



Feasibility Study for MIRERSHORAI ECONOMIC ZONE

AUGUST, 2014



FEASIBILITY STUDIES FOR ECONOMIC ZONES
SUPPORT TO CAPACITY BUILDING OF
BANGLADESH ECONOMIC ZONES AUTHORITY PROJECT
UNDER PRIVATE SECTOR DEVELOPMENT SUPPORT PROJECT

Supported By the World Bank
Implemented By Bangladesh Economic Zones Authority (BEZA)
Under Office of Prime Minister, GoB.

Consultants



Executive Summary

1. The proposed Mirershorai Economic Zone (EZ) will be the first multi-sector EZ in the country, with an existing area of 6,615.12 acres (2,678.19 hectare)s, and it is also proposed that an additional area of 580.18 acres (233.64 hectares) of land to be reclaimed from the sea. The total Project area thus would stand at 7,195.30 acres (2,911.83 hectares). The proposed Mirershorai EZ has the potential to fulfill the conditions which are necessary to become a successful economic zone in the country. Formal establishment of the EZ is expected to immediately address the huge demand for industrial plots among both the local and foreign investment communities.

Site Justification

2. Field investigations reveal that, the proposed Mirershorai EZ area is one of the most suitable large sites in the country along the strategic Dhaka-Chittagong industrial corridor. Mostly because of its strategic location, it has the potential to contribute to the economic development of the country by attracting Foreign Direct Investment (FDI) and Domestic Investment (DI).

Location and Present Conditions

3. The proposed Mirershorai EZ site is located at the end of the eastern side of the Bay of Bengal, surrounded by the coast and Mirershorai Town. It is only 10 Km west of the national Highway (Dhaka-Chittagong Highway) and 11.5 Km west of the nearby Railway Station, with Chittagong City 60 Km south of this location. The Shah Amanat International Airport at Chittagong is located south of the site at a distance of 79 Km, and, the seaport is 67 Km south of the site. Azampur Bazar, the nearest market, is only 2 Km north from the site.

4. Present on-site land use consists of fish ponds or open fields without much economic activity. The current on-site infrastructure condition is:

- i) No power line
- ii) Only mobile telephone and no fixed lines
- iii) No gas supply
- iv) Two narrow access roads to extreme corners of the site
- v) No piped water comes to the site, and, the surface water in the adjacent Feni River is saline.

Study Findings

5. The results from competitive evaluation have been sourced from aggregating seventeen (out of more than fifty) largely quantitative indicators on which information have been collected. Aggregated variables include price, capacity, and zone size variables, which have been appropriately standardized.

6. The proposed Mirershorai EZ gets the highest billing according to the evaluation exercise. Second, third and fourth billing go to the Vietnam – Singapore industrial Park (VSIP), Amata City Bien Hoa Industrial park, Vietnam and Phnom Penh Special Economic Zone (PPSEZ) in that order. The ranking was found to be robust to alternative specifications of the aggregation scheme.

Potential Industries for Mirershorai EZ

7. Selection of industries of the proposed Mirershorai EZ has been made on the basis of the demand of industries for fully serviced industrial plots, position of sectors in their life cycle, and intent for expansion for greater market share.

Particulars	2017-2019	2021-2023	2024-2026
Expansion of Existing Industries	01. Garments & Garment Supporting Industries 02. Integrated Textiles 03. Motorbike Assembly 04. Food & Beverage 05. Paint & Chemical 06. Paper & Products 07. Plastics	To continue	-
Establishment of New Industries	01. Automobile Parts 02. Other Parts & Machinery	To continue	To continue from the previous period plus: 1. Automobile Assembly
Supporting Facilities	01. Coal-fired Power Plant 600MW 02. Coal Handling Jetty with stockyard		

8. A demand survey was conducted on 107 industries. In that survey 39 industries indicated interest in investing in the zone. The total demand is found to be 445 hectares. The study team's demand survey cannot be expected to cover the total supply of land of a large size EZ like Mirershorai. The survey was carried out as a sample of the total demand of the industries at that point in time. Development works are to be based on the demand for land which is expected to grow gradually with the passage of time. Survey results indicate that the various types of industries starting from garment manufacturing to motor cycle assembly showed interest in investing in Mirershorai EZ.

9. The following table shows a summary of the proposed industry mix for Mirershorai EZ.

Sector	Area per investment (ha)	2016-2030	
		Number of investors	Total areas for investment (ha)
Coal-fired power plant/Jetty	290	1	290
Garment	1	100	100
Garment accessories	1	42	42
Integrated textile	4	25	100
Motorcycle assembly	10	2	20
Automobile assembly	150	1	150
Automotive parts	2	252	504
Other parts and machinery	2	115	230
Chemical & Other Products	2	28	56
Food & Beverage	4	14	56
Rental Factory Zone			10
Commercial Area			20
Residential			68
Warehouse			18
Others (Medical College, Training Center, etc.)			41
Total		580	1,705

Employment Estimate for Mirershorai Economic Zone

10. It is expected that 101,000 jobs will be created by garments and supporting industries using 142 hectares (351 acres) of land. It is also expected that the integrated textile sector will employ about 40,000 workers with 100 hectares (247 acres) of land, while automobile and motorbike assembly, auto parts and other parts, and machinery, food & beverage, paint & chemical, paper products and plastic product industries are expected to employ 308,896 workers using total area of 1,017 hectares (2,511 acres). Apart from these, employment in the rental factories, service sector, coal-fired power plant, residential and commercial area is expected to be about 26,782. As such, 476,678 new jobs are expected to be directly created by this EZ. Additional 238,339 indirect employments (normally 50% of the direct employment) are likely to be created by the EZ. The total employment of direct and indirect employments may reach 715,017 workers after 7-10 years. Probably the Mirershorai area will be a new industrial city of over 1.0 million including the existing population when the EZ will be fully occupied and the industrial city became matured after 20-30 years later.

Master Plan and Phasing

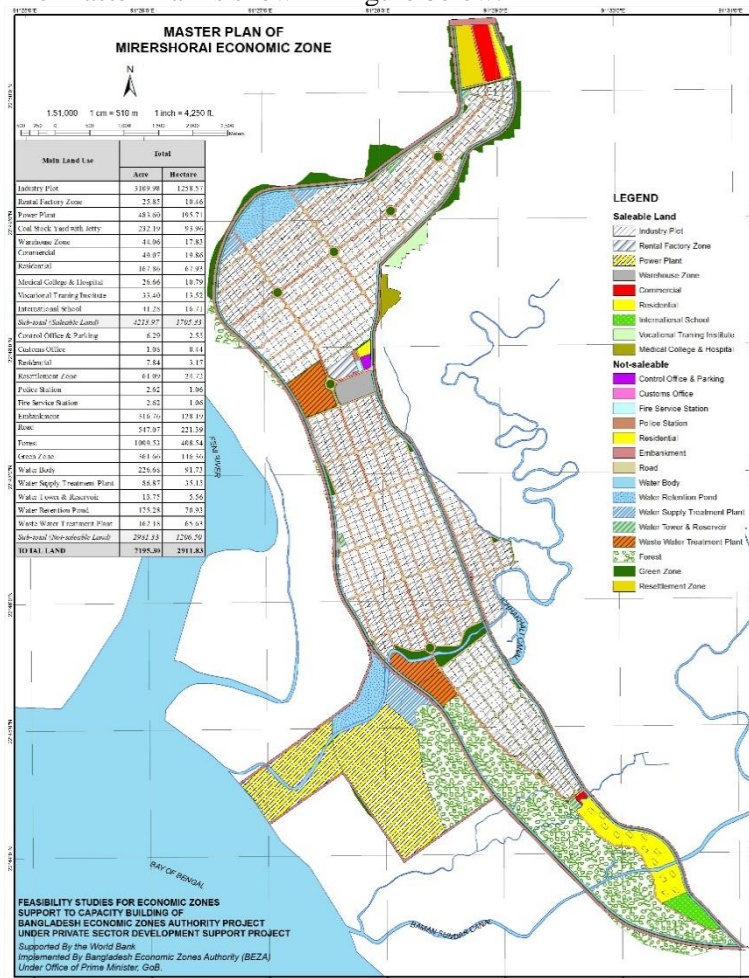
11. Of the total 6,615.12 acres (2,678.19 hectares) existing land area, 2,944.06 acres (1,191.93 hectares) is privately owned and hence needs to be acquired before the initiation of any development works on the EZ. The land is of lower elevation and protected by a small forest along the coast. Due to the less agricultural productivity and absence of proper flood control and embankment facility, this large area is almost barren. Some fishing ponds are found in the area which should be properly compensated. Mechanism is addressed in the report for swift acquisition of land and redressing grievance of the affected people. Detail of it can be found in Chapter 4. The remaining land of 3,671.06 acres (1,486.26 hectares) in the plan is owned by the government and can be used without engaging in any acquisition process.

12. Distribution of this land under different uses has been estimated to be as follows:

Land Use	Land Area in Acres				Total Area*		%
	Phase 1	Phase 2	Phase 3	Existing	Acres	Hectares	
Leasable Land	2,293.41	1,335.52	559.90	0.00	4,188.83	1,695.16	58.22
Rental Factory Land	25.85	0.00	0.00	0.00	25.85	10.46	0.36
Land for Administration	19.49	0.33	0.09	0.00	19.91	8.06	0.28
Land for Infrastructure	719.23	395.89	182.62	0.00	1,297.73	525.17	18.04
Green Zone and Others	403.56	73.88	60.87	1,063.58	1,601.88	648.26	22.26
Resettlement Zone	61.09	0.00	0.00	0.00	61.09	24.72	0.85
Total	3,522.63	1,805.61	803.47	1,063.58	7,195.30	2,911.83	100.0

*Land area includes the reclaimed land of 580.18 acre (233.64 hectare).

The Master Plan is shown in figure below.



13. The Mirershorai EZ will have a safe dike (9 metres above sea level) and modern infrastructure such as an efficient drainage system, a reliable and clean-coal power supply plant (600MW), a water supply treatment plant replenished by river water (collecting fresh water from the Feni River, 16 Km upstream from the site) and rainwater, a waste water treatment plant and communication system equipped to international standards, as well as access roads (two 4-lane access roads, 7 and 10 Km in length) from the existing Dhaka-Chittagong Highway. These strategically designed infrastructure elements are suitable for advanced foreign industries and will hopefully provoke new industrial chains in Bangladesh. “A New Gateway to Bangladesh” is the development concept recommended for the Master Plan of the site. The industrial area will be divided into 1 hectare (2.47 acres) plots for this EZ.

14. The feasibility study will be carried out within 2015. The approval of the zone, land acquisition, tender and design will be completed within the year 2016. The project is divided into three phases - first phase including design review (2017 to 2021), second phase (2022 to 2025) and third phase (2026 to 2028).

15. The construction cost estimates are prepared with three phasing plans. The phase 1 (2017 – 2021) of the Mirershorai Economic Zone requires BDT 26,854,852,386 (US\$335,685,655) for the onsite infrastructure and BDT 28,623,842,836 (US\$357,798,035) for the offsite and IPP-based infrastructure. Total 2,319.27 acres (938.57 hectares) of land will become saleable by 2019. The phase 2 (2022 – 2025) of the EZ requires BDT 14,039,450,316 (US\$175,493,129) for the onsite infrastructure and BDT 24,000,000,000 (US\$300,000,000) for IPP based infrastructure. At the middle of this phase additional 1,335.52 acres (540.47 hectare) of land will become saleable by 2024. The

phase 3 (2026 – 2028) requires BDT 6,604,492,004 (US\$82,556,150) for the onsite infrastructure. The remaining 559.90 acres (226.58 hectares) of land will become saleable by 2027.

16. Utility demand per hectare per day has been ascertained from the demand survey of 107 industries. Using this number the utility demand for the zone has been estimated. It was found that the total power demand in 2031 will be 574.28 MW and water demand 274,942.67 m³/day. These numbers has been used to finalize the capacity of the electric supply system, water supply treatment plant and waste water treatment plant in the Master Plan. A 600MW coal-fired power plant has been proposed to be established at the site. The capacity of the water treatment plant will be 280,000 m³/day, and, the waste water treatment plant will be 224,000 m³/day.

17. Building guidelines are prepared for the site and they include Architectural Plans, Compulsory Open Space Requirements, Compulsory Exterior Requirements, Utility Connections, and Approval of the Contractor. Specific figures are proposed for designating the high quality standard of the economic zones.

Possible Environmental Impact

18. The Initial Environmental Examination (IEE) covers existing environmental conditions and a qualitative assessment of the environmental impact of land filling activities and associated project components and includes recommended mitigation measures and environmental monitoring. The physical environment focuses on climate, topography and soil, geology, water resources, water quality, flooding and drainage and the diversity of flora and fauna. The Environmental Management Plan (EMP), which will deal with mitigation measures, implementation responsibilities, and monitoring plans, will result in minimal adverse impacts. As such, the Project will have an overall beneficial impact.

19. However, preliminary negative impacts of the proposed Project have been identified as follows:

- Erosion and accretion process posing a possible threat to EZ site
- Loss of paddy land and marshy areas due to proposed economic zone location
- Minor risk of degradation of aquatic habitat due to chemical pollution from the proposed garment, textile, automobile and parts, and machinery, and other industries.
- Contamination of surface and groundwater
- Leaching and disposal
- Effects on the natural environment

20. In order to determine the impacts in a precise way, a detailed Environmental Impact Assessment (EIA) is recommended, which will include monitoring and mitigation of a wide range of important environmental components for project sustainability, covering aspects such as (a) further exploration and assessment of the physical behaviour of the Feni River and the dynamic morphological process along the estuary to justify the suitability of the site for the Project; (b) identification, quantification, and valuation of impacts to ensure appropriate monitoring of parameters; (c) finding out suitable land reclamation and bank protection methods; (d) generating reliable data and further analysing the same to serve as a supplement to results and data from other sources; and (e) assessing implications of other existing and proposed projects and studies, including the impacts of the coal-fired power plant.

Social Assessment

21. The social analysis was done considering the World Bank's policies on involuntary resettlement, gender and tribal issues, physical, and cultural resources, and, considering the Land Acquisition and Requisition of Immovable Property Ordinance, 1982. Potential social impacts on people living on site and affected by the proposed offsite infrastructure of the EZ is also assessed in the study. During the field survey, it was found that a total 897 households will be affected by the establishment of the EZ

and will need to be resettled. For the widening and upgrading of the two access roads, 150 households will need to be resettled off-site. Thus the total resettlement requirement would be 1047 households. The project plans to resettle these households adjacent to the EZ area with modern amenities. However, the population who will benefit from the positive impact of the job creation by industrialization would be much higher, and will go beyond the Upazila, as the Mirershorai EZ will provide employment opportunities for about half a million workers.

