Final Report

Feasibility Study of Barishal(Agailjhara) Economic Zone




Bangladesh Economic Zones Authority

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DevCon Leading Today for Tomorrow

Mahindra Consulting Engineers

pwc

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List of Abbreviation

Abbreviation	Full Form
AADT	Annual average daily traffic
ADB	Asian Development Bank
AI	Artificial Intelligence
APC	Automated Process Control
API	Active Pharmaceutical Ingredient
BADC	Bangladesh Agricultural Development Corporation
BBIN	Bangladesh, Bhutan, India, Nepal
BBS	Bangladesh Bureau of Statistics
BCR	Benefit Cost Ratio
BDT	Bangladeshi Taka
BEPZA	Bangladesh Export Processing Zones Authority
BEZA	Bangladesh Economic Zones Authority
BIDA	Bangladesh Investment Development Authority
BIWTA	Bangladesh Inland Water Transport Authority
BLPA	Bangladesh Land Port Authority
BSTI	Bangladesh Standards and Testing Institution
CAGR	Compound Annual Growth Rate
CETP	Central Effluent Treatment Plant
CoD	Commercial Operational Date
CV	Curriculum Vitae
DDT	Dividend Distribution Tax
DevCon	DevConsultants
DSCR	Debt Service Coverage Ratio
EIRR	Economic Internal Rate of Return
EPF	Employee Provident Fund
EPZ	Export Processing Zones
ESIA	Environmental and Social Review
EXIM	Export and Import
EZ	Economic Zone
F&B	Food and Beverages
FCL	Full Container Load
FDI	Foreign Direct Investment
FIRR	Financial Internal Rate of Return
FMCG	Fast Moving Consumer Goods
G2G	Government to Government
GDP	Gross Domestic Product
GoB	Government of Bangladesh
GST	Goods and Services Tax
GTCL	Gas Transmission Corporation Limited

Abbreviation	Full Form
HSIA	Hazrat Shah Jalal International Airport
IBP	India Bangladesh Protocol
ICT	Information and Communications Technology
IPFF	Investment Promotion and Financing Facility
IT	Information Technology
ITC	International Trade Centre
IWT	Inland Water Transport
JICA	Japan International Cooperation Agency
JV	Joint Venture
KL	Kiloliters
KV	Kilovolt
KVA	Kilo-Volt Ampere
KwH	Kilowatt hour
LDC	Least Developed Country
LKR	Sri Lanka Rupee
LLP	Limited Liability Partnership
MACE	Mahindra Consulting Engineers Limited
MLD	Million Liters per Day
MT	Metric Ton
MVA	Mega Volt Ampere
MVA	Mega Volt Ampere
NAS	National Account Statistics
NGO	Non-Governmental Organisation
NPV	Net Present Value
NRB	Non-Resident Bangladeshi
NSSF	National Social Security Fund
O&M	Operation and Maintenance
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
PwC	PricewaterhouseCoopers
QIIP	Quantum Index of Industrial Production
R&D	Research & Development
REB	Rural Electricity Board
RMG	Readymade Garments
SERF	Shadow Exchange Rate Factor
SEZ	Special Economic Zone
SFB	Standard Factory Building
SPV	Special Purpose Vehicle

Abbreviation	Full Form
STP	Sewage Treatment Plant
SWBEC	South West Bangladesh Economic Corridor
SWRF	Shadow Wage Rate Factor
TEU	Twenty-Foot Equivalent Unit
ToR	Terms of Reference
TVET	Technical and Vocational Education and Training
UNO	Upazila Nirbahi Officer
USD	United States Dollar
VAT	Value-added Tax
WB	World Bank

1. Executive summary

Over the last few decades, Asian economies have demonstrated robust growth. This growth is owing to various country level initiatives such as easing up FDI rules, ease of doing business, creating specialized industrial corridors and manufacturing parks. Bangladesh has also demonstrated steady growth in the past. It has graduated from Least Developed Country (LDC) status and progressing towards developed nation status by 2041. With the vison of improving the economy of the country, Government of Bangladesh (GoB) has set forth aggressive plans to improve the competitiveness of this nation with respect to other economies in the region through organized industrialization. The journey of this reform commenced with the regime of export processing zones (EPZs), which was export oriented. In order to boost local supply chains and domestic manufacturers, GoB decided to move from the typical EPZ regime and envisioned setting up economic zones (EZ) instead. The advent of the EZ model is poised to nurture organized industrialization in the country, which in turn shall promote investment inflow and employment generation.

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 by 2029 spread across various locations of Bangladesh. As part of this endeavor, BEZA intend to undertake pre-feasibility studies of two economic zone at Barishal and Moheshkhali. This report captures pre-feasibility assessment of economic zone located at Barishal.

Proposed EZ is spread over an area of 329.43 acres (entirely private land) and it is located in Agailjhara Upazila, Barishal district. Proposed EZ is located at the northern boundary of the Barishal district and is surrounded by Gopalgonj district. Agailjhara – Kotalipara road (Z8031) abuts the proposed EZ on its southern side, thus alleviating the need for a separate last-mile approach road for the proposed EZ. Nearest highway connectivity for the proposed EZ is Dhaka-Barishal highway (N8) which is at a distance of ~15 km and is connected via Z8031. N8 connects the proposed EZ with Dhaka (~163 km) which includes a ferry ride from Mawa to the other side at the Korarakandi ghat (~96 km). Once Padma Bridge becomes operational, direct road connectivity to Dhaka would also be established. N8 connects the proposed EZ with Chittagong (~291 km) through Dhaka – Chittagong highway (N1) which includes a ferry ride from Elisha ferry terminal (~99 km) to Motirhat ferry terminal. The nearest rail head is at Khulna which is at a distance of around 94 km from the proposed EZ. The nearest seaport at Mongla is at a distance of ~110 km from the proposed EZ. Barishal river port is located at a distance of ~45 km from the proposed EZ.

Paysa river which is at a distance of ~2 km (aerial distance) from the proposed EZ can act as source of surface water. The groundwater depth in the region of the proposed EZ varies from 60-80 ft. The nearest power source is 33/11 kV substation (~4 km) with total capacity of 10 MVA and surplus capacity of 1 MVA. As per the discussion with Rural Electrification Board (REB) officials, it was revealed that there is a proposal for new substation (of capacity 20 MVA) adjacent to the existing facility. This can be relied as a source of power supply to meet the power requirements of the initial construction activities for proposed EZ. There is also an existing 132/33 kV grid substation located in Madaripur with a capacity of 150 MVA which is ~40 km from the proposed EZ. Nearest gas pipeline is at Burhanuddin which at a distance of ~96 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 Khulna.

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 finalize 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:

- Textile and RMG
- Light engineering equipment
- Wooden products and furniture
- Food and Beverages (Including Agro-based)
- Paper and Packaging

Desk based study in synthesis with primary survey indicates that the economy of Barishal district and the surrounding region is predominantly dependent on the agriculture and aquaculture which might act as a steady source of raw materials for establishment of food and agro-based sector. Presence of wooden products and furniture enterprises (capex investments) in the influence region indicates an existing ecosystem for the sector. Therefore, the proposed EZ can provide a conducive ecosystem for growth of industries in this sector. Proximity to Khulna could also be leveraged towards setting up of industrial units related to light engineering sector. Voice on ground also captured that the investors have certain challenges such as shortage of power, availability of gas, high utility tariffs and access to credit 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 conservative case, complete industrial space uptake would take place in 12 years. For base and aggressive cases, the same would be spread over 11 years and 9 years respectively. Corresponding to this land demand, the ultimate power and potable water demand for the proposed economic zone is 40 MVA and 4 MLD respectively (for Base case). The project would generate direct employment in the concerned area in the range of 27,882 (approximately; for Base case).

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

Table 1: Final land demand uptake at the proposed EZ

Scenarios	2026	2027	2028	2029	2030	2031
Conservative	3%	7%	13%	18%	23%	30%
Base	5%	10%	18%	25%	32%	43%
Aggressive	7%	15%	26%	37%	48%	62%

Source: Demand estimation; Statistical projection technique

Table 2: Final land demand uptake at the proposed EZ

Scenarios	2032	2033	2034	2035	2036	2037	2038 to 2045
Conservative	38%	45%	53%	66%	89%	100%	100%
Base	53%	64%	76%	94%	100%	100%	100%
Aggressive	78%	95%	100%	100%	100%	100%	100%

Source: Demand estimation; Statistical projection technique

Off-site infrastructure captures the external basic infrastructure facilities which need to be developed. Development of off-site infrastructure is the responsibility of BEZA. The major off-site infrastructure considered for the proposed EZ are Boundary wall, water supply, power supply, access road and drainage. These external infrastructure facilities and sources have been identified and well-integrated with the proposed EZ based on site

visit, data collection, stakeholder consultations with various government agencies (such as RHD, REB, and DPHE). Key recommendations formulated from this exercise are outlined below-

- Proposed site has good connectivity and is adjacent to Zila road namely Agailjhara-Kotalipara road (Z8031);
- Groundwater shall be tapped to meet the water demand during construction stage and during operation stage, River Paisarhat (located at an aerial distance of 3 km from the site) is recommended as source to meet the water requirement of EZ;
- 33/11 kV Agailjhara sub-station (located at an aerial distance of 4 km from the proposed EZ) is suggested as source of power for the project at initial stage and 132/33 kV Madaripur grid sub-station (located at an aerial distance of 40 km from the proposed EZ) as a source to meet the increased power demand in future;
- Boundary wall for a length of about 5 km has been proposed along the periphery of the EZ;
- The estimated site filling quantity is 3999467 cum and the source for site filling is the dredged sand from River Parishat;
- An administration building of 1500 sqm built-up area has been proposed in EZ; and
- The gas supply line for a length of about 32 km has been proposed to connect EZ.

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 & land parcellation plan and phasing plan. Key recommendations formulated from this exercise are outlined below-

- During zoning, entry/exits have 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;
- After zoning, internal road network has been planned based on planned entry/exit followed by sub-zoning, land parcellation, planning of utilities & amenities and phasing of proposed master plan;
- This project has been planned to be developed over 2 phases. It is proposed to develop 175.86 acres of land in phase I and 153.5 acres in phase II.
- Best practice master planning indicates that 71.67% of land area accounts for saleable area and remaining 28.33% of land area accounts for non-saleable area. Out of 71.67% total saleable area, 69.99% accounts for industrial use of targeted sector & zone-specific infrastructure and remaining 1.68% is for public and support amenities; and
- 172 plots have been earmarked in the proposed master plan for different usage out of which 165 plots are earmarked for industrial usage, 6 plots for utilities, and 1 plot for public & support amenities and administration building & customs block.

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 24 m width and collector road of 18 m width);
- It is suggested to align the feeder line from Agailjhara sub-station along the existing Zila road (Z8031) and proposed approach road. From the receiving sub-station, the internal distribution line network is aligned along the proposed road network of EZ to feed the individual plots;
- 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 individually along the roadside for plot connection has been considered individually;
- CETP have been proposed to treat the wastewater and effluent generated from EZ. The entire sewer and effluent network are 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
- It is suggested to adopt Sequencing Batch Reactor (SBR) technology for wastewater treatment.

Social Assessment of proposed Agailjhara EZ adequately addresses the land, assets, structures, livelihood, and living standard etc. issues of project affected people. The SIA identified and assess a project's social impacts that are directly related to the project and propose measures to enhance potential positive impacts and strategies to avoid, manage, mitigate or offset the predicted negative project impacts.

The socio- economic data/Information was collected using household survey; inventory of losses survey, Focus Group Discussion, and Stakeholder Consultation meetings with was affected people. The collected data was compared with the national average specially BBS.

The project area is socially and naturally very active. The proposed EZ is spread over an area of 328.51 acres which is used for Agricultural and Aqua cultural activity. A total 58 households (population 258) have been living here permanently who are mostly (83%) Hindu community and no ethnic people found. Literacy situation is excellent (85%), although no primary school or no NGO run school is existing; therefore no educational institute needs to be rehabilitated. Agriculture activity is the dominant source of employment (79.93%). Tin-made (84.2%) is the major among dwelling house structure followed by semi-pucca (5.40%). The majority 85.20 percent of household use sanitary latrine. 88.0 percent households' member drinks tube-well water. The Upazila headquarter has one hospital with 50 bed and 11 MBBS doctor and 49.6% of the households have grid electricity connection.

It is impossible to avoid the displacement. So, the permanent settlers (58 no. families) need to be resettled before land acquisition taken. Local people demand fair compensation without any delay in compensation for their lost assets like land, housing and commercial structure and trees. They also demand livelihood restoration program for economic displacement resulting from the Project.

The resettlement cost for proposed Agailjhara EZ is estimated at BDT. 2544974728.00 which will be met from government funds. The budget includes compensation for land (BDT. 2,332,592,328.00 for 328 acre) and structures at replacement cost (BDT. 450,00,000.00 for 177 nos. structure) compensation for trees (BDT.162382400), fish stock (BDT. 1000000), grants/benefits for loss of business, wage income and vulnerability (BDT. 1000000.00). The budget also kept provision extra grants for livelihood restoration BDT. 3000000.00.

Under the ECR 97, the Project is classified as a 'Category Red', requiring preparation of an IEE and EIA, along with the issuance of a Site Clearance Certificate (SCC) for which a No Objection Certificate (NOC) from the Local Authority is required, to accompany the IEE application) and an Environmental Clearance Certificate (ECC) by the DoE.

Table 3: Existing Environmental Settings of Barishal EZ

Particulars	Details
Climate	Agailjhara Upazila is situated at a tropical monsoon climate zone, with average annual precipitation of 2148 mm. The annual average temperature varies maximum 35.4 °C to minimum 12.6 °C.
Ecologically Critical Areas (ECAs)	There is no Ecologically Critical Area (ECA) and Protected Area located within and around 10Km radius of the proposed EZ site boundary.
Reserve/Protected Forests	No reserve or protected forests area was found in the study area. Even there is no national park in the project site.
Topography	The project site has a flat topography with very little relief or changes in elevation. The proposed EZ has a level difference of approximately 8 m with a gentle slope from North East to West direction towards Agailjhara – Kotalipara road with minor undulations. The natural slope of ground is advantageous for gravity network of water supply, sewer and storm water drains.
Major Soil Type	The general soil type of the project site is Non-calcareous Dark Grey Flood Plain soils. The majority of these soils are Eutric Gleysols. The soil layer is acidic in character and the pH ranges from 7 to 8.5.

Major crops	The major crops of the project area are, jute, mustard seed, Rice, Potato, Banana etc.
Flooding	Project area is not flood prone. But the project area is affected, though infrequently, by internal and external flood. External floods are caused in the low area by overflow of sorrowing River and khal, while internal floods are caused by storm water due to rainfall and insufficient drainage facilities.
Seismicity	Agailjhara area falls in the Seismic Zone-I is mostly classified as low risk zone and the earthquake coefficient is 0.12 for this zone. No major earthquake has been reported in the Project area in recent years or recent past.
Land use	87 % of the Project corridor is used for agricultural purposes. The local resident's covers 7%, and water bodies 6%.
Air Quality	None of the test results at all sampling station exceeded the DoE acceptable limits.
Noise level	None of the test results at all sampling station exceeded the DoE acceptable limits.
Water Quality	The water quality results indicate that water quality condition is suitable for Fisheries, irrigation and agricultural use.
Drainage pattern	The site lies on the east side of river Paisarhat. In general, the flow of the surrounding area will be towards the river.
Biodiversity	In total 77 species of terrestrial and aquatic plants, 5 species of amphibians, 21 species of reptiles, 24 species of mammals and birds 103, 41 fishes have been identified from field survey and secondary data And the project command area is not the specific habitat for any particular species of flora and fauna hence none such species will be specifically affected due to project implementation.
Socioeconomic Conditions	The population density per square kilometer is 961 and literacy rate is 62.9%. 50% of total population depend on agricultural activities while about 39% depend on industry and the rest is on service.

During the site visit, various environmental sensitive features were identified which may potentially be impacted by the project at various stages. Consultations were also held with people in the locality including those presently living in and around the Project areas, local government authorities, schoolteacher, nearby residents, etc. Outcome of these consultations were used in impact assessment and devising mitigation measures.

In terms of physical environment, most of the impacts are controlled and limited in and around the Project area. The key negative impacts such as dredging, dust generation, noise from vehicles and machinery and sanitary and domestic waste generation are some of the impacts to be caused during the pre-construction and construction stages. Implementation of the mitigation measures, including fencing, water spraying, turning off un-used machinery/vehicles, greenbelt development, waste segregation and site-specific waste dumping would reduce these impacts. However, the major impacts would occur during the operation phase, generation of SOx, NOx, CO, CO2 and SPM and contamination of surface and ground water are of high possibility. Implementation of the mitigation measures suggested in this report would reduce these impacts.

In terms of health and safety, some impacts on occupational/community health and safety and increase in number of accidents are expected. However, implementation of appropriate mitigation, such as to manage working conditions during the construction work and to provide security and maintain safety prevention measures during construction/operation phase will minimize these impacts.

In terms of social environment, the proposed EZ will cause displacement of titleholders and squatters and impose adverse impacts on their assets and livelihoods. On the other hand, some positive impacts of the Project such as increase in job opportunity and improvement of social infrastructure are also expected.

In consideration of the result of the environmental assessments study for the Project, adequate mitigation measures to reduce the negative impacts and Environmental Monitoring Plan (EMoP) are proposed along with indicated cost of EMP implementation for each phase of the Project: Pre-Construction Phase, Construction/Closing Phase, and Operation Phase, which should be implemented at every suggested step of EZ construction and operation.

Considering the sensitivity of the proposed site, it can be said that overall the impacts from preconstruction, construction and operation phase will have quite detrimental impacts to the surrounding environment. Many of the impacts are possibly irremediable in nature and can't be replenished. A thorough EIA/EMP study needs to be conducted.

The recommendations made for the project development on the basis of Environmental and Social Review study are given below:

- A detailed Environmental and Social impact assessment should be carried out by BEZA prior to any site preparation/construction activity and prior environment clearance certificate from DoE, Bangladesh should be taken.
- Construction activities for the development of project should be started after obtaining environment clearance certificate from DoE, Bangladesh.
- Environment management plan should be implemented strictly during preconstruction, construction and operation phase of the project.
- Green area development should be carried out.
- Proper training of maintaining environment, health and safety should be given to Project management unit in preconstruction, construction and operation phase.
- Provision of garland drain, thick green belt, ETP, STP, segregated storm water should be adhered to.
- Environmental monitoring should be conducted as suggested in environment management plan.

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.

Where BEZA plays the role of the developer of the project, it bears the responsibility of land acquisition and construction of both off-site and on-site infrastructure of the project. In this scenario, BEZA being the apex authority of industrial development in the country could opt for concessional borrowing from various multilaterals in order to fund the project. Analysis of the various scenarios reveals the following. In case of Business as Usual scenario, with BEZA charging prevalent tariffs (land tariffs prevalent in Jamalpur EZ – 1), the project fails to generate healthy returns. The project can fetch highest return of 14.73% in base case if BEZA is developer, when both the off-site and on-site infrastructure is being developed by nodal agencies.

Tariff plan B (Increased tariff rates) increases the project financial returns across options substantially but the returns are still below the bankable threshold (i.e.< 13% to 14%) where offsite and onsite infrastructure are being developed by the concerned nodal agencies.

Project returns are not attractive for the PPP model even when BEZA decides to extend certain fiscal stimuli to the PPP developer in form of Waiver on the pay-outs and Any nature of grant through VGF/ annuity.

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

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 25.3%, which indicates that the project is 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 Agailjhara, Barishal 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, which calls for re-evaluation. Moreover, lack of ready-made social infrastructure in proximity to EZ could act as a hindrance 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.

2. Introduction

The objective of this chapter is to establish the background and the necessity of the economic zone regime in Bangladesh. Further, the chapter delves deeper to lay out the project timelines, team deployed and a brief description of the proposed EZ location and the existing transport and utility infrastructure prevalent at the site.

2.1. Emergence of Economic Zones in Bangladesh Context

Over the last few decades, Asian economies have been witnessing robust growth and gradually shaping up as the engines of economic activity. South Asian nations such as Vietnam, Thailand, Indonesia and Malaysia have been creating their place in the global map by various proponents of economic proliferation such as easing up FDI rules, increased ease of doing business, and creating specialized industrial corridors and manufacturing parks. Bangladesh has also demonstrated steady growth in the past. With constant price Gross Domestic Product (GDP) growth rate ranging over 6% in the last decade, the country has graduated from Least Developed Country (LDC) status. Bangladesh is gradually progressing to achieve middle-income economy status by 2021 and developed nation status by 2041. With the vison of improving the economy of the country and generating livelihood for the burgeoning populace, Government of Bangladesh (GoB) has also ushered in the era of organized industrialization by following the footsteps of other South Asian economies.

GoB has laid down an aggressive plan to boost the competitiveness of the nation with respect to other economies in the region through organized industrialization. The journey of this reform commenced with the regime of export processing zones (EPZs) – an institutional change in the approach to organized manufacturing. Advent of EPZ regime coupled with the cost-friendly pool of human resources positioned Bangladesh in the global map as the hub of readymade garments (RMG). EPZ regime also fostered foreign investment in the country especially in textile and RMG sector.

With time, the government decided to move from the typical EPZ regime and envisioned setting up economic zones (EZ) instead. The motive behind this shift was the inclusive nature of EZs that would promote inclusion of local supply chains and domestic manufacturers, thus enabling a deeper rooted and inclusive growth for the economy in general.

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.

2.2. Background of the Project

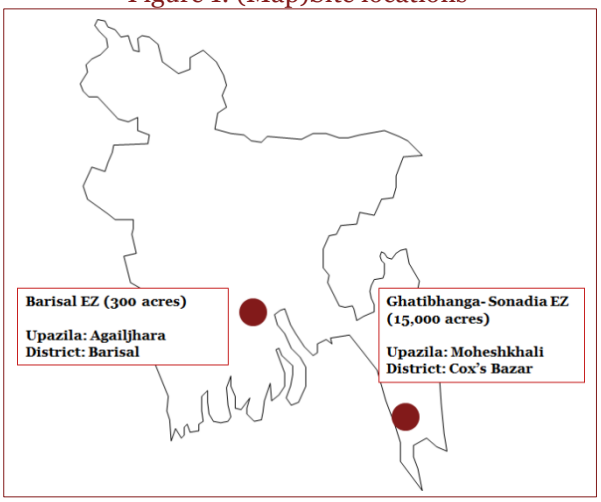
In line with this aspiring growth agenda, BEZA has envisaged development of two prospective locations as economic zones.

- Barishal (Agailjhara) spread over 328.51 acres
- Moheshkhali SEZ (Ghatibanga – Sonadia) spread over 15,000 acres

BEZA has engaged the Joint Venture (JV) of DevConsultants Limited, Bangladesh (DevCon) and Mahindra Consulting Engineers Limited, India (MACE) in association with PricewaterhouseCoopers Private Limited (PwC) to undertake feasibility study of these proposed EZs.

In the inception meeting dated 25th April, it was concluded that since the exact demarcation of Ghatibanga proposed EZ is not available the consultants shall undertake feasibility study of Sonadia proposed EZ instead. Further, BEZA shall explore the possibility for feasibility study of Ghatibanga proposed EZ as an enhancement to the existing contract.

Figure 1: (Map)Site locations



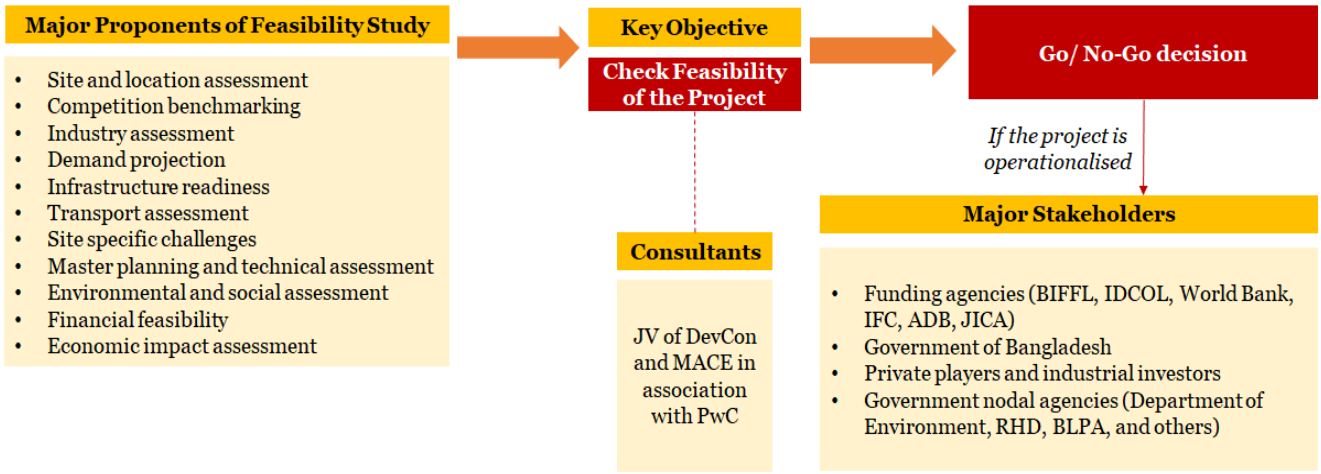
Source: PwC Analysis

This report captures the feasibility assessment of the proposed EZ at Agailjhara, Barishal.

2.3. Objectives of the Project

BEZA has identified the proposed EZ at Barishal for setting up of manufacturing based economic zone. There is a need of critically examining this site on various techno-commercial parameters to assess the feasibility of establishing economic zones. The plan of setting up the infrastructure for industrial support involves considerable amount of capex and interplay of various stakeholders from the private and public domains.

Figure 2: Key objective of the project



Source: PwC Analysis

Feasibility analysis of the proposed project would essentially encompass a holistic assessment of this proposed EZ from an industry attractiveness perspective, commercial diligence, infrastructure readiness, site intrinsic challenges, master planning, environmental and social review aspects, cost implications, and the financial/ economic impact assessment. This analysis would help BEZA to take a go/no-go decision on operationalizing these two proposed EZs. Findings from this study shall also help BEZA in coordinating with the funding agencies, private players and various nodal agencies (such as but not limited to the transport and utility departments) in Bangladesh while operationalizing this proposed EZ.

2.4. Overview of the Team of Experts

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

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 3: Team of Experts

Source: Proposal submitted to BEZA dated 6 May 2018

2.5. Project Timelines

In conformance to this project's Terms of Reference (ToR), following deliverables will be submitted to BEZA as per the schedule laid out in the following table.

Table 3: Project timelines

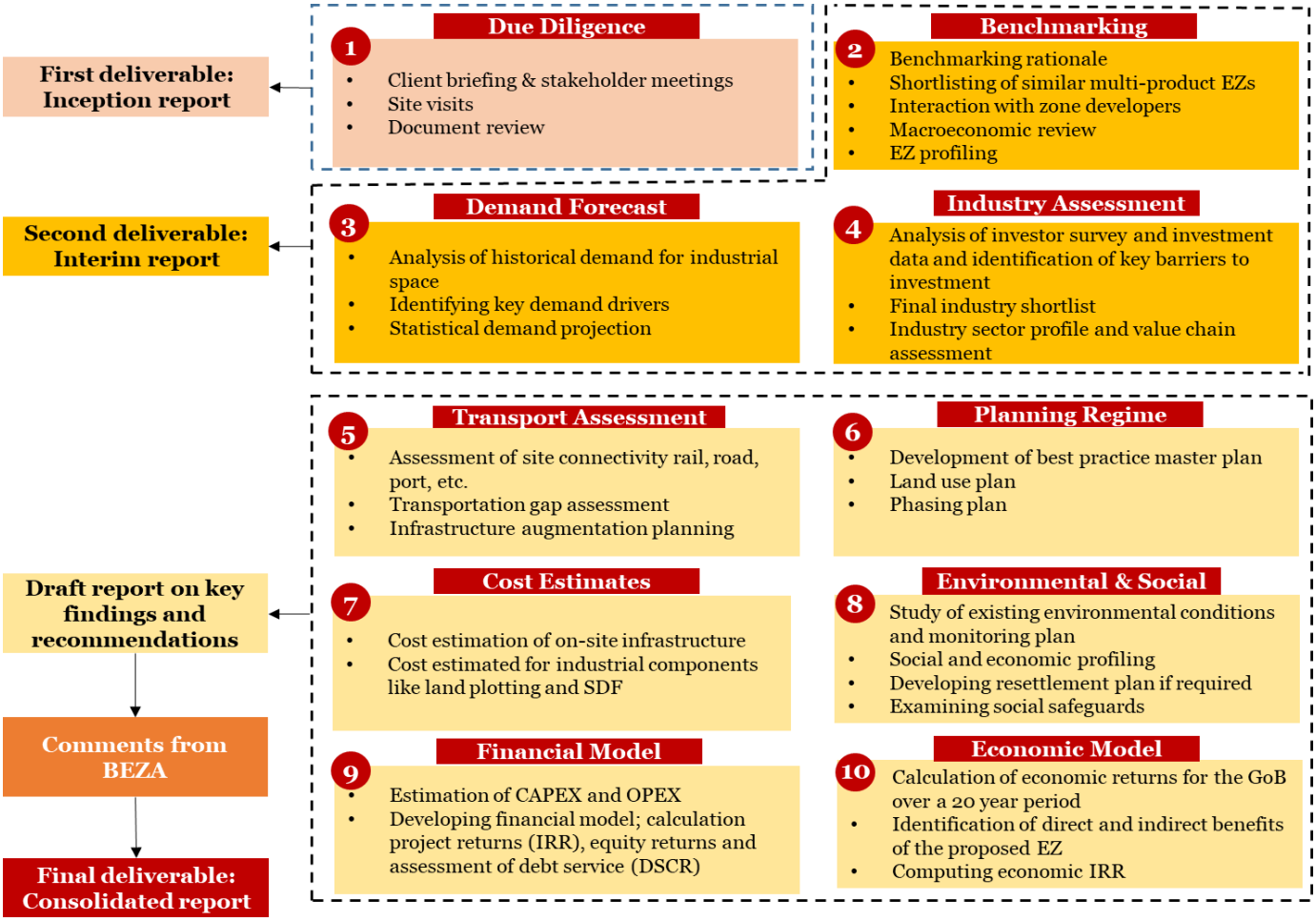
D1	Inception report	At 15-day milestone	Submitted
D2	Draft interim report	At 3 months' milestone	Submitted
	Presentation workshop to discuss findings of the interim report		Submitted
	Final interim report		
D3	Draft final feasibility report	At 6 months' milestone	Submitted
	Presentation workshop to discuss findings of the draft final report		
D4	Final feasibility report		
	Deliverable submitted		
	Deliverable to be submitted		

Source: Contract agreement executed between DevCon and BEZA dated 27 February 2019

2.6. Outline of the ToR for this Project

Following figure captures the brief outline of the ToR for this project in line with the contract agreement executed between DevCon and BEZA dated 27 February 2019

Figure 4: Brief outline of the ToR



Source: Contract agreement executed between DevCon and BEZA dated 27 February 2019

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

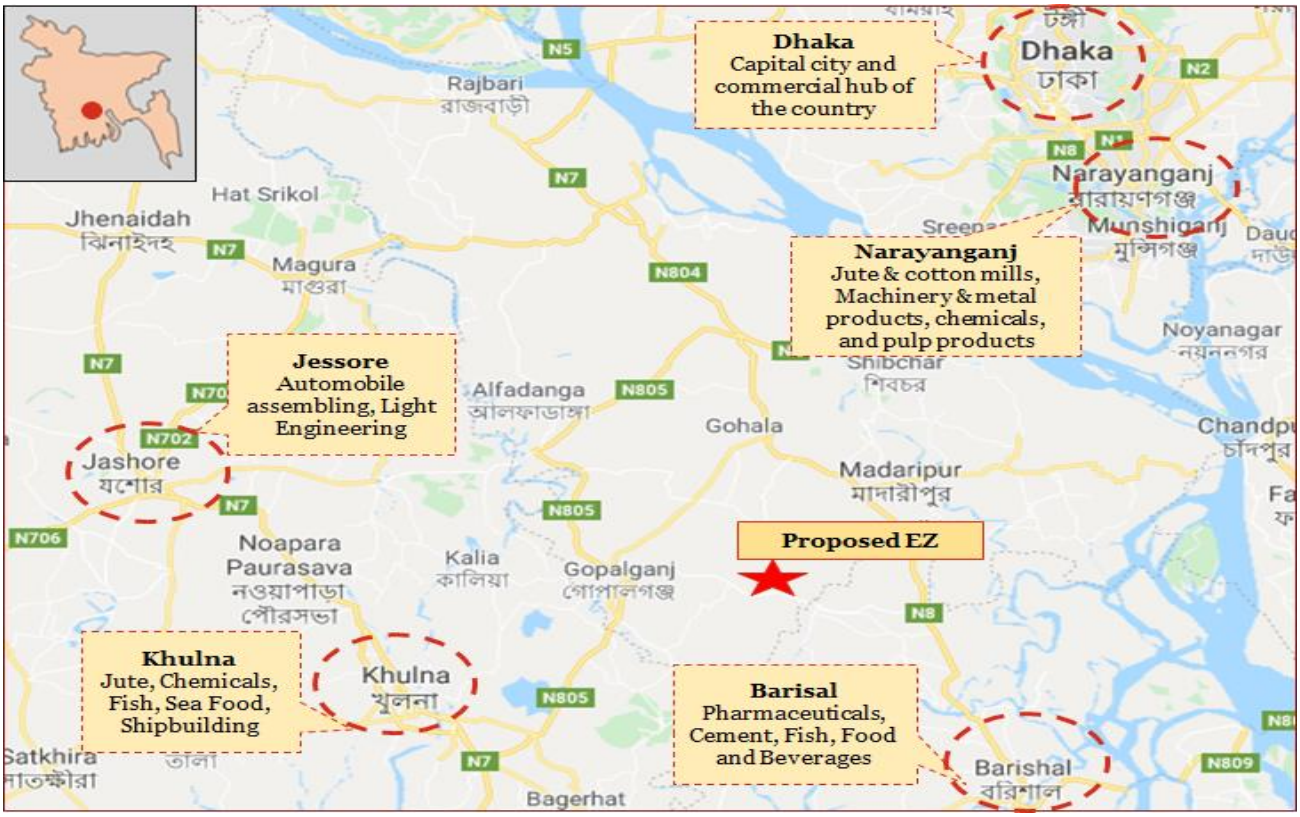
This chapter aims at assessing the key features of the proposed EZ to evaluate its adequacy to shape up as a prospective EZ location based on the above-mentioned aspects. This analysis is based on the information obtained through initial site reconnaissance and stakeholder consultation with various government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

3.1. Location of the Proposed EZ

Proposed EZ is located in Agailjhara Upazila of Barishal district in Barishal division. Regional landscape of Barishal district indicates that the economy of Barishal district is primarily dependent on agriculture. The district houses Barishal river port which is the second largest and busiest river port in the country. Located in the South-Western part of the country, the proposed EZ lacks direct connectivity with Dhaka, capital city. **Once Padma Bridge (~100 km from the proposed EZ) is operational, direct road connectivity would be established and travel time would reduce significantly.**

There are three important industrial/ urban clusters (Khulna, Jessore, and Barishal) located within a radius of 100 km from the proposed EZ and the most important industrial/ urban cluster of the country (i.e. Dhaka, Gazipur, and Narayanganj) is located at a radius of approximately 150 km from the proposed EZ. These nodes can act as the immediate market for the proposed EZ and may facilitate in establishing industrial linkages.

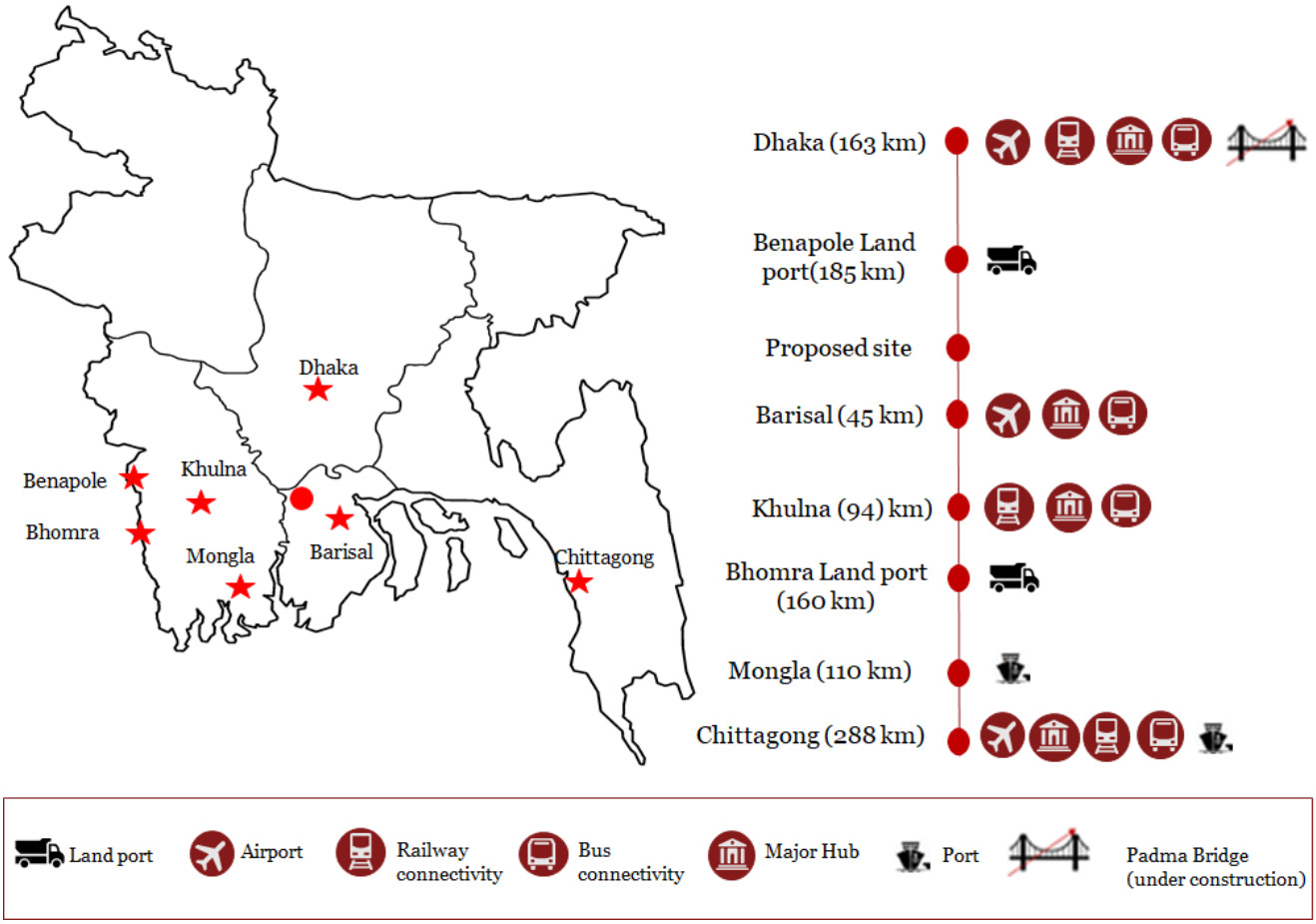
Figure 5: Location of the Proposed EZ and the Industrial/Urban clusters



Source: Google Maps and PwC Research

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

Figure 6: Urban/ industrial nodes and EXIM gateways with respect to the proposed EZ



Source: Google Maps and PwC Research

3.2. Context of the Region Surrounding Proposed EZ

As mentioned earlier, **the economy of Barishal district is primarily dependent on Agriculture.** Barishal is major rice producing center of Bangladesh. Major crops produced in this district are paddy, jute, oil seeds, betel leaf, onion, sugarcane etc. In addition to crops, various fruits such as mango, jackfruit, banana, litchi, black berry, guava etc are grown in this district. Fish is produced in abundance in this district. The region is famous for Hilsa fish and is one of the major exports from this district.

Besides involvement in the primary sectors, local populace is also involved in small-scale cottage industries and medium to large industrial units. The major industries in the region are cement, pharmaceuticals industry, food and beverages, flourmill, oil mill, cold storage factory, rice mill, jute mill, textile mill etc.

Industrial regions in the proximity to the district include:

i) Khulna district (jute, chemicals, fish, seafoods, shipbuilding etc.)

ii) Jessore district (automobile assembling, light engineering 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, site location and demarcation details have been reconfirmed.

Table 4: Site Description

Parameters	Details
Site co-ordinates	22°57´58.80´´ N - 22°59´1.22´´ N & 90°05´38.20´´ E - 90°06´22.62´´ E
Site boundaries on East	Agricultural land (single and double cropping)
Site boundaries on West	Agricultural (single and double cropping) and Aqua cultural land
Site boundaries on North	Agricultural (single and double cropping) and Aqua cultural land
Site boundaries on South	Agailjhara – Kotalipara road (Z8031)
Total area of the site	329.43 Acres
Land ownership details	Privately owned
Government land	Nil (as per details obtained from UNO Office)
Private land	329.43 Acres (as per details obtained from UNO Office)
Current land use pattern	Agriculture (single and double cropping) and Aqua culture
Resettlement within the site	There are settlements within the proposed EZ. Details of the same and resettlement and rehabilitation related details have been captured in the Social Review chapter
Nearest administrative node/ town	Barishal
Expansion potential	• East: May be possible as agricultural land (single and double cropping) is located • West: May be possible as agricultural (single and double cropping) and aqua cultural land is located • North: May be possible as agricultural (single and double cropping) and aqua cultural land is located • South: Not possible as Agailjhara – Kotalipara road (Z8031) abuts the site Hence expansion potential of the proposed EZ is limited towards the east, west and north sides. Moreover, discussions with UNO officials revealed that most of these lands are privately owned with some settlements on them. However, expansion is subjected to land survey, and rehabilitation & resettlement study.
Site surrounding features	• Paysa river ~2 km aerial distance • Several small and medium scale industries are operating in this region (in the vicinity of the proposed EZ). Some industries operating in this region are: Cottage industries, furniture, fish export, rice mills, wheat mills, oil mills etc.

Source: Information collected during site visit

Since the land parcel designated for the proposed EZ is privately owned, thus significant cost and time would be consumed for land acquisition activities. Details of the same have been captured in the relevant chapters in this report.

Following figure elucidates the site boundary of the proposed EZ.

Figure 7: Site boundary of the proposed EZ

Source: MACE analysis

3.4. Access to Transport Network

Any location to be shape up as a potential EZ requires access to multimodal connectivity. To enable seamless logistics, access to multimodal connectivity is crucial. Figure in the next page depicts the site location in light of the major trade gateways, industrial nodes and transport infrastructure of the country.

Table 5: Assessment of Transport infrastructure

	**Highway connectivity**	• Nearest highway connectivity is Dhaka-Mawa Highway (N8) (~15 km). N8 connects the proposed EZ with Dhaka (~163 km) which includes a ferry ride from Kaorakandi ferry ghat (~96 km) to Mawa ghat. • Once the Padma bridge is operational, direct road access would be established between the proposed EZ and major consumer hub, Dhaka. • N8 connects the proposed EZ with Chittagong (~291 km) through Dhaka – Chittagong highway (N1). This route includes a ferry ride from Elisha ferry terminal (~99 km) to Motirhat ferry terminal.
	**Last mile connectivity with nearest highway**	• Proposed EZ is connected to Agailjhara upazila by Agailjhara-Kotalipara road (Z8031) which provides last mile connectivity to the site. It is a two-lane bituminous road maintained by RHD. There is no requirement for a separate approach road for the proposed EZ as it is located immediately adjacent to this road. • It merges into N8 (Z8031) at ~15 km from the proposed EZ • Adequacy of this road to cater to the increased traffic movement and the possibility of widening (once this EZ is operational) has been evaluated in the transport assessment section.
	**Rail connectivity**	• Khulna railway station (approx. 94 km) is the nearest railway station to the proposed EZ. It is a junction station with cargo handling facility. • It can be accessed by Gaurnadi-Kotalipara-Gopalgonj highway and Dhaka-Khulna highway (N7) • Khulna railway station is connected to Rajshahi, Dhaka, Jessore, Benapole and Kolkata.
	**Air connectivity**	• Barishal airport (~45 km) is the nearest domestic airport. Agailjhara – Kotalipara road (Z8031) and N8. • Hazrat Shah Jalal International Airport (~163 km) at Dhaka is the nearest international airport to the proposed EZ. This airport can be accessed via Agailjhara – Kotalipara road (Z8031) and N8.
	**Sea Port and IWT connectivity**	• There is no prevailing IWT connectivity; nearest river port is at Barishal (~45 km) and is accessible via Z8031 and N8. Barishal river port is the second largest river port of the country; however, the transport of cargo is still limited to use by the Government departments and some private entities. • Mongla Sea Port (~110 km) is the nearest seaport to the proposed EZ. It is connected to the proposed EZ through a combination of Z8031, Gaurnadi – Kotalipara – Gopalgonj highway, Gopalgonj – Khulna highway (N805) and Khulna – Mongla highway (N7). Due to low draft at Mongla port only feeder vessels can berth at the port resulting in

		increased turnaround time for vessels. This can challenge movement of goods through this trade gateway. • Access to Chittagong seaport (~288 km) is through Z8031, N8, and further through N1. This route includes a ferry ride from Elisha ferry terminal (~**99** km) to Motirhat ferry terminal. • There is an upcoming seaport at Payra (~148 km). It can be accessed via, Z8031, N8 and Dhaka-Kuakata road (R881).
	Land Port Connectivity	• Bhomra land port is the nearest land port from the proposed EZ located at a distance of ~160 km in Satkhira district. It can be accessed via Z8031, Dhaka – Khulna Highway (N805), Khulna City Bypass (N709), and Khulna – Satkhira road (R760) • Benapole land port (approx. 185 km) is another major land port on the South-western border of Bangladesh. Access to Benapole takes place through Z8031, Khulna-Jessore Highway and Jessore-Benapole Highway • This provides an opportunity for the proposed EZ to participate in 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 6: Assessment of Utility linkages

	Power availability	• During preliminary site assessment, it was observed the nearest 33/11 KV substation to the proposed EZ is at a distance of ~4 km • This sub-station has a total capacity of 10 MVA and surplus power available is 1 MVA • Discussion with the officials at the Rural Electrification Board (REB) revealed that there is a proposal to build a new substation (of capacity 20 MVA) adjacent to the existing facility. This new substation is planned to provide industrial power connection in this region • Once operational, this can be relied as a source of power to meet the power requirements of the initial construction activities (approx. 4 MVA) for proposed EZ. • There is also an existing 132/33 kV grid substation located in Madaripur with a capacity of 150 MVA which is ~30 km from the proposed EZ • Total power demand during operation stage is around 36 MVA.

Water availability	• Paysa river (aerial distance of 2 km) is a perennial river which can act as surface water source for the proposed EZ. • Groundwater depth in the area surrounding the proposed EZ varies from 60 to 80 ft. • Estimated water demand is approx. 13 MLD
Gas availability	• Presently, there is no gas source or gas supply near to the proposed EZ. Nearest gas pipeline is in Burhanuddin (~96 km). • GoB is undertaking a project to install 6.15 km long, 30-inch diameter gas pipeline over Padma River Bridge to west and south-west Bangladesh. It also intends to import LNG from Payra port and transmit the same to the nation grid of Bangladesh. It is envisaged that these projects would be implemented in the coming five years. • These projects may ensure availability of gas in Agailjhara.
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.

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 Barishal district.

Table 7: Prevailing Social infrastructure

Educational facilities	• There are over 113 schools (primary, secondary) and 15 colleges in Agailjhara upazila. • Good quality educational facilities are not available in this upazila. Khulna, Barishal and Jessore house good standard educational facilities. • There is a total of 23 Technical and Vocational Education and Training (TVET) institutes operational in the Barishal 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 Health Complex (Capacity of 50 bed), 5 Family Welfare Centers, 8 diagnostic centers, and 3 private clinics at Agailjhara Upazila. • There are 9 upazila health complex, 7 private hospitals, 88 union health, 50 family welfare centers, 9 missionary hospitals, and 81

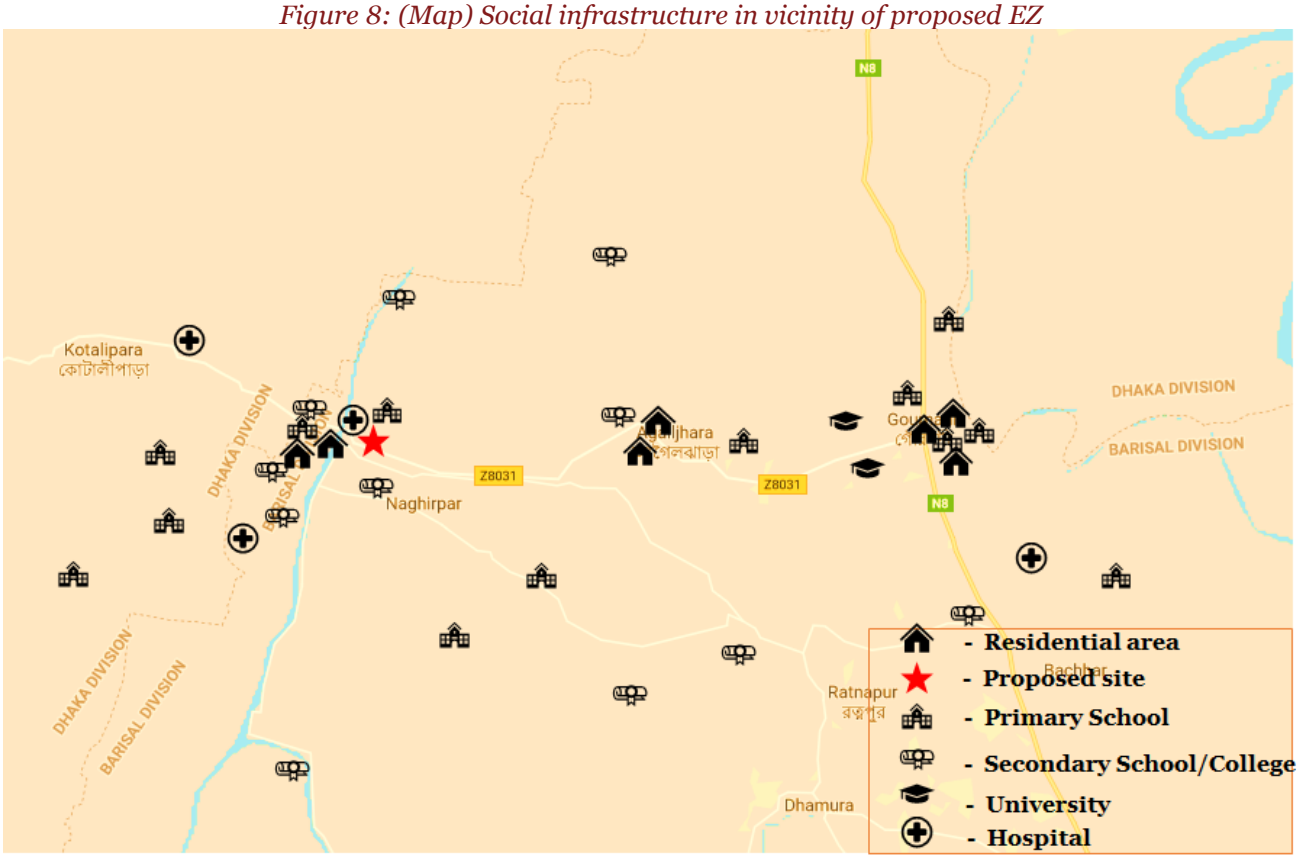
	private clinics in Barishal district. There is also a medical college in Barishal district. • Basic healthcare facilities are available in these medical units however state of the art medical facilities can be availed in Khulna which also has a prominent medical college.

Source: Site visits and PwC Research

Residential Facilities:

Basic residential facilities are available in Agailjhara Upazila. Basis primary site visit and discussion with the local residents, it was informed that residential requirements of unskilled and semi-skilled workforce employed in the proposed EZ are available in the surrounding region.

Figure 8: (Map) Social infrastructure in vicinity of proposed EZ



Source: Google maps and Site visits

3.6.1. *Voice on Ground about the Location*

During our site visits, voice on ground has been recorded which captures the opinion formed by local (Manikgonj and regional level) and national (Bangladesh level) investors/ other stakeholders about the locational attributes of the proposed EZ.

National Medical gas manufacturer	"The land notified for the proposed EZ is entirely private land. This might lead to acquisition issues and increase cost of the project."
Local Govt. stakeholder	"Agailjhara already has some traction in terms of industrialization due to its proximity to Barishal. The proposed EZ could further act as a catalyst in bringing more industries to the area"

National Agro based industry player	"The area suffers from frequent power outages which hampers production process. In future we can think of shifting into the proposed EZ if we are offered uninterrupted utility services"
Local furniture manufacturer	"It would be beneficial for us if land tariffs in the proposed EZ is cheap and the authorities allow concessional loans for small enterprises such as ours ."

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 329.43 acres, which is entirely privately-owned land. This shall poise a significant challenge in terms of land acquisition. At present there are a total of 58 residences located within the proposed EZ boundary.
- Located in the South-West part of the country, proposed EZ would have direct road access to Dhaka once Padma Bridge is operational. Proposed EZ has good road and rail connectivity but located far away from the EXIM gateways.
    - Dhaka-Mawa highway (N8) is the nearest highway (~15 km) and provides access to Dhaka
    - Proposed EZ is adjacent to Agailjhara-Kotalipara road (which is connected with N8) and provides last mile connectivity. Thus, there is no requirement for a separate approach road.
    - Khulna rail station (~94 km) is the nearest rail node with cargo handling facility.
    - Proposed EZ is located in close proximity to Bhomra (~160 km) and Benapole land port (~185 km). This could be beneficial in terms of foreign trade with India.
- Proposed EZ has access to power and water. At present, there is no gas connection in this region. Gas connection is expected to be operational in the next five years timeframe
    - Nearest substation is at ~4 km from the proposed EZ. There are proposals to upgrade this facility to 20 MVA. Once operational, this can be used for sourcing initial power requirement. Madaripur grid substation (~30 km) can act as the source of power during operation stage.
    - Paysa River (~2 km) is the nearest surface water source and ground water is available at a depth of 60 to 80 feet.
- Basic social infrastructure is available in Agailjhara upazila and Barishal district, which can cater to the needs of semi-skilled and unskilled employees. It is recommended that a vocational training center and medical facilities be established in the earmarked "support amenities" area in the non-processing part of the proposed EZ.

4. Competition Benchmarking

4.1. Key Objectives

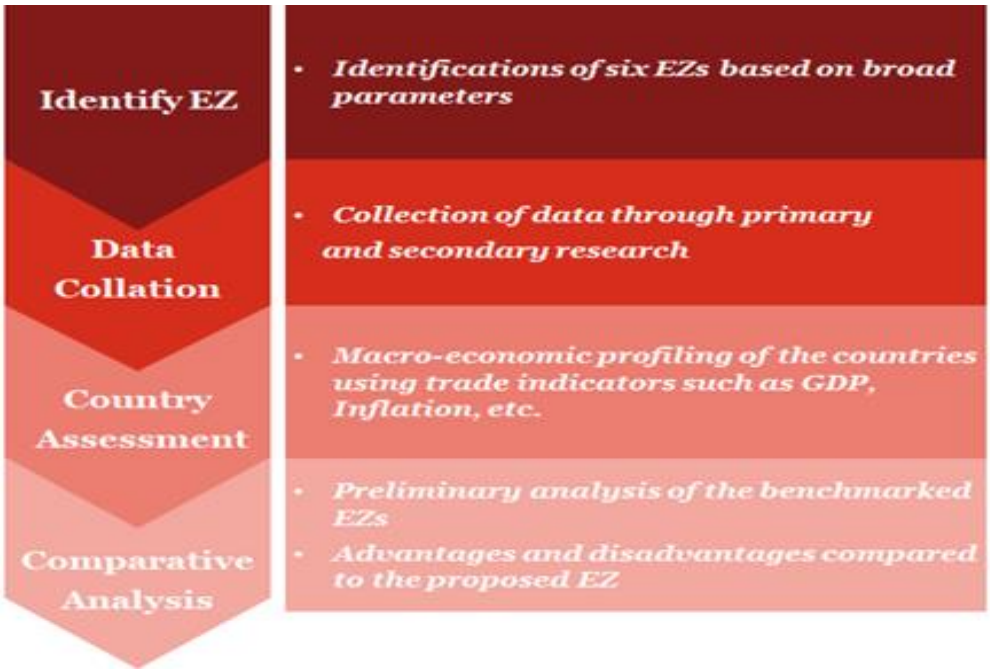
It is imperative for any economic development project across geographies to understand the prevalent best practices in a particular landscape. Thus, the success of an economic zone can often be co-related with similar developments across comparable economies around the globe. Moreover, at the inception 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:

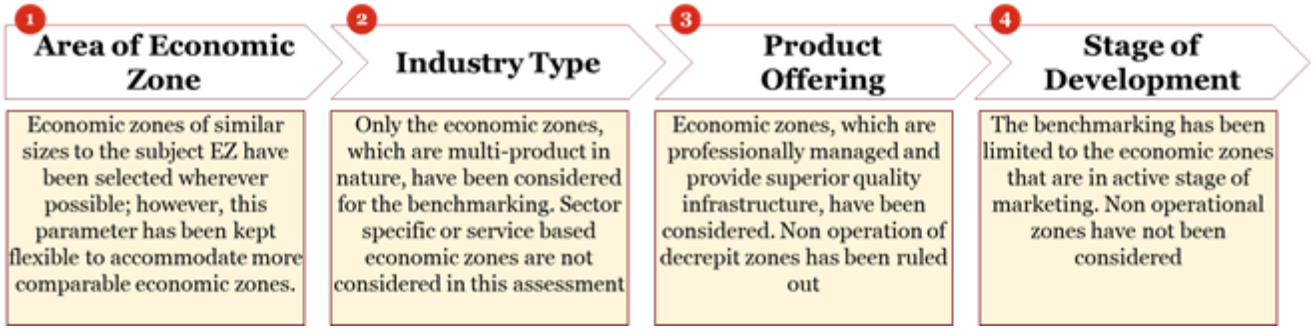
Figure 9: Benchmarking Methodology



Source: PwC Analysis

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

Figure 10: Benchmarking Rationale



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.

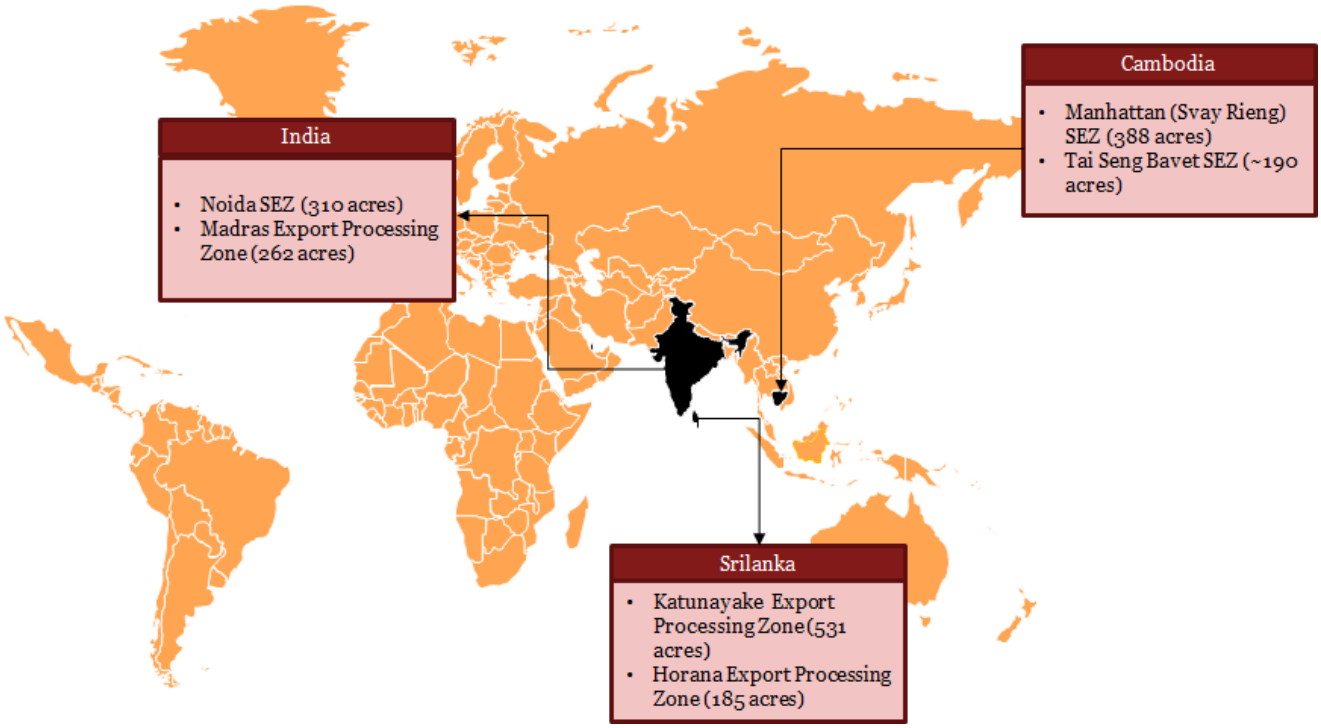
Post receipt of all data points a brief macro-economic profiling of the respective countries has been conducted to assess their economic landscapes.

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

4.3. Competitor Identification

The subject economic zone is located in Agailjhara, Bangladesh and is envisaged to cover a **land area of 329.43 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 11: (Map) Geographic Spread of Comparable EZ



Source: PwC Research

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

Table 8: Brief Overview of Shortlisted SEZ / Industrial Park

Name of Zone	Country	Industries	Business Model	Land Area	Selection Rationale
Manhattan (Svay Rieng) SEZ	Cambodia	Light engineering, footwear, textile/RMG, bags, packaging, plastic, mattress	Government	388 acres	• Area(s) of these shortlisted EZs are similar to 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
Tai Seng Bavet SEZ	Cambodia	Bicycle manufacturing, footwear manufacturing, garment manufacturing industries	PPP	~190 acres	
Noida SEZ	India	Gems and Jewelry, Textiles & RMG, Electronics, Leather, Chemicals, Pharmaceuticals, Food & Agro, Trading and services	Government	310 acres	
Madras Export Processing Zone	India	Engineering, automobile, pharmaceuticals, leather and sports goods, electronics, textiles, agriculture and food processing, granite, etc.[1]	Government	262 acres	
Katunayake Export Processing Zone	Sri Lanka	Electrical and Electronics, Light Machinery, Food Processing, Furniture products, toys	Government	531 acres	
Horana Export Processing Zone	Sri Lanka	Apparels, Textiles, Chemicals, Furniture, FMCG	Government	185 acres	

Source: PwC Research

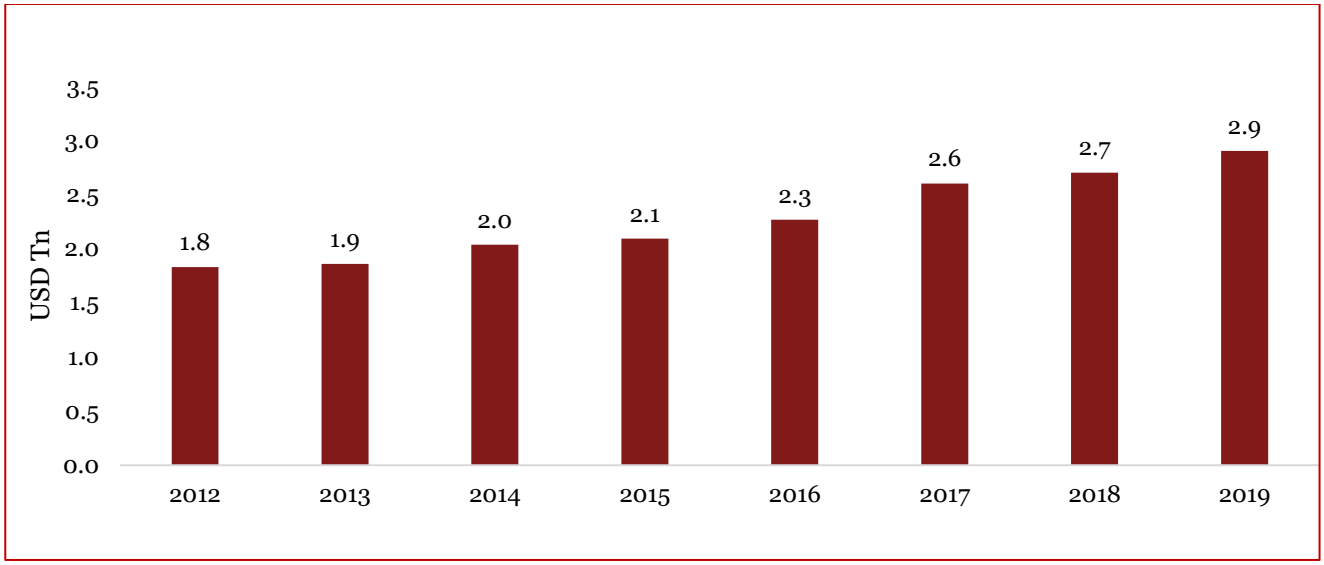
The following sections of the report shall elucidate the macroeconomic landscape of the each of the host country and a profiling of the respective economic zones.

[1] *Source: http://www.mepz.gov.in/sectDistribEou.html*

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.**

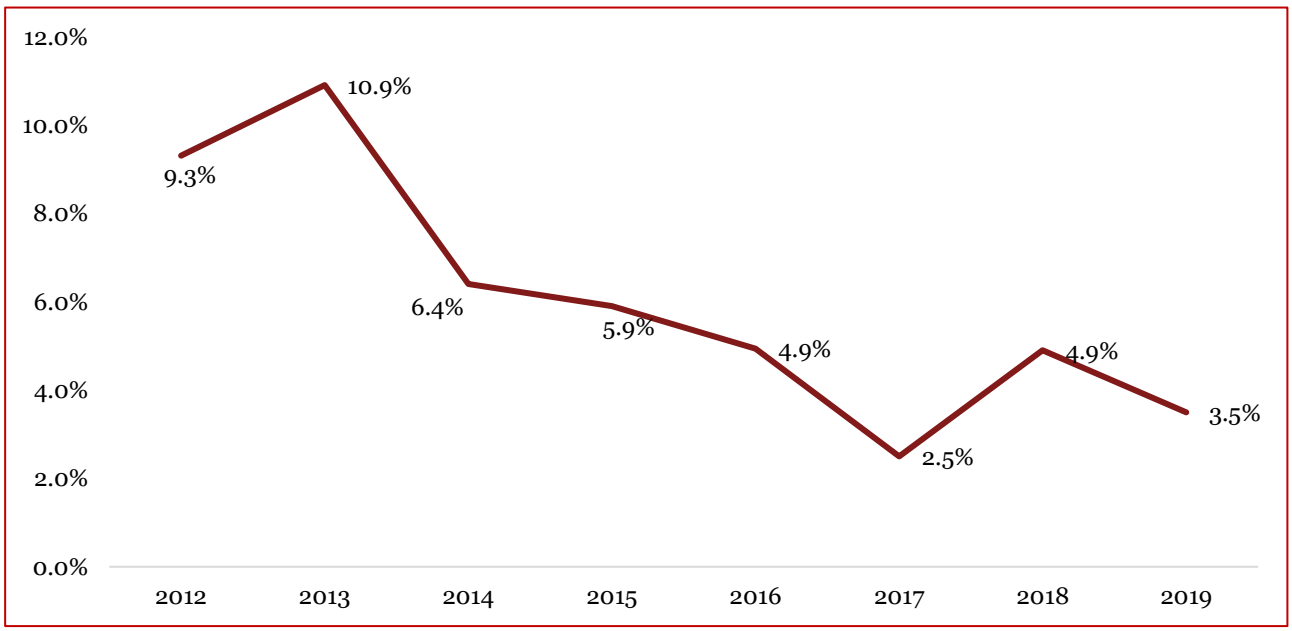
Figure 12: GDP Trend of India



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 13: 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 9: 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 identified economic zone in the country.

4.3.1.1. *Noida SEZ*

The Noida SEZ is located in the planned city of Noida within the National Capital Region (NCR). The SEZ is one of the smaller economic zones in India and draws its strength from its strategic location and well developed social and institutional infrastructure within the vicinity. The zone provides excellent infrastructure, supportive services and sector specific facilities for the thrust areas of exports like gems and jewelry and electronics/software. This has resulted in the zone experiencing heightened level of interest from investors.

Figure 14: Noida SEZ

Source: Google Images

Table 10: Noida SEZ

Factors	Noida SEZ
Site	
Year of establishment/Start year of operations	It was set up in 1985[2]
Land Size (acres)	310 acres
Number of Plots/Units/Firms	Noida SEZ has 202 plots of varying sizes[3] Currently there are 274 industrial units in the Noida SEZ[4]
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)	Lease rentals for industrial plots in the SEZ is USD 2.22/m²/annum[5] (BDT 188.5/ m²/annum)
Pre-Built Factories (PBF) (Y/N)	There are 13 Standard Design Factory (SDF) blocks available.
Lease Rate for PBF (Taka/USD)	The Lease rent for PBF is USD 30.78/m²/annum[6] (BDT 321/ m²/annum)
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is no onsite captive power plant available for the special economic zone; there is 33/11 KV sub-station within the zone Power is supplied by UPPCL
Cost of Power (Taka/USD)	The cost of power is approx. USD 0.091/KwH (BDT 7.73/KwH)

[2] *Source: https://www.nsez.gov.in/NSEZAtaglance.aspx*
[3] *Source: https://www.nsez.gov.in/NSEZAtaglance.aspx*
[4] *Source: https://www.nsez.gov.in/Resources/Approval_Committees/Noida/NSEZ%20Unit%20Details.xlsx*
[5] *Source: https://www.nsez.gov.in/Resources/Announc/Revised%20lease%20rent.pdf*
[6] *Source: https://www.nsez.gov.in/Resources/Announc/Vacancy%20position%20in%20Noida%20SEZ.pdf*

Factors	Noida SEZ
Cost of Water (Taka/USD)	The charge for industrial water is reserved at: USD 74.01/annum (BDT 6286.89/annum) for plots up to 1,000m²; USD 104.55/annum (BDT 8881.16/annum) for plots up to 5,000m²; USD 209.09/annum (BDT 17761.47/annum) for plots above 5,000m²,[7] USD 139.40/annum (BDT 11841.55/annum) for PBF[8]
Onsite Wastewater Treatment Plant (Y/N)	There is onsite wastewater treatment plant available within the special economic zone
Transport costs	
Cost of shipping 20-foot FCL container	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows: • Hamburg – Kandla port → USD 725-1,415[9] (BDT 61,586-120,199) • Rotterdam – Kandla port → USD 725-1,415[10] (BDT 61,586-120,199) • Antwerp – Kandla port → USD 725-1,303[11] (BDT 61,586-110685) • New York – Kandla port → USD 880-1,888[12] (BDT 74,753-160,379)
Cost of Labour (Taka/USD)	
Management	The average salary of an operations manager is estimated at USD 803.97/month[13] (BDT 68294.48/month)
Technicians	The average salary of a maintenance technician is estimated at USD 297.76/month[14] (BDT 25293.68/month)
Skilled	The average salary of a skilled manpower is estimated at USD 182.42/month[15] (BDT 15495.95/month)
Unskilled	The average salary of an unskilled manpower is estimated at USD 150/month[16] (BDT 12741.98/month)
Sectors	
Type of Sectors within the Zone	Gems and Jewelry, Textiles & RMG, Electronics, Leather, Chemicals, Pharmaceuticals, Food & Agro, Trading and services
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	Exemptions from customs duty on imports.
Corporate Taxes / Indirect Taxes	Exemption from central and state level taxes
Income Tax on Profits	100% income tax exemption on export income for SEZ units under section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.
Social Security Tax	No social security tax is available in India
No restrictions on Money Transfers	Profit and dividend earned from an Indian company are repatriable after payment of dividend distribution tax (DDT). DDT @ 16.995% (inclusive of cess) is payable by the company (that declares dividend) on the amount of dividend distributed. However, dividend is free of Indian income tax in the hands of the recipient shareholders, Indian

[7] *Source: https://www.nsez.gov.in/Resources/Announc/Circular%20for%20Revision%20in%20lease%20rentals%20&%20water%20charges.pdf*
[8] *Source: https://www.nsez.gov.in/Resources/Announc/Vacancy%20position%20in%20Noida%20SEZ.pdf*
[9] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[10] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[11] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[12] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[13] *Source: https://www.payscale.com/research/IN/Location=New-Delhi-Delhi/Salary*
[14] *Source: https://www.indeed.co.in/salaries/Maintenance-Technician-Salaries,-New-Delhi-DL*
[15] *Source: https://paycheck.in/main/salary/minimumwages/delhi*
[16] *Source: https://paycheck.in/main/salary/minimumwages/delhi*

Factors	Noida SEZ
	or foreign. Profit of LLP is flow-through and repatriable without payment of any taxes and without any regulatory approval[17].
Others	Exemption from service tax
Non-Fiscal Incentives	
One Stop Shop Within the Zone	**Yes**, there is a one stop shop within the zone
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone
Onsite Convenience Retail	There is no convenience retail available within the zone
Onsite Housing	There is no onsite housing available within the zone
Onsite Schools	There is no onsite housing available within the zone
Onsite Community Facilities	There are community facilities available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	Quality international housing like Exotica Fresto, Lotus Zing and many others are available around the area of SEZ
International Hospital/Clinic (Within 20 Km)	Quality international hospital like max multi-specialty, metro multi-specialty hospitals are available in close proximity to the economic zone
International Schools (Within 20 Km)	Quality international schools like Kothari International school, Ryan International school, Sapphire International school, Billabong high International school etc. are available in close proximity to the economic zone

Source: PwC analysis and data collection

The Noida SEZ is one of the smaller multi-product economic zones of India and has witnessed resounding success owing to its proximity to the capital city of New Delhi and the thriving industrial eco system in Noida. Access to superior quality physical and social infrastructure has also facilitated industrial development within the zone.

4.3.1.2. *Madras Export Processing Zone*

MEPZ Special Economic Zone is a multi-product SEZ. The zone was established as an EPZ in the year 1984. MEPZ is spread over an area of 262 acres and is located on GST Road in Tambaram, Chennai. It is located 6 km south of Chennai International Airport. Apart from manufacturing, this zone also caters to the services sector as it is home to a number of IT companies which include Cognizant Technology Solutions, Computer Sciences Corporation, CSS and HTC Global Services among others.

Figure 15: Madras Export Processing Zone

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

Source: Google Images

A detailed profiling of the park has been provided below –

Table 11: Madras Export Processing Zone

Factors	Madras Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1984
Land Size (acres)	262 acres
Number of Plots/Units/Firms	In phase 1 and phase 2, 79 and 65 plots have been developed respectively[18]. There are 109 firms operating in the zone[19]
No. of Development Phases	The development has been carried out in two phases[20].
Land Lease (+length) or Sale (Taka/USD)	Tariff to MEPZ-SEZ authority for Plot is USD 2.23 / sq.m. / annum (BDT 189.43 /m²/annum)(subject to upward revision by a minimum of 10% every year)[21]
Pre-Built Factories (PBF) (Y/N)	Yes, total 227 SDF blocks are available[22].
Lease Rate for PBF (Taka/USD)	Lease rate for PBF is USD 24.66 /m²/annum (BDT 2094.78 /m²/annum) (subject to upward revision by a minimum of 10% every year)[23]
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	No onsite captive power plant available for the SEZ
Cost of Power (Taka/USD)	The cost of power as supplied by TNEB is USD 0.082 / kwh[24] (BDT 6.97/ kwh)
Cost of Water (Taka/USD)	The cost of industrial water is USD 2.09/ KL[25] (BDT 177.54/ KL)
Onsite Wastewater Treatment Plant (Y/N)	Yes, there is onsite wastewater treatment plant available within the SEZ[26]
Transport costs	
Cost of shipping 20-foot FCL container shipping to Kolkata	The approximate shipping charges of a 20-foot FCL Container from the nearest port[27] are as follows: • Hamburg – Port of Chennai→ USD 1,086-1,873[28] (BDT 92,552-159,105) • Rotterdam – Port of Chennai → USD 1,165-2,090[29] (BDT 98,963-177,538) • Antwerp – Port of Chennai → USD 921-1650[30] (BDT 78,236-140162) • New York – Port of Chennai → USD 1880-3764[31] (BDT 159,700-319,739)
Cost of Labour (Taka/USD)	

[18] *Source: http://www.mepz.gov.in/infrastructure.html*
[19] *Source: http://www.mepz.gov.in/sezUnits.html*
[20] *Source: http://www.mepz.gov.in/infrastructure.html*
[21] *Source: http://www.mepz.gov.in/tariff.html*
[22] *Source: http://www.mepz.gov.in/infrastructure.html*
[23] *Source: http://www.mepz.gov.in/tariff.html*
[24] *Source: http://www.tnerc.gov.in/orders/Tariff%20Order%202009/2017/TariffOrder/TANGEDCO-11-08-2017.pdf*
[25] *Source: http://www.mepz.gov.in/tariff.html*
[26] *Source: http://www.mepz.gov.in/underConstruction.html*
[27] *Source: http://www.mepz.gov.in/location.html*
[28] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[29] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[30] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[31] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*

Factors	Madras Export Processing Zone
Management	The salary of a management professional in Chennai is approx. USD 3,076/ month[32] (BDT 261,205/month)
Technicians/Engineers	The salary of a technician in the state of Tamil Nadu is approx. USD 1,107 / month[33] (BDT 94,036/month)
Skilled	The salary of a skilled laborer is approx. USD 601/month (BDT 51,050/month)
Unskilled	The salary of an unskilled labourer is approx. USD 151.64/month[34] (BDT 12,881.29/month)
Sectors	
Type of Sectors within the Zone	Engineering, IT, automobile, pharmaceuticals, leather and sports goods, electronics, textiles & RMG, agriculture and food processing, granite, gem & jewelry etc.[35]
Special Regime	
Yes/No	**Yes**, there's a special regime for incentives[36]
Fiscal Incentives	
Customs Duties	Exemptions from customs duties are applicable[37, 38]
Corporate Taxes / Indirect Taxes	There is no exemption from minimum alternate tax[39]
Income Tax on Profits	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years[40].
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 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[41]
Others	• Exemption of service tax, reimbursement of CST and Terminal[42]
Non-Fiscal Incentives	
One Stop Shop Within the Zone	**Yes**, there is a one stop shop within the zone[43, 44]
Support Amenities	
Onsite Administration office	There is onsite administration office available within the zone.
Onsite Convenience Retail	There is onsite convenience retail available within the zone[45]
Onsite Housing	There is no onsite housing available within the zone
Onsite Schools	There are onsite schools available within the zone[46]
Onsite Community Facilities	There are community facilities available within the zone[47, 48]

[32] *Source: https://www.averagesalarysurvey.com/management-business/chennai-india*
[33] *Source: https://www.averagesalarysurvey.com/engineers-technicians-iii/chennai-india*
[34] *Source: https://tradingeconomics.com/india/wages-low-skilled*
[35] *Source: http://www.mepz.gov.in/sectDistribEou.html*
[36] *Source: https://unctad.org/en/Docs/iteipcmisc3_en.pdf*
[37] *Source: https://dgft.gov.in/sites/default/files/CHAP04_1.pdf*
[38] *Source: https://dgft.gov.in/sites/default/files/HBP%20Chapter%204%20as%20on%20June%2030%202019.pdf*
[39] *Source: https://economictimes.indiatimes.com/news/economy/policy/to-boost-make-in-india-framework-for-sezs-set-for-a-complete-makeover/articleshow/62014168.cms*
[40] *Source: http://www.mepz.gov.in/PDFs/FAQRelatingtoSEZ.pdf*
[41] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*
[42] *Source: http://www.mepz.gov.in/functionsDuties.html*
[43] *Source: https://bit.ly/32ra2Af*
[44] *Source: http://www.horiakiindia.com/contact-us.htm*
[45] *Source: http://bitly.ws/7VJd*
[46] *Source: https://www.playschoolworld.com/in/en/tamilnadu/Chennai/best-preschools-play-schools-in-mepz-tambaram*
[47] *Source: http://www.mepz.gov.in/otherInfra.html*
[48] *Source: https://shodhganga.inflibnet.ac.in/bitstream/10603/191133/6/chapter%204.pdf*

Factors	Madras Export Processing Zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	There is international housing available within the zone
International Hospital/Clinic (Within 20km)	There are no international hospitals available in close proximity to the zone; however Madras houses some of the finest international quality hospitals such as Apollo Gleneagles
International Schools (Within 20 Km)	There are quality schools like Lord's International School International School in proximity to the zone[49]

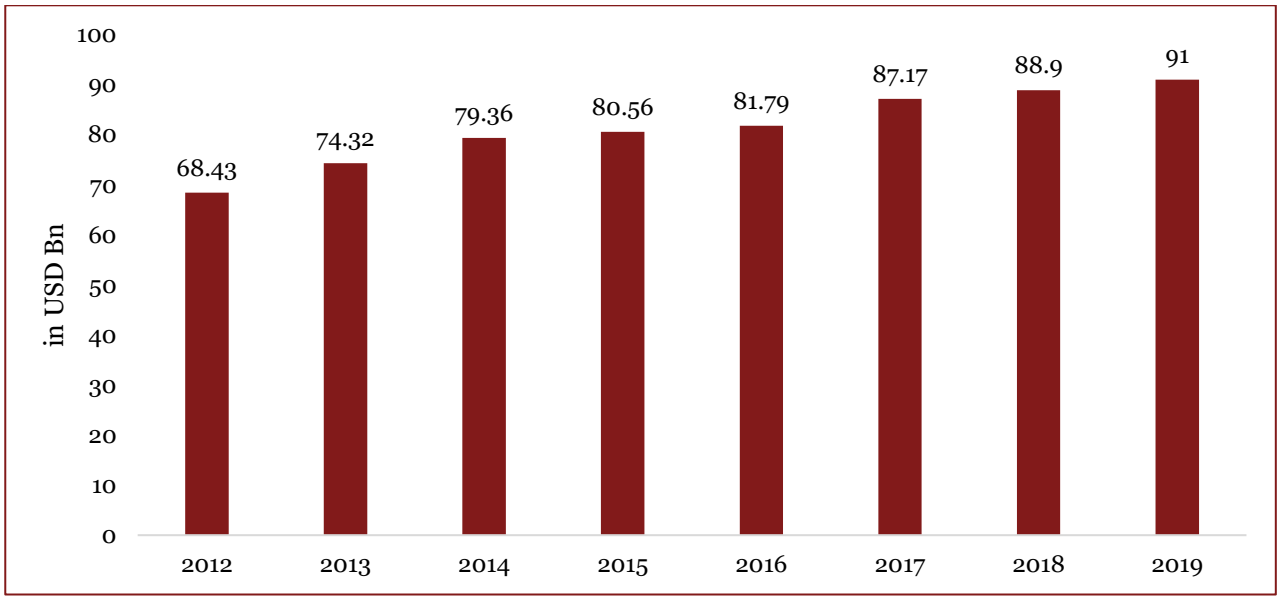
MEPZ SEZ located is on the N.H. 45 and has direct road and rail access to major ports located in and around the city of Chennai. The nearest sea & airport are the Chennai seaport and the Chennai International Airport. The export processing zone is a prime trade centre due to its proximity to Chennai port. The added objective of the SEZ is to facilitate exports through reduction of transaction costs.

[49] *Source: http://bitly.ws/7VJi*

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.**

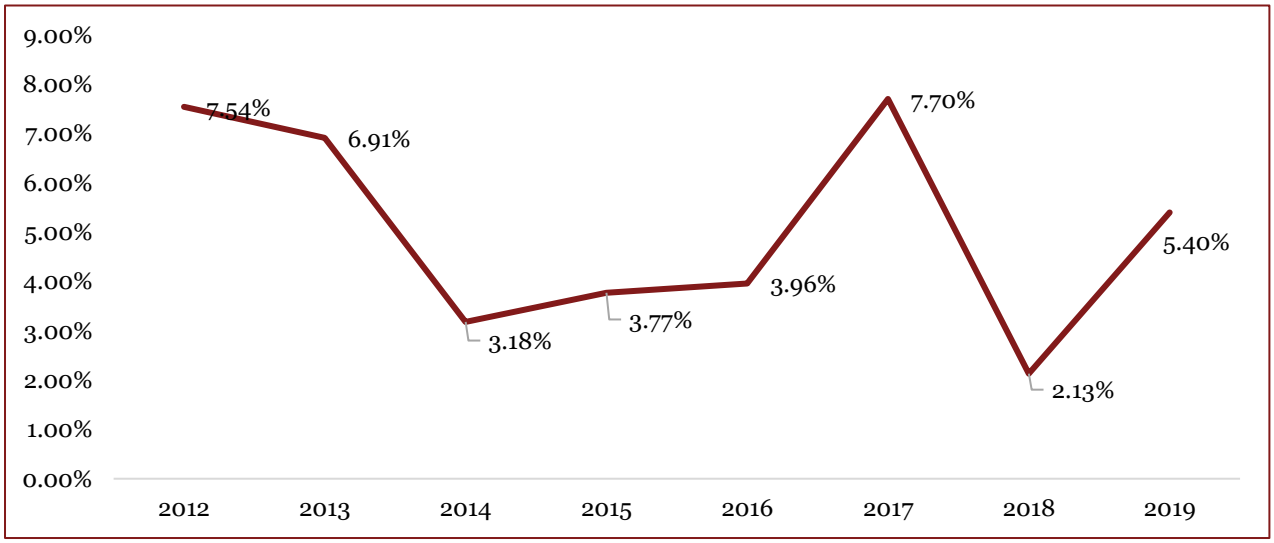
Figure 16: GDP of Sri Lanka



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 17: Inflation Trend of Sri Lanka



Source: World Bank

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

Table 12: 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[50] 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. *Katunayake Export Processing Zone*

The Katunayake Export Processing Zone is located 29 Km North-East of Colombo, Capital city of Sri Lanka. It is the largest Zone in the country with close proximity to the Bandaranaike International Airport, accommodating enterprises from different sectors and declared as a bonded area for Hub operations. The zone houses industries from sectors like light machinery, food processing, electrical and electronics, furniture products, toys etc. The zone has benefited from presence of superior quality infrastructure like internal roads, utility connections, well laid out internal roads, etc.

[50] *Source: World Bank*

Figure 18: Katunayake Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided in the next page-

Table 13: Katunayake Export Processing Zone

Factors	Katunayake Export Processing Zone
Site	
Year of establishment/Start year of operations	It was established in 1978
Land Size (acres)	531 acres
Number of Plots/Units/Firms	There are approx. 108 plots in Katunayake EPZ[51]
No. of Development Phases	The development has been carried out in 4 phases
Land Lease (+length) or Sale (Taka/USD)	There is a minimum upfront land premium of USD 60,000/acre (BDT 5,096,793/acre) (for a lease period of 50 years) Additionally, there would be a land rental of USD 5,130/acre /annum (BDT 435,776/acre/annum)
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 a dedicated grid substation of capacity 63 MVA
Cost of Power (Taka/USD) [52]	For Industries with demand less than or equal to 42 KVA the cost of power is as follows:[53] • For consumption <301 KWh, the tariff is USD 0.069/KWh (BDT 5.86/KWh) • For consumption >300 KWh, the tariff is USD 0.078/KWh (BDT 6.63/KWh) For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.13/KWh (BDT 11.04/KWh) • During day time, the tariff is USD 0.071/KWh (BDT 6.03/KWh) • During Off-peak, the tariff is USD 0.044/KWh (BDT 3.74/KWh)
Cost of Water (Taka/USD) [54]	The charge of industrial water is USD 0.47 / cu. M (BDT 39.92 / cu. M)

[51] *http://investsrilanka.com/location/katunayake-epz/*
[52] *Source: http://www.ceb.lk/for-your-business/*
[53] *https://www.ceb.lk/commercial-tariff/en*
[54] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_applicable_boi_charges*

Factors	Katunayake Export Processing Zone
Onsite Wastewater Treatment Plant (Y/N)	There is a centralized Effluent Treatment Plant facility available, charging USD 0.09/ cu. M (BDT 7.65/ cu. M)of wastewater treated.
Transport costs	
Cost of shipping 20 foot FCL container shipping to Colombo[55]	The approximate shipping charges of a 20 foot FCL Container from the nearest port are as follows: • Hamburg – Colombo port → USD 1,000 • Rotterdam – Colombo port → USD 1,012 • Antwerp – Colombo port → USD 1,083 • New York – Colombo port → USD 1,080
Cost of Labour (Taka/USD)	
Management	The average salary for a management professional is approx. USD 800 / month[56] (BDT 67,957/month)
Technicians	The average salary for a technician is approx. USD 280 / month[57] (BDT 23,785 /month)
Skilled	The average salary for a skilled labour is approx. USD 128 / month[58] (BDT 10,873/month)
Unskilled	The average salary for a un-skilled labour is approx. USD 84 / month[59] (BDT 7,136/month)
Sectors	
Type of Sectors within the Zone	Light Machinery, Food Processing, Electrical and Electronics, Toys and Furniture Products
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 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

[55] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[56] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[57] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[58] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[59] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*

Factors	Katunayake Export Processing Zone
Onsite Community Facilities	There are onsite community facilities (playground, leisure park, healthcare facilities and sports complex) available within the zone
Onsite Security	There is onsite security available within the zone
Quality of Life	
International Housing (Within 15 Km)	Residential facilities are available in Kowinna, Jayawardanapura and Mahunupitiya towns which are within 15 km to the EPZ. The commercial capital city, Colombo is round 29 km from the EPZ which has international standard residential facilities..
International Hospital/Clinic (Within 20km)	Healthcare facilities are available inside the EPZ. Air Force Hospital is just 8 km away from Katunayake EPZ. International hospitals available in Colombo (~29 km)
International Schools (Within 20 kms)	Superior quality educational institutes like Institute of Engineering Technology is present in proximity to the zone. University of Colombo, University of Sri Jayewardenepura and several other international educational institution are in Colombo.

Source: PwC Analysis

The Katunayake EPZ is well connected with the commercial city of Colombo, which also houses one of the largest transshipment ports of Asia. The zone is also located in close proximity to Bandaranaike International Airport and Katunayake Railway Station which allows seamless movements of goods from the export processing zone. The industrial infrastructure and the strategic location of EPZ has resulted in a number of investors setting up manufacturing units within the zone.

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 19: Horana Export Processing Zone

Source: Google Images

A detailed profiling of the park is provided below:

Table 14: 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[60]
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)[61]
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

[60] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Horana-Export-Processing-Zone.pdf*
[61] *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)[62] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[63] 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)[64] • During daytime, the tariff is USD 0.059/KwH (BDT 5.01/KwH)[65] • During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[66]
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.21/m^3 (BDT 17.84/m^3)[67]
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[68]	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)[69]
Technicians	The average salary for a technician is approx. USD 320/month (BDT 27,183/month)[70]
Skilled	The average salary for a skilled labour is approx. USD 128/month (BDT 10,874/month)[71]
Unskilled	The average salary for an un-skilled labour is approx. USD 84/month (BDT 7,136/month)[72]
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.
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

[62] *Source: http://www.ceb.lk/for-your-business/*
[63] *Source: http://www.ceb.lk/for-your-business/*
[64] *Source: http://www.ceb.lk/for-your-business/*
[65] *Source: http://www.ceb.lk/for-your-business/*
[66] *Source: http://www.ceb.lk/for-your-business/*
[67] *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*
[68] *Source: https://worldfreightrates.com/freight*
[69] *Source: http://investsrilanka.com/location/horana-epz/*
[70] *Source: http://investsrilanka.com/location/horana-epz/*
[71] *Source: http://investsrilanka.com/location/horana-epz/*
[72] *Source: http://investsrilanka.com/location/horana-epz/*

Factors	Horana Export Processing Zone
	(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

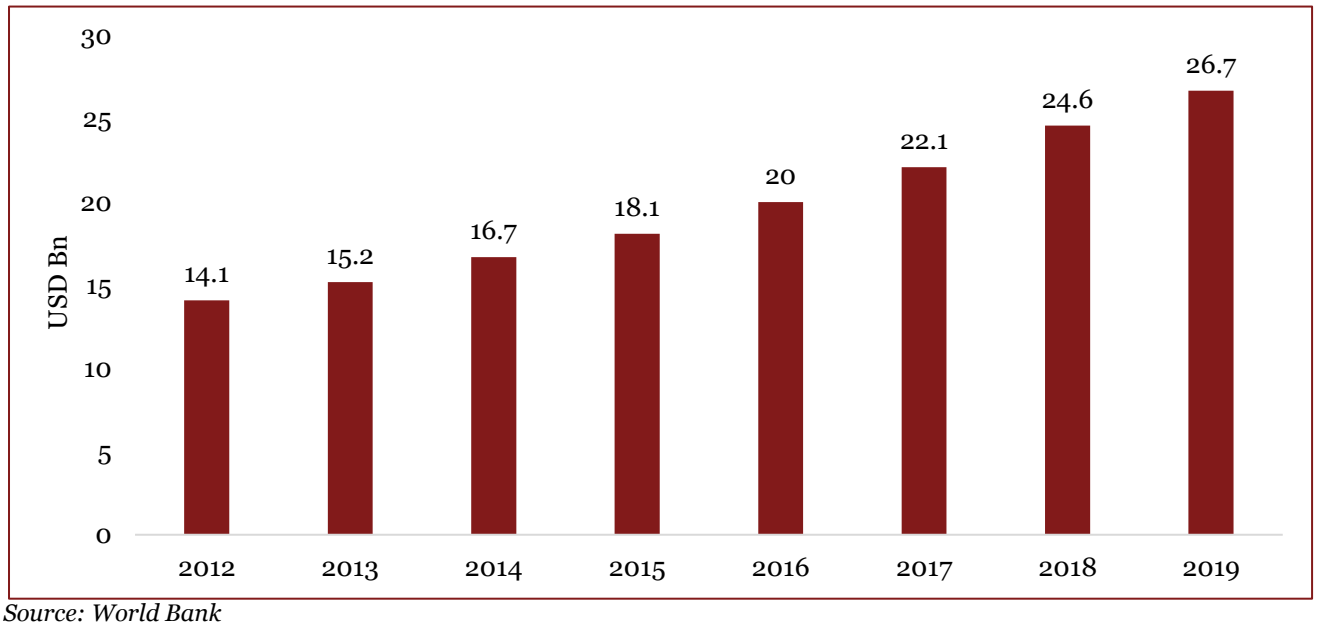
The Horana Export Processing Zone administered by the Board of Investment contributed US$ 31.8 million (Rs 5,796.7 million) in export revenue as at end of 2018.[73] Among the leading enterprises at the Horana EPZ are Unilever Sri Lanka Ltd which manufactures consumer products such as soaps, shampoos 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.

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

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.**

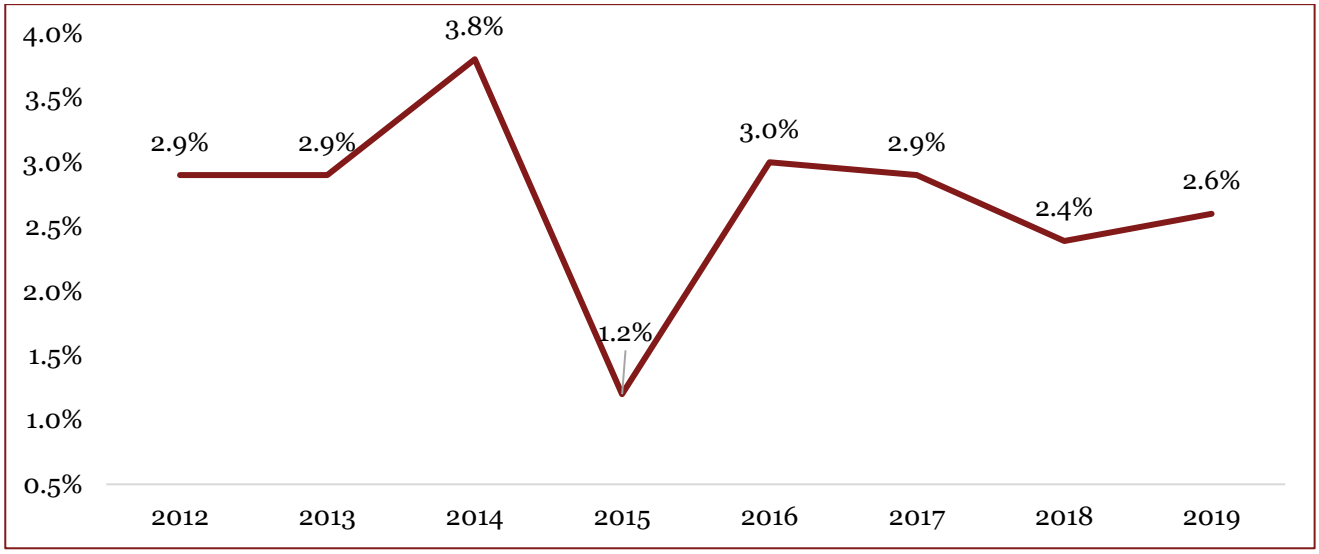
Figure 20: GDP Trend of Cambodia



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 21: 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%[74]	The Heritage Foundation
FDI Inflow	USD 3.10 billion	The World Bank
Exports	USD 25.10 billion[75] in 2019	ITC Trade Map
Imports	USD 23.13 billion[76] 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.[77]

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

4.3.3.1. *Manhattan (Svay Rieng) Special Economic Zone*

Manhattan SEZ is located in Svay Rieng Province, South Eastern Cambodia on the Cambodia-Vietnam border. It is around 160 km East of Phnom Penh and 86 km west of Ho Chi Minh City, having access to the key border crossing point with Vietnam in South-East Cambodia. Manhattan SEZ has provision for uninterrupted power and water supply, storage and transportation warehouses, container terminals, staff dormitories, product exhibition halls, hospitals, administrative centers, landscape plazas and security service. All these facilities combined with initiatives and strategic location have made Manhattan SEZ an ideal location for investors in Cambodia. It is the largest single SEZ in Cambodia, generating employment for around 28,000 people.[78]

[74] *Source: https://www.heritage.org/index/country/cambodia*
[75] *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*
[76] *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*
[77] *World Bank*
[78] *Source: https://www.adb.org/sites/default/files/publication/175236/ewp-459.pdf*

Figure 22: Manhattan (Svay Rieng) SEZ

Source: Google Images

A detailed profiling of the Manhattan SEZ is provided in the next page–

Table 16: Manhattan SEZ

Factors	Manhattan (Svay Rieng) SEZ
Site	
Year of establishment/Start year of operations	It was established in 2006
Land Size (acres)	388 acres
Number of Plots/Units/Firms	Currently, there are 27 operational industrial units within the SEZ
No. of Development Phases	The development has been carried out over a period of time in single phase
Land Lease (+length) or Sale (Taka/USD)	Land lease available at USD 30-40/m^2 (BDT 2550-3400/$m^{2)}$ ^{up} to 50 years' time period.
Pre-Built Factories (PBF) (Y/N)	There are pre-built factories provided as a part of the product offering
Lease Rate for PBF (Taka/USD)	Lease rate for PBF is USD 2/m^2/month (BDT 170//m^2/month)
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	There is an on-site substation to provide electricity to industries inside the SEZ. Electricity is sourced from Vietnam since cost of power is higher in Cambodia and due to the proximity of the SEZ to Vietnam
Cost of Power (Taka/USD)	Power is supplied at USD 0.1650/KwH (BDT 14.03/KwH)
Cost of Water (Taka/USD)	The charge of industrial water is USD 0.15/m^3 (BDT 12.75/m^3)
Onsite Wastewater Treatment Plant (Y/N)	There is an onsite wastewater treatment plant available within the special economic zone
Transport costs	

Factors	Manhattan (Svay Rieng) SEZ
Cost of shipping 20-foot FCL container [79]	• Hamburg – Ho Chi Minh City → USD 960 • Rotterdam – Ho Chi Minh City → USD 980 • Antwerp – Ho Chi Minh City → USD 960 • New York – Ho Chi Minh City → USD 615
Cost of Labor (Taka/USD)	
Management	The average salary of management professional in Cambodia is approximately USD 2770/month[80] (BDT 235525/month)
Technicians	The average salary of a technician is approx. USD 861/month (BDT 73208/month)
Skilled	The average salary of a skilled labourer in Cambodia was USD 498/month (BDT 42343/month) in 2018[81]
Unskilled	The average salary of an unskilled labourer in Cambodia was USD 128.3/month (BDT 10908/Month) in 2018[82]
Sectors	
Type of Sectors within the Zone	Light engineering, footwear, textile/RMG, bags, packaging, plastic, mattress, agro products
Special Regime	
Yes/No	Yes, there's a special regime for incentives
Fiscal Incentives	
Customs Duties	• Import duty exemption on construction materials and production equipment • Import duty exemption on production materials for export industry and export duty exemption
Corporate Taxes / Indirect Taxes	Exemption of 10% VAT in addition to import duty exemption.
Income Tax on Profits	There is profit tax exemption with a concept of "Trigger Period" + 3 years + Priority Period. The maximum trigger period is the first year of profit or 3 years after the tenant earns its first revenue, whichever sooner
Social Security Tax	Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[83]
No restrictions on Money Transfers	There are currently no restrictions on the repatriation of profit or capital derived from investments made in Cambodia, nor on most transfers of funds overseas. The Law on Investment guarantees that investors can freely remit foreign currencies overseas for the purposes of repatriation of invested capital on dissolution of an investment project.
Others	50-year lease of land available to foreign investors (renewable and transferable) No quota restrictions on imports to Europe, Canada, Japan, Australia, Taiwan etc.
Non-Fiscal Incentives	
One Stop Shop Within the Zone	Yes, there's a one stop shop within the economic zone
Support Amenities	
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 within the zone

[79] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[80] *Source: https://www.averagesalarysurvey.com/cambodia*
[81] *Source: https://tradingeconomics.com/cambodia/wages-high-skilled*
[82] *Source: https://tradingeconomics.com/cambodia/wages-low-skilled*
[83] *Source: https://shieldgeo.com/payroll-and-tax-in-cambodia/*

Factors	Manhattan (Svay Rieng) SEZ
Onsite Community Facilities	There are 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 villas available inside the Economic Zone
International Hospital/Clinic (Within 20km)	There are 5 medical facilities available within 5 km radius of the economic zone
International Schools (Within 20 kms)	There are local schools available near the SEZ, but international schools are not available within 20 km range of the SEZ

Source: PwC Research

The single biggest advantage of this zone is the strategic location of the SEZ on Vietnam-Cambodia border, which can facilitate easy border trade for industries based out of this SEZ. Manhattan SEZ has direct access to National Road No. 1 (a designated part of Asian Highway 1) providing road connection to Ho-Chi-Minh city, Phnom Penh and Bangkok. Vietnam's seaport at Saigon is 80 km away from the SEZ. This port can facilitate easy import and export of goods for industries in Manhattan SEZ. The region also has a rich pool of cheap manpower (Cambodian, as well as Vietnamese), which can attract labour intensive industries.

4.3.3.2. *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.

Figure 23: Tai Seng Bavet SEZ

Source: Google Images

A detailed profiling of the park is provided below –

Table 17: 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 /m² (BDT 1870.59/m²) and contract is for 50 years[84]
Pre-Built Factories (PBF) (Y/N)	Yes, pre-built factories are available
Lease Rate for PBF (Taka/USD)	Ground : USD 0.1/m²(BDT 8.5/ m²) Factory : USD 1.6/m² (BDT 136.04/ m²) Officious 2.8/m² (BDT 238.08/ m²) (Building only)[85]
Infrastructure/Utilities	
Onsite Independent Power (Y/N and Type)	No onsite captive power plant available for the special economic zone Power sourced from public transmission line both from Cambodia (Svay Rieng Province) and Vietnam[86]
Cost of Power (Taka/USD)	The cost of power within the economic zone is USD 0.15 / KwH[87] (BDT 12.75/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[88]
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[89]
Cost of Labour (Taka/USD)	
Management	The average salary of management professional in Cambodia is approximately USD 2770/month[90] (BDT 235525/month)
Technicians	The average salary of a technician is approx. USD 861/month (BDT 73208/month)
Skilled	The average salary of a skilled labourer in Cambodia was USD 498/month (BDT 42343/month) in 2018[91]
Unskilled	The average salary of an unskilled labourer in Cambodia was USD 128.3/month (BDT 10908/Month) in 2018[92]
Sectors	

[84] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[85] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[86] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[87] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*
[88] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*
[89] *Source: https://worldfreightrates.com/freight*
[90] *Source: https://www.averagesalarysurvey.com/cambodia*
[91] *Source: https://tradingeconomics.com/cambodia/wages-high-skilled*
[92] *Source: https://tradingeconomics.com/cambodia/wages-low-skilled*

Factors	Tai Seng Bavet SEZ
Type of Sectors within the Zone	The EZ mainly accommodates bicycle manufacturing, footwear manufacturing, garment manufacturing industries[93]
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[94] Import duty exemptions for machinery, equipment, production inputs and raw materials[95]
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[96]
Social Security Tax	Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[97]
No restrictions on Money Transfers	No restriction on foreign currencies convertibility[98] Free remittance of foreign currency Unrestricted repatriation of profit
Others	VAT suspension for all exported oriented activities[99]
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[100]
Onsite Convenience Retail	There is onsite convenient retail available within the zone
Onsite Housing	There is onsite housing available within the zone[101]
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 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

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.

[93] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[94] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*
[95] *Source: https://www.jcci.or.jp/161104%20Cambodia,%20Tokyo%20Presentation%204%20Nov%202016.pdf*
[96] *Source: https://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06_chapter3.pdf*
[97] *Source: https://shieldgeo.com/payroll-and-tax-in-cambodia/*
[98] *Source: https://www.boi.go.th/upload/Cambodia_Presentation_78898.pdf*
[99] *Source: http://www.bigconnectivity.org/beta/sites/default/files/2017-03/Cambodia%27s%20SEZ%20Policy%20in%20Shanghai%2017-22%20Oct%2016.pdf*
[100] *Source: http://www.cambodiainvestment.gov.kh/investment-scheme/the-special-economic-zones.html*
[101] *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 18: 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 19: 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 20: 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 21: 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 22: 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 23: 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 24: 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 Agailjhara 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 Agailjhara with respect to the benchmarked zones.

Table 25: Comparative Analysis

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
Site							
Land Size (acres)	329.43 acres	310 acres	262 acres	185 acres	531 acres	190 acres	388 acres
Business Model	Government (with assistance from multilaterals and respective nodal agencies for infrastructure development) or PPP	Government	Government	Government	Government	PPP	Government
Number of Plots/Units/Firms	Captured in Master Planning chapter of this report	Noida SEZ has 202 plots of varying sizes[102]	In phase 1 and phase 2, 79 and 65 plots have been developed respectively[104].	According to the existing master plan there are approximately 55 industrial plots within the zone	There are approx. 108 plots in Katunayake EPZ[107]	Plots of variable sizes are available; however, the exact number of	Currently, there are 27 operational industrial units within the SEZ

[102] *Source: https://www.nsez.gov.in/NSEZAtaglance.aspx*
[104] *Source: http://www.mepz.gov.in/infrastructure.html*
[107] *http://investsrilanka.com/location/katunayake-epz/*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
		Currently there are 274 industrial units in the Noida SEZ[103]	There are 109 firms operating in the zone[105]	There are 23 operational industrial units in the zone[106]		plots have not been demarcated 28 firms are operational within the park	
No. of Development Phases	Captured in Master Planning chapter of this report	The development has been carried out over a period of time but in a single phase	The development has been carried out in two phases[108].	The development has been carried out over a period of time but in a single phase	The development has been carried out in 4 phases	The project is to be completed in 2 phases as proposed in master plan	The development has been carried out over a period of time in single phase
Land Lease (+length) or Sale (Taka/USD)	Land lease rental is BDT 11.00/ sq. ft. per annum (for 50 years) when BEZA develops the project and BDT 25.00/sq. ft. in case of PPP developer	Lease rentals for industrial plots in the SEZ is USD 2.22/m²/annum[109] (BDT 188.5/ m²/annum)	Tariff to MEPZ-SEZ authority for Plot is USD 2.23 / sq.m. / annum (BDT 189.43 /m²/annum) (subject to upward revision by a minimum of 10% every year)[110]	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 /	There is a minimum upfront land premium of USD 60,000/acre (BDT 5,096,793/acre) (for a lease period of 50 years) Additionally, there would be a land rental of USD 5,130/acre /annum	Industrial land lease rent is USD 22 /m² (BDT 1,868.82 /m²) and contract is for 50 years[112]	Land lease available at USD 30-40/m² (BDT 2,548-3,398/m²) up to 50 years' time period.

[103] *Source: https://www.nsez.gov.in/Resources/Approval_Committees/Noida/NSEZ%20Unit%20Details.xlsx*
[105] *Source: http://www.mepz.gov.in/sezUnits.html*
[106] *Source: http://www.investsrilanka.com/wp-content/uploads/2019/05/Horana-Export-Processing-Zone.pdf*
[108] *Source: http://www.mepz.gov.in/infrastructure.html*
[109] *Source: https://www.nsez.gov.in/Resources/Announc/Revised%20lease%20rent.pdf*
[110] *Source: http://www.mepz.gov.in/tariff.html*
[112] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
				annum (BDT ~0.40 Mn/acre/annum)[111]	(BDT 435,776/acre/annum)		
Pre-Built Factories (PBF) (Y/N)	No, there is provision for PFB in the Master Plan as PBF will be constructed only in case of PPP developer developing the project	There are 13 Standard Design Factory (SDF) blocks available.	Yes, total 227 SDF blocks are available[113].	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	There are pre-built factories provided as a part of the product offering
Lease Rate for PBF (Taka/USD)	Land lease rental for PFB is BDT 300/ sq. ft. per annum	The Lease rent for PBF is USD 30.78/m²/annum[114] (BDT 321/ m²/annum)	Lease rate for PBF is USD 24.66 /m²/annum (BDT 2094.78 /m²/annum) (subject to upward revision by a minimum of 10% every year)[115]	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/m² (BDT 8.49 /m²) Factory : USD 1.6/m² (BDT 135.91 /m²) Office : USD 2.8/m² (BDT	Lease rate for PBF is USD 2/m²/month (BDT 170/m²/month)

[111] *Source: http://investsrilanka.com/location/horana-epz/*
[113] *Source: http://www.mepz.gov.in/infrastructure.html*
[114] *Source: https://www.nsez.gov.in/Resources/Announc/Vacancy%20position%20in%20Noida%20SEZ.pdf*
[115] *Source: http://www.mepz.gov.in/tariff.html*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
						237.85 /m$^{2)}$ (Building only)[116]	
Infrastructure/ Utilities							
Onsite Independent Power (Y/N and Type)	Yes, there is provision for onsite power distribution through internal sub-stations of 33/11 KV and 132/33 KV	There is no onsite captive power plant available for the special economic zone; there is 33/11 KV sub-station within the zone Power is supplied by UPPCL	No onsite captive power plant available for the SEZ Power is supplied by TNEB	There is no onsite captive power plant available for the special economic zone	There is a dedicated grid substation of capacity 63 MVA	No onsite captive power plant available for the special economic zone Power sourced from public transmission line both from Cambodia (Svay Rieng Province) and Vietnam[117]	There is an on-site substation to provide electricity to industries inside the SEZ. Electricity is sourced from Vietnam since cost of power is higher in Cambodia and due to the proximity of the SEZ to Vietnam
Cost of Power (Taka/USD)	Cost of power is BDT 9.42/ KwH (with annual escalation of 20% for a block of 3 years)	The cost of power is approx. USD 0.091/KwH (BDT 7.73/KwH)	The cost of power as supplied by TNEB is USD 0.082 / kwh[118] (BDT 6.97/ kwh)	For Industries with demand less than or equal to 42 KVA the cost of power is as follows: • For consumption	For Industries with demand less than or equal to 42 KVA the cost of power is as follows:[124] • For consumption <301 KWh, the	The cost of power within the economic zone is USD 0.15 / KwH[125] (BDT 12.74 /KwH$^{)}$	Power is supplied at USD 0.1650/KwH (BDT 14.02/KwH)

[116] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[117] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*
[118] *Source: http://www.tnerc.gov.in/orders/Tariff%20Order%202009/2017/TariffOrder/TANGEDCO-11-08-2017.pdf*
[124] *https://www.ceb.lk/commercial-tariff/en*
[125] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
				<301 KwH, the tariff is USD 0.058/KwH (BDT 4.93/KwH)[119] • For consumption >300 KwH, the tariff is USD 0.065/KwH (BDT 5.52/KwH)[120] 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)[121] • During daytime, the tariff is USD	tariff is USD 0.069/KWh (BDT 5.86/KWh) • For consumption >300 KWh, the tariff is USD 0.078/KWh (BDT 6.63/KWh) For Industries with demand more than 42 KVA the cost of power is as follows: • During peak hours, the tariff is USD 0.13/KWh (BDT 11.04/KWh) • During daytime, the tariff is USD 0.071/KWh (BDT 6.03/KWh) During Off-peak, the tariff is USD 0.044/KWh (BDT 3.74/KWh)		

[119] *Source: http://www.ceb.lk/for-your-business/*
[120] *Source: http://www.ceb.lk/for-your-business/*
[121] *Source: http://www.ceb.lk/for-your-business/*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
				0.059/KwH (BDT 5.01/KwH)[122] During Off-peak, the tariff is USD 0.037/KwH (BDT 3.14/KwH)[123]			
Cost of Water (Taka/USD)	Cost of water is BDT 39.44/ m^3 (with annual escalation of 20% for a block of 3 years)	The charge for industrial water is reserved at: USD 74.01/annum (BDT 6286.89/annum) for plots up to 1,000m^2; USD 104.55/annum (BDT 8881.16/annum) for plots up to 5,000m^2; USD 209.09/annum (BDT 17761.47/annum)	The cost of industrial water is USD 2.09/ KL[128] (BDT 177.54/ KL)	The charge of industrial water is USD 0.21/m^3 (BDT 17.84/m^3)[129]	The charge of industrial water is USD 0.47 / cu. M (BDT 39.92 / cu. M)	The water is available for free as EZ offers underground water as tenants set up underground well to draw water	The charge of industrial water is USD 0.15/m^3 (BDT 12.74/m^3)

[122] *Source: http://www.ceb.lk/for-your-business/*
[123] *Source: http://www.ceb.lk/for-your-business/*
[128] *Source: http://www.mepz.gov.in/tariff.html*
[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*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
		for plots above 5,000m²,[126] USD 139.40/annum (BDT 11841.55/annum) for PBF[127]					
Onsite Wastewater Treatment Plant (Y/N)	Yes, there is provision for wastewater treatment plan in the Master Plan of the proposed EZ	There is onsite wastewater treatment plant available within the special economic zone	Yes, there is onsite wastewater treatment plant available within the SEZ[130]	Yes, there is centralized wastewater treatment facilities available	Yes, there is a centralized Effluent Treatment Plant facility available, charging USD 0.09/ cu. M (BDT 7.65/ cu. M) of wastewater treated.	No, onsite wastewater treatment plant is not available[131]	There is an onsite wastewater treatment plant available within the special economic zone
Transport Costs							
Cost of shipping 20-foot FCL container	The approximate shipping charges of a 20-foot FCL Container from	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows:	The approximate shipping charges of a 20-foot FCL Container from	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows:	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows:	The approximate shipping charges of a 20-foot FCL Container from the nearest port are as follows:	• Hamburg – Ho Chi Minh City → USD 960 • Rotterdam – Ho Chi Minh City → USD 980

[126] *Source: https://www.nsez.gov.in/Resources/Announc/Circular%20for%20Revision%20in%20lease%20rentals%20&%20water%20charges.pdf*
[127] *Source: https://www.nsez.gov.in/Resources/Announc/Vacancy%20position%20in%20Noida%20SEZ.pdf*
[130] *Source: http://www.mepz.gov.in/underConstruction.html*
[131] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	the nearest port are as follows: • Rotterdam – Mongla → 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]	• Hamburg – Kandla port → USD 725-1,415136 • Rotterdam – Kandla port → USD 725-1,415137 • Antwerp – Kandla port → USD 725-1,303138 • New York – Kandla port → USD 880-1,888[139]	the nearest port[140] are as follows: • Hamburg – Port of Chennai→ USD 1,086-1,873[141] • Rotterdam – Port of Chennai → USD 1,165-2,090[142] • Antwerp – Port of Chennai → USD 921-1650[143]	• 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	• Hamburg – Colombo port → USD 1,000 • Rotterdam – Colombo port → USD 1,012 • Antwerp – Colombo port → USD 1,083 • New York – Colombo port → USD 1,080	• 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[145]	• Antwerp – Ho Chi Minh City → USD 960 • New York – Ho Chi Minh City → USD 615

[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://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[137] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[138] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[139] *Source: https://www.freightos.com/portfolio-items/freight-rate-calculator-free-tool/*
[140] *Source: http://www.mepz.gov.in/location.html*
[141] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[142] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[143] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[145] *Source: https://worldfreightrates.com/freight*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
			• New York – Port of Chennai → USD 1880-3764[144]				
Cost of Labor (Taka/USD)							
Management	The salary of a management professional is approximately USD 533/ month[146] (BDT 45,277/month)	The average salary of an operations manager is estimated at USD 803.97/month[147] (BDT 68294.48/month)	The salary of a management professional in Chennai is approx. USD 3,076/ month[148] (BDT 26,295/month)	The average salary for a manager is approx. USD 1,000/month (BDT 84,947/month)[149]	The average salary for a management professional is approx. USD 800 / month[150] (BDT 67,957/month)	The average salary of management professional in Cambodia is approximately USD 2770/month[151] (BDT 235,302/month)	The average salary of management professional in Cambodia is approximately USD 2770/month[152] (BDT 235,302/month)
Technicians	The salary of a technician is approx. USD	The average salary of a maintenance technician is estimated at USD	The salary of a technician in the state of Tamil Nadu is approx.	The average salary for a technician is approx. USD	The average salary for a technician is approx. USD 280 /	The average salary of a technician is approx. USD	The average salary of a technician is approx. USD

[144] *Source: https://www.freightos.com/freight-tools/freight-rate-calculator-free-tool/*
[146] *Source: http://www.averagesalarysurvey.com/bangladesh*
[147] *Source: https://www.payscale.com/research/IN/Location=New-Delhi-Delhi/Salary*
[148] *Source: https://www.averagesalarysurvey.com/management-business/chennai-india*
[149] *Source: http://investsrilanka.com/location/horana-epz/*
[150] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[151] *Source: https://www.averagesalarysurvey.com/cambodia*
[152] *Source: https://www.averagesalarysurvey.com/cambodia*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	403 / month[153] (BDT 34,223/month)	297.76/month[154] (BDT 25293.68/month)	USD 1,107 / month[155] (BDT 94,036/month)	320/month (BDT 27,183/month)[156]	month[157] (BDT 23,785 /month)	861/month (BDT 73,139/ month)	861/month (BDT 73,139/ month)
Skilled	The salary of a skilled labourer is approximately USD 107.25 / month[158] (BDT 9,110/month)	The average salary of a skilled manpower is estimated at USD 182.42/month[159] (BDT 15495.95/month)	The salary of a skilled laborer is approx. USD 601/month (BDT 51,050/month)	The average salary for a skilled labour is approx. USD 128/month (BDT 10,874/month)[160]	The average salary for a skilled labour is approx. USD 128 / month[161] (BDT 10,873/month)	The average salary of a skilled labourer in Cambodia is USD 498/month (BDT 42,304/ month)	The average salary of a skilled labourer in Cambodia is USD 498/month (BDT 42,304/ month)
Unskilled	The salary of an unskilled labourer is approx. USD 56/month[162]	The average salary of an unskilled manpower is estimated at USD	The salary of an unskilled labourer is approx. USD 151.64/month[164] (BDT 12,881.29/month)	The average salary for an un-skilled labour is approx. USD 84/month	The average salary for a un-skilled labour is approx. USD 84 / month[166] (BDT 7,136/month)	The average salary of an unskilled labourer in Cambodia is USD	The average salary of an unskilled labourer in Cambodia is USD 128.3/month (BDT 10,899/month)

[153] *Source: http://www.averagesalarysurvey.com/bangladesh*
[154] *Source: https://www.indeed.co.in/salaries/Maintenance-Technician-Salaries,-New-Delhi-DL*
[155] *Source: https://www.averagesalarysurvey.com/engineers-technicians-iii/chennai-india*
[156] *Source: http://investsrilanka.com/location/horana-epz/*
[157] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[158] *Source: http://www.averagesalarysurvey.com/bangladesh (This rate is at country level, prevailing salary structure for labors in Manikgonj district would be undertaken in the draft final stage)*
[159] *Source: https://paycheck.in/main/salary/minimumwages/delhi*
[160] *Source: http://investsrilanka.com/location/horana-epz/*
[161] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*
[162] *Source: http://www.averagesalarysurvey.com/bangladesh (This rate is at country level, prevailing salary structure for labors in Manikgonj district would be undertaken in the draft final stage)*
[164] *Source: https://tradingeconomics.com/india/wages-low-skilled*
[166] *Source: http://www.investsrilanka.com/free_trade_zones/katunayake_other_cost_factors*

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	(BDT 4,757/month)	150/month[163] (BDT 12741.98/month)		(BDT 7,136/month)[165]		128.3/month (BDT 10,899/month)	
Sectors							
Type of Sectors within the Zone	Textiles & RMG, Paper & packaging, Light engineering, Furniture and wood products, Food & Beverages including Agro-based products	Gems and Jewelry, Textiles & RMG, Electronics, Leather, Chemicals, Pharmaceuticals, Food & Agro, Trading and services	Engineering, IT, automobile, pharmaceuticals, leather and sports goods, electronics, textiles & RMG, agriculture and food processing, granite, gem & jewelry etc.[167]	Apparels, Textiles, Chemicals, Furniture, FMCG	Light Machinery, Food Processing, Electrical And Electronics, Toys and Furniture Products	The EZ mainly accommodates bicycle manufacturing, footwear manufacturing, garment manufacturing industries[168]	Light engineering, footwear, textile/RMG, bags, packaging, plastic, mattress, agro products
Special Regime							
Special Regime (Yes/No)	Yes, there's a special regime for incentives	Yes, there's special regime for incentives	Yes, 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
Fiscal Incentives							

[163] *Source: https://paycheck.in/main/salary/minimumwages/delhi*
[165] *Source: http://investsrilanka.com/location/horana-epz/*
[167] *Source: http://www.mepz.gov.in/sectDistribEou.html*
[168] *Source: http://open_jicareport.jica.go.jp/pdf/12111787_02.pdf*

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Customs Duties	• Declaration of EZ as Ware housing Station- Duty free import & Export of Raw material etc. • 100% duty free Import of Vehicle (One Car, One Microbus- 2000 cc) • 100% VAT free Import of Machinery, Construction Materials	Exemptions from customs duty on imports.	Exemptions from customs duties are applicable[169, 170]	• 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.	• 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.	Cambodian SEZs offer exemption from import duty on materials equipment used in production[171] Import duty exemptions for machinery, equipment, production inputs and raw materials[172]	• Import duty exemption on construction materials and production equipment • Import duty exemption on production materials for export industry and export duty exemption
Corporate Taxes / Indirect Taxes	• Corporate income tax waiver for 12	Exemption from central and state level taxes	There is no exemption from minimum alternate tax[173]	• Exemption of tax on dividends.	• Exemption of tax on dividends.	Corporate income tax exemption of up to nine years	Exemption of 10% VAT in addition to import duty exemption.

