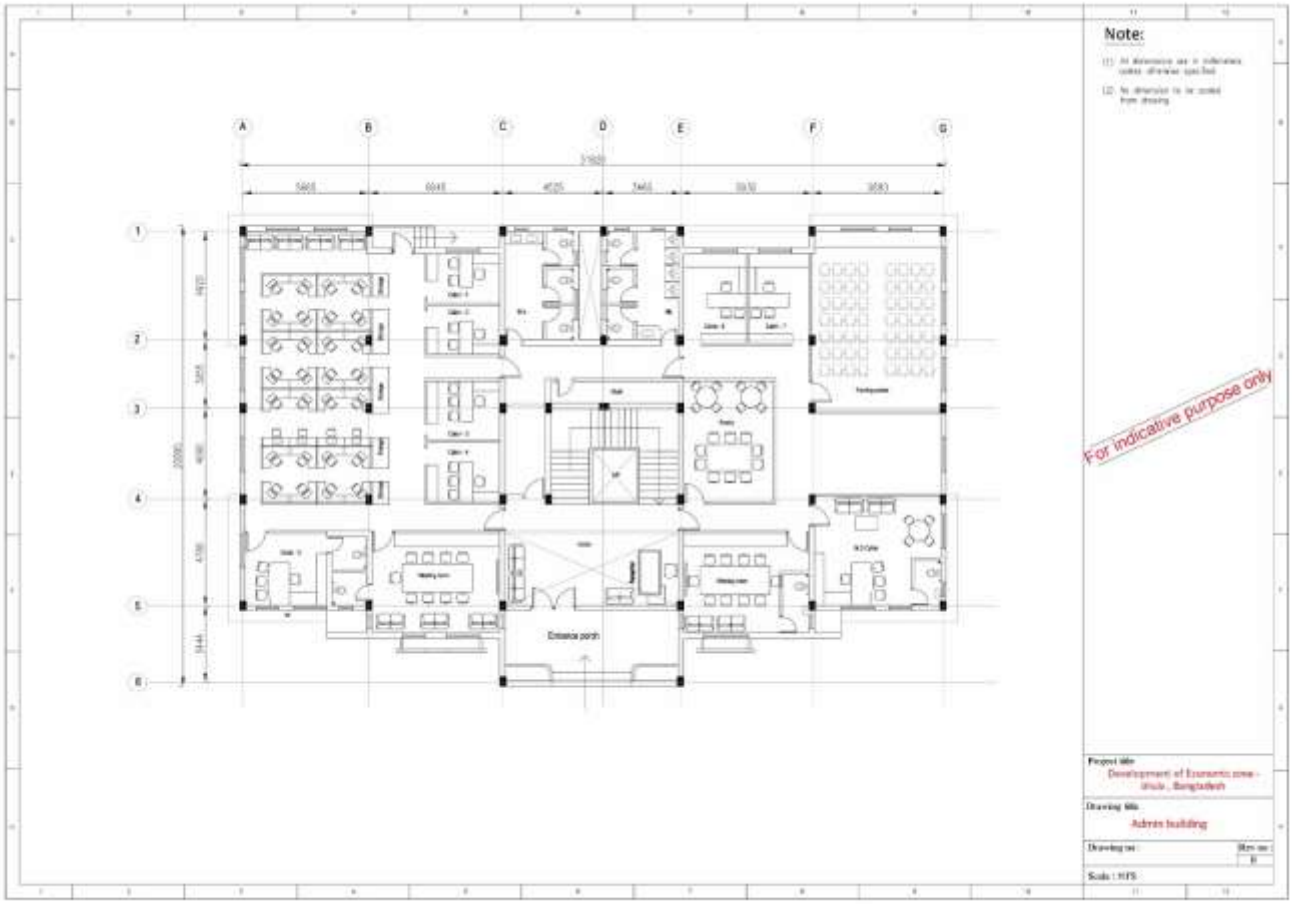


Source: MACE analysis

Administration building

It is proposed to construct an administrative building consisting of 1500 sqm of built-up area, G+2 structures within EZ. The administration building layout is depicted in figure on next page.

Figure 76: Administration building layout



Source: MACE analysis

10.4. 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 following table.

Table 93: On-site infrastructure cost estimates

Description of item	Quantity	Unit	Price without tax (In million Taka)	Phase I Cost Breakdown	Phase II Cost Breakdown
Site development					
Site filling	2214440	Cum	994.28	994.28	
Embankment	5.90	KM	1052.53	1052.53	
Total			2046.81	2046.81	
Road network					
Internal road network	7.1	KM	1163.91	581.96	581.96
Footpath	7.1	KM	242.80	121.40	121.40
Storm water drain	7.1	KM	47.02	23.51	23.51
Power supply					
Internal 11 kV power distribution line (OHT)	7.6	KM	10.63	5.31	5.31
Internal 33 kV power distribution line (OHT)	1.7	KM	6.80	3.40	3.40
Generator - 2MVA capacity	2	Nos	90.00	45.00	45.00
Streetlight	7.1	KM	24.92	12.46	12.46
Security light	4.0	KM	11.68	11.68	
Internal 33/11 kV sub-station	1	Nos	150.00	150.00	
Internal 132/33 kV sub-station	1	Nos	500.00		500.00
Total			794.03	227.85	566.17
Water supply					
Water supply network	7.1	KM	28.29	14.15	14.15
Sump & overhead tank	7.99	MLD	175.10	87.55	87.55
Water distribution pumps	12.00	Nos	2.24	1.12	1.12
Pump room	256.00	Sqm	18.00	18.00	
Water treatment plant(WTP)	4	MLD	75.85	37.93	37.93

Fire hydrant	48	Nos	3.55	1.77	1.77
Total			303.02	160.51	142.51
Effluent and solid waste collection/treatment					
Effluent network	6.7	KM	16.27	8.14	8.14
Effluent treatment plant (CETP)	4.30	MLD	645.00	322.50	322.50
Solid waste management	3	TPD	39.00	19.50	19.50
Total			700.27	350.14	350.14
Telecom	7.1	KM	72.63	36.32	36.32
Sustainable infrastructure elements					
landscaping & Greenery along road	98835	Sqm	11.04	5.52	5.52
Total			11.04	5.52	5.52
Support amenities					
Administration building	1500.00	Sqm	219.14	219.14	
Fire station	2000.00	Sqm	611.60	611.60	
Total			**830.74**	**830.74**	
Project sub-total			**6,212.28**	**4,384.75**	**1,827.52**

Source: Source: SoR of PWDB, REB, BWDB, PCGB & MACE analysis (total figures might have minor aberrations due to rounding off the decimals)

Apart from the costs considered above, calculation of total project cost also takes into consideration the construction costs of Standard Factory Buildings (SFB) and implementing environmental management plan. The costs for these components are listed below –

- Per sq. ft cost of constructing SFB has been taken to be 1,712 BDT/sq. ft. over an area of 15 acres having 60% coverage. The cost of constructing SFBs is 671.17 million BDT; and
- The cost of implementing environmental management plan during construction phase is taken to be 42.94 million BDT. 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 8836 million (without SFB).**

10.5. Key Takeaways

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 sub-station, wastewater 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 primary road of 30 m width, secondary road of 25 m width and collector road of 20 m width);
- It is planned to collect the incoming water from the source through proposed storage structures such as sump and ELSR from which the water shall be distributed along proposed internal road network connecting each plot of EZ;
- Potable and non-potable water distribution pipeline along the roadside for plot connection has been considered individually;
- CETP has been proposed to treat the wastewater and effluent generated from EZ. The entire effluent network is planned along the proposed internal roads of EZ. It is proposed to use the treated water for non-potable purpose such as flushing, watering to green areas etc. as well as for industrial usage such as cooling, cleaning etc.; and

Block cost estimated based on the above outlined infrastructure components have been considered in the financial model.

11. Social Review

11.1. 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.

11.2. 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.

11.3. Socio-Economic Environment

The Proposed EZ is located in Bhola Sadar Upazila of Bhola district in Barisal division. It is located at 22°40'25.09"N & 90°35'36.44"E in Southwest Bangladesh.

Bhola district lies between 21°54 and 22°52 north latitudes and between 90°34 and 91°01 east longitudes. The total area of the district is 3403.48 sq.km (1314.08 sq.miles) of which 1456.87 sq.km. is under forest. It is bounded on the north by Barisal zila, on the east by Lakshmipur and Noakhali zilas, on the south by the Bay of Bengal and on the west by Barisal and Patuakhali zilas. Bhola Sadar Upazila occupies an area of 413.16 sq. km where 368.74 sq. km is land area and 44.42 km is riverine area. Bhola Sadar consists with 1 municipality, 9 wards and a total of 9 unions, 57 mauzas and 46 villages.

The EZ site covers an area of 304.07 acres. It is bounded on the north by Zila road (connecting regional highway R890) followed by settlements and agricultural land, on the east by settlements followed by agricultural land (single and double cropping), village road, and water channel, on the south by Settlements followed by

agricultural land (single and double cropping) and on the west by settlements followed by agricultural land (single and double cropping), village road, Banker Hat Co-operative College, market and Masjid. The EZ is in close proximity with Ganeshpura river (tributary of River Meghna) which is located at 1.2 km from the proposed EZ, Bheduria ghat (~ 5 km) and Ilisha ghat (~17 km).

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 (CPR) use of community and natural resources. These have been provided at the Upazila level.

11.3.1. Demographics

The Upazila has a total population of approximately 430 thousand (~24% of the total 1776 thousand population of Bhola), and with a population density of 1062 people per sq.km. As per the housing and population census 2011, the Upazila is largely urban, with 1 municipality, 9 wards and a total of 9 unions, 57 mauzas and 46 villages with an urbanization rate of 20.26%.

Approximately 49% of the Upazila population is male and 51% of the population is female, with the sex ratio of 99, which is lower than the national sex ratio of 105. The average literacy rate is 45.2% and is higher for women than men by .04 percentage points. Approximately 1.4% of the population suffers from speech, vision, hearing, mental, and physical disabilities and autism. Majority of the population is Muslim (96%), followed by Hindu (3%). Other religions are below 1%.

High poverty and low-income levels are indicated by the housing structure: over 87.8% of houses are kutcha houses or jhupris and only 63.6% of houses have sanitary toilet facilities with water seals. 36.4% of the houses have non-sanitary toilets or no toilets at all. Most houses (97.5%) reply on tube wells for drinking water and 25.1% households have an electricity connection.

Table 94: Population and Demographics

Administrative Unit/ Residence Community		Upazila Total
Area (sq. km)		413.16
Total Households		88068
Total Population		430520
Avg Size of Household		4.85
Population Density (per sq. km)		1042
Male Population		214212
Female population		216308
Sex ratio		99
Literacy Rate (Both Sex)		45.2
Literacy Rate (Male)		43.6
Literacy Rate (Female)		42.9
Marital Rate - Male (%)		59.4
Marital Rate - Female (%)		66.3
Religious Distribution	Muslim	92.8
	Hindu	6.7
	Others	0.1
Urbanization (%)		20.26

Source: District Statistics, 2011 & Census 2011

Table 95: Administrative Units

Administrative Units of Upazila	
Municipality	1
Wards	9
Mahallas	19
Union	13
Mauza	92
Village	108

Source: Census, 2011

11.3.2. 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. The following social infrastructure is present at the Upazila level.

Table 96: List of Social Infrastructure

Social Infrastructure in at Upazila Level	
Educational Infrastructure	
Government primary school (class I-V)	95
Registered primary school (class I-V)	95
Kindergarten school (pre schooling)	12
NGO school	22
Government secondary school	2
Non-government secondary school	62
School & college (operating jointly)	4
Government college	2
Nongovernment college	10
Madrasah	45
Technical and vocational institution	2
Health Infrastructure	
Upazila Government health complex	-
Private hospital/clinic	8
Diagnostic centre	8
Religious Infrastructure	
Mosques	963
Eid-Gah	32
Temples	49

Source: District Statistics 2011

Source of drinking water[206]: In Bhola Sadar Upazila, 97.0% general household get the facility of drinking water from tube-well, 0.6% from tap and the remaining 2.4% household get water from other sources.

[206] *(Population and Housing Census 2011)*

Electrification: [207]As per Population and housing Census 2011, All the 13 unions of the upazila have brought under the Rural Electrification Program. However, a total of 42.3% general household reported to have electricity connection in the entire upazila in 2011 as against 18.4% in 2001.

11.3.3. Livelihood and Economy

According to site assessment and upon interactions with UNO officials, it can be inferred that Bhola Sadar is an agricultural intensive Upazila. This is supported by the housing and population census (2011), which finds that majority of the population (70.7%) works in agriculture with approximately 3.1% working in industry and 26.2% working in services.

According to the district statistics (2011), the Upazila has 155 rice mills. Our due diligence and site visits show everal small and medium scale industries (such as fish net, garments and textile, plastic, wax, shoes, hatchery, cold storage etc.) are operating in this region.

According to Population and Housing Census 2011, 41027 people or 12% of Bhola Sadar's total population is employable. Among the employed people, only 1.9% of people are looking for jobs. Outside of this, 11.6% of the total population is engaged in household work.

11.4. Calculation of land cost

The total area proposed for EZ development is 304.07 acres, and all the area is private land under Mouza 65 Paschim Char Kali.

For the development of EZ, the authority of BEZA proposes to acquire these 304.07 acres land. As per the AC Land office at Bhola Sadar, the land ownership also uses category and the area of land to be acquired for the proposed economic zone is indicated below:

Table 97: Details of land under the project area

SL No	Name of Mouza	Total land (Acre)	Ownership Pattern (Acre)		
			Private land	Khas Land (govt. land)	Long term leased/Transferred land
1	65 Paschim Char kali	304.07	304.07	0	0
Total		**304.07**	**304.07**	**0**	**0**

Source: AC Land Office Bhola Sadar

Table 98: Mouza Wise different categories of land

SL No	Name of Mouza	Total land (Acre)	Type of Land (Acre)					
			Home	Garden	Pond	Vita	Nul	Doba
1	65 Paschim Char kali	304.07	16.04	5.05	1.92	2.87	274.73	3.46
Total		**304.07**	16.04	5.05	1.92	2.87	274.73	3.46

Source: AC Land Office Bhola Sadar

Table 99: Cost of different categories of Land (BDT)

SL No	Name of Mouza	Land categories and Land Price (BDT) per acre							
		Home/Vita	Garden	Pond	Vita	Nul	Doba	Char	Chandina

[207] *(Population and Housing Census 2011)*

1	65 Paschim Char kali	1574300	1482100	154600	1989600	1193000	346300	102200	1500000

Source: Sub-Registry Office, Bhola Sadar

Table 100: Summary of Total Land Price (Million BDT)

SL No	Name of Mouza	Total land (acre)	*Land categories and Land Price (Million BDT) including 200% premium*					
			Home	*Garden*	*Pond*	*Vita*	*Nul*	*Doba*
1	65 Paschim Char kali	304.07	75.8	22.5	0.9	171.3	983.3	3.6

Source: PwC Analysis

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 was taken as 3 times the cost obtained from AC land office for all categories. Based on the information received from local Sub-Registry office the price of the proposed land as calculated has been furnished in below table. Total land price as calculated is **BDT 1257.3 Million**.

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).

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.

The proposed site boundary superimposed on Mouza Map and affected details of Plots are furnished in Annexure 2 and 3 in this report.

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11.5. Requirements for SIA and RAP

11.5.1. Social Impact Assessment Requirement

The development of the EZ is envisaged on land parcel of 304.07 acres which is contained in Bhola Sadar Upazila, all of the land area is private land. The land is used for agricultural activity and the proposed project will result in the loss of livelihood due to loss of farmlands. This requires the development of a comprehensive Resettlement Action Plan for the affected people. Based on site visits and stakeholder consultations, it can be surmised that the proposed are is predominantly used for agriculture purpose. Also, there are a number of household structures located within the proposed site[208]. The project will affect approximately 230 PAHs (~ 1115 PAPs) in terms of households who'll be losing their land and other assets. There are 14 Household structures are located within the proposed EZ boundary. The cost estimated for compensation of potentially affected structure are furnished in table below-

[208] There were 14 household structures falling within the proposed area. List of affected household structures is given in Annexure-5

Table 101: Estimated cost for Compensation for Potentially Affected Structure

Type of Structure	Number of structures	Average Size (sq.ft)	Compensation Component	Per Unit Compensation	Compensation (BDT)	Notes and Assumption
Residential Households (Non-shiftable)	14	1000	Replacement Cost	1,400,000.00	19,600,000.00	As per latest PWD rates, tinshed structure cost is BDT700, as per national law replacement cost becomes BDT1400. Average per unit replacement cost assuming 1000 sq.ft structures is BDT1,400,000.
			Transfer Grants	6,000.00	84,000.00	As per BEZA RSMP, maximum transfer grants for non-shiftable structures is BDT 6000 for each structure Note: The project is advised to re-evaluate the rate and propose a higher rate based on evaluation of ground realities and current market rates.
Total Compensation for structures					**19,684,000.00**	

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 Households (PAHs) 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.

11.5.2. Requirement of RAP

The development of the EZ is envisaged on land parcel of 304.07 acres which is contained in Bhola Sadar Upazila, all of the land area is private land. The land is used for agricultural activity and the proposed project will result

in the loss of livelihood due to loss of farmlands. This requires the development of a comprehensive Resettlement Action Plan for the affected people.

In cases of acquisition, a part of the compensation for lands and other affected assets built or grown thereon will be assessed and paid to the title holding PAPs by the Deputy Commissioners (DCs), the heads of the Acquiring Bodies. If this payment, 'compensation under-law' (CUL), is found smaller than their replacement costs and/or market prices, BEZA will directly pay the difference or 'top-up' to make up for the shortfall.

With or without acquisition compensations/assistance due to all other PAPs, such as non-titled persons, business owners and employees and those, who are not covered by the acquisition ordinance, but eligible according to this RSMF, will also be directly paid by BEZA.

Top-up Determination and Payment: Where an owner loses lands and other assets in more than one *mouza* or land administration unit, the person will be counted once, and his/her top-up will be paid together. The amount of top-up due to the affected person will be determined by comparing the *total amount of CUL* paid by the DCs for lands and other assets acquired in all mouzas with the *total replacement costs and/or market prices thereof.*

Compensation/entitlement due to the PAPs, including those who are not covered by the acquisition ordinance, but eligible according to this RSMF, will be paid in full before they are evicted from the acquired private and khas/other public lands.

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, in a tentative manner.

Table 102: Loss of Lands (Agricultural, Homestead, Commercial & Others)

Ownership Type	Entitled Person	Entitlement	Responsibility
Private	Legal Owners, as determined by DCs, or by courts in cases of legal disputes	Compensation-under-law (CUL) or replacement costs, whichever is greater. **If applicable** • Top-up equal to the difference between CUL and replacement costs. • Transition allowance (TA) for income loss (see Loss Category 5).	CUL paid by DC Top-up & TA paid by Project
Khas & Other Public Lands Under Lease.	Leaseholders	• Contractual obligations with the public agencies, as determined by DCs, and / or Contractual obligations with other GOB agencies.	Paid by DC and/or Project
Households/ residential structures on khas & other public lands	Vulnerable non-Title persons	• Relocation assistance, including developed plots in their own or other public lands, to be arranged by BEZA. • Provision of water supply & sanitation facilities.	By Project
Vested Non-Resident	Current Owners/Users	As those stipulated above for trees and fruits on trees, on private lands.	By Project

Table 103: Loss of Agricultural, Business, Employment & Rental Income

Ownership type	Entitled Person	Entitlement	Responsibility
Agricultural Income: *If acquisition*	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.	By Project

Ownership type	Entitled Person	Entitlement	Responsibility
amounts to 20% or more of the total productive area		• Current harvest prices of fruits on trees, if they are uprooted before harvest. • Owners are allowed to sell the trees and keep them.	
If acquired VNR lands are agricultural	*Present Owners/Users*	• Transition allowance equal to three times the harvest prices of one year's crops produced in the acquired parts of the lands.	By Project
Business Income: Temporary closure of businesses in existing premises	Business Owners (premise / landowners & 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
Partially affected businesses	Business Owners (premise/landowners & 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
Businesses requiring removal from the existing premises and spots	Business Owners (premise/landowners & 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
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 104: 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

Salient recommendations on resettlement and rehabilitation aspects:

- It is estimated that for rehabilitation of 14 project affected households, ~1.03 Acres of land will be required
- Based upon consultation with AC Land officials, it is understood a rehabilitation site may be proposed in Paschim Char Kali Mouza (Upazila – Bhola Sadar). The land is available within the 1 km towards Southern side and adjacent the Western North side of the proposed zone. Per acre land price including 200% premium is 3.57 Million BDT
- The type of land is *Nul* in nature
- The rehabilitation site should ensure access to better civic facilities
- The project should arrange for skill development training programs for local youths/working population as necessary for getting employed in the EZ. Employment opportunities for the locals should be provided on a priority basis
- Measures should be taken to allocate substantial percentage of job opportunity for women group in the EZ.

11.5.3. 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 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.

11.6. 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 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.

Gaps between WB OP 4.12 and GOB 2017 Act.	Recommendation to bridge the gaps
Gaps with regard to avoidance and minimized project impacts	The project designs including that of the associated facilities should aim to minimize impacts.
Existing GOB laws recognize 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 landowners 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.

11.7. Stakeholder Consultation

11.7.1. 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;
- Which private/non-government sector entities might face financial and social hardships if the predicted impacts do 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

11.7.2. 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. The details of attendees of the community consultations have been annexed to the report.

11.7.3. Level of Consultation

Public consultations in the form of institutional and focused group discussions were carried in 2 October 2020.

Level	Type	Key Participants
Institutional	Stakeholder Meeting	Various Govt. Officials
Community	Focused Group Discussion	PAP, marginalized people

11.7.4. Institutional Stakeholders Consultation

Date of Meeting: 25 July 2019

Location of Meeting: UNO Office, Bhola Sadar , Bhola Sadar

Table 105: List of Institutional Stakeholders Consulted

Name of Person	Designation	Contact Details	Date of Consultation
Ms Nazratun Nayeem	AC Land, Bhola Sadar	01700603791	25 July 2019
Mr Mahibur Rahman	Upazial Agricultural Officer	01672292196	25 July 2019
Mr Rashedul Chawdhury	Upazila Eng. LGED	01708161692	25 July 2019
Mr. Shihab Ahmed	Field assistance Upazila Fisheries Officer	0101790580342	25 July 2019
Mr badrul Islam	Tahsildar, union Land office	01715173019	25 July 2019
Mr Abdul Halim	Surveyor, Upazila Land Office	01936348027	25 July 2019
Mr Ali	Mechanical, Upazila DPHE	01715395803	25 July 2019
Shk.Amdad Hossain	Forest Guard, Bhola Sadar	01718450810	25 July 2019
Mr. Kalyan Chawdhury	ULAO	0171193587	25 July 2019

Salient Points of Discussion

At the onset, the officials from Upazila Nirbahi Officer, Bhola Sadar 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, utilities, rehabilitations and resettlement issues, etc. The discussion was concluded by a visit to the project site and nearby sub-station to gain an on-ground understanding of the various issues. Some of the key features discussed were as follows:

- Basis the site visit, it was highlighted during stakeholders meeting with the above stakeholders that the available area for the proposed EZ is presently open lands and few settlements.
- The site is adjacent to Dhaka – Bhola Sadar highway (N2) which connects the southern boundary of the site.

- River Ganeshpura present towards western side.
- Water availability is not an issue near the site as there are river channels which flow near the site location and ground water is available at a depth of a 25-40 ft which is potable in nature.
- It was highlighted from the discussion with the officials' that many crusher units are located adjacent to proposed EZ site towards west and southern side.

11.7.5. Focused Group Discussions

The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area on 02-10-2020. 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 farmers, local elites, youth group and women group. Locals from very adjacent villages i.e. Paschim char kali, participated in the discussion. The details of the Focused Group Discussions are furnished below. The record of attendees has been attached in Annexure.

Table 106: Details of Focus Group Discussions

Location: Villages : Paschim char kali, Bhola Sadar District

Date: 06-11-2020

Relevant Stakeholders	Issues	Suggestion/Demand from participants	Remarks
Affected Landowners, Farmers, Social Elites (15 persons)	• Loss of Agriculture Land	• The participants welcome the proposed EZ development. They think that this proposed EZ will be created employment to many people in the area. The proposed land for acquisition is 50% single crop land and 50% land is double crop.;	• Proper compensation should be provided for acquisition of land and loss of livelihood. Also, the PAPs should be given priority for employment in the upcoming EZ.
	• Land Value	• The government rate for land is low. The participants demanded that the market rate for land be assessed and compensation to be provided accordingly.	• The market rate of land would be assessed. Compensation would be provided as per legal requirement and BEZA's guidelines.
	• Opportunities for business during construction phase.	• The participants expressed interest in availing business or employment opportunities during the construction of the EZ. They are keen to provide construction materials.	• The option of procuring construction raw materials from the locals as per the BEZA guidelines may be assessed.
		• The participants expressed that they do not have quality schools	• Road communication

	• Development social infrastructure	or educational institutions or technical college in their locality. The project may consider developing some educational institutes for the benefit of the locals. Also, they do not have good hotels or motels in the area. Considering the future economic activities brought about by the proposed EZ, hotels or guest houses may be established.	may be established in the EZ. Establishment of educational institutes open to locals and potential employees of the EZ may be established.
Local Youth Group (18 Participants)	• Employment opportunity • Skills training to enhance the competency	• If the project is developed, various job opportunities will be created. Youth group noted that the project affected youths should be prioritized for employment opportunities. • Youth group noted that training relevant to the activities in the EZ should be provided so that youth can become fit for employment in the EZ.	• Employment opportunities for the local youths shall be provided on a priority. • The project may take into consideration of establishing a college and health center.
Women Group (09 participants)	• Safety Issue • Employment • Trainings needed	• The women group expressed concerns about the potential safety issue that may arise from migrant labour/labour arriving from different locations to work in the construction of the project. • The women of the locality also want to work in the EZ. They wanted equal opportunity as like the men. • Skill development trainings suitable for women should be provided by the project so that they can prepare themselves for employment	• The project should develop camps for workers within the EZ site away from locals. A robust GRM should be established. • Priority may be given to women for employment. • The project should arrange training programs to train the women in skills necessary for employment in the EZ.

Summary of Social Impacts

•The development of the project would cause direct impact on approximately 230 PAHs in terms of household of who'll be losing their land and other assets.
•The development of the project would cause direct impact on 14 household structure within the boundary of EZ.
•The development of the project will impact the existing livelihood patterns as it will disrupt income generated from cultivating crops.
•The existing economic structure will be impacted due to the development of the EZ, as that will potentially bring new types of jobs and livelihood opportunities that are different from the livelihood opportunities associated with farming.
•The project requires a detailed social assessment and the development of a comprehensive Resettlement Action Plan which comprises of resettlement, livelihood generation and livelihood restoration strategies.
The project preparation should also consider the existing levels of literacy and skills in the area, to ascertain skill requirements for the PAPs to take advantage of the new jobs that are created during the construction as well as operation phases of the EZ.

11.8. Conclusion

- For the development of the proposed EZ, BEZA proposes to obtain 304.07 acres of land, all the land is privately held.
- The project will affect about 230 PAHs (~1115 PAPs) in terms of Household who'll be losing their land and other assets, additionally 14 household structures will be affected by the project within the project boundary. Thus, a detailed social impact assessment and Resettlement Action Plan will be required prior to acquisition of land.
- The development of the project will impact the existing livelihood patterns as it will disrupt income generated from cultivating crops. The existing economic structure will be impacted due to the development of the EZ, as that will potentially bring new types of jobs and livelihood opportunities that are different from the livelihood opportunities associated with farming.
- The project preparation should also consider the existing levels of literacy and skills in the area, to ascertain skill requirements for the PAPs to take advantage of the new jobs that are created during the construction as well as operation phases of the EZ.
- The project requires a detailed social assessment and the development of a comprehensive resettlement Action Plan which comprises of livelihood generation/restoration strategies and a Gender Action Plan.
- 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.

12. Environmental Review

12.1. 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)

12.2. 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 and consultation with stakeholders.
  - 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.

12.3. 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 107: 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 (followed by Environmental Clearance Certificate) is to be obtained from DoE
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 if such structures are proposed.	Necessary permission would need to be taken for construction of such structures

Name	Key Requirement	Applicability	Remarks
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 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.	Not applicable.	Regulatory authority Ministry of Water Resources and FCD
Bangladesh Water Act 2013	• As per the act no person or organization is allowed to cause alteration of water course without permission from authority • withdrawal of groundwater	Applicable (for extraction of Ground Water).	Regulatory authority is National Water Resource Council
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
The Vehicle Act, 1927 The Motor Vehicles Ordinance, 1983 The Bengal Motor Vehicle Rules, 1940	To regulate vehicular exhaust emissions	Applicable as heavy vehicle movement is involved both during construction and operation phase	Regular maintenance and up keeping of the vehicles should be carried out. Regulatory authority is Bangladesh Road Transport Authority
The 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

Name	Key Requirement	Applicability	Remarks
National Environment Management Action Plan 1995	Conservation of natural habitats, biodiversity, 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 footprints 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 footprints etc.
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
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

12.4. Project Description

With the vision of improving the economy of the country and generating livelihood for the population, Government of Bangladesh (GoB) has planned an era of organized industrialization by following the footsteps of other South Asian countries. GoB set up Bangladesh Economic Zones Authority (BEZA) as the nodal agency and regulator of EZ development within the country. BEZA has set forth an ambitious target of developing 100 EZs in the coming 15 years spread across various locations of Bangladesh.

In line with the aspiring growth plan of the GoB, BEZA has envisaged and planned the development of twelve prospective growth locations as economic zones (EZs) at various locations Across the country. BEZA (through the funding from World Bank) has engaged PricewaterhouseCoopers Private Limited (PwC) in association with Mahindra Consulting Engineers Limited (MACE) and Infrastructure Investment Facilitation Company (IIFC) as sub consultants to undertake feasibility study of these project sites.

Proposed Bhola EZ is one of these 12 sites.

Proposed EZ is spread over an area of approximately 304.07 acres and is located in Bhola Sadar Upazila, Bhola district of Barisal division. Proposed EZ has no direct road connectivity to other parts of Bangladesh. It is connected to other parts of Bangladesh via Ferry and IWT. Proposed EZ is adjacent to zila road (LGED road) and it does not require a separate access. Nearest highway connectivity is Bhola-Barisal highway (N809) which is ~30 km from the proposed EZ. N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). Currently there is no rail network in the vicinity of the proposed EZ. The nearest seaport at Mongla is at a distance of ~206 km from the proposed EZ. Chittagong seaport is at distance of ~215 km from the proposed EZ. Barisal river port is the nearest river port which is located at a distance of ~53 km from the proposed EZ.
River Ganeshpura is located at a distance of 1.2 km from the proposed EZ which could act as source of surface water for the proposed EZ. The groundwater depth in the region of the proposed EZ varies from 200 to 300 ft. The nearest power source is Bangla bazar sub-station (~18 km) with total capacity of 20 MvA and surplus capacity of ~4 MvA. Nearest gas station is Bhola gas station which is located at a distance of ~10 km from the proposed EZ. Utility requirements (power, water and gas). BEZA may request relevant nodal agencies to extend the utility connection to the proposed EZ.

Based on the regional landscape and site intrinsic features, suitability of various industrial sectors has been assessed. The following industrial sectors emerged out as the potential industrial mix for the proposed EZ-

- Food and Beverages
- Non-Metallic Minerals
- Chemicals
- Agro based products

Master Plan of proposed EZ is furnished in the figure on the next page.

Figure 77: Master Plan of the Proposed EZ site

Source: MACE analysis

12.5. Baseline Scenario

12.5.1. Location and Study Area

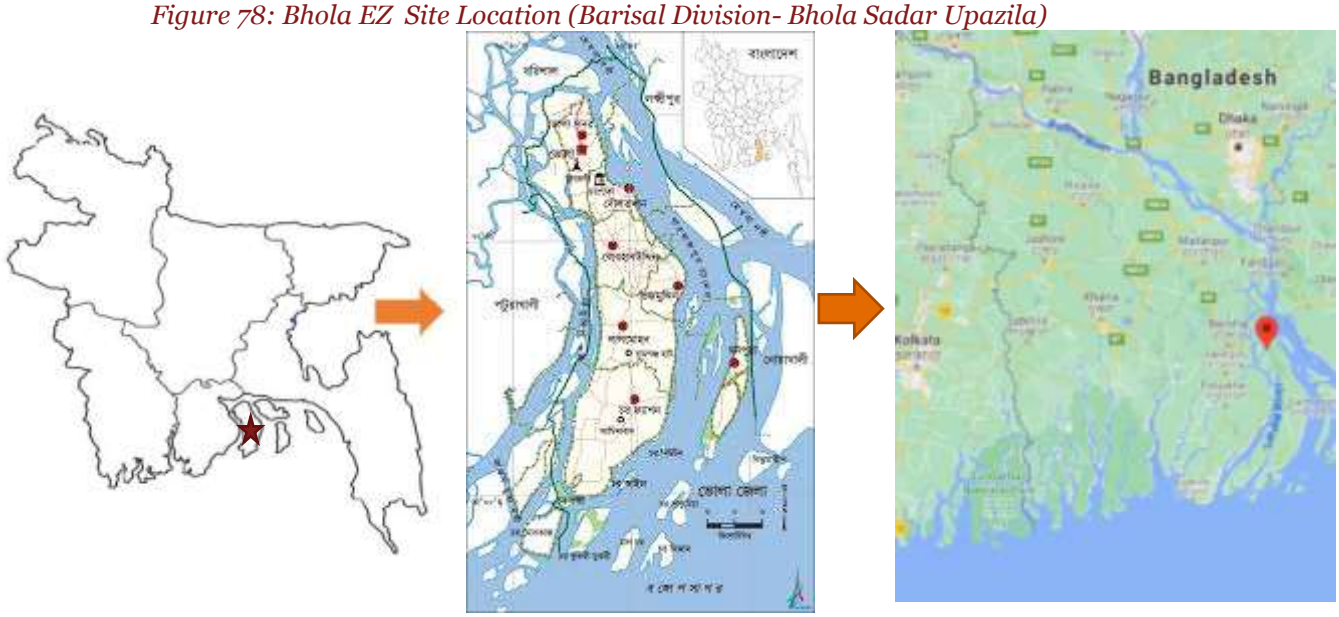
The proposed EZ is located in Bhola Sadar Upazila of Bhola district in Barisal division of Southwest Bangladesh. The district is in the South central part of Bangladesh with an area of 3737.21 square km. It is bounded by Lakshmipur and Barisal District to the north, the Bay of Bengal to the south, by Lakshmipur and Noakhali districts, the (lower) Meghna river and Shahbazpur Channel to the east, and by Patuakhali District and the Tetulia river to the west.

Bhola EZ is located in the Bhola Sadar Upazila of Bhola District in Bangladesh. It is surrounded by the following:

- Lakshmipur and Barisal districts on the North
- Bay of Bengal on the South
- Lakshmipur and noakhali districts, Meghna river and Shahbazpur channel on the East
- Patuakhali and Barisal districts and Tentulia river on the West.

The proposed site falls within 65 Paschim Char kali mouza of Bhola Sadar Upazila, Bhola district.

Figure 78: Bhola EZ Site Location (Barisal Division- Bhola Sadar Upazila)



Source: Google Map and PwC Analysis

Table 108: Proposed EZ Site Information

Parameters	Details
Site co-ordinates	22°40'25.09"N 90°35'36.44"E
Site boundaries on East	Settlements followed by agricultural land (single and double cropping), village road, and water channel
Site boundaries on West	Settlements followed by agricultural land (single and double cropping), village road, Banker Hat Co-operative College, market and Masjid.
Site boundaries on North	Zila road (connecting regional highway R890) followed by settlements and agricultural land.

Parameters	Details
Site boundaries on South	Settlements followed by agricultural land (single and double cropping)
Total area of the site	304.07
Privately owned land	304.07
Government Land/ *Khas* land	N/A

Source: Google Map and PwC Analysis

Figure 79: Location of the proposed EZ on Google Earth

Source: Google Earth; PwC & MACE analysis

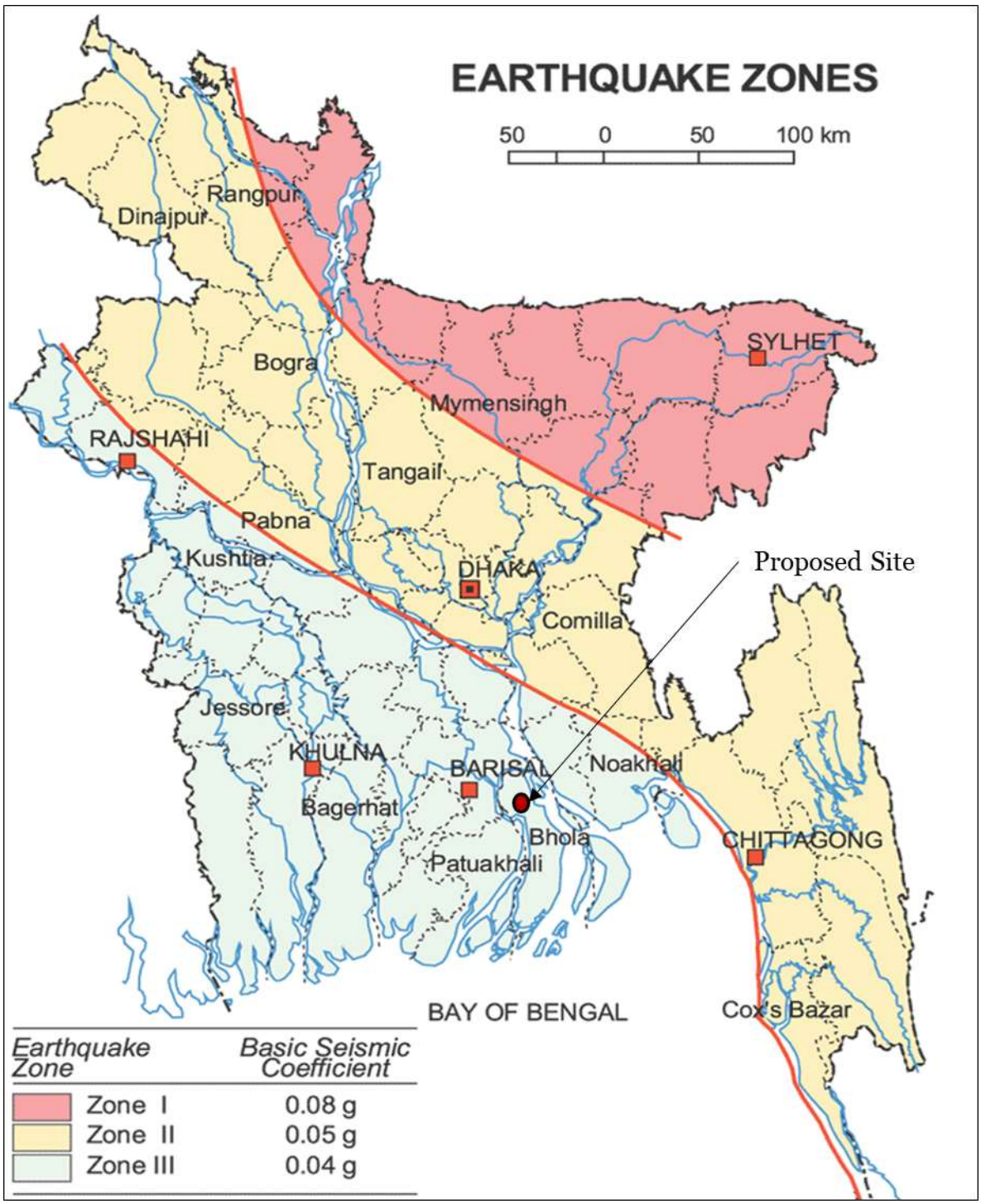
Ganeshpura river (tributary of River Meghna) is located at 1.2 km from the proposed EZ. The proposed site is located on the flood plain of the river. There is another stream flowing towards eastern side of site (300 meter) and river Meghna is located at distance of 9 Km from the proposed site. All these rivers and streams are perennial in nature and are identified as key feature of the site surrounding and currently has a significant role on the topography of proposed 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 and Social review. Zila/Upazila level secondary information was also collected for various environmental and social components irrespective of any demarcated boundary.

12.5.2. Topography and Seismology

From the site visit, it is observed that the site is on an average level of 8 to 10 feet below adjacent approach road. Also, there are low lying areas within the site. This necessitates suitable level of site filling within EZ site for which contour study has been carried out. Based on the study of contour, it is found that the site needs to be filled for a depth of about 1.8 m (10 feet) on an average and the total estimated site filling quantity is about 2214440 cum. Dredged sand from River Ganeshpura is suggested as a source for site filling. However, detailed hydrostatic study has to be carried out for identifying the suitable point of dredging and necessary permission has to be obtained from Bangladesh Inland Water Transport Authority (BIWTA) authorities for dredging of sand from the river for site filling.

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 III.

Figure 80: Seismic Zoning Map of Bangladesh



Source: Prime Minister's Office Library, Dhaka

12.5.3. Climatological Condition

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

The annual average temperature of the district varies from maximum 32.7°C to minimum 11.6°C and the average rainfall of the district is 2360 mm.[209]

12.5.4. Land use Pattern

The proposed site is predominantly agricultural (2 crops and single crops mostly) in nature. The economy of Bhola district is primarily dominated by agricultural production. The proposed site devoid of any significant tree cover. Few sporadically grown trees are found within the area earmarked for development of EZ. There is no presence of any forest land in an around the proposed EZ site. Ganeshpura river passes is adjacent through the proposed EZ which is perennial in nature. Land use of proposed EZ site is presented in following table .

Table 109: Present Land-use of Proposed EZ Site

SL No	Name of Mouza	*Mouza Wise different categories of Land (Acre)*					
		Home	*Garden*	*Pond*	*Vita*	*Nul*	*Doba*
1	65 Paschim Char kali	16.04	5.05	1.92	2.87	274.73	3.46
	Total	**16.04**	**5.05**	**1.92**	**2.87**	**274.73**	**3.46**

Source: Plots index of AC Land and BEZA office

12.5.5. Soil Environment

The soil of Bhola district is basically sandy, alluvial and bears close affinity with the soil of the Young Meghna Estuarine Floodplain. On the northern part of the district there exists underground layer of pebbles from the site visit, it is found that the proposed site area has mixture of sandy, silty and loamy soil. As indicated by Agriculture Department, almost entire proposed area is used for agricultural activity (Single and double crops).

12.5.6. 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 Bhola EZs may create significant air pollution.

To establish the baseline of the study area, ambient air quality monitoring was conducted by Bangladesh Environmental Engineering Training & Lab Services Ltd (BEETLSL), Bangladesh on January 16, 2021 to January 17, 2021. Ambient air (outdoor) quality of the project area was monitored for the parameters of NOx, SOx and Suspended Particulate Matter. The monitored results for ambient air quality are furnished in the following table –

[209] *District Statistics*

Table 110: Ambient air quality for Project Area

Parameter	Unit	Concentration Present (Longitude: 90°35'46.42"E Latitude: 22°40'10.60"N)	IFC Standard mg/m3	Bangladesh Standard	Duration (hours)	Method of Analysis
SPM	µg/m³	145	-	200	24 Hr	Gravimetric
SO_2	µg/m³	13	125	365	24 Hr	West- Geake
NO_2	µg/m³	25	200 (1 Hr)	NYS	24 Hr	Jacob and Hochheiser

Source: Primary monitoring conducted by BEETLSL, Bangladesh

The detailed report on Ambient Air Quality Monitoring is furnished in the **Annexure.**

12.5.7. Noise Environment

Based on the secondary information and the site reconnaissance survey it was observed that baseline noise level was quite satisfactory. 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. To establish the baseline condition of noise environment monitoring of noise level was carried out by Bangladesh Environmental Engineering Training & Lab Services Ltd (BEETLSL), Bangladesh on January 16, 2021 to January 17, 2021. Ambient air (outdoor) quality of the project area from the project area. 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 111: Noise quality in Project Area

Sample Location	Land Use Category	Time				Noise Level (dBA) (LAeq)	
		Day		Night		Day	Night
		Start	End	Start	End		
Economic Zone	Industrial Zone (proposed)	9.00 AM	4.59 PM	6.00 PM	1.59 AM	52.8	35.9

Noise level standard:

Bangladesh ECR -1997Standard for	Day Time	Night Time
Industrial area	75	70
Commercial	70	60
Mixed area	60	50
Residential area	55	45
World Bank / IFC Standard	Day Time	Night Time
Industrial area	70	70
Residential; Intuitional; Educational	55	45

Source: Primary monitoring conducted by BEETLSL, Bangladesh

The detailed report on Ambient Air Quality Monitoring is furnished in the **Annexure.**

12.5.8. Water Environment

Based on the assessment, it is found that the total potable water demand for the proposed EZ would be about 4 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.

12.5.8.1. Ground Water

Based on the discussion had with officials and local, it is understood that the groundwater is at a depth of 25-40 feet and is potable in nature. Hence, groundwater shall be relied to meet the initial water demand of proposed EZ during construction stage.

To understand the ground water quality of the study area ground water sample was drawn by Bangladesh Environmental Engineering Training & Lab Services Ltd (BEETLSL), Bangladesh on January 16, 2021 for further analysis. Sampling of Ground water has been conducted by following grab sampling method. The analyzed result of ground water quality of the project area is furnished in below table. The detailed report on Ground Water Monitoring is furnished in the **Annexure.**

Table 112 : Ground water quality in Project Area

SL No.	Ground Water: Parameters	Concentration Present	Unit	ECR 1997 Standard for Drinking Water	Methods of Analysis
1.	Total Dissolved Solids (TDS)	367	mg/L	1000	APHA22nd EDN.2012 (2540C)
2.	BOD	0.1	mg/L	0.2	APHA22nd EDN.2012 (5210 B)
3.	COD	1.1	mg/L	4	APHA22nd EDN.2012 (5220 B)
4.	Turbidity	2.6	NTU	10	APHA22nd EDN.2012 (2130 B)
5.	Total Coliform (TC)	00	CFU/100ml	0.00	APHA22nd EDN.2012 (9222H)
6.	Fecal Coliform (FC)	00	CFU/100ml	0.00	APHA22nd EDN.2012 (9222B)
7.	Total Iron (Fe)	0.4	mg/L	0.3-1.0	APHA22nd EDN.2012 (3500- Fe)

Source: Primary monitoring conducted by BEETLSL, Bangladesh

12.5.8.2. Surface Water & Drainage

Ganeshpura river (tributary of River Meghna) is located at 1.2 km from the proposed EZ. The proposed site is located on the flood plain of the river. There is another stream flowing towards eastern side of site (300 meter) and river Meghna is located at distance of 9 Km from the proposed site. Based on the discussion had with UNO officials, it is understood that these rivers are perennial in nature. It is proposed to provide suitable water intake system near the river basin at an approximate distance of 2 km from the site based on proposed tentative alignment. However, detailed study and hydrogeological investigations need to be carried out to determine the exact intake point and intake system. Hence, it is suggested that suitable intake system and intake point shall be proposed during detailed engineering stage.

Figure 81: Details of external water supply system

Source: MACE analysis

To understand the ground water quality of the study area surface water sample was drawn by Bangladesh Environmental Engineering Training & Lab Services Ltd (BEETLSL), Bangladesh from the stream adjacent to the proposed EZ at eastern direction on January 16, 2021 for further analysis. Sampling of surface water has been conducted by following grab sampling method. The analyzed result of surface water quality of the project area is furnished in below table. The detailed report on Surface Water Monitoring is furnished in the **Annexure 39.**

Table 113 Surface water quality in Project Area

SL No.	Surface Water: Parameters	Concentration Present	Unit	ECR 1997 Standard for Surface Water	Methods of Analysis
1.	P^H	6.8	-	6-9	APHA 22nd EDN.2012 (4500H+B)
2.	Electrical Conductivity (EC)	157	µS/cm	1200	APHA22nd EDN.2012 (2510 B)
3.	Total Dissolved Solids (TDS)	104	mg/L	2100	APHA 22nd EDN.2012 (2540C)
4.	BOD_5	14.7	mg/L	50	APHA 22nd EDN.2012 (5210 B)
5.	COD	23.1	mg/L	200	APHA 22nd EDN.2012 (5220 B)
6.	Chloride $(Cl)^-$	45	mg/L	600	APHA22nd EDN.2012 (4500 Cl-)

Source: Primary monitoring conducted by BEETLSL, Bangladesh

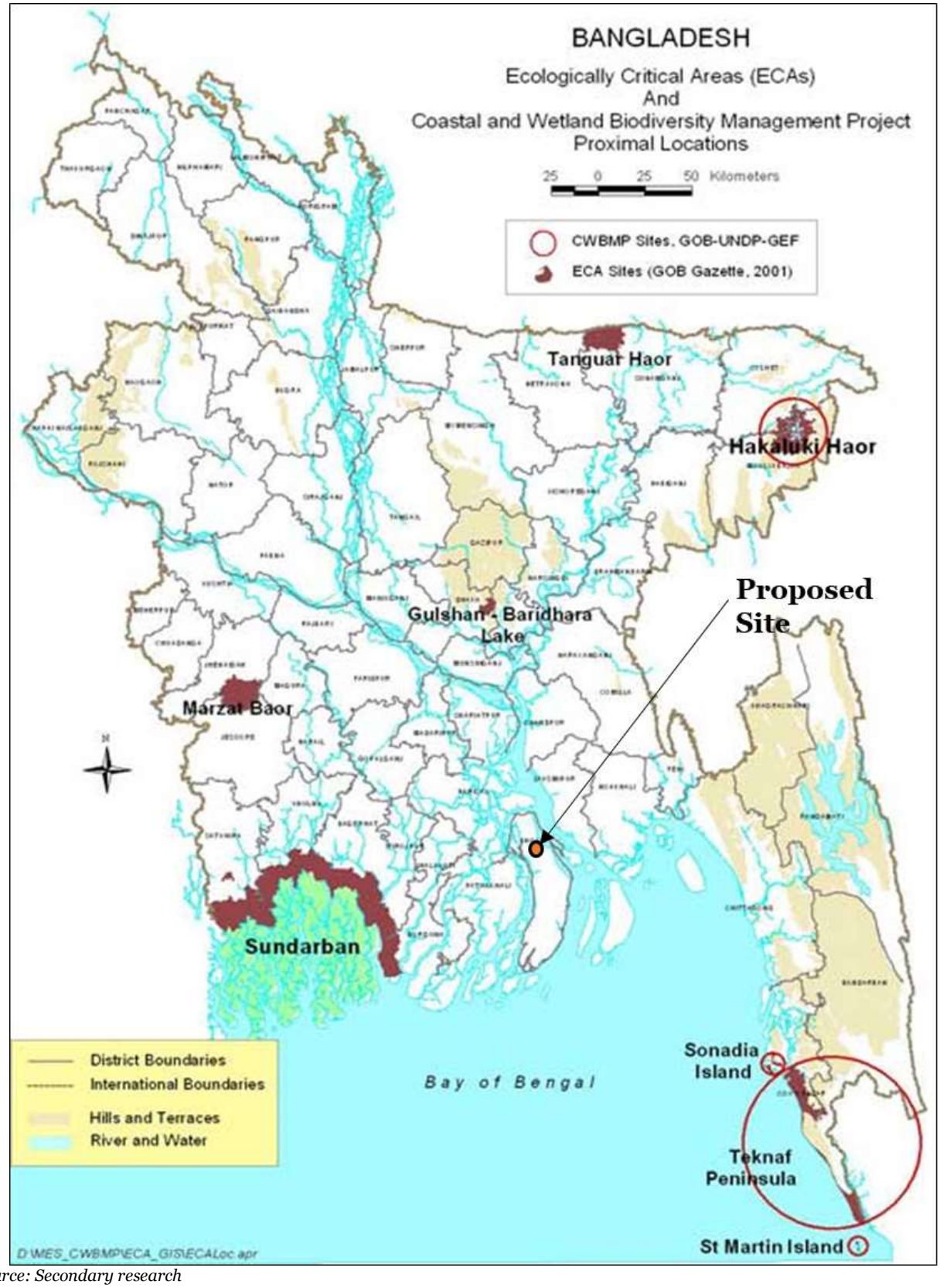
12.5.9. Biological Environment

12.5.9.1. 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 (Conservation and Security) Act, 2012 and Forest Act respectively. There is no protected area or ECA

located within the study area of 10 Km radius from proposed site boundary, however Ganges-Brahmaputra-Meghna delta Key Biodiversity Area is located about 10 km distance from the proposed site. The maps of Bangladesh showing location of ECAs and protected areas distributed across the country is furnished in following figures.

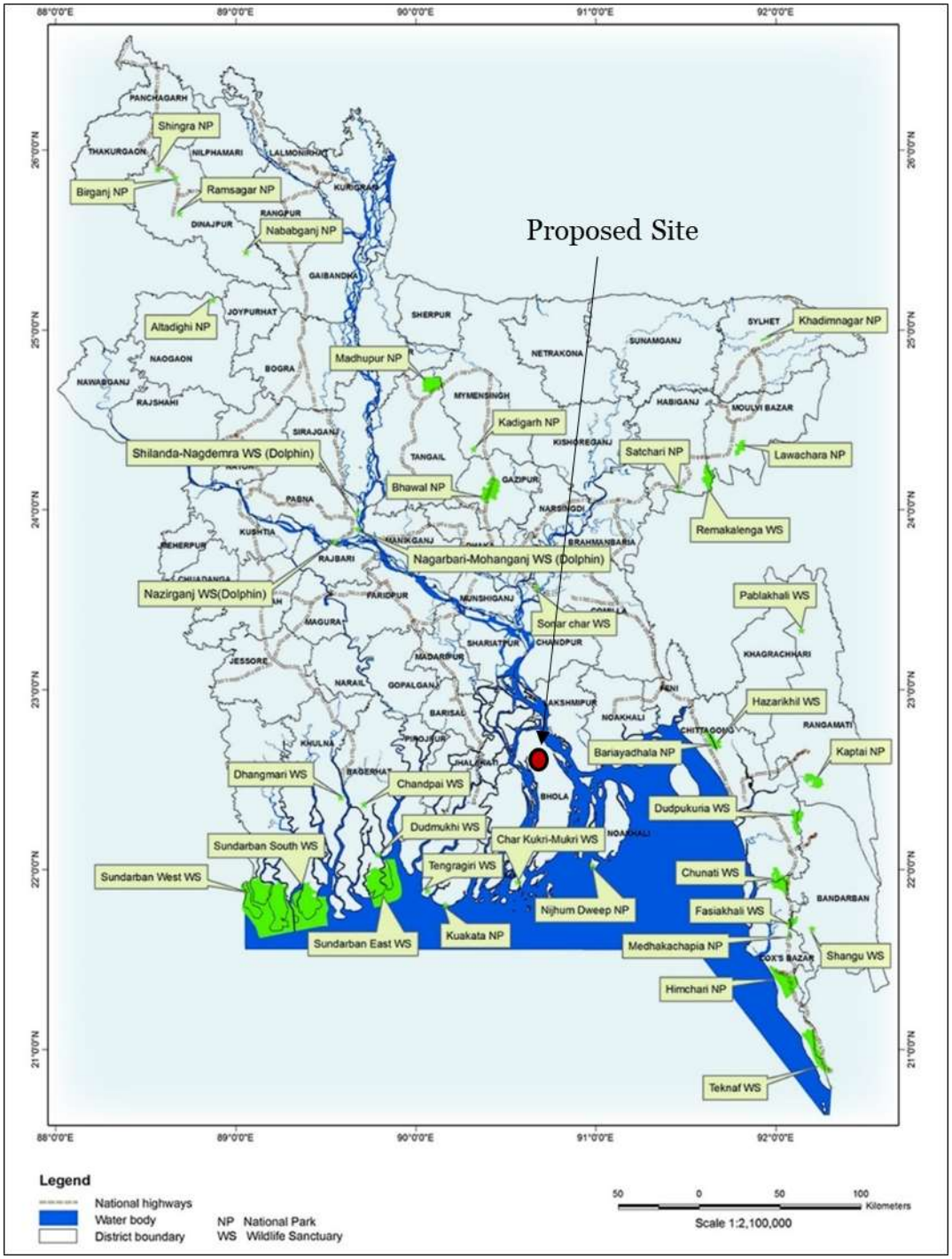
Figure 82: Ecologically Critical Areas of Bangladesh[210]



Source: Secondary research

[210] *http://www.doe-bd.org/cwbmp/*

Figure 83: Protected Areas of Bangladesh

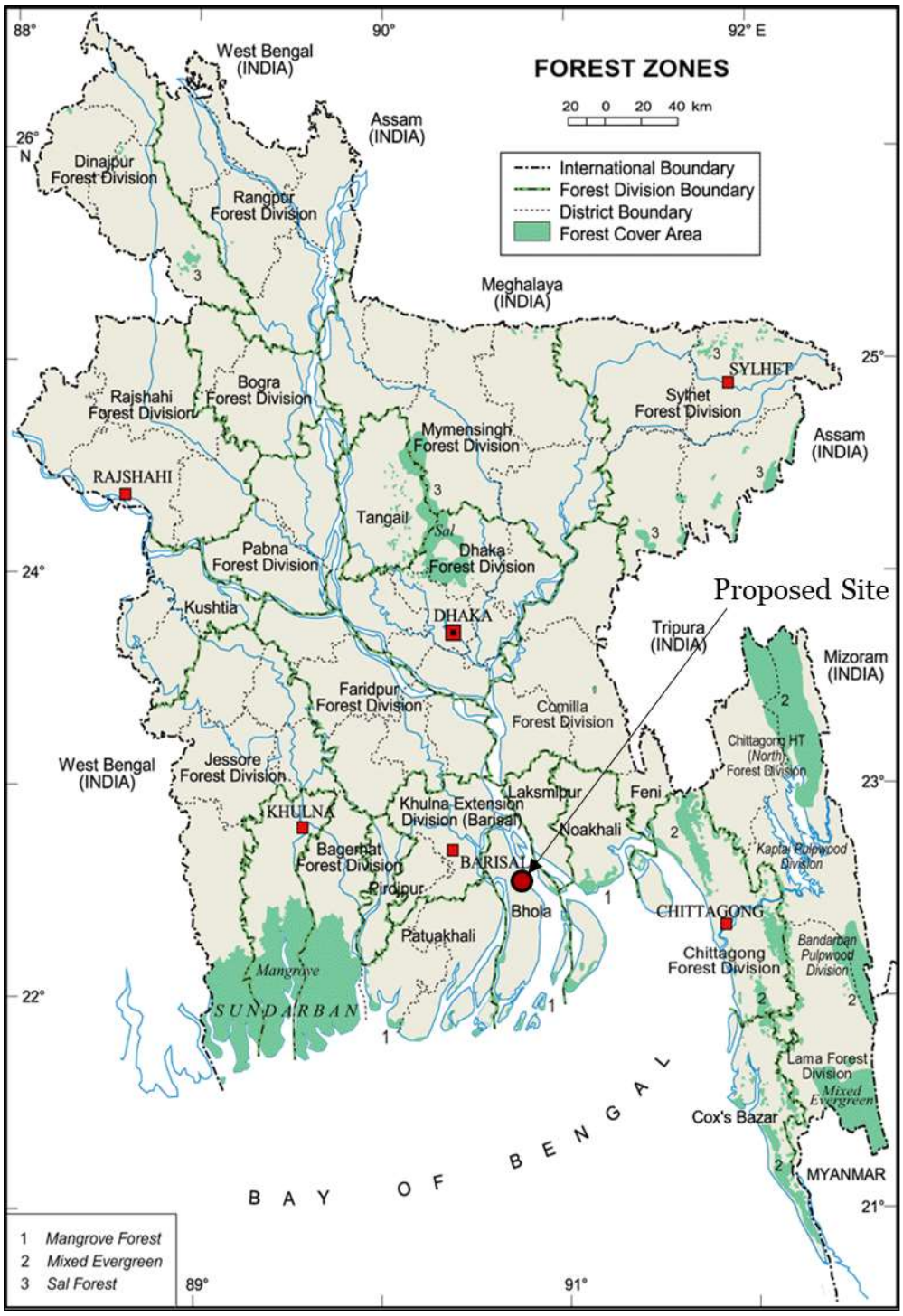


Source: Forest Department of Bangladesh

12.5.9.2. Forest Area/Vegetation Cover

There is no forest land within proposed area. No important habitats/Ecologically Critical Area (ECA)/forest etc. located within the site or vicinity. Sporadic vegetation cover on the proposed site is observed. The forest map of Bangladesh is furnished in below figure.

Figure 84: Forest Areas of Bangladesh



Source: Prime Minister's Office Library, Dhaka

12.5.9.3. Flora & Fauna

There is no forest area within the study area. from the site. There is also no presence of any eco-fragile zone/protected area/Ramsar site or any other ecologically important wetland/nesting-breeding ground. There is no record of any rare/endemic species or sighting of migratory species from the proposed project site and study area. Information pertaining to ecological resources were collected from Upazila Forest and Fisheries Officers and Local community. The flora and fauna recorded from study area is presented in below section.

Flora

The common varieties of trees that are found in the project area are Banyan tree (*Ficus benghalensis*), Peepul (*Ficus religiosa)*, *Pakur* (*ficus infectoria*), Simul or Cotton tree (*Bombax malabaricum*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Jackfruits tree (*Artocarpus heterophyllus*), Babla (*Acacia nilotica*), Jam/Black berry (*Syzygium cumini*), Guava (*Psidium guajava*), Banana (*Musa sapientum*), Bel/Wood apple (*Aegle marmelos*), Tamarind (*Tamariandus indica)*, Palas and Hijal (*Barringtonia acutangula) etc.*

Fauna

Beside domesticated mammals like cow, buffalo, goat, dog, cat etc., the recorded mammalian species from the project and its surrounding are badger civet, mongoose (*Herpestes edwarsi*), jungle cat (*Felis chaus)*, fishing cat (*Prionailurus viverrinus)*, rabbit, jackal (*Canis aureus)*, bat (*Rousettus leschenaulti),* rat (*Rattus rattus)*, Bengal Fox (*Vulpes bengalensis*), Mole Rat (*Bandicota indica*), Squirrel (*Callosciurus pygerythrus*) etc.

Commonly found bird's species in the project area are vulture (*Gyps bengalensis)*, kite (*Milvus migrans),* hawk, owl (*Bubozcylenensis*, crow (*Corvus macrorhunchos)*, cuckoo (*Cuculu microplerus)*, kingfisher (*Alcedp attjos)*, green pigeon, wood pigeon and different kinds of doves (*Streptohelia suratennis) etc*. Amongst water birds, the most important are the common coot, the moorhen and several kinds of herons *(Mycticarax mycticarax)* and crane.
Among herpetofauna snakes are fairly common, the poisonous varieties being the cobra and the karait,the banded katait are also occasionally found. Other species includes southeast Asian toad (*Bufo melanostictus*), garden lizard (*Calotes versicolor*), Skink (*Mabuya mabuya*), Gekko (*Gekko gecko*), House Lizard (*Hemidactylus brooki*) etc.

Fishes recorded from ponds, rivers, creeks, beels etc' ruhi (*Labeo rohita*), catla (*Catla catla*), mrigel (*Cirrhinus mrigala*), kalbaush (*Labeo calbasu),* sarpunti (*Puntius sarana*), chital (*Notopterus chitala*), airh (*Mystus aor*), pabda (Ompok pabda), bacha (*Eutropichthys vacha*), pangas (*Pangasius pangasia*), koi (*Anabas testudineus*), shing *(Heteropneustes fossilis*), magur *(Clarius batrachus)* etc.