Institutional Structure and PPP scheme

22. The institutional structure and the Public Private Partnership (PPP) scheme must be tailored to accommodate the existing conditions and achieve project development objectives. Considering all aspects the "concession PPP model" is recommended. The detail of this model is discussed in the report. In order to implement the EZ programme successfully BEZA should follow a workable legal framework and implementation process. Though the legal framework is present, the Authority is yet to formulate detailed guidelines and regulations in all major areas and this is to be completed prior to operation of the EZ.

23. Capacity building for BEZA officials is essential for the successful supervision and operation of the scheme. It may be mentioned that the present land regulation of 30 years lease may act as a barrier to attracting private developers/investors. The government has to increase the lease period up to 99 years or at least 50 years and give permission to transfer the leasehold properties. Details of this are given in the body of the report. One Stop Service (OSS) is to be practised properly while a Steering Committee is recommended for efficient and successful operation of the EZ.

Financial and Economic Analysis of the Project

24. The total project cost of the Mirershorai EZ is estimated to be US\$735.39 million excluding the off-site costs of US\$28.67 million. Revenue will mainly be generated from the long term lease of the land assembled for the project. The total amount of revenue generated from the lease of industrial and commercial land is estimated to be US\$1,103.35 million. Revenue will also be generated from leasing standard factory building space, premium charges for supplying water and waste water effluent treatment, and service charges for EZ management paid by each lessee on an annual basis.

25. Based on the estimated costs and revenues, the project Internal Rates of Returns (IRRs) in the base case and alternative scenario-2 stand at 21.24% and 28.43% respectively. The above IRRs could be achieved by funding all capital expenditures through cash instead of debt. With the debt/equity ratio utilized by the Special Purpose Vehicle (SPV) Company, investors could potentially secure a rate of return (equity IRR of 34.14% in the base case and 59.31% in scenario-2) higher than targeted/benchmark equity IRR of 18-20 percent for investment. The financial analysis indicates that the Mirershorai EZ is a financially feasible project for a developer &/or operator. The conclusion made for the Mirershorai EZ project is robust as the equity IRR in the base case remains above 25 percent even after considering either an increase of all costs by 10%, or a reduction of lease price and EZ service fee by 10%, or a combination of both.

26. BEZA should provide support in terms of (1) acquisition of land and (2) soft long term commercial loans guaranteed by the GoB and should finance the off-site infrastructure by public funding. The study considers a 'lease on sale' rather than a 'lease on rent' having lease period of 30 years and transferability conditions for the purpose of an SPV Company as the optimal transactional model for use in managing financial vehicles on the project.

27. With the inclusion of the cost of a coal-fired power plant, the project IRR comes down to 19.45% and 23.07% in the base case and scenario-2 respectively. It is needed to be mentioned that the financial analysis of EZ for 20 years operation includes the impact of first- and second cost of coal power plants respectively for 15 years and 11 years of its operation only as electricity generated by

coal-fired power plants is presumed to be sold respectively in the beginning year of 2021 and 2025, and forward thereafter up to the end of 2035.

28. The Economic Internal Rate of Return (EIRR) of the Mirershorai economic zone in the base-case scenario is found to be 28.41% with, and, 30.66% without the cost of the coal-fired power plant respectively. The project is economically viable, provided that the requisite quantity of electricity would be supplied to the enterprises on the zone using the IPP implementation platform. This conclusion is found to be robust throughout the ‘what-if’ scenarios of (i) a 10% increase in all costs; (ii) a 10% rollback in all benefits; and (iii) a combination occurrence of (i) and (ii).

Conclusion and Recommendations

29. Although this study was carried out over a short period of time as a preliminary Feasibility Study & Master Plan, taking all the information collected and evidence into consideration; the conclusion may be drawn that the proposed site is likely to be viable for the establishment of an Economic Zone and recommend BEZA/Bangladesh Government move to the next steps: (1) Land acquisition process, (2) Discussion with local residents who require relocation of their houses, (3) Off site infrastructure provision, and, (4) Identifying a potential developer. Once the potential developer is identified, they should conduct a further detailed market survey, soil testing, and hydrological survey and review the feasibility study according to the detailed survey results. Considering the severe shortage of well-equipped economic zones in Bangladesh and potential high demands for fully serviced industrial land, the project is likely to be successfully implemented. However, the benefits of the Project will greatly depend on how quickly and efficiently the proposed EZ moves forward towards eventual implementation.

Matrix Summary (Using Log-frame)

		Narrative Summary		Objectively Verifiable Indicators (OVI)				Means of Verification (MOV)	Assumptions		
Development Hypotheses	If Purpose, Then Goal	Project Goal: • Enhancement of Industrial Production and National Export.		• Goods worth of US\$3,000 million to be produced, out of which US\$1,500 million be exported by 2025.				<ul style="list-style-type: none"> • BEZA Project Record. • Record from Bangladesh Bank • Record from BBS 	<ul style="list-style-type: none"> • International market for Bangladeshi garments does not fall and maintain present growth rate. • No work stoppage and unruly behaviour of workers. • No severe natural calamities. • The national growth rate of production and export remain same. 		
		Project Purpose: • Mirershorai EZ operational.		<ul style="list-style-type: none"> • Construction of Phase 1 land (938.6 ha) is completed within 2020. Within 2021, 19% of the first phase land (181.47 ha) under industrial operation. • Total 1,479 ha land is developed at the end of the construction of Phase 2 in 2025. At that year 62% of the the developed land will be under industrial operation. • At the end of Phase 3 (End of year 2028); 83% of the total developed land (1,408.93 ha) is under industrial operation. Total developed land is 1,705.6 ha in 2028. • Mirershorai EZ is likely to be fully operational at the end of the year 2031. 							
Manageable Interest	If Outputs, Then Purpose	Output:		Quality		Quantity		Time (Year)	<ul style="list-style-type: none"> • BEZA Project Record. • Mirershorai Registry Office and AC Land Office Record • SPV Company Record 	<ul style="list-style-type: none"> • Export growth rate of Bangladesh does not fall. • No political disturbance like continuous blockade or hartal etc. • Government of Bangladesh provides continuous support to BEZA and allows connection of power and gas from national grid during project operation time. • Onsite coal-fired power plant of 600MW with jetty and stockyard functioning within 2025. • A warehouse of 186,991 m² area is operational within 2023. 	
		• Land Acquisition and Zone Approval by Government for EZ		Private Land Acquisition	2,944.06 acres (1,191.93 hectares)		2014-2016				
				Public Land Under Control	3,671.06 acres (1,486.26 hectares)		2014-2016				
				SRO published	1 SRO published.		2014-2016				
		• Selection and Engagement of SPV Company.		Experienced Developer	1 No.		2014-2016				
		• All infrastructure facilities developed.		Land Development, Road, Water Supply System etc.	Phase 1 & Design Review (2017-2021)		Phase 2 (2022-2025)	Phase 3 (2026-2028)			2017-2028
		(i)	Land Development completed	Site Clearing, Dredging, Reclamation, Levelling	3,522.63 acres (1,425.56 hectares)	1,805.61 acres (730.71 hectares)	803.47 acres (325.15 hectares)	Phase 1: 2017; Phase 2: 2021; Phase 3: 2026			
		(ii)	Dike System (Seaside & Inner side) developed.	Traditional dike protecting the site on all the sides from tidal surge and flooding	6,307 m	3,878 m	6,093 m	Phase 1: 2018; Phase 2: 2022; Phase 3: 2026			
		(iii)	Sheet Piling: Protection on Seaside at Jetty installed	Pile length 18m width 30cm, Sheet thickness 12mm	3000 m			Phase 1: 2017			
		(iv)	Road on top of Dike (Seaside and Inner side) is done	Road on top of inner side dike 4-lane highway	26,060 m	3,823 m	6,212 m	Phase 1: 2018; Phase 2: 2022; Phase 3: 2027			
		(v)	Road & Roundabout constructed.	33 m wide Main Road (Bituminous Carpet), 19.5 m wide Minor Road (Bituminous Carpet) Roundabout on Main road intersections	13,106 m 27,569 m 5 Nos.	4,317 m 35,205 m -	3,519 m 13,051 m 1 Nos.	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027			
		(vi)	Drainage System established.	U-Drain (W= 70cm, 1.0m, 1.2m, 1.5m, 1.8m, 2.0m, 2.5, 3.0m, 3.5m)	77,678m678 m	75,778 m	18,173 m	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027			
		(vii)	Plantation is done	High Trees along Dike Low Trees along Road and in Green Zone	High Tree 14,109 Nos. Low Tree 28,033 Nos.	High Tree 1,335 Nos. Low Tree 28,393 Nos.	High Tree 3,083 Nos. Low Tree 21,307 Nos.	Phase 1: 2020; Phase 2: 2025; Phase 3: 2028			
(viii)	Fencing is constructed.	Fencing around the perimeter	26,218 m	2,670 m	6,165 m	Phase 1: 2019; Phase 2: 2022; Phase 3: 2026					
(ix)	Box Culvert constructed.	Culvert (4 vent, 4.5x5m) of 2-lane and 4-lane	10 Nos.	2 Nos.	5 Nos.	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027					
(x)	Water Supply System established.	Treatment Plant (280,000 m ³ /day Total Capacity), Pipe Work, Water Tower, Hydrant, Valve etc.	Treatment Plant 1 No, Pipe Work 81,117 m & Others	Treatment Plant 1 No., Pipe Work 86,233 m & Others	Treatment Plant 1 No., Pipe Work 33,157 m & Others	Phase 1: 2019; Phase 2: 2024; Phase 3: 2028					
(xi)	Waste Water Collection and Treatment System installed.	Pipe works, Tower, Treatment Plant (224,000 m ³ /day total capacity) etc.	Pipe works 124,678 m etc.	Pipe works 135,861 m etc.	Pipe works 50,317 m etc.	Phase 1: 2019; Phase 2: 2024; Phase 3: 2028					
(xii)	Electrical System established.	132/33 and 33/11 KV SS, 11/0.4 KV transformer, Internal Networking, Street Lighting, Testing & Commissioning etc.	132/33 KV SS 1 set, 33/11 KV SS 4 set, 11/0.4 KV transformer 78 set, 116 Km Internal Network, etc.	33/11 KV SS 3 set, 11/0.4 KV transformer 74 set, 75 Km Internal Network, etc.	33/11 KV SS 2 set, 11/0.4 KV transformer 25 set, 24 Km Internal Network, etc.	Phase 1: 2020; Phase 2: 2025; Phase 3: 2027					
(xiii)	Telecommunications System installed	FTTc 7,500 subscribers, OFC Network, Router, ODF, Power System etc.	FTTc 1 set, Router 1 set, OFC network 75,454 m etc.	OFC Network 51,396 m	OFC Network 19,757 m	Phase 1: 2020; Phase 2: 2025; Phase 3: 2027					

Narrative Summary		Objectively Verifiable Indicators (OVI)					Means of Verification (MOV)	Assumptions
(xiv)	Residential and Administrative Buildings constructed.	Staff Quarter (232, 139, 93 & 56 m ² Buildings), Control Office 4000 m ² & Customs Office 400 m ² Rental Factory Building 2-storied; Total floor space 2,000 m ² /factory building	Control Office 2,000 m ² , Customs Office 440 m ² , Rental Factory 38,000 m ²	Staff Quarter Building 9 Nos; Customs Office 220 m ² , Rental Factory 34,000 m ²	Customs Office 220 m ²	Phase 1: 2020; Phase 2: 2025; Phase 3: 2028		
	Land Leased out to local and foreign investors by SPV company	Local & foreign investors	Minimum 189 investors are allowed to setup their industries in EZ	Minimum 196 investors are allowed to setup their industries in EZ	Minimum 120 investors are allowed to setup their industries in EZ	Phase 1: 2021; Phase 2: 2025; Phase 3: 2028		
Inputs: Activities and Type of Resources		Quality	Quantity			Time (Year)	<ul style="list-style-type: none"> • BEZA Project Record. • Mirershorai Registry Office and AC Land Office Record 	<ul style="list-style-type: none"> • Private land owners cooperate with BEZA and handover their land for EZ. • Land regulation is changed by the government (longer leasing period for 50 years and transferability condition) • Good response from local and foreign developer company. • Present level of attraction for Bangladesh as investment destination remains unchanged. • Capable and experienced developer is interested to invest BDT 48,000,000,000 (USD 600,000,000) to construct a Coal-fired Power Plant with Jetty and Stockyard within 2025. • Warehouse is constructed by an independent investor by 2023. Total cost is estimated to be BDT 2,330,478,429 (USD 29,130,980).
• Meeting of Board of Governors of BEZA arranged and SRO published declaring proposed site as Mirershorai EZ.		Meeting of Board of Governors of BEZA	1 meeting			2014		
• Floating tenders for selection of SPV Company		Tendering Process	1 No.			2014		
• Development of Infrastructure		Detail Design	1 No.	1 No.	1 No.	Early 2015		
(i)	Land Development	Site Clearing, Dredging, Reclamation (580.18 acres or 233.64 hectares), Levelling	BDT 8,891,428,388 (USD 111,142,855)	BDT 3,645,660,545 (USD 45,570,757)	BDT 2,062,010,012 (USD 25,775,125)	Phase 1: 2017; Phase 2: 2021; Phase 3: 2026		
(ii)	Dike System (Seaside & Inner side)	Traditional dike protecting the site on all the sides from tidal surge and flooding	BDT 2,613,587,644 (USD 32,669,846)	BDT 164,591,148 (USD 2,057,389)	BDT 267,426,088 (USD 3,342,826)	Phase 1: 2018; Phase 2: 2022; Phase 3: 2026		
(iii)	Sheet Piling Protection on Seaside at Jetty	Pile length 18m width 30cm, Sheet thickness 12mm	BDT 386,522,646 (USD 4,831,533)	-	-	Phase 1: 2017		
(iv)	Road on top of Dike (Seaside and Inner side)	Road on top of seaside dike 2-lane highway; Road on top of inner side dike 4-lane highway	BDT 245,176,068 (USD 3,064,701)	BDT 126,540,044 (USD 1,581,751)	BDT 252,350,992 (USD 3,154,387)	Phase 1: 2018; Phase 2: 2022; Phase 3: 2027		
(v)	Road & Roundabout	19.5 m and 33 m wide road and roundabout	BDT 4,036,911,807 (USD 50,461,398)	BDT 3,242,312,217 (USD 40,528,903)	BDT 1,478,947,264 (USD 18,486,841)	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027		
(vi)	Drainage System	U-Drain (W= 70cm, 1.0m, 1.2m, 1.5m, 1.8m, 2.0m, 2.5, 3.0m, 3.5m)	BDT 1,972,650,225 (USD 24,658,128)	BDT 1,734,683,484 (USD 21,683,544)	BDT 270,118,440 (USD 3,376,481)	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027		
(vii)	Plantation	High Trees along Dike Low Trees along Road and in Green Zone	BDT 46,815,980 (USD 585,200)	BDT 32,339,736 (USD 404,247)	BDT 27,801,873 (USD 347,523)	Phase 1: 2020; Phase 2: 2025; Phase 3: 2028		
(viii)	Fencing	Fencing around the perimeter	BDT 115,358,993 (USD 1,441,987)	BDT 11,746,982 (USD 146,837)	BDT 27,127,920 (USD 339,099)	Phase 1: 2019; Phase 2: 2022; Phase 3: 2026		
(ix)	Box Culvert	Culvert (4 vent, 4.5x5m) of 2-lane and 4-lane	BDT 87,400,023 (USD 1,092,500)	BDT 23,900,002 (USD 298,750)	BDT 55,699,990 (USD 696,250)	Phase 1: 2019; Phase 2: 2025; Phase 3: 2027		
(x)	Water Supply System	Treatment Plant (280,000 m ³ /day Total Capacity), Pipe Work, Water Tower, Hydrant, Valve etc.	BDT 2,356,443,280 (USD 29,455,541)	BDT 1,467,823,634 (USD 18,347,795)	BDT 812,304,534 (USD 10,153,807)	Phase 1: 2019; Phase 2: 2024; Phase 3: 2028		
(xi)	Waste Water Collection and Treatment System	Pipe works, Tower, Treatment Plant (224,000 m ³ /day total capacity) etc.	BDT 2,739,373,356 (USD 34,242,167)	BDT 2,034,507,942 (USD 25,431,349)	BDT 1,202,269,721 (USD 15,028,372)	Phase 1: 2019; Phase 2: 2024; Phase 3: 2028		
(xii)	Electrical System	132/33 and 33/11 KV SS, 11/0.4 KV transformer, Internal Networking, Street Lighting, Testing & Commissioning etc.	BDT 1,393,924,350 (USD 17,424,054)	BDT 294,010,012 (USD 3,675,125)	BDT 111,300,000 (USD 1,391,250)	Phase 1: 2020; Phase 2: 2025; Phase 3: 2027		
(xiii)	Telecommunication System	FTTc 7500 subscribers, OFC Network, Router, ODF, Power System etc.	BDT 205,672,860 (USD 2,570,911)	BDT 77,094,550 (USD 963,682)	BDT 29,635,150 (USD 370,439)	Phase 1: 2020; Phase 2: 2025; Phase 3: 2027		
(xiv)	Residential and Administrative Buildings	Staff Quarter (232, 139, 93 & 56 m ² Buildings), Control Office 4,000 m ² & Customs Office 400 m ² Rental Factory Building 2-storied; Total floor space 2,000 m ² /factory building	BDT 1,763,586,766 (USD 22,044,835)	BDT 1,184,240,020 (USD 14,803,000)	BDT 7,500,020 (USD 93,750)	Phase 1: 2020; Phase 2: 2025; Phase 3: 2028		
(xv)	Total Construction Cost	Construction cost of all on-site infrastructure	BDT 26,854,852,386 (USD 335,685,655)	BDT 14,039,450,316 (USD 175,493,129)	BDT 6,604,492,004 (USD 82,556,150)	Phase 1: 2021; Phase 2: 2025; Phase 3: 2028		