[169] *Source: https://dgft.gov.in/sites/default/files/CHAP04_1.pdf*
[170] *Source: https://dgft.gov.in/sites/default/files/HBP%20Chapter%204%20as%20on%20June%2030%202019.pdf*
[171] *Source: http://economists-pick-research.hktdc.com/business-news/article/Research-Articles/Cambodia-SEZs-in-Focus/rp/en/1/1X000000/1X0A9P4T.htm*
[172] *Source: https://www.jcci.or.jp/161104%20Cambodia,%20Tokyo%20Presentation%204%20Nov%202016.pdf*
[173] *Source: https://economictimes.indiatimes.com/news/economy/policy/to-boost-make-in-india-framework-for-sezs-set-for-a-complete-makeover/articleshow/62014168.cms*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	years for developer • Corporate income tax waiver for 10 years for unit investors Exemption of VAT on local purchase excluding petroleum products; and on electricity and all utility services			Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.	Minimum tax exemption of 4 to 11 years depending on the type of sectors and percentage of exports.		
Income Tax on Profits	Corporate income tax waiver for 10 years for unit investors	100% income tax exemption on export income for SEZ units under section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back export profit for next 5 years.	100% Income Tax exemption on export income for SEZ units under Section 10AA of the Income Tax Act for first 5 years, 50% for next 5 years thereafter and 50% of the ploughed back	• 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	• There is profit tax exemption with a concept of "Trigger Period" + 3 years + Priority Period. The maximum trigger period is the first year of profit or 3 years after the tenant

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
			export profit for next 5 years[174].			amendment to the law on investment of the Kingdom of Cambodia[175]	earns its first revenue, whichever sooner
Social Security Tax	No social security tax is available in Bangladesh	No social security tax is available in India	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	There is social security tax in Sri Lanka. The employer contributes 12% and the employee 8% of remuneration to the 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	Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[176]	Employers are required to contribute 3.4% of the average monthly wage of workers to the National Social Security Fund (NSSF)[177]

[174] *Source: http://www.mepz.gov.in/PDFs/FAQRelatingtoSEZ.pdf*
[175] *Source: https://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06_chapter3.pdf*
[176] *Source: https://shieldgeo.com/payroll-and-tax-in-cambodia/*
[177] *Source: https://shieldgeo.com/payroll-and-tax-in-cambodia/*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
				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.	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 reinvest their repatriable dividends and or	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	Profit and dividend earned from an Indian company are repatriable after payment of 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	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[180] Free remittance of foreign currency Unrestricted repatriation of profit	There are currently no restrictions on the repatriation of profit or capital derived from investments made in Cambodia, nor on most transfers of funds overseas. The Law on Investment guarantees that investors can freely remit foreign currencies overseas for the purposes of repatriation of invested capital on

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

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	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	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[178].	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[179]				dissolution of an investment project.
Others	Exemption from income tax on salary of expatriates, dividend tax and royalty, technical fees, local govt. tax,	Exemption from service tax	Exemption of service tax, reimbursement of CST and Terminal[181]	• Exemption of transfer charges on transfer of land	• Exemption of transfer charges on transfer of land	VAT suspension for all exported oriented activities[182]	50-year lease of land available to foreign investors (renewable and transferable) • No quota restrictions on imports

[178] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*
[179] *Source: http://www.dobusinessinindia.in/repatriationoffund.php*
[181] *Source: http://www.mepz.gov.in/functionsDuties.html*
[182] *Source: http://www.bigconnectivity.org/beta/sites/default/files/2017-03/Cambodia%27s%20SEZ%20Policy%20in%20Shanghai%2017-22%20Oct%2016.pdf*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	land development tax						to Europe, Canada, Japan, Australia, Taiwan etc.
Non-Fiscal Incentives							
One Stop Shop Within the Zone	Yes, there will be a one stop shop within the zone	Yes, there is one stop shop within the zone	Yes, there is One Stop Shop Within the Zone	Yes, there is one stop shop available within the zone.	Yes, there is a one stop shop within the zone	Yes, one stop shop is available within the zone	Yes, there is one stop shop 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[183]	There is onsite administration office available within the zone
Onsite Convenience Retail		There is no convenience retail available within the zone	There is onsite convenience retail available within the zone[184]	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	There is onsite convenience retail available within the zone

[183] *Source: http://www.cambodiainvestment.gov.kh/investment-scheme/the-special-economic-zones.html*
[184] *Source: http://bitly.ws/7VJd*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
Onsite Housing		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 no onsite housing available within the zone	There is onsite housing available within zone[185]	There is onsite housing available within the zone
Onsite Schools		There is no onsite housing available within the zone	There are onsite schools available within the zone[186]	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
Onsite Community Facilities		There are community facilities available within the zone	There are community facilities available within the zone[187, 188]	There are no onsite community facilities available within the zone	There are onsite community facilities (playground, leisure park, healthcare facilities and sports complex) available within the zone	There are onsite community facilities available within the zone	There are onsite community facilities available within the zone
Onsite Security		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	There is onsite security available within the zone
Quality of Life							
International Housing (Within 15 Km)	There is no international housing facility available within	Quality international housing like Exotica Fresto, Lotus Zing and	There is international housing available within the zone	There is no international quality housing available within 15	Residential facilities are available in Kowinna, Jayawardanapura and Mahunupitiya	There is no international housing facility available within	There are villas available inside the Economic Zone

[185] *Source: http://open_jicareport.jica.go.jp/pdf/1000009832.pdf*
[186] *Source: https://www.playschoolworld.com/in/en/tamilnadu/Chennai/best-preschools-play-schools-in-mepz-tambaram*
[187] *Source: http://www.mepz.gov.in/otherInfra.html*
[188] *Source: https://shodhganga.inflibnet.ac.in/bitstream/10603/191133/6/chapter%204.pdf*

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
	15 km radius of the EZ	many others are available around the area of SEZ		km from the export processing zone	towns which are within 15 km to the EPZ. The commercial capital city, Colombo is round 29 km from the EPZ which has international standard residential facilities.	20 km radius of the EZ	
International Hospital/Clinic (Within 20km)	There is basic healthcare facility available in the region which can be availed at various hospitals in Barishal district	Quality international hospital like max multi-specialty, metro multi-specialty hospitals are available in close proximity to the economic zone	There are no international hospitals available in close proximity to the zone; however Madras houses some of the finest international quality hospitals such as Apollo Gleneagles	The nearest hospital to the industrial park is Base Hospital Horana	Healthcare facilities are available inside the EPZ. Air Force Hospital is just 8 km away from Katunayake EPZ. International hospitals available in Colombo (~29 km)	There are no superior quality hospitals available in close proximity to the zone	There are 5 medical facilities available within 5 km radius of the economic zone
International Schools (Within 20 kms)	There are no international schools available within 20 km radius.	Quality international schools like Kothari International school, Ryan International school, Sapphire International	There are quality schools like Lord's International School International School in close	There are no international quality schools available within 15 km from the export processing zone	Superior quality educational institutes like Institute of Engineering Technology is present in proximity to the zone. University of Colombo, University	There are quality schools like Motherland International School and Harford International School available	There are local schools available near the SEZ, but international schools are not available within 20 km range of the SEZ

Parameters	Agailjhara EZ	Noida SEZ (India)	Madras Export Processing Zone (India)	Horana Export Processing Zone (Sri Lanka)	Katunayake EPZ (Sri Lanka)	Tai Seng Bavet SEZ (Cambodia)	Manhattan Special Economic Zone (Cambodia)
		school, Billabong high International school etc. are available in close proximity to the economic zone	proximity to the zone[189]		of Sri Jayewardenepura and several other international educational institutions are in Colombo.	within 20 kms from the zone	

[189] *Source: http://bitly.ws/7VJi*

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 26: 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. • Presence of industrial regions (Barishal, Khulna, and Mongla EPZ in Bagerhat district) near Barishal district can create a conducive ecosystem for growth of economic zone in Agailjhara. • However, distance from Dhaka, the capital city and absence of direct road connectivity with it may be challenging for the proposed EZ. But operationalization of Padma Bridge can alleviate its effect
 **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 at Agailjhara has access to road connectivity with major nodes such as Khulna and Barishal. It also has access to Mongla Port and Benapole land port, which are important trade gateways of Bangladesh • Presence of Barishal airport in proximity of the proposed EZ provides access to air transportation • It also has access to major railway station in Khulna
 **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 ~4 km and nearest water source Paysa river is ~ 2 km from the proposed EZ. • Two sub-stations of 33/11 KV and 132/33 KV have been planned inside the proposed EZ to receive and transmit power to the industries as per the Master Plan
 **Cost of Land and Utilities**	• Cost of land is lower when compared to India and Cambodia, but it is on the higher side when compared to Sri Lanka • Out of the competing EZs, cost of power is low in India, whereas it is high in Cambodia and Sri Lanka 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 has been evaluated for the proposed EZ and certain land parcel has been earmarked in the Master Plan as 'support amenities" to develop such facilities.
	**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. • Similar facilities i.e. wastewater treatment, sewage treatment plant and solid waste management facility has been included in the Master Plan of the proposed EZ
	**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

Industry assessment exercise aims to identify the best-fit industrial sectors that can be promoted in the proposed EZ. The assessment is carried out keeping in mind the existing supply chains and the macroeconomic profile of the region. Any industrial development recommended in the proposed EZ would primarily be established basis a sound business decision that in turn takes into account the existing factors of production and the industry linkages in the region surrounding the proposed EZ. This forms the basis of the approach adopted to arrive at the best-fit industries in the region. In addition to the factors of production, natural resources and industry linkages, the overall trade scenario in the country and the government focus sectors have been considered to further gauge business propensity for specific manufacturing sectors.

The resulting probable sectors have been further validated by an on ground primary survey (voice on ground) to validate the findings from secondary study and include the stakeholder views on the challenges and expectation from the proposed EZ. Basis the final industry shortlist, the demand projection would be undertaken to estimate the annual uptake of industrial space at the proposed EZ.

5.2. Methodology Adopted

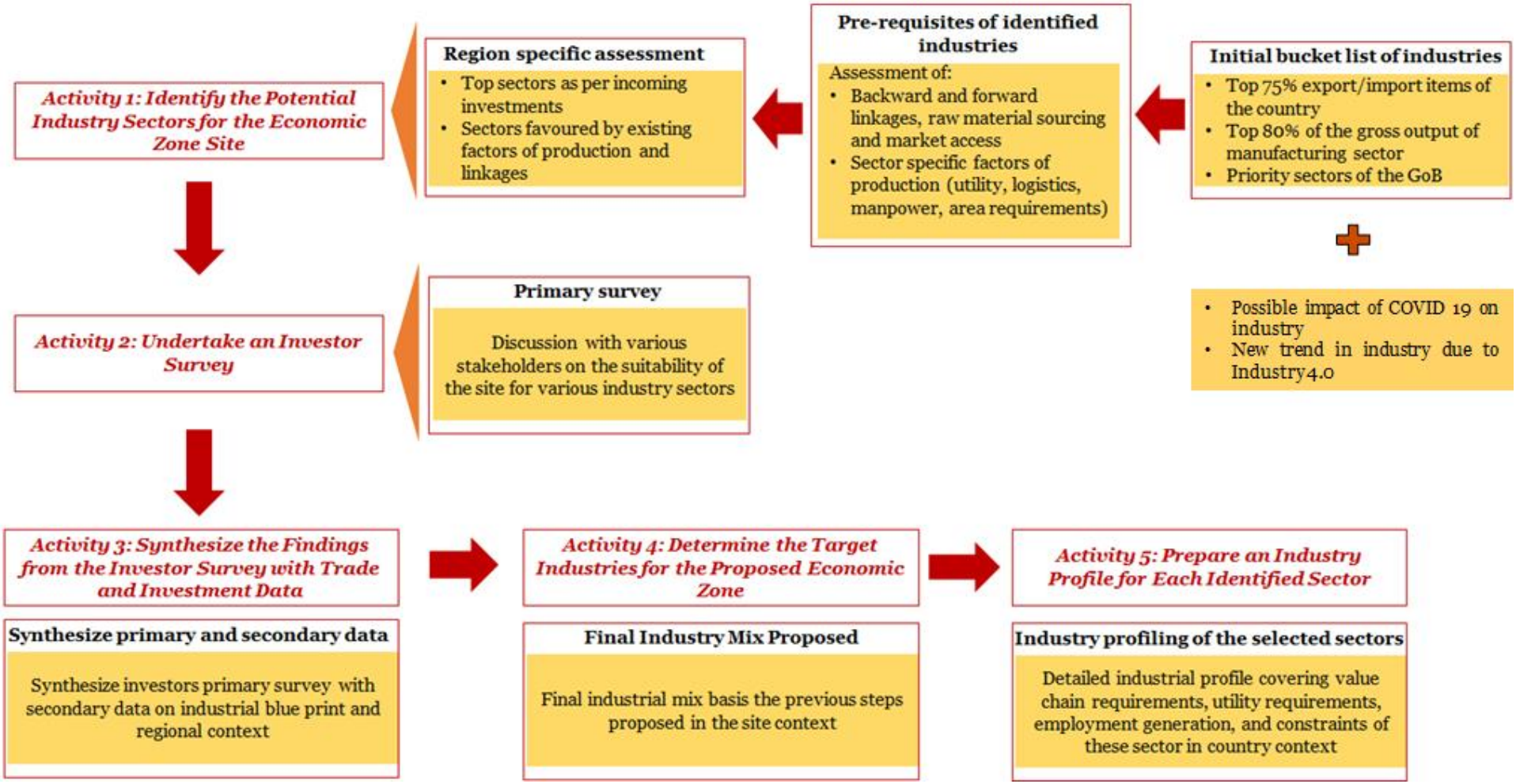
The method to arrive at the initial universe of industries primarily involves secondary research starting at the country level and gradually funneling down to the site-specific factors. Recent growth trends of different industries in manufacturing sector have been analyzed to identify an initial bucket list of industries demonstrating high growth potential. Data sources available with agencies like Bangladesh Investment Development Authority (BIDA), Bangladesh Export Processing Zones Authority (BEPZA), Bangladesh Economic Zones Authority (BEZA) and Intra Cen (ITC) trade map have been used for this study.

The growth sectors thus arrived at, have been further assessed basis forward & backward linkages and factors of production required for each sector in the bucket list. In addition to this, a deep dive into influence region assessment has been undertaken to assess the availability of raw materials, forward & backward linkages and factors of production requirements prevailing at the proposed EZ and influence region.

Post the secondary research, a primary survey was conducted to gauge the investor sentiment about the proposed EZ. The stakeholders contacted included industry leaders across the sectors identified in coherence to site specific parameters as mentioned above. The views of the industry leaders on the suitability of the site and the challenges across sectors were synthesized to arrive at the final industrial sector mix for the proposed EZ.

Diagrammatic representation of the steps followed for the industry assessment exercised have been depicted in the figure at the next page.

Figure 24: Industry Assessment Framework



Source: PwC Methodology

5.3. Country Level Assessment: Arriving at the Initial Bucket List of Industries

5.3.1. Assessment of Foreign Trade (Export and Import)

The starting point for the industrial assessment has been considered based on the country level foreign trade parameters across various sectors. Following figures enlists the top 75% of items, being exported and imported, that were shortlisted on the basis of average trade value over the past 5 years (in million USD).

Figure 25: Export/Import Data for Bangladesh

Top 75% Imports	Top 75% Exports
• Cotton	• Textile and RMG
• Heavy Machinery	• Leather and Leather Products
• Electrical and Electronics	• Wooden products
• Petroleum Products	• Fish and other sea food
• Iron and Steel	• Auto and accessories
• Food and Beverage	• Tobacco
• Wood	• Rubber
• Paper and Paper Products	• Optical goods
• Light Engineering products	• Pharmaceuticals
• Optical goods	• Electrical Equipment
• Pearls and Metals	• Non-metallic minerals
• Chemicals	• Cotton
• Non-Metallic Minerals	• Food and Beverage
• Leather	• Heavy Machinery
• Tobacco	• Chemicals
• Ships	• Iron and Steel
• Transportation Equipment	• Ships
• Glass and Glassware	• Transportation Equipment
• Sugar	• Arms and Ammunition
• Fertilizer	• Aircraft and parts
• Aircraft and parts	• Pearls and Metals
• Arms and Ammunition	• Plastic Products
• Plastic Products	• Paper

Source: ITC Trade map database

Details of the above are placed as annexure to this report.

The top five imported products include raw cotton, heavy machinery, raw materials for the electrical and electronics, petroleum and iron and steel. Import of these commodities highlights the dependence of the domestic industries on these basic ingredients:

- **Raw cotton primarily for RMG products** – domestically produced cotton is not of high-quality implicating import dependence for quality products
- **Petroleum**, as the country is not self-reliant in catering to energy demands of its vast growing population and industries
- **Electronics and electrical products** are imported primarily used as raw material for the growing demand of electronic products. Demand for electronics is rising in Bangladesh due to the recent push by

the government for rural electrification expanding the access of electricity by the large rural population in Bangladesh.

The top five exports from Bangladesh include RMG, leather, wooden products, fish products and automobile accessories. Readymade garments (RMG) exports constitute the largest chunk of exports from Bangladesh. A large and cost beneficial working population amalgamated with lower cost of operations has propelled Bangladesh as a hub for the readymade garments globally.

Leather is another industry, which is dominant among the exports from the country. About 240 tanneries in Bangladesh produce 250 million square feet[190] of hides and skins every year, which drives the exports from the sector. Apart from leather, fish products are also exported on a large scale from Bangladesh owing to the large coastline of Bangladesh.

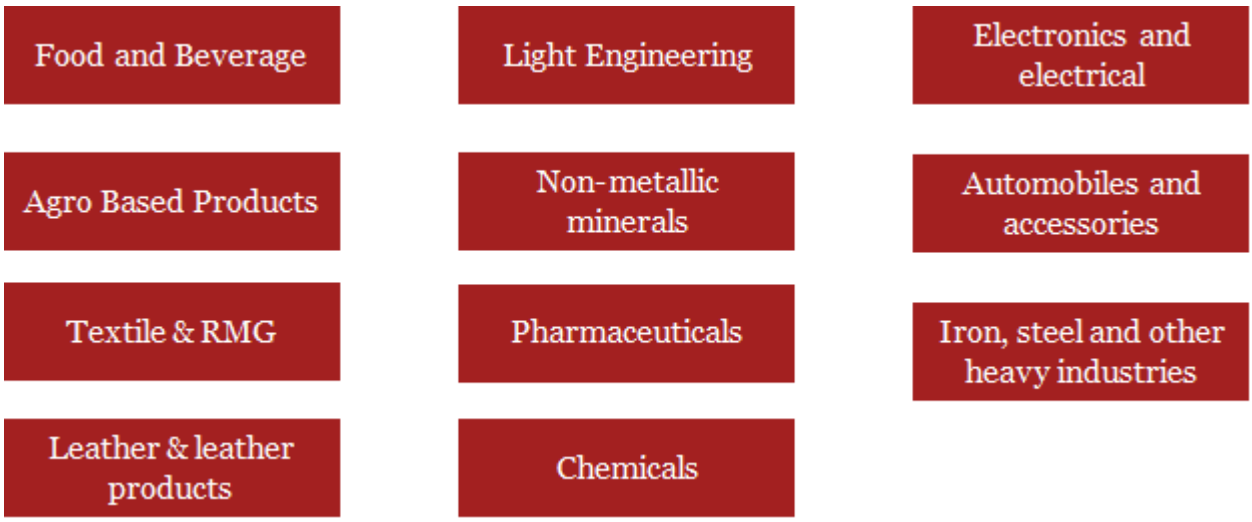
Automobile accessories is another sector, which comes under the top exporting sectors. This is because of the large presence of sub-part manufacturers, which are present in Bangladesh.

The sectors with maximum import and export values highlight the commodities that have gained maximum traction in the country. These commodities have demonstrated financial interest from the business community. These commodities are the most lucrative sectors for potential expansion. This is due to the sheer demand and consumption patterns across Bangladesh.

5.3.2. *Assessment of Gross Output of Manufacturing Sector*

Following figure enlists the items that constitute the top 80% of the total output produced in Bangladesh:

Figure 26: Top sectors by gross output added



Source: ITC Trade Map Database

Details of the above are placed as annexure to this report.

The top five performing sectors as per the industrial output include RMG, basic metals, textiles, food products and non-metallic mineral products. This indicates that the industrial manufacturing units across the country have been primarily producing RMG, food products, basic metals and other non-metallic minerals such as ceramic etc. The manufacturing output from these sectors has abundance of demand locally as well as export oriented, which makes investment into these sectors lucrative in the country.

5.3.3. *Priority Sectors Identified by the Government*

As is evident from the previous two sections, Bangladesh experiences the maximum imports of raw cotton and subsequent maximum output of readymade made garments. The country is considered as a global hub for producing export-oriented garments. Garments industry, which formed 3.89% of its total export basket in 1983-

[190] *Source: Weltann Leather, Article titled "Bangladesh: A potential Leather Sector"*

84, contributed 83.49% of the total exports in 2017-18, providing employment to around 40 million people.[191] In 2018, the share of Bangladesh in the total apparel market globally was 5% and the Government is targeting to increase its share to 8% by 2021 with an export value of USD 50 billion.[192] This underlines the importance of garment sector in Bangladesh. However, at the same time also highlights the over dependency of Bangladesh's exports on a single sector. There is a need for Bangladesh to improve its manufacturing competencies in other sectors as well, in order to make the economy resilient to possible sector specific disruptions due to automation, policy changes and increasingly competitive global scenarios. GoB has taken cognizance of this situation and has identified other sectors apart from textile and garment sector as priority sectors.

Figure 27: Government thrust sectors

Source: BIDA National Industrial Policy 2016

The above figure lists out the thrust sectors, which are being promoted by the Government across the country and as such would be a plausible option for investors to look into while setting up manufacturing shops across locations with EZs in Bangladesh.

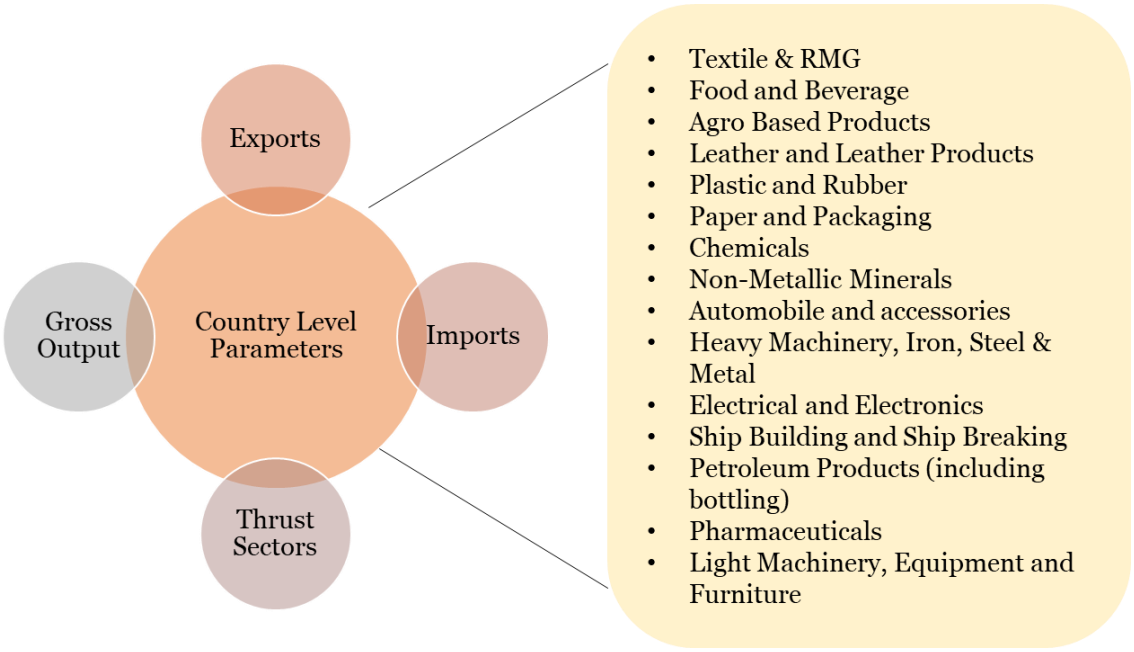
5.3.4. *Arriving at the Initial Bucket List of Industries*

Based on the above-depicted assessment, an initial bucket list of sectors was prepared by identifying those industries performing well across the parameters highlighted in the previous sections on country level indicators.

The initial bucket list of industries is as mentioned in the next page:

[191] *Article from Dhaka Tribune (https://www.dhakatribune.com/business/2018/07/05/rmg-exports-saw-8-76-growth-last-fiscal-year)*
[192] *Article in "The Textile Magazine" (http://www.indiantextilemagazine.in/cover-story/bangladesh-targets-50-billion-rmg-exports-by-2021/)*

Figure 28: Initial Bucket List of Industry Sectors



Source: PwC Methodology

5.4. Outlook of Industrial Landscape in 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.[193]

5.4.1. *Impact of COVID 19 on the Initial Shortlist of the 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.[194] 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

[193] *PwC Research*
[194] *World Economic Forum*

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.

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

Table 27: 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
	4	4
Food and Beverage/ 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
	3	1

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
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 •
	3	3
Plastic and Rubber	• Majorly import dependent, and low domestic production • Exports worth only ~125 million USD in 2019, while estimated domestic 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.	• Medium impact, as industry acts as input to both essential and non-essential services industry (e.g. food as well as RMG) • 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
	1	2
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
	2	1
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
	2	3
Non-metallic minerals	• Majorly domestic consumption market driven industry.	• Low impact in long term due to nature of products, and demand for construction, real estate (major

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
	• 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.	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 • Disruption in recently rising exports from Bangladesh might impact in long term in international market.
	2	3
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
	1	3
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.
	2	3
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

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
		• Disruption in supply chains will negatively impact the domestic production through impact on export as well as import • In long term, the industry will likely to be very less impacted.
	1	3
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
	2	1
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.
	2	3
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
	3	1
	• Exports worth ~88 million USD compared to imports worth ~202	• Decrease in demand in short term due to decrease in new infrastructure

Industrial sectors	Prevailing overview of the sector	Expected impact of COVID-19
Light Machinery, Equipment and Furniture	million USD in 2019 for furniture category. • Industry is estimated to grow at ~5% in the next coming years due to rising domestic market.	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.
	2	2
The details of Rating are as follows:		
0	Very Poor Condition	No/Minimal Impact
1	Poor Condition	Little Impact
2	Medium/Average Condition	Medium Impact
3	Above Average Condition	High Impact
4	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).

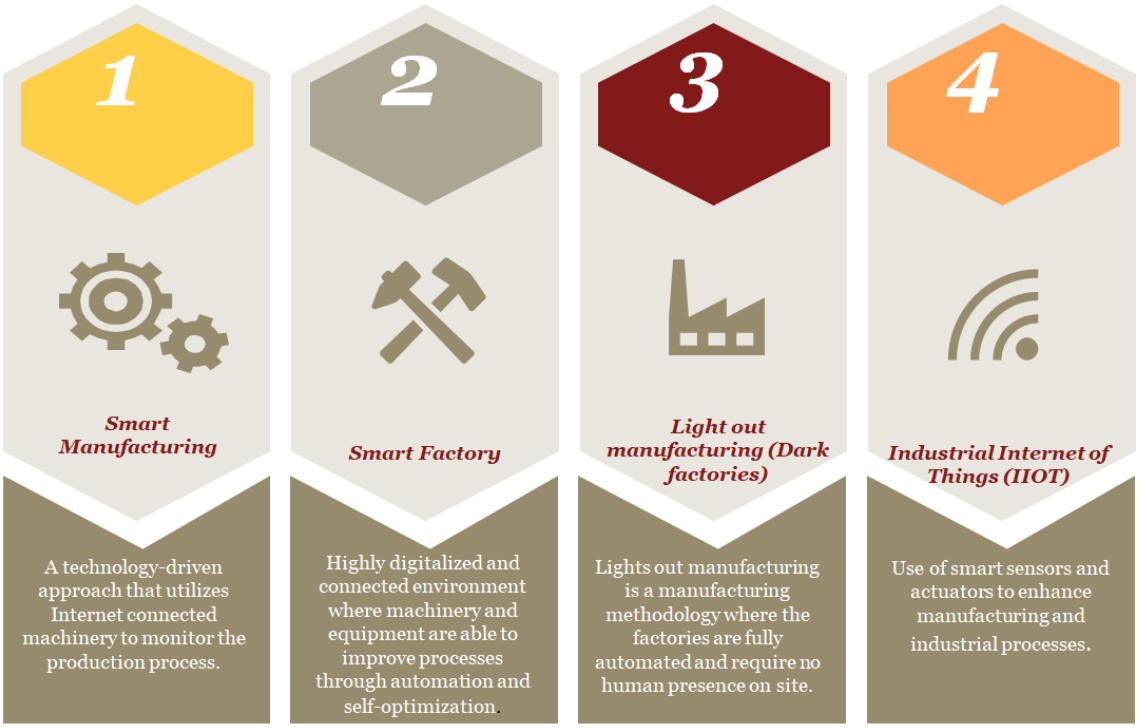
5.4.2. *Evolution of the Industrial Outlook in the Future*

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.[195] 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:

195 McKinsey Publications

Figure 29: 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.[196] 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.[197] 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.

196 PwC

Table 28: 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 and Beverage/ 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 and Beverage 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.
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.

Industrial sectors	Solutions through Industry 4.0 (2041)
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.198 • 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.
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.199 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.

[198] *nordcloud.com*
[199] *ispe.org*

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 and 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.

Table 29: 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
	• 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.

 **Tactics: Short Term**	 **Strategy: Long Term**
industries and COVID intensity in the region	

Source: PwC Research

5.5. Sector Specific Requirements

The proceeds from the country level assessment provide an apt starting point for the industry assessment. It is imperative to further understand the basic requirements of each of the above shortlisted sectors and the linkages that help the establishment of these sectors in any region. These criteria that help industry sectors to flourish in any region are classified in to two categories:

- Backward and forward linkages
- Factors of production

Backward and forward linkages essentially aim to capture information around the value chain of these sectors that starts right from the raw material procurement stage to the finished produce and its potential markets.

At the outset, the sector specific requirements of the initial bucket list of industries at the country level have been assessed and the same is placed as an annexure to this report. This country level assessment analyses the sector specific dependency on the raw material sourcing, utilities, site-specific characteristics, logistics, human resource availability, and access to major markets.

Proceeds from this country level assessment of the initial bucket list of industrial sectors have been studied in detail to arrive at the pre-requisites essential for setting up of these industrial sectors.

Table in the next page qualitatively illustrates the dependence of the initial bucket list of industrial sectors on various identified pre-requisites in order to operate out of any region.

Table 30: Factors of Production and Industry Linkages

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

Source: PwC Methodology

The table in the previous page captures various industry sectors and the degree of their dependency on various pre-requisites (factors of production and industry linkages). In the next section, the proposed EZ location and its adjoining region will be assessed based on these pre-requisites.

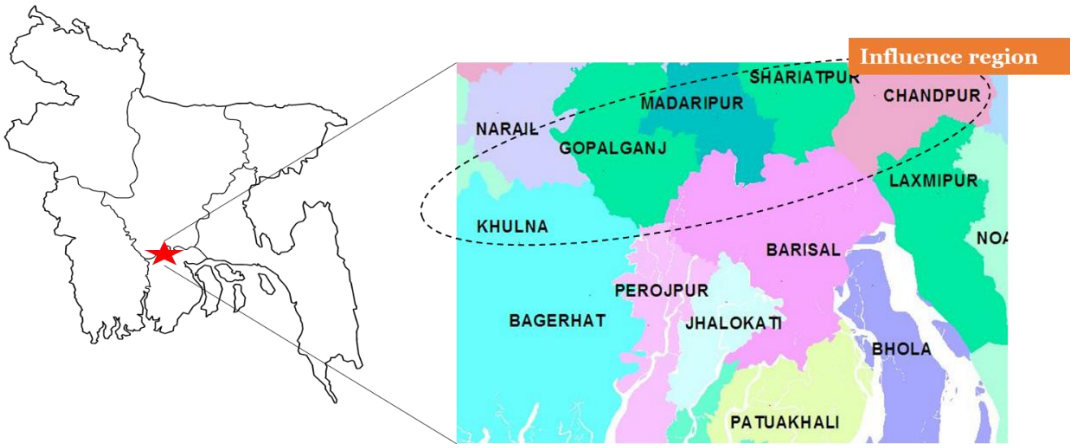
5.6. Influence Region Specific Assessment

In this section, the proposed EZ location and the surrounding upazilas/district areas hereby referred to as "influence region", have been assessed in terms of the availability of natural resources, industrial proliferation, and labor intensity. This analysis is essential to ascertain the best-suited sectors, which would flourish in the ambient conditions already available at the site. The assessment would help to negate the sectors that are by the very nature of their requirements not feasible at the proposed EZ.

As mentioned previously, influence region is the region adjoining the site and the district Barishal. The district lies in the southern part of Bangladesh and it is surrounded by many districts. Barishal district is land locked and the surrounding districts would have an influence on the availability of industrial raw materials at the proposed EZ and on the prevailing infrastructure linkages. Since the proposed EZ at Agailjhara is located on the northern fringe of Barishal district, it is pertinent to consider only the northern boundary districts as the influence region for all assessment purposes. Thus, the influence region for the proposed EZ is defined as constituting the following districts:

- Khulna
- Gopalgonj
- Madaripur
- Shariatpur
- Chandpur

Figure 30: Influence region surrounding the proposed EZ



Source: Local Government Engineering Department District Maps

Few details about the districts in the influence region are depicted in the following table:

Table 31: 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	Barishal	2,785	2.58	1,715	743

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)
2	Khulna	4,394	2.57	2,638	778
3	Gopalgonj	1,469	1.30	1,446	809
4	Madaripur	1,126	1.29	1,533	826
5	Shariatpur	1,174	1.28	1,369	774
6	Chandpur	1,645	2.68	1,447	734

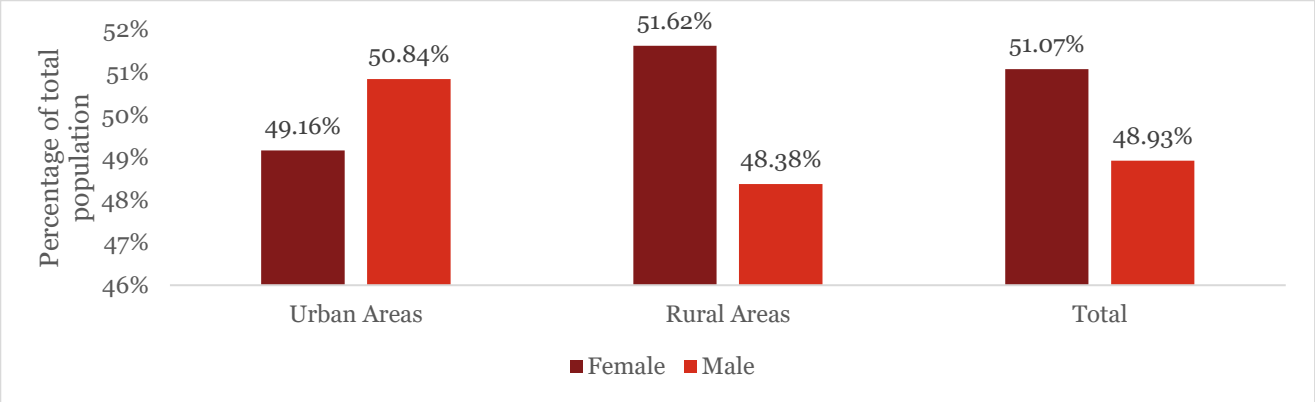
#-Estimated for 2018, the country's per capita GDP is for year 2018
Source: Lagging District Survey (LGED), Bangladesh Bureau of Statistics, and World Bank Database

It may be observed from the above table that per capital GDP is higher in districts such as Barishal and Khulna, which are industrial hubs of the region. These districts have GDP per capita higher than the country's average, i.e. ~1,698 USD per capita.[200] On the other side, the per capita average consumption expenditure is higher in districts such as Gopalgonj and Madaripur districts compared to the high income districts, Khulna and Barishal, even though it lies below the national average of ~888 USD per capita.[201]

5.6.1. *Demographics of the Influence Region*

Barishal district, located in the southern part of Bangladesh and a headquarter of Barishal division, is estimated to have ~2.58 million population by 2020, and its share in the country's population is estimated to be around ~1.6%. The district has almost equitable population of both male and female, while its most of the population resides in the rural area. Graph depicted in Figure 31 tries to depict the gender wise population distribution in the district.

Figure 31: Gender wise Population Distribution in the District (2020 estimated)



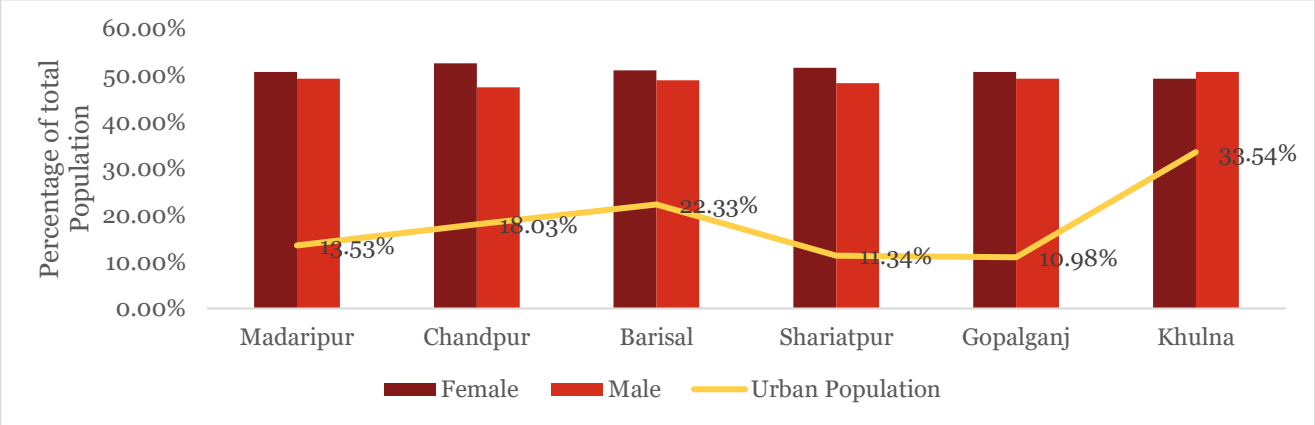
Note: The ratio is calculated on the basis of population estimated for 2020
Source: Population and Housing Census, Bangladesh Bureau of Statistics

It may be noted from Figure 31 that, proportion of female population in the rural areas is higher compared to the male population, whereas male population is depicting dominance in terms of population proportion in the urban areas. But percentage of female population in the district is marginally higher than the male population owing to the fact that most of the population in the district resides in the rural areas which still have higher proportion of female population compared to male population.

[200] World Bank Database.
[201] Lagging Districts Survey.

Graph in Figure 32 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 32: Gender wise and Urban-Rural Distribution for Districts in influence region (2020 estimated)

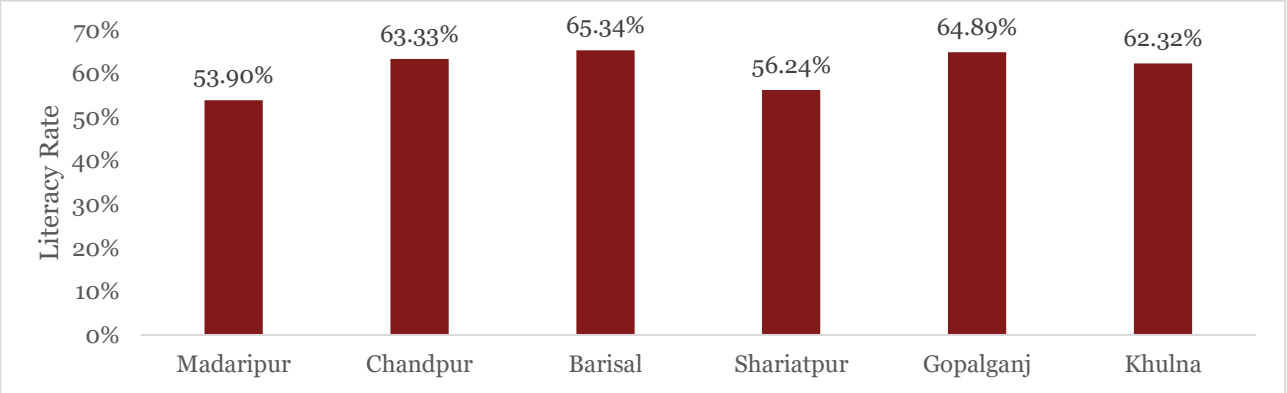


Note: The ratio is calculated on the basis of population estimated for 2020
Source: Population and Housing Census, Bangladesh Bureau of Statistics

It may be noted that, female population is marginally higher than the male population in most of the districts in influence region. Also, the share urban population is highest in Khulna district (~33.54%) while it is lowest in Gopalgonj district (~10.98%), while for the rest of the districts, the share lies mainly in the range of 10% - 25%. The high urban population in few districts depict the better urban infrastructure them, which can attract the potential workforce in the region. On the other side, the equitable distribution of the population across the gender depicts the employability of local population across various industries, be that textile & RMG industry where female employees are observed dominating in the country, or heavy industries where male employees are mostly observed.

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 33.

Figure 33: 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

Districts such as Chandpur, Barishal, Gopalgonj and Khulna are estimated to have better literacy rate compared to districts such as Madaripur, and Shariatpur. Literacy is generally seen higher in the urban areas compared to rural areas, and higher urban population has played in increasing literacy of the few districts such as Khulna as depicted in Figure 33. Agailjhara upazila has estimated literacy rate of ~67.1%, which is comparatively higher than the district average of ~65.3% as depicted in Figure 33.

~39% of the people residing in Barishal district are employed in the wholesale and retail trade activities, followed by ~17% in manufacturing activities and ~9% in accommodation and food services, and educational services each.

~4% of the district's employment is observed in transportation and storage related activities. The similar trend is observed in other districts as well.

- Appx 40% of the total employment is observed in wholesale and retail trade activities. The percentage variation is observed from ~45% in Khulna and Madaripur to ~31% in Gopalgonj district.
- Districts such as Barishal, and Gopalgonj depict ~16% of the total employable population employed in the manufacturing sector, while the same percentage between districts such has Chandpur and Shariatpur ranges between 11-12%, while for Khulna and Madaripur between 7 to 9%.
- Districts such as Barishal and Chandpur have population as less as 304% employed in transportation and logistics sector, while the same for districts such as Khulna is as high as ~16%, majorly due to presence of port in the district.

Sourcing of Human Resources

It is important to have adequate training and educational infrastructure in the district for ensuring the continuous supply of trained workforce to the domestic industry. Following table depicts the list of TVET institutions in the district.

Table 32: Upazila wise list of training institutions, along with the seating capacity

Upazila	Institution name	Seat capacity
Agailjhara	Vocational Prosikkhan Kendro	50
Gaurnadi	Kasemabad Siddikia Kamil Madrasa (vocational institute)	200
Babuganj	Krisi Prasikan Institute (Agriculture training institute)	300
	Ureka Polytechnic Institute	25
	Southern Medical & Technology Institute	7
Bakerganj	Youth Development Training Center	60
	Atahar Uddin Howladar Technical & Business Management (BM) College	60
	Modern Polytechnic Institute	24
	Father C.G. Youth Technical School	32
Barishal sadar	Barishal Polytechnic Institute	300
	Technical Training Center (Ttc)	40
	Mohila Technical Training Center (Ttc)	40
	Barishal Nursing College	361
	Sher e Bangla Regional Corporative Institute	50
	Imam Skill Academy	103
	Idial Polytechnic Institute	140
	Infra Polytechnic Institute	100
	Paribar Kollayn Skill Institute	90

Upazila	Institution name	Seat capacity
	Bangladesh Institute of Health & Technology	48
	Engineering Training Center	30
	United Polytechnic Institute	20
	Zamzam Institute of Health Technology	70
	Institute of Medical & Dental	21

Source: Technical and Vocational Education and Training (TVET) Institution Census 2015

There are no major colleges/technical institutions in the Agailjhara upazila itself, but training institutions are located in the Barishal Sadar upazila that boasts of many polytechnic and medical institutes. Graduates from these institutes would be available for working in the Agailjhara district if the compensation and benefits are provided at par or above the industrial belt of the Barishal Sadar. Especially for the pharmaceutical industry, if envisioned in the proposed EZ, the availability of pharmacists and medical representatives can be assumed plenty in case the relocation and housing is provided to the workers near the site. Industries in economic zone can also tie up with the educational institutions in the region and develop the industry-oriented courses for the training of workforce in the industries through effective industry-academic collaboration.

Apart from these institutes, which can provide for skilled labor, the primary interaction with the educational institutions in the vicinity and the nearby industrial establishments revealed that unskilled labor would be readily available from the nearby Upazilas of Gaurnadi and Wazirpur. In addition to this, unskilled labor in Bangladesh is not a major challenge, as migration of workforce for employment purpose is quite prevalent in the country.

Limited availability of skilled labor in the region and availability of unskilled labor in abundance show the opportunity for the development of industries such as textile and RMG, leather and footwear, nonmetallic, and food and beverages in the region (proposed economic zone).

5.6.2. *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.

5.6.2.1. *Agricultural Resources*

The influence region is predominantly an agriculture-based economy, because of its presence in the delta region of the river, and hence the availability of the fertile land for the agricultural activities. Few important agricultural produces in the districts of the influence region are shown in the following table:

Table 33: Major crops in the influence region (fruits not included, 2018)

Sr. No.	Name of the District	Major Crops
1	Madaripur	Rice, Wheat, Gram, Lentil, Peas, Kheshari, Coconut, Mustard, Spices, Onion, Garlic
2	Chandpur	Rice, Mustard, Soybean, Maize, Coconut, Chilli, Spices
3	Barishal	Rice, Gram, Lentil, Green Gram, Kheshari, Coconut, Soya bean, Sugarcane
4	Shariatpur	Rice, Wheat, Lentil, Kheshari, Mustard, Coconut, Chilli, Spices

Sr. No.	Name of the District	Major Crops
5	Gopalgonj	Rice, Wheat, Lentil, Kheshari, Coconut, Mustard, Spices, Onion, Sugarcane
6	Khulna	Rice, Coconut, Spices

Source: Agricultural Yearbook 2018, Bangladesh Bureau of Statistics

It may be noted from the above table that, Barishal district is rich with crops such as rice, gram, lentil, Kheshari, coconut, soybean, and sugarcane. The table given below depicts the production of major crops in Barishal district.

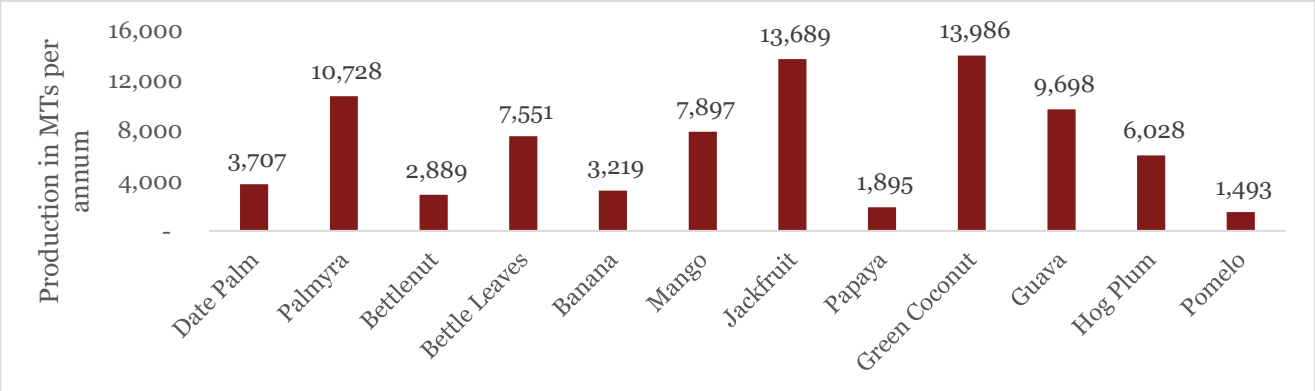
Table 34: Production of major crops in Barishal district (2018)

Sr. No.	Crop type	Area under cultivation in Ha	Production in MTs
1	Rice	197,639	462,152
2	Gram	4,179	3,765
3	Lentil	1,705	1,685
4	Kheshari	16,888	17,058
5	Coconut	81	11,977
6	Soybean	2,966	3,480
7	Sugarcane	435	8,838

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

Apart from the above mentioned crops, fruits such as banana, palmyra, green coconut and jackfruit are also produced in large quantum in the district. Following figure depicts the production of various fruits in the Barishal District.

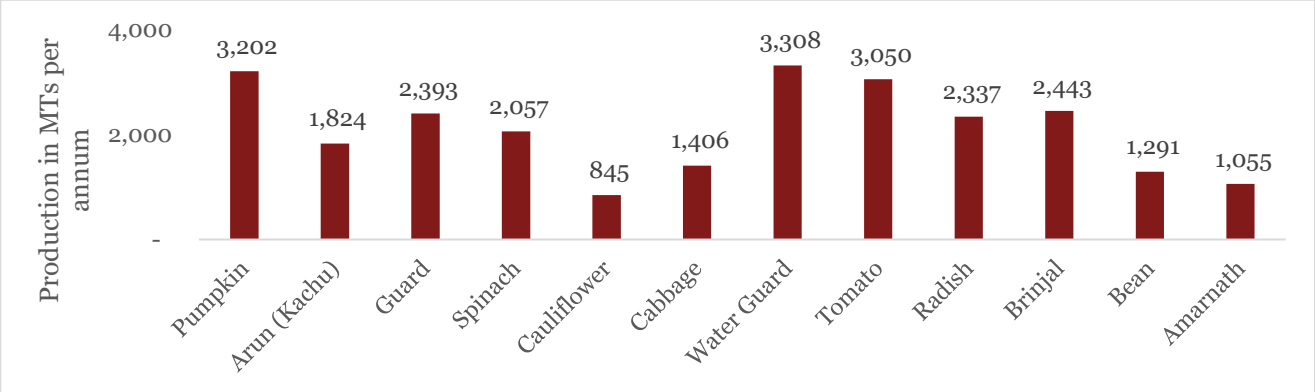
Figure 34: Production of fruits in Barishal district (2018)



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

Similarly, the production of major vegetables in Barishal district is depicted in Figure 35.

Figure 35: Production of vegetables in Barishal district (2018)



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

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 abovementioned crops, district also has ~11,318 hectare of area under the cultivation of jute, is one the largest producers of jute in the region. In 2018, district observed the production of ~107 thousand bales of jute production. The produced jute majorly serves as an input material for the domestic jute industry in the country.

Other districts in the influence region such as Madaripur, Shariatpur and Chandpur are also major producers of jute. Madaripur witnessed the production of ~310 thousand bales of jute in 2018, while the same in case of Shariatpur and Chandpur was ~256 thousand and ~41 thousand bales respectively.

5.6.2.2. *Aquaculture Resources*

The region is also rich in production of fish. Table 35 given below depicts the production of fish in the influence area.

Table 35: Fish production in the influence area (2018)

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
Madaripur	22,720	1,112	234	7,893	12,148
Chandpur	99,031	32,222	3,425	23,167	37,481
Barishal	95,928	32,757	4,115	8,262	39,976
Shariatpur	25,222	1,247	476	5,399	3,670
Gopalgonj	30,880	-	604	6,739	15,095
Khulna	87,434	-	3,346	19,129	4,588

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

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 southern as well as south west part of Bangladesh.

5.6.2.3. *Mineral Resources*

Influence region also has presence of few minerals such as peat. But their presence in not enough to support the industrial production, and hence they are not further analyzed in the section.

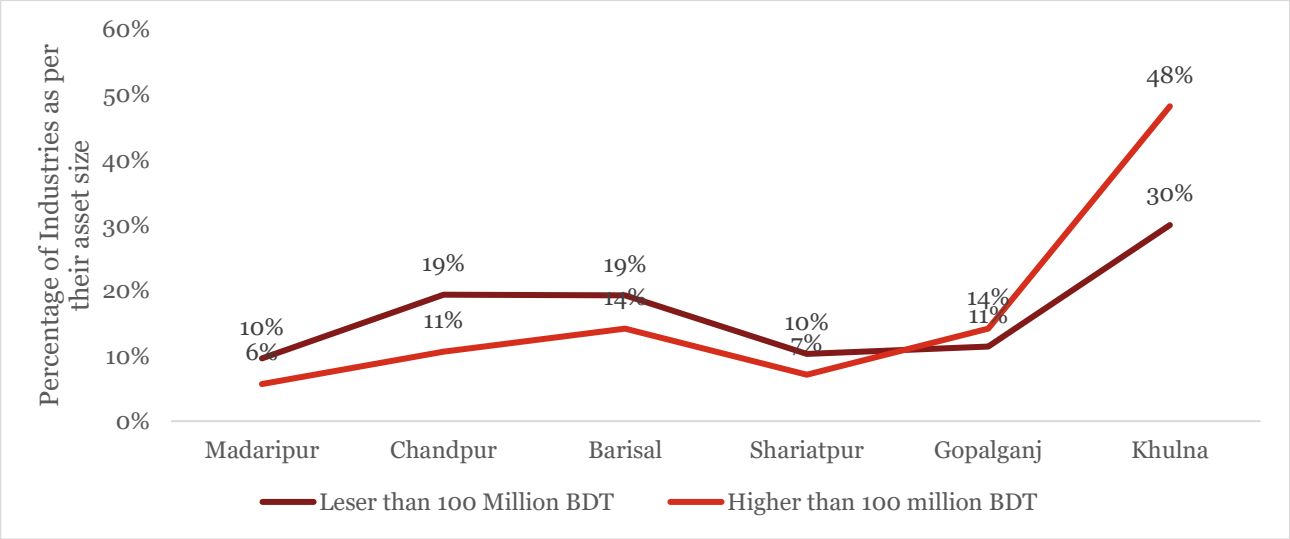
Development of food and beverages, and agro processing industry might be the better choice for the proposed economic zone considering the presence of vast natural resources in the region which may act as the sources of input.

5.6.3. *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 36 depicts the distribution of establishments (district wise) in the influence region.

Figure 36: Distribution of industries as per their asset size (2019 estimated)



Source: Economic Survey, Bangladesh Bureau of Statistics

It is easily observable from Figure 36 that, Khulna, Barishal and Chandpur are among the most industrialized districts in the influence region. Khulna has more than half the bigger establishments in the region, while almost 1/3rd the small and medium scale enterprises in the influence region. On the other side, districts such as Gopalgonj, Shariatpur, and Madaripur have comparatively less industrialization, depicting the less share in the establishments (both smaller as well as larger) in the influence region.

5.6.3.1. *Barishal District*

The economy of Barishal district is predominantly dependent on the natural resources found in the nearby regions, and most of the industries in the district are directly dependent on the production of these natural resources.

As per the economic survey, Barishal has total ~107 thousand establishments in all the secondary and tertiary sector, of which ~11,600 are involved in manufacturing activities. As per the district statistics report, Barishal district has major presence of rice mills, followed by steel and engineering and textile mills. It also has presence of pharmaceutical, food and agro, RMG, and cement industry. Being a riverine district, it also hosts shipbuilding industry, which is of one the major industry in the district. Barishal riverport in the district is the second largest

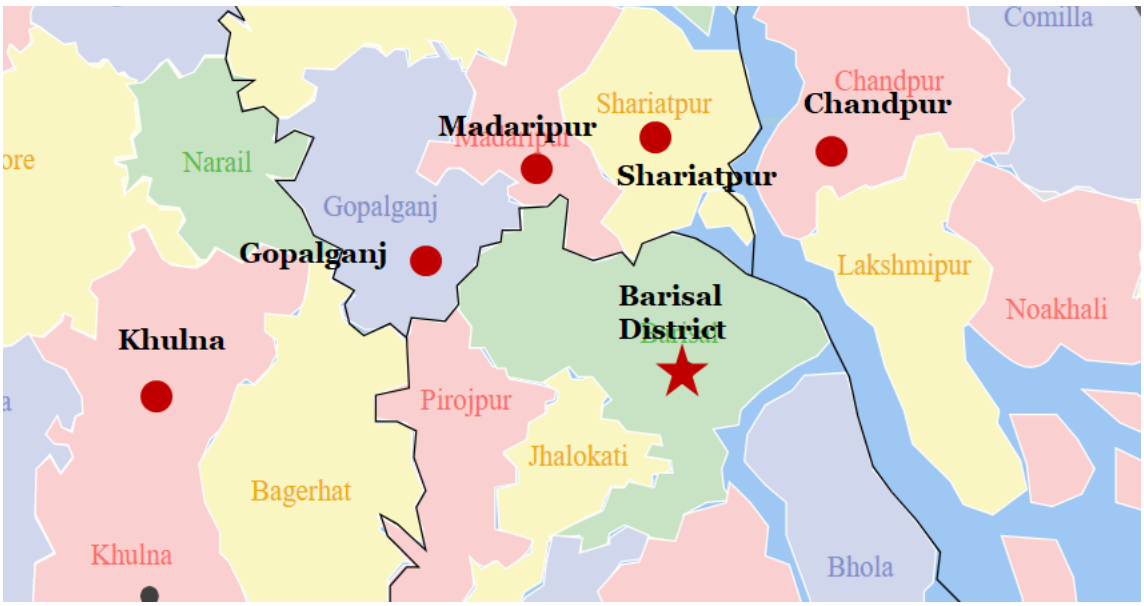
riverport in the country, and it is used majorly to transport coal, petroleum and agricultural crops to and from Narayanganj, Dhaka and Chandpur.

Presence of existing industries in the district will offer the industrial ecosystem for the upcoming factories in the proposed economic zone. The presence of supply chain networks, and a system of utilities will help new industries to set up their base easily and start their operations without a hassle in the proposed economic zone.

5.6.3.2. *Other districts in the Influence Region*

The influence region of the Barishal district covers the districts as depicted in Figure 37:

Figure 37: Influence region to Barishal District



Source: PwC Analysis

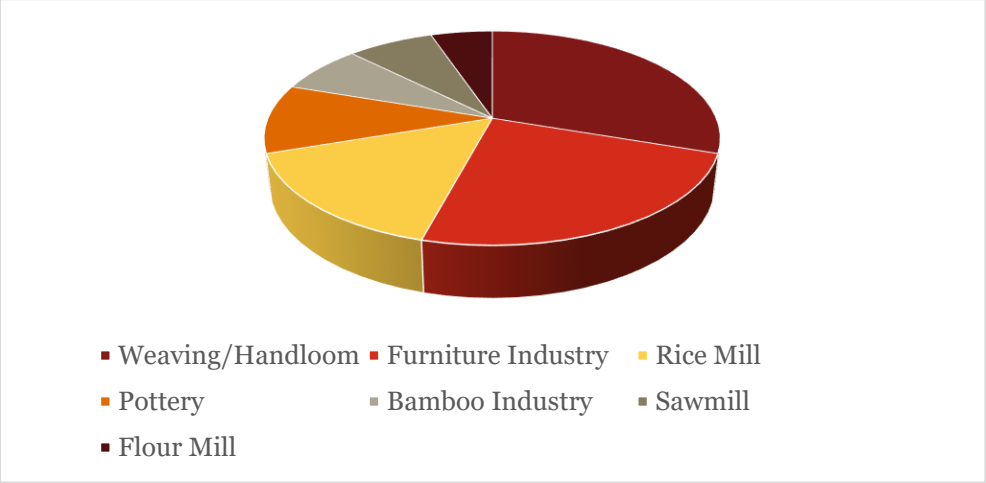
As mentioned above and depicted in Figure 37, total five districts other than the district hosting the proposed economic zone have been considered as a part of the influence region.

5.6.3.2.1. Districts in the Close Neighborhood (Madaripur, Chandpur, Shariatpur and Gopalgonj)

The districts lying in the close neighborhood of the Barishal district are mainly Madaripur, Chandpur, Shariatpur, and Gopalgonj. These districts have their economy majorly dependent on the agricultural produces, and most of these districts host industries which directly use agricultural and other natural resources as sources of input.

Madaripur district hosts industries such as furniture, rice mills, textile & RMG, bamboo and pottery. The distribution of these industries in the district is depicted in the following diagram.

Figure 38: Distribution of various industries in Madaripur district



Source: Bangladesh Bureau of Statistics

Gopalgonj district also hosts various industries which are majorly dependent on agricultural resources as a source of input. Following observation can be made about the industries in Gopalgonj district:

- Small scale cottage industries, and wooden industries are the major industry in Gopalgonj district with their share in total industrial establishments in the districts at ~58% and 26% respectively.
- Other industries majorly based on agricultural resources as an input material such as (with % of total establishments in the bracket), rice mill (~4%), saw mill (~3%), pottery (~2%), oil mill (~2%) and bakery (~1%)are presence in the district. Kotalipara upazila in the district hosts more than ~66% of the total wooden furniture establishments.

Chandpur district, being located close to Dhaka as well as Chittagong Port, it has presence of few industries in the food and agro industry, and metal industry. District hosts establishments such as Meghna Foods, Jui Food Industries, Shahjalal Plastic Industries, Karim Metal Industries, Bismillah Salt Industries to name few. On the other side, Shariatpur district host other industries such as shipbuilding, along with food and beverages, and textile industry

5.6.3.2.2. Industrial District in the Neighborhood – Khulna District

Khulna district located in the north of Mongla port is hub for various heavy and light industries. Various industries such as jute, chemicals, fish and seafood packaging, food processing, sugar mills, power generation and shipbuilding have presence in Khulna district today. Few of the major industries in Khulna district are as follows:

Khulna district has presence of shipbuilding industry, as it has presence of Khulna Shipyard, which is spread over ~69 acres in the district and has huge demand for shipbuilding in the respective market. District also hosts pharmaceutical industries with the presence of national Chemical and Pharmaceutical Works, and Aseftic Pharmaceutical Works. District also has presence of cable manufacturing industry, one of the major products of domestic electrical and electronics industry in Bangladesh and produces cables for upto 0.3 million conductor km a year. With the companies such as Rupsha Rice Mill, and Khulna Rice Mill, along with seafood companies such as Anam Sea Food, Sundarban Sea Food, Lockpur Sea Food, and Prince Sea Food to name few, district also depicts its presence in the food and agro industry sector. District also has few of the salt processing facilities such as Sundarban Salt Industries, Rajapur Salt Industries, Padma Salt, and Teesta Salt respectively.

Khulna district was also known as the hub for jute mills in the past, because of vast production of jute in the nearby regions, as discussed in the previous section. Few of the major jute mills in the district are depicted in Figure 39:

Figure 39: Few major jute mills in Khulna District

Few Major Jute Mills in Khulna District

- Khalispur Jute Mill
- Crescent Jute Mills
- Daulatpur Jute Mill
- Platinum Jubilee Jute Mill
- Star Jute Mill
- Alim Jute Mills
- Eastern Jute Mills
- Ajax Jute Mills
- Sonali Jute Mills
- Mohasin Jute Mills
- Jute Yarn and Towain Mill
- Jute Textile Mills Ltd
- Shawnawaz Jute Mills

Source: PwC Research

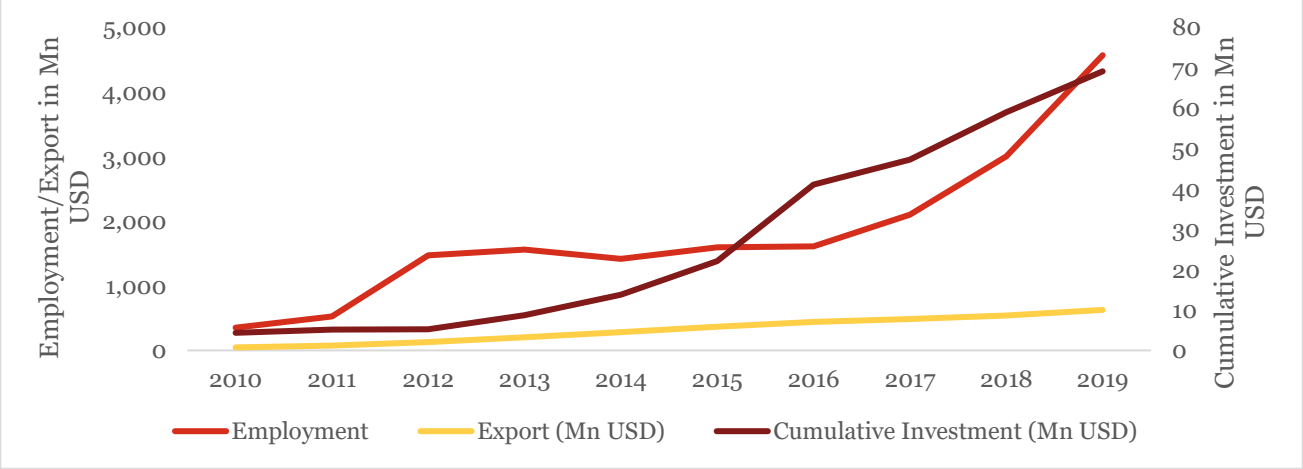
Few of the jute mills mentioned above have capacity to employ more than 3000 workers and are spread on more than 50 acres of land parcel. Few of them are serving the domestic market along with export, while few of them are completely export oriented.

Proximity to Khulna district may help the economic zone to leverage on well-developed industrial ecosystem in Khulna district, and participate at various stages of industry value chain for industries in Khulna region. Access to Mongla port will play a key role in the development of economic zone through promotion of EXIM trade, and will further strengthen the supply chains for industries in EZ, and thereby improve the competitiveness of the economic zone.

5.6.3.3. *Organized Industrial Agglomerations in the nearby regions*

The Bagerhat district located in the close proximity of the influence area hosts Mongla port as well as Mongla Export processing zone. 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 40 along with the employment offered by the EPZ.

Figure 40: Investment, Export and Employment trend at Mongla EPZ



Source: Bangladesh Export Processing Zone Authority (BEPZA)

The trend of investment in the EPZ may act as benchmark for the future investment at the proposed EZ. The investment in the EPZ has depicted the growth of ~31% year on year in the last 10 years. The export from the EPZ, and employment has depicted the same trend and have shown growth at the CAGR of ~30% and 24% respectively in the last decade.

Apart from the EPZ in the nearby area, various economic zones are also planned for development in the influence region. Table 36depicts the EZs planned for the development in the influence region.

Table 36: Planned economic zones in the influence region

Sr. No.	Name of the Economic Zone	District
1	Chandpur Economic Zone – 1	Chandpur
2	Chandpur Economic Zone – 2	Chandpur
3	Shariatpur Economic Zone, Jajira	Shariatpur
4	Shariatpur Economic Zone, Gosairhat	Shariatpur
5	Madaripur Economic Zone	Madaripur
6	Gopalgonj Economic Zone	Gopalgonj
7	Khulna Economic Zone – 1	Khulna
8	Khulna Economic Zone – 2	Khulna
9	Agailjhara Economic Zone	Barishal

All of the economic zones in the influence area are government economic zones, and they are expected to host industries such as textile & RMG, plastic and rubber, light engineering, furniture, electronics and electricals, food and beverages, and agro-based industries. These zones may act as competition to the proposed economic zone, but at the same time will offer an industrial ecosystem beneficial for the proposed economic zone to develop.

The proposed EZ is also in the close proximity of BSCIC industrial park at Gopalgonj district (part of the influence region). The BSCIC park is spread across 50 acres and is likely to house ~250 medium and small-scale enterprises, which may act as links for backward/forward integration for industries coming up in the proposed economic zone.

In summary, region offers an industrial ecosystem healthy for development of new industries in the proposed economic zone. Presence of EPZ since last 20 years, and historically observed trends for investment in the EPZ given assurance about the possible future of the proposed economic zone. Presence of standalone factories and other industrial estates also attempts to make industrial ecosystem more and more favorable for the development of an economic zone at proposed location. Government of Bangladesh has taken few infrastructure projects in the region, details of which are attached in the annexure, which can also promote the industrial ecosystem in the region through development of transport and logistics infrastructure, utilities infrastructure and social infrastructure in the region.

Considering the industrial ecosystem in the region, few of the industries such as food and agro processing, textile and RMG, light machinery, furniture, pharmaceuticals, and jute may be promoted in the proposed economic zone.

5.6.3.4. *Strategic Assets for the Proposed Economic Zone*

Following (Table 37) 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 37: Key Infrastructure Projects undertaken by GoB in the influence region

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
Construction of Padma Bridge	• Padma Bridge which is the most important infrastructure development in the country • Once operational will help in connecting the site with **Dhaka and further to the northern and eastern part of Bangladesh** • It may have an increasing effect on the market potential for the industries envisaged in the proposed EZ. • **It will significantly bring down the distance between the proposed EZ and Dhaka by about 60 km**.	June 2021[202]	Ministry of Road Transport and Bridges, Bridges Division, Bangladesh Bridge Authority
Construction of 2nd Padma Multipurpose Bridge at Paturia-Goalundo	• Proposed 2nd Padma Multipurpose Bridge at Paturia-Goalundo • The proposed bridge will connect National Highways at the Paturia and Goalundo Sides respectively, which are linked by the ferry services currently. • **This will improve the connectivity of the region with Dhaka and eastern part of Bangladesh.**	Construction work of the second Padma Bridge at Paturia-Daulatdia point will begin after completion of the Padma Bridge[203]	Ministry of Road Transport and Bridges
Construction of Khan Jahan Ali Airport	• Khan Jahan Ali Airport is a new airport construction project which will be located 20km south of the city of Khulna • The project is being undertaken by the Bangladeshi government in order to increase access to the nearby Mongla Export Processing Zone (EPZ), Mongla Economic Zone, Mongla Port and Rampal power plant as well as provide access to local tourism attractions.	Land acquisition for the project is supposed to be completed by June 2020[204] with no clear information available regarding completion time	GoB and Bangladesh Civil Aviation Authority

[202] http://www.padmabridge.gov.bd/cstatus.php
[203] https://www.dhakatribune.com/bangladesh/parliament/2019/09/09/quader-construction-of-2nd-padma-bridge-under-process
[204] Civil Aviation Authority of Bangladesh

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
	• Construction has commenced in Jul-2015. Approximately 160ha of land is to be acquired for the airport, with the project expected to cost BDT5.44 billion (USD ~70 million). • Once operational, it will help in the movement of expatriates into the subject region		
Rail connectivity between Khulna and Mongla	• The GoB is constructing rail line from Khulna to Mongla in order to increase the capacity of the Mongla seaport. • This route will help movement of goods to/from Mongla seaport. • Apart from this, **the railway link will be directly connected with Siliguri of India via Banglabandha-Panchagarh, the northern part of Bangladesh.** • **Once operational, it can facilitate cross-border trade and could also provide an alternate transport linkage to connect the proposed EZ with Mongla port.**	Out of total 65 km rail route, a total of 16 km rail line construction from Khulna side and 23 km from Mongla side has already been completed.[205] It is expected to be operational by 2022[206]	Bangladesh Railways
Construction of 6 Jetties and 1 Container Terminal at Mongla Port	• Of the six jetties, two jetties—Jetty No.1 and 2 —would be constructed under the third line of credit (LoC) of the Indian government. • Two others, Jetty No. 10 and 11, would be built under government to government (G-to-G) cooperation with the Chinese government. • Two more, Jetty No.3 and 4, would be built under public-private partnership (PPP) with the Saif Power Tech and Sikder	The project is targeted to be completed by 2023. [207]	Government of Bangladesh

[205] http://m.theindependentbd.com/printversion/details/172432
[206] https://www.banglanews24.com/national/article/77937/Khulna-Mongla-rail-services-by-2022
[207] http://www.theindependentbd.com/post/215026

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
	Group. The container terminal would be constructed under the Indian line of credit. • **The main objective of this project is to modernize and increase the port-handling capacity from six to eight lakh TEUs (twenty-foot equivalent units) annually**. • **Mongla Port Authority has also signed a coastal shipping agreement with Thailand** • **This could also be beneficial for the perspective of export and import of raw materials/goods required/manufactured in the proposed EZ as Mongla port is the nearest seaport to it**		
Dredging project at Mongla port	• The GoB has approved a USD94 million dredging project at the Port of Mongla to create a water depth of up to 10 m. • The country's second-largest seaport will see dredging at the inner bar of the port, which will **enable large vessels to berth at the jetties**. • The current water depth can only accommodate vessels with a draft of up to 7.5 m, with larger vessels unable to enter the port. • **Once executed, the port will have the same depth as Chittagong, the country's largest seaport, and will be able to take a significant load of the country's growing import-export activities.**	Works regarding the same has begun in January 2020 and is expected to be completed by June 2020[209]	Government of Bangladesh

[209] https://dredgingandports.com/news/2020/government-plans-to-dredge-mongla-port-to-accommodate-bigger-ships/

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
	• A similar government-funded dredging project valued at USD83 million is ongoing at the outer bar of the port, also taking the water depth to 10 m.[208] • **This could also be beneficial for the perspective of export and import of raw materials/goods required/manufactured in the proposed EZ as Mongla port is the nearest seaport to it**		
Road projects entailing the proposed EZ	• Improvement of Faridpur (Maijkandi) -Boalmari-Gopalgonj (Bhatiapara) Road including Sasrail-Alphadanga-Kashiyani Link Road (Z7001);. It is being funded by GoB. • Improvement and upgrading of various regional highways and zilla highways in Barishal district. It is being implemented by the RHD Bangladesh. • Construction and improvement of various internal roads within municipalities in Barishal District. The LGED within the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) with the financial assistance of Asian Development Bank (ADB) have planned to implement these projects[210] • LGED is also the implementing agency for construction of important bridges on the rural roads of the district to improve rural connectivity[211]	Varying timelines	Government of Bangladesh, RHD Bangladesh, LGED Bangladesh

[208] https://dredgingandports.com/news/2020/government-plans-to-dredge-mongla-port-to-accommodate-bigger-ships/
[210] http://oldweb.lged.gov.bd/DistrictSchemeSummary.aspx?DistrictID=28
[211] http://oldweb.lged.gov.bd/DistrictSchemeSummary.aspx?DistrictID=28

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
	• Construction of roads in Noapara which is an industrial area including Noapara bypass road; • Construction of a bridge connecting Mongla with Khanjahan Ali Bridge and a road on the Passur riverside • **Once executed, these projects could enhance the hinterland connectivity of the proposed EZ and also open avenues to serve potential local markets**		
 **Rampal Power Plant**	• The Rampal Power Plant is a proposed 1,320-megawatt imported coal-fired power plant promoted by the Bangladesh-India Friendship Power Company Limited (BIFPCL), which is a 50:50 joint venture between India's state owned National Thermal Power Corporation (NTPC) and Bangladesh's Bangladesh Power Development Board (BPDB). • Once operational, this will be immensely important in power transmission in southwestern parts of the country.[212] • **Once operational, it may provide an additional source of power for the proposed EZ**	The first unit of the project will come into commission in February 2021 and the second one in August 2021[213]	Bangladesh Power Development Board in co-operation with India
 **Gas pipeline project**	• GoB is undertaking two separate projects for constructing two 30-inch diameter gas pipelines, one in the western part of Padma Bridge and another in the south-western part	June 2021[214]	Gas Transmission Company Ltd (GTCL)

[212] https://en.wikipedia.org/wiki/Rampal_Power_Station_(Proposed)
[213] https://www.daily-sun.com/printversion/details/378712/Rampal-power-plant-attains-32pc-physical-progress
[214] https://www.daily-sun.com/post/213515/Gas-pipeline-to-Gopalgonj-thru-Padma-Bridge-likely

Strategic Projects	Project Description	Expected Timeline	Responsible Agency/Firm
	• The first pipeline will stretch 45 km from Langlolband in Narayanganj to Mawa in Munshiganj and the length of the second one will be 95 km from Jajira point to Gopalgonj. • It also intends to import LNG from Payra port and transmit the same to the nation grid of Bangladesh. • These projects may ensure availability of gas in the influence region and in future may ensure development of gas intensive industrial sectors in the proposed EZ		

Source: PwC Analysis

5.6.4. *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 ~11% to ~34% among districts in the influence region
- Most of the districts have literacy rate above 50%, with literacy rate highest in Barishal district at ~65%, and in Agailjhara upazila at ~68%.
- Large number of people are employed in the wholesale and retail sector in the influence region, followed by manufacturing sector and transport and logistics sector.
- District hosts various educational institutions which can supply the skilled labor to the proposed economic zone.

Access to Natural Resource:

- The district and the influence region is rich with the crops such as rice, wheat, gram, lentil, kheshari, mustard, and coconut.
- The major fruits produced in the district are green coconut, palmyra, banana and jackfruit, while the major vegetables are pumpkin, water guard, tomato, spinach, and brinjal.
- The influence region is rich with the aqua cultural resources, and fishing is one of the major natural produces in the region with fishing done in inland waterbodies, ponds, floor plains, and rivers such as Padma and Meghna.
- Influence region has limited presence of mineral resources which can be further used for industrial production.

Industrial Ecosystem in the Region:

- Khulna district in the influence region is the industrial hub with ~48% of the large establishments and ~30% of the small establishments in manufacturing sector within the influence region situated in it.
- Khulna district houses various industries such as jute, chemicals, fish and seafood packaging, food processing, sugar mills, power generation and shipbuilding. The Mongla port situated in Bagerhat district host the EXIM activities related to the industries in the district and the industries located in the nearby region.
- Rest districts in the influence region such as Madaripur, Chandpur, Shariatpur and Gopalgonj host industries which are majorly dependent on the agricultural produces for further production such as rice mills, and handloom industry.
- Barishal district (district where the proposed EZ is located), also hosts industries such as pharmaceutical, food and agro, RMG, and cement.
- Total nine economic zones along with one BSCIC park is planned in the influence region, while Mongla EPZ also lies in the close vicinity of the influence region and it has shown consistent growth in investment, export and employment in the last decade.
- There are various new infrastructure projects planned in the region in various sectors such as transport and logistics, utilities, social infrastructure and urban infrastructure which may promote the development of EZ at the proposed EZ.

5.7. Site Specific Compatibility Mapping of the Initial Bucket List of Industries

The factors of production and industry linkages analyzed in the previous sections have a bearing on the setting up of each of the industries previously shortlisted in the country level assessment. In the next few pages we delve deeper and critically examine all the industry sectors in lieu of the regional factors of production and the industry linkages. This will help us to ascertain the final industry shortlist before we validate the secondary research with the voice of ground primary survey.

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

Table 38: Factors of production and linkages mapping at the proposed EZ

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
Textiles & RMG	Moderately High	Low	Moderately High	Moderately Low	Moderately High	High	Moderate	Low	High	Low
Rationale for selection	• This is an export-oriented industry. Bangladesh already has a high global market share in this industry. • Sector pre-requisites are met by the proposed EZ for all parameters • Moderate presence of textiles and RMG players in the influence region indicates an existing ecosystem for the sector • Moderate investments (Capex-wise) in the influence region have been channeled through Textiles & RMG, thereby indicating healthy rates of return for equity investments • This sector requires good access to seaports in order to cater to global markets which can be achieved through the port of Mongla and the river port at Barishal • Proposed EZ can provide a conducive ecosystem for growth of industries in this sector									
Pharmaceuticals	Moderately Low	High	Moderate	Moderately High	Moderately High	High	High	Moderately High	High	Moderate
Rationale for selection	• This is one of the fastest growing sectors in Bangladesh • Besides catering to rising domestic demand, Bangladesh is also exporting pharmaceuticals to other countries • This sector is one the largest employer of white collared jobs • The requirement of gas in this industry is moderately high, as it is used in boilers. • Gas supply is not available in the vicinity to the proposed EZ. • Proposed EZ will have to provide all utilities required for establishment of this industry • Proposed EZ is ideally located for setting up of this industry due to its proximity to big domestic consumer markets like Dhaka, Khulna, Barishal • Development of API park in district of Munshiganj (~125 km from the site) will provide easy access to raw material for the domestic manufacturers across the country; however, this API park might act as a significant competition as pharma players as contemplating moving the park instead of EZs • However, there is a need to develop social infrastructure (residential areas, educational institutes, recreational facilities etc.) in the region to accommodate skilled employees who might work in this industry									

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
Non-metallic minerals (ceramics)	Low	Moderately High	Moderate	Low	High	High	Low	High	High	High
Rationale for selection	• Non-metallic minerals involve manufacturing of ceramics, glass, cement etc. • Raw material for ceramics is sourced both locally and also imported. River port in Barishal and the sea port of Mongla will be helpful in transporting clay and other materials in bulk through barges and feeder vessels. • A growing domestic market for ceramics (tiles, sanitary items and table ware) would support establishments of this industry in the proposed EZ • Manufacturing of ceramics and glass require application of high temperatures, for which gas is an indispensable source of fuel • Gas supply is not readily available in the region, but the GoB has plans for massive industrialization by supplying gas, extracted in Bhola, to Barishal and Khulna through pipelines.[215]									
Electronics and electrical	Low	Moderately High	Moderately High	Moderately Low	Moderately Low	Low	Low	Low	Moderate	Low
Rationale for rejection	• Bangladesh currently performs assembly of electronic items • These items are imported from different countries in knocked down units and assembled in workshops • Proposed EZ offers all utilities required for manufacturing of electronics and electrical items • Consumption of electrical and electronic items is rapidly rising in rural Bangladesh leading to high demand – benefiting local brands that cater to the mid and low-level income groups • However, the Proposed EZ is at a relatively larger distance from the major domestic market of Dhaka; manufacturers from this sector prefer to be in close proximity to the urban markets such as those of Dhaka and Chittagong									
Food and Beverages / Agro based	High	High	Moderately High	Moderate	Moderately High	Moderate	Moderate	Moderate	Moderate	Moderately Low

[215] *News article in the Dhaka Tribune (https://www.dhakatribune.com/bangladesh/nation/2019/03/09/immense-industrialization-initiative-using-gas-extracted-in-bhola)*

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
Rationale for selection	• 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 • Sector pre-requisites are met by the proposed EZ for all parameters • Proposed EZ holds a lot of growth potential for this industry as it has easy access to raw material from local farms, poultries, and hatcheries and nearby farmlands. • Aquaculture being practiced in proximity to proposed EZ can provide raw material for fish processing • There is an existing ecosystem for this industry to grow in the proposed EZ and food processing units are already operational in the district as is highlighted in the sectoral investment trend analysis • Water, the basic ingredient for beverage industry can be made available at proposed EZ by developing suitable ground water infrastructure • Proposed EZ is ideally suitable for setting up industries pertaining to this sector									
Plastics and rubber	Low	Moderately High	Moderate	Low	Moderately Low	Moderate	Moderate	Moderately High	Moderately High	Low
Rationale for selection	• This sector is highly dependent on import of raw material plastic beads, resin etc. for their production • Majority of the raw material for this industry is imported via Chittagong Port, which has a waterways connectivity with the Barishal river port • Gas is the primary fuel used in this industry; the region is expected to benefit from the gas extraction being carries out in Bhola island of the Barishal district which in future will lead to gas supply for industrial use in the district • Plastic products are mostly consumed in local markets and industries located in vicinity of Dhaka can act as good source of demand – approachable by the river port in Narayanganj and Barishal • Growing economy of Bangladesh has created a rising demand for plastic products in the country • Setting up of this industry can be considered in proposed EZ									
Paper and Paper based	Low	High	Moderate	Low	Moderately Low	High	High	Moderate	Low	Low

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
Rationale for selection	• 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 mainly caters to domestic demand and is a part of the larger value chain of RMG and other small-scale industries like stationery, books, etc. • Paper industry also includes the paper cone manufacturers who supply cones for the spin mills • Abundance of spinning mills in the region is suited for the growth of paper cone manufacturing players who would be in close proximity to their customers if such industries are established within the site • Setting up this industry can be considered within the proposed EZ									
Light machinery (including furniture)	Moderately High	High	Moderately High	Moderately Low	Low	Moderately Low	Moderate	Moderate	Moderate	Low
Rationale for selection	• Demand for light machinery, equipment and furniture products are rising in Bangladesh • Bangladesh is gradually shifting away from importing light engineering goods to manufacturing them inside the country • Raw material like steel, aluminum plates can be imported from India through the river port of Barishal • Light Engineering industry also includes spare machinery parts or ancillary parts for automobiles • Proposed EZ is located close to industrial region of Khulna making it ideal for establishing light engineering industries • All utilities required for setting up of this sector can be made available at proposed EZ • Proposed EZ is conducive for setting up light machinery, equipment and furniture products									
Chemicals	Moderate	High	Moderate	Moderate	Moderately High	High	High	Moderate	Low	Moderately High
Rationale for rejection	• There are different types of chemicals having varied utility requirements like fertilizers, adhesives, washing powder, paints, varnishes etc.									

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
	• Adhesives, paints and varnishes cater to domestic market which is concentrated in and around Dhaka; Manufacturers from chemicals sector are majorly import dependent and prefer to set up shops in close proximity to Dhaka and Chittagong • The industry is import dependent and players usually use the inland port jetties at Pagla and Narayanganj to receive raw materials from Chittagong port via feeder vessels; the cargo jetty at Barishal port can used for chemical barges coming from Chittagong port, but the lack of large scale consumption markets might deter players from setting up chemical plants in Barishal									
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 • Adequate social infrastructure will have to be developed within the proposed EZ to accommodate such skilled employees; this sector is best suited to be located in urban conglomeration of Narayanganj, Munshiganj, Gazipur, Chittagong, and Mymensingh • Setting up of this industry will not be favorable 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 export revenue after textile & RMG • Apart from raw hides, Bangladesh has also started exporting finished products • 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 (~200 km from Agailjhara), which might not be able to supply raw hide to the proposed EZ without increasing costs									

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
	• The foul odor from a leather processing unit will also need to be mitigated to enable minimal interference with other players in the proposed EZ • Additionally, to produce high quality finished goods, this sector requires skilled employees • In order to establish industries that can manufacture finished leather products in the proposed EZ, pre-requisite will be developing social infrastructure in the region to incentivize skilled workers									
Metals and heavy machinery	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 raw material coming through Chittagong Port • Lack of an existing waterway in the immediate vicinity of the proposed EZ will further deter transport of heavy goods (raw materials and finished products alike) • Due to the bulky nature of raw material involved in this industry, such industries could be developed further south of the proposed EZ in close proximity to Chittagong Port. • Moreover, this sector requires large quantities of power and fuel • Presently gas pipeline does not exist in the region, and the proposed gas supply connections cannot be considered adequate, so early until the implementation is complete, to be fit for this sector • The proposed EZ is presently not suitable for setting of industries in this sector									
Ship building and breaking	Low	Moderate	Moderately Low	Low	High	High	Low	Moderately High	High	High
Rationale for rejection	• Access to waterfront is mandatory for setting up of this sector • Proposed EZ does not have access to waterfront • Proposed EZ presently not suitable for setting of industries in this sector									
Petroleum Products	Low	Moderately High	Moderate	Low	High	High	Low	Moderate	Moderate	High

Sector	Access to Backward and Froward Linkage		Access to Factors of Production							
	Access to raw materials	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 prevalent at proposed EZ			Easy accessibility	Moderate access via highway	River port within approachable distance	Excess capacity at the local substation (reliability an issue)	Ground water in abundance	Limited availability	Semi-skilled / Unskilled available; Skilled available from the nearby urban hubs	Limited
Assessment of prerequisites of industrial sectors										
Rationale for rejection	• Bangladesh is currently dependent on import of petroleum products via large sea faring tankers • Access to waterfront is mandatory for setting up of this sector • Proposed EZ does not have access to waterfront • Proposed EZ presently not suitable for setting of industries in this sector									
	Green colored cells indicate the selected sectors									

Based on the above mapping factors of production and industry linkages at the proposed EZ and the prospective sectors from the country level assessment, the following sectors are deemed best fit at the proposed EZ:

1) Textiles and RMG, 2) Non-metallic minerals, 3) Light engineering (including furniture), 4) Food and beverages (including agro based), 5) Paper and packaging, 6) Pharmaceuticals 7) Plastic and rubber

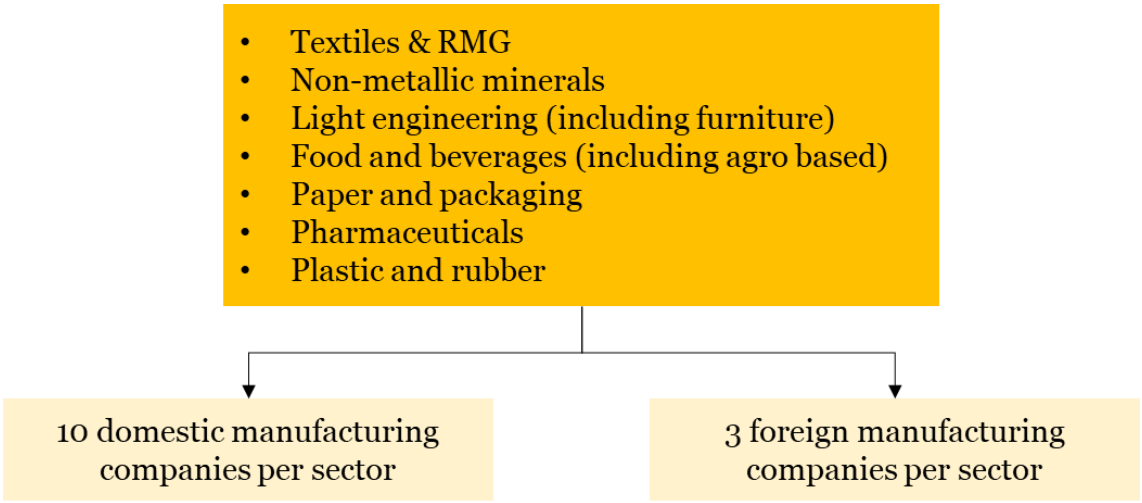
5.8. Analysis of Survey Results

The above shortlist of probable sectors was created using a combination of data available on secondary domain, site visits and interactions with government and private players. In furtherance to the above analysis, a primary survey was undertaken to validate the findings and perform a dipstick assessment so as to gauge the investor sentiment with regards to the challenges and opportunities at the proposed EZ. A total of 104 manufacturing firms were approached – 80 domestically based companies and 24 international firms based out of Bangladesh and looking to expand into Bangladesh. The questionnaire used was designed as per the sample shared in the TOR of the contract agreement with a few improvisations to effectively gauge the perception of the investors with regards to the proposed EZ and the challenges associated with the location of Agailjhara.

5.8.1. *Profile of the Respondents*

The primary survey was floated to the manufacturing players from the initial shortlist of industries. 10 domestic and 3 foreign respondents from each of the shortlisted sectors were selected for a one to one discussion. These industry representatives were from different industrial regions of Bangladesh such as Mongla, Dhaka, Chittagong and Gopalgonj.

Figure 41: Primary respondents' sectoral distribution



Source: PwC Methodology

5.8.2. *Analysis of Responses Obtained through the Survey*

The findings of the survey have been summarized in the table below that captures the willingness of the manufacturing companies to relocate to the prosed EZ and their reasons associated with it:

Table 39: Summary of primary survey capturing willingness to relocate to proposed EZ

Description	Yes	May be	No
Key reasons for the response	• Respondents expect the land lease prices to be lower in the	• Respondents who are skeptical about the location have their	• Unavailability of adequate power/gas supply

Description	Yes	May be	No
	Barishal district than the regions of Dhaka and Chittagong • Availability of low cost labor • Respondents feel that the government developing the zone would usher in investor confidence and help them operate hassle free in terms of dealing with government departments and bureaucrats • Respondents feel that access to Barishal River Port could be an added advantage for foreign trade and bulk cargo movement	reservations primarily about two aspects – the availability of gas and road connectivity with Dhaka. Currently the availability of gas in the region is minimal and plans are in prospect to connect the district with the main gas connections from Dhaka. • The operationalization of Padma Bridge is eagerly awaited and anticipated to boost up the gas supply and the connectivity with Dhaka. However as of now the plan seems distant to the respondents making them skeptical about relocating to the site • Some of the respondents also believe that it would be difficult to attract and train the primarily agrarian work force in the region for industrial work • Respondents feel the probability to use the Barishal river port for cargo movements would be a boon for them, but as of now no provision is there to use the jetty for private cargo movement; they would be interested to move to Agailjhara if BIWTA provides some arrangement to address their issue	• Some respondents are interested in a location near to Dhaka or Chittagong (such as the Mirshorai EZ) because of proximity to consumption centers and trade gateways • Some respondents have cited a negative market trend in terms of market size which negates any expansion plans for them • Some of the respondents feel that managing their country wide supply chains from a location with inferior connectivity would be a challenge and thus they are looking for a more centrally placed and well accessible place • Respondents believe that the local supply chain and logistics in the region is still at a nascent stage and lacking professional logistics providers. This makes them to believe that the region's industrial ecosystem would take a good 10 -15 years for developing and be ready to support large scale industrialization and their subsequent movement.
Prominent companies	A Ali Food Products; Sonali Ansh Jute Mills;	Kai Almunium; Ferdaus Jute Mills Limited; Mir Ceramic; Renata Pharma;	Quantum Corporation; Orion Home Appliances; H T Engineering Works; Ujala Metal Industry;

Description	Yes	May be	No
	Capital Paper and Pulp; Anik Poly and Packaging; Adams Garments; Olympic Cement; Pran Frozen Foods; Fuwang Ceramics	Ispahani Food products ltd	Progoti Engineering Works; Beacon; Orion Pharma

Source: Primary Survey of 104 respondents

5.8.3. *Barriers to Investment*

The survey conducted across sectors has brought to the forefront some of the major challenges which the industries perceive are prevalent specifically in the region and Bangladesh in general. These challenges have been observed across three major heads as enlisted below:

5.8.3.1. *Country Specific Challenges*

The respondents contacted as a part of the primary survey had mixed perceptions about the new economic zone's regime of the Bangladeshi Government. They welcomed the move by the government of setting up specialized zones for manufacturing apart from the Export Processing Zones that were specifically set up in order to promote export-oriented manufacturing. However, apart from the positive sentiments about the economic zone's regime, the manufacturing companies had some observations upon the country's business environment and challenges which are listed below:

Power shortage: All the respondents of the survey are wary of the power scenario in Bangladesh. Most people complained about 2-3 hours of load shedding that happens on a regular basis and has made them opt for a captive power plant to support continuous operations at their sites. These captive power plants use gas or diesel as the fuel, making gas or diesel as the second most sought after industrial requirement after electricity.

Gas availability: The deplorable state of power scenario in Bangladesh has made manufacturing units to setup gas-based power systems for day to day operations. The main source of fuel for producing electricity is gas (which is cheaper than diesel) that is required by mostly all the medium and large size industrial establishments. This gas for industrial use is made available by players like Titas, Bakhrabad Gas Distribution Company, etc. However, the pressure of the supplied gas is not uniform, and businesses are facing challenges in getting a new gas connection. This is primarily because of the depleting gas reserves of Bangladesh. Many of the respondents of the survey have stated postponement of their expansion plans due to slow licensing of new gas connections. This is a major hindrance to new investments in Bangladesh.

Congestion at Chittagong Port: Most of the export-oriented businesses and the ones that are import dependent for their various raw materials have highlighted the fact that congestion at the Chittagong port their outbound logistics and the production lead times are impacted. Materials take anywhere between 10 – 20 days to reach various parts of the country once the consignment is received at the Chittagong port. Chittagong port is the most important port in Bangladesh, it caters to around 92% of the country's sea borne trade.

Access to credit: During the stakeholder consultation exercise, most of the respondents expressed disappointment in getting easy access to credit. Getting credit in Bangladesh, is a tedious task spread over 2-3 months involving lot of paperwork, documentation etc. Credit rate in Bangladesh ranges from 9-14% depending on the relationship that respondents develop with the banks. Large industry houses are able to get credit at low rates while medium and small-scale manufacturers pay high interest rates. In one of the interactions with a private bank it was understood that the investors who want to setup manufacturing shops in an EZ have to either mortgage the land or existing machinery to arrange for a

collateral. This makes arrangement of loans by the new or medium scale businesses a long-drawn process especially operating out of an EZ where the ultimate land ownership lies with BEZA. Private developers on the other hand are provided loans through the Investment Promotion and Financing Facility (IPFF**)** of the Bangladesh Bank. In view of the bankers, the overall size of this fund seems to be inadequate to support the aggressive expansion plan of BEZA to set up 100 EZs in the country.

Excessive bureaucracy and corruption: Respondents lamented the poor state of interactions with the government officials for any purposes. They complained about too much bureaucracy and the prevalence of speed money (bribe) in their interactions at the government offices.

5.8.3.2. *Sector Specific Challenges*

In addition to the country specific challenges the respondents were also asked about the sector specific challenges that are hindering the business growth in terms of expansion across locations. Below mentioned are the shortlisted sectors on which the primary survey was conducted and the challenges across these:

Textiles and RMG: Respondents from this sector were optimistic about the growth prospects in the RMG space. Their swelling order books are a testimony to this growth. Players like Mahmud Group and Paramount have plans for expansion to cater to growing customer demands. Mahmud group has plans to set up an economic zone in Sirajganj while Paramount has purchased 200 acres of land in the Bhaluka area for expansion. Apart from the growth trend, the respondents also highlighted the growing problem of labor politics in the sector. Players highlighted that it is difficult to handle labor issues due to the sheer large number of local labors employed in the factories. Administrative issues are burgeoning with the increasing workforce strengths. Respondents also aired their view about high import duties on fabrics like sequins, better quality thread, beads etc. These items are used to produce high value garments.

Food and beverages (including agro-based): Players from this sector are betting on the increasing income trends in Bangladesh and the subsequent increase in demand for processed food. Respondents engaged in shrimp and fish farming have been increasingly exporting their produces to South-East Asian countries. Major challenge that was brought to the forefront in our interaction with **CP Group** (that commands the largest share of ~50% in processed food market in Bangladesh) is the cyclicity of production and consumption. The cyclicity refers to the gestation cycle of a chicken. It generally takes 42 days for the chicken to be ready for processing. However, at the end of the cycle i.e. 42 days the demand might not be there. But the chicken has to be disposed to make way for the new lot, this makes the selling of the chicken as “urgent action” and sometimes at low prices.

Apart from this fundamental challenge, the respondents are also skeptical about the new entrants particularly the foreign players like **Dabur** (from India) who have the requisite capital to avail the lost cost advantage of Bangladesh. New entrants have increased the competition and reduced the margins for smaller players. Additionally, the players are also looking to be as close to Dhaka as possible for the following reasons: proximity to the major consumer market and an underdeveloped cold chain logistics across Bangladesh, which is an area of concern for long transit times. These challenges have forced the players to tread cautiously before any expansion plans.

Light machinery (including furniture): Respondents from this sector did not highlight any major issues in the sector. In one of the primary interviews with **Otobi** (furniture player), it was revealed that the industry currently has a market size of **13-14 crore BDT** and a growth rate of **7-8%** y-o-y. The expected equity returns rate ranges from **20-25%** indicating the attractiveness of the sector. Some of the players who import high quality wood from countries such as Brazil, Malaysia, India and some other Latin American countries emphasized the importance of waterways connectivity that helps to transport heavy raw materials with ease and low cost.

Non-metallic minerals: Dependence on **gas** has been highlighted as the major challenge which is faced by these players. Gas supply is erratic in nature, varying in pressure and quality, effecting the production cycles. Obtaining **new gas licenses** is a major issue which hampers their expansion plans.

Apart from gas, the growth in the sector is driven in conjunction with the growth in construction sector all over the country. In discussion with the ceramics players, it was known that the sector is a good investment option for the foreign entities who usually engage in short term partnerships with local firms due to the high equity return rates of **15-18%.** Mir Ceramics suggested that equity IRR for an investment in the sector can be as high as 18-20% with the cost of debt being 12%. China Bangla Ceramics had a more conservative approach towards the equity IRR and placed their bets are on a return of 10-12% on equity.

Paper and packaging: Respondents from this sector highlighted the over dependence of the sector on imported wood pulp. Over 90% of the wood pulp is imported through the port of Chittagong. Although, the supply for of paper for writing, printing and newsprint purposes is met internally, consumers are still dependent on imports for packaging material used in RMG, medicine and food items. Manufacturers are thus looking to expand and position themselves around the waterways so as to lower cost of transportation.

Pharmaceuticals: The pharma sector is one of the priority sectors identified by the BIDA for promotion. This place the players operating in the sector in an advantageous position in comparison to other sectors. However, one of the major challenges facing the industry is the prospective graduation of Bangladesh from the least developed country status in 2024 which will make these players to lose the right to manufacture patented lifesaving drugs. Currently the Bangladeshi players can manufacture these drugs without the consent of the patent holders. Once the restriction is in place, the market is expected to slow down. Additionally, the players have also highlighted the issues with the availability of skilled labor. Pharmacists and medical graduates are majorly located in the areas around Dhaka which makes the expansion plan of these players dependent on the mobility of these workers which is a challenge in far flung areas with less urbanization.

Plastics and rubber: Respondents from this sector did not highlight any major challenges associated with operations. Plastics as a sector is not as organized as other manufacturing sectors in Bangladesh. Plastics and rubber industry segment acts as intermediary and backward linkages for other sectors such as leather, packaging, machineries & equipment, footwear, and accessories. Respondents are wary about the small market size of the industry and the average growth expected in the sector. This has made them defer any of their expansion plans.

5.8.3.3. *Proposed EZ-Specific Challenges*

Apart from the above-mentioned sector specific and country level challenges, the respondents were also asked about their views for the suitability of the proposed EZ for business operations. The major business challenges associated with a potential shift to the prosed site have been enumerated below:

Transport connectivity: Majority of the respondent's highlighted the fact that the proposed EZ is not well connected with the road network to Dhaka and Chittagong. The challenge of using a ferry to traverse across the river to get to the site would hinder seamless movement and increase loading/unloading handling costs for reaching the major domestic market of Dhaka.

Utility connections: The proposed EZ currently has no gas connection which is cited as the major area of concern by all the respondents. Gas, apart from acting as a raw material for sectors such as non-metallic minerals, is also used by most players to run the captive power plant for day to day industrial operations. This makes gas an indispensable factor of production.

Apart from gas, the current demand of power at the site is also met through a transmission substation located at a distance of ~5 km from the site. There is a plan for capacity augmentation at the substation, which is a pertinent step. However, respondents are not very comfortable with the idea of the zone being supplied through the substation. They ideally envisage a captive power plant within the zone that would act as a reliable power source reducing machinery downtimes associated with load shedding in the region.

Apart from power and gas, some of the respondents from the food processing industry were also skeptical about the quality of ground water available at the site. The quality of water would entail the

setting up of requisite purification systems and this would be an added cost to their manufacturing setup.

Distance from Dhaka and Chittagong: Respondents feel that the distance of site from Dhaka and Chittagong is a major area of concern as Dhaka serves as their major domestic market while Chittagong is the primary port of call for imported raw materials and finished goods. This shows the high dependency of manufacturers on Dhaka, as a major market, for selling their goods. However, once construction of Padma Bridge is complete, there will be seamless road access from proposed EZ to Dhaka.

Lack of industrial ecosystem: Many players are skeptical about the prevalent industrial ecosystem in Agailjhara. They believe that apart from the **utility linkages**, the site also does not have any **existing supplier base, trained labor force and third-party logistics providers**. This would hamper the establishment of world class manufacturing units at the proposed location.

Lack in confidence of timely completion of development: Another major reason, hindering investment in the proposed EZ is the time required for development of proposed EZ. Most respondents were unwilling to base the investment decisions so early without any preview of the proposed development in reality. At this preliminary stage of planning feasibility, not many manufacturers are sure about the actual investment decision which they said would depend upon the initial successful operationalization of the zone in a district as Barishal.

Ease of doing business at a factory level: This is a concern voiced by manufacturers who have plants on private land. They are of the opinion that establishing a plant in an economic zone would entail a lot of paperwork for day to day inbound and outbound logistics. Currently as they operate on private land, no such restriction is there for cargo movement in/out of the factory premises, but as soon as they relocate to an EZ such restrictions would be inevitable. This makes them skeptical on whether they would be able to respond to immediate customer orders and just-in-time inventory requirements – both of which require quick disbursal – while being located in an EZ.

5.8.4. *Prerequisites to Investment*

The challenges listed above are hindrances which deter manufacturing companies from setting up shops in the proposed EZ. However, some of the challenges listed above can be addressed in due course of time with the help of sound infrastructure planning and interventions. These interventions are envisaged as prerequisites for the successful implementation of the proposed EZ. In order to understand the pre-requisites of investment, all the respondents were asked about their requirement with respect to (i) fiscal and non-fiscal incentives and (ii) infrastructure & logistics.

Fiscal/ Non-Fiscal Incentives

The respondents raised concerns about the various fiscal and non-fiscal benefits such as corporate income tax subsidy, waiver on import and export duty, subsidized utility tariff, ease in concessional loan facility and ease in obtaining clearances and approvals. They would be willing to consider relocating to the proposed EZ if these aspects of incentives are addressed by BEZA and the cost-benefit of these incentives reduces their operational costs considerably than the current levels. Ease of mortgaging of EZ land to procure debt finance is also a critical factor highlighted by the respondents for moving to the EZs. The definition and application of the BEZA proposed incentives for economic zones needs to be communicated to manufacturers to build confidence and subsequent translation into an investment decision.

Infrastructure interventions

Manufacturers have expressed that the major factors which influence their investment decisions for the proposed EZ include:

- Access to uninterrupted power supply (without voltage fluctuation) - this can be achieved by a captive power plant at the site

- Availability of usable water with less particulate matter – this can be achieved by BEZA through constructing bore wells that are deep enough to enable good quality of water
- Social infrastructure in and around the site for use by the workers and the officers - this can be achieved by having in-house social components within the non-processing zone at the site

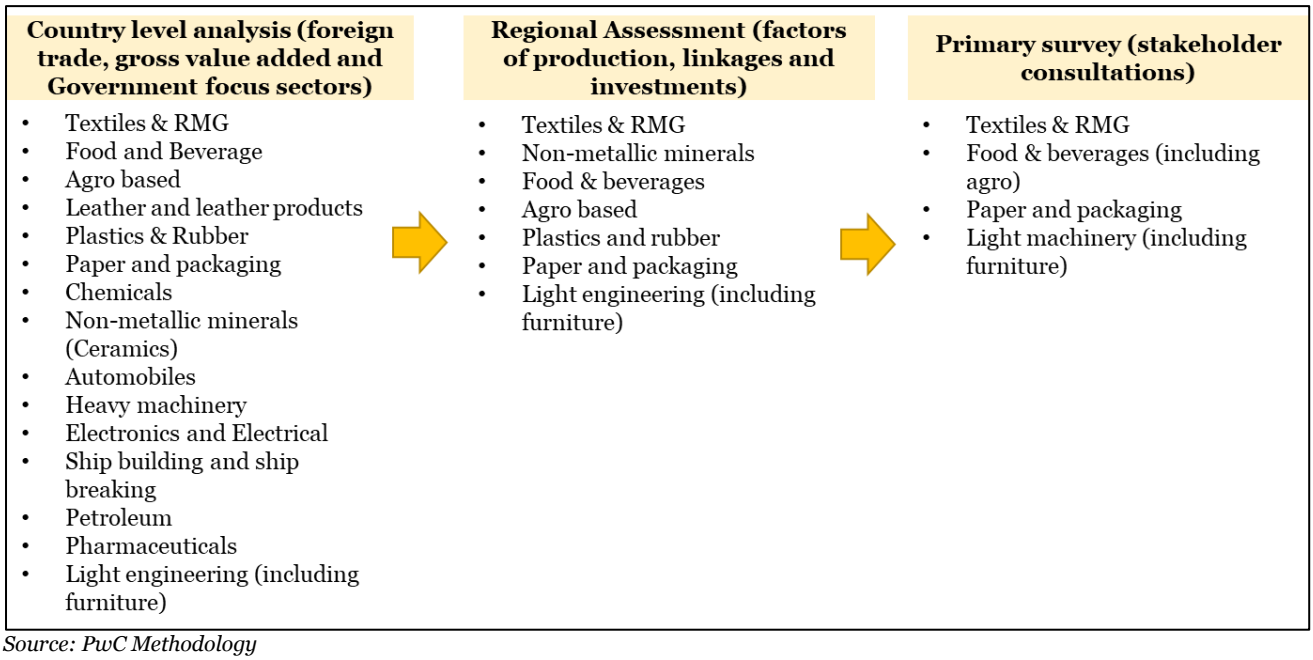
Apart from these site level interventions, BEZA could also coordinate with other government bodies to enable gas transfer to the site either from the Bhola reserve or from the main line in the Dhaka region – this would be possible after operationalization of the Padma bridge. In addition to this, BEZA could also co-ordinate with BIWTA to provide priority access of jetties at the Barishal river port for the industries at the proposed EZ which will immensely improve the connectivity of the site via waterways with other industrial hubs of the country.

5.8.5. *Final Shortlist of Industry Sectors at the Proposed EZ*

Basis the above exercise that took into consideration both the macro level developments as well as site specific support available for specific industries to experience growth within the proposed EZ, the following industries seem to be most suited at the site:

- Textiles and RMG
- Food and beverages (including agro based)
- Paper and packaging
- Light machinery (including wooden products and furniture)

Figure 42: Industry Assessment Synopsis



Source: PwC Methodology

5.8.6. *Sector Profiles*

This section depicts the brief sector profiles for the final shortlisted industries.