The project area is located about 10 km distance from the Ganges-Brahmaputra-Meghna delta, which is a key biodiversity area (Important Bird). The species from recorded from the are provided below:

Common Name	Scientific Name	Current IUCN Red List Category	Season
Bar-headed Goose	Anser indicus	LC	winter
Common Shelduck	Tadorna tadorna	LC	winter
Eurasian Curlew	Numenius arquata	NT	winter
Spoon-billed Sandpiper	Calidris pygmaea	CR	winter
Spotted Greenshank	Tringa guttifer	EN	winter
Indian Skimmer	Rynchops albicollis	VU	winter
A4iii Species group - waterbirds	n/a	n/a	unknown

Source:http://datazone.birdlife.org/site/factsheet/ganges-brahmaputra-meghna-delta-iba-bangladesh/details

12.5.10. Social Environment

The total area proposed for EZ development is 304.07 acres and is located in the the mouza 65 Paschim Char kali. All the area under the proposed EZ is privately held. 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 was taken as 3 times the cost obtained from AC land office for all categories.

Based on consultations with the community, it was estimated that the number of Project Affected Persons (PAPs) will be ~ 1115 within the demarcated project area. This would require the development of a comprehensive Resettlement Action Plan for the affected people.

The proposed site boundary superimposed on Mouza Map and affected details of Plots are furnished in **Annexure 38** in this report.

12.5.11. Demography

The Upazila has a total population of approximately 430 thousand (~24% of the total 1776 thousand population of Bhola), and with a population density of 1062 people per sq.km. As per the housing and population census 2011, the Upazila is largely urban, with 1 municipality, 9 wards and a total of 9 unions, 57 mauzas and 46 villages with an urbanization rate of 20.26%.

Approximately 49% of the Upazila population is male and 51% of the population is female, with the sex ratio of 99, which is lower than the national sex ratio of 105.The average literacy rate is 45.2% and is higher for women than men by .04 percentage points. Approximately 1.4% of the population suffers from speech, vision, hearing, mental, and physical disabilities and autism. Majority of the population is Muslim (96%), followed by Hindu (3%). Other religions are below 1%.

High poverty and low-income levels are indicated by the housing structure: over 87.8% of houses are kutcha houses or jhupris and only 63.6% of houses have sanitary toilet facilities with water seals. 36.4% of the houses have non-sanitary toilets or no toilets at all. Most houses (97.5%) reply on tube wells for drinking water and 25.1% households have an electricity connection.

12.5.12. Social Infrastructure

Bhola sadar Upazila has the following social infrastructure.

Table 114: Social Infrastructure at Upzila level

Social Infrastructure in Bhola Sadar Upazila	
Educational Infrastructure	
Government primary school (class I-V)	95
Registered primary school (class I-V)	95
Kindergarten school (pre schooling)	12
NGO school	22
Government secondary school	2
Non-government secondary school	62
School & college (operating jointly)	4
Government college	2
Nongovernment college	11
Madrasah	45
Kawmi madrasah	16
Ebtedayee madrasah	88

Technical and vocational institution	2
Medical college	0
Health Infrastructure	
Upazila Government health complex	1
Private hospital/clinic	8
Diagnostic centre	8
Religious Infrastructure	
Mosques	963
Eid-Gah	32
Temples	49
Churches	0

Source: Bangladesh Bureau of Statistics

12.5.13. Livelihood and Economy

According to site assessment and upon interactions with UNO officials, it can be inferred that Bhola is agricultural intensive district. This is supported by the housing and population census (2011), which finds that majority of the population works in agriculture and allied activities with approximately 2.5% working in industry and 14.2% working in services. According to the district statistics (2011), the Upazila has rice mills (but no auto rice mills), handlooms, small scale and cottage industries, bamboo and cane industries, wooden furniture industries, sawmills, tailoring shops, amongst other small-scale commercial units. According to the district statistics it had no textile mills, garment factories, jute mills, or sugar mills; however, our due diligence and site visits show textile, tea, and jute mills to be operating in the Upazila. Additionally, according to UNO officials, there are numerous Electrical Pole and Railway sleepers manufacturing industries in the vicinity of the proposed site.

According to Population and Housing Census 2011, 41027 people or 12% of Bhola Sadar's total population is employable. Among the employed people, only 1.9% of people are looking for jobs. Outside of this, 11.6% of the total population is engaged in household work.

12.6. 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. 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 115: Classification of Social and Environmental Components

Components	Sub-component	Parameters
PHYSICAL		
Water	Surface Water and Ground Water	Hydrology, Water Qaulity
Air	Air	Air Quality

Components	Sub-component	Parameters
Noise	Noise	Noise Level
Land	Soil	Erosion, Soil Quality
ECOLOGICAL		
Aquatic	Fisheries/Aquatic Species and Aquatic Ecsystem	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

12.6.1. 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 116: 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 ecosystem		√			
B	**Construction Phase**						
i	Development of EZ and Construction of Boundary wall, embankment, Access Road, electrical & water supply system and administration building	Loss of Top soil		√			
		Soil contamination due to spillage of material	√				
		Surface water contamination	√				
		Air pollution	√				
		Noise pollution	√				
		Increase in traffic	√				
		Un pleasant view	√				
		Impact on Health & safety	√				
		Social impact	√			√	
		Removal of Trees	√				
C	**Operational Phase**						
i	Development of Off-site Infrastructure, i.e. Boundary wall, embankment, access road, water supply system, electrical supply line and	Impact on the ambient Air Quality		√			
		Noise Pollution		√			
		Potential surface water pollution due to industrial waste discharge		√			

S. No.	Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
			Short Term	Long Term	Short Term	Long Term	
	administration building and operation of industries	Impact on river hydrology due to construction of long embankment along the river		√			
		Economic Development				√	
		Accessibility				√	
		Groundwater abstraction		√			
		Potential for land contamination due to industrial activities		√			
		Increased Run-off		√			
		Generation of Employment				√	
		Natural drainage pattern		√			

12.6.2. Impact on Climate and Meteorology

12.6.2.1. 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

- 10.52 % (31.97 acres) Greenery/Open Space inside the EZ has been recommended in the masterplan
- Plantation shall be carried out at suitable location to minimize impact on micrometeorology

12.6.3. Impact on Land and Natural Drainage

12.6.3.1. Pre-Construction and Construction Phase

From the site visit, it is observed that the site is on an average level of 8 to 10 feet below adjacent approach road. Also, there are low lying areas within the site. This necessitates suitable level of site filling within EZ site for which contour study has been carried out. Based on the study of contour, it is found that the site needs to be filled for a depth of about 1.8 m (10 feet) on an average and the total estimated site filling quantity is about 2214440 cum. Dredged sand from River Ganeshpura is suggested as a source for site filling. However, detailed hydrostatic study has to be carried out for identifying the suitable point of dredging and necessary permission has to be obtained from Bangladesh Inland Water Transport Authority (BIWTA) authorities for dredging of sand from the river for site filling.

The impacts on land due to the project are as follows:

- Dredging and landfilling activity
- 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

12.6.3.1.1. 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 nearby aquatic 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.

12.6.3.1.2. 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 footprint area and surroundings within 100 m distance. The impact is restricted to the construction phase of the project.

12.6.3.1.3. Landfilling with dredged material

Based on the study of contour, it is found that the site needs to be filled for a depth of about 1.8 m (10 ft) on an average and the total estimated site filling quantity is about 2214440 cum. Dredged sand from River Ganeshpura is suggested as a source for site filling.

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.

12.6.3.1.4. 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 wastepaper 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 1.8 m from present level, it is likely that the surface run off from site area will be drawn to the nearby surface water system. 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.

12.6.3.1.5. 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 in nature. Storm water run-off from the contaminated area can pollute the downstream soil and water quality of adjacent river, other waterbodies.

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 during filling operations. Proper embankment should be provided in the downstream areas to minimize soil percolation to river.
- 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 is 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.
- Necessary permission has to be obtained from Bangladesh Inland Water Transport Authority (BIWTA) authorities for dredging of sand from the river for site filling
- 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 rainwater;
- 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, 10.52% (31.97 acres) Greenery/Open Space inside the EZ. The green area shall be declared as the green zone of the EZ
- 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 100 m interval

12.6.3.2. Operation Phase

12.6.3.2.1. 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 Food & Beverages - Processed food, Agro-based, chemical and non-metallic minerals etc. are envisaged for this EZ. These industries are anticipated to be polluting to some extent and hence discharge of the generated sludge, effluent and solid waste shall be done in a disciplined manner. The nature of waste likely to be generated in the EZ are described in the subsequent section.

12.6.3.2.2. Waste Generation

Type of waste likely to be generated from the proposed EZ has been furnished in below table.

Table 117: Waste Generation from various industries

Industry Type	Nature of Waste
Food & Beverage Sector	Effluent generated from industrial operations contains high concentration of organic and inorganic substance causing significant polluting phenomena. The wastewater are characterized by high BOD, Suspended Solids and oil concentrations as well as emitting smells from acidification. Agro-based waste, packaging material from food processing industries etc. are other source of solid waste. Effluent containing organic and inorganic substance may cause significant pollution if properly not managed. Effluent of Sugar Mill may contain high level of Electrical Conductivity which is likely having harmful impact to living organisms of the ecosystem.
Agro-based:	
Chemicals Sector	Waste contains toxic and hazardous components such as free ammonia, numerous ammonium compounds, phosphate compounds, urea, Spent Catalyst (Ni; Cu; Zn; Mo; Fe Based), oil, grease and fuel from machinery, nitrogen, phosphate, potassium, sodium, silica, sulphur, fluorine etc.

Industry Type	Nature of Waste
Non-Metallic Minerals	Dust generated from the manufacturing process and eventually collected in bag house are the significant source of waste

Source: PwC Analysis

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. 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 ecosystem.

The estimation of solid waste to be generated have been presented in subsequent sections.

Table 118: Estimation of Solid waste generation

Land use pattern	acres	Population	Msw generation	Unit	Kg/day
Processing area					
Industrial plots	212.27	10742	200	gm/capita/day	2148.40
Utility	14.83	100	100	gm/capita/day	10.00
Road	38.80		10.12	kg/ha/day	158.99
Green & open space	31.97		30.36	kg/ha/day	392.94
Total processing zone	**297.87**	**10842**			**2710.32**
Public & support amenity	4.94	1000	100	gm/capita/day	100.00
Road	1.19	0	10.12	kg/ha/day	4.86
Total Non-processing area	**6.13**	**1000**			**104.86**
Total	**304.00**	**11842**			**2815.18**
Total solid waste generation in TPD					**~3 TPD**

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 aquatic 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, ETP has been proposed.
- A Common waste storage area 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 Biodegradable, 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.

- From the above only bio-degradable waste can be treated in the SW treatment facility; 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; 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; Suitable area has been earmarked for development of composting plant within EZ to handle the MSW generated.
- 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 livestock.
- 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

12.6.4. Impacts due to Dredging

12.6.4.1. Pre-Construction and Construction Phase

The preconstruction and construction phase will involve backfilling of the land to a level of +1.8 meter from current level. It is proposed that sand for the backfilling operations will be obtained by dredging from the Ganeshpura river located nearby. 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;

12.6.5. Impact on Air Environment

12.6.5.1. 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.

12.6.5.2. 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

12.6.5.3. 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. The cumulative effect of the industries proposed in the EZ may have negative impact on the air quality of the site and the nearby areas to some extent. Nature of Air emissions due to various industrial operations are furnished in the table below.

Table 119: Emissions from various industries

Industry Type	Nature of Emission
Food & Beverage Sector	Air emissions from food processing industry contains some volatile organic compounds but do not contain any hazardous compounds. These industries emit low process-air emissions. Most of the processes uses electrical power and rarely emit harmful compounds to environment. But air emissions from effluent treatment plant of these industries are a major concern. Beside this, Chlorofluorocarbons (CFCs) used as cooling agents in many refrigeration and cooling systems in food and beverage industries are having potential to damage ozone layer of atmosphere. Emission from boiler (if applicable) & DG Stack
Agro-based industry	
Chemicals Sector	Emission from such industries may contain CO, CO_2, NO_2, SO_2, VOCs, Trace Metals (Zn, Fe, Pb, Ni, Cd, Cr), Ammonia, Urea dust, Ammonium nitrate dust, Fluoride etc.
Non-Metallic Minerals	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 & Non-process related activity. Oxides of carbon, nitrogen, and sulfur are mainly produced as a byproduct of fuel combustion for power generation (if captive power plant is established). SO_2 is also produced from oxidation of volatile sulfur present in the kind of limestone used as raw material

Source: PwC analysis

Mitigation Measures

- Provision should be made for peripheral green belt all along the EZ boundary and in the buffer zones. 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 plot. 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.

12.6.6. Impact on Noise Environment

12.6.6.1. 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.

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 daytime (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.

12.6.6.2. 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. High noise levels are generally found in the textile process from fiber to fabric (spinning and weaving mill) and automated machines. From other type of industries proposed in the EZ the major source of noise generation is 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, headache, nausea and drowsiness. Propose PPEs must be made compulsory for workers working at locations where the intensity of noise is high.
- Acoustic design with soundproof 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

12.6.7. Impact on Water Environment

12.6.7.1. Pre-Construction and Construction Phase

12.6.7.1.1. 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 4 MLD. Groundwater and River Gandeshpura shall be relied to meet the water demand of the proposed EZ. It is proposed to provide suitable water intake system near the river basin. River Ganeshpura , a tributary of River Meghna is near the proposed site on the Western side at an aerial distance of 1.2 km. Based on the discussion had with UNO officials, it is understood that these rivers are perennial in nature and shall be relied to meet the water demand of the proposed EZ. It is proposed to provide suitable water intake system near the river basin at an approximate distance of 2 km from the site based on proposed tentative alignment.

12.6.7.1.2. Impact on Surface Water and Groundwater Quality

The major source of wastewater generation during construction phase is from the labour 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 neighboring water bodies including Ganeshpura River 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 topsoil 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 water body. Thus measures are required to be taken to minimize the surface water pollution.

Mitigation Measures

- 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 sandbags 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 riverbanks/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.

12.6.7.2. Operation Phase

To cater the industrial water requirement water from Ganeshpura River will be used. The development of economic zone shall lead to the generation of process and domestic effluent. As discussed in previous section, 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.

The estimation of Effluent and sewage likely to be generated have been presented in subsequent section

Table 120: Effluent quantity estimation

Land use pattern	Total area	Effluent generation	Sewage generation		Sullage generation	Total effluent, sewage and sullage generation	Infiltration @10%	Total sewage quantity
	acres	in cum/day	In %	In cum/day	In cum/day			
Processing area		**In Cum/day**						
Industrial plots	212.27	3639.59	0.72	115.00	296.56	411.56	53.17	464.73
Utility	14.83		0.72	1.07	2.76	3.83	0.50	4.33
Road	38.80				28.00	28.00	3.11	31.11
Green space	31.97						2.56	2.56
Total processing zone	**297.87**	**3639.59**		**116.07**	**327.32**	**443.38**	**59.34**	**502.73**
Non-processing area								
Public & support amenity	4.94		0.32	6.28	48.00	54.28	7.70	61.98
Road	1.19				0.86	0.86	0.10	0.95
Total Non-processing area	**6.13**			**6.28**	**48.85**	**55.14**	**7.80**	**62.93**
Total	**304.00**	**3639.59**		**122.35**	**376.17**	**498.52**	**67.14**	**565.66**

Source: MACE Analysis

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, wastewater and waste material should be stored in pervious unlined area/pond.
- Efficient Rainwater 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 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.
- 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 proposed 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

12.6.8. Impact on Biodiversity

The proposed site location is mostly agricultural in nature and devoid of any significant tree cover. Hence tree felling or associated impact like habitat loss of avifaunal/smaller mammals/ reptile community is expected to be very minimal. However, due to loss of agricultural field habitat loss of associated invertebrates, reptile, smaller Pisces etc. is envisaged. Dredging along River is also a threat to habitat and breeding/spawning ground of fishes and other aquatic fauna. Discharge of solid and liquid waste in rivers/waterbodies, shall also impact the aquatic life. Therefore, proper mitigation measures should be taken to minimize the impacts on biodiversity.

No infrastructure development activities shall be encouraged close to the river shoreline.

Mitigation Measures

Following measures must be taken as a compensatory act and an effort to negate the impact on biodiversity-

- Provision should be made for peripheral green belt with 2-3 rows of local fruit bearing tree species all along the EZ boundary. These will attract and support avifaunal and other faunal community
- Suitable green area should be proposed inside the EZ
- Dredging from river may be avoided if possible and alternative arrangement for filling material may be explored
- No waste shall be discharged in water bodies
- Suitable Buffer Area will be maintained for the river

12.6.9. 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 workplace 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 toolbox 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.

12.6.10. Flood Risk

The project site is in proximity to Ganeshpura River. To avoid inundation during monsoon season, minimum land filling of 1.8 meter is considered. It is recommended to adopt riverbank protection work in the dredging stretches and along the bank of River to protect the site and surrounding area from flooding.

12.6.11. 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.

12.7. 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
- 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

12.7.1. 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. 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 populace, potential PAPs and local elites. The details of attendees have been mentioned in **Annexure 23.**

12.7.2. Level of Consultations

The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area on 7-03-2020 to 8-03-2020 and consultations with institutional stakeholders were carried out on 24-7-2019. The FGD was carried out in presence of local farmers, Business group, local elites, youth group and women group. The details of the Focused Group Discussions are furnished below. The record of attendees for the FGDs has been attached in **Annexure -23.**

Table 121: Types of consultations

Level	Type	Key Participants
Institutional	Stakeholder Meeting	Various Govt. Officials
Community	Focused Group Discussion	PAP, marginalized people

12.7.3. Institutional Stakeholders Consultation

Date of Meeting: 25 July 2019

Location of Meeting: UNO Office, Bhola Sadar , Bhola Sadar

Table 122: List of Institutional Stakeholders Consulted

Name of Person	Designation	Contact Details	Date of Consultation
Ms Nazratun Nayeem	AC Land, Bhola Sadar	01700603791	25 July 2019
Mr Mahibur Rahman	Upazial Agricultural Officer	01672292196	25 July 2019
Mr Rashedul Chawdhury	Upazila Eng. LGED	01708161692	25 July 2019
Mr. Shihab Ahmed	Field assistance Upazila Fisheries Officer	0101790580342	25 July 2019
Mr badrul Islam	Tahsildar, union Land office	01715173019	25 July 2019
Mr Abdul Halim	Surveyor, Upazila Land Office	01936348027	25 July 2019
Mr Ali	Mechanical, Upazila DPHE	01715395803	25 July 2019
Shk.Amdad Hossain	Forest Guard, Bhola Sadar	01718450810	25 July 2019
Mr. Kalyan Chawdhury	ULAO	0171193587	25 July 2019

Salient Points of Discussion

At the onset, the officials from Upazila Nirbahi Office, Bhola Sadar 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, utilities, rehabilitations and resettlement issues, etc. The discussion was concluded by a visit to the project site and nearby sub-station to gain an on-ground understanding of the various issues. Some of the key features discussed were as follows:

- Basis the site visit, it was highlighted during stakeholders meeting with the above stakeholders that the available area for the proposed EZ is presently open lands and few settlements.
- The site is adjacent to Dhaka – Bhola Sadar highway (N2) which connects the southern boundary of the site.
- River Ganeshpura present towards western side.
- Water availability is not an issue near the site as there are river channels which flow near the site location and ground water is available at a depth of 25-40 ft which is potable in nature.
- It was highlighted from the discussion with the officials' that many crusher units are located adjacent to proposed EZ site towards west and southern side.

12.7.4. Focused Group Discussions (FGD)

The Focused Group Discussions (FGD) were carried out with different groups at the proposed EZ area on 06-11-2020. 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 potentially affected landowners, local farmers, social elites, members of local youth groups and a women's group. The details of the Focused Group Discussions are furnished below. The record of attendees has been attached in Annexure 23.

Table 123 Details of Focus Group Discussions

Relevant Stakeholders	Issues	Suggestion/Demand from participants	Remarks
Affected Landowners, Farmers, Social Elites (15 persons)	• Loss of Agriculture Land	• The participants welcome the proposed EZ development. They think that this proposed EZ will be created employment to many people in the area. The proposed land for acquisition is 50% single crop land and 50% land is double crop.;	• Proper compensation should be provided for acquisition of land and loss of livelihood. Also, the PAPs should be given priority for employment in the upcoming EZ.
	• Land Value	• The government rate for land is low. The participants demanded that the market rate for land be assessed and compensation to be provided accordingly.	• The market rate of land would be assessed. Compensation would be provided as per legal requirement and BEZA's guidelines.
	• Opportunities for business during construction phase.	• The participants expressed interest in availing business or employment opportunities during the construction of the EZ. They	• The option of procuring construction raw materials from the locals as per the

		are keen to provide construction materials.	BEZA guidelines may be assessed.
	• Development social infrastructure	• The participants expressed that they do not have quality schools or educational institutions or technical college in their locality. The project may consider developing some educational institutes for the benefit of the locals. Also, they do not have good hotels or motels in the area. Considering the future economic activities brought about by the proposed EZ, hotels or guest houses may be established.	• Road communication may be established in the EZ. Establishment of educational institutes open to locals and potential employees of the EZ may be established.
Local Youth Group (18 Participants)	• Employment opportunity	• If the project is developed, various job opportunities will be created. Youth group noted that the project affected youths should be prioritized for employment opportunities.	• Employment opportunities for the local youths shall be provided on a priority.
	• Skills training to enhance the competency	• Youth group noted that training relevant to the activities in the EZ should be provided so that youth can become fit for employment in the EZ.	• The project may take into consideration of establishing a college and health center.
Women Group (09 participants)	• Safety Issue	• The women group expressed concerns about the potential safety issue that may arise from migrant labour/labour arriving from different locations to work in the construction of the project.	• The project should develop camps for workers within the EZ site away from locals. A robust GRM should be established.
	• Employment	• The women of the locality also want to work in the EZ. They wanted equal opportunity as like the men.	• Priority may be given to women for employment.
	• Trainings needed	• Skill development trainings suitable for women should be provided by the project so that they can prepare themselves for employment	• The project should arrange training programs to train the women in skills necessary for employment in the EZ.

Source: FGD at site

Summary of Key Environmental Impacts

- Proposed site is located in proximity to River Ganeshpura. The surface water system may get contaminated due to surface runoff/effluent discharge if proper mitigation measure is not taken. This also pose a threat to the associated biodiversity dependent on the habitat.
- Impact due to dredging from Ganeshpura River: It may cause erosion of riverbank, bottom disturbance, impact on habitat of fish, benthos and other aquatic fauna
- The development of the project would cause direct impact on about 1115 PAPs (about 230 PAHs), in terms of loss of private and cultivable lands. Additionally, 14 household structures are likely to get affected.
- Pollution: Likely impact on neighbouring settlements (located towards Eastern Side) due to noise generation, Air emission and effluent discharge during construction/operation stage if proper mitigation measure not taken

12.8. 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.

12.8.1. Institutional Arrangement

BEZA has developed Environmental Social Management Framework (ESMF[211]) 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 Project Monitoring Consultant (PMC).

Overall Project Implementation Arrangements

The overall management of the project will be carried out for EZ 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;

[211] http://www.beza.gov.bd/wp-content/uploads/2015/10/ESMF-of-BEZA.pdf

- 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.
- 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 technical professionals of 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.

12.8.2. 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
- 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.

12.8.3. 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 124: 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 Water	Transportation of construction materials, various construction works, runoff from camp	All physio-chemical & biological parameters	Quarterly at suitable locations	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 respect to	Ambient air quality monitoring at individual industries – Monitor levels of	Monthly	Individual Industrial Units	BEZA

S. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
		industrial standards	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 water quality	To cross check accidental contamination	Nearby surface water resource (All physio-chemical & biological parameters)	Quarterly	BEZA	BEZA
2.6	Soil Erosion	River	Survey & observation;	Monthly	BEZA	BEZA

Source: PwC Analysis

12.8.4. 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:

- 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 health facility in collaboration with other industries to improve health status
- Conduct or sponsor camps to clean up river ghats in the surrounding areas.

12.8.5. Compensation Plan

For the development of EZ, the authority of BEZA proposes to acquire 304.07 acres of land, which is privately held. According to local consultation meeting, about 1115 PAPs (about 230 PAHs) 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 projects affected persons (PAPs) are more than 1115 (directly and indirectly); thus a Resettlement Action Plan needs to be prepared.

12.8.6. 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

12.9. 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 125: Cost for EMP Implementation

Bhola EZ			
S. No	**Components**	**Unit Cost (Tk)**	**Cost (Tk.)**
A	**Fixed Cost**		
A.1.	**Construction Phase (3 Years)**		
A.1.1.	PPEs for staffs of Project Proponent	60,000/year	180000
A.1.2.	CETP 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	400000/Quarter	4800000
A.1.4.	Greenbelt Development at suitable locations	60000/ Acre/Year	5760000
A.1.5.	Environmental Audit (Half Yearly)	100000/study	600000
A.1.6.	Environmental Specialist - Full Time : 2 Nos	1200000/year/person	7200000
A.1.7.	Social Analyst- Full Time: 2 Nos	1000000/year	6000000
A.1.8.	occupational health specialist and a safety specialist- Full Time : 2 Nos	900000/year/person	5400000
A.1.8.	Biodiversity Assessment (twice in a year)	500000/study	3000000
A.2.	Fund for proposed community development activities	Lumpsum	10000000
	Total Fixed Cost (BDT)		**42940000**
B	**Recurring Cost (Yearly)**		
B.1.	**Operation Phase (per year)**		
B.1.1.	PPEs for staffs of Project Proponent	100,000/year	100000
B.1.2.	Solid waste bins for common areas	100,000/year	100,000
B.1.3.	CETP operation	To be covered under project cost	-
B.1.4.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	500000/Quarter	2000000
B.1.5.	Maintenance of Green Belt	Lumpsum	576000
B.1.6.	Environmental Audit (Half Yearly)	200000/half	400000
B.1.7.	Environmental Specialist - Full Time : 2 Nos	1400000/year/person	2800000
B.1.8.	Social Analyst- Full Time : 2 Nos	1100000/year	2200000
B.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	1000000/year	2000000
B.1.10.	CETP In charge : 2 Nos	700000/year	1400000
B.1.11.	Development and maintenance of Embankment along River, maintenance of flow & Flood Protection	To be covered under engineering cost	-
B.1.12	Biodiversity Assessment (twice in a year)	600000/study	1200000
	Total Yearly Recurring Cost (BDT)		**12776000**
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 environmental audit/conditions stipulated by regulatory authority for Construction/Operation phase, the cost for the same will be additional			

Source: PwC analysis

12.10. Conclusion and Recommendation

Environmental review indicates that the overall the impacts from preconstruction, construction and operation phase have limited adverse environmental impacts, and can be readily addressed through wise mitigation

measures as suggested. 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 including development of administration building, boundary wall, electrical supply, and access road. 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. Separate environment impact assessment study must be carried out by developer for whole zone before developing the EZ
- Construction activities for the development of project should be started after obtaining environment clearance certificate from DoE, Bangladesh
- Proposed environment management plan should be implemented strictly during preconstruction, construction and operation phase of the project.
- Green area development should be carried out
- Provision of garland drain, thick green belt, ETP, segregated storm water shall be adhered to
- Environmental monitoring should be conducted as suggested in environment management plan
- River Embankment protection activity should be taken up along Ganeshpura River

13. Financial Modelling

13.1. Purpose and Objectives

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 evaluate 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.

This financial model takes into cognizance two scenarios viz. (i) **BEZA is the master developer of the project – Case 1** and (ii) **PPP developer develops the project where BEZA plays the role of regulator – Case 2**.

First scenario considers that BEZA is responsible for land acquisition, resettlement and rehabilitation, and infrastructure developments at the proposed EZ and in turn leasing out industrial space, specialized infrastructure space to private tenants. The major sources of revenue accruing to BEZA has been considered from (1) upfront fees or annual rental for land uptake and (2) mark-up on utility (power, water, gas) provided to manufacturers, (3) service fees/conservancy fees from the EZ. In addition to the capital expenditure for developing this project, BEZA also needs to incur operational expenditure towards operation and maintenance (O&M) of this project.

Second scenario considers that BEZA (as regulator of the project) is responsible for land acquisition, resettlement and rehabilitation, and off-site infrastructure developments at the proposed EZ as a condition precedent. The PPP developer is mandated to develop and maintain the on-site infrastructure and subsequently earn revenue through leasing of industrial/ specialized infrastructure space at the proposed EZ.

This model is developed to analyze revenues generating sources and consequently Project Internal Rate of Return (PIRR), Equity Internal Rate of Return (EIRR), Debt Service Coverage Ratio (DSCR), and Net Present Value (NPV) for both the scenarios.

13.2. Methodology of Financial Modelling

The financial model created takes into consideration financial return to BEZA (when BEZA is responsible for the following activities as the regulator and master developer of the project) and the PPP developer (when the PPP developer is responsible for the onsite infrastructure construction and O&M of the project). For the first scenario where BEZA is the master developer, the functionality of this financial modelling is same as the prevailing models of development followed in Economic Zones such as Bangabandhu Sheikh Mujib Industrial City (Mirsarai EZ), Feni, Jamalpur EZ 1, Shreehatta and Maheshkhali (Dhaulghata).

Table 126: Responsibilities of BEZA and PPP developer in different financial models

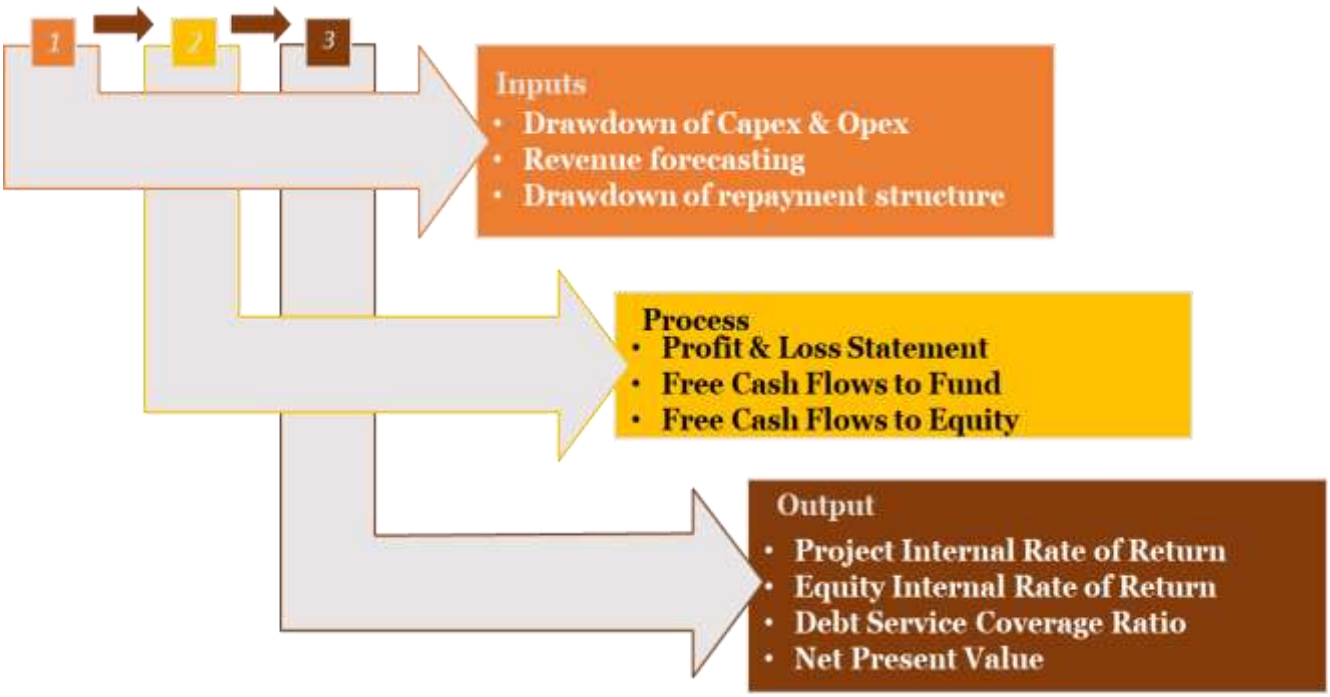
Aspects	Responsibilities of BEZA/ PPP Developer
Land acquisition and ownership	BEZA would acquire the land parcel and allocate the same to tenants (industrial & specialized infrastructure) on leasehold basis for a period of 50 years and extendable on mutual consent basis

Aspects	Responsibilities of BEZA/ PPP Developer
Resettlement & Rehabilitation	BEZA would be responsible for resettlement and rehabilitation activities for all social incumbencies prevailing within the proposed EZ
Infrastructure development (Business as usual scenario)	Development of off-site and on-site infrastructure components is the responsibility of BEZA as condition precedent. In case of PPP project, the private developer is responsible for developing the on-site infrastructure
Financing	Responsibility of BEZA (for BEZA model) and it is the responsibility of the PPP developer for the PPP model
O&M	Responsibility of BEZA (for BEZA model) and it is the responsibility of the PPP developer for the PPP model

Source: PwC analysis

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 85: Process flow of Financial Model



Source: PwC Analysis

Inputs

A yearly model has been developed to depict the Capex (cost of land acquisition, infrastructure, EMP, pre-operations) 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 BEZA or the PPP developer through lease of industrial land, land for specialized infrastructure (real estate, logistics etc.), surcharge on supply of utility services (like water, power, gas and water treatment), and EZ service fees.

Process

Considering the expenses and revenue sources above, pro-forma income statements have been calculated which captures the profits/loss and cash flows accruing to BEZA or the PPP developer. This process forms the backbone of the financial model which is used to determine the returns to BEZA or the PPP developer.

Outputs

BEZA being the Government nodal agency mandated for development of economic zones in Bangladesh, is concerned with the PIRR i.e. the overall returns accruing from the project and not on parameters such as equity IRR, Debt Service Coverage Ratio (DSCR); whereas the PPP developer is concerned with various ratios such as PIRR, EIRR, and DSCR

Thus, as a measure of calculating returns to BEZA 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.

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. The land uptake in an industrial project are highly impacted by the country's and regional economic growth. These scenarios could occur due to trickledown effect of the changing economic context on macro and micro level. These scenarios would assist BEZA 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; macro level economic conditions are improving; land uptake rate will be higher than the anticipated demand. Base case assumes macro-economic conditions of Bangladesh and the region are showing steady trend and behaving as expected; land uptake will be as per anticipated demand. Conservative case considers macro-economic conditions of Bangladesh and the region are showing declining trend; land uptake rate will be lower than the anticipated demand.

The broad level commercial aspects considered while developing the model for the scenario where BEZA plays the role of the master developer i.e. Case 1 are –

- BEZA would be responsible for financing, constructing infrastructure for the proposed EZ and subsequently the Operation and Maintenance.
- Cost of land acquisition is the prerogative of BEZA.
- Construction of the infrastructure of the proposed EZ is the prerogative of BEZA
- The project would be financed by BEZA's own equity and loans from commercial lenders & financial institutions (i.e. concessional loan).
- Marketing of the industrial plot will be done by BEZA.
- BEZA will enter into lease agreement with the industrial units/specialised infrastructure units. These units will be the end users/tenants at the plots in economic zone.
- Complete ownership of the land demarcated for this project belongs to BEZA. The private tenants who would be allocated land parcels towards industrial and specialised infrastructure space in the EZ would be required to pay BEZA as per the following:
    - Upfront fees OR Annual Land Lease premium
    - Mark-up on Utilities (power, water, gas, and water and effluent treatment)
    - EZ Conservancy/Service fees

Similarly, the commercial aspects considered when a PPP developer is assigned by BEZA to develop the project i.e. Case 2 are -

- The PPP developer would be responsible for financing, constructing on-site infrastructure for the proposed EZ and subsequently the Operation and Maintenance.
- Cost of land acquisition and construction of off-site infrastructure should be the prerogative of BEZA as per conditions precedent.
- Construction of the on-site infrastructure of the proposed EZ is the prerogative of the PPP developer
- The project would be financed by PPP developer's own equity and loans from commercial lenders & financial institutions (i.e. concessional loan).
- Marketing of the industrial plot will be done by the PPP developer.
- The PPP developer will enter into lease agreement with the industrial units/specialised infrastructure units. These units will be used by the end users/tenants at the plots in economic zone.
- Complete ownership of the land demarcated for this project belongs to BEZA which will be transferred to the PPP developer on lease hold basis. The private tenants who would be sub-leased the land parcels towards industrial and specialised infrastructure space in the EZ would be required to pay the PPP developer as per the following:
    - Annual Land Lease premium
    - Mark-up on Utilities (power, water, gas, and water and effluent treatment)
    - EZ Conservancy/Service fees

Assumptions in the financial model is captured in the next section.

13.3. 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.

13.3.1. Timing Assumptions

The proposed EZ is spread over an area of ~304.07 acres. Considering the fact that this project it has been assumed that in the coming one-year (i.e. till Dec 2021) BEZA shall complete all the regulatory activities pertaining to the approval of the project. As per market assessment it is anticipated that demand for industrial land will reach the level to support the development only by 2029, construction activities can begin from 2027. Hence, the model start date has been assumed from 1st July 2026 in case BEZA is acting as developer. In case PPP route is opted for the project starting date is considered to be 1st July 2027. A 50 years model tenure has been considered. Following table captures the timing assumptions for this project.

Table 127: Timing related assumptions

S. No.	Details	Assumptions
1	Start date	• 1st July 2026 (financial year 2027) when BEZA develops the project • 1st July 2027 (financial year 2028) when PPP developer develops the project
2	Land acquisition activities	• 2026-2027 (2 years[212]) (financial year)

[212] As per Market intelligence and discussion with BEZA officials; entire land parcel for proposed EZ i.e 304.07 acres are private owned land and needs to be acquired.

S. No.	Details	Assumptions
4	Infrastructure developments	• 2027-2029 (3 years; financial year) when BEZA develops the project • 2028-2029 (2 years; financial year) when PPP developer develops the project
5	Start of operations	• 1st July 2028 (financial year 2029)
6	Model end date	• 30th June 2076 (financial year 2073) when BEZA develops the project • 30th June 2077 (financial year 2074) when PPP developer develops the project

Source: PwC Analysis

Considering the development trends and land acquisition related aspects in Bangladesh, above stated assumptions have been taken on the conservative side.

13.3.2. Land Use Pattern

In the earlier chapters, based on the prevailing infrastructure, best practice master planning has been formulated. In line with the same, following table elaborates the land use pattern for the proposed EZ.

Table 128: Land use pattern

S. No.	Details	Land Use (in Acres)
1	Industrial Space	**212.27**
2	Public and support amenities	**4.94**
3	Non processing area (utility, road, green and open space, admin and custom block and support amenity)	**86.78**
Total		**304.00**

Source: MACE analysis

An area of 15 acres has been considered for construction of SFB in case of the PPP developer developing the project.

13.3.3. Revenue Assumptions

In case of BEZA being the master developer of the project i.e. Case 1, it will earn revenues through land leasing, mark-up on utilities and EZ service fees. The main revenue source for BEZA includes- (i) revenue from upfront fees OR annual land lease premium for industrial space (i.e. industrial land), (ii) revenue from mark-up of utilities (water, power, gas, water and effluent treatment), and (iii) EZ Conservancy/Service Fees.

Similarly, as per Case 2, where the PPP developer comes onboard, it will also have the same revenue sources except for the revenues accrued due to payment of upfront fees for industrial or specialised infrastructure land. In addition, revenue accrued due to Standard Factory Buildings will also be a source in this case.

Assumptions for revenue generating from industrial and specialized infrastructure space

BEZA as a regulator is in process of allocating land plots to industrial and infrastructure tenants in different Government owned EZs such as Bangabandhu Sheikh Mujib Industrial City (Mirsarai EZ), Feni, Jamalpur EZ 1, Shreehatta and Maheshkhali (Dhaulghata). The following table elaborates the tariff rates for direct allotment of space in these EZs.

Table 129: Land Tariff at Government owned EZs in Bangladesh

S. No.	Mode of Payment	Category of Land	Annual Rent per sq. m (USD)	Contract Period	Total Rent per sq. m. (USD)
Land tariff prevalent at Mirsarai EZ					
1	Onetime payment (Upfront fees)	Developed	**0.60**	**50**	**30.00**
2		Undeveloped	**0.30**	**50**	**15.00**
3		Specialized infrastructure	**0.345**	**50**	**17.25**
4	Annual rent basis	Developed	**1.50**	**50**	-
5		Undeveloped	**0.75**	**50**	
6		Specialized infrastructure	**0.90**	**50**	
Land tariff prevalent at Jamalpur EZ – 1					
1	Onetime payment (Upfront fees)	Developed	**0.525**	**50**	**26.75**
2		Specialized infrastructure	**0.315**	**50**	**15.75**
3	Annual rent basis	Developed	**1.25**	**50**	-
4		Specialized infrastructure	**0.81**	**50**	

Source: BEZA

Tariff plan 1: Tariff rate based on existing government EZs

Based on benchmarking exercise carried out by the study team, it has been observed that for existing economic zones the onsite and offsite infrastructure project are developed by the concerned nodal agencies. This has allowed BEZA economic zone to charge low land tariffs. Based on the benchmark the study team has identified Jamalpur and Mirsarai economic zone for tariff estimation.

Jamalpur EZ is located at ~160 Km from Dhaka in Mymensingh division in northern part of country. EZ is located away from major consumption centre such as Dhaka, Chittagong and Khulna. Proposed EZ at Bhola is located on

Island which is located close to domestic markets such as Mongla, Khulna and Chittagong but lacks the road connectivity with mainland Bangladesh. Propose EZ location also have good IWT connectivity with the Major port and other parts of the country. But the region is lagging in terms of industrialisation and backward linkage is missing in the region.

Hence, the land tariffs are assumed to be 15% lower than that of Jamalpur (annual rent of USD 1.35/Sq. m and upfront fee of USD 26.75/Sq. m) considering the location disadvantage of the proposed EZ in terms of its access to domestic markets and other regional attributes. Since the proposed EZ is expected to become operational in 2026, the above land tariffs are expected to increase. In order to consider the effect of the same, an escalation of 10% for a block of 3 years[213] on the above tariffs have been considered to evaluate the project returns in case of BEZA developing the project. **Thus, land tariff for annual rent is assumed to be USD 1.51 per sq. m USD (BDT 12 per sq. ft. per annum) and the same for upfront fees is assumed as ~USD 30.38 per sq. m (BDT 240 per sq. ft).**

Tariff plan 2: Tariff rate based on the land tariff of PPP/ Private EZs

Tariff plan 1 is based on the EZs where cost of offsite and onsite infrastructure is not borne by BEZA. Hence, the cost is not being recovered from the project. The closest benchmark available where onsite infrastructure cost is being recovered from project revenue are private or PPP economic zones. In the case of private or PPP economic zone development, the off-site infrastructure is developed by the concerned nodal agencies and private developer only bears the cost of onsite infrastructure.

Private economic zones such as Meghna Industrial Economic Zone (Narayanganj), Bay Economic Zone, Abdul Monem Economic Zone which are located in close proximity to Dhaka, charge tariffs ranging from USD 7 to USD 12 per sq. m per annum (~ BDT 95 per sq. ft. per annum) to USD 7 per sq. m per annum (~ BDT 55 per sq. ft. per annum). Land tariffs in economic zones such as the one in Mongla (PPP) developed by Sikder Group, oscillate between the tune of USD 4 per sq. m per annum (~ BDT 30 per sq. ft. per annum) to USD 7 per sq. m per annum (~ BDT 55 per sq. ft. per annum).

Mongla EZ which has been developed in PPP mode is the most suitable comparable to benchmark the tariff rates for Bhola EZ. Average lease rental for the EZ is USD 5.5 per sq. m per annum (~BDT 43 per sq. ft. per annum). Being located in close proximity of Mongla port, EZs have better access to Mongla seaport. Mongla EZ have very good IWT connectivity with Dhaka and Chittagong. While proposed EZ location lacks the direct road connectivity with mainland Bangladesh as well as located far away from EXIM gateway in comparison to Mongla EZ. Under disadvantage with the location is that region is lagging in terms of industrialization. Hence, the land tariffs are assumed to be 300% lower than average lease rental of private EZs (annual rent of USD 5.5/Sq. m) considering the location disadvantage of the proposed EZ in terms of its access to domestic markets and Mongla port. The proposed EZ is expected to become operational in 2029, the above land tariffs are expected to increase. In order to consider the effect of the same, an escalation of 10% for a block of 3 years on the above tariffs have been considered to evaluate the project returns. **Thus, land tariff for annual lease rent is assumed to be USD 5.06 per sq. m (BDT 40 per sq. ft. per annum). The upfront fee of BDT 800 per sq. ft. has been considered based on the existing ratio of annual lease rental and upfront fee.**

Same annual lease rental has been considered for evaluating project returns in case of PPP developer developing the project. Based on market information, tariff for Standard Factory Building (SFB) has been assumed as BDT 175 per sq. ft. per annum.

Assumptions for revenue generating from Mark-up on utility charges

BEZA levies a service charge (Mark-up of 5%) on the prevailing utility tariffs. The same has been considered as 10% in case of the PPP developer.

Assumptions for revenue generating from EZ Conservancy/Service fees

[213] *As per benchmarks in Southeast Asian economies such as India, industrial land tariffs increase to the tune of 10% for a block of 3 years*

BEZA charges a conservancy charge of **BDT 0.39 per annum/sq. ft. land or factory space**.[214] However, the market rates may differ for the same. In case of the PPP developer, the same is assumed as **BDT 5 per annum/sq. ft. land or factory space.**

Assumptions for revenue generating from other sources

Apart from charges mentioned above BEZA charges the following from tenants:

- Regulatory permit fees: BDT 500 per permit
- Registration of Industrial unit: USD 500
- Design approval for Industrial unit: BDT 10,000
- Compliance charges for Medical & Environment and Worker's management: to be decided later

The study team has considered 2% top up on gross revenue in the financial model to factor in the above cost. This has been considered when BEZA plays the role of the master developer and it has been waived off in case of the PPP developer developing the project.

In the financial model all revenue related assumptions have been considered in line with the above.

13.3.4. Cost Assumptions

13.3.4.1. Assumptions related to Capital expenses

Case 1: BEZA playing the role of the master developer

For undertaking this project, BEZA has to incur the following cost outlays.

- Cost of land acquisition
- Cost pertaining to resettlement and rehabilitation
- Infrastructure cost
- Other costs (EMP & Pre-operating costs)

Cost of land acquisition and resettlement and rehabilitation

The total area proposed for EZ development is 304.07 acres, and all the area is private land under Mouza 65 Paschim Char Kali. For the development of EZ, the authority of BEZA proposes to acquire these 304.07 acres land. cost of land was taken as 3 times the cost obtained from AC land office for all categories. Based on the information received from local Sub-Registry office the price. As per primary stakeholder consultations with AC land and UNO officials, cost towards acquiring this private land together with compensation for resettlement and rehabilitation is **~BDT 1,261 million**. Details of these are captured in the Social Review chapter of the report.

Cost pertaining to Off-site infrastructure

Infrastructure assessment recommends that for developing this project, BEZA must undertake off-site infrastructure development pertaining to land filling, utility supply and boundary wall. Details of the same are captured in the Infrastructure Assessment chapter. The following table depicts the cost towards the above-mentioned elements.

[214] *Source: BEZA guidelines*

Table 130: Off-site infrastructure cost estimates to be incurred by BEZA

Description of item	Price without tax (In million Taka)	Responsible Agency
Power network	17.04	BPDB, PGCB
Water supply network	92.06	DPHE, BWDB
Boundary wall	100.00	BEZA
Gas supply	1,602.60	GTCL
Road network	759.55	BEZA
Project sub-total	**2571.26**	

Source: MACE analysis; costs have been calculated using updated references and scheduled rates of concerned nodal agencies of Bangladesh

Other costs

Cost associated with Environmental Management Plan during construction is considered as ~ **BDT 42.94** million. Detailed break-up of the same has been captured in the Environmental Review chapter

Cost pertaining to On-site infrastructure

Infrastructure assessment recommends that for developing this project, BEZA/Private developer has to undertake on-site infrastructure development pertaining to internal road network, power network, water supply, wastewater treatment, support amenities etc. However, in case of the private developer, cost incurred for development of onsite infrastructure is expected to be higher than that incurred by BEZA. This can be attributed to certain elements being provided by private developer such as power, water and sewage network to individual plots, internals roads etc including SCADA based utility systems monitoring & control systems. Details of the same are captured in the Infrastructure Assessment chapter. The following table depicts the cost towards the above-mentioned elements.

Table 131: On-site infrastructure cost estimates to be incurred by PPP developer and BEZA

Description of item	Cost to be incurred without tax (In million Taka) by BEZA	Cost to be incurred without tax (In million Taka) by Private developer
Site Development	1018.98	1018.98
Road network	1005.00	1306.50
Footpath and plot entry culvert	89.00	89.00
Storm water drain	53.26	53.26
Power supply	778.04	782.83
Water supply	200.02	260.01
Sewage, effluent and solid waste collection/treatment	366.64	476.59
Telecom	42.85	42.85
Sustainable infrastructure elements	5.31	5.31
Support amenities	834.25	834.25
Project sub-total	**4,393.37**	**4,869.59**

Source: MACE analysis; costs have been calculated using updated references and scheduled rates of concerned nodal agencies of Bangladesh

In addition to the above, cost pertaining to Standard Factory Buildings has been assumed as BDT 1712/ sq. ft. in case of the PPP developer developing the project (Case 2)

13.3.4.2. Assumptions Related to Operating Expenses

For undertaking this project, both BEZA and/or the PPP developer has to incur the following operating cost outlays.

- Cost of Manpower
- Cost pertaining to operations and maintenance (O&M)

Cost of Manpower

Basis benchmarks of similar developments in Bangladesh context, total cost of manpower (at full utilization level) has been considered as **BDT 20 million for Case 1 and BDT 40 million for Case 2.** It has been assumed that in the 4th year from the start of the project, full utilization of manpower would take place.

Cost pertaining to operations and maintenance (O&M) and Marketing expense

Taking reference from similar projects, **1.25% of total infrastructure cost per annum** towards operations and maintenance (O&M) has been considered for the financial model for Case 1 and Case 2 i.e. BEZA developing the project and PPP developer developing the project respectively.

Financing Assumptions

Case 1: BEZA playing the role of the master developer

Financing assumptions pertaining to Case 1 have been outlined below:

- Debt: Equity= 70:30; Debt could be sourced through concessional loan/ grant
- Precedencies in Bangladesh indicate that BEZA being the apex authority in the domain of organized industrial development in Bangladesh has access to various financial support from donor agencies and multilaterals to drive industrial growth in Bangladesh. Thus, it has been assumed that it could be prudent for BEZA to obtain concessional loan from agencies such as World Bank, International Development Association etc. in order to fund the project.
- For concessional loan: moratorium period- 5 Years (after loan disbursement); rate of interest- 5% per year; repayment period- 15 years
- An equal spread repayment of principal has also been assumed towards repayment of the loan (for example 10% principal repayment every year over 10 years of repayment period or 5% principal repayment every year over 20 years of repayment period).

The developer will be liable to pay income taxes as per Income Tax Ordinance, 1984. As per the ordinance 'Income from Business or Profession' are taxable, 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% is applicable for any private entity. However, BEZA being a Government agency, no tax liability has been assumed in the model.

Straight Line Method (SLM) of depreciation has been considered and annual depreciation rate of 2.08% has been taken in the model for a project tenure of 48 years. Depreciation assumptions for tax treatment are in line with prevailing corporate income tax ordinance 1984 guidelines in Bangladesh (10% per annum on WDV method).

Case 2: The project being developed by a PPP developer assigned by BEZA

Financing assumptions pertaining to Case 2 have been outlined below:

- Debt: Equity = 70:30; Debt could be sourced from commercial borrowing or loan
- In case of a private developer, commercial loan from financial institutions and banks become a realistic source of obtaining debt in order to fund the project according to prevalent infrastructure funding environment in Bangladesh. However, concessional borrowing, if obtained, through support from BEZA

and GoB could improve project returns for any private player developing the project and thus enhance attractiveness of the project. This could depend on various factors such as project potential, market reputation, balance sheet exposure, occupancy risk of the project etc.

- For commercial borrowing: moratorium period- 4 Years (after loan disbursement); rate of interest- 10% per year; repayment period- 8 years
- An equal spread repayment of principal has also been assumed towards repayment of the loan (for example 10% principal repayment every year over 10 years of repayment period or 5% principal repayment every year over 20 years of repayment period).

The developer will be liable to pay income taxes as per Income Tax Ordinance, 1984. As per the ordinance 'Income from Business or Profession' are taxable, 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% is applicable for any private entity.

Straight Line Method (SLM) of depreciation has been considered and annual depreciation rate of 2.08% has been taken in the model for a project tenure of 48 years. Depreciation assumptions for tax treatment are in line with prevailing corporate income tax ordinance 1984 guidelines in Bangladesh (10% per annum on WDV method).

13.3.5. Other Assumptions

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.

Since, this report captures only the tentative breakup of industries that could be established within the proposed EZ, utility consumption figures have been considered for the industry requiring the highest water and power supply per acre for the entire industrial plot. This is a conservative assumption made to ensure adequate supply of utility within the site in future.

Table 132: Utility Usage Norms

Power Requirement (MW per acre)	Water Requirement ('000 litres per acre per day)	Gas (Cum/acre/annum)
0.17	34.3	50,000

Source: MACE Analysis & Market intelligence

Based on standard industry benchmarks, 70% of water demand is considered as effluent generated and 60% of water demand is considered as sewage generated

Prevailing tariffs for utilities

Referring to prevailing utility tariffs for EPZs in Bangladesh and other industrial units, following utility tariffs have been considered in the model[215]:

- Power tariff: **BDT 8.97/unit**
- Water tariff: **BDT 37.56/ '000 litres**
- Gas tariff: **BDT 9.80/Cum**
- Effluent treatment tariff: **BDT 33.24/ '000 litres**
- Sewage tariff: **BDT 50/ '000 litres**

Industrial space uptake rates

[215] *BEPZA rates prevalent in Chittagong Export Processing Zone*

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; macro level economic conditions are improving; land uptake rate will be higher than the anticipated demand. Base case assumes macro-economic conditions of Bangladesh and the micro-market are showing steady trend and behaving as expected; land uptake will be as per anticipated demand. Conservative case considers macro-economic conditions of Bangladesh and the region are showing declining trend; land uptake rate will be lower than the anticipated demand. As per demand forecasting exercise, complete industrial space uptake would take place in 14 years, 13 years, and 11 years respectively for conservative, base, and aggressive cases.

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

Table 133: Land uptake across three cases

S. No.	Years	Conservative	Base	Aggressive
1	2029	5%	6%	8%
2	2030	10%	13%	16%
3	2031	14%	18%	23%
4	2032	18%	25%	31%
5	2033	23%	31%	40%
6	2034	26%	36%	47%
7	2035	30%	42%	56%
8	2036	33%	47%	63%
9	2037	35%	53%	72%
10	2038	46%	66%	88%
11	2039	57%	80%	100%
12	2040	67%	94%	100%
13	2041	87%	100%	100%
14	20142 onwards	100%	100%	100%

Source: Demand Model

Other assumptions

Referring to prevailing macro-economic conditions of the country and similar benchmarks, following escalation rates have been considered:

- Operating expenses: 3% per annum for both Case 1 & Case 2
- Revenue from space (industrial & Specialized infrastructure): 1% per annum for Case 1 & Case 2

- Revenue from Standard Factory Buildings: 10% per annum only for Case 2
- Revenue from utility mark-up: 7% per annum for both Case 1 & Case 2

13.4. Sensitivity Testing on Key Inputs

The following figure summarises the revenue and cost drivers, and decision-making parameters of this financial model.

Figure 86: Revenue and Cost drivers

Revenue Drivers
Parameters
Revenue from Upfront payment for Industrial space
Revenue from annual rent for Industrial space
Revenue from Upfront payment for Specialized infrastructure space
Revenue from annual rent for Specialized infrastructure space
Mark-up on utility (power, water, gas, water and effluent treatment)
Escalations for revenue from industrial & specialized infrastructure space
Undeveloped land as a % of total land for industrial space
Undeveloped land as a % of total land for specialized infrastructure space

Cost Drivers
Parameters
Capital expenses
Operating expenses
Interest expenses for commercial borrowing
Interest expenses for concessional borrowing
Escalations on capital and operating expenses

Source: PwC analysis

Following parameters have been varied in the sensitivity analysis to assess the most sensitive variable in the financial model for **PPP developer developing the project (Unconventional Approach)**:

- Annual rent from industrial space/land
- Annual rent from space for specialized infrastructure
- Space allocated for SFB
- SFB rental
- Mark-up charges on utility
- Interest expenses for commercial borrowing
- Escalation rate for revenue from industrial and specialized infrastructure space

Based on the same, a sensitivity check has been carried out to understand the most sensitive parameter (as per the Base case of land uptake), 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.

Table 134: Sensitivity variation of Project IRR for the Base case unconventional approach

Parameters	Project IRR		
	-25%	0%	+25%
Annual rent from industrial space/land	6.64%	7.31%	8.01%
Space allocated to SFB	6.86%	7.31%	7.79%
SFB rental	6.78%	7.31%	7.88%
Escalation on revenue from SFB	6.90%	7.31%	7.76%
Annual rent from specialized infrastructure space/land	7.30%	7.31%	7.32%
Mark-up charges on utility	7.19%	7.31%	7.43%
Escalation rate for revenue from industrial and specialized infrastructure space	6.90%	7.31%	7.76%

Source: PwC Analysis

Upfront fee from industrial space, Annual rent from industrial space, and Mark-up charges on utilities have emerged out to be the most sensitive revenue driver influencing the rate of return from the project.

In order to maximise the return from this project, increasing tariffs of these three parameters would result in maximum returns for both the cases.

13.5. Assessment of Project Returns for BEZA

Two tariff plans has been considered while analysing the project return for BEZA**: i) Tariff plan 1 - Tariff rate based on EZs developed with assistance of Government of Bangladesh, ii) Tariff plan 2 - Tariff rate based on the existing land tariff of private EZs.**

The following options have been analysed based on both the tariff scenarios to determine the best case of project returns for Case 1 i.e. BEZA playing the role of the master developer of the project:

- **Option 1: offsite and onsite infrastructure to be developed by BEZA** – In this scenario, it is assumed that BEZA will bear the cost of onsite and off-site infrastructure and both to be recovered through project. Cost of debt is at commercial borrowing rates.
- **Option 2: offsite and onsite infrastructure to be financed by multilaterals** – In this scenario, it is assumed that off-site and onsite infrastructure to be financed by multilaterals on concessional borrowing rate.
- **Option 3: offsite infrastructure to be developed through nodal agencies** – In this scenario, it is assumed that BEZA will outsource costs pertaining to off-site infrastructure to nodal agencies. Cost of debt is at commercial borrowing rates.
- **Option 4: offsite infrastructure to be developed through nodal agencies and onsite infrastructure to be financed by multilaterals:** In this scenario, it is assumed that BEZA will outsource costs pertaining to off-site infrastructure to nodal agencies and onsite infrastructure to be funded by multilaterals on lower interest rate.
- **Option 5: offsite and onsite infrastructure to be developed through Nodal agencies** – In this scenario, it is assumed that BEZA will outsource all infrastructure costs (both off-site and on-site) pertaining to the project to Nodal agencies.

The flowing table summarises the returns accrued in base case of land uptake considering the Tariff plan 1.

Table 135: Project returns across scenarios – Base case[216] – when BEZA develops the project

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[217]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Option 1: offsite and onsite infrastructure to be developed by BEZA	No return	No return	0.05	0.12	-7164.5	-9809.4
Option 2: offsite and On-site infrastructure to be financed by multilaterals	No return	No return	0.07	0.17	-6009.2	-9726.8
Option 3: offsite infrastructure to be developed through nodal agencies	No return	No return	0.08	0.15	-5123.0	-6994.4
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	No return	No return	0.10	0.22	-4242.2	-6478.0
Option 5: offsite and onsite infrastructure to be developed through Nodal agencies	8.12%	9.87%	1.37	0.81	-190.4	-380.0

Source: Financial Model; #BCR and NPV values with 10% and 15% cost of equity is furnished in annexure

It can be observed that project is not feasible based on tariff plan 1 which is based on EZs developed with assistance from GoB. This further validates the requirement for increase in tariff. The study team has further carried out feasibility assessment based on increased tariff. Table below summarises the returns accrued in base case of land uptake considering the Tariff plan 2 (values pertaining to Conservative, and Aggressive cases have been furnished in Annexure 26).

Table 136: Project returns across scenarios – Base case – Tariff plan 2

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[218]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Option 1: offsite and onsite infrastructure to be developed by BEZA	3.33%	2.65%	0.47	0.33	-4936.6	-6754.5
Option 2: offsite and On-site infrastructure to be financed by multilaterals	3.78%	3.75%	0.59	0.46	-3842.3	-4618.0
Option 3: offsite infrastructure to be developed through nodal agencies	4.72%	4.45%	0.68	0.44	-3032.1	-4247.8
Option 4: offsite infrastructure to be developed through nodal agencies and	5.28%	5.79%	0.87	0.61	-2184.0	-2028.5

[216] *values pertaining to Conservative, and Aggressive cases have been furnished in Annexure 21*
[217] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*
[218] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

on-site infrastructure to be financed by multilaterals						
Option 5: offsite and onsite infrastructure to be developed through Nodal agencies*	16.59%	27.95%	4.43	2.29	1415.9	1705.2

Source: Financial Model; #BCR and NPV values with 10% and 15% cost of equity is furnished in annexure
**Return are high in option 5 as offsite and onsite infrastructure are developed through assistance of nodal agency and cost of infrastructure is not recovered through project revenue. This is not a recommended strategy to be adopted by BEZA.*

It can be observed that tariff plan improves the project financial returns across options substantially. The returns are still below the bankable threshold (i.e.< 13% to 14%) for all options other than option 5, where offsite and onsite infrastructure are being developed by the concerned nodal agencies. However, this is not recommended strategy to be adapted by BEZA.

In order to make the project financially viable in case of Option 3 (offsite infrastructure to be developed through nodal agencies), BEZA can consider charging higher lease rentals in line with private developer's rates, but high rentals may negatively impact the uptake of land. However, considering the same land uptake rate, BEZA should charge annual lease rental of rental of ~126 BDT/sq. ft/year to match project IRR with weighted average cost of capital (WACC) which is 9.9%.

This project is not financially feasible if BEZA plays the role of developer and bears all necessary development costs. Being under the ambit of Prime Minister's Office, BEZA can develop off-site and on-site infrastructure through government assistance. Under such a scenario, when the development expenses (for on-site and/ or off-site) are not incurred directly by BEZA, and tariff plan 1 rentals are being charged then project fetch return of 8.12%.

Queen Bee Strategy

The Queen Bee Strategy involves attracting anchor investors to economic zones through concessions in upfront fees and charging nominal yearly lease. Ancillary industries generally follow the anchor industries and set up shop in the economic zones to cater to requirements of the anchor industries. The ancillary industries can be charged tariff in line with private economic zones tariff to compensate for the concessions given to anchor industry. The study team has assumed that 1 units with 50 acre land will be offered to anchor tenant at nominal annual lease rental of **BDT 1/Sq. Ft/year**. Anchor tenant will attract original equipment manufacturers, Small and medium enterprises across the value chain of the product.