Note: Existing land of 1,063.58 acres (430.41 hectares) under forest and water bodies will be kept as it is. Land regulations should be included into as one of the inputs, as it is a critical assumption. Carefully choosing experienced and capable SPV Company and supervision and monitoring development works are needed. Training of BEZA Officials is essential. Offsite infrastructure cost is not included into the matrix. Total offsite cost is BDT 2,293,364,407 (USD 28,667,055). This cost should be borne by the government and have to start and should be completed simultaneously along with the project.

Abbreviation

ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BB	Bangladesh Bank
BBS	Bangladesh Bureau of Statistics
BEPZA	Bangladesh Export Processing Zone Authority
BEZA	Bangladesh Economic Zone Authority
BG	Broad Gauge
BIAM	Bangladesh Institute of Administration and Management
BIFFL	Bangladesh Infrastructure Finance Fund Limited
BIWTA	Bangladesh Inland Water Transport Authority
BOI	Board of Investment
BPDB	Bangladesh Power Development Board
BTMA	Bangladesh Textile Manufacturers Association
BWDB	Bangladesh Water Development Board
CCI&E	Chief Controller of Imports and Exports
CCT	Chittagong Container terminal
CDs	Customs duties
CDSP	Char Development and Settlement Project
CEPZ	Chittagong Export Processing Zone
CNG	Compressed Natural Gas
CNN	Cable News Network
CPA	Chittagong Port Authority
DBFOOT	Design-Build-Finance-Own-Operate-Transfer
DC	Deputy Commissioner
DG	Double Gauge
DoE	Department of Environment
EA	Environmental Assessment
EBRIDP	Eastern Bangladesh Rural Infrastructure Development Project
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
EIA	Environmental Impact Assessments
EIRR	Economic Internal Rates of Return
EMP	Environmental Management Plan
ENPVs	Economic Net Present Values
EPZ	Export Processing Zone
ETP	Effluent Treatment Plant
EZs	Economic Zones
FDI	Foreign Direct Investment
FGD	Focus Group Discussions
FOC	Fiber Optic Cable
Ft/ft.	Foot/foot
GCB	General Cargo Berth
GDP	Gross Domestic Product
GoB	Government of Bangladesh
Ha/ha	Hectare
HS	Harmonic-systems
ICD	Inland Clearance Depot
ICT	Inland Container Terminal
ICZM	Integrated Coastal Zone Management
IDCOL	Infrastructure Development Company Limited
IFC	International Finance Corporation
IPFF	Investment Promotion and Financing Facility

IPP	Independent Power Producer
IPs	Industrial Parks
IRR	Internal Rate of Return
JBIC	Japan Bank for International Cooperation
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
Km	Kilometre
KV	Kilo-volt
KWH	Kilo-watt Hour
LGED	Local Government Engineering Department
LIBOR	London Interbank Offered Rate
m	metre
MES	Minimum-Efficient-Scales
MMCFD	Millions of Cubic Feet per Day (of gas)
MPa	Megapascal
MSL	Mean Sea Level
MTD	Multimodal Transport Document
MTO	Multimodal Transport Operator
MW	Mega-watt
NCS	National Conservation Strategy
NCT	New Mooring Container Terminal
NEMAP	National Environmental Management Plan
NPV	Net Present Value
O&M	Operation and Maintenance Costs
ODA	Official Development Assistance
ODF	Optical Distribution Frame
OSS	One-Stop-Service
PAP	Project Affected People
PFI	Participating Financial Institution
PGCB	Power Grid Company of Bangladesh
PIU	Project Implementation Unit
PPP	Public-Private Partnership
PRG	Partial Risk Guarantees
QOL	Quality-of-Life
RAP	Resettlement Action Plan
RD	Regulatory Duty
REA	Rapid Environmental Assessment
REB	Rural Electrification Board
RMG	Ready-made Garments
SCF	Standard Conversion Factor
SD	Supplementary Duty
SEZ	Special Economic Zone
SME	Small and Medium-sized Enterprises
SOB	Survey of Bangladesh
SPV	Special Purpose Vehicle
SWOT	Strength, Weakness, Opportunity, and Threat
TEU	Twenty-foot Equivalent Unit
UNO	Upazila Nirbahi Officer
VAT	Value-added Taxes
VGf	Viability Gap Financing
WARPO	Water Resources Planning Organization
WATSAN	Water Supply and Sanitation
WB	World Bank

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Distance Table

Distance Table: Mirershorai

Distance (in Km)	Location (from Mirershorai)
2	Azampur Bazar
7	Highway (via Muhuri Project Road)
10	National Highway (via DC Obaidullah Road)
11.5	Borotakia Railway Station
66	District Headquarter
67	Chittagong City
67	Chittagong Port
79	Chittagong Airport (Shah Amanat International Airport)
85	Chittagong port by sea route
182	Dhaka City

Exchange Rate used in this report	
US \$ 1	BDT 80

CHAPTER 1

INTRODUCTION

1.1 Background

Bangladesh had achieved sustained annual GDP growth of approximately 6.3% during the Financial Years (FY) 2005-2009, even after the global financial crisis and global food price shock. This growth was underpinned by stable macro-economic and prudent monetary policies, rising industry and service outputs and a continued high level of exogenous remittances. Going forward, the objective of the Government of Bangladesh (GoB) is to develop a growth trajectory that will support an overall increase in the real GDP growth to 8% per annum and reduce poverty from 40% to 15% by 2021.

The uninterrupted growth in the number of Bangladeshis entering the labour force - nearly 2 million people/year - is an asset that simultaneously increases the country's vulnerability. Creating productive employment will largely depend on creating an environment conducive to private sector investment, particularly for establishing labour-intensive manufacturing and service industries.

The Government of Bangladesh (GoB) has successfully provided tailored infrastructure services and a business environment through the operation of the Export Processing Zones (EPZs). The Bangladesh Export Processing Zone Authority (BEPZA) was established in 1980. The EPZ Program was the first systematic initiative to provide fully-serviced land and a better business environment for investors, targeting establishment of large-scale export-oriented manufacturing industries in the country.

But, the hard fact remains that, Bangladesh's EPZ Model has its limitations, both in terms of generating cumulative positive impact and in terms of creating spill-over to the domestic economy. As an exporting enclave, EPZs have provided little in the way of creating linkage effects in the domestic economy, either up-stream or down-stream, resulting in low technology and spill-over, which usually accompany foreign investment. Investments in other sectors beyond the low capital investment oriented RMG sector have also not materialized.

The Government's objective is, therefore, to maximize potential direct and indirect impacts through a more modern, generalized regime for Economic Zones (EZs). The Government has launched an effort to establish a new EZ paradigm for Bangladesh drawing tenaciously from successful examples of EZs around the world, as well as Bangladesh's positive experience with the EPZ model. The expectation is that more spill-over benefits will be harnessed by local firms from foreign direct investment and as such, additional investment will be encouraged within value chains, more local products will be procured, and better linkages will be established between commercial firms and educational institutions. A faster adaptation to international environmental and social practices in the private sector would also be encouraged through the new EZ policy.

The new EZ regime provides for a new approach, both in management and in investment. The policy allows the Government to develop and pilot an approach that is less reliant on Government subsidies, while leveraging comparative advantages and private sector capability wherever possible.

The Economic Zone Act was passed in the Parliament in August 2010, providing the overall framework for establishing EZs all over Bangladesh.

1.2 Objectives of the Project

Against the backdrop of the above scenario, the objective of the Project is to attract and leverage private investment from multiple sources in the development of the Economic Zones. These investors will act as the Zone developers or operators and in the provision of tailored infrastructure services, such as the private provision of power, effluent treatment, etc. selected on a Public-Private Partnership (PPP) basis.

1.3 Objectives of the Study

The objective of the study was to provide the necessary data, information, and analysis sufficient to determine the feasibility of the proposed Mirershorai EZ - one of the three initially selected locations for the study.

1.4 Scope of the Study

This feasibility study is specifically made for the Mirershorai site only. It comprises the following components.

- Component – 01: A Competitiveness Analysis, including Transport Assessment, Industry/Market Assessment, and Demand Forecast;
- Component – 02: Master Planning, Infrastructure Requirements, and Environmental and Social Review;
- Component – 03: Institutional Framework; and
- Component – 04: Economic and Financial Modelling.

1.5 Study Methodology Adopted

The study has followed a market-driven approach and the methodology followed consists of a collection of both qualitative and quantitative data and information from both primary and secondary sources, as has been indicated in the ‘Description of Approach, Methodology, and Work Plan’ submitted in response to the Terms of Reference, with emphasis on the technical, economic, marketing, and financial soundness of the proposed Project site.

1.6 Stakeholders’ Meetings and Workshops Organized

1.6.1 Organization of Stakeholders’ Meetings:

During the interim period, stakeholders’ meetings were held at the following places/locations:

- a) Meeting with UNO at Mirershorai Upazila on July 08, 2013.
- b) Meeting with the Union Council Chairman and local people on July 08, 2013.
- c) Chittagong Chamber of Commerce & Industry on September 02, 2013 (minutes of the meeting can be found in the annex report submitted with the Sherpur Interim Report)

1.6.2 Organization of Workshops

The first workshop was organized in Dhaka at the auditorium of Bangladesh Institute of Administration and Management (BIAM) on September 10, 2013. The Workshop was presided over by Mr Abul Kashem, Executive Member, BEZA, in which Mr Fakhrul Islam, Executive Chairman, BEZA, participated as the Chief Guest. The workshop agenda was as follows:

- a) Addresses by the distinguished guests.
- b) Presentation of the Project Inception Report by Dr. Shoichi Kobayashi, Team Leader of the Feasibility Study Project.
- c) Open discussion.
- d) Address by the chief guest

The second workshop was held on November 28, 2013 in the Ball Room of Ruposhi Bangla Hotel. The workshop was presided over by Mr Fakhrul Islam, Executive Chairman, BEZA while Mr Shaikh Md. Wahid-uz-Zaman, Principal Secretary, Prime Minister's Office; attended the workshop as the chief guest. The agenda of the workshop was as follows:

- a) Address by the distinguished guest & Project Director, BEZA office
- b) Presentation on the Interim Report of the Feasibility Study by Dr. Shoichi Kobayashi, Team Leader
- c) Address by the Principal Secretary, Prime Ministers' Office and chief guest of the function
- d) Question and answer session
- e) Address by the BEZA Chairman & Secretary (in charge)

The third and final workshop was held on February 23, 2014 at the Ball Room of The Westin Hotel, Gulshan. The workshop was presided over by Mr. Fakhru Islam, Executive Chairman (Secretary in Charge), BEZA whereas the Honorable Minister, Ministry of Housing and Private Works Engineer Mosharraf Hossain MP attended the workshop as the chief guest. Honorable Advisor to the Honorable Prime Minister Dr. Mashiur Rahman, Honorable State Minister, Ministry of Land Mr. Saifuzzaman Chowdhury (Javed), and Secretary Prime Minister's Office Mr. Abul Kalam Azad attended the workshop as special guests. Among others President, FBCCI & President, Chittagong Chamber of Commerce and Industry were also present. The agenda of the workshop was as follows:

- a) Welcome address by the Executive Chairman, BEZA
- b) Power Point presentation on the Draft Final Report by the team leader Dr. Shoichi Kobayashi.
- c) Address of the special guests
- d) Address of the Chief guest
- e) Open discussion on the Draft Final Report
- f) Vote of thanks by the Project Director

1.7 Location of Project Area

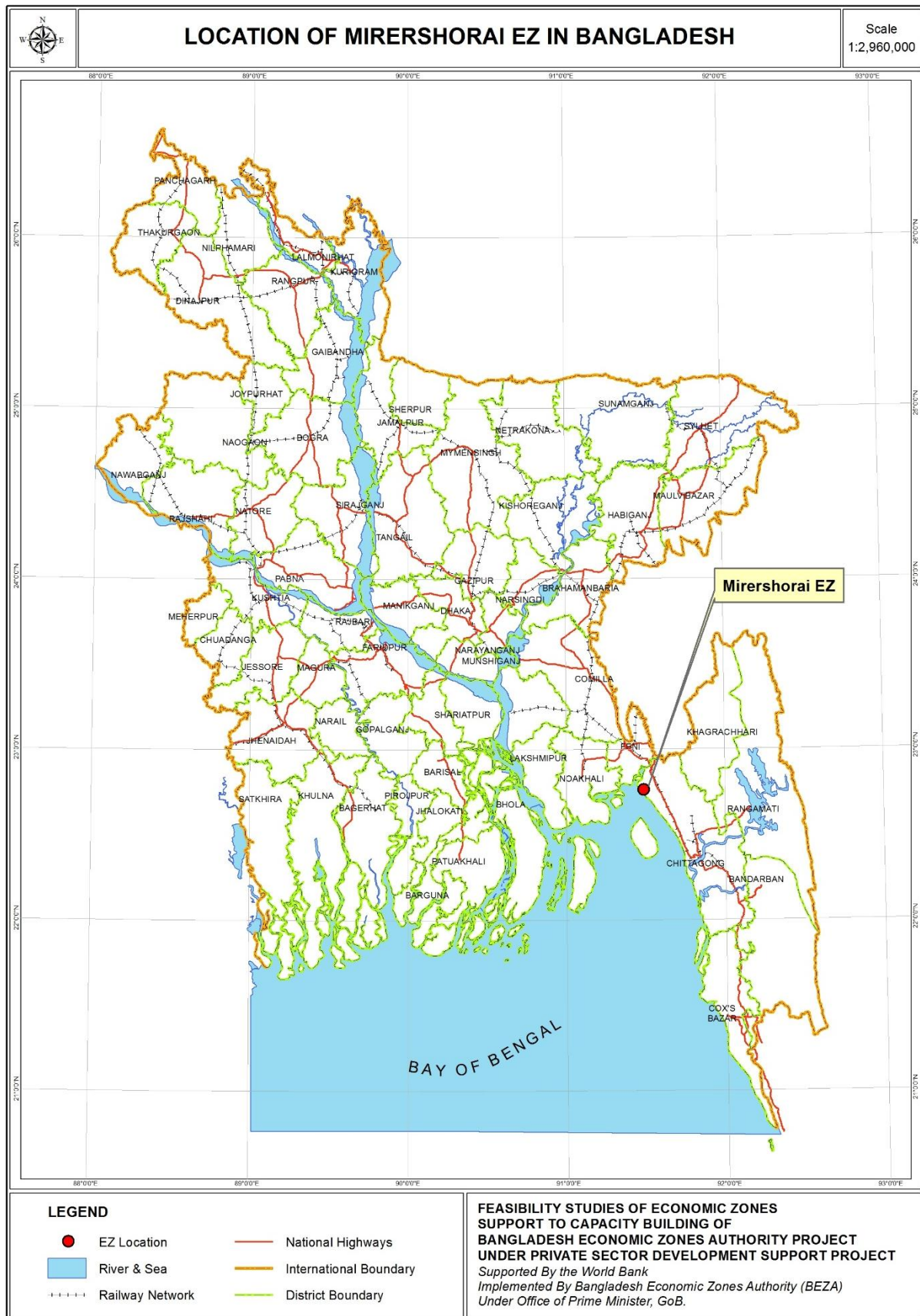
The location of the project area, Mirershorai EZ, is in Mirershorai Upazila of Chittagong District. It is situated on the seashore, southeast of Mirershorai Upazila Complex and at a distance of 13 Km from it. The list of mouzas¹ falling into this EZ is given in the following table. Figure 1.8-1 shows the location of Mirershorai EZ in Bangladesh.

Table 1.7-1: List of Mouzas in Mirershorai EZ

Sl. No.	Mouza Name
1	Purba Ichhakhali
2	Domkhali
3	Dakshin Maghadia
4	Saherkhali
5	Banshkhali
6	Uttar Ichhakhali
7	Pashchim Ichhakhali
8	Nilokkhir Char
9	Companingagar

¹ Mouza is the unit of a cadastral survey in Bangladesh

Figure 1.7-1: Location of Mirershorai EZ in Bangladesh



CHAPTER 2

COMPETITIVE ADVANTAGE AND
INDUSTRY ASSESSMENT

(COMPONENT 1)

2.1 Comparative Analysis of the Mirershorai Economic Zone (EZ)

The following subsections assess the relative competitiveness of the proposed Mirershorai Economic Zone (EZ) project. One focus of the following material is about the results of a competitive evaluation exercise. The rest of the section provides a rationalization of the selection of Mirershorai. The material in the subsections is structured as follows - subsection 2.1.1 discusses the methods and data chosen to perform the analysis. There, we devote ourselves to presenting the detailed data generated. The sources are shown as footnotes attached to the findings to which they relate. Towards the end of that subsection, we present the results from our exercise that give off the ranks among the economic zones (EZs)/industrial parks (IPs) under examination. Section 2.1.2 is about the strengths, weaknesses, and threats for the site selected for the Mirershorai EZ.

2.1.1 Benchmarking Assessment

2.1.1.1 Methodology

Comparative assessment usually yields a summary measure that fuses together a large number of quantitative investment or locational factors. One needs a scheme for aggregation across a number of such variables. In all, we have tried to marshal data on more than fifty variables, presented in Table-2.1.1-1 below. Despite our best efforts to the contrary, there are a small number of gaps in the data. In any case, it is impracticable to generate a ranking using the much larger set of fifty or so variables.

A smaller number of core criterion used in the evaluation appear here:

- (1) Size of each zone;
- (2) Number of plots;
- (3) The unit lease-price and fee on account of maintenance of infrastructure;
- (4) If land is leased or sold, or if a mix prevails;
- (5) If the zone-developer offers pre-built facilities as well as land on the zone, and unit costs of such facilities;
- (6) Availability and access-costs of treated and piped water, ready and reliable power supply, telecommunications network;
- (7) Availability of treated waste-water;
- (8) Solid-waste removal facilities;
- (9) Piped supply of natural gas;
- (10) The entire range of incentives defining the package for the economic zones;
- (11) Wages of each of three categories of workers, i.e. management, skilled and largely unskilled workers;
- (12) Labor indicators (rigidity of working hours index, difficulty in hiring);
- (13) International freight rates
- (14) Tele-communications rates;
- (15) A comprehensive battery of zone-related economic and financial incentives (including the tenure of tax-holiday on the corporate income tax (CIT); the extent, if any, of CIT rate-relief after tax-holiday expiry; the extent of tax-relief, if any, accorded to export-oriented firms in the zone/park on account of imported materials and components; exemptions from import duties, in years; partial waivers of import duties, in years)
- (16) A more comprehensive bundle of quality-of-life (QOL) factors including whether 24*7 security is provided by the zone-management or have to be tenants-arranged, the percentage of open space (roads, parks, golf-course, etc) in total zone area; the existence and the proximity of educational facilities from the residential blocks.

2.1.1.2 The Choice of an Aggregator

Now that quite a good number of data fragments have been generated, one needs a scheme for aggregation. We propose a number of quantitative variables to underlie this aggregation exercise:

- ✓ zone size;
- ✓ lease duration;
- ✓ power-charges;
- ✓ water-charges;
- ✓ waste-water charges;
- ✓ land-lease charges;
- ✓ cargo rates;
- ✓ telecoms rates;
- ✓ wage rates;
- ✓ Water-treatment plant capacity per hectare;
- ✓ Waste-water treatment plant capacity per hectare;
- ✓ Whether a high-quality school exists on the economic zone;
- ✓ The length of the tax-holiday allowed in the tax-code of the country;
- ✓ Country rank per World Economic Forum's Global Competitiveness Index, 2013.

The foregoing competitive indicators come in two categories. First, there are the unit charges that need to be paid, like the unit user-cost for using power. The lower they are, the more attractive is the EZ in question. In contrast, then there are the indicators, such as average capacity of the water-treatment plant per hectare of land in the EZ. The higher they are, the more attractive is the EZ in question. The two kinds of indicators ought to enter into the averaging scheme differently from each other. More specifically, the indicators whose values correlate inversely with the degree of attractiveness, ought to be subtracted from 1 before being inserted into the averaging scheme, whereas no similar compulsion exists for the other series of indicators.

Each price-like variable is standardized, and expressed as a percentage difference relative to the highest value observed. That is, each cost variable value is a measure of the cost-advantage it represents relative to the highest-cost zone. That advantage is measured as 0 for the highest-cost zone in a given case, and it is the highest for the lowest-cost zone. In symbols,

$$I_{ij} = \frac{X_{ij} - \text{Min}(X_{ij})}{\text{Max}(X_{ij}) - \text{Min}(X_{ij})}$$

Where, I_{ij} is the i 'th economic zone's value for the j 'th attribute.

Where X_{ij} is the index value i of country j , Min is the smallest value in the sample and Max the largest. The top country in the sample has the value 1 while the worst performing country has the value 0.²

The foregoing formulation is appropriate when attractive is a direct function of the I_{ij} above. Where the converse is the case, we need to invoke the expression of $1 - I_{ij}$.

$$I_{ij} = 1 - \frac{X_{ij} - \text{Min}(X_{ij})}{\text{Max}(X_{ij}) - \text{Min}(X_{ij})}$$

² This basic method is adapted here from UNIDO, "Vietnam Industrial Competitiveness Report.", Vienna, 2011 available at http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Reports/Other_Reports/VICR2011%20final.pdf, box-1, page 25 accessed February 27, 2014)

(http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Reports/Other_Reports/VICR2011%20final.pdf, box-1, page 25) accessed February 27, 2014)

Aggregative competitiveness of i 'th economic zone/industrial park is therefore average value of the two sets of I_{ij} s over a desired domain of attributes. At its most inclusive state, our domain of choice includes seventeen (out of a total of some fifty-one) attributes, all quantitative.

Both I_{ij} and $1-I_{ij}$ are mirror images of each other, and have the same range of values, ie between 0 and 1. The index is calculated as the arithmetic mean of the standardized values of those two indicators, namely, the I_{ij} s and the $1-I_{ij}$ s. Averaging can meaningfully be done because both indexes fall in the same range of values. All indicators are given equal weight.

2.1.1.3 Data

We have made a diligent effort to locate the information from the following sources: (i) a large number of web-sites, including those hosted by the authorities that run these comparator industrial parks or special economic zones (SEZ) as the case may be; (ii) a quite exhaustive collection of research papers brought out by agencies as JETRO, JICA, UN ESCP; (iii) academic outputs that presented relevant scraps of information. The annex to this chapter provides greater details. When the extensive Web-based research proved to be not entirely satisfactory, we took the initiative of sending by email a questionnaire to each of the comparator IPs, with a request that the authorities return the courtesy by filling up and sending back the questionnaires. Out of the respondents, the management of Amata, Vietnam, responded with full disclosure, while Mahindra World City's response is still awaited at this stage. Despite reminders, none of the other EZs/IPs has responded to our questionnaire. The filled-in questionnaire from the Amata Vietnam is attached in the Annex to this section. Despite our best efforts, there still, as can be seen in the benchmarking chart below, are gaps in information.

A very large proportion of the data we use comprises quantitative ones, such as the unit leasing price of land per square-meter, for example. Units are always cited with regard to such quantitatively recorded data in the interest of complete transparency. Some of the data, however, also happen to be qualitative, for example: case in point is whether the economic zone in question provides for solid-waste removal, pipeline for natural gas, pre-built factories, an one stop service (OSS) in the EZ in question. The valid responses to such categorical questions happen to be '1', '0', and 'NA (not applicable)'. For such situations calling for qualitative answers, the domain of valid answers includes three values, 1 to denote unconditionally yes, 0 to denote no. NA denotes 'not available', which is a valid value.

Data related to the rigidity of working hours index and difficulty of hiring index are both from Doing Business 2011. The 2011 report of Doing Business did not include any information relating to the difficulty-of-firing index. Information on non-wage labor costs in % of salary was looked for. With the exception of Vietnam, Thailand and Cambodia reported for the first two countries in admittedly dated sources of MIGA (for 2003) and by New York Times in 2012 for Cambodia, the incidence of such non-wage labour costs are negligible in the other countries. Those sources have been cited in the Annex to this chapter. There have been reports that employers on Cambodian SEZs such as the Manhattan SEZ avoid paying such social security costs. In fact, as the authors of the a report³ show, Taiwanese bi-cycle producer, Bestway Bi-cycle Factory, located on Cambodia's Manhattan SEZ, do not even pay the country's minimum wage of US\$61 per month to its workers. It only pays US\$31 to many of its workers. This is probably because this particular Taiwanese firm does not allow its workers to form unions. Exception does exist, too, in some of Cambodia's other well-known SEZs. For example, the same authors report that yet another, large, Taiwanese exporter of ready-made garments to the United States located on the Phnom Penh SEZ, Evergreen Garments, pay US\$61 to their workers. We have not benchmarked our economic zones on the basis of social-security labor

³ <http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

costs for the foregoing reasons. As well, next to nothing in information is available for the industrial park Kyaukpyu in Myanmar, largely because the latter is still and will remain under implementation for some more time. Despite our best efforts, inland cargo-freight rates for a recent comparable year have not been available through our Web-based search, and are therefore left blank.