Sector	**Textiles and RMG**
Sub-Categories Proposed	Manufacture of textiles and readymade garments

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- • Export oriented industry with exports worth ~40 billion USD, majorly to the western regions such as US and Europe • The most important input material, cotton is imported in the country (~98% of the total requirement), as domestic production is very limited. • ~30% of the yarn, ~85% of the knit fabric and~10% of the woven fabric is imported from abroad. • Limited presence at the upstream and downstream of the industry, as major presence is at RMG manufacturing • Low cost of RMG manufacturing in the country today is the major reason behind Bangladesh's role as a RMG manufacturer for the western markets. • Most of the employed population is female today • Manufacturing clusters are currently concentrated in Dhaka and Chittagong region. • Bangladesh Garments Manufacturers and Exporters Association (BGMEA) a governing authority uniting all the RMG manufacturers in the country. • Some major domestic players in RMG manufacturing: Beximco Fashion LTD, Square Fashion Limited, Opex Sinha Group, Fakir Group, DBL Group, Standard Group, Asian Apparel Ltd etc.
Sector Trends	• Bangladesh aims to increase the exports in the RMG industry to 50 billion USD by 2050. • Exports are growing rapidly for RMG from Bangladesh, and RMG exports have shown growth of ~10% year on year in the last five years • New economic zones getting developed are trying to expand the industry beyond the traditional production hubs such as Dhaka and Chittagong. • With the automation happening in the western markets, the RMG industry in Bangladesh may face challenge in future, as the low cost of manufacturing will not be a major advantage then • This is further challenged by the rising wages in the country • The limited research and innovation in the sector also restricts the growth of industry in future if the above condition prevails.
Current Barriers to Investment	Mentioned in chapter 5.8.2
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 4 to 6 acres of land; whereas large scale players require 7 to 10 acres for setting up a single textile and RMG 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 0.7 to 1.2 MVA for single facility; whereas, for a large-scale facility, power requirement may vary from 1.2 MVA to 2 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 20 to 42 Cum/ day for single facility; whereas, for a large-scale facility, water requirement may vary from 40 cum/ day to 70 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 900 to 1600 number of manufacturing related employees are employed in a single facility • Following chapter delves into forecasting of manpower requirement for this sector

Table 40: Sector profiles: Light Machinery (including furniture)

Sector	**Light Machinery, Equipment and Furniture Sector**
Sub-Categories Proposed	Manufacture of spare parts of machines, and equipment and furniture
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- • The light machinery sector is often referred to as the 'mother industry' which is significantly integrated into the backward linkage for agriculture, food processing, railway, shipbuilding, RMG, cement, paper, jute, textile, and sugar industries • Light machinery sector provides support for operation and maintenance of heavy machines through production of spare parts, castings, molds, dies, fittings etc. Apart from these, various equipment and bicycles also form a part of this sector • In recent 'Industry policy 2016' and 'Export policy 2018-21', the sector is considered as one of the highest priority sectors • The industries in this sector mostly develop in vicinity of industrial zones in order to provide support to large-scale capital-intensive factories requiring heavy machinery • As per information provided by BIDA there are currently 40,000 light engineering units/workshops scattered across Bangladesh Local players are dependent on import of raw materials and manufacturing of spare parts locally • This sector has experienced traction from exporters from countries like China, Japan and Korea are developing light engineering facilities in Bangladesh in order to cater to export market. • Availability of skilled labour is one of the critical ingredients for this sector • These sectors mostly consist of micro, small and medium enterprises; but large conglomerates such as Walton, RFL, Meghna Group, Alim Industries Ltd., ACI Motors etc. also participate in the light machinery and equipment sector • Sylhet, Bogura, Natore, Dhaka, Gazipur, Narayanganj, Khulna, Barishal, Jessore and Chittagong are the major hubs of this sector • The furniture sector has also seen huge growth in Bangladesh. The market is dominated by micro and small-scale enterprises (associated with furniture manufacturing as well as backward and forward linkages) while there are medium and large-scale organizations that are dominating the urban areas, especially in Dhaka and Chittagong. • Some of the major local players in the furniture sector are Otobi, Akhtar, Navana, Hatil etc
Sector Trends	• Domestic focused sector with considerable export potential, and import dependent for raw materials • Bangladesh is gradually shifting away from importing light engineering goods and furniture to manufacturing them inside the country

	• Growing domestic demand, improving supply-side capabilities, inexpensive labour costs, and possibilities of backward and forward linkages are some of the drivers of this sector • Sub-sectors such as bicycle manufacturing, agro-machinery, automotive spare parts have witnessed significant growth over the last few years • Bangladesh is the third-largest non-EU exporter of bicycles to the EU and the eighth largest exporter overall and with the global bicycle market anticipated to expand by 37.5% by 2024[216], it presents huge opportunity to Bangladesh • Proximity of the proposed EZ from Khulna and Jessore which are known for being hubs of agro-machinery and automotive spare parts will present huge potential for this sector in the proposed EZ • In case of the furniture industry, the domestic demand is mostly concentrated around Dhaka and Chittagong and 90% of furniture demand in the country is met locally. However, the furniture sector recorded export earnings of USD 75 million in 2018-19 which was up from the same recorded during 2017-18 by 18.5%[217] • Since major consumption hub is centered around Dhaka, once Padma Bridge is operational, proposed EZ would have very good access to the main market of the country
Current Barriers to Investment	Mentioned in chapter 5.8.2
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 2 to 3 acres of land; whereas large scale players require 4 to 10 acres for setting up a single light machinery, equipment and furniture 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 0.2 to 0.4 MVA for single facility; whereas, for a large-scale facility, power requirement may vary from 0.5 MVA to 1.2 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)

[216] Persistence Market Research
[217] http://m.theindependentbd.com/post/216403

	• For medium scale facility, water requirement can vary from 100 to 150 Cum/ day for single facility; whereas, for a large-scale facility, water requirement may vary from 200 cum/ day to 500 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 400 to 600 number of manufacturing related employees are employed in a single facility; whereas for a large facility, typically 800 to 2000 number of manufacturing related employees are employed in a single facility • Following chapter delves into forecasting of manpower requirement for this sector

Table 41: Sector profiles: Paper and packaging

Sector	**Paper and packaging**
Sub-Categories Proposed	Packaging for processed food products and paper cones for spinning mills
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- • Bangladesh is estimated to have ~100 paper mills in the country with production capacity upto ~1.5 million MTs of paper year.[218] • Bangladesh exported paper and paper products worth ~13 million USD in 2018, and they were exported to over 40 countries. • Exports of paper and packaging has depicted growth of ~22% YOY in the last four years. • Owing to the low quality of the wood pulp in the domestic market, most of the manufacturers of papers import wood pulp via Chittagong Port. • Limited forest cover in the country is also a challenge for procuring the wooden pulp in the country today. • Despite this, various industries consumers in the sectors such as RMG, pharmaceuticals, food and beverages, agro processing, and leather are dependent on the import of packaging materials. • Some major players in the paper and packaging industry in Bangladesh are: Meghna Group, Ripon, Unicorn Industries, Miracle Industries etc.

[218] Bangladesh Paper Mills Association

Sector Trends	• The sector is estimated to grow at the CAGR of ~8-9% year on year in the coming years. • The sector is highly likely to face challenges with respect to the domestic procurement of input materials due to less forest cover in the country. • The rising demand for the industries such as RMG, pharmaceuticals, leather and footwear in the domestic market may promote the demand for paper and packaging products. • The imports of paper and packaging products have shown growth of only ~0.7% year on year in the last five years, which depict the decreasing reliance on the imported paper and packaging materials from consumer industries.
Current Barriers to Investment	Mentioned in chapter 5.8.2
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 4 to 7 acres of land; whereas large scale players require 8 to 12 acres for setting up a single light machinery, equipment and furniture 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 1.3 MVA; whereas, for a large-scale facility, power requirement may vary from 1.3 MVA to 2.3 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 24 to 56 Cum/ day; whereas, for a large-scale facility, water requirement may vary from 48 cum/ day to 100 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 900 to 1700 number of manufacturing related employees are employed; whereas for a large facility, typically 1500 to 3000 number of manufacturing related employees are employed in a facility • Following chapter delves into forecasting of manpower requirement for this sector

Table 42: 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.[219] • 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

[219] 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, once Padma Bridge is operational, proposed EZ would have very good access to the main market of the country • Pran is the most prominent food and 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 and Beverages sector is dominated by medium and large players (some being foreign)
Current Barriers to Investment	Mentioned in chapter 5.8.2
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

6. Demand Forecasting

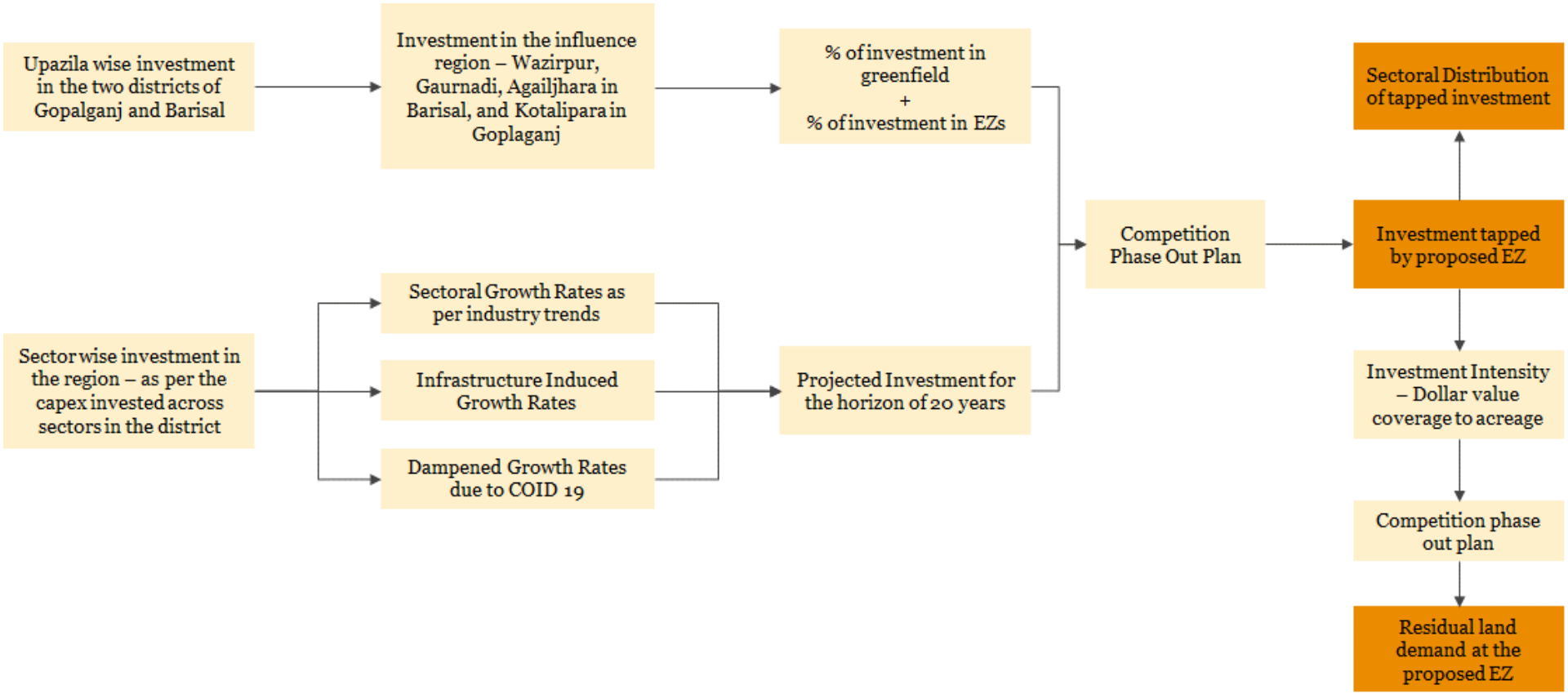
6.1. Key Objectives

In the previous chapter the best fit industries for the proposed economic zone were established basis the factors of production, industry linkages and primary survey. These industries are best suited to be established on the land in the economic zone. However, the decision of the investors from these best fit sectors to move to the BEZA proposed zone is also dependent on the supply of industrial land from elsewhere in the district as well nearby areas. Thus, an important aspect of commercial feasibility of the economic zone is the land demand forecasting exercise wherein the supply of industrial land from competing EZs is taken into consideration to arrive at the probable occupancy rates of industrial land at the proposed EZ. This will provide a comparative scenario of supply v/s demand and aid in decision making for the feasibility of the proposed EZ.

6.2. Methodology Adopted

The methodology adopted for land demand calculation at the proposed EZ includes an associative forecasting method. Investments in the influence region have been forecasted to arrive at future anticipated capex in the region and further the dollar value of capex has been converted to acreage using investment intensity benchmarks for land usage across South Asia and the Indian subcontinent. Following figure demonstrates the methodology diagrammatically:

Figure 43: Land Demand Forecast Methodology



Source: PwC Methodology

Stepwise approach has been elucidated in the following-

Step-1: In order to analyze the investment trends in the influence districts of Barishal and Gopalgonj, the economic census data of Barishal and Gopalgonj was collected to arrive at the amount of investment flowing into each of the sectors such as textile and RMG, non-metallic industries etc. (as per BSIC code).

Step-2: In order to analyze the investment trends in the micro influence region of the proposed EZ which consists of Gaurnadi, Wazirpur and Agailjhara upazilas in Barishal and Kotalipara upazilas in Gopalgonj, the economic census data of Barishal and Gopalgonj was collected to arrive at the Non-resident Bangladeshi investments across these upazilas of the two districts. The NRB investments provide an insight into the attractiveness of each of the upazilas within the two districts in terms of garnering capex for industrial establishments.

Step-3: The investment contribution of each of these four upazilas to the total investment made in Barishal and Gopalgonj districts respectively was then ascertained and using this percentage the amount of investment across pre-determined industrial sectors (Textiles & RMG, Light Engineering, Wood products and Furniture, Food & Beverages, Agro based products, and Paper & packaging) which could be entailed in the proposed EZ was arrived at.

Step-4: The capex investment across these sectors was corresponding to the economic census data from 2013 which was then projected till 2044 (20 years from the start of land uptake for the proposed EZ). Forecasting of investment data is based on industrial growth rates. It has been considered that these growth rates are occurring due to (i) organic growth rate(s) of the respective industrial sector(s) and (ii) infrastructure induced growth rates. The growth rates were dampened during the span of 2020 to 2027 in order to consider the negative impact of COVID 19 on industrial sector and investment in Bangladesh.

Step-5: 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.

Step-6: Basis secondary research on industry sector outlook and primary interaction with industries, investment-land intensity ratio (investment per unit area) has been assessed. This ratio is applied on the projected Greenfield EZ-based investment to estimate the land uptake forecasting in the greenfield economic zones of the influence area of the proposed EZ.

Step-7: In addition to the proposed EZ, two 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.

Step-8: 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.

Step-9: 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

Demand forecasting model takes into cognizance three demand scenarios.

- **Aggressive case:** Economic conditions of Bangladesh and the region are improving and behaving better than expected; because of the same, macro-economic indicators showing increasing prospect and potential infrastructure projects are commencing before 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 and potential infrastructure projects are commencing as scheduled.
- **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 and infrastructure projects are commencing after scheduled.

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

6.4. Key Assumptions

6.4.1. Timing 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[220], BEZA owned zones (like Dhaulghata in Maheshkhali, Jamalpur), 20[221] 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 Agailjhara EZ was assumed to start in midterm (i.e. after the first five years) and thus it had been previously assumed in the model that industrial space uptake should commence from 2025 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 2022 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 2023. Taking cues from similar developments across the globe, and the area being ~329 acres, construction timeline of 4 years (from 2023 to 2026) has been considered.

Basis above timelines, it has been assumed that land uptake in the proposed EZ to commence from 2026 and accordingly a demand model has been prepared for 20 years (i.e. from 2026 to 2045).

6.4.2. Industrial Tenants Considered for Land Uptake

The previous chapter on industrial assessment enlisted the following major industrial segments that would be best fit for the proposed EZ:

[220] 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

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

- Textile and RMG
- Paper and packaging
- Light engineering including
    - Wooden products and furniture
- Food and beverages including
    - Agro based

These industrial sectors have been considered for demand uptake projections at the proposed EZ.

6.4.3. *Industrial Growth Assumptions (Sectoral and Infrastructure Induced)*

Quantum Index of Industrial Production (QIIP) published in National Account Statistics 2017 (NAS) by BBS has been analyzed to find out Compound Annual Growth Rate (CAGR) for each of shortlisted industry sectors. The results obtained from the same have been further validated by detailed secondary research on sectoral outlook and industry trends in the country.

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.

Table 43: Growth rate assumptions

Industrial sectors	Description of Assumptions
Textile and RMG	• 13.0% annual growth from 2013 to 2016 • 12.0% annual growth from 2017 to 2019 • 8.0% annual growth from 2028 to 2045
Light Engineering including Wooden Products and Furniture	• 20.0% annual growth from 2013 to 2017 • 21.0% annual growth from 2018 to 2019 • 18.0% annual growth from 2028 to 2045
Food and beverages including Agro based	• 8.5% annual growth from 2013 to 2019 • 10.0% annual growth from 2028 to 2045
Paper and packaging	• 8.0% annual growth from 2013 to 2017 • 10.0% annual growth rate from 2018 to 2019 • 10.0% annual growth rate from 2028 to 2045
Padma bridge	• The bridge is expected to boost the connectivity in the region as well as providing gas connection from the central region of Dhaka to the southern part of Bangladesh • 0.125 % of growth is expected due to operationalization of the Padma bridge, in the Base Case
Expansion of the Dhaka Barishal Highway	• The expansion of the Dhaka Barishal highway is planned to cater to the growing traffic on the stretch – RHD plans to expand it to 4 lanes from the existing two lanes • 0.075% of growth is assumed due to upgradation of Dhaka Barishal highway, in the Base Case

Source: National Accounts Statistics (May' 2017) 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. **Error! Reference source not found.** figure depicted the impacted growth r ates for the above industries due to COVID 19 during this period.

Figure 44: Revised Growth Rates for Industries due to COVID 19

Source: PwC Analysis

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 44, the dip in growth rates between 2020 to 2025 can be observed, while the expected boom posts the dip can also be seen for year 2026 and 2027.

6.4.4. *Assumptions Related to Investment Inflows in the Region Surrounding the Site*

In the previous sections, it was established that the surrounding upazilas of Kotalipara, Gaurnadi, and Wazirpur would garner the same interest as the Agailjhara upazila in terms of investment propensity (influence area) because of closeness in terms of distance and similar macro-economic characteristics. NRB investment trend analysis brings to the forefront the fact that Barishal Sadar attracts ~40% of the total investment coming into Barishal while the upazilas of Agailjhara, Gaurnadi and Wazirpur attract ~23% of the total inflow of NRB investment in Barishal.

This forms the basis of the investment calculation exercises. Further, the proportion of this total investment that is directed towards green field projects has been assumed to be 55% and within these 55%, the share of economic zones is assumed to be 50% (base cases). Research suggest that in developing countries, percentage of Greenfield investment is ~57.85%[222]. Thus, in base case, 55% of Greenfield investment has been assumed.

6.4.5. *Competition Landscape*

In conversation with various stakeholders and other industry players, the following list of competing EZs has been prepared:

Table 44: Competing economic zones

Sl. No.	Name of EZ	Location	District	Gross area (acres)[223]	Remarks
1	Kotalipara Economic Zone	Kotalipara	Gopalgonj	201.83	Govt. driven
2	Gopalgonj Economic Zone	Gopalgonj Sadar	Gopalgonj	200	Govt. driven
3	Investments opting for other regions in the country & Future competition	-	-	241.10	Investments in the EZ space can also deviate towards other regions in the country. This can be because these regions are more lucrative to investors and industrialists looking to set up in economic zones. In order to

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

[223] 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 (acres)[223]	Remarks
					factor that in our calculations and to factor the effect of future competitions that may creep up in the form of more EZs in the same influence area, we have assumed that **~80%** 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: Discussion with BEZA officials

The above uptake scenario for different competing EZs has been assumed post conversations with various Govt. officials and private industry players. The total processing or industrial area (roughly this is equal to 75% of the total land area) of the competing EZs has been considered for uptake assumptions.

6.4.6. *Assumptions Related to Investment Land Intensity and Number of Establishments*

Basis primary stakeholder and technical consultations, the investment-land intensity ratio (investment per unit land area) for the shortlisted industries have been arrived at. This ratio varies geographically and is an indicator of the amount of investment required per acre for an industrial sector excluding shop floor equipment. The figures assumed are indicative in nature and are based on industry standards which might vary with geography, time and disruptions in technology.

Additionally, apart from the investment intensity assumptions for shortlisted sectors, we have also estimated the average area required by unit establishment of each sector. The establishments' data from the Survey of Manufacturing Industries 2012 was analyzed and together with inputs from the primary survey, the analytical calculations were done.

Table 45: Investment Intensity and Area requirement (shortlisted sectors)

Industrial sectors	Investment Intensity (BDT million/acre)	Area requirement for each industrial establishment (small, medium and large)
Food and Beverages	36.76	2.0
Agro Based	51.37	1.0
Textiles and RMG	34.80	2.0
Paper and packaging	119.32	1.0
Light engineering	198.86	5.0
Wood products and furniture	198.86	1.00

Source: PwC Analysis and Stakeholder Consultations

6.4.7. *Assumptions Related to Utility Requirements and Employment Generation*

Standard benchmark consumption numbers from various industries gathered through primary survey and secondary research have been used to arrive at the prospective power and water demands for various proposed industrial sectors. In addition to the utility requirements the employment generated have also been culled through extensive secondary research and primary surveys. These assumptions are subjective in nature and might deviate in actual implementation scenarios. Following table captures these assumptions for various shortlisted sectors:

Table 46: Utility and Employment generation benchmarks

Industrial sectors	Power (MVA/acre)	Water (MLD/acre)	Direct employment generated (per acre)
Food and Beverages	0.18	0.04	24
Agro Based	0.14	0.04	120
Textiles and RMG	0.18	0.06	142
Paper and packaging	0.18	0.07	246
Light engineering	0.12	0.05	153
Wood products and furniture	0.12	0.06	171

Source: PwC Analysis

6.5. *Demand Forecasting*

6.5.1. *Industrial Land Uptake Scenarios*

In furtherance to the above assumptions, the demand uptake calculations were carried out to arrive at the residual demand at the proposed EZ.

Following table elucidates the annual residual demand (cumulative) of industrial space in the proposed EZ after considering the competitions.

Table 47: Final land demand uptake at the proposed EZ

Scenarios	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2044
Conservative	3%	7%	13%	18%	23%	30%	38%	45%	53%	66%	89%	100%	100%
Base	5%	10%	18%	25%	32%	43%	53%	64%	76%	94%	100%	100%	100%
Aggressive	7%	15%	26%	37%	48%	62%	78%	95%	100%	100%	100%	100%	100%

Source: Demand estimation; Statistical projection technique

As mentioned earlier, the total land area available for the proposed EZ is 329.43 acres out of which 243.32 acres will be dedicated to the processing area, remaining area would be dedicated towards non-processing area and commercial area (including infrastructure and utilities) for smooth functioning of EZ. It is evident from the above table that the demand for land is more than supply in the base and aggressive cases making the establishment of industrial units a feasible option for the developer, BEZA.

Following table indicates the sectoral distribution of industrial land in the proposed EZ (for sectors shortlisted in the industry assessment):

Table 48: Sectoral demand for industrial land (conservative case)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textile and RMG	1.06	2.47	4.19	5.90	7.21	9.35	11.42	13.23	15.07	18.04	23.09	25.22	25.22
Wood products and furniture	2.76	6.77	12.15	17.98	22.85	31.56	40.74	49.51	59.26	76.49	108.44	123.21	123.21
Food and beverages	2.96	6.91	11.86	16.86	20.75	27.23	33.61	39.29	45.17	54.87	71.62	78.84	78.84
Agro based	0.53	1.23	2.11	2.99	3.68	4.84	5.97	6.97	8.02	9.74	12.71	13.99	13.99
Paper and packaging	0.04	0.10	0.18	0.25	0.31	0.41	0.50	0.59	0.68	0.82	1.07	1.18	1.18
Light engineering	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.12	0.17	0.19	0.19
Total	**7.36**	**17.49**	**30.51**	**44.02**	**54.84**	**73.44**	**92.30**	**109.67**	**128.29**	**160.08**	**217.11**	**243.32**	**243.32**

Source: Demand estimation; Statistical projection technique

Table 49: Sectoral industrial land uptake (base case)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textile and RMG	1.66	3.72	6.16	8.64	10.77	13.81	16.84	19.68	22.63	26.83	28.29	28.29	28.29
Wood products and	4.32	10.20	17.82	26.27	34.17	46.54	60.00	73.80	89.45	113.79	123.00	123.00	123.00

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
furniture													
Food and beverages	4.62	10.43	17.43	24.67	30.99	40.20	49.55	58.48	67.93	81.62	86.45	86.45	86.45
Agro based	0.30	0.64	1.01	1.36	1.64	2.00	2.34	2.64	2.92	3.29	3.41	3.41	3.41
Paper and packaging	0.07	0.16	0.26	0.37	0.46	0.60	0.74	0.88	1.02	1.22	1.29	1.29	1.29
Light engineering	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.12	0.14	0.18	0.19	0.19	0.19
Total	**10.97**	**25.16**	**42.70**	**61.35**	**78.09**	**103.22**	**129.58**	**155.59**	**184.09**	**226.94**	**243.32**	**243.32**	**243.32**

Source: Demand estimation; Statistical projection technique

Table 50: Sector industrial land uptake (aggressive case)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textile and RMG	2.40	5.26	8.57	11.99	15.14	19.27	23.49	27.61	28.93	28.93	28.93	28.93	28.93
Wood products and furniture	6.24	14.42	24.72	36.37	48.10	64.89	83.62	103.67	110.64	110.64	110.64	110.64	110.64
Food and beverages	6.67	14.75	24.22	34.20	43.58	56.09	69.10	82.07	86.28	86.28	86.28	86.28	86.28
Agro based	1.19	2.62	4.30	6.07	7.74	9.96	12.27	14.57	15.32	15.32	15.32	15.32	15.32
Paper and packaging	0.10	0.22	0.36	0.51	0.65	0.84	1.03	1.23	1.29	1.29	1.29	1.29	1.29
Light engineering	0.01	0.02	0.04	0.06	0.08	0.10	0.13	0.16	0.17	0.17	0.17	0.17	0.17
Total	**16.60**	**37.29**	**62.22**	**89.21**	**115.28**	**151.16**	**189.64**	**229.32**	**243.32**	**243.32**	**243.32**	**243.32**	**243.32**

Source: Demand estimation; Statistical projection technique

Detailed calculations are attached in the Annexures.

The projections for number of establishments across the 3 scenarios are shown below:

Table 51: Number of establishments (across all sectors) cumulative

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Conservative	5	13	22	33	41	55	70	83	98	124	170	190	190
Base	8	18	31	45	57	76	96	116	139	173	185	185	185
Aggressive	12	27	46	66	86	113	143	174	185	185	185	185	185

Source: Demand estimation; Statistical projection technique

6.5.2. *Utility Projections*

In furtherance to the above-mentioned land uptake scenarios, the table below elucidates the power and water requirements for the proposed industries in the upcoming EZ:

Table 52: Power requirement projections (in MVA) cumulative

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Conservative	1.14	2.71	4.70	6.76	8.40	11.19	14.00	16.57	19.31	23.94	32.21	35.88	35.88
Base	1.71	3.91	6.61	9.46	12.00	15.79	19.73	23.59	27.79	34.05	36.33	36.33	36.33
Aggressive	2.58	5.77	9.59	13.70	17.64	23.03	28.76	34.64	36.60	36.60	36.60	36.60	36.60

Source: Demand estimation; Statistical projection technique

Table 53: Water requirement projections (in MLD) cumulative

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Conservative	0.37	0.89	1.55	2.25	2.80	3.77	4.75	5.66	6.64	8.32	11.35	12.71	12.71
Base	0.56	1.29	2.20	3.16	4.04	5.35	6.74	8.12	9.64	11.93	12.77	12.77	12.77
Aggressive	0.84	1.89	3.17	4.55	5.90	7.76	9.76	11.84	12.54	12.54	12.54	12.54	12.54

Source: Demand estimation; Statistical projection technique

The above stated figures for utility consumption are primarily based on primary interaction and industry benchmarks which might vary once the project is implemented.

6.5.3. *Employment Generation*

In line with the above-mentioned land demand and utility projections the direct employment (across all sectors) slated to be generated by the proposed EZ is mentioned in the table below:

Table 54: Expected direct employment generation by the proposed industrial development

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Conservative	769	1,849	3,257	4,744	5,954	8,066	10,244	12,282	14,500	18,348	25,356	28,541	28,541
Base	1,139	2,641	4,529	6,571	8,436	11,283	14,319	17,367	20,763	25,950	27,882	27,882	27,882
Aggressive	1736	3939	6638	9606	12521	16597	21039	25694	27281	27281	27281	27281	27281

Source: Demand estimation; Statistical projection technique

Detailed calculations for the above projections have been added in the Annexure

6.6. 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 12 years. For base and aggressive cases, the same would be spread over 11 years and 9 years respectively in the Post-COVID scenario. In Pre-COVID scenario, the same was spread over 11, 10 and 8 years respectively across conservative, base and aggressive scenarios.
- Our analysis indicates that Wood products and Furniture exhausting most of the industrial land (~72%), followed by Food & Beverages (~22%) and Textile & RMG (~6%) respectively. These form the primary industrial mix of the proposed EZ. Sectors like Agro-based products, Paper & Packaging and Light Engineering products (with a cumulative share of ~1%) constitutes the secondary industrial mix.
- Total number of industrial establishments (small, medium, and large) for conservative case is 190. For base and aggressive cases, it is 185 respectively.
- For conservative case, ultimate power and water demand have been estimated as 35.88 MVA and 12.71 MLD; For base case, ultimate power and water demand have been estimated as 36.33 MVA and 12.77 MLD; For aggressive case, ultimate power and water demand have been estimated as 36.60 MVA and 12.54 MLD.
- Proposed EZ is expected to generate direct employment of 28,541 in conservative case. In base and aggressive cases, employment generation figures could be 27,882 and 27,281. These figures are indicative and may vary during implementation.

It would be prudent to consider the fact that these estimations are indicative in nature and might vary upon actual implementation of the project, the construction period and the economic landscape of the region in the future.

7. Transport Assessment

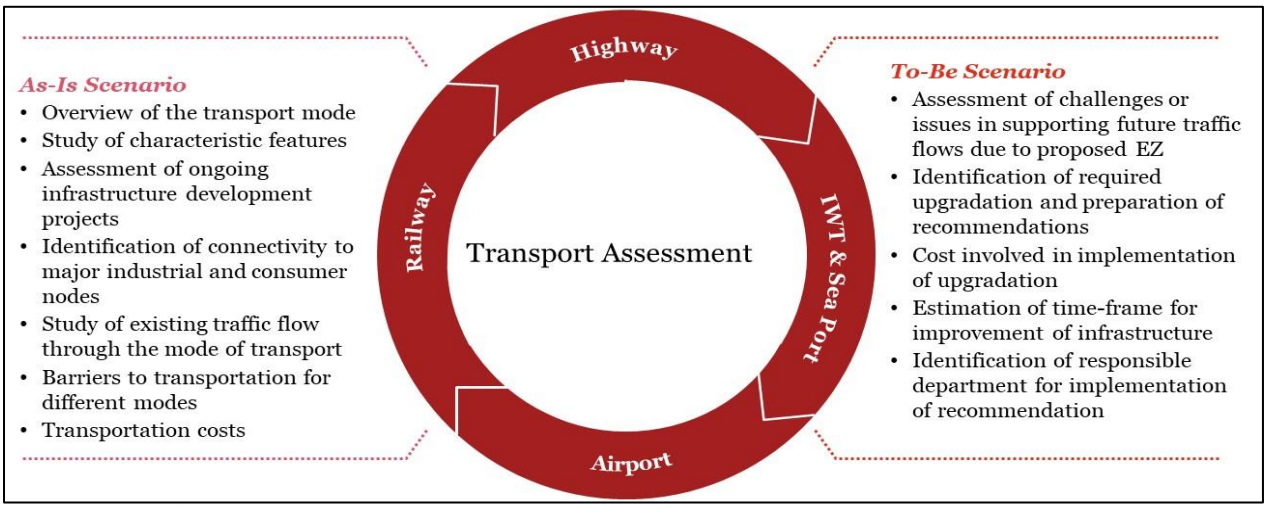
7.1. Purpose and Objective

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

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

7.2. Methodology of Transport Assessment

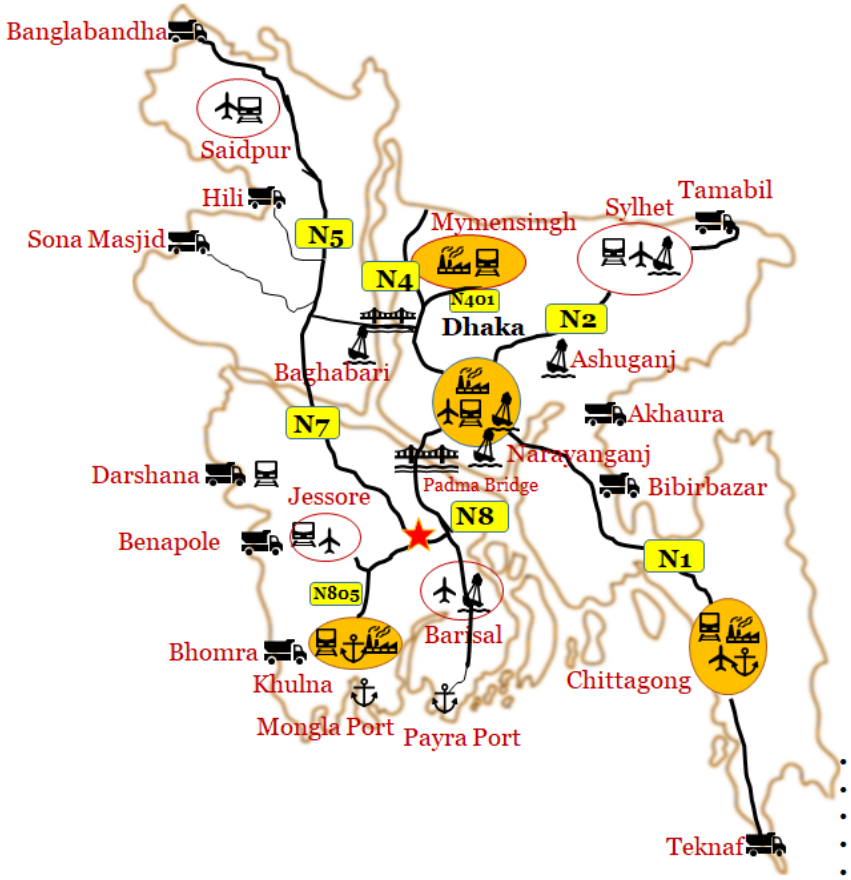
The approach adopted to assess transport infrastructure supporting movement of goods and passengers in the vicinity of the proposed EZ is segregated into 2 modules. 1st module deals with evaluation of the existing status of different modes of transport with respect to its features, connectivity, traffic 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.



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 –



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	163	Chittagong	291
Barisal	45	Khulna	94
Jessore	128	Bhomra	160
Benapole	185	Mongla	110
Payra	148	Sylhet	443

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

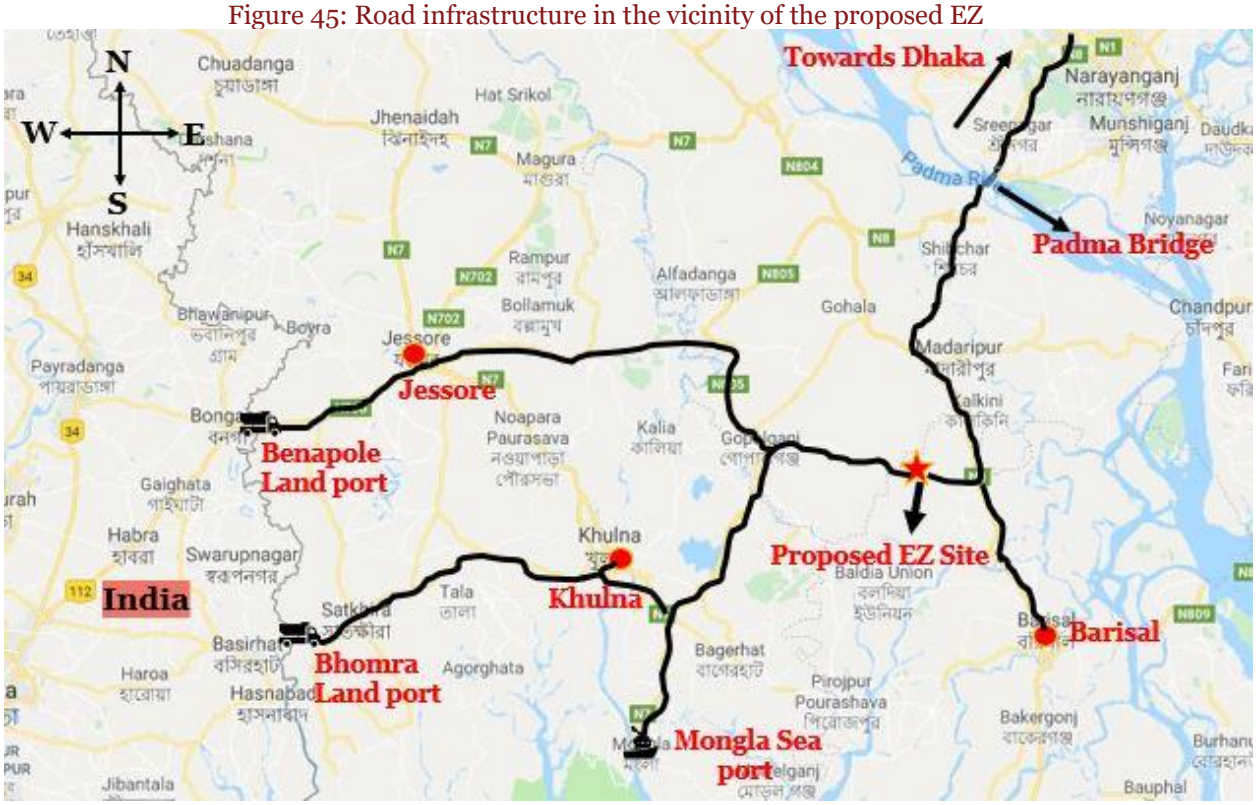
Source: PwC Analysis

7.3.1. *Road connectivity*

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 proposed EZ.

Figure 45: Road infrastructure in the vicinity of the proposed EZ



Source: Google Map and PwC Analysis

The figure above elucidates that the proposed EZ has direct road access to Khulna, Jessore and Barishal. It also has direct road access to Bhomra and Benapole land ports. Operationalization of Padma Bridge will provide direct road access between the proposed EZ and consumer hub in Dhaka.

7.3.1.1. *Highways near the Proposed EZ*

As shown in Figure 46, the proposed EZ is connected to Agailjhara upazila by Agailjhara-Kotalipara road (Z8031) which abuts the proposed EZ on its southern side.

Zila Road, Z8031 (Agailjhara-Kotalipara road) borders the proposed EZ towards the southern side. Presently, Z8031 is a two-lane bituminous road maintained by RHD and can support the movement of heavy vehicles and no traffic stagnation takes place on this stretch. Z8031 has an average width of 5.48 m.[224] Once, the construction and operations commence at the proposed EZ, the road width might hinder smooth flow of traffic on Z8031, as it might not be able to support two way traffic of cargo carrying large vehicles, resulting in congestion and risk of accident. The widening of the road alignment would be assessed in the infrastructure assessment section. From the Agailjhara bus top, a regional highway R852 (Gouranadi-Paisarhat-Kotalipara-Gopalgonj Road) connects to Gaurnadi bus stop. The local bus stop in Agailjhara is at a distance of 14km from the Gaurnadi bus stop. This R852 is a bituminous 2-lane road with an average width of 5.37m.[225] Conversation with the executive engineer of Barishal Roads and Highways Department (RHD) revealed that the width of this road would be increased in due course of time. RHD has already acquired land at both side of this regional highway R852 and is waiting for budget approvals to begin construction. The road is good enough for cargo movement and no traffic

[224] *Roads and Highways Department*
[225] *Roads and Highways Department*

stagnation takes place at this stretch. From regional highway R852, the Gaurnadi bus stop is further connected to N8 (Jatrabari-Mawa-Bahnga-Panchar national highway). From the Korarakandi ghat, ferry ride is required to cross over to the other site at the Mawa ghat.

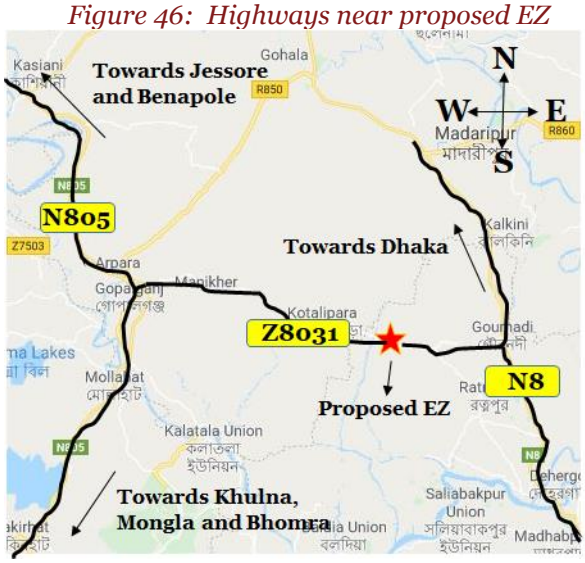
GoB is envisaging development of South West Bangladesh Economic Corridor (SWBEC); this will enable the region's economic output increase up to USD 148 billion by 2050.[226] Economic Corridors focus on holistic development in terms of industrial development, urban growth and infrastructure development projects. The alignment of SWBEC is from Bagerhat and Jessore to Dhaka through Khulna and Gopalgonj. Since the two growth centers of the country (i.e. Dhaka and Khulna) would be connected to the South West region of Bangladesh, Proposed EZ in Agailjahara is poised to reap the benefit of industrialization and transportation improvement owing to the establishment of SWBEC. In furtherance to improving connectivity and industrialization, SWBEC could also improve connectivity with the neighboring countries and North Eastern part of India.

GoB is also supporting growth of economic activity in the region through entering into a BBIN (Bangladesh, Bhutan, India, Nepal) Motor Vehicles Agreement, which would allow seamless movement of vehicles of these countries.

Vehicular Traffic

As per data available in Roads and Highways Department (RHD) database, Average Annual Daily Traffic (AADT) for R852 (Gouranadi-Paisarhat-Kotalipara-Gopalgonj Road) is 3,401 vehicles, out of which 2,868 is motorized, rest is non-motorized.

Figure 46: Highways near proposed EZ



Source: Google Map and PwC Analysis

Traffic volume in R852 is significantly lower than the traffic volume of busiest road links in the country. This may be attributed to the fact that Agailjhara area is yet to witness industrial development.

Data from RHD reveals that AADT for N8 is 9,127, out of which 8,104 is motorized and rest is non-motorized. Comparison with busiest road links of Bangladesh indicates that the AADT for N8 is approximately 34% of the AADT of the busiest road links in the country.

Basis our discussion with RHD officials, we were informed that Roads and Highways Department has plans to widen R852. Widening of roads would greatly improve upon the already favorable last mile infrastructure. This would allow a faster 2-way movement of heavy vehicles, required for transporting construction material as well as manufactured goods.

[226] *https://www.thedailystar.net/business/economic-corridor-southwest-will-bump-growth-adb-1504156*

The proposed EZ is located in between a Zila Road and Regional Highway, which provides last mile connecting infrastructure to the proposed EZ. Last mile connectivity to proposed EZ is further set to improve, given the road widening plans of RHD.

7.3.1.2. *Trunk Connectivity to Mongla, Khulna and Jessore*

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

- Mongla
- Khulna
- Jessore

Mongla is an upcoming industrial town located around 110 km away from the proposed EZ location, requiring a travel time of around 2.25 hours from the site location. This town is home to Mongla Port, Mongla EPZ, LPG bottling plants and 2 Economic Zones (under development).

Mongla can be accessed through Agailjhara-Kotalipara road (Z8031) via Dhaka-Khulna National Highway (N805) followed by Khulna-Mongla Road (N7). Presently, these road alignments are bituminous and conducive for movement of heavy vehicles. Basis stakeholder discussions with RHD officials, we were informed that RHD is in process of widening roads along this stretch from existing 2-lane to 4-lane, this will improve the vehicle carrying capacity of the roads and create an industry friendly passageway for transportation of goods and services to and from the proposed EZ. Accessibility to the sea port in Mongla will aid in the import and export of goods and materials.

Khulna is an industrial city in proximity of EZ location. This town is around 94 km away from proposed EZ at Agailjhara, requiring a travel time of around 2 hrs. It is the 3rd largest city of Bangladesh and is home to various industries like jute, chemicals, seafood packaging, food processing, sugar mills etc.

Khulna can be accessed from the proposed EZ location through Agailjhara-Kotalipara road (Z8031), Dhaka-Khulna National Highway, N805 and onto Khulna-Jessore-Dhaka highway, N7. Presently, these road alignments are 2-lane, however work is under progress to convert sections of the stretch of road in between Khulna and Gopalgonj to 4-lane.

Jessore is the gateway to Benapole Land Port. This is a major city in close proximity to proposed EZ location at a distance of around 128 km. Travel time from proposed EZ to Jessore is around 3.5 hours and can be accessed via Agailjhara-Kotalipara road (Z8031), Dhaka-Khulna highway, N805 and Khulna-Jessore-Dhaka highway, N7. This town has a major automobile assembly plant, several jute industries and recently BEZA has announced plans to set up two economic zones in this district.[227] This town can serve as a good demand center for finished products as well as provide raw material for the industries in proposed EZ.

The proposed EZ is in close proximity to the industrial belt in Khulna and Jessore, which are approachable by regional highways. This makes it pertinent to assume that the site could be used for industries that form a part of the existing value chain at Khulna and can be integrated with these domestic industrial hubs in addition to far off domestic consumption centers of Dhaka, Chittagong and export markets. Additionally, exiting industries in the above-mentioned areas could serve as prospective local market and source of raw materials for the proposed EZ. Agro-based economy of Barishal district may provide supply of raw materials for agro processing related industries at the proposed EZ.

7.3.1.3. *Trunk Connectivity from Dhaka*

Currently there is no direct road access to Dhaka. The proposed EZ is around 163 km from Dhaka city and can be accessed by travelling along N8 (Dhaka-Mawa Highway) till Mawa Ferry Ghat. Dhaka-Mawa Highway is 2-lane bituminous road and work is in progress to make it a 4-lane highway. Four laning of

[227] *http://www.daily-sun.com/post/272989/Jessore-to-have-2-economic-zones*

Dhaka-Mawa road is being undertaken in anticipation of meeting the requirements of additional traffic flow that will take place, upon operationalization of Padma River Bridge.

Travel on Dhaka-Mawa Highway is followed by a ferry ride till Kaorakandi Ferry Ghat. This ferry ride presently requires at least 2 hours of travel time, however traffic at ghat, often results delay of 2-3 hours in crossing the Padma River. From the ghat, N8 Highway continues towards Gaurnadi bus stop. Gaurnadi upazila lies adjacent to the Agailjhara upazila. The local bus stop in Agailjhara is at a distance of 14 km from the Gaurnadi bus stop. From the N8, a regional highway R852 (Gouranadi-Paisarhat-Kotalipara-Gopalgonj Road) connects the Gaurnadi bus stop to the Agailjhara bus stop. This road leads to Z8031 (Agailjhara-Kotalipara road), a zila road, which provides last mile connectivity to the proposed EZ. Road condition of the entire stretch (from ferry ghat to EZ) is suitable for movement of heavy goods and vehicles.

R852 is a bituminous 2-lane road with a width of 5.48 m. The conversation with the executive engineer of Barishal Roads and Highways Department (RHD) revealed that the width of this road would be increased in due course of time. Widening of R852 could enhance the vehicle carrying capacity of the road thus enabling faster movement of men and material.

The travel time required for crossing the Padma River could come down once the construction of Padma River Bridge is completed. This would also result in direct road access to the consumer hub, Dhaka.

7.3.2. *Land Ports*

Bangladesh and India share a border line of 4,096 km, which is the fifth longest border in the world.[228] 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, warehouses, Inland Container Depots etc. Currently, India and Bangladesh have 23 land ports to facilitate trade between the two countries.[229]

Bhomra land port is the nearest land port from the proposed EZ located at around 160 km in Shakthira district. It is the land ports which has the second highest cargo handling between India and Bangladesh after Burimari. Bhomra land started its operation on May 2013 and has a capacity to handle 2.62 million tons of goods per year. This port was developed in 2013. With rising trade between India and Bangladesh, the traffic through this land port has drastically increased. Access to Bhomra takes place through Gaurnadi-Kotalipara-Gopalgonj, Khulna-Satkhira Road (R760) and Satkhira-Bhomra highway.

Benapole land port is located at a distance of 185 km from the proposed EZ. It has a capacity to handle 2.61 million Metric Tonnes (MT) of goods per year. Access to Benapole takes place through Agailjhara-Kotalipara road, Khulna-Jessore Highway and Jessore-Benapole Highway. Khulna-Jessore and Jessore-Benapole highways are part of the Asian Highway network and basis our discussion with RHD officials, procurement process is completed towards upgradation of these road alignments.

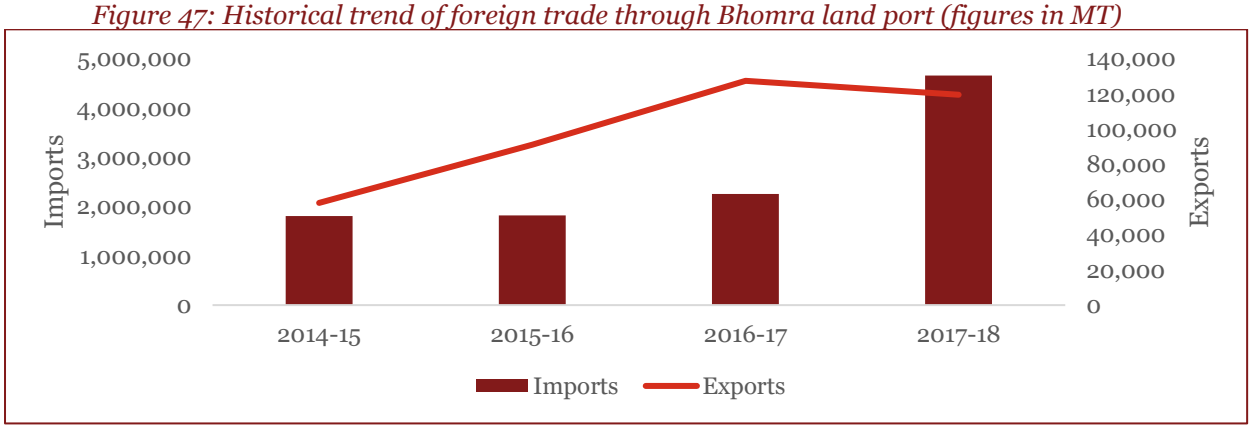
Bhomra and Benapole land ports are at considerable distances from the proposed EZ making transfer of raw materials or finished goods alike difficult to be transported to India, one of the major trade partners of Bangladesh.

Present Hindrance and Redressal by GoB

Bhomra land port is spread over an area of ~16 acres, having storage capacity of 1600 MT. Bhomra port has weighbridges and warehouses to support movement of goods.[230]

[228] *http://www.thehindu.com/news/national/half-of-indiabangladesh-border-fenced/article17396794.ece*
[229] *Bangladesh Land Port Authority*
[230] *Bangladesh Land Port Authority*

Figure 47: Historical trend of foreign trade through Bhomra land port (figures in MT)



Source: Data from Bangladesh Land Port Authority Website

Presently the imports and exports at this land port are done through on transshipment basis. Bangladesh Land Port Authority is very much optimistic that with the increase of volume of trade, the importers will avail the storage facilities available at the land port. Apart from this, BLPA is keen to establish quarantine & BSTI laboratories, setting broadband internet connection, introducing automation piloting, obtaining approval for all importable goods from National Board of Revenue so as to boost import-export activities through this port.

Major commodities traded through Bhomra land port is listed in the table below.

Table 55: Types of goods being traded through Bhomra land port

Major imports	Livestock, Fruits, Coal, Chemical fertilizer, Ball clay, China clay, Timber, Limestone, Lentil, Rice, Maize, Fish, Sugar, Motor parts, Marble slabs, Aluminum, Kitchenware etc.
Major exports	Jute & jute goods, paddy, shrimp, wheat, leather goods, betel leaf etc.

Source: Data from Bangladesh Land Port Authority Website

Benapole land port is yet to be modernized. Lack of digitization and absence of modern surveillance system at Benapole Land Port results in mismanagement and theft of goods. Also, 60% of goods traded through Benapole is handled manually resulting in higher lead-time for clearance of vehicles. This results in traffic congestion at this land port. On an average cargo movement of ~250 trucks carrying export goods reach Benapole land port on a daily basis, however 100-150 vehicles are cleared. Voice on ground reveals that owing to high gestation time at this land port, cost of export increases due to demurrage charges.[231]

Bangladesh Land Port Authority inaugurated a new gate at Benapole on May 28, 2018 in order to ease traffic congestion at the land port and provide an alternative gate for movement of cargo carrying vehicles. A pilot project for digitalization of records has been initiated at Benapole Land Port in order to improve data entry and record maintenance. Works are also underway to install more equipment for mechanized cargo-handling at Benapole Land Port.

Benapole land port is spread over an area of ~87 acres, having storage capacity of 40,000 MT. Benapole port has weighbridges, mechanized cargo handling facilities, and warehouses to support movement of goods.[232]

Table 56: Historical trend of foreign trade through Benapole land port (figures in MT)

EXIM	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19

[231] *Bangladesh Land Port Authority*
[232] *Bangladesh Land Port Authority*

Import	112,4126	1,252,250	1,379,350	1,288,938	1,393,329	1,988,357	2,181,124
Export	562,616	300,274	295,277	475,739	325,381	352,963	401,177

Source: Data from Bangladesh Land Port Authority Website

The above table indicates that imports and exports have demonstrated stable trends from FY13 to FY19. However, in FY19 there was a spike in the imports (~2.1 million tonnes) while the exports were ~0.40 million tonnes indicating that consumption and manufacturing activities have recently started to pick up after remaining broadly unchanged over a long timeframe. Absence of marquee industrial projects in South-West Bangladesh region is a major factor hindering growth of export through Benapole Land Port. Imports through Benapole Land Port is higher as compared to exports, this signifies lack of industrialization in immediate vicinity of Benapole Port resulting higher dependency on India for consumer goods. Bangladesh also lacks in availability of raw material fit for industrial consumption, due to which industries (such as textile/RMG, automobile, light engineering, food and beverages) are dependent on India for import of raw material.

Major commodities traded through Benapole land port is listed in the table below.

Table 57: Types of goods being traded through Benapole land port

Major imports	Cotton, chemical, motor car, motorcycle, tyre-tube, machinery & spare parts, food grains, fish, spices, sugar, egg, aluminum, refrigerator, paper etc.
Major exports	Jute & jute goods, fish, soap, plastic goods, battery, construction materials etc.

Source: Data from Bangladesh Land Port Authority Website

Products enlisted above indicate the market potential for cross-border trade from proposed EZ.

Darshana Land Port is located ~202 km North-West of the proposed EZ. This port does not have direct road connectivity to India, but this port facilitates trade with India through railways. Wagon to wagon transshipment on railway tracks takes place at Darshana Land Port. Generally, commodity items like rice, wheat, clinker, sugar, fish and milk powder are transported through this port. Currently this is a single broad-gauge line, however, GoB has recently approved doubling of this line to provide connectivity from India to Mongla Port in order to facilitate better access of Indian traders to Mongla Port.[233]

Although the proposed EZ has access to both Bhomra and Benapole land ports but due to the location of these land ports at considerable distances from the proposed EZ, it would lead to higher lead times and increased logistics cost for the transportation of raw materials and finished goods.

7.3.3. *Sea Ports and Inland Water Terminals*

Waterway transport is one of the most fuel efficient, environment friendly and cheapest mode of transportation. Cost of transporting one 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.[234] Bangladesh is blessed with a riverine geography, especially towards its south, where distributaries of large rivers like Padma and Meghna drain the region. This creates a fairly widespread inland waterways network, creating an opportunity for Inland waterways transportation. Bangladesh also has a coastline of 580 km which creates good potential for sea trade with other countries. Currently, more than 75% of international trade in Bangladesh is done via seaports. This makes it vital to understand potential of waterways connectivity to support transportation in the proposed EZ region.

Barishal river port is the nearest river port which is located at a distance of approximately 45 km (by road) from the proposed EZ. It is the second largest river port in the country after Dhaka and handles

[233] *https://www.joc.com/rail-intermodal/double-track-seen-slashing-bangladesh-india-transit-cost-time_20180508.html*
[234] *https://www.thehindubusinessline.com/opinion/flowing-down-the-waterways/article23384237.ece*

around 18,000 passengers on a daily basis. This river port at Barishal serves as an important gateway for connectivity of the Agailjhara upazila from Dhaka via waterways. Access to Barishal river port takes place by Agailjhara-Kotalipara road(Z8031), which is in turn connected to Dhaka-Barishal highway (N8). Travel time from the proposed EZ to Barishal river port is around 1.5 hours. Approach to Barishal river port takes place by Band Road (~220m stretch). It is a single lane road with moderate traffic stagnation and settlements located on both sides of road alignment, thus restricting the possibility of widening.

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 58: 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.

Proposed EZ is on the south of Kaorakandi ghat and southwest of Shariatpur ghat on Padma River. These ghats are around 96 km and 95 km respectively away from the proposed EZ and are equipped to handle movement of heavy vehicles. However, these ghats do not have any mechanized cargo handling facilities and serve to transport passengers and vehicles across the river. Currently, these ferry ghats can handle movements of agro based products, chemicals, fertilizer, light machinery, processed food, fish products etc. Developing these ferry ghats as river ports and/ or private jetty over Padma River enables riverine transport of bulk cargo for the proposed EZ. However, any decision on the same is subjected to bathymetric analysis, topo survey, and feasibility assessment. Land acquisitions issues and government approvals need to be taken into cognizance.

Protocol on Inland Water Transit and Trade

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

Figure 48 captures the route earmarked under the Protocol on Inland Water Transit and Trade between India and Bangladesh.

Figure 48: India Bangladesh Inland Waterways Route

Source: Bangladesh Inland Waterways Authority

The India Bangladesh Protocol (IBP) route extends from Kolkata on India's National Waterway-1 (Ganges-Bhagirathi-Hooghly) to Silghat (Assam) on its National Waterway-2 (Brahmaputra River) and Karimganj (Assam) on National Waterway-16 (Barak River). Two new routes have been proposed in developing two stretches of Bangladesh inland waterways — Sirajganj to Daikhowa and Ashuganj to Zakiganj — on the IBP route. The development of these stretches is expected to provide seamless navigation to and from Northeast India through waterways via the IBP route. [235] India and Bangladesh have taken major steps to enhance utilization of waterways. These include agreement on declaration of additional Ports of Call under PIWTT at Kolaghat, Dhulian, Maia and Sonamura in India, and Chilmari, Rajshahi, Sultanganj and Daukhandi in Bangladesh. This IWT route can be used by industries in the proposed EZ to transport cargo across Bangladesh and also to India leveraging the proximity to Barishal river port.

New protocol route development and new ports of call will facilitate deeper penetration of cargo movements through IWT

Barishal river port is the nearest river port which is located at a distance of approximately 45km (by road) from the proposed EZ. As per information available with Bangladesh Inland Waterways Authority, Barishal river port has a capacity of handling 10,000 MT of cargo per month and 11,000 MT of bulk goods. Draft at this port is around 3.66 meters. This port can be used to transport cement, fertilizers, construction materials, coal, packaged food products, etc.

Mongla Sea Port is another port close to the proposed EZ used by India-Bangladesh protocol vessels, as per information available with Mongla Port Authority an average of 106 ships have called at this port over past 5 years.

Access to Sea Port

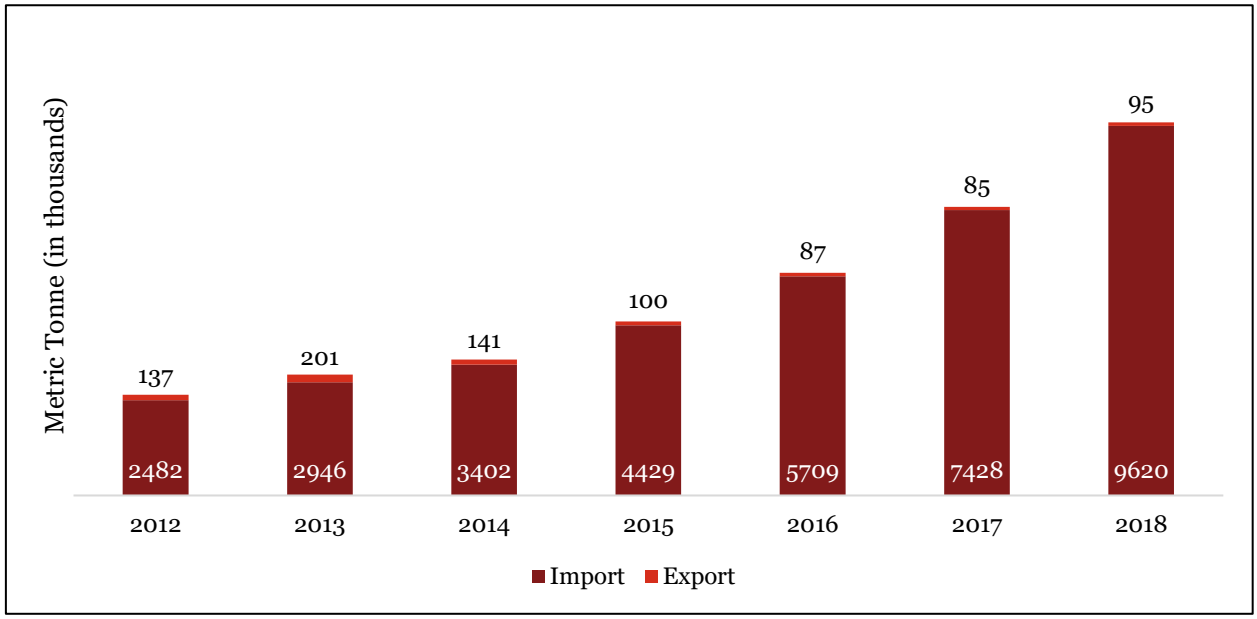
[235] https://www.dhakatribune.com/bangladesh/government-affairs/2019/11/05/bangladesh-india-herald-new-chapter-in-river-route-cargo-trade

Mongla Sea Port is the nearest seaport to the proposed EZ at a distance of 110 km. It is the 2nd busiest port in Bangladesh after Chittagong Port (288 km from EZ), having the capacity to handle 1 lakh TEUs of containers every year.[236] It currently is handling ~10 million tonnes of cargo annually. Proposed EZ is land locked and access to these seaports is achieved only through roads and the river port at Barishal. Proximity and ease of connectivity to ports is of prime importance as the ports serve as a gateway for trade (both domestic and export) and aid in bulk transfer of heavy cargo such as non-metallic minerals, heavy machinery and plant equipment.

However, due to Bangladesh's major industries being located in Dhaka-Chittagong region and lack of direct road or rail connectivity of the industrial region with Mongla port, this port's capacity remains under-utilized. Presently goods like jute products, frozen food, fertilizer, food grains, sugar, vehicles and containers are transported through this port.[237] Draft at Mongla Sea Port is currently around 4.9-6.1 meters,[238] which necessitates the use of smaller feeder vessels to transport goods from mother ships till the port. To address this issue, GoB is also developing another port at Payra as a deep-sea port (148 km from site location), having draft of up to 16m.[239]

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

Figure 49: Mongla Port - Annual Import and Export Figures



Source: Mongla Port Authority

The above figure elucidates that volume of cargo being imported through Mongla Port is far higher that export figures. This indicates that there is a lack of industrialization in vicinity of Mongla seaport. Imports have grown at a CAGR of over ~25% from FY12 to FY18 while the exports have slightly declined.

Present Hindrance and Redressal by GoB

Factors, which are currently hindering growth of traffic at Mongla Port, can be attributed to the following:[240]

- Heavy siltation in Pussur Channel where Mongla Port is located. This has decreased the navigable draft available to cargo carrying vessels.
- Irregular dredging in Pussur channel

[236] *Director (Traffic) Mongla Port Authority*
[237] *Bangladesh Port of Mongla, Additional Information*
[238] *https://www.searates.com/port/mongla_bd.htm*
[239] *https://www.joc.com/regulation-policy/infrastructure-news/asia-infrastructure-news/bangladesh-opts-make-payra-deep-sea-port_20171121.html*
[240] *http://article.sciencepublishinggroup.com/pdf/10.11648.j.ijtet.20160202.11.pdf*

- Inadequate port facilities – like obsolete equipment, dearth of storage facilities, insufficient manpower at port etc.
- Lack of direct road connectivity to Dhaka resulting in higher lead time and cost due to multiple handling of goods

Developing Mongla Port can create a viable alternative to facilitate sea bound trade for Bangladesh, as the existing seaport at Chittagong is already handling traffic much beyond its designed capacity. Recognizing the potential of Mongla Port to be developed as an important international gateway for trade and commerce, GoB has undertaken five development projects worth about BDT 42.16 billion BDT to develop facilities at Mongla Sea Port. These projects are –

- Procurement of cutter suction dredger, pilot and dispatch boat
- Navigational aids to Mongla Port
- Dredging at outer bar in Pussur Channel
- Dredging in harbor channel
- Procurement of container and cargo handling facility

Mongla Port could witness higher movement of cargo, once the above-mentioned projects are executed. Operationalization of Padma Bridge could also give an impetus to the traffic at this port, since it will create direct road connectivity between Mongla Port and existing industrial hubs of Bangladesh.

Mongla Sea Port would provide a transit gateway to manufacturers from EZ to meet their sea trade requirements.

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.

The proposed EZ is located at a distance of approximately 45 km from Barishal domestic airport and can be accessed via Agailjhara-Kotalipara road(Z8031) and Dhaka-Barishal highway (N8). These two roads (i.e. Z8031 and N8) are two-lane bituminous roads are favourable for passage of heavy vehicles. Travel time from Barishal airport to proposed EZ is around 1 hour.

Nearest international airport to the proposed EZ is Hazrat Shah Jalal International Airport (HSIA) in Dhaka. This airport provides both international as well as domestic flight services. It is Bangladesh's largest and busiest airport. This airport is around 163 km away from EZ and requires around 7-8 hours of travel time, due to absence of direct road connectivity. 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.[241] This airport also has a freight village (warehouse), terminal buildings, hangers and other modern equipment for aircraft handling.[242] Goods like RMG, vegetables, fruits, fish, dry fish and crabs are transported through HSIA.

Present Hindrance and Redressal by GoB

Air freight transportation services are used for EXIM cargo movement only with Dhaka international airport providing facilities for cargo handling. Most of the major international airline operators such as

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

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

Given the current capacity of the airport, GoB has already appointed developers to construct a new terminal at HSIA. This project is being funded by Japan International Cooperation Agency (JICA) and post operationalization of this terminal in 2021, annual passenger handling capacity of this airport could be 20 million and cargo handling capacity could rise to 5 hundred thousand metric tonnes.[243]

In order to meet the continuously rising air traffic in Bangladesh. GoB has also planned construction of two Greenfield airports. These airports are –

i. Khan Jahan Ali Airport in Bagerhat (94 km from proposed EZ)

ii. Bangabandhu Sheikh Mujib International Airport near Dhaka (location to be finalized) – however, as learnt from CAAB, this project might not be taken up

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

As mentioned above, the distance between the proposed EZ and HSIA 163 km, which could create challenges in logistics of perishable products due to higher lead-time involved. Thus, it is pertinent to explore the possibility of leveraging upcoming international airports in vicinity of the proposed EZ. Presently conceptualization of developing Khan Jahan Ali Airport in Bagerhat is in progress. This airport could be developed within the next 5 – 10 years. Once developed, this airport could provide a faster transit point for perishable goods manufactured in the proposed EZ.

Barishal airport is the nearest domestic airport close to the proposed EZ at a distance of 45 km, from where flights till Dhaka and Chittagong can be taken.

Developing of a direct road connectivity could bring down travel time to HSIA airport from proposed EZ to 4-5 hours.

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. There is no prevailing rail network in Barishal District. The nearest railway station is Khulna railway station, which is approximately 94 km from the proposed EZ. It can be accessed by Gaurnadi-Kotalipara-Gopalgonj highway and Dhaka-Khulna highway (N7). Travel time to Khulna

[243] *http://www.dhakatribune.com/bangladesh/dhaka/2017/06/12/construction-third-airport-terminal-begins-next-year/*

railway station from the proposed EZ is around 3 hours. This station has direct connectivity till Benapole Land Port, enabling movement of goods between India and Bangladesh. As per Bangladesh Railway, an average of 4 freight trains move in between Khulna-Jessore section transporting ~2,324 tonnes of goods on a daily basis. Presently, goods handled at this station are cotton, chemical, food grains, spices, fish products, jute, plastic goods etc.

Recently commissioned Gopalgonj station is located at a distance of 34 km from the proposed EZ. However, it is a small station with no cargo handling facility.

GoB has already started work on improving railway connectivity in South West region of the country with plans to connect Khulna railway station to Mongla Sea Port, extending direct railway route from Khulna till Barishal and onwards to Chittagong.[244] On completion, these projects will transform the rail connectivity in the region of proposed EZ by creating infrastructure to transport goods and passenger from Agailjhara to different parts of Bangladesh, as well as to neighboring countries like India. It can be envisaged that goods being transported to/from Benapole Land Port, Mongla Sea Port as well as from Chittagong Sea Port will be able to reach Gopalgonj Station and thus to Agailjhara via direct railway line in future. GoB is also working with Indian Government to establish better rail links between the 2 countries. In an effort to boost transportation of goods via railways, a pilot container train containing animal feed was flagged off from India for Bangladesh on April 3, 2018. This train reached Bangabandhu west station (near Bangabandhu Bridge), 117 km from Dhaka after a 24 hours journey. Based on the results of this trial run India and Bangladesh might further increase the frequency container trains between India and Bangladesh.[245]

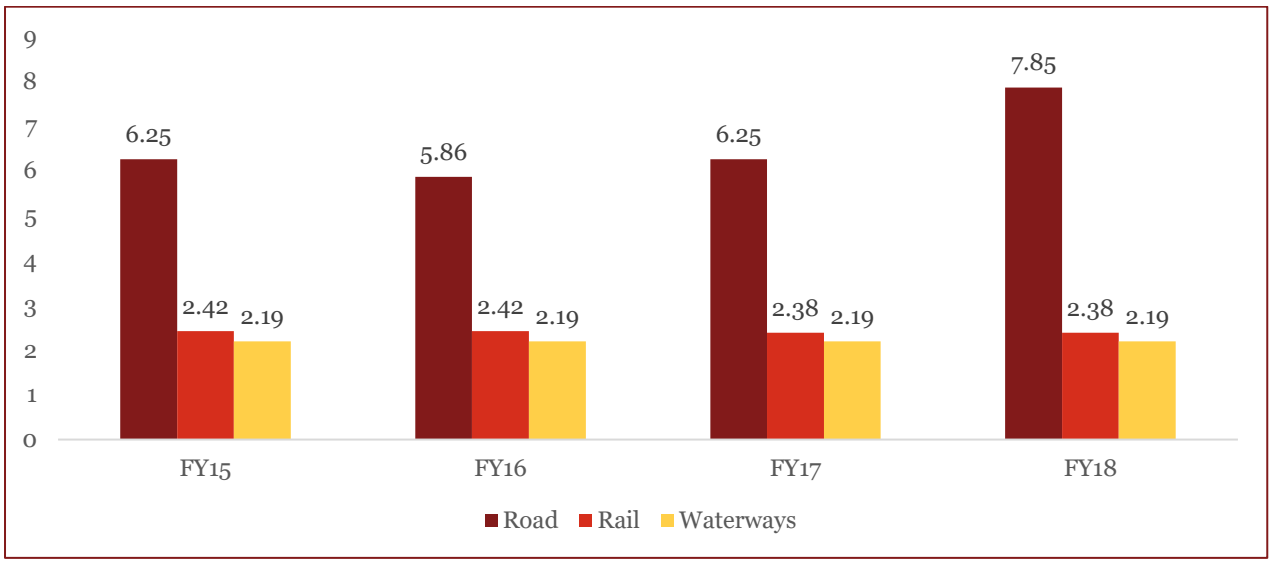
Once the railway network in the vicinity of the proposed EZ is established, manufacturers could benefit from faster movement of bulk cargo through different parts of Bangladesh and India. However, last mile rail connectivity if ensured will help reap the real benefits of railway transit, else multiple handling will result in cost increases and thus cargo owners might resort to going back to road.

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 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.

[244] *http://mor.portal.gov.bd/sites/default/files/files/mor.portal.gov.bd/page/9a1ba160_209b_4d94_9077_3befdc9e2ef3/8.%20Formulation%20of%20BR%20Masterplan.pdf*
[245] *https://www.thehindubusinessline.com/news/pilot-container-train-chugs-off-to-bangladesh/article23427404.ece*

Figure 50: Freight per tonne per km across different transit modes



Source: Bangladesh 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 IWT for longer distances and can then be transported via roadways to provide last mile delivery.

7.5. Potential Infrastructure Interventions to Support Proposed EZ

Proposed EZ at Agailjhara has an advantage of being located in proximity to Barishal River Port which is located at a distance of 45 km from the site. 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.

While the proposed EZ 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 Proposed EZ with respect to transport infrastructure. This could include and not be limited to the following table on the next page.

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 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 59: Proposed Infrastructure Interventions

Key Asset	Existing Condition	Issues	Recommendation	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
Upgradation of Benapole Land Port	Equipment being used at the land port is outdated with 60% of cargo being handled manually.	Lack of modern surveillance system adversely affects cargo handling in the port.	• Setting up of modern surveillance system to track movement of cargo across the port.	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Land Port Authority
Upgradation of existing land ports	Currently, equipment being used at the land ports is outdated with most of the cargo being handled manually.	• Lack of modern surveillance system adversely affects cargo handling in the ports. • Existing warehousing space is blocked-up due to higher turnaround time in the clearance process	Mechanization of cargo handling facility at land ports would increase the handling efficiency and High turnaround time.	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Land Port Authority
Area demarcation at Benapole Land Port	Currently no separate zone has been earmarked for goods being transported to Economic Zones.	Congestion at Benapole Port results in delay and increased lag time in transportation of goods.	• Allocation of a separate zone within Benapole for faster clearance of goods being transported to/from the cluster of Economic Zones in South West Bangladesh	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Land Port Authority
Cargo Handling Facilities at Gopalgonj Railway Station	This station is primarily to cater to passenger movement.	Absence of cargo handling facilities at the station necessitates longer road transport of cargo till the nearest	• Set up a cargo-handling facility at Gopalgonj station	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Railways

Key Asset	Existing Condition	Issues	Recommendation	Cost Implications	Timeframe for Improvement	Jurisdictional Responsibility
		major railway station in Khulna.				
River Jetty	Nearest river ferry is at a distance of 50 km from Proposed EZ	Transporting goods over road for 50 km, till nearest existing river ferry would increase the cost of transportation.	• Establishing a river jetty in Madhumoti River about 1 km from Proposed EZ	A detailed feasibility study needs to be undertaken in order to arrive at cost estimation and timeframe for improvement.		Bangladesh Inland Waterways 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 & approach road for EZ, the existing infrastructure facilities surrounding the site need to be identified and gaps that could hinder the development of EZ site, need to be addressed. The major off-site infrastructure components considered for proposed EZ are as follows –

Figure 51: 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 Agailjhara EZ. The location of the proposed site to establish Agailjhara EZ is shown below.

Figure 52: Location map of Agailjhara EZ

Source: *MACE analysis*

8.2. Methodology of off-site infrastructure assessment

A stepwise approach has been adopted to assess the off-site infrastructure at 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

Site filling- Availability of material for site filling, quantity and distance of source from the site.

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

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

Water supply

Surface water: Availability of water to meet the 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 the quality of groundwater.

8.3. Review of last mile off-site infrastructure

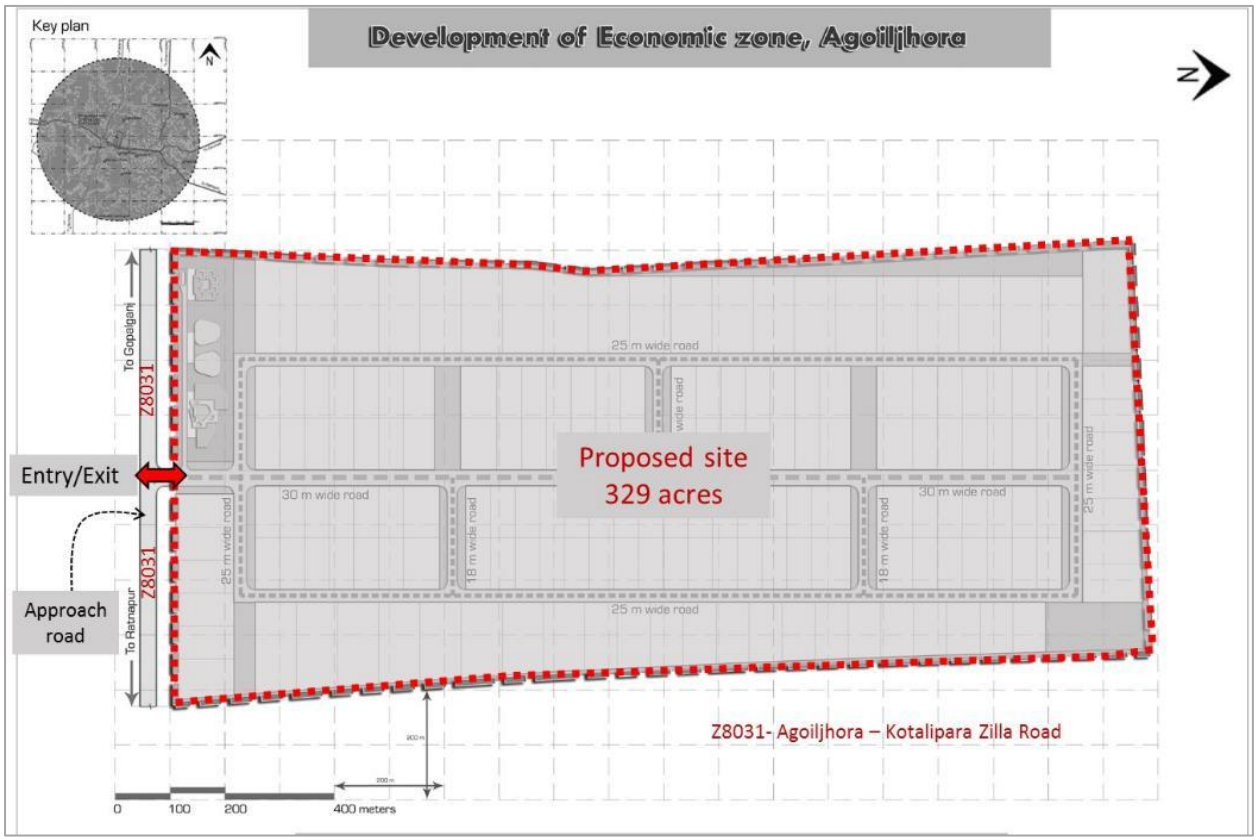
Approach road connecting EZ

Proposed EZ is located at a distance of approximately 7 km from Agailjhara and is connected by Agailjhara -Kotalipara road (Z8031) which is two-lane bituminous road maintained by RHD and is abutting the site on the southern side. During site visit, it has been observed that the road condition is suitable for cargo movement. This road acts as approach road to reach the site and the internal spine road shall be connected from this approach road Z8031. The proposed site boundary is 30 m from Z8031.

This Zila road connects with National Highway (N8) through which it connects the site with National capital Dhaka, Bhanga, Barishal and Patuakhali. N8 (Dhaka-Barishal highway) is at a distance of 14 km from the site in Eastern direction. At present this is 2-lane and there is a proposal for widening to 4-lane.

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

Figure 53: Map of last mile connectivity to proposed EZ

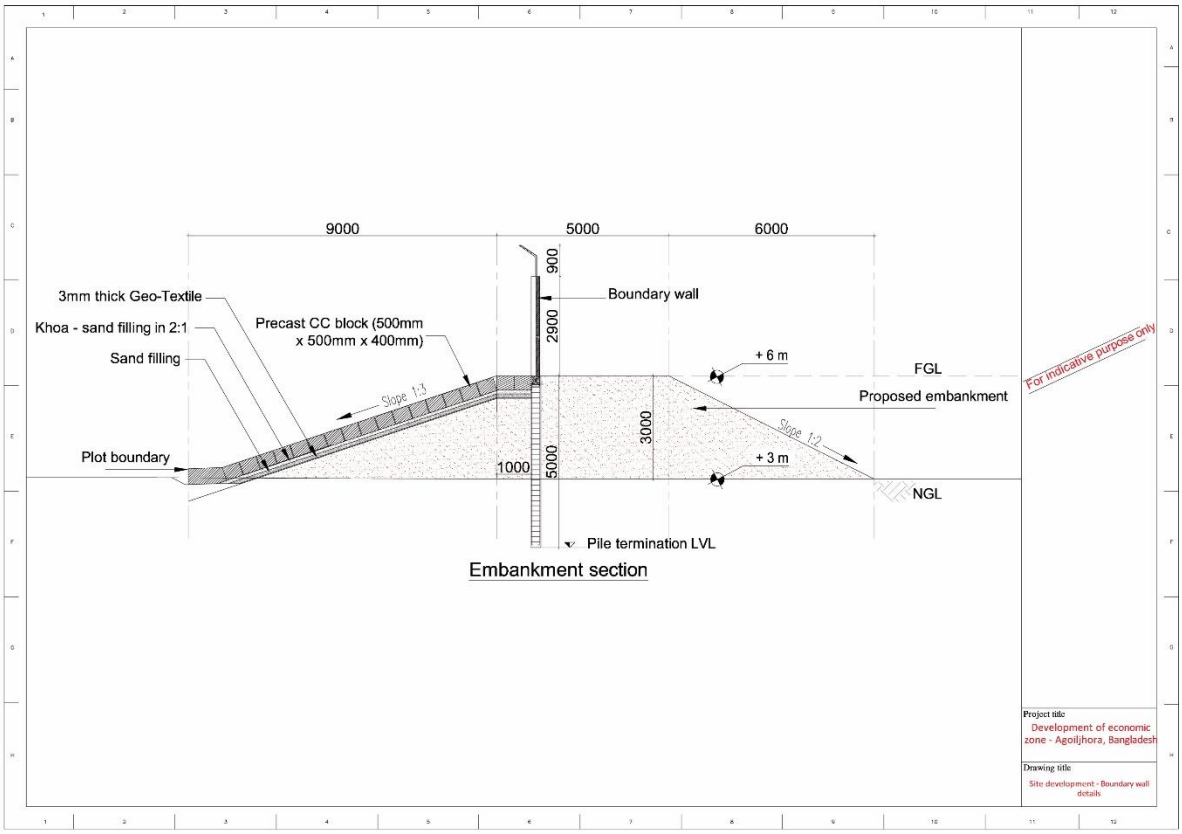


Source: *MACE analysis*

Boundary wall

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 for a length of about 5 km. The boundary wall details are depicted in figure below:

Figure 54: 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 40 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.

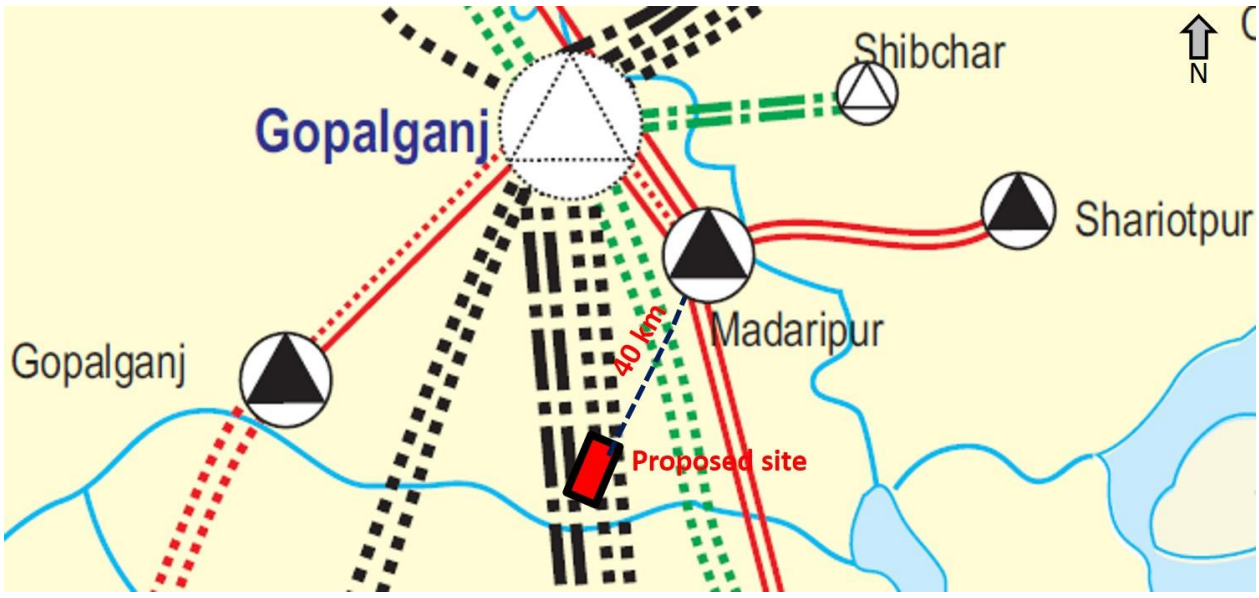
During the initial phase of development, 33/11 kV main receiving sub-station (MRSS) shall be established within the site and as suggested by the officials, power to this sub-station shall be availed by establishing 33 kV overhead transmission line from 33/11 kV Agailjhara sub-station at an aerial distance of 3.8 km (~4 km) from the site (based on proposed tentative alignment). Based on the increased demand of EZ in future, 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 Madaripur grid sub-station of 150 mVA capacity located at an aerial distance of 40 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 55: Details of external 33 kV power supply system

Source: *MACE analysis*

Figure 56: Details of external 132 kV power supply system



Source: Power Grid Company of Bangladesh (PGCB) and 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 800-1000 feet which is potable in nature. Lithology profile of the region is enclosed as Annexure 25. Hence, groundwater shall be relied to meet the initial water demand of proposed EZ.

River Paisarhat is at an aerial distance of about 3 km on the west side of the proposed site. Based on the discussion had with the UNO officials, it is understood that River Paisarhat 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 3 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 the suitable intake system and intake point shall be proposed during detailed engineering stage. Details regarding the external water supply system has been provided in the figure below.

Figure 56: Details of external water supply system

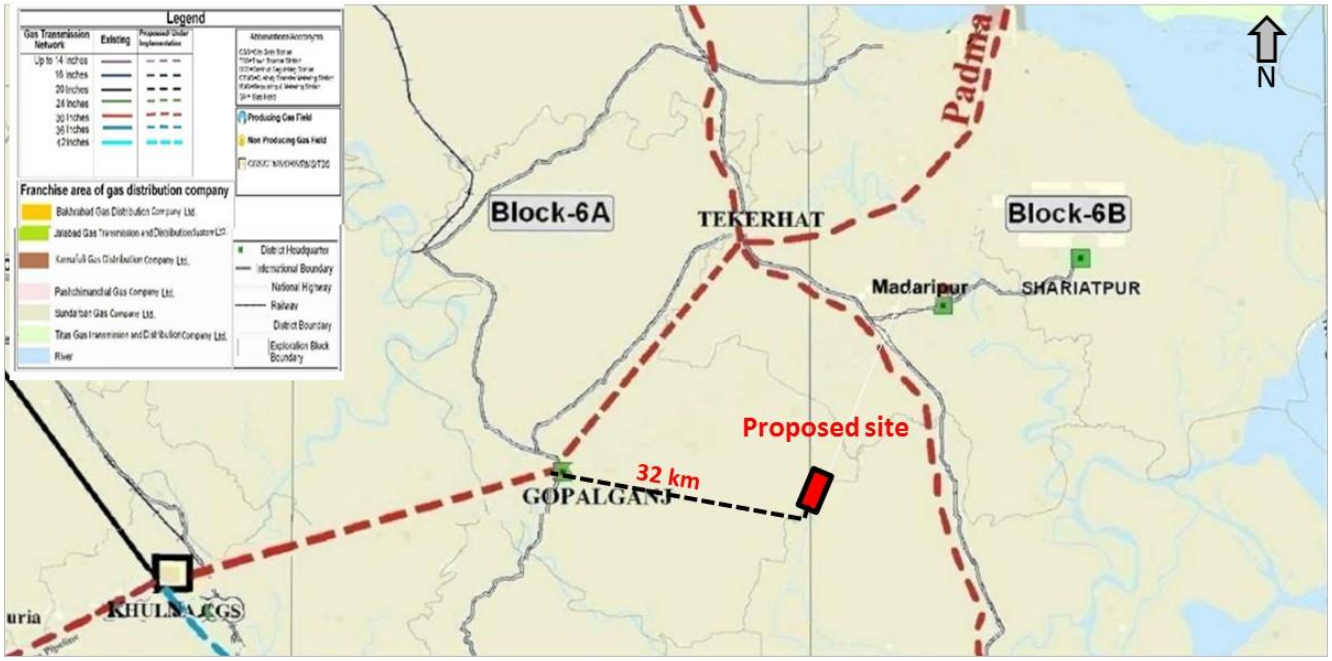
Source: *MACE analysis*

Gas supply to EZ

Based on the assessment, it is found that the total gas demand for the proposed EZ would be about 15800 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 Cite Gate Station (CGS) at Khulna and proposed gas transmission line by Gas Transmission Company Limited (GTCL) connecting Khulna-Tekerhat via Gopalganj at an aerial distance of about 32 km from the site from which an exclusive gas line shall be established connecting EZ site. Refer figure below depicting the location of existing CGS station and proposed gas line network connecting EZ.

Figure 60: Gas supply line network



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

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 Paisarhat River to the west side of the site. The internal drain network has been planned with the discharge to Paisarhat River.

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

It is proposed to construct a 30 m wide approach road for a length of 30 m to connect the industrial area from Zila Road – Z8031. While connecting the approach road with the existing Zila road namely Agailjhara -Kotalipara road (Z8031), necessary turning radius should be provided and the junction of the Zila road 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 33kV overhead transmission line from the Agailjhara sub-station to meet the initial demand and 132 kV overhead transmission line from the Madaripur 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 Paisarhat 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 3 km from the site. It is suggested that the suitable intake system and intake point shall be proposed during detailed engineering stage.

8.5. Last mile off-site infrastructure action plan

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

Table 60: Off-site infrastructure action plan

Key assets	Existing condition	Issues	Recommendations	Cost implication	Timeframe for improvement	Jurisdictional responsibility
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 5 km is recommended at the EZ site.	114.69million BDT	12 months	BEZA
Power supply	33/11 kV Agailjhara sub-station at an aerial distance of 4 km from the site is suggested by the officials to meet the power demand.	No power supply connection nearby site for industrial usage	To build a new 33 kV dedicated overhead transmission line from Agailjhara sub-station and 132 kV overhead transmission line from Madaripur grid sub-station to connect EZ.	896.00 million BDT	18 months	REB, BEZA
Water supply	The nearest water source to EZ is Paisarhat river which is approximately 3 km from the proposed site.	-	Draw external water supply network lines from River Paisarhat.	25.56 million BDT	12 months	DPHE
Gas supply line	There is an existing gas station at Khulna from which there is a proposed line connecting Tekerhet via Gopalganj by GTCL.	-	An exclusive tapping line shall be established connecting the proposed line at Gopalganj at an aerial distance of about 32 km from the site.	320.00 million BDT	24 months	GTCL

Source: 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 61: Off-site infrastructure cost estimates

Description of item	Quantity	Unit	Price without tax (In million Taka)
Power network			
33 kV overhead transmission line	4.0	km	16.00
132 kV overhead transmission line	40.0	km	880.00
Water supply network	3.0	km	25.56
Boundary wall	5	km	114.69
Gas supply	32	km	320.00
Project sub-total			**1356.25**

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

8.6. Key takeaway

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

Key recommendations formulated from this exercise are outlined below-

- Proposed site has good connectivity and is adjacent to Zila road namely Agailjhara-Kotalipara road (Z8031);
- Groundwater shall be tapped to meet the water demand during construction stage and during operation stage, River Paisarhat (located at an aerial distance of 3 km from the site) is recommended as source to meet the water requirement of EZ;
- 33/11 kV Agailjhara sub-station (located at an aerial distance of 4 km from the proposed EZ) is suggested as source of power for the project at initial stage and 132/33 kV Madaripur grid sub-station (located at an aerial distance of 40 km from the proposed EZ) as a source to meet the increased power demand in future;
- Boundary wall for a length of about 5 km has been proposed along the periphery of the EZ; and
- The gas supply line for a length of about 32 km has been proposed to connect EZ.

9. Master Plan

9.1. Purpose and objective

The aim of setting up an EZ in Agailjhara is to develop multi-sectoral industries such as readymade garments, food & beverages, light machinery and paper & packing industries with excellent state-of-the-art infrastructure facilities and professional management to attract and support investments in industrial sector.

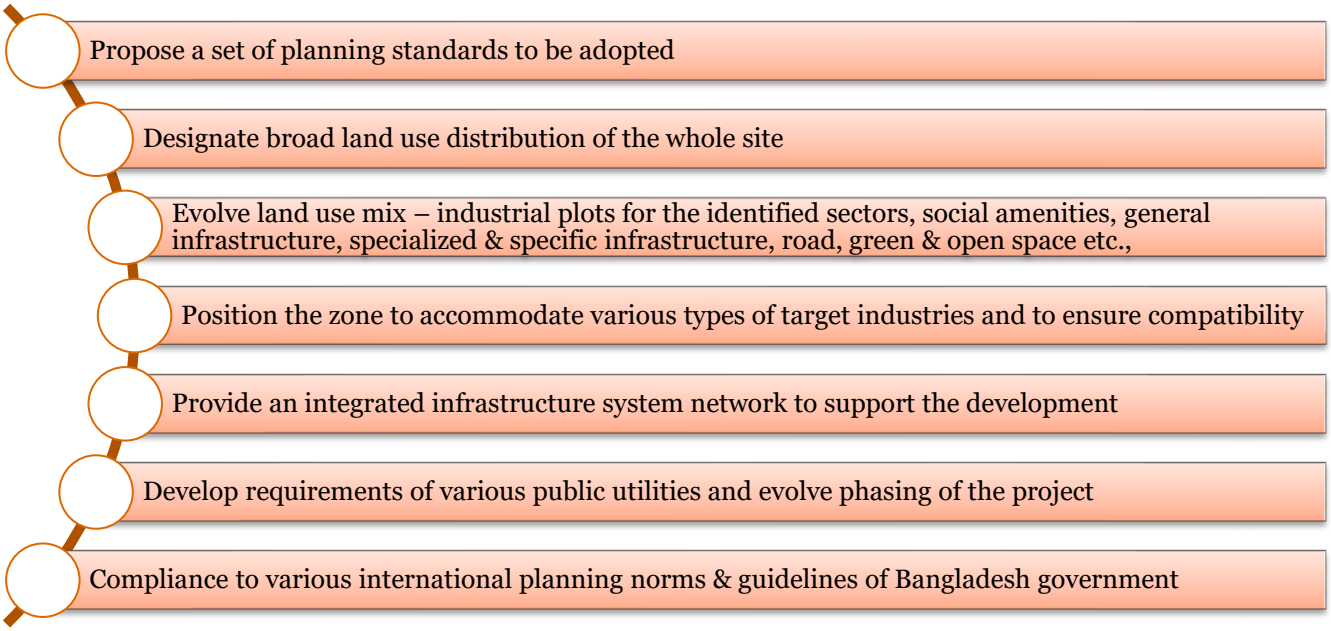
Master plan has been prepared considering the above industrial zones. However, this plan is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate the same.

Hence, Agailjhara 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 Barishal 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 57: 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 has been 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.

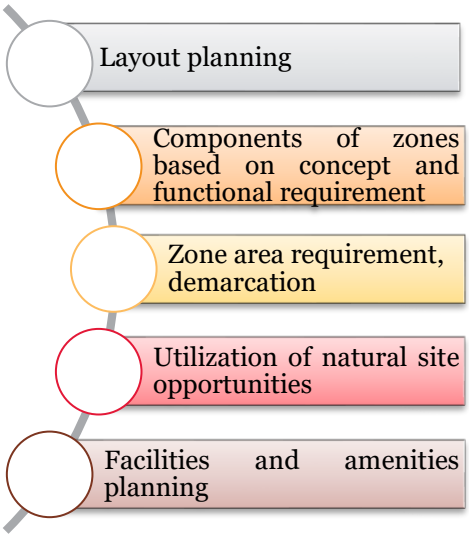
Social and commercial amenities are also planned to provide convenience to visitors as well as to the working population within the EZ. The project is planned to be housed in a lush green environment and accordingly, landscaping and greenery are planned.

- **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 58: 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.

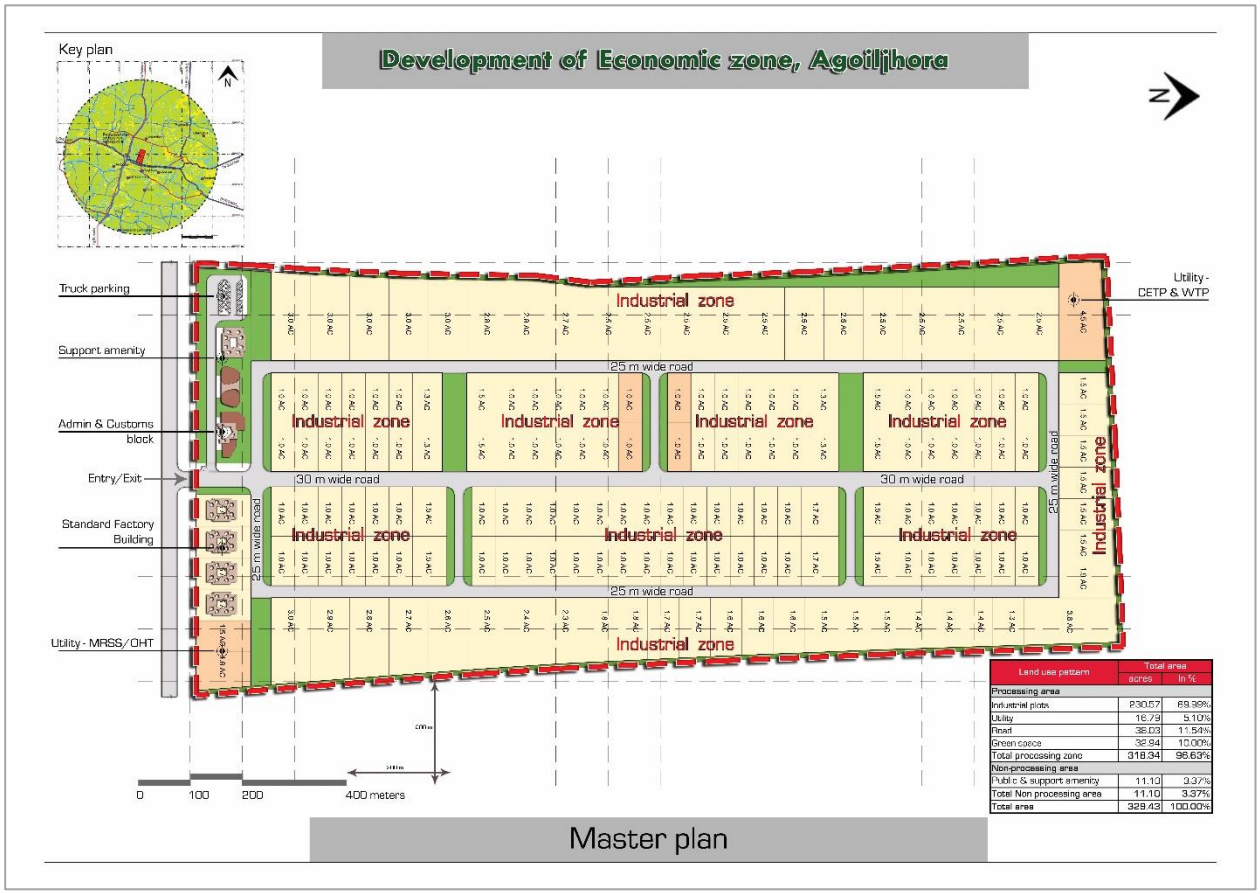
Detailed master planning is done on basis of a cluster wise approach covering the following components:

- Micro level zoning;
- Land use plan;
  - Detailing the locations and sizes of various land uses
- Land parcel plan;
  - Showing the subdivision of industrial land
- 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 59: Master plan of EZ



Source: MACE analysis

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

1. Readymade garments;
2. Food & beverages;
3. Light machinery; and
4. Paper & packaging

In the proposed master plan, area for different types of industries arrived from market demand assessment have been demarcated within the processing area. This plan is suggestive 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 to validate the same.

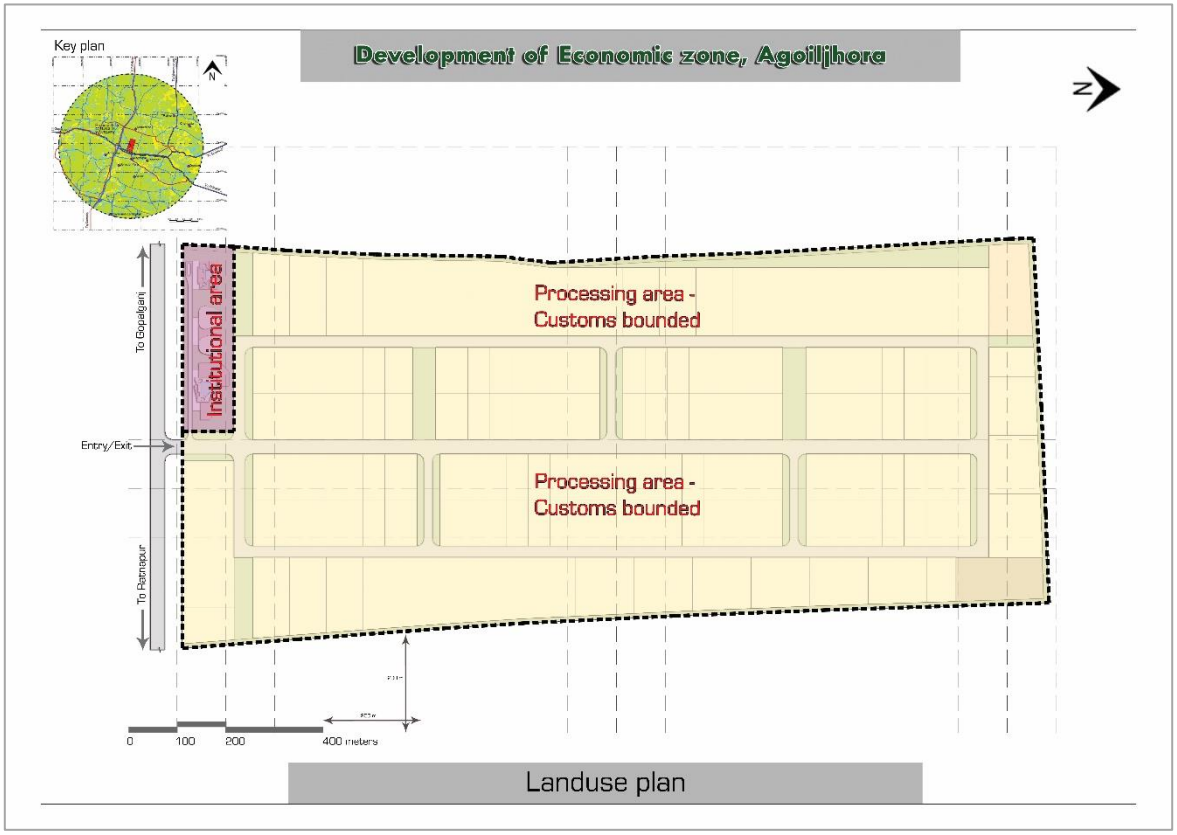
Apart, area for utilities, public amenities, green & open space and supporting facilities have been earmarked in the proposed parcellation plan.

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 on next page.

Figure 60: Land use plan of EZ



Source: MACE analysis

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

Table 60: Land use pattern of the proposed EZ

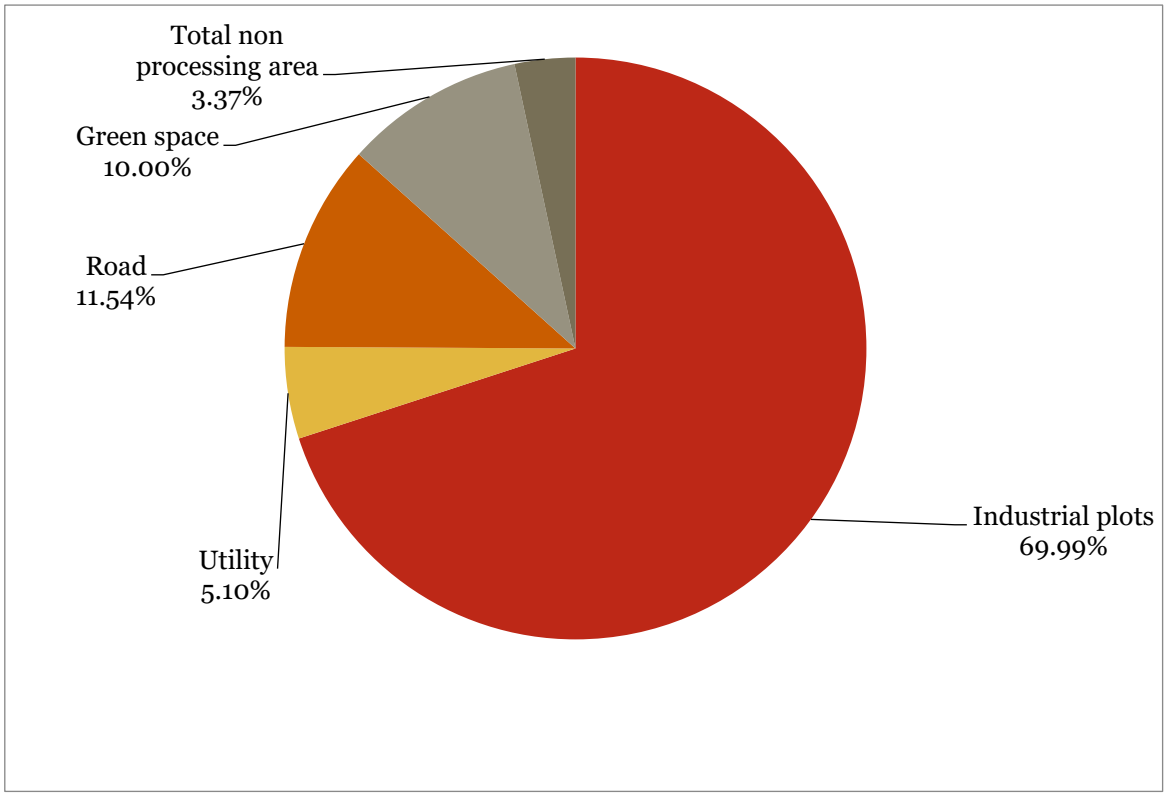
Land use pattern	Total area		Saleable area		Non-saleable area	
	acres	In %	acres	In %	acres	In %
Processing area						
Industrial plots	230.57	69.99%	230.57	69.99%		
Utility • CETP – 5.0 Ac • SWM – 3.50 Ac • MRSS – 5.19 Ac • WTP & OHT – 3.0 Ac	16.79	5.10%			16.79	5.10%
Road	38.03	11.54%			38.03	11.54%
Green space	32.94	10.00%			32.94	10.00%
Total processing zone	**318.34**	**96.63%**	**230.57**	**69.99%**	**87.76**	**26.64%**
Non-processing area						
Public & support amenity	11.10	3.37%	5.55	1.68%	5.55	1.68%
Total Non-processing area	**11.10**	**3.37%**	**5.55**	**1.68%**	**5.55**	**1.68%**
Total area	**329.43**	**100.00%**	**236.12**	**71.67%**	**93.31**	**28.33%**

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 10 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 61: Land use pattern – EZ site



Source: MACE analysis

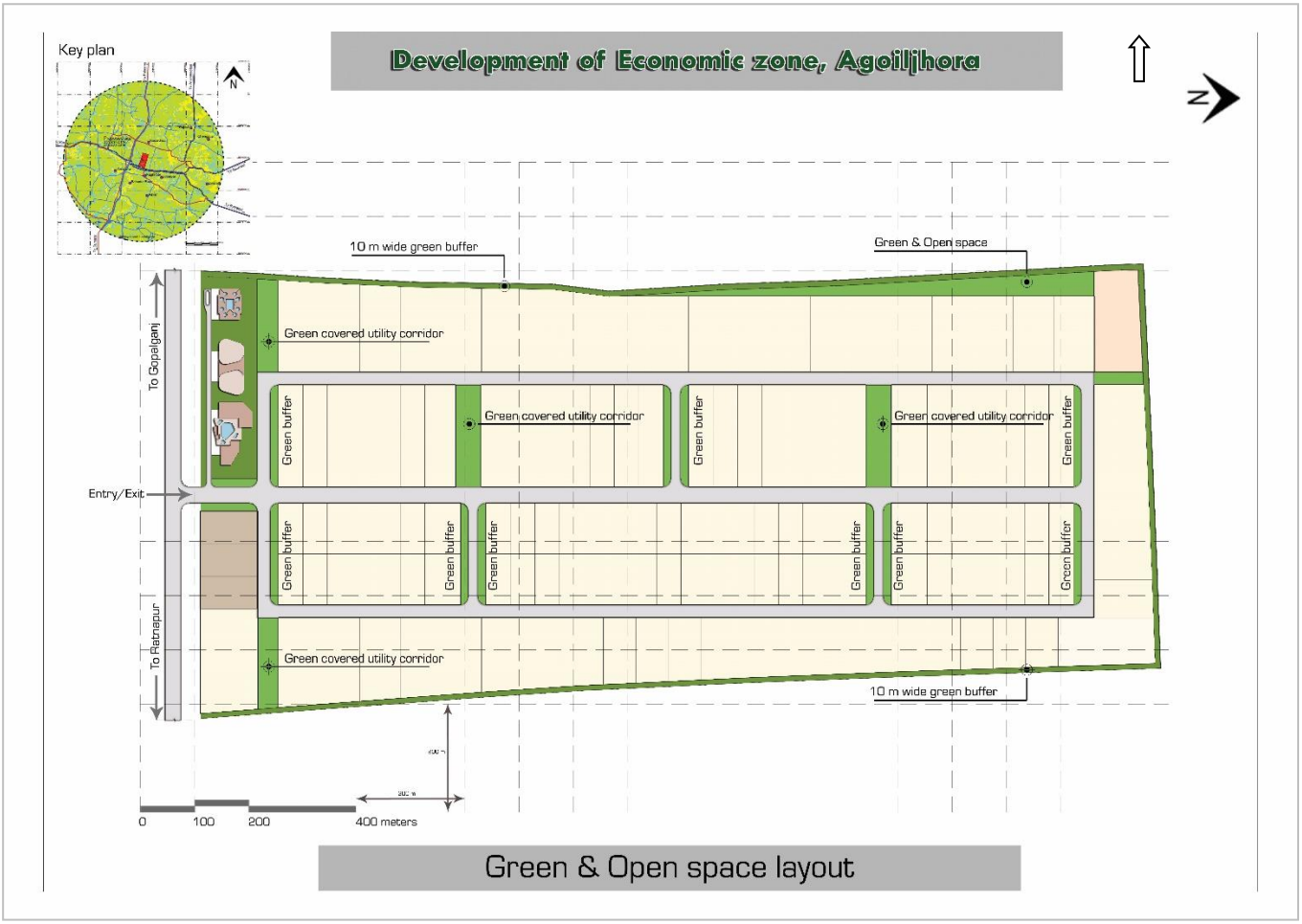
The above figure indicates a percentage wise breakup of land use pattern of the entire EZ site. An overview of this figure reveals that industrial area has been allocated as maximum area in the EZ site, given the fact that Agailjhara has potential to establish industries with good access to raw materials.

Based on the land use pattern shown in the previous page, 71.67% of land area accounts for saleable area and remaining 28.33% of land area accounts for non-saleable area. Out of 71.67% total saleable area, 69.99% accounts for industrial use of targeted sector and zone-specific infrastructure. Remaining 1.68% of saleable land area is earmarked for supporting facilities and 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, fire station, truck parking, 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 on next page.

Figure 62: Green and open space



Source: MACE analysis

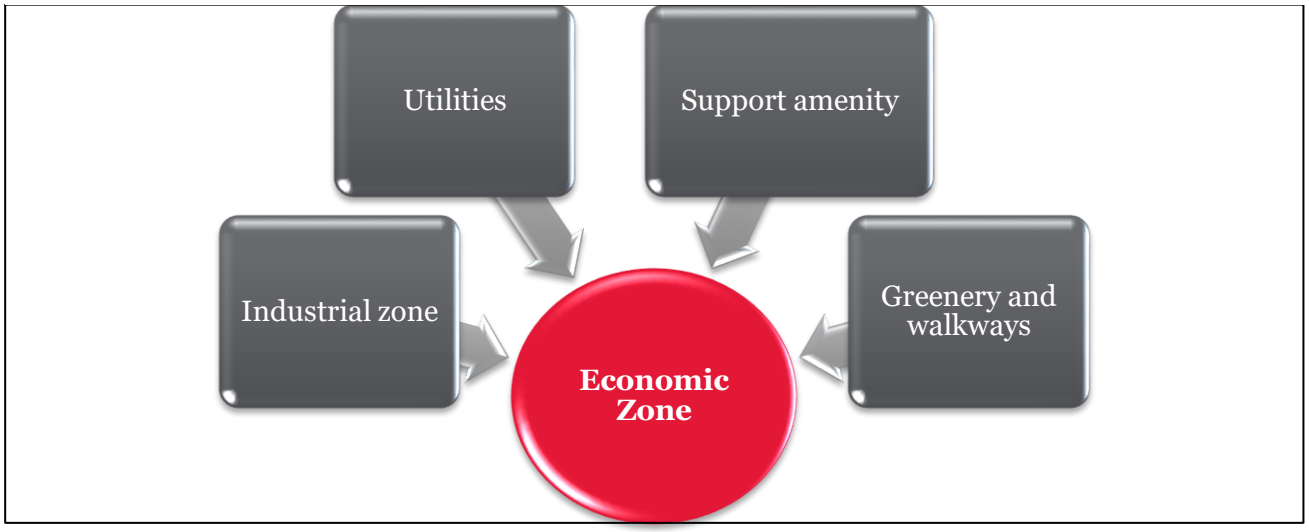
9.6. Zoning Plan

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 63: 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.