This will amplify the land demand within proposed EZ and this will result in faster land uptake. Based on benchmark of EZs/industrial zones it has been observed that uptake time is generally reduced by 50%. Hence, the study team has assumed an uptake time of 9 years. Considering the demand generated by the anchor tenant OEMs/SMEs would be attracted to setup unit in proximity. This can be leveraged by BEZA and a higher tariff can be charged from the ancillary units to coup the upfront cost of the anchor tenant.

The tariff rate for remaining industrial plot has been benchmarked based on the private EZs in the country. Private economic zones such as Meghna Industrial Economic Zone (Narayanganj), Bay Economic Zone, Abdul Monem Economic Zone which are located in close proximity to Dhaka, charge tariffs ranging from USD 7 to USD 12 per sq. m per annum (~ BDT 95 per sq. ft. per annum) to USD 7 per sq. m per annum (~ BDT 55 per sq. ft. per annum). The average annual lease tariff for industrial land in the private EZ is USD 9.5 per sq. m.

The private EZs which are considered as benchmark are located in close proximity of Dhaka which is countries largest urban agglomeration and consumption centre. While proposed EZ at Bhola is located in the southern part of Bangladesh with no significant industrial proliferation in the region and also located away from commercial centres such as Dhaka and Chittagong. The Island also lacks road connectivity with mainland Bangladesh. Hence, the land tariffs are assumed to be 30% lower than average lease rental of private EZs (annual rent of USD 9.5/Sq. m) considering the location disadvantage of the proposed EZ in terms of its access to domestic markets.

The proposed EZ is expected to become operational in 2029, the above land tariffs are expected to increase. In order to consider the effect of the same, an escalation of 10% for a block of 3 year. Tariff for industrial land has been assumed as **lease rental of BDT 66 per sq. ft.** per annum and upfront fee of **BDT 1320 per sq. ft.** for remaining industrial land other than offered to anchor tenant for evaluating project returns.

The flowing table elucidate the returns accrued in case BEZA adopts queen bee strategy to BEZA as per mentioned options in previous section for the Base case of land uptake.

Table 137: Project returns in queen bee strategy Base case – Queen Bee Strategy

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[219]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Option 1: offsite and onsite infrastructure to be developed by BEZA	2.43%	1.43%	0.25	0.31	-5343.8	-8880.2
Option 2: offsite and onsite infrastructure to be financed by multilaterals	3.19%	3.30%	0.41	0.43	-3982.0	-6231.5
Option 3: offsite infrastructure to be developed through nodal agencies	3.82%	3.44%	0.46	0.40	-3310.4	-5778.3
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	4.92%	5.86%	0.78	0.56	-2064.2	-2761.2

Source: Financial Model;

It has been observed that if BEZA adopts the queen bee strategy it improves the project returns across all options. The returns are still below the bankable threshold (i.e.< 13% to 14%) for all options other than option 5, where offsite and onsite infrastructure are being developed by the nodal the concerned nodal agencies.

The project fetches highest return (4.92%) is case of option 4 i.e. if BEZA decides to play the role of developer and the offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals.

However, this simulation requires BEZA to be able to attract anchor tenants to the proposed EZ.

13.6. Assessment of Project Returns for the PPP Developer

In this model, the PPP developer shall inject equity in the SPV and borrow debt from financial institutions through Special Purpose Vehicle (SPV) to execute the project. The SPV shall obtain necessary regulatory approvals from BEZA and other regulatory bodies. The SPV shall lease out the industrial space and provide utility services to the industrial units against the lease payments, conservancy/service fees and utility markup whereas cost related to land acquisition and off-site infrastructure development is to be borne by BEZA.

International Competitive Bidding methodology is generally followed to shortlist the preferred bidder to exercise the best outcome and to maintain complete transparency. Bidders are chosen on the basis of their technical capabilities, and experience of handling similar projects globally together with their commercial competency in lieu of pre-determined financial specifications. Similar methodologies have been followed in case of other PPP economic zone projects in Bangladesh. Mirsarai Phase I and Mongla EZ are the only two examples where PPP

[219] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

project structuring was devised in economic zone development projects. Keeping cognizance of the past examples of PPP transactions in Bangladesh in the EZ space and in the global context, two broad approaches have been analyzed to assess the project returns for the private developer.

13.6.1.1. Approach-1: Conventional PPP

Conventionally in case of PPP transactions, the regulatory authorities generally follow the competitive bidding procedure which judges' bidders based on their technical know-hows and certain commercial strengths. To shortlist the most capable or financially stable bidders, certain bid parameters (or modes of pay-outs) are considered. These pay-outs are devised to recover the costs borne by the authorities to facilitate the project. Similar approach has been prevalent in case of both Mirsarai Phase I and Mongla economic zone development projects, which were structured on the PPP route. For BEZA to recover its cost related to land acquisition and off-site infrastructure development, the following pay-out scenarios (or a combination of them) was devised:

- Upfront payment (capped at BDT 600 million taking benchmark of previous PPP transactions of BEZA)
- Annual Land lease
- Gross revenue share
- Equity Stake by BEZA in the SPV (and subsequent dividend pay-out)

Therefore, in order to determine the best mode of pay-out amongst the above-mentioned scenarios, all the pay-out scenarios and their necessary combinations have been evaluated to understand which one or which combination of these helps BEZA in recovering its cost outlay for the project. This is estimated by the ratio of the NPV of BEZA's income from the PPP developers (subject to the above-mentioned scenarios) to the NPV of its cost outlay throughout the tenure of the project. The combination of the above-mentioned modes pertaining to which the NPV of cost equals that of income is deemed best for BEZA to go forward with.

As per the simulations[220], it was evident that **combinations corresponding to upfront payment, annual land lease and revenue share present the most viable option for BEZA** in terms of determining the project structuring. Thus, combination of **upfront payment (BDT 600 million), together with an annual land lease (BDT 8 per sq. ft. per annum) and a revenue share to BEZA (8.00%)** emerges as the most suitable option for BEZA in case it embarks on the conventional approach. However, this simulation is hypothetical in nature based on BEZA's prerogative to recover its cost outlay with respect to the project and moreover, the determined values project an ideological viewpoint on the magnitude of the pay-outs (which could be altered in different combinations to suffice BEZA's objective) that could be charged by BEZA.

Following table indicates the various financial ratios when the conventional approach is adopted.

Table 138: Project returns in the Base case for the PPP developer- Conventional Approach[221]

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[222]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Conventional approach	5.66%	5.56%	0.16	0.58	-4260.9	-4893.0

Source: Financial Model; #BCR and NPV values with 10% and 15% cost of equity is furnished in annexure

[220] *Results of the simulation with different combinations have been furnished in Annexure 24*
[221] *Project returns across Conservative and Aggressive scenarios are furnished in Annexure 26*
[222] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

The project return reduces to 5.16% in case mark-up on utility is not charged, which shows that mark-up charge on utility have a marginal impact on project return in case of conventional approach.

It is evident that this project generates unattractive returns for a PPP developer when the PPP developer is making pay-outs to BEZA.

13.6.1.2. Approach-2: Assistance from BEZA

Ultimate objective of BEZA and GoB behind developing this EZ project is to promote employment and to uplift the socio-economic status of the region surrounding this project. Although the conventional approach involves certain pay-outs from the PPP developer to BEZA, above discussions entail that the same would lower the financial returns of the PPP developer.

Traditionally, in case of PPP projects, the developer is liable to make certain pay-outs to the regulatory authority (in this case BEZA) for it recover its cost lay-out. However, globally there are precedencies of projects which have been developed through the PPP route without involvement of any pay-outs to the authorities regulating them. Since, the ultimate objective of BEZA through this project is overall socio-economic upliftment of the region through employment generation, thus, to make the proposition of developing the proposed EZ attractive, BEZA may consider foregoing pay-outs for the private developer. Similar examples have been adopted in the past in developed economies to promote private sector participation in industrial projects. One such successful case in point is the Panama Pacifico SEZ project in the Republic of Panama. A case study pertaining to the same has been furnished in the Annexure of this report. Although, Bangladesh does not have similar precedencies in case of PPP transactions, however, globally successful PPP projects have adopted PPP project structuring route sans the pay-out criteria as demonstrated in the case study mentioned above.

Globally in PPP projects, Government/ authority considers certain grants and fiscal stimuli to support the private sector so that the project is financially feasible as well as attains the ultimate objectives of employment generation and socio-economic development for the community.

To promote private sector inclusion and thus create more efficiency and dynamism in developing similar industrial projects, BEZA and GoB may consider certain fiscal stimuli to the PPP developer so that the projects yields attractive financial returns. The same can be formulated through any (or combination of) the following approaches-

- Waive off the pay-outs to BEZA
- Any nature of grant through VGF/ annuity

In order to further improve the project profitability under such circumstances, mechanisms such (i) Funding the project through an equal combination of Commercial and Concessional Loan, (ii) Modification in Bid parameters with BEZA foregoing full recovery of its cost layout, and (iii) infusion of financial stimuli in the form of Viability Gap Funding or Annuity or a combination of both was explored. Analysis demonstrates that none of these mechanisms succeed in improving the profitability of the project above desired levels (i.e. >13%-14%) in terms of the returns it offers. Alternatively, even a combination of VGF and Annuity to the tune of 40% of the project cost fails to improve the project returns to a viable extent. Thus, it can be concluded that the project does not renders PPP-ability for BEZA even when it follows the unconventional approach or foregoes full recovery of its cost associated with the project.

Table 139: Project returns in the Base case for the PPP developer- Assistance from BEZA Approach[223]

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[224]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Without Pay-out to BEZA approach	7.31%	7.53%	0.32	0.63	-2471.1	-2952.6

Source: Financial Model; #BCR and NPV values with 10% and 15% cost of equity is furnished in annexure

The project return reduces to **6.81%** in case mark-up on utility is not charged, which shows that mark-up charge on utility have a marginal role in making the project return attractive in case of unconventional approach.

The project (which was financially not attractive in conventional approach) yields similar unattractive returns even when BEZA foregoes the pay-out criteria based upon the strategic importance of the project and to imbibe private sector efficiency into it. Thus, it can be concluded that the project is not suitable for PPP route considering the low return on investment.

Evidently, it will not be prudent for BEZA to explore the PPP route in developing this project as it would be difficult for them to on-board PPP developers of domestic and international repute, even when it offers additional fiscal assistance (beyond foregoing pay-outs) in form of VGF/ annuity, assistance to obtain concessional borrowing options.

Combination of VGF to the tune of 40% and Annuity as high as 40% of the O&M cost (for a period of 15 years from start of operations of the proposed EZ) improve the project return to 10.7%, which is still below the bankable threshold of 13%-14%.

Evidently, it will not be prudent for BEZA to explore the PPP route in developing this project as it would be difficult for them to on-board PPP developers of domestic and international repute, even when it offers additional fiscal assistance (beyond foregoing pay-outs) in form of VGF/ annuity, assistance to obtain concessional borrowing options.

13.7. Conclusions and Recommendations

Financial modelling exercise highlights the entire gamut of cost and revenue assumptions taken in order to evaluate the financial feasibility for BEZA which would envisage development and operation of the proposed EZ. It is to be noted that this financial modelling exercise takes into consideration two cases viz. Case 1 - where BEZA is playing the role of a master developer for this project and Case 2 – where BEZA assigns a PPP developer to develop the project thus imbibing private sector efficiency into the project. The following key points elucidate on the findings of the financial modelling exercise.

- This project is financially unattractive only when BEZA plays the role of a master developer and subsequently incurs all pertinent cost of development.
- To make this project financially attractive, BEZA may consider developing infrastructure through assistance from nodal agencies. This could enable BEZA to act as the developer of the project from the perspective of its ultimate objective of socio-economic upliftment of the communities through manufacturing-based employment generation.
- Project returns are unattractive for the PPP model even when BEZA decides to develop the project with conventional approach.

[223] *Project returns across Conservative and Aggressive scenarios are furnished in Annexure 26*

[224] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

- The assistance from BEZA will improve the return from project from 5.66% in conventional approach to 7.31% in unconventional approach which is still not attractive for private player.
- The project should only be pursued by BEZA (under developer mode) if BEZA is interested in boosting economic development in the region, otherwise the project is unviable in terms of financial feasibility.

14. Economic Modelling

14.1. Purpose and Objective

The objective of economic modeling is to analysis and quantify the impact of the development of the proposed Economic Zone on the economy of Bangladesh. The impact of an industrial project can be adjudged based on its potential to affect the indigenous population or the local communities positively. This can be computed through a qualitative economic impact analysis, which demonstrates the project's ability to influence the economy of the micro market and regional population. Likewise, its quantification is determined through the calculation of the Economic Internal Rate of Return (EIRR). 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.

14.2. Economic Impact Analysis

Economic modelling quantifies the economic benefits of a particular project to the government but does not quantify the impact on local population. The motive of this section is to scale the impact of the project on the economy of the micro market and regional population. The indirect impact of the project are more than direct visible impacts. Economic impact analysis framework analyzes the impact of the project on basic five capitals of community which are essential part of any social development.

14.2.1. Core features of the Economic Impact Analysis Framework (EIAF)

The EIAF will help to analyze the impact of project on the micro level, local population and the people who will lose or gain maximum from the proposed project. The framework will broadly analyze the impact of project on following aspects.

- Education, information, technologies, training and better nutrition, and health;
- Social environment;
- Natural resources;
- Basic infrastructure;
- Access to financial resources; and
- Policy and institutional environment that supports multiple livelihood strategies and promotes equitable access to competitive markets for all.

The application of the Economic Impact Analysis framework (EIAF) involves consideration of the following aspects:

- **Human Capital:** It represents the abilities, experience, work skills and the physical state of good health which, when combined, allow populations to engage with different strategies and fulfil their own objectives for their livelihoods.
- **Social Capital:** It refers to the social resources, which populations will rely on when seeking their objectives relating to livelihoods (in the present study this refers specifically to local social capital, this being networks, associations, local authorities, local officials and broader population receiving program assistance).
- **Natural Capital:** It is the term used to refer to the stocks of naturally occurring resources (soil, water, air, genetic resources, etc.) which can be used as inputs to create additional benefits, such as food chains, protection against soil or coastal erosion, and other natural resources which can support livelihoods.

- **Physical Capital:** This refers to the basic infrastructure and production inputs needed to support livelihoods.
- **Financial Capital:** This refers to the financial resources which population employ to achieve their objectives regarding livelihoods.

14.2.2. Core Concept of the Economic Impact Analysis Framework (EIAF)

The EIAF approach aims to focus on the development of the people which is equally important at higher levels (when we think about the achievement of objectives such as poverty reduction, economic reform or sustainable development) as it is at the micro or community level (where in many cases it is already well entrenched). At a practical level, this means that the approach:

- starts with an analysis of people's livelihoods and their economic conditions and how these conditions have been changing over time;
- focuses on the impact of different policy and institutional arrangements upon people/households and dimensions of poverty (rather than on resources or overall output);
- works to support people to achieve their livelihood goals

Development activity tends to focus either at the macro or micro level. The EIAF approach attempts to bridge this gap, emphasizing the importance of macro level policy and institutions to the livelihood and economic options of communities and individuals on micro level.

The first step is to propose a way to provide a qualitative evaluation, which can also act as a numerical quantifier, of each capital relevant to the formation of sustainable economic development. Typical ranges are between 0-5. an analysis of the proposed development will be judged on basis of following:

- Unsustainable: 0 <= capital < 1
- Limited sustainability: 1 <= capital < 2
- Sustainable: 2 <= capital < 3
- Progressively sustainable: 3 <= capital < 4
- Abundant: 4 <= capital <= 5

The framework considers different parameters under five capital to analyze the projects impact on the micro level. Theses parameters are decided based on the impact that project would have on regional population. The following parameters have been analyzed under each capital which have impact on economic development of the region.

Table 140: Impact indicators under each capital

Sl. No.	Human Capital	Physical Capital	Financial Capital	Natural Capital	Social Capital
1	Capacity Building in government institution	Infrastructure development	Increase in services for local development	Sustainable industrialization	Issues of Rehabilitation and resettlement
2	Training for project stakeholders	Improved productivity	Increase in value for regional produce	Introduction of sustainable industrial practices	Community participation
3	Capacity building for local residents	Investment in production infrastructure	Impact on minimum daily wages for unskilled labour	Environmental Sustainability	Promotion of the participation of different actors

Sl. No.	Human Capital	Physical Capital	Financial Capital	Natural Capital	Social Capital
4	Institutional intervention	Technology transfer	Indirect employment generation	Introduction of eco-friendly energy production	Positive impact on existing social webs

Source: PwC Analysis

14.2.3. Assumptions

Following table summarizes the assumptions and their sources which have been taken into account for quantifying the impact of the proposed development.

Table 141: Assumptions for Economic Impact Analysis

Attributes	Assumptions	Source
Human Capital		
Literacy Rate	43.20%	Bangladesh Bureau of Statistics
Unemployment Rate	4.15%	Bangladesh Bureau of Statistics
Institutional Intervention	Very few as of now, Not organized	NA
Financial Capital		
Per Capital GDP (Nominal USD)[225]	1,674	Bangladesh Bureau of Statistics
Poverty Rate	33.2%	World Bank
Score on Global food security index parameters	53.2	Food Security index by Economist Intelligence Unit
Indirect employment generation factor	0.7	Standard from developing countries
Physical Capital		
Existing physical infrastructure	Basic infrastructure	Site Visit
Industrial Infrastructure	Basic infrastructure	Site Visit
Existing production technology	In process of modernization	Secondary Research
Natural Capital		
Industrial practice	Manual or semi-mechanized	PwC Research
processing units	Very few	PwC Research
Industrialization in region	Few	PwC Research
Means of industrial energy	Mostly from non-renewable sources, 93% of the country's power producing thermal plants are gas-based	Energypedia
Social Capital		
Rehabilitation	Resettlement is required for the chunk of land parcel	Site visit

Source: PwC Analysis

[225] *Estimated for 2018, the country's per capita GDP is for year 2018*

14.2.4. Results

All the impact parameters are rated based on the assumptions and the impact it would have on local economy.

Table 142: Results of Economic Impact Analysis

Different form of capital in sustainable projects and there rating on scale of 5							
Sl. No.	**Impact Indicators**	**Human Capital**	**Physical Capital**	**Financial Capital**	**Natural Capital**	**Social Capital**	**Marking Rational**
1.	Capacity Building in government institution	3					Existing expertise pertaining to industrial processing is moderate
2.	Training for project stakeholders	4					Basic training for local administrative agency is required for implementation of project, it will have trickle down impact on local population
3.	Capacity building for local residents	4					Knowledge related to industrial practices will trickle down from EZ industries to the locals
4.	Institutional intervention	4					Institutional intervention is required for making project viable, and would have major effect on knowledge base of local population
5.	Infrastructure development		5				As of now presence of physical infrastructure is not developed in immediate region, the proposed project demands development of other industrial infrastructure which will further boost economy in the region
6.	Improved productivity		4				The proposed industrial facilities will boost the industrial productivity in the region
7.	Investment in production infrastructure		5				To become more sustainable industrial processing units will tends towards investing more in local production infrastructure that in turn will help in local procurement of raw materials
8.	Technology transfer		5				Bangladesh lags in technological advancement in industrial sector, the investment from outside country will help in technology transfer to country as well as in local region
9.	Increase in services for local development			4			Once the EZ will start working in full fledge it will attract other services such as banking, security, local market etc. which will equally benefit the local population
10.	Increase in value for regional produce			4			Industrialization in the region will boost the demand for other FMCG and other daily consumable goods, this will provide the

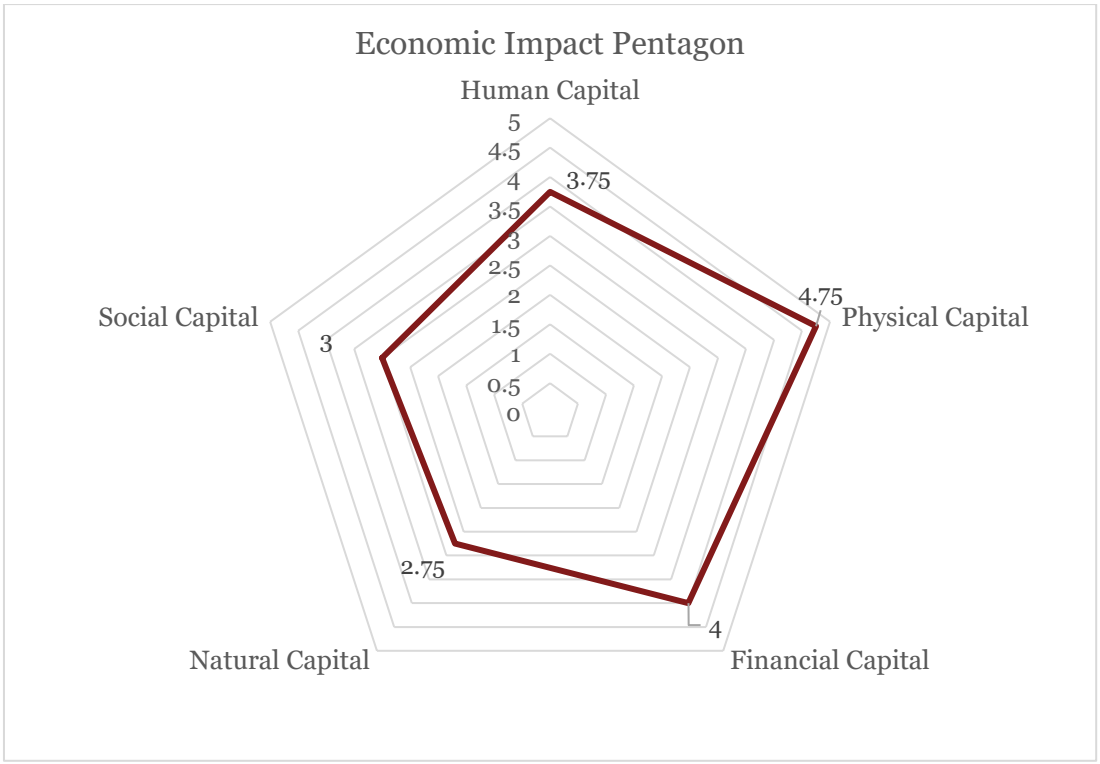
Different form of capital in sustainable projects and there rating on scale of 5							
Sl. No.	**Impact Indicators**	**Human Capital**	**Physical Capital**	**Financial Capital**	**Natural Capital**	**Social Capital**	**Marking Rational**
							market for regional produce, that will increase the value for regional produce in turn
11.	Impact on minimum daily wages for unskilled labour			4			60% of the total employment generated by the proposed EZ will for unskilled labour, development of this scale will boost the labour demand directly and indirectly in the region
12.	Indirect employment generation			4			The proposed development will require various services for industries and employee engaged in these industries on local level which will generate indirect employment for locals.
13.	Sustainable Industrialization				3		The proposed development will promote environmentally sustainable industrialization under guidance and instruction of various governing agencies
14.	Introduction of sustainable industrial practices				4		The proposed development will attract a lot of investment and competition within firms will promote sustainable industrial practice
15.	Environmental Sustainability				3		The proposed development will have negative impact on local environment, as it would disturb the regional ecosystem
16.	Introduction of eco-friendly energy production				1		The proposed do not have any component to promote eco-friendly energy production
17.	Issues of Rehabilitation and resettlement					1	Rehabilitation is required as the proposed EZ has a part of private land
18.	Community participation					4	The proposed development will promote community participation by increasing demand for various services for smooth functioning of EZ
19.	Promotion of the participation of different actors					3	The EZ will promote participation of different stakeholders from local community in limited scope
20.	Positive impact on existing social webs					4	Development of this scale will help in strengthening social ties by providing platform for locals to interact with each other.
	Average Impact on capital	**3.8**	**4.8**	**4.0**	**2.8**	**3.0**	

Source: PwC Analysis

14.2.5. Economic Impact pentagon

The pentagon summarizes the impact of proposed development on different types of capital; which have impact on micro level economy. It is the average of impact on each parameter under different capital. Value on each arm of pentagon shows the scale of impact on that particular capital of local population of region.

Figure 87: Economic impact on micro market population



Source: PwC Analysis

From the economic impact pentagon, it can be inferred that apart from natural capital, the project has progressively sustainable impact on the different capital of the micro market. It can be concluded that the envisaged EZ is sustainable and will help in uplifting the economic condition of the population in the area or residing in the project impact region.

In order to quantify this impact on the macro economic landscape of the country, Economic Internal Rate of Return (EIRR) is calculated. It quantifies the economic benefits that will be attributed to the macroeconomy due to the development of the proposed EZ at Bhola.

14.3. Methodology of Economic Modelling

14.3.1. 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 during construction and during operation period) generated because of the project,
- The suppliers and customers of the project,
- Residents who are being affected by the implementation of the project and

The purpose of EIRR calculation is directly aligned with the objectives of the multilateral agencies i.e. alleviation of poverty, employment generation and overall development of the country.

EIRR replicate the wider spectrum of project on regional and countries economy. The model accounts the direct benefit in form of tax and VAT to the government as well as employment which will be generated due to the project.

The Economic Rate of Return (ERR) can loosely be defined as "The net benefits to all members of society, as a percentage of cost, taking into account externalities and other market imperfections." In a Harvard Business School Professor Benjamin Esty defined a two-step process for calculating an Economic Rate of Return. This method is described briefly thus:

EIRR = Actual Revenues – Opportunity Costs

= Actual Revenues – Opportunity Costs + (Actual Costs – Actual Costs)

= (Actual Revenues – Actual Costs) + (Actual Costs – Opportunity Costs)

EIRR = Private Returns + Cost Gains, where

Private Returns = Actual Revenues – Actual Costs

Cost Gains = Actual Costs – Opportunity Costs

This simple calculation assumes the exclusion of taxes and other social complexities.

The analysis presented above highlights the fact that there is a difference between Private and Social Returns. Though the difference between opportunity costs and actual costs is the only difference noted above, other reasons for this difference could include:

- Taxes, Tariffs and other forms of Government intervention which could reduce private returns;
- Transaction Costs; and
- Non-market effects such as the impact of the project on the environment.

In addition to highlighting the differences between the EIRR and the FIRR (or social returns and private returns), the analysis also shows, through the gains in costs, that investments in large-scale projects should result in economic development. Model works on principal of with project and without project scenario, so all tax 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:

- 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.

- 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.

14.3.2. 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 labour. 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 prevalent in Bangladesh, SWRF, and SERF have been considered to arrive at the economic value of the total employment generated.
4) 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.

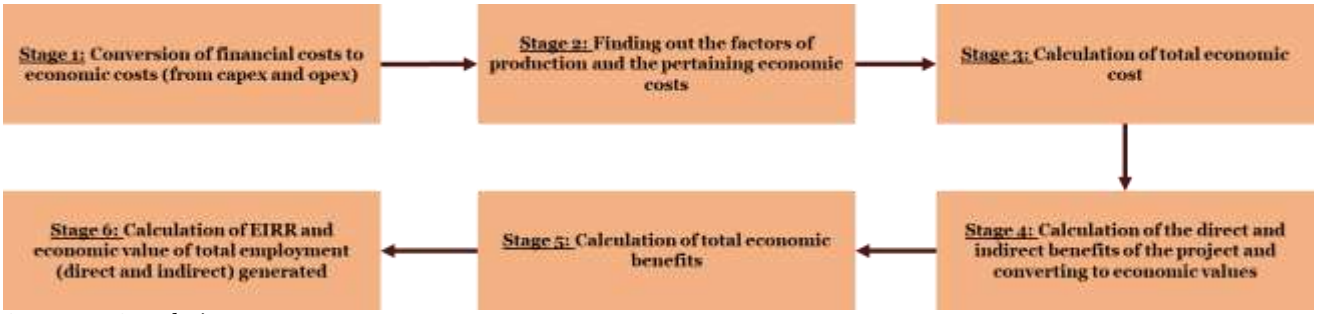
Economic modelling exercise has been undertaken for three scenarios as elucidated in the following-

- 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 following diagram.

Figure 88: Framework for Economic IRR calculation



Source: PwC Analysis

14.4. 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:

- *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 wastewater, 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 (for both on-site and off-site infrastructure 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) Labour – 20% of total capex

- *Operating Expenditure (Opex):* We have assumed that 90% Opex will generate on account of the materials and consumables; 10% of Opex will generate on account of the equipment. The operating cost for personnel is calculated separately in the economic model.
- *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%.[226]
    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 labour and land that have been valued at border price equivalent values, with project effects measured at domestic market price values left unadjusted.

226 Additional Financing to the Third Primary Education Development Project RRP BAN 42122 by ADB (2015)

- *Shadow Wage Rate Factor (SWRF)* of 1.00 for skilled labour and 0.75 for unskilled labour was assumed.[227] Further it was considered that the project will have a mix of 75% skilled labour and 25% unskilled labour. Hence, SWRF of 0.9375 has been arrived.
  SWRF is the ratio of the shadow wage rate of a unit of a certain type of labour, measured in the appropriate numeraire, and the project wage for the same category of labour. Alternatively, the ratio of the economic and the SWRF can be used to convert the financial cost of labour into its economic cost.

- *Wage Rate:* Average Wage rate considered for the direct and indirect employment is BDT 8000

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 labour 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 0.50. The coefficient was extracted from Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation"[228]. 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 the model consider the scenario with project and without project, tax subsidies will be not treated as loss to the economy.
- 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.

The guide for operating this economic model is placed in the annexure.

14.5. Results and Conclusions

Base case Economic Internal Rate of Return (EIRR) has been calculated as **20.96%**, which indicates that the project is providing good returns throughout the tenure of the project. Following table depicts the scenario analysis of the proposed EZ.

Table 143: Scenario Analysis of the Proposed EZ

Scenario	EIRR
Conservative Scenario	18.52%
Base Scenario	20.96%
Aggressive Scenario	23.39%

Table above indicates that in conservative case, project generates **18.52%** economic return. Aggressive scenario also indicates the project provides very attractive economic return of **23.39%.**

The following key points shall summarize the economic impact of the proposed EZ at Bhola:

- Microeconomic impact evaluated through the economic impact analysis exercise also depict the project's positive impact on the human development capitals.

227 Similar assumption was taken for ADB-Khulna water supply project

228 Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation" by Christian Kingombe and Dirk Willem te Velde, Overseas Development Institute

- It appears from the above analysis that the proposed EZ generates very attractive economic return in the context of Bangladesh's economy and growth targets and consequently the economic returns accrued are also commensurate with similar EZ projects based out of other Southeast Asian and global economies.
- The project has the potential to generate ultimate direct employment of ~38,471 (in Base case) with a value of BDT 3,693 million which indicates its ability to provide organised manufacturing-based employment to the local communities. It thus, falls in line with BEZA's ultimate objective of socio-economic development through organised industrialization.
- Overall, it could be prudent to surmise that the proposed EZ at Bhola has the potential to transform the economic landscape of its influence region.

Implementation strategy

The proposed site of Economic Zone at Bhola is in proximity to Mongla and has strategic location in terms of connectivity through waterways. However, the site is located on a river island and posses challenge in terms of last mile connectivity to mainland. Being located on a river island the site requires development of an embankment and adequate land filling to avoid flooding. The land development costs further add to the development cost of the site and impacts viability. In order, for the site to start operations it is advised to develop offsite last mile infrastructure before EZ construction begins. Offsite infrastructure development required for the project has been identified by the study team under the transport assessment chapter.

The large-scale infrastructure development required for the EZ would impact the demand offtake and this is highlighted in the delay in demand offtake. The study team forecasts land offtake for proposed site at Bhola to begin in FY 2029 with offtake to be completed by FY 2041 in base case scenario.

Financial analysis has been carried under two scenarios – a) Proposed Economic Zone to be developed by BEZA and b) Proposed Economic Zone to be developed under PPP mode. Viability under both scenarios has been detailed below -

a) **Proposed Economic Zone to be developed by BEZA -** The financial analysis for the site shows that the project is financially feasible only when both offsite and onsite infrastructure is developed through assistance of the respective nodal agencies. Thus, government fiscal support is crucial for BEZA to develop the site. In case, BEZA intends to develop the proposed site without any fiscal support in line with development model followed by other private player economic zone then BEZA should charge lease rental of ~126 BDT/sq. ft/year to match project IRR with weighted average cost of capital (9.9%).[3] The project however fetches good economic return when developed on the stipulated time.

b) **Proposed Economic Zone to be developed under PPP mode –** The project is not viable for development under PPP mode until viability gap funding is provided by BEZA. The study team advises BEZA against development of the site under PPP mode.

Based on above assessment the study team proposes that BEZA should place the development of the proposed EZ at Bhola under low priority.

[3] Base case demand offtake considered. Impact of high lease rental not considered on demand.

15. Annexures

15.1. Annexure 1 – Team of Experts and Project Timeframe

Our team of experts are duly supported by a large team of non-key experts (i.e. support staffs) spread across different locations in India and in Bangladesh. Some of the non-key experts are placed on-ground to ensure smooth project coordination.

Figure 89: Team of Experts

Source: Contract agreement executed between PwC & BEZA dated 26th June 2019

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 144: Project timeframe

D1	Inception report	31st July 2019	Submitted
	Presentation on Inception Report findings	7th November 2019	Completed
D2	Draft interim report	04th February 2020	Submitted
	Presentation workshop to discuss findings of the interim report	03rd and 04th March 2020	Completed

	Final interim report	01st June 2020	
D3	Draft final pre-feasibility report	20th February 2021	Submitted
	Presentation workshop to discuss findings of the draft final report	26th to 28th January 2021 and 24th February 2021	Completed
D4	Final pre-feasibility report	25th February 2021	Submitted
	Deliverable submitted		
	Deliverable to be submitted		

Source: Contract agreement executed between PwC & BEZA dated 26th June 2019

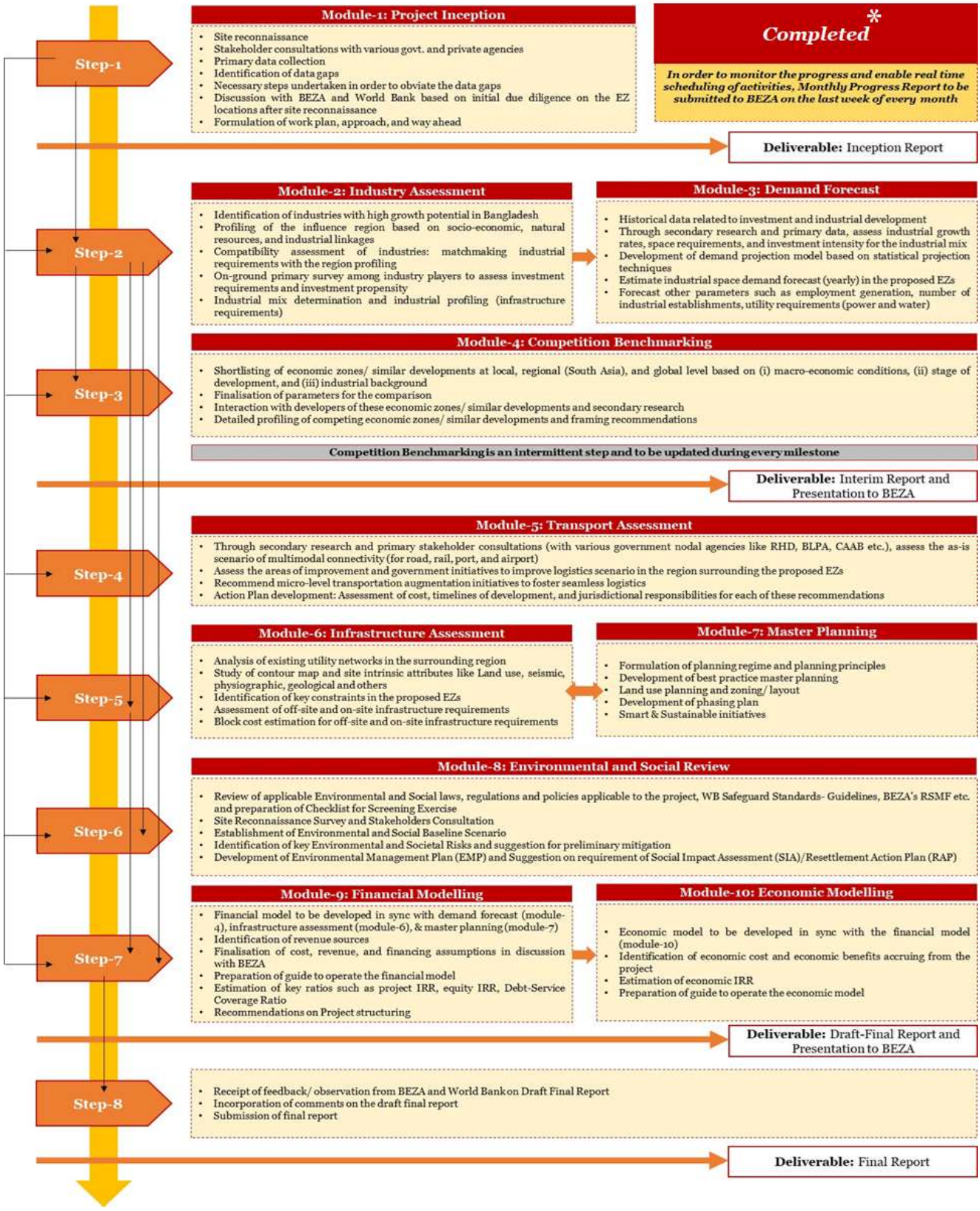
Legend:

D1: Inception Report
D2: Draft Interim Report, Presentation on Key Findings & Final Interim 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 4.2 of the Inception Report dated, 31st July 2019.

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

Figure 90: Outline of the engagement



15.2. Annexure 2 – Site Photographs

The photographs taken during the site visits have been shown below.

Agricultural land within the proposed site

Zila road (LGED Road) adjacent to the proposed site

Discussions with UNO officials at UNO Office

Agricultural land within the proposed site

Discussion with Potential Project Affected People & Local elites

Discussion with women group


Discussion with women group


Boundary identifiing with Land Official and local people


Discussion with Youth group


Part of proposed EZ area

15.3. Annexure 3 - Adamjee EPZ

The Adamjee Export Processing Zone (AEPZ) is located in Siddhirganj in Narayanganj district of Dhaka division in central part of Bangladesh. Adamjee EPZ is a custom bonded enclave is well connected with decent communication network to roads, air, waterways and railways. Bangladesh's first internal container terminal Pangaon, is only 22 km distant from Adamjee EPZ

Figure 91: Adamjee EPZ

Source: Google Images

A detailed profiling of the park has been provided below –

Table 145: Adamjee EPZ

Factors	Adamjee EPZ
Site	
Year of establishment/Start year of operations	It was established in 2006
Land Size (acres)	245.12 acres
Number of Plots/Units/Firms	Currently there are 229 industrial units[229]
No. of Development Phases	The developments have been carried out over a period of time but in a single phase
Land Lease (+length) or Sale (Taka/USD)	Industrial land lease length is for 30 years which is renewable and land lease is USD 2.20 /sq.m./year (BDT 187/sq.m./year) [230]
Standard-Factory Building (SFB) (Y/N)	There are Standard-Factory Buildings provided as a part of the product offering.
Lease Rate for SFB (Taka/USD)	The tariff for SFB is USD 2.75/sq.m./month
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is own sub-station available for the special export processing zone
Cost of Electricity (Taka/USD)	The cost of electricity is approx. USD 0.11 / Kwh (BDT 8.97/Kwh) for industries[231]

[229] *Source: https://bepza.gov.bd/pages/epzdetails/adamjee-export-processing-zone-2/profile-of-zone*
[230] *Source: https://bepza.gov.bd/pages/epzdetails/adamjee-export-processing-zone-2/profile-of-zone*
[231] *Source: https://bepza.gov.bd/pages/epzdetails/adamjee-export-processing-zone-2/utility-services-2*

Factors	Adamjee EPZ
Cost of Water (Taka/USD)	The cost of industrial water is approx. USD 0.42 /CM (BDT 35.78/CM)[232]
Onsite Wastewater Treatment Plant (Y/N)	There is onsite water treatment plant since industries within the zone
Onsite Gas Supply (Y/N and Type)	Gas is supplied by Titas Gas Transmission & Distribution Company Ltd.
Cost of Gas (Taka/USD)	The tariff of gas is approx. USD 0.10 /CM (BDT 8.97/CM)[233]
Cost of Labor (Taka/USD)	
Management	The basic salary for a management professional in Bangladesh is approx. USD 917.65 / month (BDT 78,000/month)[234]
Technicians	The basic salary for a technician in Bangladesh approx. USD 341.17 / month (BDT 29,000/month)[235]
Skilled	The basic salary for a skilled labour in Bangladesh approx. USD 258.82 / month (BDT 22,000/month)[236]
Unskilled	The basic salary for an unskilled labour in Bangladesh is approx. USD 97.05 / month (BDT 8,250/month)[237]
Sectors	
Type of Sectors within the Zone	Garments, Garment Accessories, Knitting & Other Textile Products, Footwear & Leather Goods, Chemical & Fertilizer, Metal Products, Jewelry
Special Regime	
Yes/No	**Yes**, Adamjee EPZ is the special regime
Fiscal Incentives	
Yes/No	Fiscal incentives are available at the EPZ: 1. Five (5) years tax holiday for Adamjee EPZ; first 02 years 100% exemption, next 02 years 50% exemption and last 01 year (5th year) 25% exemption 2. Duty free import of construction materials 3. Duty free import of machineries, office equipment & spare parts etc. 4. Duty free import and export of raw materials and finished goods 5. Relief from double taxation 6. Exemption from dividend tax 7. GSP facility available 8. Accelerated depreciation on machinery or plant allowed 9. Remittance of royalty, technical and consultancy fees allowed 10. Duty & quota free access to EU, Canada, Norway, Australia etc
Non-Fiscal Incentives	
Yes/No	Non-Fiscal incentives are available at the EPZ: 1. 100% foreign ownership permissible 2. Enjoy MFN (most favored nation) status 3. No ceiling on foreign and local investment 4. Full repatriation of capital & dividend 5. Foreign Currency loan from abroad under direct automatic route 6. Non-resident Foreign Currency Deposit (NFCD) Account permitted 7. Operation of FC account by 'B' and 'C' type Industries allowed.
One Stop Shop Within the Zone	One stop shop is available within the zone.
Support Amenities	

[232] *Source: https://bepza.gov.bd/pages/epzdetails/adamjee-export-processing-zone-2/utility-services-2*
[233] *Source: https://bepza.gov.bd/pages/epzdetails/adamjee-export-processing-zone-2/utility-services-2*
[234] *Source: Pay Scale 2015, Civil*
[235] *Source: Pay Scale 2015, Civil*
[236] *Source: Pay Scale 2015, Civil*
[237] *Source: Pay Scale 2015, Civil*

Factors	Adamjee EPZ
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is onsite convenience retail available within the zone
Onsite Housing	There is onsite housing available within the zone
Onsite Schools	There are no onsite schools available inside the zone
Onsite Community Facilities	There are onsite community facilities available within the zone.
Onsite Security	There is onsite security available at the zone.
Quality of Life	
International Housing (Within 45 Km)	Quality housing facilities are available in the close proximity in Narayanganj and Dhaka
International Hospital/Clinic (Within 45 km)	Quality healthcare facilities like SAJIDA Hospital, Labaid Multi Specialty Hospital, LABAID Diagnostic Narayangj etc. are available in proximity to the EPZ in Narayanganj district
International Schools (Within 45 Km)	Various upscale schools like Adarsha School Narayanganj, Narayanganj Ideal School Narayanganj Technical School & College etc. are present in close proximity to the EPZ in Narayanganj district and multiple upscale schools, colleges and universities are in Dhaka district

Source: PwC Research

15.4. Annexure 4 - Project Boundary shown on Mouza Map


REFERENCE :

15.5. Annexure 5 – Country Level Assessment of Industrial Sectors

Assessment of Export and Import Basket of the Country

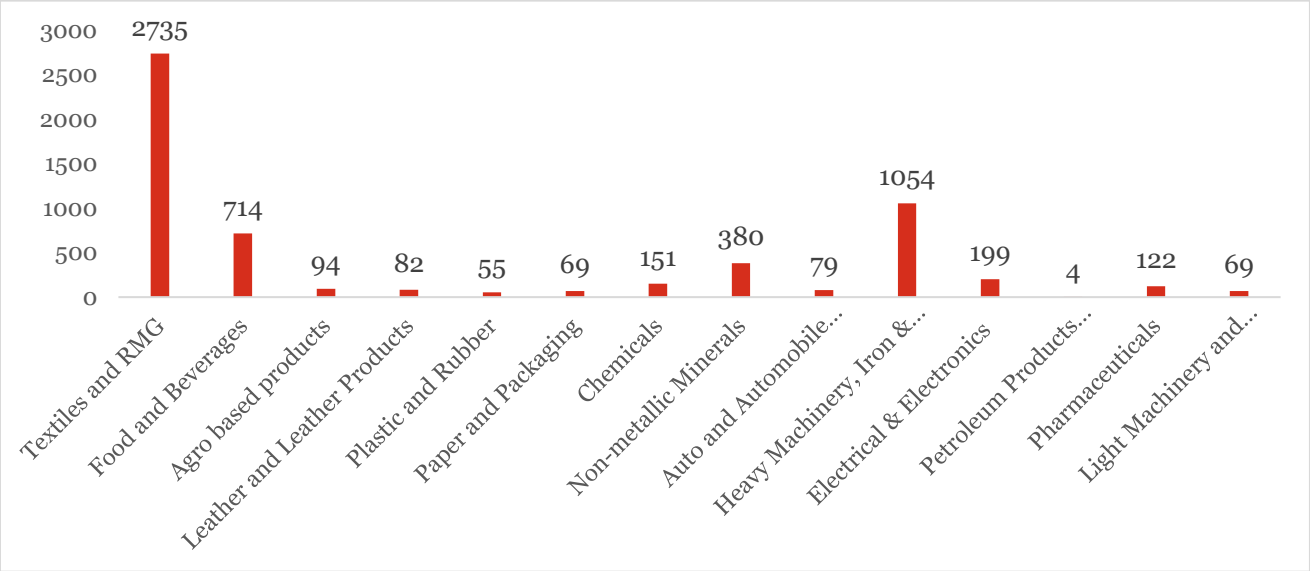
Analysis of the export basket of the country reveals that more than 90% of the exports are from the Textile & RMG oriented products. Its top exports are from RMG, leather, wooden products, fish products and automobile accessories. The following figure depicts the top 75% of items, being exported and imported, that were shortlisted on the basis of average trade value over the past 5 years.

Figure 92: Top Export and Import basket of Bangladesh

Source: ITC Trademap

Assessment of Gross Output of Manufacturing Sector

Figure 93: Gross output across various sectors in Bangladesh (Estimated 2019, In BDT Billion)



#Estimated for 2019
Source: Bangladesh Bureau of Statistics, Survey of Manufacturing Industries 2012

In terms of the specific sectors, it needs to be noted that Textiles and RMG , Food and Beverage, Heavy Machinery, Iron & Steel, Non-metallic mineral products, Electrical & Electronics, Chemicals, Pharmaceuticals are dominant in country. Following figure enlists the items that constitute the top 80% of the total output produced in Bangladesh.

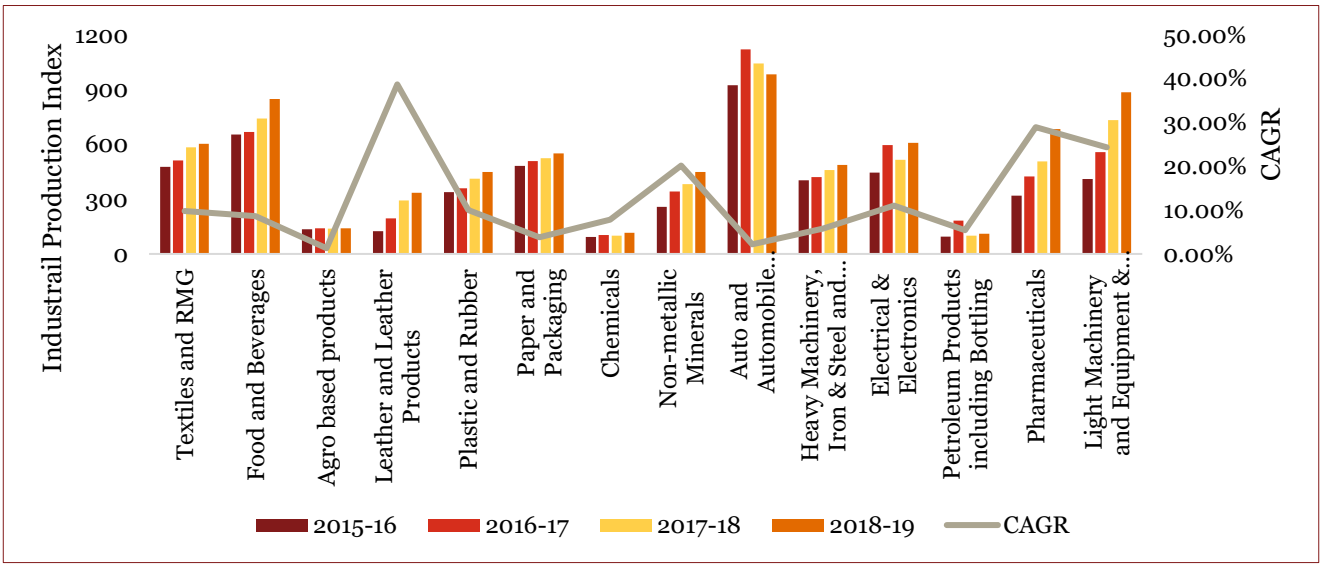
Figure 94: Top 80% of items produced in Bangladesh in terms of gross output

Source: ITC Trade Map

Index of Industrial Production Analysis

Industrial production index measures changes in industrial production and is widely used for the observation and analysis of the current economic activity. The graph below represents the Industrial Production Index within Bangladesh over the past 4 years.

Figure 95: Industrial Production Index of industrial sectors in Bangladesh



Source: SMI

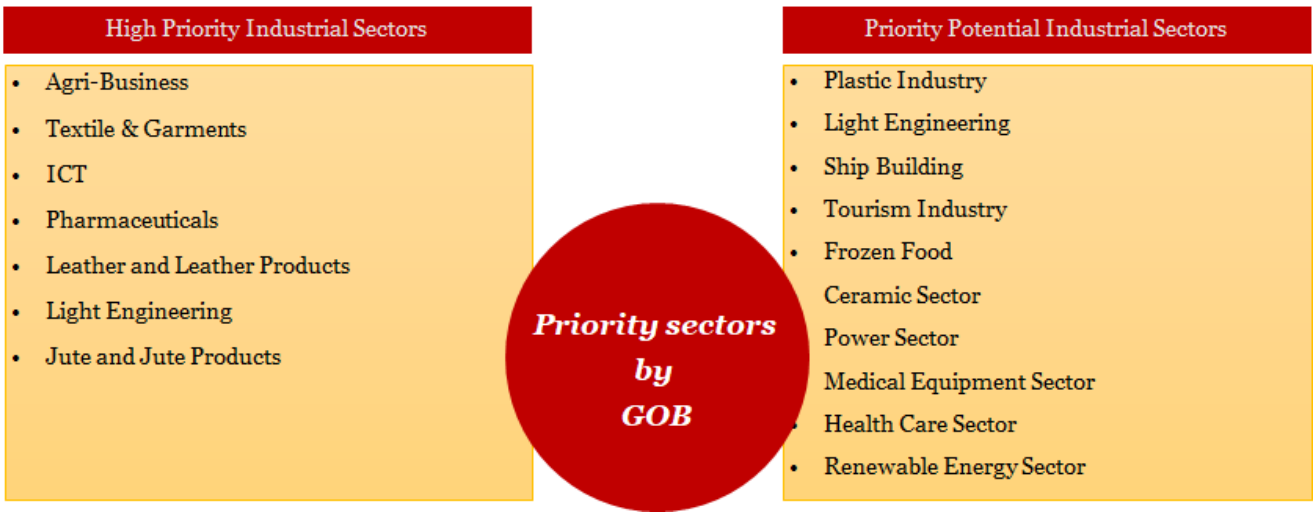
Above graph depicts that a positive growth in production is observed in Textiles and RMG, Food and Beverages, Leather and Leather products, Pharmaceuticals, Electrical and Electronics, Non-metallic minerals, Chemicals, Light Machinery, Equipment and Furniture over the past 4 years.

Priority Sectors Identified by the Government of Bangladesh

Government of Bangladesh has identified priority sectors to make its economy resilient to possible sector specific disruptions due to automation, policy changes and increasingly competitive global scenarios.

The following figure illustrates the priority sectors identified by the Government of Bangladesh.

Figure 96: Priority Sectors by Government of Bangladesh



Source: Bangladesh Investment Development Authority

15.6. Annexure 6 – Import Trend of Bangladesh

Table 146: Top 75% Imports of Bangladesh (Figures in USD Million)

Products	2015	2016	2017	2018	2019
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	4,792.33	5,245.07	5,953.71	6,824.21	5,800.91
Cotton	7,150.50	5,413.81	6,253.97	6,894.38	5,422.53
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	5,219.95	2,095.46	3,105.25	5,129.26	4,380.85
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	2,450.61	3,156.28	3,660.48	4,103.02	3,242.16
Iron and steel	2,407.67	2,074.97	2,120.63	2,775.30	2,909.47
Plastics and articles thereof	1,795.19	1,923.41	2,160.39	2,457.64	2,208.76
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	1,143.51	1,676.47	1,976.15	2,077.69	1,747.36
Man-made staple fibres	1,623.93	1,509.96	1,702.43	1,955.58	1,617.90
Man-made filaments; strip and the like of man-made textile materials	1,102.78	956.64	1,071.64	1,391.35	1,415.96
Knitted or crocheted fabrics	590.15	1,013.30	1,197.23	1,383.06	1,353.37
Cereals	1,521.25	1,147.37	2,248.16	1,727.74	1,239.31
Articles of iron or steel	444.89	594.06	814.38	1,062.22	1,082.47
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	592.23	386.41	531.16	608.82	881.37
Organic chemicals	656.77	596.30	734.91	813.40	835.14

Products	2015	2016	2017	2018	2019
Aircraft, spacecraft, and parts thereof	201.34	59.79	150.33	454.95	792.36
Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other coloring ...	587.91	630.57	672.72	767.72	752.98
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical ...	400.35	577.74	642.54	680.57	700.44
Edible vegetables and certain roots and tubers	704.76	628.73	554.85	510.02	684.07
Sugars and sugar confectionery	837.74	696.75	1,144.73	585.74	666.22
Miscellaneous chemical products	505.04	546.39	629.25	716.08	650.06
Paper and paperboard; articles of paper pulp, of paper or of paperboard	581.33	667.13	681.39	689.27	599.03
Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal ...	2,769.62	1,461.94	1,652.26	1,742.63	585.54
Salt; Sulphur; earths and stone; plastering materials, lime and cement	991.99	674.74	783.80	994.90	556.41
Ships, boats and floating structures	994.16	113.42	234.71	241.95	551.66
Fertilizers	1,255.60	671.00	715.47	832.05	520.09
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	7.92	497.08	629.93	979.17	501.92
Residues and waste from the food industries; prepared animal fodder	490.72	419.12	524.97	422.61	495.39
Special woven fabrics; tufted textile fabrics;	162.76	390.81	391.12	464.10	482.81

Products	2015	2016	2017	2018	2019
lace; tapestries; trimmings; embroidery					
Edible fruit and nuts; peel of citrus fruit or melons	273.63	316.23	354.11	370.66	425.29
Miscellaneous manufactured articles	257.80	436.70	435.18	466.29	422.39
Aluminum and articles thereof	262.47	308.86	388.68	443.96	398.94
Commodities not elsewhere specified	0.54	595.40	446.14	341.06	398.42
Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, ...	375.39	260.81	294.15	478.95	391.53
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	290.12	248.06	342.61	374.73	374.27
Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable ...	138.18	309.05	311.82	368.34	360.60
Rubber and articles thereof	298.67	294.25	300.93	310.32	309.22
Coffee, tea, maté and spices	229.66	165.88	185.73	215.74	270.07
Pharmaceutical products	186.78	230.05	245.07	228.66	267.49
Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	42.14	151.98	155.99	225.66	258.17
Copper and articles thereof	210.42	177.55	253.98	210.44	238.23
Footwear, gaiters and the like; parts of such articles	153.11	193.27	227.95	217.66	231.29

Products	2015	2016	2017	2018	2019
Miscellaneous articles of base metal	58.96	204.72	217.61	206.04	202.36
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	74.23	237.80	229.50	238.41	202.17
Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial ...	160.87	174.77	193.72	196.27	199.38
Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	45.89	114.07	116.91	159.82	177.61
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	73.75	137.94	170.80	184.54	169.37
Articles of apparel and clothing accessories, not knitted or crocheted	887.05	240.18	186.70	172.51	158.44
Zinc and articles thereof	158.64	163.57	179.75	164.47	158.07
Glass and glassware	72.50	119.27	122.93	150.44	145.15
Raw hides and skins (other than furskins) and leather	169.20	162.94	179.04	175.87	123.96
Preparations of cereals, flour, starch or milk; pastrycooks' products	70.82	84.70	94.25	112.03	122.35
Albuminoidal substances; modified starches; glues; enzymes	75.81	94.49	106.70	108.36	105.26
Articles of stone, plaster, cement, asbestos, mica or similar materials	35.70	63.07	61.50	77.33	105.12
Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or ...	165.61	257.40	205.52	283.57	104.17

Products	2015	2016	2017	2018	2019
Ceramic products	67.75	146.71	116.66	104.72	101.66
Miscellaneous edible preparations	74.28	88.93	83.37	95.08	97.64
Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	54.53	78.60	87.68	88.86	88.85
Toys, games and sports requisites; parts and accessories thereof	23.56	64.63	81.59	82.84	83.85
Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	297.23	54.15	87.78	101.50	82.81
Wool, fine or coarse animal hair; horsehair yarn and woven fabric	43.29	62.24	60.98	71.32	80.17
Other made-up textile articles; sets; worn clothing and worn textile articles; rags	34.16	59.87	64.88	67.68	71.24
Fish and crustaceans, molluscs and other aquatic invertebrates	55.28	42.74	46.49	46.57	68.90
Ores, slag and ash	72.46	30.36	28.86	61.46	59.60
Products of animal origin, not elsewhere specified or included	59.81	32.30	28.04	40.49	55.86
Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles ...	28.67	104.30	83.60	65.37	51.10
Arms and ammunition; parts and accessories thereof	130.36	7.44	25.41	21.38	46.32
Photographic or cinematographic goods	29.45	40.29	39.51	39.63	45.11
Wood and articles of wood; wood charcoal	113.80	61.44	70.21	51.84	45.11

Products	2015	2016	2017	2018	2019
Lead and articles thereof	55.49	42.17	78.58	67.47	42.08
Articles of apparel and clothing accessories, knitted or crocheted	22.90	91.83	73.82	57.78	41.12
Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles ...	4.06	42.07	49.12	44.59	38.77
Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	4.88	39.82	32.20	24.28	27.99
Railway or tramway locomotives, rolling stock and parts thereof; railway or tramway track fixtures ...	6.59	117.93	23.35	10.56	26.59

Source: ITC Trade Database

15.7. Annexure 7 – Export Trend of Bangladesh

Table 147: Top Exports 75% from Bangladesh (Figures in USD million)

Products	2015	2016	2017	2018	2019
Articles of apparel and clothing accessories, knitted or crocheted	12,767.10	16,668.99	17,791.37	20,115.53	20,343.41
Articles of apparel and clothing accessories, not knitted or crocheted	13,765.23	16,559.78	16,832.96	18,834.03	19,350.13
Footwear, gaiters and the like; parts of such articles	696.82	894.90	949.66	1,017.42	1,110.00
Other made-up textile articles; sets; worn clothing and worn textile articles; rags	818.60	990.73	1,131.16	1,094.95	1,004.95
Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn	681.19	788.68	853.45	720.81	603.28
Fish and crustaceans, molluscs and other aquatic invertebrates	445.01	623.07	636.25	545.33	532.93
Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles …	293.25	253.73	277.00	309.25	368.31
Headgear and parts thereof	75.63	280.17	300.51	311.30	332.64
Raw hides and skins (other than furskins) and leather	298.99	215.76	153.07	175.50	139.79
Plastics and articles thereof	80.22	84.50	95.81	108.51	113.23
Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles …	14.81	58.01	68.17	82.45	108.61
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical …	53.47	70.24	87.67	100.72	106.96
Tobacco and manufactured tobacco substitutes	48.84	91.58	97.62	117.55	99.86
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	130.52	89.51	85.06	82.20	93.93

Products	2015	2016	2017	2018	2019
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	39.82	45.13	63.37	91.08	88.91
Toys, games and sports requisites; parts and accessories thereof	26.71	59.09	64.37	92.24	87.89
Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal ...	17.56	10.93	10.75	23.21	86.20
Aircraft, spacecraft, and parts thereof	14.53	1.51	18.32	43.32	80.13
Commodities not elsewhere specified	0.51	36.79	72.67	85.33	73.55
Cotton	91.68	24.35	35.51	39.33	66.35
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television ...	59.52	63.62	62.51	83.75	59.79
Preparations of cereals, flour, starch or milk; pastrycooks' products	84.84	35.94	42.47	55.52	58.08
Pharmaceutical products	70.12	90.30	108.43	108.39	57.44
Copper and articles thereof	26.26	24.82	51.01	59.58	53.37
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	171.26	25.26	40.93	55.99	49.21
Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	29.85	37.27	31.32	32.64	46.39
Ceramic products	36.85	48.64	58.56	61.40	42.32
Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, ...	22.43	23.49	17.30	32.83	36.86
Iron and steel	18.91	14.89	23.70	31.27	32.05
Carpets and other textile floor coverings	19.07	33.53	32.97	32.48	31.79
Beverages, spirits and vinegar	25.27	16.93	22.24	23.89	27.69

Products	2015	2016	2017	2018	2019
Edible vegetables and certain roots and tubers	70.25	51.59	56.14	54.82	25.01
Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork	8.25	11.01	14.88	20.10	23.68
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral ...	178.12	52.21	54.29	25.03	21.61
Coffee, tea, maté and spices	25.70	18.75	24.73	26.61	20.89
Knitted or crocheted fabrics	33.81	8.70	11.06	12.32	20.73
Edible fruit and nuts; peel of citrus fruit or melons	26.62	26.67	36.86	40.15	17.09
Miscellaneous chemical products	3.66	6.90	10.54	13.10	17.07
Man-made staple fibres	26.20	16.26	23.43	24.40	15.62
Residues and waste from the food industries; prepared animal fodder	3.24	8.00	0.89	7.68	15.13
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal ...	17.87	14.84	9.74	10.67	14.32
Salt; Sulphur; earths and stone; plastering materials, lime and cement	2.20	13.27	20.48	13.84	13.49
Paper and paperboard; articles of paper pulp, of paper or of paperboard	36.00	6.01	14.75	24.35	13.46
Articles of iron or steel	26.89	9.75	6.79	13.76	13.23
Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates	2.34	18.27	13.51	12.04	12.29
Rubber and articles thereof	21.68	9.61	9.44	10.51	12.25
Ships, boats and floating structures	19.97	18.77	18.59	3.42	12.18
Miscellaneous manufactured articles	15.30	7.78	10.78	12.68	11.34
Preparations of vegetables, fruit, nuts or other parts of plants	70.47	30.17	29.34	18.69	10.86

Products	2015	2016	2017	2018	2019
Cereals	6.05	11.13	8.04	9.90	9.58
Ores, slag and ash	7.74	10.50	9.71	6.05	9.00
Zinc and articles thereof	2.67	4.29	5.87	4.29	8.49
Sugars and sugar confectionery	9.18	12.99	8.32	7.32	7.71
Printed books, newspapers, pictures and other products of the printing industry; manuscripts, ...	0.95	1.75	3.08	18.97	6.84
Organic chemicals	0.70	3.49	3.34	6.17	6.04
Products of animal origin, not elsewhere specified or included	14.88	2.77	2.69	2.77	5.87
Glass and glassware	1.56	2.85	3.19	2.40	5.08
Vegetable plaiting materials; vegetable products not elsewhere specified or included	23.92	0.53	0.33	0.56	4.59
Umbrellas, sun umbrellas, walking sticks, seat-sticks, whips, riding-crops and parts thereof	0.03	3.05	4.46	4.72	4.20
Nickel and articles thereof	0.08	0.45	3.24	2.68	3.97
Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	6.28	2.25	3.00	3.58	3.80
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere ...	1.67	1.47	0.84	1.70	3.64
Wood and articles of wood; wood charcoal	4.06	5.67	5.60	6.56	3.53
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad ...	5.02	5.17	6.02	4.44	3.46
Cocoa and cocoa preparations	0.39	0.94	1.89	3.07	3.00
Aluminum and articles thereof	1.60	1.81	2.03	14.32	2.78
Miscellaneous edible preparations	0.25	7.69	5.12	5.57	2.37
Products of the milling industry; malt; starches; inulin; wheat gluten	1.62	1.00	1.33	2.55	2.32

Products	2015	2016	2017	2018	2019
Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	49.34	3.78	5.11	2.49	2.28
Articles of stone, plaster, cement, asbestos, mica or similar materials	0.03	1.85	1.56	3.48	2.26
Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial ...	3.04	1.25	1.46	2.30	1.39
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	0.63	1.29	1.91	3.85	1.37
Miscellaneous articles of base metal	0.43	1.39	1.26	1.86	1.29

Source: ITC Trade Database

15.8. Annexure 8 – Gross Output of Manufacturing Sector in Bangladesh

Highlighted cells belong to top 80% products

BSIC code and description	Gross Output (2012) (in BDT Million)	Estimated Gross Output (2019)# (in BDT Million)	Rank
Total	**5,394,875**	**11,250,901**	
10 Manufacture of food products	608,777	1,077,622	4
11 Manufacture of beverages	52,826	93,510	15
12 Manufacture of tobacco products	87,197	149,440	9
13 Manufacture of textiles	715,247	1,682,694	2
14 Manufacture of wearing apparel (Ready-made garments)	1,819,482	4,280,523	1
15 Manufacture of leather and related products	76,147	122,275	11
16 Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials.	6,912	11,846	22
17 Manufacture of paper and paper products	57,187	101,672	12
18 Printing and reproduction of recorded media	10,821	19,239	21
19 Manufacture of coke and refined petroleum products	3,684	9,630	23
20 Manufacture of chemicals and chemical products	140,184	229,332	7
21 Manufacture of pharmaceuticals, medicinal chemical and botanical products	113,070	220,341	8
22 Manufacture of rubber and plastics products	51,143	82,124	17
23 Manufacture of other non-metallic mineral products	351,779	730,350	5
24 Manufacture of basic metals	905,850	1,581,350	3
25 Manufacture of fabricated metal products, except machinery and equipment	71,357	124,569	10
26 Manufacture of computer, electronic and optical products	39,623	87,594	16
27 Manufacture of electrical equipment	145,166	320,916	6

BSIC code and description	Gross Output (2012) (in BDT Million)	Estimated Gross Output (2019)# (in BDT Million)	Rank
28 Manufacture of machinery and equipment n.e.c.	13,141	22,940	19
29 Manufacture of motor vehicles, trailers and semitrailers	36,780	101,268	13
30 Manufacture of other transport equipment	36,291	99,922	14
31 Manufacture of furniture	39,685	77,335	18
32 Other manufacturing	11,263	21,948	20
33 Repair and installation of machinery and equipment	1,134	2,210	24
34 Recycling	129	251	25

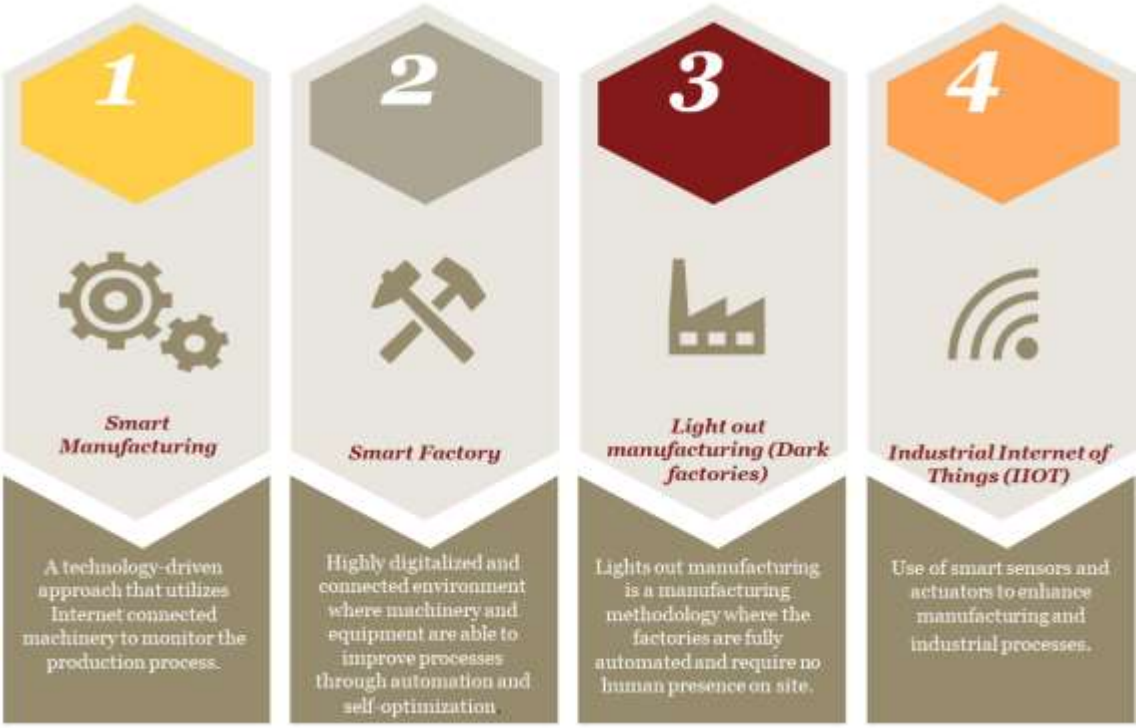
#Estimated for 2019
Source: Bangladesh Bureau of Statistics, Survey of Manufacturing Industries 2012

15.9. Annexure 9 – Industry 4.0

The fourth industrial revolution characterized by the increasing digitization and interconnection of products, value chains and business models – has arrived in the industrial sector. The term Industry 4.0 encompasses a promise of new industrial revolution. It is the digital transformation of industrial markets; specifically manufacturing industry driven by four disruptions: the astonishing rise in data volumes, computational power, connectivity and business intelligence capabilities.[238] It takes the automation of manufacturing processes to a new level by introducing customized and flexible mass production technologies.