One of our respondents from AMATA Viet Nam, Ms. Kim (kim@amata.com) had this to write to us in an email, dated November 21, 2013: “Please kindly understand that there are several "Not Available" (NA) figures, which means cases in which our tenants contact the supplier and deal directly with them. Figures vary year by year. Thus, these figures are only valid this year.” The acronym NA (Not Available) occurs at several places in the table. The acronym NA, that stands for not available occurs at several places in the table.⁴

⁴ In comments made by the World Bank, exception was taken to the use by the member of a JDI team, in an earlier draft, of ‘personal communications’, reproducing a part of an email message that was sent by a JDI correspondent in official capacity. As well as a very exhaustive desk- and Web-based research we also contacted authorities that had originally developed the seven Industrial Parks: a questionnaire soliciting all needed information was sent by email. Ms Kim alone filled in the entire questionnaire: no one else did. Her ownership in this World Bank sponsored study was stellar. Her testimony therefore was to be valued and disseminated. She shared an important *institutional* detail shedding critically-important light on how much to lean on the kind of data that we had solicited. How were we expected to cite her testimony? We quote guidance from the University of Chicago Press in its answers to frequently asked questions: “Q: Do I need to cite everything I use in the paper? A: Pretty much. Cite anything you rely on for data or authoritative opinions. Cite both quotes and paraphrases. Cite *personal communications* such as e-mails, interviews, or conversations with professors if you rely on them for your paper (italics added)” <http://www.press.uchicago.edu/books/lipson/honestcollege/citationfaq.html>. Many similar endorsement of our practice of citing Kim’s testimony as ‘personal communication’ is being omitted due to space limitations. Out of our regard for the World Bank, the words ‘personal communications’ has been expunged from the narrative related to the testimony of Mr. Kim. In sum, the JDI team did everything humanly possible to comprehensively corral the data needed for the competitiveness benchmarking exercise.

Table-2.1.1.1-1: Multivariate Competitive Benchmarking Across Eight EZs/IPs

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Size (ha)	2,911.83 ⁶	350 ⁷	607 ⁸	805 ⁹	90 ¹⁰	700 ¹¹	500 ¹²	1,353 ¹³
No. of plots	1,240	NA	62 ¹⁴	336 ¹⁵	41 ¹⁶	112 ¹⁷	238 ¹⁸	695 ¹⁹
Employment	476,678 ²⁰	20,000 ²¹	131,000 ²²	135,000 ²³	NA	33,576 ²⁴	9,6367 ²⁵	28,866 ²⁶
Major economic characteristics								
Leased-tenure (yrs)	30	99 ²⁷	99 ²⁸	70 ²⁹	49 ³⁰	50 ³¹	50 ³²	50 ³³

⁵All information in this column are sourced from elsewhere in this report.

⁶JDI/MSL/Sheltech Final Report for Mirershorai

⁷<http://www.skyscrapercity.com/showthread.php?t=1133119>

⁸http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdfSize (ha)

⁹[http://www.ubs.com/microsites/ib-](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[aWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

¹⁰<http://mingaladon.com/introduction.htm>

¹¹http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹²http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

¹³http://www.amata.com/eng/industrial_amatacity.html

¹⁴<http://www.thehindubusinessline.com/markets/expectation-of-tax-sops-sends-mahindra-lifespaces-higher/article6119252.ece>

¹⁵[http://www.ubs.com/microsites/ib-](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[aWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy) No. of plots

¹⁶http://mingaladon.com/land_use_plan_lease_terms.htm No. of plots

¹⁷http://www.amata.com/eng/industrial_amatavietnam_factsheet.htmlNo. of plots

¹⁸http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

¹⁹http://www.amata.com/eng/industrial_amatanacity_factsheet.html

²⁰JDI/MSL/Sheltech Final Report for Mirershorai

²¹http://www.nytimes.com/2013/04/09/business/global/wary-of-events-in-china-foreign-investors-head-to-cambodia.html?hpw&_r=1&

²²http://www.mahindralifespaces.com/pdf/1_Mahindra_World_City_Developers_Ltd_2013.pdf

²³[http://www.ubs.com/microsites/ib-](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[aWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

²⁴Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

²⁵http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

²⁶http://www.amata.com/eng/industrial_amatanacity_factsheet.html

²⁷<http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

²⁸<http://www.thehindu.com/today-paper/tp-national/tp-tamilnadu/cag-finds-irregularities-in-land-deals-involving-two-sez-properties/article4719483.ece>

²⁹[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf),

³⁰http://mingaladon.com/land_use_plan_lease_terms.htm

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Power-plant(MW)	600	15 ³⁴	230 KV ³⁵	350 ³⁶	20 ³⁷	12.8 ³⁸	173 ³⁹	22 KV ⁴⁰
Power-supply nature	Limited	Unlimited ⁴¹	Limited ⁴²	Unlimited ⁴³	Limited	Limited ⁴⁴	Unlimited ⁴⁵	Limited ⁴⁶
Water treatment unit (m ^{^3})	280,000	5,300 ⁴⁷	22,932	72,000 ⁴⁸	5,000 ⁴⁹	30,000 ⁵⁰	42,000 ⁵¹	18,000 ⁵²
Wastewater TP (m ^{^3})	224,000	4,000 ⁵³	17,640	64,800 ⁵⁴	5,000 ⁵⁵	7,000 ⁵⁶	18,000 ⁵⁷	14,000 ⁵⁸
Solid-waste removal	1	1 ⁵⁹	1 ⁶⁰	1	1 ⁶¹	0 ⁶²	1	1
Natural gas	0	0	0	1 ⁶³	0	0 ⁶⁴	1	1 ⁶⁵

³¹http://www.vsip.com.vn/out-project/industrial-park/vsip-bac-ninh-vsip_project-11.html

³²http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

³³ 'freehold' mentioned in http://www.amata.com/eng/industrial_utilities.html

³⁴<http://www.cambodiainvestment.gov.kh/investment-enviroment/cost-of-doing-business/utility-cost.html>

³⁵http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

³⁶[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf),

³⁷http://www.ide.go.jp/English/Publish/Download/Brc/pdf/06_chapter5.pdf

³⁸http://www.amata.com/eng/industrial_utilities.html

³⁹<http://www.semcorp.com/en/src/docx/usrdocx/FacilitiesAtAGlance.pdf>

⁴⁰http://www.amata.com/eng/industrial_utilities.html

⁴¹ <http://www.opendevelopmentcambodia.net/tag/electricity-price/> about the Power- supply nature and electricity charges in Cambodia as of 2013

⁴²http://www.mahindraworldcity.com/chennai_mwc_chennai_sustainable_initiatives.aspx

⁴³<http://www.balidiscovery.com/messages/message.asp?Id=9266>

⁴⁴http://www.amata.com/eng/industrial_utilities.html

⁴⁵<http://www.semcorp.com/en/src/docx/usrdocx/FacilitiesAtAGlance.pdf>

⁴⁶http://www.amata.com/eng/industrial_utilities.html

⁴⁷<http://www.cambodiainvestment.gov.kh/investment-enviroment/cost-of-doing-business/utility-cost.html>

⁴⁸[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf)

⁴⁹http://mingaladon.com/infrastructure_services.htm

⁵⁰http://www.amata.com/eng/industrial_utilities.html

⁵¹<http://www.semcorp.com/en/src/docx/usrdocx/FacilitiesAtAGlance.pdf>

⁵²http://www.amata.com/eng/industrial_utilities.html

⁵³<http://www.cambodiainvestment.gov.kh/investment-enviroment/cost-of-doing-business/utility-cost.html>

⁵⁴[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf) (page 50) Wastewater TP (m^{^3})

⁵⁵http://mingaladon.com/infrastructure_services.htm

⁵⁶http://www.amata.com/eng/industrial_utilities.html

⁵⁷http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

⁵⁸http://www.amata.com/eng/industrial_utilities.html

⁵⁹<http://www.ppsez.com/the-zone/facilities-a-services.html>

⁶⁰http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

⁶¹http://www.uncred.or.jp/env/3r_02/presentations/BG1/1-3%20Myanmar-2nd-3R-Forum.pdf

⁶² Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

⁶³[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf),

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Other gas	0	0	0	1 ⁶⁶	0	1 ⁶⁷	1	1
No. of tel. lines	7,500	530 ⁶⁸	FOC backbone	10,000 ⁶⁹	300 ⁷⁰	960 ⁷¹	6,000 ⁷²	FOC/ISDN ⁷³
Pre-built factories?	1	1 ⁷⁴	1	1		1 ⁷⁵	1	1 ⁷⁶
Sewage-treatment (KLD)	1	1 ⁷⁷	9,000			1(NA) ^{78, 79}	1 ⁸⁰	
Land price	50 ⁸¹	60 ⁸²	65	175 ⁸³	58	90	117	125
Maintenance charge/m2/month	0.16	0.06+10% VAT ⁸⁴		0.06 ⁸⁵		0.08 ⁸⁶	0.07	0.047
Infrastructure								
Distance(1)	70	226 ⁸⁷	57	30	50 ⁸⁸	25 ⁸⁹	16	27 ⁹⁰

⁶⁴ Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

⁶⁵ <http://amata.com/site/inside.php?m=utilities&p=9&sub=28>

⁶⁶ http://www.mm2100.co.id/main_industrialtown.php?id=2

⁶⁷ Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

⁶⁸ http://en.wikipedia.org/wiki/Telecommunications_in_Cambodia#cite_note-CIA-Factbook-Cambodia-2013-1; for no. of fixed telephone lines.

⁶⁹ http://www.mm2100.co.id/main_industrialtown.php?id=2

⁷⁰ http://mingaladon.com/infrastructure_services.htm

⁷¹ http://www.amata.com/eng/industrial_utilities.html

⁷² http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

⁷³ http://www.amata.com/eng/industrial_utilities.html

⁷⁴ <http://www.phnompenhpost.com/business/made-here-owned-there>

⁷⁵ Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

⁷⁶ <http://www.pattayapropertynews.com/thailand-property-news/eia-approval-amata-for-its-3500rai-expansion-in-thailand>

⁷⁷ <http://www.ppssez.com/the-zone/infrastructure.html>

⁷⁸ <http://www.sembcorp.com/en/src/docx/usrdocx/FacilitiesAtAGlance.pdf>

⁷⁹ Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

⁸⁰ http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

⁸¹ Unit land lease price for Mirershorai ranges between 50-80 US\$/m² (over a eleven year period starting in 2017). In this table we're only using 50 US\$/m² for presentational purposes. That said, in our detailed calculations, preparatory to ranking we used an weighted average of 56 US\$/m² (This is shown in the Excel spreadsheet submitted with this report).

⁸² <http://www.emergingfrontiers.com/2013/04/26/cambodias-first-dairy-plant/#more-14002>

⁸³ [http://www.ubs.com/microsites/ib-](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZSh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQlBldml0ZS9hcGFJL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

[conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZSh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQlBldml0ZS9hcGFJL2FzZWFuMjAxMy9jb3JwLW1hdGVy](http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZSh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQlBldml0ZS9hcGFJL2FzZWFuMjAxMy9jb3JwLW1hdGVy)

⁸⁴ <http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

⁸⁵ [http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf)

⁸⁶ http://www.amata.com/eng/industrial_utilities.html

⁸⁷ http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

⁸⁸ http://mingaladon.com/location_map.htm

⁸⁹ http://www.amata.com/eng/industrial_amatavietnam_map.html

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Distance(2)	68	20 ⁹¹	50	32	23 ⁹²	30 ⁹³	20	114 ⁹⁴
Distance(3)	73	20 ⁹⁵	36	50	7 ⁹⁶	35 ⁹⁷	20	99 ⁹⁸
Electricity (/kWh)	0.084	0.28	0.105	0.1354	0.12	0.077 ⁹⁹	0.078	0.15
Water (/cu.-m/month)	0.30	0.30	0.60	0.40 ¹⁰⁰	0.05	0.218 ¹⁰¹	0.310	0.65
Waste-water (/cu.-m/month)	0.35	0.26	0.01	0.55 ¹⁰²	NA	0.28 ¹⁰³	0.190	0.233
Government policy								
Corporate tax rate (%)	28	20 ¹⁰⁴	34	25 ¹⁰⁵	30 ¹⁰⁶	22 ¹⁰⁷	22 ¹⁰⁸	20 ¹⁰⁹
VAT (%)	15	10 ¹¹⁰	NA ¹¹¹	10		10 ¹¹²	10 ¹¹³	0
OSS	1	1 ¹¹⁴	1	1	1 ¹¹⁵	1 ¹¹⁶	1 ¹¹⁷	1 ¹¹⁸
Incentives								

⁹⁰<http://amata.com/site/inside.php?m=locations&p=7>

⁹¹http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

⁹²http://mingaladon.com/location_map.htm

⁹³http://www.amata.com/eng/industrial_amatavietnam_map.html

⁹⁴<http://amata.com/site/inside.php?m=locations&p=7>

⁹⁵http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

⁹⁶http://mingaladon.com/location_map.htm

⁹⁷http://www.amata.com/eng/industrial_amatavietnam_map.html

⁹⁸<http://amata.com/site/inside.php?m=locations&p=7>

⁹⁹<http://www.miga.org/documents/asiareport.php>

¹⁰⁰[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf),

¹⁰¹Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹⁰²[http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/\\$file/industrial%20parks.pdf](http://lnweb90.worldbank.org/ECA/Transport.nsf/ExtECADocByUnid/B9A56DE687D977AD85256BFB007248E1/$file/industrial%20parks.pdf),

¹⁰³Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹⁰⁴<http://www.pwc.com/th/en/publications/download/south-east-asia-web.pdf>

¹⁰⁵<http://www.deloitte.com/assets/Dcom-Indonesia/Local%20Assets/Documents/Tax/Taxation%20&%20Investment%20Guide%20Indonesia%202013.pdf> (page 7)

¹⁰⁶http://www.rd.go.th/publish/fileadmin/user_upload/AEC/AseanTax-Myanmar.pdf

¹⁰⁷Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹⁰⁸<http://www.vsip.com.vn/assets/uploads/myfiles/files/Leaflet/Brochure/VSIP-brochure-English-Vietnam-2014.pdf> (page 2)

¹⁰⁹<http://asiafoundation.org/in-asia/2013/01/30/thailand-adopts-nationwide-minimum-wage-policy-amid-controversy/>

¹¹⁰<http://www.tax.gov.kh/en/bvat.php>

¹¹¹http://www.mahindravorldcity.com/docs/chennai/special_economic_zones.pdf

¹¹²Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹¹³<http://www.gbs.com.vn/index.php/en/faq/business-registration/597-vietnam-vat-value-added-tax-rates>

¹¹⁴http://www.ide.go.jp/English/Publish/Download/Brc/pdf/06_chapter1.pdf

¹¹⁵http://mingaladon.com/infrastructure_services.htm

¹¹⁶Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹¹⁷<http://www.vsip.com.vn/investment-guide/one-stop-service.html>