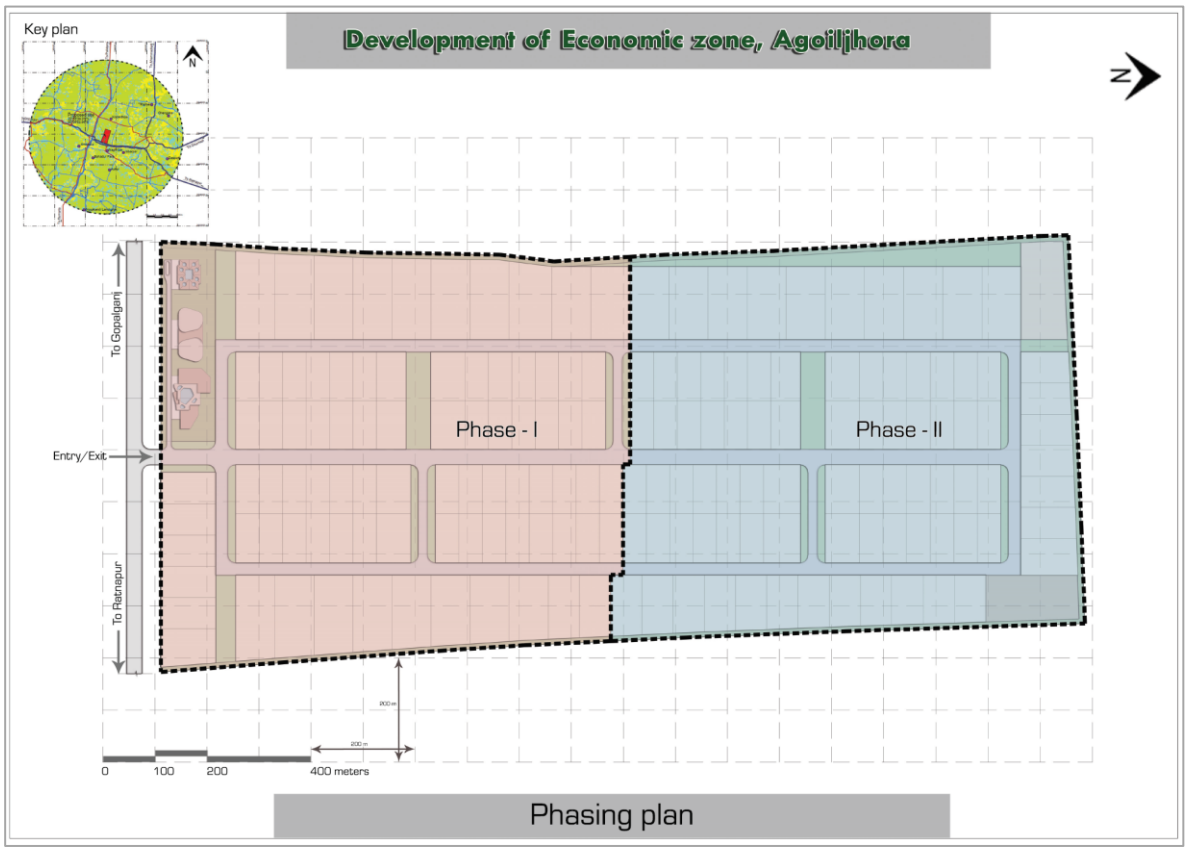
Community open space for industrial plots.

- 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 175.86 acres of land in phase I and, 153.57 acres in phase II. The details of the phasing plan are as shown in the figure below.

Figure 64: Phasing plan of EZ



Source: MACE analysis

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

Table 61: Phase wise land use breakup

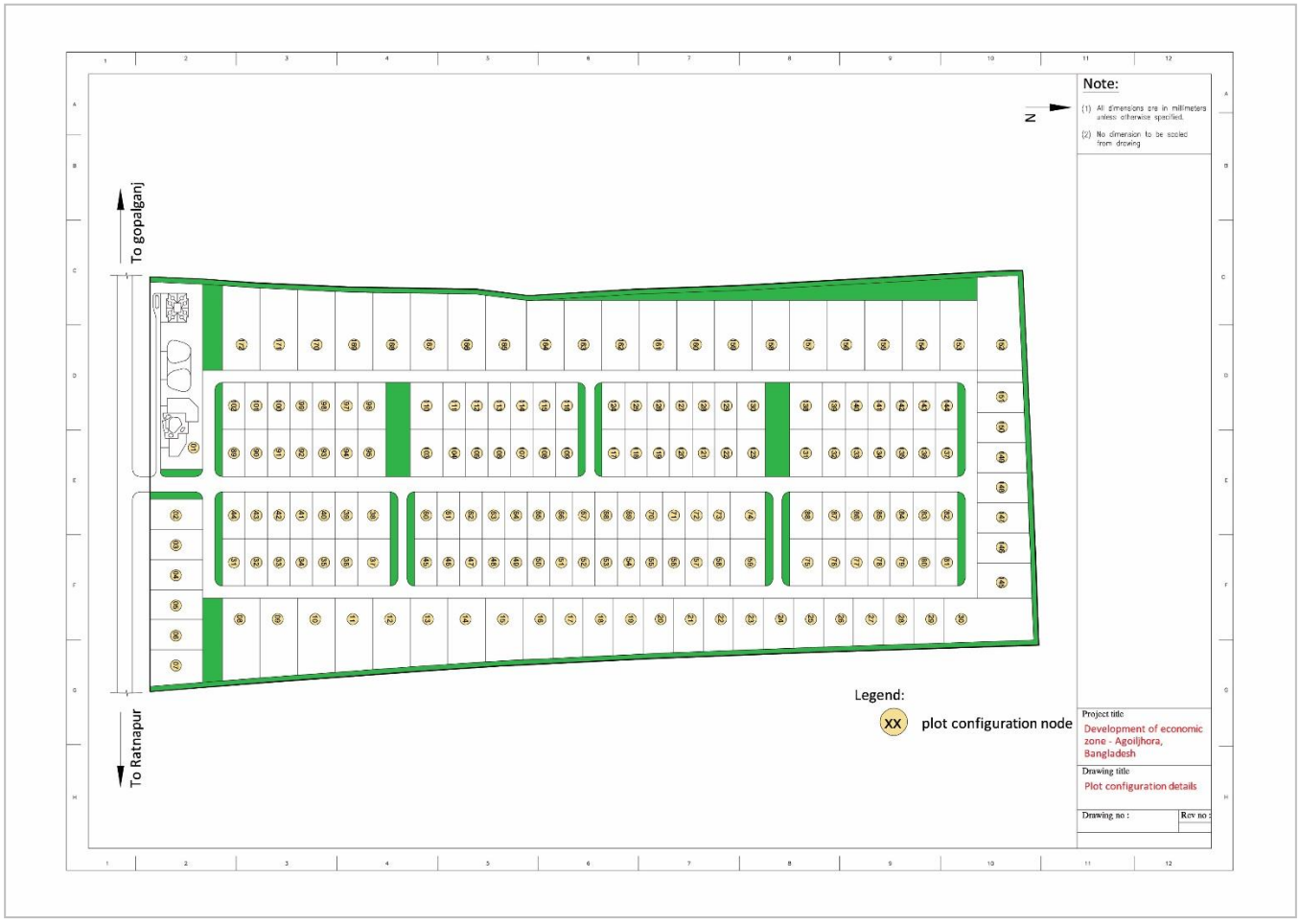
Land use pattern	Total area (in acres)	Phase I (in acres)	Phase II (in acres)
Industries	230.57	112.93	117.64
Utility	16.79	12.82	3.97
Road	38.03	21.74	16.29
Green and open space	32.94	17.27	15.67
Non-processing area	11.10	11.10	-
Total	**329.43**	**175.86**	**153.57**

Source: MACE analysis

9.9. Plot details

There are totally 172 plots within EZ out of which 165 plots are earmarked for industrial usage, 6 plots are earmarked for utilities and 1 plot is earmarked for public & support amenities and administration building & customs block. The number of plots and different configuration of plots provided in the master plan are shown below.

Figure 65: 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 multi-national 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 have been provided to meet the varied needs of the industrialists. Breakup of the industrial area and plot details envisaged for the EZ site is given below.

Table 62: Breakup of industrial area and plots

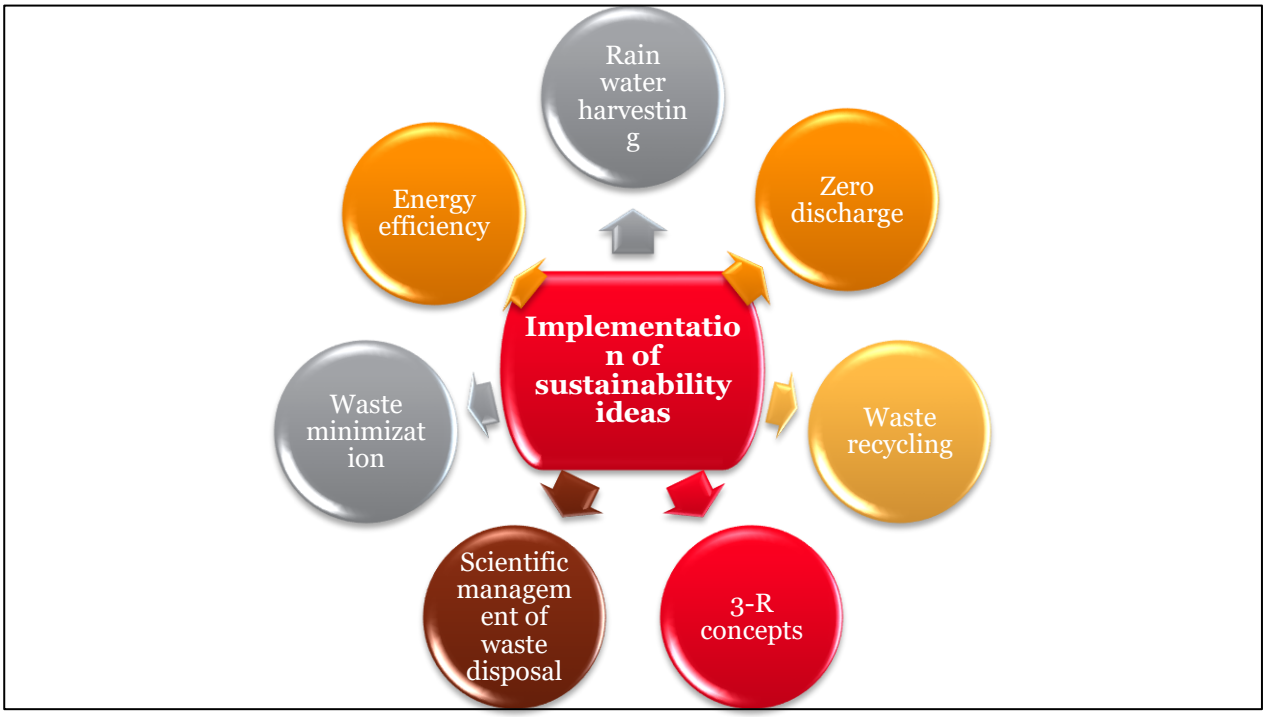
Description	Industrial area/ plots	Phase I-industrial breakup	Phase II- industrial breakup
Industrial area (in acres)	230.57	112.93	117.64
Number of industrial plots	**165**	**85**	**80**
Upto 2-acre plots	120	52	68
>2 acre plots	31	19	12

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 66: 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 takeaway

Taking inputs from industry assessment and demand forecasting, best practice master planning has been carried out to enable state-of-the art infrastructure facilities in the proposed EZ to attract and support investments in industrial sectors.

Master planning takes into cognizance layout planning, zoning based on concept & functional requirements, facilities & amenities planning. Master plan comprise of zoning plan, road network plan, detailed land use and phasing plan.

Key recommendations formulated from this exercise are outlined below-

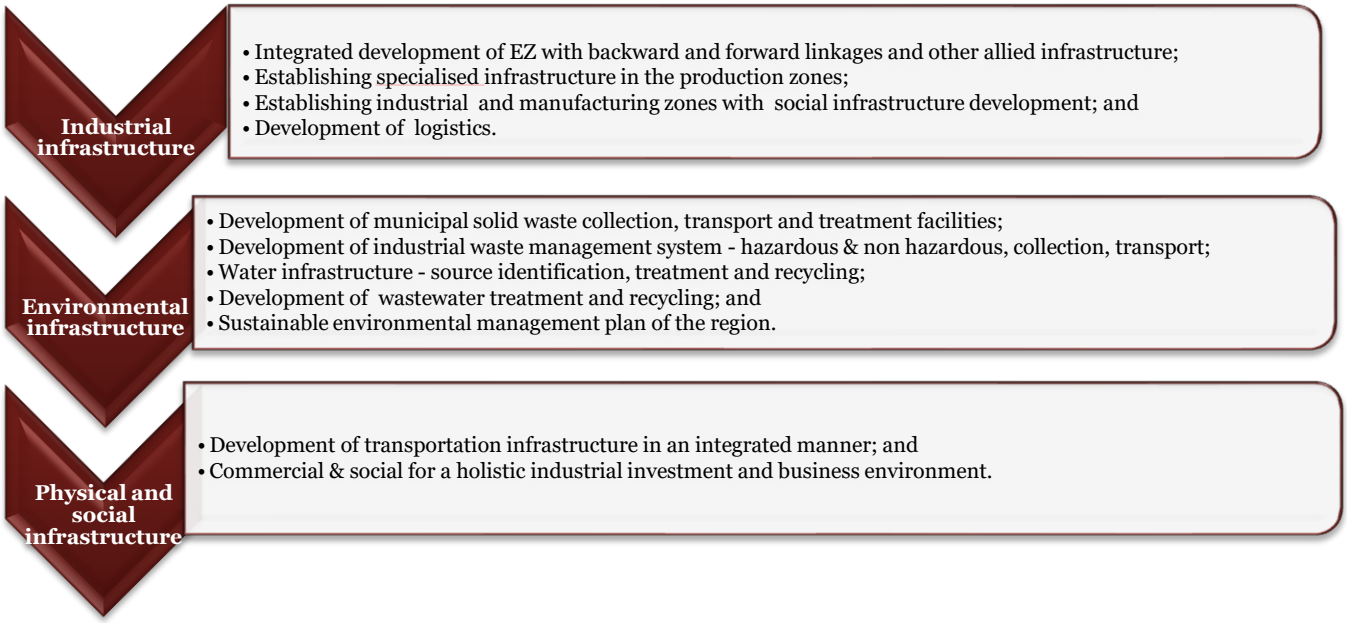
- During master plan, entry/exit has been planned from the approach road connecting the site. The whole site area has been divided into various zones such as industrial zone, institutional zone, amenities and utilities zones;
- Land parcellation, planning of utilities & amenities and phasing of proposed master plan;
- This project has been planned to be developed over 2 phases with each phase having a construction period of 2 years. 175.86 acres will be developed in phase I and 153.57 acres will be developed in phase II;
- Best practice master planning indicates that 71.67 % of land accounts for saleable area and remaining 28.33 % of land accounts for non-saleable area. Out of 71.67 % total saleable area, 69.99 % accounts for industrial use of targeted sector and remaining 1.68 % is for public and support amenities: and
- 172 plots have been earmarked in the proposed master plan for different usage out of which 165 plots are earmarked for industrial usage, 6 plots for utilities and remaining 1 plot has been earmarked for public & support amenities.

10. Infrastructure Plans

10.1. Purpose and objectives

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

Figure 67: 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.

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 63: Details of components covered under infrastructure plan

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Roads – General considerations**	○ Primary, secondary and collector roads are planned to give access to the industries within 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

Components	Detailing of utilities, infrastructure within proposed EZ
	○ The details are given in **Table-Hierarchy of roads.** ○ 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) considered is 30; ○ Wherever necessary, the unsuitable soil at sub-grade/below sub-grade level shall be replaced with suitable materials as per standard specifications; ○ 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 the 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 C = Co-efficient of runoff I = Intensity of rainfall, mm/hr A = Catchment area, hectare • Considering the nature of soil/surface, the co-efficient 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.

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **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 considered to be used for processing, bathing and washing clothes, cooking, drinking and washing vessels; ○ Non-potable water has been considered to be used for gardening, cleaning, cooling and toilet flushing; and ○ The water consumption pattern assumed is given in **Table-Water consumption pattern.**
➢ **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} = 849 lpm = 47 cum/hr ○ Considering two hours fire demand requirement, the total quantity of water required for fire protection is 94 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

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Water storage**	○ The water demand estimation for different components in the processing and non-processing area is depicted in **Table- Estimation of average daily water demand.** ○ 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 numbers of sump 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; ▪ 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.**
➢ **Sewage quantity estimation**	○ The sewerage system is planned to cater for the anticipated peak discharge requirements and to treat the waste to the required discharge standards; ○ The estimation of the sewage shall vary depending upon the land use distribution; ○ The domestic sewage to be generated has been assumed to be 80% of the domestic water consumption in addition to an infiltration of 10%; ○ The general wastewater generation pattern adopted in domestic premises is presented in **Table- Wastewater generation pattern;**

Components	Detailing of utilities, infrastructure within proposed EZ
	○ Wastewater generated from toilets is considered as sewage (blackwater) and wastewater generated from bath/shower, laundry, hand basin and kitchen are considered as sullage (greywater) and the pattern of the same is depicted in **Table-Sewage and sullage generation pattern;** ○ The estimation of average daily sewage and sullage generation is detailed in **Table- Sewage and sullage generation estimation;** ○ Treated wastewater available @ 90% = 543 cum/day; ○ Non-potable water demand is 3866 cum/day; ○ Entire treated wastewater shall be utilized for non-potable usage; ○ Following design criteria is proposed for sewage collection system. • Demand computation based on the analysis; • Working hours per day – 24; • Pipe material - NP2 RCC for all areas except road crossing and NP3 RCC for road crossing; • Pipe roughness co-efficient - 0.011; • Peak flow factor – 3; • Formula used to calculate friction loss - Manning's; • Infiltration - 10%; • Self-cleansing velocity - 0.6 m/s; • Minimum cover - 1 m; and • Manhole spacing – 30 m up to pipe size 900 mm. ○ It is proposed to collect sewage & sullage through a single collection network which is planned based on the above design criteria. Sewerage network shall be established by the project implementation agency considering the topography of the site; ○ The network is divided into trunk main and sub-mains according to the natural topography and other site constraints. Minimum pipe size of 150 mm diameter is considered for sewerage network; and ○ Proposed pipe size of sewer network is provided in **Table- Pipe size-sewer network.**
➢ **Quality of sewage**	○ In general, the quality of domestic sewage generation shall be as per **Table-Sewage quality;** and ○ The design and treatment scheme have been worked out based on the assumption of input quality. It is proposed to treat both sewage & sullage in a single treatment system.
➢ **Effluent quantity estimation**	○ Total estimated effluent quantity= 4 MLD; ○ Since, the generated effluent characteristics will vary among different industrial zones, it is suggested to establish zone wise CETP for each industrial zone based on homogeneity in characteristics of effluent. ○ 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% = 3360cum/day; ○ Non-potable water demand is 3866 cum/day;

Components	Detailing of utilities, infrastructure within proposed EZ
➢ **Solid waste management (SWM)**	○ Entire treated effluent shall be utilized for non-potable usage; ○ SWM is one of the most essential services for maintaining the quality of life in EZ and for ensuring better standards of health and sanitation. ○ If properly collected at source, SWM would reduce a number of downstream problems related to transportation and disposal of the same. Solid waste (SW) generated in EZ can be broadly categorized as under: • 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/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/person/day. ○ Based on the above, MSW quantification has been carried out and depicted in **Table- Estimation of Municipal solid waste (MSW) generation;** ○ Total estimated MSW quantity=3 TPD; ○ Source segregation should be made mandatory and due care has to 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. • 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 biomedical waste. ○ From the above only bio-degradable waste can be treated in the SW treatment facility within the EZ;

Components	Detailing of utilities, infrastructure within proposed 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 a 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 40 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; • Solar street lighting. ○ All the road and streets are provided with street lighting not only to assist pedestrians and traffic, but also to increase safety and security in the area. It is recommended that all lighting should be by energy-efficient LED 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.,

10.3. Infrastructure requirements and concept drawings

10.3.1. *Roads*

Hierarchy of roads

Primary, secondary and collector 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 64: Hierarchy of roads

Category	Road width (m)	Carriage way width (m)	Number of lanes	Length (m)		
				Processing area	Non-processing area	Total
Primary road	30.00	7.5+ 7.5	4	1647	-	1647
Secondary road	25.00	7.5 + 7.5	4	3904	-	3904
Collector road	18.00	3.75+3.75	2	600	-	600
Total				**6151**	**-**	**6151**

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 65: 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%)

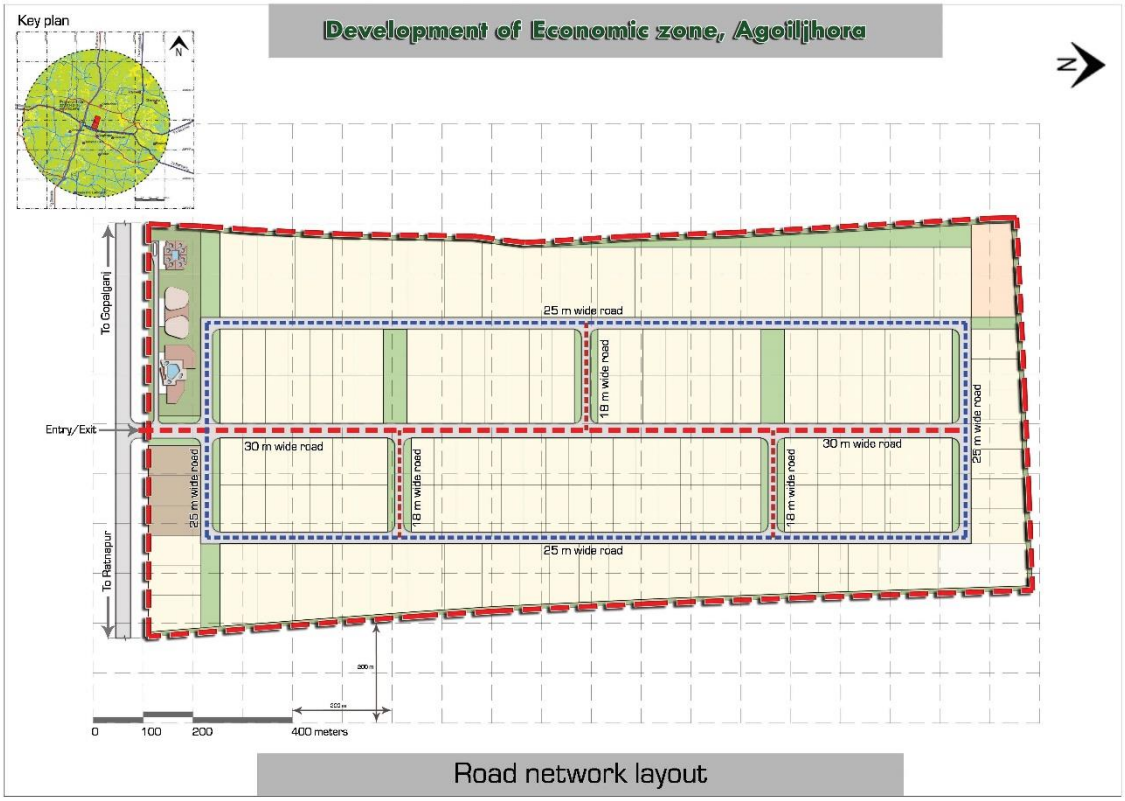
Source: MACE analysis

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 in the figure on next page.

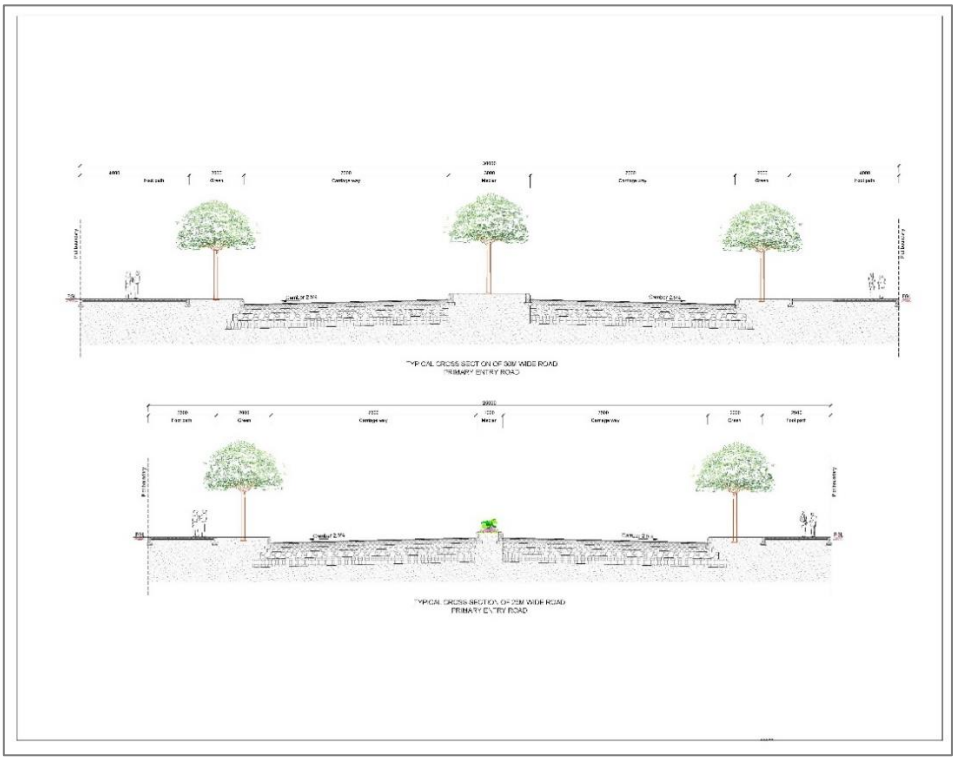
Figure 69: Road network



Source: MACE analysis

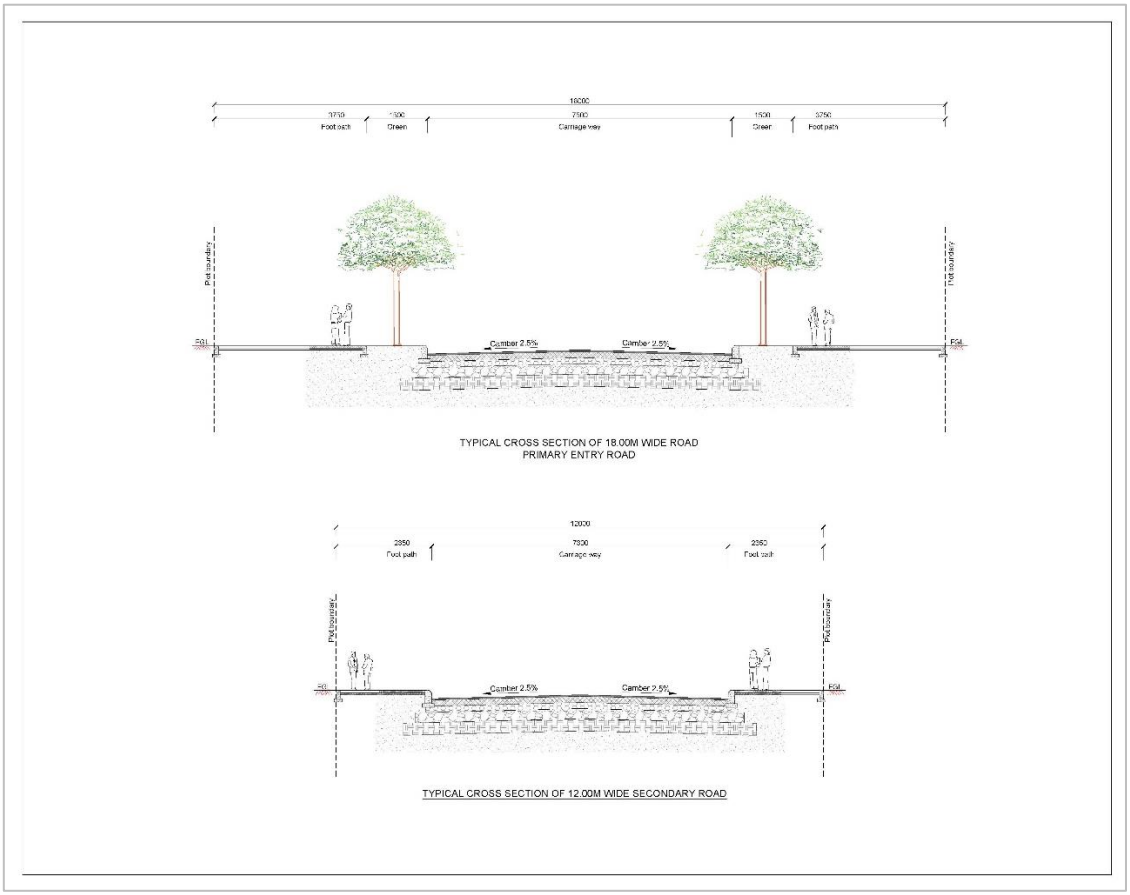
The above figure outlines the top view of the road network diagram. As evident from the diagram, road plan has been prepared to ensure last mile connectivity to all units inside the EZ site. Figure below outlines the cross-sectional view of the road structure.

Figure 70: Road cross-section (30 m and 25 m)



Source: MACE analysis

Figure 71: Road cross-section (18 m and 12 m)



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

Table 66: 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 represents 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; and
  - 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 below.

Table 67: Summary of electrical load estimate

SI. No	Type of development	Load in kVA
1	Processing area	38619.00
2	Non-processing area	1489.00
	Total estimated load in kVA	40108.00
	Total estimated load in MvA	**40.10**
		~40

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 mentioned in the table is indicative in nature and may vary based on on-ground implementation of the project. The individual land use wise estimated electrical demand for this facility is given in the table below**.**

Table 68: Power demand calculation

Land use pattern	Total area	Load in kVA/acre & kVA/sqm of BUA	Simultaneity factor	Loss factor	Load in kVA
	acres				
Industrial plots	230.57	185.00	80%	1.10	37537.00
Utility	16.79	105.00	40%	1.10	776.00
Road	38.03	14.00	40%	1.10	234.00
Green space	32.94	5.00	40%	1.10	72.00
Total processing zone	**318.34**				**38619.00**
Non-processing area					
Public & support amenity	11.10	0.14	70%	1.10	1489.00
Total Non processing area	**11.10**				**1489.00**
Total	**329.43**			**Load in kVA**	40108.00
				Load in mVA	**40.11**

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 40 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.

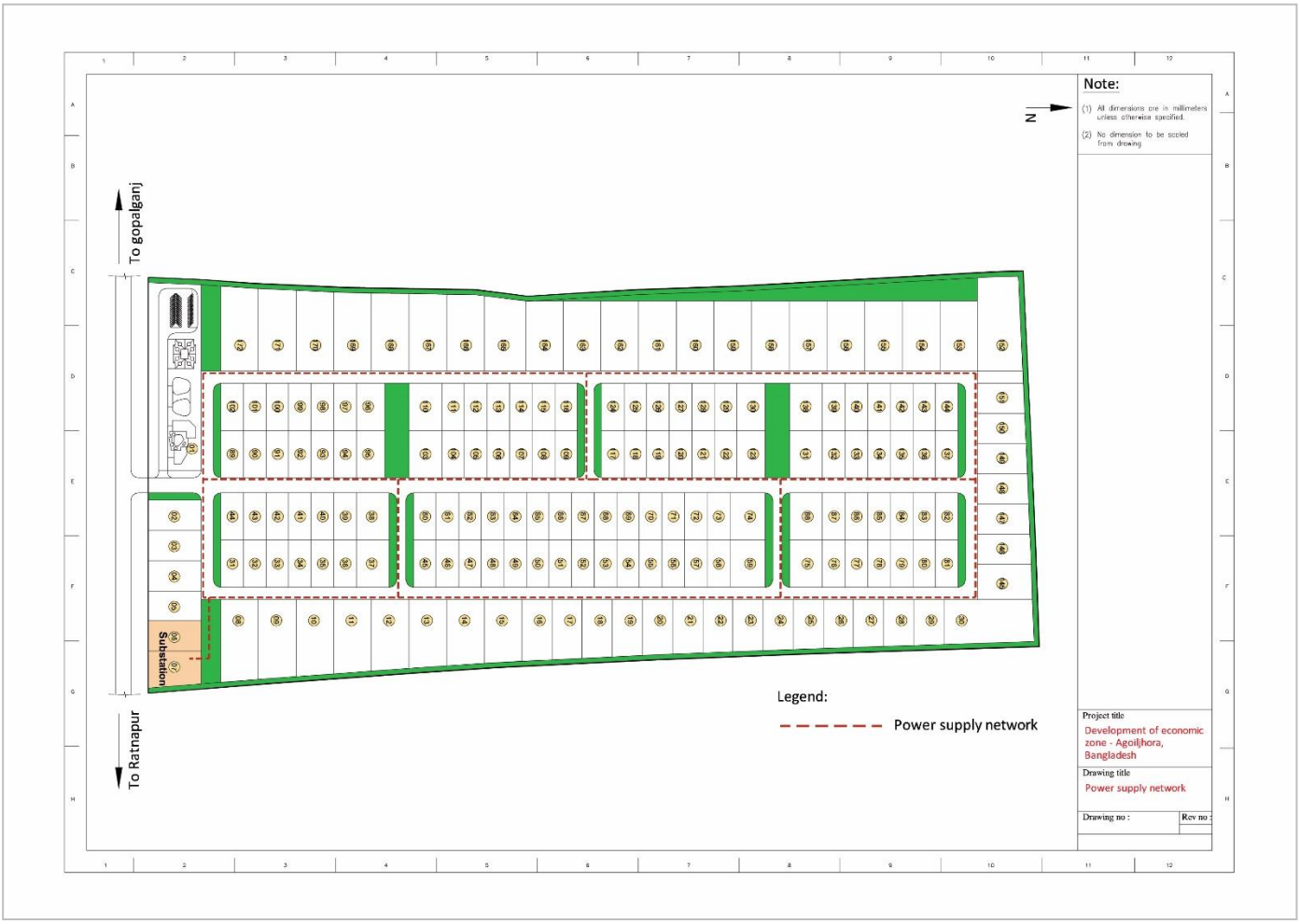
To cater this power demand, a main receiving 132/33/11 kV sub-station shall be established within the proposed site.

During the initial phase of development, 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 33/11 kV Agailjhara sub-station at an aerial distance of 3.8 km (~4 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 grid sub-station and incoming 132 kV overhead transmission line shall be established from 132/33 kV Madaripur grid sub-station of 150 mVA capacity located at an aerial distance of 40 km from the site (based on proposed tentative alignment).

Power supply network planned within EZ

The suggestive alignment of feeder line from Agailjhara sub-station is proposed along the existing Zila road-(Z8031). The receiving sub-station is located within EZ from which an internal distribution network is planned along the proposed road network of EZ to feed the individual plots as shown in the figure on next page.

Figure 72: 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 is based on published standards, guidelines and best industry standards. However, this is indicative in nature and may vary based on on-ground implementation of the project.

Table 69: Water demand estimation- Basis

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
Road	1.8 cum/ha/day

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

Table 70: Water consumption pattern

For areas with bathing facilities	
Potable water	70%
Non- potable water	30%
For areas without bathing facilities	
Potable water	67%
Non- potable water	33%

Source: MACE analysis

Water demand calculation

The summary of water demand for EZ is given below

Table 71: Summary of water demand

S.No.	Description	Processing area	Non- processing area	Total	Unit
1	Total average demand	7827	77	7904	cum/day
2	Total potable water demand	3982	55	4037	cum/day
3	Total non-potable water demand	3845	22	3867	cum/day
4	Fire demand	91	3	94	cum

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

Table 72: 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	230.57	6534	525	706	7765	3979	3786
Utility	16.79		5	0	5	3	2
Road	38.03		28	3	30		30
Green space	32.94		24	2	26		26
Total processing area	**318.34**	**6534.41**	**581.28**	**711.57**	**7827.26**	**3982.27**	**3844.99**
Non processing area							
Public & support amenity	11.10		70.00	7.00	77.00	55.00	22.00
Total non-processing area	**11.10**		**70.00**	**7.00**	**77.00**	**55.00**	**22.00**
Total	**329.43**	**6534.41**	**651.28**	**718.57**	**7904.26**	**4037.27**	**3866.99**

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 800-1000 feet which is potable in nature. Hence, groundwater shall be relied to meet the initial water demand of proposed EZ.

River Paisarhat is immediately adjacent to the proposed site on its western side at an aerial distance of about 3 km from the site. Based on the discussion had with the UNO officials, it is understood that River Paisarhat is 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 3 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 the suitable intake system and intake point shall be proposed during detailed engineering stage. Details regarding the external water supply system has been provided in the figure below.

Potable and Non potable water supply network

The potable and non-potable water supply network are 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 73: 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 73: Sump storage capacity

S. No.	Description	Processing area	Non- processing area	Unit
1	Potable water	3982	55	cum
2	Non- potable water including fire demand	3936	25	cum
	Total	**7918**	**80**	**cum**

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

Table 74: ELSR capacity

S. No.	Description	Processing area	Non- processing area	Unit
1	Potable water	332	5	cum
2	Non- potable water	320	2	cum
	Total	**652**	**7**	**cum**

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

The tables in previous page 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 7998 cum and total ELSR capacity requirement would be 659 cum.

Required pipe size and pump capacity

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

Table 75: Pipe size- water supply network

Pipe size in mm	Processing area length in m	
	Potable water	Non-potable water
110	2153	6151
140	615	-
160	615	-
200	615	-
250	615	-
300	615	-
350	308	-
400	308	-
450	308	-
Total	**6151**	**6151**

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

Table 76: Pump capacity

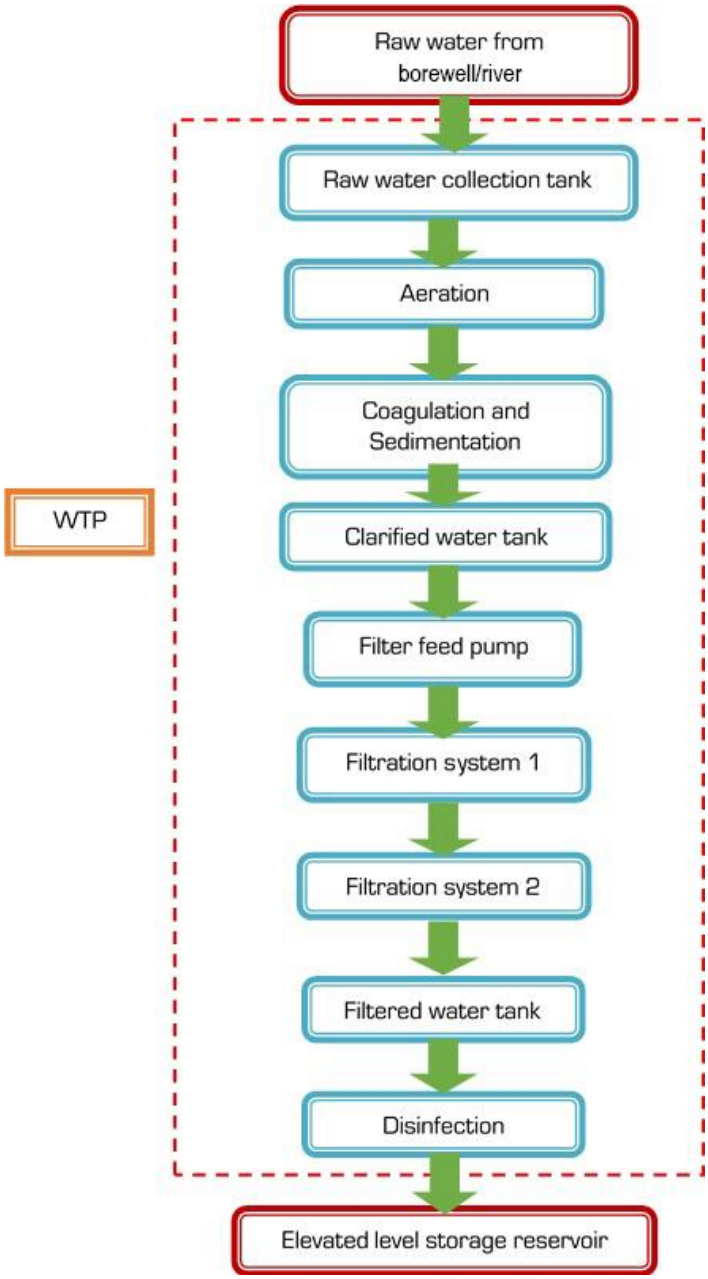
Description		Processing area	Non-processing area	Unit
Potable water	Capacity	0.13	0.001	cum/sec
	Number of pumps	2 W+1S	2 W+1S	

Description		Processing area	Non-processing area	Unit
	Power requirement of each pump	23.00	0.4	Kw
Non- potable water	Capacity	0.06	0.00067	cum/sec
	Number of pumps	2 W+1S	2 W+1S	
	Power requirement of each pump	22.00	0.2	Kw

Source: MACE analysis

The requirement of pipe size and pump capacity has been calculated in the above tables on basis of the water demand, water storage capacity and the size of the EZ site.

Figure 74: WTP flow diagram



Source: MACE analysis

Note: The above process is given for illustrative purpose only. The same shall be finalised after testing the raw water quality.

10.3.4. *Effluent generation*

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

Table 77: 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 is tabulated below.

Table 78: Effluent quantity estimation

Land use pattern	Total area	Effluent generation	Sewage generation		Sullage generation	Total effluent, sewage and sullage generation	Infiltration @10%	Total effluent generation
	acres	in cum/day	In %	In cum/day	In cum/day			
Processing area		In Cum/day						
Industrial plots	230.57	3953.32	0.72	124.91	322.13	4400.35	440.04	4840.39
Utility	16.79		0.72	1.07	2.76	3.83	0.38	4.33
Road	38.03				27.44	27.44	2.74	30.49
Green space	32.94							2.64
Total processing zone	**318.34**	**3953.32**		**125.98**	**352.32**	**4431.62**	**443.16**	**4877.84**
Non-processing area								
Public & support amenity	11.10		0.32	6.28	48.00	54.28	5.43	61.98
Total Non-processing area	**11.10**			6.28	48.00	54.28	5.43	61.98
Total	**329.43**	**3953.32**		**132.27**	**400.32**	**4485.90**	**448.59**	**4939.82**

Note: Since the total sewage generation is meager, the same is combined with the effluent generation.
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 5 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 75: Internal effluent network

Source: MACE analysis

Required pipe size

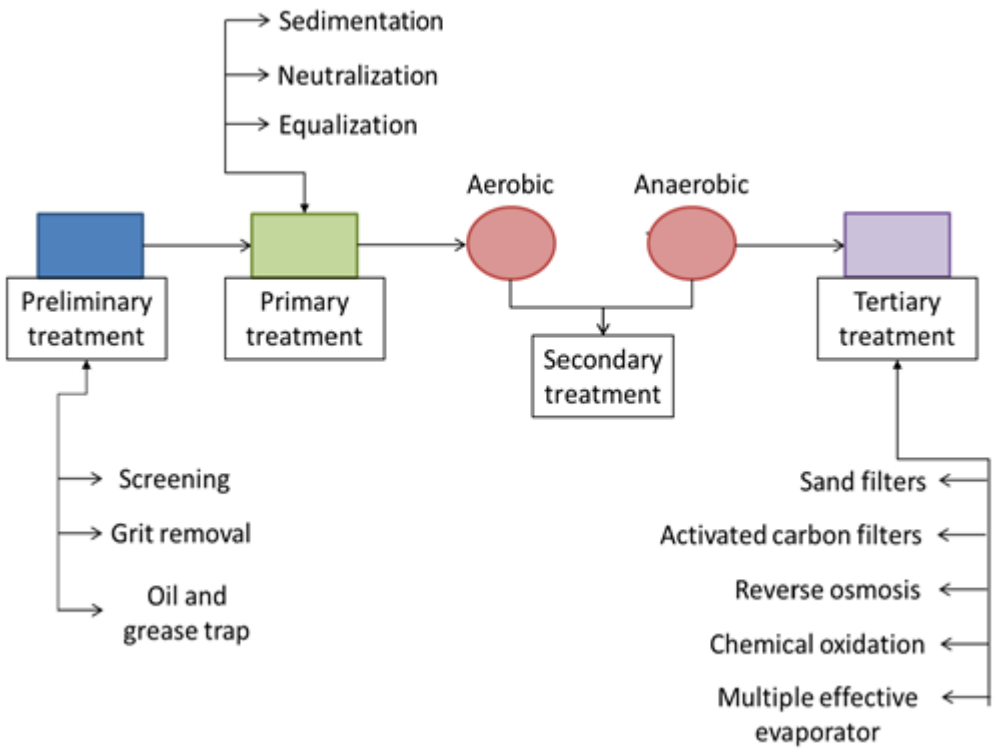
Table 79: Pipe size- Effluent network

Pipe size in mm	Processing area length in m
150	2768
200	1538
300	922
400	615
500	308
Total	**6,151**

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.

Figure 76: CETP flow diagram



Source: MACE analysis

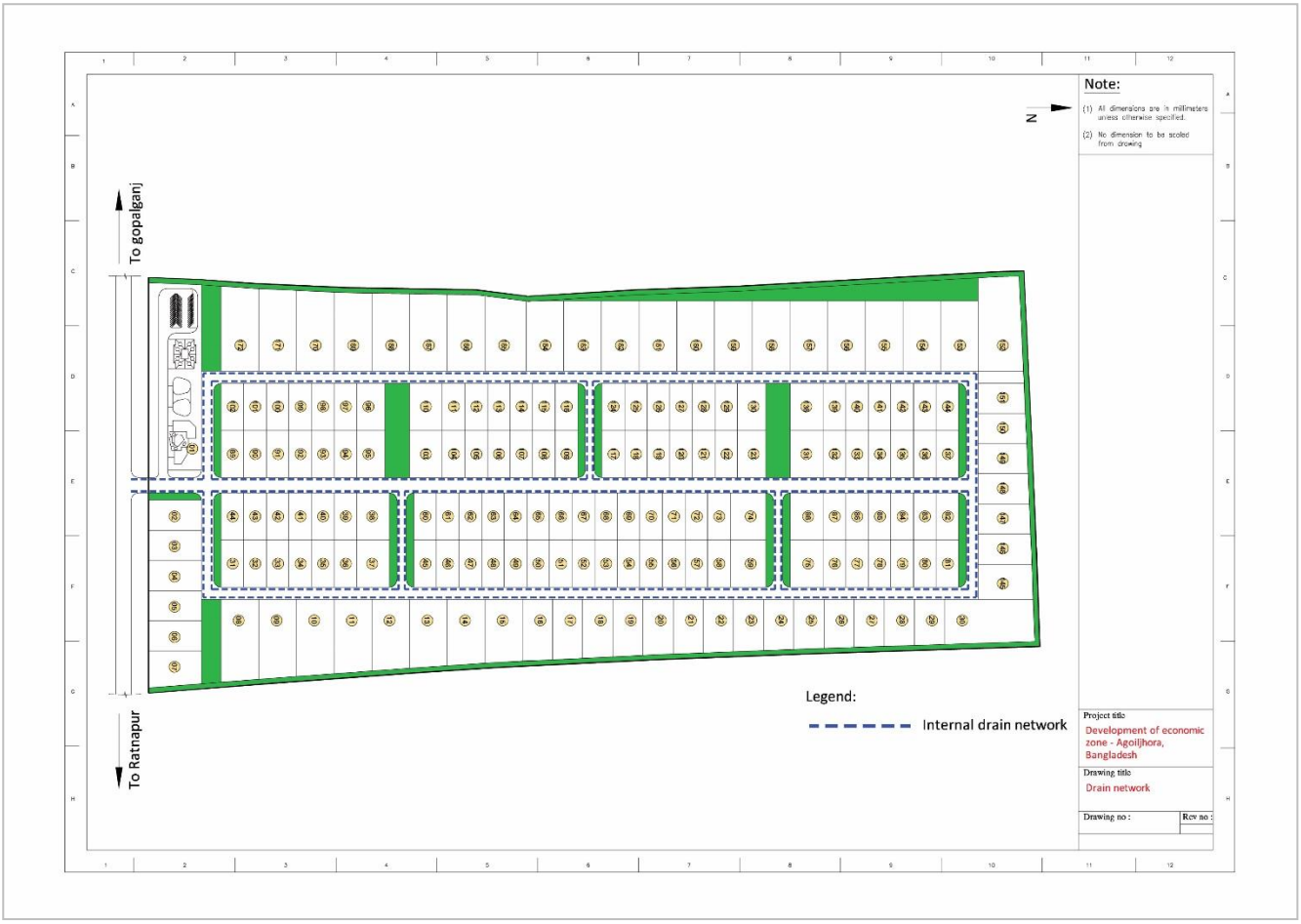
Note: The above process is given for illustrative purpose only. The same shall be finalised based on the inlet effluent parameters

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 adjacent River Paisarhat and its channels.

- 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 77: Internal stormwater drain network



Source: MACE analysis

10.3.6. *Solid waste*

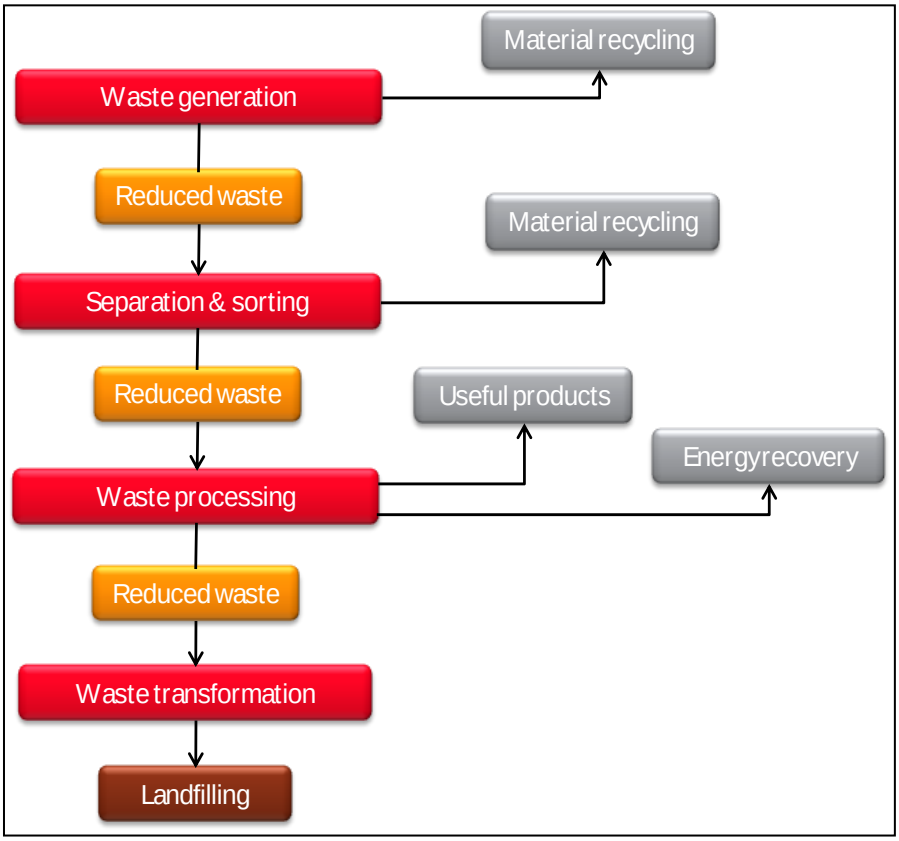
The estimated solid waste quantity is provided in the table on the next page. The estimated solid waste quantity is about 3 TPD. It is suggested to adopt bio-methanation process for treating the bio-degradable waste generated within EZ. The other waste such as non-bio-degradable and industrial waste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

Table 80: Estimation of MSW generation

Land use pattern	acres	Population	Msw generation	Unit	Kg/day
Processing area					
Industrial plots	230.57	11668	200	gm/capita/day	2333.60
Utility	16.79	100	100	gm/capita/day	10.00
Road	38.03		10.12	kg/ha/day	155.82
Green space	32.94		30.36	kg/ha/day	404.92
Total processing zone	318.34	**11768**			**2904.34**
Public & support amenity	11.10	1000	100	gm/capita/day	100.00
Total Non processing area	**11.10**	**1000**			**100.00**
Total	**329.43**	**12768**			**3004.34**

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

Figure 78: Waste reduction by integrated SWM



Source: MACE analysis

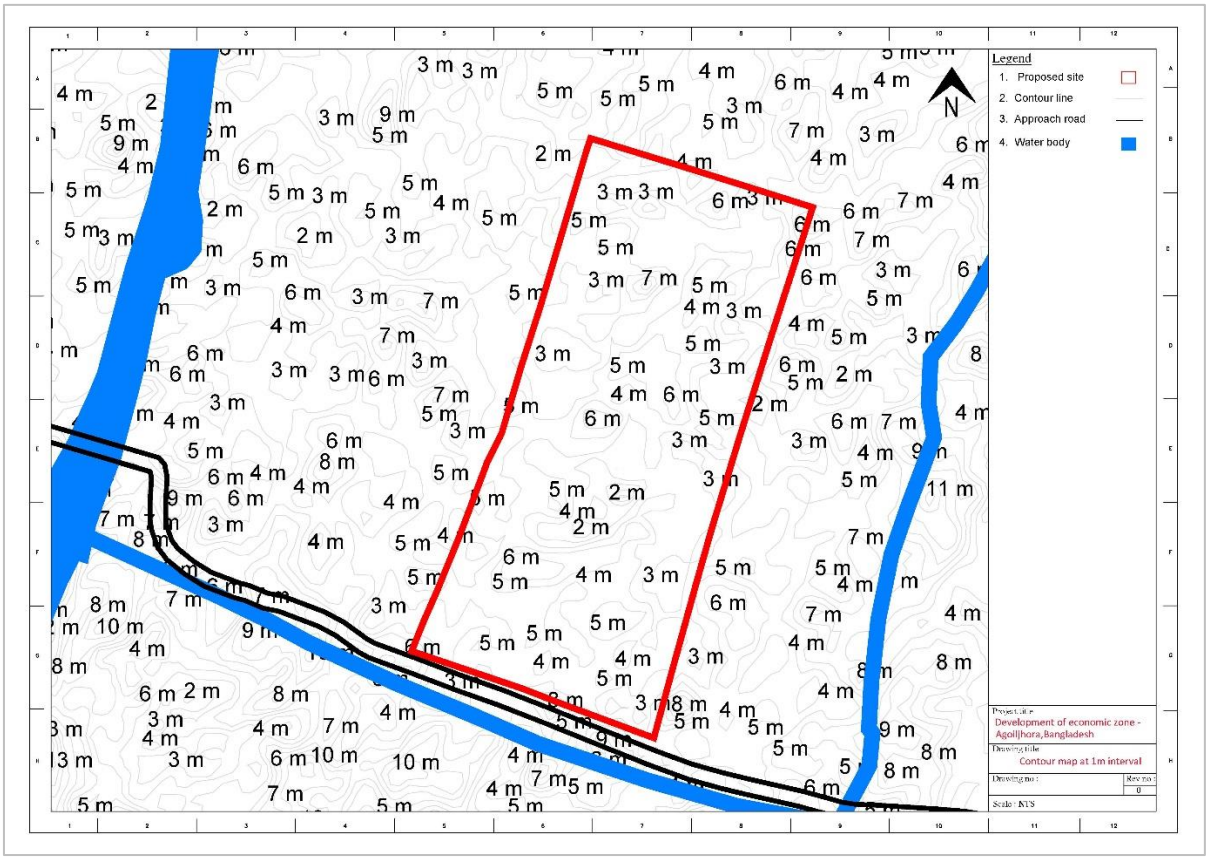
Site development for EZ

From the site visit it is observed that the site is low-lying when compared with the adjacent road levels. Based on the discussion had with the officials, it is found that there will be no water intrusion due to overflow from the adjacent rivers by meandering effect. However, every year during monsoon season, the site is getting inundated for a height of about 6 to 8 feet due to heavy rain. This necessitates to develop embankment with suitable level of site filling within EZ site for which contour study has been carried out.

The understanding about the historical flood level (HFL) variation supports to decide the top level of the proposed embankment and the depth of site filling.

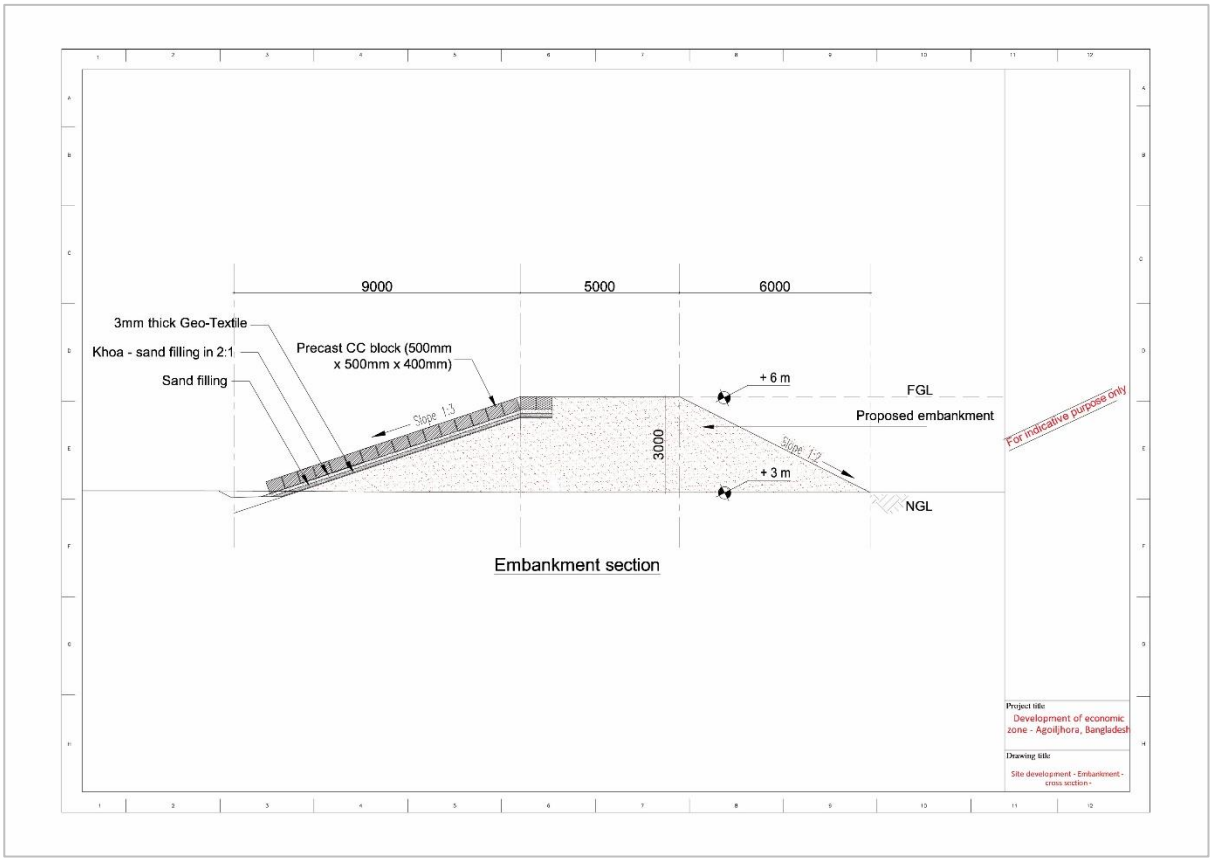
Based on the study of contour, it is found that the site needs to be filled for a depth of about 3 m on an average and the total estimated site filling quantity is about 3999467 cum. Dredged sand from River Paisarhat is suggested as a source for site filling. However detailed hydrostatic study has to 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 79: Site development layout



Source: MACE analysis

Figure 80: Embankment cross section

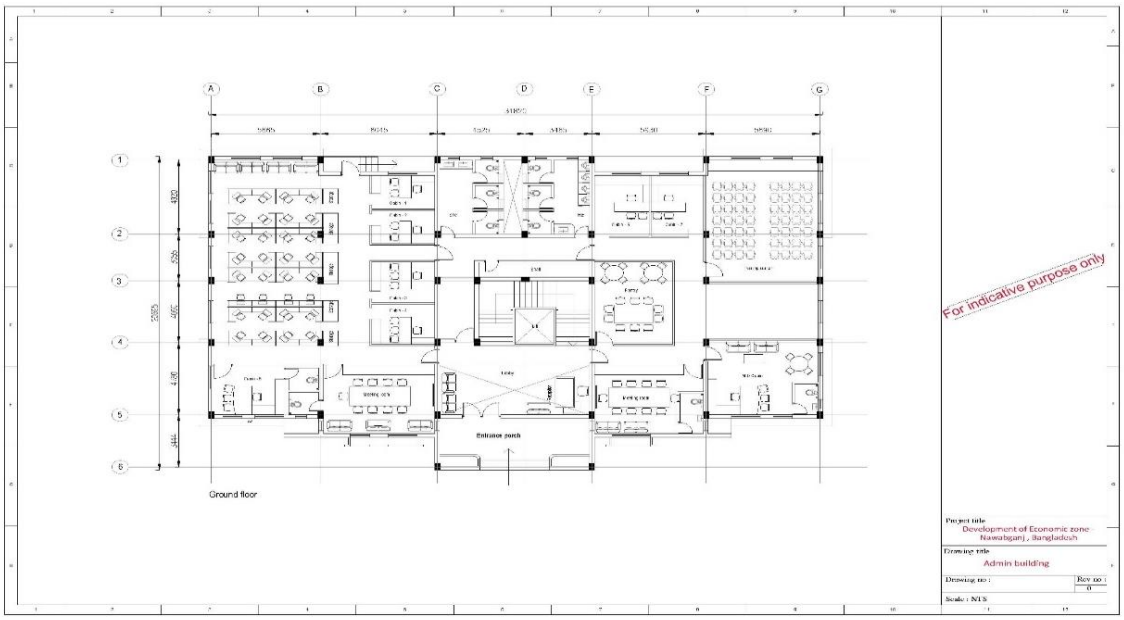


Source: MACE analysis

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 below.

Figure 81: Administration building layout



Source: MACE analysis

10.3.7. *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 81: 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	3999467	Cum	1795.76	1795.76	
Embankment	5.00	KM	916.88	916.88	
Total			**2712.64**	**2712.64**	
Road network					
Internal road network	6.2	KM	**1238.59**	619.29	619.29
Footpath	6.2	KM	**243.99**	122.00	122.00
Storm water drain	6.2	KM	**46.65**	23.32	23.32
Power supply					
Internal 11 kV power distribution line (OHT)	6.8	KM	9.51	4.75	4.75
Internal 33 kV power distribution line (OHT)	2.5	KM	9.92	4.96	4.96
Generator - 2MVA capacity	2	Nos	90.00	45.00	45.00
Street light	6.2	KM	21.68	10.84	10.84
Security light	5.0	KM	14.60	14.60	
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			**795.70**	**230.15**	**565.55**
Water supply					
Water supply network	6.2	KM	25.24	12.62	12.62
Sump & overhead tank	8.66	MLD	189.67	94.84	94.84
Water distribution pumps	6.00	Nos	2.45	1.23	1.23
Pump room	256.00	Sqm	18.00	18.00	
Water treatment plant(WTP)	4	MLD	82.29	41.15	41.15
Fire hydrant	42	Nos	3.10	1.55	1.55

Description of item	Quantity	Unit	Price without tax (In million Taka)	Phase I Cost Breakdown	Phase II Cost Breakdown
Total			**320.76**	**169.38**	**151.38**
Effluent and solid waste collection/treatment					
Effluent network	6.2	KM	15.19	7.59	7.59
Effluent treatment plant (CETP)	4.60	MLD	690.00	345.00	345.00
Solid waste management	3	TPD	41.62	20.81	20.81
Total			**746.81**	**373.40**	**373.40**
Telecom	6.2	KM	**63.18**	**31.59**	**31.59**
Sustainable infrastructure elements					
landscaping & Greenery along road	98442	Sqm	10.99	5.50	5.50
Total			**10.99**	**5.50**	**5.50**
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			**7,010.05**	**5,118.01**	**1,892.04**

Source: 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 10 acres having 60% coverage. The cost of constructing SFBs is 447.45 million BDT; and
- The cost of implementing environmental management plan during construction phase is taken to be 65.68 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 7010.05 million (without SFB).**

10.4. Key takeaway

On-site infrastructure captures the internal infrastructure facilities which need to be developed within the project site. Development of on-site infrastructure is responsibility of the developer. The major on-site infrastructure considered for the proposed EZ are internal road network, power 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 24 m width and collector road of 18 m width);
- It is suggested to align the feeder line from Agailjhara sub-station along the existing Zila road (Z8031) and proposed approach road. From the receiving sub-station, the internal distribution line network is aligned along the proposed road network of EZ to feed the individual plots;
- 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 individually along the roadside for plot connection has been considered individually;
- CETP have 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
- It is suggested to adopt Sequencing Batch Reactor (SBR) technology for wastewater treatment.

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

11. Social Review

11.1. Introduction

Bangladesh has graduated from Least Developed Country (LDC) status and progressing to achieve middle-income economy status by 2021 and developed nation status by 2041. With the vision of improving the economy of the country, Government of Bangladesh (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. As part of this endeavor, BEZA intend to undertake pre-feasibility studies at Agaijhara of Barishal.

The proposed EZ is spread over an area of 328.51 acres and it is located in Agailihara Upazila, Barishal district. Subject site is located at the northern boundary of the Barishal district and is surrounded by Gopalganj district.

11.1.1. Background

Under this planning study, a Social Impact Assessment (SIA) was conducted. The purpose of SIA is to define the present socio-economic conditions of the people of the project area which will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions in future.

The SIA identified and assess a project's social impacts that are directly related to the project and propose measures to enhance potential positive impacts and strategies to avoid, manage, mitigate or offset the predicted negative project impacts.

11.2. Socio-Economic Condition

One of the purposes of Social Assessment is to define the present socio-economic conditions of the people of the project area which will provide sound reference and assess probable socio-economic impact of the proposed interventions. This will enable us to compare the changes and impacts of the project interventions in future.

11.2.1. Administrative Units

The project area lies within the administrative Agailjhara Upazila (more specifically at Bakali union) of Barishal district. Agailjhara Upazila came into existence on the 16th June, 1981 as Thana and it was turned into an upazila on 7 November 1983. It is not definitely known about the origin of name of the Upazila. Once it was under Gaurnadi Upazila.

The total area of Agailjhara Upazila is 155.47 sq km, located in between 22°54' and 23°03' north latitudes and in between 90°03' and 90°13' east longitudes. It is bounded on the north and on the east by Gaurnadi upazila, on the south by Wazirpur upazila and on the west by Kotalipara upazila of Gopalganj zila.

Table 82: Administrative Units

Upazila	Land area	Reserve Forests	Riverine Area	Union	Mauza	Village
Agailjhara	155.47 sq km	0	0	5	78	96

Source: UNO Office, Agailjhara

Agailjhara is only upazila under Barishal district having no reserve forests and riverine area. The survey area is under Bakali union which is 5 k.m. away from the Upazila head quarter.

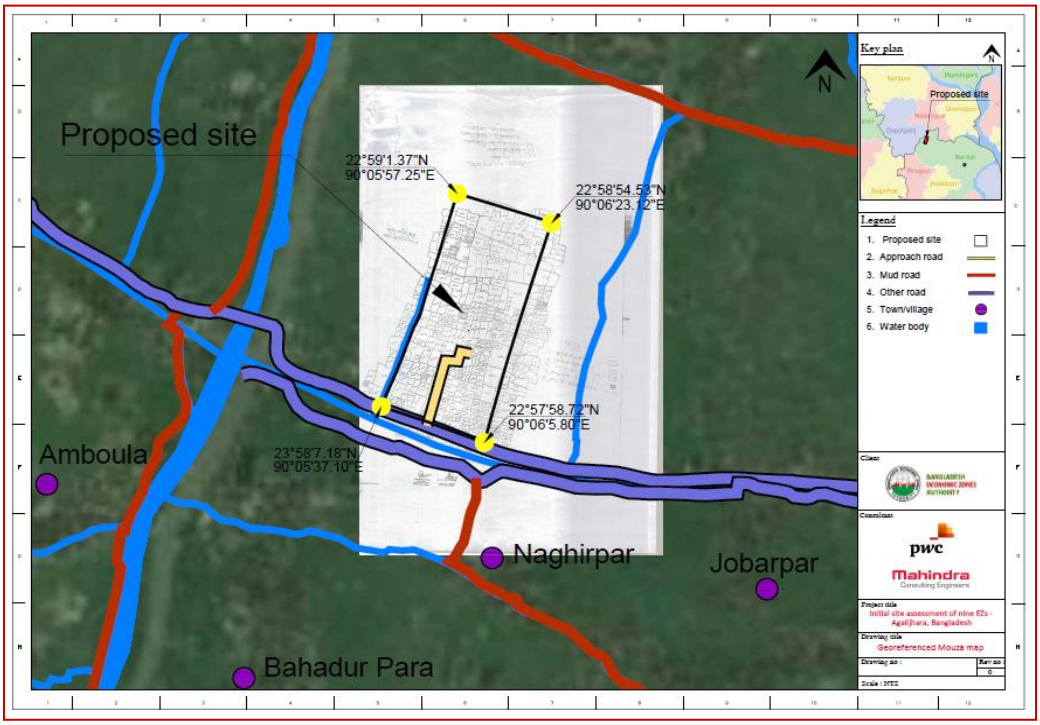
11.2.2. Location of the Project

Proposed Economic Zone falls in Northern part of Agailjhara upazila, Barishal district. It is located adjacent to the Agailjhara-Kotalipara road and located at 5 km distance from Agailjhara Township.

Table *83*: Site details

Parameters		Details
Site co-ordinates		22°57´58.80´´ N - 22°59´1.22´´ N & 90°05´38.20´´ E - 90°06´22.62´´ E
Site boundaries on East		Agricultural activity
Site boundaries on West		Agricultural and Aqua cultural activity
Site boundaries on North		Agricultural and Aqua cultural activity
Site boundaries on South		Agailjhara – Kotalipara road
Total area of the site		328.51 Acres
Land ownership details		Private owned
Government land		Nil
Private land		328.51 Acres
Others		Nil
Existing land use		Agriculture and Aqua culture
Land cost (per acre)		BDT 37 Lakh

Figure 82: Mouza map superimposed on Google map (Agailjhara EZ)



11.2.3. *Archaeological Heritage and Relics of Barishal*

Rammohan Samadhi Mandir, Sujabad Kella, Sangram Kella, Sharkal Fort, Girja Mahalla, Bell's Park, Ebadullah Mosque, Kasai Mosque, Oxford Church, Shankar Math, Kali Bari of Mukunda Das, Joint Mosque at Bhatikhana, ASWINI KUMAR TOWN HALL, Charkella, DURGASAGAR Dighi, one domed Mosque (Kasba), brass image of Manasa weighing three maunds (Char Bania Bari).

11.2.4. *Population and Demography*

There are around 32,840 household with 4.53 person per household found in the Agailjhara area. The total population is 149,456 and sex ratio (number of males per 100 females) 94 which is lower than national figure (100.3). The population density per square km is 961 in this area which is slightly lower than national figure (976). Bangladesh is considered one of the highly dense countries and this area bears the different trend; the density reduced to 961 from 1001 within one decade (2001 to 2011). The average HH size is 4.61 lower than national figures 4.44. (Source Census 2011, BBS)

Population	*: 149,456*
Sex Ratio	*: 94*
Households (HH)	*: 32,840*
Average HH Size	*: 4.53*
Population Density	*: 961*
Urbanization (%)	*:7.26*
Annual growth rate	*: 0.40 (-)*

The average household size is found declining trend with minus .4 percent during the last decade. It seems joint family has lost its necessity or individualism is being increased. Urbanization rate 7.26% which higher than previous census due to definition changes for urban people. (Source Census 2011, BBS).

The current population is 149,456 which are lower than previous decade; it seems population is decreasing (not due to population growth rate) and it may be 144,000 in 2019, as per linear projection techniques.

11.2.5. *Demographic profile and the existing human settlement*

According to Socio-Economic Survey (SES, 2019) total 58 households have been living here for years and this is their permanent residence location. Of the 58 PAHs, 138 were males and remaining 120 were females. The demographic data as tabulated indicate that the females constitutes 47% of the total project affected populations while the males constituted 53% and it can be said fair distribution.

The existing community people says hearing from their forefather that more than hundred year ago this community began to settle here. The settlement is developed scattered fashion. **The profile or the list affected HHs and their identity is given in annexture.**

Figure 83: Settlement pattern in the proposed area.

11.2.6. *Religion*

The Muslim community (population is 82720) dominates in terms of faith at the upazila level. The second group goes to Hindu who is 42.27% (population is 63175) and Christian are below three percent (2.82%). The other

group is very negligible in percentage. Some 6 people found Buddhist by faith. No ethnic minorities are living here.

It is interesting that 83% Hindu community people live in the proposed project area. It is reverse to upazila level trend and only 13% Muslim households found in the area and no diversity of faith beyond these two groups is found.

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)

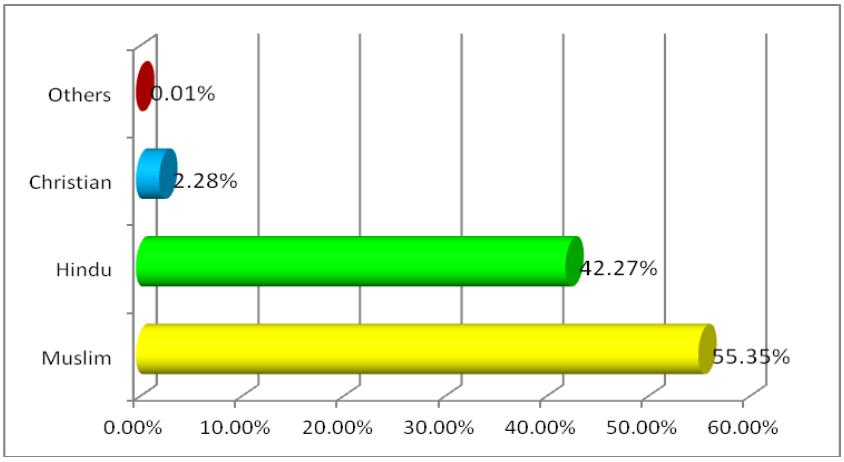


Table *84*: Religion Profile of Project Area

11.2.7. *Education*

The literacy rate in the Agailjhara area is around 62.9 percent (Male 65.4%, Female 60.6%) which is much higher than national figure (51.8 percent). School Attendance (5 to 24 years) is around 64.8 percent in the project area, whereas the national figure is 52.7. The literacy rate has increased 3.6% during the last decade. Male are the slightly ahead in literacy rate and school attendance rate as well. Male female discrimination is found in urban and rural area where male are ahead in both school attendance and literacy rate. Female representation is very minimal in higher education. The literacy rate is also increasing quickly.

But the literacy situation in the proposed project area (350 acre) is excellent, among the total population, only 15% are illiterate, male female discrimination in literacy and school going rate is almost equal. The high education levels emphasize the need employment in service sector. At present, there is no primary school or no NGO run school or no madrasahs is exists in this area. Therefore no educational institute needs to be rehabilitated.

11.2.8. *Occupation and Economic Wellbeing*

According to BBS 2011, Population Aged 7+ but not attending school is found 22906 in Agailjhara Upazila. Among them, most of the people engaged in household work (42.36%) where female are sole dominant.32.45% people are employed which occupied second position. It is unfortunate that 24.84% people have no work for earning income. Very negligible numbers (0.385%) of people looking for work. women get opportunity in formal sector.

Population Aged 7+, not attending school			**Employment status**							
			Employed		Looking for work		Household work		Do not work	
Total	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
22906	9283	13623	6818	613	55	31	299	9402	2111	3577
	40.41	59.49	29.77	2.68	0.24	0.14	1.31	41.05	9.22	15.62
% of Employment Status			32.45		0.38		42.36		24.84	

Table *85*: Distribution of percentage of population by Employment status

In accordance to the Census of Bangladesh (2011), these employed people (total 7431 or 32.45%) were categorized according to three sector namely agriculture, industry and service. Agriculture including direct farming, sharecropping, agricultural laborers etc. is the dominant source of employment in the project study area. Approximately, 79.93% (75.13% male and 4.80% female) involve in Agricultural activities. Agriculture (including livestock and agricultural labor) is the primary source for income. Moreover, significant numbers of the population; 13.08% male and 3.11% female, of the project area are employed in services. e. In the project study area only 263 male and 25 female (out of total 7431people) are working in industry sector. **Table** shows employment status of the project area.

Table 86: status Population Aged 7+, not attending school and employed

Field of Activity	Agriculture		Industry		Service		
Gender	Male	Female	Male	Female	Male	Female	Total
Number of employed	5583	357	263	25	972	231	652335
% of male female	75.13	4.80	3.54	0.34	13.08	75.13	100%
Sector %	79.93		3.88		16.19		

Source: Population and Housing Census, 2011, Bangladesh Bureau of Statistics (BBS)

The labor force (age between 15 to 59 year) is the actual number of people available for work is found 55.6%. The labor force includes both the employed and the unemployed. The percent of people up to the age 14 is 34.7%. Only 9.7% People are above 60 year old. So the 44.4% people depend on 55.6%.

11.2.9. *Economic Situation*

According to BBS Economic Census 2013 (District Report: Barishal), it is observed that there are a total of 1,07,072 economic units in Barishal of which 75,513 is permanent, 5,139 temporary and 26,420 economic households. It is evident that permanent establishments occupy the largest share with 70.53% followed by economic household with 24.67% and the temporary establishments with 4.80%. Analysing the figures by location, it is found that of the total, the major portion 65.02% is located in the rural areas and the rest 34.98% in the urban. Out of 65.02% economic units in the rural areas, 45.67% is permanent, 3.58% temporary and 15.78% economic households whereas out of 34.98% economic units in urban areas, 24.86% is permanent, 1.22% temporary and 8.90% economic households.

It is also observed that 3,42,511 persons are engaged in various non-farm economic activities in Barishal of whom 3,06,673 is male and 35,838 female. Out of the total, 83.25% is engaged in permanent establishments, 2.98% in temporary establishments and 13.77% in economic households. It is important to note that the largest number is engaged in permanent establishments.

11.2.10. *Industrial Landscape*

The economy of Barishal is predominantly agricultural. Barishal is a rice producing center of Bangladesh. Balam (a kind of basmati) is the most popular rice in Barishal. It is also famous for Betel Leaf, a typical south Asian chewing item. The district has some small industries which include Pharmaceutical industry, biscuit factory, flourmill, oil mill, ice factory, rice mill, jute mill, textile mill etc.

11.2.11. *Health service*

The people of the project area generally go to Upazila and Barishal medical college & Hospital for treatment. For the 147 thousand people, the following facilities are available.

Table *87*: Hospital Facilities

Types of Hospital	Number of Bed	Number of Doctor	Number of Nurse	Number of Technician	Number of Other Stuff
Govt. Hospital (1)	50	11	16	9	63
Private Hospital (3)	27	3	4	4	17

Source: Site Survey (2019)

It seems the Upazila headquarter has hospital with 50 bed and 11 MBBS doctor. There are 8 no. diagnostic centres found active but no missionary hospital is exists. Every union has heath centre. The health facilities in Agiljhara are very common like other Upazila of Bangladesh.

It is evident from the hospital bulletin that people suffer from Diarrhoea, gastroenteritis infectious origin, Pneumonia, Typhoid, paratyphoid fevers, febrile convulsions, Pedestrian injured Organophosphate, carbamate insecticides, and Stroke etc.

11.2.12. *Residence*

According to the SES survey August 2019, in the Tin-made (84.2%) is the major among dwelling house structure followed by Katcha (10.0%). For the Agailjhara Upazila the percentage of semi-pucca (5.4%) is slightly higher pucca (3.4%). In urban area Pucca (9.4%) structure is three times higher than rural area. the percentage of semi-pucca is increasing considering utility value and manufacturing cost. The jhupri (2.0%) is still found both in urban and rural area.

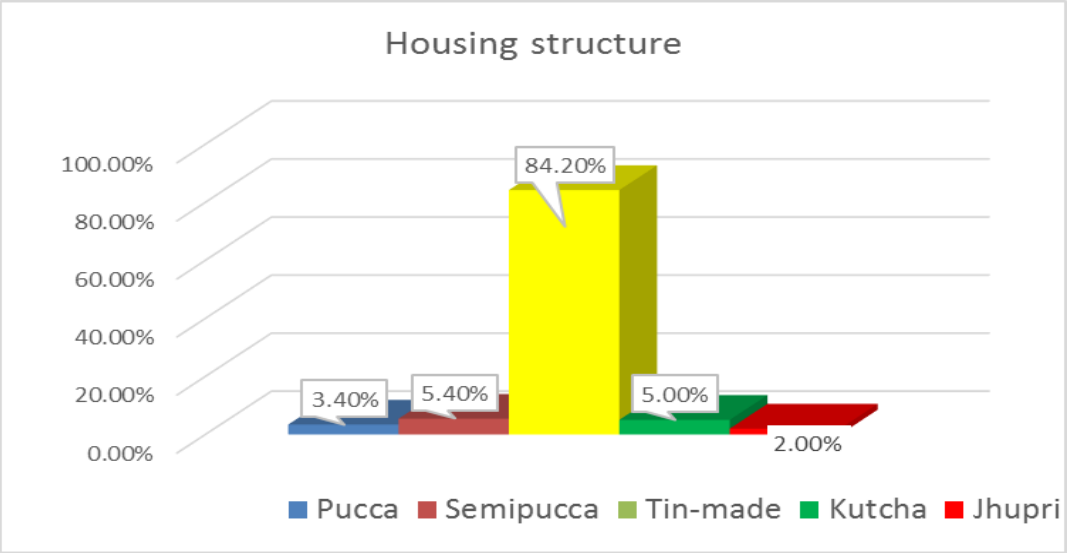


Table 88: Distribution of percentage by types of structure of residence

11.2.13. *Housing Tenancy*

Almost 97% dwellers of this area reside in own house and only 2% people reside in rented house. Homeless people are very rare in this area and only one in hundred resides in rent-free house.

11.2.14. *The affected structure*

Table 89: Affected structures status

Name of Structure	Number	Volume	Unit	Name of Structure
Residence	58	17804	sft.	Tin-made (95%)
Kitchen	55	4118	Sft	Tin-made (35%)
Tube-Well	3	6	Nos.	Deep Tube Well
Cow Shed	34	3662	Sft.	Katcha (98%)

It will not be possible to avoid physical and economic displacement from the proposed area. People have to move their structure. It is appeared from the survey that 58 families live here permanently. Generally each household own one tin-made residence, one katcha kitchen. 34 families have cowshed it seems 60% family rear livestock. 6 nos. DTW need to be shifted if the project is implemented. The total volume of the structure is given in above **Table** which need to be compensated. The people want to relocate same vicinity. In the following picture; a typical housing structure is given below.

Figure 84: A typical housing structure in project area

11.2.15. *Land acquisition*

A total 328.51 Acres will be acquired following law of the land. The detailed of project area land acquisition is given in **Annexure 15.19**. The Proposed Acquired Land and Name of Titleholders

11.2.16. *Water and Sanitation*

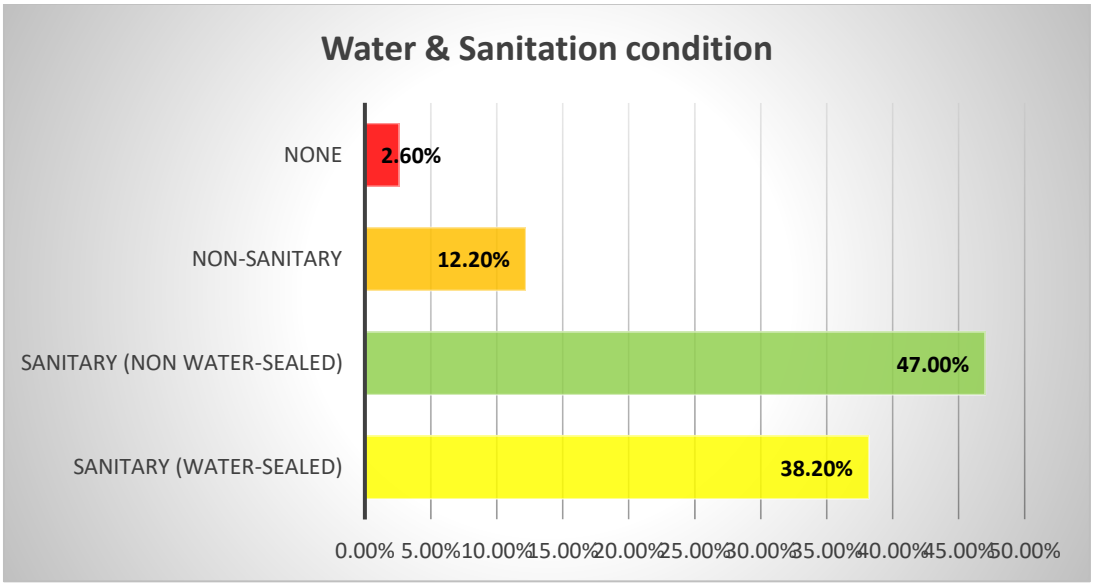


Table 90: Sanitation status

The sanitation system is satisfying in the impact influencing zone (Agailjhara Upazila), the majority 85.20 percent of household use sanitary latrine (water sealed 38.2% + non water sealed 47.0%). Some 12.2 percent people use non-sanitary latrine or kutcha latrine which is far below than national figure (35.1%); though it is not expected so many non-sanitary latrine in the modern era. People should give more importance on sanitation day by day;

the cent percent sanitation program is on in our country; hope the situation will be much better in the coming days. Still there is 2.60% HHs have no toilet facilities. (Source: Census, 2011, BBS)
According to Figure, 88.0 percent households' member of project influence zone drinks tube-well water followed by other water 11.7% (The other source means well, Pond, River, Ditch, Canal water etc., Source: Census, 2011, BBS). The facility of tap water is found basically confined in the urban area. The use of tube-well water is decreasing in urban in the last decade.

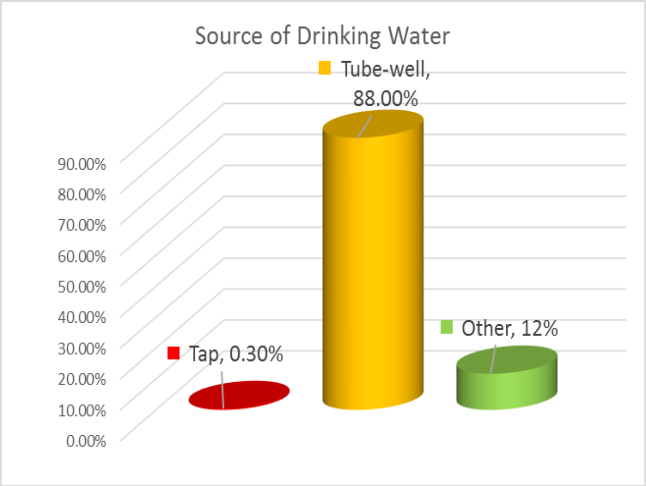


Table 91: Distribution of percentage by sources of drinking water

But Tube well is the major source for drinking water in the project area. 99.1% general households get the facilities of drinking water from tube-well and the remaining household get water from well, Pond, River, Ditch, other sources.

11.2.17. *Electricity*

Electricity is an important indicator for measuring the quality of life in the Study area. In the project study area, only 49.6% of the households have grid electricity connection. However, households mostly use the electricity for lighting and fanning purposes. Kerosene still occupies second position. No people/Household found use Bio-gas. (Source: population and housing survey, BBS 2011)

11.2.18. *Transportation*

In the project area; Metaled, Semi metalled, Unmetalled (kacha) road is 589 Kilometer. Total Railway (all broad gage, meter gage and duel gage) is 0 kilometer. Water way in monsoon (river + canal) is 182 Kilometer. Water way round the year (river + canal) is 182 Kilometer. Embankment road, Canal, Others are 207 kilometer.

Rural road communication has been improving and it becomes the main communication system now. Taxi, auto-rickshaw, Nochimon/korimon/bhotvoti are important mode of transport from Upazila to unions. Waterways still remain important mode of communication.

Connectivity with proposed area:

Road connectivity: The Proposed EZ is connected with Dhaka and other parts of the country through road network. Once Padma Bridge is operational, direct road access would be established between the proposed EZ and Dhaka.

Rail connectivity: No prevailing rail network in Barishal District. The nearest railway station is Khulna railway station, which located at a distance of 94 km from the proposed EZ.

Air Connectivity: The proposed EZ is located at a distance of approximately 45 km from Barishal domestic airport and can be accessed via Agailjhara – Kotalipara road (Z8031) and Dhaka – Barishal highway (N8).

River Port Connectivity: The major feature of the proposed EZ is its proximity to the Barishal river port. It is the second largest river port in the country, and it is located approximately 45 km from the proposed EZ. However, the transport of cargo is still restricted to use by the Government departments and some private entities.

Sea Port Connectivity: Mongla Sea port is the nearest port to the project EZ site at a distance of 110 km. Project site is land locked and access to these seaports is achieved only through roads and the river port at Barishal.

Land Port Connectivity: Bhomra land port, located at a distance of 160 km and Benapole land port, located at a distance of 185 km from the EZ location. These land ports are at considerable distances from the proposed

EZ, thus causing impact of lead time making transfer of raw materials or finished goods alike difficult to be transported to India, one of the major trade partners of Bangladesh.

11.3. Stakeholder Consultation

In order to carry out SIA, stakeholder consultation was conducted to assess opinion of local people who will be impacted due to project intervention. Consultations were conducted arranging 5 sessions of Focus Group Discussions (FGDs) with local people for assessing their opinion and to share their experiences. Ten Key Informant Interviews (KIIs) were conducted to explore the views of the informants. Consultations were carried out with different stakeholders like Local Government Representatives; local influential people, business community, women group etc.

11.3.1. Objective of Public Consultation

- Learn about the present socio-economic conditions of the study area and its existing scenario, problem, prospect and improvement.
- Try to build up awareness among the local people and society members about the project, its nature and implementation process.
- Encourage the local community to participate in the planning and implementation process.
- Identify and mitigate conflict of interest among the groups;
- Learn about people's participation on the impact of proposed interventions.
- Obtain people's suggestions on the enhancement measures of the positive impact; and identify solutions to the apparent problems related to the project and ideas on mitigating the negative impacts.

11.3.2. Approach of public consultations

A participatory approach was followed for conducting public consultation meetings. The consultant used checklist for conducting the meetings to maintain consistency and relevancy in discussion and recorded the views and perceptions of the participants properly. Socio-economic and some environmental issues were discussed in detail, including potential impacts of the interventions on environmental and social parameters.

11.3.3. Summary of Comments by Participants

- Since it is not possible to avoid the displacement. So the permanent settlers (58 no. families) want resettlement village before land acquisition taken place and they would prefer to stay within close to project area.
- Local people have willingness to move from proposed area for the economic -zone if the fair compensation is provided.
- There shouldn't be any delay in compensation for their lost assets (land, housing and commercial structure and secondary structure).
- Since 58 families would lose all the agricultural land along with their homestead, they also desire provision of agricultural land when resettled.
- The land owners who live outside the proposed area need to be compensated well ahead of time and no harassment is expected to get compensation from concern DC office.
- Design for a sustainable livelihood restoration program who will be suffered any economic displacement resulting from the Project, whether permanent or temporary, will be restore in a responsible manner.
- People whose lands are getting affected should be provided the scope of cultivation as long as the lands keep idle.
- Some affected people wanted to continue to work as self-employed. To be self-employed, they require training. The major interest sectors are Agriculture, Domestic Animal Bearing, Sewing and Garment Clothing, Fish Cultivation, Poultry, Crab Cultivation, Motor Cycle Driving, Mobile Repairing etc.

- The affected people do not want to change their current livelihood style. Generally, the lowest-risk option will be to re-establish the existing livelihoods of the affected people, so that they can continue doing what they know best and what is known to work in the local situation.

Figure 85: Public consultation with affected people

- In terms of livelihood replacement, the substitution of a new type of livelihood (for example doing business) for an existing one (for example farming) should only be considered when there is no feasible way of restoring the existing means of livelihood.
- Local people should be given preference during recruitment in civil work of different project implementation activities.

11.4. Livelihood Restoration and Training

The aim of this section is to provide a detailed plan to provide livelihood restoration strategy and options for the people affected due to land acquisition for Agailjhara EZ Project and Identify feasible livelihood restoration options and alternative economic activities that can be facilitated.

This proposed Economic Zone requires 300 acres of land from private owner. Both physical and economic displacement couldn't be avoided. There are 58 HHs (258 people) need to be physical displaced but there is no exact information of how many people or households were economically displaced as many land owners live outside the proposed site. For livelihood restoration, the project is concern who will be economically displaced

11.4.1. Livelihood feature of existing community

The occupational status of pre-displacement of PAPs are very common like traditional rural Bangladesh. It is evident from the survey that the livelihood of displaced people (80%) were agricultural activities and the second major profession was wage laboring that constitute 7%. The occupational variation was very minimum.

Main Occupation (Male)	%	Main Occupation (Female)	%
Farming (agriculture & fish culture)	75	House wife	90
wage Labor	7	Poultry	8
Service/Job (Private/ Govt.)	3	Handicrafts	2
Business	6		
Others (Rickshaw /Auto van driver etc.)	5		
Total	100%		100%

Women work force are confined in household activities inside the domestic level.

There is long term effect on occupation replacement and it is not easy to change lifetime earning pattern and people don't interest to change their set profession. Initially this change was stressful as it was involuntary.

11.4.2. *Potential Scope of alternative Livelihood*

Every area has some livelihood opportunities that local people may enjoy or capitalize for their well-being. Currently these are predominantly associated with Business, poultry rearing, cow rearing, Fish/crab farming, mobile repairing and auto/car driving.

Business plays a major role in urban area and makes important impacts on livelihoods. It also plays a vital role in-term of self-employment; enhance well-being because it has become the only source of income to those who are not able to secure a space in the limited formal jobs. Even Small business is truly a poverty reduction strategy in this area. The major challenge that could come to one's mind about establishing a business is finance and experience.

11.4.3. *Need assessment for training*

It is now widely accepted that promotion of large number of livelihoods required to develop practical skills. Almost 74% respondents called for training. They require the training from two points of view;

1) To increase skill for better performing of existing livelihood; and

2) To involve in alternative livelihoods.

In terms of livelihood replacement, the substitution of a new type of livelihood (for example doing business) for an existing one (for example farming) should only be considered when there is no feasible way of restoring the existing means of livelihood. Then he needs training how to run a business, just to know very basic skill for doing business.

People are interested to get training on different skill. The list of training is very limited and most of them are related to traditional rural profession. The following list show the name of training they wanted to be trained-

Name of Training

1. *Training on domestic animal Farming*
2. *Training on business management*
3. *Training on Fish farming*
4. *Training on Poultries*
5. *Tailor training*
6. *Training on crab farming*
7. *Mobile servicing*

In the Agailjhara EZ, the economic displaced people can be easily restored as the scope is enough. Mitigation measures will be planned to take account of each individual situation, and not aggregate measures of economic benefits. It will be better to restore of existing livelihoods, and intensify existing livelihoods. In terms of livelihood replacement, the substitution of a new type of livelihood for an existing one should only be considered when there is no feasible way of restoring the existing means of livelihood.

Budget for Training

A lump-sum budget (BDT 30,00,000.00) is allocated for livelihood restoration training. This budget will be distributed equally among the following seven types of training course e.g., 1) Training on domestic animal Farming, 2) Training on business management, 3) Training on Fish farming, 4) Training on Poultries, 5) Tailor training, 6) Training on crab farming, 7) Mobile servicing.

Capital Requirement for Running a Business

Respondents were asked how much money is required to start a business at minimum scale whether it is poultry farming or small business. Though the amount is depending to the types and scale of the business. They informed that hundred thousand (one lakh) is the minimum and ten lacks is maximum. Seven out of ten respondent need capital for running alternative livelihood or IGA.

11.5. Mitigation and Management Measures

1) Land Acquisition and Requisition

a) 300 acres land will be required which is publicly owned should be appropriately compensated to at least market rates and/or in accordance with policies of the Government of Bangladesh.

b) There shouldn't be any delay in compensation for their lost assets (land, housing, tree and commercial structure etc).

c) The affected land owner should be provided the scope of cultivation as long as the lands keep idle after acquisition of land.

d) If land for land compensation is possible then it if preferred by PHPs

2) Relocation or Rehabilitation Site

a) Every displaced household (here 58 HHs/families) should be given housing structure with legal document of land and structure;

b) Relocation/rehabilitation site should be developed before dismantling the structure;

c) Necessary civil amenities (access road, playground, mosque/mandir, community center, electricity, water and sanitation facilities) should be provided to Relocation site.

3) Livelihood Disturbance or Economic Displacement

a) Mitigation measures will be planned to take account of each individual's livelihood situation, and not aggregate measures of economic benefits. It will be better to restore of existing livelihoods, and intensify existing livelihoods.

b) Eligible members of affected households losing income permanently will get training on income generating activities (IGA) such as Small Business, Poultry Rearing, Domestic Animal rearing, Cow Fattening, Tailoring, Car/Auto/Motor Cycle Driving, Mobile Repairing etc.

c) Local people (PAPs), whose livelihood were affected by the project, will get preference in jobs associated with the project construction. BEZA will facilitate the affected people to form Labor Contracting Society (LCS) with assistance from the IA. The civil works contractors will hire local laborers through the LCSs. Affected persons will get preferential employment in project works based on their age, education and skills.

d) The project will provide capacity building training for women focusing on IGA and encourage them to engage in such activities. The project will try to link interested women with financing agencies for financial assistance.

11.6. Resettlement cost/Budget

The budget includes compensation for land and structures at replacement cost, compensation for trees, structures, fish stock, grants/benefits for loss of business, wage income and vulnerability. The budget also kept provision extra grants for livelihood restoration.

Figure 86: Resettlement cost/Budget

sl. no	Category of Losses	Amount	Market Value	As Per ARIPA 2017	Total (BDT)
1	Compensation for land	300 acres	77,75,30,776.00	3 Times	2,332,592,328.00
2	Compensation for structure	32000 square feet (177 nos. structure)	2,25,00,000.00	2 Times	4,50,00,000.00
3	Compensation for trees	More than 20000 nos. trees	8,11,91,200.00	2 Times	162382400

sl. no	Category of Losses	Amount	Market Value	As Per ARIPA 2017	Total (BDT)
4	Compensation for fish stock	50 ponds	5,00,000.00	2 Times	1000000
5	livelihood restoration		30,00,000.00	lump-sum	3000000.00
6	Other resettlement benefits		10,00,000.00	lump-sum	1000000.00
				Total	**2544974728.00**

In words: BDT. 2544.97 million

12. Environmental Review

12.1. Introduction

Over the last few decades, Asian economies have been witnessing robust growth and gradually shaping up as the engines of economic activity. South Asian nations such as Vietnam, Thailand, Indonesia and Malaysia have been creating their place in the global map by various proponents of economic proliferation such as easing up FDI rules, increased ease of doing business, and creating specialized industrial corridors and manufacturing parks. Bangladesh has also demonstrated steady growth in the past. With constant price Gross Domestic Product (GDP) growth rate ranging over 6% in the last decade, the country has graduated from Least Developed Country (LDC) status. Bangladesh is gradually progressing to achieve middle-income economy status by 2021 and developed nation status by 2041. With the vison of improving the economy of the country and generating livelihood for the burgeoning populace, Government of Bangladesh (GoB) has also ushered in the era of organized industrialization by following the footsteps of other South Asian economies.

GoB has laid down an aggressive plan to boost the competitiveness of the nation with respect to other economies in the region through organized industrialization. The journey of this reform commenced with the regime of export processing zones (EPZs) – an institutional change in the approach to organized manufacturing. Advent of EPZ regime coupled with the cost-friendly pool of human resources positioned Bangladesh in the global map as the hub of readymade garments (RMG). EPZ regime also fostered foreign investment in the country especially in textile and RMG sector.

With time, the government decided to move from the typical EPZ regime and envisioned setting up economic zones (EZ) instead. The motive behind this shift was the inclusive nature of EZs that would promote inclusion of local supply chains and domestic manufacturers, thus enabling a deeper rooted and inclusive growth for the economy in general.

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. As part of this endeavor, BEZA intend to undertake environmental assessment studies of economic zone located at Barishal.

12.2. 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 analyze 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)

12.3. Methodology of Environmental Assessment

A wide range of environmental issues including physical, chemical, biological, socioeconomic, cultural, landscape values are considered in the environmental review processes using methods and techniques to quantify or to qualify those changes to identify the problems, assess negative impacts and recommending integrated environmental management plan for anticipation and mitigation of the potentially harmful or adverse changes and finally ensuring the proposed measures through monitoring.

Since identification of the probable adverse impact on surrounding socio-cultural and environmental situation including its magnitude, geographical extension of that impact, duration and frequency, the degree of reversibility, auditing probability of occurrence are critical for, all the issues were addressed in the current environmental review study.

The methodology for the environmental review of the proposed site are:

- Identification and review of applicable local, state, national and international environmental and social regulatory and institutional frameworks;
- Establishment of baseline conditions of the site and surrounding area through the following:
    - Detailed surveys to observe environmental and social characteristics of the project area;
    - Discussions with the stakeholders and identification key issues during planning, construction and operation phase of the project;
    - Baseline data collection of the site and project area with respect to water, ambient air and noise quality etc.
    - Ecological assessment on flora and fauna of the site and project area through secondary data collection.
    - Assessment of the socio-economic environment through collation of secondary information of the site, supplemented by consultations with the local communities to understand community perception with regard to the project and its activities;
- Impact Assessment and Mitigation Measures for environmental and social components for preconstruction/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.

12.4. Overview of Environmental Legal, Regulatory and Policy Requirements for the Project

12.4.1. Policy, Legal and Administrative Framework

This chapter provides a description of the regulatory framework applicable to the Barishal Economic Zone. It highlights environmental, health & safety and social regulations with applicable permits and standards in association with the Project. 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 below.

It broadly focuses on the:

- Legal Enforcement Agencies at National Level;
- Applicable national and local Environmental and Social Laws, Regulations and Policies;

- World Bank Environmental Safeguard Policies and expected trigger ability;
- World Bank (WB) Environmental Impact Assessment Guidelines;
- International & National Environment Standards/ Guidelines; and
- Applicable International Conventions/Protocols.

Bangladesh is a developing country particularly vulnerable to environmental change. Poverty, growth and environmental sustainability are bound together in Bangladesh. Half of the population depends on an over exploited and degrading natural resource base. Industrial urban growth is improving livelihoods, but already there are serious threats to environmental and human health because of inadequate attention to the environment and sustainable development. Bangladesh has been experiencing degradation of the natural environment for decades in terms of deforestation, river erosion, soil quality depletion, water and air pollution, poor solid waste disposal practices, pollution from chemical fertilizers and pesticides, biodiversity loss and urban congestion. On the top of all these, climate change impacts may lead to devastating flooding, impacting the environment and people.

Bangladesh's constitution is the supreme law of the country, and Article 18 A ensures environmental protection and pursuit of sustainable development. The Article 18 states that "The State shall endeavor to protect and improve the environment and to preserve and safe-guard the natural resources, biodiversity, wetlands, forest and wildlife for the present and future citizens". The pursuit of sustainable development is, therefore, a Constitutional obligation in Bangladesh.

In late 1980s, the Government started to attach increased importance to environmental issues. Creation of a separate Ministry of Environment and Forests in 1989 and restructuring and expansion of the DoE are the major Government initiatives.

The Ministry of Environment and Forest is responsible for control and abetment of water pollution comes under the jurisdiction of DoE with in the Ministry of Environment and Forest (MoEF). The MoEF is the principal Government institution dealing with the environmental issues in Bangladesh. It is the final arbitrator for all the matters relating to National Environmental Policy and regulatory issues. It was created with stated goal to play a key role in planning, reviewing, monitoring and environmental initiates and ensuring that environmental concerns were properly integrated into national development process. It has a jurisdiction over the activities of the following technical/implementing agencies under it: DoE, Department of Forests, Bangladesh Forest Industries Development Corporation, and Bangladesh Forest Research Institute.

12.4.2. *Environmental Clearance Procedures*

The Environmental Conservation Act's (ECA) Rule (ECR) provides a basic framework for environmental evaluation of the Project, and establishes procedures. Accordingly, the Project proponent should first obtain a location clearance and conduct the appropriate study to obtain environmental clearance of the Project. Any project constructed in Bangladesh must obtain an Environmental Clearance Certificate (ECC) before construction can begin.

Rule 7 of the ECR provides a list classifying many types of projects into the following four categories based on the site conditions and the environmental impacts recorded for past and similar projects. The categories are: Green, Orange A, Orange B and Red. Various industries/projects falling under each category have been listed in Schedule 1 of the ECR. According to the Rules all existing and proposed industrial units and projects falling in the green category are exempted from EIA. However, Category Orange A and B and for Red Projects require location clearances referred to No Objection Certificate, followed by issuing of ECC upon the satisfactory submission of the required documents to DoE.

For getting location and environmental clearances, BEZA must submit to DoE Form-3 as per the rules given in the ECR (Figure 91 and Figure 92). The form must be accompanied with the following documents:

- Application through prescribed form-3 under ECR 1997
- Fee under the schedule of ECR 1997 (Amended in 2002)

- Feasibility Study for the Project
- EIA as per the Terms of Reference Provided by the DoE
- EMP for the Project (included as part of the EIA)
- No Objection Certificates (NOC) from the Local Authorities.
- Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution
- Outline of Relocation and rehabilitation plan (from RP document)
- Other necessary information (based on the type of the project)

The ECC is valid for one year and will be sought for seven of the eight components of the Projects, which come under the Red Category. The environmental clearance process as per the DoE, Ministry of Environment and Forests, Government of Bangladesh is shown in Figure 95.

The document is the detailed EIA and includes the EMP, as defined above.

Under the ECR1997, once the EIA has been filed, DoE has 60 days to respond with its review comment, and approval. Submission of any further materials would be carried out, as per requirement of DoE in order to obtain the ECC. Steps to be followed for obtaining the ECC for this railway Project are shown in Figure 81. Additionally, a flow diagram detailing the steps for obtaining an ECC is shown in Figure 82.

Figure 87: Government of Bangladesh Environmental Assessment Process (the IEE step does not apply to the Project)

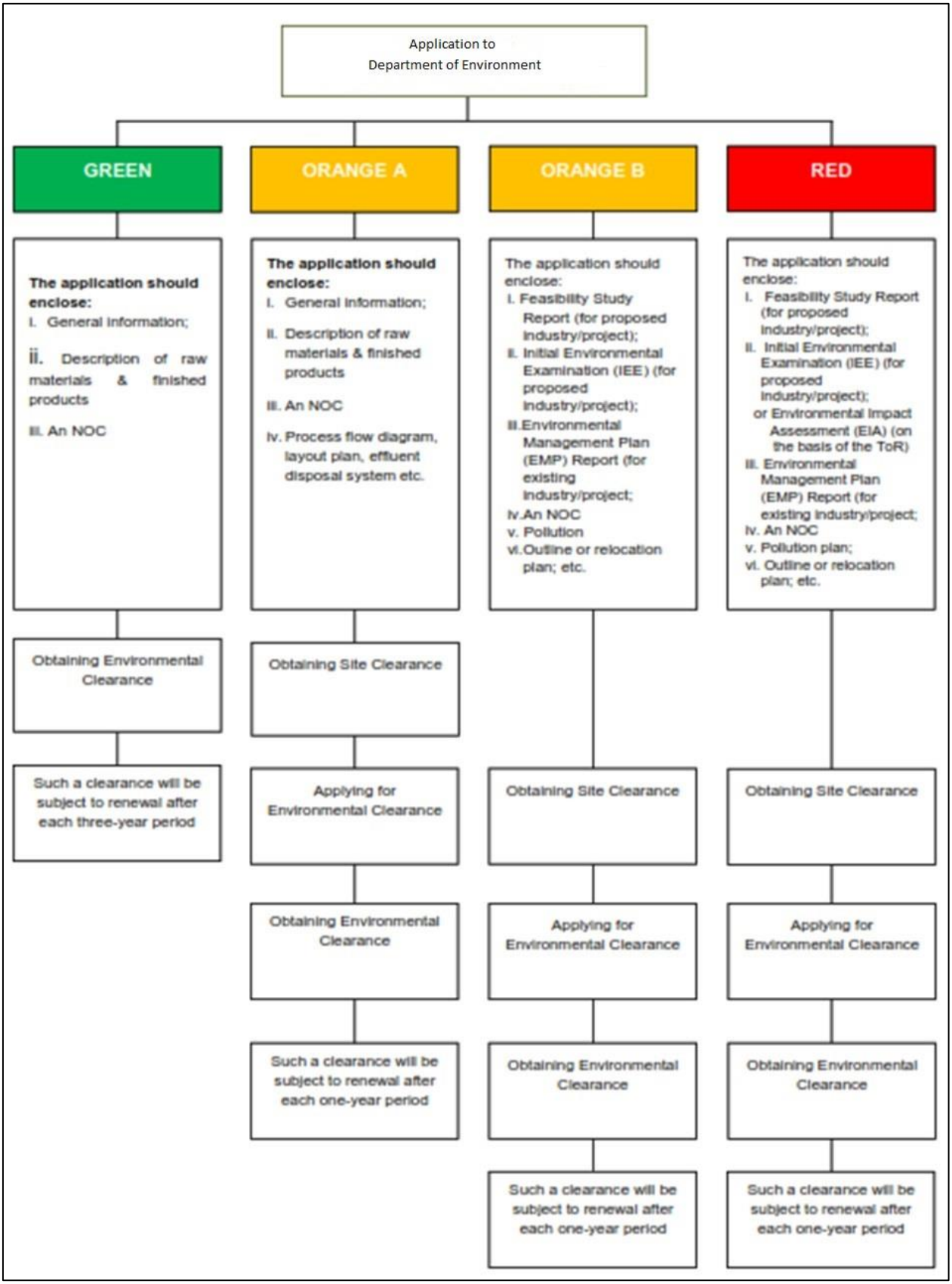
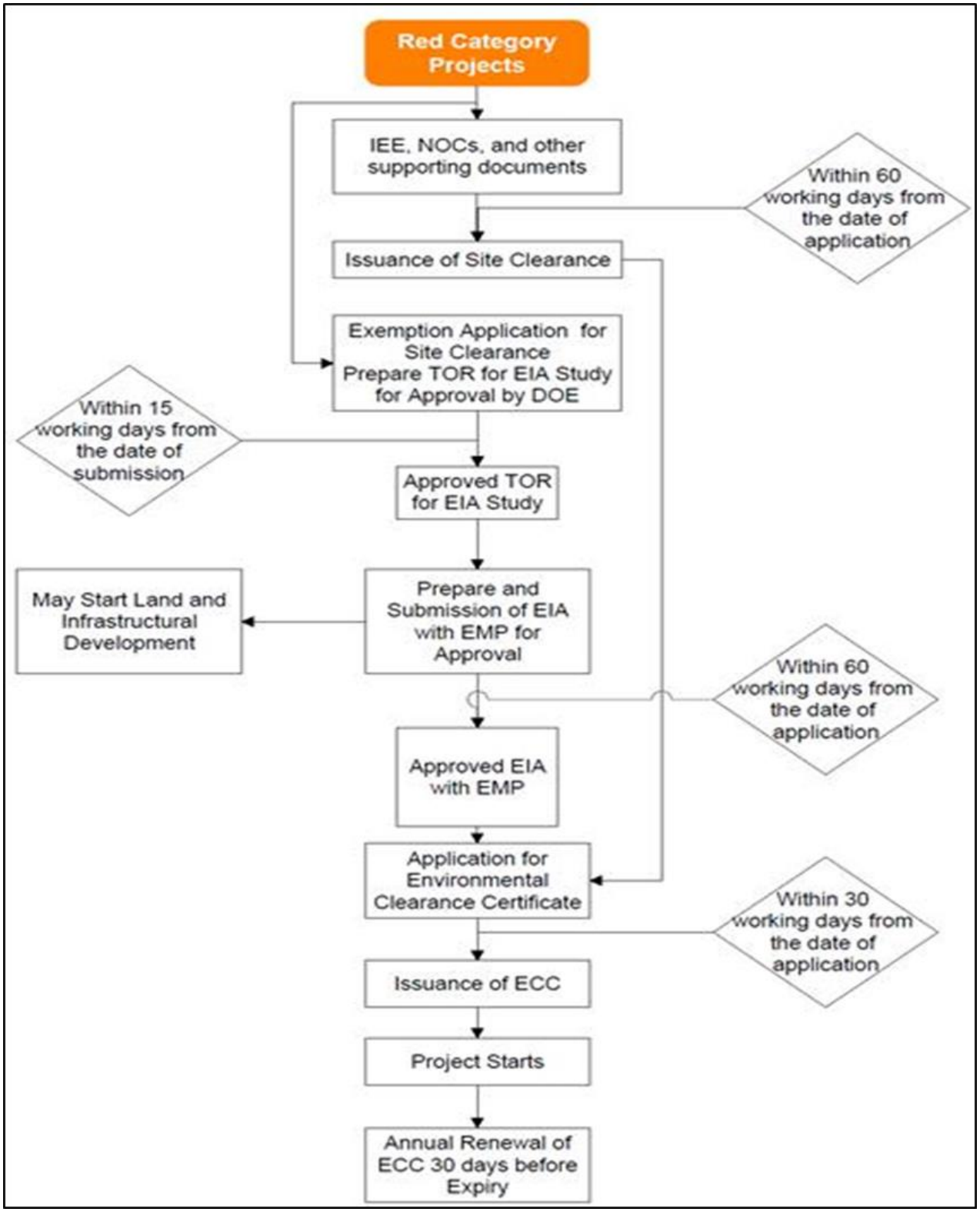


Figure 88: Process for Obtaining an Environmental Clearance Certificate of Red Category Project



12.4.3. *Applicable Environmental and Social Laws, Regulations and Policies*

In addition to the ECA 1995 and ECR 1997, there are a number of other policies, plans, and strategies, which need to be considered in the Project. A summary of relevant national legislation is provided in Table 98.

Table 92: Applicability of Key National Environmental Legislation

Name	Key Requirement	Applicability	Remarks
Acts/Rules			
The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002 and 2010)	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.	Applicable. The project is classified under red Category. EIA study is required to be undertaken	Site approval certificate is to be obtained from DoE
Environment Conservation Rules, 1997 (Subsequent Amendments in 2002 and 2003)	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.		

Name	Key Requirement	Applicability	Remarks
Environment Court Act, 2000 (subsequent amendments in 2002)	To give high priority to environment pollution prevention	Applicable as the project shall have environmental impacts	All the developments to be carried out as per ECA, 1995 & ECR, 1997 and amendments.
The Private Forests Ordinance Act, 1959	Conservation of private forests and for the afforestation on wastelands.	Applicable as the tree cutting is involved in development of off-site facilities	Tree cutting to be carried out after taking permission from Regional Forest Officer, Forest Department
The Protection and Conservation of Fish Act, 1950 and subsequent amendments in 1982	Prohibit or regulate the construction, temporary or permanent of weirs, dams, bunds, embankment and other structures	Applicable. The project involves construction of boundary wall and other structures.	Necessary permission would need to be taken for construction of boundary wall and other structures
Water Pollution Control Ordinance 1970	Prevention of water pollution	Applicable from the prospective of prevention of pollution	Applicable during both construction stage (e.g. sewage and equipment washing and maintenance liquid waste discharges at construction camps) and operation phase
The ground Water Management Ordinance 1985	Management of Ground Water Resources. Tube well shall not be dug in any place without permission from Upzilla parishad.	Applicable. 3-4 nos. bore wells will be dug to develop water supply system during initial phase	Permission should be taken before digging tube wells
The Embankment and drainage Act 1952	n Act to consolidate the laws elating to embankment and rainage and to make better ovision for the construction, naintenance, management, removal and control of embankments and water urses for the better drainage of lands and for their otection from floods, erosion nd other damage by water.	Applicable. The project proposes construction of boundary wall and drainage system.	Regulatory authority Ministry of water Resources and FCD

Name	Key Requirement	Applicability	Remarks
Wetland Protection Act 2000	Adhere to a formal environmental impact assessment (EIA) process, as set out in EIA guidelines and manuals for water sector projects or related to alteration of natural drainage. No construction of roads if likely to effect the flow of navigable water ways without clearance from concerned authorities Upland flow in water channels to preserve eco-system Protection against degradation and resuscitation of natural waterbodies such as lakes, ponds, beels, khals, tanks, etc. affected by manmade interventions or other causes. Completely stop the filling of publicly-owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. Stop unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land	Applicable. The proposed site is located in low lying area	Permission to be taken from the Ministry of water Resources and DoE
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

Name	Key Requirement	Applicability	Remarks
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 Labour Law 2006, amendment 2013 Bangladesh Labour 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 labour
Policies			
National Environment Policy, 1992	For sustainable development	Applicable for all development projects	Usage of energy efficient building material, fuel etc. should be encouraged
National Environment Management Action Plan 1995	Conservation of natural habitats, bio-diversity, energy, sustainable development and improvement of life of people	Applicable for all development projects	Usage of energy efficient material, green building techniques, reduction of carbon foot prints etc.
National Conservation Strategy	Sustainable development of Industrial Sector	Applicable for all development projects	Usage of energy efficient material, green building techniques, reduction of carbon foot prints etc.
The National Energy Policy, 1995	Protecting the environment by requiring an EIA for any new energy development project, introduction of economically viable and environment friendly technology.	Applicable. EIA study is to be carried out	Energy efficient materials and techniques should be explored

Name	Key Requirement	Applicability	Remarks
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
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.