The concept of Industry 4.0 includes:

Figure 97: Concept of Industry 4.0



Industry 4.0 digitizes and integrates vertical and horizontal value chains, vertically across the entire organization, from product development and purchasing, through manufacturing, logistics and service. All data about operations processes, process efficiency and quality management, as well as operations planning are available real-time, supported by augmented reality and optimized in an integrated network.[239] Horizontal integration stretches beyond the internal operations from suppliers to customers and all key value chain partners. It includes technologies from track and trace devices to real-time integrated planning with execution. In this way, the entire manufacturing and development industry effectively restructures and boosts the efficiency and profitability of the industry.

According to recent research study by McKinsey Global Institute, industries with highest potential for automation are manufacturing, accommodation, food services, transportation and warehousing. Experts forecast that businesses will be able to increase their productivity by about 30% using Industry 4.0 by 2025.[240] Bangladesh being a developing economy depends on export of manufactured products to foreign countries. However, with the advent of industry 4.0 regime, manufacturing is becoming less labor intensive, which might create challenges for manufacturing industry in Bangladesh, which is majorly driven by cheap labor in the country. In light of

238 McKinsey
239 PwC

Industry 4.0, it is pertinent for countries like Bangladesh, to do away with cheap labor being the primary driver of competitiveness and focus on infrastructure & logistics, research & development, and technology will be required to remain competitive in a changed industrial landscape. Therefore, it is imperative to develop the management of manufacturing and chain productions so that the efficiency would be substantially increased which is a strong indicator that Industry 4.0 is crucial for Bangladesh to move forward. Bangladesh needs the adaptation of Industry 4.0 not only to increase the industrial production but also to bolster the overall socio-economic growth. Additionally, to successfully implement the Industry 4.0 corresponding initiatives towards the development of human resource is necessary as it requires highly skilled manpower. Hence, the upgradation of the current educational infrastructure in the country with focus on developing the secondary and higher education is essential.

15.10. Annexure 10 – Global Value Chain Concept and Analysis

Description of the Concept:

The value chain of a project is defined as "the full range of activities that firms and workers do to bring a product from its conception to its end use" (Gereffi and Fernandez-Stark, 2011)

These days value chains of various products are highly fragmented and are spread across the globe to take advantage of the unique advantages on offer at different countries for certain specific activities/productions along the value chains of these products, thereby improving the quality of the product and minimizing the production cost.

The purpose of using the GVC concept to identify products that Bangladesh can diversify into is explained as follows – A product with a highly fragmented value chain spread across different countries, offers Bangladesh an opportunity to participate in its value chain.

For e.g. – Let us say product P1 is manufactured in India, and the various inputs required to produce the product P1 is imported by India from other countries. Bangladesh being the neighboring countries and with obvious logistics cost advantage, can attempt to produce one or more of the various inputs that India is importing to produce P1, given it has the necessary capacity. Using the GVC concept, we will attempt to identify products like P1 in whose value chain Bangladesh can participate

In order to identify such products with highly fragmented value chains, we will use an index called the GVC participation index. Higher the value of GVC index, higher is the fragmentation of the value chain of the product.

The GVC index is given by the formula –

$$\text{GVC\_Participation}_{ik} = \frac{FV_{ik}}{E_{ik}} + \frac{IV_{ik}}{E_{ik}}$$

FV_{ik} –Foreign value added in the export of product k by country i

IV_{ik} – Domestic value added by country i in the product k used in the export of third countries

E_{ik} – Gross value of export of product k by country i

Methodology used:

The methodology adopted for identification of new products that Bangladesh can diversify into and export with an advantage, using the GVC concept is described below systematically

1. Step 1 – Shortlist the countries whose products will be assessed. Neighboring countries and countries with similar economies are shortlisted, and a list of products is compiled by taking the union of the set of products for each country.
2. Step 2 – A threshold value of GVC participation index is selected. The GVC index value which is more than 70% of all the GVC values in the GVC table is selected as the threshold value
3. Step 3 – Using these threshold value, a score is assigned to each product by counting the number of times the GVC value associated with the product for each country is more than the threshold value

   For e.g.

	Country 1	Country 2	Country 3	Country 4	Country 5	Country 6	Score
GVC value for Product P1	3	4	2	2	4	2	3

In the above table, the score for product P1 will be 3, as the GVC value associated with P1 is equal to or more than 3 in three cases

4. Step 4 – Using this score the products will be shortlisted. The top five products have been identified from this approach
5. Step 5 – The value chain of these shortlisted products will be assessed, and the input products (backward linkages of the shortlisted products) and the products which can be produced by using the shortlisted products (forward linkages of the shortlisted products) is identified

GVC Analysis:

The objective of Global Value Chain analysis is to identify products that Bangladesh can diversify into. Thus, for a product with a highly fragmented value chain spread across different countries, this assessment intends to identify opportunity for Bangladesh to participate in its global value chain. For e.g. – Let's say a product P is manufactured in a country like China, and the various inputs required to produce the product P are imported by China from different countries. Bangladesh being the neighboring country has an obvious logistics cost advantage; it can attempt to produce one or more of the various inputs that China is importing to produce the product P, given it has the necessary capacity. Using the GVC concept we will attempt to identify products like P in whose value chain Bangladesh can participate.

The industries with high GVC index across the globe are listed in the table below:

Table 148: Industries with high GVC index across globe

Industries with high GVC index across the globe	Sectors shortlisted
Chemicals and non-metallic mineral products	**Chemicals, Ceramics**
Electrical and optical equipment	**Electrical and electronics**
Basic metals and fabricated metal products	**Light machinery**
Transport equipment (Automobiles)	**Automobiles and accessories**
Machinery and equipment	**Heavy machinery**
Textiles, leather and footwear	**Textiles and RMG, Leather and leather products**

Source: PwC Research

15.11. Annexure 11 – Sector Specific Forward and Backward 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 6.5% of global market share. 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. GoB has set a target to achieve 8% share of the global apparel market with USD 50 billion of exports from RMG sector by 2021, 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.[241] 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.[242] 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. [243] These countries have a lot of immigrants from Bangladesh, who drive

[241] *http://rmgbd.net/incentives-for-textile-clothing/*
[242] *Primary Survey with Industry sectors*
[243] *http://www.bapabd.org/home/export/1*

Sector	Description of raw materials, industrial linkages, and market access
	demand for Bangladesh food products in these countries. As per data available with BAPA, Bangladesh processed food fetched all time high export receipts of $ 700 million in 2018-19.[244]Major items of exports were fruit juice, biscuits, potato crackers, chips, puffed rice, jam, confectionery items, ketchup, parathas, singharas etc. As per BIDA, 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 take 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.

[244] https://thefinancialexpress.com.bd/views/processed-food-export-1583854567

Sector	Description of raw materials, industrial linkages, and market access
	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).[245] 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.[246] 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. 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 topmost 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. Bangladesh meets the demand of 10% of the world's total leather market. 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. 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

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

Sector	Description of raw materials, industrial linkages, and market access
	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.[247] Bangladesh is a net exporter of raw hides and skins. 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. 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%.[248] 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

[247] *Research Gate. 2013. Bangladeshi Leather Industry: An Overview of Recent Sustainable Developments.*
[248] *http://bida.gov.bd/plastic-industry*

Sector	Description of raw materials, industrial linkages, and market access
	requirements of plastic is met through import and from local recycled plastic waste.[249] It is to be noted that 20% of raw materials are from recycled materials.[250] 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. Natural rubber is produced from rubber plantations located in Chittagong, Sylhet, Madhupura, and in Bandarban hill tracts.[251] 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.
Paper and Packaging	As per Bangladesh Paper Mills Association, there are 110 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 and paper products exports from Bangladesh generated revenue of USD 16.24 million in 2018.[252] 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.[253] 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.[254] 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

[249] *http://emergingrating.com/wp-content/uploads/2017/09/Plastic-Industry-of-Bangladesh-Vol-I.pdf*
[250] *The Financial Express. 2015. Export-Oriented Plastic Industry of Bangladesh: Opportunities and Challenges*
[251] *http://en.banglapedia.org/index.php?title=Rubber_Industry*
[252] *https://www.thedailystar.net/business/news/exports-prove-boon-paper-mills-1686010*
[253] *Paper Sector in Bangladesh: MMA Quader (2011)*
[254] *Paper Sector in Bangladesh: MMA Quader (2011)*

Sector	Description of raw materials, industrial linkages, and market access
	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.
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%.[255] 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.[256] 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 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 micronutrients (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%.[257] Manufacturing output from these sectors primarily caters to the domestic demand.

[255] 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/

256 www.banglajol.info/index.php/jce/article/download/10178/7533

[257] http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489

Sector	Description of raw materials, industrial linkages, and market access
	Bangladesh glass and glassware sector is demonstrating healthy growth rate of ~20% annually. Main ingredient of glass industry is sand, although quality sand is imported from China and Egypt.[258] 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.[259] 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).[260] The domestic market for ceramic products, including tableware, tiles and sanitary ware, is worth about BDT 6,000 crore annually. According to Bangladesh Ceramics Manufacturers and Exporters Association (BCMEA), Bangladesh exported ceramic products worth BDT 585 crore last year,.[261] 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).[262] 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.[263] 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 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 470 million (in 2019). 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

[258] *Secondary research and primary survey*
[259] *Banglapedia*
[260] *http://www.thedailystar.net/news-detail-42940*
[261] *http://www.theindependentbd.com/post/227968*
[262] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*
[263] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*

Sector	Description of raw materials, industrial linkages, and market access
	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 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. Waterfront 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 shipbuilding, heavy machineries & equipment, and light machinery. The market size of the electronics industry (including both industrial and consumer electronics) is around 4 billion USD in 2017 and is expected to reach around 12 billion USD by 2025.[264] 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

[264] *https://www.hcidhaka.gov.in/pdf/Report_on_Consumer_Electronics_Industry_in_Bangladesh(1).pdf*

Sector	Description of raw materials, industrial linkages, and market access
	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.[265] 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.[266]
Ship Building and Ship Breaking	Shipbuilding industry in Bangladesh is growing; exports earning from this sector in 2018 was USD 30 million, whereas in FY 2012-13 it was USD 5.73 million.[267] However, Bangladesh is still a net importer of end products of shipbuilding industry, with imports of USD 163.5 million in 2019.[268] 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.[269] Approximately 70% of the yards are located in and around Dhaka and Narayanganj along the side of the riverbanks of the Buriganga, Shitalakshya, 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 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.[270] 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

[265] *Primary survey with industry players*
[266] *Primary Survey with industry players*
[267] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*
[268] *ITC Trade Database*
[269] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*
[270] *Japan Bangla Business Center. 2014. A Report on Shipbuilding Industry of Bangladesh.*

Sector	Description of raw materials, industrial linkages, and market access
	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 coastline of Bangladesh is also conducive for setting up ship breaking industry which primarily requires cheap labour. Shipyards in India, Pakistan and Bangladesh comprise around 80% of global breaking and recycling market.[271] The biggest ship recycling yard out of these 3 countries is in Chittagong, which recycled 230 ships in 2017.[272] 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%.[273] 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 waterfront locations mostly located near the sea sides of the country. 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 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. Bangladeshi pharmaceutical industry is growing very fast meeting 98% of domestic demand and posting a 27% growth in export earnings. In 2018, the country's domestic pharmaceutical market size stood at BDT 20,511.8 crore with 15.6% CAGR for the last five years.[274] The sector is expected to grow at 15% year-on-year to reach $5.11 billion by 2023, propelled by high investment by local companies as they seek to grab a bigger share of the global market.

[271] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[272] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[273] *http://fpd-bd.com/wp-content/uploads/2016/10/Research-Report-on-Energy-Sector-of-Bangladesh-Initiation-Mar-15-11.pdf*
[274] *https://www.dhakatribune.com/business/2019/08/22/bangladesh-pharmaceutical-industry-blooms-bigger*

Sector	Description of raw materials, industrial linkages, and market access
	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), APIs are manufactured. APIs are the key ingredients for drug manufacturing. 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 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. 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.

15.12. Annexure 12 – Respondents' Profile: Primary Survey

Sl. No.	Name of Company	Sector	Contact	Email address	Origin
1	vai bekary	Food and Beverages	01715-229585	NA	Domestic
2	sonali bread & biscuit factory	Food and Beverages	01711-908782	NA	Domestic
3	modhuful bekary	Food and Beverages	01712-254887	NA	Domestic
4	m/s Gazi bekary	Food and Beverages	01712-540478	NA	Domestic
5	monzil bekary	Food and Beverages	01711-929269	NA	Domestic
6	libiya bekary & confectionary	Food and Beverages	01786-117128	NA	Domestic
7	Bengal Group Of Industries	Food and Beverages	1936009035	fin@bengal.com.bd	Domestic
8	Aman Group	Food and Beverages	1713756565	NA	Domestic
9	Ovijat Food & Beverage Ind. Ltd.	Food and Beverages	17141655781	NA	Domestic
10	Mierotrade Food & Beverage Ltd	Food and Beverages	02-9888092	NA	Domestic
11	BRAC Dairy & Food Project	Food and Beverages	1799985653	NA	Domestic
12	A.T Beverage Ltd.	Food and Beverages	1988808055	NA	Domestic
13	Aman Feed	Agro based	01755-675854	info@amangroupbd.com	Domestic
14	Saha Auto Mills	Agro based	1712973487	NA	Domestic
15	Khan Rice Mills	Agro based	162818514	NA	Domestic
16	Jagorony Agro Food & Beverage Ltd.	Agro based	1902503312	NA	Domestic
17	Femase Rice Agency	Agro based	1963340529	NA	Domestic
18	Pusti Dairy Farm	Agro based	1719461446	NA	Domestic
19	Arnela Dairy Farm	Agro based	1771571673	NA	Domestic
20	Vuiya Rice Agency	Agro based	1711528594	NA	Domestic
21	M/S Niloy Rice Agency	Agro based	1813895260	NA	Domestic
22	Bashundhara Group	Agro based	01938-873425	sakhawat.islam@bg.com.bd	Domestic

Sl. No.	Name of Company	Sector	Contact	Email address	Origin
23	Prime Group(agro based)	Agro based	9564851	NA	Domestic
24	Ispahani Tea	Agro based	1937900062	mustafiz_ial@monisphano.com	Domestic
25	Ispahani Agro Limited	Agro based	0189-284161	ceo@tantreadebdltd.com	Domestic
26	Ikbal Perfumery & Chemical	Chemicals	1716729944	NA	Domestic
27	Kannauj Attar products	Chemicals	1715014835	zahidanwar673@gmail.com	Domestic
28	Kamal Chemical & perfumery	Chemicals	1745986666	kamal_chemicals@yahoo.com	Domestic
29	Bangladesh M.K.M company	Chemicals	1836979537	helaluddinsarker05@gmail.com	Domestic
30	JABED Group	Chemicals	1797781640	afruzasurovi92@gmail.com	Domestic
31	Bangladesh M.K.M company	Chemicals	1836979537	helaluddinsarker05@gmail.com	Domestic
32	ACI	Chemicals	28878603	tarekaci@gmail.com	Domestic
33	Remo Chemicals Limited	Chemicals	1714022235	info@remochemical.com	Domestic
34	Hagi Perfumery & Chemicals	Chemicals	1713012488	gtirepon@hotmail.com	Domestic
35	Anan Chemical Industries Limited	Chemicals	(+880)2-5501-3505	info@ananchemical.com	Domestic
36	Milla Chemicals Co. Ltd.	Chemicals	01715298830	NA	Domestic
37	Sheltech Ceramics Ltd	Non-metallic minerals	1708121291	admin5@sheltechceramics.com	Domestic
38	Yeasmin Furniture	Non-metallic minerals	1725098904	NA	Domestic
39	Smart Furniture	Non-metallic minerals	1616806733	smartfurniturebhola@gmail.com	Domestic
40	Sopnodip Furniture	Non-metallic minerals	1712007538	NA	Domestic
41	M/S Super Bricks	Non-metallic minerals	1718306041	NA	Domestic
42	Prince Bricks	Non-metallic minerals	1988455555	NA	Domestic
43	Ekota auto bricks ltd.	Non-metallic minerals	1711232699	eabl.bezerdanga@yahoo.com	Domestic
44	Best bricks	Non-metallic minerals	1937706355	NA	Domestic
45	j b bricks	Non-metallic minerals	17250337924	NA	Domestic
46	United Bricks	Non-metallic minerals	1716079951	NA	Domestic
47	Super bricks	Non-metallic minerals	1716222609	NA	Domestic

Sl. No.	Name of Company	Sector	Contact	Email address	Origin
48	Indian Potash Limited	Food and Beverage	91-04442160090,+91-04428297855	rajeshkumar@potindia.com	India
49	Ruchi Soya Industries Ltd. (India)	Food and Beverage	2513281/ 2513282/ 2513283	ruchisoyasecretarial@ruchisoya.com	India
50	Pt Indofood Sukses Makmur Tbk (Indonesia)	Food and Beverage	62-21-5795-8822	victor.suhendra@indofood.co.id	Indonesia
51	ACI Godrej Agrovet Private Limited	Agro-Based Products	01713039811	ayg.rajendra@acigodrej.com	India
52	JGB Indo-Bangla Pvt. Ltd.	Agro-Based Products	01713366656	avijit@hbdco.org	India
53	C.P. BANGLADESH Co. Ltd.	Agro-Based Products	+8801730358275	info@cpbangladesh.com	Thailand
54	Deccan Fine Chemicals India Private Limited (India)	Chemicals	91-04043459970	sangeetha.iyer@deccanchemicals.com	India
55	Galaxy Surfactants Ltd. (India)	Chemicals	27616666	investorservices@galaxysurfactants.com	India
56	Coromandel International Ltd. (India)	Chemicals	66997000/ 66997300/ 66997500	investorsgrievance@coromandel.murugappa.com	India
57	Asahi India Glass Ltd. (India)	Non-metallic minerals	49454900	investorrelations@aisglass.com	India
58	Wonder Cement Limited (India)	Non-metallic minerals	91-01463260151	corp.sect@wondercement.com	India
59	HSIL Ltd. (India)	Non-metallic minerals	22487406/ 22487407/ 22485668	hsilinvestors@hindware.co.in	India
60	Doji Gold & Gems Group Joint Stock Company (Vietnam)	Non-metallic minerals	(84)-2422206688	NA	Vietnam

15.13. Annexure 13 – Gross Value Added of Manufacturing Sector in Bangladesh

BSIC Code	Category	Gross Value Added ('000 BDT) 2012	Estimated Gross Value Added ('000 BDT) 2019#
10	Food products	173,959,169	307,932,474
11	Beverages	13,563,935	24,010,094
12	Tobacco products	24,103,009	41,308,322
13	Textiles	219,728,433	516,934,316
14	RMG	555,979,580	1,308,000,607
15	Leather & related products	22,180,319	35,616,745
16	Wood products & cork, except furniture; articles of straw & plaiting materials	2,305,861	3,951,841
17	Paper products	15,690,942	27,896,721
18	Printing and reproduction of recorded media	4,862,787	8,645,486
19	Coke & refined petroleum products	1,309,369	3,422,638
20	Chemical products	37,247,914	60,935,216
21	Pharmaceuticals, medicinal chemical & botanical products	33,880,955	66,024,396
22	Rubber & plastics products	16,903,205	27,142,853
23	Other non-metallic mineral products	110,552,682	229,525,073
24	Basic metals	216,992,159	378,805,097
25	Fabricated metal products, except machinery & equipment	22,258,815	38,857,407
26	Computer, electronic & optical products	10,776,985	23,824,480
27	Electrical equipment	41,146,392	90,961,564
28	Machinery & equipment n.e.c.	3,912,336	6,829,799
29	Motor vehicles, trailers & semi-trailers	9,970,559	27,452,407
30	Transport equipment	10,290,836	28,334,241

BSIC Code	Category	Gross Value Added ('000 BDT) 2012	Estimated Gross Value Added ('000 BDT) 2019#
31	Furniture	11,321,651	22,062,695
32	Other manufacturing	3,497,927	6,816,470
33	Repair and installation of machinery and equipment	459,602	895,634
34	Recycling	51,653	100,657
Total		**1,562,947,075**	**3,286,287,235**

 # Estimated for 2019
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 (In BDT Mn) at 2012	Estimated Gross Value Added ('000 BDT) at 2019#
Textiles and RMG	775,708	1,776,485
Food and Beverages	187,523	331,943
Agro based products	24,103	41,308
Leather and Leather Products	22,180	35,617
Plastic and Rubber	16,903	27,143
Paper and Packaging	17,997	32,589
Chemicals	37,248	61,505
Non-Metallic Minerals	110,553	229,525
Auto and Automobile Accessories	20,261	56,757
Heavy Machinery, Iron & Steel and Metals	239,251	421,530
Electrical & Electronics	51,923	117,861
Ship Building and Ship Breaking	511	1,052
Petroleum Products including Bottling	1,309	3,393
Pharmaceuticals	33,881	67,225

Industry Sectors	Gross Value Added (In BDT Mn) at 2012	Estimated Gross Value Added ('000 BDT) at 2019#
Light Machinery and Equipment & Furniture	18,732	36,503

 # Estimated for 2019

15.14. Annexure 14 – Estimation of Industrial Growth Rate

Methodology for assessment of COVID 19 Impact on Industry Growth Rates:

- Step-1: In the first step, impact of COVID 19 on every industry was assessed on various parameters such as industry inputs, domestic and international market, and trade, and possible impact on each industry was rated on a scale of 5.
- Step-2: In second step, growth rates of every industry were decreased in the ratio of the rating received through impact assessment exercise. The Word Bank revised growth rate estimates for Bangladesh's industrial sector along with the ratings received were used to calculate the dips in growth rates of every industry

Industry	2019	2020	2021	2022	2023	2024	2025
Textiles and RMG	10.00%	-0.10%	0.83%	2.83%	4.31%	5.89%	8.00%
Food and Beverages	8.50%	5.96%	6.41%	7.41%	8.16%	8.95%	10.00%
Agro based products	8.00%	6.38%	7.39%	7.84%	8.17%	8.53%	9.00%
Leather and Leather Products	7.00%	1.53%	2.26%	3.86%	5.05%	6.32%	8.00%
Plastic and Rubber	7.00%	3.15%	3.70%	4.90%	5.79%	6.74%	8.00%
Paper and Packaging	10.00%	5.96%	7.06%	8.16%	8.97%	9.84%	11.00%
Chemicals	8.00%	1.53%	2.83%	4.83%	6.31%	7.89%	10.00%
Non-Metallic Minerals	11.00%	2.68%	3.96%	6.76%	8.84%	11.05%	14.00%
Auto and Automobile Accessories	17.00%	3.26%	4.24%	7.24%	9.47%	11.84%	15.00%
Heavy Machinery, Iron & Steel and Metals	9.00%	1.72%	2.83%	4.83%	6.31%	7.89%	10.00%
Electrical & Electronics	15.00%	2.87%	4.24%	7.24%	9.47%	11.84%	12.00%
Ship Building and Ship Breaking	12.00%	7.15%	6.41%	7.41%	8.16%	8.95%	10.00%
Petroleum Products including Bottling	14.00%	2.68%	3.68%	6.28%	8.21%	10.26%	13.00%
Pharmaceuticals	12.00%	9.57%	9.85%	10.45%	10.89%	11.37%	12.00%
Light Machinery and Equipment & Furniture	15.00%	7.09%	8.32%	11.02%	13.02%	15.16%	18.00%

Industry	2026	2027	2028	2029	2030	2031	2032
Textiles and RMG	9.63%	9.64%	8.00%	8.00%	8.00%	8.00%	8.00%
Food and Beverages	10.82%	10.82%	10.00%	10.00%	10.00%	9.00%	9.00%
Agro based products	10.41%	10.41%	10.00%	10.00%	10.00%	8.00%	8.00%
Leather and Leather Products	9.31%	9.31%	8.00%	8.00%	8.00%	7.00%	7.00%
Plastic and Rubber	8.98%	8.98%	8.00%	8.00%	8.00%	7.00%	7.00%
Paper and Packaging	10.82%	10.82%	10.00%	10.00%	10.00%	10.00%	10.00%
Chemicals	9.31%	9.31%	8.00%	8.00%	8.00%	8.00%	8.00%
Non Metallic Minerals	13.96%	13.97%	12.00%	12.00%	12.00%	12.00%	12.00%

Industry	2026	2027	2028	2029	2030	2031	2032
Auto and Automobile Accessories	17.45%	17.46%	15.00%	15.00%	15.00%	15.00%	15.00%
Heavy Machinery, Iron & Steel and Metals	10.47%	10.48%	9.00%	9.00%	9.00%	9.00%	9.00%
Electrical & Electronics	13.96%	13.97%	12.00%	12.00%	12.00%	12.00%	12.00%
Ship Building and Ship Breaking	10.82%	10.82%	10.00%	10.00%	10.00%	10.00%	10.00%
Petroleum Products including Bottling	15.12%	15.13%	13.00%	13.00%	13.00%	13.00%	13.00%
Pharmaceuticals	12.49%	12.49%	12.00%	10.00%	10.00%	10.00%	10.00%
Light Machinery and Equipment & Furniture	20.21%	20.21%	18.00%	15.00%	15.00%	15.00%	15.00%

Industry	2033	2034	2035	2036	2037	2038	2039
Textiles and RMG	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Food and Beverages	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Agro based products	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Leather and Leather Products	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Plastic and Rubber	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Paper and Packaging	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Chemicals	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Non Metallic Minerals	12.00%	12.00%	12.00%	11.00%	11.00%	11.00%	11.00%
Auto and Automobile Accessories	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Heavy Machinery, Iron & Steel and Metals	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Electrical & Electronics	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%
Ship Building and Ship Breaking	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Petroleum Products including Bottling	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Pharmaceuticals	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Light Machinery and Equipment & Furniture	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%

Industry	2040	2041	2042	2043	2044	2045
Textiles and RMG	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Food and Beverages	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Agro based products	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Leather and Leather Products	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%

Industry	2040	2041	2042	2043	2044	2045
Plastic and Rubber	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Paper and Packaging	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Chemicals	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Non Metallic Minerals	11.00%	11.00%	11.00%	11.00%	11.00%	11.00%
Auto and Automobile Accessories	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%
Heavy Machinery, Iron & Steel and Metals	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Electrical & Electronics	12.00%	12.00%	12.00%	12.00%	12.00%	12.00%
Ship Building and Ship Breaking	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Petroleum Products including Bottling	13.00%	13.00%	13.00%	13.00%	13.00%	13.00%
Pharmaceuticals	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%
Light Machinery and Equipment & Furniture	15.00%	15.00%	15.00%	15.00%	15.00%	15.00%

15.15. Annexure 15 – Assumption 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 influence region of Bhola EZ in Barisal Division as a proxy of Investment share with respect to the country:

District	Total GDP (Estimated 2018) in Mn USD in Current USD
Barisal	3,988
Jhalokati	940
Patuakhali	2,681
Bhola	2,414
Lakshmipur	2,975
Pirojpur	1,682
Bangladesh	262,512
Contribution of Barisal division	**5.6%**

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 (In BDT Mn)#	Gross Value added (In BDT Mn)#
Textiles and RMG	0.74	1,313,004	1,776,485
Food & Beverages	0.84	280,013	331,943
Agro based products	0.45	18,756	41,308
Leather and Footwear	1.29	45,917	35,617
Plastic and Rubber	0.98	26,609	27,143
Paper and Packaging	1.05	34,065	32,589
Chemicals	1.40	86,299	61,505
Non-Metallic Minerals	0.80	92,224	229,525
Auto and Automobile Accessories	0.67	38,266	56,757
Heavy Machinery, Iron & Steel and Metals	0.47	197,544	421,530
Electrical, Electronics and ICT	0.48	57,091	117,861
Ship Building and Ship Breaking	0.63	667	1,052
Petroleum Products including Bottling	1.71	5,805	3,393
Pharmaceuticals	2.05	137,662	67,225
Light Machinery and Equipment & Furniture	0.76	37,625	49,827

#Estimated till 2019
Source: Survey of Manufacturing Industries 2012

15.16. Annexure 16 - Sub-sector/product identification

Sector	Sub-sector/product	Regional/EZ overview	Recommendation
Food & Beverage	Ready to eat (Biscuit, Jam, Chips, processed food, etc.)	• The region is rich in fruits, vegetables and other agricultural produces and Bhola has highest export of potatoes which will ensure uninterrupted supply for raw material for few of the industries • Patuakhali district also hosts Payra port, the newly developing deep seaport in Bangladesh which can provide the EXIM trade gateway for the industries in the influence region.	Ready to eat/beverage manufacturing/ Fishery and seafood
	Tea Processing	• As tea processing plant are placed close to tea producing areas to have better access to raw material. Subject site is located far from tea producing areas which makes site unviable for the tea processing industry	
	Beverage Manufacturing	• Since banana, watermelon, mango and jackfruit are the major fruits are majorly available here, the input for this industry is not a challenge • Water, the basic ingredient for beverage industry can be made available at proposed EZ by developing suitable infrastructure to source surface water from the River Ganeshpura (tributary of River Meghna) • Industries nearby Khulna, Barisal city will provide the backward linkage to the sector	
	Fishery and seafood	• As region has highest fish catch and the region lies in the river basin, hence fishing and related industries can be established	
	Dairy Product	• Procurement of raw material of consistent quality would be a challenge	
Agro Based products	Jute Processing Unit	• Jute is grown in large quantity in the south west part of Bangladesh, and existing jute industries are dominant near Khulna division (~88km). • Water utilization is very high in jute processing industry which ccan be made available at proposed EZ by developing suitable infrastructure to source surface water from the River Ganeshpura (tributary of River Meghna)	Jute Processing Unit/Grain mills /Sugar mills Tobacco processing

	Grain mills (Flour/rice)	• The major crop cultivated in this region is rice and wheat, and hence the base material for this sub-sector is easily available • District of Barisal near proposed EZ is a major rice producing region and hence can suffice the input to the proposed EZ	
	Sugar mills	• Sugar sector in country predominantly dependent on import of raw sugar in bulk form, IWT connectivity with existing and upcoming port will ease the procurement of raw material • IWT connectivity with major consumption centers such as Dhaka and Chittagong will ease the distribution of finished product.	
	Tobacco processing	• Khulna (~88km) division is the topmost tobacco producing division, and hence the transport of raw materials to the EZ is not a challenge	
Chemicals	Fertilizer	• Fertilizers have a high demand in proximity to proposed EZ region, due to widespread agriculture-produce • Sugar sector in country predominantly dependent on import of raw material • Establishing of fertilizer industry at proposed EZ in Bhola requires to access of river which is adjacent to the proposed EZ	Fertilizer
	Textile processing chemicals	• Primary auxiliary industry for textiles in terms of textile processing is dyeing. Existing dye manufacturers in this sector are located in Dhaka and hence EZ needs to ensure that the raw material is supplied uninterrupted for this sector to flourish.	
	Other chemicals	• Backward and forward linkage for chemical industry is missing in the region	
Non-metallic minerals	Ceramic	• Clay (main ingredient) should be sourced from Mymensingh (~300km from proposed EZ). • Hence procurement of raw material might increase the logistics cost to the manufacturer	Cement

	Cement	• For manufacturing of cement, the basic prerequisite is to have a waterfront access which facilitates smooth logistics and supply of raw materials. Water frontage is available adjacent to the proposed EZ. • Most of the cement plant are located along riverbanks and have private jetty for efficient handling of raw material. Hence this EZ is suitable for this industry.	
	Glass	• Since the district has no major mineral deposits, procurement of raw material will be a challenge • Manufacturing of glass require application of high temperatures for which gas is an indispensable source of fuel and is available at Shahbazpur Gas Field.	

15.17. Annexure 17 – Competition Phase Out Plan

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2024	2025	2026	2027	2028	2029	2030	2031
Agailjhara Economic Zone	Barisal	300	210	2%	2%	3%	5%	5%	5%	5%	6%
Outward investment/ future competition		255	191							2%	4%

Name of EZs	Location	Area (acres)	Industrial Area (acres)	2032	2033	2034	2035	2036	2037	2038	2039	2040
Agailjhara Economic Zone	Barisal	300	210	6%	7%	12%	12%	15%	15%			
Outward investment/ future competition		255	191	5%	5%	7%	8%	10%	12%	12%	15%	20%

15.18. Annexure 18- Logistics cost Assessment

Attribute	IWT total logistics cost assessment			
	Dhaka	Chittagong port	Mirsarai	Mongla port
Distance (Km)	108	129	119	320
Distance till nearest Jetty	12	12	12	12
Fare for 14 ton cargo (BDT)	6,000	6,000	6,000	6,000
Cost for initial miles	429	429	429	429
Fare for 2000 ton cargo (BDT)	1,100,000	1,900,000	1,900,000	2,300,000
Fare (BDT/MT/Km)	5.09	7.36	7.98	3.59
Cost (BDT/MT)	550	950	950	1150
No. of times loading and unloading is required	3	2	2	2
Loading and unloading rate (BDT/MT)	120	120	120	120
Total loading unloading cost	360	240	240	240
Last mile distance	19	0	0	0
Fare for 14 ton cargo (BDT)	9,500	6,000	6,000	6,000
Last mile logistics cost	679	429	429	429
Total Logistics cost (BDT/MT)	2017	2047	2047	2247

Attribute	Road transport logistics assessment					
	Dhaka	Chittagong port	Mirsarai	Mongla port	Bibirbazar land port	Akhaura land port
Distance (Km)	185	214	176	484	171	217
Fare for 14 ton cargo (BDT)	27,000	27,000	27,000	43,366	27,000	27,000
Fare (BDT/MT/Km)	10.42	9.01	10.96	6.40	11.28	8.89
Cost (BDT/MT)	1929	1929	1929	3098	1929	1929

No. of times loading and unloading is required	1	1	1	1	1	1
Loading and unloading rate (BDT/MT)	120	120	120	120	120	120
Total loading unloading cost	120	120	120	120	120	120
Last mile distance	0	0	0	0	0	0
Total Logistics cost (BDT/MT)	2049	2049	2049	3218	2049	2049

Note:

1. The logistics cost assessment is based on the rates as per market, which factors the trip time as well with the distance.

2. Loading and unloading cost is based on the loading and unloading rate for the bulk cargo

**Market rate may vary depending on the demand supply scenario*

15.19. Annexure 19 – Demand Forecasting Calculations

Cumulative power demand (Conservative) - figures in MVA

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	0.88	1.85	2.71	3.68	4.71	5.51	6.44	7.28	8.32	10.60	13.13	15.45	18.68	21.22	21.22
Agro-based products	0.03	0.07	0.10	0.13	0.16	0.18	0.21	0.24	0.27	0.34	0.42	0.49	0.58	0.65	0.65
Chemicals	0.03	0.06	0.09	0.13	0.17	0.19	0.23	0.26	0.29	0.37	0.46	0.53	0.64	0.73	0.73
Non-Metallic Minerals	0.32	0.67	1.03	1.44	1.89	2.25	2.68	3.05	3.50	4.53	5.69	6.78	8.32	9.55	9.55
Total	**1.26**	**2.65**	**3.93**	**5.38**	**6.93**	**8.14**	**9.56**	**10.83**	**12.39**	**15.84**	**19.69**	**23.26**	**28.22**	**32.15**	**32.15**

Cumulative power demand (Base) - figures in MVA

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	1.13	2.35	3.48	4.74	6.09	7.22	8.53	9.78	11.25	14.02	17.07	19.97	21.37	21.37	21.37
Agro-based products	0.04	0.09	0.12	0.16	0.21	0.24	0.28	0.32	0.37	0.45	0.54	0.63	0.67	0.67	0.67
Chemicals	0.04	0.08	0.12	0.17	0.21	0.26	0.30	0.34	0.40	0.49	0.59	0.69	0.74	0.74	0.74
Non-Metallic Minerals	0.40	0.85	1.32	1.86	2.45	2.96	3.56	4.10	4.75	6.00	7.40	8.76	9.43	9.43	9.43
Total	**1.61**	**3.37**	**5.05**	**6.93**	**8.95**	**10.67**	**12.67**	**14.54**	**16.77**	**20.96**	**25.61**	**30.05**	**32.21**	**32.21**	**32.21**

Cumulative power demand (Aggressive) - figures in MVA

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	1.39	2.91	4.33	5.91	7.60	9.11	10.82	12.52	14.48	17.77	21.40	21.50	21.50	21.50	21.50
Agro-based products	0.05	0.11	0.15	0.20	0.26	0.30	0.36	0.41	0.47	0.57	0.68	0.68	0.68	0.68	0.68
Chemicals	0.05	0.10	0.15	0.21	0.27	0.32	0.38	0.44	0.51	0.62	0.75	0.75	0.75	0.75	0.75
Non-Metallic Minerals	0.50	1.06	1.65	2.31	3.05	3.73	4.52	5.26	6.13	7.61	9.28	9.33	9.33	9.33	9.33
Total	**1.99**	**4.17**	**6.28**	**8.63**	**11.17**	**13.46**	**16.08**	**18.63**	**21.59**	**26.58**	**32.11**	**32.25**	**32.25**	**32.25**	**32.25**

Cumulative water demand (Conservative) - figures in thousand cum/ day (MLD)

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	0.19	0.40	0.59	0.80	1.02	1.19	1.39	1.58	1.80	2.29	2.84	3.34	4.04	4.59	4.59
Agro-based products	0.01	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.07	0.09	0.11	0.13	0.16	0.18	0.18
Chemicals	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.12	0.15	0.17	0.21	0.24	0.24
Non-Metallic Minerals	0.13	0.27	0.41	0.58	0.76	0.90	1.07	1.22	1.40	1.81	2.28	2.71	3.33	3.82	3.82
Total	**0.34**	**0.71**	**1.05**	**1.45**	**1.87**	**2.20**	**2.60**	**2.94**	**3.37**	**4.32**	**5.38**	**6.36**	**7.74**	**8.82**	**8.82**

Cumulative water demand (Base) - figures in thousand cum/ day (MLD)

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	0.24	0.51	0.75	1.03	1.32	1.56	1.84	2.11	2.43	3.03	3.69	4.32	4.62	4.62	4.62
Agro-based products	0.01	0.02	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.12	0.15	0.17	0.18	0.18	0.18
Chemicals	0.01	0.03	0.04	0.05	0.07	0.08	0.10	0.11	0.13	0.16	0.19	0.22	0.24	0.24	0.24
Non-Metallic Minerals	0.16	0.34	0.53	0.74	0.98	1.18	1.42	1.64	1.90	2.40	2.96	3.50	3.77	3.77	3.77
Total	**0.43**	**0.90**	**1.36**	**1.87**	**2.42**	**2.89**	**3.44**	**3.95**	**4.56**	**5.71**	**6.99**	**8.22**	**8.82**	**8.82**	**8.82**

Cumulative water demand (Aggressive) – figures in thousand cum/ day (MLD)

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	0.30	0.63	0.94	1.28	1.64	1.97	2.34	2.71	3.13	3.84	4.63	4.65	4.65	4.65	4.65
Agro-based products	0.01	0.03	0.04	0.06	0.07	0.08	0.10	0.11	0.13	0.16	0.19	0.19	0.19	0.19	0.19
Chemicals	0.02	0.03	0.05	0.07	0.09	0.10	0.12	0.14	0.17	0.20	0.24	0.24	0.24	0.24	0.24
Non-Metallic Minerals	0.20	0.42	0.66	0.93	1.22	1.49	1.81	2.10	2.45	3.05	3.71	3.73	3.73	3.73	3.73
Total	**0.53**	**1.11**	**1.69**	**2.33**	**3.02**	**3.65**	**4.37**	**5.07**	**5.88**	**7.25**	**8.77**	**8.81**	**8.81**	**8.81**	**8.81**

Cumulative employment generation (Conservative) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	111	231	339	460	589	688	805	910	1,040	1,325	1,641	1,932	2,335	2,652	2,652
Agro-based products	26	55	78	104	131	151	175	197	223	280	342	399	477	538	538
Chemicals	27	55	83	114	147	172	201	228	259	329	405	474	570	644	644
Non-Metallic Minerals	1,534	3,232	4,964	6,952	9,132	10,852	12,927	14,699	16,906	21,870	27,468	32,721	40,137	46,077	46,077
Total	**1,697**	**3,573**	**5,464**	**7,630**	**9,999**	**11,864**	**14,108**	**16,034**	**18,428**	**23,803**	**29,855**	**35,526**	**43,518**	**49,911**	**49,911**

Cumulative employment generation (Base) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	141	294	436	593	761	903	1,066	1,222	1,406	1,752	2,133	2,496	2,671	2,671	2,671
Agro-based products	34	70	101	134	169	198	232	263	300	369	445	516	550	550	550
Chemicals	34	71	107	148	190	226	267	306	351	435	527	613	655	655	655
Non-Metallic Minerals	1,954	4,122	6,381	8,960	11,801	14,261	17,166	19,789	22,942	28,954	35,716	42,262	45,484	45,484	45,484
Total	**2,162**	**4,558**	**7,025**	**9,834**	**12,921**	**15,588**	**18,730**	**21,580**	**24,999**	**31,510**	**38,821**	**45,887**	**49,359**	**49,359**	**49,359**

Cumulative employment generation (Aggressive) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	174	364	542	738	949	1,138	1,352	1,564	1,810	2,221	2,675	2,687	2,687	2,687	2,687
Agro-based products	42	87	125	166	211	250	294	337	386	468	558	560	560	560	560
Chemicals	42	87	133	184	238	285	339	391	451	551	661	664	664	664	664
Non-Metallic Minerals	2,415	5,101	7,939	11,166	14,733	18,007	21,823	25,382	29,572	36,737	44,779	44,994	44,994	44,994	44,994
Total	**2,673**	**5,640**	**8,739**	**12,254**	**16,131**	**19,680**	**23,807**	**27,674**	**32,219**	**39,978**	**48,672**	**48,905**	**48,905**	**48,905**	**48,905**

Cumulative no. of establishments (Conservative) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	2	5	7	10	13	15	17	20	22	29	35	42	50	57	57
Agro-based products	0	0	1	1	1	1	1	2	2	2	3	3	4	5	5
Chemicals	0	0	1	1	1	1	1	1	2	2	2	3	3	4	4
Non-Metallic Minerals	1	1	2	2	3	4	4	5	6	7	9	11	13	15	15
Total	**3**	**7**	**10**	**14**	**18**	**21**	**24**	**28**	**32**	**40**	**50**	**59**	**71**	**81**	**81**

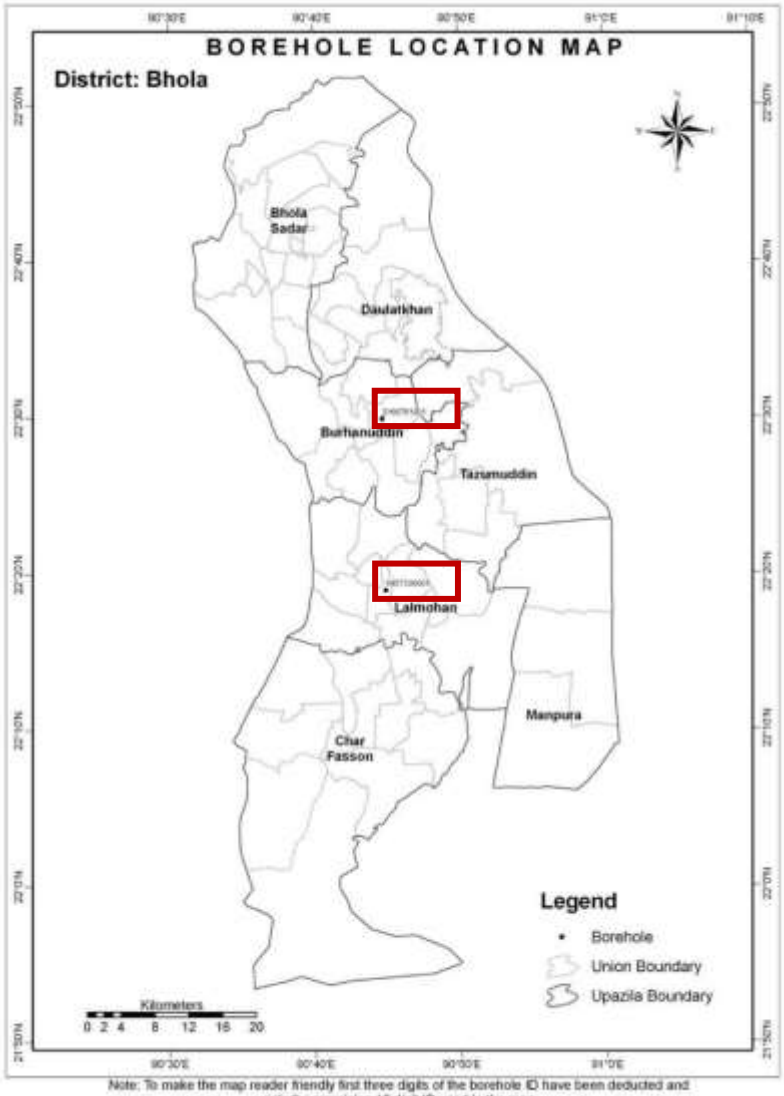
Cumulative no. of establishments (Base) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	3	6	9	13	16	20	23	26	30	38	46	54	58	58	58
Agro-based products	0	1	1	1	1	2	2	2	3	3	4	4	5	5	5
Chemicals	0	0	1	1	1	1	2	2	2	3	3	4	4	4	4
Non-Metallic Minerals	1	1	2	3	4	5	6	7	8	10	12	14	15	15	15
Total	**4**	**9**	**13**	**18**	**23**	**27**	**32**	**37**	**43**	**53**	**65**	**76**	**81**	**81**	**81**

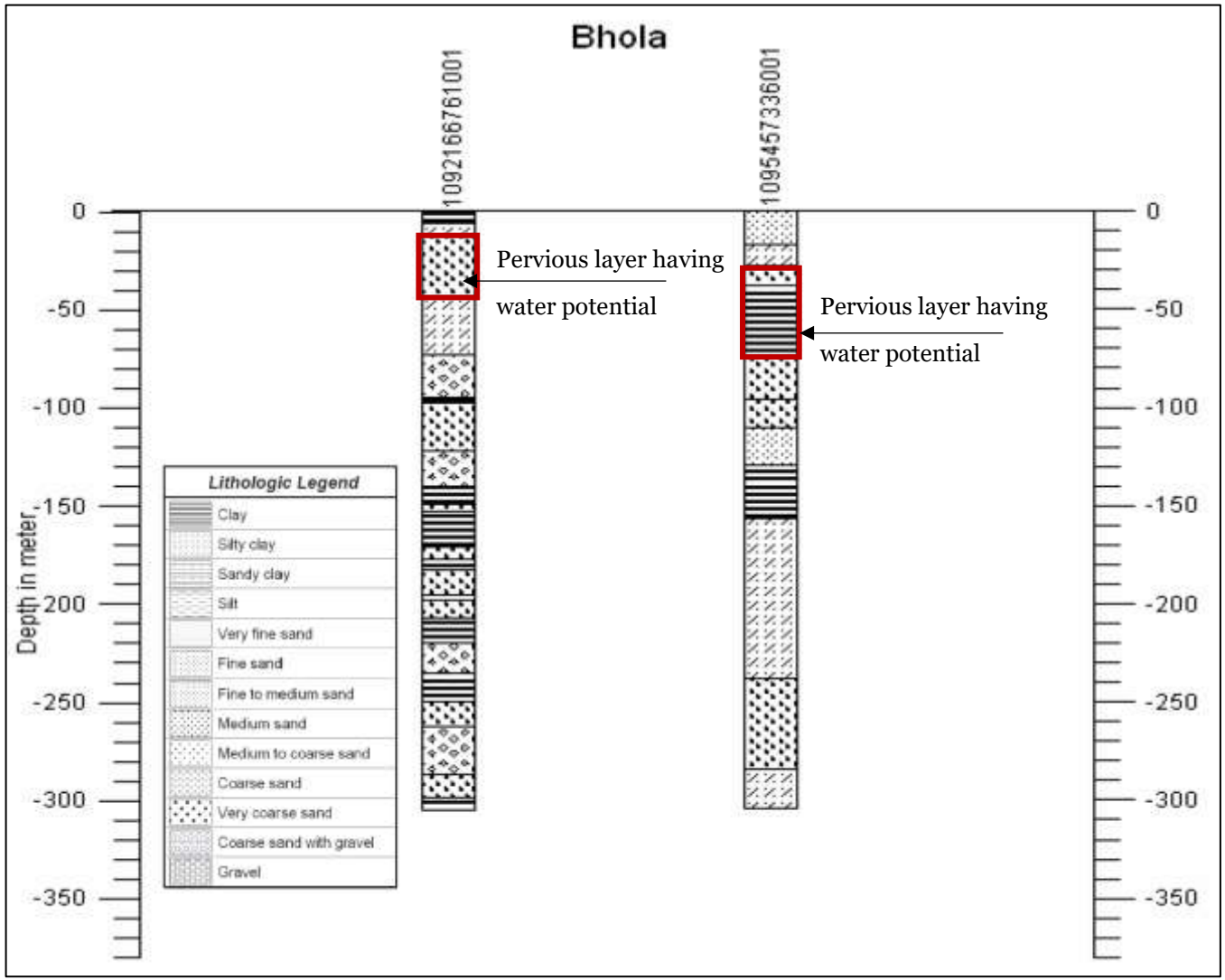
Cumulative no. of establishments (Aggressive) - figures in nos.

Industry	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043
Food & Beverages	4	8	12	16	21	25	29	34	39	48	58	58	58	58	58
Agro-based products	0	1	1	1	2	2	2	3	3	4	5	5	5	5	5
Chemicals	0	1	1	1	1	2	2	2	3	3	4	4	4	4	4
Non-Metallic Minerals	1	2	3	4	5	6	7	8	10	12	15	15	15	15	15
Total	**5**	**11**	**16**	**22**	**29**	**34**	**41**	**47**	**55**	**68**	**81**	**82**	**82**	**82**	**82**

15.20. Annexure 20 – Borewell Information



Note: To make the map reader friendly first three digits of the borehole ID have been deducted and only the remaining 10 digit ID used in the map.



Bore Well Profile of Project Area - 90.7452, 22.4994 & 90.7486 ,22.3167

15.21. Annexure 21 – Offsite Infrastructure cost estimates

Cost abstract for access road - Embankment

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Qty	Rate in Tk	Amount
1	2.1	Earth work in excavation in all kinds of soil for foundation trenches including. layout, providing center lines, local bench-mark pillars, leveling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer, subject to submit method statement of carrying out excavation work to the Engineer for approval. However, Engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract.				
	2.1.1	Layout and marking for earthwork in excavation in foundation accepted by the Engineer. [Plinth area of the structure shall be considered for measurement]				
		Formation for road embankment	Sqm	288,000.00		

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Qty	Rate in Tk	Amount
			Sqm	288,000.00	21.77	6,269,760.00
2	LGED - 2.02.2	EFW(AE): Earth filling work with specified soil in any type of embankment including cutting, carrying, filling by throwing earth in layers not more than 150mm in each layer in proper alignment, grade, camber and side slope in all types of soil except rocky, gravelly and slushy including benching not more than 30cm in vertical and 60cm in horizontal steps along the sides while widening any embankment, etc. all complete as per the direction of E-I-C. Earth shall be arranged by the contractor at his own cost and it will include all necessary lead & lift. Payment will be made on the basis of compacted volume. Note: This item shall be used when the work will be done by contractor	Cum			
		Formation for road embankment	Cum			
		Embankment		702,000.00		
				702,000.00	165	115,830,000.00

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Qty	Rate in Tk	Amount
3	LGED - 2.03.2	Mechanical compaction of earthworks in 150mm thick compacted layers by breaking clods to a maximum size of 25mm using wooden drag or ladder and compacting using mechanical equipment, watering or drying to obtain optimum moisture content watering if necessary including the equipment and other tools required to work site, etc. all complete as per direction of the E-I-C. 98% compaction of the maximum dry density is to be obtained by the standard compaction test (Rate is for each layer of 150mm thick).				
		same as filling Qty	Cum	702,000.00	77.25	54,229,500.00
4	31.31	Compaction test				
	31.31.1	Modified proctor	Per test	117.00	1800	210,600.00
		Total Cost in Taka				**176,539,860.00**
		Total Cost in Million Taka				**176.54**

Cost abstract for access road

Sl. No.	Description	Unit	Quantity	Rate in Taka as per SoR	Amount	Amount in million Taka
1	[RHD-2/1/01] Clearing & grubbing	sqm	30000	55	1650000	1.65
2	(RHD-2/2/02) Roadway Excavation in Suitable soil	cum	10318	144	1485792	1.485792
3	[RHD-2/7/02] Preparation of Subgrade	sqm	30000	40	1200000	1.2
4	[RHD-2/8/01] Improved Subgrade (Sand F.M >0.80)	cum	3850	1099	4231150	4.23115
5	[RHD-2/6/02] Earth filling work. (Filling in embankment, ditches, widening at intersection & curves.) Contractors arranged land	cum	810	397	321570	0.32157
6	[RHD-03/02/01 (b)] Sub-Base (Sand F.M >1.0 and Brick Khoa <40 mm)	cum	4620	5363	24777060	24.77706
7	(MR, Based on RHD_03/03/02b) Aggregate base type-II	cum	4620	7384	34114080	34.11408
8	(RHD-03/03/01b) Aggregate base type-I	cum	3850	8461	32574850	32.57485
9	[RHD-03/06/1a] Bituminous Prime Coat (Plant Placed)	sqm	15400	113	1740200	1.7402
10	[RHD-03/07/1a] Bituminous Tack Coat (Plant Work)	sqm	30800	50	1540000	1.54
11	[RHD-03/10/1 (b)] 155 mm Dense Bituminous surfacing-base course (Plant Method) Bitumen Grade 60/70 (Coarse sand F.M >2.5, Crushed boulder/gravel aggregate <25 mm etc.	cum	2387	22133	52831471	52.831471
12	[RHD_03/10/02 (b)] 40 mm Dense bituminous surfacing wearing course (Plan method) bitumen grade 60/70	cum	616	23295	14349720	14.34972

Sl. No.	Description	Unit	Quantity	Rate in Taka as per SoR	Amount	Amount in million Taka
	Total Cost in Million Taka					**170.815893**
	Total road length					1000
	Cost of road per Rm					0.170815893

Description of items	Unit	Quantity	Rate (Million BDT)	Total amount (Million BDT)
	a	b	c	d=bxc
Construction of access road	**km**	**6.00**	**170.82**	**1024.90**

Cost abstract for external power line

Remarks/ PWD SCHEDULE 2018 Item no	Description of items	Unit	Quantity	Rate (BDT)	Total amount (BDT)	Total amount (in million Taka)
		a	b	c	d=bxc	
BPDB	Supply, installation/ construction and testing & commissioning work of double circuit 33 kV line.	km	16	4000000.00	64,000,000.00	**64.00**
BPDB	Supply,installation/construction and testing & commissioning work of double circuit 132kV transmission line.	km	30	22,000,000.00	660,000,000.00	**660**

Cost abstract for street lighting system

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
1	Cable work (through PVC pipe)	Underground wiring: Providing & laying of the following XLPE insulated & PVC sheathed cable (N2XY) with PVC insulated green/white coloured ECC wire (BYA) connecting at both ends, through PVC pipe & accessories in the following manner: All electrical contacts shall be of brass/copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC/BDS/BS/VDE standards and as per detailed specification mentioned in Annexure-A. The work shall be carried out as per direction/ approval/ acceptance of the Engineer. *With cable manufactured by M/S BRB/ Paradise/ Poly/ Citizen/BBS/Super sign cables Ltd.*					
		i) In kutcha ground by cutting 45.70 cm width x 91.40 cm depth trench with necessary brick or tile protection and mending the					

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		damages good by refilling trench with proper compaction.					
		ii) In pucca floor through PVC pipe by cutting trench of necessary size and mending the damages good by brick soling, 75 mm (1:2:4) CC work with neat cement finishing etc.					
		1C-2 x 16 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 40 mm having wall thickness of 1.9 mm.					
		In katcha ground	meter	588.00	1205.00	708540.00	
		In pucca floor	meter	245.00	1294.00	317030.00	
2	Concealed wiring (BYM)	1C-4 x 25 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 50 mm having wall thickness of 2.59 mm. The work shall be carried out as per direction & approval of the Engineer.					
		In katcha ground	meter	312.00	1,844.00	575,328.00	
		In pucca floor	meter	62.60	1,927.00	120,630.20	
3	STREET LIGHT FITTINGS (LED)	Supply & fixing of LED street light fitting of the following features and model with all necessary elements such as driver, chips etc. complete. Model & sample shall be approved by the Engineer.					