¹¹⁸http://www.ide.go.jp/English/Publish/Download/Brc/pdf/06_chapter1.pdf

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Tax h' day(yrs)	10	9 ¹¹⁹	5 ¹²⁰		5 ¹²¹	0 ¹²²	4 ¹²³	8 ¹²⁴
Lower tax rate (yrs)	0	3-6 ¹²⁵	5 ¹²⁶		3 ¹²⁷	0 ¹²⁸	9 ¹²⁹	5 ¹³⁰
Industrial percentages, where available, calculated relative to total built-up area								
Most dominant	Automobile Parts	Apparels & Accessories ¹³¹	IT ¹³²	Automotives (30) ¹³³	Garments (32.2)	Chemicals/plastics/paint ¹³⁴ (23)	Apparel	Steel/metal/plastics (32)
Next	Other Parts & Machinery	Footwear ¹³⁵	Autos ¹³⁶	Logistics (10) ¹³⁷	Optical lenses (23.8)	Auto/machinery parts, steel, metal ¹³⁸ (18)	Engineering	Auto-making (24)
Next	Automobile Assembly	Electronics ¹³⁹	Apparels ¹⁴⁰	Electronics (7) ¹⁴¹	Foodstuff (16.2)	Textiles/apparel ¹⁴² (16)	Automotive	Consumption goods (18)

¹¹⁹<http://www.opendevelopmentcambodia.net/briefing/special-economic-zones-2/>

¹²⁰<http://commerce.nic.in/annual2006-07/html/chapter6.html>

¹²¹http://mingaladon.com/investment_incentives.htm

¹²²Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹²³<http://www.vsip.com.vn/investment-guide/investment-incentives.html>

¹²⁴http://www.amata.com/eng/why_economic_%20incentives.html

¹²⁵http://www.pwc.com/en_KH/kh/publications/2012/assets/cambodia-tax-book2012-05042012.pdf

¹²⁶<http://www.mahindraworldcity.com/docs/mwcesebooklet.pdf>

¹²⁷http://mingaladon.com/investment_incentives.htm

¹²⁸Annex-3 to this section based on responses by Ms. Kim to the questionnaire sent to this *industrial park* by JDI team

¹²⁹<http://www.vsip.com.vn/investment-guide/investment-incentives.html>

¹³⁰http://www.amata.com/eng/why_economic_%20incentives.html

¹³¹http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

¹³²http://www.mahindraworldcity.com/chennai_business_overview.aspx

¹³³http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBlldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyYWVsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹³⁴http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹³⁵http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

¹³⁶http://www.mahindraworldcity.com/chennai_business_overview.aspx

¹³⁷http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBlldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyYWVsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹³⁸http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹³⁹http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

¹⁴⁰http://www.mahindraworldcity.com/chennai_business_overview.aspx

¹⁴¹http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBlldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyYWVsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹⁴²http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Next	Garments	Food items ¹⁴³	Gems/ ¹⁴⁴ Jewellery	Metals ¹⁴⁵ (7)	Shoes (9.1)	Electric ¹⁴⁶ (11)	NA	Electronics (14)
Next	Integrated Textile	Plastics goods ¹⁴⁷		Steel ¹⁴⁸ (6)	Watch-dial (6.49)	Beverage ¹⁴⁹ (7)	NA	Service and Infrastructure(7)
Next	Food & Beverage	NA	N.A	Food-beverages ¹⁵⁰ (6)	Electronics (3.99)	Miscellaneous ¹⁵¹ (14)	NA	Chemicals (4)
Next	Chemical & Other Products	NA	NA	Printing ¹⁵² (4)	NA	NA	NA	NA
Next	Garment Accessories	NA	NA	NA	NA	NA	NA	NA
Next	Motorbike Assembly	NA	NA	NA	NA	NA	NA	NA
Individual operating costs¹⁵³								
Mgmt wage rates	578	700 ¹⁵⁴	1510	995	600	1,146	1,146	1,565
Skilled wage rates	251	180 ¹⁵⁵	607	414	145	521	521	641
Semiskilled wage rates	78	120 ¹⁵⁶	264	209	92	128	128	286

¹⁴³http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

¹⁴⁴http://www.mahindraworldcity.com/chennai_business_overview.aspx

¹⁴⁵http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyaWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹⁴⁶http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹⁴⁷http://www.acledabank.com.kh/kh/assets/pdf_zip/Conference2007_08.pdf

¹⁴⁸http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyaWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹⁴⁹http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹⁵⁰http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyaWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹⁵¹http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹⁵²http://www.ubs.com/microsites/ib-conferences/apac/aseanconf2013/en/material/_jcr_content/par/table.1958697584.file/dGFibGVUZXh0PS9jb250ZW50L2RhbS91YnMvbWljcm9zaXRlcy9JQiBldml0ZS9hcGFjL2FzZWFuMjAxMy9jb3JwLW1hdGVyaWFsL0Jla2FzaSBGYWphci5wZGY=/Bekasi%20Fajar.pdf

¹⁵³ Board of Investment, Bangladesh, Annual Report, 2012, citing results about many capitals of Asian countries

¹⁵⁴<http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

¹⁵⁵<http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

¹⁵⁶<http://www.sciencespo.fr/coesionet/sites/default/files/GMS%20Capstone%20Report%20May%2017.pdf>

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Min. wage	39	61 ¹⁵⁷	120	167	68	111	111	230
Rigidity of working hours ¹⁵⁸								
Premium-1	0	30	0	0	NA	30	30	0
Premium-2	0	100	0	0	NA	100	100	0
Difficulty in hiring workers ¹⁵⁹								
Curbs on hiring-1	Yes	0	0	1	N.A.	0	0	1
Curbs on hiring-1	NL	24	NL	36	N.A.	72	72	NL
Curbs on hiring-1	23.2	41.0	24.1	105.9	N.A.	40.7	40.7	78.9
Curbs on hiring-1	0.30	0.3	0.16	0.38	N.A.	0.33	0.33	0.33
Non-labour wage% of salary	0	10 ¹⁶⁰	6	5	N.A.	20 ¹⁶¹	20	20
Operating costs								
Cargo rates-1 ¹⁶²	900	1,500	979	800	1,600	500	500	1,162
Cargo rates-2 ¹⁶³	3,675	4,000	2,817	2,600	6,500	2,600	2,600	3,863
Telecom rate (/line) ¹⁶⁴	24	15 ¹⁶⁵	9.3	69	2,000	22	22	106
Use (/min)	1.12	5	21	6.28	0.15	1.05	1.05	3.16
Logistics perf. (score)	2.74 ¹⁶⁶	2.56 ¹⁶⁷	3.08 ¹⁶⁸	2.94 ¹⁶⁹	2.37 ¹⁷⁰	3.00 ¹⁷¹	3.00 ¹⁷²	3.18 ¹⁷³
Quality-of-life (QOL) ratings								
Security (24*7)	1	1 ¹⁷⁴	1 ¹⁷⁵	1 ¹⁷⁶	1 ¹⁷⁷	1 ¹⁷⁸	1	1 ¹⁷⁹

¹⁵⁷<http://www.ssez.com/en/company.asp?Ilt=4&Ione=2>

¹⁵⁸ International Finance Corporation (IFC), *Doing Business, 2011*, background tables

¹⁵⁹ International Finance Corporation (IFC), *Doing Business, 2011*, background tables

¹⁶⁰; http://www.nytimes.com/2013/04/09/business/global/wary-of-events-in-china-foreign-investors-head-to-cambodia.html?hpw&_r=1&

¹⁶¹<http://www.miga.org/documents/asiareport.pdf>

¹⁶² Board of Investment, Bangladesh, Annual Report, 2012, citing results about many capitals of Asian countries

¹⁶³ Board of Investment, Bangladesh, Annual Report, 2012, citing results about many capitals of Asian countries

¹⁶⁴ Board of Investment, Bangladesh, Annual Report, 2012, citing results about many capitals of Asian countries

¹⁶⁵<http://www.cambodiainvestment.gov.kh/investment-enviroment/cost-of-doing-business/telecommunication-cost.html>

¹⁶⁶World Bank, Logistics Performance Survey, 2012.

¹⁶⁷World Bank, Logistics Performance Survey, 2012.

¹⁶⁸World Bank, Logistics Performance Survey, 2012.

¹⁶⁹World Bank, Logistics Performance Survey, 2012.

¹⁷⁰World Bank, Logistics Performance Survey, 2012.

¹⁷¹World Bank, Logistics Performance Survey, 2012.

¹⁷²World Bank, Logistics Performance Survey, 2012.

¹⁷³World Bank, Logistics Performance Survey, 2012.

¹⁷⁴<http://www.ppsez.com/the-zone/facilities-a-services.html>

Items Compared	Mirershorai ⁵	Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
		Phnom Penh	Mahindra City	MM2100	Mingaladon	Amata	VSIP	Amata
Open-space (%)	36.7		30			14		
Entertainment	0	0 ¹⁸⁰	1 ¹⁸¹	1 ¹⁸²	0	1	1	1 ¹⁸³
Golf-course	0	0 ¹⁸⁴	0 ¹⁸⁵	1 ¹⁸⁶	0	0	0	2 ¹⁸⁷
Qty Housing	1	1 ¹⁸⁸	1 ¹⁸⁹	1 ¹⁹⁰	0	1	1 ¹⁹¹	1 ¹⁹²
High school	1	0 ¹⁹³	1 ¹⁹⁴	0	0	1 ¹⁹⁵	1	1 ¹⁹⁶
University	1	0 ¹⁹⁷	0 ¹⁹⁸	0	0	1 ¹⁹⁹	1 ²⁰⁰	0

Note: The detailed sources of the information presented in the foregoing table are presented in the footnotes. The one stop service (OSS) is evaluated in terms of qualitative answers to whether an OSS exists in the EZ in question, or not. The domain of valid answers includes three values, 1 to denote unconditionally yes, 0 to denote no. NA denotes 'not available', which is a valid value. NL denotes 'no limits'. FOC stands for fiber-optic cabling. ISDN denotes International Subscribers' Digital Network. KLD stands for kilo-litre per day.

Distance(1) is about distance from nearest sea-port or deep-sea port, measured in kilometres; distance (2) is about distance from the largest commercial metropolis, in km; distance(3) is about distance from the largest airport in the country, in km. Land-price is for industrial land and measured per sq.-meter.

¹⁷⁵http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

¹⁷⁶http://www.mm2100.co.id/main_industrialtown.php?id=3

¹⁷⁷http://mingaladon.com/infrastructure_services.htm

¹⁷⁸http://www.amata.com/eng/industrial_standard.html

¹⁷⁹<http://amata.com/site/inside.php?m=utilities&p=11>

¹⁸⁰<http://www.ppsez.com/the-zone/facilities-a-services.html>

¹⁸¹http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

¹⁸²http://www.mm2100.co.id/main_industrialtown.php?id=3

¹⁸³<http://www.amata.com/site/inside.php?m=locations&p=7&sub=28>

¹⁸⁴<http://www.ppsez.com/the-zone/facilities-a-services.html>

¹⁸⁵http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

¹⁸⁶http://www.mm2100.co.id/main_industrialtown.php?id=3

¹⁸⁷<http://www.amata.com/site/inside.php?m=locations&p=7&sub=28>

¹⁸⁸<http://www.ppsez.com/about-us/overview.html>

¹⁸⁹http://www.mahindraworldcity.com/chennai_living_residential_zone.aspx

¹⁹⁰http://www.mm2100.co.id/main_industrialtown.php?id=3

¹⁹¹http://www.vsip.com.vn/out-project/industrial-park/vsip-ii-binh-duong-vsip_project-9.html

¹⁹²<http://www.amata.com/site/inside.php?m=locations&p=7&sub=28>

¹⁹³<http://www.ppsez.com/the-zone/facilities-a-services.html>

¹⁹⁴http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

¹⁹⁵http://www.amata.com/eng/industrial_amatavietnam_factsheet.html

¹⁹⁶<http://www.amata.com/site/inside.php?m=locations&p=7&sub=28>

¹⁹⁷<http://www.ppsez.com/the-zone/facilities-a-services.html>

¹⁹⁸http://www.mahindraworldcity.com/Docs/downloads/Mwc_Brochure_Prepress_19_DEC_2007.pdf

¹⁹⁹http://www.amata.com/eng/industrial_amatavietnam_factsheet.htmlUniversity

²⁰⁰<http://www.vsip.com.vn/assets/uploads/myfiles/files/Media/Location%20Map.pdf>

Logistics performance is measured using quantitative scores published by the World Bank in its Logistics Performance Survey, 2012. A medical college has been proposed for Mirershorai EZ in the plans. Medical colleges are 'equated' with a university in Bangladesh---both deliver tertiary education.

2.1.1.4 Benchmarking Results

Based on the calculations, the proposed zone of Mirershorai is found to be the most competitive among the eight options presented in the table, with the next three top billings going to VSIP, Amata City Bien Hoa Vietnam and PPSEZ, in that order. In a second iteration, we take the IP's land area out of the equation. The billings remain unchanged.

That Mirershorai overhauls the rest of the field would be perceived as counter-intuitive to many. However, bear in mind that land is going to be offered at a strategic price of only US dollar 60 per sq-meter when comparable prices for Amata City, VSIP and MM2100 are US dollar 125, 175 and 117, respectively. That addresses one part of the answer. As well, with its captive power-plant on the EZ itself, power costs for tenants at Mirershorai, at less than seven cents, compare with 15 and 14 cents, respectively, in Thailand and Indonesia, respectively. There is nothing counter-intuitive in these results. Mirershorai is more attractive due to its strategic land pricing, cheaper international shipping rates. By comparison, in more mature capitalist economies of Thailand and Indonesia, land prices are between two-and-a-half times to almost three times more expensive. Finally, bear in mind that Mirershorai being at a planning stage, the numbers used for it are at times forecasts, whereas the corresponding numbers for the comparators are actual. Time will tell if the actual experience at Mirershorai's implementation exceeds or falls short of those 'forecasts.'

Table 2.1.1.4-1: Competitive Ranking of the Eight Economic Zones/Industrial Parks

Sl.	EZs/SEZs/IPs	Average of standardized values over all indicators		Average of standardized values over all indicators, except land area of the EZ/SEZ/IP	
		Quantitative Score	Rank	Quantitative score	Rank
(1)	Mirershorai	0.668	1 st	0.648	1 st
(2)	Phnom Penh SEZ	0.521	4 th	0.548	4 th
(3)	Mahindra World City	0.481	6 th	0.50	6 th
(4)	MM2100 Industrial Park	0.460	7 th	0.473	7 th
(5)	Mingaladon Industrial Park	0.513	5 th	0.545	5 th
(6)	Amata Bien Hoa IP Vietnam	0.541	3 rd	0.561	3 rd
(7)	VSIP	0.581	2 nd	0.608	2 nd
(8)	Amata City Thailand	0.426	8 th	0.425	8 th

Source: WB Study Team's calculations based on the sources cited in the above

We have already pointed out in the Sherpur draft final report that four attributes are especially powerful investment factors, namely, broad infrastructure, industrial infrastructure, labor costs and country risk. A variation on that theme is that, as the American Chamber of Commerce in Malaysia point out, the top-ten locational factors²⁰¹ are as follows:

- ✓ Political and social stability;
- ✓ Cost of doing business;
- ✓ Electricity availability;
- ✓ Availability of industrial land;
- ✓ Proximity to container port;
- ✓ Availability of skilled and technical workers;
- ✓ Availability of suppliers and vendors;
- ✓ Availability of production workers;
- ✓ Total unit manufacturing costs;

²⁰¹ Source: <http://www.amcham.com.my/index.php/news-resource/news-highlights/business-news/519-made-in-myanmar-manufacturing-site-location-considerations-in-asia-s-final-frontier-economy>

- ✓ Availability of management talent.