The key permits required to be obtained by BEZA for the construction and operations of the proposed power plant are set out in the following table.

Table 93: Key Permit required to be obtained by BEZA

Permit	Permitting Authority	Relevant Legislation	Role of Permit
Permission for Construction of a Building (construction of	Authorized Officer or Committee	The Building and Construction Act, 1952	Authorization to construct the proposed Project
Location Clearance Certificate (for establishing the	Director General, DoE	Environment Conservation Rules, 1997	Authorization to construct the proposed Project

Permit	Permitting Authority	Relevant Legislation	Role of Permit
Environmental Clearance Certificate	DoE, Bangladesh	Environment Conservation Rules, 1997	Authorization to set up the plant with limited environmental effects of development and operation of the proposed Project.
Installation of a tube - well	Ministry of Environment and Forests, Bangladesh Union/ Upazila Parishad	Ground Water Management Ordinance 1985	Installation of tube in any place.
No Objection Certificate from Union Parishad	Union/ Upazila Parishad	Environment Conservation Rules, 1997	A consent in form of NOC from respective Union Parishad
Approval of Plans and registration of the proposed Project	Chief Inspector	The Factories Act, 1965	Approval of plans and specifications of the Project.

12.4.4. *Applicability of IFC Performance Standards*

The IFC Performance Standards stipulates that any proposed Project shall meet the following requirements throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety, and Security;
- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts.

12.4.4.1. *Performance Standard (PS) 1: Assessment and Management of Environmental and Social Risks and Impacts*

PS 1 establishes the importance of:

- Integrated assessment to identify the environmental and social impacts, risks, and opportunities of Projects;
- Effective community engagement through disclosure of Project-related information and consultation with local communities on matters that directly affect them; and

- The Project Proponent's management of environmental and social performance throughout the life of the Project;
- PS 1 is applicable to all Projects and associated facilities having environmental and/or social risks and/or impacts. Some of the key environmental and social impacts that the proposed Project can be associated with:
- Disposal of Dredged material (particularly if the sediments are contaminated and accumulation of hazardous materials;
- Air emissions in terms of ship's propulsion, engines, fuel storage and transfer (release of SO2, NOx and Volatile Organic Compounds);
- Emission of dust from dry bulk material storage and handling facilities;
- Discharge of various type of effluents into river-sewage from ship operations, bilge water, vessel cleaning water.
- Management of solid waste generating from ship activities and hazardous material;
- Land acquisition and possible resettlement of local population; and
- Loss of livelihood of local population due to Project operations etc.

Box 1: Applicability to PS1

PS 1 is applicable for the Project and an Environmental and Social Impact Assessment (EIA) study needs to be conducted prior to the commencement of the Project. BEZA also needs to develop and implement an Environmental and Social Management System (ESMS) to manage the identified risks associated with its operations during construction and operation phase of the Project.

12.4.4.2. *Performance Standard 2: Labor and Working Conditions*

PS 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. The objectives of the PS 2 are:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers;
- To establish, maintain, and improve the worker-management relationship;
- To promote compliance with national employment and labor laws;
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain;
- To promote safe and healthy working conditions, and the health of workers; and
- To avoid the use of forced labor.

The applicability of PS2 will be more important during the construction phase as operation phase will have lesser number of staff. This PS covers not only the main plant employees, but all employees/workers, even indirect workers working through contractors. Migrant workers will be engaged for the Project and they will be provided accommodation in labour camps. Hence, standards pertaining to campsites will be applicable.

Box 2: Applicability to PS2

PS 2 are applicable to the Project and BEZA shall ensure provision of adequate facilities such as access to clean water, sanitary facilities and other necessary facilities at the construction sites. BEZA shall ensure measures to prevent child labor, forced labor, and discrimination are strictly implemented. Freedom of association and collective bargaining shall be provided. Wages, work hours and other benefits shall be regulated as per the national labor and employment laws.

12.4.4.3. *Performance Standard 3: Resource Efficiency and Pollution Prevention*

The PS 3 outlines approach to pollution prevention and abatement in line with internationally disseminated technologies and practices with the following objectives:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities; and
- Promote the reduction of emissions that contribute to climate change.

Box 3: Applicability to PS3

The impacts and risks associated with the generation, use, storage, release, and/or disposal of pollutants has been assessed as part of this EIA. BEZA shall ensure implementation of the mitigation measures provided in the ESMP. BEZA shall also ensure that pollution control measures are planned and implemented right from the Project conception stage. Practices like minimal release of waste/emissions, safe disposal of waste, waste water management etc. shall be considered prior to each Project phase. PS 3 is therefore applicable for the proposed Project.

12.4.4.4. *Performance Standard 4: Community Health, Safety and Security*

PS 4 recognizes that Project activities, equipment, and infrastructure can increase community exposure to risks and impacts. Its main stress is to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

Box 4: Applicability to PS4

The Applicability of this PS has been extended to construction as well as operational phases of the Project. It will be associated with unloading and loading of activities of different industries, movement of vehicles, noise generation, etc. Community health and safety consideration related to the Project has been addressed while assessing the environmental and social risks and impacts. Security staff will be engaged form local community whereas labor engaged will be both local as well as migrant.

A stakeholder engagement process has been formulated as a part of community engagement requirements consistent with the requirements of PS 1 including the informed consultation and participation process of Affected Communities. It will also include dissemination of information pertaining to security arrangements to workers and community. Also, BEZA will construct and operate the structural elements of the Project in accordance with GIIP taking into consideration safety risks to the affected community.

12.4.4.5. *Performance Standard 5: Land Acquisition and Involuntary Resettlement*

PS 5 recognizes that Project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Its main aim is to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by providing compensation for loss of assets at replacement cost and ensuring that resettlement activities

are implemented with appropriate disclosure of information, consultation, and the informed participation of affected persons and community.

Box 5: Applicability to PS5

Land required for the Project will be purchased through negotiated settlements between landowners and BEZA's land procurement representatives. The procured lands were reclaimed after filling it up by river sand. The land procurement will result in loss of livelihood of the landowners since the land being used for economic activities by the villagers prior to sale (as 93% of the land is used for agricultural and aqua cultural activities). There has also been physical displacement or resettlement as 7% of the procured lands were inhabited. Thus PS 5 will be applicable.

12.4.4.6. *Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources*

PS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. This standard is aimed to promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.

Box 6: Applicability to PS5

The proposed Project will involve discharge of various type of waste water generating from the production activities of different industries like sewage and ballast water, effluent chemical water, bilge water, etc. This poses risk to aquatic species (especially fishes) present in adjacent River and surrounding wetland.

BEZA shall ensure that the discharge of waste water will be undertaken only after suitable treatment of the waste and the limit of the parameters have to be within the standards prescribed by applicable national laws and international guidelines whichever of the two is more stringent. It shall ensure that indiscriminate fishing is prohibited in the Project area as mandated by the national laws. PS 6 will be applicable in addressing the aforementioned issues and managing the risks posed by such Project operations.

The details of this PS have been detailed out in the EIA study, while implementation of the actions necessary to meet the requirements of this PS shall be managed through the suggested mitigation measures. The operation phase of the proposed Project shall ensure protection of fauna and flora of the site and surroundings.

12.4.4.7. *Performance Standard 7: Indigenous Peoples*

PS 7 recognizes Indigenous Peoples as social groups with identities that are distinct from mainstream groups in national societies, and are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development.

Box 7: Applicability to PS7

Census records and public consultations indicate that there are no Indigenous populations in the study area. Thus, PS 7 shall not be applicable to this Project.

12.4.4.8. *Performance Standard 8*

PS 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their Project activities. In addition, the requirements of this Performance Standard on a Project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

Box 8: Applicability to PS8

This PS is applicable when tangible forms of cultural heritage, unique natural features or tangible objects that embody cultural values and certain instances of intangible forms of culture are impacted or are proposed to be used for commercial purposes. No such tangible forms of cultural heritage or objects were found in the Project area. Hence this PS is not applicable to the proposed Project.

12.4.5. *World Bank's Operational Policies and Guidelines*

The World Bank follows an operational policy statement (updated in February, 2011), which stipulates that all operations are carried out in an environmentally responsible manner and that Projects must comply with all local environment legal obligations and appropriate World Bank guidelines[1]. The World Bank sets out its procedures and policies with regard to conducting environmental assessments on Operational Policy 4.1: Environmental Assessment (October, 1991) and its updates and other pertinent Guidelines.

Table 94: Potential World Bank Environmental Safeguard Policies and Applicability to Project

Safeguard Policy	Requirement	Policy Triggered	Applicability/ Compliance
Environment Assessment (OP 4.1)	The Bank requires environmental assessment (EA) of Projects proposed for *Bank* financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.	Yes	This policy applies to all Projects requiring a Category (A) Environmental Assessment under OP 4.1. All environmental and social aspects included in the proposed Project are adequately examined. The Project is likely to have significant potential adverse environmental risks & impacts in its area of influence regarding the natural environment, water, land, human health and safety.
Natural Habitats (OP 4.4)	The Bank requires borrowers to incorporate into their development and environmental strategies analyses of any major natural habitat issues, including identification of important natural habitat sites, the ecological functions they perform, the degree of threat to the sites, priorities for conservation, and associated recurrent-funding and capacity-building needs	Yes	Detailed ecological study has been carried out, which is presented in Chapter 5 of the report.
Pest Management (OP 4.9)	In appraising a Project that will involve pest management, the Bank assesses the capacity of the country's regulatory	No	Project Proponent will ensure that the requirements of the operational policy will be

Safeguard Policy	Requirement	Policy Triggered	Applicability/ Compliance
framework and institutions to promote and support safe, effective, and environmentally sound pest management. As necessary, the Bank and the borrower incorporate in the Project components to strengthen such capacity.		adhered to during procurement of pesticides for the Project.	
Involuntary Resettlement (OP 4.12)	World Bank recognizes that Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out.	No	The land required for the Project has been purchased through negotiated settlements on 'willing buyer-willing seller' basis between landowners and the Proponent of BEZA. As the land purchase was registered with the land registrar of the locality and the sale deed requires a witness of a local person from the area, the land purchase process has reportedly been transparent.
Indigenous People (OP 4.10)	The Bank recognizes that the identities and cultures of Indigenous Peoples are inextricably linked to the lands on which they live and the natural resources on which they depend. Hence, A Project proposed for Bank financing must be screened for presence of indigenous people.	No	Census records and public consultations indicate that there are no Indigenous populations in the study area.
Forests (OP 4.36)	If a Project involves significant conversion or degradation of natural forests or related natural habitats that the Bank determines are not critical, and the Bank determines that there are no feasible alternatives to the Project and its siting, and comprehensive analysis demonstrates that overall benefits from the Project substantially Outweigh the environmental costs; the Bank may finance the Project provided that it incorporates appropriate mitigation measures.	No	The proposed Project does not comprise any kind of forest land.

Safeguard Policy	Requirement	Policy Triggered	Applicability/ Compliance
Physical Cultural Resources(OP 4.11)	The borrower needs to addresses impacts on physical cultural resources in Projects proposed for Bank financing, as an integral part of the environmental assessment (EA) process.	No	No such tangible forms of cultural heritage or objects were found within the Project area.
Safety of Dams (OP 4.37)	When the Bank finances a Project that includes the construction of a new dam, it requires that the dam be designed, and its construction supervised by experienced and competent professionals.	No	The Project involves the construction of dam.
Project in Disputed Areas (OP 7.60)	Projects in Disputed Areas may affect the relations between the Bank and its borrowers, and between the claimants to the disputed area. Therefore, the Bank will only finance Projects in disputed areas when either there is no objection from the other claimant to the disputed	No	The proposed Project is not situated in a disputed area. Any component likely to be financed as part of the Project is not situated in a disputed area.
Projects on International Waterways (OP 7.50)	The Bank recognizes that the cooperation and goodwill of riparian's is essential for the efficient use and protection of the waterway. Therefore, it attaches great importance to riparian's making appropriate agreements or arrangements for these purposes for the entire waterway or any part thereof.	No	The adjacent Paisarhat River is not a recognized national and/or international waterway.

12.4.6. *International Policy*

Most development projects implemented in Bangladesh have been facilitated by the financial help and technical guidance by international lending agencies. These agencies have their own environmental and social safeguard policies, design codes, standards and guidelines which must be adhered to and which this EIA comply with.

Bangladesh is a party to a large number of international conventions, treaties, and protocols related to the environmental protection and are committed to ensuring that these protocols are complied with during all development works. The applicable international conventions, treaties, and protocols (**Table 101**) are the Rio Declaration (environment and development) 1992, Convention on Biological Diversity (Rio de Janeiro) 1992, UNESCO World Heritage Convention 2011, International Plant Protection Convention 1951, Plant Protection Agreement for the South East Asia and Pacific Region 1956, Convention on Biological Diversity 1992, UN Framework Convention on Climate Change 1992, Ramsar Convention (Convention on Wetlands of International Importance especially as Waterfowl Habitat) 1971, Convention on Persistent Organic Pollutants (Stockholm) 2001.

Table 95: Applicable International Laws

International Policy	Year	Description
Convention of Biological Diversity	1993	EIA must be introduced to any proposed development projects that are likely to have significant adverse effects on biodiversity, with a view to avoiding or minimizing such effects, and where applicable allow for public participation in such procedures; and Appropriate arrangements must be introducing to ensure that environmental consequences of its programs and policies, that are likely to have significant adverse impacts on biodiversity, are duly taken into account, It is obligatory to Bangladesh as a contracting party to provide EIA of projects that are likely to have significant adverse effects on biological diversity (art. 4).
UNESCO World Heritage Convention	1975	Under the Convention, participating countries nominate sites to be included on the World Heritage List and the List of World Heritage in Danger (Danger List). Countries that are party to the Convention agree to protect listed sites within their borders and refrain from actions that might harm such sites in other countries. Currently, the World Heritage List is composed of 936 natural and cultural sites in 153 countries, and the Danger List includes35 sites from 28 countries. These are the 'Jewels in the Crown' of conservation.
Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris	1972	Convention concerning the Protection of the World Cultural and Natural Heritage was held at Paris in 1972. This convection has been ratified by 175 states. This defines and conserves the world's heritage by drawing up a list of natural and cultural sites whose outstanding values should be preserved for all humanity. Of the 730 total sites, there are currently 144 natural, 23 mixed and 563 cultural sites that have been inscribed on the World Heritage List (distributed in 125 State parties).
International Plant Protection Convention	1951	This convention was arranged at Rome in 1951. Bangladesh has ratified this convention. Under the convention, Bangladesh has to secure actions to prevent the introduction of plants pests from Project work or construction materials and to promote appropriate measures for their control. It is governed by the Commission on Phyto-sanitary measures, which adopts international standards of this measure.
Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES)	1973	Bangladesh has also ratified this Convention. It provides guidance for international cooperation for the protection of certain species of wild fauna and flora against over-exploitation through international trade.
Ramsar Convention (Convention on Wetlands of International Importance especially as Waterfowl Habitat)	1971	There are 127 Parties with 1085 wetland sites designated as Wetlands of International Importance. This is an intergovernmental treaty, which provides direction for the conservation and wise use of all wetlands and wetland habitats through local, regional, and national actions and international cooperation. The Convention includes marine wetlands (wetlands up to a depth of six metres at low tide), islands, lakes and rivers.

International Policy	Year	Description
UN Framework Convention on Climate Change (UNFCCC)	1992	UNFCCC sets out a legal framework for stabilizing atmospheric concentrations of greenhouse gases (GHGs) to avoid "dangerous anthropogenic interference with the climate system". Together with mitigation, adaptation and loss & damage as well have been adopted as policy planks to address climate change and its impacts. Because of her disadvantaged geographical location, Bangladesh is regarded as one of the most vulnerable countries in the world.
Paris Climate Conference Cop 21	2015	Bangladesh has Committed to a long -term goal of limiting warming to well below 2°C and to pursue efforts to limit temperature increase to 1.5°C. This is one of the most significant elements of the agreement; Establishes global goals for mitigation and adaptation, which ensure balance between mitigation and adaptation in the agreement; Sets out a framework for country commitments (nationally determined contributions) that will be submitted, implemented and strengthened in 5 -year cycles starting in 2020; Includes strong recognition of the value of reducing emissions through forest protection, sustainable management and restoration, and the need to scale - up finance for these measures through, inter alia, international trading of credits; Reflects a commitment towards scaled up climate finance; and Acknowledges the need to address irreversible and extreme climate change impacts. In addition to the Agreement, in the margins of the COP: Significant pledges to support action on climate change before the new agreement takes effect were made, including a new pledge of up to US$5 billion for REDD+; and The Consumer Goods Forum Co-chairs, Unilever and Marks & Spencer, unveiled their "Produce and Protect" commitment, a new kind of public-private partnership in addition to and supportive of current commitments to net zero deforestation.
Kyoto Proto col and Copenhagen Accord	1997 and 2009	To achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. To achieve such a level within a timeframe sufficient to allow ecosystems to adapt naturally to climate change. To ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

12.5. Baseline Environment

The environmental and social baseline is the existing status of environment and society around the proposed project site. It has been analyzed through assessment of environmental components like air, water, land, noise, soil, etc. and environmental characteristics like physical, biological and socio-economic components, within the 10 km radial zone of the project site. Physical environment includes topography, land, soil, meteorology, air, water, noise, etc., and the biological environment includes flora and fauna composition of the study area. Socio-economic environment of the study area includes demography, ethnicity, religion, education and employment opportunity, occupation, income, poverty, social relations, etc. Baseline environmental conditions are based on the data collected from various related agencies and the secondary documents from published sources and website. The secondary sources included: Bangladesh Water Development Board (BWDB), ENRAC's own database, Bangladesh Meteorological Department (BMD), and Bangladesh Bureau of Statistics (BBS).The environmental baseline provides the basis for assessment of impact (potential changes in the baseline conditions) due to the development of proposed Economic Zone.

Base line information of existing environment is essential to take decision regarding lay out, mitigation measures and plant operation process. Information was gathered on the existing physical environment including meteorology, geology, topography, soils, hydrology and drainage, surface water quality, air quality and noise levels. The following tables illustrate the project location and the summary of various environmental settings considering 10 km radius around the proposed Economic Zone.

12.5.1. *Physical Environment*

The physical environment is an important determinant of the environment. The term Physical Environment means the material and tangible conditions in which we live. The baseline conditions of the physical environment of the study area, in terms of meteorology, seismicity, and environmental qualities (water quality, noise quality and air quality), are presented in the following sections.

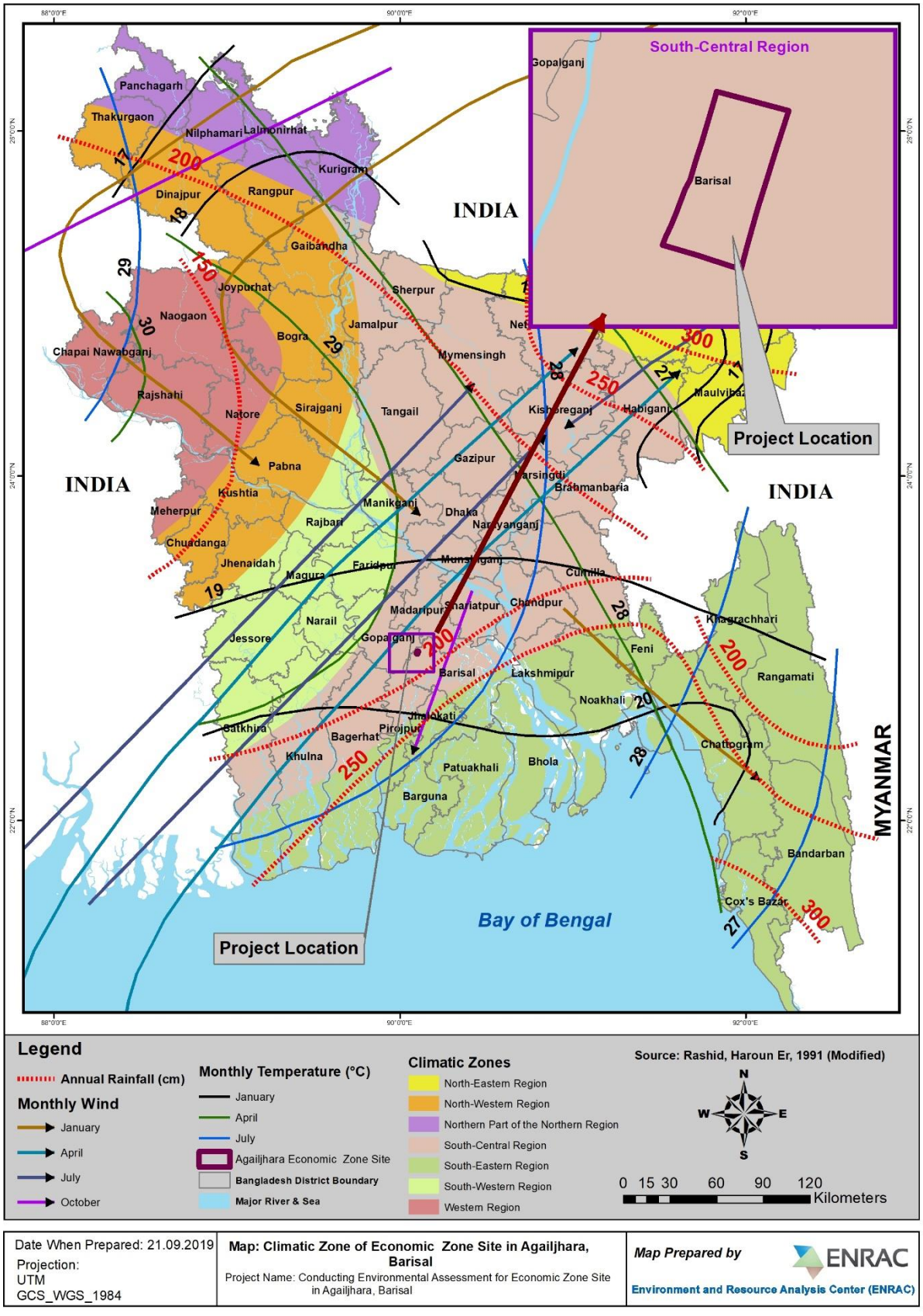
12.5.1.1. *Climatological Condition*

The entire country is divided into 7 climatic regions based on average summer temperatures and annual rainfall, these are: south eastern, north eastern, northern part of the northern region, north western, western, south western, and south central as depicted in Figure 92. In general, the rainfall increases from west to east and temperature from north to south. Higher temperatures and rainfall are observed in the south eastern region, while the western and south western region has higher temperatures and less rainfall.

Like other parts of the country, the Project area has a tropical monsoon climate with four seasons namely: the dry or winter season (December-February); the pre-monsoon hot season (March-May); the monsoon or rainy season (June-September) and the post–monsoon or autumn season (October-November).

The proposed area fall within South-central zone (Figure), where rainfall is abundant, being above 2,000 mm. The range of temperature is, as can be expected, much less than to the west, but somewhat more than in South-eastern zone. This is a transitory zone between the South-eastern, North-western and South-western zones and most of the severe hail storms, nor'westers and tornadoes are recorded in this area.

Figure 89: Climatic Zone of Economic Zone site in Agailjhara, Barishal



Rainfall and Air Temperature

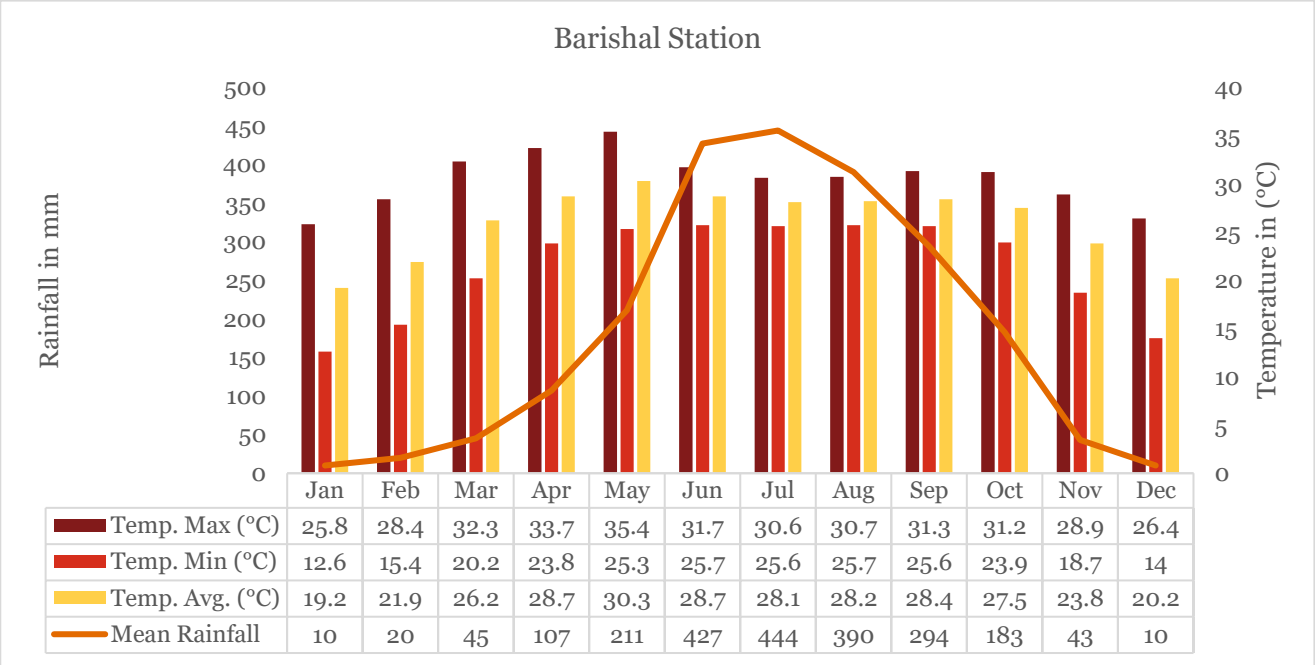
Rainfall varies considerably from year to year and month to month. The proposed project is in a high rainfall zone, with average annual precipitation of 2148 mm of which 1472 mm (69% of annual) occurs in the Monsoon months. During May to September average number of rainy days remains quite high and often impacts construction work.

The driest month is January, with 10 mm of rainfall and the greatest amount of precipitation occurs in June and July, with an average of 1040 mm.

The below figure show the mean maximum and minimum air temperature (during 2014-2018) of the Barishal substation. May is the warmest month with average temperature 35.4 °C. As recorded, January is the coolest month with temperature averaging 12.6 °C.

The difference in precipitation between the driest month and the wettest month is 434 mm. During the year, the average temperatures vary by 11.1 °C.

Figure 90: Mean rainfall and average, minimum and maximum temperature of Barishal station

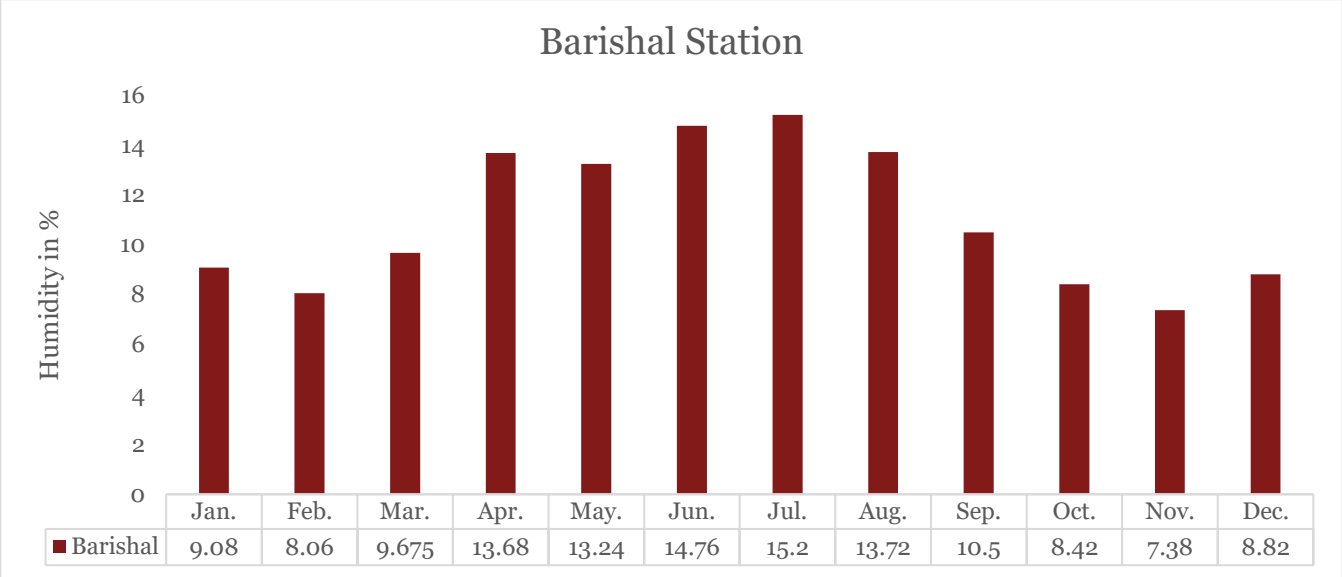


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp. Max (°C)	25.8	28.4	32.3	33.7	35.4	31.7	30.6	30.7	31.3	31.2	28.9	26.4
Temp. Min (°C)	12.6	15.4	20.2	23.8	25.3	25.7	25.6	25.7	25.6	23.9	18.7	14
Temp. Avg. (°C)	19.2	21.9	26.2	28.7	30.3	28.7	28.1	28.2	28.4	27.5	23.8	20.2
Mean Rainfall	10	20	45	107	211	427	444	390	294	183	43	10

Humidity

Humidity levels are consistently very high during the monsoon season, and drop significantly for a relatively short period at the end of the dry season. Sunshine levels are low during the monsoon, but from November to May are consistently high. The five-yearly average relative humidity at Barishal is 66% with maximum in July 78%.

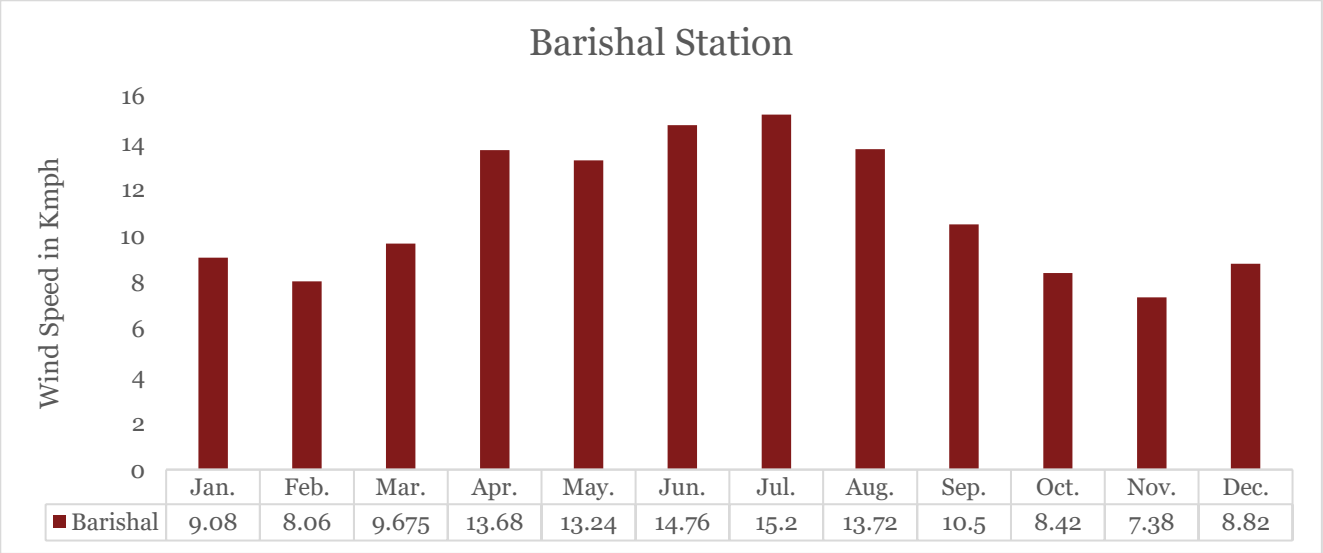
Figure 91: Five-year average relative humidity at Barishal



Wind Speed

Wind could be the biggest and most influential weather factor. So, it is extremely important to know the direction and velocity. Monthly prevailing wind data (wind speed) were collected from Barishal weather substations for 5 years (2014-2018) and analyses to determine the distribution of wind force within the study area. Based on the 2014 to 2018 data, the monthly maximum wind speed in the study area is occur in July, which is 15.2 Kmph..

Figure 92: Five-year average relative humidity at Barishal



Agailjhara (Barishal) is located in southern coastal area of Bangladesh. Wind speed in the coastal areas of Bangladesh could go up to 3-6 km per hour. From March to May, violent thunderstorms, called northwesters, are observed having a wind speed up to 60 km per hour. The early summer and late monsoon seasons are characterized by intense storms. During this season, southerly wind blow at a speed of more than 160 km per hour and it induces around 6 meter high waves in the Bay of Bengal. This is a prime cause for most of the flooding witnessed each year in the coastal areas.

12.5.1.2. *Topography*

Figure 87 presents a digital elevation model (DEM) of Bangladesh based on a 300 m grid. From the DEM, it is observed that the project site has a flat topography with very little relief or changes in elevation. The proposed EZ

has a level difference of approximately 8 m with a gentle slope from North East to West direction towards Agailjhara – Kotalipara road with minor undulations. The natural slope of ground is advantageous for gravity network of water supply, sewer and storm water drains.

The physiography of the region surrounding the proposed EZ falls in Old Meghna Estuarine floodplain. The relief is almost level, with little difference in elevation between ridges and basins. Natural rivers and streams are far apart in the southern part and drainage is provided by a network of man-made canals. The sediments are predominantly deep and silty, but a shallow clay layer in some basin centers overlies them. Seasonal flooding is mainly deep, but it is shallow in the southeast. Some basin centers stay wet throughout the dry season. Virtually everywhere, this flooding is by rainwater ponded on the land when external rivers flow at high levels.

Geology

The geology of the Project area can be classified as Peat soils and Marshy clays geological units (Figure 88) soils and Marshy clays in the surface geology of the area is indication of swampy and humid environment of present active river plain deposits. In these soils, partially or wholly decomposed organic matter are present. These soils have a low infrastructure and of low quality on engineering value. Peat and muck layers are black to dark brown, strongly reduced, and neutral in reaction under persisting conditions. When these layers are allowed to dry, they become extensively acidic. The unit is seasonally flooded by both increased river water and rainwater, hence, remains wet around this time. During the dry season where mineral topsoil is present they become dry. Under dry condition mineral top-soils are mainly grey or dark grey and become strongly acidic. The soil has generally low agricultural productivity. The land is used for reed production and fishing under natural conditions.

12.5.1.3. *Seismology*

Bangladesh and north-east Indian state have been one of the seismically active regions of the world and they have experienced numerous earthquakes during the past 200-years at an average rate of one in every 30 year. According to ADPC (2016), Bangladesh is classified into four seismic zones with Zone IV is the most and Zone I is the least vulnerable to seismic risks. The Zone-IV has high seismic risk with the value of basic seismic coefficient z=0.36. The basic seismic co-efficient of this Zone-III is z=0.28. The central part of Bangladesh is considered as Zone-III. The basic seismic co-efficient of this zone is z=0.20. The south western part of Bangladesh is considered as Zone-1. This zone is comparatively safe zone and has low seismic risk. The basic seismic co-efficient of this zone is z=0.12.

Agailjhara area falls in the Seismic Zone-I is mostly classified as low risk zone and the earthquake coefficient is 0.12 for this zone. No major earthquake has been reported in the Project area in recent years or recent past.

Figure 93: DEM of Bangladesh

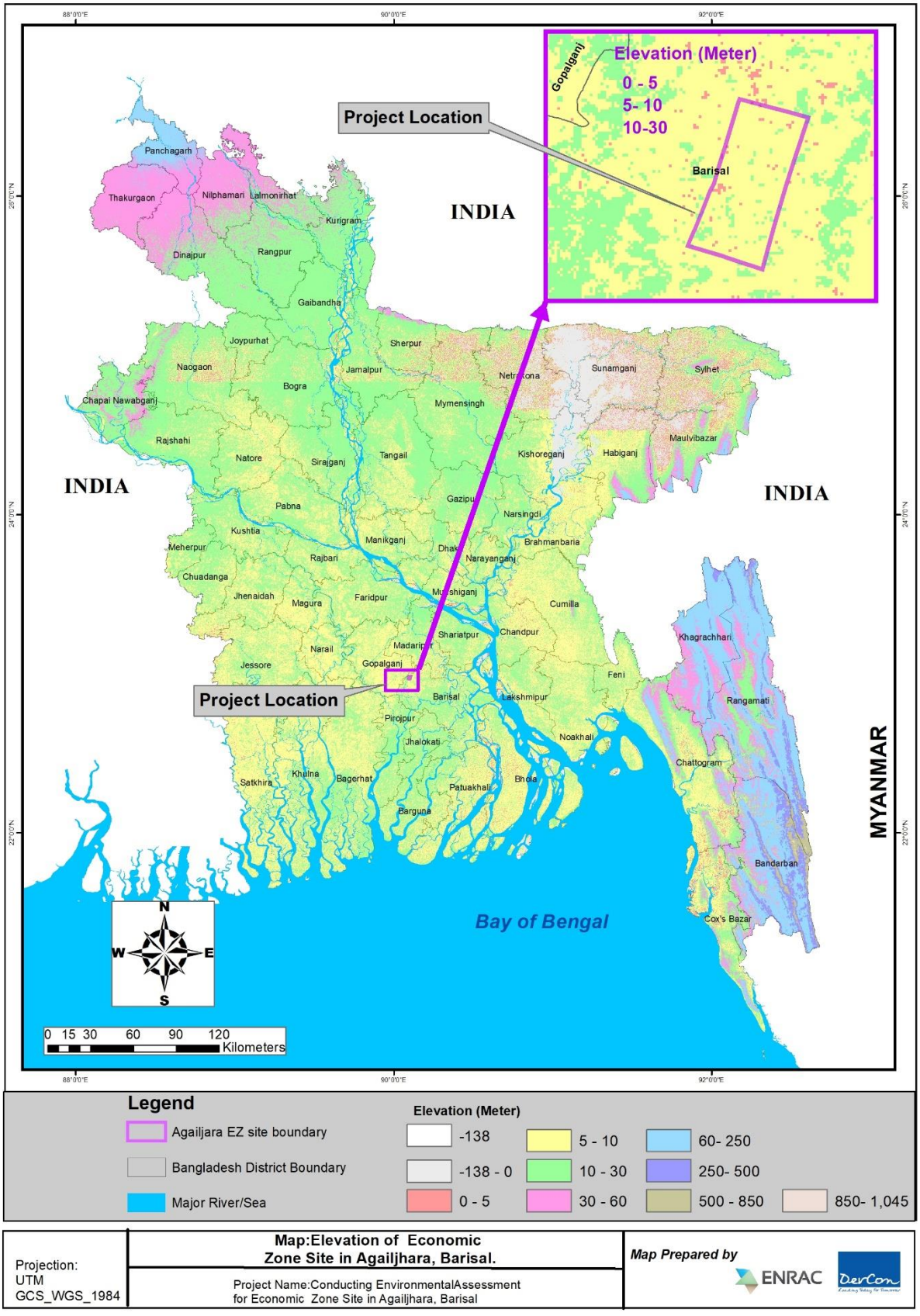
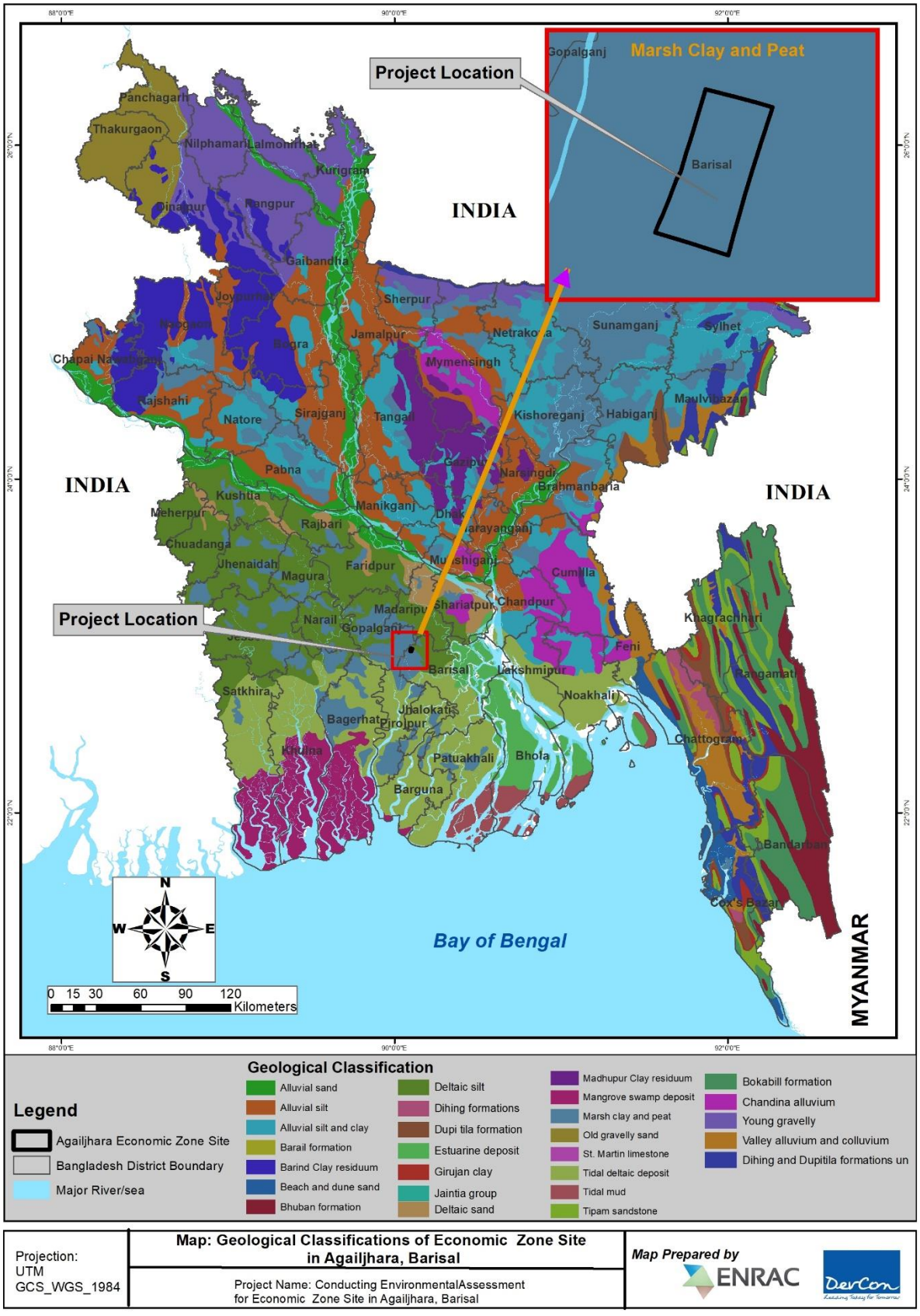


Figure 94: Surface Geological Map of Bangladesh



12.5.1.4. *Cyclone*

In Bangladesh, due to its unique geographic location, suffers from devastating tropical cyclones frequently. The funnel-shaped northern portion of the Bay of Bengal causes tidal when cyclones make landfall due to which thousands of people living in the coastal areas are affected. Some of the most devastating natural disasters in recorded history with high casualties were tropical cyclones that hit the region now forming Bangladesh. Figure 90 shows that the Project area lies in low risk zone area of cyclone. The cyclone risk map shows the location of proposed EZ is in a very safe zone. Due to a cyclone, rising of water level and tidal flooding from Rivers was not experienced before in the project area. But seasonal storms, popularly known as 'norwesters' (Kalbaishakhi) occur in the project area. Tornadoes can be associated with severe norwesters. The frequency of nor 'westers is greatest in April and they most often occur in late afternoons. Agailjhara area witnesses cyclone or storms which generally occur in early summer (April-May) or late rainy season (October-November).

12.5.1.5. *Flood*

Bangladesh is prone to seasonal flooding due to being situated on the Ganges Delta and the many distributaries flowing into the Bay of Bengal. Floods usually occur between July and August, and severe floods seem to reoccur every 7 years, and catastrophic floods every 33-50 years. Every year, nearly 26,000 km2 or around 18% of the country is flooded. But the project area are mostly above prevailing flood level. Figure 91, shows the flood risk zones within the project corridor and from the figure it's recorded that the project area is not flood prone. But the project area is affected, though infrequently, by internal and external flood. External floods are caused in the low area by over flow of sorrowing River and Khal, while internal floods are caused by storm water due to rainfall and insufficient drainage facilities. It is unlikely that the area would be flooded even by a flood of 1988 magnitude.

12.5.1.6. *Soil Environment*

The general soil type of the project site is Non-calcareous Dark Grey Flood Plain soils (Figure 92) They have a cambic B-horizon, non-calcareous dark grey topsoil and subsoil. They occur extensively on the Old Brahmaputra and old Meghna estuarine floodplain. Silt loam and silty clay loam are predominant on the Meghna estuarine floodplain and in the Tista meander floodplain, whereas silty clays and heavy clays are extensive on the Old Brahmaputra floodplain. The majority of these soils are Eutric Gleysols. The soil layer is acidic in character and the pH ranges from 7 to 8.5. The soils are moderately fertile and are characterized by calcium carbonate content and are well supplied with phosphate and potassium.

Given its very flat topography the Project area is not prone to erosion hazards. Historically, the area has seen little erosion.

Figure 95 : Earthquake risk map of Bangladesh

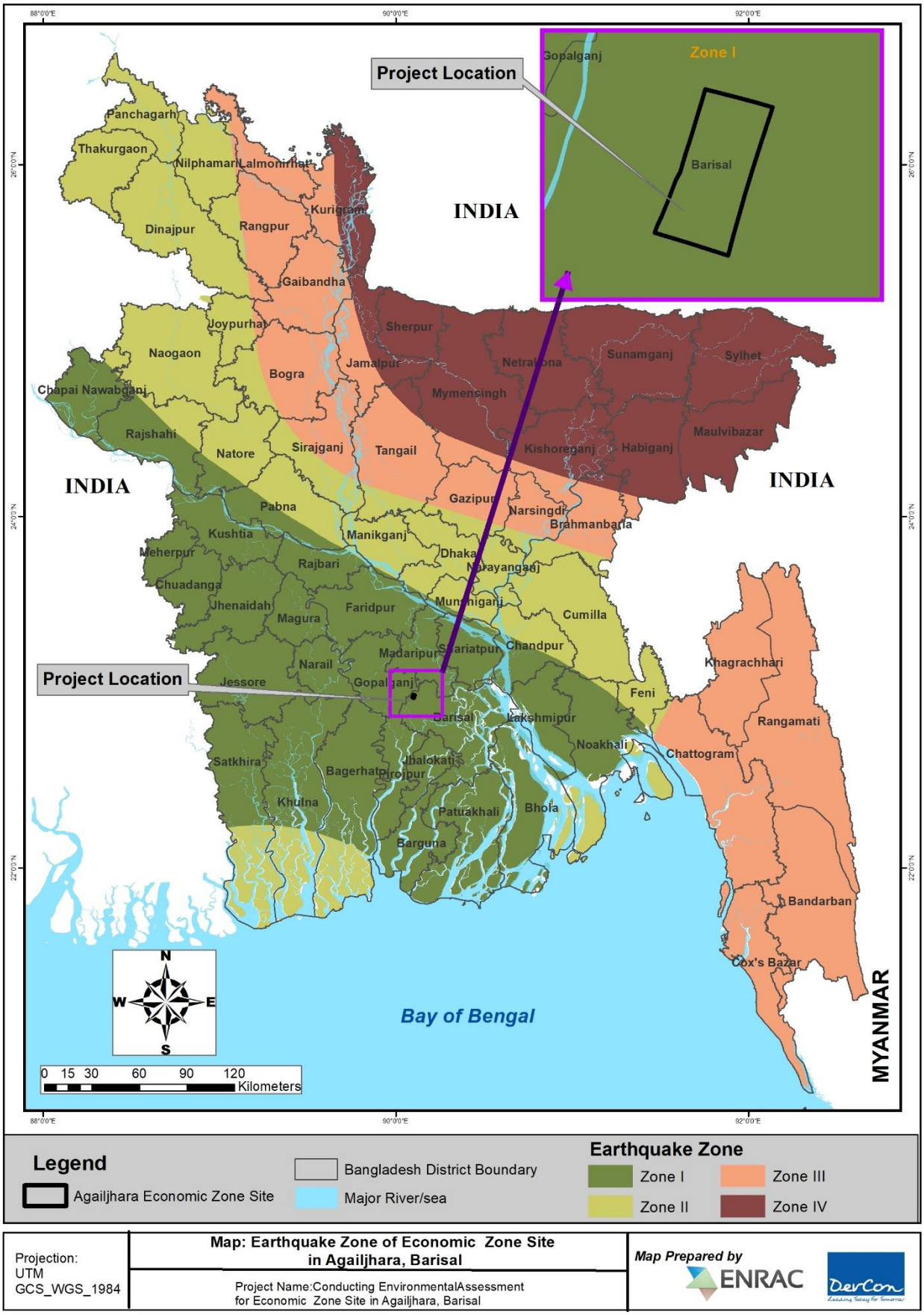


Figure 96: Cyclonic risk zone of Bangladesh

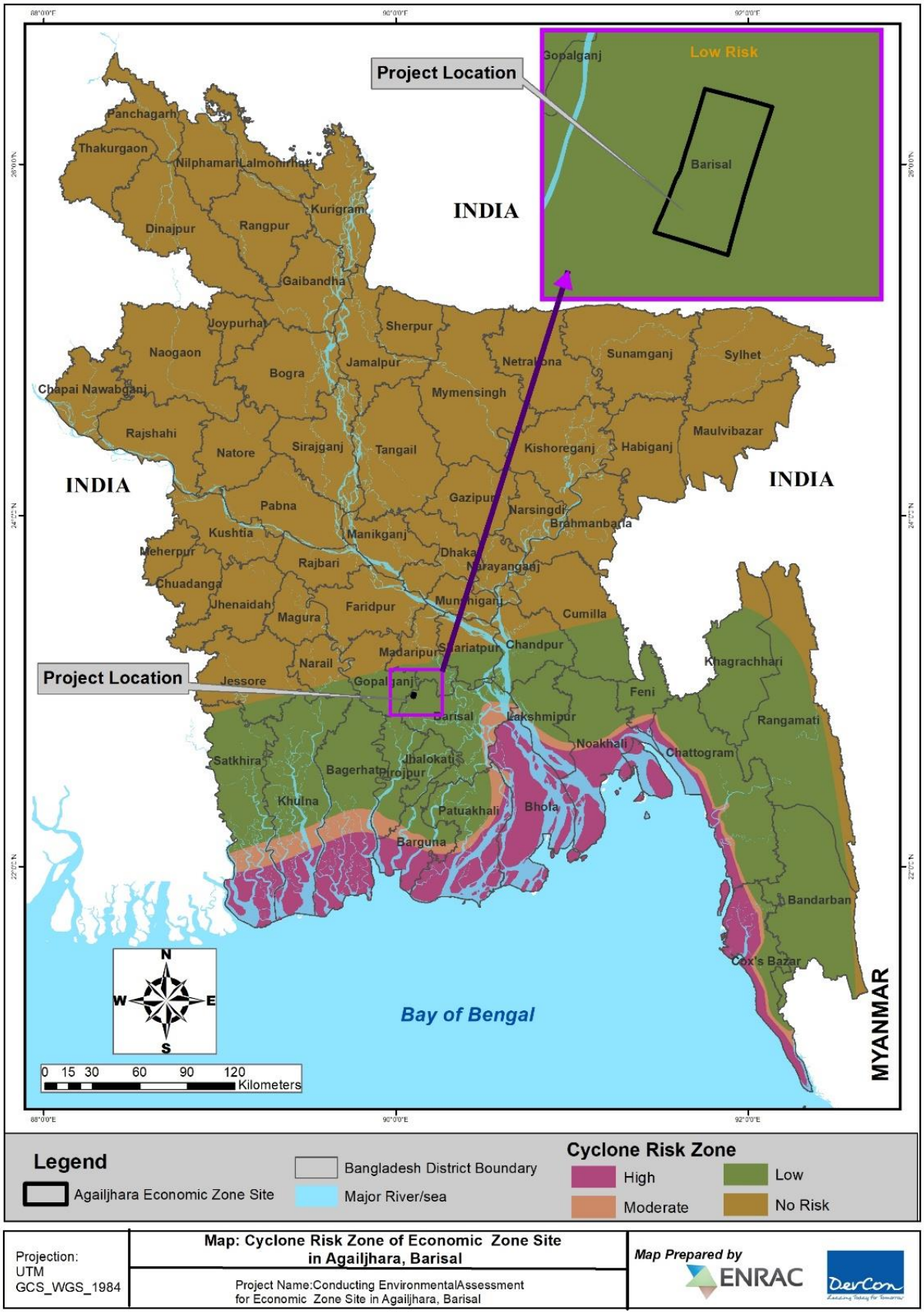


Figure 97: Flood prone area of Bangladesh

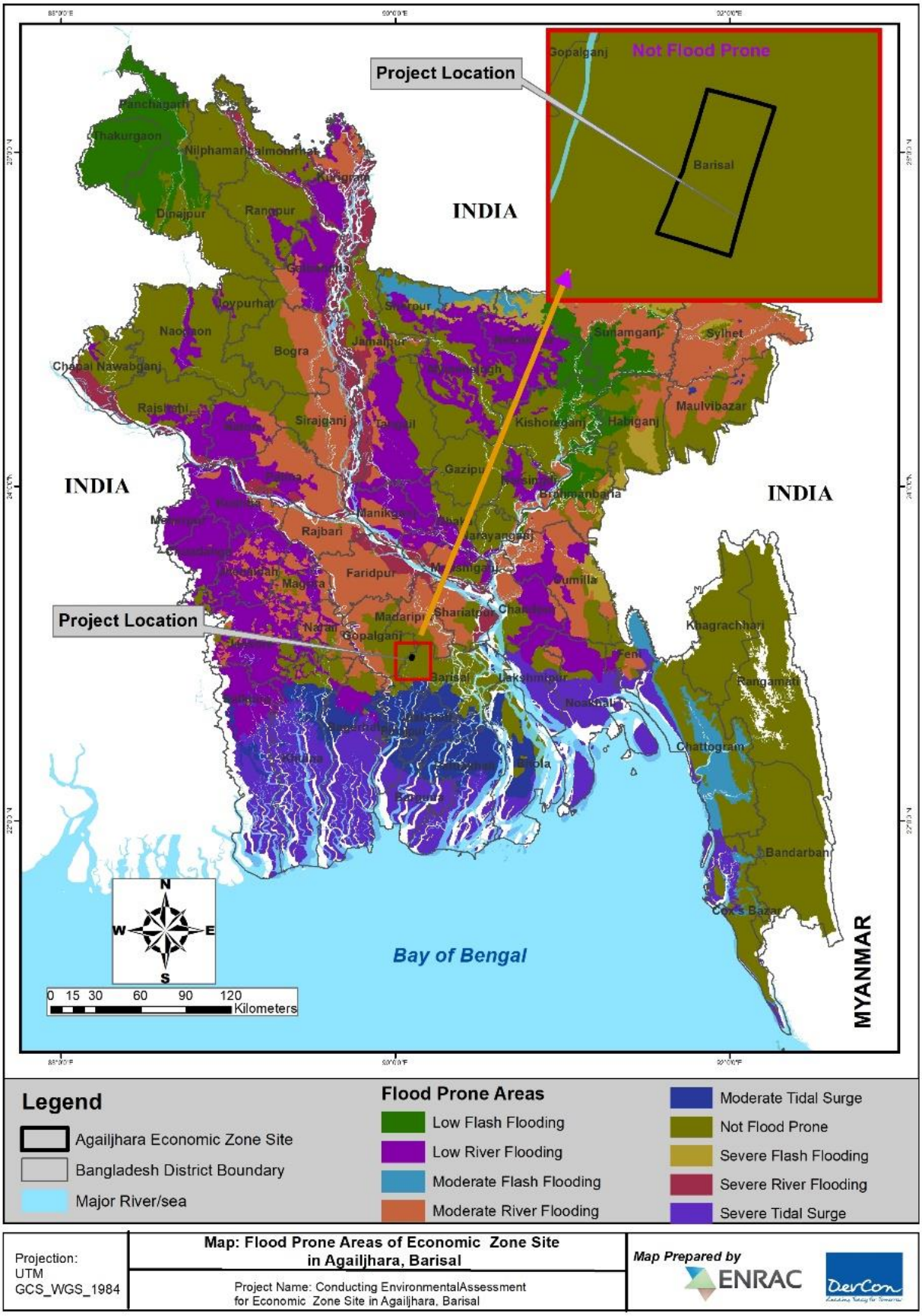
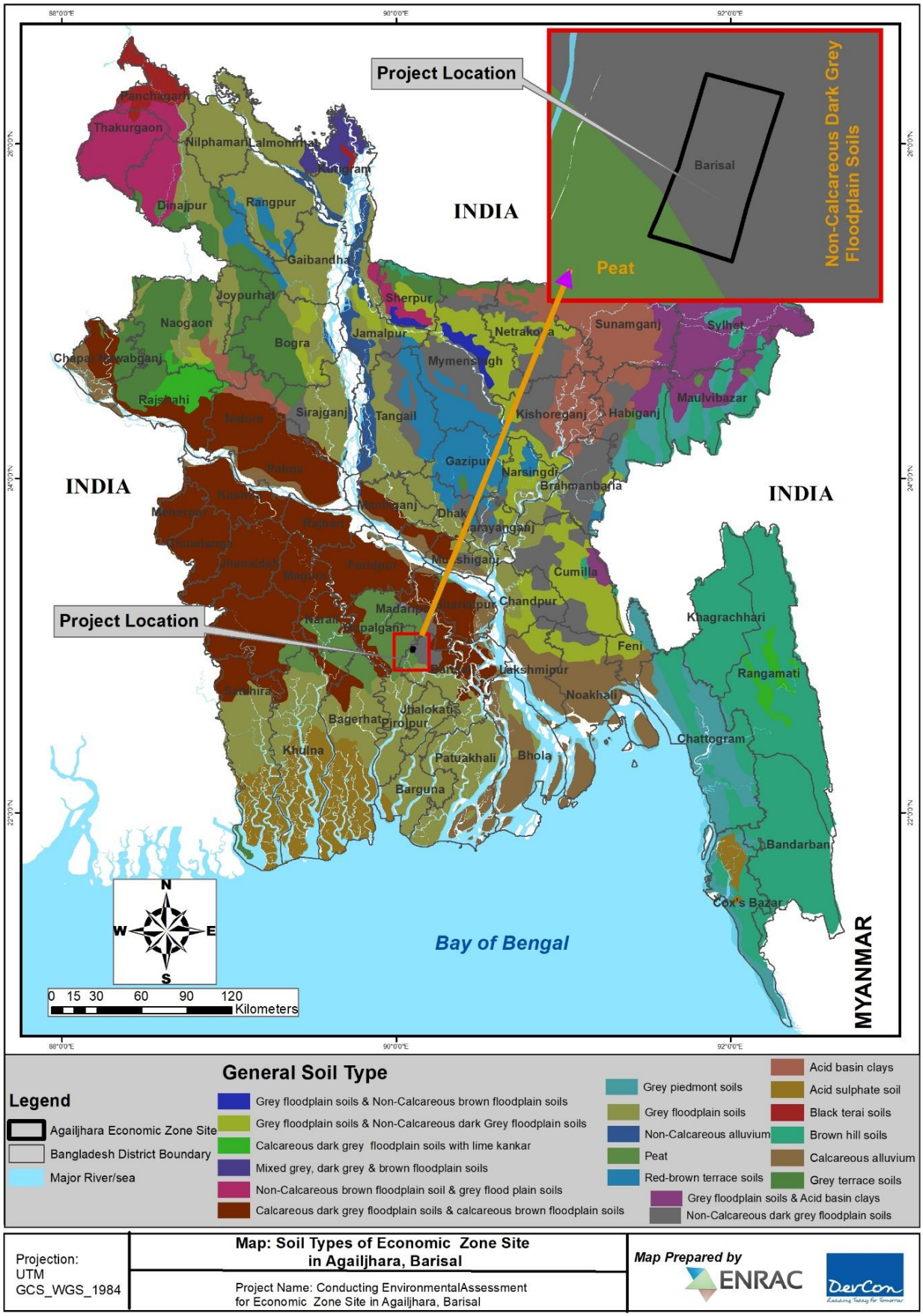


Figure 98: General Soil classification Map of Bangladesh

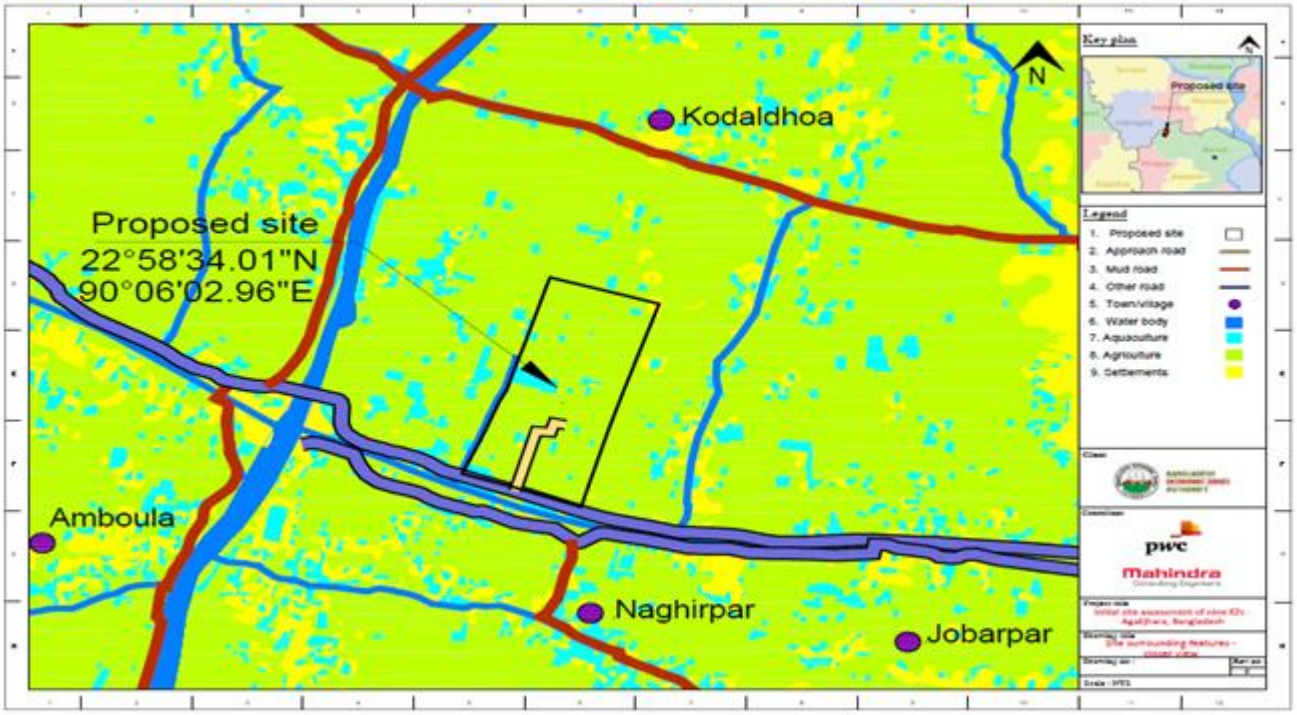


12.5.1.7. *Land Use Pattern*

The land use pattern of the proposed EZ area falls under agriculture and aquaculture zone of Agailjhara upazila. It was observed during our site visit that two crops are being cultivated in most of the land parcels throughout the year, the major crops are Rice, Potato and Banana, etc.

Figure 99: Agriculture and aquaculture activities within the project area

Figure 100: Existing Land Use Pattern within the Proposed EZ



A land use map has been developed for the Project corridor to identify the land classification within the Project corridor. From the land use map it is found that agriculture is the major food supplier for the people living along the Project corridor as 87 % of the Project corridor is used for agricultural purposes. The local resident's covers 7%, and water bodies 6%.

Table 96: Land Use Classification of the Project

Classification	Acre	Percentage
Agricultural land	285.09	87
Residential land	23.42	7

Classification	Acre	Percentage
Aquaculture (Water body)	20.10	6
Total	328.5	100

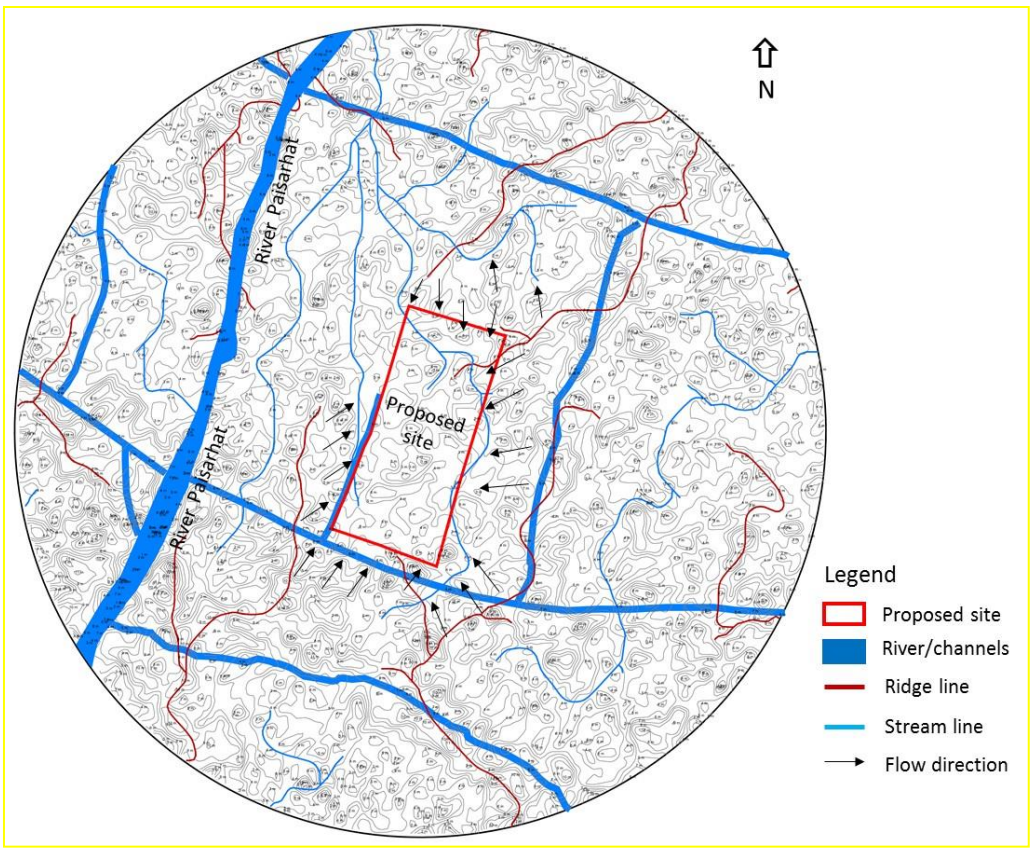
12.5.1.8. *Drainage Pattern*

The site lies on the east side of river Paisarhat. In general, the flow of the surrounding area will be towards the river.

To determine the vulnerability of site for flooding due to surface storm water runoff, detailed contour study of the surrounding area was carried out based on GIS data for the radius of about 5 km surrounding the site and the flow pattern of the surface storm water runoff based on the same is provided in the figure below. In the following figure, various details such as Ridge lines, Stream lines, and contours with levels, existing water bodies and flow pattern based on the contour have been shown. Ridge lines are the lines connecting highest elevation points and the stream lines are the line connecting lowest elevation points. In general, the flow will be from the ridge line towards stream lines.

From the figure, it is observed that, the site falls on 2 streamlines which finally connects with the River. The site is elevated and having ridge lines on the South, Southwest corner, East and North side of surrounding terrain. From these surrounding terrain, the surface storm water runoff will be flowing through the path of stream line and finally discharge into river.

Figure 101: Drainage pattern and flow direction of the study area



12.5.1.9. *Air Environment*

To assess the present air quality of the area, one Ambient Air Quality Monitoring (AAQM) Stations were setup at four specific locations within the Project corridor during September 2019. The locations of the monitoring stations for air quality study were selected on the basis of meteorological data, topography, sensitive locations etc. Monitoring was conducted in respect of the following parameters: (PM10 & PM2.5), Sulphur Dioxide (SO2), Nitrogen Oxides (NOx) and Carbon monoxide

The data was collected using the Environmental Perimeter Air Sampler (EPAS) (model haz-Scanner) of Environmental Devices Corporation (EDC), USA. All the above mentioned pollutants were monitored at the station. The equipment were placed at a height of 3 to 7 meters above ground level at the monitoring stations, thus negating the effects of windblown ground dust and free from vertical obstructions within a cone of 120 degree from the actual position of the sampler, to avoid any impedance to the pollutants. The equipment was always placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results. These data were used to develop Table 104 and compared with Bangladesh national standards for ambient air quality. The test results show that the local ambient air quality condition meets the national standard, according to the Bangladesh National Ambient Air Quality Standards defined in the Environmental Conservation Rules amendment 19th July 2005 vide S.R.O. No. 220-Law/2005. All air quality test reports have been provided in Annex. Summary of the monitored results are given below in the following Table.

Table 97: Ambient Air Quality of the Project Area (September 2019)

Sampling Location	GPS Coordinates	CO	NO_2	SO_2	PM_{10}	$PM_{2.5}$
		mg/m³	µg/m³	µg/m³	µg/m³	µg/m³
AAQ-1	22°58'13.16" N 90°05'27.50" E	0.05	32.17	10.26	57.58	39.47
AAQ-2	22°58'01.03" N 90°05'57.61" E	0.09	24.36	13.79	33.17	23.33
AAQ-3	22°58'31.95" N 90°05'51.94" E	0.01	2.42	7.38	9.85	8.77
AAQ-4	22°58'33.63" N 90°06'09.99" E	0.02	5.39	6.29	10.12	7.23
GoB Air Quality Standards*		10 (8 hour) 40 (1 hour)	100 (Annual)	365 (24 hour) 80 (Annual)	150 (24 hour) 50 (Annual)	65 (24 hour) 15 (Annual)

** Data Source: Field Sample and Data Analysis; The amended schedule-2, 2005, of (Air Measurement Standard) Environmental Conservation Rules, 1997*

Carbon monoxide ranged from 0.01 to 0.09 µg/m³. Measured concentrations for **NO2** were ranged from 2.42 to 32.17 µg/m³. **Sulphur dioxide (SO_2)** ranges from 6.29 to 13.79 µg/m³. Measured concentrations for Particulate matters **PM10 and PM2.5** varied from 9.85 to 57.58 µg/m³ and 7.23 to 39.47 µg/m³, respectively. None of the test results at all sampling station exceeded the DoE acceptable limits.

The measurement results showed achievement of all air quality standards. Based on the ambient air quality standard of DoE, air quality in the Project area can be stated as in good condition. 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.

Figure 102: Ambient Air and Noise Quality Measurement in the Project Area

12.5.1.10. *Noise Environment*

Excessive noise from the proposed EZ is a potential issue for both human and biological receivers and can potentially cause a range of negative issues, from mild annoyance and moderately elevated levels of aggression to significant disturbance of behavioral patterns and in severe cases temporary or permanent hearing loss. According to World Health Organization's Guidelines for Community Noise (1999), daily sound pressure levels of 50 decibels (dB) or above can create discomfort amongst humans, while ongoing exposure to sound pressure levels over 85 dB is usually considered the critical level for at least temporary hearing damage. According to DoE (Department of Environment, Bangladesh) acceptable noise level for industrial areas are 75dB at day time and 70 dB at night.

The noise level measurements were conducted at four sampling stations on the same location specified for air quality measurement. Measurements were taken using a Lutron's Sound Level Meter (SL-4033SD). Noise level was measured in terms of the A-weighted equivalent continuous sound pressure level (Leq). The noise measurements were taken at the known sensitive receptors important for their ecological and social value. These data were used to develop the below table and compared with the amended Schedule-4, 2006, of (Noise Level Measurement Standard) Environmental Conservation Rules, 1997, DoE. The laboratory test results have been provided in Annex.

Table 98: Noise Level Measurement of the Proposed EZ (September 2019)

ID	Location	GPS Location	Noise Level (Leq)dB			Evaluation Criteria	GoB Noise Standard* dB)	
							Day	Night
			Minimum	Maximum	Average			
NM_01	South-West	22°58'13.16" N 90°05'27.50" E	36.00	67.30	50.75	Mixed area	60	50
NM_02	South-East	22°58'01.03" N 90°05'57.61" E	32.70	64.10	42.95	Mixed area	60	50
NM_03	West	22°58'31.95" N 90°05'51.94" E	36.00	58.40	43.77	Mixed area	60	50
NM_04	East	22°58'33.63" N	34.40	59.00	44.28	Residential	55	45

ID	Location	GPS Location	Noise Level (Leq)dB			Evaluation Criteria	GoB Noise Standard* dB)	
			Minimum	Maximum	Average		Day	Night
		90°06'09.99" E						

** Data Source: Field Sample and Data Analysis; The amended schedule-4, 2006, of (Noise Measurement Standard) Environmental Conservation Rules, 1997*

The existing general noise level within the study area varies from 43 dB to 51 dB during day time which is within the standard of mixed zone land use (DoE, 1997).

12.5.1.11. *Water Environment*

The Paisarhat River is the major surface water body of the study area which is 2km away from the proposed EZ. Numerous other water bodies are connected to this River.

12.5.1.12. *Surface Water Quality*

Surface water quality is represented by some selected parameters, which are crucial for agricultural activities and industries and to maintain optimum aquatic environment. The standard values of these indicators set by the Department of Environment, Bangladesh are also shown for comparison purposes.

Sampling stations for surface water were selected to capture any possible runoff pollution from worksites into the water within the project corridor. After analyzing the map, two sample points were selected within the project corridor. The samples were collected on September 2019 by the environmental survey team. All samples were collected in plastic and amber sampling bottles and stored according to standard methods and analyzed within 24 hours of being collected at an ISO 14000-certified laboratory. The parameters measured were total organic carbon (TOC), pH, total phosphate, total suspended solids (TSS) and dissolved oxygen.

The samples were submitted to DPHE Laboratory and analyzed for the presence of BOD, COD, DO, p^H, TDS, TSS & Turbidity. These analyzed result were used to develop below table and compared with the Schedule-3(A) of (Standards for Inland Surface Water) Environmental Conservation Rules, 1997. All water quality test reports have been provided in **Annex.**

Table 99: Surface Water Quality in project Influence Area September, 2019

Sample ID	Sampling Location	GPS Coordinates	Results						
			BOD	COD	DO	pH	TDS	TSS	Turbidity
SW 01	Stream	22° 58/ 03.18// N 90° 05/ 55.68// E	4.00	12.00	6.42	7.7	70.00	12.00	1.00
SW 02		22° 58/ 37.69// N 90° 06/ 07.65// E	9.00	32.00	5.80	7.4	90.00	13.00	1.10
Env. Conservation Rule (ECR) Standard Limit for Potable Water			0.2	4.0	6.0	6.5-8.5	1000	10	10

Data Source: Field Sample and laboratory Analysis by DPHE

Dissolved Oxygen (DO) -The dissolved oxygen values ranged from 5.8 to 6.42 mg/L. The DO level in good fishing waters generally averages about 9.0 mg/L. Decrease in DO values below the critical level of 3 mg/L causes death of most fishes and other aerobic aquatic organisms. Many scientific studies suggest that 4-6 mg/L of DO is the minimum amount that will support a large, diverse fish population.

BOD & COD –. The concentration of BOD & COD ranges from 4 mg/L to 9 mg/L. and 12 to 36 mg/L. The higher the BOD value, the greater the amount of organic matter or "food" available for oxygen consuming bacteria. If the rate of DO consumption by bacteria exceeds the supply of DO from aquatic plants, algae photosynthesis or diffusing from air, unfavorable conditions occur. High COD/BOD levels in surface water are cause by the residual food and agricultural activities.

TSS & Turbidity: The concentration levels of TSS & Turbidity parameters for surface water were within the acceptable limit set by the DoE, GoB

Total Suspended Solids (TSS) - The concentration of total suspended solids ranges from 12 mg/L to 13 mg/L which exceed the standard limit of DoE's water quality guidelines. High levels of total suspended solids will increase water temperatures and decrease dissolved oxygen (DO) levels. Excess over background amounts are attributed to human influence.

The concentration levels of all the parameters for surface water were within the acceptable limit set by the DoE, GoB except BOD, COD & TSS. The water quality results indicate that water quality condition is suitable for Fisheries, irrigation and agricultural use.

Figure 103: Surface water collection from the Project area, September, 2019

12.5.1.13. *Ground Water Quality*

According UNO Officials and local inhabitants the ground water is available at a depth of 60-80 feet from the natural ground level. Appropriate hydrological observations and tests need to be carried out within the proposed EZ site to determine the exact depth of groundwater. The highest groundwater table occurs during the month of August-September when the aquifer recharges fully and the surface water level and ground water table merges.

To understand the ground water quality of the study area ground water sample was collected by ENRAC, Bangladesh on 26-27 September 2019 for further analysis. Two groundwater sample were collected from deep well within the proposed project corridor. Water samples were collected in pre washed one liter plastic bottles. After collection the samples, it was sent to Department of Public Health and Engineering (DPHE) laboratory at Dhaka for further examination of ground water parameters. The samples were analyzed for parameters such as Arsenic, Iron, Manganese, pH, Phosphate and Temperature. The sample was analyzed as per standard method given in standard Method for Examination of Water and Wastewater Edition 20, published by APHA.

These analyzed result were used to develop table below and compared with the Schedule- of (Standards for Drinking Water) Environmental Conservation Rules, 1997. The concentration levels of all the parameters for ground water were within the acceptable limit set by the DoE, GoB. All ground water quality test reports have been provided in Annex.

Table 100: Ground Water Quality Analysis Result in the Project area

SL No.	Sample ID	Sampling Location	GPS Coordinates	Results				
				Arsenic (As)	Iron (Fe)	Manganese (Mg)	pH	Phosphate
01	GW 01	Rupganj	22° 58/ 09.87// N 90° 05/ 37.21// E	0.001	0.21	0.04	7.7	0.57
02	GW 02	Rupganj	22° 58/ 31.68// N 90° 05/ 52.08// E	0.001	0.71	0.05	7.6	0.63
Env. Conservation Rule (ECR) Standard Limit for Potable Water				0.05	0.3 - 1.0	0.1	6.5 to 8.5	6.0

Data Source: Field Sample and laboratory Analysis by DPHE

Arsenic (As): The values of Arsenic (As) for two collected samples from the project influence area are found within the standard limit of DoE's potable water quality guidelines.

Iron (Fe): Aeration of iron-containing layers in soil can affect the quality of both groundwater and surface water if the groundwater table is lowered or nitrate leaching takes place. Dissolution of iron can occur as a result of oxidation and decrease in pH. The concentration of Iron (Fe) in groundwater samples ranges between 0.21 to 0.71 mg/L, which comply with respect to DoE standard for potable water.

Manganese (Mn): Manganese (Mn) values indicate the general nature of water quality. The value of Manganese (Mn) in two ground water samples collected from the project area are within the potable water quality criteria of DoE.

pH: pH is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkaline. The measurement of alkalinity and acidity of pH is required to determine the corrosiveness of the water. It is observed that all the pH values are within in the permissible limit.

Phosphate: The concentration of phosphate in all groundwater samples is below with respect to DoE standard. In summary, the ground water analysis reveal that all the parameters are within the standard value of ECR, 1997 and it can be assume that the ground water quality is satisfactory for drinking in the study area. It is drinkable without treatment.

Figure 104: Ground water collection from the Project area, September 2019

12.6. Biological Environment

The project site terrestrial and aquatic flora and fauna were assessed from visual observations, focus group discussion, public consultation, review of literature, and information documented by other agencies. In the context of physiography and biological diversity, IUCN, The World Conservation Union, has divided Bangladesh into 25 Bio-ecological Zones (Nishat et al, 2002). The study area has fallen under bio-ecological zones of Gopalganj/Khulna Peat land. The area (both directly and indirectly impacted area) occupies terrestrial as well as aquatic ecosystems. Each of the bio-ecological zones represents the overall ecological situation of an area of the country. A map of the Bio-ecological zone is presented in the Figure 105**.** In general, the project area has been modified variously from its natural state and almost all the habitats present have been influenced by anthropogenic activities to varying degrees.

12.6.1. Protected Area/Ecologically Critical Area (ECA)

An Ecologically Critical Area (ECA) is an environmental protection zone in Bangladesh. In 1995, specific areas in Bangladesh could be deemed Ecologically Critical Areas as a result of the Environmental Conservation Act. The Government after considering the human habitat, ancient monument, archaeological site, forest sanctuary, national park, game reserve, wild animal habitat, wetland, mangrove, forest area, biodiversity and other relevant factors of the area can be declared as ECA. As per the legal mandate the MOEF till now declared 12 areas as ECA. DoE as a statutory body is entrusted to manage the ECAs.

Under the Environmental Conservation Act, ecologically sensitive and precious areas are designated as Ecologically Critical Area (ECA) by Department of Environment in Bangladesh in cases where an ecosystem or biodiversity area is considered to be threatened to reach to a critical state. On the other hand, protected areas such as national parks and protected forests are designated by Department of Forest under the Wildlife Order and Forest Act.

There is no Ecologically Critical Area (ECA) and Protected Area located within and around 10Km radius of the proposed EZ site boundary. The maps of Bangladesh showing location of ECAs and protected areas distributed across the country are presented in Figure 106 and Figure 107 respectively.

12.6.2. Forest Area/Vegetation Cover

There is no presence of forest land in and around the proposed EZ. The forest map of Bangladesh is furnished in the Figure 108. But around the study area Village groves or village forests is present, which play a very important role in the economy of the country. These provide a significant portion of the wood and firewood supply of the country. Besides wood production, village forests have several important uses. They provide fruit, fodder, fuel, raw material for small and cottage industries, house construction materials, agricultural implements, cartwheel, etc. This is not forest as per definition. However, in the Bangladesh context this tree cover is very significant in many ways. During the field visit mixed vegetation pattern was observed in the project.

Figure 105: Bio-ecological zone of Bangladesh including the project area

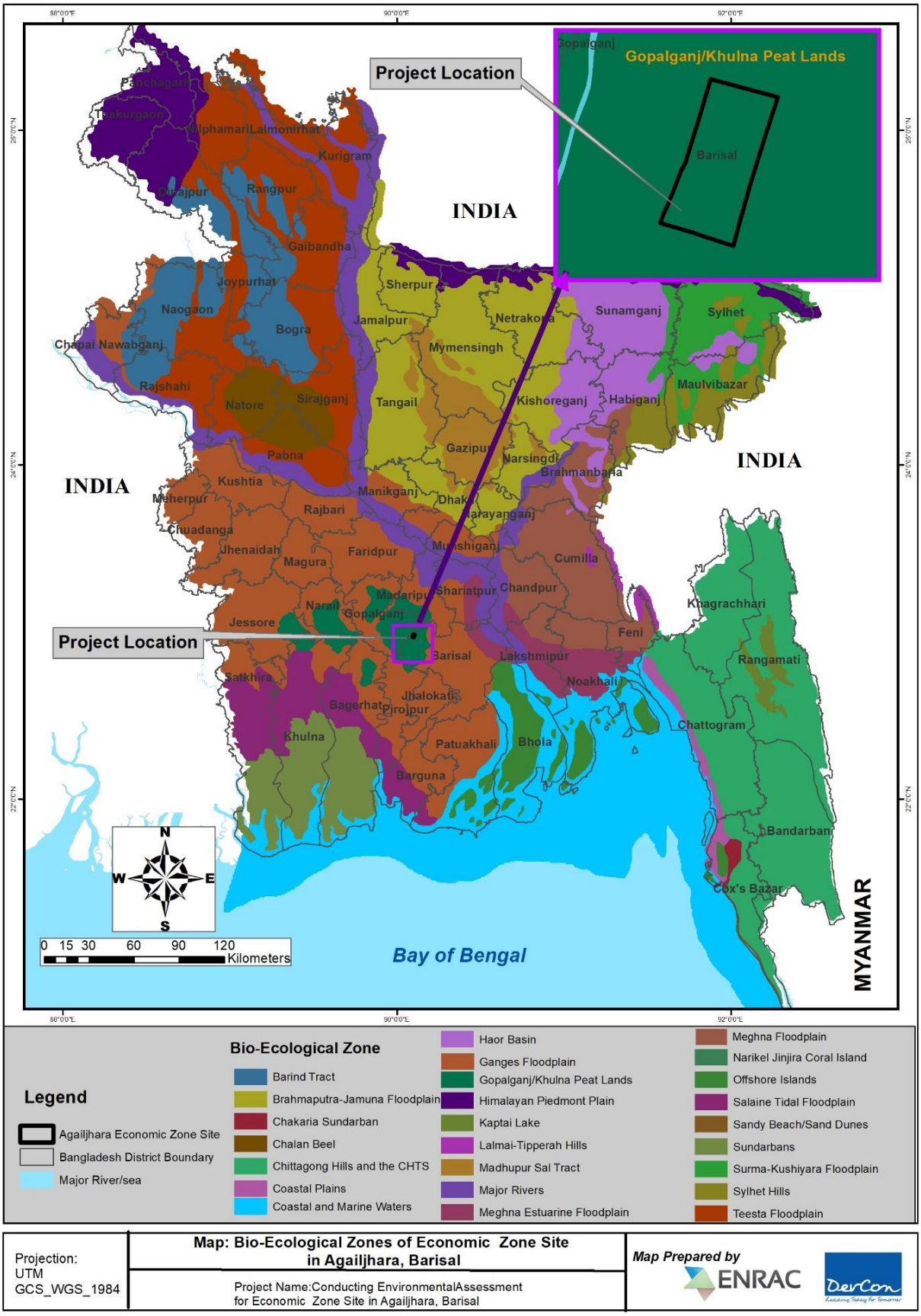
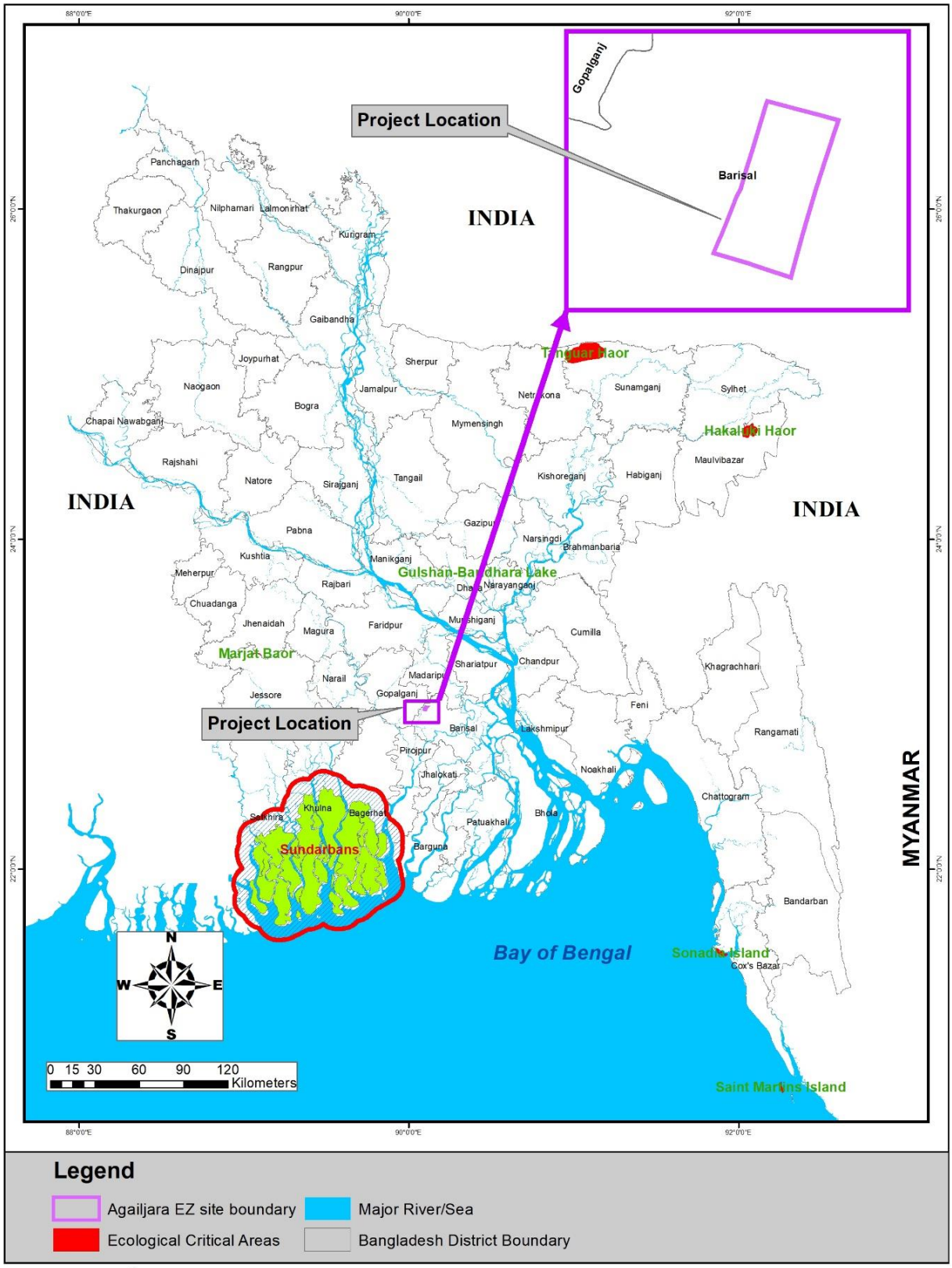


Figure 106: Ecological Critical area of Bangladesh and the Proposed Project



Projection: UTM GCS_WGS_1984	**Map:Ecological critical Area of Economic Zone Site in Agailjhara, Barisal.** Project Name:Conducting EnvironmentalAssessment for Economic Zone Site in Agailjhara, Barisal	*Map Prepared by* ENRAC DevCon

Figure 107: Ecological Protected Area of Bangladesh and the Proposed Project

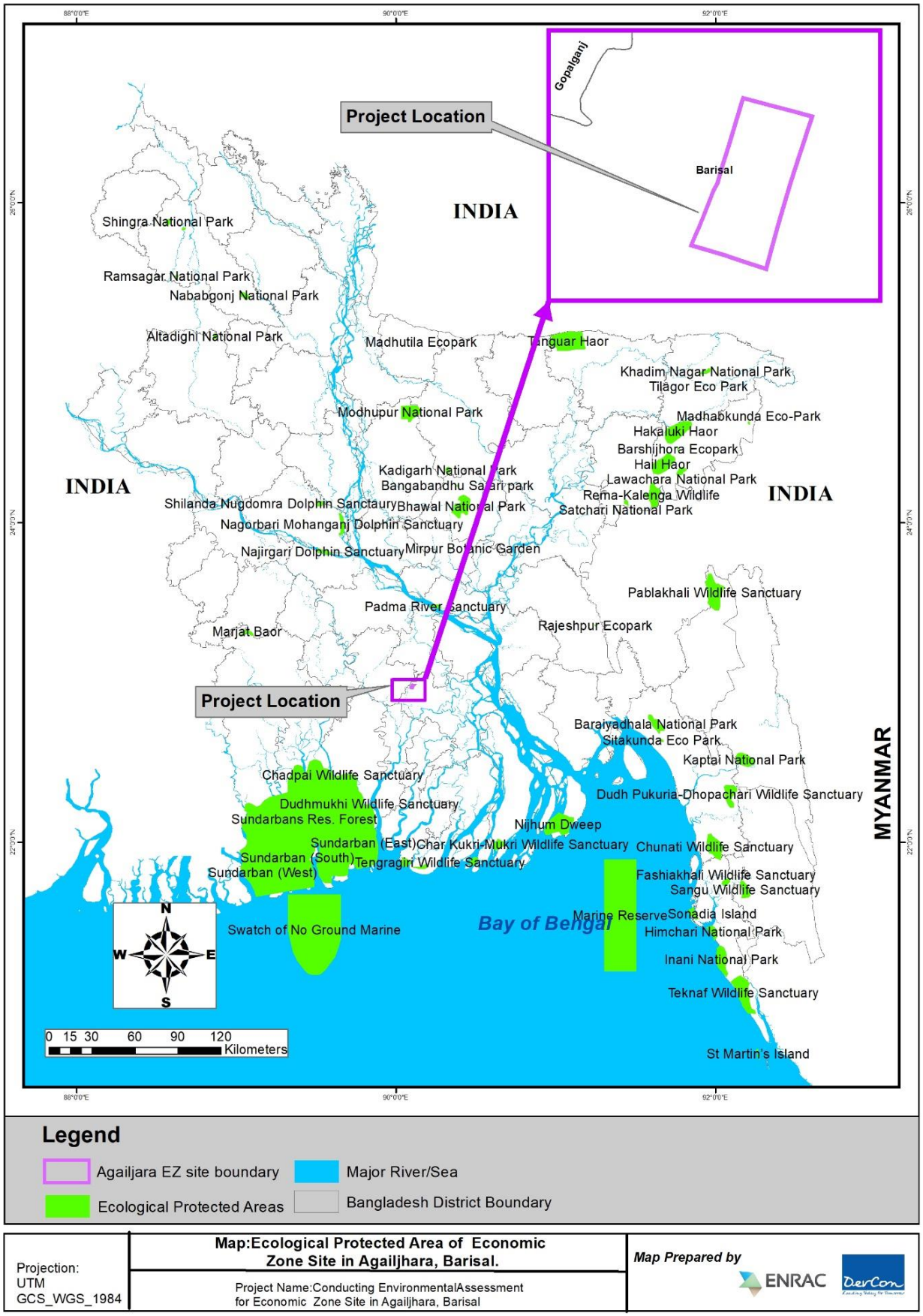
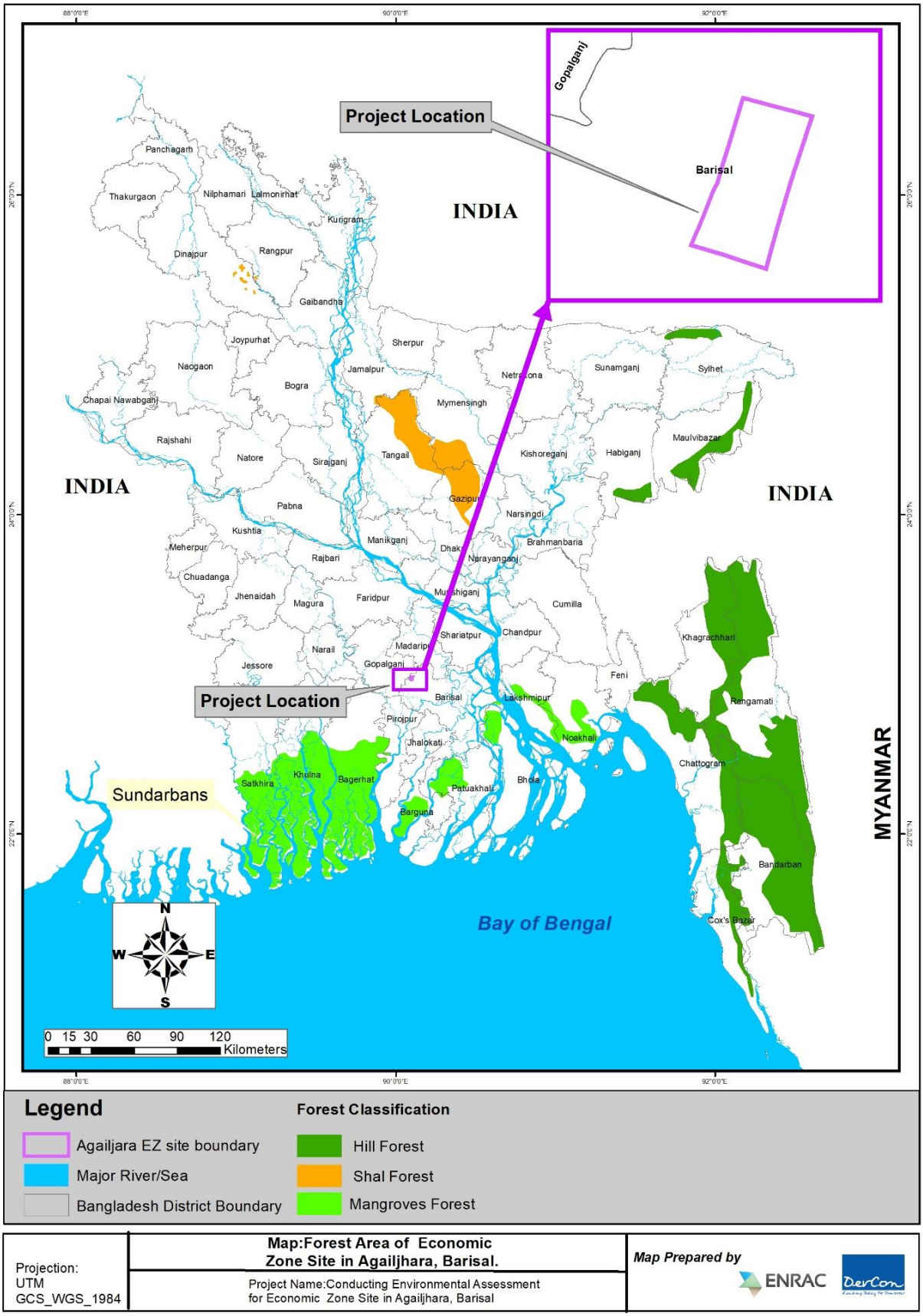


Figure 108: Forest area of Bangladesh



12.6.3. *Flora and Fauna*

Floral diversity of the project Area

In general terms an ecological system can be defined as an assemblage of organisms (plant, animal and other living organisms - also referred to as a biotic community) living together with their environment (or biotope), functioning as a loose unit. That is, a dynamic and complex whole, interacting as an "ecological unit". Ecosystems are functional units of interacting abiotic, biotic, and cultural (anthropogenic) components. All-natural ecosystems are open systems where energy and matter are transferred in and out through the complex interactions of energy, water, carbon, oxygen, nitrogen, phosphorus, Sulphur and other cycles. The project site is located in rural area. The floral diversity of the project area is very rich.

Terrestrial plants found during survey in and around the project area, on homesteads, roadside and agricultural lands have been listed. The project area provides the following major species of natural plants including herbs, shrubs, grasses and plants which are important both economically as well as for environmental sustainability of the area. In total 77 species of terrestrial and aquatic plants have been identified from field survey.

Among them, Coconut (Cocos nucifera), Palm (Borassus flabellifer), Akashmani (Acacia auriculiformis), Bel (Aegle marmlos), Sirish (Albizia lebbek), Devil's Tree (Alstonia macrophylla), Beetle Nut (Arecha catechu), Jackfruit (Artocarpus heterophyllus), Hijol (Barringtonia acutangula), Akanda (Calotropis gigantean), Papaya (Carica papaya), Jambura (Citrus maxima), Lime (Citrus aurantifolia), Madar (Erythrina variegta), Dumur (Ficus hispida), Chinese rose (Hibiscus rosa sinensis), Mango (Mangifera indica), Moringa (Moringa olifera), Banana (Musa itinerans), Date Palm (Phoenix sylvestris), False Ashoka (Polyalthia longifolia) etc. are commonly found in the study area.

Table 101: List of terrestrial fauna recorded in the project area

No.	English Name	Local Name	Scientific Name	IUCN Status
1.	Paddy	Dhan	*Oryza sativa*	LC
2.	Jack Fruit	Katal	*Artocarpus heterophyllus*	LC
3.	Mango Tree	Aam	*Mangifera indica*	LC
4.	Banana Plant	Kala	*Musa sepientum*	LC
5.	Banana Plan	Kancha Kala	*Musa paradisiaca*	LC
6.	Flowering Banana/Ornamental Banana	Kala	*Musa ornata*	LC
7.	Chinese Date/ Chinee Apple/Indian Jujube	Boroi/Kul	*Zizyphus mauritiana*	LC
8.	Guava/Lemon Guava	Payra	*Psidium guajava*	LC
9.	Java Apple/Wax Jambu	Jamrul	*Syzygium samarangense*	LC
10.	Eggplant	Begun	*Solanum menlongena*	LC
11.	Potato	Alu	*Solanum tuberosum*	LC
12.	Sweet Potato	Misti Alu	*Ipomoea batatas*	LC
13.	Water Spinach	Kolmishak	*Ipomoea aquatica*	LC
14.	Tomato	Tomato	*Lycopersicon esculentum*	LC
15.	Wood Apple/Elephant Apple	Bael	*Limonia acidissima*	LC
16.	Bottle Gurd	Lau	*Lagenaria siceraria*	LC
17.	Bean	Sheem	*Lablab purpureus*	LC

No.	English Name	Local Name	Scientific Name	IUCN Status
18.	Cylon Olive/Indian Olive	Jalpai	*Elaeocarpus robustus*	LC
19.	Edible Fern	Dhekia Shak	*Diplazium esculentum*	LC
20.	West Indian Mahogany	Mahogany	*Swietenia mahagoni*	LC
21.	Water Hyacinth	Kochuripana	*Eichhornia crassipes*	LC
22.	Elephant Apple	Chalta	*Dellenia indica*	LC
23.	Malabar Ebony/Pale Moon Ebony	Gaub	*Diospyros perigrina*	LC
24.	Pumpkin	Misti Kumra	*Cucurbita maxima*	LC
25.	Koroi	Silk Trees	*Aegle marmelos*	LC
26.	Bhel	Wood Apple	*Aegle marmelos*	LC
27.	Bailly Great Weed	Ochunti	*Ageratum conyzoides*	LC
28.	Gaint Taro	Makachu	*Alocasia macrorrhizos*	LC
29.	Sharifa	Custard Apple	*Annona squamosa*	LC
30.	Lal Shak	Red Amaranth	*Amaranthus gengeticus*	LC
31.	Data Shak	Green Amaranth	*Amaranthus viridis*	LC
32.	Badam	Penut	*Arachis hypogaea*	LC
33.	Supari	Betel Palm	*Areca catechu*	LC
34.	Deaua	Monkey Fruit	*Artocarpus lacucha*	LC
35.	Kamranga	Star fruit	*Averrhoa carambola*	LC
36.	Neem Tree	Margosa/Neem Tree	*Azadirachta indica*	LC
37.	Bash	Indian Timber Bamboo	*Bambusa tulda*	LC
38.	Pui Shak	Spinach	*Basella alba*	LC
39.	Chal Kumra	White Gourd/Winter Gourd	*Benincasa hispida*	LC
40.	Tal	Sugar Palm	*Borassus flabellifer*	LC
41.	Kagoj Phool	Paper Flower	*Bougainvillea peruviana*	LC
42.	Ghash	Soap Bush	*Calibanus hookeri*	LC
43.	Chili Peppers	Morich	*Capsicum annum*	LC
44.	Pepper	Morich	*Capsicum frutescens*	LC
45.	Papaya	Pepe	*Carica papaya*	LC
46.	Lemon	Lebu	*Citrus aurantifolia*	LC
47.	Pomelo	Jambura	*Citrus grandis*	LC
48.	Coconut Tree	Narikel	*Cocos nucifera*	LC
49.	Garden Croton	Pata Bahar	*Codiaeum variegatum*	LC

No.	English Name	Local Name	Scientific Name	IUCN Status
50.	Common Coleus	Pata Bahar	*Coleus Scutellarioides*	LC
51.	Taro	Kochu	*Colocasia esculenta White*	LC
52.	Jute	Deshi Pat	*Corchorus capsularis*	LC
53.	Nabhali	Ghash	*Cyanotis cristata*	LC
54.	Bermuda Grass	Durva Grass	*Cynodon dactylon*	LC
55.	Hairy Fig/Devil Fig	Kakdumur/Dumur	*Ficus hispida*	LC
56.	Bengal Arum	Ghet Kachu	*Typhonium trilobatum*	LC
57.	Madagascar Periwinkle/ Rosy Periwinkle	Noyon Tara	*Vinca rosea*	LC
58.	Pink Morning Glory	Dhol Kolmi	*Ipomoea fistulosa*	CD
59.	West Indian Jasmine	Rangan	*Ixora chinesis*	LC
60.	Arabian Jasmine	Beli	*Jasminum duplex*	LC
61.	Green Kayllinga	Ghash	*Kayllinga brevifolia*	LC
62.	Henna Tree	Mehedi	*Lawsonia inermis*	LC
63.	China Rose	Joba	*Hibiscus risa-sinensis*	LC
64.	Sapodilla/Chiku	Sofeda	*Manilkara achras*	LC
65.	Spanish Cherry/ Medlar/ Bullet Wood	Bokul	*Mimusops elengi*	LC
66.	Holy Basil	Tulshi	*Ocimum sanctum*	LC
67.	Creeping Woodsorrel/ Sleeping Beauty	Amrul	*Oxalis corniculata*	LC
68.	Betel	Pan	*Piper betle*	LC
69.	Chinese Brake/Chinese Ladder Brake	Dhekia Shak	*Pteris vittata*	LC
70.	Low Flat-Sedge	Ghash	*Pycreus pumilus*	LC
71.	Sugarcane	Aakh		CD
72.	Bur Tree/Canary Wood	Kodom	*Sarcocephalus cordatus*	LC
73.	Rose	Golap	*Rosa centrifolia*	LC
74.	Rain Tree	Rain Tree	*Samanea saman*	LC
75.	Black Plum	Jam	Syzygium cumini	LC
76.	Silver Date Palm/Sugar Date Palm	Khajur/Khejur	Phoenix sylvestris	LC
77.	Laddies Finger/Okra	Verendi/Dheros	Abelmoschus esculentus	LC

**LC = Least Concern, NE= Not Evaluated, CD= Conservation Dependent according to IUCN Bangladesh (2000)*

Olive Tree (Olea Europaea)

Black Berry (Syzygium cumini)

Haritoki (Terminalia chebula)

Amloki (Phyllanthus emblica)

Date Tree (hoenix dactylifera) + Coconut (Cocos nucifera) + Kul (Ziziphus mauritiana)

Banana (Musa acuminate)

Terrestrial Fauna diversity of the project Area

A total of 153 species of wildlife have been identified and recorded through visual observation, sharing photographs of wildlife with community and secondary information from journal and books and categorized the wildlife under endangered, critical endangered, vulnerable, data deficient etc as IUCN status. Among them 5 species of amphibians, 21 species of reptiles, 24 species of mammals and birds 103.

Table 102: Terrestrial Fauna diversity of the project area with threatened status

Group	Total No.	Threatened Status						
		CR= Critically Endangered	EN= Endangered	VU= Vulnerable	LC= Least Concern	NE= Not Evaluated	NT=Not Threatened	DD= data Deficit
Amphibians	5	0	0	1	4	0	0	0
Reptiles	21	2	1	0	13	1	3	1
Mammals	24	1	2	1	14	1	5	0
Birds	103	0	0	0	95	2	2	4
Total	153	3	3	2	126	4	10	5

Table 103: List of Reptiles recorded in the project area

Sl.No	English Name	Scientific Name	IUCN Status
1	Banded kralt	Bungarus fasciatus	LC
2	Bengal monitor	Varanus bengalensts	NT
3	Checkered keelback	Xenochrophis piscator	LC
4	Common garden lizard	Calotes versicolor	LC
5	Common kralt	Bungarus cacruleus	LC
6	Common skink	Mabuya cartnata	CR
7	Common smooth water snake	Enhydris	LC
8	Common wolf snake	Lycodon aullicus	LC
9	Copper head trinket snake	Elaphe radiate	LC
10	Garden lizard	Calotes jerdoni	DD
11	Common garden lizard	Calotes versicolor	LC
12	House lizard	Hemidactylus brookil	LC
13	Monocellate cobra	Naja kaouthia	NT
14	Olive keelback	Atrecium schistosum	LC
15	Rat snake	Cokraber mucsus	LC
16	Russell's viper	Vipera russellii	VU
17	Spotted pond tutle	Geoclemys Hamilton	NE
18	Stripped keelback	Amphlesma stofata	LC
19	Wall lizard	Gekka gecka	CR
20	Yellow monitor	Varanus flavescens	NT
21	Yellow speckled wolf snake	Lycodonjara	LC

**LC = Least Concern, NE= Not Evaluated, CD= Conservation Dependent according to IUCN BD (2000)*

Table 104: List of Amphibian recorded in the Project area

Sl.No	English Name	Local Name	Scientific Name	IUCN Status
1	Bull frog	Sona Bang	Hoplobatrchus tigerinus	LC
2	Common toad	Kuno Bang	Duttaphrynus melanostictus	LC
3	Cricket frog	Jhijhi Bang	Fejervarya teraiensis	VU
4	Maculated tree frog	Gecho Bang	Polypedates maculatus	LC
5	Skipper frog	Kotkoti Bang	Euphlyctis cyanophlyctis	LC

**LC = Least Concern, NE= Not Evaluated, CD= Conservation Dependent according to IUCN BD (2000)*

Table 105: List of mammals recorded in the project area

Sl.No	English Name	Scientific Name	IUCN Status
1	Bengal fox	Vulpes bengalensis	VU
2	Common House Rat	Raltus rattus	LC
3	Common mongoose	Herpestes edwardst	LC
4	Common palm civet	(Paradoxurus hermaphroditus	LC
5	Fishing cat	Prionailurus viverrinus	EN
6	Five striped palm squirrel	Funambulus pennantii	LC
7	Fulvous fruit bat	Cynopterus sphinx	LC
8	Ganges river dolphin	Platanista gangetica	NE
9	Gray musk shrew	Suncus murinus	LC
10	House mouse	Mus musculus	LC
11	Indian false vampire	Megaderma lyra	LC
12	Indian flying fox	Pteropus giganteus	LC
13	Indian pigmy pipistrelle	Pipistrellus mimus	LC
14	Indian porcupine	Hystrix indica	LC
15	Irrawaddy squirrel	Callosciurus pygerythrus	LC
16	Jackal	Cants aureus	LC
17	Jungle cat	Felis chaus	NT
18	Large indian civet	Viverra zibetha	NT
19	Leopard cat	Prionailurus javanensis sumatranus	NT
20	Lesser bandicoot rat	Prionailurus bengalensis	NT
21	Rufous tailed hare	Lepus nigeicollts	EN
22	Small Indian civet	Viverricula indica	NT
23	Small Indian mongoose	Herpestes auropunctatus	LC
24	Smooth coated otter	Lutra perspicillata	CR

**LC = Least Concern, NE= Not Evaluated, CD= Conservation Dependent according to IUCN BD (2000).*

Table 106: List of Birds recorded in the Project area

Sl.No	English Name	Scientific Name	IUCN Status
1	Abbot's babbler	Malacoci45ncla abbotti	LC
2	Ashy prinla	Prinia socialts	DD
3	Ashy wood swallow	Artamus fuscus	LC
4	Ashy-crowned sparrow lark	Eremopterix grisea	LC

Sl.No	English Name	Scientific Name	IUCN Status
5	Aslan cuckoo	Eudynamys scolopacea	LC
6	Asian openbill	Anastomus oscltans	LC
7	Asian paradise-flycatcher	Terpstphone paradisl	LC
8	Asian pied starling	Sturnus montra	LC
9	Bank myna	Accidotheres gingintanus	LC
10	Barn owl	Tyto alba	LC
11	Baya weaver	Ploceus philippinus	LC
12	Black Drongo	Dicrurus macrocereus	LC
13	Black crowned night heron	Nycticorax nycticorax	LC
14	Black headed cuckoo shrike	Coracina melanoptera	LC
15	Black headed munla	Lanchura Malacca	LC
16	Black headed oriole	Oriolus xanthornus	LC
17	Black naped monarch	Hypothymis azurea	LC
18	Black rumped flameback	Dinopium benghalense	LC
19	Brahminy kite	Haltastur indus	LC
20	Bronzed drongo	Dicrurus aeneus	LC
21	Bronze winged jacana	Metopidlus indicus	LC
22	Brown fish owl	Ketupa zeylonensis	LC
23	Brown Cheeked fulvetta	Alcippe potoicephala	LC
24	Cattle egret	Bubulcus fbis	LC
25	Chestnut talled starling	Sturnus malabaricus	NT
26	Cinnamon bittern	Ixobrychus cinmmomeus	LC
27	Common babbler	Turdoldes caudatus	LC
28	Common hawk cuckoo	Hieroccyx varius	LC
29	Common hoopoe	Upupa epops	LC
30	Commo lora	Aegithina tiphta	LC
31	Common kingfisher	Alcedo atthis	LC
32	Common myna	Accridotheres tristis	DD
33	Common wood sharike	Tephrodornts pondicerianus	LC
34	Common tailorbird	Orthofornus sutarfas	LC
35	Coppersmith barbell	Megalalma heamacephala	LC
36	Cotton pygymy goose	Nettapus coromandelianus	LC
37	Crested serpent eagle	Spilomis cheela	NE
38	Fulvous Whistling duck	Dendrocygna bicofor	LC
39	Great egret	Casmerodius albus	LC
40	Great tit	Parus major	LC
41	Great coucal	Centrnpus sinensis	LC
42	Greater painted –snipe	Rostratula bengalensts	LC
43	Green bee-cater	Merops or ientalts	LC
44	House crow	Corvus splendens	LC
45	House sparrow	Passer domesticus	LC
46	House swift	Apus affints	LC
47	Indian cuckoo	Cuculus micropterus	LC
48	Indian pond heron	Ardeola grayil	LC
49	Indian roller	Coractas benghalensts	LC
50	Indian silverbill	Lonchura malabarica	LC
51	Intermediate egret	Mesophoyx intermedit	LC
52	Jungle babbler	Turdoldes striatus	LC

Sl.No	English Name	Scientific Name	IUCN Status
53	Jungle myna	Acridotheres fuscus	LC
54	Jungle crow	Curvus macrurhynclios	LC
55	Large cuckoosheike	Coracinna macel	LC
56	Lesser whistling duck	Dendrocygna javanica	LC
57	Lineated barbet	Megalaima lineats	LC
58	Little cormorant	Phalacrocorax niger	DD
59	Little egret	Egretta garzetta	LC
60	Little heron	Butorides striatus	LC
61	Long tailed shrike	Lanius schach	LC
62	Oriental magpie robin	Copsyehus saularis	LC
63	Oriental skylark	Alauda gulgula	LC
64	Oriental white eye	Zastrops palpehmsus	LC
65	Pied falconet	Microhierax melanoleucos	LC
66	Pled cuckoo	Clamator jacohinus	LC
67	Pied kingfisher	Ceryle rudis	LC
68	Plain printa	Printa inomata	LC
69	Purple sunbird	Nectarinta astatica	LC
70	Purple rumped sunbird	Nectarinia zeylonica	LC
71	Red avadavat	Amandava amandava	NE
72	Red collared dove	Streptopella tranquebarica	LC
73	Red Vented bulbul	Pycnonotus cafer	LC
74	Red wattled lapwing	Vanellus indicus	LC
75	Red whiskered bulbul	Pycnonotus Jocusus	LC
76	Rock eagle owl	Bubo bengalensts	LC
77	Rock pigeon	Columba tivta	LC
78	Roseringed parakeet	Psiltacula krament	LC
79	Rufous treeple	Dendrocitta vagabunda	LC
80	Rufous winged hushlark	Mirafra assarnica	LC
81	Scaly breasted munla	Lonchura punctulata	LC
82	Shikra	Accipiter badius	LC
83	Small minivet	Pericrocotus cinnamomeus	LC
84	Small pratincole	Glareola lacteal	LC
85	Spotted dove	Spilopelia chinensis	LC
86	Spotted owlet	Athene brama	LC
87	Stork billed kingfisher	Halcyon capensis	LC
88	Streaked weaver	Ploceus manyar	LC
89	Strtated babbler	Turdoides earler	LC
90	Tawny bellied babbler	Dumetta hyperythra	LC
91	White breasted waterhen	Amaurornis phoenicunis	LC
92	White browed fantail	Rhipidura aureola	LC
93	White browed wagtall	Motacilla maderaspatensis	LC
94	White eyed buzzard	Butastur teesa	LC
95	White rumped munia		LC
96	White rumped vulture	Gyps bengalersis	LC
97	White throated fantail	Rhipidura albicollis	LC
98	White Throated kingfisher	Halcyon smyrnensis	LC
99	Yellow biltern		LC
100	Yellow footed green pigeon	Treron phoenicoptera	NT

Sl.No	English Name	Scientific Name	IUCN Status
101	Yellow fronted pled woodpecker	Leiopicus mahrattensis)	LC
102	Yellow wattled lapwing	Vanellus malabaricus	LC
103	Zitting cisticola		DD

**LC = Least Concern, NE= Not Evaluated, CD= Conservation Dependent according to IUCN BD (2000).*

Aquatic Fauna/Fish species

The list of aquatic Fauna/Fish species identified in the project is having been given in the following Table.