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		(i) GLORIA cat No- GLST. 1205 or equivalent product of ENERGY +, SUNKO, etc. (ii) Rated life : 50,000 hr (minimum) (iii) Luminux flux : 100 + 1m/w (iv) LED chips: EDISON/EPISTOR/OSRAM/PHILIPS/CREE/BRIDGELUX. (v) Driver: MEANWELL/OSRAM/PHILIPS/IEC standard. (vi) Body: Tempered glass pure Aluminium.					
		100 W	each	50.00	9,358.00	467,900.00	6.A.8.(iii).(a).1
		150 W	each	10.00	11,773.00	117,730.00	6.A.8.(iii).(a).2
4	GI POLE	Providing following seamless hot dip galvanized GI pole fabricated with GI pipe complete with GI sockets, MS. base plate, top cover, necessary welding as required:-The length of the bracket shall be such that the end of light fixture will be 1.5meter (approx.) from the light column. A junction box to be installed at botton level of the pole fabricated from 2.0mm (min.) mild steel sheet and hot deep galvanized complete with cover including					

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		termination unit, circuit breaker and earthing terminal etc. The work shall be completed as per drawing and direction of the Engineer.					
		Total langth-30'(9m),Botton-150mm, Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	30	24149	724470	3.2.3
		Total langth-25'(8m),Botton-150mm, Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	2	19319	38638	3.2.4
5	Anchor Bolt	Supply and fixing of galvanized anchor bolts of variable dia for rigid frame conforming to ASTM F1554 Grade 55, Galvanized to A153, Class C or equivalent with minimum yield strength of 380 MPa, as per manual of steel construction by American Institute of Steel Construction (AISC) etc. including the cost of washer & bolts, material testing etc. all complete as per drawing, specification and direction of the Engineer-in-charge. Langth-400mm,Dia -20mm, Bend langth-100mm, Thred langth-75mm with Nut ,Washer .	kg	202	180	36360	10.1(Civil)

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
6	FORMWORK (Wooden)	Centering and shuttering, including strutting, propping etc. and removal of form after hardening of the concrete for:					
		Padestals, column, wall	sqm	136.60	429.00	58,601.40	07.15.3(Civil)
7	Re-Bar work	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.	kg	2749.60	82.00	225467.2	08.1.2(Civil)
8	Earth work	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and	Cum	82.80	217.00	17967.6	02.1.5 (Civil)

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.					
9	Back filling	Earth filling in foundation trenches and plinth in 150 mm layer with earth available within 90 m of the building site to achieve minimum dry density of 95% with optimum moisture content (Modified proctor test) including carrying, watering, levelling, dressing and compacting to a specified percentage each layer up to finished level etc. all complete	Cum	70.54	149.00	10510.46	2.13 (Civil)

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		and accepted by Engineer-in-charge.					
10	C.C. Work	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge.(Cement: CEM-II/A-M) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	3.22	6,647.00	21403.34	03.4.1 (Civil)
11	RCC work	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:1.5:3 having minimum f'cr = 30 MPa, satisfying a specified compressive strength f'c = 25 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2					07.3.1(Civil)

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position and maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing with standard mixer machine with hopper, fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and concrete cylinders as required, cost of all materials and other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering)					
		Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level	cum	15.00	12154.00	182310.00	

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
12	GI Pipe for light bracket	G.I pipe 50mm dia	meter	280.00	410.00	114800.00	PWD-EM - ANALYSIS-38
13	MCB Box	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6") duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision for cable inlets and exits as required (only front surface of the board will be considered for measurement). (Manufactured by RECO / NASCO / C&S or equivalent product of any other manufacturer)					
		With water tight arrangement.	sqm	5.3200	16240.00		4.9.2
	DB	Supply & installation of outdoor type distribution board made of epoxy powder coated 14 SWG sheet steel with hinge type double doors having built in flash type locking arrangement, complete with copper					

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		bus bars (phases & nentral), copper earthing bars and indicating lamps in conformity to the distribution boards ratings as detailed below. The box shall be double door type i.e. one cover door inside through which knobs of MCB/MCCB's are accessible and no live part shall be accessible to an operator. The rate shall include supply & installation of MCB/MCCB, magnetic contractor (Siemens/Dorman Smith/Schneider/Eaton), photo cell, timer etc. The work shall be complete in all respect as per specifications, drawing and direction of the Engineer-in-Charge. Sufficient gap must be maintained between bus bars and back side of the box. The item also includes the fixing of the cable lugs for distribution cables as per drawing and direction of the Engineer-in-Charge.					
		Box size : 650mm x 750mm x 150mm, Busbar: 120A SPN & E;Incoming: 63A SP/DP MCB;63A SP/DP Magnetic Contractor; Photo	Set	1.00	50000.00	50000.00	

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		Cell & Timmer; Outgoing: up to 5x 30 A TP MCB (minimum 6 KA)					
	Auto Controller	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6") duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision for cable inlets and exits as required. Magnatic contructor -38A (Ith 60A) magnetic contactor -1nos, Tharmal over load Relay-24- 36A ,Photo cell -2 nos, TPMCB-50A-1Nos, Internal wiring,Phase indicator, all complete, approved and accepted by the Engineer-in-charge. MCB-2499,MC-12225,OLR-2777,Box 1 sqm-16240.	each	2.00	50,000.00		
16	Earthing	Earthing the electrical installation with 40 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm. dia hole across the pipe at 305 mm.					

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		interval securely bonded by soldering with 2 nos. of No-2 SWG HDBC earth leads (at the top of the electrode) with its protection by 20 mm. (3/4") dia G.I. pipe up-to plinth level run at a depth of 609.6 mm (2 ft.) below G.L up-to main board to be earthed including necessary connecting copper sockets, bolts, nuts, etc. complete for maintaining earth resistance within 1 ohm.					
		Depth of bottom of main electrode at 37338 mm. (122.5 ft) from GL & length of electrode 36576 mm. (120 ft).	per set	1.00	42,261.00	42,261.00	4.17 (vi)
	Connecting wire	Providing and drawing No.2 SWG HDBC wire through 20mm (3/4") dia G.I. pipe including fitting, fixing the G.I. pipe in wall or column complete as required.	meter	25.00	614.00	15,350.00	
17	Earth Pit	Construction of earthing inspection pit inside measurement 600 mm x 600 mm with 250 mm thick brick in cement mortar (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450 mm dia water sealed CI man-hole cover with locking arrangement including	each	1.00	6,037.00	6,037.00	4.18

Item no.	Item name	Description of items	Unit	Quantity	Rate	Total Amount	Remarks/ PWD SCHEDULE 2018 Item no
			a	b	c	d=bxc	
		necessary earth works, site filling and one brick flat soling 75 mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of .75 meter.					
						3,851,334.20	
		Road length considered	650	m			
		Road width considered	30	m			
		Carriageway width considered	7.5	m			
		Per m cost for streetlight	5,925.13				
		Description of items	**Unit**	**Quantity**	**Rate (BDT)**	**Total amount (BDT)**	**Total amount in Million Taka**
		Supply and installation of streetlight- Approach road (Off site road)	**meter**	**6000**	**5925.13**	**35550777.23**	**35.55**

Cost abstract for external water supply

Sl. No.	Description	Nos.	Quantity	Unit	Rate (Tk)	Amount (Tk)
1	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing centre lines, local bench mark pillars, levelling , ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc., all complete and accepted by the Engineer, subject to submit method statement of carrying out excavation work to the Engineer for approval. However Engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract		29748	Cum	100	2,974,800.00
2	Reinstating the road surface to its original WBM condition wherever disturbed.		125256	Sqm	40	5,010,240.00
3	Supplying, Loading & Transporting Ductile Iron pipes (Class K7) and specials, unolading, lowering in trenches, laying (CI as per standards) with ordinary bedding and jointing with tyton joints, with EPDM rubber rings (Type II) flanged joints, with rubber gaskets ,pipes and specials, joints in chambers, including providing all jointing materials as per specifications, testing the pipeline for specified heads and leakages and disinfecting before commissioning complete					
	Spun D.I. pipe 200 mm diameter		19600	Rm	7,800	152,880,000.00
	Spun D.I. pipe 125 mm diameter		430	Rm	4,800	2,064,000.00
4	Providing, installing, jointing to pipelines, testing and commissioning. Butterfly Valves, Sluice Valves, Kinetic Double Air Valves with isolating Sluice Valves, Scour Valves with all jointing materials, gaskets, bolts, nuts, inclusive of dismantling pieces, washers, rubber gaskets as per standards etc. complete as per drawing and specifications provided.					
a	C.I Kinetic Double Air Valves					

Sl. No.	Description	Nos.	Quantity	Unit	Rate (Tk)	Amount (Tk)
	80mm valve on 225-350mm. Dia. Pipe, rating 10kg/cm2		16	Nos.	50,000	800,000.00
b	C.I Sluice Valve					
	200 mm. dia. pipe rating 10 kg/cm2		9	Nos.	30,000	270,000.00
	125 mm. dia. Pipe rating 10 kg/cm2					
c	C.I Scour (Gate) Valve including drain pipe of diameter equivalent to that of Scour valve of about and 6 m. length					
	350 mm. dia. pipe rating 10 kg/cm2		5	Nos.	50,000	250,000.00
d	Pressure reducing valve of diameter equivalent to that of pipe diameter at the entry point of sump		3	Nos.	40,000	120,000.00
5	Providing and constructing rectangle / square valve chambers as per drawing including bed concrete, masonry in C.M. 1:4, plaster in C.M. 1:4 rough finish on external surfaces and smooth cement finish on internal surfaces, pre-cast covers, joint for inlet and outlet in the masonry, providing RCC NP2 drain pipe 150 mm. dia. of about 6 m. length from chamber to nearest storm drain, testing for water tightness etc. complete including de-watering whenever required					
a	For air valves					
	Chamber size (Inner) 2.2 m. x 1.2 m. for air valve on pipe of dia 300 mm to 500 mm.		18	Nos.	20,000	360,000.00
b	For Sluice Valves					
	Chamber size (Inner) 2.2 m. x 1.2 m. for Sluice valve on pipe of dia. 200 to 500 mm.		7	Nos.	20,000	140,000.00
c	For Scour Valves					
	Chamber size (Inner) 2.2 m. x 1.6 m. for scour valve on pipe of dia 300 mm to 350 mm.		7	Nos.	22,000	154,000.00
d	For pressure reducing valve					
	Chamber size (Inner) 2.2 m. x 1.6 m. for pressure reducing valve on pipe of dia 300 mm to 350 mm.		1	Nos.	22,000	22,000.00
6	Providing and placing P.C.C. M-15 for thrust blocks at bends of water mains and junctions including necessary shuttering, curing etc. all complete		45	Nos.	13,000	585,000.00

Sl. No.	Description	Nos.	Quantity	Unit	Rate (Tk)	Amount (Tk)
7	Electromagnetic flow meter of suitable model with hard rubber liner, SS316 electrode, SS 304 Coil Housing, SS 316 Grounding Ring, Flanged connection with IP 68 protection with suitable electronics components for input power supply of 230 V AC and output of 4- 20 MA DC with flow indicator and totaliser of 350 mm DIA		2	Nos.	350,000	700,000.00
	One layer of brick flat soling in foundation or floor with first class brick or picked jhma bricks including preparation of bed and filling the interstices with local sand, levelling, etc., complete and accepted by engineer.		694	sqm	355	246,214.69
	Lime Soil		520	cum	3,484	1,812,310.02
	Anti-Corrosion		2694	sqm	853	2,298,572.88
Total pumping main length			20.03	KM		
Amount in Taka			170,687,137.59	Taka		
Cost per KM			8,521,574.52	Taka		
		In Million	8.52	Taka		
					Unit in Km	Amount in Million Taka
Total cost for external water supply in Million Taka					**2**	**17.04**

Cost abstract for boundary wall

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
1	9.1	Boring / drilling for cast in situ under reamed piles up to the required depth and diameter with minimum 6 m long temporary steel casing, true to vertical, providing bentonite slurry and maintaining water level in the hole, washing the hole for atleast 30 minutes, clean the bore-hole and make the bore-hole ready for placing steel cage and concreting including hire charge of rig set with winch machine, tripod stand, trimie pipe, cost of fuel, lubricant, mobilization, demobilization, maintenance, spares, stand-byes, insurance coverage, water, electricity and other charges all compete approved and accepted by the Engineer. Before commencing boring operation contractor shall submit the method statement of cast-in-situ pile work including sequence of boring and casting, disposal of spoils, test result of materials				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		to the Engineer for approval. However, Engineer's approval shall not relieve the contractor of his responsibilities and obligations under contract.				
	9.1.1.1	400 mm dia pile	7,170.00	Meter	536.00	3843120.00
2		Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per standards to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.				
		400 mm dia pile	1,140.00	Cum	11,578.00	13198920.00

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
3	9.6	Labour for breaking head of hardened cast in situ bored pile/pre-cast pile up to a required length by any means but without damaging the rest and removing the dismantled materials such as concrete to a safe distance including scraps and cleaning concrete from steel/M.S. rods, straightening and bending of pile bars, preparation and making platform where necessary, carrying, all sorts of handling, stacking the same properly after clearing, leveling and dressing the situ and clearing the bed etc. complete in all respects and accepted by the Engineer. (Measurement will be given for the actual· pile head volume to be broken)	69.00	Cum	3,603.00	248607.00
4		Providing and injecting the unslaked lime slurry shall be a filled with bore. Proportion unslaked lime within the range of 1% volume of soil and closed with sand gunny bags or stone slabs including necessary				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		tools, plants, machinery and all related operations as required to complete the work as per drawings and Specifications with all leads, lifts etc. all complete and accepted by the Engineer-in-charge.				
		38 kg per pile	54,492.00	Kg	12.00	653904.00
5		Lime soil mix filling in foundation trenches and plinth in 150 mm layers, proportion of lime soil mix 1:4 including leveling, by ramming each layer up to finished level as per design supplied by the design office only etc. all complete and accepted by the Engineer.				
			330.00	Cum	2,918.00	962940.00
6	9.7	Conducting static load test as per ASTM D1143 or equivalent standard for the cast - in - situ / pre - cast pile providing required scaffolding, bracing, jacks, pressure test gauge,				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		loading, unloading, Kentledge and other plants and equipment including staging, mobilization, demobilization, hire charge, gunny bags, sand and filling sacs / gunny bags for loading, record readings and preparation of results in standard forms and other incidental charges per standard practice and procedures including submission of load test report, furnishing all graph and chart, etc., complete in all respects approved and accepted by the Engineer (minimum two cyclic loading, one at service load and another cycle at double the load of service load then to continue loading till failure of the pile). Before commencing load test, contractor shall submit method statement for conducting load test to the Engineer for approval. However, Engineer's approval shall not relieve the contractor of his responsibilities and obligations under contract.				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		Load test and report shall be conducted under the supervision of a professional Geotechnical Engineer registered in BPERB or Geotechnical Firm registered in PWD. Boring and pouring logs / driving logs of piles and method statement shall be the part of load test report. (Rates on load test under the supervision of experts in the laboratory of universities and HBRI can be found in Chapter - 32)				
		Initial test	2.00			
		Routine test	8.00			
	9.7.1	For design load tonne 1 no. of test	10.00	Per test	53,423.00	534230.00
7	2.1	Earth work in excavation in all kinds of soil for foundation trenches including. layout, providing center lines, local bench-mark pillars, leveling, ramming and preparing the base, fixing bamboo spikes and				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer, subject to submit method statement of carrying out excavation work to the Engineer for approval. However, Engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract.				
	2.1.1	Layout and marking for earthwork in excavation in foundation accepted by the Engineer. [Plinth area of the structure shall be considered for measurement]				
			1,200.00	Sqm	11.00	13200.00
8	2.1.2	Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		lead: in soft clayey soil / loose sand / silt.				
		Plinth beam	1,950.15	Cum		
			1,950.10	Cum	67.00	130656.70
9	2.10.1	Sand filling in foundation trenches and plinth with sand having F.M. 0.5 to 0.8 in 150 mm layers including leveling, watering and compaction to achieve minimum dry density of 90% with optimum moisture content (Modified proctor test) by ramming each layer up to finished level as per design supplied by the design office only etc. all complete and accepted by the Engineer.				
		Plinth beam	300.02	Cum	602.00	180613.55
10	3.4.	Mass concrete (1:3:6) in foundation with cement, sand (F.M. 1.2) and picked jhama chips including breaking chips, screening, mixing, laying, compacting to levels and curing for at least 7 days including the supply of water,				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		electricity and other charges and costs of tools and plants etc. all complete and accepted by the Engineer.(Cement: CEM-II/A-M)				
	3.4.1	Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M.1.2				
		Plinth beam	300.02	Cum	6,319.00	1895842.18
11		Providing and laying in position machine batched and machine mixed design mix M-25 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including admixtures in recommended proportions as per standards to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
	7.6.4	Pedestals, column, column capitals, lift walls and walls up to ground floor				
	7.6.4.1	**Concrete**				
		For column	1,122.82			
			1,122.82	Cum	10,626.00	11931106.57
12	7.6.4.2	**Formwork/shuttering, prop and necessary supports etc. (steel)**				
		For column	8,733.06	Sqm		
			8,733.06	Sqm	373.00	3257431.38
13	7.6.5	**Tie beam and lintels : Ground floor**				
	7.6.5.1	**Concrete**				
		Plinth beam	360.00	Cum		
		leveling coarse for between column @ mid of 125 mm thick brick wall	31.89	Cum		
		Reinforced coping concrete	31.89	Cum		
			423.78	Cum	10,929.00	4631512.11

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
14	7.6.5.2	**Formwork/shuttering, prop and necessary supports etc. (steel)**				
		Plinth beam	2,400.00	Sqm		
		leveling coarse for between column @ mid of 125 mm thick brick wall	510.26	Sqm		
		Reinforced coping concrete	510.26	Sqm		
			3,420.51	Sqm	380.00	1299793.80
15	4.16	125 mm brick works with first class bricks in cement sand (F.M. 1.2) mortar (1:4) and making bond with connected walls including necessary scaffolding, raking out joints, cleaning and soaking the bricks for at least 24 hours before use and washing of sand curing at least for 7 days in all floors including cost of water, electricity and other charges etc. all complete and accepted by the Engineer.(Cement: CEM-II/A-M)				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		Above NGL	9,354.68			
			9,354.68	Sqm	837.00	7829863.00
16	8.1	Supplying, fabrication and fixing to details as per design deformed bar reinforcement in concrete in accordance with BDS 1313 : 1991 standard including straightening and cleaning rust, if any, bending and binding in position including supply of G.I. wires etc. complete in all respects and accepted by the Engineer.				
	8.1.2	Grade 400 (RB 400 / 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh Standard, with minimum yield strength fy (ReH) = 400 Mpa but fy not exceeding 418 MPa and whatever is the yield strength within allowable limit as per BNBC sec 8.3.3.5 / ACI 318-11 sec 21.1.5.2, the ratio ultimate tensile strength fu to yield strength fy, shall be at				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		least 1,25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.				
		Pile	136,800.00	Kg		
		For column	129,124.53	Kg		
		Plinth beam	27,000.00	Kg		
		leveling coarse for between column @ mid of 125 mm thick brick wall	6,580.00	Kg		
		Reinforced coping concrete	6,580.00	Kg		
			306,084.53	Kg	85.00	26017185.05
17	15.1	Minimum 12 mm thick cement sand (F.M. 1.2) plaster (1:4) with fresh cement to wall both inner and outer surface, finishing the corner and edges including washing of sand cleaning the surface, scaffolding and curing at least for 7 days, cost of water, electricity and other charges				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		etc. all complete in all respect as per drawing and accepted by the Engineer.				
		For column	12,796.66	Sqm		
		For wall	20,580.29	Sqm		
			33,377.00	Sqm	214.00	7142678.00
18	16.3	Cement paint of approved quality and colour delivered from authorized local agent of the manufacturer in a sealed container, made water based powder mixed with water (1:1), applying first coat, curing the same after six hours for 24 hours, second coat applied and curing the same for 7 (seven) days etc, taking care and cleaning the surface fully from grease, oily substances, old paint, lime wash, fungus, algae etc., sand papering the surface before applying 1st and 2nd coat, complete including cost of electricity, water and other changes etc. complete in all				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		floors and accepted by the Engineer.				
		Same as plastering quantity	33,377.00	Sqm		
			33,377.00	Sqm	128.00	4272256.00
19		Providing band course work flat 10 mm thick and 50 mm deep with cement mortar 1:3 (1 cement and 3 river sand) including rendering smooth, curing, etc., complete as directed during execution.				
		Boundary wall top level	4,359.00	Meter	129.00	562311.00
20	21.7	Supplying, fitting and fixing 12 BWG barbed wire (2 ply, 4 points) in fencing work @ 150 mm c/c in both horizontally and vertically, supported by 38 x 38 x 6 mm M.S. angle post (300 mm embedded in R.C.C or in brick work with a cement concrete base of 75 x 75 x 300 mm) 600 mm vertical and 450 mm inclined or as per requirement @ 2.5 m c/c including straightening,				`

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		binding the joints with 18 BWG wire making holes in the angle etc. including supplying of all necessary materials complete in all respect and accepted by the Engineer. (Rate is excluding the cost of R.C.C or brick work or C.C which is to be paid as per corresponding items in the schedule)				
		Horizontal barbed wire	4,200.00	Sqm	760.00	3192000.00
21	19.5	Manufacturing, supplying, fittings and fixing G.I. pipe gate of any design and shape having 38 mm dia G.I. pipe outer frame and 19 mm dia G.I. pipe vertical member placed @ 75 mm c/c by welding at top and bottom of G.I. pipe frame, cutting the pipes in proper shape and size including making semicircular band at the corner of the outer frame without damaging the pipe, covering 50% of the gate area with 18 BWG M.S. sheet, providing also two extra	26.00	Sqm	9,307.00	241982.00

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		horizontal 38 mm dia G.I. pipes welded with vertical post, providing 6 nos. huskle domney with R.C.C. or R.C.C core pillar with cement concrete (1:2:4) in masonry including cutting holes, mending the damages, making provision for minimum 0.61 m x 1.4 m pocket gate having its outer frame and inner vertical members made with 19 mm dia G.I pipe including necessary locking arrangements. Painting the gate with 2 (two) coats of synthetic enamel paint over a coat of anti-corrosive priming, welding as and where necessary including necessary locking arrangements and providing 2 nos. 16 mm M.S. socket bolts etc. all complete as per design and drawing and accepted by the Engineer. **(Rate is excluding the cost of painting)**				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
22		Painting new iron work with one coat of approved primer. (ISI STD)				
		Gate	25.20			
		Fencing	274.64			
			300.00	Sqm	55.00	16500.00
					Total	**92056652.34**
					in Million (Tk)	**92.1**

Cost abstract for gas supply network

Remarks/PWD SCHEDULE 2018 Item no	Description of items	Unit	Quantity	Rate (BDT)	Total Amount (BDT)	Amount in Million Taka
GTCL	Supply and installation of 8" dia external gas supply line	km	10	10000000.00	100000000.00	**100**

15.22. Annexure 22 – Onsite Infrastructure cost estimates

Cost abstract for site development works – Site filling

Item. No	BPWD Item. Code	Description	Unit	Total Qty	Rate in Tk	Amount in Tk
1	2.16	Site development/improvement by carted earth or dredged sand, sandy silt (free from any organic, foreign, environmental hazardous substances) carried by head or truck or any other means in/c cost of cutting or by dredging of sand, sandy silt, all; in/c local carrying, placing the earth/sand, sandy silt in the designated area, maintaining slopes, breaking lumps, levelling and dressing in layers up to finished level etc. all complete as per direction and accepted by the engineer in charge.	Cum			
	02.16.2.2	By Dredging	Cum	2214440	449.00	994,283,381.84
		Total for Site Development in Tk				**994,283,381.84**
					Total Cost in Million Taka	**994.28**

Abstract for site development works – Embankment

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
1	2.1	Earth work in excavation in all kinds of soil for foundation trenches including. layout, providing center lines, local bench-mark pillars, leveling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer, subject to submit method statement of carrying out excavation work to the Engineer for approval. However, Engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract.				
	2.1.1	Layout and marking for earthwork in excavation in foundation accepted by the Engineer. [Plinth area of the structure shall be considered for measurement]				

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		Formation for road embankment	Sqm			
			Sqm	**100300.00**	21.77	2,183,531.00
2	LGED - 2.02.2	EFW(AE): Earth filling work with specified soil in any type of embankment including cutting, carrying, filling by throwing earth in layers not more than 150mm in each layer in proper alignment, grade, camber and side slope in all types of soil except rocky, gravelly and slushy including benching not more than 30cm in vertical and 60cm in horizontal steps along the sides while widening any embankment, etc. all complete as per the direction of E-I-C. Earth shall be arranged by the contractor at his own cost and it will include all necessary lead & lift. Payment will be made on the basis of compacted volume. Note: This item shall be used when the work will be done by contractor	Cum			
		Formation for road embankment	Cum			
		Embankment				
				129800.00	165	21,417,000.00

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
3	LGED - 2.03.2	Mechanical compaction of earthworks in 150mm thick compacted layers by breaking clods to a maximum size of 25mm using wooden drag or ladder and compacting using mechanical equipment, watering or drying to obtain optimum moisture content watering if necessary including the equipment and other tools required to work site, etc. all complete as per direction of the E-I-C. 98% compaction of the maximum dry density is to be obtained by the standard compaction test (Rate is for each layer of 150mm thick).				
		same as filling Qty	Cum	**129800.00**	77.25	10,027,050.00
4	31.31	Compaction test				
	31.31.1	Modified proctor	Per test	**22.00**	1800	39,600.00
5	2.1	Earth work excavation for Hard stones		82,600.00	257.50	21269500
6	2.10.1	Sand filling (For cement concrete block) in foundation trenches and plinth with sand having F.M. 0.5 to		7,463.50	2860.11	21346430.99

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		0.8 in 150mm layers including leveling, watering and compaction to achieve minimum dry density of 90% with optimum moisture content (Modified proctor test) by ramming each layer up to finished level as per design supplied by the design office only etc. all complete and accepted by the Engineer.				
7	2.11	50 mm downgraded picked jhama Khoa consolidation in foundation trenches by mixing the same with best quality local sand (F.M. 1.2) in (2:1) (khoa : sand) proportion to achieve minimum dry density of 90% with optimum moisture content (Modified proctor test) including breaking and screening chips, laying and spreading in 100mm layers uniformly etc. all complete and accepted by the Engineer.		7,463.50	5999.40	44776521.9
8	40-280-30	Supply of stone boulders at site: 30cm to 45cm size		33585.75	5649.80	189752770.4
9	3385	Labour charge in laying stone boulders		33585.75	257.5	8648330.625
10	2.8	Supply and laying 3 mm thick geo-textile of approved quality and origin		74635.00	146.06	10901188.1

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		/manufacturer as per manufacturer's instructions approved and accepted by the Engineer. Before commencing lying of geo-textile, the contractor must submit the method statement for carrying out this work including sample with evidence of origin and compliance certificate from independent testing laboratory for approval.				
11	40-140	Manufacturing and supplying C.C. blocks (Block size 50cmx50cmx40cm) in leanest mix. 1:3:6, with cement, sand (FM>=1.5) and Stone Chips (40mm downgraded), to attain a minimum 28 days cylinder strength 'of 25 Mpa including grading, washing stone chips, mixing, laying in forms; consolidation, curing for at least 21 days, including preparation of platform, shuttering and stacking in measurable stacks etc complete- including · supply of all materials (steel shutter to be Used) as per direction of Engineer in charge.		298540.00	1547.72	462056328.8
12	40-220	Labour charge for protective works in laying CC blocks of different sizes including preparation of base,		33585.75	257.5	8648330.625

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		watering and ramming of base etc. complete as per direction of Engineer in charge.				
13	15.7	**Flush pointing** to CC blocks with cement sand (F.M. 1.2), mortar (1:2) with cement including raking out the joints, and necessary scaffolding curing at least for 7 days, cost of water, electricity and other charges etc. all complete in all respect as per drawing and accepted by the Engineer. (Cement: CEM-11/A-M). Ground floor.		74635.00	429.16	32030356.6
14	40-280-40	Supplying of local hard rock (Madhyapara) at site: 60cm and above size		41300.00	429.16	17724308
15	NTI	Manufacturing and supplying C.C. blocks in leanest mix. 1 :3:6, with cement, sand (FM>=1.5) and Stone Chips (40mm downgraded), to attain a minimum 28 days cylinder strength 'of 9.0· N/mm2 including grading, washing stone chips, mixing, laying in forms; consolidation, curing for at least 21		86041.67	2220.49	191054660.4

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		days, including preparation of platform, shutteting and stacking in measurable stacks etc complete- including · supply of all materials (steel shutter to be Used) as per direction of Engineer in charge.				
		block size 100cmx80cmx60cm				
16		Labour charge for protective works in laying CC blocks of different sizes including preparation of base, watering and ramming of base etc. complete as per direction of Engineer in charge.	Cum	41300.00	257.9	10651270
		Total Cost in Tk				**1,052,527,177.40**
					Total Cost in Million Taka	**1,052.53**

Cost abstract for internal road network

Description	Unit	Quantity	Rate in Taka	Rate in Taka as per SoR	Amount	Amount in Million Taka
[RHD-2/1/01] Clearing & grubbing	Sqm	161832		55.00	8,900,760.00	**8.90**
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	88627	142.00	144.00	12,762,344.20	**12.76**
[RHD-2/7/02] Preparation of Subgrade	Sqm	161832		40.00	6,473,280.00	**6.47**
[RHD-2/8/01] Improved Subgrade (Sand F.M >0.80)	Cum	21203		1099.00	23,301,794.80	**23.30**
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	1338.81	1768.00	397.00	531,507.60	**0.53**
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	Cum	25443	6738.00	5363.00	136,452,257.00	**136.45**

Description	Unit	Quantity	Rate in Taka	Rate in Taka as per SoR	Amount	Amount in Million Taka
with vibratory roller to achieve the desired density (Aggregate type 2 as per Bangladesh SoR)						
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. (Aggregate type base II as per Bangladesh SoR)	Cum	25443		7384.00	187,873,105.70	**187.87**
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. (Aggregate type base I as per Bangladesh SoR)	Cum	46646	5715.00	8461.00	394,671,763.70	**394.67**
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	84811	82.00	113.00	9,583,631.70	**9.58**

Description	Unit	Quantity	Rate in Taka	Rate in Taka as per SoR	Amount	Amount in Million Taka
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	Sqm	169622	31.00	50.00	8,481,090.00	**8.48**
Providing and laying dense graded bituminous macadam 155 mm 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	Cum	13146	13848.00	22133.00	290,953,545.70	**290.95**
Providing and laying bituminous concrete 40mm thick with 40-60 TPH hot mix plant 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 & specification clause No.509 complete in all respects (Bitumen = 0.109 Metal = 1.36, Cement 0.0469)	Cum	3392	14818.00	23295.00	79,026,796.60	**79.03**

Description	Unit	Quantity	Rate in Taka	Rate in Taka as per SoR	Amount	Amount in Million Taka
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	15440	692.00	317.33	4,899,626.70	**4.90**
Total Cost in Million Taka						**1163.91**

Cost abstract for foot path

Sl. No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	**2.1.5**	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.	Cum	1539	217.00	333,881.63	**0.33**
2	**2.15.4**	Earth filling in foundation trenches and plinth in 150 mm layers with carted earth carried by truck or by any other means including loading and unloading at both ends, leveling, watering and compacting to achieve minimum dry density of 95% with optimum moisture content (modified proctor test) including local carriage each layer up	Cum	1538.63	393.00	604,679.63	**0.60**

Sl. No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		to finished level including cost of water and test (carried from beyond 300 m) etc. all complete and accepted by the Engineer-in-charge					
3	**3.4.1**	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	1590	6647.00	10,570,375.13	**10.57**
4	**7.3.1**	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:1.5:3 having minimum f'cr = 30 MPa, satisfying a specified compressive strength f'c = 25 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position and maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing with standard mixer machine with hopper, fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator	Cum	9909	12154.00	120,431,859.05	**120.43**

Sl. No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and cylinders as required, other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering) Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level					
5	**8.1.2**	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.	Kg	1162611	82.00	95,334,102.00	**95.33**
6	**30.28**	Supplying, carrying, placing, providing of concrete Kerb stone size 600 mm x 300 mm x 100 mm approved and accepted by the Engineer-in-charge.	Rm	10258	238.00	2,441,285.00	**2.44**
7	**30.15.2**	Supplying and placing of approx. 60 mm thick coloured uni-block for paving walk way having compressive strength of 15 N/mm2 on compacted sand bed of 50 mm on stabilized	Sqm	10258	1276.00	13,088,570.00	**13.09**

Sl. No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		soil base, and filling all interstices with sand, cleaning etc. accepted by the Engineer-in-charge.					
						Total Cost in Million Taka	**242.80**

Cost abstract for storm water drain

Sl. No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	2.1.5	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.	Cum	10971.69	217.00	2380857.63	2.38
2	3.4.1	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to	Cum	2185.84	6647.00	14529282.03	14.53

Sl. No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2					
3	7.2.1	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:2:4 having minimum f'cr = 27 MPa, satisfying a specified compressive strength f'c = 22MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position maintaining true to plumb, making shutter water-tight properly, placing reinforcement n position; mixing in standard mixer machine with hopper fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and cylinders as required, other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering) Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level	Cum	231.79	11817.00	2739064.50	2.74

Sl. No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
4	8.1.2	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.	Kg	4559.63	82.00	373889.25	0.37
5	4.1	Brick works with first class bricks with cement sand (F.M. 1.2) mortar (1:6) in foundation and plinth, filling the joints/interstices fully with mortar, racking out the joints, cleaning and soaking the bricks at least for 24 hours before use and curing at least for 7 days etc. all complete including cost of water, electricity and other charges and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)	Cum	2463.02	6040.00	14876654.37	14.88
6	7.2.1	Providing and laying coping and Screed concrete with 1 :2:4 cement concrete, 40 mm thick Sqm 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	7033.40	296.00	2081886.40	2.08
7	15.1	Minimum 12 mm thick cement sand (F.M. 1.2) plaster (1:4) with fresh cement to both inner-and outer surface of wall, finishing the corner and edges	Sqm	17222.98	243.00	4185183.96	4.19

Sl. No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		including washing of sand, cleaning the surface, curing at least for 7 days, cost of water, electricity, scaffolding and other charges etc. all complete in all respect as per drawing and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) ground floor.					
8	937	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	4294.00	133.00	571102.00	0.57
9		Providing and laying non pressure NP 2 class (light duty) RCC pipes with collars jointed with stiff mixture of the cement mortor.. etc					
	1151	300mm dia RCC pipe	Rm	100.00	1895.00	189500.00	0.19
	MR	500mm dia RCC pipe	Rm	44.00	2954.00	129976.00	0.13
10	Annexure A 15. (iii)	Providing apron with 50 mm thick cement concrete (1:2:4) with cement, coarse sand and picked jhama chips including breaking chips and one layer brick flat soling at bottom with first class or picked jhama bricks including cutting earth for preparation of bed and filling the interstices with local sand (F.M. 0.8) including finishing, dressing, curing at least for 7 days etc. all complete, including cost of water, electricity, other charges accepted by the Engineer in charge.(Cement: CEM-II/A-M)	Sqm	5401.90	918.00	4958947.19	4.96
						Total Cost in Million Taka	**47.02**

Cost abstract for electrical infrastructure related work

Remarks/PWD SCHEDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate (BDT)	Total Amount (BDT)	Total Amount in Million BDT
REB	Internal 11 kV line	Supply, installation/construction and testing & commissioning work of double circuit 33 kV line.	km	7.6	1400000.00	10626000.00	10.63
BPDB	33 kV & 132 kV Line construction	Supply, installation/construction and testing & commissioning work of double circuit 33 kV line.	km	1.7	4000000.00	6,800,000.00	6.8
BanglCAT	Generator	Supply and installation of a 2 MVA Generator with all accessories. -Integration with existing substation	numbers	2	45,000,000.00	90,000,000.00	90
PBS-Mirsharai	33/11kV Sub-station	Supply, installation and testing & commissioning work of a complete 33/11 kV substation. Including construction of control room for 33/11 kV voltage level.	numbers	1	150,000,000.00	150,000,000.00	150
PGCB	132/33/11kV Sub-station	Supply,iinstallation and testing & commissioning workof a complete 132/33 kV	numbers	1	500,000,000.00	500,000,000.00	500

		substation.excluding control room. And integration work with 132/33/11 kV substation.					

Cost abstract for street light network

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
1		Cable work (through PVC pipe)	Underground wiring: Providing & laying of the following XLPE insulated & PVC sheathed cable (N2XY) with PVC insulated green/white coloured ECC wire (BYA) connecting at both ends, through PVC pipe & accessories in the following manner: All electrical contacts shall be of brass/copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC/BDS/ BS/ VDE standards and as per detailed specification mentioned in Annexure-A. The work shall be carried out as per direction/approval/acceptance of the Engineer. *With cable manufactured by M/S BRB/Paradise/Poly/Citizen/BBS/Super sign cables Ltd.*				
			i) In kutcha ground by cutting 45.70 cm width x 91.40 cm depth trench with necessary brick or tile protection and mending the damages good by refilling trench with proper compaction.				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			ii) In pucca floor through PVC pipe by cutting trench of necessary size and mending the damages good by brick soling, 75 mm (1:2:4) CC work with neat cement finishing etc.				
			1C-2 x 16 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 40 mm having wall thickness of 1.9 mm.				
			In katcha ground	meter	12750.00	480.00	6120000.00
			In pucca floor	meter	5400.00	520.00	2808000.00
2		Concealed wiring (BYM)	1C-4 x 25 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 50 mm having wall thickness of 2.59 mm. The work shall be carried out as per direction & approval of the Engineer.				
			In katcha ground	meter	6,780.00	760.00	5,152,800.00
			In pucca floor	meter	1,350.00	800.00	1,080,000.00
3		STREET LIGHT FITTINGS (LED)	Supply & fixing of LED street light fitting of the following features and model with all necessary elements such as driver, chips etc. complete. Model & sample shall be approved by the Engineer.				
			(i)GLORIA cat No- GLST. 1205 or equivalent product of ENERGY +, SUNKO, etc.				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			(ii) Rated life : 50,000 hr (minimum) (iii) Luminux flux : 100 + 1m/w (iv) LED chips: EDISON/EPISTOR/OSRAM/PHILIPS/CREE/BRIDGELUX. (v) Driver: MEANWELL / OSRAM / PHILIPS / IEC standard. (vi) Body: Tempered glass pure Aluminium.				
	6.A.8.(iii).(a).1		100 W	each	1,610.00	9,358.00	15,066,380.00
	6.A.8.(iii).(a).2		150 W	each	-	11,773.00	
4		GI POLE	Providing following seamless hot dip galvanized GI pole fabricated with GI pipe complete with GI sockets, MS. base plate, top cover, necessary welding as required:-The length of the bracket shall be such that the end of light fixture will be 1.5meter (approx.) from the light column. A junction box to be installed at bottom level of the pole fabricated from 2.0mm (min.) mild steel sheet and hot deep galvanized complete with cover including termination unit, circuit breaker and earthing terminal etc. The work shall be completed as per drawing and direction of the Engineer.				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
	3.2.3		Total length-30'(9m),Bottom-150mm,Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	925	24149	22337825
	3.2.4		Total length-25'(8m),Bottom-150mm,Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	0	19319	0
5	10.1(Civil)	Anchor Bolt	Supply and fixing of galvanized anchor bolts of variable dia for rigid frame conforming to ASTM F1554 Grade 55, Galvanized to A153, Class C or equivalent with minimum yield strength of 380 MPa, as per manual of steel construction by American Institute of Steel Construction (AISC) etc. including the cost of washer & bolts, material testing etc. all complete as per drawing, specification and direction of the Engineer-in-charge. Length-400mm,Dia -20mm,Bend length-100mm ,Thred length-75mm with Nut ,Washer .	kg	5155	180	927900
6		FORMWORK (Wooden)	Centering and shuttering, including strutting, propping etc. and removal of form after hardening of the concrete for:				
	07.15.3(Civil)		Padestals, column, wall	sqm	2,964.38	429.00	1,271,716.88

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
7	08.1.2(Civil)	Re-Bar work	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.	kg	14920.00	82.00	1223440
8	02.1.5 (Civil)	Earth work	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-	Cum	2241.88	217.00	486486.875

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.				
9	2.13 (Civil)	Back filling	Earth filling in foundation trenches and plinth in 150 mm layer with earth available within 90 m of the building site to achive minimum dry density of 95% with optimum moisture content (Modified proctor test) including carrying, watering, levelling, dressing and compacting to a specified percentage each layer up to finished level etc. all complete and accepted by Engineer-in-charge.	Cum	1530.00	149.00	227970
10	03.4.1 (Civil)	C.C. Work	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required	Cum	70.13	6,647.00	466120.875

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge.(Cement: CEM-II/A-M) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2				
11	07.3.1(Civil)	RCC work	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:1.5:3 having minimum f'cr = 30 MPa, satisfying a specified compressive strength f'c = 25 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position and maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing with standard mixer machine with hopper,				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and concrete cylinders as required, cost of all materials and other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering)				
			Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level	cum	500.00	12154.00	6077000.00
12	PWD-EM - ANALYSIS-38	GI Pipe for light bracket	G.I pipe 50mm dia	meter	0.00	410.00	0.00
13		MCB Box	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6”) duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision for cable inlets and exits as required (only front surface of the board will be considered for measurement). (Manufactured by RECO / NASCO / C&S or equivalent product of any other manufacturer)				
	4.9.2		With water tight arrangement.	sqm	5.3200	16240.00	86396.80
		DB	Supply & installation of outdoor type distribution board made of epoxy powder coated 14 SWG sheet steel with hinge type double doors having built in flash type locking arrangement, complete with copper bus bars (phases & nentral), copper earthing bars and indicating lamps in conformity to the distribution boards ratings as detailed below. The box shall be double door type i.e. one cover door inside through which knobs of MCB/MCCB's are accessible and no live part shall be accessible to an operator. The rate shall include supply & installation of MCB/MCCB, magnetic contractor				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			(Siemens/Dorman Smith/Schneider/Eaton), photo cell, timer etc. The work shall be complete in all respect as per specifications, drawing and direction of the Engineer-in-Charge. Sufficient gap must be maintained between bus bars and back side of the box. The item also includes the fixing of the cable lugs for distribution cables as per drawing and direction of the Engineer-in-Charge.				
			Box size : 650mm x 750mm x 150mm, Busbar: 120A SPN & E; Incoming: 63A SP/DP MCB;63A SP/DP Magnetic Contractor; Photo Cell & Timmer; Outgoing: up to 5x 36 A TP MCB (minimum 6 KA)	set	45.00	50000.00	2250000.00
		Auto Controller	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6”) duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision	each	2.00	50,000.00	

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			for cable inlets and exits as required. Magnetic contractor -38A (Ith 60A) magnetic contactor -1nos, Tharmal over load Relay-24- 36A ,Photo cell -2 nos, TPMCB-50A-1 Nos, Internal wiring, Phase indicator, all complete, approved and accepted by the Engineer-in-charge. MCB-2499, MC-12225, OLR-2777, Box 1 sqm-16240.				
16		Earthing	Earthing the electrical installation with 40 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm. dia hole across the pipe at 305 mm. interval securely bonded by soldering with 2 nos. of No-2 SWG HDBC earth leads (at the top of the electrode) with its protection by 20 mm. (3/4") dia G.I. pipe up-to plinth level run at a depth of 609.6 mm (2 ft.) below G.L up-to main board to be earthed including necessary connecting copper sockets, bolts, nuts, etc. complete for maintaining earth resistance within 1 ohm. [Fig : 4.17]				
	4.17 (vi)		Depth of bottom of main electrode at 37338 mm. (122.5 ft) from GL & length of electrode 36576 mm. (120 ft).	per set	10.00	42,261.00	422,610.00

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
		Connecting wire	Providing and drawing No.2 SWG HDBC wire through 20mm (3/4") dia G.I. pipe including fitting, fixing the G.I. pipe in wall or column complete as required.	meter	100.00	614.00	61,400.00
17	4.18	Earth Pit	Construction of earthing inspection pit inside measurement 600 mm x 600 mm with 250 mm thick brick in cement mortar (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450 mm dia water sealed CI man-hole cover with locking arrangement including necessary earth works, site filling and one brick flat soling 75 mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of .75 meter.	each	10.00	6,037.00	60,370.00
				for	18.761	km	66,126,416.43
				for	1.00	km	3,524,674.40
			proportionately for	for	7.1	km	24,922,972.68
						Total Cost in Million Taka	**24.92**

Cost abstract for security light network

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
1		Cable work (through PVC pipe)	Underground wiring: Providing & laying of the following XLPE insulated & PVC sheathed cable (N2XY) with PVC insulated green/white coloured ECC wire (BYA) connecting at both ends, through PVC pipe & accessories in the following manner: All electrical contacts shall be of brass/copper connected through connector or soldering (no twisting shall be allowed) and cables shall be manufactured and tested according to relevant IEC/BDS/ BS/ VDE standards and as per detailed specification mentioned in Annexure-A. The work shall be carried out as per direction/approval/acceptance of the Engineer. *With cable manufactured by M/S BRB/Paradise/Poly/Citizen/BBS/Super sign cables Ltd.*				
			i) In kutcha ground by cutting 45.70 cm width x 91.40 cm depth trench with necessary brick or tile protection and mending the damages good by refilling trench with proper compaction.				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			ii) In pucca floor through PVC pipe by cutting trench of necessary size and mending the damages good by brick soling, 75 mm (1:2:4) CC work with neat cement finishing etc.				
			1C-2 x 16 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 40 mm having wall thickness of 1.9 mm.				
			In katcha ground	meter	8000.00	1205.00	9640000.00
			In pucca floor	meter	500.00	1294.00	647000.00
2		Concealed wiring (BYM)	1C-4 x 25 sq.mm (N2XY) with 35 sq.mm (BYA) ECC wire through PVC pipe of minimum inner dia 50 mm having wall thickness of 2.59 mm. The work shall be carried out as per direction & approval of the Engineer.				
			In katcha ground	meter	2,500.00	1,844.00	4,610,000.00
			In pucca floor	meter	200.00	1,927.00	385,400.00
3		SECURITY LIGHT FITTINGS (LED)	Supply & fixing of LED street light fitting of the following features and model with all necessary elements such as driver, chips etc. complete. Model & sample shall be approved by the Engineer .				
			(i) GLORIAcatNo-GLST.1205 or equivalent product of ENERGY +, SUNKO, etc. (ii) Rated life : 50,000 hr (minimum) (iii) Luminux flux : 100 + 1m/w				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			(iv) LED chips: EDISON/EPISTOR/OSRAM/PHILIPS/CREE / BRIDGELUX. (v) Driver: MEANWELL/OSRAM/PHILIPS/IEC standard. (vi) Body: Tempered glass pure Aluminium.				
	6.A.8.(iii).(a).1		100 W	each	250.00	9,358.00	2,339,500.00
	6.A.8.(iii).(a).2		150 W	each	-	11,773.00	
4		GI POLE	Providing following seamless hot dip galvanized GI pole fabricated with GI pipe complete with GI sockets, MS. base plate, top cover, necessary welding as required:-The length of the bracket shall be such that the end of light fixture will be 1.5meter (approx.) from the light column. A junction box to be installed at bottom level of the pole fabricated from 2.0mm (min.) mild steel sheet and hot deep galvanized complete with cover including termination unit, circuit breaker and earthing terminal etc. The work shall be completed as per drawing and direction of the Engineer.				
	3.2.3		Total length-30'(9m),Bottom-150mm,Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	125	24149	3018625

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
	3.2.4		Total length-25'(8m),Bottom-150mm,Top-100mm, Thikness-4.0mm, Base plate-300mmx300mm with 12mm th.	each	0	19319	0
5	10.1(Civil)	Anchor Bolt	Supply and fixing of galvanized anchor bolts of variable dia for rigid frame conforming to ASTM F1554 Grade 55, Galvanized to A153, Class C or equivalent with minimum yield strength of 380 MPa, as per manual of steel construction by American Institute of Steel Construction (AISC) etc. including the cost of washer & bolts, material testing etc. all complete as per drawing, specification and direction of the Engineer-in-charge. Langth-400mm, Dia -20mm,Bend length-100mm,Thred length-75mm with Nut ,Washer .	kg	582	180	104760
6		FORMWORK (Wooden)	Centering and shuttering, including strutting, propping etc. and removal of form after hardening of the concrete for:				
	07.15.3(Civil)		Padestals, column, wall	sqm	334.80	429.00	143,629.20
7	08.1.2(Civil)	Re-Bar work	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within	kg	8424.00	82.00	690768

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.				
8	02.1.5 (Civil)	Earth work	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.	Cum	253.20	217.00	54944.4

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
9	2.13 (Civil)	Back filling	Earth filling in foundation trenches and plinth in 150 mm layer with earth available within 90 m of the building site to achive minimum dry density of 95% with optimum moisture content (Modified proctor test) including carrying, watering, levelling, dressing and compacting to a specified percentage each layer up to finished level etc. all complete and accepted by Engineer-in-charge.	Cum	172.80	149.00	25747.2
10	03.4.1 (Civil)	C.C. Work	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-in-charge.(Cement: CEM-II/A-M) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	7.92	6,647.00	52644.24
11	07.3.1(Civil)	RCC work	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:1.5:3 having minimum f'cr = 30 MPa, satisfying a specified compressive strength f'c = 25 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM,				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position and maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing with standard mixer machine with hopper, fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and concrete cylinders as required, cost of all materials and other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering)				
			Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level	cum	62.50	12154.00	759625.00

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
12	PWD-EM - ANALYSIS-38	GI Pipe for light bracket	G.I pipe 50mm dia	meter	720.00	410.00	295200.00
13		MCB Box	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6") duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision for cable inlets and exits as required (only front surface of the board will be considered for measurement). (Manufactured by RECO / NASCO / C&S or equivalent product of any other manufacturer)				
	4.9.2		With water tight arrangement.	sqm	5.3200	16240.00	86,396.80
		DB	Supply & installation of outdoor type distribution board made of epoxy powder coated 14 SWG sheet steel with hinge type double doors having built in flash type locking arrangement, complete with copper bus bars (phases & nentral), copper earthing bars and indicating lamps in conformity to the distribution boards ratings as detailed below.				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			The box shall be double door type i.e. one cover door inside through which knobs of MCB/MCCB's are accessible and no live part shall be accessible to an operator. The rate shall include supply & installation of MCB/MCCB, magnetic contractor (Siemens/Dorman Smith/Schneider/Eaton), photo cell, timer etc. The work shall be complete in all respect as per specifications, drawing and direction of the Engineer-in-Charge. Sufficient gap must be maintained between bus bars and back side of the box. The item also includes the fixing of the cable lugs for distribution cables as per drawing and direction of the Engineer-in-Charge.				
			Box size : 650mm x 750mm x 150mm, Busbar: 120A SPN & E;Incoming: 63A SP/DP MCB;63A SP/DP Magnetic Contractor;Photo Cell & Timmer; Outgoing: up to 5x 36 A TP MCB (minimum 6 KA)	set	4.00	50000.00	200000.00

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
		Auto Controller	Supplying and fixing of almirah type 18 SWG metal board of depth 228mm (6") duly painted with powder coating with epoxy polyester resin on all surfaces of board (gray / off-white) having built in push type / suitable locking arrangement including metal bridges of suitable size for fixing of all electrical control devices complete with suitable anchoring arrangement in wall / column and keeping provision for cable inlets and exits as required. Magnetic contractor -38A (Ith 60A) magnetic contactor -1nos,Tharmal over load Relay-24-36A ,Photo cell -2 nos, TPMCB-50A-1 Nos, Internal wiring, Phase indicator, all complete, approved and accepted by the Engineer-in-charge. MCB-2499, MC-12225, OLR-2777, Box 1 sqm-16240.	each	2.00	50,000.00	100,000.00
16		Earthing	Earthing the electrical installation with 40 mm (1.5") dia G.I. pipe (earth electrode) having 6.35 mm. dia hole across the pipe at 305 mm. interval securely bonded by soldering with 2 nos. of No-2 SWG HDBC earth leads (at the top of the electrode) with its protection by 20 mm. (3/4") dia G.I. pipe up-to plinth level run at a depth of 609.6 mm (2 ft.) below G.L up-to main board to be earthed including necessary				

Item no.	Remarks/PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			connecting copper sockets, bolts, nuts, etc. complete for maintaining earth resistance within 1 ohm.				
	4.17 (vi)		Depth of bottom of main electrode at 37338 mm. (122.5 ft) from GL & length of electrode 36576 mm. (120 ft).	per set	4.00	42,261.00	169,044.00
		Connecting wire	Providing and drawing No.2 SWG HDBC wire through 20mm (3/4") dia G.I. pipe including fitting, fixing the G.I. pipe in wall or column complete as required.	meter	15.00	614.00	9,210.00
17	4.18	Earth Pit	Construction of earthing inspection pit inside measurement 600 mm x 600 mm with 250 mm thick brick in cement mortar (1:4) with 100mm thick RCC top slab (1:2:4) with 1% re-enforcement 450 mm dia water sealed CI man-hole cover with locking arrangement including necessary earth works, site filling and one brick flat soling 75 mm thick (1:3:6) base concrete for making inlet channel & 12mm thick (1:2) cement plaster with neat finishing etc. all complete up to a depth of .75 meter.	each	4.00	6,037.00	24,148.00
				For	8.00	km	23,356,642
				for	1.00	km	2,919,580.25
			proportionately for	For	4	km	11678321
Total Cost in Million Taka							**11.68**

Cost abstract for Water supply network

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
02.1.5	1	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer‟s approval shall not relieve the contractor of his responsibilities and obligations under the contract. Extra rate for each additional 0.5 meter depth exceeding 1.5 meter.	Cum	11864	237.00	2811823.03	**2.81**
02.16.1.2	2	Site development/improvement by carted earth or dredged sand, sandy silt (free from any organic, foreign, environmental hazardous substances) carried by head or truck or any other meansl in/c cost of cutting or by dredging of sand, sandy silt, all; in/c local carrying, placing the earth/sand, sandy silt in the designated area, maintaining slopes, breaking lumps, levelling and dressing in layers up to finished level etc. all complete as per direction and accepted by the engineer in charge.	Cum	1040	449.00	466891.75	**0.47**

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
	3	Providing and fixing 3 layer PPR pipes UV stabilised & anti - micro bial fusion welded, having thermal stability for hot & cold water supply, excludingtrenching, refilling cost ..etc - External work					
MR	a)	PN - 16 40mm dia pipe	Rm	800	111.84	89474.88	**0.09**
MR	e)	PN - 10 110mm dia pipe	Rm	9673	582.94	5638801.84	**5.64**
MR	f)	PN - 10 140mm dia pipe	Rm	667	1004.90	670266.83	**0.67**
MR	g)	PN - 10 160mm dia pipe	Rm	667	1224.35	816640.45	**0.82**
MR	h)	PN - 10 200mm dia pipe	Rm	667	1999.63	1333751.88	**1.33**
MR	i)	Providing and laying S& Scentrifugally cast (spun) / Ductile iron 250mm dia pipes (classK7)	0	667	5304.00	3537768.00	**3.54**
MR	j)	Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 300mm dia pipes (classK7)	Rm	667	10123.00	6752041.00	**6.75**
MR	k)	Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 350mm dia pipes (classK7)	Rm	334	11736.00	3919824.00	**3.92**
	4	Providing and fixing Butterfly valve					
MR	a)	PN - 16 40mm Butterfly valve	Each	2	11115.60	22231.20	**0.02**
MR	f)	PN - 16 110mm Butterfly valve	Each	5	17074.80	85374.00	**0.09**
MR	g)	PN - 16 160mm Butterfly valve	Each	1	21513.60	21513.60	**0.02**
MR	h)	PN - 16 200mm Butterfly valve	Each	1	44820.00	44820.00	**0.04**
MR	i)	250mmdia Butterfly valve - Ductile iron	Each	1	57967.20	57967.20	**0.06**

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
MR	o)	PN - 16 110mm Air valve	Each	16	40338.00	645408.00	**0.65**
MR	p)	PN - 16 160mm Air valve	Each	1	40836.00	40836.00	**0.04**
MR	q)	PN - 16 200mm Air valve	Each	1	41035.20	41035.20	**0.04**
MR	r)	250mm dia Air valve - Ductile iron	Each	1	42240.00	42240.00	**0.04**
MR	s)	300mm dia Air valve - Ductile iron	Each	1	42480.00	42480.00	**0.04**
MR	t)	350mm dia Air valve - Ductile iron	Each	1	43320.00	43320.00	**0.04**
MR	u)	400mm dia Air valve - Ductile iron	Each	2	45240.00	90480.00	**0.09**
MR	x)	PN - 16 110mm Gate valve	Each	11	8605.20	94657.20	**0.09**
MR	y)	PN - 16 160mm Gate valve	Each	1	9852.00	9852.00	**0.01**
MR	z)	PN - 16 200mm Gate valve		1	10806.00	10806.00	**0.01**
MR	aa)	250mm dia Gate valve - Ductile iron	Each	1	14760.00	14760.00	**0.01**
MR	ab)	300mm dia Gate valve - Ductile iron	Each	1	17400.00	17400.00	**0.02**
MR	ac)	350mm dia Gate valve - Ductile iron	Each	1	18000.00	18000.00	**0.02**

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
MR	ad)	400mm dia Gate valve - Ductile iron	Each	2	24000.00	48000.00	**0.05**
MR	7	Constructing masonry chamber 120x120x100cm 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	15	2000.00	30000.00	**0.03**
MR	8	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	21	1800.00	37800.00	**0.04**
MR	9	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	26	1600.00	41600.00	**0.04**
		Total Cost in Million Taka					**28.29**

Cost abstract for sump & overhead tank

Sl. No	BPWD Item Code	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	BPWD rates 2018, Annex - A	Sump - Potable - Processing	Lit	3667000	20.34	74,591,588.74	74.59
2	BPWD rates 2018, Annex - A	OHT - Potable - Processing	Lit	306000	40.95	12,529,719.45	12.53
3	BPWD rates 2018, Annex - A	Sump - Non-Potable - Processing	Lit	3637000	20.34	73,981,349.40	73.98
4	BPWD rates 2018, Annex - A	OHT - Non-Potable - Processing	Lit	295000	40.95	12,079,304.70	12.08
5	BPWD rates 2018, Annex - A	Sump - Potable - Non-Processing	Lit	55000	20.34	1,118,772.12	1.12
6	BPWD rates 2018, Annex - A	OHT - Potable - Non-Processing	Lit	5000	40.95	204,733.98	0.20
7	BPWD rates 2018, Annex - A	Sump - Non-Potable - Non-Processing	Lit	25000	20.34	508,532.78	0.51
8	BPWD rates 2018, Annex - A	OHT - Non-Potable - Non-Processing	Lit	2000	40.95	81,893.59	0.08
Total Cost in Million Taka							**175.10**

Cost abstract for water distribution pumps

Sl. No	BPWD Item Code	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	MR	Potable water pump - Processing	nos	3.00	381819.00	1,145,457.00	1.15
2	MR	Non-Potable water pump - Processing	nos	3.00	363637.00	1,090,911.00	1.09
						Total cost in Million Taka	**2.24**

Cost abstract for pump room

Sl. No	BPWD Item Code	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	MR	Construction of pump house with 16 m x 8 m area with hand operated crane for lifting the pump as per the specification and design in drawing for potable water - Processing area	Sqm	128	70313.00	9,000,064.00	9.00
2	MR	Construction of pump house with 16 m x 8 m area with hand operated crane for lifting the pump as per the specification and design in drawing for potable water - Non processing area	sqm	128	70313.00	9,000,064.00	9.00
						Total cost in Million Taka	**18.00**

Cost abstract for water treatment plant

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
1	02.1.5	Earthwork excavation in all stiff clay, stiff back cotton, hard red earth, shales, murum, gravel, stoney earth and earth mixed with small size boulders and to the required depth including surveying wherever necessary with all leads and lifts for the materials as may be directed except in hard rock requiring blasting but inclusive of shoring strutting and baling out water wherever necessary, depositing the surplus earth in places shown clearing and levelling the site all complete in all respects complying with relevant standard specification and including the cost of removing shrubs, logs, roots, jungles if any, providing barricading arrangements and adequate safety measures (including refilling) 0 to 2m depth	237.00	Cum	610.40	144664.80	55.50	13153.50	27.20	6446.40	11.00	2607.00	626.66	148517.47
		Below 2m depth	155.25	Cum										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
6	02.15.2	Refilling in foundation and basement and other similar works with excavated earth in layers of 150mm thickness well-watered rammed and consolidated complying with relevant standard specifications as directed by the Departmental officers.	497.00	Cum							4.00	1988.00		
2	02.16.1.2	Supplying and filling in foundation and basement with sand in layers of 150 mm thickness well-watered rammed and consolidated complying with relevant standard specifications including cost of sand and as directed by the Engineer in charge.	449.00	Cum	29.20	13110.80	2.70	1212.30	1.10	493.90	2.52	1132.83	23.58	10586.19
8	2.11	50 mm downgraded picked jhama khoa consolidation in foundation trenches by mixing the same with best quality local sand (F.M. 1.2) in 2:1 (khoa: sand) proportion to achieve minimum dry density of 95% with optimum moisture	4239.00	Cum										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		content (Modified proctor test) including breaking and screening chips, laying and spreading in 150 mm layers uniformly and compacting etc. all complete and accepted by the Engineer-in-charge.												
3	03.4.1	Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	6647.00	Cum	29.20	194092.40	2.70	17946.90	1.10	7311.70	2.00	13294.00	23.58	156718.05
10	4.1	Brick works with first class bricks with cement sand (F.M. 1.2) mortar (1:6) in foundation and plinth, filling the joints/interstices fully with mortar, racking out the joints, cleaning and soaking the bricks at least for 24 hours before use and curing at least for 7 days etc. all complete including cost of water, electricity and other charges and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)	6040.00	Cum										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
12		Brick partition wall in cement mortar 1:4 (One of cement and six of sand) 115 mm thick for superstructure In Following Floors using chamber burnt second class stock bricks of size 9"X41/2"X.3" having minimum average crushing strength of 50Kg/sqcm. including labour for fixing the doors, windows and ventilator frames in position fixing of hold fasts scaffolding, curing etc. complete in all respects complying with relevant standard specifications and drawings and as directed by the Departmental Officers.												
a		Ground floor	598.32	Sqm										
#REF !		In First floor	607.32	Sqm										
4	07.4.1	Reinforced cement concrete works with minimum cement content relates to mix ratio1:1.25:2.5 having minimum f'cr = 40 MPa, satisfying a specified compressive strength f'c =32 MPa at 28 days on standard												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		cylinders as per standard practice of CodeACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa)/ASTM-C 150 Type – I, and adding approved high range water reducing admixture ofcomplying specific type (generally be Type-G) under ASTM-C 494, best quality coarsesand [Sylhet sand or coarse sand of equivalent F.M. 2.2], 20 mm down well gradedcrushed stone chips conforming to ASTM C-33, including screening sand through propersieves, making and placing shutter in position and maintaining true to plumb, makingshutter water-tight properly, placing reinforcement in position; mixing with standard mixermachine with hopper and fed by standard measuring boxes or mixing in batching plant,casting in forms, compacting by vibrator machine and curing at least for												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		28 days, removingcentering-shuttering after specified time approved; including cost of water, electricity,testing charges of materials and cylinders as required, other charges etc. all complete,approved and accepted by the Engineer-in-charge. (Doses of admixture to be fixed inconsultation with design office) (Rate is excluding the cost of reinforcement and itsfabrication, placing, binding etc, admixture and the cost of shuttering & centering)												
a		In foundation and basement upto 1.50 Mt from Ground Level.	12451.00	Cum	341.30	4249526.30	8.80	109568.80	2.40	29882.40	3.00	37353.00	93.05	1158517.25
b		In Stilt floor	6062.82	Cum	304.56	1846493.74	10.49	63613.53	14.23	86244.82			165.85	1005513.49
5	07.2.1	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:2:4 having minimum f'cr = 27 MPa, satisfying a specified compressive strength f'c = 22 MPa at	11817.00	Cum										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing in standard mixer machine with hopper fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials											