Where Mirershorai is concerned, several of these enablers in the case of Mirershorai are available in and around the city of Chittagong. This would particularly apply to the proximity to the container port, skilled workers, production workers, the dense presence of suppliers and vendors, availability of management talent.

2.1.2 Mirershorai's Location on Sea-Coast: a Major Source of Competitiveness Over the Medium Term

Strengths:

Mirershorai boasts its location on the coast, where the draft in the sea rarely exceeds 1 meter. The establishment of a power-plant, and the lure of a stable and adequate supply of clean electricity at an affordable price (of less than seven cents per Kwh), will very likely spur Mirershorai's potential value as a strategic location and will increase her cachet in the near future.

- It is practicable through the building of high-durability access roads, dikes that increase the environmental safeguards, and careful positioning of landscaping, to increase the experiential value of a peninsular location in bringing planned industrialization to fruition. Mirershorai has this built-in site-specific advantage. Unlocking the economic potential of Mirershorai is largely only limited by planner's imagination, BEZA's 'political will,' institutional and coordination skills, and the private developer's implementation capability. The precipitate 'over-development' of dense industrial clusters around Dhaka and Chittagong cities, and the overheating of the land-price in the prized Dhaka-Chittagong corridor will drive the demand for industrial land towards the coastal areas offering reasonably good road access, and credible safeguards against the occasional natural calamity. That is why industries will locate in the coastal corridor within easy reach of downtown Chittagong and the Chittagong international airport. Energy-intensive industries will of necessity gravitate towards the Mirershorai coastline.
- The relatively low draft makes reclamation of land and further adding to the draft in the sea economically more feasible.

Weakness:

Like all sites on the eastern coast of the Bay of Bengal, Mirershorai is more vulnerable to the loss of property and lives arising from the periodic cyclones and storm surges, comparable to inland locations. When, as happened on 29 April, 1991, a category-4 cyclone hits the eastern coastline of the Bay, hundreds of thousand people vulnerable people, mostly living in the islands, could perish. However, it would be quite inappropriate to call that a site-specific weakness. It is true of all sites on the Eastern Bay of Bengal. There has not been a recurrence of the 1991 super-cyclone in the last 22 years.

Threats

Burning coal to produce much-needed electricity all has heavy environmental footprints. The proposed 600MW power-plant will itself will necessitate annually the haulage of more than 2.143 million tonnes of coal from the proposed deep-sea port under consideration at Sonadia, near Cox's Bazar. Even merely transporting coal on open barges over the roughly 90 miles between Sonadia and Mirershorai will expose the environment along the maritime route to release of fly-ash from the coal being carried.

2.1.3 Major Conclusions

- The major conclusions reached for Mirershorai are similar to those reached already for Anwara.
- The synergy between a coastal location with the added attraction of offering of a fully-equipped economic zone with the lure of clean, stable, and adequate electric power appear to render Mirershorai a major attractive force.
- Mirershorai will be attractive to foreign direct investment originators. Its cachet with domestic investors will, however, be even greater.
- Close proximity to the very active communications and logistics hub of Chittagong is another economic attraction of Mirershorai.

2.1.4 Implications for Anwara EZ and Mirershorai EZ

Based on the EZ and Power development strategy, both Mirershorai and Mirershorai EZ are meeting the Economic Development and Power development strategy because able to construct jetty for unloading imported coal delivering from the Cox's Bazar coal depots by barge fleets of 4,000 to 5,000 tons. Several barges can be pulled by a powerful tug boat carrying 20,000 to 50,000 tons of coal at once economizing on the transportation cost.

The depth of the jetty can be 5 metre to 6 metre which is easy to construct along coastal areas and along the major rivers of Bangladesh. Also use of land reclamation is a useful tool to creating new industrial land next to the jetty/port. Both Anwara EZ and Mirershorai EZ use the land reclamation method to create new industrial land.

2.2 Industry Assessment

2.2.1 Overview

2.2.1.1 Current Status

Led by the strong growth in the export of readymade garments (RMG) and large remittances from overseas workers and emigrated Bangladeshis, Bangladesh experienced rapid economic growth over the last two decades. The RMG sector, nearly non-existent at the beginning of the 1980s, blossomed in the last few decades and accounted for around 80% of total national exports by 2010. This sector contributed to growth in various related sectors and a wide range of economic activities. With this growth in the RMG sector, the export to GDP ratio increased from 6.8% in 1991 to 17.2% in 2010. The manufacturing sector now accounts for around 18% of the Bangladesh economy.

Table 2.2.1.1-1: Manufacturing Sector of Bangladesh

Item/Year	1981	1991	2001	2010
Export (% of GDP)	4.10%	6.80%	10.60%	17.20%
Manufacturing (% of Total Export)	65.50%	78.90%	92.10%	90.90%
RMG of total export	0.10%	38.90%	56.10%	77.10%
Manufacturing Sector of GDP	13.70%	13.40%	15.60%	17.90%

Source: Sixth Five Year Plan (SFYP)

The table below looks at major manufacturing sectors from the value-added perspective. The garment and garment-related sector is the largest manufacturing sector in terms of added value, followed by machinery products, food processing, and chemical fertilizer sectors. The garment sector accounted for 6.8% of GDP in 2011.

Table 2.2.1.1-2: Industrial Sectors of Bangladesh in 2011

Sectors	Share*
Manufacturing	18.20%
Textile and Clothing	6.80%
Machinery Products	5.20%
Food Processing	2.50%
Chemical Fertilizer	2.00%
Leather Products	0.90%
Petroleum Products	0.80%
Other Manufacturing	1.20%
Construction	8.20%
Other Industries	2.30%
Total Industries	28.70%

Source: Sixth Five Year Plan (SFYP)

*Estimated figures from SFYP. Addition of subsections does not match total manufacturing 18.2%. Reasons are unknown.

Over the period from 2006 to 2011, RMG exports increased at 20% per annum for knitwear and at around 16% for woven garments. Home textiles which account for only 3.4% of total exports grew more than RMG at an average annual rate of around 37%. Dwarfed by the growth of those sectors, however, exports of pharmaceuticals and frozen food also increased at the rate of over 9% and over 6%, respectively. Others which are reported at the growth of nearly 14% include ceramic table ware and agricultural products such as vegetables and tobacco. Many sectors emerged and are growing in export markets, following the big success of RMG.

Table 2.2.1.1-3: Merchandise Exports of Bangladesh

Sectors	2006		2011		Average Growth
	(US\$ Million)	Share	(US\$ Million)	Share	
Leather	257	2.40%	298	1.30%	3.00%
Frozen Food	459	4.40%	625	2.70%	6.40%
Woven Garments	4,084	38.80%	8,432	36.80%	15.60%
Knitwear	3,817	36.30%	9,482	41.40%	20.00%
Home Textiles	165	1.60%	789	3.40%	36.70%
Pharmaceuticals	28	0.30%	44	0.20%	9.50%
Others	1,716	16.30%	3,254	14.20%	13.70%
Total	10,526	100.00%	22,924	100.00%	16.80%

Source: Export Promotion Bureau

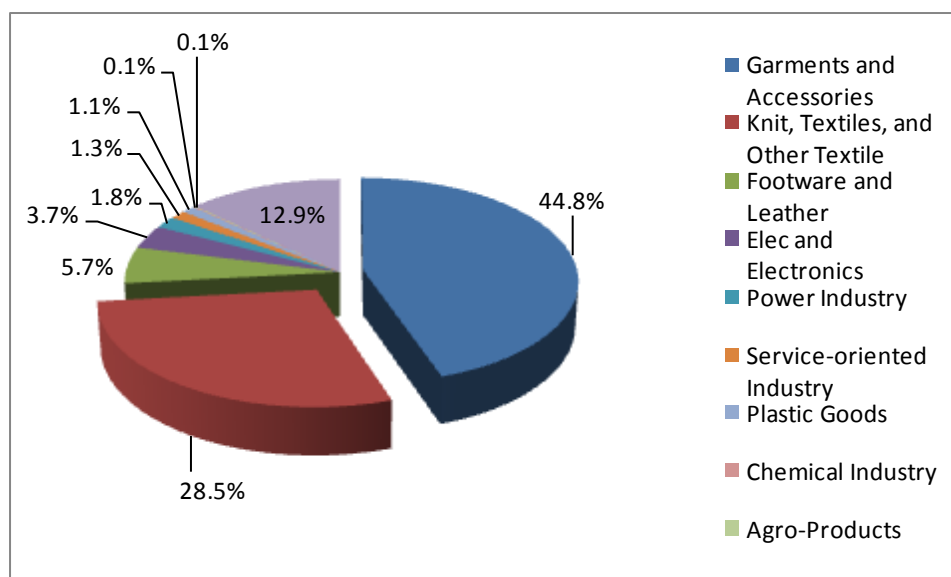
Over the period from 2006 to 2011, RMG exports increased at 20% per annum for knitwear and at around 16% for woven garments. Home textiles, which account for only 3.4% of total exports, grew more than RMG at an average annual rate of around 37%. Dwarfed by the growth of those sectors, however, exports of pharmaceuticals and frozen food also increased at the rate of over 9% and over 6%, respectively. Others which are reported at the growth of nearly 14% include ceramic table ware and agricultural products such as vegetables and tobacco. Many sectors emerged and are growing in export markets, following the big success of RMG.

Dhaka and Chittagong are the venues for the growing manufacturing sectors. Dhaka attracts all kinds of business investment during the course of growth and formed clusters of many manufacturing sectors including garment and textiles, pharmaceuticals, ceramics, food processing, and so on. Chittagong is the location of the country's heavy industries like steel making, shipbuilding, urea fertilizer manufacture, oil refining, and others. Of course, Chittagong, as the second largest city, has a wide range of export sectors, but the magnitude of each sector producing export products is small as compared to each corresponding sector in Dhaka. The corridor connecting the two cities is also

economically flourishing to host various growing sectors like steel, cement, garment and so on. The other regions, which cover the vast territory of Bangladesh, are still predominantly rural areas with economic activities limited to agriculture and fishery.

In the light of aggregate investment by manufacturing industry up to 2012, a large amount of investment emanates from the garment and textile industry, followed by footwear and leather, electric appliances and electronics, etc. The garment and textile industry accounts for 73.3% of total investments into the Export Processing Zones (EPZ). The share of the EPZ investments for footwear and leather and electric appliances and electronics is 5.7% and 3.7%, respectively²⁰².

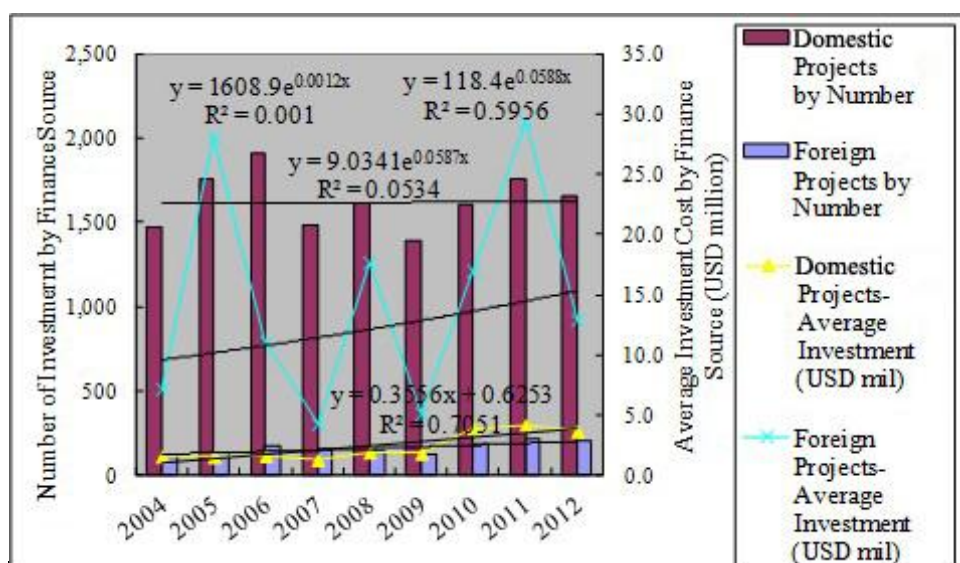
Figure 2.2.1.1-1: EPZ Investment by Industry up to July 2012



Both domestic and foreign firms and their joint ventures registered at the Investment Board of Bangladesh revealed a profound and steady evolution of growth by number and investment value as well as by employment in the last decade. During this period, domestic and foreign firms posted the average annual growth of 11.1% and 7.6%, respectively in terms of investment value, subject to somewhat periodical fluctuations. The number registered at the Board increased at 6.7% for foreign firms and 1.5% for domestic firms annually. These chronological transitions are shown in Figure 2.2.1.1-2, where the exponential approximate equations are derived as $y = 1608.9e^{0.0012x}$ ($R^2 = 0.001$) for foreign firms and $y = 118.4e^{0.0588x}$ ($R^2 = 0.5956$) for domestic firms.