No.	Scientific Name	English Name	Local Name	IUCN Status
1.	*Hypophthalmichthys molitrix*	Silver carp	Silver carp	-
2.	*Hypophthalmichthys*	Bighead carp	Bighead carp	-
3.	*Ctenopharyngodon idella*	Grass carp	Grass carp	-
4.	*Cyprinus carpio*	Common carp	Common carp	-
5.	*Cyprinus carpiovar specularis*	Mirror carp	Mirror carp	-
6.	*Oreochromis mossambicus*	Mozambique mouth-breeder	Tilapia	-
7.	*Channa striata*	Stripped snakehead	Shol	NO
8.	*Channa marulius*	Great snakehead	Gajar	EN
9.	*Channa barca*	Barca snakehead	Tila	CR
10.	*Channa punctata*	Green snakehead	Taki, Lata, Lati, Okol, Chaitan	NO
11.	*Channa orientalis*	smooth-breasted snakefish, Walking snakehead	Gachua, Raga, Cheng	VU
12.	*Amblypharyngodon mola*	Mola carplet	Mola, Molongi, Moya	NO
13.	*Cirrhinus cirrhosus*	Mrigal	Mrigal, Mirka	NO
14.	*Puntiussarana*	Olive barb	Sarpunti, Sarnaputi, Saralpunti	CR
15.	*Puntius chola*	Swamp barb	Chala punti	NO
16.	*Puntius guganio*	Glass barb	Mola punti	NO
17.	*Puntius conchonius*	Rosy barb	Kanchan punti, Taka punti	NO
18.	*Puntius ticto*	Two-spot barb	Tit punti	VU
19.	*Puntius sophore*	Pool barb	Punti, Jat punti, Vasipunti	NO
20.	*Gibelion catla*	Catla	Catla, Katal	NO
21.	*Clarias batrachus*	Walking catfish	Magur	NO

No.	Scientific Name	English Name	Local Name	IUCN Status
22.	*Wallago attu*	Freshwater shark	Boal	NO
23.	*Heteropneustes fossilis*	Stinging catfish	Shingi, Shing	NO
24.	*Pangasius pangasius*	Yellow tail catfish	Pangas	CR
25.	*Pseudeutropius atherinoides*	Indian potasi	Batasi	NO
26.	*Sperata aor*	Long whiskered catfish	Ayre	VU
27.	*Mystus gulio*	Long whiskers catfish	Nuna-tengra	DD
28.	*Chitala chitala*	Featherback, Clown knife fish	Chital	EN
29.	*Notopterus*	Asiatic knifefish, Bronze feather back	Foli	VU
30.	*Gudusia chapra*	India river shad	Chapila	NO
31.	*Corica soborna*	Ganges river sprat	Kachki	NO
32.	*Mastacembelus armatus*	Zig-zag eel, Spiny eel	Baim, Bam, Sal baim	EN
33.	*Macrognathus pancalus*	Indian mastacembelid	Guchi, Baim, Pankal	NO
34.	*Colisa fasciata*	Banded gourami	Khailsha, Khaila, Cheli, Chopra, Khoksa	NO
35.	*Colisa lalia*	Doarf gourami	Lal Khailsha, Boicha, Ranga Khailsha	NO
36.	*Anabas testudineus*	Climbing perch	Koi	NO
37.	*Glossogobius giuris*	Tank goby	Bele, Bailla	NO
38.	*Odontamblyopus rubicundus*	-	Lal chewa	NO
39.	*Nandus nandus*	-	Meni, Bheda	VU
40.	*Chanda nama*	-	Chanda, Nama chanda	VU
41.	*Pseudambassis ranga*	Indian glass fish	Chanda, Ranga-chanda, Lal chanda	VU

**Status DD=data deficient, CR=critically endangered, EN= endangered, VU= vulnerable and NO=not threatened are based on IUCN Bangladesh, 2000.*

12.6.4. *Conservation Significance*

The project command area is not the specific habitat for any particular species of flora and fauna hence none such species will be specifically affected due to project implementation. Previously declared protected areas were not found within the project area.

12.7. Social Environment

This section provides a profile and analysis of the socio-economic characteristics that currently exist within the project corridor. The data analyzed in this section have been collected from a number of primary and secondary sources as detailed in the methodology section, and include:

- Interviews with government officials from several districts and Upazilas;

- Field assessments for community property resources outside of proposed width of the expressway, historical, cultural and archaeological sites;
- Published government documents, especially those of the Bangladesh Bureau of Statistics (BBS), including census data on agriculture; and
- Reports by international organizations such as the United Nations and World Bank.

12.7.1. *Demography*

The project area is located within Agailjhara Upazila under Barishal Districts and located in South-centre part of the country. Barishal district was established in 1797. The total area of the district is 2784.52 sq. km. of which 160.37 sq. km. is riverine. Barishal district is bounded by Madaripur, Shariatpur, Chandpur and Lakshmipur districts on the north, Patuakhali, Barguna and Jhalakathi districts on the south, Bhola and Lakshmipur districts on the east, Jhalakathi, Pirojpur and Gopalganj districts on the west. Total population both man and females in Barishal district is 2324310 while males are 1131705 and females are 1181575. The average size of household in the district is 4.52 with the population density being 840 per Square kilometer. The literacy rate is 61.2%. In terms of population, project districts represent 1.6% of the total population of the country. The female to male ratio is close to 1:1 (BBS, 2013). As per 2011 census, Agailjhara Upazila consist of total population is 149,456. The population density per square kilometer is 961 and literacy rate is 62.9%.

Table 107: Total population in Barishal district

Population			
Upazila	**Year**		
	1991	**2001**	**2011**
Agailjhara	**147343**	**155661**	**149456**
Babuganj	135905	146740	140361
Bakerganj	336706	353909	313845
Banaripara	143825	152877	148188
Barishal Sadar	414281	463032	527017
Gaurnadi	171602	180219	188586
Hizla	166265	174508	146077
Mehendiganj	292436	304364	301046
Muladi	171948	183283	174775
Wazirpur	227115	241374	234959
Barishal	**2207426**	**2355967**	**2324310**

Source: Bangladesh Bureau Statistics, 2011

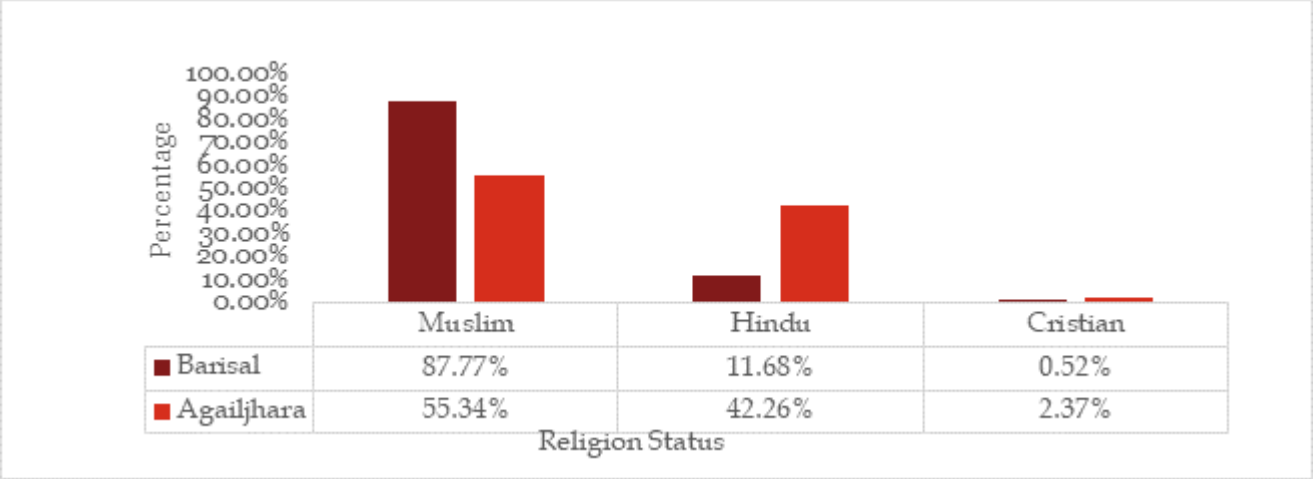
Table 108: Population, household, average size of household and density

Region	Male	Female	Male (%)	Female (%)	Total household	Avg. size of house hold	Literacy rate	Density per sq.km
Barishal	1131705	1181575	48.9	51.1	513673	4.52	61.2%	840
Agaijhara	72421	77035	48.45	51.54	32839	4.53	62.9%	961

Religion Status

There are a number of different religions; Muslims, Hindus, Christians, and Buddhists, and others. The majority of the people from the project covering districts are Muslims 88% in Barishal districts and 55.34 % in Agailjhara Upazila. In Agailjhara Hindu religion represent 42%. The following religions practiced by the people of the project covering districts are Hinduism, Buddhism and others respectively.

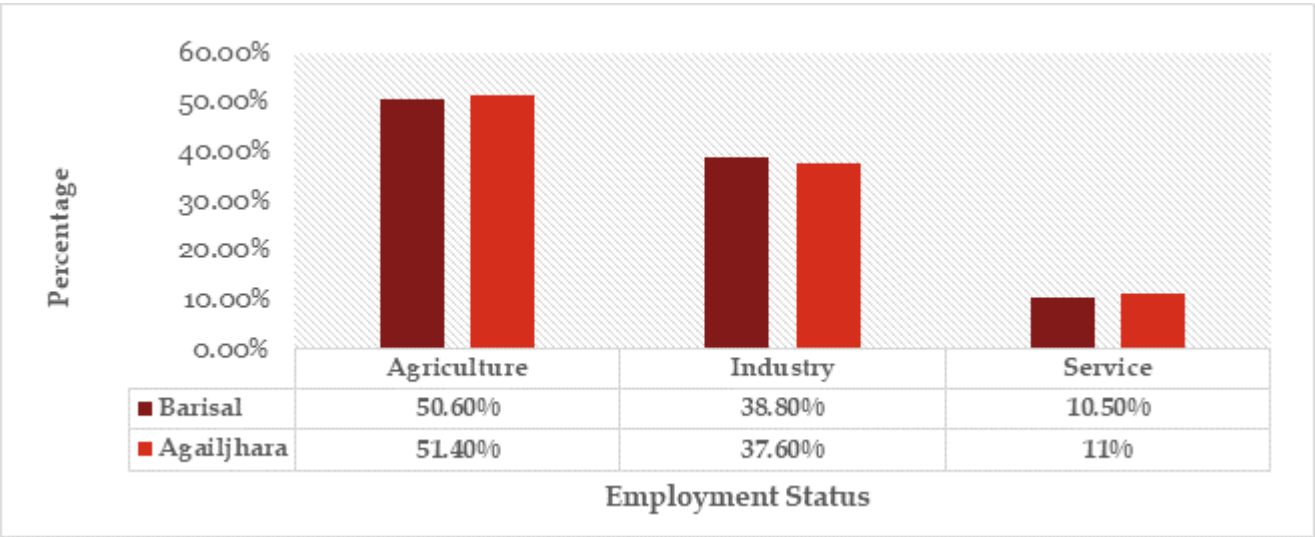
Figure 109: Religious status



Employment Status

BBS, 2013 census data on occupation and livelihood for districts and upazila in project corridor indicate that livelihood is mixed in nature and majority of population depend on agriculture and industrial and service work. 50% of total population depend on agricultural activities while about 39% depend on industry and the rest is on service.

Figure 110: Occupations and Livelihood Status of Project Districts and Upazila



Cultural Aspects

There are a number of different religions; Muslims, Hindus, Christians, and Buddhists, among others. Besides the general culture and heritage of the area, culture also differs throughout the regions. The Muslims pray in the mosques and observe their religious festivals like Eid, the Hindus observe their Pujas (Durga puja, Kali puja, etc.) in the temples and the Christians observe their prayer in the church and observe Christmas.

Archaeological, historical treasures and scenic areas

There are only few sites of significant archaeological value or sites of tourist interest in and around the survey area. There are several old mosques, temples and churches found in the area.

According to the Bangladesh district statistics, Barishal district having following Archaeological Heritage like Rammohan Samadhi Mandir, Sujabad Kella, Sangram Kella, Sharkal Fort, Girja Mahalla, Bangabandhu Uddan, Muktijoddha Park, Ebadullah Mosque, Kasai Mosque, Oxford Mission Church, Shankar Math, Kali Bari of Mukunda Das, Joint Mosque at Bhatikhana, Aswini Kumar Townhall, Charkella, Durgasagar Dighee, One domed

Mosque (Kasba), Brass image of Manasa weighing three maunds (Char Bania Bari), Padda Pukur, Bibir Pukur, Ulania Jamidar Bari (Mehendiganj), Bara Auliar Majar (Bakerganj), Beptist Church, Cathalik Church, Saint Alfreed Church reported (Population and housing census, 2011).

No Archaeological, historical treasures were exist within the proposed EZ.

12.7.2. *Social Infrastructure*

Agailjhara Upazila has the following social infrastructure and public utility infrastructures.

Table 109: Social infra Structure of Agailjhara Upazila

Social infrastructure	Numbers
Govt. primary School	96
None- government primary school	3
High school	25
Girls High school	3
Junior high school	2
College	6
College (Girl)	1
Alim madrasah	3
Dakhil madrasah	3
Upazila health complex	1
Family planning center	34
Upazila health and welfare center	20
M.C.H unit	1
Government Orphan	1
None- government Orphan	5
Masque	169
Mandir	63
Bank branch	6
Post office	18
Telephone exchange	1
Deep tube well	1024
Shallow tube well	2423
Tube well	4276
Energy controlling pump	488
Upazila animal health center	1

Social infrastructure	Numbers
Artificial insemination center	1
Central cooperative society Ltd.	1
Young cooperative society Ltd.	17
Fisheries cooperative society Ltd.	21
Farmer cooperative society	8
Fisheries seed producing farm	16
Market	18
Cattle farm	62
Broiler farm	45

Source: Bangladesh Bureau of Statistic (BBS)

12.7.3. *Livelihood and Economy*

According to housing and population census 2011, the economy of Barishal are fully agriculturally enriched. The people of Barishal have different profession and their livelihood pattern. According to Bangladesh bureau statistics 2011, In Barishal district, 50.6% agricultural, 38.8% Industry and 10.5 % services while 51% agricultural, 37.6% industry and 11% are services holding in Agailjhara Upazila. The main crops of that region are paddy, wheat, jute, cotton, tobacco, sugarcane, pulses, oil seeds, potato, vegetables and other seasonal crops also a seasonal harvest. Various fruits like Mango, jackfruit, coconut, guava, lemon, banana and other fruit varieties are all permanent crops. As the coastal region, fish of different varieties abound in this district is common phenomena which enjoy the advantages coastal fishing. Here, fisheries farming and salt production is the most important economic sources of that region. Dry fish in another important income sources specially fisherman.

Cropping Season & Crop Production

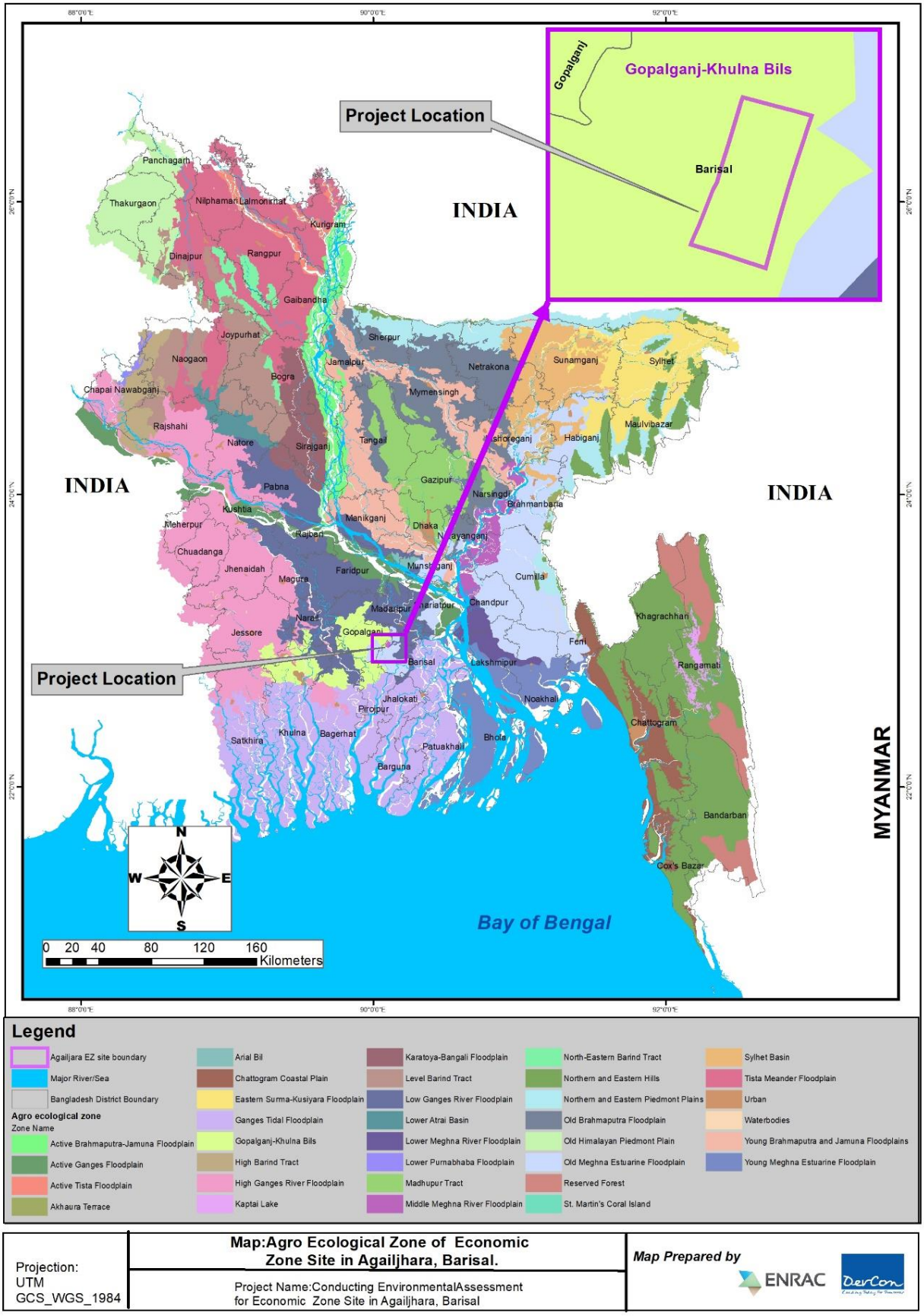
Agro-ecological Zones of Bangladesh define the fertility of land units in terms of Physiography, hydrology, seasonal flooding, soil type and tidal activity. Bangladesh has been tentatively divided into 30 agro ecological zones and 88 agro-ecological sub regions (Yearbook of Agricultural Statistics-2012, BBS.). The proposed EZ falls on Gopalganj-Khulna bils agro-ecological zone (Error! Reference source not found.). The region occupies e xtensive low-lying areas between the Ganges river floodplain and the Ganges tidal floodplain. Soils of the area are grey, and dark grey, acidic, heavy clays overlay peat or muck at 25-100 cm. General soil types include mainly peat and non-calcareous dark grey floodplain soils. Organic matter content is medium to high. Fertility level is medium.

The crop-growing period of the project is divided into three seasons: Kharif-1, Kharif-2 and Rabi. Kharif-1 season starts from March-April and ends in May-June. Kharif-2 season extends from May through October, while the Rabi seasons starts from November and continues up to April.Kharif-1 Season is characterized by unreliable rainfall and varies in timing, frequency and intensity from year to year, and provides only an intermittent supply of moisture for such crops as Aus, groundnut, amaranths, thus requiring irrigation. With the expansion of irrigation facilities, some of the Kharif-1 crops are now grown under irrigated conditions. These include Aus, jute, amaranths, groundnut, banana, sesame, lady's finger, sweet gourd, white gourd, bitter gourd, ribbed gourd, turmeric etc.

During Kharif-2 the moisture supply from rainfall plus soil storage is enough to support rain fed or un-irrigated Kharif crops. The crops most extensively cultivated during the Kharif-2 season are transplant Aman, jute, sesame, different kinds of summer vegetables, ginger, turmeric, green chili, different kinds of aroids, green gram etc. The Rabi season starts at the end of the humid period and lasts to the Kharif-1 season. The mean length of the Rabi growing period ranges from 140-150 days. The starting date of the Rabi season ranges from to 1-10 November in

this project area. Most common Rabi or winter crops are groundnut, sesame, potato, sweet potato, lentil, gram, grass pea, cow pea etc.

Figure 111: Agro-ecological zone of Bangladesh including the project



12.8. Impact Assessment and Proposed Mitigation

The environmental impact assessment was carried out considering present environmental setting, nature and extent of the proposed activities. The proposed project involves development of EZ and offsite facilities for upcoming EZ in Agailjhara. Potential environmental impacts associated with EZ and proposed off-site facility are classified as: i) impacts during site preparation or pre- construction phase, ii) construction phase, and ii) operation or post construction 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.

12.8.1. Impact Identification

During the site visit, various environmental sensitive features were identified which may potentially be impacted by the project at various stages. Consultations were also held with people in the locality including those presently living in and around the Project areas, local government authorities, school teacher, nearby residents, etc. Outcome of these consultations were used in impact assessment and devising mitigation measures. Identified impacts of the project activities on the environment components are given below along with the associated activities.

Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
		Short Term	Long Term	Short Term	Long Term	
Pre-Construction Phase						
Land Acquisition for site, access road and utility supply system	Change in land use pattern		✓			
	Impact on livelihood		✓			
	Shifting of Utilities	✓				
Site Preparation	Removal of Vegetation.		✓			
	Impact on aesthetic aspects		✓			
Construction Phase						
Development of EZ and Construction of Boundary wall, embankment, Access Road, super dyke, 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	✓				

Activities	Impacts	Negative Impact		Positive Impact		Not Applicable
		Short Term	Long Term	Short Term	Long Term	
	Impact on Health & safety	✓				
	Social impact	✓			✓	
	Removal of Trees	✓				
Operational Phase						
Development of Off-site Infrastructure, i.e. Boundary wall, embankment, access road, water supply system, electrical supply line and administration building and operation of industries	Ambient Air Quality		✓			
	Noise Pollution		✓			
	Potential Surface water pollution due to industrial waste discharge		✓			
	Economic Development				✓	
	Accessibility				✓	
	Groundwater depletion		✓			
	Potential for land contamination due to industrial activities		✓			
	Increased Run-off		✓			
	Generation of Employment				✓	
	Natural drainage pattern		✓			

12.8.2. *Pre-Construction and Construction*

12.8.2.1. *Impact on Climate and Methodology*

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

- 10.45 % Greenery/Open Space inside the EZ has been recommended
- Plantation shall be carried out at suitable location to minimize impact on micrometeorology

12.8.2.2. *Impact on Land and Natural Drainage*

The preconstruction and construction phase will involve backfilling of the land to a level higher than the High Flood Line (HFL) of the nearby area with respect to the site to keep the eventual site ground level more than the high flood level ever recorded.

Pre-Construction phase

The topography of Project site is high flat land. The land filling may affect the topography and geology of the area around the proposed site. Filling will cause change of land types. Some protection measures against slope sliding or erosion especially in rainy season need to be considered. Land filling can disrupt the natural drainage pattern and cause drainage congestion which can affect the land resource. Protecting national storm water drainage network and/or creating more drainage network could be a solution.

Construction Phase

The construction of the road may affect the topography and geology of the area around the proposed site. Construction of infrastructures will cause change of land types and the entire topography of Project site is high flat land. Some protection measures against slope sliding or erosion especially in rainy season need to be considered.

Soil pollution at the construction site will be occurred possibly by leakages of oil and chemical materials from vehicles, vessels and construction machineries. Vehicles and machineries will be maintained regularly, oil and chemical materials will be stored at an appropriate storage site to prevent any permeation into the ground. These measures will minimize the impact of any soil contamination.

Sediment pollution may occur in the case construction wastewater flows into the river. Channels, ditches and temporary settling ponds will be dug and constructed around the construction area. Wastewater treatment facilities for workers, such as septic tanks and oil separators for oily run-off water, will be installed in the workers' camp and the construction area. Oil and chemical materials will be stored in an appropriate storage site to prevent any permeation into the ground.

12.8.2.2.1. Soil Erosion and Soil Compaction

During the pre-construction and construction phase, the site clearance activities including clearing of vegetation, construction of the structures, labour camps, storage area, toilets will involve removal of top soil which will result in slope destabilization and the land will be more susceptible to soil erosion. The soil erosion will result in the run-off of the silt to surface water affecting estuarine and marine ecosystem with increased suspended sediment load and associated nutrients. Most importantly after landfilling, if the land is be kept for long without further development, it leads to soil erosion due to loose top soil.

During construction activities, there will be compaction of soil in the project area due to construction of the internal access roads, movement of vehicles/ construction machinery and work force movement. The soil compaction would impact the soil physical properties such as reduction in pore spaces, water infiltration rate and soil strength etc. The extent of soil compaction is primarily limited to the Project foot print area and surroundings within 100 m distance. The impact is restricted to the construction phase of the project.

12.8.2.2.2. Landfilling with Dredged Material

The project site is located in low lying area and landfilling up to 8-10 ft. above mean sea level will be done during site development activity. About 3650420 cum filling material is required for landfilling. It is proposed that sand for the backfilling operations will be obtained by dredging from the nearby River. Dredging activity may be carried out near the site location or away from site. Dredging activity will have two fold impacts - firstly as a result of the dredging process itself and secondly as a result of the landfilling of the dredged material.

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.

12.8.2.2.3. Waste Generation

The construction waste generated onsite comprises of materials such as excavated soil, rocks, concrete, wooden pallets, steel cuttings/filings, packaging paper or plastic, wood, metals etc. Municipal domestic wastes consisting of food waste, plastic, glass, aluminum cans and waste paper will also be generated by the construction workforce and labor camp site.

The waste generated during the construction phase will also include hazardous waste such as used oil, hydraulic fluids, waste fuel, grease and waste oil containing rags. If improperly managed, solid waste could create impacts not only to land but also to local air quality, water quality, and human health. Since the site will be raised to about 8-10 ft above mean sea level, it is likely that the surface run off from site surrounding area will be drawn to the nearby surface water system and marine water. From the drainage pattern it is observed that, in general the flow of the surrounding area will be towards the river, eventually to the sea. If the waste and raw material are poorly managed, it will also be carried away by surface run off, which will eventually contaminate the aquatic system.

12.8.2.2.4. Soil Contamination

Soil contamination during the construction phase may result from filling activity, leaks and spills of oil, lubricants, or fuel from heavy equipment and wastewater. Such spills could have a long-term impact on soil quality, but are expected to be localized. Storm water run-off from the contaminated area can pollute the downstream soil and water quality of adjacent river, other waterbodies and sea.

Spill control measures such as the storage and handling of chemicals and fuel in concrete areas with secondary containment will be implemented to minimize impacts in the event of a spill.

The soil characteristics of the native soil may also be changed due to import of soil for filling and levelling purpose. It is envisaged that the filling activity may impact the native soil due to spillages during transportation of soil and run-off during filling and compaction.

Apart from the embedded controls to be included in project design, the following mitigation measures will reduce the negative impacts on soil environment:

Mitigation Measures

- Top soil should be preserved and should be reused in borrow area or green area development
- Stripping of topsoil should be scheduled as the last mile activity (maintain vegetation cover for as long as possible) in order to prevent the erosion (wind and water) of soil;
- Care should be taken to minimize percolation of soil used for filling to adjacent rivers and sea during filling operations. Proper embankment should be provided in the downstream areas to minimize soil percolation to rivers. Proposed super dyke structure will also help to avoid soil erosion due to tidal influence.
- Provision for channels at suitable locations should be kept to maintain flow of marine water towards the riverine system
- Vegetation should be planned and maintained for slope stabilization and to prevent soil erosion after construction period;
- The disturbed areas and soil stock piles should be maintained moist to avoid wind erosion of soil;
- The routes for movement of heavy machinery should be designated to avoid the soil compaction in other areas;
- Transport vehicles and equipment should undergo regular maintenance to avoid any oil leakages; designate routes for bringing construction material and outside soil;
- Construction contractor should designate the sites to be used for storage of hazardous wastes including waste oils, solvents, paint and batteries;
- The Contractor should ensure that no unauthorized dumping of hazardous waste are undertaken and contractor should dispose of hazardous waste through licensed traders ;
- Fuel and other hazardous substances should be stored in areas provided with roof, impervious flooring and bund/containment wall;

- The soil used for landfilling should have similar characteristics to the native soil and free of any type of contamination.
- Prior to dredging activity, analyses the soil sample to prevent impacts on the receiving environment as a result of mismatch in soil characteristics;
- During dredging activity, physical barriers such as silt screen/ curtains should be employed to prevent the spread of suspended sediments;
- The storm water drainage system shall be designed in synchronization with the existing natural drainage pattern. The direction of the flow shall be engineered to be same as that of the natural flow direction of rain water;
- The construction debris and high silt content of the virgin soil, post excavation, should be kept in a designated location so as to prevent leaching during monsoons. Storm water drains shall be designed and shall be connected with rainwater harvesting pits. All the construction wastes and excavated soil shall be temporarily stacked on tarpaulin sheet (in order to prevent leaching to groundwater) and a temporary tin sheet shall be placed on the top to prevent rainwater to maximum extent to carry the soil and construction wastes to the adjacent aquatic system
- To demonstrate the commitment towards better environment, 17.09% of total area has been designated for green and open spaces. These green area shall be declared as the green zone of the EZ
- Based on drainage pattern study it was seen that surface run off from northern side will be towards the proposed site and the river. Hence, it is recommended to provide peripheral structure to collect and divert the surface runoff from the surrounding area in Northern side protect the site
- Based on the site gradient, the drainage pattern has been decided. It has been planned to discharge the flow of the internal drain into nearby highway drain to be developed.

  The drainage system is planned to cater for the entire EZ through gravity flow.
    - Drains are proposed to be provided on both sides of the roads.
    - Open trapezoidal drain is considered for the surface run off collection due to easy maintenance for the primary road. Stone pitching is considered for the side walls and PCC for the base.
    - Covered rectangular brick masonry drain is considered for the remaining areas for optimization of area under drainage.
    - RCC box / pipe culverts of suitable sizes are considered for road crossings.
    - Rainwater harvesting structures are envisaged all along the drain at every 30 m interval.

12.8.2.3. *Impacts Due to Dredging*

The preconstruction and construction phase will involve backfilling of the land to a level of 8-10 ft. above mean sea level. It is proposed that sand for the backfilling operations will be obtained by dredging from the nearby River. 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, analyse 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 inspection of dredging activity in case of any organism in the vicinity.
- Conduct visual inspections for aquatic life and dredging must not be carried out when the fish are likely to be breeding in the river, or in the period normally from April to August between spawning and the subsequent emergence of juvenile fish. To the end, water samples will be collected upstream and downstream of the dredger while in full operation and tested for nutrient, sediment loads, heavy metals as well as oil and grease concentrations, and river bed dredged materials of the river need to be tested by the contractor.

12.8.2.4. *Impact on Air Environment*

Pre-construction phase

The pre-construction phase will involve site preparation activity for development of EZ, 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.

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/hr which will help in minimizing fugitive dust emissions due to vehicular movement

12.8.2.5. *Impact on Noise Environment*

Pre-construction phase will involve site clearance activity for development of access road and utilities. The site clearance will involve removal of vegetation and land levelling activities. Operation of different machineries and equipment for construction activities, running of heavy load traffic for construction materials transportation, and regular traffic movement may generate noise during construction period. The heavy equipment, machineries, transportation and earthworks used for the construction activities are the major sources of noise. It is envisaged that there will be an increase in traffic and thereby in traffic noise impacts on the receptors near the approach road from the transportation of equipment, construction materials. Few settlements located in the northern side of proposed site are likely to be exposed to higher level of noise due to construction activity if proper mitigation measures are not taken.

Mitigation Measures

The following mitigation measures should be implemented to minimize potential noise impacts during preconstruction and construction phases:

- Regular maintenance of equipment such as lubricating moving parts, tightening loose parts and replacing worn out components should be conducted;
- Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during idle time;
- Acoustic enclosure should be provided for the DG set;
- Equipment known to generate noise strongly in one direction should be orientated so that the noise is directed away from nearby sensitive receptors as far as practicable;
- Honking should be avoided;
- Construction work should be carried out only during day time (from 8.00am to 6 pm);
- Machinery to be used should comply with the noise standards prescribed by DoE.
- To deal with noise exposure by construction workers in construction site, pocket guide by OSHA is helpful.
- At individual worker level, the construction contractor should be insisted to provide earmuffs to the workers exposed to high noise levels.

12.8.2.6. *Impact on Water Environment*

12.8.2.6.1. Impact on Surface Water and Groundwater Resource

On the basis of industrial assessment and demand forecasting for the proposed EZ, potable water demand for the proposed EZ would be about 8.7 MLD and total water demand would be 9.3 MLD. This figure is indicative in nature and may vary based on on-ground implementation of the project. The developer may undertake a separate industry assessment and master planning exercise in order to validate this figure.

Site is situated adjacent to Paisarhat River on its western side, which is 1 km from EZ site. It is proposed to provide infiltration gallery/well, collection well and pump house near the river basin at an approximate distance of 3 km from the site to meet the water demand of EZ on a long-term basis from which external water supply pipe line needs to be established to connect the proposed site.

For the initial demand it is planned to build 1 bore well within the proposed site to draw the ground water. Exact location of water intake (i.e., the locations of the tube wells) within the site needs to be finalized during the construction stage.

Potable and non-potable water supply network

It is proposed to provide infiltration gallery/well, collection well and pump house near the river basin and the feeder line from the source to EZ. It is proposed to establish collection sump and OHT (located at NW corner) within EZ and from OHT, the water supply pipeline is proposed along the proposed road network of 30 m, 25 m and 18 m roads. This pipeline feeds the individual plots. Also, the non-potable water pipeline from STP is proposed in parallel with potable line. The layout depicting proposed potable and non-potable water supply network is provided below.

Figure 112: Detail of External Water supply system

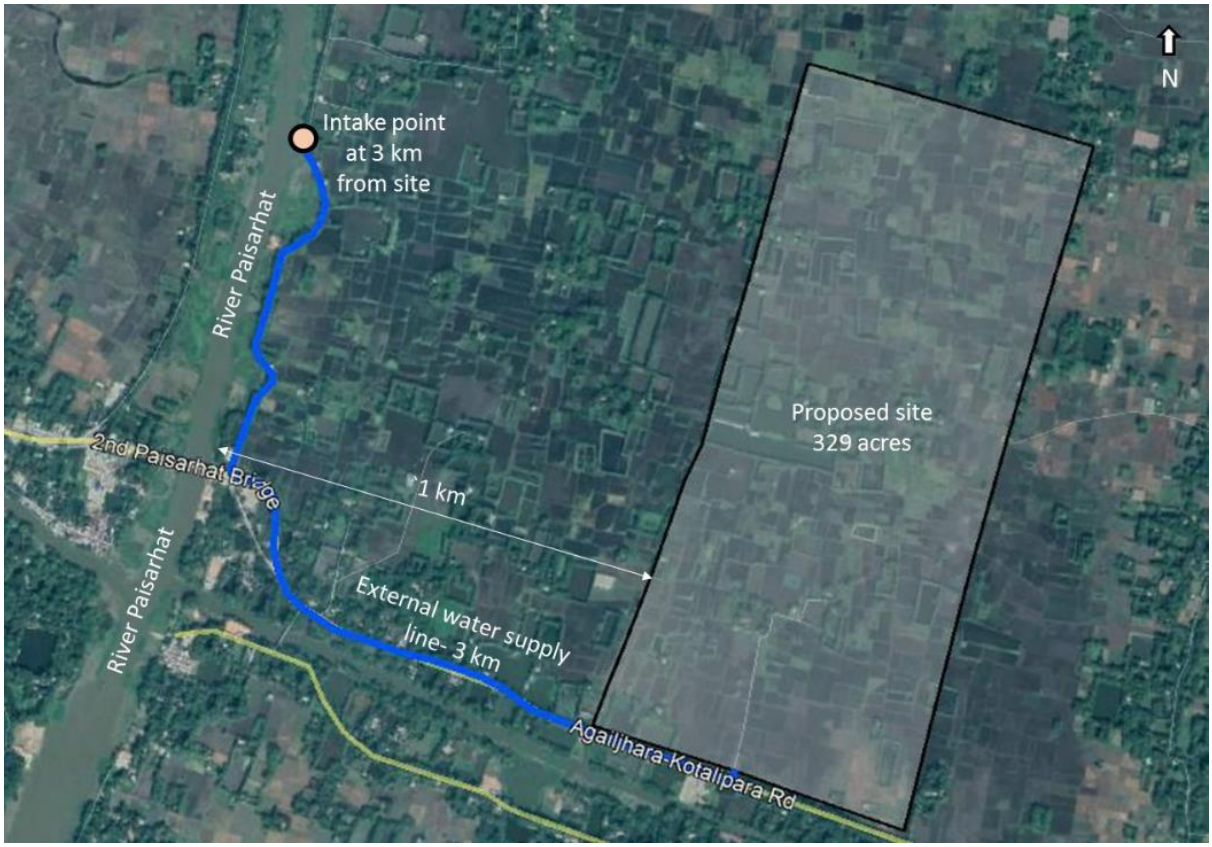
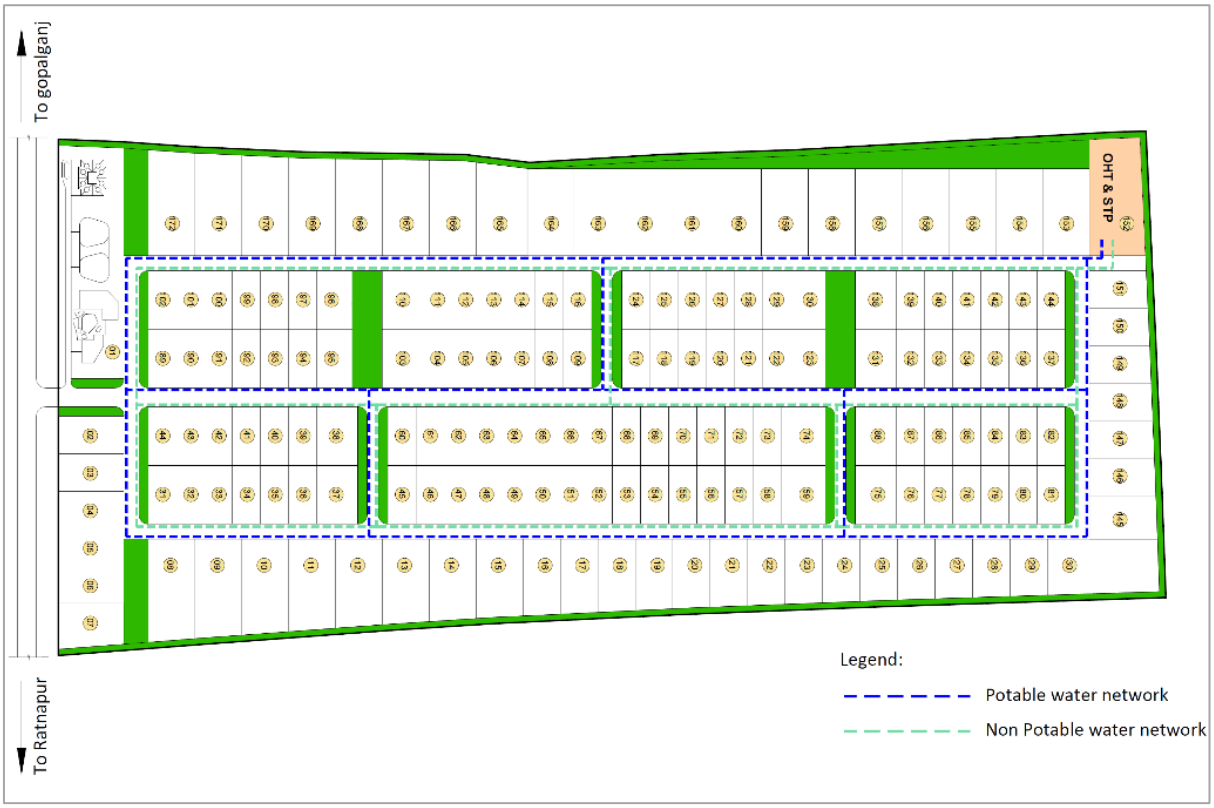


Figure 113: Potable and non-potable water supply network



12.8.2.6.2. 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.

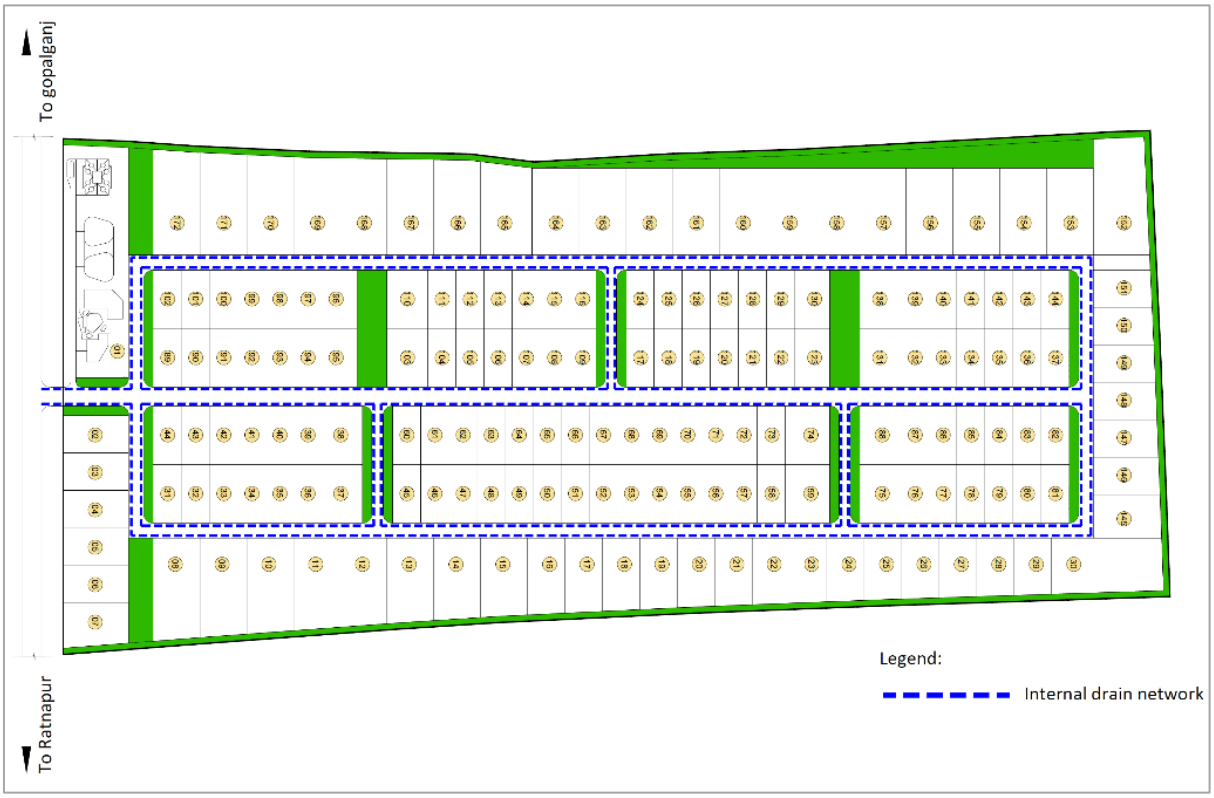
The quality of surrounding water bodies including the River and streamlet could also be affected due to surface runoff from contaminated soil (soil contamination due to oil/ fuel spillage and leakages), particularly during monsoon season. The surface runoff carrying the loose top soil will lead to increased sedimentation in the receiving water bodies. Contamination to water bodies may also result due to oil spilling during construction activities and/or surface runoff from the construction site to the adjacent water drainage system. 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 sand bags as partition as barrier for direct flow of run off to aquatic system
- Check dams should be provided to prevent construction runoff from the site to the surrounding water bodies.
- Minimize run-off by using sprays for curing
- Construction of adequate nos. of toilets and proper sanitation system for workers to prevent open defecation along the river banks/water supply lines
- Construction of soak pits/septic tanks to dispose-off the domestic wastewater generated from labour camps to prevent disposal of sewage in surface water bodies. Alternatively collect labour 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;
- Labourers 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.

Figure 114: Internal storm water drain network



12.8.2.7. *Impact on Biodiversity*

As a part of site preparation activity, backfilling will be done to reach ground level of 8-10 ft. above Mean Sea Level and vegetation cover will be cleared. The site can be filled through dredging. As per discussion with BIWTA, River Paisarhat can be the source of dredging sand. However, detailed hydrostatic study has to be carried out for identifying the suitable point of dredging. As a result of these, following impacts on biodiversity is envisaged-

- Dredging- Impact on habitat and breeding/spawning ground of fishes and other aquatic fauna due to bottom disturbances. Affect bottom dwellers; the Benthos are likely to be majorly affected. Possibility for loss of wildlife
- Site preparation- Vegetation cover will be lost from the area. The loss will be irreversible in nature. Various Avifauna, Herpetofauna, Pisces, Arthropods dependent with on the homestead, roadside and other vegetation for various reason like shelter, basking, Hunting resting will be affected.
- Contamination- Accidental spillage, poor management of waste may contaminate the water, eventually aquatic life.

Mitigation Measures

Following measures must be taken as a compensatory act and an effort to negate the impact on biodiversity-

- Plantation on the buffer zones as shown in the master plan and monitoring of its survival
- Wildlife awareness program among the workers (during preconstruction and construction phase) should be conducted. Workers should report sighting of any uncommon species to the environmental expert, who immediately should inform the incidence to local forest/wildlife authority/ conservationists
- Strict instruction to the workers must be passed on, so that they not to harm-catch-kill any wildlife or cut down trees for any reason
- Awareness program on wildlife conservation among local community should be conducted so that they can also feel the necessity for conservation of wildlife of the area
- Emission, effluent and waste must comply to GoB standard norms
- No waste shall be discharged in water bodies
- Accidental spill management plan should be developed
- No infrastructure development activities shall be encouraged close to the river
- A half-yearly ecological assessment (preferably in winter and monsoon) during preconstruction, construction should be conducted through specialists to record chronological trend of biodiversity in the project area surrounding

12.8.2.8. *Impacts on Occupation Health and Safety*

The lack of adequate mitigation measures on the health and safety of the workers will result in accidents and injuries leading to loss of life or property. It is proposed to implement the following mitigation measures to ensure safe work place for the construction labor.

Mitigation Measures:

- The project proponent should ensure that the contractor (make part of contractor's contract) to have and occupational health and safety plan. The contractor should provide accidental insurance and medical insurance to all the workers.
- The contractor should conduct daily tool box meeting for all workers to discuss potential work-related hazards and other safety aspects.
- The contractor should conduct training for all workers on safety and environmental hygiene at no cost to the employees.
- The contractor should maintain first aid facilities for the workers and will instruct and induct all workers in health and safety matters (induction course) including construction camp rules and site agents/foremen will follow up with toolbox talks on a weekly basis. Workforce training for all workers starting on site will include safety and environmental hygiene.
- Fencing on all areas of excavation greater than 1m deep and sides of temporary works should be observed.
- Workers should be provided with appropriate personnel safety equipment such as safety boots, helmets, gloves, protective clothes, dust mask, goggles, and ear protection at no cost to the workers.
- Reversing signals (visual and audible) should be installed on all construction vehicles and plant.
- Contractor should be responsible for evacuation injured person to the nearest medical center
- Pertinent H&S trainings should be provided to all the workers with respect to hazards linked to the activities. Additionally, the workers will be informed of precautions to be taken to avoid impacts to the local community;
- Monitoring of the PPE usage can be strengthened, in that, a mechanism can be adopted whereby defaulters receive a warning on non-usage and stringent actions can be taken on subsequent offences;
- Maintain H&S records of occupational H&S incidents, accidents, diseases and dangerous occurrences
- The contractors should ensure H&S standards of labour camps. The labour 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 labour 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.

12.8.2.9. *Flood and Cyclone Risk*

The 1965 cyclone affected the coastal areas of the Barishal and Bakerganj resulting in 16,456 casualties in the Barishal region. During the master planning stage, cyclone structures and multipurpose cyclone shelters may be taken into consideration as a part of the disaster mitigation plan.

12.8.2.10. *Sanitation and Disease Vectors*

Potential sanitation and impacts from disease need to be controlled by maintaining hygienic conditions in the EZ area 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 and also that the contractor (during construction 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.

12.8.3. *Operation Phase*

12.8.3.1. *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, Wood products & furniture, Food and Beverages, Agro based products, Paper & packing and light engineering industries are envisaged for this EZ. These industries are anticipated to be polluting to some severe extent and hence discharge of the generated sludge, effluent and solid waste shall be done in a structured manner. The nature of waste likely to be generated in the EZ are described in the subsequent section.

12.8.3.2. *Waste Generation*

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

- Hospital and biomedical waste.

The generation rates of industries, logistics, commercial & residential 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. MSW quantification has been carried out and depicted in Error! Reference source not found. Estimation of MSW Generation. Total estimated MSW q uantity – 4.45 TPD. 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 estimation of the sewage shall vary depending upon the land use distribution. Wastewater generated from toilets is considered as sewage and wastewater generated from bath / shower, laundry, hand basin and kitchen are considered as sullage (grey water). Based on the general wastewater generation pattern, the quantity of wastewater generated in domestic premises is presented in the below table Sewage and Sullage Generation Estimation. The estimation of average daily sewage and sullage generation is 6.2 MLD

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 vendors for recycling e-waste in Bangladesh. E-waste to be picked up by authorized vendors. 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 Spent Catalyst, organic/inorganic residue, used oil, scrap batteries, waste fuel, grease, waste oil containing rags etc. If improperly managed, waste could pollute not only to land but also to local air quality, water quality, human health and the rich estuarine ecosystem.

Table 110: Estimation of solid waste generation

Land use pattern	Total area	Population	MSW generation		
	Acres		MSW generation rate	Unit	Kg/day
Processing area					
Industries	243.10	13232	200	gm/capita/day	2646.40
Loading & Unloading area	3.82	832	100	gm/capita/day	83.20
Utility	4.51	982	100	gm/capita/day	98.20
Road	38.03		10.12	kg/ha/day	155.82
Green & open space	32.55		30.36	kg/ha/day	400.13
Total processing area	322.02				3383.75
Non- processing area					
Admin & Customs block	2.47	5318	100	gm/capita/day	531.80
Supporting amenities	2.47	2659	100	gm/capita/day	265.90
Public amenities	2.47	2659	100	gm/capita/day	265.90
Total non-processing area	7.41	10636			1063.60
Total	329.43	10636			4447.35

Land use pattern	Total area	Water demand				Effluent generation	Sewage generation	Sullage generation	Total effluent, sewage and sullage generation	Infiltration @10%	Total sewage quantity
	Acres	Process water	Domestic water	Potable	Non-potable	In cum/day					
Processing area											
Industries	243.10	6889.60	595.44	7938.80	294.74	3,444.80	212.48	886.82	4,544.10	823.35	5,367.45
Loading & Unloading area	3.82	137.51	37.44	173.91	18.53	68.76	13.36	32.47	114.59	19.24	133.83
Utility	4.51		44.19	26.73	21.87	-	15.77	25.54	41.31	4.86	46.17
Road	38.03		27.72	16.77	13.72					3.05	3.05
Green & open space	32.55		23.72		34.40					3.44	3.44
Total processing area	322.02	7027.11	728.51	8156.22	383.27	3513.56	241.61	944.83	4699.99	853.95	5553.94
Non- processing area											
Admin & Customs block	2.47		239.31	184.27	78.97	-	25.07	161.32	186.39	26.32	212.71
Supporting amenities	2.47		119.66	92.13	39.49	-	12.53	75.88	88.41	13.16	101.57
Public amenities	2.47		358.97	276.40	118.46	-	85.40	241.98	327.38	39.49	366.87
Total non-processing area	7.41		717.93	552.81	236.92		123.00	479.18	602.18	78.97	681.15
Total	329.43	7027.11	1446.44	8709.02	620.18	3513.56	364.60	1424.01	5302.17	932.92	6235.09

Mitigation Measures

- Provision shall be made for proper storage and disposal of industrial waste by respective industries.
- Special care must be taken by all the industries to avoid any kind of accidental contamination which could be a threat to the surrounding estuarine and marine ecosystem
- Provisions shall be made to segregate e-waste with rest of the wastes generated.
- Alliance shall be done with e-waste recycling vendor and the segregated e-waste shall be send to the vendor for recycling purposes
- ETP shall be mandatory for all the industries. Every unit shall have its own ETP unit.
- Based on estimated quantity of sewage and effluent, a Sewage Treatment Plants (STP) of 6.24 MLD capacities have 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 recyclable and rejected waste. Recyclable waste should be sent to licensed traders for recycling and rejected waste should be disposed of as per the best industrial practice for particular waste
- Industrial waste generated should be stored on sealed surfaces and should be disposed of as per the best industrial practice
- Local environmental bodies shall be consulted for the initiation for the designing and constructing localized landfill for the disposal of process waste.
- No chemical/hazardous raw material should be allowed to spill over the land and should be operated in covered systems
- Excessive packaging should be reduced and recyclable products such as aluminum, glass, and high-density polyethylene (HDPE) should be used where applicable.
- Organic waste should be resold to value addition industries or can be fed to live stock.
- Sludge generated in effluent treatment plant should be sold to authorized recyclers or could be dried into cakes and used as manure for green belt

12.8.3.3. *Impact on Air Environment*

Post development of the EZ & setting up of industries, the impacts on the air quality of the area will be from (a) air emissions from the proposed industries and (b) emissions from increased vehicular movements. Many of the industries proposed for this EZ will cause significant air pollution. The cumulative effect of the industries may have severe negative impact on the air quality of the site and the nearby areas.

Mitigation Measures

- Provision should be made for peripheral green belt all along the EZ boundary and in the buffer, zones as shown in the master plan. For peripheral green belt, the tree species should be selected such that first inside row is of smaller height, middle row of tree is of medium height and last row of tree is of higher height so that green belt formed appears like a cascading canopy.
- Development of thick green belt and organized greens within each industrial plots. Broad-leaved species, which can absorb pollutants, should be planted as they help to settle particulates with their higher surface areas along with thick foliage
- Power Generators should be provided with stacks of adequate height (higher than nearest building) to allow enough dispersion of emission.
- Process emission if any 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.

12.8.3.4. *Impact on Noise Environment*

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. The major noise generating source of food processing industries could be Boiler, Motors and pumps Distillation units etc. The following mitigation measures are suggested to mitigate the noise pollution during operation phase.

Mitigation Measures

- Pumps should be fitted in close room, preferably acoustic enclosure to reduce the noise generation
- Green buffer should be developed all along the project boundary and buffer zone. This will help in reducing the noise level significantly.
- Noise regulators must put a strong mandate and fine on vehicle operators which are not properly maintained, produce noise (silencers not proper).
- All industries should obtain clearance from DoE before establishing industrial unit and should comply with all the conditions mentioned in the letter of environment clearance
- All industries should install the new machinery of modern make which complies with the noise standards prescribed by DoE.
- Job rotations should be practiced for workers in working at noise intensive locations to prevent prolonged exposure to high noise level as it may lead to deafness, fatigue, head ache, nausea and drowsiness. Propose PPEs must be made compulsory for workers working at locations where the intensity of noise is high.
- Acoustic design with sound proof glass paneling will be provided for critical operator cabins / control rooms of individual modules as well as central control facilities.
- Proper greasing, periodic checkups for frictionless movements.
- Honking should be regulated within the economic zone

12.8.3.5. *Impact on Water Environment*

To cater the industrial water requirement water from Paisarhat River after desalination will be used. The development of economic zone shall lead to the generation of process and domestic effluent. Liquid waste from the proposed industries will be having potentiality to affect the water quality. The direct discharge of the untreated process and domestic effluent waste will lead to impacts in the surface water quality. Also, it is anticipated that surface run-off may significantly increase post development of economic zone which may impact surface water quality. The nature of waste and effluent likely to be generated from various industries are discussed under 'waste generation' section.

Following measures should be adopted during operation phase to minimize impacts of development of Economic zone on water quality:

Mitigation Measures

- Each industry should obtain consent of DoE Bangladesh before construction and operation and should comply to the conditions laid by them
- The Industry should also obtain the consent of the water abstraction limit from DoE, Bangladesh.
- No leachate, waste water and waste material should be stored in pervious unlined area/pond.
- Efficient Rain water Management Plan will be adopted to reduce the impact due to surface runoff
- ETP shall be mandatory for all the industries. Every unit shall have its own ETP unit.

- Each industry should treat the effluent and sewage generated by them so as to achieve zero discharge and no untreated effluent should be discharged into any water body
- Sludge generated in effluent treatment plant should be sold to authorized recyclers or could be dried into cakes and used as manure for green belt

12.8.3.6. *Impact on Biodiversity*

Once the site is developed on proposed land, which is currently being used as habitat by various species, will be lost. It is envisaged that, during operational period very limited diversity will be found in the EZ area. Poor waste effluent-sewage management, mishandling of raw material, accidental spillage may contaminate the river as well as marine ecosystem. This kind of occurrence can threat wildlife of a vast area of the EZ surrounding. Therefore, proper mitigation measure is essential.

Mitigation Measures

Following measures must be taken as a compensatory act and an effort to negate the impact on biodiversity-

- Plantation on the buffer zones as shown in the master plan and monitoring of its survival
- Wildlife awareness program among the workers (Operation phase) should be conducted. Workers should report sighting of any uncommon species to the environmental expert, who immediately should inform the incidence to local forest/wildlife authority/ conservationists
- Strict instruction to the workers must be passed on, so that they not to harm-catch-kill any wildlife or cut down trees for any reason
- Awareness program on wildlife conservation among local community should be conducted so that they can also feel the necessity for conservation of wildlife of the area
- Emission, effluent and waste must comply to GoB standard norms
- No waste shall be discharged in water bodies
- Accidental spill management plan should be developed
- No infrastructure development activities shall be encouraged close to the river
- A half-yearly ecological assessment (preferably in winter and monsoon) during operation phase should be conducted through specialists to record chronological trend of biodiversity in the project area surrounding

12.8.3.7. *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 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 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.

12.9. Stakeholder Consultations

This section provides the stakeholder identification and analysis as well as a brief understanding of the engagement process for the project. “Stakeholder” refers to those who have plausible stake in the

environmental/social impacts of the project or activity are ascertained with a view to taking into account all the material concerns in the project or activity design as appropriate. It is highly desirable for all key stakeholders to arrive at a consensus on sensitive features, impacts and remedial actions. Stakeholder identification was done by examining the potential impacts of the project in terms of:

- Who may be affected directly (project affected people);
- Which agencies might have responsibility for the impact management;
- Which other organizations might have an interest in monitoring proponent activities or have local knowledge to contribute; and
- Which private/non-government sector entities might face financial and social hardships if the predicted impacts occur

The stakeholders identified in the project comprise of project impacted people, project beneficiaries, various government officials.

The main objective of the consultation process is to minimize negative impacts of the project and to maximize the benefits from the project to the local populace. The objectives of public consultation as part of this project are:

- Promote public awareness and improve understanding of the potential impacts of proposed projects
- Identify alternative sites or designs, and mitigation measures
- Solicit the views of affected communities / individuals on environmental and social problems
- Improve environmental and social soundness
- Clarify values and trade-offs associated with the different alternatives
- Identify contentious local issues which might jeopardize the implementation of the project
- Establish transparent procedures for carrying out proposed works
- Inform the affected populace about the entitlement framework and to settle problems with mutual consent
- Create accountability and sense of local ownership during project implementation; and
- To obtain information on baseline environment

12.9.1. *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. In this regard, 1 Focused Group Discussion was conducted in presence of local farmer, fishermen and local elites. Locals from 3 mouza i.e. Kodal doha, Paisar hat and jalirpur under Bakal Union participated in the discussion. Consultation with various institutional stakeholders like Forest Department, Revenue Department, and Department of Environment etc. had also been conducted during the study period.

12.9.2. *Level of Consultation*

Public consultations in the form of institutional and focused group discussions were carried out during the period from 22th September 2019 till 26th September 2019. Types of consultations done with various participants using various tools including, interviews with government officials, focused group discussion etc. are presented below.

Table 111: Types of Consultation

Level	Type	Key Participants
Institutional	Stakeholder Meeting	Various Govt. Officials
Community	Focused Group Discussion	PAP, Women, marginalized people

12.9.3. *Institution Stakeholders Consultation*

Location of Meeting: UNO Office, Agailjhara Upazila

Name of Person	Designation	Contact Number	Date of Consultation
Bipul Chandra Das	UNO, Agailjhara Upazila	01705406549	25 September 2019
Fatema Ajrin Tonni	AC Land officer, Agailjhara Upazila	01918883311	25 September 2019
Masudur Rahman	Surveyor, Agailjhara Upazila	01710289473	25 September 2019
Bashar	Office Assistant, SA, Poisar Hat Union Office	01743932217	25 September 2019
Siddikur Rahman	CEO, UNO Office, Agailjhara Upazila	01717611907	25 September 2019

Salient Points of Discussion

The following issues were discussed during the meeting

- The proposed site is located in middle southern part of the Bangladesh, which falls in Old Meghna Estuarine floodplain with little difference in elevation between ridges and basins. The landscape of this floodplain is quite different from that on river and tidal floodplains. Natural rivers and streams are far apart in the southern part and drainage in provided by a network of manmade channels. The major part of the site remains submerged under water 7 months (April – October) in a year. Seasonal flooding is deep, but it is shallow in the southeast, some basin centers stay wet through the dry season. It occurs a natural fresh water ecosystem.
- The area supports significant growth of various aquatic species as well. The proposed site is located in aqua and agricultural Zone. The legal status of land is of private type.
- The project area is quite rich in terms of number of species (i.e. species richness) for being a part of fresh water ecosystem.
- Livelihood of many local farmers is dependent on the ecosystem of the project area. Crops, potato, Fish, and agroforestry is being undertaken by the local community in some part of the proposed site.
- There is no presence of government land around the proposed site.

12.9.4. *Focused Group Discussions (FGD)*

The Focused Group Discussions (FGD) were carried out with different group at the proposed EZ area on 25 September 2019. 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, fishermen and local elites. Locals from 3 mouza i.e. Kodal doha, Paisar hat and jalirpur under Bakal Union participated in the discussion. The details of the Focused Group Discussions are furnished below.

Table 112: Details of Focus Group Discussion

Stakeholders	Issues	Suggestion/Demand from participants	Remarks
Affected farmer, PAPs, adjacent residential community	Loss crops/ fish cultivation land Loss of Livelihood Employment Opportunity Improved communication and social infrastructure Skills training to enhance the competency Priority for local manpower	Welcomed the project. They believe it will bring various economical opportunity to them. However, crops/fish cultivation land and some household falling within the proposed EZ boundary will be acquired. Acquisition of crops/fish cultivation land will lead to loss of livelihood to the owners, workers associated with the process of cultivation, local farmers. Currently small scale fishermen are dependent on the submerged site and its surround areas for fishing activity. It is envisaged that they are also likely to be affected. At the same time, locals also feel that the development of EZ will bring new opportunities to the community widely. The fore mentioned communities will also be benefited in various ways and new livelihood opportunities will be created to them as well. Locals are expecting that, as a foremost need for EZ development, connectivity and new livelihood opportunities will be improved. The social infrastructure like schools, colleges, medical facilities will gradually be developed in the area. They fear that the people in this region will not get job in EZ as they are neither technically skilled nor literate. The project authority should undertake skill development program in neighboring areas. This will ascertain that the priority will be given to the locals for various employment opportunities during development and operation stage of EZ	Employment should be given to the PAPs from the earliest stage of site development so that they don't get Economically deprived/jobless or they don't face any limitation about their livelihood support issues.

Summary of Environmental Impacts

- Cumulative Impact: Possibility of significant cumulative impact during operation stage due to the occurrence of new upcoming industries of the proposed EZ
- Irreversible Impact on Trees: The proposed project requires clearance of 8-10% tree cover area
- Impact on Household: 58 households need to be resettled for development of EZ

- Impact on Biodiversity: Loss of trees, loss of associated species, impact on habitat
- Impact on farmers dependent on this land for agriculture and aquaculture: There may be an accessibility issue after development of EZ. Farmers currently cultivate crops at proposed EZ area, will be lost
- The runoff from EZ can draw waste & contaminants from site area (during construction & operation stage) to the soil, water also maybe nearby river.

12.10. Environmental Management Plan and Monitoring Plan

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.

12.10.1. Institutional Arrangement

BEZA has developed Environmental Social Management Framework (ESMF246) with the help of World Bank. The institutional arrangement of EZ shall be aligned as per this framework. Proposed EZ will have an Environmental and social cell which will coordinate with site engineers and PMC.

Overall Project Implementation Arrangements

The overall management of the project will be carried out by EZ which is the project implementing unit (PIU).

Institutional Set Up For Environment Management

The institutional arrangements for the implementation of various aspects of ESMF and environment management of the proposed project envisaged to be implemented as part of the Private Sector Development and Support Project (PSDSP) comprise the following.

- Project Environment Cell (PEC) at PIU to ensure adequate integration of environment management measures in the design phase and supervise implementation of ESMF and specific requirements of EMP
- Environment Management Unit (EMU) at EZ to implement EMP and other regulatory requirements during construction & operation phase of EZ.

Project Environment Management Cell (PEC) at PIU

The Project Implementation Unit (PIU) will establish a Project Environmental Cell (PEC) headed by a 'Manager – Environment' and supported by environmental engineers. The PEC will function to:

- Supervise implementation of ESMF throughout project implementation period;
- Ensure integration of the EA and the EMP measures into the sub-project design and implementation plans such as contract documents, maintenance contracts, tenant lease agreements, etc;
- 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

246 http://www.beza.gov.bd/wp-content/uploads/2015/10/ESMF-of-BEZA.pdf

with relevant experience on environmental issues associated with EZ. The EMU will function all through construction and operation phase of the EZ and perform the following functions.

- Identify regulatory requirements of the sub-project and initiate necessary actions / studies to ensure compliance to the same;
- Co-ordinate with DoE and PIU and ensure securing SCC and ECC as applicable for the project(s);
- Co-ordinate with the contractors / sub-contractors and all other agencies involved in the development and operation of EZ / EPZ and ensure that all the requirements of EMP are fully complied;
- Ensure that all the common environmental infrastructure in EZ / EPZ is operated and maintained in compliance with the regulatory requirements of GoB;
- Liaise with individual enterprise/tenants and ensure that all environmental management conditions of the tenant lease agreement are fully complied;
- Prepare regular reports on environment management and submit to PIU/GoB.

12.10.2. *Monitoring Indicators*

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

- Air quality
- Water quality
- Noise levels
- Soil quality
- Solid & Hazardous Waste Management
- Plantation success / survival rate ☐ Biodiversity and species richness
- Soil Erosion
- Siltation
- Contamination of area surrounding to the project site
- Record of accidents
- Recorded public grievance

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

12.10.3. *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 below.

Table 113: Environmental Monitoring Plan

SL. 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

SL. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
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	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
1.9	Ecological Assessment of surrounding area covering terrestrial and aquatic ecosystem	Various construction activity	Status of floral & Faunal community, Species richness, species diversity,	6 monthly (winter and monsoon)	Contractor	BEZA & PMC

SL. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
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 industrial standards	Ambient air quality monitoring at individual industries – Monitor levels of PM_{10}, $PM_{2.5}$, SO_2, NOx, CO	Monthly	Individual Industrial Units	BEZA
		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	Paisarhat River/shore line	Survey & observation;	Monthly	BEZA	BEZA

SL. No.	Aspect	Source of Impact	Monitoring Methods and Parameters	Frequency	Executing Agency	Enforcement Agency
2.7	Ecological Assessment of surrounding area covering 5 Km radius	Various industrial operation and traffic	Status of floral & Faunal community, Species richness, species diversity,	6 monthly (winter and monsoon)	BEZA	BEZA

12.10.4. *Community Development Plan*

It is recommended that EZ owner involves the local community during the project development. The EZ owner/its contractors may recruit local workforce to the extent possible during construction phase. The EZ owner would identify technically qualified unemployed youth around the project location and other nearby areas, and employ as far as practical. The EZ owner should form a forum/ association/ trust along with its industrial units to look after community development activities of EZ. All the industrial units should periodically contribute to this Trust. The Trust would represent EZ and its industries for all matters related to community and its development. This would act as interface between EZ and community. The Trust should encourage its industrial units to recruit local unemployed youth in the jobs during operational phase. For this if required arrange training for the local people to develop skilled manpower required if sufficient skilled manpower is not available to carry out technical work in the industrial units during operational phase.

The Trust will organize a community advisory group involving local representatives, representatives from EZ industries and neighboring industries; that would help them in finding ways to participate with its neighbors in addressing socio-economic concerns. With the advice of its community advisory panel, local officials, and other key individuals and groups, the trust along with its constituent industries may sponsor appropriate programs and projects to benefit its community as a whole.

Some specific community development programs that could be considered by the Trust in coordination with other industries in the locality are suggested here:

- Importance of wildlife and necessity for its Protection
- Conducting awareness programs in surrounding villages on health impacts due to environmental pollution (air, noise, water, solid waste, etc.), and precautions to be taken to minimize health impacts.
- Conducting periodic health check-ups to the EZ (including industries) staff and in the surrounding villages to identify pollution related diseases.
- Encouragement to residents in the nearby localities for self-employment ventures, such as by assisting them in arranging micro finances to develop them as artisans/ skilled personnel.
- Periodic training programs on health and sanitary education, women and child development, and income generation schemes.
- Participation in improving the existing medical and educational facilities of the area - for this purpose, it is suggested that the Trust provide funds for facilities improvement (providing toilets, furniture, additional space creation, any other needed) to the local hospitals and schools
- Development of greenbelt/greenery or tree plantation in the nearby vacant government lands to build a green and clean environment in the surrounding areas and to reduce pollution impacts to some extent.
- Sponsoring fellowships to students in surrounding villages to encourage them to go for higher education
- Construction of a hospital in collaboration with other industries to improve health status
- Conduct or sponsor camps to clean up river ghats, jetties and terminals in the surrounding areas.

12.10.5. *Compensation Plan*

For the development of EZ, the authority of BEZA proposes to acquire 329 acres land, which is private land. The proposed land for acquisition is mostly agricultural land. Based on AC land and Union level land office information and details shared by UNO office along with the stakeholders' discussion with the local farmers and fisherman's, 87% of total proposed area is agricultural land, residential and aquaculture land is 7% and 6% respectively. As a result of the development of the project, residential land owners (Kutcha, Pucca and semi Pucca) and agricultural land owners (Rice, potato, banana etc.) will lose entire land holding. As informed by the UNO officials, due to the development of this project, around 40 - 50 household structures will be directly affected. This includes dwellings and associated infrastructures are to be re-located. All affected structures are kutcha and sheet structures and the average size of the structures is 100 sq. ft. As a result of loss of agricultural land, local farmers, fishermen, yearly lease holders (agricultural land) and owners of agricultural assets (deep tube-wells and shallow tube-wells etc.) would be directly affected. Indirectly, seasonal agriculture labors and crop traders will be affected. Basis preliminary assessment and details shared by UNO office, Resettlement Plan would need to be formulated for 40-50 numbers of households and some other households (around 200 – 300) near the proposed EZ, who are dependent on the agriculture land of the proposed EZ. These households might have to be compensated for their lost income/livelihood as a result of the development of the project. Hence proper compensation based on present market rates to be provided to the PAPs.

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 assets- fixed and otherwise, 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.

12.10.6. *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

12.10.7. *Cost of EMP*

Parameters of various environmental components will be adversely affected due to implementation of the Project. Therefore, a budget has been estimated to handle the mitigation and monitoring measures to be implemented during the preconstruction construction and operational periods of the Project.

Table 114 shows the estimated costs of implementing the EMP mitigation and monitoring measures, including audit and greenbelt development, estimated at 180.07 Million BDT during construction period. The cost of implementing the EMP monitoring measures during operation, including air quality and noise, has been estimated at 18.40 Million BDT per year.

The cost of EMP given here includes only for Environment and Social safety, Environmental Monitoring, Audit and greenbelt development. The costs are approximate and need calibration at the time of detailed design and estimation stage.

Table 114: Indicative Cost for EMP Implementation

S. No	Components	Unit Cost (Tk)	Cost (Million BDT.)
A	**Fixed Cost**		
A.1.	**Construction Phase (11 Years)**		
A.1.1.	PPEs for staffs of Project Proponent	30,000/year	0.33
A.1.2.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	500000/Quarter	22.00
A.1.3.	Greenbelt Development at suitable locations	Lumpsum	100.00
A.1.4.	Ecological study (Half Yearly)	200000/study	4.40
A.1.5.	Environmental Audit (Half Yearly)	120000/study	2.64
A.1.6.	Environmental Specialist - Full Time : 2 Nos	800000/year/person	17.60
A.1.7.	Social Analyst- Full Time	700000/year	7.70
A.1.8.	occupational health specialist and a safety specialist- Full Time : 2 Nos	700000/year/person	15.40
A.2.	Fund for proposed community development activities	Lumpsum	10.00
	Total Fixed Cost (BDT)		**180.07**
B	**Recurring Cost (Yearly)**		
B.1.	**Operation Phase (per year)**		

S. No	Components	Unit Cost (Tk)	Cost (Million BDT.)
B.1.1.	PPEs for staffs of Project Proponent	50,000/year	00.05
B.1.2.	Solid waste bins for common areas	50,000/year	00.05
B.1.3.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	600000/Quarter	02.40
B.1.4.	Maintenance of Green Belt	Lumpsum	10.00
B.1.5.	Ecological study (Half Yearly)	200000/study	00.40
B.1.6.	Environmental Audit (Half Yearly)	150000/study	00.30
B.1.7.	Environmental Specialist - Full Time : 2 Nos	900000/year/person	01.80
B.1.8.	Social Analyst- Full Time	800000/year	00.80
B.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	800000/year	01.60
B.1.10.	CETP/STP In charge : 2 Nos	700000/year	01.40
	Total Yearly Recurring Cost (BDT)		**18.80**

Note: The costs are approximate and need calibration at the time of detailed design and estimation stage

* Monitoring/Mitigation cost at individual industry level has not been covered

** If there is need of any specific mitigation according to Ecological study during Construction/Operation phase, the cost for the same will be additional

The EMP should be strictly implemented right from the start of the Project. BEZA should monitor the mitigation measures on a regular basis. The grievance should be handled immediately at the site. The Project should be made environmentally sustainable fashion

12.11. Conclusion and Recommendation

The proposed project would be constructed on a 329 acres land that falls within Agailjhara Upazila, Barishal District. Considering the sensitivity of the proposed site, it can be said that overall the impacts from preconstruction, construction and operation phase will have quite detrimental impacts to the surrounding

environment. Many of the impacts are possibly irremediable in nature and can't be replenished. A thorough EIA/EMP study needs to be conducted. It must also to be ensured that EMP plan is followed religiously as a compensatory act and an effort to negate the impact to some acceptable extent. BEZA will invest in land and related off-site infrastructure development so as to make zone accessible and resourceful. Thereafter economic zone development will be responsibility of private developers. The off-site facilities proposed to be developed by BEZA includes development of administration building, boundary wall, electrical supply, access roads etc. The project falls under Red category as per ECA, 1995 and requires prior environment clearance from DoE, Bangladesh.

Dredging, dust generation, noise from vehicles and machinery and sanitary and domestic waste generation are some of the impacts to be caused during the pre-construction and construction stages. Implementation of the mitigation measures, including fencing, water spraying, turning off un-used machinery/vehicles, greenbelt development, waste segregation and site-specific waste dumping would reduce these impacts .However, the major impacts would occur during the operation phase, generation of SOx, NOx, CO, CO2 and SPM and contamination of surface and ground water are of high possibility. Implementation of the mitigation measures suggested in this report would reduce these impacts. Land acquisition and resettlement is also another major concern in this project. Since a large portion of the private land would have to be acquired for the construction of this project, the payment process from the lands sold should be made as smooth as possible. A Resettlement Action Plan (RAP) study should be conducted as soon as possible that should cover resettlement and compensation plan and all the land prices should be paid to the respected landowners before starting project activities. Above all, all project activities should be shared with the stakeholders of all levels and they should be encouraged to take an active part by providing positive comments and suggestions to make this project an environmentally viable project. Proper Resettlement and Rehabilitation plan is necessary for proper compensation to Project Affected Persons. Environmental Management Plan and, Hazard and Safety Management Plan should be implemented at every suggested step of plant construction and operation.

The recommendations made for the project development on the basis of Environmental and Social Review study are given below:

- A detailed Environmental and Social impact assessment should be carried out by BEZA prior to any site preparation/construction activity and prior environment clearance certificate from DoE, Bangladesh should be taken.
- Construction activities for the development of project should be started after obtaining environment clearance certificate from DoE, Bangladesh.
- A half-yearly ecological assessment (preferably in winter and monsoon) during preconstruction, construction, operation phase should be conducted by ecological specialists to record chronological trend of biodiversity in the project area surrounding.
- Wildlife awareness program among the workers (during preconstruction, construction and operation phase) should be conducted. Workers should report sighting of any uncommon species to the environmental expert, who immediately should inform the incidence to local forest/wildlife authority/ conservationists.
- Proposed environment management plan should be implemented strictly during preconstruction, construction and operation phase of the project.
- Green area development should be carried out.
- Proper training of maintaining environment, health and safety should be given to Project management unit in preconstruction, construction and operation phase.
- Provision of garland drain, thick green belt, ETP, STP, segregated storm water should be adhered to.
- Environmental monitoring should be conducted as suggested in environment management plan.

- Separate environment impact assessment study must be carried out by developer for whole zone before developing the EZ.
- Resettlement and Rehabilitation plan is utmost necessary for the Project Affected People
- The payment process for the compensation for the land to be used for the project should be made as smooth as possible
- People (not the owner of the land) dependent on the land to be used for the project should be compensated and opportunities should be created for an alternative way of livelihoods
- Environmental Management Plan and, Hazard and Safety Management Plan should be implemented.
- Provide training for Environment, Health and Safety in Project Management Unit during pre-construction, construction and operation phases of the project.
- Care should be taken for fish and aquatic animal protection as per EMP.
- Relevant national laws and conventions should be enforced properly by the concerned authorities for coal Transportation.

13. Project Cost

13.1. Approach for project cost estimation

The cost of developing the EZ covering both EPC and non-EPC costs are computed. The proposed development components for the EZ include:

a) Processing zone
b) Non processing zone
c) Amenities zone

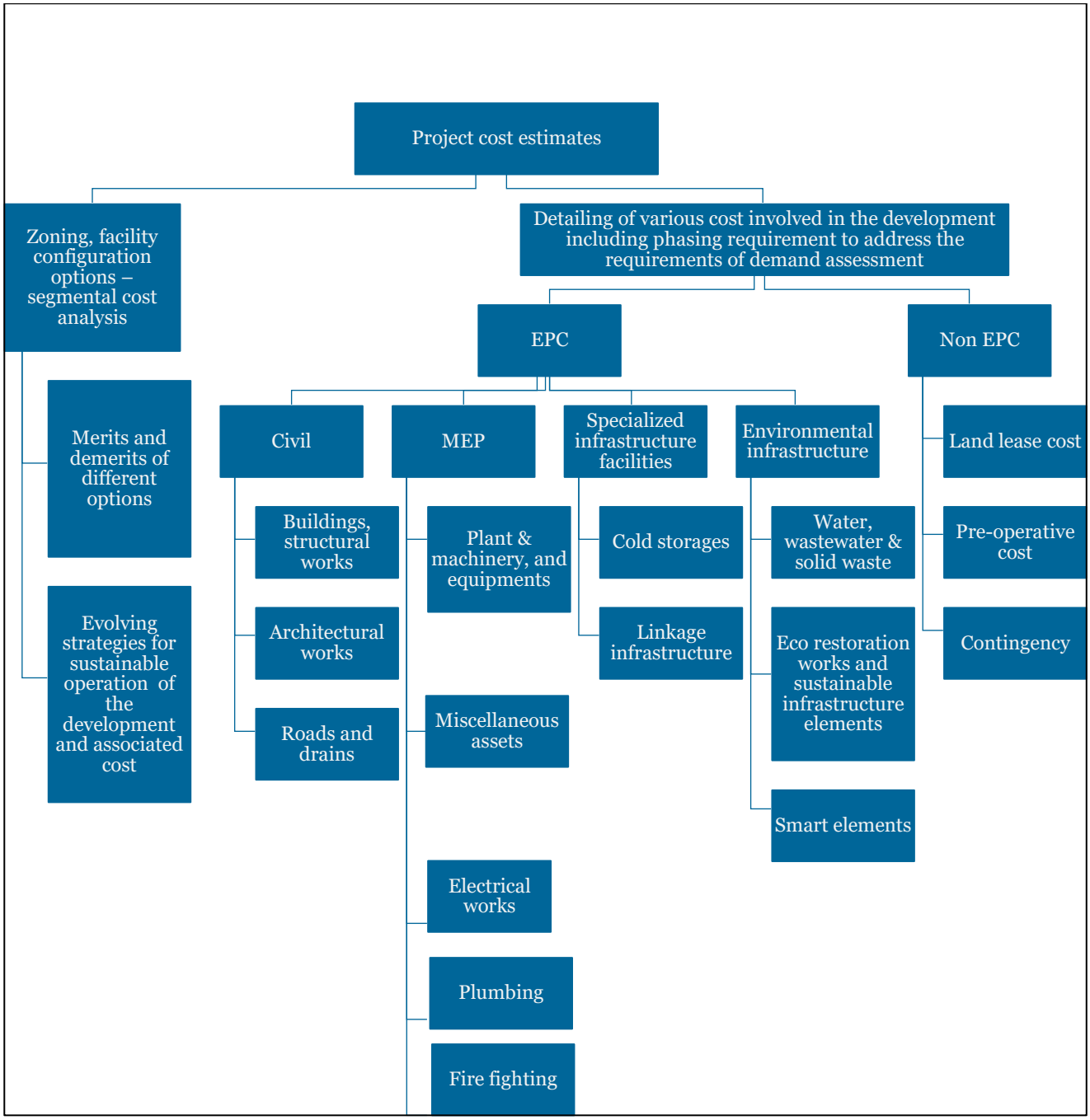
Based on the project requirements, the study includes computation of cost for establishing zones mentioned above.

The exercise includes the estimation of cost based on the schedule of rates published by the competent public authorities in Bangladesh, prevailing market prices, consultant's experience and data bank and target market segments.

The proposal is to develop EZ in a phased manner to facilitate the flow of investment and to recalibrate the development especially the warehouses and related infrastructure to the market needs. In the initial phases, the general approach is to develop industrial plots with essential infrastructures to facilitate visibility and cater to the needs of market demand and fulfilling the perceived requirements and trigger industrial activities. During the subsequent phases, the development would encompass the building of additional industrial areas and required infrastructure in line with market demand requirements. Thus, the study includes an analysis of project development phasing and computation of investment requirements during each phase of development.

Figure No. 115 and Table No. 115 depict the process and the considerations involved in project cost computation.

Figure 115: Computation of project cost



Source: *MACE analysis*

13.2. Details of Infrastructure cost estimates

Description of item	Quantity	Unit	Cost (In million Taka)
A. Onsite infrastructure cost details			
Site development			
Site filling	3999467	Cum	1795.76

Description of item	Quantity	Unit	Cost (In million Taka)
Embankment	5.00	KM	916.88
Total			**2712.64**
Road network			
Internal road network – 30 m Wide road - 4 lane	1.6	KM	349.17
Internal road network – 24 m Wide road - 4 lane	3.9	KM	697.36
Internal road network – 18 m Wide road -2 lane	0 .6	KM	192.05
Footpath	6.2	KM	**243.99**
Storm water drain	6.2	KM	**46.65**
Power supply			
Internal 11 kV power distribution line (OHT)	6.8	KM	9.51
Internal 33 kV power distribution line (OHT)	2.5	KM	9.92
Generator - 2MVA capacity	2	Nos	90.00
Street light	6.2	KM	21.68
Security light	5.0	KM	14.60
Internal 33/11 kV sub-station	1	Nos	150.00
Internal 132/33 kV sub-station	1	Nos	500.00
Total			**795.70**
Water supply			
Water supply network - Potable	6.2	KM	19.63
Water supply network – Non-Potable	6.2	KM	5.61
Sump & overhead tank	8.66	MLD	189.67
Water distribution pumps	6.00	Nos	2.45
Pump room	256.00	Sqm	18.00
Water treatment plant(WTP)	4	MLD	82.29
Fire hydrant	42	Nos	3.10
Total			**320.76**
Effluent and solid waste collection/treatment			
Effluent network	6.2	KM	15.19
Effluent treatment plant (CETP)	4.60	MLD	690.00
Solid waste management	3	TPD	41.62
Total			**746.81**
Telecom	6.2	KM	**63.18**
Sustainable infrastructure elements			
landscaping & Greenery along road	98442	Sqm	10.99

Description of item	Quantity	Unit	Cost (In million Taka)
Total			**10.99**
Support amenities			
Administration building	1500.00	Sqm	219.14
Fire station	2000.00	Sqm	611.60
Total			**830.74**
Total onsite infrastructure cost - A			**7,010.05**
B. Offsite infrastructure cost details			
Power network			
33 kV overhead transmission line	4.0	km	16.00
132 kV overhead transmission line	40.0	km	880.00
Water supply network	3.0	km	25.56
Boundary wall	5	km	114.69
Gas supply	32	km	320.00
Total offsite infrastructure cost - B			**1356.25**
Total infrastructure cost – (A+B)			**8,366.30**

13.3. Details of cost estimates - Phase I

The cost of EZ Phase 1 development is estimated to be **BDT 6,474.26 million Taka**.

Table No. 115 below gives the project cost details, component wise pertaining to Phase I of EZ development. It may be noted that some of the developments need to be carried out in Phase I itself considering the project as a whole.

Table 115: Project cost - ICD phase 1 development

Description of item	Quantity	Unit	Phase I Cost Breakdown (In million Taka)
Onsite infrastructure cost			
Site development			
Site filling	3999467	Cum	1795.76
Embankment	5.00	KM	916.88
Total			**2712.64**
Road network			
Internal road network	6.2	KM	619.29
Footpath	6.2	KM	122.00
Storm water drain	6.2	KM	23.32
Power supply			
Internal 11 kV power distribution line (OHT)	6.8	KM	4.75
Internal 33 kV power distribution line (OHT)	2.5	KM	4.96
Generator - 2MVA capacity	2	Nos	45.00
Street light	6.2	KM	10.84
Security light	5.0	KM	14.60
Internal 33/11 kV sub-station	1	Nos	150.00
Total			**230.15**
Water supply			
Water supply network	6.2	KM	12.62
Sump & overhead tank	8.66	MLD	94.84
Water distribution pumps	6.00	Nos	1.23
Pump room	256.00	Sqm	18.00
Water treatment plant(WTP)	4	MLD	41.15
Fire hydrant	42	Nos	1.55
Total			**169.38**

Description of item	Quantity	Unit	Phase I Cost Breakdown (In million Taka)
Effluent and solid waste collection/treatment			
Effluent network	6.2	KM	7.59
Effluent treatment plant (CETP)	4.60	MLD	345.00
Solid waste management	3	TPD	20.81
Total			**373.40**
Telecom	6.2	KM	**31.59**
Sustainable infrastructure elements			
landscaping & Greenery along road	98442	Sqm	5.50
Total			**5.50**
Support amenities			
Administration building	1500.00	Sqm	219.14
Fire station	2000.00	Sqm	611.60
Total			**830.74**
Total onsite infrastructure cost			**5,118.01**
Offsite infrastructure cost			
Power network			
33 kV overhead transmission line	4.0	km	16.00
132 kV overhead transmission line	40.0	km	880.00
Water supply network	3.0	km	25.56
Boundary wall	5	km	114.69
Gas supply	32	km	320.00
Total offsite infrastructure cost			**1,356.25**
Total Phase I cost			**6,474.26**

Source: *MACE analysis*

The details of EZ costing is provided in Table No. 116.

Table 116: Project cost details of EZ development

Components	Details of EZ project cost
➢ General considerations	The factors considered for project cost estimates for the identified development components of EZ would include: ○ Type of construction for each project component and identified facilities ○ Specification for developments and type of finishes required ○ Utility provisions as per applicable codes and standards ○ Electro-mechanical utilities with power back-up for essentials and distribution network ○ Specialized industrial infrastructure within EZ ○ Environmental infrastructure covering water, wastewater and solid waste management including solar power systems ○ Sustainability elements, smart features, smart monitoring, and green infrastructure, etc.
➢ Buildings & civil works	○ The buildings & civil works consist of developing social, residential, commercial, administrative buildings, other buildings, open area facilities and other miscellaneous civil works ○ Subsequent phases include additional required infrastructure established as per market demand.
➢ Equipment's, machineries, and miscellaneous fixed assets	○ The plant, machinery, and equipment consist of environmental infrastructure, water treatment plants, water supply lines, waste management and sewerage lines. Further, it also includes electrical comprising of transformer and captive backup power generation sets for the essentials, LT Switchboards and cables, special light fittings, an electrical installation and solar power systems. Apart, ventilation systems, utilities like ducting, piping, compressed air, SWM system, firefighting equipment, office equipment, software and other such infrastructure/ utilities constitute plant and machinery. ○ The cost includes the cost of boreholes including pumping networks and power connectivity.

13.4. Phase wise project cost – EZ

It is proposed to implement EZ in a phased manner.

The total investment outlay in real terms for all phases is estimated at **BDT 8,366.3 million Taka** which is detailed in Table No. 117

Table 117: Phase wise project cost

Description of item	Quantity	Unit	Price without tax (In million Taka)	Phase I Cost Breakdown	Phase II Cost Breakdown
Site development					
Site filling	3999467	Cum	1795.76	1795.76	
Embankment	5.00	KM	916.88	916.88	
Total			**2712.64**	**2712.64**	
Road network					
Internal road network	6.2	KM	**1238.59**	619.29	619.29
Footpath	6.2	KM	**243.99**	122.00	122.00
Storm water drain	6.2	KM	**46.65**	23.32	23.32
Power supply					
Internal 11 kV power distribution line (OHT)	6.8	KM	9.51	4.75	4.75
Internal 33 kV power distribution line (OHT)	2.5	KM	9.92	4.96	4.96
Generator - 2MVA capacity	2	Nos	90.00	45.00	45.00
Street light	6.2	KM	21.68	10.84	10.84
Security light	5.0	KM	14.60	14.60	
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			**795.70**	**230.15**	**565.55**
Water supply					
Water supply network	6.2	KM	25.24	12.62	12.62
Sump & overhead tank	8.66	MLD	189.67	94.84	94.84
Water distribution pumps	6.00	Nos	2.45	1.23	1.23

Description of item	Quantity	Unit	Price without tax (In million Taka)	Phase I Cost Breakdown	Phase II Cost Breakdown
Pump room	256.00	Sqm	18.00	18.00	
Water treatment plant(WTP)	4	MLD	82.29	41.15	41.15
Fire hydrant	42	Nos	3.10	1.55	1.55
Total			**320.76**	**169.38**	**151.38**
Effluent and solid waste collection/treatment					
Effluent network	6.2	KM	15.19	7.59	7.59
Effluent treatment plant (CETP)	4.60	MLD	690.00	345.00	345.00
Solid waste management	3	TPD	41.62	20.81	20.81
Total			**746.81**	**373.40**	**373.40**
Telecom	6.2	KM	**63.18**	**31.59**	**31.59**
Sustainable infrastructure elements					
landscaping & Greenery along road	98442	Sqm	10.99	5.50	5.50
Total			**10.99**	**5.50**	**5.50**
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**	-
Power network					
33 kV overhead transmission line	4.0	km	16.00	16.00	
132 kV overhead transmission line	40.0	km	880.00	880.00	
Water supply network	3.0	km	25.56	25.56	
Boundary wall	5	km	114.69	114.69	
Gas supply	32	km	320.00	320.00	
			1356.25	**1356.25**	
Project sub-total			**8,366.3**	**6,474.26**	**1,892.04**

Description of item	Quantity	Unit	Price without tax (In million Taka)	Phase I Cost Breakdown	Phase II Cost Breakdown

Source: *MACE analysis*

13.5. Cost of land acquisition and resettlement and rehabilitation

For the development of the EZ, BEZA proposes to possess 300 acres of land, which is entirely private in nature comprising of settlements. 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 2544.97 million**. Details of these are captured in the Social Review chapter of the report.

Table 118: Land acquisition and resettlement and rehabilitation cost

sl. no	Category of Losses	Amount	Market Value	As Per ARIPA 2017	Total (BDT)
1	Compensation for land	300 acres	77,75,30,776.00	3 Times	2,332,592,328.00
2	Compensation for structure	32000 square feet (177 nos. structure)	2,25,00,000.00	2 Times	4,50,00,000.00
3	Compensation for trees	More than 20000 nos. trees	8,11,91,200.00	2 Times	162382400
4	Compensation for fish stock	50 ponds	5,00,000.00	2 Times	1000000
5	livelihood restoration		30,00,000.00	lump-sum	3000000.00
6	Other resettlement benefits		10,00,000.00	lump-sum	1000000.00
				Total	**2544974728.00**

13.6. Environmental Management Plan fixed cost

Cost associated with Environmental Management Plan is considered as ~ **BDT 180.07 million.**

Table 119: Environmental Management Plan (EMP) cost

S. No	Components	Unit Cost (Tk)	Cost (Million BDT.)
A	**Fixed Cost**		
A.1.	**Construction Phase (11 Years)**		
A.1.1.	PPEs for staffs of Project Proponent	30,000/year	0.33
A.1.2.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	500000/Quarter	22.00
A.1.3.	Greenbelt Development at suitable locations	Lumpsum	100.00
A.1.4.	Ecological study (Half Yearly)	200000/study	4.40
A.1.5.	Environmental Audit (Half Yearly)	120000/study	2.64
A.1.6.	Environmental Specialist - Full Time : 2 Nos	800000/year/person	17.60
A.1.7.	Social Analyst- Full Time	700000/year	7.70

S. No	Components	Unit Cost (Tk)	Cost (Million BDT.)
A.1.8.	occupational health specialist and a safety specialist- Full Time : 2 Nos	700000/year/person	15.40
A.2.	Fund for proposed community development activities	Lumpsum	10.00
	Total Fixed Cost (BDT)		**180.07**
B	**Recurring Cost (Yearly)**		
B.1.	**Operation Phase (per year)**		
B.1.1.	PPEs for staffs of Project Proponent	50,000/year	00.05
B.1.2.	Solid waste bins for common areas	50,000/year	00.05
B.1.3.	Environmental Monitoring (Quarterly) from site and surrounding area Ambient Air Ambient Noise Surface Water Ground/Drinking Water Soil Quality	600000/Quarter	02.40
B.1.4.	Maintenance of Green Belt	Lumpsum	10.00
B.1.5.	Ecological study (Half Yearly)	200000/study	00.40
B.1.6.	Environmental Audit (Half Yearly)	150000/study	00.30
B.1.7.	Environmental Specialist - Full Time : 2 Nos	900000/year/person	01.80
B.1.8.	Social Analyst- Full Time	800000/year	00.80
B.1.9.	occupational health specialist and a safety specialist- Full Time : 2 Nos	800000/year	01.60
B.1.10.	CETP/STP In charge : 2 Nos	700000/year	01.40
	Total Yearly Recurring Cost (BDT)		**18.80**

Note: The costs are approximate and need calibration at the time of detailed design and estimation stage
* Monitoring/Mitigation cost at individual industry level has not been covered
** If there is need of any specific mitigation according to Ecological study during Construction/Operation phase, the cost for the same will be additional

14. Cost-Benefit Analysis

The objective of this chapter is to establish the cost-benefit analysis and summarize the financial and economic analysis for the proposed project.

14.1. Proposed Project Brief

BEZA has envisaged development of Barisal (Agailjhara). There is a need of critically examining this site on various techno-commercial parameters to assess the feasibility setting up of manufacturing based economic zone.

The proposed EZ is spread over an area of 328.51 acres and it is located in Agailjhara Upazila, Barisal district. Economy of Barisal district is primarily dependent on agriculture and aquaculture. Besides involvement in the primary sectors, local populace is also involved in small-scale cottage industries and medium to large industrial units. Major industrialization has not taken place in this district apart from a few industrial units from sectors such as pharmaceutical, cement, chemicals, and textile (spinning). Apart from the food and dairy-based products, the district also has many brick kilns and small light engineering and furniture establishments (majorly into decorator services). The details of the site surrounding features is given in section 3.2 and reconfirmation of site location is given in 3.3.

Benchmarking exercise brings out the fact that the EZ site at Barisal is competitive with respect to factors such as country's demographic dividend, labour arbitrage, fiscal incentives offered by offered by GoB, like exemption on corporate income tax for a period of 10 years and exemption of VAT on utilities, import of machinery and construction material are attractive as compared to the incentives offered in India. EPZs in Sri Lanka provides similar incentives for investors but the incentives are sector specific unlike Bangladesh. These incentives might attract international investors to the country. Moreover, absence of any social security tax in the country unlike Sri Lanka might further incentivize investors. The details of the competition benchmarking are provided in the chapter 4.

Industry assessment exercise aims to identify the best-fit industrial sectors that can be promoted in the proposed EZ. The assessment is carried out keeping in mind the existing supply chains and the macroeconomic profile of the region. Any industrial development recommended in the proposed EZ would primarily be established basis a sound business decision that in turn takes into account the existing factors of production and the industry linkages in the region surrounding the proposed EZ. Basis the exercise that took into consideration both the macro level developments as well as site specific support available for specific industries to experience growth within the EZ site, the industries seem to be most suited at the site are Textiles & RMG, Food & Beverage (including agro based), Paper & Packaging and Light Machinery (including furniture). The detailed industry assessment has been provided in chapter 5.

An important aspect of commercial feasibility of the economic zone is the land demand forecasting exercise wherein the supply of industrial land from competing EZs is taken into consideration to arrive at the probable occupancy rates of industrial land at the proposed EZ. This will provide a comparative scenario of supply v/s demand and aid in decision making for the feasibility of the proposed EZ. Basis primary stakeholder and technical consultations, the investment-land intensity ratio (investment per unit land area) for the shortlisted industries have been arrived at. This ratio varies geographically and is an indicator of the amount of investment required per acre for an industrial sector excluding shop floor equipment.

The demand assessment exercise was undertaken considering three different scenarios of growth – both sectoral trends and infrastructure induced. The growth projections were further used to arrive at the prospective investments in the influence area across the same three scenarios of conservative, base and aggressive. The detailed demand assessment has been provided in chapter 6.

A robust transport infrastructure is the most vital enabler for movement of men and matial from origin to destination. The study covers delineation of the transport infrastructure available in the vicinity of proposed EZ and existing connectivity with major international transit points. While the proposed EZ 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 attractivess of the proposed EZ with respect to transport infrastructure. The details are provided in chapter 7.

For sustained business operation of EZ, it is pertinent that off-site infrastructure and EZ connectivity to the propose sectors are adequately addressed. Development of off-site infrastructure is the responsibility of BEZA. The major off-site infrastructure considered for proposed EZ are Boundary wall, water supply, power supply, access road and drainage. These infrastructure facilities and sources have been identified and well-integrated with the proposed EZ based on site visit, stakeholder consultations with various government agencies (such as RHD, REB and DPHE). The detailed off-site infrastructure assessment is provided in chapter 8.

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 the industrial sectors. The detailed master plan is given in chapter 9.

All the necessary infrastructure facilities for the development are desifned to create an ideal ambience and best environment. On-site infrastructure captures the internal infrastructure facilities which need to be developed within the site. 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. The detailed infrastructure plans are given in chapter 10.

Social Review and Environmental Review are subsequently provided in chapter 11 and 12.

Proposed project cost estimation is provided in the table given below.

Table 120: Proposed Project Cost Estimation

Description of item	Quantity	Unit	Cost (In million Taka)	Reference
Onsite infrastructure cost details				
Site development				
Site filling	3999467	Cum	1795.76	Please refer to the section 15.26. Annexure-26
Embankment	5.00	KM	916.88	
Total			**2712.64**	
Road network				
Internal road network – 30 m Wide road - 4 lane	1.6	KM	349.17	Please refer to the section 15.26. Annexure-26
Internal road network – 24 m Wide road - 4 lane	3.9	KM	697.36	
Internal road network – 18 m Wide road -2 lane	0 .6	KM	192.05	
Footpath	6.2	KM	**243.99**	
Storm water drain	6.2	KM	**46.65**	
Power supply				
Internal 11 kV power distribution line (OHT)	6.8	KM	9.51	Please refer to the section 15.26. Annexure-26
Internal 33 kV power distribution line (OHT)	2.5	KM	9.92	
Generator - 2MVA capacity	2	Nos	90.00	
Streetlight	6.2	KM	21.68	
Security light	5.0	KM	14.60	
Internal 33/11 kV sub-station	1	Nos	150.00	
Internal 132/33 kV sub-station	1	Nos	500.00	
Total			**795.70**	
Water supply				
Water supply network - Potable	6.2	KM	15.14	Please refer to the section 15.26. Annexure-26
Water supply network – Non-Potable	6.2	KM	10.09	
Sump & overhead tank	8.66	MLD	189.67	
Water distribution pumps	6.00	Nos	2.45	

Description of item	Quantity	Unit	Cost (In million Taka)	Reference
Pump room	256.00	Sqm	18.00	
Water treatment plant (WTP)	4	MLD	82.29	
Fire hydrant	42	Nos	3.10	
Total			**320.76**	
Effluent and solid waste collection/treatment				
Effluent network	6.2	KM	15.19	Please refer to the section 15.26. Annexure-26
Effluent treatment plant (CETP)	4.60	MLD	690.00	
Solid waste management	3	TPD	41.62	
Total			**746.81**	
Telecom	6.2	KM	**63.18**	
Sustainable infrastructure elements				
Landscaping & Greenery along road	98442	Sqm	10.99	Please refer to the section 15.26. Annexure-26
Total			**10.99**	
Support amenities				
Administration building	1500.00	Sqm	219.14	Please refer to the section 15.26. Annexure-26
Fire station	2000.00	Sqm	611.60	
Total			**830.74**	
Total onsite infrastructure cost - A			**7,010.05**	
Offsite infrastructure cost details				
Power network				Please refer to the section 15.25. Annexure-25
33 kV overhead transmission line	4.0	km	16.00	
132 kV overhead transmission line	40.0	km	880.00	
Water supply network	3.0	km	25.56	
Boundary wall	5	km	114.69	
Gas supply	32	km	320.00	
Total offsite infrastructure cost - B			**1,356.25**	
Total infrastructure cost – (A+B)			**8,366.30**	
Resettlement and Rehabilitation Cost				
Compensation for land	300	Acres	2,332.59	Please refer to the section 13.5
Compensation for structure	32,000 square feet (177 nos. structure)		45.00	
Compensation for trees	More than 20000 nos. trees		162.38	
Compensation for fish stock	50	Ponds	1.00	
Livelihood restoration (lump sum)			3.00	
Other resettlement benefits (lump sum)			1.00	
Total Resettlement and Rehabilitation Cost			**2,544.97**	
EMP Fixed Cost				
PPEs for staffs of Project Proponent	30,000/year		0.33	
Environmental Monitoring (Quarterly) from site and surrounding area - Ambient Air - Ambient Noise - Surface Water - Ground/Drinking Water - Soil Quality	500,000/Quarter		22.00	Please refer to the section 13.6

Description of item	Quantity	Unit	Cost (In million Taka)	Reference
Greenbelt Development at suitable locations (Lumpsum)			100.00	
Ecological study (Half Yearly)	200,000/study		4.40	
Environmental Audit (Half Yearly)	120,000/study		2.64	
Environmental Specialist - Full Time: 2 Nos	800,000/year/person		17.60	
Social Analyst- Full Time	700,000/year		7.70	
Occupational health specialist and a safety specialist- Full Time: 2 Nos	700,000/ year/person		15.40	
Fund for proposed community development activities (Lumpsum)			10.00	
Total EMP Fixed Cost			**180.07**	
Total Project Cost			**11,091.34**	

Source: The study team analysis

Since the proposed EZ at Agailjhara exudes locational attributes comparable to Jamalpur, which is at considerable distance from Dhaka, land tariff corresponding to Jamalpur EZ 1 (**BDT 11/sq.ft./annum**) have been considered for the financial model. Precedence in Bangladesh indicate that PPP developers typically charge **BDT 25 per sq. ft. per annum** as annual rent for industrial land. The table below summarizes the financial returns for the proposed project under different scenarios assessed for cost-benefit analysis.

Table 121: Proposed Project Financial Returns

Scenarios	Conservative			Base			Aggressive		
	@10% cost of equity	@12% cost of equity	@15% cost of equity	@10% cost of equity	@12% cost of equity	@15% cost of equity	@10% cost of equity	@12% cost of equity	@15% cost of equity
Case 1: BEZA playing the role of the master developer of the project (Business As-usual scenario (Scenario A)) at lease rental of BDT 11/sft.									
Financial NPV[247]	-6267.42	-6576.36	-6957.47	-5907.35	-6227.12	-6623.87	-5505.97	-5835.93	-6247.59
Financial BCR	0.89	0.89	0.89	0.97	0.97	0.97	1.07	1.07	1.07
Financial IRR[247]	3.56%	3.56%	3.56%	3.71%	3.71%	3.71%	3.87%	3.87%	3.87%
Case 1: BEZA playing the role of the master developer of the project (Increased space tariffs (Scenario B)) at lease rental of BDT 25/sft.									
Financial NPV[247]	-5211.57	-5610.19	-6108.87	-4756.42	-5169.89	-5689.89	-4244.75	-4672.70	-5213.68
Financial BCR	1.03	1.03	1.03	1.13	1.13	1.13	1.26	1.26	1.26
Financial IRR[247]	4.31%	4.31%	4.31%	4.51%	4.51%	4.51%	4.74%	4.74%	4.74%
Case 1: BEZA playing the role of the master developer of the project (Offsite infrastructure to be developed through nodal agencies (Scenario C = Scenario B + Offsite infrastructure to be developed through nodal agencies) at lease rental of BDT 25/sft.									
Financial NPV[247]	-4017.96	-4428.12	-4940.80	-3563.83	-3989.13	-4523.53	-3053.14	-3493.22	-4049.02
Financial BCR	1.03	1.03	1.03	1.13	1.13	1.13	1.26	1.26	1.26
Financial IRR[247]	4.78%	4.78%	4.78%	5.01%	5.01%	5.01%	5.27%	5.27%	5.27%

[247] NPV FCFF is considered as Financial NPV and Project IRR is considered as Financial IRR.

Scenarios	Conservative			Base			Aggressive		
	@10% cost of equity	@12% cost of equity	@15% cost of equity	@10% cost of equity	@12% cost of equity	@15% cost of equity	@10% cost of equity	@12% cost of equity	@15% cost of equity
Case 1: BEZA playing the role of the master developer of the project (On-site infrastructure to be developed by respective nodal agencies (Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies) at lease rental of BDT 25/sft.									
Financial NPV[247]	5367.61	4726.79	3889.25	5828.52	5174.55	4318.02	6345.79	5679.03	4803.89
Financial BCR	1.03	1.03	1.03	1.13	1.13	1.13	1.26	1.26	1.26
Financial IRR[247]	13.17%	13.17%	13.17%	14.01%	14.01%	14.01%	15.10%	15.10%	15.10%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator – Business As Usual (Assessment of Project Returns for the PPP Developer: Without Pay-outs to BEZA) at lease rental of BDT 25/sft									
Financial NPV[247]	-1391.19	-1856	-2443	-1075	-1550	-2151.87	-535.57	-1031	-1662.69
Financial BCR	0.66	0.66	0.66	0.69	0.69	0.69	0.74	0.74	0.74
Financial IRR[247]	8.23%	8.23%	8.23%	8.46%	8.46%	8.46%	8.87%	8.87%	8.87%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator – Business As Usual (Assessment of Project Returns for the PPP Developer: With Pay-outs to BEZA) at lease rental of BDT 25/sft									
Financial NPV[247]	-3855	-4210	-4648	-3568	-3929	-4381	-3081	-3461	-3939
Financial BCR	0.56	0.56	0.56	0.59	0.59	0.59	0.63	0.63	0.63
Financial IRR[247]	6.53%	6.53%	6.53%	6.69%	6.69%	6.69%	6.99%	6.99%	6.99%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator - Increased space tariffs (Assessment of Project Returns for the PPP Developer: Without Pay-outs to BEZA) at lease rental of BDT 40/sft									
Financial NPV[247]	-343.91	-894	-1593.25	35.55	-527	-1244.3	656.69	70	-680.89
Financial BCR	0.76	0.76	0.76	0.80	0.80	0.80	0.86	0.86	0.86
Financial IRR[247]	9.04%	9.04%	9.04%	9.32%	9.32%	9.32%	9.80%	9.80%	9.80%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator - Increased space tariffs (Assessment of Project Returns for the PPP Developer: With Pay-out to BEZA) at lease rental of BDT 40/sft									
Financial NPV[247]	-2915.1	-4428	-3881.8	-2560.13	-4142	-3555.95	-1975.55	-3681	-3026.37
Financial BCR	0.65	0.65	0.65	0.68	0.68	0.68	0.73	0.73	0.73
Financial IRR[247]	7.28%	7.28%	7.28%	7.49%	7.49%	7.49%	7.86%	7.86%	7.86%

Source: The study team analysis, (Financial NPV is in BDT million)

In order to make the project financially viable in case of where offsite infrastructure to be developed through nodal agencies and 50% of project cost will be finance by the multilaterals, BEZA may consider charging higher lease rentals, but high rentals may negatively impact the uptake of land. However, considering the same land uptake rate, BEZA should charge lease rental of rental of ~93.5 BDT/sq. ft/year to match project IRR with weighted average cost of capital (WACC) which is 7.6%.

Table below summarizes the economic returns which project will fetch for the Government of Bangladesh.

Table 122: Proposed Project Economic Returns

Scenarios	Conservative			Base			Aggressive		
	@10% equity discounting rate	@12% equity discounting rate	@15% equity discounting rate	@10% equity discounting rate	@12% equity discounting rate	@15% equity discounting rate	@10% equity discounting rate	@12% equity discounting rate	@15% equity discounting rate
Economic NPV	29384.5	18050.41	8867.26	47237.6	29860.64	15718.22	68112.18	43665.56	23722.89
Economic BCR	5.77	4.20	2.76	8.66	6.29	4.13	12.05	8.74	5.72
Economic IRR[248]	25.0%	25.0%	25.0%	30.2%	30.2%	30.2%	35.1%	35.1%	35.1%

Source: The study team analysis, (Economic NPV is in BDT million)

It appears from the analysis that the proposed EZ generates good to highly attractive economic return in the context of Bangladesh's economy and growth targets.

14.2. Financial Analysis

14.2.1. 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 facilitator and nodal agency – 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.

[248] Please refer to Interpreation of the results section, under Economic Analysis

14.2.2. *Definitions*

Net Present Value (NPV): NPV is the difference between the present value of cash inflows and outflows over a period.

Internal Rate of Return (IRR): The IRR is a financial measure that is used to evaluate the profitability of potential investments. In a discounted cash flow analysis, the IRR is a discount rate that makes the net present value (NPV) of all cash flows equal to zero.

Free Cash Flow to the Firm (FCFF): FCFF is the amount of cash flow from operations that is available for distribution after depreciation, taxes, working capital, and investments have been taken into consideration. FCFF is a metric for determining a company's profitability after all expenditures and reinvestments have been deducted.

Free Cash Flow to Equity (FCFE): Free cash flow to equity is a measure of how much cash is available to the equity shareholders of a company After all costs, investments, and debt have been paid.

Debt-Service Coverage Ratio (DSCR): In the context finance, the DSCR is a measurement of a firm's available cash flow to pay current debt obligations. The DSCR shows investors whether a company has enough income to pay its debts.

Benefit-Cost Ratio (BCR): BCR is a ratio used which summarize the overall relationship between the relative costs and benefits of a proposed project.

Cost of Equity: Cost of equity is the return that a company requires to decide if an investment meets capital return requirements. A firm's cost of equity represents the compensation that the market demands in exchange for owning the asset and bearing the risk of ownership.

Weighted Average Cost of Capital (WACC): WACC is a calculation of a firm's cost of capital in which each category of capital is proportionately weighted.

Discount Rate: Discount rate refers to the interest rate used in discounted cash flow (DCF) analysis to determine the present value of future cash flows.

Equity Discount Rate: Equity Discount Rate is the cost of capital refers to the actual cost of financing business activity through either debt or equity capital

14.2.3. *Components of Cost & Benefit*

Cost Assumption

Table below summerises the onsite infrastructure project cost considered for financial model.

Table 123: Onsite Infrastructure Cost

Description of item	Price without tax (In million Taka)
Site development	2712.64
Internal road network	1238.59
Footpath	243.99
Storm water drain	46.65
Power supply	795.70
Water supply	320.76
Effluent and solid waste collection/treatment	746.81
Telecom	63.18
Sustainable infrastructure elements	10.99
Support amenities	830.74
Project sub-total	**7,010.05**

Source: MACE analysis

Table below summerises the offsite infrastructure project cost considered for financial model.

Table 124: Offsite infrastructure cost

Description of Item	Quantity	Unit	Price without tax (in million BDT)
Power network	7.8	km	896.00
Water network	3	km	25.56
Boundary Wall	5.5	km	114.69
Gas supply	32	km	320
Project Sub-total			**1356.25**

Source: MACE analysis

Cost of land acquisition and resettlement and rehabilitation

For the development of the EZ, BEZA proposes to possess 329.43 acres of land, which is entirely private in nature comprising of settlements. 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 2544.97 million**. Details of these are captured in the Social Review chapter of the report.