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		and cylinders as required, other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering)												
6		Providing formwork for reinforced cement concrete works using M.S. or plywood shuttering of size 90x60cm and MS 10 gauge stiffened with M.S. angle of size 25mm x 25mm x 3mm for boarding laid over silver oak (C.W.) joist of size 10cm x 6.50cm (spaced about 90cm c/c) and supported by MS pipe supports/wooden props of 10cm to 13 cm dia. (spaced about 75 cm c/c) etc., including strutting up to 3 m height and removing the same after a specified period without damaging the CC works complying with relevant standard												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		specification and as directed by the Engineer in charge												
		a) For R.C.C. works in foundation and basement such as grid beam, plinth beam, raft beam, raft slab, column base, column footings, other similar nature of works etc all complete	450.00	Sqm	71.70	32265.00	6.30	2835.00	6.80	3060.00	8.00	3600.00	39.08	17586.64
		b) For reinforced cement concrete works such as floor and roof slab, lintels, beams staircase waist and landing slab and plane surfaces and other similar works. (0-3 m)	500.00	Sqm	984.95	492473.02	38.30	19149.81	42.21	21105.00			54.82	27411.24
		c) For RCC surface of columns and in small quantities such as sunshades, parapet cum drops, window boxing in projections and other similar works.	550.00	Sqm	624.50	343475.00	41.60	22880.00	82.80	45540.00			1021.95	562072.66
23		Supplying, fitting and fixing of aluminium sliding window as per the U.S. Architectural Aluminium Manufacturer"s Association (AAMA) standard specification and BDS 1879:2014 having 1.2 mm thick												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		outer bottom (size 75.50 mm, 32mm), 1.2 mm thick outer top (size 75.50 mm, 16.80 mm), 1.2 mm thick shutter top (size 33 mm.26.80, 22 mm), 1.2 mm thick shutter bottom (size 60mm, 24.40 mm), 1.2 mm thick outer side (size 75.50 mm,19.90 mm), 1.2 mm thick shutter lock (size 49.20 mm 26.20 mm) and 1.2 mm thick inter lock (size 34.40 mm, 32.10 mm) sections all aluminium members (total weight kg/sqm) will be anodized to aluminium bronze/silver/ss/black colour with a coat not less than 15 microns in thickness or powder coated to any colour with a coat not less than 25 microns in thickness and density of 4 mg per square cm etc. including all accessories like sliding door key lock, sliding door wheel, sliding door mohair, sliding door neoprene, bolts and nuts including sealants, keeping provision for fitting 5												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		mm thick glass including labour charge for fitting of accessories, making grooves and mending good damages, carriage, and electricity complete in all respect as per drawing and accepted by the Engineer-in-charge.												
		Aluminum clips, handle stoppers and fixing 4mm thick plain glass lock L angles, screws including, conveyance scaffolding if any etc complete. necessary dismantling makes holes in RCC columns, beams, masonry wherever necessary power drill to extent required and made good the original condition after fixing as directed by the departmental officers and complying with relevant standard specification. The alu. surface is to be anodized with matt finish under electrically controlled condition in accordance with ISI specification 1868/1962 for an average anodic film												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		thickness of not less than 15 (fifteen) microns. All the materials should be got approved by the SE before fixing in position.												
	14.6	a) Window	4146.00	Sqm										
8	4.25	75 mm thick cement concrete (1:3:6) flooring with cement, best quality coarse sand and 19 mm downgraded picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting, washing and screening of sand (F.M 1.2) and curing at least for 7 days etc. including cost of water, electricity and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)	507.00	Sqm									214.94	108976.53
#REF !														
37	6.11	Supplying, fitting and fixing country made rustic or matt finished stair tiles complying BDS ISO 13006: 2015, water absorption ≤	1935.00	Sqm										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		0.5%, modulus of rupture (MOR) ≥ 27 N/mm2, irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:3) base and raking out the joints with white cement including cutting, laying and hire charge of machine and finishing with care etc. including water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEMII/ A-M). In ground floor												
#REF !	6.14	Supplying, fitting and fixing country made floor tiles complying BDS ISO 13006: 2015, water absorption ≤ 0.5%, modulus of rupture (MOR) ≥ 27 N/mm2, irrespective of color &/or design, with adhesives in full thickness of tiles, filler/tiles grout including cutting, shaping, placing in proper level etc. all complete and accepted by the Engineer-in-charge.	2256.00	Sqm										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		In ground floor GP mirror polished floor tiles (600 mm x 900 mm)												
39	6.16	Supplying, fitting and fixing 20mm to 25mm thick machine made cement pavement tiles having minimum compressive strength of 27 MPa, irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:4) base and making the joints carefully in true straight line including cutting, laying and hire charge of machine and finishing with care etc. including water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M). In ground floor Pavement tiles of size 300 mm x 300 mm	2481.00	Cum										
43	07.17.3	Water-proofing membrane on the floor or on the horizontal surfaces with permanent protective cover & wearing coarse.	908.00	Sqm										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		(Rate is excluding the cost of protective cover and wearing coarse which to be paid as per corresponding items in this schedule)												
9	4.3	Brick works with first class bricks with cement sand (F.M. 1.2) mortar (1:4) in exterior walls including filling the interstices with mortar, raking out joints, cleaning and socking the bricks at least for 24 hours before use and washing of sand, necessary scaffolding, curing at least for 7 days etc. all complete including cost of water, electricity and other charges (measurement to given as 250 mm width for one brick length and 375 mm for one brick and a half brick length) accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) In ground floor	6769.00	Cum			6.00	40614.00						
10	06.6.3	Supplying, fitting and fixing country made glazed wall tiles complying BDS ISO 13006: 2015,	1817.00	Sqm			27.32	49633.44						

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:3) base and raking out the joints with white cement including cutting, laying and hire charge of machine and finishing with care etc. including cost of water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEMII/ A-M). In ground floor Wall tiles more than 250 mm x 400 mm & less than or equal to 300 mm x 600 mm in sizes												
11	15.1	Minimum 12 mm thick cement sand (F.M. 1.2) plaster (1:4) with fresh cement to both inner- and outer surface of wall, finishing the corner and edges including washing of sand, cleaning the surface, curing at least for 7 days, cost of water, electricity, scaffolding and other charges etc. all complete in all respect as per drawing	243.00	Sqm	310.90	75548.70	7.50	1822.50	36.80	8942.40			673.21	163590.21

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) ground floor.												
12		Plastering in C.M 1:3 (one of cement OPC 53 grade (Considered 35% of fly ash in replacement of cement) and three of sand) 10 mm thick for bottom of sunshade, ceiling in all floors, including scaffolding, curing, finishing, etc complete in all respects complying with relevant standard specification and as directed by the Engineer in charge (Cement will be supplied free of cost by the Employer at project site; The contractor is to take delivery of the cement from the site. The quote should not include the cost of cement but should include all other items including fly ash)	197.80	Sqm	1014.90	200747.22	64.90	12837.22	32.10	6349.38				
13	08.1.2	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.												
		Mild steel bars/RTS bars	82000.00	MT	50.26	4121635.28	1.70	139400.00	1.800	147600.00	0.417	34194.00	18.452	1513095.83
75	30.15.2	Supplying and placing of approx. 60 mm thick coloured uni-block for paving walk way having compressive strength of 15 N/mm2 on compacted sand bed of 50 mm on stabilized soil base, and filling all interstices with sand, cleaning etc. accepted by the Engineer-incharge.	1276.00	Sqm										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clariflocculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
76	30.3	Supplying, carrying, placing, providing of concrete Kerb stone size 600 mm x 300 mm x 100 mm approved and accepted by the Engineer-in-charge.	238.00	Sqm										
		.												
#REF!	26.82.1	950 mm x 950 mm x 75 mm R.C.C. pit cover with 450 mm dia C.I. manhole cover.	2280.00	Nos	3.00	6840.00			16.00	36480.00				
#REF!		Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing and staircase railing including applying a priming coat of approved steel primer.	316.70	Rmt	40.53	12835.22							51.00	16151.70
		Total				117337.00		494667.00		399456.00		94169.00		4888738.00
		Total amount in lakhs				117.337		4.947		3.995		0.942		48.887

Cost abstract for water treatment plant (Continuation)

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
1	02.1.5	Earthwork excavation in all stiff clay, stiff back cotton, hard red earth, shales, murum, gravel, stoney earth and earth mixed with small size boulders and to the required depth including surveying wherever necessary with all leads and lifts for the materials as may be directed except in hard rock requiring blasting but inclusive of shoring strutting and baling out water wherever necessary, depositing the surplus earth in places shown clearing	237.00	Cum	282.89	67046.06			66.90	15855.30	90.50	21448.50	63.00	14931.00	1834.05	434670.03

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		and levelling the site all complete in all respects complying with relevant standard specification and including the cost of removing shrubs, logs, roots, jungles if any, providing barricading arrangements and adequate safety measures (including refilling) 0 to 2m depth														
		Below 2m depth	155.25	Cum	77.80	12077.84			49.50	7684.88			50.00	7762.50	177.30	27525.21
6	02.15.2	Refilling in foundation and basement and other similar works with excavated earth in layers of 150mm thickness well-watered rammed and consolidated complying with relevant	497.00	Cum									52.00	25844.00	56.00	27832.00

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		standard specifications as directed by the Departmental officers.														
2	02.16.1.2	Supplying and filling in foundation and basement with sand in layers of 150 mm thickness well-watered rammed and consolidated complying with relevant standard specifications including cost of sand and as directed by the Engineer in charge.	449.00	Cum	10.06	4518.86			2.20	987.80	18.10	8126.90	5.00	2245.00	94.46	42414.58
8	2.11	50 mm downgraded picked jhama khoa consolidation in foundation trenches by mixing the same with best quality local sand (F.M. 1.2) in 2:1 (khoa:	4239.00	Cum												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		sand) proportion to achieve minimum dry density of 95% with optimum moisture content (Modified proctor test) including breaking and screening chips, laying and spreading in 150 mm layers uniformly and compacting etc. all complete and accepted by the Engineer-in-charge.														
3	03.4.1	Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	6647.00	Cum	10.06	66897.27			2.20	14623.40	18.10	120310.70	4.00	26588.00	92.94	617782.42
10	4.1	Brick works with first class bricks with cement sand (F.M. 1.2) mortar (1:6) in	6040.00	Cum												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		foundation and plinth, filling the joints/interstices fully with mortar, racking out the joints, cleaning and soaking the bricks at least for 24 hours before use and curing at least for 7 days etc. all complete including cost of water, electricity and other charges and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)														
12		Brick partition wall in cement mortar 1:4 (One of cement and six of sand) 115 mm thick for superstructure In Following Floors using chamber burnt														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		second class stock bricks of size 9"X41/2"X.3" having minimum average crushing strength of 50Kg/sqcm. including labour for fixing the doors, windows and ventilator frames in position fixing of hold fasts scaffolding, curing etc. complete in all respects complying with relevant standard specifications and drawings and as directed by the Departmental Officers.														
a		Ground floor	598.32	Sqm												
#REF!		In First floor	607.32	Sqm												
4	07.4.1	Reinforced cement concrete works														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		with minimum cement content relates to mix ratio1:1.25:2.5 having minimum f'cr = 40 MPa, satisfying a specified compressive strength f'c =32 MPa at 28 days on standard cylinders as per standard practice of CodeACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa)/ASTM-C 150 Type – I, and adding approved high range water reducing admixture ofcomplying specific type (generally be Type-G) under ASTM-C 494, best quality coarsesand [Sylhet sand or														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		coarse sand of equivalent F.M. 2.2], 20 mm down well gradedcrushed stone chips conforming to ASTM C-33, including screening sand through propersieves, making and placing shutter in position and maintaining true to plumb, makingshutter water-tight properly, placing reinforcement in position; mixing with standard mixermachine with hopper and fed by standard measuring boxes or mixing in batching plant,casting in forms, compacting by vibrator machine and curing at least														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		for 28 days, removingcentering-shuttering after specified time approved; including cost of water, electricity,testing charges of materials and cylinders as required, other charges etc. all complete,approved and accepted by the Engineer-in-charge. (Doses of admixture to be fixed inconsultation with design office) (Rate is excluding the cost of reinforcement and itsfabrication, placing, binding etc, admixture and the cost of shuttering & centering)														
a		In foundation and basement upto 1.50 Mt from Ground Level.	12451.00	Cum	125.13				6.70	83421.70			16.00	199216.00	596.38	7425472.42

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
b		In Stilt floor	6062.82	Cum					15.00	90942.29					510.13	3092807.87
5	07.2.1	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:2:4 having minimum f'cr = 27 MPa, satisfying a specified compressive strength f'c = 22 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded	11817.00	Cum							70.20	829553.40			70.20	829553.40

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		stone chips conforming to ASTM C-33, making and placing shutter in position maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing in standard mixer machine with hopper fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water,														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		electricity, testing charges of materials and cylinders as required, other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering)														
			.													
6		Providing formwork for reinforced cement concrete works using M.S. or plywood shuttering of size 90x60cm and MS 10 gauge stiffened with M.S. angle of size 25mm x 25mm x 3mm for boarding laid over silver														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		oak (C.W.) joist of size 10cm x 6.50cm (spaced about 90cm c/c) and supported by MS pipe supports/wooden props of 10cm to 13 cm dia. (spaced about 75 cm c/c) etc., including strutting up to 3 m height and removing the same after a specified period without damaging the CC works complying with relevant standard specification and as directed by the Engineer in charge														
		a) For R.C.C. works in foundation and basement such as grid beam, plinth beam, raft beam, raft slab, column base, column	450.00	Sqm	16.99	7646.79			6.40	2880.00	21.20	9540.00	95.00	42750.00	271.47	122163.43

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		footings, other similar nature of works etc all complete														
		b) For reinforced cement concrete works such as floor and roof slab, lintels, beams staircase waist and landing slab and plane surfaces and other similar works. (0-3 m)	500.00	Sqm											1120.28	560139.07
		c) For RCC surface of columns and in small quantities such as sunshades, parapet cum drops, window boxing in projections and other similar works.	550.00	Sqm	222.27	122250.68			126.90	69795.00					2120.02	1166013.34
23		Supplying, fitting and fixing of aluminium sliding window as per the U.S. Architectural Aluminium Manufacturer‟														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		s Association (AAMA) standard specification and BDS 1879:2014 having 1.2 mm thick outer bottom (size 75.50 mm, 32mm), 1.2 mm thick outer top (size 75.50 mm, 16.80 mm), 1.2 mm thick shutter top (size 33 mm.26.80, 22 mm), 1.2 mm thick shutter bottom (size 60mm, 24.40 mm), 1.2 mm thick outer side (size 75.50 mm,19.90 mm), 1.2 mm thick shutter lock (size 49.20 mm 26.20 mm) and 1.2 mm thick inter lock (size 34.40 mm, 32.10 mm) sections all aluminium members (total weight kg/sqm) will be													

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		anodized to aluminium bronze/silver/ss/black colour with a coat not less than 15 microns in thickness or powder coated to any colour with a coat not less than 25 microns in thickness and density of 4 mg per square cm etc. including all accessories like sliding door key lock, sliding door wheel, sliding door mohair, sliding door neoprene, bolts and nuts including sealants, keeping provision for fitting 5 mm thick glass including labour charge for fitting of accessories, making grooves and														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		mending good damages, carriage, and electricity complete in all respect as per drawing and accepted by the Engineer-in-charge.														
		Aluminum clips, handle stoppers and fixing 4mm thick plain glass lock L angles, screws including, conveyance scaffolding if any etc complete. necessary dismantling makes holes in RCC columns, beams, masonry wherever necessary power drill to extent required and made good the original condition after fixing as directed by the departmental officers and														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		complying with relevant standard specification. The alu. surface is to be anodized with matt finish under electrically controlled condition in accordance with ISI specification 1868/1962 for an average anodic film thickness of not less than 15 (fifteen) microns. All the materials should be got approved by the SE before fixing in position.														
	14.6	a) Window	4146.00	Sqm												
8	4.25	75 mm thick cement concrete (1:3:6) flooring with cement, best quality coarse sand and 19 mm	507.00	Sqm	83.65	42408.92			8.00	4056.00			13.00	6591.00	319.59	162032.45

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		downgraded picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting, washing and screening of sand (F.M 1.2) and curing at least for 7 days etc. including cost of water, electricity and other charges etc. all complete and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M)														
#REF!																
37	6.11	Supplying, fitting and fixing country made rustic or matt finished stair tiles complying BDS ISO 13006: 2015, water absorption ≤ 0.5%, modulus	1935.00	Sqm												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		of rupture (MOR) ≥ 27 N/mm2, irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:3) base and raking out the joints with white cement including cutting, laying and hire charge of machine and finishing with care etc. including water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEMII/ A-M). In ground floor														
#REF!	6.14	Supplying, fitting and fixing country made floor tiles complying BDS ISO 13006:	2256.00	Sqm												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		2015, water absorption ≤ 0.5%, modulus of rupture (MOR) ≥ 27 N/mm2, irrespective of color &/or design, with adhesives in full thickness of tiles, filler/tiles grout including cutting, shaping, placing in proper level etc. all complete and accepted by the Engineer-in-charge. In ground floor GP mirror polished floor tiles (600 mm x 900 mm)														
39	6.16	Supplying, fitting and fixing 20mm to 25mm thick machine made cement pavement tiles having minimum	2481.00	Cum												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		compressive strength of 27 MPa, irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:4) base and making the joints carefully in true straight line including cutting, laying and hire charge of machine and finishing with care etc. including water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M). In ground floor Pavement tiles of size 300 mm x 300 mm														
43	07.17.3	Water-proofing membrane on	908.00	Sqm												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		the floor or on the horizontal surfaces with permanent protective cover & wearing coarse. (Rate is excluding the cost of protective cover and wearing coarse which to be paid as per corresponding items in this schedule)														
9	4.3	Brick works with first class bricks with cement sand (F.M. 1.2) mortar (1:4) in exterior walls including filling the interstices with mortar, raking out joints, cleaning and socking the bricks at least for 24 hours before use and washing of sand, necessary	6769.00	Cum											6.00	40614.00

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		scaffolding, curing at least for 7 days etc. all complete including cost of water, electricity and other charges (measurement to given as 250 mm width for one brick length and 375 mm for one brick and a half brick length) accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) In ground floor														
10	06.6.3	Supplying, fitting and fixing country made glazed wall tiles complying BDS ISO 13006: 2015, irrespective of color &/or design, with 20 mm thick cement sand (F.M. 1.2) mortar (1:3) base and	1817.00	Sqm											27.32	49633.44

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		raking out the joints with white cement including cutting, laying and hire charge of machine and finishing with care etc. including cost of water, electricity and other charges complete in all respect and accepted by the Engineer-in-charge. (Cement: CEMII/ A-M). In ground floor Wall tiles more than 250 mm x 400 mm & less than or equal to 300 mm x 600 mm in sizes														
11	15.1	Minimum 12 mm thick cement sand (F.M. 1.2) plaster (1:4) with fresh cement to both inner-and outer surface of wall, finishing	243.00	Sqm	194.78	47332.46			134.90	32780.70			90.00	21870.00	1448.09	351886.96

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		the corner and edges including washing of sand, cleaning the surface, curing at least for 7 days, cost of water, electricity, scaffolding and other charges etc. all complete in all respect as per drawing and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) ground floor.														
12		Plastering in C.M 1:3 (one of cement OPC 53 grade (Considered 35% of fly ash in replacement of cement) and three of sand) 10 mm thick for bottom of sunshade, ceiling in all floors, including	197.80	Sqm											1111.90	219933.82

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		scaffolding, curing, finishing, etc complete in all respects complying with relevant standard specification and as directed by the Engineer in charge (Cement will be supplied free of cost by the Employer at project site; The contractor is to take delivery of the cement from the site. The quote should not include the cost of cement but should include all other items including fly ash)														
13	08.1.2	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
		bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.														
		Mild steel bars/RTS bars	82000.00	MT	12.177	998487.24			1.400	114800.00			3.00	246000.00	89.21	7315212.34

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
75	30.15.2	Supplying and placing of approx. 60 mm thick coloured uni-block for paving walk way having compressive strength of 15 N/mm2 on compacted sand bed of 50 mm on stabilized soil base, and filling all interstices with sand, cleaning etc. accepted by the Engineer-incharge.	1276.00	Sqm												
76	30.3	Supplying, carrying, placing, providing of concrete Kerb stone size 600 mm x 300 mm x 100 mm approved and accepted by the Engineer-in-charge.	238.00	Sqm												
		.														

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Filter feed tank		Valve sump		Sludge & Valve sump		Filter platform		Back wash sump		Total Qty	Amount
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount		
	26.82.1	950 mm x 950 mm x 75 mm R.C.C. pit cover with 450 mm dia C.I. manhole cover.	2280.00	Nos	3.00	6840.00									22.00	50160.00
		Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing and staircase railing including applying a priming coat of approved steel primer.	316.70	Rmt											91.53	28986.92
		Total				**293350.0**				**437828.00**		**988980.00**		**593798.00**		**2256483 4.00**
		Total amount in lakhs				**29.335**				**4.378**		**9.890**		**5.938**		**225.648**

Cost abstract - WTP

S. No.	Description	Amount	Amount in Million Taka
1	Collection sump	11,733,708	11.73
2	Aeration tank	494,667	0.49
3	Flash mixer & Spillter Box	399,456	0.40
4	Clariflocculator	4,888,738	4.89
5	Filter feed tank	2,933,494	2.93
6	Sludge sump	437,828	0.44
7	Filter platform	988,980	0.99
8	Air blower /MCC control room	4,884,836	4.88
9	Chemical storage house	900,749	0.90
10	Filter Press house	2,962,088	2.96
11	Building-Internal electrification	614,910	0.61
12	Elctro mechanical cost	12,744,354	12.74
13	Back wash drain collection sump	593,798	0.59
14	Filter press drain water return pump platform	94,169	0.09
Total		**44,577,606**	**44.67**
15	**WTP Infrastructure cost (10%)**		4.47
		Total cost in Lakhs	**49.14**
	WTP capacity	2.5	MLD
		Cost per MLD	19.66
		Cost escalation	4%
		cost per MLD in Million Taka	20.383
		Total cost for 3.72 MLD in Million Taka	**75.85**

Cost abstract for fire hydrant

S. No	Reference -	Description	Unit rate (USD)	Quantity	Amount (USD)
1	MR	Supply and fixing of Fire Hydrant (From the non-potable water main line), Dry Pillar Type, 100mm Dia High Barrel Depth and angle inlet Made of Ductile Iron, (1200 mm Bury Length), with One Pumper Connection 4" BSP Threaded and Outlet with two nos. of 2.5" BSP Aluminium couplings, Rated Pressure 16 Bar, BS EN14384, LPCB Approved, complete as per direction of Engineer in Charge.	432	1	432
2	MR	Supply and fixing of Valve-Gate, Resilient Wedge OS&Y. 4" Size, Flanged X Flanged Type WP 300 PSI, FM/UL Approved, complete as per direction of Engineer in Charge.	112.75	1	112.75
3	MR	Supply and fixing of Standard Hydrant Cabinet, Self-Standing Type, Standard Accessories, Made of Full 1mm Mild Steel Red Painted, Size (800x1000x250x600Leg). Hose Synthetic Single Jacket 2.5" x 30 Mtrs. with Morris Std. Aluminium Anodized Coupling, 200psi Working Pressure, Red Color, UL Listed , BRANCH -2 Nos.(FOG NOZZLE) 2.5" MALE BS336 BRASS JET & SPRAY UL LISTED, Axe with wood/plastic handle size small -1 No, for hydrant cabinet, -1 No. Hydrant Universal Spanner -1 No. Key for Hydrant, Chrome Plated Handle	334.5	1	334.5
				Unit rate in USD	879.25
				Unit rate in in BDT	73857

Description	Unit -Nos	Unit rate in Taka	Rate in Taka	Amount in million Taka
Fire hydrant	48.00	73857	3545136	**3.54**

Cost abstract for Effluent network

Sl. No.	BPWD Item Code	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	02.1.5	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Extra rate for each additional 0.5 meter depth exceeding 1.5 meter.	Cum	20587.78	237.00	4879302.68	4.88
2	MR	Constructing brick masonry 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	100.00	2371.00	237100.00	0.24
3	MR	Constructing brick masonry circular manhole 1.22m 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	89.00	2534.00	225526.00	0.23
c)	MR	Effluent pipe - RCC hume pipe 150mm dia	Rm	3002	795.60	2388391.20	2.39

d)	MR	Effluent pipe - RCC hume pipe 200mm dia	Rm	1668	1216.80	2029622.40	2.03
f)	MR	Effluent pipe - RCC hume pipe 300mm dia	Rm	1001	1761.50	1763261.50	1.76
	MR	Providing, laying and jointing of pipe approved material and brand for plot connection including construction of 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 transporting to the spot, handling, lifting, etc all including jointing of pipes as per standard, testing, ancillary materials, labour all complete and as directed by the engineer-in-charge	Each	427	5500.00	2348500.00	2.35
						Total Cost in Million Taka	**16.27**

Cost abstract for effluent treatment plant (ETP)

S. No.	Particulars	Estimated Cost in BDT
1	Intake Tank, Raw Effluent Tank, Pump House	3749662.3
2	Elevated Receiving Chamber, Platform for Grit Dewatering, Grit Pump	672162.19
3	Grit Removal-Cum-Oil & Grease Skim, Flow Measure. Channel	834782.73
4	Equalization Tank ,Flash Mixing Tanks- 1&2	4143588.18
5	Panel Room-1	864031.59
6	Panel Room-2	864031.59
7	Aeration Tank, Return Sludge Pump Tank	13207026.68
8	Housing For Twin Lobe Air Blowers	1140294.13
9	Housing for Chlorine Tonners	579637.64
10	Shed For Chlorinators	962683.63
11	Workshop Cum Store	936351.88
12	Sludge Pump Room	1221141.09
13	WET CHEMICAL SLUDGE, BIO SLUDGE TANK	863451.35
14	Pump House (PH - 2)	1050479.1
15	Primary & Secondary Clarifier	3982983.39
16	Dry Sludge Storage Shed	1517329.11
17	Chlorine Contact Tank & Filter Feed Water Tank	5886528.67
18	Platform For Volute Press & Centrifuge, ASF & PSF	437871
19	G.A Of Chemical House	2460907.88
20	Security Room	631512.91
21	PLC Room	1144413.64
22	Office Building	4615244.16
Total (Civil Works)		**51766114.84**
	Total civil works cost in Million Taka	**51.77**

S. No.	Description	Cost in Million Taka

1	Control Panel A.C. Room and Plant Room	3.3
2	Tanks	2.111
	Total	**5.411**

S. No.	Equipment / Drive Name	Nos.	Rate (In Lac Taka)	Amount (In Lac Taka)
1	Coarse Screens (mechanical operation)	1	3.5	3.5
2	Medium Screens (manual operation)	2	0.72	1.44
	Centrifugal Pumps (45m3/ Hr), in Pump			
3	Houses PH-1 & PH-2	2	0.47	0.94
	Centrifugal Pumps (25 m3/ Hr), in Pump			
4	Houses PH-1 & PH-2	4	0.43	1.72
	Centrifugal Pumps (35 m3/ Hr), in RAS Pump			
5	House	2	0.68	1.36
6	Pit Dewatering Pumps, centri., 3m3/Hr	6	0.34	2.04
	Centrifugal Pumps (45 m3/ Hr), in Pump			
7	House PH-4.	1	0.85	0.85
	Centrifugal Pumps (25 m3/ Hr m3/ Hr), in			
8	Pump House PH-4.	2	0.64	1.28
9	Grit removal devices, oil skimmers	1	2.5	2.5
10	Grit Lifting Pump	2	0.5	1
11	Air Compressor	1	1.95	1.95
12	EOT hoists	6	0.72	4.32
13	EOT hoists	1	1.5	1.5
14	Agitator- Lime Dosing Tank	2	0.46	0.92
15	Agitator- F. S. / F.A. Dosing Tank	2	0.46	0.92
16	Agitator- Poly Electrolyte Dosing Tank	1	0.46	0.46
17	Mixer - Flash Mixer Tank-1&2	2	0.65	1.3
18	Rotary Air Blower for Chem. House and sludge mixing	2	1.2	2.4
19	Mixer for Floculation Chamber	1	1.85	1.85
20	Dosing Pumps for Lime Solution	2	0.6	1.2
21	Dosing Pumps For Fer.Sul. / F.A. Solu.	2	0.65	1.3
22	Dosing Pump For P E Solution	2	0.59	1.18
23	Primary Clarifier Mechanism	1	4.5	4.5

S. No.	Equipment / Drive Name	Nos.	Rate (In Lac Taka)	Amount (In Lac Taka)
24	Secondary Clarifier Mechanism	1	4.5	4.5
25	Twin Lobe Air Blowers for Aeration Tanks	2	4.2	8.4
26	Sludge Feed Centri. Pumps for PH-3	2	0.23	0.46
	Sludge Feed Screw Pump to Filter Press for			
27	PH-3	2	0.48	0.96
28	Tube well & Pump (Submersible)	1	0.8	0.8
29	Centrifugal Pumps for reuse of Treated effluent in Chem. House	2	0.25	0.5
30	Filter Press with Hydraulic system	1	2.36	2.36
31	Filter Press without Hydraulic system- Manual operation	1	2	2
32	Centrifuge / Volute Press for bio-sludge dewatering	1	18.85	18.85
33	Pressure Sand Filters	2	2.4	4.8
34	Activated Carbon Filters	2	2.79	5.58
35	Chlorinators with Tonners before filtration.	2	4	8
36	Piping, valves, fittings, air diffusers, air pipe grid as per requirement	Lot	27.71	27.71
37	V-Notch	1	0.13	0.13
			Total Basic cost for Mechanical items	**125.48**
	Drawing, document preparation & Approval, TPI		0.50%	0.62
	Local VAT/CST/WCT/S.Tax		15%	18.82
	Labor Cess.		1%	1.25
	Freight		3%	3.76
	Installation & Testing		4.50%	5.64
	Contractor Profit		10%	12.548
Total cost for Mechanical items including Packing, transport, taxes, installation and contractor profit.			**34.00%**	**168.12**
			Total cost in Million Taka	**16.81**

S. No.	Equipment / Drive Name		Nos.	Rate (In Lac Taka)	Amount (In Lac Taka)
1	LT Panels and accessories for all drives at various locations Pumps Houses, aeration tanks, chemical houses etc		6	1.5	9
2	HT Panels and accessories	Total Load = 200 kW	1	3	3
3	Cables, cable trays and accessories including for DG sets.	Size and materials as per requirement of standards and layout plan.	Lot.	L.S.	25
4	Electrical fixtures for lighting in buildings, on tanks and roads.	As per requirement of buildings standards and layout plan.	Lot	L.S.	12
	Sub- Total for Electrical				**49**
INSTRUMENTATION -					
5	Level Sensors and Controllers for Pumps Houses	SS / metallic probes and copper cables. Automatic On/Off control.	5	0.3	.5
6	On-line pH meters	Sensor with Digital Display unit	1	0.15	0.15
7	On-line DO meters Controllers for aerators /blowers in Aeration tank	Sensor with Digital Display unit, protected probes and cables.	2	1.5	3
8	Flow Rate and Total Flow Recorder	Electromagnetic with Digital Display	1	1	1
9	Flow Rate and Total Flow Recorder	Ultrasonic, Digital Display (LCD) Flow rate range = 20 to 100cu.m/ hr.	1	4	4
10	Software, Computers and PLC for ASP, On-line Real Time Monitoring Instrumentation	Process monitoring & control Software, PLC with relays, cables etc. complete	20+20 20	60	60
11	Laboratory instruments, glassware and chemicals.	For testing of common and special parameters as per CPCB /BSPCB	Lot	10	10
	Sub- Total for Instrumentation				**79.65**
	Total cost In Million Taka				**7.965**

S. No.	Particulars	Cost (in Lacs)
1	Civil Cost	58
Electromechanical Items		
2	RO System Cost	185
3	Evaporators System Cost	
3.1	TRIPLE forced circulation evaporator system	63
3.2	Other costs	50
	Total Advance Treatment Cost(excluding civil))	356
	Total cost in Million Taka	**35.6**

S. No.	Particulars	Cost (in Million Taka)
1	Civil Cost till tertiary treatment	**51.**77
2	Civil Cost for Advance Treatment	5.411
3	Mechanical Cost	16.81
4	Electrical & Instrumentation Cost	15.598
7	Advance Treatment Cost for Electromechanical items	35.6
	Total Project Cost in Million Taka	**125.19**
	Escalation -20%	25.04
	Total Project Cost in Million Taka per MLD	**150**
	Total Project Cost in Million Taka for 4.3 MLD	**645.00**

Cost abstract for solid waste management

Sl. No.	Description	Quantity	Unit	Rate (in Taka)	Amount (in Taka)
1.	Waste collection platform	1	No	216,533	216,533
2.	Crusher and mixing unit	1	No	43,307	43,307
3.	Primary anaerobic plant digester	1	No	690,200	690,200
4.	Secondary anaerobic plant digester	1	No	690,200	690,200
5.	Slurry pit	1	No	75,787	75,787
6.	Slurry chamber	1	No	140,747	140,747
7.	Purification unit	1	Lot	692,907	692,907
8.	Storage and dispensing unit	1	Lot	433,067	433,067
9.	Non-bio degradable waste storage shed 1 (For storing recyclable waste)	1	No	238,187	238,187
10.	Non-bio degradable waste storage shed 2 (For storing inert waste)	1	No	519,680	519,680
11.	Internal electrification for buildings	1	Lot	216,533	216,533
12.	Any other components in civil structures required for the construction of SWM plant missing out in the above	1	Lot	216,533	216,533
	Total - I				**4,173,680**
II. SWM Plant with a capacity of 1 TPD: Electro-mechanical works					
1.	Waste collection and segregation unit				
	a) Hopper with weighing arrangement for receiving organic waste of required size	1	No	273,760	273,760
	b) Shaft less screw conveyor for transferring waste from hopper to pulper/grinder of required capacity/size	1	No	205,320	205,320
	c) Suitable crusher / pulper / shredder for crushing the organic waste of required capacity/size	1	No	342,200	342,200
2.	Primary anaerobic plant digester				

Sl. No.	Description	Quantity	Unit	Rate (in Taka)	Amount (in Taka)
	a) Floating FRP hood	1	No	446,600	446,600
3.	Secondary anaerobic plant digester				
	a) Floating FRP hood	1	No	446,600	446,600
4.	Slurry Pit				
	a) FRP cover for slurry pit	1	No	34,220	34,220
5.	Agitator	1	No	91,253	91,253
6.	Pumps				
	a) Digester feed pump	2	No	18,251	36,501
	b) Filtrate recirculation pump	2	No	14,829	29,657
	c) Submersible mixer	4	No	22,813	91,253
7.	Flaring unit – Gas flare system	1	No	22,813	22,813
8.	Bio gas engine	1	No	684,400	684,400
9.	Purification unit				
	a) Hydrogen sulphide remover	1	No	228,133	228,133
	b) Carbon-di-oxide remover	1	No	1,140,667	1,140,667
10.	Piping and valves				
	a) Interconnecting pipes with approved makes and size	1	Lot	159,693	159,693
	b) Valves: Butterfly valves, ball valves, non-return valves wherever applicable	1	Lot	68,440	68,440
11.	Storage and dispensing unit				
	a) Suitable compressor along with cylinders for storage of bio gas	1	No	1,277,547	1,277,547
12.	**Electrical works including gas flow meter** - MCC panel, local push buttons stations, power, control cables, cable end terminations, earthing system, electronic type gas flow meter, etc.,	1	Lot	228,133	228,133
13.	**Automation with PLC system -** PLC control panel, SCADA system, input waste weighing monitoring, Field Instruments, power, control,	1	Lot	456,267	456,267

Sl. No.	Description	Quantity	Unit	Rate (in Taka)	Amount (in Taka)
	instrumentation cables, cable end terminations, earthing system, field junction box. The system should be suitable for control/monitor from the centralized control station.				
14.	Any other electromechanical components required for the construction of SWM plant missing out in the above	1	Lot	456,267	456,267
	Total - II				**6,719,725**
III. SWM Plant with a capacity of 1 TPD: Common works					
1.	Road	1	Lot	135,333	135,333
2.	Fencing & gate	1	Lot	139,200	139,200
3.	Drain	1	Lot	145,000	145,000
4.	Any other common works required for the construction of SWM plant missing out in the above	1	Lot	232,000	232,000
	Total III				**651,533**
	Grand total (I+II+III)				**11,544,939**
				Cost per TPD in Taka	11,544,939
				Cost escalation	20%
				Total cost per TPD in Taka	13,853,930.00
				in Million Taka	13.85393
	Total SWM cost for 3 TPD in Million Taka				**39.00**

Cost abstract for telecom duct

Sl. No.	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	**2.1.5**	Earth work in excavation in all kinds of soil for foundation trenches including layout, providing center lines, local bench-mark pillars, levelling, ramming and preparing the base, fixing bamboo spikes and marking layout with chalk powder, providing necessary tools and plants, protecting and maintaining the trench dry etc., stacking, cleaning the excavated earth at a safe distance out of the area enclosed by the layout etc. all complete and accepted by the Engineer-in-charge, subject to submit method statement of carrying out excavation work to the Engineer-in-charge for approval. However, engineer's approval shall not relieve the contractor of his responsibilities and obligations under the contract. Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in very soft / saturated / organic clayey soil / soil of semi-liquid state.	Cum	9997	217.00	2,169,267.90	**2.17**
2	**3.4.1**	Mass concrete (1:3:6) in foundation or in floor with cement, sand (F.M. 1.2) and picked jhama brick chips including breaking of chips, screening, mixing, laying, compacting to required level and curing for at least 7 days including the supply of water, electricity, costs of tools & plants and other charges etc. all complete and accepted by the Engineer-incharge. (Cement: CEM-II/A-M)	Cum	769	6647.00	5,111,351.90	**5.11**

Sl. No.	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
		Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2					
3	**7.3.1**	Reinforced cement concrete works with minimum cement content relates to mix ratio 1:1.5:3 having minimum f'cr = 30 MPa, satisfying a specified compressive strength f'c = 25 MPa at 28 days on standard cylinders as per standard practice of Code ACI/BNBC/ASTM, Cement conforming to BDS EN-197-1-CEM-I, 52.5N (52.5 MPa) / ASTM-C 150 Type – I, best quality Sylhet sand or coarse sand of equivalent F.M. 2.2 and 20 mm down well graded stone chips conforming to ASTM C-33, making and placing shutter in position and maintaining true to plumb, making shutter water-tight properly, placing reinforcement in position; mixing with standard mixer machine with hopper, fed by standard measuring boxes or mixing in batching plant, casting in forms, compacting by vibrator machine and curing at least for 28 days, removing centering-shuttering after specified time approved; including cost of water, electricity, testing charges of materials and cylinders as required, other charges etc. all complete, approved and accepted by the Engineer-in-charge. (Rate is excluding the cost of reinforcement and its fabrication, placing, binding etc. and the cost of shuttering & centering) Individual & combined footing, pile cap, raft/mat, floor slab and foundation beam up to plinth level	Cum	3270	12154.00	39,747,681.98	**39.75**

Sl. No.	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
4	**8.1.2**	Grade 400 (RB 400 /RB 400W: complying BDS ISO 6935-2:2006) ribbed or deformed bar produced and marked according to Bangladesh standard, with minimum yield strength, fy (ReH)= 400 MPa but fy not exceeding 450 MPa and whatever is the yield strength within allowable limit as per BNBC/ ACI 318, the ratio of ultimate tensile strength fu to yield strength fy, shall be at least 1.25 and minimum elongation after fracture and minimum total elongation at maximum force is 16% and 8% respectively : up to ground floor.	Kg	294330	82.00	24,135,090.75	**24.14**
5	**7.9.2**	Centering and shuttering, including strutting, propping etc. (The formwork must be rigid enough both in and out of plane, to make the concrete surface true to the designed shape and size by using necessary MS sheets of minimum 16 BWG, angles of minimum size 40 mm x 40 mm x 5 mm, flat bars etc.) and removal of form for: In raft/mat/floor slab up to plinth level	Sqm	1061	434.00	460,322.10	**0.46**
6	**7.9.4**	Centering and shuttering, including strutting, propping etc. (The formwork must be rigid enough both in and out of plane, to make the concrete surface true to the designed shape and size by using necessary MS sheets of minimum 16 BWG, angles of minimum size 40 mm x 40 mm x 5 mm, flat bars etc.) and removal of form for: Pedestal, column, column capital, lift wall and wall up to ground floor	Sqm	1326	408.00	540,931.50	**0.54**

Sl. No.	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
7	**7.9.7**	Centering and shuttering, including strutting, propping etc. (The formwork must be rigid enough both in and out of plane, to make the concrete surface true to the designed shape and size by using necessary MS sheets of minimum 16 BWG, angles of minimum size 40 mm x 40 mm x 5 mm, flat bars etc.) and removal of form for: Floor and roof slab up to ground floor	Sqm	884	532.00	470,221.50	**0.47**
						Total cost in Million Taka	**72.63**

Cost abstract for landscaping & greenery along road

Sl. No.	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
1	**25.2**	Preparation of ground to make ready for plantation by spading the ground to a depth of 150 mm to 230 mm beyond 38 mm deep scrapped ground by spade, breaking earth clods to powder by hammers, picking up all sorts of rubbish, unwanted grasses by suitable tools, carrying and spreading the surplus earth into low lying area including supply of tools and plants etc. all complete and accepted by the Engineer-in-charge.	Sqm	98835	20.00	1,976,700.00	**1.98**
2	**25.5**	Supply well decomposed cow dung carried by trucks or any other means including loading, unloading at both ends, stacking the same at site including supply of tools and plants etc. all complete and accepted by the Engineer-in-charge	Cum	2471	1507.00	3,723,608.63	**3.72**
3	**25.8**	Supply of lawn grass of approved quality by truck or by any other means, sorting the grass to proper size, washing the grass, dibbling the grass 6 mm to 50 mm apart, irrigation of lawn area till the grass grown at least for two months after plantation, weeding the undesirable grass, mowing the lawn grass by lawn mower up to two months after plantation, applying urea fertilizer on the lawn surface @ 1 kg per 9.29 sqm including supply of tools and plants etc. all complete and accepted by the Engineer-in-charge.	Sqm	98835	54.00	5,337,090.00	**5.34**
		Total Cost in Million Taka					**11.04**

15.23. Annexure 23 – Attendees of Public Consultation

Date of Meeting: 06-11-2020
Location of Meeting: Paschim Char Kali Village

Stakeholders Consultation Meeting with Affected person & Elites Group

S. No	Name of Person	Location/Village	Contact Details
1	Md. Billal Hossain	Paschim Char Kali	01316562353
2	Md. Abdul Sufian	Paschim Char Kali	01784682718
3	Md. Lokman Matobbor	Paschim Char Kali	01735863837
4	Md. Kalu Bepari	Paschim Char Kali	-
5	Md. Mohashin	Paschim Char Kali	01915967962
6	Md. Nobir	Paschim Char Kali	01926591135
7	Md. Nazim Uddin	Paschim Char Kali	01905467729
8	Md. Motasin Billah	Paschim Char Kali	-
9	Md. Shahejan	Paschim Char Kali	01746678125
10	Md. Bojlu Rahman	Paschim Char Kali	01949484453
11	Md. Mansur Alam	Paschim Char Kali	01704272965
12	Md. Jahid Hasan	Paschim Char Kali	01753020799
13	Md. Azizul Islam	Paschim Char Kali	01761729450
14	Md. Jakir	Paschim Char Kali	01746434502
15	Md. Rasel	Paschim Char Kali	-

Stakeholders Consultation Meeting with Youth Group

Date of Meeting: 06-11-2020
Location of Meeting: Paschim Char Kali Village

S. No	Name of Person	Location/Village	Contact Details
1	Md. Sohel	Paschim Char Kali	01747525125
2	Md. Mosleh Uddin	Paschim Char Kali	01733250333
3	Md. Alauddin	Paschim Char Kali	01306480999
4	Md. Rakib Hossain	Paschim Char Kali	01756333785
5	Monir Hossain	Paschim Char Kali	01740506797
6	Rasel Miah	Paschim Char Kali	01790530884
7	Md. Jakir	Paschim Char Kali	01746434502
8	Wahid Hoq	Paschim Char Kali	01757244538
9	Didar Miah	Paschim Char Kali	01640208252
10	Al Amin	Paschim Char Kali	-
11	Zahangir Hossain	Dararhat Adorsho village	01738373825
12	Amzad Hossain	Dararhat Adorsho village	01774185225
13	Rakib Hossain	Paschim Char Kali	01740506797
14	Helal Miah	Paschim Char Kali	-
15	Md Jamal	Paschim Char Kali	01781181787
16	Nirob Hossain	Paschim Char Kali	01916333934
17	Kalu Miah	Paschim Char Kali	01947687349
18	Jahid Hasan	Paschim Char Kali	01753020799
19	Kawsar Hossain	Paschim Char Kali	01737207039

S. No	Name of Person	Location/Village	Contact Details
20	Hridoy Miah	Paschim Char Kali	01608565220

Consultation Meeting with Women Group

Date of Meeting: 06-11-2020
Location of Meeting: Paschim Char Kali Village

SL No.	Name of Participants	Name of Husband/Father	Contact Number
1	Gole Nur	Md Siddik mia	
2	Rokeya Begum	Late Mokbul Ahmed	
3	Meher Afjan	Khorshed Alam	
4	Halima Begum	Kalu Bepari	
5	Sokhina Begum	Kalu Bepari	
6	Ajimon Nesa	Motasin	
7	Asma Begum	Jafar Ahmed	
8	Julekha Begum	Lokman Matobbor	
9	Parvin Begum	Fajlur Rahman	
10	Gole Nur	Siddik mia	
11	Gole Nur	Md Siddik mia	

15.24. Annexure 24 – Affected Household Structures

SL No	List of Households Owner	Father's Name	Mouza Name
1	Md Liton Miah	Abdus Shahid	65 Paschim Char Kali
2	Abu Hanif	Nazir Ahmed	
3	Harun Miah	Abdus Shahid	
4	Faysel Miah	Altaf Hossain	
5	Altaf Hossain	Late Mahmud	
6	Nur Uddin	Sirajul Islam	
7	Maksudur Rahman	Abdul Wadud	
8	Moslem Uddin	Golam Mostafa	
9	Alauddin	Late Siddiur Rahman	
10	Md Liton	Nur Islam	
11	Abul Kashem	Md Sadeq Hossain	
12	Azizul Islam	Rostom Ali	
13	Nazim Uddin	Nasir Uddin	
14	Mofiz uddin	Md Nur Islam	

15.25. Annexure 25 - Cost of EMP Implementation

Bhola EZ			
S. No	**Components**	**Unit Cost (Tk)**	**Cost (Tk.)**
A	**Fixed Cost**		
A.1.	**Construction Phase (3 Years)**		
A.1.1.	PPEs for staffs of Project Proponent	60,000/year	240000
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	1200000/Quarter	16000000
A.1.4.	Greenbelt Development at suitable locations	Lumpsum 400000/ Acre	12800000
A.1.5.	Environmental Audit (Half Yearly)	150000/study	1200000
A.1.6.	Environmental Specialist - Full Time : 2 Nos	1200000/year/person	9600000
A.1.7.	Social Analyst- Full Time	1000000/year	4000000
A.1.8.	occupational health specialist and a safety specialist- Full Time : 2 Nos	900000/year/person	7200000
A.1.9.	Ecological Assessment (Half yearly)	1500000/year	6000000
A.2.	Fund for proposed community development activities	Lumpsum	25000000
	Total Fixed Cost (BDT)		**82040000**
B	**Recurring Cost (Yearly)**		
B.1.	**Operation Phase (per year)**		
B.1.	**Operation Phase (per year)**		
B.1.1.	PPEs for staffs of Project Proponent	90,000/year	90000
B.1.2.	Solid waste bins for common areas	100,000/year	100,000
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	1500000/Quarter	6000000

Bhola EZ			
S. No	**Components**	**Unit Cost (Tk)**	**Cost (Tk.)**
	Ground/Drinking Water Soil Quality		
B.1.5.	Maintenance of Green Belt	Lumpsum	2560000
B.1.6.	Enviornmental Audit (Half Yearly)	200000/half	400000
B.1.7.	Environmental Specialist - Full Time : 2 Nos	1400000/year/person	2800000
B.1.8.	Social Analyst- Full Time	1100000/year	1100000
B.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	1000000/year	2000000
B.1.10.	CETP/STP Incharge : 2 Nos	800000/year	2800000
B.1.11.	Ecological Assessment (Half yearly)	3000000/year	2000000
	Total Yearly Recurring Cost (BDT)		**19850000**
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 environmental audit during Construction/Operation phase/recommendation of regulatory authority, the cost for the same will be additional			

15.26. Annexure 26 - Financial Model Calculations – Case 1 (BEZA as the Master Developer) – Base Case

Profit and Loss Statement (BDT millions)										
Financial year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Revenue	0	0	0	155	205	202	256	312	274	336
O&M expenses	0	0	0	0	0	171	181	187	192	198
EBIDTA	0	0	0	155	205	30	75	126	82	138
Depreciation	0	0	0	0	269	269	269	269	269	269
EBIT	0	0	0	155	-64	-239	-195	-144	-187	-131
Interest	0	0	0	0	0	684	634	583	532	481
Profit before tax (PBT)	0	0	0	155	-64	-923	-828	-727	-719	-612
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	0	0	0	155	-64	-923	-828	-727	-719	-612

Financial year	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**
Revenue	353	460	741	839	974	685	373	414	414	414
O&M expenses	204	210	0	0	0	0	0	0	0	0
EBIDTA	149	250	741	839	974	685	373	414	414	414
Depreciation	269	269	269	269	269	269	269	269	269	269
EBIT	-120	-19	472	569	705	416	104	145	145	145
Interest	431	380	329	279	228	177	127	76	25	0

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Profit before tax (PBT)	-551	-399	143	291	477	239	-23	69	119	145
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	-551	-399	143	291	477	239	-23	69	119	145

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Revenue	459	459	459	510	510	510	567	567	567	630
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	459	459	459	510	510	510	567	567	567	630
Depreciation	269	269	269	269	269	269	269	269	269	269
EBIT	190	190	190	241	241	241	297	297	297	361
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	190	190	190	241	241	241	297	297	297	361
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	190	190	190	241	241	241	297	297	297	361

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Revenue	630	630	702	702	702	783	783	783	873	873
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	630	630	702	702	702	783	783	783	873	873
Depreciation	269	269	269	269	269	269	269	269	269	269

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBIT	361	361	433	433	433	513	513	513	604	604
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	361	361	433	433	433	513	513	513	604	604
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	361	361	433	433	433	513	513	513	604	604

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Revenue	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
Depreciation	269	269	269	269	269	269	269	269	269	269
EBIT	604	707	707	707	822	822	822	953	953	953
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	604	707	707	707	822	822	822	953	953	953
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	604	707	707	707	822	822	822	953	953	953

Cash Flows (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash Inflow										
PAT	0	0	0	155	-64	-923	-828	-727	-719	-612
Book depreciation	0	0	0	0	269	269	269	269	269	269
Equity infusion	312	1,195	1,192	721	201	0	0	0	0	0
Debt drawdown	727	2,788	2,780	1,682	469	0	0	0	0	0
Total cash inflow	1,039	3,983	3,972	2,558	876	-654	-559	-457	-450	-343
Cash Outflow										
Capex	1,039	3,983	3,972	2,408	714	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	0	0	0	0	563	563	563	563	563	563
Total cash outflow	1,039	3,983	3,972	2,408	1,277	563	563	563	563	563
Net Cash Generation	0	0	0	151	-401	-1,217	-1,122	-1,021	-1,013	-906

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Cash Inflow										
PAT	-551	-399	143	291	477	239	-23	69	119	145
Book depreciation	269	269	269	269	269	269	269	269	269	269
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	-282	-130	412	560	746	508	247	338	388	414
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	563	563	563	563	563	563	563	563	563	0
Total cash outflow	563	563	563	563	563	563	563	563	563	0
Net Cash Generation	-845	-693	-151	-3	183	-55	-317	-225	-175	414

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Cash Inflow										
PAT	190	190	190	241	241	241	297	297	297	361
Book depreciation	269	269	269	269	269	269	269	269	269	269
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	459	459	459	510	510	510	567	567	567	630
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	459	459	459	510	510	510	567	567	567	630

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Cash Inflow										
PAT	361	361	433	433	433	513	513	513	604	604
Book depreciation	269	269	269	269	269	269	269	269	269	269
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Total cash inflow	630	630	702	702	702	783	783	783	873	873
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	630	630	702	702	702	783	783	783	873	873

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Cash Inflow										
PAT	604	707	707	707	822	822	822	953	953	953
Book depreciation	269	269	269	269	269	269	269	269	269	269
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223

Balance Sheet (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Liabilities										
Equity	312	1,506	2,698	3,419	3,620	3,620	3,620	3,620	3,620	3,620
Reserves and Surplus	0	0	0	155	91	-833	-1,661	-2,387	-3,107	-3,719
Long term loan	727	3,515	6,295	7,978	7,884	7,321	6,758	6,195	5,631	5,068
Total	1,039	5,021	8,994	11,552	11,595	10,109	8,717	7,428	6,145	4,970
Assets										
Net Block (long term asset- depreciation)	1,039	5,021	8,994	11,401	11,846	11,577	11,307	11,038	10,769	10,500
Cash and bank balance	0	0	0	151	-251	-1,468	-2,590	-3,610	-4,624	-5,530
Total	1,039	5,021	8,994	11,552	11,595	10,109	8,717	7,428	6,145	4,970

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Liabilities										
Equity	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620
Reserves and Surplus	-4,270	-4,669	-4,526	-4,236	-3,759	-3,520	-3,543	-3,474	-3,355	-3,210
Long term loan	4,505	3,942	3,379	2,816	2,253	1,689	1,126	563	0	0
Total	3,855	2,893	2,473	2,200	2,114	1,790	1,204	709	265	410
Assets										
Net Block (long term asset- depreciation)	10,230	9,961	9,692	9,423	9,154	8,884	8,615	8,346	8,077	7,807
Cash and bank balance	-6,375	-7,068	-7,219	-7,222	-7,039	-7,094	-7,411	-7,637	-7,811	-7,397
Total	3,855	2,893	2,473	2,200	2,114	1,790	1,204	709	265	410

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Liabilities										
Equity	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620
Reserves and Surplus	-3,020	-2,831	-2,641	-2,400	-2,160	-1,919	-1,622	-1,324	-1,027	-666
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	600	790	979	1,220	1,461	1,701	1,999	2,296	2,593	2,954
Assets										
Net Block (long term asset- depreciation)	7,538	7,269	7,000	6,731	6,461	6,192	5,923	5,654	5,384	5,115
Cash and bank balance	-6,938	-6,479	-6,020	-5,511	-5,001	-4,491	-3,924	-3,358	-2,791	-2,161
Total	600	790	979	1,220	1,461	1,701	1,999	2,296	2,593	2,954

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Liabilities										
Equity	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620
Reserves and Surplus	-305	56	489	922	1,355	1,868	2,381	2,895	3,499	4,103
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	3,316	3,677	4,109	4,542	4,975	5,488	6,002	6,515	7,119	7,723
Assets										
Net Block (long term asset- depreciation)	4,846	4,577	4,308	4,038	3,769	3,500	3,231	2,961	2,692	2,423
Cash and bank balance	-1,530	-900	-198	504	1,206	1,988	2,771	3,553	4,427	5,300
Total	3,316	3,677	4,109	4,542	4,975	5,488	6,002	6,515	7,119	7,723

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Liabilities										
Equity	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620
Reserves and Surplus	4,707	5,413	6,120	6,827	7,649	8,471	9,293	10,247	11,200	12,154
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	8,327	9,034	9,740	10,447	11,269	12,091	12,914	13,867	14,820	15,774
Assets										
Net Block (long term asset- depreciation)	2,154	1,885	1,615	1,346	1,077	808	538	269	0	0
Cash and bank balance	6,173	7,149	8,125	9,101	10,192	11,284	12,375	13,598	14,820	16,043
Total	8,327	9,034	9,740	10,447	11,269	12,091	12,914	13,867	14,820	16,043

FCFF Calculation (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
EBIT	0	0	0	155	-64	-239	-195	-144	-187	-131
Add: Depreciation	0	0	0	0	269	269	269	269	269	269
Less: IDC	-33	-191	-441	-642	-714	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Capex	-1,006	-3,792	-3,531	-1,765	0	0	0	0	0	0
Free Cashflow to Fund	-1,039	-3,983	-3,972	-2,253	-509	30	75	126	82	138
Retained Earnings	0	0	0	155	205	-654	-559	-457	-450	-343
Cumulative Retained Earnings	0	0	0	155	360	-294	-853	-1,310	-1,761	-2,104
Retained Earnings used to fund opex	0	0	0	155	205	0	0	0	0	0
Retained Earnings available after funding opex	0	0	0	4	43	0	0	0	0	0
Retained Earnings used to fund project cost	0	0	0	4	43	0	0	0	0	0

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBIT	-120	-19	472	569	705	416	104	145	145	145
Add: Depreciation	269	269	269	269	269	269	269	269	269	269
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	149	250	741	839	974	685	373	414	414	414
Retained Earnings	-282	-130	412	560	746	508	247	338	388	414
Cumulative Retained Earnings	-2,385	-2,515	-2,103	-1,543	-797	-289	-43	295	683	1,097
Retained Earnings used to fund opex	0	0	412	560	746	508	247	338	388	414
Retained Earnings available after funding opex	0	0	196	337	517	272	3	87	130	148
Retained Earnings used to fund project cost	0	0	196	337	517	272	3	87	130	148

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
EBIT	190	190	190	241	241	241	297	297	297	361
Add: Depreciation	269	269	269	269	269	269	269	269	269	269
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	459	459	459	510	510	510	567	567	567	630
Retained Earnings	459	459	459	510	510	510	567	567	567	630
Cumulative Retained Earnings	1,556	2,015	2,474	2,984	3,494	4,004	4,570	5,137	5,704	6,334
Retained Earnings used to fund opex	459	459	459	510	510	510	567	567	567	630
Retained Earnings available after funding opex	185	177	168	210	201	192	239	230	219	273
Retained Earnings used to fund project cost	185	177	168	210	201	192	239	230	219	273

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBIT	361	361	433	433	433	513	513	513	604	604
Add: Depreciation	269	269	269	269	269	269	269	269	269	269
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	630	630	702	702	702	783	783	783	873	873
Retained Earnings	630	630	702	702	702	783	783	783	873	873
Cumulative Retained Earnings	6,964	7,595	8,297	8,999	9,701	10,483	11,266	12,048	12,921	13,795
Retained Earnings used to fund opex	630	630	702	702	702	783	783	783	873	873
Retained Earnings available after funding opex	262	251	311	299	287	356	343	330	407	393
Retained Earnings used to fund project cost	262	251	311	299	287	356	343	330	407	393

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
EBIT	604	707	707	707	822	822	822	953	953	953
Add: Depreciation	269	269	269	269	269	269	269	269	269	269
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
Retained Earnings	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
Cumulative Retained Earnings	14,668	15,644	16,620	17,595	18,687	19,778	20,870	22,093	23,315	24,538
Retained Earnings used to fund opex	873	976	976	976	1,092	1,092	1,092	1,223	1,223	1,223
Retained Earnings available after funding opex	378	466	451	435	534	518	500	614	596	577
Retained Earnings used to fund project cost	378	466	451	435	534	518	500	614	596	577

FCFE Calculation (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
EBIDTA	0	0	0	155	205	30	75	126	82	138
Less: Interest	0	0	0	0	0	-684	-634	-583	-532	-481
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	-563	-563	-563	-563	-563	-563
Less: Capex	-1,039	-3,983	-3,972	-2,403	-670	0	0	0	0	0
Add: Debt Investment	727	2,788	2,780	1,682	469	0	0	0	0	0
Free Cash Flow to Equity	-312	-1195	-1192	-566	-559	-1217	-1122	-1021	-1013	-906

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBIDTA	149	250	741	839	974	685	373	414	414	414
Less: Interest	-431	-380	-329	-279	-228	-177	-127	-76	-25	0
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	-563	-563	-563	-563	-563	-563	-563	-563	-563	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	-845	-693	-151	-3	183	-55	-317	-225	-175	414

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
EBIDTA	459	459	459	510	510	510	567	567	567	630
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	459	459	459	510	510	510	567	567	567	630

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBIDTA	630	630	702	702	702	783	783	783	873	873
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	630	630	702	702	702	783	783	783	873	873

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
EBIDTA	873	976	976	976	1092	1092	1092	1223	1223	1223
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	873	976	976	976	1092	1092	1092	1223	1223	1223

15.27. Annexure 27 – Project Returns Calculations – Conservative and Aggressive scenarios – Case 1 (BEZA as the Master Developer)

Conservative case:

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[275]	NPV FCFE (in BDT million)	NPV FCFF (in BDT million)
Option 1: offsite and onsite infrastructure to be developed by BEZA	3.19%	2.49%	0.46	0.30	-5266.7	-7092.3
Option 2: offsite and onsite infrastructure to be financed by multilaterals	3.56%	3.47%	0.56	0.43	-4204.7	-5089.0
Option 3: offsite infrastructure to be developed through nodal agencies	4.51%	4.15%	0.65	0.40	-3326.1	-4535.0
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	4.98%	5.33%	0.81	0.58	-2504.7	-2439.2
Option 5: offsite and onsite infrastructure to be developed through Nodal agencies*	15.37%	24.35%	4.41	2.12	1205.4	1471.6

 # NPV values with cost of equity as 10% and 15% have been furnished in Annexures

[275] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

Aggressive case:

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[276]	NPV FCFF (in BDT million) #	NPV FCFE (in BDT million) #
Option 1: offsite and onsite infrastructure to be developed by BEZA	3.43%	2.79%	0.46	0.35	-6526.4	-4684.4
Option 2: offsite and onsite infrastructure to be financed by multilaterals	4.00%	4.06%	0.63	0.48	-4193.0	-3508.7
Option 3: offsite infrastructure to be developed through nodal agencies	4.86%	4.68%	0.68	0.46	-4035.2	-2795.3
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	5.57%	6.29%	0.90	0.64	-1641.4	-1864.8
Option 6: offsite and onsite infrastructure to be developed through Nodal agencies	17.91%	32.18%	4.38	2.44	1914.6	1607.8

 # NPV values with cost of equity as 10% and 15% have been furnished in Annexures

[276] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

15.28. Annexure 28 - NPV and BCR Calculations – Case 1 (BEZA as the Master Developer)

Table 149: NPV (@ 10% cost of equity) calculations across scenarios – Case 1

Scenarios	NPV FCFF (in BDT million)			NPV FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Option 1: offsite and onsite infrastructure to be developed by BEZA	-6948.9	-6597.7	-6369.5	-5512.4	-5145.0	-4873.5
Option 2: offsite and onsite infrastructure to be financed by multilaterals	-4617.7	-4128.8	-3691.6	-4254.1	-3845.4	-3470.7
Option 3: offsite infrastructure to be developed through nodal agencies	-4344.9	-4043.1	-3830.2	-3304.9	-2968.0	-2712.0
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	-1914.6	-1486.0	-1090.9	-2329.3	-1961.2	-1608.5
Option 6: offsite and onsite infrastructure to be developed through Nodal agencies	1772.7	2017.4	2227.0	1866.7	2103.2	2307.7

Source: Financial Model

Table 150: BCR (@ 10% cost of equity) calculations across scenarios – Case 1

Scenarios	BCR		
	Conservative	Base	Aggressive
Option 1: offsite and onsite infrastructure to be developed by BEZA	0.32	0.35	0.37

Scenarios	BCR		
	Conservative	Base	Aggressive
Option 2: offsite and onsite infrastructure to be financed by multilaterals	0.47	0.49	0.51
Option 3: offsite infrastructure to be developed through nodal agencies	0.43	0.47	0.50
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	0.75	0.78	0.80
Option 6: offsite and onsite infrastructure to be developed through Nodal agencies	2.30	2.47	2.62

Source: Financial Model

Table 151: NPV (@ 15% cost of equity) calculations across scenarios – Case 1

Scenarios	NPV FCFF (in BDT million)			NPV FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Option 1: offsite and onsite infrastructure to be developed by BEZA	-7241.6	-6913.6	-6696.5	-4763.9	-4478.5	-4261.5
Option 2: offsite and onsite infrastructure to be financed by multilaterals	-5626.6	-5173.4	-4774.7	-3930.0	-3623.3	-3347.7
Option 3: offsite infrastructure to be developed through nodal agencies	-3053.6	-2660.4	-2294.0	-2498.2	-2233.9	-1964.8

Scenarios	NPV FCFF (in BDT million)			NPV FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	-4751.9	-4476.0	-4274.4	-3141.1	-2896.5	-2693.5
Option 6: offsite and onsite infrastructure to be developed through Nodal agencies	1094.1	1321.2	1519.7	631.4	811.0	977.6

Source: Financial Model

Table 152: BCR (@ 15% cost of equity) calculations across scenarios – Case 1

Scenarios	BCR		
	Conservative	Base	Aggressive
Option 1: offsite and onsite infrastructure to be developed by BEZA	0.27	0.30	0.32
Option 2: offsite and onsite infrastructure to be financed by multilaterals	0.38	0.41	0.43
Option 3: offsite infrastructure to be developed through nodal agencies	0.51	0.55	0.57
Option 4: offsite infrastructure to be developed through nodal agencies and on-site infrastructure to be financed by multilaterals	0.36	0.40	0.42
Option 6: offsite and onsite infrastructure to be developed through Nodal agencies	1.89	2.06	2.20

Source: Financial Model

15.29. Annexure 29 – A Case Study on Panama Pacifico SEZ Project

Traditionally, in case of PPP projects, the developer is liable to make certain pay-outs to the regulatory authority (in this case BEZA) in order for it recover its cost lay-out. However, globally there are precedencies of projects which have been developed through the PPP route without involvement of any pay-outs to the authorities regulating them. Since, the ultimate objective of BEZA through this project is overall socio-economic upliftment of the region through employment generation, private sector participation in such projects brings with it a plethora of advantages such as:

- 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.

Thus, in order to make the proposition of developing the proposed EZ attractive BEZA may consider foregoing pay-outs for the private developer. Similar examples have been adopted in the past in developed economies to promote private sector participation in industrial projects. One such successful case in point is the Panama Pacifico SEZ project in the Republic of Panama. The following table illustrates on the parameters behind its success.

Table 153: Successful PPP project without pay-out criteria: Panama Pacifico

Project	Project Type	Location	Master Developer
Panama Pacifico	**Special Economic Zone developed through PPP**	**Panama City, Republic of Panama**	**London & Regional Properties**
Project Overview	The Panama Pacifico project created in 2007 transformed the former Howard U.S. Air Force base outside Panama City into a hub for international trade, logistics, services, commerce, and industry. Located in the District of Arraijan, on the west side of the Canal, Panama Pacific is mixed-use development project which aimed at economic development of the region.		
Key Components	As principal advisor to the government, IFC recommended that a private investor develop the 2,500-hectare site through the establishment of a special economic zone (SEZ) with a modern regulatory framework and administration conducive to business and direct foreign investment		
Project Structuring parameters	• **Strict global standard eligibility criteria to target international master developers** • **Transaction structure for 40-year development period with exclusive development rights for 15 years and limited rights for the rest of the concession for the master developer** • **Pre-defined obligations for minimum investments from master developer - the winning proposal included commitments to invest a minimum of USD 405 million over the first 8 years of the project with no other pay-outs involved** • **Allocation of infrastructure development obligations to Government**		

	• **Clear allocation of risks between parties, pre-defined pricing of land, minimum land takedowns by category of use, rules of land development, penalties for non-compliance, etc.**
Success factors	• **USD 405 millions of investment within first 8 years i.e. till 2016** • **USD 300 million more of investment in the next phase** • **Globally reputed organizations such as Dell, 3M, CAT, Singapore Airlines, Cable & Wireless etc. investing in the SEZ** • **Accreditation of U.S. Green Building Council and the Clinton Climate Initiative as "Climate-positive SEZ"**

Source: PwC Research

15.30. Annexure 30 – Determination of Bid parameters for the PPP developer

The following table elucidates on the results obtained from the simulations performed to determine the best combination of the above-mentioned scenarios for the Base case. Two scenarios have been evaluated in the simulations – (i) BEZA bearing costs only towards land acquisition and off-site infrastructure is funded through assistance from multilaterals, and (ii) BEZA bearing costs towards both land acquisition and off-site infrastructure development.

Table 154: Simulation results to determine the best-case pay-out mode for BEZA - Base case (Case 2)

S. No.	Parameters	BEZA bearing costs only towards land acquisition	BEZA bearing costs towards land acquisition and off-site infrastructure
1	Annual Land lease mode (I)	• An Annual land lease of **BDT 2.60 per sq. ft.** per annum will correspond to the NPV of cost being equal to that of income for BEZA	• An Annual land lease of **BDT 6.50 per sq. ft.** per annum will correspond to the NPV of cost being equal to that of income for BEZA
2	Gross revenue share mode (II)	• A Gross revenue share of **5%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA	• A Gross revenue share of **12%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA
3	Upfront payment + (I)	• An upfront payment of **BDT 500 million** per annum will correspond to the NPV of cost being equal to that of income for BEZA	• An Annual land lease of **BDT 3.50 per sq. ft.** per annum will correspond to the NPV of cost being equal to that of income for BEZA

S. No.	Parameters	BEZA bearing costs only towards land acquisition	BEZA bearing costs towards land acquisition and off-site infrastructure
4	Upfront payment + (II)	• An upfront payment of BDT million 400 and Gross revenue share of **1%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA	• A Gross revenue share of **7%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA
5	Upfront payment + (I) + (II)	• An Annual land lease of **BDT 1 per sq. ft.** per annum together with a gross revenue share of **1%** with an upfront payment of BDT 200 million will correspond to the NPV of cost being equal to that of income for BEZA	• An Annual land lease of **BDT 2 per sq. ft**. per annum together with a gross revenue share of **3%** will correspond to the NPV of cost being equal to that of income for BEZA

Source: Financial Model

15.31. Annexure 31 - Financial Model Calculations – Case 2 (PPP Developer developing the Project) – Without Pay-outs – Base Case

Profit and Loss Statement (BDT millions)										
Financial year	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Revenue	0	0	96	188	211	275	308	334	419	451
O&M expenses	0	0	127	0	157	171	177	182	187	0
EBIDTA	0	0	-31	188	54	104	131	152	232	451
Depreciation	0	0	0	183	183	183	183	183	183	183
EBIT	0	0	-31	5	-129	-79	-51	-30	49	268
Interest	0	0	0	0	548	475	402	329	256	183
Profit before tax (PBT)	0	0	-31	5	-677	-554	-453	-359	-206	85
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	0	0	-31	5	-677	-554	-453	-359	-206	85

Financial year	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**
Revenue	490	643	733	817	974	974	974	1,107	1,107	1,107
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	490	643	733	817	974	974	974	1,107	1,107	1,107
Depreciation	183	183	183	183	183	183	183	183	183	183
EBIT	307	460	550	634	791	791	791	925	925	925

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Interest	110	37	0	0	0	0	0	0	0	0
Profit before tax (PBT)	198	424	550	634	791	791	791	925	925	925
Tax	0	0	0	58	154	265	273	327	333	338
Profit after tax (PAT)	198	424	550	576	637	525	518	598	592	587

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Revenue	1,262	1,262	1,262	1,441	1,441	1,441	1,649	1,649	1,649	1,890
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	1,262	1,262	1,262	1,441	1,441	1,441	1,649	1,649	1,649	1,890
Depreciation	183	183	183	183	183	183	183	183	183	183
EBIT	1,080	1,080	1,080	1,259	1,259	1,259	1,466	1,466	1,466	1,707
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	1,080	1,080	1,080	1,259	1,259	1,259	1,466	1,466	1,466	1,707
Tax	397	402	406	472	475	478	553	556	558	644
Profit after tax (PAT)	682	678	674	787	783	780	913	910	908	1,063

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Revenue	1,890	1,890	2,170	2,170	2,170	2,497	2,497	2,497	2,879	2,879
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	1,890	1,890	2,170	2,170	2,170	2,497	2,497	2,497	2,879	2,879
Depreciation	183	183	183	183	183	183	183	183	183	183

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBIT	1,707	1,707	1,988	1,988	1,988	2,315	2,315	2,315	2,696	2,696
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	1,707	1,707	1,988	1,988	1,988	2,315	2,315	2,315	2,696	2,696
Tax	646	647	747	748	749	865	866	867	1,001	1,002
Profit after tax (PAT)	1,061	1,060	1,241	1,239	1,238	1,450	1,449	1,448	1,695	1,695

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Revenue	2,879	3,325	3,325	3,325	3,848	3,848	3,848	4,461	4,461	4,461
O&M expenses	0	0	0	0	0	0	0	0	0	0
EBIDTA	2,879	3,325	3,325	3,325	3,848	3,848	3,848	4,461	4,461	4,461
Depreciation	183	183	183	183	183	183	183	183	183	183
EBIT	2,696	3,142	3,142	3,142	3,665	3,665	3,665	4,278	4,278	4,278
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	2,696	3,142	3,142	3,142	3,665	3,665	3,665	4,278	4,278	4,278
Tax	1,002	1,159	1,159	1,160	1,343	1,344	1,344	1,559	1,559	1,559
Profit after tax (PAT)	1,694	1,984	1,983	1,983	2,322	2,322	2,321	2,719	2,719	2,719

Cash Flows (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash Inflow										
PAT	0	0	-31	5	-677	-554	-453	-359	-206	85
Book depreciation	0	0	0	183	183	183	183	183	183	183
Equity infusion	0	1,352	998	157	0	0	0	0	0	0
Debt drawdown	0	3,155	2,328	366	0	0	0	0	0	0
Total cash inflow	0	4,507	3,294	711	-494	-372	-271	-177	-24	268
Cash Outflow										
Capex	0	4,507	3,325	567	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	0	0	0	0	731	731	731	731	731	731
Total cash outflow	0	4,507	3,325	567	731	731	731	731	731	731
Net Cash Generation	0	0	-31	144	-1,225	-1,103	-1,002	-908	-755	-463

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Cash Inflow										
PAT	198	424	550	576	637	525	518	598	592	587
Book depreciation	183	183	183	183	183	183	183	183	183	183
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	380	606	733	759	819	708	701	781	775	769
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0

Repayment (Principal)	731	731	0	0	0	0	0	0	0	0
Total cash outflow	731	731	0	0	0	0	0	0	0	0
Net Cash Generation	-351	-125	733	759	819	708	701	781	775	769

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Cash Inflow										
PAT	682	678	674	787	783	780	913	910	908	1,063
Book depreciation	183	183	183	183	183	183	183	183	183	183
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	865	860	856	969	966	963	1,095	1,093	1,091	1,246
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	865	860	856	969	966	963	1,095	1,093	1,091	1,246

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Cash Inflow										
PAT	1,061	1,060	1,241	1,239	1,238	1,450	1,449	1,448	1,695	1,695
Book depreciation	183	183	183	183	183	183	183	183	183	183
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	1,244	1,242	1,423	1,422	1,421	1,632	1,631	1,631	1,878	1,877

Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	1,244	1,242	1,423	1,422	1,421	1,632	1,631	1,631	1,878	1,877

Financial year	**Year 41**	**Year 42**	**Year 43**	**Year 44**	**Year 45**	**Year 46**	**Year 47**	**Year 48**	**Year 49**	**Year 50**
Cash Inflow										
PAT	1,694	1,984	1,983	1,983	2,322	2,322	2,321	2,719	2,719	2,719
Book depreciation	183	183	183	183	183	183	183	183	183	183
Equity infusion	0	0	0	0	0	0	0	0	0	0
Debt drawdown	0	0	0	0	0	0	0	0	0	0
Total cash inflow	1,877	2,166	2,166	2,165	2,505	2,504	2,504	2,902	2,902	2,902
Cash Outflow										
Capex	0	0	0	0	0	0	0	0	0	0
Dividend pay-out	0	0	0	0	0	0	0	0	0	0
Repayment (Principal)	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	1,877	2,166	2,166	2,165	2,505	2,504	2,504	2,902	2,902	2,902

Balance Sheet (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Liabilities										
Equity	0	1,352	2,350	2,507	2,507	2,507	2,507	2,507	2,507	2,507
Reserves and Surplus	0	0	-31	-26	-703	-1,257	-1,710	-2,070	-2,276	-2,191
Long term loan	0	3,155	5,483	5,849	5,118	4,387	3,655	2,924	2,193	1,462
Total	0	4,507	7,801	8,329	6,921	5,636	4,452	3,361	2,424	1,778
Assets										
Net Block (long term asset- depreciation)	0	4,507	7,833	8,217	8,034	7,851	7,669	7,486	7,304	7,121
Cash and bank balance	0	0	-31	113	-1,113	-2,215	-3,217	-4,125	-4,880	-5,343
Total	0	4,507	7,801	8,329	6,921	5,636	4,452	3,361	2,424	1,778

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Liabilities										
Equity	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507
Reserves and Surplus	-1,993	-1,570	-1,020	-443	193	719	1,237	1,835	2,427	3,014
Long term loan	731	0	0	0	0	0	0	0	0	0
Total	1,244	937	1,487	2,063	2,700	3,225	3,743	4,341	4,934	5,520
Assets										
Net Block (long term asset- depreciation)	6,938	6,756	6,573	6,391	6,208	6,025	5,843	5,660	5,478	5,295
Cash and bank balance	-5,694	-5,819	-5,086	-4,327	-3,508	-2,800	-2,100	-1,319	-544	225
Total	1,244	937	1,487	2,063	2,700	3,225	3,743	4,341	4,934	5,520

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Liabilities										
Equity	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507
Reserves and Surplus	3,696	4,374	5,047	5,834	6,617	7,398	8,310	9,221	10,129	11,192
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	6,202	6,880	7,554	8,341	9,124	9,904	10,817	11,727	12,635	13,698
Assets										
Net Block (long term asset- depreciation)	5,112	4,930	4,747	4,565	4,382	4,200	4,017	3,834	3,652	3,469
Cash and bank balance	1,090	1,950	2,807	3,776	4,742	5,705	6,800	7,893	8,984	10,229
Total	6,202	6,880	7,554	8,341	9,124	9,904	10,817	11,727	12,635	13,698

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
Liabilities										
Equity	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507
Reserves and Surplus	12,253	13,313	14,553	15,793	17,031	18,481	19,929	21,377	23,073	24,767
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	14,760	15,819	17,060	18,299	19,537	20,987	22,436	23,884	25,579	27,274
Assets										
Net Block (long term asset- depreciation)	3,287	3,104	2,921	2,739	2,556	2,374	2,191	2,008	1,826	1,643
Cash and bank balance	11,473	12,715	14,138	15,560	16,981	18,613	20,245	21,875	23,753	25,630
Total	14,760	15,819	17,060	18,299	19,537	20,987	22,436	23,884	25,579	27,274

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Liabilities										
Equity	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507	2,507
Reserves and Surplus	26,461	28,445	30,428	32,411	34,733	37,054	39,375	42,095	44,814	47,533
Long term loan	0	0	0	0	0	0	0	0	0	0
Total	28,968	30,951	32,934	34,917	37,239	39,561	41,882	44,602	47,321	50,040
Assets										
Net Block (long term asset- depreciation)	1,461	1,278	1,096	913	730	548	365	183	0	0
Cash and bank balance	27,507	29,673	31,839	34,004	36,509	39,013	41,517	44,419	47,321	50,222
Total	28,968	30,951	32,934	34,917	37,239	39,561	41,882	44,602	47,321	50,222

FCFF Calculation (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
EBIT	0	0	-31	5	-129	-79	-51	-30	49	268
Add: Depreciation	0	0	0	183	183	183	183	183	183	183
Less: IDC	0	-158	-432	-567	0	0	0	0	0	0
Less: Tax paid	0	0	0	0	0	0	0	0	0	0
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	-4,350	-2,893	0	0	0	0	0	0	0
Free Cashflow to Fund	0	-4,507	-3,356	-379	54	104	131	152	232	451
Retained Earnings	0	0	-31	188	-494	-372	-271	-177	-24	268
Cumulative Retained Earnings	0	0	-31	157	-338	-709	-980	-1,157	-1,181	-913
Retained Earnings used to fund opex	0	0	0	188	0	0	0	0	0	268
Retained Earnings available after funding opex	0	0	0	44	0	0	0	0	0	75
Retained Earnings used to fund project cost	0	0	0	44	0	0	0	0	0	75

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBIT	307	460	550	634	791	791	791	925	925	925
Add: Depreciation	183	183	183	183	183	183	183	183	183	183
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	0	0	0	-58	-154	-265	-273	-327	-333	-338
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	490	643	733	759	819	708	701	781	775	769
Retained Earnings	380	606	733	759	819	708	701	781	775	769

Cumulative Retained Earnings	-533	74	806	1,565	2,384	3,092	3,793	4,574	5,348	6,118
Retained Earnings used to fund opex	380	606	733	759	819	708	701	781	775	769
Retained Earnings available after funding opex	181	401	522	542	596	478	463	536	523	510
Retained Earnings used to fund project cost	181	401	522	542	596	478	463	536	523	510

Financial year	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**
EBIT	1,080	1,080	1,080	1,259	1,259	1,259	1,466	1,466	1,466	1,707
Add: Depreciation	183	183	183	183	183	183	183	183	183	183
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	-397	-402	-406	-472	-475	-478	-553	-556	-558	-644
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	865	860	856	969	966	963	1,095	1,093	1,091	1,246
Retained Earnings	865	860	856	969	966	963	1,095	1,093	1,091	1,246
Cumulative Retained Earnings	6,982	7,843	8,699	9,668	10,634	11,597	12,692	13,785	14,876	16,122
Retained Earnings used to fund opex	865	860	856	969	966	963	1,095	1,093	1,091	1,246
Retained Earnings available after funding opex	598	585	573	677	665	653	776	764	752	897
Retained Earnings used to fund project cost	598	585	573	677	665	653	776	764	752	897

Financial year	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
EBIT	1,707	1,707	1,988	1,988	1,988	2,315	2,315	2,315	2,696	2,696
Add: Depreciation	183	183	183	183	183	183	183	183	183	183
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	-646	-647	-747	-748	-749	-865	-866	-867	-1,001	-1,002
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0

Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	1,244	1,242	1,423	1,422	1,421	1,632	1,631	1,631	1,878	1,877
Retained Earnings	1,244	1,242	1,423	1,422	1,421	1,632	1,631	1,631	1,878	1,877
Cumulative Retained Earnings	17,366	18,608	20,031	21,453	22,874	24,506	26,137	27,768	29,646	31,523
Retained Earnings used to fund opex	1,244	1,242	1,423	1,422	1,421	1,632	1,631	1,631	1,878	1,877
Retained Earnings available after funding opex	885	873	1042	1030	1017	1216	1203	1189	1423	1409
Retained Earnings used to fund project cost	885	873	1042	1030	1017	1216	1203	1189	1423	1409

Financial year	**Year 41**	**Year 42**	**Year 43**	**Year 44**	**Year 45**	**Year 46**	**Year 47**	**Year 48**	**Year 49**	**Year 50**
EBIT	2,696	3,142	3,142	3,142	3,665	3,665	3,665	4,278	4,278	4,278
Add: Depreciation	183	183	183	183	183	183	183	183	183	183
Less: IDC	0	0	0	0	0	0	0	0	0	0
Less: Tax paid	-1,002	-1,159	-1,159	-1,160	-1,343	-1,344	-1,344	-1,559	-1,559	-1,559
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Free Cashflow to Fund	1,877	2,166	2,166	2,165	2,505	2,504	2,504	2,902	2,902	2,902
Retained Earnings	1,877	2,166	2,166	2,165	2,505	2,504	2,504	2,902	2,902	2,902
Cumulative Retained Earnings	33,400	35,566	37,731	39,897	42,401	44,905	47,409	50,311	53,213	56,115
Retained Earnings used to fund opex	1,877	2,166	2,166	2,165	2,505	2,504	2,504	2,902	2,902	2,902
Retained Earnings available after funding opex	1394	1669	1654	1638	1962	1945	1928	2309	2291	2272
Retained Earnings used to fund project cost	1394	1669	1654	1638	1962	1945	1928	2309	2291	2272

FCFE Calculation (BDT million)

Financial year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
EBIDTA	0	0	-31	188	54	104	131	152	232	451
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Interest	0	0	0	0	-548	-475	-402	-329	-256	-183
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	-731	-731	-731	-731	-731	-731
Less: Capex	0	-4,507	-3,325	-523	0	0	0	0	0	0
Add: Debt Investment	0	3,155	2,328	366	0	0	0	0	0	0
Free Cash Flow to Equity	0	-1352	-1029	31	-1225	-1103	-1002	-908	-755	-463

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBIDTA	490	643	733	817	974	974	974	1107	1107	1107
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Interest	-110	-37	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	-58	-154	-265	-273	-327	-333	-338
Less: Debt repayments	-731	-731	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	-351	-125	733	759	819	708	701	781	775	769

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
EBIDTA	1262	1262	1262	1441	1441	1441	1649	1649	1649	1890
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	-397	-402	-406	-472	-475	-478	-553	-556	-558	-644
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	865	860	856	969	966	963	1095	1093	1091	1246

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBIDTA	1890	1890	2170	2170	2170	2497	2497	2497	2879	2879
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	-646	-647	-747	-748	-749	-865	-866	-867	-1,001	-1,002
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	1244	1242	1423	1422	1421	1632	1631	1631	1878	1877

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
EBIDTA	2879	3325	3325	3325	3848	3848	3848	4461	4461	4461
Less: Dividend payout	0	0	0	0	0	0	0	0	0	0
Less: Interest	0	0	0	0	0	0	0	0	0	0
Less: Tax	-1,002	-1,159	-1,159	-1,160	-1,343	-1,344	-1,344	-1,559	-1,559	-1,559
Less: Debt repayments	0	0	0	0	0	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Add: Debt Investment	0	0	0	0	0	0	0	0	0	0
Free Cash Flow to Equity	1877	2166	2166	2165	2505	2504	2504	2902	2902	2902

15.32. Annexure 32 - Project Returns Calculations – Conservative and Aggressive scenarios – Case 2 (PPP developer as the Master Developer)

Conservative scenario

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[277]	NPV FCFF (in BDT million)	NPV FCFE (in BDT million)
Without Pay-out to BEZA approach	7.09%	7.24%	0.26	0.60	-3191.3	-2687.0
Conventional approach	5.44%	5.32%	0.09	0.55	-5178.0	-4510.7

Aggressive scenario

Scenarios	PIRR	EIRR	Avg. DSCR	BCR[278]	NPV FCFF (in BDT million)	NPV FCFE (in BDT million)
Without Pay-out to BEZA approach	7.59%	7.89%	0.40	0.66	-2653.7	-2199.5
Conventional approach	5.82%	5.74%	0.21	0.61	-4687.9	-4079.2

[277] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

[278] *Weighted average cost of capital is used as discount factor in BCR calculations with cost of equity as 12%. Calculations pertaining to cost of equity of 10% and 15% have been furnished in Annexures of this report*

15.33. Annexure 33 - NPV and BCR Calculations – Case 2 (PPP Developer developing the Project) – Base

Table 155: NPV (@ 10% cost of equity) calculations across scenarios – Case 2

Scenarios	NPV FCFF (in BDT million)			NPV FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Without Pay-out to BEZA approach	-2866.4	-2613.8	-2299.0	-2098.8	-1839.1	-1517.2
Conventional approach	-4946.0	-4644.1	-4427.9	-4200.5	-3898.7	-3682.4

Source: Financial Model

Table 156: BCR (@ 10% cost of equity) calculations across scenarios – Case 2

Scenarios	BCR		
	Conservative	Base	Aggressive
Without Pay-out to BEZA approach	0.66	0.69	0.72
Conventional approach	0.61	0.63	0.66

Source: Financial Model

Table 157: NPV (@ 15% cost of equity) calculations across scenarios – Case 2

Scenarios	NPV FCFF (in BDT million)			NPV FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Without Pay-out to BEZA approach	-3576.0	-3356.5	-3079.8	-2953.9	-2788.3	-2575.8
Conventional approach	-5440.5	-5178.8	-4989.1	-4492.7	-4302.7	-4161.3

Source: Financial Model

Table 158: BCR (@ 15% cost of equity) calculations across scenarios – Case 2

Scenarios	BCR		
	Conservative	Base	Aggressive
Without Pay-out to BEZA approach	0.53	0.56	0.59
Conventional approach	0.49	0.51	0.54

Source: Financial Model

15.34. Annexure 34 – Mechanisms to improve debt serviceability of the project in case of PPP developer developing the project in case of the Conventional approach

In order to improve the returns and debt serviceability of the project, the following avenues could be explored which would eventually benefit both the private entity and BEZA.

Funding the Project through a combination of Commercial and Concessional Loan

As explained earlier, in case of a PPP developer, commercial loan from financial institutions and banks become a realistic source of obtaining debt in order to fund similar projects according to prevalent infrastructure funding environment in Bangladesh. However, concessional borrowing, if obtained, through support from BEZA and GoB could improve project returns for any private player developing the project and thus enhance attractiveness of the project. This could depend on various factors such as project potential, market reputation, balance sheet exposure, occupancy risk of the project etc. Keeping cognizance of the same, even if the project is funded through a combination of commercial and concessional borrowing in the ratio of 35%:35% respectively (with Debt: Equity as 70%:30%), **the project returns still remain unattractive.**

Modifying the pre-determined Bid Parameters below desired levels

As mentioned earlier, a combination of **upfront payment, together with an annual land lease charge and a revenue share to BEZA** emerges as a suitable option for BEZA in case it embarks on the conventional PPP approach. This combination of bid parameters enables BEZA to recover its cost outlay in terms of land acquisition and off-site infrastructure development. However, as demonstrated in the Financial Modelling chapter, the project returns for the private developer under such a scenario remain unattractive. This further diminishes the private developer's chances of obtaining commercial debts to fund the project. In order to improve the same, BEZA may forego or modify the bid parameters determined above. In lieu of the same, **a reduction in the annual land lease to BDT 1 per sq. ft. per annum together with a waiver on revenue share (to BEZA), improves the PIRR still fails to render the project attractive for private developers.**

Through the infusion of Financial Stimuli

An effective and prevalent project structuring mechanism to make a PPP project financially attractive and bankable for private developers could be through imbibing financial stimuli over existing fiscal incentives provided by BEZA. These financial stimuli could be in the form of Capital subsidy or Viability Gap Funding (VGF) or Opex subsidy or Annuity or a combination of both.

Capital subsidy or Viability Gap Funding (VGF)

Viability Gap Funding or VGF is a measure by Govt. authorities to make a PPP project profitable. It refers to a grant to support projects that are economically justified but not financially viable. Such a grant under VGF is provided as a capital subsidy to attract the private sector players to participate in PPP projects that are otherwise financially unviable. Projects may not be commercially viable because of long gestation period and small revenue flows in future. This grant or capital subsidy is generally provided as a one-time payment to meet the capex lay-out of the project and thus making in financially attractive for private bidders. Similar precedence is also prevalent in Bangladesh, where the government extends financial support towards financially unviable but socially and economically beneficial PPP projects to maximize value for money and to imbibe private sector efficiency. GoB has mandated that the VGF in the form of capital grant shall be limited to 40% of the total estimated capital cost of the project.[279] In countries such as India, VGF has been mostly limited to hard core

[279] *http://www.pppo.gov.bd/download/ppp_office/Rules-for-VGF-for-PPP-Projects-2018.pdf*

infrastructure such as roads and highways sector but also extendable to power, urban transport, SEZs, etc. As per prevalent norms, the total Viability Gap Funding will not exceed 20% of total project cost, provided that the Government or statutory entity that owns the project may, if it so decides, provide additional grants out of its budget, but not exceeding a further 20% of the total project cost. In India, similar schemes are also exercised at the State level, such as in the state of Assam, VGF is provided by the State Govt. mostly in roads sector and the amount of VGF shall be equivalent to the lowest bid for capital subsidy, but subject to a maximum of 20% of the total project cost. Similarly, under the UDAN scheme proposed by the Govt. of Maharashtra, 50% seats in airplanes are offered at concessional rates to passengers in order to make air travel affordable. In case of vacant seats, the State Govt. shall offer capital subsidy in the form of VGF to the airline operator to compensate the loss.

Table 159: Case study on f VGF[280]

Project	Project Type	Location
Panvel - Indapur Highway project	**Highway project Build, Operate, Transfer (BOT) mode**	**Maharashtra, India**
Supreme Infra's 84km Panvel-Indapur highway project in Maharashtra was stuck for years due to lack of land clearances, hurting the firm as costs shot up. The project, estimated to cost INR 1,206 crore, was targeting a completion date of June 2017. However, inefficiencies in land acquisition caused delay. **In order to cater to the needs of the project, NHAI extended a VGF of INR 500 crore towards the project. With 60% of the project already completed this provided an impetus to the private developer who went on to complete the phase I & II of the project as per previous expectations thus preventing further delay.**		

Source: PwC Research

Although there is no precedence of VGF in the economic zone space in Bangladesh but as per VGF rules referred above, it is permissible. An extension of **VGF equal to high as 40%** of the total project cost although **improves the project returns (with PIRR of ~8.50%) but is still below desired levels.**

Opex subsidy or Annuity

In addition to capital subsidy, government also extends support in the form of operational subsidy or annuity for a period of time thus helping private developers suffice their operational expenses. Although, this mode of financial support is more prevalent in hardcore infrastructure projects mainly highway projects in countries such as India but as per the guidelines of GoB[281], annuity is disbursed on a periodic basis during the period when the Project Company provides service under the PPP project after commencement of operations and it is deemed applicable for all kinds of PPP projects including priority projects. In India, the extension of annuity is almost entirely limited to roads and highway projects where revenues from tolling are uncertain or will be insufficient to attract BOT operators. The Govt. of India thus devised Engineering, Procurement and Construction (EPC) contracts which entail little or no risk on the part of the private sector. To fill this gap, NHAI has developed the Annuity Concession model. To date, approximately 8% of the length of roadways subject to NHDP funding has been commissioned using the Annuity model.[282] Similarly, Opex subsidy, which can also be considered as annuity, is also extended by the State Govt. in India. For example, the State of Gujarat provides an Opex subsidy of a maximum amount of INR 2.5 million for a period of 10 years to support MSMEs in the State.

Although there is no precedence of annuity or Opex subsidy being extended in the economic zone space in Bangladesh but as per VGF rules referred above, it is permissible. However, even an extension of **Annuity as high as 40%** of the O&M cost (for a period of 15 years from start of operations of the proposed EZ) **fails to**

[280] *https://www.moneycontrol.com/news/business/companies/nhai-to-infuse-rs-500cr-vgfpanvel-project-supreme-infra-981577.html*
[281] *http://www.pppo.gov.bd/download/ppp_office/Rules-for-VGF-for-PPP-Projects-2018.pdf*
[282] *https://ppiaf.org/sites/ppiaf.org/files/documents/toolkits/highwaystoolkit/6/pdf-version/india.pdf*

improve the project returns. Even, a combination of these two mechanisms, although enhances the project returns but does not render the project attractive for the private developers.

15.35. Annexure 35 - Economic Model Calculations

Total Economic Benefits (conservative)

Financial year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Net Economic Value Addition by Industries	0	0	0	0	0	0	0	0	8	15
Employment Generation	0	0	0	0	0	0	146	146	393	495
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	0	0	0	0	0	0	146	146	401	511

Financial year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Net Economic Value Addition by Industries	22	29	36	41	46	50	54	70	86	101
Employment Generation	718	965	1240	1412	1622	1762	1926	2521	3137	3739
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	739	994	1276	1452	1668	1812	1980	2591	3223	3841

Financial year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Net Economic Value Addition by Industries	131	150	150	150	150	150	150	150	150	150
Employment Generation	4904	5685	5685	5685	5685	5685	5685	5685	5685	5685
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5035	5835	5835	5835	5835	5835	5835	5835	5835	5835

Financial year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Net Economic Value Addition by Industries	150	150	150	150	150	150	150	150	150	150
Employment Generation	5685	5685	5685	5685	5685	5685	5685	5685	5685	5685
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5835	5835	5835	5835	5835	5835	5835	5835	5835	5835

Financial year	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Net Economic Value Addition by Industries	150	150	150	150	150	150	150	150	150	150
Employment Generation	5685	5685	5685	5685	5685	5685	5685	5685	5685	5685
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5835	5835	5835	5835	5835	5835	5835	5835	5835	5835

Total Economic Benefits (Base)

Financial year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Net Economic Value Addition by Industries	0	0	0	0	0	0	0	0	10	20
Employment Generation	0	0	0	0	0	0	146	146	461	639
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	0	0	0	0	0	0	146	146	471	658

Financial year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Net Economic Value Addition by Industries	29	38	48	56	65	72	81	101	121	142
Employment Generation	945	1286	1666	1955	2295	2570	2883	3644	4444	5249
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	973	1324	1714	2011	2360	2643	2964	3744	4565	5391

Financial year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Net Economic Value Addition by Industries	151	151	151	151	151	151	151	151	151	151
Employment Generation	5606	5606	5606	5606	5606	5606	5606	5606	5606	5606
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5757	5757	5757	5757	5757	5757	5757	5757	5757	5757

Financial year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Net Economic Value Addition by Industries	151	151	151	151	151	151	151	151	151	151
Employment Generation	5606	5606	5606	5606	5606	5606	5606	5606	5606	5606
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0

Financial year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Total Economic Benefits	5757	5757	5757	5757	5757	5757	5757	5757	5757	5757

Financial year	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Net Economic Value Addition by Industries	151	151	151	151	151	151	151	151	151	151
Employment Generation	5606	5606	5606	5606	5606	5606	5606	5606	5606	5606
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5757	5757	5757	5757	5757	5757	5757	5757	5757	5757

Total Economic Benefits (aggressive)

Financial year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Net Economic Value Addition by Industries	0	0	0	0	0	0	0	0	12	25
Employment Generation	0	0	0	0	0	0	146	146	535	796
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	0	0	0	0	0	0	146	146	548	821

Financial year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Net Economic Value Addition by Industries	36	48	62	73	85	97	110	135	152	152
Employment Generation	1195	1639	2134	2551	3035	3458	3935	4878	5544	5544

Total Economic Benefits (aggressive)										
Financial year	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	1231	1687	2196	2624	3120	3555	4045	5012	5696	5696

Financial year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Net Economic Value Addition by Industries	152	152	152	152	152	152	152	152	152	152
Employment Generation	5544	5544	5544	5544	5544	5544	5544	5544	5544	5544
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5696	5696	5696	5696	5696	5696	5696	5696	5696	5696

Financial year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Net Economic Value Addition by Industries	152	152	152	152	152	152	152	152	152	152
Employment Generation	5544	5544	5544	5544	5544	5544	5544	5544	5544	5544
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5696	5696	5696	5696	5696	5696	5696	5696	5696	5696

Financial year	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Net Economic Value Addition by Industries	152	152	152	152	152	152	152	152	152	152
Employment Generation	5544	5544	5544	5544	5544	5544	5544	5544	5544	5544
Tax Incentive Availed by the Developer (Loss for Exchequer)	0	0	0	0	0	0	0	0	0	0
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	5696	5696	5696	5696	5696	5696	5696	5696	5696	5696

All figures are in BDT million

15.36. Annexure 36 – Information Regarding Private EZs

লাইসেন্সপ্রাপ্ত বেসরকারি অর্থনৈতিক অঞ্চল-এর হালনাগাদ তথ্য

ক্র: নং	অর্থনৈতিক অঞ্চলের নাম	জমির পরিমাণ (একর)	নীতমালার অনুচ্ছেদ ৫ (২) মোতাবেক পত্রিকায় প্রকাশের তারিখ গেজেটে প্রকাশের তারিখ	প্রাক-যোগ্যতাপত্র প্রদানের তারিখ	ফিজিবিলিটি স্ট্যাডি রিপোর্ট সংশ্লিষ্ট কমিটি কর্তৃক সুপারিশ প্রদানের তারিখ	মাস্টার প্ল্যান রিপোর্ট সংশ্লিষ্ট কমিটি কর্তৃক সুপারিশ প্রদানের তারিখ	পরিবেশগত ছাড়পত্র প্রদান (EIA অনুমোদন)-এর তারিখ	বেসরকারি অর্থনৈতিক অঞ্চল ঘোষণা সংক্রান্ত গেজেট প্রকাশের তারিখ	লাইসেন্স প্রদানের তারিখ	মেয়াদ উত্তীর্ণের তারিখ
১	২	৩	৪	৫	৬	৭	৮	৯	১০	১১
১	মেঘনা ইকোনমিক জোন জেলা: নারায়নগঞ্জ উপজেলা: সোনারগাঁও মৌজা: চররমজান সোনউল্লাহ	৬৭.৯১৬৩	৩০/০৭/২০১৫ ০৩/০৮/২০১৫	১৮/১০/২০১৫	২৪/০৩/২০১৬	৩০/০৩/২০১৬	২৭/০৩/২০১৬	১৮/০৮/২০১৬	২৩/০৮/২০১৬	২২/০৮/২০৩১
২	আবদুল মোনেম অর্থনৈতিক অঞ্চল জেলা: মুন্সিগঞ্জ উপজেলা: গজারিয়া মৌজা: চর বাউশিয়া, চর জাজিরা	১৮৯.৯৪	২৯/০৪/২০১৬ ১২/০৫/২০১৫	১৬/০৫/২০১৫	১০/০৪/২০১৬	২৪/০৩/২০১৬	১১/০৮/২০১৬	২৯/১২/২০১৬	০৩/০১/১৭	০২/০১/২০৩২
৩	আমান ইকোনমিক জোন জেলা: নারায়ণগঞ্জ উপজেলা: সোনারগাঁও মৌজা: সোনামযী, ছোটদেওভোগ ও হাড়িয়া	৮৩.১৩৯৪	৯/১২/২০১৫	১৫/০২/২০১৬	৩১/০৭/২০১৬	১৭/১০/২০১ ৬	২৮/৬/২০১৬	০৮/০৩/২০১৭	১৬/০৩/১৭	১৫/০৩/২০৩২
৪	'বে' ইকোনমিক জোন জেলা: গাজীপুর উপজেলা: কালিয়াকৈর মৌজা: কৌচাকুরি, বাঘিয়া, মিরপুর	৩৫.০০৭৭	১২/০১/২০১৬	১১/০২/২০১৬	০২/০৫/২০১৬	২৩/০৬/২০১৬	০৩/১১/২০১৬	০৯/০৪/২০১৭	২৪/০৪/১৭	২৩/০৪/২০৩২
৫	মেঘনা ইন্ডাস্ট্রিয়াল ইকোনমিক জোন, সোনারগাঁ নারায়ণগঞ্জ মৌজা: ছোটশীলামান্দি, মল্লিকের পাড়া, ঝগড়াখোলা, কামারগাঁও, শীলামান্দি, জগৎদী, সতরাজদী, মিঠাদী ও রতনদী	৭১.৯০২০	২৫/১১/২০১৬	১৯/০১/২০১৭	২০/৯/২০১৭	২০/৯/২০১৭	১/১১/২০১৬	১৩/০৯/২০১৭	২১/০৯/১৭	২০/৯/২০৩৩
৬	সিটি ইকোনিমক জোন রুপগঞ্জ, নারায়ণগঞ্জ মৌজা: উত্তর রুপসী, গর্ব্ধবপুর ও চর গর্ব্ধবপুর	৭৭.৯৬৫৫	১১/০৮/২০১৬	২২/০৫/২০১৭	২৬/১২/২০১৭	২৬/১২/২০১৭	০৫/০৯/২০১৭	১৮/০১/২০১৮	২৩/০১/২০১৮	২২/০১/২০৩৩

৭	সিরাজগঞ্জ ইকোনমিক জোন জেলা: সিরাজগঞ্জ উপজেলা: বেলকুচী ও সিরাজগঞ্জ মৌজা: সয়দাবাদ, বড়শিমুল পঞ্চসোনা, খাসবড়শিমুল, বিরহাটি, চকবয়রা, বয়রা মাসুম, বড়বেড়া খারুয়া	১০৩৫.৯৩	-------	২০/০৬/২০১৭	০৬/০৩/২০১৮	০৬/০৩/২০১৮	২৬/১১/২০১৭	১৯/০৬/২০১৮	০৪/১০/২০১৮	৩/১০/২০৩৩
৮	কর্ণফুলী ড্রাই ডক স্পেশাল ইকোনমিক জোন জেলা: চট্টগ্রাম উপজেলা: আনোয়ারা মৌজা: বাদলপুরা	১৬.০৮৬১	১৭/০৯/২০১৭	১৭/০৯/২০১৭	২৫/০৪/২০১৮	২৫/০৪/২০১৮	১৪/০২/২০১৮	২৪/০১/২০১৯	৭/০২/২০১৯	৬/০২/২০৩৪
৯	কিশোরগঞ্জ ইকোনমিক জোন জেলা: কিশোরগঞ্জ উপজেলা: পাকুন্দিয়া মৌজা: মাইজহাটি	৯১.৬৩	২৮/০৫/২০১৭	০৩/০৭/২০১৭	১৯/০৭/২০১৮	১৯/০৭/২০১৮	২৭/০৩/২০১৮	১৪/০১/২০১৯	১৮/০২/২০১৯	১৭/০২/২০৩৪
১০	ইস্ট ওয়েস্ট স্পেশাল ইকোনমিক জোন জেলা : ঢাকা উপজেলা: কেরাণীগঞ্জ মৌজা: হাজারীবাগ, আইন্তা	১০২.৬৯৯২	২২/০৬/২০১৬	২৮/০৭/২০১৬ সংশোধিত ১০/০৪/২০১৮	৯/১০/২০১৮	৯/১০/২০১৮	৯/০৮/২০১৮	১৩/০২/২০১৯	২৫/০২/২০১৯	২৪/০২/২০৩৪
১১	হোসেন্দী ইকোনমিক জোন জেলা: মুন্সিগঞ্জ উপজেলা: গজারিয়া মৌজা: চর বেতাকী, ভবানীপুর, রঘুর চর, হোসেন্দী	১০৮.০৫৭০	০৫/১২/২০১৮	০৭/০১/২০১৯	১৭/০৬/২০১৯	১৭/০৬/২০১৯	০৭/০৪/২০১৯	১৯.১২.২০১৯	০১.০১.২০২০	৩১.১২.২০৩৫

প্রাক-যোগ্যতাপত্রপ্রাপ্ত বেসরকারি অর্থনৈতিক অঞ্চল-এর হালনাগাদ তথ্য

ক্র: নং	অর্থনৈতিক অঞ্চলের নাম	জমির পরিমাণ (একর)	নীতমালার অনুচ্ছেদ ৫ (২) মোতাবেক পত্রিকায় প্রকাশের তারিখ গেজেটে প্রকাশের তারিখ	প্রাক-যোগ্যতাপত্র প্রদানের তারিখ বর্ধিত সময়	ফিজিবিলিটি স্ট্যাডি রিপোর্ট অনুমোদনের তারিখ	মাস্টার প্ল্যান অনুমোদনের তারিখ	পরিবেশগত ছাড়পত্র প্রদান (EIA অনুমোদন)-এর তারিখ	মেয়াদ উত্তীর্ণের তারিখ
১	২	৩	৪	৫	৬	৭	৮	৯
১	এ কে খান বেসরকারি অর্থনৈতিক অঞ্চল জেলা: নরসিংদী উপজেলা: পলাশ মৌজা: কাজৈর ও কাজিরচর	২০০	২৬/১২/২০১৪- ১১/০১/২০১৫	১০/০২/২০১৫ ০৯/০৫/২০১৬ ০৮/১১/২০১৬	২১/০৬/২০১৬	২১/০৬/২০১৬ জমা প্রদান করা হয়েছে শংশোধনের কাজ চলছে	২০/০৪/২০১৭	০৮/১১/২০১৭
২	আরিশা বেসরকারী অর্থনৈতিক অঞ্চল জেলা: ঢাকা উপজেলা: কেরাণীগঞ্জ, সাভার মৌজা: ঘাটারচর,ওয়াশপুর, শ্যামলাপুর	৫০.৮১২১	০৫/০২/২০১৬	১৪/০৩/২০১৬ ১৪/০৩/২০১৭ ১৪/০৩/২০১৮	সংশোধিত ফিজিবিলিটি রিপোর্ট জমা দেওয়া হয়েছে		২২/০২/২০১৭	১৩/০৩/২০১৯
৩	ইউনাইটেড সিটি IT Park লি: জেলা: ঢাকা উপজলো: বাড্ডা ও ভাটারা মৌজা: সাতারকুল	২.৪৪৩২	২৬/১২/২০১৪	১৮/০৭/২০১৬	ফিজিবিলিটি রিপোর্ট জমা দেওয়া হয়েছে		EIA রিপোর্ট জমা দেওয়া হয়েছে	১৭/০৭/২০১৮
৪	বসুন্ধরা স্পেশাল ইকোনমিক জোন জেলা : ঢাকা উপজেলা: কেরাণীগঞ্জ মৌজা: কাটুরাইল	৫৬.০৮২০	২২/০৬/২০১৬ ২৩/০৬/২০১৬	২৮/০৭/২০১৬				২৭/০৭/২০১৮
৫	সোনারগাঁও ইকোনমিক জোন জেলা: নারায়নগঞ্জ উপজেলা: সোনারগাঁও মৌজা: চরভবনাথপুর ও ভাটিবন্দ	৫৫.০০৭৮	২২/০৭/২০১৬ ২৩/০৭/২০১৬	২৪/০৮/২০১৬				২৩/০৮/২০১৮
৬	আকিজ ইকোনমিক জোন জেলা: ময়মনসিংহ উপজেলা: ত্রিশাল	১০০.০০	২৮/০৭/২০১৬	২১/০৯/২০১৬	০৫/১২/২০১৮	০৫/১২/২০১৮	০২/০৪/২০১৭	২০/০৯/২০১৮

	মৌজা: খাগাতীপাড়া							
৭	কুমিল্লা ইকোনমিক জোন জেলা: কুমিল্লা উপজেলা: মেঘনা মৌজা: সোনাচর	১০২.৫৮৩০	১৪/১০/২০১৬	০৮/১২/২০১৬				০৮/১২/২০১৮
৮	হামিদ ইকোনমিক জেলা: ময়মনসিংহ উপজেলা: ত্রিশাল মৌজা: নারায়নপুর ও খাগাতীপাড়া	৫৫.৭০৭		২৬/১২/২০১৮				২৫/১২/২০১৯
৯	স্ট্যান্ডার্ড গ্লোবাল ইকোনমিক জোন লি: জেলা: মুন্সিগঞ্জ উপজেলা: গজারিয়া মৌজা: বড় বালুয়াকান্দি	১০৮.৩২৯৪		২৭/০১/২০১৯				২৬/০২/২০২০

মোট জমির পরিমাণ: লাইসেন্স প্রাপ্ত-১৮৮২.২৭৩২ একর এবং প্রাক-যোগ্যতাপত্র প্রাপ্ত-৭৩০.৯৬৪৫ একর মোট (১৮৮২.২৭৩২ + ৭৩০.৯৬৪৫)=২৬১৩.২৩৭৭ একর

15.37. Annexure 37 - Affected Plot Details

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
জেলা প্রশাসকের কার্যালয়, ভোলা।
(রাজস্ব শাখা)

স্মারক নং- ৩১.১০.০৯০০.০০৬.১৫.০০৭.১৩- ১৬৪০ তারিখ-৩০/১০/২০১৩খ্রি.

বিষয় : অর্থনৈতিক অঞ্চল প্রতিষ্ঠার জন্য প্রস্তাব প্রেরণ।

সূত্র : ১.মহোদয়ের স্মারক নং-০৩.৭৫২.০১৪.১০.০০.০৫৯.২০১৩-৯২৯ তারিখ-০৯/০৯/১৩খ্রি.
২. মহোদয়ের স্মারক নং-০৩.৭৫১.০১৪.০০.০৬.০১২.২০১২-৬০৯ তারিখ-২৬/০২/১৩খ্রি.
৩. সহকারী কমিশনার (ভূমি), ভোলা সদর এর স্মারক নং-৩১.১০.০৯১৮.০০০.৩৫.০০১.১৩-৫৭৪ তারিখ-০২/১০/২০১৩খ্রি.

উপর্যুক্ত বিষয় ও সূত্রোক্ত স্মারকের প্রেক্ষিতে মহোদয়ের সদয় অবগতির জন্য জানানো যাচ্ছে যে, ভোলা জেলায় অর্থনৈতিক অঞ্চল প্রতিষ্ঠার জন্য ১নং সূত্রোক্ত স্মারকে চাহিত তথ্যাদি সহকারী কমিশনার (ভূমি), ভোলা সদর ৩নং সূত্রোক্ত স্মারকে প্রেরণ করেছেন (কপি সংযুক্ত)। ২নং সূত্রোক্ত স্মারকের নির্দেশনামতে ভোলা সদর উপজেলার ৬৫ নং পশ্চিম চর কালী মৌজার ১২৫.৫০ একর জমির স্থলে ৩০৪.০৭ একর ব্যক্তিমালিকানাধীন জমিতে অর্থনৈতিক অঞ্চল প্রতিষ্ঠার জন্য প্রস্তাব প্রেরণ করা হয়েছে। প্রস্তাবের সাথে নক্সা, দাগ- সূচী, অধিগ্রহণের সম্ভাব্য মূল্য, মাটি ভরাটের সম্ভাব্য ব্যয়, স্থানীয় জন প্রতিনিধিদের সমর্থনের বিষয় ও যোগাযোগ সুবিধার বিষয় উল্লেখ করা হয়েছে। উক্ত প্রস্তাবের সাথে একমত পোষণ করে পরবর্তী প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য এতদসংগে প্রেরণ করা হলো।

সংযুক্ত: বর্ণনামতে ১৩(তের) ফর্দ।

(খোন্দকার মোস্তাফিজুর রহমান)
জেলা প্রশাসক
ভোলা।

সচিব (যুগ্ম- সচিব)
বাংলাদেশ অর্থনৈতিক অঞ্চল কর্তৃপক্ষ
প্রধানমন্ত্রীর কার্যালয়
বিডিবিএল ভবন,১২,কারওয়ান বাজার ঢাকা।

স্মারক নং- ৩১.১০.০৯০০.০০৬.২৬.০০১.১৩- তারিখ- /০৯/২০১৩খ্রি.

অনুলিপি সদয় অবগতির জন্য প্রেরণ করা হলো:

১. কমিশনার, বরিশাল বিভাগ, বরিশাল।

জেলা প্রশাসক
ভোলা।

20400131006100900

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

স্মারক নং-৩১ . ১০ . ০৯১৮ . ০০০ .৩৫.০০১ . ১৩- ৫৭৪ তারিখঃ- ০২ /১০/২০১৩ খ্রিঃ।

বিষয় ঃ অর্থনৈতিক অঞ্চল প্রতিষ্ঠার বিষয়ে প্রস্তাব পেরণ।

সূত্র ঃ ১। প্রধানমন্ত্রীর কার্যালয়ের স্মারক নং- ০৩.৭৫১.০১৪.০০.০৬.০১২.২০১২.৬০৯, তারিখ- ২৬/০২/২০১৩খ্রি.।

২। জেলা প্রশাসক, ভোলা মহোদয় কার্যালয়ের স্মারক নং- ৩১.১০.০৯০০.০০৬.১৫.০০৭.১৩-১১৫৯, তারিখ- ০২/০৭/২০১৩খ্রি.।

৩। জেলা প্রশাসক, ভোলা মহোদয় কার্যালয়ের স্মারক নং- ৩১.১০.০৯০০.০০৬.১৫.০০৭.১৩-১৪৯৭, তারিখ- ১৭/০৯/২০১৩খ্রি.।

উপর্যুক্ত বিষয় ও সূত্রোক্ত স্মারকের প্রেক্ষিতে মহোদয়ের সদয় অবগতির জন্য জানানো যাচ্ছে যে, ভোলা সদর উপজেলাধীন ৬৫ নং জে,এল,ভূক্ত পশ্চিম চরকালী মৌজার ব্যক্তিমালিকানাধীন ৩০৪.০৭ একর জমির উপর অর্থনৈতিক অঞ্চল প্রতিষ্ঠার লক্ষ্যে নিম্ন বর্নিত ৭টি শর্ত পূরন সাপেক্ষে প্রস্তাব প্রেরণ করা হলো।

(ক) ব্যক্তিমালিকানাধীন জমি ৩০৪.০৭ একর। প্রস্তাবিত জমি খাস নয়।

(খ) প্রস্তাবিত এলাকার ট্রেস ম্যাপ, দাগ সূচী, জমির পরিমান ভিন্ন সীটে দাখিল করা হলো।

(গ) প্রস্তাবিত এলাকার যোগাযোগ আঞ্চলিক সড়ক, নদী এবং বিদ্যুৎ সুবিধা বিদ্যমান।

(ঘ) আনুমানিক ৬৩৪৭৮০০০ ঘনফুট মাটির প্রয়োজন হতে পারে।

(ঙ) স্থানীয় জনপ্রতিনিধিগণের পূর্ন সমর্থন রয়েছে।

(চ) প্রযোজ্য নয়।

(ছ) জমি অধিগ্রহনের সম্ভাব্য মূল্য প্রায় ২২,০০০০০০০/-(বাইশ কোটি টাকা)

ইহ মহোদয়ের সদয় অবগতি ও পরবর্তী প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য প্রেরণ করা হলো।

সংযুক্তঃ সংযুক্ত- ১২ ফর্দ।

(এস,এম, ফরিদ উদ্দিন)
সহকারী কমিশনার(ভূমি)
ভোলা সদর, ভোলা।

জেলা প্রশাসক
ভোলা।

(৫৬)

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
০১	৪১১	৩৪৩	১.৯৪	১.৯৪	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
০২	৪১২	৩৪৮	০.০৫	০.০৫	নাল	ঐ	ঐ
০৩	৩৭০	৩০৮	৫.৮৭	৪.৮২	নাল	ঐ	ঐ
০৪	৪০৬	৩৪১,৪১৮	০.৯৯	০.৯৯	নাল	ঐ	ঐ
০৫	৪০৫	ঐ	১.৬৫	১.৬৪	নাল	ঐ	ঐ
০৬	৪০১	২০৪	১.৪৮	১.৪৬	নাল	ঐ	ঐ
০৭	৪০০	২০৪	১.২১	১.২০	নাল	ঐ	ঐ
০৮	৩৯৯	২০৩	১.২২	০.২০	নাল	ঐ	ঐ
০৯	৩৯৫	২০৩	১.৯০	১.৮৬	নাল	ঐ	ঐ
১০	৩৯৪	২০৩	১.৮৪	১.৮০	নাল	ঐ	ঐ
১১	৩৯৩	১১৫	১.৫৬	১.৫৪	নাল	ঐ	ঐ
১২	৩৯২	৪২৪	৬.২৫	৪.৬১	নাল	ঐ	ঐ
১৩	৩৯৬	৪৪১	১.৬৪	১.৬৪	নাল	ঐ	ঐ
১৪	৩৯৭	৪৫,৪৬	২.৬৯	২.৬৯	নাল	ঐ	ঐ
১৬	৩৯৮	১৫৪,৩৬৮	৩.২৭	৩.২৭	নাল	ঐ	ঐ
১৭	৪০২	১৫৪,৩৬৮	৩.২২	৩.২২	নাল	ঐ	ঐ
১৮	৪০৩	৬	১.২৯	১.২৯	নাল	ঐ	ঐ
১৯	৪০৪	৫	২.৯৫	২.৯৫	নাল	ঐ	ঐ
২০	৪০৭	৩৪৯	৭.৪২	৭.৪২	নাল	ঐ	ঐ
২১	৪০৮	৩৪৫	১.৩৫	১.৩৫	নাল	ঐ	ঐ
২২	৪০৯	৪০৮	০.২১	০.২১	ভিটা	ঐ	ঐ
২৩	৪১০	৪০৮	৩.০৯	৩.০৯	নাল	ঐ	ঐ
২৪	৬১১	৩৫০,৩৫১	২.৯৭	২.৯৭	নাল	ঐ	ঐ
২৫	৬১০	১১০	২.১৫	২.১৫	নাল	ঐ	ঐ
২৬	৬০১	৪০৭,৪৫৬	১.২০	১.২০	নাল	ঐ	ঐ
২৭	৬০০	৩৯	০.৪১	০.৪১	নাল	ঐ	ঐ

=৫৫.৯৭একর

চলমান পাতা-২

02/10/16

(অতনু কর্মকার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
তেঁতুলিয়া, তোলা সদর, তোলা।

02/10/16

02/10/16

02/10/16

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
২৮	৫৯৯	৪৯	০.৪৫	০.৪৫	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
২৯	৫৯৮	৩৩৬	০.৪৭	০.৪৭	নাল	ঐ	ঐ
৩০	৫৯৭	৩৩৬	০.২১	০.২১	নাল	ঐ	ঐ
৩১	৫৯৫	৩৩৫	০.০২	০.০২	নাল	ঐ	ঐ
৩২	৫৯৪	৩৩৬	০.০৯	০.০৯	ভিটা	ঐ	ঐ
৩৩	৫৯৩	৩৩৫	০.২২	০.২২	ডোবা	ঐ	ঐ
৩৪	৫৯২	৩৮০	০.১২	০.১২	নাল	ঐ	ঐ
৩৫	৫৯১	৩৮০	০.১০	০.১০	নাল	ঐ	ঐ
৩৬	৫৯০	৩৩৬	০.০৪	০.০৪	নাল	ঐ	ঐ
৩৭	৫৮৯	৩৩৬	০.১৪	০.১৪	ভিটা	ঐ	ঐ
৩৮	৫৮৮	৩৩৬	০.৩০	০.৩০	ভিটা	ঐ	ঐ
৩৯	৫৮৭	১৪৮	০.০৩	০.০৩	নাল	ঐ	ঐ
৪০	৬০২	৪০৭	০.৯৮	০.৯৮	বাগান	ঐ	ঐ
৪১	৬০৩	৪০৭	০.১২	০.১২	পুকুর পাড়	ঐ	ঐ
৪২	৬০৪	১৯৬	০.৪৮	০.৪৮	পুকুর	ঐ	ঐ
৪৩	৬০৫	৪০৭	০.২২	০.২২	পুকুর পাড়	ঐ	ঐ
৪৪	৬০৬	৪০৭	০.৪৯	০.৪৯	বাড়ী	ঐ	ঐ
৪৫	৬০৭	১১২	০.১৩	০.১৩	ভিটা	ঐ	ঐ
৪৬	৬০৮	২০৭	০.১৩	০.১৩	নাল	ঐ	ঐ
৪৭	৬০৯	১১১	০.০১	০.০১	নাল	ঐ	ঐ
৪৮	৬১২	৩৫১	০.০২	০.০২	ভিটা	ঐ	ঐ
৪৯	৬১৩	১৯৬	০.১২	০.১২	ডোবা	ঐ	ঐ
৫০	৬১৪	২০৭	০.০২	০.০২	ডোবা	ঐ	ঐ
৫১	৬১৫	২০৭	০.০৪	০.০৪	ভিটা	ঐ	ঐ
৫২	৬১৬	১১২	০.১৩	০.১৩	ভিটা	ঐ	ঐ
৫৩	৬১৭	১৯৬	০.০২	০.০২	বাড়ী	ঐ	ঐ

=৫.১০ একর

চলমান পাতা-৩

(মোঃ কামরুল ইসলাম)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
চরফ্যাশন, ভোলা সদর, ভোলা।

০২/১০/১৬

০২/১০/১৬

০২/১০/১৬

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
৫৪	৬১৮	৩৪৬	০.১৭	০.১৭	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
৫৫	৬১৯	৪০৬	০.৩৮	০.৩৮	নাল	ঐ	ঐ
৫৬	৬২০	৪০৬	০.২৯	০.২৯	খাল	ঐ	ঐ
৫৭	৬২১	৮৪	০.৮০	০.৮০	বাড়ী	ঐ	ঐ
৫৮	৬২২	১৪১	০.৩৭	০.৩৭	বাড়ী	ঐ	ঐ
৫৯	৬২৩	২২	০.২০	০.২০	বাড়ী	ঐ	ঐ
৬০	৬২৪	৬৩	০.১৪	০.১৪	ভিটা	ঐ	ঐ
৬১	৬২৫	৩৯৯	০.২৫	০.২৫	বাড়ী	ঐ	ঐ
৬২	৬২৬	৩৫১	০.০৩	০.০৩	বাগান	ঐ	ঐ
৬৩	৬২৭	৪০০	০.০৪	০.০৪	নাল	ঐ	ঐ
৬৪	৬২৮	৪০০	০.০৩	০.০৩	ডোবা	ঐ	ঐ
৬৫	৬২৯	৩৯৯	০.১০	০.১০	বাড়ী	ঐ	ঐ
৬৬	৬৩০	১৩৩	০.১০	০.১০	বাড়ী	ঐ	ঐ
৬৭	৬৩১	৩৪৫	০.০৬	০.০৬	নাল	ঐ	ঐ
৬৮	৬৩২	২৫	০.১৩	০.১৩	বাড়ী	ঐ	ঐ
৬৯	৬৩৩	৩১৫	০.২৩	০.২৩	বাড়ী	ঐ	ঐ
৭০	৬৩৪	৮৪	০.০২	০.০২	ভিটা	ঐ	ঐ
৭১	৬৩৫	৮৪	০.৭০	০.৭০	নাল	ঐ	ঐ
৭২	৬৩৬	৮৪	০.৯৬	০.৯৬	ভিটা	ঐ	ঐ
৭৩	৬৩৭	১১	০.২৬	০.২৬	বাড়ী	ঐ	ঐ
৭৪	৬৩৮	৪	০.১১	০.১১	নাল	ঐ	ঐ
৭৫	৬৩৯	৬	১.১৫	০.৩৯	নাল	ঐ	ঐ
৭৬	৬৪০	৫	২.৮২	০.৭৯	নাল	ঐ	ঐ
৭৭	৬৪১	৪০৬	০.৩০	০.৩০	বাগান	ঐ	ঐ
৭৮	৬৪২	৩৪৯	২.২১	২.২১	বাগান	ঐ	ঐ
৭৯	৬৪৩	৪০৮	১.৬৯	০.৮৬	নাল	ঐ	ঐ