Other costs

Cost associated with Environmental Management Plan is considered as ~ **BDT 180.07 million.**

Revenue Assumption

Table 125: Tariff assumption

Category of Land/Type of Development	Lease rate as per tariff rate of Jamalpur EZ	Lease rate as per Mongla EZ (BDT/Sft./year)
(BDT/Sft./year)	11.00	25.00

Source: PwC analysis

14.2.4. *Transferred in Monetary Value*

The financial model created takes into consideration financial return to BEZA (when BEZA is responsible for the following activities as the facilitator (nodal agency) and master developer of the project) and the PPP developer (when the PPP developer is responsible for the 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
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 certain on-site infrastructure components is the responsibility of BEZA as condition precedent. In case of PPP

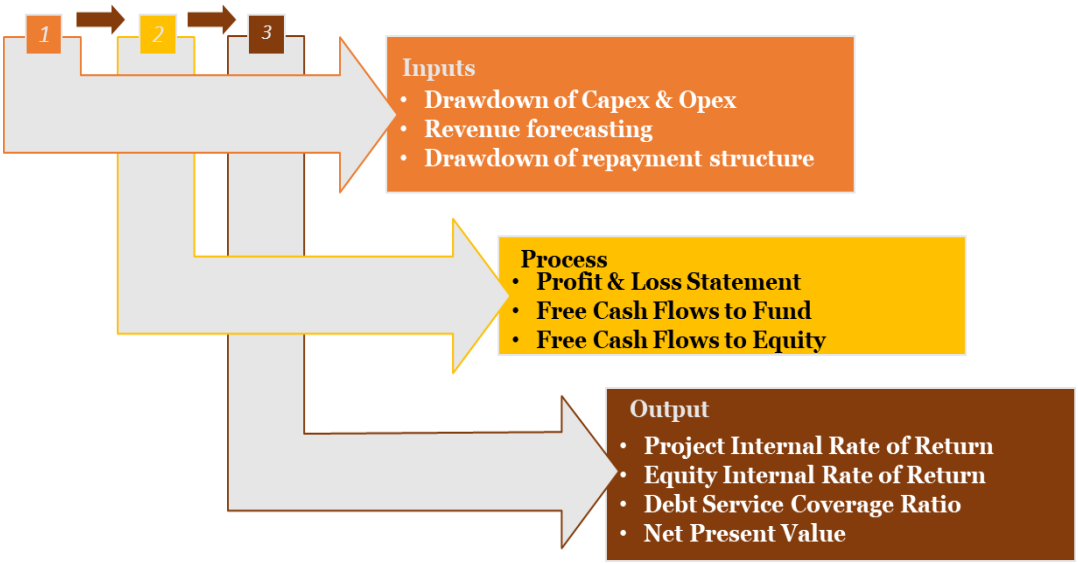
Aspects	Responsibilities of BEZA/ PPP Developer
	project, the private developer is responsible for developing the on-site infrastructure
Financing	Responsibility of BEZA (for BEZA model) and it is the responsibility of the PPP developer for the PPP model
O&M	Responsibility of BEZA (for BEZA model) and 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.

In the PPP 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, service fees and utility markup. Government may consider providing grants, if required.

Figure 116: 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 is 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.

14.2.5. *Cash Flow*

(in BDT millions)

Cash Flow Statement

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash Flows from Operating Activities										
Retained Earnings / (Loss)	-	(83)	(397)	(449)	(624)	(471)	(331)	(217)	(129)	19
Non-Operating Income	-	-	-	-	-	-	-	-	-	-
Change in Net Working Capital	-	7	3	2	0	(1)	(1)	(1)	(2)	(2)
Change in WC loan	-	-	-	-	-	-	-	-	-	-
Depreciation	-	-	98	118	118	118	118	118	118	118
Net Cash from Operating Activities	-	(76)	(296)	(329)	(506)	(354)	(215)	(100)	(13)	135
Cash Flows from Investing Activities										
Asset Disposal	-	-	-	-	-	-	-	-	-	-
Asset Acquisition	-	-	-	-	-	-	-	-	-	-
Net Cash Used for Investing Activities	(4,714)	(4,897)	(1,170)	(946)	-	-	-	-	-	-
Cash Flows from Financing Activities										
Disbursement	-	-	-	-	-	-	-	-	-	-
IDCP Capitalized	3,002	2,929	662	662	-	-	-	-	-	-

Principal Repayment	115	298	224	-	-	-	-	-	-	-
Equity	-	-	-	-	(881)	(900)	(919)	(940)	(572)	(465)
Short term debt drawdown	1,286	1,255	284	284	-	-	-	-	-	-
Short term loan repayment	-	-	-	-	-	-	-	-	-	-
Equity drawdown For DSCR	-	-	-	-	-	-	-	-	-	-
Net Cash from Financing Activities	-	-	-	-	-	-	-	-	-	-
Net Increase / (Decrease) in Cash	**4,403**	**4,482**	**1,170**	**946**	**(881)**	**(900)**	**(919)**	**(940)**	**(572)**	**(465)**
Beginning Cash Balance	**(312)**	**(491)**	**(296)**	**(329)**	**(1,387)**	**(1,254)**	**(1,134)**	**(1,040)**	**(585)**	**(330)**
Ending Cash Balance	**-**	**(312)**	**(803)**	**(1,098)**	**(1,427)**	**(2,814)**	**(4,068)**	**(5,202)**	**(6,242)**	**(6,827)**

Cash Flow Statement

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Cash Flows from Operating Activities										
Retained Earnings / (Loss)	109	227	354	618	516	369	359	438	426	413
Non-Operating Income	-	-	-	-	-	-	-	-	-	-
Change in Net Working Capital	(2)	(5)	(3)	(5)	(7)	1	1	(6)	1	1

Change in WC loan	-	-	-	-	-	-	-	-	-	-
Depreciation	118	118	118	118	118	118	118	118	118	118
Net Cash from Operating Activities	225	339	469	731	626	488	478	549	545	533
Cash Flows from Investing Activities										
Asset Disposal	-	-	-	-	-	-	-	-	-	-
Asset Acquisition	-	-	-	-	-	-	-	-	-	-
Net Cash Used for Investing Activities	-	-	-	-	-	-	-	-	-	-
Cash Flows from Financing Activities										
Disbursement	-	-	-	-	-	-	-	-	-	-
IDCP Capitalized	-	-	-	-	-	-	-	-	-	-
Principal Repayment	(489)	(514)	(540)	(568)	(597)	-	-	-	-	-
Equity	-	-	-	-	-	-	-	-	-	-
Short term debt drawdown	-	-	-	-	-	-	-	-	-	-
Short term loan repayment	-	-	-	-	-	-	-	-	-	-
Equity drawdown For DSCR	-	-	-	-	-	-	-	-	-	-
Net Cash from Financing Activities	(489)	(514)	(540)	(568)	(597)	-	-	-	-	-

Net Increase / (Decrease) in Cash	**(264)**	**(175)**	**(71)**	**163**	**30**	**488**	**478**	**549**	**545**	**533**
Beginning Cash Balance	**(7,157)**	**(7,421)**	**(7,596)**	**(7,667)**	**(7,504)**	**(7,474)**	**(6,987)**	**(6,509)**	**(5,960)**	**(5,415)**
Ending Cash Balance	**(7,421)**	**(7,596)**	**(7,667)**	**(7,504)**	**(7,474)**	**(6,987)**	**(6,509)**	**(5,960)**	**(5,415)**	**(4,882)**

Cash Flow Statement

	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
Cash Flows from Operating Activities										
Retained Earnings / (Loss)	509	495	480	594	578	560	698	678	657	823
Non-Operating Income	-	-	-	-	-	-	-	-	-	-
Change in Net Working Capital	(8)	1	2	(9)	2	2	(11)	2	2	(13)
Change in WC loan	-	-	-	-	-	-	-	-	-	-
Depreciation	118	118	118	118	118	118	118	118	118	118
Net Cash from Operating Activities	619	614	599	703	697	680	804	798	777	927
Cash Flows from Investing Activities										
Asset Disposal	-	-	-	-	-	-	-	-	-	-
Asset Acquisition	-	-	-	-	-	-	-	-	-	-

Net Cash Used for Investing Activities	-	-	-	-	-	-	-	-	-	-
Cash Flows from Financing Activities										
Disbursement	-	-	-	-	-	-	-	-	-	-
IDCP Capitalized	-	-	-	-	-	-	-	-	-	-
Principal Repayment	-	-	-	-	-	-	-	-	-	-
Equity	-	-	-	-	-	-	-	-	-	-
Short term debt drawdown	-	-	-	-	-	-	-	-	-	-
Short term loan repayment	-	-	-	-	-	-	-	-	-	-
Equity drawdown For DSCR	-	-	-	-	-	-	-	-	-	-
Net Cash from Financing Activities	-	-	-	-	-	-	-	-	-	-
Net Increase / (Decrease) in Cash	**619**	**614**	**599**	**703**	**697**	**680**	**804**	**798**	777	**927**
Beginning Cash Balance	**(4,882)**	**(4,263)**	**(3,649)**	**(3,050)**	**(2,348)**	**(1,650)**	**(971)**	**(167)**	**631**	**1,408**
Ending Cash Balance	**(4,263)**	**(3,649)**	**(3,050)**	**(2,348)**	**(1,650)**	**(971)**	**(167)**	**631**	**1,408**	**2,335**

Cash Flow Statement

	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40

Cash Flows from Operating Activities										
Retained Earnings / (Loss)	799	775	974	946	918	1,157	1,126	1,091	1,379	1,342
Non-Operating Income	-	-	-	-	-	-	-	-	-	-
Change in Net Working Capital	2	2	(16)	3	3	(20)	3	3	(24)	3
Change in WC loan	-	-	-	-	-	-	-	-	-	-
Depreciation	118	118	118	118	118	118	118	118	118	118
Net Cash from Operating Activities	919	895	1,076	1,067	1,038	1,255	1,246	1,212	1,473	1,463
Cash Flows from Investing Activities										
Asset Disposal	-	-	-	-	-	-	-	-	-	-
Asset Acquisition	-	-	-	-	-	-	-	-	-	-
Net Cash Used for Investing Activities	-	-	-	-	-	-	-	-	-	-
Cash Flows from Financing Activities										
Disbursement	-	-	-	-	-	-	-	-	-	-
IDCP Capitalized	-	-	-	-	-	-	-	-	-	-
Principal Repayment	-	-	-	-	-	-	-	-	-	-
Equity	-	-	-	-	-	-	-	-	-	-
Short term debt drawdown	-	-	-	-	-	-	-	-	-	-

Short term loan repayment	-	-	-	-	-	-	-	-	-	-
Equity drawdown For DSCR	-	-	-	-	-	-	-	-	-	-
Net Cash from Financing Activities	-	-	-	-	-	-	-	-	-	-
Net Increase / (Decrease) in Cash	**919**	**895**	**1,076**	**1,067**	**1,038**	**1,255**	**1,246**	**1,212**	**1,473**	**1,463**
Beginning Cash Balance	**2,335**	**3,254**	**4,149**	**5,225**	**6,292**	**7,330**	**8,585**	**9,832**	**11,044**	**12,517**
Ending Cash Balance	**3,254**	**4,149**	**5,225**	**6,292**	**7,330**	**8,585**	**9,832**	**11,044**	**12,517**	**13,980**

Cash Flow Statement

	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	
Cash Flows from Operating Activities										
Retained Earnings / (Loss)	1,303	1,649	1,605	1,558	1,977	1,925	1,870	2,373	1,912	1,843
Non-Operating Income	-	-	-	-	-	-	-	-	-	-
Change in Net Working Capital	4	(29)	4	4	(35)	5	5	(42)	5	6

Change in WC loan	-	-	-	-	-	-	-	-	-	-
Depreciation	118	118	118	118	118	118	118	118	118	118
Net Cash from Operating Activities	1,424	1,738	1,727	1,680	2,061	2,047	1,993	2,449	2,035	1,967
Cash Flows from Investing Activities										
Asset Disposal	-	-	-	-	-	-	-	-	-	-
Asset Acquisition	-	-	-	-	-	-	-	-	-	-
Net Cash Used for Investing Activities	-	-	-	-	-	-	-	-	-	-
Cash Flows from Financing Activities										
Disbursement	-	-	-	-	-	-	-	-	-	-
IDCP Capitalized	-	-	-	-	-	-	-	-	-	-
Principal Repayment	-	-	-	-	-	-	-	-	-	-
Equity	-	-	-	-	-	-	-	-	-	-
Short term debt drawdown	-	-	-	-	-	-	-	-	-	-
Short term loan repayment	-	-	-	-	-	-	-	-	-	-
Equity drawdown For DSCR	-	-	-	-	-	-	-	-	-	-
Net Cash from Financing Activities	-	-	-	-	-	-	-	-	-	-

Net Increase / (Decrease) in Cash	**1,424**	**1,738**	**1,727**	**1,680**	**2,061**	**2,047**	**1,993**	**2,449**	**2,035**	**1,967**
Beginning Cash Balance	**13,980**	**15,404**	**17,143**	**18,869**	**20,550**	**22,610**	**24,657**	**26,650**	**29,099**	**31,134**
Ending Cash Balance	**15,404**	**17,143**	**18,869**	**20,550**	**22,610**	**24,657**	**26,650**	**29,099**	**31,134**	**33,101**

14.2.6. *Key Assumptions*

In this section, the key assumptions used in developing the financial model (to assess the financial viability of the proposed project) have been elucidated.

14.2.6.1. *Timing Assumptions*

The proposed EZ is spread over San area of ~329.43 acres. Considering the fact that this project is a priority for BEZA, it has been assumed that in the coming six months (i.e., till June 2020) BEZA shall complete all the regulatory activities pertaining to the approval of the project. Hence, the model start date has been assumed from 1st July 2023. A 50-year 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 2023 (financial year 2024)
2	Land acquisition activities	2023-2026 (4 years)
3	Resettlement & Rehabilitation activities	2023-2026 (4 years)
4	Infrastructure developments	2023-2026 (4 years)
5	Start of operations	1st Jan 2026 (financial year 2027)
6	Model end date	30th June 2073 (financial year 2073)

Source: PwC Analysis

Considering the development trends and land acquisition related aspects in Bangladesh, above stated assumptions have been taken on the conservative side.

14.2.6.2. *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	**230.57**
2	Utility, road and green and open space area	**87.76**
3	Non processing area (admin and custom block and support amenity)	**11.10**
Total		**329.43**

Source: MACE analysis

14.2.6.3. *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 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 nodal agency and facilitator 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	**1.35**	**50**	-
4		Specialized infrastructure	**0.81**	**50**	

Source: BEZA

Since the proposed EZ at Agailjhara exudes locational attributes comparable to Jamalpur, which is at considerable distance from Dhaka, land tariff corresponding to Jamalpur EZ 1 (**BDT 11/sq.ft./annum**) have been considered for the financial model. Land tariffs at Mirsarai, on the other hand are slightly on the higher side owing to its proximity to Chittagong port and its overall developmental strategy as an industrial city.

Above mentioned rates have been considered as base to evaluate the suitability in the context of the subject EZ. However, annual land lease for specialized infrastructure land (developed) is assumed to be corresponding to that prevalent in Mirsarai EZ due to the facilities planned within that demarcated land. Additionally, it is assumed that PPP developer in Bangladesh will be charging **BDT 300 per sq. ft. of land as lease rental for SFB per annum.** This has been assumed based on prevalent SFB tariffs charged by PPP players in Bangladesh. Similarly, precedence in Bangladesh indicate that PPP developers typically charge **BDT 25 per sq. ft. per annum** as annual rent for industrial land. The same has been considered for evaluating Case 2. However, both these assumptions have been considered in the conservative side.

Assumptions for revenue generating from Mark-up on utility charges

As per the land allotment brochures for Government owned EZs in Bangladesh, 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 Service fees

As per the land allotment brochures for Government owned EZs in Bangladesh, BEZA charges a conservancy charge of **BDT 0.39 per annum/sq. ft. land or factory space**. However, the market rates may differ from the same. In case of the PPP developer, the same is assumed as **BDT 5 per annum/sq. ft. land or factory space**

In the financial model all revenue related assumptions have been considered in line with the above.

14.2.6.4. *Cost Assumptions*

14.2.6.4.1. 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

For the development of the EZ, BEZA proposes to possess 329.43 acres of land, which is entirely private in nature comprising of settlements. 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 2544.97 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.

Table 130: Off-site infrastructure cost estimates to be incurred by BEZA

Description of Item	Quantity	Unit	Price without tax (in million BDT)
Power network	7.8	km	896.00
Water network	3	km	25.56

Boundary Wall	5.5	km	114.69
Gas supply	32	km	320
Project Sub-total			**1356.25**

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 is considered as ~ **BDT 180.07 million.**

Cost pertaining to On-site infrastructure

Infrastructure assessment recommends that for developing this project, BEZA has to undertake on-site infrastructure development pertaining to internal road network, power network, water supply, wastewater treatment, support amenities etc. 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	Price without tax (In million Taka)	Phase I Cost	Phase II Cost
Site development	2712.64	2712.64	
Internal road network	1238.59	619.29	619.29
Footpath	243.99	122.00	122.00
Storm water drain	46.65	23.32	23.32
Power supply	795.70	230.15	565.55
Water supply	320.76	169.38	151.38
Effluent and solid waste collection/treatment	746.81	373.40	373.40
Telecom	63.18	31.59	31.59
Sustainable infrastructure elements	10.99	5.50	5.50
Support amenities	830.74	830.74	-
Project sub-total	**7,010.05**	**5,118.01**	**1,892.04**

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 1600/ sq. ft. in case of the PPP developer developing the project (Case 2)

14.2.6.4.2. 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 2nd 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.

14.2.6.5. *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 from either commercial borrowing or through concessional loan/ grant
- Commercial borrowing: Concessional borrowing = 20%:50%
- 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 in greater proportion than commercial borrowings from multilaterals, International Development Association etc. in order to fund the project.
- For commercial borrowing: moratorium period- 4 Years (after construction period); rate of interest- 10% per year; repayment period- 8 years
- For concessional loan: moratorium period- 4 Years (after construction period); 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 either commercial borrowing or through concessional loan/ grant
- Commercial borrowing: Concessional borrowing = 50%:20%
- 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 construction period); rate of interest- 10% per year; repayment period- 8 years
- For concessional loan: moratorium period- 4 Years (after construction period); 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.

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).

14.2.6.6. *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)	ETP (Cum/acre/day)
0.17	108.91	76.24

Source: MACE Analysis & Market Intelligence

Based on standard industry benchmarks, 70% of water demand is considered as effluent 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[249]:

- Power tariff: **BDT 8.97/unit**
- Water tariff: **BDT 37.56/ '000 litres**
- Effluent treatment tariff: **BDT 36.95/ '000 litres**

Since, gas is currently not available in the proposed EZ, service charge of 25% has been assumed as a top up for future availability of gas (after a span of 5 years)

Industrial space uptake rates

In line with the best practices prevailing in economic zone development, it has been assumed that developer will construct the basic shell infrastructure- public amenities, utilities and roads. This developed land in the proposed

[249] *BEPZA rates prevalent in Dhaka Export Processing Zone*

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 12 years, 11 years, and 9 years respectively for conservative, base, and aggressive cases.

Table 133: Land uptake across three cases

S. No.	Years	Conservative	Base	Aggressive
1	2026	3%	5%	7%
2	2027	7%	10%	15%
3	2028	13%	18%	26%
4	2029	18%	25%	37%
5	2030	23%	32%	48%
6	2031	30%	43%	62%
7	2032	38%	53%	78%
8	2033	45%	64%	95%
9	2034	53%	76%	100%
10	2035	66%	94%	100%
11	2036	89%	100%	100%
12	2037 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: 5% per annum for both Case 1 & Case 2
- Revenue from space (industrial & Specialized infrastructure): 1% per annum for Case 1 & 10% per annum Case 2
- Revenue from Standard Factory Buildings: 10% per annum only for Case 2
- Revenue from utility mark-up: 20% per annum (for block of 3 years) for both Case 1 & Case 2

14.2.7. *Interpretation of the results*

14.2.7.1. *Financial Net Present Value (FNPV)*

Scenarios	Conservative (in BDT million)	Base (in BDT million)	Aggressive (in BDT million)
Case 1: BEZA playing the role of the master developer of the project			
Prevailing tariffs of BEZA i.e., Business As usual= A	-6576.36	-6227.12	-5835.93
Increased space tariffs=B	-5610.19	-5169.89	-4672.70
Offsite infrastructure funded by concerned nodal agency +(B)= C	-4428.12	-3989.13	-3493.22
Infrastructure to be developed by respective nodal agencies +(C) = D	4726.79	5174.55	5679.03
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (Without Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	-1856	-1550	-1031
Increased space tariffs (Scenario B)	-894	-527	70
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (With Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	-4210	-3929	-3461
Increased space tariffs (Scenario B)	-4428	-4142	-3681

Source: PwC analysis

14.2.7.2. *Financial Benefit Cost Ratio (FBCR)*

Scenarios	Conservative (at 12% discount rate)	Base (at 12% discount rate)	Aggressive (at 12% discount rate)
Case 1: BEZA playing the role of the master developer of the project			
Prevailing tariffs of BEZA i.e., Business As usual = A	0.89	0.97	1.07
Increased space tariffs =B	1.03	1.13	1.26
Offsite infrastructure funded by concerned nodal agency + (B) = C	1.03	1.13	1.26
Infrastructure to be developed by respective nodal agencies + (C) = D	1.03	1.13	1.26
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (Without Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	0.66	0.69	0.74

Scenarios	Conservative (at 12% discount rate)	Base (at 12% discount rate)	Aggressive (at 12% discount rate)
Increased space tariffs (Scenario B)	0.76	0.80	0.86
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (With Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	0.56	0.59	0.63
Increased space tariffs (Scenario B)	0.65	0.68	0.73

Source: PwC analysis

14.2.7.3. *Financial Internal Rate of Return (FIRR)*

Scenarios	Conservative	Base	Aggressive
Case 1: BEZA playing the role of the master developer of the project			
Prevailing tariffs of BEZA i.e. Business As usual= A	3.56%	3.71%	3.87%
Increased space tariffs=B	4.31%	4.51%	4.74%
Offsite infrastructure funded by concerned nodal agency +(B)= C	4.78%	5.01%	5.27%
Infrastructure to be developed by respective nodal agencies +(C) = D	13.17%	14.01%	15.10%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (Without Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	8.23%	8.46%	8.87%
Increased space tariffs (Scenario B)	9.04%	9.32%	9.80%
Case 2: PPP developer develops the project with BEZA playing the role of facilitator and regulator (With Pay-outs to BEZA)			
Business As-usual scenario (Scenario A)	6.53%	6.69%	6.99%
Increased space tariffs (Scenario B)	7.28%	7.49%	7.86%

Source: PwC analysis

14.2.8. *Scenario Analysis*

The following scenarios have been analysed to determine the best case of project returns for Case 1 i.e. BEZA playing the role of the master developer of the project:

- **Business As-usual scenario (Scenario A) –** In this scenario, it is assumed that BEZA will be the bearer of all costs pertaining to the project and the fees charged for both upfront payment and annual rent for industrial and specialized infrastructure space is as per the prevailing rates of BDT 11/sft.
- **Increased space tariffs (Scenario B)** – In this scenario, it is assumed that BEZA will bear all costs pertaining to the project but in return will charge increased rates for both upfront payment (@ BDT 280/sq. ft) and annual rent for industrial and specialized infrastructure space (@ BDT 25/sq. ft. per annum) from tenants.

- **Offsite infrastructure to be developed through nodal agencies (Scenario C = Scenario B + 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 the donor agency and charge increased rates for both upfront payment and annual rent for industrial and specialized infrastructure space from tenants.
- **On-site infrastructure to be developed by respective nodal agencies (Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies)** – In this scenario, it is assumed that BEZA will outsource all infrastructure costs pertaining to the project to the respective nodal agencies and charge increased rates for both upfront payment and annual rent for industrial and specialized infrastructure space from tenants.

Similarly, the following scenarios have been analysed to determine the best case of project returns for Case 2 i.e., when PPP developer develops the project with BEZA playing the role of facilitator and regulator:

- **Business As-usual scenario (Scenario A) –** In this scenario, it is assumed that the PPP will be the bearer of all costs pertaining to the on-site infrastructure of the project and in return will charge increased rates for both SFB (@ BDT 300/sq. ft) and annual rent for industrial and specialized infrastructure space (@ BDT 25/sq. ft. per annum) from tenants.
- **Increased space tariffs (Scenario B)** – In this scenario, it is assumed that the PPP will be the bearer of all costs pertaining to the on-site infrastructure of the project but in return will charge increased rates for both SFB (@ BDT 350/sq. ft) and annual rent for industrial and specialized infrastructure space (@ BDT 40/sq. ft. per annum) from tenants.

14.2.9. *Detailed Assessment of Project Returns for BEZA*

As explained earlier, the following scenarios have been analysed to determine the best case of project returns for Case 1 i.e. BEZA playing the role of the master developer of the project:

- **Business As-usual scenario (Scenario A)**
- **Increased space tariffs (Scenario B)**
- **Offsite infrastructure to be developed through nodal agencies (Scenario C = Scenario B + Offsite infrastructure to be developed through nodal agencies)**
- **On-site infrastructure to be developed by respective nodal agencies (Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies)**

The flowing table elucidates on the returns accrued (Project IRR, Equity IRR, average DSCR, BCR) to BEZA as per the above-mentioned scenarios for the three cases of land uptake (Conservative, Base and Aggressive).

Table 134: Project returns across scenarios – **Case 1**

Scenarios	Project IRR			Equity IRR			Average DSCR		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Prevailing tariffs of BEZA i.e. Business As usual= A	3.56%	3.71%	3.87%	2.88%	3.04%	3.22%	0.3	0.4	0.4
Increased space tariffs=B	4.31%	4.51%	4.74%	3.78%	4.01%	4.26%	0.3	0.5	0.6
Offsite infrastructure to be developed through nodal agencies +(B)= C	4.78%	5.01%	5.27%	4.34%	4.60%	4.91%	0.4	0.5	0.7
Onsite infrastructure to be developed by respective nodal agencies +(C) = D	13.17%	14.01%	15.10%	15.09%	16.52%	18.52%	1.03	2.7	3.0

Source: Financial Model; #BCR values with 15% cost of equity is furnished in annexure

Thus, project IRR in Base case improves up to 14.01% with a BCR (Benefit Cost Ratio) of 2.70 (with 12 % discount rate) when BEZA develops the infrastructure with assistance from the respective nodal agencies. This indicates the profitability of the project when BEZA acts as the developer of the project. The project profitability further improves if BEZA obtains concessional loan at cheaper rates than assumed in this case. Thus, in order to fulfil its ultimate objective of socio-economic upliftment of the communities through manufacturing-based employment generation, BEZA could act as a developer of the project with assistance concerned with infrastructure development from respective authorities or agencies.

Table 135: NPV (@ 12% 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
Prevailing tariffs of BEZA i.e. Business As usual= A	-6576.36	-6227.12	-5835.93	-6553.84	-6300.88	-6004.50
Increased space tariffs=B	-5610.19	-5169.89	-4672.70	-6135.77	-5824.20	-5457.17
Offsite infrastructure funded by concerned nodal agency +(B)= C	-4428.12	-3989.13	-3493.22	-5191.52	-4879.95	-4512.92

Scenarios	NPV# FCFF (in BDT million)			NPV# FCFE (in BDT million)		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Infrastructure to be developed by respective nodal agencies +(C) = D	4726.79	5174.55	5679.03	883.52	1195.09	1562.12

Source: Financial Model; #NPV values with 15% cost of equity is furnished in annexure

Thus, NPV of FCFF in Base case can be BDT -6227.12 million (with BEZA charging prevailing tariffs from industrial tenants), which improves up to BDT 5174.55 million with assistance from respective nodal agencies of Bangladesh in developing infrastructure for the project.

In order to make the project financially viable in case of where offsite infrastructure to be developed through nodal agencies and 50% of project cost will be finance by the multilaterals, BEZA may consider charging higher lease rentals, but high rentals may negatively impact the uptake of land. However, considering the same land uptake rate, BEZA should charge lease rental of rental of ~93.5 BDT/sq. ft/year to match project IRR with weighted average cost of capital (WACC) which is 7.6%.

14.2.10. *Detailed Assessment of Project Returns for the PPP Developer*

Development of economic zones in Bangladesh is in line with BEZA's end objective of promoting industrial development and employment generation in Bangladesh. Getting a PPP private developer to construct and operate the EZ site would result in better quality and improved operational efficiency in the service provided to the manufacturers who would invest in the EZ site. PPP developer has better access to following key resources as compared to BEZA:

- **Human Resources:** The Developer has a better access to human resources, and does not have to go through government bureaucracy for deployment of human resources, which gives it better access to human resources, and more efficient operations.
- **Finance:** The developer has full access to diversified project finance instruments with limited or no constraints. This provides flexibility on capital structures and capital costs;
- **Expertise:** The developer will have better access to resources such as the required expertise in project preparation, design, management and implementation;
- **Experience:** The developer's team may have better experience in developing and managing SEZs, especially on facility management and operation;
- **Technologies:** The Developer has better access to cutting edge technologies.

In the PPP 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. In this type of project structuring, International Competitive Bidding methodology is generally followed to shortlist the preferred bidder in order 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 PPP projects in the economic zone space in Bangladesh. Precedencies such as Mirsarai Phase I and Mongla EZ are the only two examples where PPP 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 scenarios have been analyzed to assess the project returns for the private developer. The following sub-sections elaborate on each of them in details.

14.2.10.1. *Assessment of Project Returns for the PPP Developer: Without Pay-outs to BEZA*

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. The following table illustrates on the parameters behind its success.

Table 136: 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

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 above. Project returns accruing to the PPP developer in this scenario is tabulated below.

Table 137: Project returns across scenarios – Case 2

Project returns	Scenario A	Scenario B

	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Project IRR	**8.23%**	**8.46%**	**8.87%**	**9.04%**	**9.32%**	**9.80%**
Equity IRR	**8.08%**	**8.32%**	**8.77%**	**8.98%**	**9.29%**	**9.84%**
Avg. DSCR	**1.9**	**2.4**	**3.0**	**2.3**	**2.9**	**3.5**
NPV# FCFF (in BDT million)	**-1856**	**-1550**	**-1031**	**-894**	**-527**	**70**
NPV# FCFE (in BDT million)	**-3086**	**-2830**	**-2403**	**-2439**	**-2132**	**-1640**
BCR# (at 12% discount rate)	**0.66**	**0.69**	**0.74**	**0.76**	**0.80**	**0.86**

Source: Financial Model; #BCR and NPV values with 15% cost of equity is furnished in annexure

Thus, it is evident that in case of the PPP developer developing the project, the project does not generate attractive returns even when the developer charges higher tariffs (Scenario B). This emphasizes on the fact that even if BEZA foregoes the pay-out criteria, the analysis of the project return depicts that it shall fail to attract best in class private developers of domestic and international repute considering the low returns it offers.

14.2.10.2. *Assessment of Project Returns for the PPP Developer: With Pay-out to BEZA*

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. In order to shortlist the most capable or financially stable bidders, certain bid parameters or modes of pay-outs are considered. These pay-outs are devised in order to recover the costs borne by the authorities in order 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. In order 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)
- **Annual Land lease**
- **Gross revenue share**
- **Equity stake to BEZA**

Through the development of the proposed EZ at Agailjhara, BEZA is striving towards holistic development of the communities related to the project and overall economic upliftment of the southern parts of Bangladesh, which yet to witness significant industrial development. Therefore, in order to determine the best mode of pay-out amongst the above-mentioned scenarios, all the pay-out scenarios and their necessary permutations and combinations have been evaluated or varied to understand which one or which combination of them helps BEZA in recovering its cost outlay for the project which is indicated 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. Subsequently, the values corresponding to that scenario should be the guiding principles for BEZA in terms of determining or formulating the appropriate bidding parameters while appointing the PPP developer.

As per the simulations[250], it was evident that combinations corresponding upfront payment, annual land lease and revenue share present the most viable option for BEZA in terms of determining the project structuring for

[250] *Results of the simulation with different combinations have been furnished in Annexure 19*

this particular project. Thus, from a project structuring and determination of bidding parameters perspective, a combination of **upfront payment (BDT 600 million), together with an annual land lease (BDT 9 per sq. ft. per annum) charge and a revenue share to BEZA (10%)** emerges as the most suitable option for BEZA in case it embarks on the conventional approach. The following table elucidates on the returns accrued in this case for the PPP developer across Scenario A and Scenario B (mentioned earlier; with PPP developer making pay-outs to BEZA).

Table 138: Project returns across scenarios when BEZA bears the cost of land acquisition and off-site infrastructure – **Upfront payment + Annual Land lease + Revenue share to BEZA pay-out mode**

Project returns	Scenario A			Scenario B		
	Conservative	Base	Aggressive	Conservative	Base	Aggressive
Project IRR	6.53%	6.69%	6.99%	7.28%	7.49%	7.86%
Equity IRR	6.26%	6.42%	6.73%	7.06%	7.28%	7.68%
Avg. DSCR	1.2	1.7	2.3	1.6	2.2	2.8
NPV# FCFF (in BDT million)	-4210	-3929	-3461	-3344	-3000	-2438
NPV# FCFE (in BDT million)	-5013	-4776	-4392	-4428	-4142	-3681
BCR# (at 12% discount rate)	0.56	0.59	0.63	0.65	0.68	0.73

Source: Financial Model; #BCR and NPV values with 15% cost of equity is furnished in annexure

In case of pay-out to BEZA developer will pay upfront payment, annual land lease and revenue share to BEZA to maintain a BCR of 1 for BEZA. In that case project returns for the PPP developer deteriorates indicating its inability to become financially sound. This further implies that it would be difficult for BEZA to attract private developers (with the above-mentioned pay-out structure) to develop the project. Moreover, the location of the proposed EZ and its considerable distance from the commercial centres of the country further amplifies the situation.

However, the project returns improve once the PPP developer considers charging higher tariff (@ BDT 40/sq. ft/annum for industrial space & BDT 350/sq. ft./annum for SFB rental) to ~7.49% (PIRR) and 7.028 (EIRR) with a BCR of 0.68 in the Base case, which is still below desired levels.

As depicted above, going by the traditional approach with the PPP developer mandated to make pay-outs to BEZA in lieu of upfront payment, annual land lease and a revenue share fetches unattractive returns. This could make it difficult for BEZA to attract reputed private entities for developing the project. This is further amplified by the location of the proposed EZ. Thus, in order to improve the returns of the project, the following avenues could be explored which would eventually benefit both the private entity and BEZA.

14.2.11. *Summary on Financial Analysis*

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 – 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 assumptions and findings of the financial modelling exercise.

Cost Assumption

Table below summerises the onsite infrastructure project cost considered for financial model.

Table 139: Onsite Infrastructure Cost

Description of item	Price without tax (In million Taka)
Site development	2712.64
Internal road network	1238.59
Footpath	243.99
Storm water drain	46.65
Power supply	795.70
Water supply	320.76
Effluent and solid waste collection/treatment	746.81
Telecom	63.18
Sustainable infrastructure elements	10.99
Support amenities	830.74
Project sub-total	**7,010.05**

Source: MACE analysis

Table below summerises the offsite infrastructure project cost considered for financial model.

Table 140: Offsite infrastructure cost

Description of Item	Quantity	Unit	Price without tax (in million BDT)
Power network	7.8	km	896.00
Water network	3	km	25.56
Boundary Wall	5.5	km	114.69
Gas supply	32	km	320
Project Sub-total			**1356.25**

Source: MACE analysis

Cost of land acquisition and resettlement and rehabilitation

For the development of the EZ, BEZA proposes to possess 329.43 acres of land, which is entirely private in nature comprising of settlements. 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 2544.97 million**. Details of these are captured in the Social Review chapter of the report.

Other costs

Cost associated with Environmental Management Plan is considered as ~ **BDT 180.07 million.**

Revenue Assumption

Table 141: Tariff assumption

Category of Land/Type of Development	Lease rate as per tariff rate of Jamalpur EZ	Lease rate as per Mongla EZ (BDT/Sft./year)
(BDT/Sft./year)	11.00	25.00

Return Calculation

Table below summerises the return in all three scenarios in case BEZA develops the project.

Table 142: Project returns where BEZA is playing role of developer (Base case)

Scenarios	Project IRR	Equity IRR	Average DSCR	BCR# (@ 12% discount rate)	NPV# FCFF (in BDT million)	NPV# FCFE (in BDT million)
Prevailing tariffs of BEZA i.e. Business As usual= A	3.71%	3.04%	0.4	0.97	-6227.12	-6300.88
Increased space tariffs=B	4.51%	4.01%	0.5	1.13	-5169.89	-5824.20
Offsite infrastructure to be developed through nodal agencies=C	5.01%	4.60%	0.5	1.13	-3989.13	-4879.95
Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies	14.01%	16.52%	2.7	1.13	5174.55	1195.09

Source: PwC analysis

Table 143: Project returns where BEZA is playing role of developer (Conservative case)

Scenarios	Project IRR	Equity IRR	Average DSCR	BCR# (@ 12% discount rate)	NPV# FCFF (in BDT million)	NPV# FCFE (in BDT million)
Prevailing tariffs of BEZA i.e. Business As usual= A	3.56%	2.88%	0.3	0.89	-6576.36	-6135.77
Increased space tariffs=B	4.31%	3.80%	0.3	1.03	-5610.19	-6112.34
Offsite infrastructure to be developed through nodal agencies=C	4.78%	4.34%	0.4	1.03	-4428.12	-5191.52
Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies	13.17%	15.09%	2.1	1.03	4726.79	883.52

Source: PwC analysis

Table 144: Project returns where BEZA is playing role of developer (Aggressive case)

Scenarios	Project IRR	Equity IRR	Average DSCR	BCR# (@ 12% discount rate)	NPV# FCFF (in BDT million)	NPV# FCFE (in BDT million)
Prevailing tariffs of BEZA i.e. Business As usual= A	3.87%	3.22%	0.4	1.07	-5835.93	-6004.50
Increased space tariffs=B	4.74%	4.26%	0.6	1.26	-4672.70	-5457.17
Offsite infrastructure to be developed through nodal agencies=C	5.27%	4.91%	0.7	1.26	-3493.22	-4512.92
Scenario D = Scenario C + On-site infrastructure to be developed by respective nodal agencies	15.10%	18.52%	3.0	1.26	5679.03	1562.12

Source: PwC analysis

Table below summarises the return in case PPP developer develops the project and charges annual lease rental of BDT 40/sft.

Table 145: Project returns where PPP developer develops the project (with Pay out to BEZA)

	Conservative	Base	Aggressive
Project IRR	7.28%	7.49%	7.86%
Equity IRR	7.06%	7.28%	7.68%
Avg. DSCR	1.6	2.2	2.8
NPV# FCFF (in BDT million)	-3344	-3000	-2438
NPV# FCFE (in BDT million)	-4428	-4142	-3681
BCR# (at 12% discount rate)	0.65	0.68	0.73

Source: PwC analysis

Pay-out: Upfront: BDT 600 Mn, Annual land lease: BDT 9/ Sft, Gross revenue share of 10%

Table 146: Project returns where PPP developer developi9ng the project (Without Payout to BEZA)

	Conservative	Base	Aggressive
Project IRR	9.04%	9.32%	9.80%
Equity IRR	8.98%	9.29%	9.84%
Avg. DSCR	2.3	2.9	3.5
NPV# FCFF (in BDT million)	-894	-527	70

NPV# FCFE (in BDT million)	-2439	-2132	-1640
BCR# (at 12% discount rate)	0.76	0.80	0.86

Source: PwC analysis

14.2.12. *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 – 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.

- For Case 1, where BEZA plays the role of the developer of the project, it bears the responsibility of land acquisition and construction of both off-site and on-site infrastructure of the project. In this scenario, BEZA being the apex authority of industrial development in the country could opt for concessional borrowing from various multilaterals in order to fund the project. Analysis of the various scenarios reveals the following.
- In case of Business-as-Usual scenario, with BEZA charging prevalent tariffs (land tariffs prevalent in Jamalpur EZ – 1), the project fails to generate healthy returns.
- Tariff plan B improves the project financial returns across options substantially, but the returns are still below the bankable threshold (i.e., <13% to 14%) where offsite and onsite infrastructure are being developed by the concerned nodal agencies.
- However, since the ultimate objective of BEZA and GoB is to generate employment and improve the socio-economic conditions of the region surrounding the proposed EZ, it could be prudent for BEZA to play the role of regulator and developer of this project.
- As an alternative, in order to imbibe private sector efficiency into the project which ensures better financial flexibility together with technical advancements and efficient operations, BEZA could also develop the project via the PPP route.
- Project returns are not attractive for the PPP model even when BEZA decides to extend certain fiscal stimuli to the PPP developer in form of:
    - Waiver on the pay-outs
    - Any nature of grant through VGF/annuity
- The project can fetch highest return of 14.01% in base case if BEZA is developer, when both the off-site and on-site infrastructure is being developed by nodal agencies. BEZA may consider off-loading the infrastructure development activities through nodal agencies and charging tariff rate as per tariff plan A. Tariff plan B is not advisable as development assistance from government infrastructure should be used for socio-economic benefits rather than making projects financially viable. BEZA can act as the developer of the project from the socio-economic perspective assisting in goals for upliftment of the communities through manufacturing-based employment generation.

14.3. *Economic Analysis*

14.3.1. *Purpose and Objectives*

The objective of economic modeling is to analyse and quantify the impact of the development of the proposed Economic Zone on the economy of Bangladesh. Financial analysis (or Financial IRR) estimates the return

accruing to the project operating entity (EZ developer), whereas Economic Internal Rate of Return (EIRR) estimates the return on the investment to the national economy. Economic analysis is essential to develop a rationale for Government of Bangladesh to support the development of the proposed EZ and illustrate the measure of the accrued economic benefits.

14.3.2. *Direct, Indirect and Associated Cost and Benefit Components*

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.

Economic cost for the project includes:

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.

Economic benefits considered are:

1) Value added in export owing to the industrial activities within the economic zone.
2) Economic benefit (through gains for the exchequer) as a result of the industrial operations within the proposed EZ
3) Employment generation owing to the development of the proposed economic zone. Minimum wage rate of BEPZA, SWRF, and SERF have been considered to arrive at the economic value of the total employment generated.
4) Tax paid by the developer is a gain (economic benefit) for the exchequer.

14.3.3. *Methodology of Economic Modelling*

14.3.3.1. *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.

14.3.3.2. *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 of BEPZA, 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.

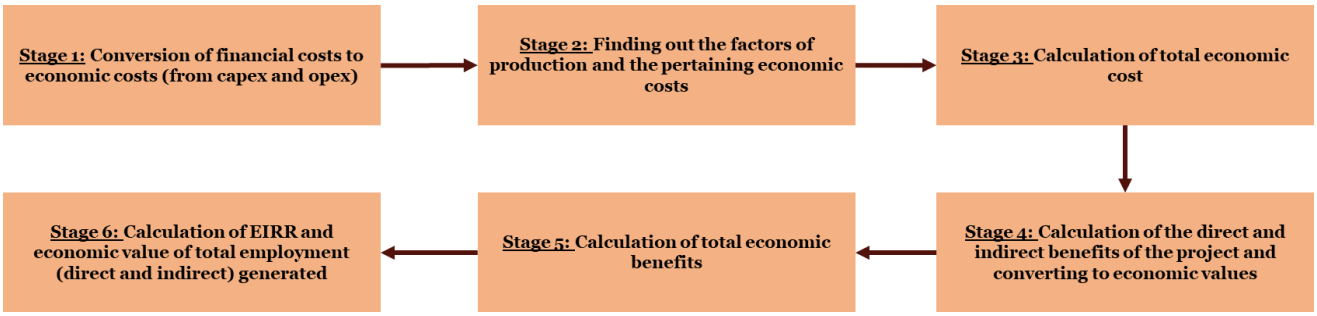
Economic modelling exercise has been undertaken for three scenarios as elucidated in the following-

- 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 117: Framework for Economic IRR calculation



Source: PwC Analysis

14.3.4. *Value of Cost & Benefit Components Converted into Economic Price by using Standard Conversion Factor (SCF)*

The study team has used the following conversion factor for Capex and Opex to convert 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%.[251] 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.

- *Shadow Wage Rate Factor (SWRF)* of 1.00 for skilled labour and 0.75 for unskilled labour was assumed.[252] 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.

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.

251 Additional Financing to the Third Primary Education Development Project RRP BAN 42122 by ADB (2015)

252 Similar assumption was taken for ADB-Khulna water supply project

14.3.5. *Cash Flow*

(in BDT millions)

Total Economic Costs										
	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Capital Expenditure										
Capex Expenses	-		4,600	4,600	946	946	-	-	-	-
Total (cost of the private developer)	-	-	4,600	4,600	946	946	-	-	-	-
(1) Material	-	-	1,955	1,955	402	402	-	-	-	-
(2) Equipment	-	-	1,387	1,387	285	285	-	-	-	-
(3) Labor	-	-	1,466	1,466	302	302	-	-	-	-
(4) Land	1,272	1,272	-	-	-	-	-	-	-	-
Operating Expenditure										
O&M Cost	-	-	-	66	95	127	133	140	147	154
Manpower Cost	-	-	-	17	22	24	25	26	27	29
(1) Material	-	-	-	56	81	108	113	119	125	131
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor (Cost of Personnel)	-	-	-	17	22	24	25	26	27	29
Total Economic Costs	**1,272**	**1,272**	**4,808**	**4,881**	**1,092**	**1,120**	**138**	**145**	**152**	**160**
Total Economic Benefits (base)										
(11) Net Economic value	-	-	-	-	-	473	1,093	1,867	2,699	3,455

addition by industries										
(12) Employment Generation	-	-	30	27	27	98	158	272	394	506
(13) Tax Incentive Availed by the Developer (Loss for Exchequer)	-	-	-	-	-	-	-	-	-	-
(14) Tax Paid by the Developer (Gain for Exchequer)	-	-	-	-	-	-	-	-	-	-
Total Economic Benefits	-	-	30	27	27	399	884	1,553	2,256	2,825

Total Economic Costs

	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Capital Expenditure										
Capex Expenses	-	-	-	-	-	-	-	-	-	-
Total (cost of the private developer)	-	-	-	-	-	-	-	-	-	-
(1) Material	-	-	-	-	-	-	-	-	-	-
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor	-	-	-	-	-	-	-	-	-	-
(4) Land	-	-	-	-	-	-	-	-	-	-
Operating Expenditure										
O&M Cost	162	170	179	188	197	207	217	228	239	251

Manpower Cost	30	32	33	35	37	38	40	42	44	47
(1) Material	138	145	152	159	167	176	185	194	204	214
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor (Cost of Personnel)	30	32	33	35	37	38	40	42	44	47
Total Economic Costs	**168**	**176**	**185**	**194**	**204**	**214**	**225**	**236**	**248**	**260**
Total Economic Benefits (base)										
(11) Net Economic value addition by industries	4,603	5,821	7,036	8,383	10,430	11,189	11,189	11,189	11,189	11,189
(12) Employment Generation	677	859	1,042	1,246	1,557	1,673	1,673	1,673	1,673	1,673
(13) Tax Incentive Availed by the Developer (Loss for Exchequer)	-	-	-	-	-	-	-	-	-	-
(14) Tax Paid by the Developer (Gain for Exchequer)	-	3	26	39	37	59	54	48	70	63
Total Economic Benefits	3,815	4,829	5,775	6,799	8,567	11,773	13,224	13,224	13,224	13,224

Total Economic Costs										
	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Capital Expenditure										
Capex Expenses	-	-	-	-	-	-	-	-	-	-

Total (cost of the private developer)	-	-	-	-	-	-	-	-	-	-
(1) Material	-	-	-	-	-	-	-	-	-	-
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor	-	-	-	-	-	-	-	-	-	-
(4) Land	-	-	-	-	-	-	-	-	-	-
Operating Expenditure										
O&M Cost	264	277	291	306	321	337	354	371	390	410
Manpower Cost	49	52	54	57	60	63	66	69	72	76
(1) Material	224	236	247	260	273	286	301	316	332	348
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor (Cost of Personnel)	49	52	54	57	60	63	66	69	72	76
Total Economic Costs	**273**	**287**	**301**	**317**	**332**	**349**	**366**	**385**	**404**	**424**
Total Economic Benefits (base)										
(11) Net Economic value addition by industries	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189
(12) Employment Generation	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673
(13) Tax Incentive Availed by the Developer (Loss for Exchequer)	-	-	-	-	-	-	-	-	-	-
(14) Tax Paid by the Developer	56	80	72	62	90	79	68	98	86	73

(Gain for Exchequer)										
Total Economic Benefits	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224

Total Economic Costs										
	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Capital Expenditure										
Capex Expenses	-	-	-	-	-	-	-	-	-	-
Total (cost of the private developer)	-	-	-	-	-	-	-	-	-	-
(1) Material	-	-	-	-	-	-	-	-	-	-
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor	-	-	-	-	-	-	-	-	-	-
(4) Land	-	-	-	-	-	-	-	-	-	-
Operating Expenditure										
O&M Cost	430	451	474	498	523	549	576	605	635	667
Manpower Cost	80	84	88	92	97	102	107	112	118	124
(1) Material	365	384	403	423	444	466	490	514	540	567
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor (Cost of Personnel)	80	84	88	92	97	102	107	112	118	124
Total Economic Costs	**445**	**468**	**491**	**516**	**541**	**568**	**597**	**627**	**658**	**691**

Total Economic Benefits (base)

(11) Net Economic value addition by industries	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189
(12) Employment Generation	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673
(13) Tax Incentive Availed by the Developer (Loss for Exchequer)	-	-	-	-	-	-	-	-	-	-
(14) Tax Paid by the Developer (Gain for Exchequer)	107	92	77	115	98	80	124	104	83	131
Total Economic Benefits	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224

Total Economic Costs

	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Capital Expenditure										
Capex Expenses	-	-	-	-	-	-	-	-	-	-
Total (cost of the private developer)	-	-	-	-	-	-	-	-	-	-
(1) Material	-	-	-	-	-	-	-	-	-	-
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor	-	-	-	-	-	-	-	-	-	-
(4) Land	-	-	-	-	-	-	-	-	-	-
Operating Expenditure										

O&M Cost	700	735	772	811	851	894	939	986	1,035	1,087
Manpower Cost	130	137	143	151	158	166	174	183	192	202
(1) Material	595	625	656	689	724	760	798	838	880	924
(2) Equipment	-	-	-	-	-	-	-	-	-	-
(3) Labor (Cost of Personnel)	130	137	143	151	158	166	174	183	192	202
Total Economic Costs	**725**	**762**	**800**	**840**	**882**	**926**	**972**	**1,021**	**1,072**	**1,125**
Total Economic Benefits (base)										
(11) Net Economic value addition by industries	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189	11,189
(12) Employment Generation	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673	1,673
(13) Tax Incentive Availed by the Developer (Loss for Exchequer)	-	-	-	-	-	-	-	-	-	-
(14) Tax Paid by the Developer (Gain for Exchequer)	108	84	139	112	84	146	115	82	152	116
Total Economic Benefits	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224	13,224

Source: PwC analysis

14.3.6. *Key Assumptions*

The Economic IRR for the project has been calculated considering economic costs and benefits generating out of the project over the project tenure. The assumptions adopted for computation of economic IRR are based on the assumptions as depicted in our financial analysis. Base case was used for calculating the EIRR for the project. In addition to the above, the following assumptions were considered for arriving at the EIRR:

- *Cost of land:* Since this project also envisages land being acquired by BEZA (in case of BEZA playing the role of the master developer), cost of land has been considered in this economic model.
- *Environmental costs:* Costs related to Environment have been also included in the model. Costs associated with technical support, development of green belt, solid and hazardous waste management, waste and 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 100% Opex will generate on account of the materials and the consumables; 0% of opex will generate on account of the equipment. The operating cost for personnel is calculated separately in the economic model.
- *Land lease expenses:* Land lease expense is not included in the economic analysis
- *Import of Equipment:* We have assumed that 75% of the equipment and machinery used for the project would be imported. This is based on the standard practice and market benchmark of similar industries in Bangladesh.
- Capex and Opex have been converted to economic equivalents/ market costs using the following assumptions:
  - *Shadow Exchange Rate Factor (SERF)* of 1.05 was considered. The basis is that BDT is overvalued by about 5%.[253]
    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.
  - *Shadow Wage Rate Factor (SWRF)* of 1.00 for skilled labour and 0.75 for unskilled labour was assumed.[254] 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.

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

253 Additional Financing to the Third Primary Education Development Project RRP BAN 42122 by ADB (2015)
254 Similar assumption was taken for ADB-Khulna water supply project

domestic equivalents. It may be noted that since SERF is applied on the costs, factors such as the import duty is considered to be adjusted in the SERF and hence import duty has not been considered separately.

- VAT rate (for both capex and opex) has been considered as 15% according to the prevailing rate for Bangladesh.
- Estimation of indirect and induced employment generation (due to generation of downstream industries) is based on Employment Multiplier Coefficient of 0.7. The coefficient was extracted from Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation"[255]. 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.

14.3.7. *Interpretation of the results*

14.3.7.1. *Economic Net Present Value (ENPV)*

Scenarios	@10% equity discounting rate	@12% equity discounting rate	@15% equity discounting rate
Conservative	29384.50	18050.41	8867.26
Base	47237.60	29860.64	15718.22
Aggressive	68112.18	43665.56	23722.89

Source: PwC analysis

14.3.7.2. *Economic Benefit Cost Ratio (EBCR)*

Scenarios	@10% equity discounting rate	@12% equity discounting rate	@15% equity discounting rate
Conservative	8.66	6.29	4.13
Base	3.31	2.34	1.33
Aggressive	12.05	8.74	5.72

Source: PwC analysis

255 Background Paper for World Development Report 2013 "Structural Transformation and Employment Creation" by Christian Kingombe and Dirk Willem te Velde, Overseas Development Institute

14.3.7.3. *Economic Internal Rate of Return (EIRR)*

Base case Economic Internal Rate of Return (EIRR) has been calculated as **30.20%**, which indicates that the project is providing attractive returns throughout the tenure of the project. Following table depicts the scenario analysis of the proposed EZ.

Scenario	Conservative	Base	Aggressive
Economic Internal Rate of Return	25.0%	30.2%	35.1%

Table above indicates that in conservative case, project generates **25.00%** economic return which is good in nature. Aggressive scenario indicates that economic return of the project is **35.10**%, which is highly attractive.

It appears from the above analysis that the proposed EZ generates good to highly attractive economic return in the context of Bangladesh's economy and growth targets.

14.3.8. *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.

14.3.8.1. *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.

14.3.8.2. *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 147: 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
4	Institutional intervention	Technology transfer	Indirect employment generation	Introduction of eco-friendly energy production	Positive impact on existing social webs

Source: PwC Analysis

14.3.8.3. *Assumptions*

Following table summarizes the assumptions and their sources which have been taken into account for quantifying the impact of the proposed development.

Table 148: Assumptions for Economic Impact Analysis

Attributes	Assumptions	Source
Human Capital		
Literacy Rate	73.9%	Bangladesh Bureau of Statistics
Unemployment Rate	4.37%	Bangladesh Bureau of Statistics
Institutional Intervention	Very few as of now, Not organized	NA
Financial Capital		
Per capita Income (on PPP basis $ /year)	4,992	IMF
Poverty Rate	7.50%	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	Moderate	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 huge chunk of land parcel	Site visit

Source: PwC Analysis

14.3.8.4. *Results*

All the impact parameters are rated based on the assumptions and the impact it would have on local economy.

Table 149: 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	3					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	3					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		4				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			5			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			5			Industrialization in the region will boost the demand for other FMCG and other daily consumable goods, this will provide the

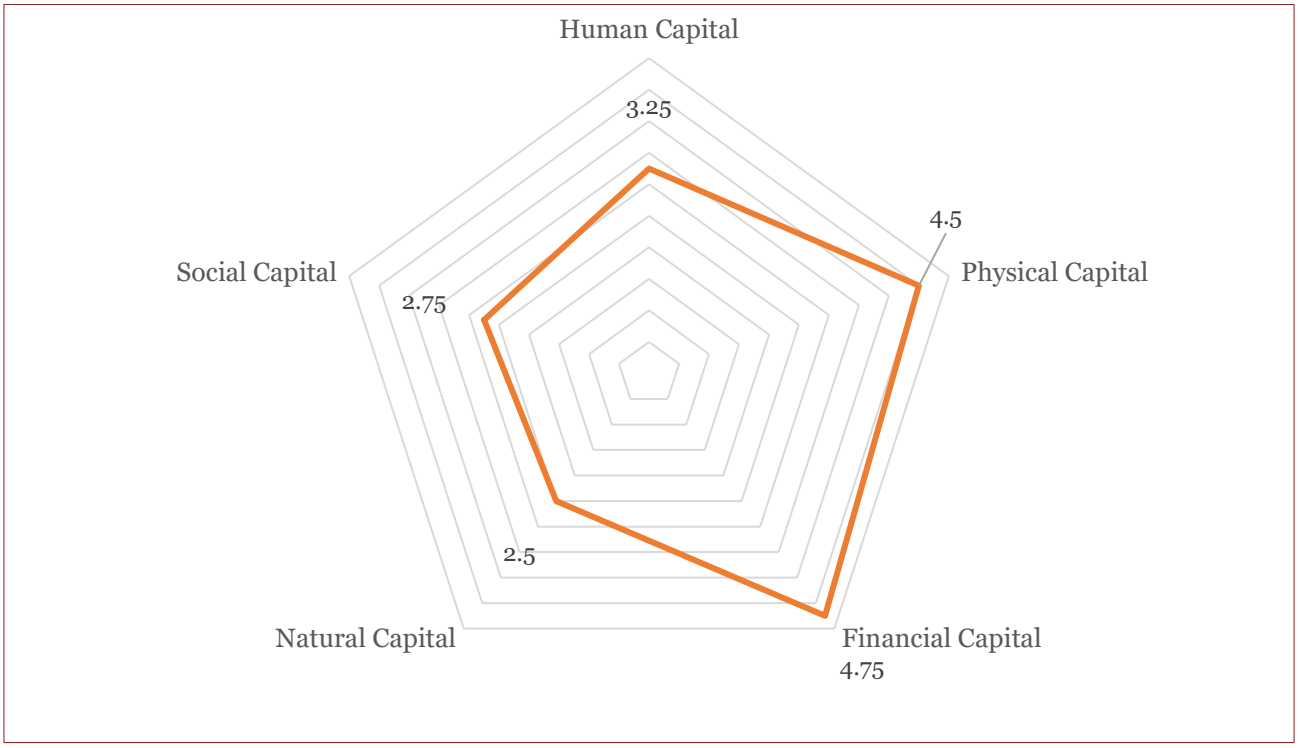
Different form of capital in sustainable projects and there rating on scale of 5							
Sl. No.	**Impact Indicators**	**Human Capital**	**Physical Capital**	**Financial Capital**	**Natural Capital**	**Social Capital**	**Marking Rational**
							market for regional produce, that will increase the value 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			5			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				2		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					2	Rehabilitation is required as the proposed EZ covers huge chunk of private land
18.	Community participation					3	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					3	Development of this scale will help in strengthening social ties by providing platform for locals to interact with each other.
	Average Impact on capital	**3.25**	**4.5**	**4.75**	**2.5**	**2.75**	

Source: PwC Analysis

14.3.8.5. *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 118: Economic impact on micro market population



Source: PwC Analysis

From the economic impact pentagon, it can be inferred that apart from natural and social capital, the project has progressively sustainable impact on the different capital of the micro market. However, impact on social issues can be mitigated by resolving rehabilitation issue in best interest of local population. 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.

The proposed EZ project will have positive economic impact on macro market as well as micro market and in turn help the economic upliftment of the country.

14.3.9. *Conclusion and recommendations*

The proposed EZ will have multi-dimensional impact on both micro and macro economy. Industrialization being one of the priorities of Bangladesh government, this envisaged project will help to move one step forward in that direction. The proposed EZ will ensure better job opportunity and services for the local population. The other indirect benefits include improved social services such as banking, medical and hospitality.

The benefits that are highlighted in this chapter will help the economic development of Bangladesh, especially the industrial sector. The proposed EZ at Agailjhara will attract industries, looking to set up their facilities within the park and hence will enable technology transfer to country. This will be beneficial for the industrial sector in the long run.

15. Annexures

15.1. Annexure-1: Photographs of the Proposed EZ

Figure 119: Local land and UNO office

Agailjhara land office

UNO office Agailjhara

Figure 120: Regional highways and upazila roads

Gaurnadi Gopalganj Regional Highway

Agailjhara upazila roads

Figure 121: Site photographs

15.2. Annexure-2: Import Trend of Bangladesh

Table 150: 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 fibers	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
Aircraft, spacecraft, and parts thereof	201.34	59.79	150.33	454.95	792.36

Products	2015	2016	2017	2018	2019
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; lace; tapestries; trimmings; embroidery	162.76	390.81	391.12	464.10	482.81

Products	2015	2016	2017	2018	2019
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 fibers; 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
Miscellaneous articles of base metal	58.96	204.72	217.61	206.04	202.36
Furniture; bedding, mattresses, mattress	74.23	237.80	229.50	238.41	202.17

Products	2015	2016	2017	2018	2019
supports, cushions and similar stuffed furnishings; ...					
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 foreskins) 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
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

Products	2015	2016	2017	2018	2019
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, mollusks 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
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

Products	2015	2016	2017	2018	2019
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 map

15.3. Annexure-3: Export Trend of Bangladesh

Table 151: 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 fibers; paper yarn and woven fabrics of paper yarn	681.19	788.68	853.45	720.81	603.28
Fish and crustaceans, mollusks 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 fur skins) 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
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; ...	39.82	45.13	63.37	91.08	88.91

Products	2015	2016	2017	2018	2019
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
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	8.25	11.01	14.88	20.10	23.68

Products	2015	2016	2017	2018	2019
materials; basket ware and wickerwork					
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 fibers	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, mollusks 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
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

Products	2015	2016	2017	2018	2019
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
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

Products	2015	2016	2017	2018	2019
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

15.4. Annexure-4: Gross Output of Manufacturing Sector in Bangladesh

Table 152: Gross Output of Manufacturing Sector (Highlighted cells belong to top 80% products)

BSIC code and description Total	Gross Output (in BDT Million) 5,394,902	Rank
10 Manufacture of food products	608777	4
11 Manufacture of beverages	52826	13
12 Manufacture of tobacco products	87197	9
13 Manufacture of textiles	715247	3
14 Manufacture of wearing apparel (Ready-made garments)	1819482	1
15 Manufacture of leather and related products	76147	10
16 Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials.	6912	22
17 Manufacture of paper and paper products	57187	12
18 Printing and reproduction of recorded media	10821	21
19 Manufacture of coke and refined petroleum products	3684	23
20 Manufacture of chemicals and chemical products	140184	7
21 Manufacture of pharmaceuticals, medicinal chemical and botanical products	113070	8
22 Manufacture of rubber and plastics products	51143	14
23 Manufacture of other non-metallic mineral products	351779	5
24 Manufacture of basic metals	905850	2
25 Manufacture of fabricated metal products, except machinery and equipment	71357	11
26 Manufacture of computer, electronic and optical products	39623	16
27 Manufacture of electrical equipment	145166	6
28 Manufacture of machinery and equipment n.e.c.	13141	19
29 Manufacture of motor vehicles, trailers and semitrailers	36780	17
30 Manufacture of other transport equipment	36291	18
31 Manufacture of furniture	39685	15
32 Other manufacturing	11263	20
33 Repair and installation of machinery and equipment	1134	24
34 Recycling	129	25

Source: Bangladesh Bureau of Statistics, Survey of Manufacturing Industries 2012

15.5. Annexure-5: Respondents in Primary Survey

Table 153: Respondents in the Primary Survey

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
1	Canara Lightning Industry	Light Engineering	Mr. Sidda	Regional Manager	,919003019179	Foreign
2	Surya Roshni	Light Engineering	Mr. Akhilesh Agarwal	Head of Business Development	,009111471080 0	Foreign
3	Orient Electric India Ltd	Light Engineering	Mr. Pankit Mahendru	Manager, Marketing	,009188001 00948	Foreign
4	MTR Foods India Limited	Food Processing	Ms. Nalini Rao	Asst Manager Public Relations	,009180408 12100	Foreign
5	Green Dot Health Food Limited	Food Processing	Mr. Vikram Agarwal	Director	,009187550 01065	Foreign
6	Britania Industries Limited	Food Processing	Mr. Sonaraj		,009133228 72439	Foreign
7	Ishar Dass Amir Chand	Agro Processing	Mr. Divendear Kumar	Vice President	,009198110 14277	Foreign
8	NS Sugar India Ltd	Agro Processing	Mr. K Ramakoteswara	Vice President	,009140305 14444	Foreign
9	3F Oil Plam India Ltd	Agro Processing	Mr. Upendra Mogili	HOD, HR	,009177020 20111	Foreign
10	Aurobindo Pharma	Pharma	Mr. Mr. Viswanadh Kandala	Senior Manager, HR	91894288330	Foreign
11	Alkem Laboratories Ltd	Pharma	Ms. Girza	Head of International Marketing	912239829999	Foreign
12	Glen Mark Pharmaceuticals	Pharma	Deepika Gupta	International Marketing, Africa	091224018965 6	Foreign
13	Epic Garments	RMG	Mr. Prem Soni	CEO	1715561035	Foreign
14	Roulin BD	RMG	Ms. Hosne-Ara	Manager, Admin	1738915897	Foreign
15	South Chaina Garments Ltd	RMG	Mr. Tariqul Islam	Manager, Production	1819229648	Foreign
16	Super Cone Inda Pvt Ltd	Paper and Packaging	Mr. Aman Gupta	Director	009170421491 5	Foreign
17	PUDUMJEE	Paper and Packaging	Mr. Stanford S	Manager, International Market	,009122435533 33	Foreign

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
18	Om Printers and Packaging	Paper and Packaging	Mr. Gupta	Proprietor	,919821586853	Foreign
19	RAK Ceramics BD Ltd	Ceramic and Ceramic	Mahmudul Kabir Khan	Company Sec	1730331215	Foreign
20	Lafarge Surma Cement Bangladesh	Ceramic and Ceramic	Mr. Ashraf	Head of Logistic	1714096579	Foreign
21	Ultratech Cement	Cement and Ceramic	Md. Tanveer Alam	Manager A&F	1711807797	Foreign
22	AG Agro Foods Limited	Food processing Final Product: Various Raw Processed Chicken	Md. Mashiur Rahman	Manager Business Development	88 01777719193	Domestic
23	Ahmed Food Products Limited	Food processing Final Product: Jam, Jelly, Juice and Pickels	Minhaj Ahmed	Deputy Managing Director	19137444222	Domestic
24	Ispahani Food products ltd	Food processing Final Products: Powder Drinks, Sancks and Bakery iteam	Md. Zillur Rahman	General Manager	1755644002	Domestic
25	Tiwan Food Ltd	Food Processing Final Products: Aluvera Juice and Pineapple Juice	Mr. Ershed Ahmed	GM	1711865861	Domestic
26	Quantum Corporation Limited	Food Processing Final Products: Biscuits	Mr. Nasir Uddin	Owner	1713017472	Domestic
27	A Ali Food Products	Food Processing Final Products: Sancks and Chanachur	Mr. Mithun Saha	Manager Marketing	1671120346	Domestic
28	Orion Home appliances	Light Engineering Final Products: TV, Fridge, Microwave, coockware	Tonmoy Das	Manager, Accounts	1717739043	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
29	Energypac Ltd	Light Engineering Final Products: Steel Lamp holder, Electric Motor	Masud Hossain Mizi	Manager, Costing	1701227666	Domestic
30	Kai Almunium	Light Engineering Finish Products: Aluminum Bars, Doors Frame nad Windows Frame	Md. Kamrul Hasan	GM	1917701727	Domestic
31	H.T Engineering Works	Light Engineering Finish Products: Piston, Small rotator, Bearing Holder, Spoke	Md. Abdul Hakim Miah	Proprietor	1713042630	Domestic
32	Ujala Metal Industry Ltd	Light Engineering Finish Products: Small Auto Parts	Hazi Md. Ali	Proprietor	02 7443660	Domestic
33	M/S Progoti Engineering Works	Light Engineering Finish Products: Various Mold Dises of Capital Machinery Parts	Md. Safiul Islam	Proprietor	1713014825	Domestic
34	Sonali Ansh Jute Mills Limited	Agro Processing Finish Products: Jute Sack and Jute Yarn	Mr. Nissan	Managing Director	16191513131	Domestic
35	Kishwan Food Products Limited	Agro Processing Finish Products: Spices, Powder Juice and Pickle	Md. Shahidul Islam	Manging Director	17111726092	Domestic
36	Green Firm Asia BD Ltd	Agro Processing Finish Product:	Mr. A. M.M. Nasir Uddin	MD	1713104202	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
		Frozen Vegetables and Fruits				
37	HIFS Agro Food Industries Ltd	Agro Processing Finish Product: Jelly, Jam, Juice and Spices	Syed Md. Shoaib Hasan	Proprietor	18199314974	Domestic
38	Desi Meat Ltd	Agro Processing Finish Product: Various types of Raw Meat (Cow & Buffalo)	Md. Nessar Uddin	GM	1713015074	Domestic
39	Rangpur Dairy Ltd	Agro Processing Finish Product: Various types of RawMilk nad Milk Products	Mr. Ranjit Bssak	Company Secretary	1978090817	Domestic
40	RN Packaging Ltd	Paper and Packaging Finish Products: Corrogated Paper Box for RMG	Mr. Saiful Islam	Proprietor	1919426408	Domestic
41	Capital Paper and pulp Industries Ltd	Paper and Packaging Finish Products: Various Writing Paper and News print paper for publishing	Shaik Mohammad Sharif	GM	1841097226	Domestic
42	S.B.M Paper Cones Ltd	Paper and Packaging Finish Products: Paper Cones for Spinning Mills	A.S. Moazzam Hossain	Manager, HR and Admin	171304287	Domestic
43	Anik Poly & Packagingg Ind. Ltd	Paper and Packaging Finish Products: Various Packaging Carton for RMG	Alomgir Hossain	MD	1713006138	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
44	Al Araf Packaging Ind. Ltd	Paper and Packaging Finish Products: Various types of tags and lebels	Mr. Md. Ali Majumdar	Proprietor	1819217921	Domestic
45	Khansons Textile Limited	RMG Finish Product: Various types of Yarn	Mr. Arjun Paul	GM	1711463975	Domestic
46	Adams Garments Limited	RMG Finish Product: Mens Clothing	Mr. Shahidul Islam Mukul	Managing Director	1819217797	Domestic
47	Bengal Leisure Wear Ltd	RMG Finish Product: Mens and Womens Under Garments	Ratan Chandra Saha	Manager (A&F)	1716390912	Domestic
48	Opsonin Pharma	Pharma	S. M. Azizul Islam	Advisor, Engineering	1730034351	Domestic
49	Beacon	Pharma	Giashuddin	General Secretary	88 01730025964	Domestic
50	Amancem Ltd	Cement and Ceramics Finish Product: Cement	Engr. Md. Habibur Rahman	COO	1708832510	Domestic
51	Olympic Cement	Cement and Ceramics Finish Product: Cement	Mr. Slaluddin Chowdhurry	Head of Project	1711343640	Domestic
52	Regal furniture	Light engineering (furniture)	Md. Touhidul Islam Bhuiya	DGM - Sales	01841257446	Domestic
53	Mr. Baker	Food Processing	Mr. Shahdat Hossain	GM	1955578800	Domestic
54	Julphar Pharma Bangladesh	Pharma	Mr. Sayed Ahmed FCA	Company Secretary	1988881130	Domestic
55	Amber Paper Mills Ltd	Paper and Packaging	Md. Anisur Hoque	GM Finance	1766664343	Domestic
56	Hua Thai	Ceramics	Mr. Ataur Rahman	Manager	1716353044	Domestic
57	Ferdaus Jute Mills Limited	Agro Processing Finish Products: Various types of Jute Yarn	Alhaz Abdul Hai Babu	Director	1711522472	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
58	Pran Frozen Foods Limited	Food Processing Finish Products: Frozen Meat and Frozen Snacks	Mr. Moin	CEO (Frozen Food Division)	1704133742	Domestic
59	Fuwang Ceramics Limited	Cement and Ceramics Finish Product: Ceramic Tiles and House wear	Mr. Rafiquzzaman	GM	1914077099	Domestic
60	Panbo Bangla Mashroom Ltd	Agro Processing Finish Products: Various edible mashroom	Mrs. Ferdousi Alam	Director	1755631941	Domestic
61	Eurasia Food	Food Processing Finish Products: Frozen Parata, Vegetables, Fruits and Frozen Snacks	Mr. Md. Shehezad	GM	1715770840	Domestic
62	Baizid Group	Light Engineering Finish Products: Steel products	Liaquat Ali Chowdhury	COO	1819225327	Domestic
63	Popular Pharmaceuticals	Pharma	Kazi Mohammed Badruddin	Director Finance and Accounts	88 029101730 - 2	Domestic
64	ASR Apparels	RMG Finish Product: Womens wear	A.S.M Shafiul Karim	MD	1819315563	Domestic
65	Excel Technologies	Light engineering				Domestic
66	Mir Ceramic	Nonmetallic minerals	Farid Ahmed			Domestic
67	Arla Foods	Food processing	Rajib Jony		1709661982	Domestic
68	Renata Pharma	Pharma	Khayrul Islam			Domestic
69	Beximco Pharma	Pharma	Rabbur Reza	COO	1711522070	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
70	Radiant Pharma	Pharma	Mr. Rabiul Islam	Manager, Commercial	1720045375	Domestic
71	Labaid Pharma	Pharma	Mr. Razibul Hoque	Plant Manager	1850067433	Domestic
72	Orion Pharma	Pharma	Mr. Salman Obaidul Karim	MD	002 8870133	Domestic
73	Sydney Ehsan Group	RMG Finish Product: Various Apperals	Mr. Md. Abdul Hakim	MD	1711901419	Domestic
74	Total Socks Industries Ltd	RMG Finish Product: Socks	SKM Hafeez	Factory Manager	1991322562	Domestic
75	Premier Cement Mills Limited	Cement	Mr. Md. Aminul Islam	DGM- A&F	1714109412	Domestic
76	Fresh Cement	Cement	Chowdhury Saifuddin Haider	Head of Branding	1617611027	Domestic
77	SIAM CITY CEMENT	Cement	Md. Nasiur Alam Sumon	GM- Sales	17111539918	Domestic
78	Incepta Pharma	Pharma	Mr. Naumul Huda	GM- A&F	1713043443	Domestic
79	Abulkhair Ceramic Industries Ltd	Cement and Ceramic	Md. Mustafizur Rahman	Manager A&F	1919875115	Domestic
80	Quality Engineering Works	Light Engineering Finish Product: Temparature Control Showcase, Coffee Maker, Griller	Mr. Rubel	Owner	1711281050	Domestic
81	Hamdard Laboratories	Pharma	ASM Md. Riaz	Assisstant Manager	1731063355	Domestic
82	Atlantic Packaging Ltd	Paper and Packaging	Mr. Didarul Alam	MD	1710800689	Domestic
83	Ayman Printing and Packaging	Paper and Packaging	Mr. Mohammad Sazzadur Rahman	MD	1816309260	Domestic
84	Bagdad Packaging Ltd	Paper and Packaging	Mr. Md. Abul Hasnat	Owner	1711529009	Domestic
85	Blazon Trim and Packaging	Paper and Packaging	Md. Miraz Ahmed Khan	MD	1711479584	Domestic
86	Masco Group	RMG	Ms. Fahim Akhter Shampa	Director	1711528839	Domestic
87	Well Textile	Textile & RMG	Syed Shahidul Islam	Director	1819288283	Domestic

SNo	Name of the Company	Industrial Sector	Respondent	Designation	Mobile Number	Origin
88	Star Sea Food industries Ltd	Agro Processing	Md. Ismail Hossain	Deputy Managing Director	1714002054	Domestic
89	Chaina Bangla Ceramic Industry Ltd	Ceramics	Md. Amjad Hossain	CFO	01714 037525	Domestic
90	Ayman Textile Industry Ltd	RMG	Mr. Bahauddin Yusuf	MD	1717-442929	Domestic
91	Standard Group	RMG	Mr. Abdul Matin	CFO	1708496400	Domestic

15.6. Annexure-6: Country level Sectoral Profiles

Sector	Description of raw materials, industrial linkages, and market access
Textile & Ready-Made Garments (RMG)	Textile & RMG is the major industrial sector in the country. Bangladesh is 2nd largest exporter of RMG in the world after China, having 6.4% of global market share. This industry is already well developed in Bangladesh generating growth rate of 13%.[256] Gross value added from this sector is BDT 2534.7 million, which is ~47% of the country's overall gross value added from manufacturing sector.[257] GoB has set a target to achieve USD 50 billion of exports from RMG sector by 2020, in order to do so, it has also placed textile & RMG sector in its high priority industrial sector list. Among the incentives offered by GoB, garment manufacturers and exporters get 4 percent cash incentive against value addition of products manufactured in the country using locally manufactured yarn.[258] 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.[259] 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. [260] These countries have a lot of immigrants from Bangladesh, who drive demand for Bangladesh food products in these countries. As per data available with Bangladesh Agro-Processors Association, Bangladesh clocked a growth of 33% in exports of processed food in between 2011-12 to 2013-14. Major items of exports were fruit juice, biscuits, potato crackers, chips, puffed rice, jam, confectionery items, ketchup, parathas, singharas etc. As per Bangladesh Investment Development Authority, frozen food export is a priority sector for Bangladesh with special focus towards exports of shrimps. Food and Beverage industry can be broadly segregated into two categories – (i) agro based products and (ii) animal products For agro based products, the first stage is cultivation of necessary agricultural crops like cereals, fruits and vegetables. This is followed by 2-stage processing, where products like

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

Sector	Description of raw materials, industrial linkages, and market access
	wheat are converted into flour by agro based industries and flour is then converted into 2nd stage products. These products are then packaged and sent to consumer markets. F&B is the second stage in the value chain, while the first being agro based products. Although Bangladesh being an agrarian economy is able to supply most of the raw material required for agro based industry, it also has to rely on imports for products like Wheat, Sugar and few fruit various reasons ranging from poor protein content in wheat to poor productivity of sugarcane. For animal products, Bangladesh is primarily focussed of exports of fish products, in particular exports of shrimp. Shrimp production is a three-stage process, starting at hatcheries, where shrimp fries are cultivated, followed by farming where adult shrimps are cultivated from the shrimp fries. This is followed by processing, where activities like deshelling, de-heading and some minimal processing takes place in order to increase the shelf life of shrimp products. Lack of technological know-how prevents shrimp processing firms from adding further value to the processed shrimps. Fish and shrimp cultivation takes place in coastal parts of the country like Khulna, Barishal, Cox's Bazar and Chittagong. Basis primary survey, investors prefer setting up of F&B units at central locations of Bangladesh so that seamless supply to consumers located across the country can take place easily. Some large domestic and foreign F&B players also source a part of their raw materials (like additives, flavours, and chemicals) from outside the country from registered vendors in order to conform to their global quality policy.
Agro Based Products	Agro based products act as source of raw material and intermediaries/ backward linkage to F&B sector in Bangladesh. Agro based products can broadly be classified into three categories viz. (a) cereal, egg & fruits based; (b) tobacco; and (c) non-edibles (such as jute, cotton). This sector deals with first level processing of agricultural products and it acts as the upstream industry sector for F&B sector. Being an agrarian economy, Bangladesh cultivates agricultural products in abundance. Although Bangladesh shows prominence in yield per unit area for wheat (3.1 MT per hectare vis-à-vis 3.07 MT per hectare globally), locally produced wheat are low on protein content. As a result of the same, Bangladesh has import dependency for wheat (Russia, Ukraine, and India are the major importers).[261] 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.[262] 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 top most tobacco producing divisions. Tobacco cultivated caters to the domestic demand and the tobacco leaves are being exported to large economies. Jute is one of the predominant cash crops in Bangladesh. Bangladesh is contributing ~39% of world's jute production. Jute is cultivated in almost all districts of Bangladesh; various jute mills are located in Khulna division. As explained earlier, humid climate in this country is not conducive for cultivation of cotton, hence cotton is primarily imported from countries like China, and India owing to quality aspects as well as less lead time requirement due to import from neighbouring countries.

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

Sector	Description of raw materials, industrial linkages, and market access
	Agro based products manufactured in Bangladesh primarily caters to the domestic demand and as feed to F&B industry. Export of agro based products mostly takes place to India and the surrounding countries. High dependency on primary sector (agriculture) necessitates the usage of light machinery and agricultural equipment in Bangladesh.
Leather and Leather Products	Leather industry is the second largest export earning sector of Bangladesh with major markets being Italy, England, Spain, France, Germany, Poland, China, Japan, USA and Canada. The overall leather industry is classified into three broad categories such as finished leather, leather products, and footwear. GoB has also declared this industry as the priority sector. This sector caters to only 0.5% of the world's leather trade (worth USD 75 billion). About 113 tanneries in Bangladesh produce 220 million square feet of hides and skins every year.[263] There are about 30 modern shoe manufacturing plants involved in production of high-quality footwear; also, ~2,500 small and medium scale footwear manufacturers are operational.[264] Value chain assessment of this sector depicts that in tanneries raw animal skins and hides are processed (using industrial salt and chemicals) to manufacture finished leather, which in turn is used to manufacture leather based products and footwear. Design of the leather products is a critical step which precedes the leather-based products manufacturing. Designing involves skilled human resources and there appears to be a clear gap in availability of specialised manpower towards this stage. Tanneries in Bangladesh form a cluster, recently this cluster has been relocated to Savar area from Hazaribagh area of Dhaka. This move was undertaken in order to regulate tanneries in Bangladesh and to ensure that proper safety and environment friendly norms were being followed. Basis primary survey, these tanneries suffer from inadequate infrastructure (such as non-metalled internal road, non-functional CETP, and high electricity cost), resulting in adverse effect on production of leather and underutilization of capacity for tanneries, located in Savar. The raw material required for leather is animal hide and skin. Due to its large cattle population, Bangladesh has a good supply of leather. Cow hides account for 56% of production, goat skins for 30% and buffaloes make up the rest.[265] Bangladesh is a net exporter of raw hides and skins. In 2016, Bangladesh's exports within the category were about ~USD 208 million and imports were ~USD 116 million.[266] 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%.[267]

[263] *http://www.theindependentbd.com/printversion/details/112906*
[264] *https://www.researchgate.net/publication/235609270_Bangladeshi_Leather_Industry_An_Overview_of_Recent_Sustainable_Developments*
[265] *Research Gate. 2013. Bangladeshi Leather Industry: An Overview of Recent Sustainable Developments.*
[266] *ITC Trade map*
[267] *http://bida.gov.bd/plastic-industry*

Sector	Description of raw materials, industrial linkages, and market access
	There are a total of 300 manufacturers in Bangladesh generating export of plastic goods is ~USD 99 million (in 2015-16, contributing to ~0.01% of global export) primarily to India.[268] Oil and gas industries are the primary upstream industries required for plastic and synthetic rubber production. From crude oil distillation, compounding exercise is undertaken in which plastic products are polymerised. Further, mixing and moulding takes place for converting polymers to plastic products. Natural (procured from rubber plantation) and synthetic rubber are compounded through adding chemical additives to manufacture rubber based products for industrial, commercial, and household purposes. Owing to lack of oil refineries in this country, Bangladesh has limited participation in the plastic compounding stage. Since there is no polyolefin units in Bangladesh and demand of polymers is met through import (from China, Saudi Arabia, Chinese Taipei, Korea, and Thailand). Raw material requirements of plastic is met through import and from local recycled plastic waste.[269] It is to be noted that 20% of raw materials are from recycled materials.[270] Bangladesh has limited production capacity in this sector due to lack of advanced machinery and lack of skilled human resources. As a result, plastic products manufactured in this country primarily cater to domestic demand. Due to lack of upstream petrochemical industries, there is no production of synthetic rubber in Bangladesh. USD 25 million of synthetic rubber is imported annually. Natural rubber is produced from rubber plantations located in Chittagong, Sylhet, Madhupura, and in Bandarban hill tracts.[271] 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 100 paper mills in Bangladesh with a production capacity of 1.5 million metric tonne per year. Manufacturers in Bangladesh are investing in upgradation of technology to produce export quality papers in order to export paper to 40 countries. Paper exports from Bangladesh generated revenue of USD 920,488 in fiscal year 2016-17.[272] 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.[273] 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.[274] This shows that Bangladesh is still lagging behind the world in per capita paper production. Although, Bangladesh is producing sufficient paper for writing, printing

[268] *Bangladesh Investment Development Authority*
[269] *http://emergingrating.com/wp-content/uploads/2017/09/Plastic-Industry-of-Bangladesh-Vol-I.pdf*
[270] *The Financial Express. 2015. Export-Oriented Plastic Industry of Bangladesh: Opportunities and Challenges*
[271] *http://en.banglapedia.org/index.php?title=Rubber_Industry*
[272] *http://www.theindependentbd.com/home/printnews/139544*
[273] *Paper Sector in Bangladesh: MMA Quader (2011)*
[274] *Paper Sector in Bangladesh: MMA Quader (2011)*

Sector	Description of raw materials, industrial linkages, and market access
	and newsprint purposes, consumers are still dependent on imports for packaging material used in RMG, medicine and food items. This is because Bangladesh does not produce high quality pulp locally and while local raw material can meet local demand for basic paper and tissues, it does not satisfy the needs of manufacturers in RMG, F&B and pharmaceutical sectors, who are very particular about their paper quality. Paper packaging items are currently imported from Japan, South Korea, China, India and Indonesia. Bangladesh imported 1 million MT of packaging material in 2016-17.[275]
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%.[276] 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.[277] 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 micro nutrients (NKPF) to urea in order to enhance the quality. Resin is the basic raw material for adhesive manufacturing, the same is imported. Downstream produces from adhesives are used in footwear, light engineering and construction sectors in the country. Large paints companies in Bangladesh are dependent on procuring raw materials through import from reputed empanelled vendors worldwide. Basis primary survey with industrial players, local (small and medium scale) chemicals manufacturers are dependent on importing resins from countries like India and South Asia. Outputs of Chlor Alkali and Hydrogen Peroxide are basic chemicals necessary for all industrial usage. Downstream products from these basic chemicals have demand across various sectors such as dyeing, textile, F&B, Electrical & Electronics, Steel, Leather, Pharmaceuticals, and Plastic. These inputs are primarily imported from India, China, and other Asian countries. Due to lack of integrated chemical manufacturing facilities in Bangladesh, this sector is import dependent.
Non-metallic minerals	Non-metallic minerals sector comprises of (a) glass, (b) ceramics, and (c) cement. This sector records an average annual growth trend of ~24%.[278] Manufacturing output from these sectors primarily caters to the domestic demand. Domestic market for glass and glassware has been estimated at USD 2 billion (2016) and sectoral outlook is demonstrating healthy growth rate of ~20% annually. Main ingredient of glass industry is sand, although quality sand is imported from China and Egypt.[279] 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.[280] Secondary research depicts that local glass sector caters to ~95% of the domestic demand; local glass companies are

[275] *http://www.theindependentbd.com/home/printnews/139544*
[276] *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/*
[277] *www.banglajol.info/index.php/jce/article/download/10178/7533*
[278] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*
[279] *Secondary research and primary survey*
[280] *Banglapedia*

Sector	Description of raw materials, industrial linkages, and market access
	exporting products to South Asian countries (such as India, Nepal, Bhutan, and Sri Lanka).[281] Domestic market for ceramics industry has been estimated at USD 593 million (2016) and this segment is growing at ~20% annually; Bangladesh is a net importer of ceramics (USD 145 million).[282] 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).[283] 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.[284] 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 351 million (in 2015). Basis interaction with respondents from automobile sector it was informed that import duty on brand new vehicles ranges from 100% to 300% and as a result of the same, passenger cars are costly in the country. Due to GoB's tax structure which imposes 165 percent duty on imported new cars, 60 percent duty on cars made in Bangladesh and 25 percent Supplementary Duty on reconditioned hybrid cars, Bangladesh is witnessing a rising demand of refurbished vehicles in Bangladesh.[285] [286] However, with development of technological know-how automobile manufacturers are starting to manufacture vehicles at competitive prices locally and have also started targeting export markets. In the recent past several foreign entities expressed their intent to invest in Bangladesh. For example, recently Ashok Leyland opened a new commercial vehicle assembly plant near Dhaka. Various assemblers of vehicles are joint-ventures with foreign entities to help bring in technology and parts. Examples include a partnership between Ashok Leyland and IFAD Autos Limited, and a partnership between Tata Motors and Nitol Niloy Group. Bangladesh has duty-free agreement with several countries due to which cars manufactured and exported from Bangladesh do not attract import duties. These cars can also attract local customers who are interested in buying new cars rather than refurbished cars.
Heavy Machinery, Iron, Steel and Metal	Bangladesh is one of Asia's emerging steel markets having more than 400 steel, re-rolling and auto re-rolling mills. Most of steel manufacture in Bangladesh takes place in form of long steel products and MS bars used in construction of buildings. Majority of the steel and metal based industrial units in Bangladesh are re-rolling mills and they are located in

[281] *http://www.thedailystar.net/news-detail-42940*
[282] *Secondary Research and information obtained from industry associations*
[283] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*
[284] *http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489*
[285] *http://www.thedailystar.net/business/sales-of-reconditioned-cars-getting-popular-in-bangladesh-1530604*
[286] *http://www.business-standard.com/article/companies/bangladesh-firm-keen-to-assemble-tata-small-cars-117092600034_1.html*

Sector	Description of raw materials, industrial linkages, and market access
	Chittagong and Narayanganj areas, where downstream produces (steel and metal scraps) from ship breaking industry are readily available. As per discussions with leading steel manufacturers, Bangladesh currently produces more than 4 million tonnes of steel and production of this sector is expected to double by 2022. The value of chain of this sector involves mining of iron ore and converting it into pig iron inside blast furnace. This pig iron is converted into steel ingots by adding metals like magnesium, nickel etc. as per requirements of the final products. These steel ingots are then sent to rolling mills where they are converted into billets. Billets are then converted into final products in re-rolling mills. Due to absence of iron ore deposits, steel industry in Bangladesh is dependent on import of scraps and billets to produce final products. Bangladesh is a net importer of iron ore; as per ITC trade data Bangladesh imported USD 2054 million worth of iron and steel products, and USD 31 million worth of iron ore and slag in 2015. This contributes to ~5% of total import of the country.[287] However, Bangladesh has now developed capacity to manufacture 90% of its billet requirement locally. Bangladesh currently manufactures steel for its domestic consumption only, however due to capacity expansion by steel manufacturers, Bangladesh has also developed potential to export steel products. Heavy machineries are dependent on supply of metals and steel. However the skill and technology requisite for the same are not available in the country. Water front facilities are required for setting up of steel, metal, and heavy machinery manufacturing related industries in the country.
Electrical and Electronics	Electrical and electronics sector consists of various end products such as cables, electrical appliances, switches, white goods, electronics appliances and goods. This sector caters to both household requirements as well as industrial requirements in sectors such as shipbuilding, heavy machineries & equipment, and light machinery. Size of this sector is BDT 150 billion, out of which ~BDT 70-80 billion is met through domestic production.[288] Raw materials for this sector is diversified and dependent on industrial linkages of various sectors. Products from plastic and rubber industries are used as base for production of switches and cables. Products from metal based industries are used for electrical wiring. Electronics sector has a fragmented value chain spread across various geographic locations. Spare parts of electronics sector (such as compressor, coil, and circuit) are sourced through import from India, China, Thailand, Singapore, and Malaysia. In addition to assembling of the spare parts, manufacturing of spare parts are also available in the country.[289] 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.[290]
Ship Building and Ship Breaking	Shipbuilding industry in Bangladesh is growing; exports earning from this sector in FY 2016-17 was USD 65.61 million, whereas in FY 2012-13 it was USD 5.73 million.[291] However, Bangladesh is still a net importer of end products of shipbuilding industry, with imports of

[287] *ITC Trade Database*
[288] *INSPIRED, Electronics Sector Report, EU*
[289] *Primary survey with industry players*
[290] *Primary Survey with industry players*
[291] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*

Sector	Description of raw materials, industrial linkages, and market access
	USD 155 million in 2016.[292] 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.[293] Approximately 70% of the yards are located in and around Dhaka and Narayanganj along the side of the river banks of the Buriganga, Shitalakhya, 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 Barishal division. Almost all inland, coastal, and bay crossing ships are constructed and repaired locally in these local shipyards.[294] Design stage is the first component in the value chain where the layout of the ship is finalized. Ship production is primarily dependent on using steel plates to manufacture the hull of the ship and installing engines, cables and machines inside the ship. Manufacturing of ship requires designing of ship and availability of power sources. Shipbuilding industry requires input from various other downstream industries such as light engineering, chemicals (paints and adhesives), and steel. At present, Bangladesh has limited participation at the design stage of the value chain, which requires skilled manpower. Bangladesh shipbuilders (due to lack of specialised skillset) are supplied with designs by foreign ship owners. From the input perspective, inputs such as steel plates, switch boards, steel cables, and power transformers, are procured locally, whereas engines are imported exclusively. With regard to steel, which is the primary input necessary for the industry, Bangladesh is import-dependent. This is because maximum steel rolling mills in Bangladesh are focussed towards producing long bars which have a higher demand from the construction industry and Bangladesh has a limited steel plate producing capacity. The coast line of Bangladesh is also conducive for setting up ship breaking industry which primarily requires cheap labour. Shipyards in India, Pakistan and Bangladesh comprise around 80% of global breaking and recycling market.[295] The biggest ship recycling yard out of these 3 countries is in Chittagong, which recycled 230 ships in 2017.[296] 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%.[297] Gross value added in this sector is estimated at BDT 1309 billion.[298] Bangladesh is a major importer of petroleum products. Based on the petroleum and petroleum based products (such as LPG, LNG, and polymers), gas refining, storage and bottling facilities have been developed in water front locations mostly located near the sea sides of the country. Imported volume of POL (petrol, oil, lubricants) products has clocked 4.1 million MT (2016).[299] 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

[292] *ITC Trade Database*
[293] *https://thefinancialexpress.com.bd/trade/export-earnings-from-shipbuilding-soar-1513396358*
[294] *Japan Bangla Business Center. 2014. A Report on Shipbuilding Industry of Bangladesh.*
[295] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[296] *http://www.atimes.com/article/shipbreaking-asia-profit-price/*
[297] *http://fpd-bd.com/wp-content/uploads/2016/10/Research-Report-on-Energy-Sector-of-Bangladesh-Initiation-Mar-15-11.pdf*
[298] *Survey of Manufacturing Industries by Bangladesh Bureau of Statistics*
[299] *Bangladesh Petroleum Corporation*

Sector	Description of raw materials, industrial linkages, and market access
	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; gross value added from this sector is BDT 113 billion yearly.[300] Domestic market has been estimated at ~USD 2 billion (2016) with an indicative growth rate of 15% annually.[301] Pharmaceuticals is a highly research and development oriented industry where regulatory aspects (like drug laws, patent issues, and affiliation with drug agencies) play key role. From basic chemicals and other products (like herbal contents), Active Pharmaceutical Ingredients (APIs) are manufactured. APIs are the key ingredients for drug manufacturing. Active Pharmaceutical Ingredients (APIs) of Pharmaceutical sector is sourced through import owing to quality issues and lack of API manufacturing ecosystem in the country. Basis primary survey, Bangladesh has commenced API manufacturing, but the production is not sufficient to cater to the economies of scale (~10% APIs are locally sourced). Also, owing to lack of educational ecosystem and lack of research facilities, Bangladesh is limited in R&D and sourcing of skilled technicians in this sector. Chemicals and various ingredients of drug are imported (from various markets spread across USA, Europe, and Asia) and end products (drugs) are being manufactured in this country. Dhaka and the surrounding region has evolved as a hub for pharmaceutical manufacturing with majority of the pharmaceutical units are located in this region. Basis primary survey with industry players, lack of adequate educational system related to pharmaceutical sector and availability of skilled human resources are major challenges that this sector is facing. End products of this industry primarily caters to domestic demand and minuscule export takes place (mostly to Africa and LDC countries).
Light Machinery, Equipment and Furniture	This sector involves production of mechanical equipment, agricultural machinery, bicycles, and furniture. Produces from this sector is predominantly used for catering to domestic demand. This is an important industry in Bangladesh as it provides backward and forward linkages to all other industries. Light machinery sector provides support for operation and maintenance of heavy machines through production of spare parts, castings, moulds, dies, fittings etc. As per information provided by Bangladesh Investment Development Authority (BIDA) there are currently 40,000 light engineering units/workshops scattered across Bangladesh. These industries develop in vicinity of industrial clusters in order to provide support to large scale capital intensive factories requiring heavy machinery. Products manufactured by this sector can be made out of rubber, ceramics, metals or plastic. Exporters from countries like China, Japan and Korea are developing light engineering facilities in Bangladesh in order to cater to export market. Raw materials are steel scraps, components of plastic and rubber, and wood. Basis primary interaction, it was 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.

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

15.7. Annexure-7: Estimation of Industrial Growth Rate

Table 154: Quantum Index of Major Industries

BSIC Code	Category	2013-14	2014-15	2015-16	2016-17 (Jul-Dec)
10	Food products	241.52	333.07	385.10	360.82
11	Beverages	243.19	230.06	269.75	261.03
12	Tobacco products	149.65	147.37	135.48	136.82
13	Textiles	139.68	122.81	138.90	156.49
14	RMG	293.70	304.76	338.73	332.28
15	Leather & related products	147.83	140.48	125.44	160.23
16	Wood products & cork, except furniture; articles of straw & plaiting materials	243.39	269.88	301.72	321.11
17	Paper products	151.95	174.68	181.08	183.29
18	Printing and reproduction of recorded media	127.73	140.91	147.83	154.18
19	Coke & refined petroleum products	92.76	96.79	112.00	173.35
20	Chemical products	80.41	77.49	92.73	97.95
21	Pharmaceuticals, medicinal chemical & botanical products	230.60	290.98	319.26	359.37
22	Rubber & plastics products	263.84	292.69	338.14	360.10
23	Other non-metallic mineral products	144.18	182.78	258.34	298.31
24	Basic metals	150.20	187.13	202.85	171.74
25	Fabricated metal products, except machinery & equipment	164.33	182.30	200.53	229.84
26	Computer, electronic & optical products	105.46	148.37	231.89	219.00
27	Electrical equipment	132.06	164.56	214.12	352.52
28	Machinery & equipment n.e.c.	172.68	204.89	279.14	360.95
29	Motor vehicles, trailers & semi-trailers	205.84	178.83	331.63	744.63
30	Transport equipment	152.88	340.12	592.41	493.28
31	Furniture	101.12	116.35	132.02	148.71
Overall manufacturing sector growth (CAGR from 13-14 to 16-17)=		**8.9%**			

Source: Quantum Index of major industries (base: 2005-06) based on National Accounts Statistics May' 2017

Industrial growth rate (organic) has been derived based on data available in secondary domains.

Table 155: Industrial Growth Rates

Industry Sectors	Annual Growth Rate	Annual Growth Rate
Textiles and RMG	13%	https://www.textiletoday.com.bd/overview-bangladesh-rmg-2016/
Food and Beverages	8%	http://katalyst.com.bd/wp-content/uploads/2017/01/Roles-and-Opportunities-for-Private-Sector-in-Agro-food-Processing-Industry-of-Bangladesh.pdf
Agro based products		Not Available
Leather and Leather Products	44%	https://sourcingjournalonline.com/bangladesh-aims-grow-leather-exports-5-billion-2021/

Industry Sectors	Annual Growth Rate	Annual Growth Rate
Plastic and Rubber	20%	http://bida.gov.bd/plastic-industry
Paper and Packaging		Not Available
Chemicals	9%	http://www.thedailystar.net/supplements/painting-the-future-bright-1331338 https://factsweek.com/160464/asia-textile-chemicals-market-is-projected-to-exhibit-a-cagr-of-7-6-from-2014-2020/ https://advancedtextilessource.com/2014/07/23/bangladesh-textile-chemicals-market-growth-continues/
Non Metallic Minerals	24%	http://www.thedailystar.net/supplements/overview-bangladeshs-ceramics-industry-1498489
	9.60%	http://today.thefinancialexpress.com.bd/print/outlook-for-cement-industry-in-bangladesh-1510666253
Auto and Automobile Accessories		Not Available
Heavy Machinery, Iron & Steel and Metals	15%	http://www.thedailystar.net/business/bangladeshs-steel-sector-beating-global-market-186499
Electrical & Electronics		Not Available
Ship Building and Ship Breaking		Not Available
Petroleum Products including Bottling	10%	http://fpd-bd.com/wp-content/uploads/2016/10/Research-Report-on-Energy-Sector-of-Bangladesh-Initiation-Mar-15-11.pdf
Pharmaceuticals	15%	https://www.jetro.go.jp/ext_images/world/asia/bd/seminar_reports/20160413/p4.pdf
Light Machinery and Equipment & Furniture		Not Available

Rationale behind the assumptions related to Infrastructure Induced Industrial growth rates are indicated below

Infrastructure Project	Project Cost (USD billion)	Forecasted boost in GDP and industrial growth	Source
Padma Bridge	3.77	1%-2%	• http://www.dhakatribune.com/business/2017/02/22/tofail-bangladeshs-gdp-8-padma-bridge-built-2015/ • https://mpra.ub.uni-muenchen.de/37904/ • http://www.thedailystar.net/round-tables/padma-bridge-new-lifeline-development-203326 • http://www.dhakatribune.com/bangladesh/development/2017/09/18/padma-bridge-cost-shoot/

15.8. Annexure-8: 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%
Auto and Automobile Accessories	17.45%	17.46%	15.00%	15.00%	15.00%	15.00%	15.00%

Industry	2026	2027	2028	2029	2030	2031	2032
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%
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%

Industry	2040	2041	2042	2043	2044	2045
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%

15.9. Annexure-9: Investor Survey Questionnaire

Company Profile

1. Company Name:
2. Country of origin:
3. Year of establishment in Bangladesh:
4. Respondent's name:
5. Position:
6. Telephone number:
7. Company address:
8. Firm located in an industrial estate (Y/N):
9. Firm located in an EPZ (Y/N):
10. Firm located in an EZ (Y/N):

Company Activities

11. Which sector are you into?
12. What are the key raw materials that are needed (list of domestic and imported raw material)?
13. Where do you import raw materials from, if at all (country/region of origin)?
14. The domestically sourced raw materials are brought in from which part of the country?
15. What are the final products of your company?
16. Which countries do you export to?
17. What proportion of your output is exported (percentage distribution)?
18. What are the major local markets for your products?
19. Do you utilize any preferential trade agreements (list of bi/multi-lateral agreements)?
20. Broadly, how many competitors you have in the country and region?
21. Do you require any business support services like capacity building?

Industry Trends

22. Which industries in the region have witnessed growth in the region and any reason that can be attributed to the growth?
23. Which all industries are not performing well and any reason that you are aware of? (such as stagnating demand, new entrants, lack of support policies, etc.)
24. Which all industries in your opinion could be best suited in the context of the proposed EZ and the surrounding region?

Land & Facilities

25. How many plots and sites do you have and their areas?
26. What is the size of your plot and building?
27. Do you have any expansion plans?
28. Do you prefer land or built up structures?
29. At what rate have you currently leased or purchased land for industrial setup?
30. Do you require any specific land and building facility for your unit?

Shipment & Logistics

31. Which mode of transportation do you utilize for shipping goods in and out of the country?
32. What is the monthly volume of goods that you bring into the country (through various modes like bulk, container, cargo, air, etc.)
33. What is the monthly volume of goods that you take out of the country (through various modes like bulk, container, cargo, air, etc.)
34. What is the mode of transportation utilized for bringing products into your factory? What is the cost? (road, rail, sea, airplane, etc.)
35. How long does it take for clearing the customs in the nearest port?
36. What are the challenges faced by you during shipping of goods? (Customs, freight forwarding, paper work, road problem, corruption, etc.)

Utilities

37. Water consumption in cubic meter / month
38. Primary source of water in your factory? (Govt. agency, private sector, piped system or

boreholes/wells)
39. How often do you get disconnected from the water source? (daily, monthly, yearly)
40.What is the cost of water?
41. What is the power consumption per month? (kwh/month)
42. What is the power source? (Govt. agency, private sector, captive power plant, others)
43. How often do you experience power outage? (daily, monthly, yearly)
44. How much do you pay for power? (per month)
45. What kind of fuel do you use like coal, gas, alternate energy? What is the primary use of the fuel? What is the consumption of the fuel and what is the associated cost?
46. How does the fuel reach your factory (like gas pipeline, trucks, rail)
47. Do you have internet connection and what speed?
48. Do you experience internet outage and any reason that you are aware of?
49. Do you get any incentives on utilities?

Employment

50. How many people do you employ in you units?
51. What is share of skilled, semi-skilled and un-skilled worker?
52. What are the wage rates for labours?
53. Where are the workers from originally? (district, division, country)

Investment Propensity

54. What are the current benefits that you are enjoying currently? (tax breaks, subsidies, etc.)
55. What are the growth inhibitors of your business?
56. Would you like to relocate to an EZ?
57. If yes, what are your requirements?
58.Would you be interested to relocate to the present proposed EZ? If yes, what are your requirements and expectations from the proposed EZ? (such as support solicited from the developer in terms of ease of operations, paper work, clearances, labor issues, etc.)
59. Do you foresee any issues in terms of collocating with other industries in a common zone that might be a problem for your products or materials? (such as existing besides a tannery or leather or specialty chemicals which might have a strong odor or toxic effervescence)
60.What would be your comfort rental for land and building?

15.10. Annexure-10: Investment Related Assumptions

Table 156: Number of Establishments by Size of Investment Invested by Non-Resident Bangladeshi (NRB), Economic Census for Barishal District (Investment in '000 BDT)

Upazila	0 – 50	51 – 100	101 – 500	Above 500	Total NRB investment	% share of each upazila
Barishal Sadar	71	29	87	262	161050	40%
Bakerganj	19	7	27	152	85100	21%
Wazirpur	15	1	39	87	55650	14%
Gaurnadi	10	4	10	41	24050	6%
Babuganj	1	0	0	42	21025	5%
Agailjhara	1	5	5	22	12900	3%
Banari Para	0	0	1	23	11800	3%
Muladi	11	3	5	18	11000	3%
Hizla	0	0	2	17	9100	2%
Mehendiganj	2	2	1	14	7500	2%

Source: Economic Census Barishal, BBS

Table 157: Number of Establishments by Size of Investment Invested by Non-Resident Bangladeshi (NRB), Economic Census, Gopalgonj

Upazila	0 – 50	51 – 100	101 – 500	Above 500	Total NRB investment	% share of each upazila
Gopalgonj Sadar	26	2	9	123	65000	43.3%
Kashiani	4	1	4	12	7375	4.9%
Kotalipara	21	7	8	50	28450	18.9%
Muksudpur	7	6	20	61	37125	24.7%
Tungipara	21	3	15	14	12250	8.2%

Source: Economic Census Gopalgonj, BBS

Sectoral distribution of investments across the districts

Table 158: Capex invested across sectors in Barishal

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
23	Manufacture of other non-metallic mineral products	392	13	120	40	2	0	0	34837.5

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
16	Manufacture of wood and products of wood and cork except furniture; manufacture of articles of straw and plaiting materials	2823	188	10	4	0	0	0	15177.5
10	Manufacture of food products	1908	162	20	7	0	0	0	14575
31	Manufacture of furniture	1657	214	11	2	0	0	0	11952.5
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	3	2	3	1	0	2	2	11337.5
32	Other manufacturing	809	225	3	1	0	0	0	8985
30	Manufacture of other transport equipment	7	2	0	0	0	1	1	5322.5
25	Manufacture of fabricated metal products except machinery and equipment	595	103	5	1	0	0	0	5245
12	Manufacture of tobacco products	1195	7	3	3	0	0	0	5055
13	Manufacture of textiles	600	43	1	0	0	1	0	5007.5
18	Printing and reproduction of recorded media	74	19	8	1	0	0	0	1857.5
22	Manufacture of rubber and plastics products	8	1	2	1	0	0	0	747.5
17	Manufacture of paper and paper products	172	6	2	0	0	0	0	745
14	Manufacture of wearing apparel (Readymade garments)	42	0	0	1	0	0	0	655

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
27	Manufacture of electrical equipment	12	2	0	1	0	0	0	635
15	Manufacture of leather and related products	15	5	0	0	0	0	0	175
28	Manufacture of machinery and equipment n.e.c.	2	2	0	0	0	0	0	60
29	Manufacture of motor vehicles, trailers and semi-trailers	0	1	0	0	0	0	0	27.5
20	Manufacture of chemicals and chemical products	4	0	0	0	0	0	0	10
24	Manufacture of basic metals	1							2.5
26	Manufacture of computer electronic and optical products	1	0	0	0	0	0	0	2.5
11	Manufacture of beverages	0	0	0	0	0	0	0	0
19	Manufacture of coke and refined petroleum products	0	0	0	0	0	0	0	0

Table 159: Capex invested across sectors in Gopalgonj

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
10	Manufacture of food products	724	67	14	3	0	0	0	6352.5
11	Manufacture of beverages	0	0	0	0	0	0	0	0
12	Manufacture of tobacco products	0	0	0	0	0	0	0	0
13	Manufacture of textiles	91	3	2	2	0	0	0	1560
14	Manufacture of wearing apparel	3	0	0	0	0	0	0	7.5

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
	(Readymade garment)								
15	Manufacture of leather and related products	12	2	1	0	0	0	0	160
16	Manufacture of wood and products of wood and cork except furniture; manufacture of articles of straw and plaiting materials	450	36	3	3	0	0	0	3990
17	Manufacture of paper and paper products	62	2	0	0	0	0	0	210
18	Printing and reproduction of recorded media	45	4	0	0	0	0	0	222.5
19	Manufacture of coke and refined petroleum products	0	0	0	0	0	0	0	0
20	Manufacture of chemicals and chemical products	0	0	0	0	0	0	0	0
21	Manufacture of pharmaceuticals, medicinal chemical and botanical products	0	0	0	0	0	0	0	0
22	Manufacture of rubber and plastics products	0	0	0	0	0	0	0	0
23	Manufacture of other non-metallic mineral products	171	15	16	7	6	0	0	13390
24	Manufacture of basic metals	0	0	0	0	0	0	0	0
25	Manufacture of fabricated metal products except machinery and equipment	220	34	4	0	0	0	0	1785

BSIC code	Sector	0-5	5-50	50-100	100-1000	1000-1500	1500-3000	3000+	Capex invested (BDT million)
26	Manufacture of computer electronic and optical products	0	0	0	0	0	0	0	0
27	Manufacture of electrical equipment	1	0	0	0	0	0	0	2.5
28	Manufacture of machinery and equipment n.e.c.	1	0	0	0	0	0	0	2.5
29	Manufacture of motor vehicles, trailers and semi-trailers	0	0	0	0	0	0	0	0
30	Manufacture of other transport equipment	0	0	0	0	0	0	0	0
31	Manufacture of furniture	1199	137	5	0	3	0	0	10890
32	Other manufacturing	466	52	2	1	0	0	0	3295

Source: Economic census, Gopalgonj, BBS

15.11. Annexure-11: Competition Phase Out Plan

Table 160: Phasing plan of Competing EZs

Competing EZs	Total Area	Industrial Area	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
Kotalipara	201.83	151.37			10%	5%	5%	5%	7%	10%	10%	10%	15%	15%	5%	3%
Gopalgonj sadar	200	150.00	10%	10%	10%	5%	5%	5%	7%	10%	5%	10%	15%	3%	5%	
Investment flowing into Other EZs	321.46	241.10				5%	5%	5%	5%	7%	7%	8%	8%	20%	20%	10%

Competing EZs	Total Area	Industrial Area
Kotalipara	201.83	151.37
Gopalgonj sadar	200	150.00
Investment flowing into Other EZs	321.46	241.10

Source: PwC Analysis

15.12. Annexure-12: Demand Forecast

Power Demand (in MVA)

Table 161: Sectoral power demand – Conservative case (figures in MVA)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.19	0.44	0.75	1.06	1.30	1.68	2.06	2.38	2.71	3.25	4.16	4.54	4.54
Wood products and furniture	0.33	0.81	1.46	2.16	2.74	3.79	4.89	5.94	7.11	9.18	13.01	14.78	14.78
Food and beverages	0.54	1.26	2.16	3.07	3.78	4.96	6.12	7.16	8.23	9.99	13.04	14.36	14.36
Agro based	0.07	0.17	0.29	0.42	0.52	0.68	0.84	0.98	1.12	1.36	1.78	1.96	1.96
Paper and packaging	0.01	0.02	0.03	0.05	0.06	0.07	0.09	0.11	0.12	0.15	0.19	0.21	0.21
Light engineering	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
Total	**1.14**	**2.71**	**4.70**	**6.76**	**8.40**	**11.19**	**14.00**	**16.57**	**19.31**	**23.94**	**32.21**	**35.88**	**35.88**

Table 162: Sectoral power demand – Base case (figures in MVA)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.30	0.67	1.11	1.56	1.94	2.49	3.03	3.54	4.07	4.83	5.09	5.09	5.09
Wood products and furniture	0.52	1.22	2.14	3.15	4.10	5.58	7.20	8.86	10.73	13.65	14.76	14.76	14.76

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Food and beverages	0.84	1.90	3.17	4.49	5.64	7.32	9.02	10.65	12.37	14.86	15.74	15.74	15.74
Agro based	0.04	0.09	0.14	0.19	0.23	0.28	0.33	0.37	0.41	0.46	0.48	0.48	0.48
Paper and packaging	0.01	0.03	0.05	0.07	0.08	0.11	0.13	0.16	0.18	0.22	0.23	0.23	0.23
Light engineering	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02
Total	**1.71**	**3.91**	**6.61**	**9.46**	**12.00**	**15.79**	**19.73**	**23.59**	**27.79**	**34.05**	**36.33**	**36.33**	**36.33**

Table 163: Sectoral power demand - Aggressive case (figures in MVA)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.43	0.95	1.54	2.16	2.72	3.47	4.23	4.97	5.21	5.21	5.21	5.21	5.21
Wood products and furniture	0.75	1.73	2.97	4.36	5.77	7.79	10.03	12.44	13.28	13.28	13.28	13.28	13.28
Food and beverages	1.22	2.69	4.41	6.23	7.94	10.21	12.58	14.95	15.71	15.71	15.71	15.71	15.71
Agro based	0.17	0.37	0.60	0.85	1.08	1.39	1.72	2.04	2.14	2.14	2.14	2.14	2.14
Paper and packaging	0.02	0.04	0.07	0.09	0.12	0.15	0.19	0.22	0.23	0.23	0.23	0.23	0.23
Light engineering	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total	**2.58**	**5.77**	**9.59**	**13.70**	**17.64**	**23.03**	**28.76**	**34.64**	**36.60**	**36.60**	**36.60**	**36.60**	**36.60**

Water Demand (in MLD)

Table 164: Sectoral water demand - Conservative case (figures in MLD)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.06	0.15	0.25	0.35	0.43	0.56	0.69	0.79	0.90	1.08	1.39	1.51	1.51
Wood products and furniture	0.17	0.41	0.73	1.08	1.37	1.89	2.44	2.97	3.56	4.59	6.51	7.39	7.39
Food and beverages	0.12	0.28	0.47	0.67	0.83	1.09	1.34	1.57	1.81	2.19	2.86	3.15	3.15
Agro based	0.02	0.05	0.08	0.12	0.15	0.19	0.24	0.28	0.32	0.39	0.51	0.56	0.56
Paper and packaging	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.06	0.08	0.08	0.08
Light engineering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
Total	**0.37**	**0.89**	**1.55**	**2.25**	**2.80**	**3.77**	**4.75**	**5.66**	**6.64**	**8.32**	**11.35**	**12.71**	**12.71**

Table 165: Sectoral water demand - Base case (figures in MLD)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.10	0.22	0.37	0.52	0.65	0.83	1.01	1.18	1.36	1.61	1.70	1.70	1.70
Wood products and furniture	0.26	0.61	1.07	1.58	2.05	2.79	3.60	4.43	5.37	6.83	7.38	7.38	7.38
Food and beverages	0.18	0.42	0.70	0.99	1.24	1.61	1.98	2.34	2.72	3.26	3.46	3.46	3.46
Agro based	0.01	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.12	0.13	0.14	0.14	0.14

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Paper and packaging	0.00	0.01	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.09	0.09	0.09	0.09
Light engineering	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.56**	**1.29**	**2.20**	**3.16**	**4.04**	**5.35**	**6.74**	**8.12**	**9.64**	**11.93**	**12.77**	**12.77**	**12.77**

Table 166: Sectoral water demand - Aggressive case (figures in MLD)

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	0.14	0.32	0.51	0.72	0.91	1.16	1.41	1.66	1.74	1.74	1.74	1.74	1.74
Wood products and furniture	0.37	0.87	1.48	2.18	2.89	3.89	5.02	6.22	6.64	6.64	6.64	6.64	6.64
Food and beverages	0.27	0.59	0.97	1.37	1.74	2.24	2.76	3.28	3.45	3.45	3.45	3.45	3.45
Agro based	0.05	0.10	0.17	0.24	0.31	0.40	0.49	0.58	0.61	0.61	0.61	0.61	0.61
Paper and packaging	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.09	0.09	0.09	0.09	0.09	0.09
Light engineering	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total	**0.84**	**1.89**	**3.17**	**4.55**	**5.90**	**7.76**	**9.76**	**11.84**	**12.54**	**12.54**	**12.54**	**12.54**	**12.54**

Employment Generation

Table 167: Sectoral employment - Conservative case

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	151	350	595	838	1024	1328	1622	1878	2139	2562	3278	3581	3581
Wood products and furniture	473	1158	2078	3075	3908	5396	6966	8467	10133	13080	18544	21069	21069
Food and beverages	71	166	285	405	498	654	807	943	1084	1317	1719	1892	1892
Agro based	63	147	253	359	442	580	716	837	962	1169	1526	1679	1679
Paper and packaging	11	25	44	62	76	100	124	145	166	202	264	290	290
Light engineering	1	2	3	4	6	8	10	12	14	18	26	30	30
Total	**769**	**1849**	**3257**	**4744**	**5954**	**8066**	**10244**	**12282**	**14500**	**18348**	**25356**	**28541**	**28541**

Table 168: Sectoral employment - Base case

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	236	529	875	1227	1529	1961	2391	2795	3214	3810	4017	4017	4017
Wood products and furniture	738	1745	3046	4491	5844	7958	10261	12619	15296	19458	21033	21033	21033
Food and beverages	111	250	418	592	744	965	1189	1404	1630	1959	2075	2075	2075
Agro based	36	76	121	163	196	240	281	316	350	395	409	409	409

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Paper and packaging	17	38	64	91	114	148	182	215	250	301	318	318	318
Light engineering	1	2	4	6	8	11	15	18	22	27	30	30	30
Total	1,139	2,641	4,529	6,571	8,436	11,283	14,319	17,367	20,763	25,950	27,882	27,882	27,882

Table 169: Sectoral Employment - Aggressive case

Sectors	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038 to 2045
Textiles and RMG	340	747	1217	1702	2150	2736	3335	3921	4108	4108	4108	4108	4108
Wood products and furniture	1066	2466	4228	6219	8224	11097	14299	17727	18920	18920	18920	18920	18920
Food and beverages	160	354	581	821	1046	1346	1658	1970	2071	2071	2071	2071	2071
Agro based	143	315	516	729	929	1195	1472	1748	1838	1838	1838	1838	1838
Paper and packaging	25	54	89	126	160	207	254	302	318	318	318	318	318
Light engineering	2	3	6	9	12	16	20	25	27	27	27	27	27
Total	**1,736**	**3,939**	**6,638**	**9,606**	**12,521**	**16,597**	**21,039**	**25,694**	**27,281**	**27,281**	**27,281**	**27,281**	**27,281**

15.13. Annexure-13: Air Quality Monitoring Results

ENRAC REF. : ENRAC 00206/19

AMBIENT AIR QUALITY TESTING REPORT

COMPANY NAME : Bangladesh Economic Zones Authority (BEZA)
PROJECT NAME : Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT REF. : N/A
CLIENT ADDRESS : Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT :01 hour (10.00 AM - 11:00 AM)
SAMPLING DATE : 25/09/2019
ANALYSIS DATE : 01/10/2019
SAMPLING ID : AAQ-1
GPS COORDINATES : 22°58'13.16"N 90°05'27.50"E

Ambient Air Quality (AAQ) Test Results

Sampling Site Description	Description of Parameters	Unit	Concentration of Ambient Air Quality Parameters (Average)	GoB Air Quality Standards*
•The Ambient Air Quality Measurement AAQ-01 had been conducted 340m away from the proposed Economic Zone beside Agailjhara-Kotalipara road. •There was a local market name Purbo-Paisarhat. •Various vehicles like Bus, Truck, Easy bike, Motor Cycle etc. were passed away during sampling time. •The sensitive receptor was scattered Households, Mosque, and School etc. near sampling location.	Carbon Monoxide (CO)	mg/m^3	0.05	10 (8 hour) 40 (1 hour)
	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	32.17	100 (Annual)
	Sulphur Dioxide (SO_2)	$\mu g/m^3$	10.26	365 (24 hour) 80 (Annual)
	Particulate Matter (PM_{10})	$\mu g/m^3$	57.58	150 (24 hour) 50 (Annual)
	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	39.47	65 (24 hour) 15 (Annual)

* The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rules, 1997
** NSE- No standards established yet

Prepared by
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ENRAC REF. : ENRAC 00207/19

AMBIENT AIR QUALITY TESTING REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (BEZA)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT REF.	: N/A
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (04.00 PM - 05:00 PM)
SAMPLING DATE	: 25/09/2019
ANALYSIS DATE	: 01/10/2019
SAMPLING ID	: AAQ-2
GPS COORDINATES	: 22°58'01.03"N 90°05'57.61"E

Ambient Air Quality (AAQ) Test Results

Sampling Site Description	Description of Parameters	Unit	Concentration of Ambient Air Quality Parameters (Average)	GoB Air Quality Standards*
•The Ambient Air Quality Measurement AAQ-2 had been conducted 25m away from the proposed Economic Zone Site beside Agailjhara-Kotalipara high way. •Some vehicles like Bus, Truck, Easy bike, Motor Cycle etc. were passed away during sampling time. •There were some scattered households at the south side of the sampling location.	Carbon Monoxide (CO)	mg/m^3	0.09	10 (8 hour) 40 (1 hour)
	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	24.36	100 (Annual)
	Sulphur Dioxide (SO_2)	$\mu g/m^3$	13.79	365 (24 hour) 80 (Annual)
	Particulate Matter (PM_{10})	$\mu g/m^3$	33.17	150 (24 hour) 50 (Annual)
	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	23.33	65 (24 hour) 15 (Annual)

* The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rules, 1997
** NSE- No standards established yet

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ENRAC REF. : ENRAC 00208/19

AMBIENT AIR QUALITY TESTING REPORT

COMPANY NAME : Bangladesh Economic Zones Authority (BEZA)
PROJECT NAME : Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT REF. : N/A
CLIENT ADDRESS : Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT : 01 hour (9.00 AM - 10:00 AM)
SAMPLING DATE : 26/09/2019
ANALYSIS DATE : 01/10/2019
SAMPLING ID : AAQ-3
GPS COORDINATES : 22°58'31.95"N 90°05'51.94"E

Ambient Air Quality (AAQ) Test Results

Sampling Site Description	Description of Parameters	Unit	Concentration of Ambient Air Quality Parameters (Average)	GoB, Air Quality Standards*
• The Ambient Air Quality Measurement AAQ-3 had been conducted at the middle-West side of the proposed Economic Zone. •The three sides of the specific sample location are covered by Agricultural land, Aqua-Culture and poultry firm. •Trees and water bodies are surrounded the sampling location.	Carbon Monoxide (CO)	mg/m^3	0.01	10 (8 hour) 40 (1 hour)
	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	2.42	100 (Annual)
	Sulphur Dioxide (SO_2)	$\mu g/m^3$	7.38	365 (24 hour) 80 (Annual)
	Particulate Matter (PM_{10})	$\mu g/m^3$	9.85	150 (24 hour) 50 (Annual)
	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	8.77	65 (24 hour) 15 (Annual)

* The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rules, 1997
** NSE- No standards established yet

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ENRAC REF. : ENRAC 00209/19

AMBIENT AIR QUALITY TESTING REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (BEZA)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT REF.	: N/A
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (04.00 PM - 05:00 PM)
SAMPLING DATE	: 26/09/2019
ANALYSIS DATE	: 01/10/2019
SAMPLING ID	: AAQ-4
GPS COORDINATES	: 22°58'33.63"N 90°06'08.99"E

Ambient Air Quality (AAQ) Test Results

Sampling Site Description	Description of Parameters	Unit	Concentration of Ambient Air Quality Parameters (Average)	GoB Air Quality Standards*
• The Noise Level Measurement NM_04 had been conducted 1.05 km North from the Agailjhara-Kotalipara highway. •There were some sensitive receptor i.e. scattered households. •Trees and water bodies were located around the sampling location.	Carbon Monoxide (CO)	mg/m^3	0.02	10 (8 hour) 40 (1 hour)
	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	5.39	100 (Annual)
	Sulphur Dioxide (SO_2)	$\mu g/m^3$	6.29	365 (24 hour) 80 (Annual)
	Particulate Matter (PM_{10})	$\mu g/m^3$	10.12	150 (24 hour) 50 (Annual)
	Particulate Matter ($PM_{2.5}$)	$\mu g/m^3$	7.23	65 (24 hour) 15 (Annual)

* The amended Schedule-2, 2005, of (Air Quality Standard) Environmental Conservation Rules, 1997
** NSE- No standards established yet

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15.14. Annexure-14: Noise Level Monitoring Result

ENRAC REF: ENRAC 00202/19

ENRAC

NOISE LEVEL MEASUREMENT REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (*BEZA*)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (10.00 AM - 11:00 AM)
SAMPLING DATE	: 25/09/2019
DATE OF ANALYSIS	: 01/10/2019
SAMPLING ID	: NM_01
GPS COORDINATES	: 22°58'13.16"N 90°05'27.50"E

Sampling Site Description
The Noise Level Measurement NM_01 had been conducted 340m away from the proposed Economic Zone beside Agailjhara-Kotalipara road. There was a local market name Purbo-Paisarhat. Various vehicles like Bus, Truck, Easy bike, Motor Cycle etc. were passed away during sampling time. The sensitive receptor was scattered Households, Mosque, and School etc. near sampling location.

Noise Measurement (NM) Results

Sampling ID	Time	Unit	Noise Measurement Data		
			Minimum	Maximum	LAeq
NM_01	Morning	dBA	36	67.3	50.75
GoB Noise Standard*	Zone	Day		Night	
	Silent Zone	50		40	
	Residential Zone	55		45	
	Mixed Area (Residential together with areas used for commercial and industrial purposes)	60		50	
	Commercial Area	70		60	
	Industrial Area	75		70	

* The amended Schedule-4, 2006, of (Noise Level Measurement Standard) Environmental Conservation Rules, 1997

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ENRAC REF: ENRAC 00203/19

NOISE LEVEL MEASUREMENT REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (*BEZA*)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (04.00 PM - 05:00 PM)
SAMPLING DATE	: 25/09/2019
DATE OF ANALYSIS	: 01/10/2019
SAMPLING ID	: NM_02
GPS COORDINATES	: 22°58'01.03"N 90°05'57.61"E

Sampling Site Description
The Noise Level Measurement NM_02 had been conducted 25m away from the proposed Economic Zone Site beside Agailjhara-Kotalipara high way. Some vehicles like Bus, Truck, Easy bike, Motor Cycle etc. were passed away during sampling time. There were some scattered households at the south side of the sampling location.

Noise Measurement (NM) Results

Sampling ID	Time	Unit	Noise Measurement Data		
			Minimum	Maximum	LAeq
NM_02	Afternoon	dBA	32.7	64.1	42.95
GoB Noise Standard*	Zone		Day		Night
	Silent Zone		50		40
	Residential Zone		55		45
	Mixed Area (Residential together with areas used for commercial and industrial purposes)		60		50
	Commercial Area		70		60
	Industrial Area		75		70

* The amended Schedule-4, 2006, of (Noise Level Measurement Standard) Environmental Conservation Rules, 1997

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ENRAC REF.: ENRAC 00204/19

NOISE LEVEL MEASUREMENT REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (*BEZA*)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (9.00 AM - 10:00 AM)
SAMPLING DATE	: 26/09/2019
DATE OF ANALYSIS	: 01/10/2019
SAMPLING ID	: NM_03
GPS COORDINATES	: 22°58'31.95"N 90°05'51.94"E

Sampling Site Description
The Noise Level Measurement NM_03 had been conducted at the middle-West side of the proposed Economic Zone. The three sides of the specific sample location are covered by Agricultural land, Aqua-Culture and poultry firm. Trees and water bodies are surrounded the sampling location.

Noise Measurement (NM) Results

Sampling ID	Time	Unit	Noise Measurement Data		
			Minimum	Maximum	LAeq
NM_03	Morning	dBA	36	58.4	43.77
GoB Noise Standard*	Zone		Day		Night
	Silent Zone		50		40
	Residential Zone		55		45
	Mixed Area (Residential together with areas used for commercial and industrial purposes)		60		50
	Commercial Area		70		60
	Industrial Area		75		70

* The amended Schedule-4, 2006, of (Noise Level Measurement Standard) Environmental Conservation Rules, 1997

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ENRAC REF.: ENRAC 00205/19

NOISE LEVEL MEASUREMENT REPORT

COMPANY NAME	: Bangladesh Economic Zones Authority (*BEZA*)
PROJECT NAME	: Conducting Environmental Assessment for Economic Zone Site in Agailjhara, Barisal.
CLIENT ADDRESS	: Level 12 Monem Business District, 111 Bir Uttam CR Dutta Rd, Dhaka 1205, Bangladesh.
SAMPLE COUNT	: 01 hour (04.00 PM - 05:00 PM)
SAMPLING DATE	: 26/09/2019
DATE OF ANALYSIS	: 01/10/2019
SAMPLING ID	: NM_04
GPS COORDINATES	: 22°58'33.63"N 90°06'08.99"E

Sampling Site Description
The Noise Level Measurement NM_04 had been conducted 1.05 km North from the Agailjhara-Kotalipara highway. There were some sensitive receptor i.e. scattered households. Trees and water bodies were located around the sampling location. Homestead sounds was generated from the Households during sampling time.

Noise Measurement (NM) Results

Sampling ID	Time	Unit	Noise Measurement Data		
			Minimum	Maximum	LAeq
NM_04	Afternoon	dBA	34.6	59	44.28
GoB Noise Standard*	Zone		Day		Night
	Silent Zone		50		40
	Residential Zone		55		45
	Mixed Area (Residential together with areas used for commercial and industrial purposes)		60		50
	Commercial Area		70		60
	Industrial Area		75		70

* The amended Schedule-4, 2006, of (Noise Level Measurement Standard) Environmental Conservation Rules, 1997

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15.15. Annexure-15: Surface Water Quality Test Result

Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 307/ CC, DPHE, CL, Dhaka. Date: 13-10-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019100093	Sample Receiving date: 01-10-2019
Ref. Memo No: ENRAC/2019/Nill & Dated: 01-10-2019	Sample Source: Suface Water
Sent by:Nazmul Huda ,Environmental Officer , ENRAC, Khilgaon, Dhaka-1219.	Dist:Barisal, Upa:Agailjhara
Care Taker: ENRAC (EZSB , SW-01)	Union:, Vill.:
Sample Collection date:	Date of Testing: 01/10/2019-07/10/2019

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	4	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	12	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	6.42	mg/L	Multimeter	-
4	pH	6.5-8.5	7.7	-	pH Meter	-
5	Total Dissolved Solid (TDS)	1000	70	mg/L	Multimeter	-
6	Total Suspended Solid (TSS)	10	12	mg/L	Gravimetric Method	-
7	Turbidity	10	1.0	NTU	Turbidity Meter	-

Comments: Sample was collected & Supplied by client.
N.B: CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by: Signature

1.) Name: Md. Saiful Alam Khosru
Designation: Sample Analyzer
13.10.19

2.) Name: Taslima Akhter
Designation: Sample Analyzer
13.10.19

Countersigned/Approved by: Signature

1.) Name: Md. Zahidul Islam Miah
Designation: Senior Chemist
13.10.19

2.) Name: Md. Biplab Hossain
Designation: Chief Chemist
13/10/2019
Md. Biplab Hossain
Chief Chemist
Department of Public Health Engineering
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Page 1 of 1

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Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 307/ CC, DPHE, CL, Dhaka.

Date: 13-10-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019100094	Sample Receiving date: 01-10-2019
Ref. Memo No: ENRAC/2019/Nill & Dated: 01-10-2019	Sample Source: Suface Water
Sent by:Nazmul Huda ,Environmental Officer , ENRAC, Khilgaon, Dhaka-1219.	Dist:Barisal, Upa:Agailjhara
Care Taker: ENRAC (BEPP , SW-02)	Union:, Vill.:Paisarhat
Sample Collection date:	Date of Testing: 01/10/2019-07/10/2019

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	9	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	32	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	5.80	mg/L	Multimeter	-
4	pH	6.5-8.5	7.4	-	pH Meter	-
5	Total Dissolved Solid (TDS)	1000	90	mg/L	Multimeter	-
6	Total Suspended Solid (TSS)	10	13	mg/L	Gravimetric Method	-
7	Turbidity	10	1.1	NTU	Turbidity Meter	-

Comments: Sample was collected & Supplied by client.
N.B: CRM-Closed Reflex Methods, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	13.10.19	1.) Name: Md. Zahidul Islam Miah Designation: Senior Chemist	13.10.19
2.) Name: Taslima Akhter Designation: Sample Analyzer	13.10.19	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	13/10/2019 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka.

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15.16. Annexure-16: Ground water Quality Results

Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 307/ CC, DPHE, CL, Dhaka. Date: 13-10-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019100097	Sample Receiving date: 01-10-2019
Ref. Memo No: ENRAC/2019/Nill & Dated: 01-10-2019	Sample Source: Ground Water
Sent by:Nazmul Huda ,Environmental Officer , ENRAC, Khilgaon, Dhaka-1219.	Dist:Barisal, Upa:Agailjhara
Care Taker: ENRAC (EZSB , GW-01)	Union:, Vill.:Paisarhat
Sample Collection date:	Date of Testing: 01/10/2019-07/10/2019

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
2	Iron (Fe)	0.3-1	0.21	mg/L	AAS	0.05
3	Manganese (Mn)	0.1	0.04	mg/L	AAS	0.03
4	pH	6.5-8.5	7.7	-	pH Meter	-
5	Phosphate	6.0	0.57	mg/L	UVS	0.10

Comments: Sample was collected & Supplied by client.
N.B: AAS - Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	13.10.19	1.) Name: Md. Zahidul Islam Miah Designation: Senior Chemist	13.10.19
2.) Name: Taslima Akhter Designation: Sample Analyzer	13.10.19	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	13/10/2019 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka.

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Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 307/ CC, DPHE, CL, Dhaka.

Date: 13-10-2019

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2019100098	Sample Receiving date: 01-10-2019
Ref. Memo No: ENRAC/2019/Nill & Dated: 01-10-2019	Sample Source: Ground Water
Sent by:Nazmul Huda ,Environmental Officer , ENRAC, Khilgaon, Dhaka-1219.	Dist:Barisal, Upa:Agailjhara
Care Taker: ENRAC (BEPP , GW-02)	Union:, Vill.:Paisarhat
Sample Collection date:	Date of Testing: 01/10/2019-07/10/2019

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Arsenic (As)	0.05	0.001	mg/L	AAS	0.001
2	Iron (Fe)	0.3-1	0.71	mg/L	AAS	0.05
3	Manganese (Mn)	0.1	0.05	mg/L	AAS	0.03
4	pH	6.5-8.5	7.6	-	pH Meter	-
5	Phosphate	6.0	0.63	mg/L	UVS	0.10

Comments: Sample was collected & Supplied by client.
N.B: AAS - Atomic Absorption Spectrophotometer, UVS- UV-Visible Spectrophotometer, LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	13.10.19	1.) Name: Md. Zahidul Islam Miah Designation: Senior Chemist	13.10.19
2.) Name: Taslima Akhter Designation: Sample Analyzer	13.10.19	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	13/10/2019 Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka.

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15.17. Annexure-17: 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 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 170: Simulation results to determine the best-case pay-out mode for BEZA - Base case (**Case 2**)

		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 13 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 30 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 **25%** 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 **57%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA
3	Equity stake to BEZA mode (III)	Not Viable	Not Viable
4	Upfront payment + (I)	• An Annual land lease of **BDT 8.5 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 26 per sq. ft.** per annum will correspond to the NPV of cost being equal to that of income for BEZA
5	Upfront payment + (II)	• A Gross revenue share of **15.5%** 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 **49.5%** between BEZA and the PPP developer will correspond to the NPV of cost being equal to that of income for BEZA
6	Upfront payment + (I) + (II)		

		BEZA bearing costs only towards land acquisition	BEZA bearing costs towards land acquisition and off-site infrastructure
		• An Annual land lease of **BDT 6 per sq. ft.** per annum together with a gross revenue share of **5%** will correspond to the NPV of cost being equal to that of income for BEZA	• An Annual land lease of **BDT 16 per sq. ft**. per annum together with a gross revenue share of **18%** will correspond to the NPV of cost being equal to that of income for BEZA

Source: Financial Model

15.18. Annexure-18: Financial Model Calculations – Case 2 (PPP Developer developing the Project) – with Upfront Payment + Annual Land Lease + Equity Stake to BEZA – 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	39	127	184	290	360	427	541	658
O&M expenses	0	83	183	235	243	251	259	268	278	288
EBIT	0	-83	-144	-108	-58	39	100	158	263	371
Interest	0	0	134	233	231	177	123	68	27	21
Profit before tax (PBT)	0	-83	-278	-341	-290	-138	-23	90	236	350
Tax	0	0	0	0	0	0	0	0	0	0
Profit after tax (PAT)	0	-83	-278	-341	-290	-138	-23	90	236	350

Financial year	**Year 11**	**Year 12**	**Year 13**	**Year 14**	**Year 15**	**Year 16**	**Year 17**	**Year 18**	**Year 19**	**Year 20**
Revenue	768	979	1145	1355	1608	1650	1651	1859	1906	1906
O&M expenses	298	309	320	332	345	358	372	387	402	418
EBIT	470	671	825	1023	1263	1292	1279	1473	1504	1488
Interest	16	10	4	-2	-9	0	0	0	0	0
Profit before tax (PBT)	454	660	820	1025	1272	1292	1279	1473	1504	1488
Tax	0	0	0	152	433	444	443	514	528	525
Profit after tax (PAT)	454	660	820	873	839	848	836	959	976	963

Financial year	**Year 21**	**Year 22**	**Year 23**	**Year 24**	**Year 25**	**Year 26**	**Year 27**	**Year 28**	**Year 29**	**Year 30**

Revenue	2154	2205	2205	2499	2556	2556	2906	2968	2968	3384
O&M expenses	435	453	471	491	511	533	555	579	604	630
EBIT	1719	1752	1734	2009	2045	2023	2350	2388	2364	2753
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	1719	1752	1734	2009	2045	2023	2350	2388	2364	2753
Tax	608	622	618	716	730	723	839	854	846	984
Profit after tax (PAT)	1111	1130	1116	1293	1315	1299	1511	1535	1518	1770

Financial year	**Year 31**	**Year 32**	**Year 33**	**Year 34**	**Year 35**	**Year 36**	**Year 37**	**Year 38**	**Year 39**	**Year 40**
Revenue	3452	3452	3948	4022	4022	4612	4696	4694	5397	5488
O&M expenses	658	687	717	749	782	817	854	893	934	976
EBIT	2794	2765	3231	3273	3240	3795	3842	3802	4464	4512
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	2794	2765	3231	3273	3240	3795	3842	3802	4464	4512
Tax	999	989	1153	1168	1157	1352	1369	1355	1587	1604
Profit after tax (PAT)	1796	1776	2078	2105	2083	2443	2473	2446	2877	2907

Financial year	**Year 41**	**Year 42**	**Year 43**	**Year 44**	**Year 45**	**Year 46**	**Year 47**	**Year 48**	**Year 49**	**Year 50**
Revenue	5490	6326	6426	6426	7428	7535	7535	8728	7646	7643
O&M expenses	1021	1068	1117	1169	1224	1281	1341	1404	1470	1540
EBIT	4469	5258	5308	5256	6204	6254	6194	7324	6176	6103
Interest	0	0	0	0	0	0	0	0	0	0
Profit before tax (PBT)	4469	5258	5308	5256	6204	6254	6194	7324	6176	6103

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
Tax	1590	1866	1884	1866	2198	2215	2195	2590	2188	2163
Profit after tax (PAT)	2879	3392	3424	3390	4006	4039	3999	4734	3987	3940

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
EBITDA	0	-83	-83	-28	22	120	181	239	343	451
Change in Net Working Capital	0	7	3	1	-1	-3	-3	-3	-6	-5
Change WC loan	0	0	0	0	0	0	0	0	0	0
Interest on working capital loan	0	0	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Capex	-1030	-1030	-988	-988	0	0	0	0	0	0
FCFF	-1030	-1106	-1069	-1015	21	117	178	236	338	446

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBITDA	550	751	905	1103	1344	1373	1359	1553	1584	1568
Change in Net Working Capital	-5	-12	-7	-11	-16	1	1	-15	1	1
Change WC loan	0	0	0	0	0	0	0	0	0	0
Interest on working capital loan	0	0	0	0	0	0	0	0	0	0
Less: Tax	0	0	0	-152	-433	-444	-443	-514	-528	-525
Less: Capex	0	0	0	0	0	0	0	0	0	0
FCFF	545	739	898	940	894	930	917	1024	1058	1045

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
EBITDA	1800	1833	1814	2089	2125	2103	2431	2469	2445	2834
Change in Net Working Capital	-18	2	2	-21	2	2	-25	2	2	-30

FCFF Calculation (BDT million)										
Change WC loan	0	0	0	0	0	0	0	0	0	0
Interest on working capital loan	0	0	0	0	0	0	0	0	0	0
Less: Tax	-608	-622	-618	-716	-730	-723	-839	-854	-846	-984
Less: Capex	0	0	0	0	0	0	0	0	0	0
FCFF	1174	1212	1198	1353	1397	1382	1566	1617	1600	1820

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBITDA	2874	2846	3312	3354	3320	3875	3922	3882	4544	4592
Change in Net Working Capital	2	2	-36	3	3	-43	3	3	-52	4
Change WC loan	0	0	0	0	0	0	0	0	0	0
Interest on working capital loan	0	0	0	0	0	0	0	0	0	0
Less: Tax	-999	-989	-1153	-1168	-1157	-1352	-1369	-1355	-1587	-1604
Less: Capex	0	0	0	0	0	0	0	0	0	0
FCFF	1878	1859	2122	2188	2166	2480	2556	2530	2905	2991

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
EBITDA	4549	5338	5389	5337	6284	6334	6274	7404	6256	6184
Change in Net Working Capital	4	-62	4	4	-75	5	5	-90	5	6
Change WC loan	0	0	0	0	0	0	0	0	0	0
Interest on working capital loan	0	0	0	0	0	0	0	0	0	0
Less: Tax	-1590	-1866	-1884	-1866	-2198	-2215	-2195	-2590	-2188	-2163
Less: Capex	0	0	0	0	0	0	0	0	0	0
FCFF	2963	3410	3509	3475	4011	4124	4085	4724	4073	4026

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
EBITDA	0	-83	-83	-28	22	120	181	239	343	451
Change in Net Working Capital	0	7	3	1	-1	-3	-3	-3	-6	-5
Less: Interest on debt	0	0	-134	-233	-231	-177	-123	-68	-27	-21
Less: Tax	0	0	0	0	0	0	0	0	0	0
Less: Debt repayments	0	0	0	0	-555	-559	-563	-567	-193	-72
Less: Capex	-1030	-1030	-988	-988	0	0	0	0	0	0
Less IDC	-43	-105	-36	0	0	0	0	0	0	0
Add: Debt Investment	721	721	692	692	0	0	0	0	0	0
Free Cash Flow to Equity	-352	-491	-547	-556	-765	-619	-508	-399	117	354

Financial year	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
EBITDA	550	751	905	1103	1344	1373	1359	1553	1584	1568
Change in Net Working Capital	-5	-12	-7	-11	-16	1	1	-15	1	1
Less: Interest on debt	-16	-10	-4	2	9	0	0	0	0	0
Less: Tax	0	0	0	-152	-433	-444	-443	-514	-528	-525
Less: Debt repayments	-77	-82	-88	-95	-101	0	0	0	0	0
Less: Capex	0	0	0	0	0	0	0	0	0	0
Less IDC	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	453	646	806	848	802	930	917	1024	1058	1045

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
EBITDA	1800	1833	1814	2089	2125	2103	2431	2469	2445	2834
Change in Net Working Capital	-18	2	2	-21	2	2	-25	2	2	-30
Less: Interest on debt	0	0	0	0	0	0	0	0	0	0
Less: Tax	-608	-622	-618	-716	-730	-723	-839	-854	-846	-984

Financial year	Year 21	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30
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
Less IDC	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	1174	1212	1198	1353	1397	1382	1566	1617	1600	1820

Financial year	Year 31	Year 32	Year 33	Year 34	Year 35	Year 36	Year 37	Year 38	Year 39	Year 40
EBITDA	2874	2846	3312	3354	3320	3875	3922	3882	4544	4592
Change in Net Working Capital	2	2	-36	3	3	-43	3	3	-52	4
Less: Interest on debt	0	0	0	0	0	0	0	0	0	0
Less: Tax	-999	-989	-1153	-1168	-1157	-1352	-1369	-1355	-1587	-1604
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
Less IDC	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	1878	1859	2122	2188	2166	2480	2556	2530	2905	2991

Financial year	Year 41	Year 42	Year 43	Year 44	Year 45	Year 46	Year 47	Year 48	Year 49	Year 50
EBITDA	4549	5338	5389	5337	6284	6334	6274	7404	6256	6184
Change in Net Working Capital	4	-62	4	4	-75	5	5	-90	5	6
Less: Interest on debt	0	0	0	0	0	0	0	0	0	0
Less: Tax	-1590	-1866	-1884	-1866	-2198	-2215	-2195	-2590	-2188	-2163
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
Less IDC	0	0	0	0	0	0	0	0	0	0
Add: Debt Investment	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
Free Cash Flow to Equity	2963	3410	3509	3475	4011	4124	4085	4724	4073	4026

15.19. Annexure-19: NPV and BCR Calculations – Case 2 (PPP Developer developing the Project)

Table 171: 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
Prevailing tariffs = Scenario A (without pay-out)	**902**	**1176**	**1637**	**-768**	**-576**	**-256**
Increased space/SFB tariffs =Scenario B (without pay-out)	**1828**	**2155**	**2741**	**-281**	**-53**	**353**
Prevailing tariffs = Scenario A (with pay-out)	**-2482**	**-2244**	**-1856**	**-3167**	**-3001**	**-2731**
Increased space/SFB tariffs =Scenario B (with pay-out)	**-1714**	**-1433**	**-973**	**-2761**	**-2565**	**-2244**

Source: Financial Model

Table 172: BCR (@ 15% cost of equity) calculations across scenarios – **Case 2**

Scenarios	BCR		
	Conservative	Base	Aggressive
Prevailing tariffs = Scenario A (without pay-out)	**0.80**	**0.85**	**0.93**
Increased space/SFB tariffs =Scenario B (without pay-out)	**0.95**	**1.00**	**1.10**
Prevailing tariffs = Scenario A (with pay-out)	**0.55**	**0.58**	**0.64**
Increased space/SFB tariffs =Scenario B (with pay-out)	**0.65**	**0.69**	**0.75**

Source: Financial Model

15.20. Annexure-20: Economic Model Calculations

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	473	1093	1867	2699	3455
Employment Generation	0	0	30	27	27	98	158	272	394	506
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**	**30**	**27**	**27**	**571**	**1251**	**2139**	**3093**	**3961**

Financial year	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Net Economic Value Addition by Industries	4603	5821	7036	8383	10430	11189	11189	11189	11189	11189
Employment Generation	677	859	1042	1246	1557	1673	1673	1673	1673	1673
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	3	26	39	37	59	54	48	70	63
Total Economic Benefits	**5280**	**6683**	**8104**	**9668**	**12025**	**12921**	**12915**	**12909**	**12932**	**12925**

Financial year	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Net Economic Value Addition by Industries	11189	11189	11189	11189	11189	11189	11189	11189	11189	11189
Employment Generation	1673	1673	1673	1673	1673	1673	1673	1673	1673	1673
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)	56	80	72	62	90	79	68	98	86	73

Financial year	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Net Economic Value Addition by Industries	11189	11189	11189	11189	11189	11189	11189	11189	11189	11189
Employment Generation	1673	1673	1673	1673	1673	1673	1673	1673	1673	1673
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)	107	92	77	115	98	80	124	104	83	131
Total Economic Benefits	**12969**	**12954**	**12939**	**12977**	**12960**	**12942**	**12985**	**12965**	**12944**	**12993**

Financial year	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Net Economic Value Addition by Industries	11189	11189	11189	11189	11189	11189	11189	11189	11189	11189
Employment Generation	1673	1673	1673	1673	1673	1673	1673	1673	1673	1673
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)	108	84	139	112	84	146	115	82	152	116
Total Economic Benefits	**12970**	**12946**	**13000**	**12974**	**12945**	**13007**	**12976**	**12944**	**13013**	**12977**

Total Economic Benefits	12917	12942	12933	12924	12951	12941	12930	12960	12948	12934

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	323	773	1358	1971	2468

Employment Generation	0	0	30	27	27	76	111	195	285	357
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**	**30**	**27**	**27**	**399**	**884**	**1553**	**2256**	**2825**

Financial year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Net Economic Value Addition by Industries	3331	4215	5038	5929	7467	10252	11511	11511	11511	11511
Employment Generation	484	615	737	870	1101	1521	1712	1712	1712	1712
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	**3815**	**4829**	**5775**	**6799**	**8567**	**11773**	**13224**	**13224**	**13224**	**13224**

Financial year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Net Economic Value Addition by Industries	11511	11511	11511	11511	11511	11511	11511	11511	11511	11511
Employment Generation	1712	1712	1712	1712	1712	1712	1712	1712	1712	1712
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	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**

Financial year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Net Economic Value Addition by Industries	11511	11511	11511	11511	11511	11511	11511	11511	11511	11511
Employment Generation	1712	1712	1712	1712	1712	1712	1712	1712	1712	1712
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	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**

Financial year	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**	**2067**	**2068**	**2069**	**2070**
Net Economic Value Addition by Industries	11511	11511	11511	11511	11511	11511	11511	11511	11511	11511
Employment Generation	1712	1712	1712	1712	1712	1712	1712	1712	1712	1712
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	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**	**13224**

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	729	1648	2768	3993	5190

Employment Generation	0	0	30	27	27	134	236	398	576	751
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**	**30**	**27**	**27**	**863**	**1885**	**3166**	**4569**	**5941**

Financial year	**2031**	**2032**	**2033**	**2034**	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**
Net Economic Value Addition by Industries	6854	8658	10538	11175	11175	11175	11175	11175	11175	11175
Employment Generation	996	1262	1542	1637	1637	1637	1637	1637	1637	1637
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	**7850**	**9920**	**12079**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**

Financial year	**2041**	**2042**	**2043**	**2044**	**2045**	**2046**	**2047**	**2048**	**2049**	**2050**
Net Economic Value Addition by Industries	11175	11175	11175	11175	11175	11175	11175	11175	11175	11175
Employment Generation	1637	1637	1637	1637	1637	1637	1637	1637	1637	1637
Tax Incentive Availed by the	0	0	0	0	0	0	0	0	0	0

Developer (Loss for Exchequer)										
Tax Paid by the Developer (Gain for Exchequer)	0	0	0	0	0	0	0	0	0	0
Total Economic Benefits	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**

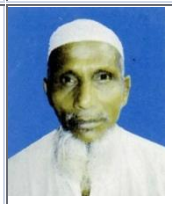
Financial year	**2051**	**2052**	**2053**	**2054**	**2055**	**2056**	**2057**	**2058**	**2059**	**2060**
Net Economic Value Addition by Industries	11175	11175	11175	11175	11175	11175	11175	11175	11175	11175
Employment Generation	1637	1637	1637	1637	1637	1637	1637	1637	1637	1637
Tax Incentive Availed 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	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**

Financial year	**2061**	**2062**	**2063**	**2064**	**2065**	**2066**	**2067**	**2068**	**2069**	**2070**
Net Economic Value Addition by Industries	11175	11175	11175	11175	11175	11175	11175	11175	11175	11175
Employment Generation	1637	1637	1637	1637	1637	1637	1637	1637	1637	1637
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	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**	**12812**

All figures are in BDT million

15.21. Annexure-21: List of displaced families/households and their identity

1		MOSHAROF BAKHTIAR S/O: LATE A. MALEK BAKHTIAR Purba Paysa NID: 19620610215546184 Phone # 01782403643	30		NOGENDRO ADHIKARI S/O: LATE KIBOT ADHIKARI Barabari NID: 0610215595834 Phone # 01724370685
2		HABIB BAKTIAR S/O: SAGED BAKTIAR Purba Paysa NID: 0610215596298	31		NIKHIL ADHIKARI S/O: KHIBOD CHANDRO Barabari NID: 0610215595860 Phone # 01731490052
3		SEKANDAR KHANDAKAR S/O: RAHAM ALI Paysa NID: 01610215596764 Phone # 01747971187	32		ALOK BARI S/O: CHINDO KANCHON Barabari NID: 0610215545522 Phone # 01745066347
4		BADSHA BAKHTIAR S/O: LATE SUNDAR ALI Barabari NID: 8610215596208 Phone # 01858236190	33		ATAL BARAI S/O: LATE ANIL CHANDRA BARAI Barabari NID: 0610215575883 Phone # 01754427857
5		A. ZABBAR TALUKDER S/O: LATE KASEM ALI TALUKDER Paysa NID: 01610215596866 Phone # 01711480457	34		HARBILAS BARAI S/O: ANIL CHANDRA Barabari NID: 0610215595851 Phone # 01854158640
6		JOGENDRONATH S/O: JATINDRONATH Paysa NID: 2699040685816 01719718529	35		SURJAN BARAI S/O: SURJA BARAI Barabari NID: 0610215596002 Phone # 01764489176

7		NITTANANDA BARAI S/O: LATE GANESH BARAI Paysa NID: 0610215596835 Phone # 01308271940	36		KANAI ADHIKARI S/O: LATE BASANTA ADHIKARI Barabari NID: 0610215595949 Phone # 01742526947
8		SAHDEB BARAI S/O: LATE LASMAN CHANDRA BARAI Paysa NID: 0610213575550 Phone # 01876230421	37		HASIT BARAI S/O: LATE HARENDRA BARAI Barabari NID: 0610215019823 Phone # 01783171066
9		BINAY HALDER S/O: LATE BHUBAN HALDER Kadam Bari NID: 0610215596860 Phone # 01758312971	38		BINAY BHUSON BARAI S/O: BISHSHARUP BARAI Barabari NID: 0610215546042 Phone # 01770496117
10		SACHINDA NATH BARAI S/O: LATE JOGESSAR BARAI Kadam Bari NID: 0610215542866 Phone # 01738196959	39		BIBEK BARAI S/O: BISHARUP BARAI Barabari NID: 0610215595885 01725804245
11		SACHIL BAIDA S/O: LATE GANESH BAIDA Barabari NID: 0610215595925 01910454784	40		BABU RAM ADHIKARI S/O: LATE NAGANDA NATH ADHIKARI Barabari NID: 0610215596788 Phone # 01752605049
12		MONOHAR BAIDA S/O: LATE OSEM BAIDA Barabari NID: 0610215595959 Phone # 01622848718	41		SIB PROSAD ADHIKARY S/O: MODUSUDON ADHIKARY Barabari NID: 0610215595832 01725376662

13		MANI MAHAN S/O: LATE MANORANJAN Kadam Bari NID: 0610215592870 Phone # 01883434798	42		ROSIK CHANDRO ALI S/O: LATE JOGESH ALI Barabari NID: 0160247612317 Phone # 01728330483
14		MAHADEB HALDER S/O: LATE RAJAN HALDER Barabari NID: 0610215595922 Phone # 01621606840	43		SUMON BARI S/O: LATE MONORONJON Kadam Bari NID: 0610215592895 Phone # 01723540947
15		SARGA HALDER S/O: LATE RAJNI HALDER Barabari NID: 01610215595921 Phone # 01859494136	44		NIBARONJON BAROI S/O: LATE NARON BAROI Barabari Phone # 01720170722
16		SANJIT BARAI S/O: BUJAN BARAI Barabari NID: 0610215545893 Phone # 01625303449	45		RUBDI S/O: LATE MONTU BAROI Barabari
17		LALIT BARAI S/O: JURAN BARAI Barabari NID: 0610215545916 Phone # 01646188493	46		MASUD BAKHTIAR Jolirpar NID: 0610213571021 Phone # 01712608971
18		AVIRAM BARAI S/O: LATE JURAN BARAI Barabari NID: 0610215545957 01310219897	47		SUVAS BOIDDO S/O: SOCHIN BOIDO Barabari NID: 06905808173 01710454784
19		KHUDIRAM BARAI S/O: JURAN BARAI Barabari NID: 0610215595918 Phone # 01706598813	48		SPON BOIDDO S/O: SOCHIN BOIDDO Barabari NID: 5549276185 Phone # 01742401201

20		NIKHIL BARAI S/O: LATE ANANTA BARAI Barabari NID: 0610215545825 01743115758	49		MOMINDRO BOIDDO S/O: MONOHOR BOIDO Barabari NID: 0610215595420 01622848718
21		BIJOY KISNA BARAI S/O: KANAI LAAL BARAI Barabari NID: 0610215595952 Phone # 01648540726	50		JOYDEV BOIDDO S/O: MONOHOR BOIDDO Barabari NID: 0610215595890 Phone # 01763450864
22		SUNIL BARAI S/O: LATE KANAI BARAI Barabari NID: 0610215545917 Phone # 01738868169	51		JOGANONDO BARI S/O: HOREKRISNO BARI Barabari NID: 0610215515403 Phone # 01629924520
23		SHITAL CHANDA BARAI S/O: HIRCHARAN BARAI Barabari NID: 0610215595895 Phone # 01752969126	52		JOYONTO HAWLADER S/O: JOGODIS HAWLADER Barabari NID: 061029546323 Phone # 0176474436
24		HAR BILAS BARAI S/O: HARE KISHNA BARAI Barabari Phone # 01775344923	53		SOMIR BARI S/O: HORE KRISNO Barabari NID: 0610215545404 01748015350
25		JAGDIS BARAI S/O: SHIBCHARAN BARAI Barabari NID: 0610215595891 Phone # 01874884784	54		AKTAB TALUKDER S/O: ABUL HOSEN TALUKDER Poierhat NID: 0610215596661
26		JAHIRUL SARDER S/O: MD. SHAHRAB SARDER Barabari NID: 0623207421656 Phone # 01716518306	55		PORITOS BARI S/O: HORIBORBARI Barabari NID: 0610215595429 Phone # 01759049713

27		JATIN SARKER S/O: LATE NAGENDRA NATH SARKER Barabari NID: 0610279642778 Phone # 01709098952	56		ALOMGIR S/O: BADSHA BOKTIER Barabari NID: 061015546310 01738995066
28		AKKAS DEWAN S/O: LATE TAMIJUDDIN DEWAN Paysa Gram NID: 0610215596844 Phone # 01729922038	57		ALOMOTI S/O: SOTISH CHNADRO Barabari NID: 0610215595886
29		KHAGENDRA NATH ADHIKARI S/O: LATE KHIRID ADHIKARI Barabari NID: 06102155947 Phone # 01744501927	58		KHOKON ADHIKKARI S/O: KOGENDRO ADHKARI Barabari NID: 0610215596001 Phone # 01624204485

15.22. Annexure-22: The Proposed Acquired Land and Name of Titleholders

উপজেলাঃ আগৈলঝাড়া

জেএল নং-৯৪

ক্রমিক নং	এস. এ খতিয়ান নং	দাগ নং	দাগের মোট জমি (একরে)	প্রস্তাবিত জমি (একরে)	আংশিক/পূর্ণ	জমির শ্রেনী (রেকর্ড দৃষ্টে)	মন্তব্য	মালিকানাধীন
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1	489	2366	0.9	0.28	আংশিক	নাল		PROSANTO KUMAR GONG. & SURJO KUMAR GONG.
2	489	2367	0.9	0.9	পূর্ণ	নাল		PROSANTO KUMAR GONG. & SURJO KUMAR GONG.
3	489	2368	0.92	0.92	পূর্ণ	নাল		PROSANTO KUMAR GONG. & SURJO KUMAR GONG.
4	244	2369	2	2	পূর্ণ	নাল		JOLDHOR GONG
5	394	2370	0.1	0.1	পূর্ণ	নাল		KOILAMA GONG
6	394	2371	0.22	0.09	আংশিক	নাল		NAGENDA GONG
7	394	2372	0.46	0.1	আংশিক	পুকুর		NAGENDA GONG
8	394	2373	0.59	0.25	আংশিক	পুকুর পাড়		NAGENDA GONG
9	394	2377	0.51	0.24	আংশিক	নাল		NAGENDA GONG
10	75	2378	0.71	0.3	আংশিক	নাল		MAFIJ UDDIN GONG
11	165	2379	0.26	0.26	পূর্ণ	নাল		GAYAL GONG & NAROD GONG.
12	165	2380	0.54	0.54	পূর্ণ	বাড়ী		GAYAL GONG & NAROD GONG.
13	165	2381	0.88	0.88	পূর্ণ	নাল		GAYAL GONG & NAROD GONG.
14	165	2382	0.8	0.6	আংশিক	নাল		GAYAL HAQUE KUMAR
15	828	2390		0.9	আংশিক	নাল		BENI MADHAB RATKANTO GANG, SISTI KOR GONG

			Total	8.36				

জেলা ঃ বরিশাল
মৌজাঃ জলিয়ারপাড়
উপজেলাঃ আগৈলঝড়া জেএল নং-৯২

ক্রমিক নং	এস. এ খতিয়ান নং	দাগ নং	দাগের মোট জমি (একরে)	প্রস্তাবিত জমি (একরে)	আংশিক/পূর্ণ	জমির শ্রেনী (রকর্ড দৃষ্টে)	মন্তব্য	মালিকানাধীন
1	2	3	4	5	6	7	8	9
1	46	48	0.3	0.03	আংশিক	নাল		FATIK GONG.
2	46	49	0.29	0.04	আংশিক	নাল		FATIK GONG.
3	6	50		0.45	আংশিক	নাল		ADITTA ASCHANI GONG.
4	29,126	51	1.42	0.9	আংশিক	নাল		KOYSUBAT MANARANJAN, GOPAL GONG.
5	65,151	55	1.66	1.3	আংশিক	নাল		NISHIKANDO GONG., KALICHARON GONG.
6	18	56	5.36	2.7	আংশিক	নাল		KINAI GONG.
7	61,116	57	1.74	1.74	পূর্ণ	নাল		PURNA CHANDRA, JAGESSAR GONG
8	46	58	0.7	0.7	পূর্ণ	নাল		DARIKANATH
9	61,116	59	2.38	2.38	পূর্ণ	নাল		PURNACHANDRA, JAGSSAR GONG
10	116	60	0.19	0.19	পূর্ণ	বাড়ী		JAGSSAR GONG
11	61	61	0.06	0.06	পূর্ণ	ডভটা		PURNACHANDA
12	116	62	0.09	0.09	পূর্ণ	বেড়		JAGSSAR GONG
13	63	63	3.62	3.62	পূর্ণ	বেড়		AMARI GONG
14	63	64	1.54	1.54	পূর্ণ	বেড়		KOILAMA

15	63	65	0.66	0.66	পূর্ণ	বেড়		GURU CHARON
16	89	66	0.43	0.43	পূর্ণ	বেড়		BARDA KANTO GONG.
17	78	67	0.34	0.34	পূর্ণ	বেড়		BEGAI GONG.
18	63	68	0.68	0.68	পূর্ণ	বেড়		AMARI GONG.
19	63	69	1.65	1.65	পূর্ণ	বেড়		GORAL GONG.
20	63	70	0.57	0.57	পূর্ণ	বেড়		NARAD GONG.
21	63	71	1.42	1.42	পূর্ণ	বেড়		
22	149	72	0.66	0.66	পূর্ণ	বেড়		ADITTA GONG.
23	121	73	1.03	1.03	পূর্ণ	বেড়		RAMESH CHANDRA GONG.
24	40,96	74	2.17	2.17	পূর্ণ	বেড়		JALDHAR GONG. BHUSON GONG.
25	8	75	2.46	2.46	পূর্ণ	নাল		AHMMED ALI GONG.
26	5	76	0.21	0.21	পূর্ন	নাল		SHIMANTA GONG.
27	5	77	1.1	1.1	পূর্ন	নাল		UMACHARAN GONG.
28	5	78	0.74	0.74	পূর্ন	নাল		AKSHAY GONG.
29	100	79	4.1	4.1	পূর্ন	নাল		MAIJUDDIN GONG.
30	98	80	2.93	2.93	পূর্ন	নাল		MAIJUDDIN KHALIFA
31	99	81	1.03	1.03	পূর্ন	নাল		MAIJUDDIN KHALIFA GONG.
32	158	82	2.72	2.72	পূর্ন	নাল		SONAULLAH GONG.
33	75	83	2.4	0.8	আংশিক	নাল		BALRAM GONG.
34	51	84	2.47	0.6	আংশিক	নাল		DARISH NATH GONG.
35	46	85	4.06	3	আংশিক	নাল		TARANI GONG.

36	2	89	4.48	2.9	আংশিক	নাল		ASHINI GONG.
37	126	103	1.01	0.28	আংশিক	নাল		RAJENDRA GONG.
38	63	561	1.38	1.38	পূর্ন	নাল		AMURI GONG.
39	46	564	0.19	0.19	পূর্ন	নাল		PURNA CHANDRA GONG.
40	63	570	0.52	0.52	পূর্ন	নাল		RAM KISHNA
41	152	586	0.13	0.13	পূর্ন	নাল		SIDESHAR GONG
42	46	587	0.23	0.23	পূর্ন	নাল		SARDA GONG
			TOTAL	50.67				

জেলাঃ বরিশাল
মৌজাঃ পয়সা
উপজেলাঃ আগৈলঝাড়া
জেএল নং-৯৪

ক্রমিক নং	এস. এ খতিয়ান নং	দাগ নং	দাগের মোট জমি (একরে)	প্রস্তাবিত জমি (একরে)	আংশিক/পূর্ণ	জমির শ্রেনী (রেকর্ড দৃষ্টে)	মন্তব্য	মালিকানাধীন
1	2	3	4	5	6	7	8	9
1	408	1119	6.57	0.3	আংশিক	নাল		RAJBIHARI GONG.
2	354	1254	2.5	0.45	আংশিক	নাল		MAFEL GONG.
3	300	1259	1.81	0.65	আংশিক	নাল		MESER GONG.
4	300	1260	0.73	0.73	পূর্ন	নাল		BASHIRAM GONG.
5	15	1261	2.1	2.1	পূর্ন	নাল		AHED GONG.

6	65	1262	1.74	0.7	আংশিক	নাল		AMAN UDDIN GONG.
7	380	1263	1.2	1.2	পূর্ন	নাল		RAJ BIHARI GONG.
8	222	1264	0.41	0.39	আংশিক	নাল		TARINI
9	118	1265	0.57	0.03	আংশিক	নাল		ALOKESHI
10	219	1270	1.14	0.06	আংশিক	নাল		ZHARU GONG
11	15	1271	1.11	1.11	পূর্ন	নাল		AHED GONG.
12	219	1272	0.68	0.68	পূর্ন	নাল		ZHARU GONG.
13	219	1273	3.26	2.48	আংশিক	নাল		ZHARU GONG.
14	219	1274	1.61	0.5	আংশিক	নাল		ZHARU GONG.
15	289	1280	0.88	0.88	পূর্ন	নাল		GURU CHARON GONG.
16	289	1281	2.78	2.78	পূর্ন	নাল		GURU CHARON GONG.
17	251	1282	1.49	0.03	আংশিক	নাল		NARAYAN GONG.
18	251	1293	2.16	1.1	আংশিক	নাল		UMESH GONG.
19	251	1294	1.22	1.22	পূর্ন	নাল		NARAYAN GONG.
20	64, 305	1295	0.42	0.42	পূর্ন	নাল		BIMLA
21	285, 305	1296	0.42	0.42	পূর্ন	নাল		FELU CHOTA BIDI GONG.
22	64, 259	1297	0.41	0.41	পূর্ন	নাল		SAHER ALI GONG.
23	63, 64	1298	0.8	0.8	পূর্ন	নাল		ADHANUDDIN GONG.
24	347, 348	1299	1.77	1.77	পূর্ন	নাল		AJED ALI GONG.
25	347, 348	1300	0.85	0.85	পূর্ন	নাল		GURU CHARAN
26	347, 348	1301	1.73	1.73	পূর্ন	নাল		BIRAN GONG

27	408	1302	1.99	1.99	পূর্ন	নাল		JOGESH GONG.
28	408	1303	2.06	2.06	পূর্ন	নাল		RREBTI GONG.
				27.84				
29	408	1304	2.13	2.13	পূর্ন	নাল		SUREN GONG.
30	258	1305	2.19	1.14	আংশিক	নাল		ANNADA GONG.
31	258	1306	0.74	0.36	আংশিক	নাল		ANNADA GONG.
32	408	1307	1.42	1.42	পূর্ন	নাল		SUREN GONG.
33	408	1308	1.44	1.44	পূর্ন	নাল		RAJ BIHARI GONG.
34	251	1309	2.01	2.01	পূর্ন	নাল		MADAN GONG.
35	198	1310	1.17	1.17	পূর্ন	নাল		KALICHARAN
36	251	1311	2.26	2.26	পূর্ন	নাল		UMESH GONG.
37	412	1312	1.01	1.01	পূর্ন	নাল		RAMKISHNA
38	412	1313	1.41	1.41	পূর্ন	নাল		FELU
39	224	1314	2.48	2.48	পূর্ন	নাল		TIN KAR
40	257	1315	0.84	0.84	পূর্ন	নাল		UMESH GONG.
41	257	1316	0.95	0.95	পূর্ন	নাল		GANGA CHARAN
42	257	1317	1.61	1.61	পূর্ন	নাল		SADHU GONG.
43	257	1318	1.48	1.48	পূর্ন	নাল		RAJNI GONG.
44	257	1319	7.89	7.89	পূর্ন	নাল		MANOHAR GONG.
45	257	1320	2.25	2.25	পূর্ন	নাল		RAJNI GONG.
46	257	1321	2.07	2.07	পূর্ন	বেড়		MANOHAR GONG.

47	257	1322	0.54	0.54	পূর্ন	বাড়ী		SADHU GONG.
48	257	1323	57	0.57	পূর্ন	পুকুর		MANOHAR GONG.
49	257	1324	0.54	0.54	পূর্ন	পুকুর পাড়		MANOHAR GONG.
50	176	1325	0.81	0.81	পূর্ন	নাল		RAKHAL GONG.
51	176	1326	0.82	0.82	পূর্ন	নাল		KINA RAY
52	176	1327	0.98	0.98	পূর্ন	নাল		GANESH GONG.
53	176	1328	1.04	1.04	পূর্ন	নাল		GARAL GONG.
54	176	1329	0.72	0.72	পূর্ন	নাল		KINA ROY
55	176	1330	0.72	0.72	পূর্ন	নাল		RAKHAL GONG.
56	176	1331	0.33	0.33	পূর্ন	নাল		KINA RAY
57	176	1332	0.83	0.83	পূর্ন	বাড়ী		KINA RAY
58	176	1333	0.26	0.26	পূর্ন	নাল		GORAL GONG.
59	347,348	1334	0.22	0.22	পূর্ন	নাল		KALI CHARON
60	347,348	1335	0.25	0.25	পূর্ন	নাল		GONESH GONG
61	347,348	1336	0.14	0.14	পূর্ন	নাল		GONESH GONG
62	1769	1337	0.24	0.24	পূর্ন	বাড়ী		KINA RAY
63	347,348	1338	0.09	0.09	পূর্ন	নাল		KALI CHARON
64	176	1339	0.33	0.33	পূর্ন	পুকুর		GORAL GONG
65	176	1340	0.37	0.37	পূর্ন	পুকুর		GORAL GONG
66	359	1341	0.09	0.09	পূর্ন	নাল		KALI CHARON GONG.
67	359	1342	1.05	1.05	পূর্ন	নাল		KALI CHARON GONG.

68	359	1343	1.33	1.33	পূর্ন	নাল		SHARSOTI
69	415	1344	1.21	1.21	পূর্ন	নাল		RAJNI GONG.
70	415	1345	1.14	1.14	পূর্ন	নাল		RAKHAL GONG
71	415	1346	2.19	2.99	পূর্ন	নাল		RAJNI GOMG
72	257	1347	1.54	1.54	পূর্ন	নাল		RADHAK GONG
73	257	1348	0.86	0.86	পূর্ন	নাল		BIGHAMARI GONG
74	257	1349	1.48	1.48	পূর্ন	নাল		
75	257	1350	1.05	1.05	পূর্ন	নাল		ASSANI GONG.
76	257	1351	1.09	1.09	পূর্ন	নাল		GANESH GONG.
77	257	1352	1.11	1.11	পূর্ন	নাল		MILI GONG. & CHAMAN GONG.
78	121,122	1353	1.95	1.95	পূর্ন	নাল		MILI GONG. & CHAMAN GONG.
79	397,399	1354	0.47	0.47	পূর্ন	নাল		MILI GONG. & CHAMAN GONG.
80	257	1355	0.63	0.63	পূর্ন	নাল		GURU CHARON
				61.71				
81	257	1356	0.63	0.63	পূর্ন	নাল		????
82	251	1357	2.48	2.48	পূর্ন	নাল		????
83	300	1358	0.49	0.49	পূর্ন	নাল		????
84	300	1359	1.07	1.07	পূর্ন	নাল		????
85	418	1360	1.21	1.21	পূর্ন	নাল		RADHANATH GONG.
86	418	1361	1.28	1.28	পূর্ন	নাল		SREEKANTO GONG.
87	218	1362	1	1	পূর্ন	নাল		BIMALA

88	259	1363	0.31	0.31	পূর্ন	নাল		BIMALA
89	251	1364	1.19	1.19	পূর্ন	নাল		UMESH GONG.
90	418	1365	0.84	0.84	পূর্ন	নাল		KEDAR GONG.
91	418	1366	0.4	0.4	পূর্ন	নাল		KEDAR GONG.
92	300	1367	1.61	1.61	পূর্ন	নাল		BIMLA
93	357	1368	0.12	0.12	পূর্ন	ডোবা		MAFEJ GONG.
94	357	1369	1.89	1.89	পূর্ন	নাল		MAFEL GONG.
95	3	1370	0.18	0.18	পূর্ন	নাল		ANUKUL GONG.
96	219	1371	1.07	1.07	পূর্ন	নাল		ZHARU GONG.
97	219	1372	1.1	1.1	পূর্ন	নাল		ZHARU GONG.
98	237	1373	1.25	1.25	পূর্ন	নাল		DALAL UDDIN GONG.
99	3	1374	0.24	0.24	পূর্ন	নাল		ANUKUL GONG.
100	257	1375	1.12	1.12	পূর্ন	বেড়		ADITTA GONG.
101	257	1376	0.51	0.51	পূর্ন	পুকুরপাড়		ADITTA GONG.
102	257	1377	0.68	0.68	পূর্ন	পুকুর		ADITTA GONG.
103	257	1378	0.46	0.46	পূর্ন	বাড়ী		ADITTA GONG.
104	257	1379	0.07	0.07	পূর্ন	ডোবা		BINDABON GONG.
105	257	1380	0.86	0.86	পূর্ন	নাল		BINDABON GONG.
106	257	1381	0.82	0.82	পূর্ন	নাল		ANIL GONG.
107	257	1382	0.9	0.9	পূর্ন	নাল		ADITTA GONG.
108	257	1383	0.02	0.02	পূর্ন	নাল		ADITTA GONG.

109	72	1384	0.3	0.3	পূর্ন	ডোবা		MEBSAR GONG.
110	261	1385	0.59	0.59	পূর্ন	নাল		AHMMED GONG.
111	251	1386	1.46	1.46	পূর্ন	নাল		NARAYAN GONG.
112	219	1387	1.27	1.27	পূর্ন	নাল		SETU GONG.
113	219	1388	1.27	1.27	পূর্ন	নাল		ZHARU GONG.
114	257	1389	0.95	0.95	পূর্ন	নাল		
115	257	1390	0.81	0.81	পূর্ন	নাল		???
116	257	1391	1.28	1.28	পূর্ন	নাল		BHUBON GONG.
117	257	1392	2.57	1	আংশিক	নাল		SHIROMONI
118	257	1393	0.13	0.13	পূর্ন	নাল		BASANTA GONG
119	257	1394	0.14	0.14	পূর্ন	নাল		AKHAY
120	257	1395	0.27	0.27	পূর্ন	বেড়		SHIRONATH GONG.
121	257	1396	0.22	0.22	পূর্ন	ভিটা		SHIRONATH GONG.
122	257	1397	0.26	0.26	পূর্ন	নাল		UMESH GONG.
123	257	1398	0.41	0.37	আংশিক	নাল		BASANTA GONG.
124	257	1399	0.16	0.12	আংশিক	নাল		UMESTH
125	257	1403	0.96	0.4	আংশিক	নাল		ASHINI GONG.
126	257	1404	0.71	0.4	আংশিক	নাল		KALICHARON GONG.
127	449	1406	3.54	2.2	আংশিক	নাল		SHIRONATH GONG.
128	475, 257	1408	0.64	0.06	আংশিক	নাল		????
129	257, 475	1409	0.5	0.5	পূর্ন	নাল		GOLAP SUNDORI SURENJON GONG

130	257	1410	0.18	0.16	আংশিক	নাল		MANOHOR GONG.
131	257	1411	0.24	0.24	পূর্ন	নাল		BISHANATH GONG.
132	254, 405	1413	0.24	0.24	পূর্ন	নাল		
133	257	1414	0.48	0.48	পূর্ন	নাল		MANOHAR GONG.
				38.92				
134	257	1415	0.42	0.42	পূর্ন	নাল		BISHANATH GONG.
135	257,475	1416	0.83	0.83	পূর্ন	নাল		JOGEL GONG, SURENJON GONG.
136	257	1418	0.57	0.57	পূর্ন	নাল		BISHANATH GONG,
137	257	1419	0.49	0.49	পূর্ন	নাল		BIHARI
138	257	1420	0.81	0.81	পূর্ন	নাল		RASIK GONG
139	257	1421	0.97	0.97	পূর্ন	নাল		
140	257	1422	1.15	1.15	পূর্ন	নাল		DAHAL GONG.
141	257	1423	1.72	1.72	পূর্ন	নাল		BINDABON GONG.
142	257	1424	1.8	1.8	পূর্ন	নাল		GOLAP SUNDORI
143	257	1425	0.45	0.45	পূর্ন	নাল		POKAI GONG
144	257	1426	0.43	0.43	পূর্ন	নাল		BIRENDRA GONG.
145	257	1427	0.76	0.76	পূর্ন	নাল		NISHAN GONG.
146	474	1428	1.18	1.18	পূর্ন	নাল		SURJA KANTO
147	280,390	1429	1.16	1.16	পূর্ন	নাল		PRANKUMAR, JOHEL GONG.
148	13	1430	0.69	0.69	পূর্ন	নাল		SISTI CHARON
149	317	1431	2.9	1.9	পূর্ন	নাল		BINDABON

150	316	1432	1.2	1.2	পূর্ন	নাল		???
151	13	1433	0.6	0.6	পূর্ন	নাল		AKSHAY GONG.
152	257	1434	0.3	0.3	পূর্ন	নাল		BIHARI
153	257	1435	0.3	0.3	পূর্ন	নাল		SHIROMANI GONG.
154	257	1436	0.56	0.56	পূর্ন	নাল		MAHINDRA
155	257	1437	0.56	0.56	পূর্ন	নাল		SHIROMANI GONG.
156	347, 348	1438	2.29	2.29	পূর্ন	নাল		MADHU SUDHON
157	257	1439	0.98	0.38	আংশিক	নাল		BISHFNATH GONG.
158	257	1440	0.48	0.42	আংশিক	নাল		FIROJ
159	257	1445	0.57	0.42	আংশিক	নাল		JOGESH
160	257	1446	0.59	0.4	আংশিক	নাল		POKAI GONG.
161	257	1449	1.47	0.33	আংশিক	নাল		SREE CHARON
162	257	1450	0.54	0.35	আংশিক	নাল		NIBARON
163	257	1451	0.56	0.56	পূর্ন	নাল		SREE CHARON
164	257	1452	0.56	0.56	পূর্ন	নাল		POKAI GONG
165	257	1453	0.57	0.57	পূর্ন	নাল		NIBARON
166	257	1454	0.52	0.52	পূর্ন	নাল		SREE CHARON
167	257	1455	1.17	1.17	পূর্ন	নাল		GOPAL GONG.
168	257	1456	0.55	0.55	পূর্ন	নাল		GANESH GONG.
169	257	1457	0.5	0.5	পূর্ন	নাল		GANESH GONG.
170	257	1458	0.37	0.37	পূর্ন	নাল		GOPAL GONG.

171	257	1459	1.2	1.2	পূর্ন	নাল		HARIHAR GONG.
172	257	1460	0.58	0.58	পূর্ন	নাল		GOPAL GONG.
173	127	1461	0.5	0.5	পূর্ন	নাল		WAHAJED GONG.
174	127	1462	0.75	0.75	পূর্ন	নাল		NISHI KANTO
175	127	1463	0.64	0.64	পূর্ন	নাল		NISHI KANTO
176	257	1464	0.67	0.67	পূর্ন	নাল		ASHINI GONG.
177	48	1465	0.54	0.54	পূর্ন	নাল		SHARAT
178	48	1466	0.52	0.52	পূর্ন	নাল		KANAI
179	48	1467	0.54	0.54	পূর্ন	নাল		AMRI
180	257	1468	61	0.61	পূর্ন	নাল		GOPAL GONG.
181	48	1469	2.98	2.98	পূর্ন	নাল		SHAHI GONG.
182	15	1470	2.04	2.04	পূর্ন	নাল		AINUDDIN GONG.
183	257	1471	1	1	পূর্ন	নাল		NISHI GONG.
184	257	1472	1.07	1.07	পূর্ন	নাল		BASANTA GONG.
185	15	1473	0.43	0.43	পূর্ন	নাল		????
186	15	1474	0.31	0.31	পূর্ন	নাল		JOGENDRO
				42.62				
187	15	1475	0.69	0.69	পূর্ন	নাল		AMINUDDIN
188	257	1476	0.47	0.47	পূর্ন	বাড়ী		NIBARON GONG.
189	251	1477	0.24	0.24	পূর্ন	নাল		JOGESH
190	251	1478	0.27	0.27	পূর্ন	নাল		RAM

191	251	1479	0.46	0.46	পূর্ন	নাল		NIBARON GONG.
192	119	1480	0.2	0.2	পূর্ন	নাল		OSMAN
193	12	1481	0.7	0.7	পূর্ন	নাল		ADITTA GONG.
194	12	1482	0.77	0.77	পূর্ন	নাল		AKSHAY
195	257	1483	0.69	0.69	পূর্ন	নাল		???
196	12	1484	2.84	2.84	পূর্ন	নাল		BINDABON GONG.
197	257	1485	0.82	0.82	পূর্ন	নাল		
198	257	1486	0.62	0.62	পূর্ন	নাল		
199	257	1487	0.86	0.86	পূর্ন	নাল		NIBARON GONG.
200	257	1488	0.69	0.69	পূর্ন	নাল		MAHINDRA
201	257	1489	1.14	1.14	পূর্ন	নাল		SHIROMAN GONG.
202	257	1490	0.65	0.65	পূর্ন	নাল		BASANTA GONG.
203	257	1491	0.63	0.63	পূর্ন	নাল		
204	257	1492	0.21	0.21	পূর্ন	নাল		GONESH
205	257	1493	0.47	0.47	পূর্ন	নাল		SHIROMANI
206	474	1494	1.25	1.25	পূর্ন	নাল		SURJAKANTA
207	303	1495	0.41	0.41	পূর্ন	নাল		BABURAM
208	390	1496	0.43	0.43	পূর্ন	নাল		JOGHESH GONG
209	316	1497	0.51	0.51	পূর্ন	নাল		???
210	299	1498	0.52	0.52	পূর্ন	নাল		BASHIRAM GONG.
211	483	1499	0.46	0.46	পূর্ন	নাল		SONATON

212	327	1500	0.85	0.85	পূর্ন	নাল		BHUSON GONG.
213	257	1501	1.3	1.3	পূর্ন	নাল		MANOHAR GONG
214	257	1502	0.26	0.26	পূর্ন	ডোবা		MANOHAR GONG
215	257	1503	1.12	1.12	পূর্ন	নাল		SADHU GONG.
216	257	1504	0.36	0.36	পূর্ন	নাল		AKKARI GONG.
217	257	1505	0.08	0.08	পূর্ন	ডোবা		GADA CHARAN GONG.
218	257	1506	0.22	0.22	পূর্ন	নাল		GADA CHARAN GONG.
219	257	1507	0.12	0.12	পূর্ন	ডোবা		SADHU GONG.
220	257	1508	0.23	0.23	পূর্ন	নাল		SADHU GONG.
221	257	1509	0.21	0.21	পূর্ন	নাল		RAJNI GONG
222	257	1510	0.1	0.1	পূর্ন	ডোবা		RAJNI GONG
223	257	1511	0.79	0.79	পূর্ন	নাল		MANOHAR GONG.
224	223	1512	0.83	0.83	পূর্ন	নাল		???
225	255	1513	1.08	1.08	পূর্ন	নাল		NISHI KANTA GONG.
226	223	1514	0.1	0.1	পূর্ন	ডোবা		???
227	386,495	1515	1.21	1.21	পূর্ন	নাল		???
228	451	1516	0.54	0.54	পূর্ন	নাল		HASEM
229	451	1517	0.59	0.59	পূর্ন	নাল		JAGENDRA GONG.
230	451	1518	0.6	0.6	পূর্ন	নাল		KISHNA CHARAN
231	257	1519	0.66	0.66	পূর্ন	বাড়ী		MANAHAR GONG.
232	257	1520	0.51	0.51	পূর্ন	নাল		UMESH GONG.

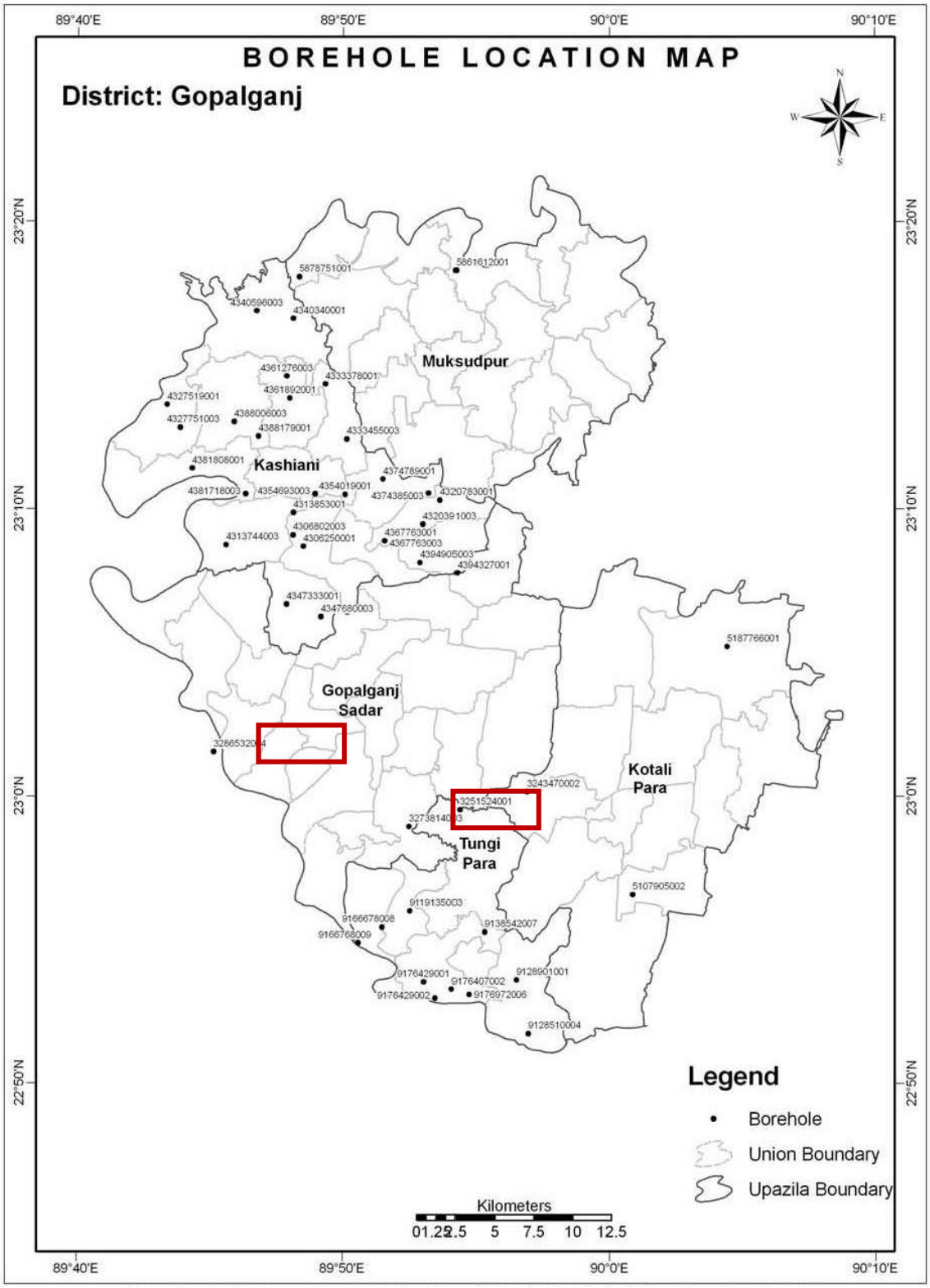
233	257	1521	0.63	0.63	পূর্ন	নাল		GANGACHARAN GONG.
234	386	1522	0.16	0.16	পূর্ন	নাল		SHISTA
235	386	1523	0.41	0.41	পূর্ন	নাল		JOGENDRA GONG.
236	386	1524	0.38	0.38	পূর্ন	নাল		JADAB GONG.
237	495	1525	0.67	0.67	পূর্ন	নাল		DOARI GONG.
238	257	1526	1.2	1.2	পূর্ন	নাল		???
239	257	1527	0.94	0.94	পূর্ন	নাল		SADU GONG.
				33.15				
240	443	1528	0.17	0.07	আংশিক	নাল		GANESH GONG.
241	443	1532	0.13	0.06	আংশিক	নাল		SHITAL GONG.
242	293	1533	0.08	0.08	পূর্ন	নাল		BARKAT ULLAH GONG.
243	325	1534	0.09	0.01	আংশিক	নাল		BHUSAN GONG
244	151	1537	0.6	0.25	আংশিক	নাল		KANAI GONG.
245	331	1538	0.51	0.3	আংশিক	নাল		MAMTAJ UDDIN
246	220	1546	0.56	0.15	আংশিক	নাল		???
247	443	1560	0.81	0.05	আংশিক	নাল		GANESH GONG.
248	443	1561	0.88	0.8	পূর্ন	নাল		SHITAL GONG.
249	386	1562	0.66	0.4	আংশিক	নাল		JOGENDRA GONG.
250	386	1563	0.6	0.6	পূর্ন	নাল		JADAB GONG.
251	10, 223	1564	0.44	0.44	পূর্ন	নাল		ASHINI CHARAN GONG.
252	223	1565	0.73	0.25	আংশিক	নাল		???

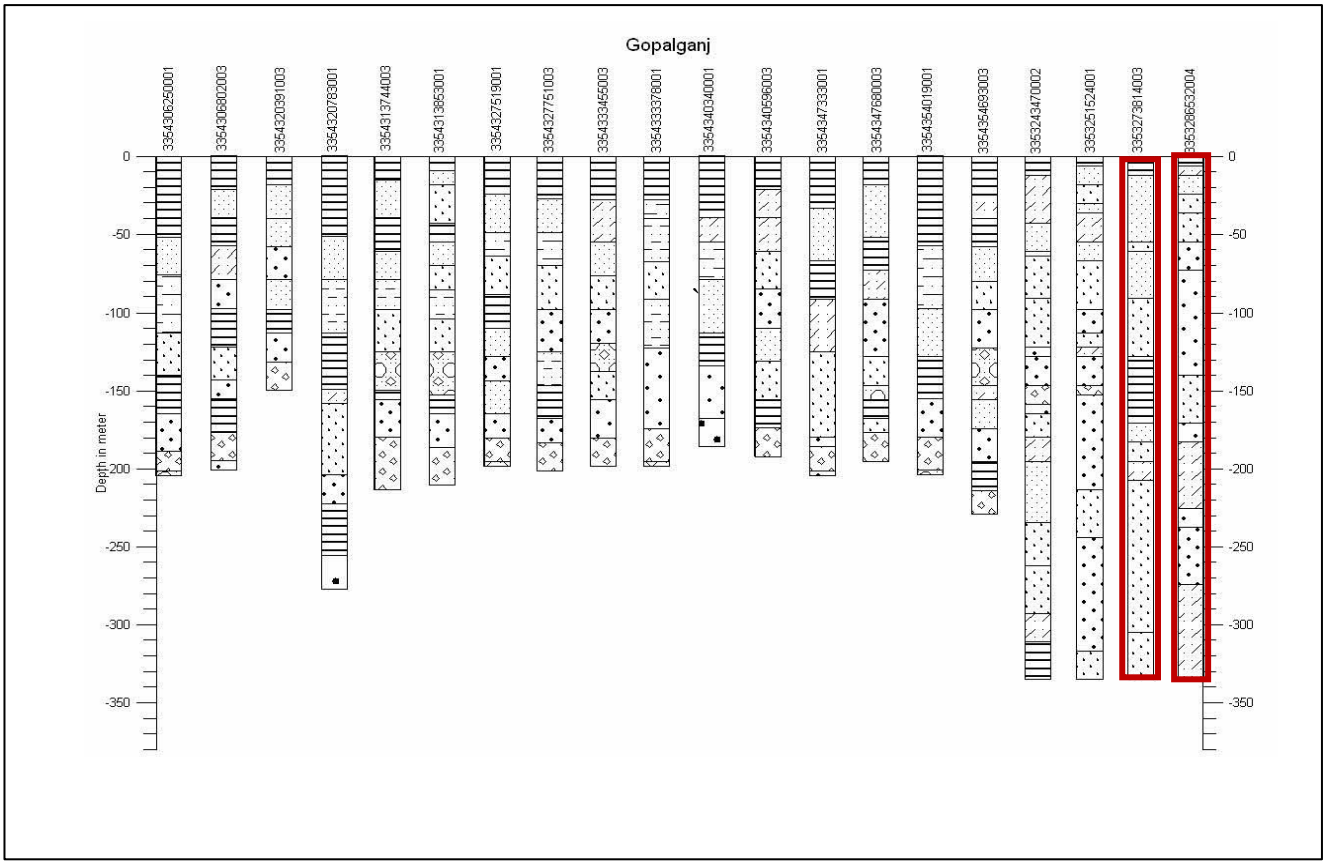
253	221	1569	0.76	0.7	আংশিক	নাল		SHIROMAN GONG.
254	221	1570	0.85	0.7	আংশিক	নাল		JOGESH GONG.
255	167	1571	1.66	1.66	পূর্ন	নাল		KESHAB GONG.
256	306	1572	6.34	6.34	পূর্ন	নাল		SHIMUL CHANDRA GONG.
257	430	1573	0.52	0.35	আংশিক	নাল		???
258	400	1575	1.9	0.13	আংশিক	নাল		RASHIK CHANDRA GONG
259	358	1576	0.98	0.25	আংশিক	নাল		MANAHAR GONG.
260	241	1581	0.56	0.25	আংশিক	নাল		DARIKA NATH
261	398	1582	4	4	পূর্ন	নাল		???
262	168	1583	2.16	1.5	আংশিক	নাল		KESHAB GONG.
263	168	1586	0.64	0.45	আংশিক	নাল		KESHAB GONG.
264	168	1587	0.7	0.45	আংশিক	নাল		BRAJENDRA
265	6, 7	1588	2.16	1.05	আংশিক	নাল		MADHU GONG, ASHANI GONG.
266	359	1591	1.56	0.85	আংশিক	নাল		MANOHAR GONG.
267	257	1592	1.29	0.55	আংশিক	নাল		RASHIK GONG.
268	359, 462	1593	0.86	0.86	পূর্ন	নাল		MANOHAR GONG., SADHURAM
269	345	1594	2.14	0.6	আংশিক	নাল		MADHU GONG.
270	344, 346	1604	0.41	0.25	আংশিক	নাল		MADHU GONG.
271	349	1605	0.38	0.22	আংশিক	নাল		MADHU GONG.
272	257	1606	0.66	0.66	পূর্ন	নাল		PROVATI
273	257	1607	0.56	0.56	পূর্ন	নাল		BISHNATH GONG.

274	257	1608	0.67	0.67	পূর্ন	নাল		???
275	397,399	1609	1.38	1.38	পূর্ন	নাল		RASHIDK GONG.
276	166	1610	0.37	0.37	পূর্ন	নাল		NISHI KANTA
277	257	1611	0.28	0.28	পূর্ন	নাল		GANGA CHARAN
278	257	1612	0.3	0.3	পূর্ন	নাল		UMESH GONG.
279	166	1613	0.36	0.36	পূর্ন	নাল		NISHIKANTA
280	166	1614	0.34	0.34	পূর্ন	নাল		???
281	257	1615	0.5	0.48	আংশিক	নাল		MANAHAR GONG
282	257	1617	0.37	0.33	আংশিক	নাল		ASHINI GONG.
283	257	1618	94	0.68	আংশিক	নাল		GANESH GONG.
284	257	1624	0.57	0.06	আংশিক	নাল		ASHAINI GONG.
285	349	1633	3.34	1.85	আংশিক	নাল		MADHU GONG.
286	72	1651	0.26	0.26	পূর্ন	নাল		???
287	400	1656	1.62	1.1	আংশিক	নাল		RASHIK CHANDRA GONG.
288	257	1658	1.7	1.7	পূর্ন	নাল		MANOHAR GONG.
289	257	1662	0.66	0.66	পূর্ন	নাল		BIHARI GONG.
290	257	1663	0.22	0.22	পূর্ন	নাল		BIHARI GONG.
291	184	1664	0.65	0.65	পূর্ন	নাল		GOPAL CHANDRA GONG.
				37.53				

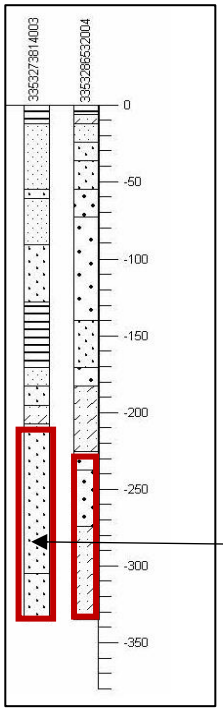
Source: Social Survey & UNO Office

15.23. Annexure-23: Borewell Information

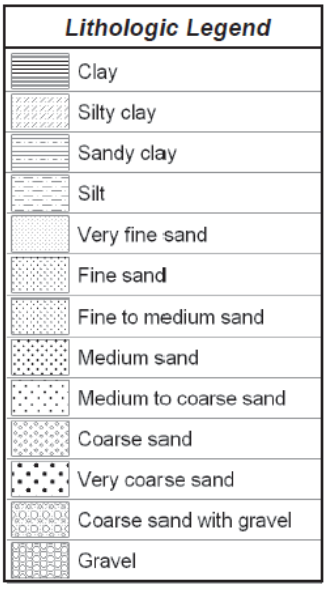




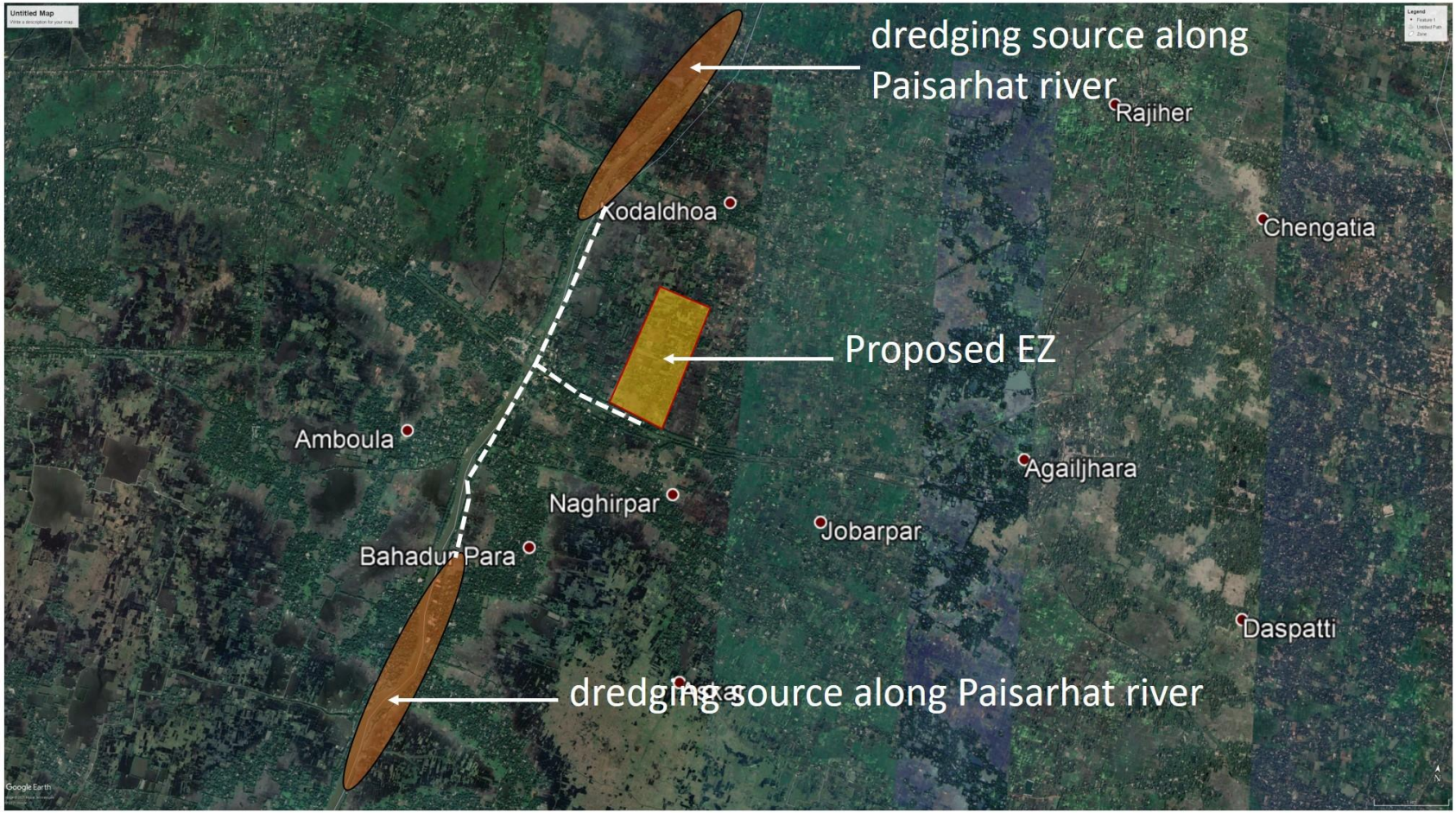
Bore Well Profile of Project Area - 22°59'0.96"N, 89°52'29.64"E & 23° 1'37.20"N, 89°45'7.56"E



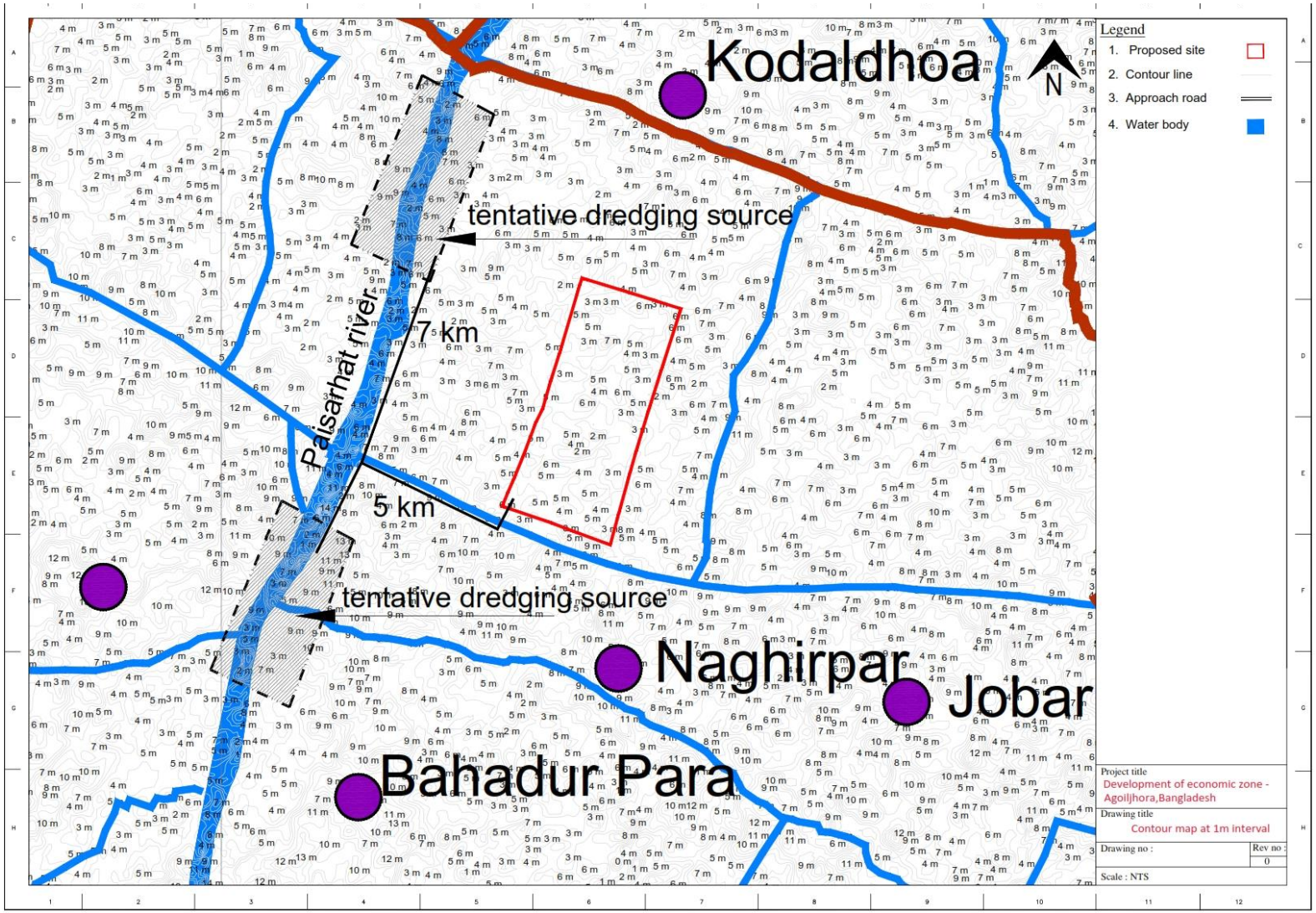
Pervious layer having water potential



15.24. Annexure-24: Location Map for dredging



Note: 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



Note: 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

15.25. Annexure-25: Offsite Infrastructure cost estimates

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	4	4000000.00	16,000,000.00	**16.00**
BPDB	Supply,installation/construction and testing & commissioning work of double circuit 132kV transmission line.	km	40	22,000,000.00	880,000,000.00	**880**

Cost abstract for external power line – 33kV line

SL	Major Items	Unit	Unit system Cost	Demand milage (km)	Total System Cost
A)	**Material's Estimated Cost:**				
1	33 kV Line material (New)	Tk./ km	2542000	1	2542000.00
B)	**Installation/ Construction Cost:**				
2	Construction of 33kV Line	Tk./ km	260000	1	260000
C)	**Electrical Works Design, Implementation & Supervision Consultant Cost:**				
3	33kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	30000	1	30000

	D) Civil & other Cost:				
4	33kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	1168000	1	1168000
	Total				
5	Design, supply, installation, testing & commissioning etc all complete as required of 33kV new Line	Tk./ km	4000000	1	4000000
	Cost abstract for Power supply external network - 33 kV	Tk./ km	4000000	4	16000000

Cost abstract for external power line – 132 kV line

SL	Major Items	Unit	Unit system Cost	Demand milage (km)	Total System Cost
	A) Material's Estimated Cost:				
1	132 kV Line material (New)	Tk./ km	12710000	1	12710000.00
	B) Installation/ Construction Cost:				
2	Construction of 132 kV Line	Tk./ km	1300000	1	1300000
	C) Electrical Works Design, Implementation & Supervision Consultant Cost:				

3	132 kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	150000	1	150000
	D) Civil & other Cost:				
4	132 kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	7840000	1	7840000
	Total				
5	Design, supply, installation, testing & commissioning etc all complete as required of 33kV new Line	Tk./ km	22000000	1	22000000
	Cost abstract for Power supply external network - 132 kV	Tk./ km	22000000	40	880000000

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		29748	Cum	100	2,974,800.00

Sl. No.	Description	Nos.	Quantity	Unit	Rate (Tk)	Amount (Tk)
	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	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					
	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					

Sl. No.	Description	Nos.	Quantity	Unit	Rate (Tk)	Amount (Tk)
	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
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					**3**	**25.56**

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 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	8,965.00	Metre	536.00	4805240.00
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	1,426.00	Cum	11,578.00	16510228.00
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	86.00	Cum	3,603.00	309858.00

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		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)				
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 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	68,134.00	Kg	12.00	817608.00
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.				
			412.50	Cum	2,918.00	1203675.00
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, 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				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		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.				
		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	9.00			
	9.7.1	For design load tonne 1 no. of test	11.00	Per test	53,423.00	587653.00
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 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]				
			1,500.00	Sqm	11.00	16500.00

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
8	2.1.2	Earthwork in excavation in foundation trenches up to 1.5 m depth and maximum 10 m lead: in soft clayey soil / loose sand / silt.				
		Plinth beam	2,437.65	Cum		
			2,437.60	Cum	67.00	163319.20
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	375.02	Cum	602.00	225763.55
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, 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	375.02	Cum	6,319.00	2369767.18
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.				
	7.6.4	Pedestals, column, column capitals, lift walls and walls up to ground floor				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
	7.6.4.1	**Concrete**				
		For column	1,403.92			
			1,403.92	Cum	10,626.00	14918043.29
12	7.6.4.2	**Formwork/shuttering, prop and necessary supports etc. (steel)**				
		For column	10,919.37	Sqm		
			10,919.37	Sqm	373.00	4072925.01
13	7.6.5	**Tie beam and lintels : Ground floor**				
	7.6.5.1	**Concrete**				
		Plinth beam	450.00	Cum		
		leveling coarse for between column @ mid of 125 mm thick brick wall	39.88	Cum		
		Reinforced coping concrete	39.88	Cum		
			529.75	Cum	10,929.00	5789651.41
14	7.6.5.2	**Formwork/shuttering, prop and necessary supports etc. (steel)**				
		Plinth beam	3,000.00	Sqm		
		leveling coarse for between column @ mid of 125 mm thick brick wall	638.01	Sqm		
		Reinforced coping concrete	638.01	Sqm		
			4,276.02	Sqm	380.00	1624887.60
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				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		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)				
		Above NGL	11,696.85			
			11,696.85	Sqm	837.00	9790263.00
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 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	171,120.00	Kg		
		For column	161,450.69	Kg		
		Plinth beam	33,750.00	Kg		
		leveling coarse for between column @ mid of 125 mm thick brick wall	6,580.00	Kg		
		Reinforced coping concrete	6,580.00	Kg		
			379,480.69	Kg	85.00	32255858.23
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				

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		and other charges etc. all complete in all respect as per drawing and accepted by the Engineer.				
		For column	16,000.28	Sqm		
		For wall	25,733.07	Sqm		
			41,734.00	Sqm	214.00	8931076.00
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 floors and accepted by the Engineer.				
		Same as plastering quantity	41,734.00	Sqm		
			41,734.00	Sqm	128.00	5341952.00
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	5,449.00	Metre	129.00	702921.00
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, binding the joints with 18 BWG wire making holes in the angle etc. including supplying of all necessary materials complete in all respect and				`

Sl. no.	Item no. (BNBC)	Description	Quantity	Unit	Rate in Tk	Amount in Tk
		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	5,250.00	Sqm	760.00	3990000.00
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 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)**	26.00	Sqm	9,307.00	241982.00
22		Painting new iron work with one coat of approved primer. (ISI STD)				
		Gate	25.20			
		Fencing	343.40			
			369.00	Sqm	55.00	20295.00
					Total	**114689466.46**
					in Million (Tk)	**114.7**

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	32	10000000.00	320000000.00	**320**

15.26. Annexure-26: 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	3999467	449.00	1,795,760,824.99
		Total for Site Development in Tk				1,795,760,824.99
					Total Cost in Million Taka	**1,795.76**

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]				
		Formation for road embankment	Sqm			
			Sqm	**115000.00**	21.77	2,503,550.00
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	Cum			

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		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				
		Formation for road embankment	Cum			
		Embankment				
				210000.00	165	34,650,000.00
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	**210000.00**	77.25	16,222,500.00
4	31.31	Compaction test				
	31.31.1	Modified proctor	Per test	**35.00**	1800	63,000.00
5	2.1	Earth work excavation for Hard stones		70,000.00	257.50	18025000

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
6	2.10.1	Sand filling (For cement concrete block) in foundation trenches and plinth with sand having F.M. 0.5 to 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.		6,325.00	2860.11	18090195.75
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.		6,325.00	5999.40	37946205
8	40-280-30	Supply of stone boulders at site: 30cm to 45cm size		28462.50	5649.80	160807432.5
9	3385	Labour charge in laying stone boulders		28462.50	257.5	7329093.75
10	2.8	Supply and laying 3 mm thick geo-textile of approved quality and origin /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.		63250.00	146.06	9238295

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
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.		253000.00	1547.72	391573160
12	40-220	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.		28462.50	257.5	7329093.75
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.		63250.00	429.16	27144370
14	40-280-40	Supplying of local hard rock (Madhyapara) at site: 60cm and above size		35000.00	429.16	15020600
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		72916.67	2220.49	161910729.2

Item. No	BPWD Item. Code/ Market rate	Description	Unit	Total Qty	Rate in Tk	Amount
		days cylinder strength 'of 9.0· N/mm2 including grading, washing stone chips, mixing, laying in forms; consolidation, curing for at least 21 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	35000.00	257.9	9026500
		Total Cost in Tk				**916,879,725.00**
					Total Cost in Million Taka	**916.88**

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 with vibratory roller to achieve the desired density (Aggregate type 2 as per Bangladesh SoR)	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
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**
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**

Description	Unit	Quantity	Rate in Taka	Rate in Taka as per SoR	Amount	Amount in Million Taka
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**
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 footpath

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	1649	217.00	357,919.80	**0.36**

Sl.No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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 achive minimum dry density of 95% with optimum moisture content (modified proctor test) including local carriage each layer up to finished level including cost of water and test (carried from beyond 300 m) etc. all complete and accepted by the Engineer-in-charge For other than Dhaka, Chittagong, Sylhet, Rajshahi, Barisal, Khulna metropolitan area and Narayanganj district.	Cum	1649.40	393.00	648,214.20	**0.65**
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-incharge.(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**

Sl.No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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 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	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
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	10996	238.00	2,617,048.00	**2.62**
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 soil base, and filling all interstices with sand, cleaning etc. accepted by the Engineer-incharge.	Sqm	10996	1276.00	14,030,896.00	**14.03**
		Total Cost in Million Taka					**243.99**

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	11399.82	217.00	2473761.10	2.47
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) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	2303.43	6647.00	15310882.81	15.31

Sl.No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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 = 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 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 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	2262.76	6040.00	13667046.93	13.67
6	7.2.1	Providing and laying coping and Screed concrete with 1 :2:4 cement concrete, 40 mm thickSqm 150.09 using broken granite metal of 20mm and down size laid to line and level in one layer and finish with a floating coat of neat cement, including cost of materials, labour, curing, complete as per specifications.	Sqm	6455.40	296.00	1910798.40	1.91
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 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.	Sqm	12270.15	243.00	2981646.10	2.98
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	5206.00	133.00	692398.00	0.69

Sl.No	PWD /SOR 2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
9		Providing and layiing 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 RCCpipe	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	6731.46	918.00	6179478.16	6.18
		Total Cost in Million Taka					**46.65**

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	6.8	1400000.00	9516000.00	9.51
BPDB	33 kV Line construction	Supply, installation/construction and testing & commissioning work of double circuit 33 kV line.	km	2.5	4000000.00	9,920,000.00	9.92
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	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, installation and testing & commissioning workof a complete 132/33 kV substation. Excluding control room. And integration work with 132/33/11 kV substation.	numbers	1	500,000,000.00	500,000,000.00	500

Cost abstract for electrical line 33 kV & 11 kV

SL	Major Items	Unit	Unit system Cost	Demand milage (km)	Total System Cost
A)	**Material's Estimated Cost:**				
1	33 kV Line material (New)	Tk./ km	2542000	1	2542000.00
2	11 kV Line material (New)	Tk./ km	800000	1	800000.00

	B) Installation/ Construction Cost:				
3	Construction of 33kV Line	Tk./ km	260000	1	260000
4	Construction of 11kV Line	Tk./ km	100000	1	100000
	C) Electrical Works Design, Implementation & Supervision Consultant Cost:				
5	33kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	30000	1	30000
6	11kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	10000	1	10000
	D) Civil & other Cost:				
7	33kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	1168000	1	1168000
8	11kV Line Works Design, Implementation & Supervision Consultant (New)	Tk./ km	490000	1	490000
	Total				
9	Design, supply, installation, testing & commissioning etc all complete as required of 33kV new Line	Tk./ km	4000000	1	4000000

10	Design, supply, installation, testing & commissioning etc all complete as required of 11kV new Line	Tk./ km	1400000	1	1400000
	Cost abstract for Power supply internal network - 33 kV	Tk./ km	4000000	2.48	9920000
	Cost abstract for Power supply internal network - 11 kV	Tk./ km	1400000	6.83	9516000.00

Cost abstract for 33/11 kV substation

Item No	Description	Quantity	Unit	Price in Taka (Source REB)
	PART-A: SUBSTATION EQUIPMENT			
1	33 KV ACR (AUTO CIRCUIT RECLOSER)	1	Set	2,700,000
2	33 KV ISOLATOR	1	Set	240,000
3	33 KV ABS (AIR BREAK SWITCH)	1	Set	240,000
4	33 KV LIGHTNING ARRESTOR	2	Set	420,000
5	33 KV HT SWITCHGEAR (VCB) INDOOR TYPE	1	Set	6,000,000
6	33/11 KV, 8000 KVA TRANSFORMER WITH OLTC	1	Set	18,000,000
7	110V DC BATTERY & 3 PHASE BATTERY CHARGER	1	Job	1,350,000
8	AC/DC PANEL	1	No	300,000
	Sub Total -A			29,250,000
	PART-B: INSTALLATION			
9	INSTALLATION OF 33 KV SUB-STATION EQUIPMENT	1	Job	600,000
10	EARTHING MATERIALS FOR SUB-STATION MEASH EARTHING	1	Job	1,350,000
11	2 NOS. POLE WITH STRUCTURE	1	Job	450,000
12	LOADING, UNLOADING & TRANSPORTATION COST	1	Job	300,000
	Sub Total -B			2,700,000
	PART-C: (11 KV SUBSTATION)			
13	11 KV HT SWITCHGEAR PANEL (VCB) INCOMING FEEDER	1	Set	700,000

14	11 KV HT SWITCHGEAR PANEL (VCB) OUTGOING FEEDER	1	Set	1,400,000
15	11 KV HT SWITCHGEAR PANEL (VCB) OUTGOING FEEDER	2	Set	700,000
16	11/0.415 KV, 3000 KVA DRY TYPE TRANSFORMER	1	Set	8,400,000
17	11/0.415 KV, 2500 KVA DRY TYPE TRANSFORMER	1	Set	3,000,000
18	HEAT SHRINK KIT	12	Set	36,000
19	INSTALLATION OF SUB-STATION EQUIPMEN	1	Job	500,000
20	EARTHING FOR SUBSTATION	10	Set	400,000
	Sub Total -C			15,136,000
	PART-C: Building			
21	Control room & other civil works	2400	Sqm	102,914,000
	Total cost (A+B+C+D)			**150,000,000**

Cost abstract for 132 kV/33 kV substation

SI.No	Description	Quantity	Unit	unit price(in TK)	Total price (in TK)	Cost of local transport,erection,testing & commissioning(in TK)	Total price in Taka
1	132/33kV power transformer with on load tap charger	3	No	150000000	450000000	5000000	455000000
2	132 kV transformer as per SLD	2	Sets	1040000	2080000	25000	2105000
3	33kV,2000Amp, 25kA, indoor type SF6 circuit breaker	2	Sets	4200000	8400000	30000	8430000
4	33kV transformer as per SLD	2	Set	2150000	4300000	30000	4330000
5	33 kV 2000A disconnecting switch	2	Set	950000	1900000	30000	1930000
6	Control room & other civil cost	1	LS	28205000	28205000		28205000
	Total cost for 132/33kV substation in BDT						**500000000**

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.				
			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

Item no.	Remarks/ PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
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. (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.				
	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,	kg	5155	180	927900

Item no.	Remarks/ PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			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 .				
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
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-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	2241.88	217.00	486486.875
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	Cum	1530.00	149.00	227970

Item no.	Remarks/ PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			compacting to a specified percentage each layer up to finished level etc. all complete and accepted by Engineer-in-charge.				
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	70.13	6,647.00	466120.875
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, 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

Item no.	Remarks/ PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
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	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 (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

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	
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
		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

Item no.	Remarks/ PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
				for	1.00	km	3,524,674.40
			proportionately for	for	6.2	km	21,680,272.24
						Total Cost in Million Taka	**21.68**

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.				
			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	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.	Remarks /PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
		FITTINGS (LED)	(i) GLORIAcatNo-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.				
	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
	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	Centering and shuttering, including strutting, propping etc. and removal of form after hardening of the concrete for:				

Item no.	Remarks /PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
	07.15.3(Civil)	(Wooden)	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 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	8424.00	82.00	690768
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
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)	Cum	7.92	6,647.00	52644.24

Item no.	Remarks /PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			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, 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
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)				

Item no.	Remarks /PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
	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. 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
		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				

Item no.	Remarks /PWD SCHDULE 2018 Item no	Item name	Description of Items	Unit	Quantity	Rate	Total Amount
				a	b	c	d=bxc
			to be earthed including necessary 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	5	km	14597901.25
Total Cost in Million Taka							**14.60**

Cost abstract for Water supply network – Potable

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	5601	237.00	1327402.94	**1.33**
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	475	449.00	213213.49	**0.21**

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	e)	PN - 10 110mm dia pipe	Rm	2768	582.94	1613584.56	**1.61**
MR	f)	PN - 10 140mm dia pipe	Rm	615	1004.90	618012.15	**0.62**
MR	g)	PN - 10 160mm dia pipe	Rm	615	1224.35	752974.33	**0.75**
MR	h)	PN - 10 200mm dia pipe	Rm	615	1999.63	1229771.22	**1.23**
MR	i)	Providing and laying S& Scentrifugally cast (spun) / Ductile iron 250mm dia pipes (classK7)	o	615	5304.00	3261960.00	**3.26**
MR	j)	Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 300mm dia pipes (classK7)	Rm	615	10123.00	6225645.00	**6.23**
MR	k)	Providing and laying S& Scentrifugally cast (spun)/ Ductile iron 350mm dia pipes (classK7)	Rm	308	11736.00	3614688.00	**3.61**
	4	Providing and fixing Butterfly valve					
MR	f)	PN - 16 110mm Butterfly valve	Each	1	17074.80	17074.80	**0.02**
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**
MR	o)	PN - 16 110mm Air valve	Each	2	40338.00	80676.00	**0.08**

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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	x)	PN - 16 110mm Gate valve	Each	3	8605.20	25815.60	**0.03**
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	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	7	2000.00	14000.00	**0.01**
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	9	1800.00	16200.00	**0.02**
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	8	1600.00	12800.00	**0.01**
		Total Cost in Million Taka					**19.63**

Cost abstract for Water supply network – Non Potable

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	4848	237.00	1148881.93	**1.15**
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	437	449.00	196087.73	**0.20**

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	e)	PN - 10 110mm dia pipe	Rm	6151	582.94	3585678.70	**3.59**
MR	f)	PN - 16 110mm Butterfly valve	Each	3	17074.80	51224.40	**0.05**
MR	o)	PN - 16 110mm Air valve	Each	13	40338.00	524394.00	**0.52**
MR	x)	PN - 16 110mm Gate valve	Each	7	8605.20	60236.40	**0.06**
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	3	2000.00	6000.00	**0.01**
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	7	1800.00	12600.00	**0.01**

BPWD Item Code	Sl.No	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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	13	1600.00	20800.00	**0.02**
		Total Cost in Million Taka					**5.61**

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	3982000	20.34	80,999,101.81	81.00
2	BPWD rates 2018, Annex - A	OHT - Potable - Processing	Lit	332000	40.95	13,594,336.13	13.59
3	BPWD rates 2018, Annex - A	Sump - Non-Potable - Processing	Lit	3936000	20.34	80,063,401.49	80.06
4	BPWD rates 2018, Annex - A	OHT - Non-Potable - Processing	Lit	320000	40.95	13,102,974.59	13.10
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	**189.67**

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	418182.00	1,254,546.00	1.25
2	MR	Non-Potable water pump - Processing	nos	3.00	400000.00	1,200,000.00	1.20
						Total cost in Million Taka	**2.45**

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		Clarifloculator	
					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										
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

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
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 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.	4239.00	Cum										
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										
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												

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
		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 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 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												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		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 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 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)	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		Clarifloccul ator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
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 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 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,												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloccul ator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amou nt
		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 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 thickness of not less than 15 (fifteen)												

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		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 ≤ 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	1935.00	Sqm										
#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	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		Clarifloccul ator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		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 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. (Rate is excluding the cost of protective cover and wearing coarse which to be paid as per corresponding items in this schedule)	908.00	Sqm										
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	6769.00	Cum			6.00	40614.00						

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloccul ator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		(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 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	1817.00	Sqm			27.32	49633.44						
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 and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) ground floor.	243.00	Sqm	310.90	75548.70	7.50	1822.50	36.80	8942.40			673.21	163590.21
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	197.80	Sqm	1014.90	200747.22	64.90	12837.22	32.10	6349.38				

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		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 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	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										
76	30.3	Supplying, carrying, placing, providing of concrete Kerb stone size 600 mm x 300 mm	238.00	Sqm										

S. No.	Reference - BPWD 2018	Description of work	Rate	Unit	Collection sump		Aeration tank		Flash mixer		Filter Press feed & Back wash return pump		Clarifloculator	
					Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount	Qty	Amount
		x 100 mm approved and accepted by the Engineer-in-charge.												
		.												
#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 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	282.89	67046.06			66.90	15855.30	90.50	21448.50	63.00	14931.00	1834.05	434670.03
		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 standard specifications as directed by the Departmental officers.	497.00	Cum									52.00	25844.00	56.00	27832.00
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	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	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		
		2:1 (khoa: 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 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												
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												

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		
#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 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 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)													

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		
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
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 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 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)	11817.00	Cum							70.20	829553.40			70.20	829553.40
			.													
6		Providing formwork for reinforced cement concrete works using M.S. or plywood shuttering of size 90x60cm and MS 10 gauge stiffened with														

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		
		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 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	16.99	7646.79			6.40	2880.00	21.20	9540.00	95.00	42750.00	271.47	1221633.43
		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 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 anodized to aluminium bronze/silver/ss/black colour with a coat not less than 15 microns in														

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		
		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 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 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	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		
		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 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	1935.00	Sqm												
#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. In ground floor GP mirror polished floor tiles (600 mm x 900 mm)	2256.00	Sqm												
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	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		
		(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 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)	908.00	Sqm												
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, 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	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		
		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 and accepted by the Engineer-in-charge. (Cement: CEM-II/A-M) ground floor.	243.00	Sqm	194.78	47332.46			134.90	32780.70			90.00	21870.00	1448.09	351886.96
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											1111.90	219933.82
13	08.1.2	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														

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		
		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
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												
		.														
	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**				**4378 28.00**		**988 980.00**		**59379 8.00**		**2256 4834.00**
		Total amount in lakhs				**29.335**				**4.378**		**9.890**		**5.938**		**225.648**

Cost abstract for water treatment plant (Continuation)

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 4 MLD in Million Taka	**82.3**

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	42.00	73857	3101994	**3.10**

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	18983.25	237.00	4499030.25	4.50
2	MR	Constructing brickmasonry circular manhole 0.91m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 inside cement plaster 12mm thick in cement mortar 1:3 foundation concrete 1:3:6 mix and making ..etc	Each	92.00	2371.00	218132.00	0.22
3	MR	Constructing brickmasonry 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	82.00	2534.00	207788.00	0.21
c)	MR	Effluent pipe - RCC hume pipe 150mm dia	Rm	2768	795.60	2202220.80	2.20
d)	MR	Effluent pipe - RCC hume pipe 200mm dia	Rm	1538	1216.80	1871438.40	1.87
f)	MR	Effluent pipe - RCC hume pipe 300mm dia	Rm	923	1761.50	1625864.50	1.63

Sl.No	BPWD Item Code	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
	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
							15.19

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**

Cost abstract for effluent treatment plant ETP – Continuation

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
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

S. No.	Equipment / Drive Name	Nos.	Rate (In Lac Taka)	Amount (In Lac Taka)
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**

Cost abstract for effluent treatment plant ETP – Continuation

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	1.5
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**

Cost abstract for effluent treatment plant ETP – Continuation

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**

Cost abstract for effluent treatment plant ETP – Continuation

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 4.6 MLD	**690.00**

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				
	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

Sl. No.	Description	Quantity	Unit	Rate (in Taka)	Amount (in Taka)
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, instrumentation cables, cable end terminations, earthing system, field junction box. The system should be suitable for control/monitor from the centralized control station.	1	Lot	456,267	456,267
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	**41.62**

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	8696	217.00	1,887,026.85	**1.89**

Sl.No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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) Mass concrete in foundation (1:3:6) with cement, brick chips and sand of F.M. 1.2	Cum	669	6647.00	4,446,319.55	**4.45**

Sl.No	PWD SOR/2018	Description	Unit	Quantity	Rate in Taka	Amount	Amount in Million Taka
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	2845	12154.00	34,576,154.98	**34.58**

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	256035	82.00	20,994,900.75	**20.99**
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	923	434.00	400,430.10	**0.40**
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	1153	408.00	470,551.50	**0.47**

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	769	532.00	409,041.50	**0.41**
		Total Cost in Million Taka					**63.18**

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	98442	20.00	1,968,837.60	1.97
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	2461	1507.00	3,708,797.83	3.71
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	98442	54.00	5,315,861.52	5.32
		Total Cost in Million Taka					**10.99**

Cost abstract for support amenities

Cost abstract for admin building

Plinth area	Unit	Qty		
Ground floor	Sqm	750		
1st floor	Sqm	750		
Total built up area	Sqm	1500		

A. Foundation cost	Unit	Qty	rate	Total in Taka
Pile foundation	Sqm	750	60000	45000000
B. Superstructure cost				
Ground floor	Sqm	750	40000	30000000
1st floor	Sqm	750	40000	30000000
C. Other building cost				
Internal sanitary & water supply				
Ground floor	Sqm	750	5000	3750000
1st floor	Sqm	750	5000	3750000
Internal electrification				
Ground floor	Sqm	750	3000	2250000
1st floor	Sqm	750	3000	2250000
D.Additional superstructure cost				
Porch,water tank,parapet wall,compound wall,landscape & etc	LS	1		102140000
Total cost in Taka (A+B+C+D)				**219140000**

Cost abstract for fire station – B category

Sl. No	Description	Amount (in million Lac)	Remarks
A	**Construction works**		As per Fire Service & Civil Defence Department requirement (as per **BNBC-2006**)
1	Construction of 2-storied Fire Station	120	
2	Others Costruction Works	48	
Sub-Total (A)		**168**	
B	**Equipment & Others**		

3	Equipment	400.00	
	Furniture	10.00	
Sub-Total (B)		**410.00**	
Total (A+B)		**578.00**	
Consider **Safety factor 1.20** (only construction work) for BNBC-2020 application			
	So Total Construction Cost (lac)	201.60	
	Total Equipment Cost	410.00	
	Grand Total	**611.60**	