=৯.৯২একর

চলমান পাতা-৪

02/10/16
(অভিনু কর্মকার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া, ভোলা সদর, ভোলা।

02/10/16
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

02/10/16
মোঃ খলিলুর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

02/10/16
(এস,এম,ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা।

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
৮০	৬৪৪	৩৫১	২.৩১	১.১৮	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
৮১	৬৪৫	১১১	১.৪৩	১.৪০	নাল	ঐ	ঐ
৮২	৬৪৮	৪০৩	০.৪৯	০.০২	নাল	ঐ	ঐ
৮৩	৬৪৯	৩৪৯	৫.৪৫	০.৬৭	নাল	ঐ	ঐ
৮৪	৬৭১	৪০৪	৫.২৩	২.৫৪	নাল	ঐ	ঐ
৮৫	৬৭২	৩৩৬	১.৪৬	০.৭৫	নাল	ঐ	ঐ
৮৬	৬৭৩	৩৩৬	১.৪২	০.৭১	নাল	ঐ	ঐ
৮৭	৬৭৪	৩৩৬	৩.১৪	১.৪২	নাল	ঐ	ঐ
৮৮	৬৭৫	৩৮২	২.৬৫	১.৩৩	নাল	ঐ	ঐ
৮৯	৬৭৬	৩৮২	২.২৭	১.৪৫	নাল	ঐ	ঐ
৯০	৬৭৭	৩৮২	১.৬৫	০.৯১	নাল	ঐ	ঐ
৯১	৬৭৮	৩৭১	২.১৫	০.৭৭	নাল	ঐ	ঐ
৯২	৩৭৯	১০,৩১০	১.৪২	০.০৪	নাল	ঐ	ঐ
৯৩	১০০২	৪১০	৩.৬৮	২.৬৮	নাল	ঐ	ঐ
৯৪	১০১২	৪০৯	০.২২	০.২০	নাল	ঐ	ঐ
৯৫	১০১৩	৪০৯	০.২৪	০.২৪	নাল	ঐ	ঐ
৯৬	১০১৪	৪০৯	০.১৯	০.১৯	নাল	ঐ	ঐ
৯৭	১০১৫	৪০৯	০.৪৮	০.৪৮	নাল	ঐ	ঐ
৯৮	১০১৬	৪০৯	০.১৩	০.১৩	নাল	ঐ	ঐ
৯৯	১০১৭	৪০৯	০.৩৩	০.৩৩	নাল	ঐ	ঐ
১০০	১০১৮	৪০৯	০.৪২	০.৪২	নাল	ঐ	ঐ
১০১	১০১৯	৪০৯	০.৫০	০.৫০	নাল	ঐ	ঐ
১০২	১০২০	৩৭	২.৫৮	২.৫৮	নাল	ঐ	ঐ
১০৩	১০২২	৩৭	১.৪৮	০.২০	নাল	ঐ	ঐ
১০৪	১০৫৫	৪১১	০.৯৭	০.৭৬	নাল	ঐ	ঐ
১০৫	১০৫৬	৪১১	০.২১	০.২১	নাল	ঐ	ঐ

=২১.৯০একর

চলমান পাতা-৫

02/10/16
(অতনু করণ্ডাই)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া, তোলা সদর, ভোলা।

02/10/16
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
তোলা সদর, তোলা।

02/10/16
মোঃ অলিউর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
তোলা সদর, তোলা।

(এস,এম,ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
তোলা সদর, তোলা।

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
১০৬	১০৫৭	৪১১	০.০২	০.০২	ডোবা	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
১০৭	১০৫৮	৪১১	০.০২	০.০২	ডোবা	ঐ	ঐ
১০৮	১০৫৯	৪১১	১.৩৫	১.৩৫	নাল	ঐ	ঐ
১০৯	১০৬০	৪১১	০.৭১	০.৭১	নাল	ঐ	ঐ
১১০	১০৬১	৪১১	০.৬৯	০.৬৯	নাল	ঐ	ঐ
১১১	১০৬২	৪১১	০.০৪	০.০৪	ডোবা	ঐ	ঐ
১১২	১০৬৩	৭৮	৩.২৭	০.৬০	নাল	ঐ	ঐ
১১৩	১০৭৫	১৬৯	৩.০০	২.২৮	নাল	ঐ	ঐ
১১৪	১০৭৬	১৬৯	১.২২	১.২২	নাল	ঐ	ঐ
১১৫	১০৭৭	১৬৯	১.৩০	১.৩০	নাল	ঐ	ঐ
১১৬	১০৭৮	১৬৯	০.৫৭	০.৫৭	নাল	ঐ	ঐ
১১৭	১০৭৯	৩১৯,৪০১	৭.২৬	১.১৪	নাল	ঐ	ঐ
১১৮	১০৮৭	১৭২	২.৯০	০.০৩	নাল	ঐ	ঐ
১১৯	১১১৩	১৬৭	০.৫০	০.৫০	নাল	ঐ	ঐ
১২০	১১১৪	১৬৭	০.৬০	০.৬০	নাল	ঐ	ঐ
১২১	১১১২	৫৭	০.৫৯	০.৫৯	নাল	ঐ	ঐ
১২২	১১১১	৫৭	০.৬৬	০.৬৪	নাল	ঐ	ঐ
১২৩	১১১০	২৮০	০.২৯	০.২৭	নাল	ঐ	ঐ
১২৪	১১০৪	১৭১	০.৫৫	০.৫১	নাল	ঐ	ঐ
১২৫	১১০৩	২২৫,২৯১, ৩২০,৪৪৭	০.৫১	০.৪৬	নাল	ঐ	ঐ
১২৬	১১০১	১৪,২৮৪	৩.০৫	২.০৫	নাল	ঐ	ঐ
১২৬	১৫৩৪	১৭০	২.১৯	১.০১	নাল	ঐ	ঐ
১২৭	১০৯৬	২৮৪	৩.০৫	০.১৫	নাল	ঐ	ঐ
১২৮	১০৯৭	২১২	১.৫৮	০.২০	নাল	ঐ	ঐ
১২৯	১০৯৮	২৩৯	১.৬০	০.২১	নাল	ঐ	ঐ
১৩০	১১০০	২২৫	৫.০২	২.৪২	নাল	ঐ	ঐ

=১৯.৫৮ একর

চলমান পাতা-৬

০২/১০/১৬
(অতনু করমাই)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া, তোলা সদর, তোলা

০২/১০/১৬
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
তোলা সদর, তোলা।

০২/১০/১৬
মোঃ ফজলুর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
তোলা সদর, তোলা।

(এস, এম, ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
তোলা সদর, তোলা

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
১৩১	১১০২	৫৭	২.৪৪	১.৬৬	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
১৩২	১১০৫	৫৭	২.৪৫	১.৯২	নাল	ঐ	ঐ
১৩৩	১১০৬	২৮১	৩.৫৩	৩.০৮	নাল	ঐ	ঐ
১৩৪	১১০৭	২৮০	১.৩৬	১.৩৬	নাল	ঐ	ঐ
১৩৫	১১০৮	১৬৭	১.৫৯	১.৫৯	নাল	ঐ	ঐ
১৩৬	১১০৯	১৬৭	২.০৩	২.০৩	নাল	ঐ	ঐ
১৩৭	১১১৫	২৮২	৩.৪০	৩.৪০	নাল	ঐ	ঐ
১৩৮	১১১৬	২৫৯	২.৭৪	২.৭৪	নাল	ঐ	ঐ
১৩৯	১১১৭	১৪৪	৩.১০	৩.১০	নাল	ঐ	ঐ
১৪০	১১১৮	১০৮	২.০২	২.০২	নাল	ঐ	ঐ
১৪১	১১১৯	২৮১	০.২২	০.২২	নাল	ঐ	ঐ
১৪২	১১২০	৫৭	০.২২	০.২২	নাল	ঐ	ঐ
১৪৩	১১২১	৫৭	০.২১	০.২১	নাল	ঐ	ঐ
১৪৪	১১২২	২৮০	০.২২	০.২২	নাল	ঐ	ঐ
১৪৫	১১২৩	৩৯১	০.৬৯	০.৬৯	নাল	ঐ	ঐ
১৪৬	১১২৪	৩৯১	২.৪৮	২.৪৮	নাল	ঐ	ঐ
১৪৭	১১২৫	২৩১	৬.৮২	৬.৮২	বাড়ী	ঐ	ঐ
১৪৮	১১২৭	৩১৪,৪০১	৪.৫৫	৪.৫৫	নাল	ঐ	ঐ
১৪৯	১১২৮	১৬৬	২.৬৪	২.৪৫	নাল	ঐ	ঐ
১৫০	১১২৯	৪০৮	১০.০৪	৯.৩০	নাল	ঐ	ঐ
১৫১	১১৩০	৪৩১	৯.৫১	৮.৪৩	নাল	ঐ	ঐ
১৫২	১১৩১	১৭৪	৫.০৯	৪.৫১	নাল	ঐ	ঐ
১৫৩	১১৩২	২৭৩	৫.১৮	৪.৫৯	নাল	ঐ	ঐ
১৫৪	১১৩৩	৩৫৮	৪.১৪	৩.৪৯	নাল	ঐ	ঐ
১৫৫	১১৩৪	৩৫৮	৪.১৬	৩.৫০	নাল	ঐ	ঐ
১৫৬	১১৩৫	২৩৮	৫.১৩	৪.৪২	নাল	ঐ	ঐ

=৭৯.০০ একর

চলমান পাতা-৭

02/10/16
(অতনু সরকার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া, ভোলা সদর, ভোলা

02/10/16
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

02/10/16
মোঃ শহিদুর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

02/10/16
(এস,এম,ফারিদ উদ্দিন)
সহকারী সহিসনার (ভূমি)
ভোলা সদর, ভোলা

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
১৫৭	১১৩৬	১৯৯	৪.০২	৪.০২	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
১৫৮	১১৩৭	১৯৯	০.০৩	০.০৩	খাল	ঐ	ঐ
১৫৯	১১৪০	১৬৮	০.০৩	০.০৩	খাল	ঐ	ঐ
১৬০	১১৪১	১৬৮	৪.০১	৩.৯২	নাল	ঐ	ঐ
১৬১	১১৪২	৩৩৭	৪.৫৯	৪.৫৯	নাল	ঐ	ঐ
১৬৪	১১৪৩	৩৩৭	০.০৩	০.০৩	খাল	ঐ	ঐ
১৬৫	১১৪৮	৩৩৭	২.৩৬	২.৩৬	নাল	ঐ	ঐ
১৬৬	১১৪৯	১৮২	০.১০	০.১০	বাড়ী	ঐ	ঐ
১৬৭	১১৫০	১৮২,২৬২	৭.৬৩	৭.৬৩	নাল	ঐ	ঐ
১৬৮	১১৫১	৫৪	০.০৬	০.০৬	ভিটা	ঐ	ঐ
১৬৯	১১৫২	৫৪	৪.১১	৪.১১	নাল	ঐ	ঐ
১৭০	১১৫৩	৫৪,১০০,২৭৯	১.২৮	১.২৮	নাল	ঐ	ঐ
১৭১	১১৫৪	২৯৩	১.৬২	১.৬২	নাল	ঐ	ঐ
১৭২	১১৫৬	২৯৩	৩.৬০	৩.৬০	নাল	ঐ	ঐ
১৭৩	১১৫৭	১০০,২৭৯	১.৫৪	১.৫৪	নাল	ঐ	ঐ
১৭৪	১১৫৮	৪২২	১.৮২	১.৮২	নাল	ঐ	ঐ
১৭৫	১১৫৯	২	০.২৫	০.২৫	হালট	ঐ	ঐ
১৭৬	১১৬০	৪০২	০.০৫	০.০৫	ভিটা	ঐ	ঐ
১৭৭	১১৬১	৪০২	৩.৫৫	৩.৫৫	নাল	ঐ	ঐ
১৭৮	১১৬২	১০৩	১.২৩	১.২৩	নাল	ঐ	ঐ
১৭৯	১১৬৩	১০৩	০.৩২	০.৩২	নাল	ঐ	ঐ
১৮০	১১৬৪	১০৩	০.০৯	০.০৯	ডোবা	ঐ	ঐ
১৮১	১১৬৫	১০২	০.০৭	০.০৭	ডোবা	ঐ	ঐ
১৮২	১১৬৬	১০২	০.৩১	০.৩১	নাল	ঐ	ঐ
১৮৩	১১৬৭	১০২	১.৪৬	১.৪৬	নাল	ঐ	ঐ
১৮৪	১১৬৮	১০২	১.০৯	১.০৯	নাল	ঐ	ঐ

=৪৫.১৬ একর

চলমান পাতা-৮

০২/১০/১৬
(অতনু কর্মকার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভদ্রিয়া, ভোলা সদর, ভোলা।

০২/১০/১৬
(মোঃ মিজানুর রহমান)
সার্কেল
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

০২/১০/১৬
(মোঃ জাকির হোসেন)
সার্কেল
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

০২/১০/১৬
(এস.এস.রফিক উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
১৮৫	১১৬৯	৮৩	০.২১	০.২১	খাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
১৮৬	১১৭০	৮৩	১.২৮	১.২৮	নাল	ঐ	ঐ
১৮৭	১১৭১	১, ১৩	০.৬৭	০.৬৭	নাল	ঐ	ঐ
১৮৮	১১৭২	১, ১৩	২.৫৬	২.৫৬	নাল	ঐ	ঐ
১৮৯	১৫৫৮	৪২২	১.৮২	১.৮২	নাল	ঐ	ঐ
১৯০	১১৭৩	২৫৮	১.৩৪	১.৩৪	নাল	ঐ	ঐ
১৯১	১১৭৪	৬১	২.৫৪	২.৫৪	নাল	ঐ	ঐ
১৯২	১১৭৫	৮৩	১.২৮	১.২৮	বাগান	ঐ	ঐ
১৯৩	১১৭৬	৮৩	১.২৬	১.২৬	বাড়ী	ঐ	ঐ
১৯৪	১১৭৭	৬	২.৫৪	২.৫৪	বাড়ী	ঐ	ঐ
১৯৫	১১৭৮	৮৩	০.৫৬	০.৫৬	বাড়ী	ঐ	ঐ
১৯৬	১১৭৯	১০২	০.৩৯	০.৩৯	বাড়ী	ঐ	ঐ
১৯৭	১১৮০	৮৩	০.০৪	০.০৪	বাড়ী	ঐ	ঐ
১৯৮	১১৮১	৮৩	০.২৫	০.২৫	বাড়ী	ঐ	ঐ
১৯৯	১১৮২	৬০	০.১৮	০.১৮	ভিটা	ঐ	ঐ
২০০	১১৮৩	৮২	০.৫৪	০.৫৪	পুকুর	ঐ	ঐ
২০১	১১৮৪	৮২	০.৫৬	০.৫৬	পুকুর পাড়	ঐ	ঐ
২০২	১১৮৫	১৩৪	১.৮১	০.৩৩	নাল	ঐ	ঐ
২০৩	১১৮৬	১৩৫	২.৮১	০.৪১	নাল	ঐ	ঐ
২০৪	১১৮৭	১৩৫	০.১৭	০.১৭	বাড়ী	ঐ	ঐ
২০৫	১১৮৮	১৩৪	০.০৬	০.০৬	ডোবা	ঐ	ঐ
২০৬	১১৮৯	১৩৪	৩.০৮	৩.০৮	নাল	ঐ	ঐ
২০৭	১১৯০	১৩৫	৫.২০	৫.২০	নাল	ঐ	ঐ
২০৮	১১৯১	৮১, ১৫১	১০.৫৮	৭.২৩	নাল	ঐ	ঐ
২০৯	১১৯৩	২৫৭	১.৪৯	০.১৫	নাল	ঐ	ঐ
২১০	১১৯৪	২৫৭	০.১৫	০.১৫	নাল	ঐ	ঐ

=৩৪.৮০ একর

চলমান পাতা-৯

02/10/16
(অতনু কুমার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া, ভোলা সদর, ভোলা

02/10/16
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

02/10/16
মোঃ খলিলুর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

(এস.এম. ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা।

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
২১১	১১৯৫	২৯৫	০.৭৮	০.১৫	নাল	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
২১২	১১৯৬	২৯৫	০.৭৫	০.১৪	নাল	ঐ	ঐ
২১৩	১১৯৭	২৯৫	০.২৫	০.২৫	বাগান	ঐ	ঐ
২১৪	১১৯৮	২৯৫	০.২২	০.২২	বাড়ী	ঐ	ঐ
২১৫	১১৯৯	২৫৭	০.৬১	০,৬১	বাড়ী	ঐ	ঐ
২১৬	১২০০	২৫৭	০.০৮	০.০৮	ভিটা	ঐ	ঐ
২১৭	১২০১	২৫৭	২.৬৮	২.৬৮	নাল	ঐ	ঐ
২১৮	১২০২	১১৪	০.৬১	০.৬১	নাল	ঐ	ঐ
২১৯	১২০৩	২৯৫	১.৭২	১.৭২	নাল	ঐ	ঐ
২২০	১২০৪	২৯৫	১.৩৫	১.৩৫	নাল	ঐ	ঐ
২২১	১২০৫	২৫৬	৩.৩১	২.০৭	নাল	ঐ	ঐ
২২২	১২০৬	২৫৬	২.৮২	১.৫৮	নাল	ঐ	ঐ
২২৩	১২০৭	৪৪১	১.৩৯	০,৪৭	নাল	ঐ	ঐ
২২৪	১২০৮	৪৫, ৪৬	২.৪৩	০.৬৮	নাল	ঐ	ঐ
২২৫	১২০৯	১৫৪, ৩৬৮	২.৪৯	০.৬৮	নাল	ঐ	ঐ
২২৬	১২১০	১৫৪, ৩৬৮	২.৪২	০.৭২	নাল	ঐ	ঐ
২২৭	১২৮৮	৩৯১	১.৫৪	০.১৩	নাল	ঐ	ঐ
২২৮	১২৮৯	৩১৪, ৪০১	১.২৭	১.০০	নাল	ঐ	ঐ
২২৯	১২৯০	৩১৪, ৪০১	১.১৯	১.১৯	নাল	ঐ	ঐ
২৩০	১২৯১	১	৩.০৯	১.৩৫	খাল	ঐ	ঐ
২৩১	১২৯২	২৩১	০.০২	০.০২	নাল	ঐ	ঐ
২৩২	১২৯৩	২২৯	০.২২	০.২২	ডোবা	ঐ	ঐ
২৩৩	১২৯৪	২২৯	০.১৩	০.১৩	বাড়ী	ঐ	ঐ
২৩৪	১২৯৫	২২৯	০.২২	০.২২	ভিটা	ঐ	ঐ
২৩৬	১২৯৬	৪১	০.৫১	০.৫১	নাল	ঐ	ঐ
২৩৬	১২৯৭	১৪৫	০.৪৫	০.৪৫	নাল	ঐ	ঐ

=১৯.২৩ একর

চলমান পাতা-১০

(অতনু সরকার)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভেদুরিয়া ভোলা সদর, ভোলা।

০২/১০/১৮
(মোঃ মিজানুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

০২/১০/১৮
মোঃ খলিলুর রহমান
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

০২/১০/১৮
(এস.এম.ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা।

ক্রমিক নং	দাগ নং	খতিয়ান নং	জমির পরিমান		শ্রেণী	মালিকানার ধরণ	বর্তমান দখল অবস্থা
			দাগের মোট জমির পরিমান(একরে)	প্রস্তাবিত জমির পরিমান			
২৩৭	১২৯৮	২	২.০০	২.০০	হালট	ব্যক্তি মালিকানাধীন	রেকর্ডীয় মালিকগন চাষাবাদ ক্রমে ভোগ দখলে আছেন।
২৩৮	১২৯৯	১৭৫	০.৯৫	০.৯৫	নাল	ঐ	ঐ
২৩৯	১৩০০	২২৯	১.৫৮	১.৫৮	নাল	ঐ	ঐ
২৪০	১৩০১	১৬৪	০.৯৭	০.৯৭	নাল	ঐ	ঐ
২৪১	১৩০২	১৪৫	০.৩২	০.৩১	নাল	ঐ	ঐ
২৪২	১৩০৩	২৮৩	০.২১	০.০১	নাল	ঐ	ঐ
২৪৩	১৩০৬	১৪৫	০.৯৪	০.০২	নাল	ঐ	ঐ
২৪৪	১৩০৫	১	০.২৫	০.১৮	নাল	ঐ	ঐ
২৪৫	১৩০৭	২২৯	০.০৭	০.০৭	নাল	ঐ	ঐ
২৪৬	১৩০৮	৫৫,৫৬,৫৮	০.০৫	০.০৫	খামার	ঐ	ঐ
২৪৭	১৩০৯	৫৫,৫৬,৫৮	২.৯৩	১.৪৫	নাল	ঐ	ঐ
২৪৮	১৩১০	১৪৫	১.৫৭	০.২৮	নাল	ঐ	ঐ
২৪৯	১৩১১	২২৯	১.৬৫	০.২৭	নাল	ঐ	ঐ
২৫০	১৩১২	১২, ৩০৫	১.৯২	০.২৩	নাল	ঐ	ঐ
২৫১	১৩১৩	৩৬৫	১.৩৮	০.১৩	নাল	ঐ	ঐ
২৫২	১৩১৪	২২৯	০.১১	০.০৫	ভিটা	ঐ	ঐ
২৫৩	১৩১৫	২২৯	২.১৩	০.০১	নাল	ঐ	ঐ
২৫৪	১২৬৪	১	২.৮২	১.৪০	নাল	ঐ	ঐ
২৫৫	১২৫৮	১৮২	২.৯৫	০.৪০	নাল	ঐ	ঐ
২৫৬	১২৫৬	৫৪, ২৯৩	১.৩৩	০.৭০	নাল	ঐ	ঐ
২৫৭	১২৫৫	২৯৩	০.০৫	০.০৫	নাল	ঐ	ঐ
২৫৮	১২৫৪	২৯৩	১.৬২	০.৩০	নাল	ঐ	ঐ
২৫৯	১২৫৩	১০০	০.৮৬	০.১৬	নাল	ঐ	ঐ
২৬০	১২৫২	৪২২	০.৮১	০.১৭	নাল	ঐ	ঐ
২৬১	১২৫১	৪০২	১.৭৮	০.৪৪	নাল	ঐ	ঐ
২৬২	১২৫০	১০৩	০.৮৪	০.১৬	নাল	ঐ	ঐ

=১২.৩৪ একর

চলমান পাতা-১১

(অতন্দ্র করণাই)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
তেঁতুলিয়া, ভোলা সদর, ভোলা

02/10/16

02/10/16

(এস, এম, ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা।

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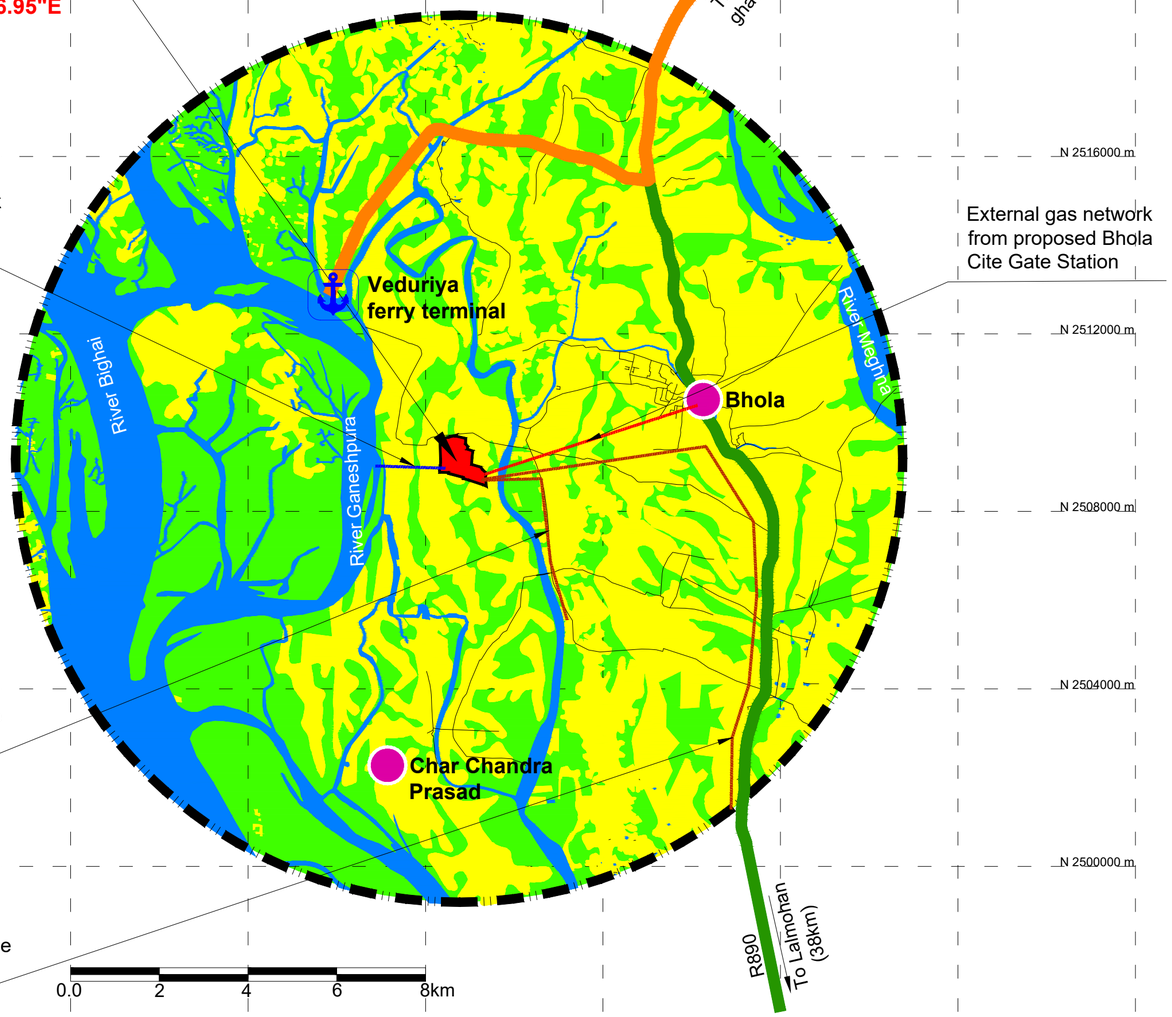
(অতনু করঞ্জাই)
ইউনিয়ন ভূমি সহকারী কর্মকর্তা
ভোলা সদর, ভোলা।

(মোঃ নিজামুর রহমান)
কানুনগো
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

(মোঃ খলিলুর রহমান)
সার্ভেয়ার
উপজেলা ভূমি অফিস
ভোলা সদর, ভোলা।

(এস.এম.ফরিদ উদ্দিন)
সহকারী কমিশনার (ভূমি)
ভোলা সদর, ভোলা।

15.38. Annexure 38 – Land Use Map



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LEGEND:

- Proposed site
- National road
- Regional road
- Other road
- 10km radius
- Agriculture
- Settlements
- Water body
- Town/village
- Ferry terminal

Project title
Development of economic zone - Bhola,Bangladesh

Drawing title
Landuse Map - Proposed external utility network

Drawing no :

Rev no :

15.39. Annexure 39 – Baseline Monitoring Report

BHOLA ECONOMIC ZONE

Environmental Baseline Report

(January, 2021)

BANGLADESH ENVIRONMENTAL ENGINEERING TRAINING & LAB SERVICES LTD.

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EXECUTIVE SUMMARY

Bangladesh has been depicting sound growth with Gross Domestic Product (GDP) growth rate ranging over 6% in the last decade. The country is taking rapid strides towards shaping up as a "developed economy" by 2041. The country aims to become efficiency driven economy in the future by focusing on efficient process and technology enablement to produce specialized products and to obviate the import dependency. For the economic development of nation of a country, investment is a crucial component that cannot be overlooked. Bangladesh has a broad market oriented economy and offers the most investor friendly regulatory regime in South Asia. The country provides trainable, enthusiastic, hardworking and competent labor force for labor intensive industries. Bangladesh is a highly populated country. Economic growth will enhance the purchasing power of that population and make the country a significantly big market. Bangladesh is endowed with abundant supply of natural gas, water, and its soil is very fertile. The Geographical location of the country is ideal for global trade with very convenient access to international sea and air route. Current government has targeted to make Bangladesh a middle income country within 2021 by creating economic zones in different investment sectors under the constitution of Bangladesh Economic Zone Authority (BEZA).

Bhola Economic Zone is such an initiatives is going to be located at Bhola district of Barisal Division. Bhola district is geographically different from other districts of Bangladesh. As a result, significant industrial development is yet to take place in this region. Lack of proper connectivity and adequate infrastructure are major constraints for industrial growth. The region is rich in agricultural production such as rice, jute, potato, chili, cucumber, watermelon etc. Thus, development of food and beverages and agro-based industries is a possibility considering the agricultural resources available in the region. The same would be delved deeper in the industry assessment chapter. There is no organized industrial set up in this district. Some of the industries operating in the region are: rice mills, garments and textile, plastic, cold storage etc.

Proposed EZ is spread across an area of 304.07 acres on private land located in Bhola Sadar Upazila, Bhola district of Barisal division. Proposed EZ is adjacent to zila road (LGED road) and it does not require a separate access. Nearest highway connectivity is Bhola-Barisal highway (N809) which is ~30 km from the proposed EZ. N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). Site co-

ordinates of the proposed Economic Zone is 22°40'25.09"N & 90°35'36.44"E. Total area of the site is 208.04 acres where Privately owned land 207.46 acres and Government Land/ Khas land is 0.54 acres. Current land use pattern of the economic zone is Agricultural with single and double cropping pattern.

Air Quality Monitoring

The condition of environmental quality in the locality of project site serves as the basis for identification, prediction and evaluation of impacts. The environmental quality was assessed through extensive field visits within the project impact zone for various components of the environment and in order to depict the existing physical environment in the project area.

The result found for ambient air quality monitoring shows concentrations of the SPM, SO_2 and NO_2 in the ambient air. From the results it is discernible that all the parameters are within the permissible limits.

Monitoring of Noise Level

Noise is an important environmental physical pollutant. A survey by the U S. Federal Council of Science and Technology has revealed that noise is a technology generated problem and that the overall loudness of environmental noise doubles every ten years in pace with our social and industrial progress. This geometric progression wise growth of noise could be mind-boggling in view of the ever-increasing pace of technological growth. Noise quality has been measured instantly on the site by Noise level meter. At each location Leq data was taken uninterruptedly for 8 hours. At the time of measurement, whenever there was an interfering effect was also recorded. According to the Department of Environment (ECR-1997), the standard for ambient noise level in the industrial zone is 75 decibels at day & 70 decibels at night. In that case all the results were found within the limit as per DoE Standards.

Monitoring of Surface & Ground Water

Water quality is one of the important indicators of the environment. Surface and Groundwater samples were collected from the stream adjacent to the proposed EZ at eastern direction and a tube well respectively to understand the baseline condition of the water quality in the study area. Major physicochemical parameters such as pH, EC and TDS, of the surface water quality were measured in-situ during the field visit while the rests were measured in the lab. For the

groundwater, water sample was collected from the tube-wells at the identified area and tested in BEETLSL Environmental Laboratory. All of the parameters of surface and ground water were found within the DoE standard.

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ABBREVIATIONS AND NOTATIONS

ASTM	:	American Society for Testing and Materials
AASHTO	:	American Association of State Highway Transportation Official
BNBC	:	Bangladesh National Building Code
API		American Petroleum Institute
B.M	:	Bench Mark
EGL	:	Existing Ground Level
F.M	:	Fineness Modulus
SBC	:	Safe Bearing Capacity
FoS	:	Factor of Safety
GWT	:	Ground Water Table
KN	:	Kilo Newton
LL	:	Liquid Limit
MN	:	Mega Newton
MPa	:	Mega Pascal
NBC	:	Net Bearing Capacity
TBM	:	Temporary Bench Mark
USCS	:	Unified Soil Classification System
UCT	:	Unconfined Compression Test
UD	:	Undisturbed Sample
Cc	:	Compression index
Cr	:	Recompression index
Cs	;	Swelling index
Cz	:	Coefficient of curvature
Cu	:	Coefficient of uniformity
cu	:	Undrained shear strength
c	:	Apparent cohesion
F	:	Silt factor
Fb	:	Unit end bearing

Fs	:	Unit skin friction
Nc	:	Bearing capacity factor
Qult	:	Ultimate load bearing capacity
Qs	:	Friction or shaft friction or side shear of the pile
Qb	:	Base or tip of the pile
qu	:	Unconfined compression strength
σ´z	:	Effective stress
σ	:	Normal stress
τ	:	Shearing stress
ε	:	Strain

1 INTRODUCTION

1.1 Project Background

Bhola Economic Zone is going to be a government approved multi-sector Economic Zone in the country. Proposed EZ is spread across an area of 304.07 acres on private land located in Bhola Sadar Upazila, Bhola district of Barisal division. Proposed EZ has no direct road connectivity to other parts of Bangladesh. It is connected to other parts of Bangladesh via Ferry and IWT. Proposed EZ is adjacent to zila road (LGED road) and it does not require a separate access. Nearest highway connectivity is Bhola-Barisal highway (N809) which is ~30 km from the proposed EZ. N809 connects the proposed EZ with Barisal (~53 km). It is further connected to Dhaka (~194 km) via Dhaka-Barisal highway (N8). Currently there is no rail network in the vicinity of the proposed EZ. The nearest seaport at Mongla is at a distance of ~206 km from the proposed EZ. Chittagong seaport is at distance of ~215 km from the proposed EZ. Barisal river port is the nearest river port which is located at a distance of ~53 km from the proposed EZ. River Ganeshpura is located at a distance of 2 km from the proposed EZ which could act as source of surface water for the proposed EZ. The groundwater depth in the region of the proposed EZ varies from 200 to 300 ft. The nearest power source is Bangla bazar sub-station (~18 km) with total capacity of 20 MvA and surplus capacity of ~4 MvA. Nearest gas station is Bhola gas station which is located at a distance of ~10 km from the proposed EZ. Utility requirements (power, water and gas) and the possible strategies to source the same would be assessed in the draft final report. BEZA may request relevant nodal agencies to extend the utility connection to the proposed EZ. Basic social infrastructure (medical, residential, and academic) are available in this region to cater to the requirements of unskilled and semi-skilled manpower. Quality social infrastructure (medical, residential, and academic facilities suitable for expats, executives and skilled human resources) is available in Barisal (~53 km) and Dhaka (~194 km). Provisions will be evaluated in the draft final report to include adequate social infrastructure facilities that could serve the needs of skilled personnel and expats working in the proposed EZ.

The proposed project is one of the environmental friendly projects. As enhancement plan, BEZA will develop a green belt in the EZ site. However to ensure the proper planning at first it is

necessary to identify the impact so baseline monitoring is essential issue. Bangladesh Environmental Engineering Training & Lab Services Ltd. (BEETLSL) project team will perform these overall baseline survey for executing the said project for Environmental Compliance of the client.

1.2 Purpose of the Report

The main purpose of this Environmental Baseline Monitoring Report is to understand the current conditions of the area, and how the project needs to be implemented considering these conditions. Second, it helps us assess and predict the possible environmental changes that could occur, once the project is underway.

1.3 Locations of the Project Areas

Proposed EZ is located in Bhola Sadar Upazila of Bhola district in Barisal division. Bhola district is one of the biggest deltas in Bangladesh. It is located in the southern part of the country and three sides of the delta is surrounded by water. Regional landscape of Bhola district indicates that the economy is primarily dependent on agriculture and aquaculture. Proposed EZ has no direct road connectivity to other parts of Bangladesh. It can be accessed only via IWT network. Proposed EZ is connected with multiple ferry ghats (such as Ilisha Ghat, Laharhat Ferry terminal, Bheduria ghat etc.) in the vicinity. This is a key feature of the proposed EZ as goods can be supplied to/ from the proposed EZ across the country through IWT network. Barisal (~53 km) is the nearest urban/industrial node from the proposed EZ which can provide steady demand and ready markets for the proposed EZ. Barisal river port is the second largest port and most important hub of steamer and motor launch services in southern Bangladesh.

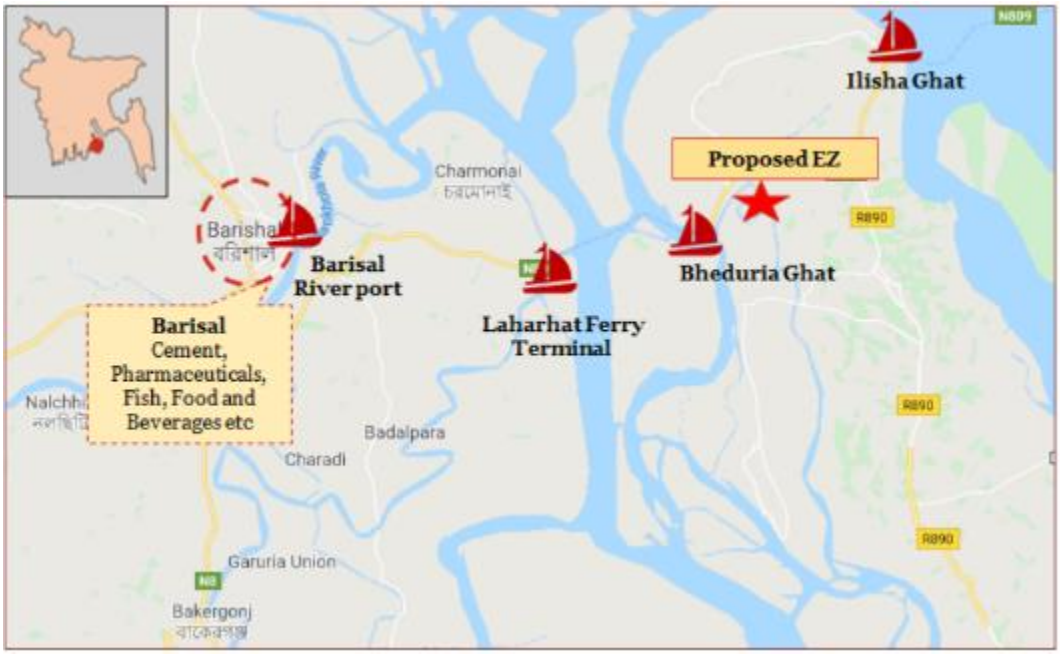

Figure 1.1: Project location

1.4 Scope of Works

BEETLSL has been engaged by PricewaterhouseCoopers Private Limited ("PwC") for preparing Environmental Baseline monitoring report of Bhola Economic Zone. A baseline study is essential in order to be able to determine the level of impact expected and to enable the monitoring of impacts after the development has occurred. According to the Technical specification, the environmental baseline report of this project includes following scope of work:

- Conducting primary monitoring for ambient air, ambient noise, groundwater and surface water as per the below scope in accordance to Bangladesh DoE, WHO, etc. guidelines;
- Baseline Monitoring report by elaborating sampling, preservation technique, transportation and analysis methodology for each and every parameters;
- The baseline monitoring report must explain results with proper inferences and compare with prevailing standards of DoE-Bangladesh, WHO, etc. and
- Photographs and GPS coordinates for all the monitoring / sampling locations must be taken and should be presented in the report.

Table 1.1: *Primary monitoring for ambient air, ambient noise, groundwater and surface water*

Environmental Component	Parameters/Activities
Air Quality	SO_2, NO_2, SPM.
Noise Measurement	(Leq) (8 hours average days and nights as per DoE requirement)
Surface Water Quality	pH, Total Dissolved Solids (TDS), EC, BOD_5 day, COD, Chlorine.
Groundwater Quality	Total Dissolved Solid (TDS), BOD_5, COD, Turbidity, Total Coliform, Fecal Coliform, Total Iron.

2 LEGISLATIVE, REGULATION AND POLICY CONSIDERATION

2.1 The Bangladesh Environment Conservation Act of 1995 (ECA, 1995)

The Bangladesh Environment Conservation Act of 1995 (ECA, 1995) is the key legislation in relation to environment protection in Bangladesh. This Act is promulgated for environment conservation, standards, development, pollution control, and abatement. It has repealed the Environment Pollution Control Ordinance of 1977. The Act has been amended in 2000, 2002, 2007 and 2010. This law governs all environmental degradation and pollution management issues including impacts management due to implementation of any development projects as well.

The main objectives of the Act are:

- Conservation and improvement of the environment; and
- Control and mitigation of pollution of the environment.

The main strategies of the Act can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- Regulations in respect of vehicles emitting smoke harmful for the environment;
- Environmental clearance;
- Regulation of the industries and other development activities' discharge permits;
- Promulgation of standards of ECR (1997) and also IFC HES standards guidelines (whichever is stringent) for quality of air, water, noise and soil for different areas for different purposes;
- Promulgation of a IFC HES thermal power plant standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines (ECR, 1997).

2.2 The Bangladesh Environment Conservation Act (Amendment), 2000 Focuses on

(1) Ascertaining responsibility for Compensation in cases of damage to ecosystems, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.

2.3 The Bangladesh Environment Conservation Act (Amendment), 2002 Elaborates on

(1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like polythene bags, (3) assistance from law enforcement agencies for environmental actions, (4) break up of punitive measures and (5) authority to try environmental cases.

2.4 The Bangladesh Environment Conservation Act (Amendment), 2010

This act introduces new rules & restriction on: a) Ensure proper management of hazardous wastes to prevent environmental pollution and Health Risk, b) No remarked water body cannot be filled up/changed; in case of national interest; it can be done after getting clearance from the respective department; and c) Emitter of any activities/incident will be bound to control emission of environmental pollutants that exceeds the existing emission standards (d) Government may declare any ecosystem as "Ecologically Critical Area(ECA)" if it appears to be degraded or expected to be degraded and take all precaution measures to protect that ecosystem. In addition, Government shall stop any ongoing activities and will not allow any new developments in the ecosystem after declaration of "Ecologically Critical Area".

2.5 The Bangladesh Environment Conservation Rules, 1997

This is the first set of rules, promulgated under the ECA, 95 (so far there have been three amendments to this set of rules – February and August 2002 and April 2003). The Environment Conservation Rules of 1997 has provided categorization of industries and Projects and identified types of environmental assessments needed against respective categories of industries or Projects.

Among other things, these rules set (i) the National Environmental Quality Standards for ambient air, various types of water, industrial effluent, emission, noise, vehicular exhaust etc., (ii) the requirement for and procedures to obtain environmental clearance, and (iii) the

requirement for IEE and EIA's according to categories of industrial and other development interventions.

2.6 Noise Pollution (Control) Rules, 2006

Noise Pollution (Control) Rules, 2006 gives the authority to all the Union Councils, Paurasabhas, City Corporations, City Development Authority (i.e. RAJUK, CDA, KDA, RDA etc.) to mark off the areas under their jurisdiction as silent, residential, mixed, commercial or industrial. They should also put signs to mark those areas. The act also describes the approved standard limit of sound in the added schedule 1 and 2. In the schedule 1, silent area means area up-to a radius of 100 meters around hospitals or educational institutions or special institutions/ establishments identified/to be identified by the government. In the silent area it is prohibited to use any kind of horns of vehicles, audio signals and loudspeakers.

2.7 The Bangladesh Water Act 2013

The Bangladesh Water Act. 2013 was passed by the Government on 6 November 2013 to ensure "integrated development, management, abstraction, distribution, use, protection and conservation of water resources". By virtue of this Act, all rights over surface water, ground water, sea water rain water and water in the atmosphere is vested on the State. Notwithstanding the above, "rights over the surface water on any private land shall remain with the owners of such land", and such right to use the water shall be subject to the provision of the Act. Furthermore, under the provisions of this Act, "right to potable water, and to water for hygiene and sanitation shall be treated as the highest priority right".

The Act makes a provision for constituting a National Water Resources Council headed by the Prime Minister. The Council is the highest decision making body and is empowered to make policies, give instructions to develop National Water Resources Plan for integrated development and safe abstraction of water and its proper use to ensure protection and conservation of water resources. The Council is also mandated to approve the National Water Resources Plan and ensure its implementation, as well as give advice to the Government to enter into agreement through signing memorandum of understanding and/or signing conventions and treaty with any Government and international or regional organization to

undertake joint survey, exchange data/information with respect to common water resources and it abstraction and development and undertaking joint measures to prevent pollution of common water resources.

The Act also makes a provision for approving national water resources plan prepared in accordance with the Water Resources Planning Act, 1992 containing among others the following matters namely:

- Analysis of economic , natural, social, political, environmental, and ecological and institutional elements, characteristics and impact of water resources;
- Integrated use of surface and ground water emphasizing the highest possible use of rain water;
- Determination of water quality standard;
- Fixation of priority of water use.

The Act also makes further provision for:

- declaration of water stress area and management thereof;
- preferential use of water in the water stress area and exemption thereof;
- fixing the lowest safe yield level of aquifer and restrictions on abstracting groundwater; and
- Protection of flood control embankment, which states “to ensure the sustainability of the flood control embankment, no person shall, without the permission of the appropriate authority, be allowed to construct any house, establishment or any other structure on, or on the slope of such embankment.”

Finally, if anybody deliberately violates or ignore the responsibility or protection under this Act, in that case, under the provisions of sub-section (2), she/he will get maximum of 5 years imprisonment or maximum Tk. 10,000 as financial punishment or both the punishments.

2.8 IFC Safeguard Policies

The International Finance Corporation (IFC) developed its Sustainability Framework in 2006, which articulates its strategic commitment to sustainable development. The IFC's Environmental and Social Performance Standards, part of the overall Sustainability Framework, have been adopted by many as an international benchmark for identifying and managing environmental and social risks within the private sector.

3 METHODOLOGY

3.1 Sampling Details

Sampling location for primary monitoring for ambient air, ambient noise, ground-water and surface water are given below:

Table 3.1: *Sampling locations for primary monitoring of ambient air, ambient noise, groundwater and surface water*

Environmental Component	Number of Sample	Geographical Location	
		Latitude	**Longitude**
Air Quality	01	22°40'10.60"N	90°35'46.42"E
Noise Measurement	01	22°40'9.97"N	90°35'39.95"E
Groundwater Quality	01	22°40'13.94"N	90°35'51.73"E
Surface Water Quality	01	22°39'59.84"N	90°36'9.16"E

Location map with sample collection point are given below:

Figure 3.1: Location map of the Sample Collection Point

Sample ware collected with following time duration:

Table 3.2: *Time Duration of Sample Collection*

Date & Time	Day Time (January 16, 2021) AM										Night Time (January 16, 2021) PM							Night Time (January 17, 2021) AM					Day Time (January 17, 2021) PM	
	08	o9	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	01	02	03	04	05	06	07
Air Quality																								
Noise Measurement																								
Groundwater Quality																								
Surface Water Quality																								

3.2 Methodology of Determining Air Quality Parameters

Ambient air sample is collected from the site using Respirable Dust Sampler Lata Envirotech APM–860 for SPM with an attachment APM 411TE to measure ambient gaseous compounds (SO2, NO2). The APM 860 system is a manual method for sampling SPM and is based on impactor designs standardized by USEPA for ambient air quality monitoring. The collected samples are analyzed as per standard procedure to determine all parameters in the BEETLSL laboratory.

3.2.1 SPM (Suspended Particulate Matter) Gravimetric Method

*Filter Preparation –Expose each filter to the light source and inspect for pinholes, particles and other imperfection. Filters with visible imperfection s hall not are used. A small brush is useful for removing particles. Equlibrate the filters in the filter conditioning environment for 24 hours. Weigh the filters to the nearest milligram; record tare and filter identification number. Do not bend or fold the filter before collection of the sample.

*Sample Collection: Open the shelter. Loosen the wing nuts, and remove the face plate from the filter holder. Install the numbered, pre-weighed, glass-fiber filter in position (rough side up). Replace the face plate without disturbing the filter and fasten securely under tightening will allow air leakage. Over tightening will damage the sponge-rubber face plate gasket. A very light application of talcum powder may be used on the sponge-rubber face-plate gasket to prevent the filter from sticking. During inclement weather the sampler may be removed to a protected area for filter change.

*Close the roof of the shelter run the sampler for about 5 minutes, connect the rotameter to the nipple on the lock of the sampler and lead the rotameter ball with rotameter in the vertical position. Estimate to the nearest whole number. If the ball is fluctuating rapidly, tap the rotameter and slowly straighten it until the ball gives a constant reading. Disconnect the rotameter from the nipple; record the initial rotameter reading and the starting time and date on the filter holder. Note – The rotameter should never be connected to the sampler except when the flow is being measured.

*Collect the sample for 24 hours and take a final rotameter reading. Record the final rotameter reading and ending time and date on the filter holder. Remove the face-plate as described above and carefully remove the filter from the holder, touching only the outer edges. Fold the filter lengthways so that only surfaces with collected particulate are in contact and place in special folder. Record on the folder the filter number. Location and any other factors, such as meteorological conditions or razing of nearby buildings that might affect the results.

3.2.2 Sulfur Dioixide (SO_2): Principle of west-geake method:

When air containing SO2 is bubbled through potassium tetrachloromercurate solution (absorbent) taken in the impinge, SO_2 forms a stable dichlorosulphitomercurate complex (DCSM).This complex is not oxidized by the oxygen of air of that remains dissolved in the absorbent containing DCSM is then treated with pararosaniline and formaldehyde to form an intense red-violet color . The intensity of this occurence is directly related to the amount of SO_2 absorbed and is measured colorimetrically by spectrophotometer .The quantity of SO_2 is then obtained from a calibration curve prepared earlier. The absorbed are relatively stable. Losses of

SO2 from the sample may occur at a rate of one percent per day at 22°C. No measurable loss is found to occur when stored at 5°C for 30 days.

3.2.3 Nitrogen Dioixide (NO_2):

Measurement of Nitrogen Dioxide in Ambient Air:

Principle: NO2 is absorbed in an alkaline solution (NaOH-sodium arsenite solution) where in it forms sodium nitrite which is quite stable. The solution is then freed of possible SO2 interference, by treatment with H2O2 and acidified. The nitrite ion reacts with sulphnilamide phosphoric acid solution to form a diazonium salt which couples with NEDA to form a deep colored azo dye. Absorbance due to this color is measured in spectrophotometer against a blank. **Analysis Procedure**:

• At the end of the stipulated sampling period note the flowmeter reading and switch off the air pump.

• Make up the exposed absorbent volume to 20 ml with distilled water to compensate for any loss of water due to evaporation during sampling.

• Transfer by pipetting 10 ml of the exposed absorbent into a test tube.Add 1.0 ml of H_2O_2 solution, 10.0 of sulphanilamide solution and 1.4 ml of NEDA with through mixing after the addition of each reagent A 10ml unexposed absorbent taken in another test tube and treated similarly serves as the reagent blank for colorimetry.

• After 10 min color development period, the absorbance/transmittance of the exposed sample is measured with a spectrophotometer at 540nm against the reagent blank, microgram of NO2 per ml is read from the calibration curve. .

Figure 3.2: Air Quality Test

3.3 Methodology of Noise Level Analysis

The noise levels were measured with the help of a portable precision digital sound level meter (Model-Sl-4033DS, made in Taiwan). The instrument calibration was achieved using manufacturer supplied pistaphone calibrator capable of producing known sound pressure level. Sampling was done to measure the Sound Level for day time and night time of the Bhola Economic Zone.

During the sampling procedure, the instruction stated in the Work Instruction **EN-N_00** was followed.

Instrument Specification is given below:

Table 3.3: *Instrument Specification for Noise Level*

Instrument Name	Resolution	Measuring Range	Accuracy
Digital Sound Level Meter	0.1 dB.	35 to 130 dB.	± 5 dB.

Figure 3.3: Noise Inspection

3.4 Methodology of Surface water quality Test:

Surface water quality parameters such as, pH, Total Dissolved Solids (TDS), EC, BOD_5, COD, Chlorine were measure among which major physicochemical properties such as pH, EC, TDS were measure in-situ during the field visit while the rests were measured in the laboratory. Values of different parameters of the surface water quality with reference to the DoE standard are given in result and discussion part. For Surface water quality test APHA22ndEDN.2012 guideline was followed.

Figure 3.4: Surface Water Sample Collection

3.5 Methodology of Ground water Quality Test:

Groundwater samples have been collected from the tube wells of the nearby community of the study area to understand the groundwater quality. The sample has been investigated from laboratory test. For Ground water quality test APHA 22nd EDN.2012 guideline was followed.

Figure 3.5: Ground Water Sample Collection

4 RESULT AND DISCUSSION:

4.1 Ambient Air Quality Monitoring Result:

Project Name	Bhola Economic Zone
Project Location	Bhola Sadar Upazila, Bhola, Barisal.
Geographical Location	22°40'10.60"N & 90°35'46.42"E
Sampling Date	January 16, 2021 (8.00 AM) to January 17, 2021 (7.59 AM)
Reporting Date	January 24, 2021
Sample Collector	BEETLSL Team

Table 4.1: *Test Result of Ambient Air Quality Analysis*

Parameter	Unit	Concentration Presentat AQ 1 (Longitude: 91.412643° Latitude: 22.783037°)	IFC Standard mg/m3	Bangladesh Standard**	Duration (hours)	Method of Analysis
SPM	µg/m^3	145	-	200	24 Hr	Gravimetric
SO_2	µg/m^3	13	125	365	24 Hr	West- Geake
NO_2	µg/m^3	25	200 (1 Hr)	NYS	24 Hr	Jacob and Hochheiser

Note:

- *The Bangladesh National Ambient Air Quality Standards have been taken from the Environmental Conservation Rules, 1997which was amended on 19thJuly 2005 vide S.R.O. No. 220-Law/2005.*
- *WHO Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank and IFC's General EHS Guidelines (2007)*

- NYS: Not Yet Standardized

Description of the Surrounding Environment

Table 4.2: *Description of the Surrounding Environment*

Location	Sample site description
Bhola Economic Zone	➢ Weather Condition: • Weather: Sunny • Temperature 21° C, • Wind: 3 km/h • Humidity: 72% ➢ Sampling site was open area. ➢ No traffic congestion were observed in there. ➢ Very low people movement was observed in there.

Comments: Air sample has been carried out by high volume dust sampler at the identified geographical location of the Bhola Economic Zone. Approved analytical methods have been applied for estimation of air pollutants. The level of concentrations of air pollutants were within the limit of Environmental Conservation Rules 1997 of Bangladesh (Amendment 2005) and IFC's General EHS Guidelines (2007).

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4.2 Noise Inspection Results:

Project Name	**Bhola Economic Zone**
Project Location	Bhola Sadar Upazila, Bhola, Barisal.
Geographical Location	22°40'9.97"N & 90°35'39.95"E
Sampling Date	January 16, 2021 (9.00 AM) to January 17, 2021 (2.00 AM)
Reporting Date	January 24, 2020
Sample Collector	BEETLSL Team

Test Method:			
The noise levels were measured with the help of a portable precision digital sound level meter (Model-Sl-4033DS, made in Taiwan). The instrument calibration was achieved using manufacturer supplied pistaphone calibrator capable of producing known sound pressure level.			
Instrument's Specifications:			
Instrument Name	Digital Sound Level Meter	Resolution	0.1 dB.
Measuring Range	35 to 130 dB.	Accuracy	± 5 dB.

Table 4.3: Inspection Result of Noise Level

Sample ID	**Sample Location**	**Land Use Category**	**Time**				**Noise Level (dBA) (LAeq)**	
			Day		**Night**		**Day**	**Night**
			Start	**End**	**Start**	**End**		
N1	Bhola Economic Zone	Industrial Zone	8.00 AM	3.59 PM	5.00 PM	12.59 AM	52.8	35.9

Noise level standard:

Bangladesh ECR - 1997Standard for	Day Time	Night Time
Industrial area	75	70
Commercial	70	60
Mixed area	60	50
Residential area	55	45
World Bank / IFC Standard	Day Time	Night Time
Industrial area	70	70
Residential; Intuitional; Educational	55	45

Notes:

- Land use category is based on the classification provided in the Noise Pollution Control Rules (2006)
- Abbreviation: NM- Noise Measurement, dB- decibel

Location	Sample site description
Bhola Economic Zone	➢ Weather Condition: • Weather: Sunny • Temperature 21° C, • Wind: 3 km/h • Humidity: 72% ➢ Sampling site was open area. ➢ No traffic congestion were observed in there. ➢ Very low people movement was observed in there.

Comments: In-situ noise levels for both day and night time have collected from the sample locations of the Bhola Economic Zone. **LAeq** data of 8 hours represent that the noise levels were found below the standard limit of Department of Environment, Govt. of Bangladesh and IFC/WB standard.

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4.3 Surface Water Quality test result

Sample Ref. No : 2021.01.SW-16	**Delivery Date : 24.01.2021**
Sample Location : Bhola Economic Zone	**Address:** Bhola Sadar Upazila, Bhola, Barisal.
Sample Collected by : BEETLSL Team	**Sampling Date : 16.01.2021**
Client Rf. No. & Date: 2021.01-BEETLSL-16; 24.01. 2021	**Geographical Location:** 22°39'59.84"N **&** 90°36'9.16"E
Name of Test :	**Physical/ Chemical/ Biological Analysis of Surface Water**

Table 4.4: Test Report of Surface Water (River Water)

SL No.	Surface Water Upstream	Concentration Present	Unit	ECR 1997 Standard for Surface Water	Methods of Analysis
1.	P^H	6.8	mg/L	6-9	APHA 22nd EDN.2012 (4500H+B)
2.	Electrical Conductivity (EC)	157	µS/cm	1200	APHA22nd EDN.2012 (2510 B)
3.	Total Dissolved Solids (TDS)	104	mg/L	2100	APHA 22nd EDN.2012 (2540C)
4.	BOD_5	14.7	mg/L	50	APHA 22nd EDN.2012 (5210 B)
5.	COD	23.1	mg/L	200	APHA 22nd EDN.2012 (5220 B)
6.	Chloride $(Cl)^-$	45	mg/L	600	APHA22nd EDN.2012 (4500 Cl^-)

Comment:

Surface water samples were collected on 16th January, 2021. The locations along with results are given in Table 4.3. The test result shows that all the tested parameters are within the national standard set by government of Bangladesh.

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4.4 Ground Water Quality test result

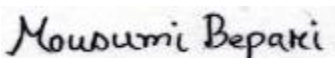
Sample Ref. No : 2021.01.DW-17	**Delivery Date :** 24.01.2021
Sample Location : Bhola Economic Zone	**Address:** Bhola Sadar Upazila, Bhola, Barisal.
Sample Collected by : BEETLSL Team	**Sampling Date :** 16.01.2021
Client Rf. No. & Date: 2021.01-BEETLSL-17; 24.01. 2021	**Geographic Location:** 22°40'13.94"N & 90°35'51.73"E
Name of Test :	**Physical/ Chemical/ Biological Analysis of Ground Water.**

Table 4.5: Test Report of Ground Water (Tubewell Water)

SL No.	Ground Water Upstream	Concentration Present	Unit	ECR 1997 Standard for Drinking Water	Methods of Analysis
1.	Total Dissolved Solids (TDS)	367	mg/L	1000	APHA22nd EDN.2012 (2540C)
2.	BOD	0.1	mg/L	0.2	APHA22nd EDN.2012 (5210 B)
3.	COD	1.1	mg/L	4	APHA22nd EDN.2012 (5220 B)
4.	Turbidity	2.6	NTU	10	APHA22nd EDN.2012 (2130 B)
5.	Total Coliform(TC)	00	CFU/100 ml	0.00	APHA22nd EDN.2012 (9222H)
6.	Fecal Coliform(FC)	00	CFU/100 ml	0.00	APHA22nd EDN.2012 (9222B)
7.	Total Iron (Fe)	0.4	mg/L	0.3-1.0	APHA22nd EDN.2012 (3500- Fe)

Comment:

Ground water samples were collected from project area on 16th January, 2020. The locations along with results are given in Table 4.4. The test result shows that all of the tested parameters are within the national standard set by government of Bangladesh.

Test Performed & Lab Report Prepared By	Test Supervised By
	
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5 INTERPRETATION

5.1 Air Quality Monitoring Report:

Particulate Matter (SPM):

Particulate matter is the general term used to describe a mixture of solid and liquid particles in air including dust, soot, smoke, and dirt. Normally SPM is partial matter less than 100 micron, Exposure of this SPM can cause respiratory morbidity, impaired lung function and irritation. It may also be carcinogenic. This pollution is sometimes referred to as “black carbon pollution”. Ambient air quality report reflects that SPM is within the standard according the Bangladesh Ambient Air Quality Standard ECR 1997, Schedule 2 so that it can be interpret that the air is good for human health and other living thing.

Gaseous Pollutant NO_2 :

Oxides of Nitrogen are a noxious gas. It’s highly reactive and formed when fuel is burned at high temperature. The main sources are motor vehicles, engine water vessel with, generator and

industrial fuel burning instruments. Nitrogen dioxide can cause respiratory problems. It can also take part in the chemical reactions in the atmosphere to form corrosive nitric acid and can also react with sunlight to form ground level ozone Long term exposure can decrease lung function, increase the risk of respiratory conditions and increases the response to allergens. Results revealed that concentration of NO_2 is within the standard of WHO Ambient Air Quality Guideline Values (2005 and 2000), which are also being referred in the World Bank and IFC's General EHS Guidelines (2007) On the other hand DoE yet not set any standard on it.

Gaseous Pollutant SO_2:

Sulfur dioxide (SOx) is a gas that is often produced in the burning of fossil fuels containing Sulphur. It can cause respiratory problems and damage vegetation. Sulfur dioxide dissolves easily in water and therefore can contribute to acid rain, once it released into the atmosphere. To know the concentration of SO_2 ambient air quality was tested. Results revealed that concentration of SO_2 is within the standard of according the Bangladesh Ambient Air Quality Standard ECR 1997, Schedule 2 so that it can be interpret that the air is good for human health, agriculture and other living thing. As well as it will not contribute to create acid rain.

5.2 Interpretation on Noise Inspection Report:

Exposure to loud noise can also cause high blood pressure, heart disease, sleep disturbances, and stress. Noise pollution also impacts the environmental health and well-being of wildlife. Study area falls on industrial area. Day time and night time data was monitored. Results revealed that noise level is within the standard of according the ECR 1997, Schedule 4 so that it can be interpret that present sound level is good for human health and other living thing. However during construction period noise level may increase.

5.3 Interpretation on Ground water Test Report:

Ground water samples were collected from project area on 09th January, 2021. The locations along with results are given in Table 4.4. The test result shows that all the tested parameters are within the national standard set by government of Bangladesh. This results indicates that ground water is not polluted with any types of pollutants and it is safe for human health.

5.4 Interpretation on Surface Water Test Report:

Surface water samples were collected on 09th January, 2021. The locations along with results are given in Table 4.3. The test result shows that all the tested parameters are within the national standard set by government of Bangladesh. This results indicates that this surface water is safe for aquatic biodiversity.

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