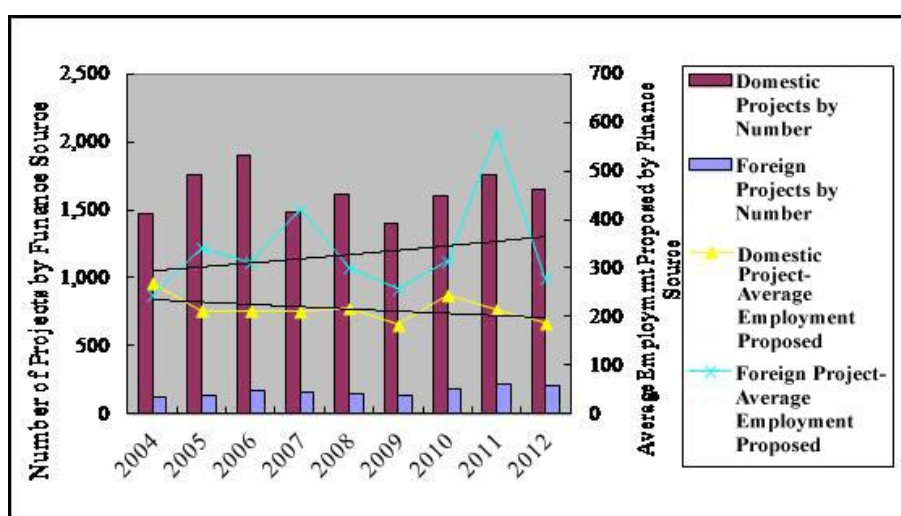
²⁰² Source: The Ministry of Finance, Finance Division, *Economic Review*, 2013, p. 133

Figure 2.2.1.1-2: Number and Average Investment Costs by Registered Domestic and Foreign Firms



Likewise, the growth trends of employment proposed to be created by both foreign and domestic firms were steady, as depicted below as Figure 2.2.1.1-3, where the exponential approximate equations are derived as $y = 239.63e^{-0.022x}$ ($R^2 = 0.2416$) for foreign firms and $y = 286.03e^{0.0269x}$ ($R^2 = 0.076$) for domestic firms.

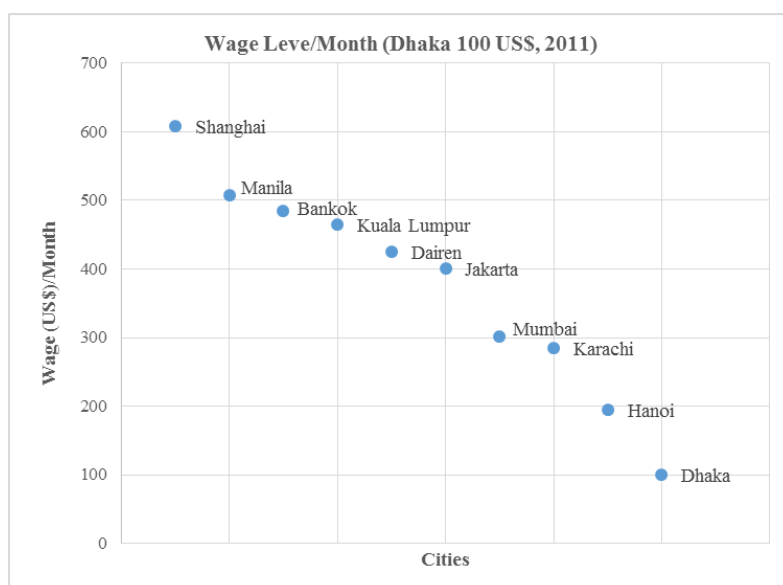
Figure 2.2.1.1-3: Number and Average Employees by Registered Domestic and Foreign Firms



2.2.1.2 The Next 20 Years

Bangladesh’s wage level is one fifth of that of China and is the lowest among ASEAN countries other than Myanmar. All indications point to the relative wage competitiveness of Bangladesh to China, India, and the ASEAN countries remaining the same over the next two decades. Consequently, Bangladesh is expected to continue to attract export oriented labour intensive industries which are expected to increase both in volume and in types of business (Figure 2.2.1.2-1).

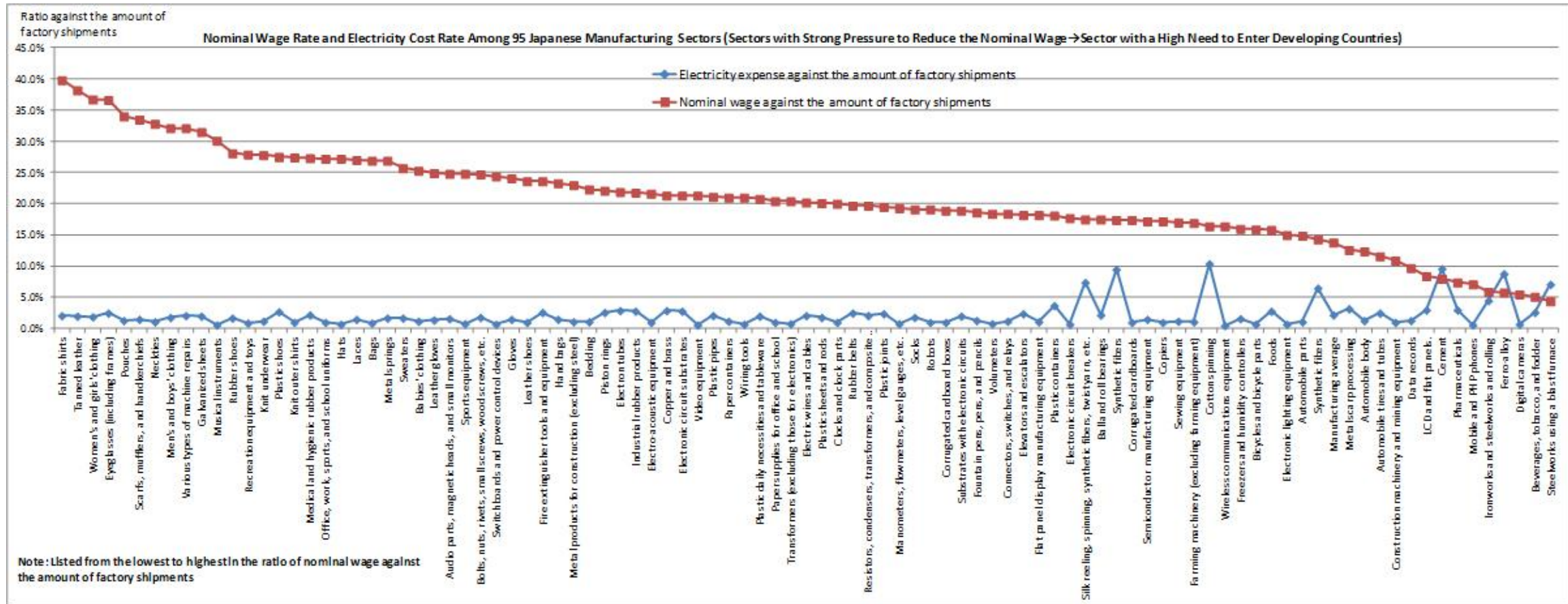
Figure 2.2.1.2-1: Wage Level among Major Asian Cities (2011)²⁰³



This export growth will be fed back to the country’s economic activities through the following three channels: import substitution of materials, parts and machinery; production expansion of domestic market oriented sectors, and, introduction of new lines of business requiring higher skills and technologies. This chain reaction of industries is already visible in many areas of business. The scope and scale of this interaction will be intensified in the next two decades, involving energy, capital and knowledge intensive sectors. The figure below shows a wide variety of Japanese industries in terms of usage of electricity and labour.

²⁰³ Source: JETRO, Comparison of annual actual wages in major cities in Asia in 2011

Figure 2.2.1.2-2: Wage and Electricity to Total Factory Shipment Cost of Representative Japanese Manufacturing Sectors



Based upon the current situation of Bangladesh industries and experiences learned from the cases of industrialization in ASEAN countries, the types of industries envisaged for the Bangladesh economy are summarized in Figure 2.1.6 in a five year interval over the next two decades. The Garment industry will continue to dominate Bangladesh economic scenes for the foreseeable future. But other sectors such as pharmaceuticals, ceramics, and IT related sectors will become important emerging sectors in the Bangladeshi export mix. Construction materials and food processing will continue to expand under a rapidly growing economy.

Per capita income was reported recently to have surpassed US\$1,000 in Bangladesh and it could reach over US\$2,500 (passing the current income level of the Philippines) in the next twenty years if it grew at the current rate²⁰⁴. In the second five year interval starting from 2020, manufacturing of motorcycles, electric appliances and other consumer durable goods will be intensified to meet rapidly increasing demand. Similar achievements will happen for the sectors of automobile parts and components, precision machinery, other parts and machinery. These sectors will not be confined to local markets for their operations, but are expected to invest and expand production in parallel with their sales strategies targeting regional and global markets. International automobile assemblers will invest in Bangladesh from the same perspective in the middle of the second five year interval. During the same timeframe, shipbuilders will come to construct medium-size vessels for export market.

The automobile industry will be an important driving force to change the industrial structure of Bangladesh, which will have become a middle income country, in the third interval starting in 2025. Various metal fabrications and steel making will start to supply products to the automobile industry and others, using imported steel and metal products. And then those imports will be replaced by domestic production. Basic materials such as non-ferrous metals and chemicals will be produced on a large scale to meet increasing domestic demand. Many other industries, which did not exist in Bangladesh and therefore required the reliance on import, will have emerged by then. In the final stage of the next two decades, Bangladesh will produce steel from imported iron ore through a blast furnace process. By that time, steel consumption of Bangladesh will exceed that of Thailand's current consumption.

²⁰⁴ The per capita income is extrapolated based upon the current US\$1,000, assuming the real economic growth of 6.0% and the population growth of 1.2%.

Figure 2.2.1.2-3: Major Manufacturing Sectors of Bangladesh from 2015-2034

Sectors/Year	2015 – 2019	2020 – 2024	2025 – 2029	2030 – 2034
Garment & Textile	←			→
Leather Products	←			→
Pharmaceuticals	←			→
ICT	←			→
Tableware/ceramics	←			→
Construction Materials	←			→
Food Processing	←			→
Light Engineering	←			→
Ship Breaking	←			→
Shipbuilding - Small Vessels	←			→
Shipbuilding - Medium Size Vessels		←		→
Shipbuilding - Large Vessels			←	→
Steel Making - Induction Furnace	←			→
Steel Making - Blast Furnace				←
Bicycle & Motorbike	←			→
Automobile Parts		←		→
Precision Machinery		←		→
Automobile Assembly			←	→
Non-ferrous Metals			←	→
Chemicals			←	→

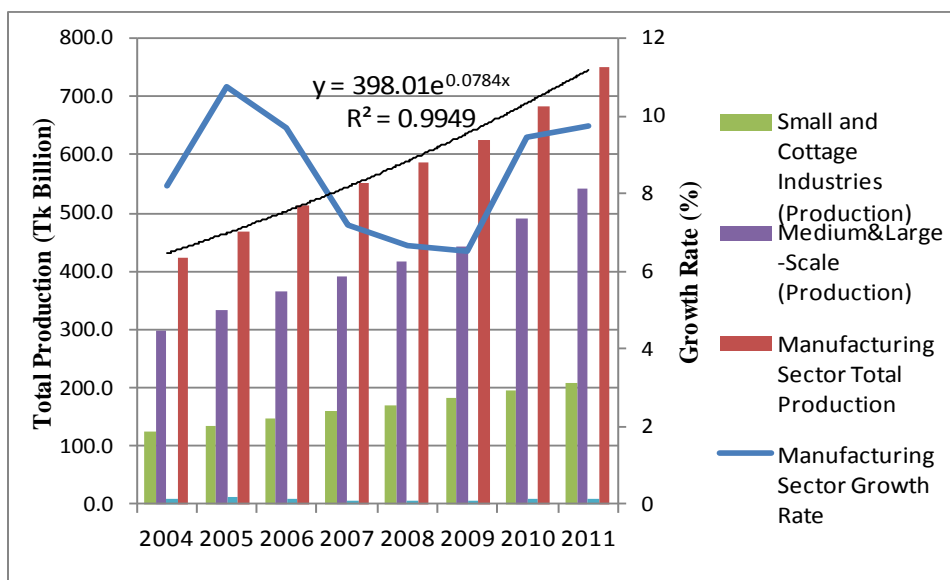
Many constraints and obstacles need to be eliminated to realize this scenario of industrial development. Basic physical infrastructure such as roads, jettys, power generation and transmission facilities (including lines), among others, need to be developed to sustain increasing economic activities. The various areas of soft transactional infrastructure in the methods of doing business easily will need to be in place. Strategies and policies need to be formulated and implemented to promote foreign direct investment and allocate limited resources to priority sectors. Through this series of actions, Bangladesh will further climb the ladder of industrialization.

2.2.1.3 Envisaged Growth of the Manufacturing Sector and Export Processing Zones (EPZs)

Evolution of the manufacturing sector (small and cottage industries, medium and large scale industries and the aggregate) over 7 years (FY 2004 - 2011) are depicted in Figure 2.2.1.3-1, where the approximate exponential equation is derived as $y = 398.01e^{0.0784x}$ ($R^2 = 0.9949$) for the total sector production²⁰⁵. With this, the growth rate of the manufacturing sector would remain at around 7.8% in the future, on a *Ceteris Paribus* basis)

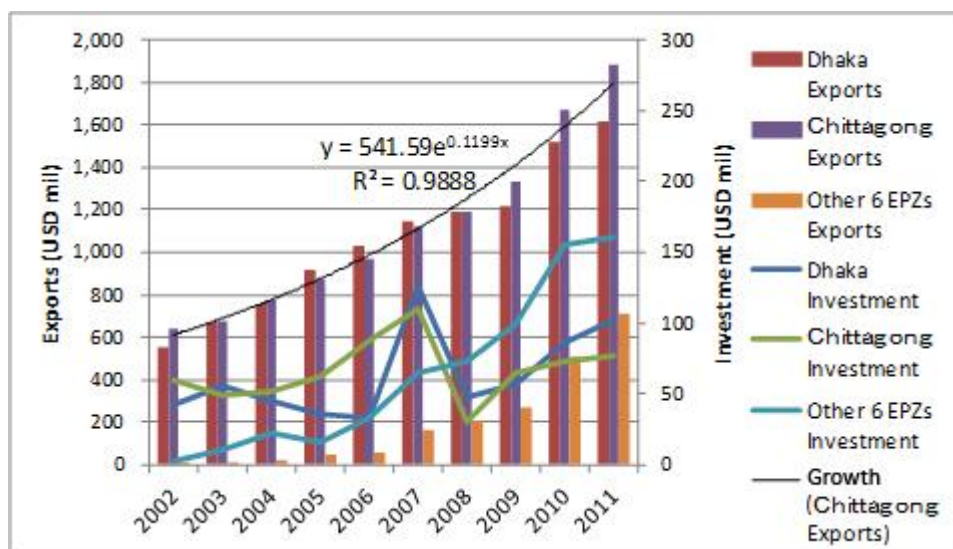
²⁰⁵ Source: The Ministry of Finance, *Op., Cit.*, 2013, p. 117

Figure 2.2.1.3-1: Manufacturing Sector Nominal Production and Growth (2004-2011)



Likewise, Dhaka and Chittagong EPZs posted the annual average growth of manufacturing goods exports at 11.9% ($y = 541.59e^{0.1199x}$, $R^2 = 0.9888$) and 11.3% ($y = 541.84e^{0.1129x}$, $R^2 = 0.9666$), respectively²⁰⁶ (Figure 2.2.1.3-2).

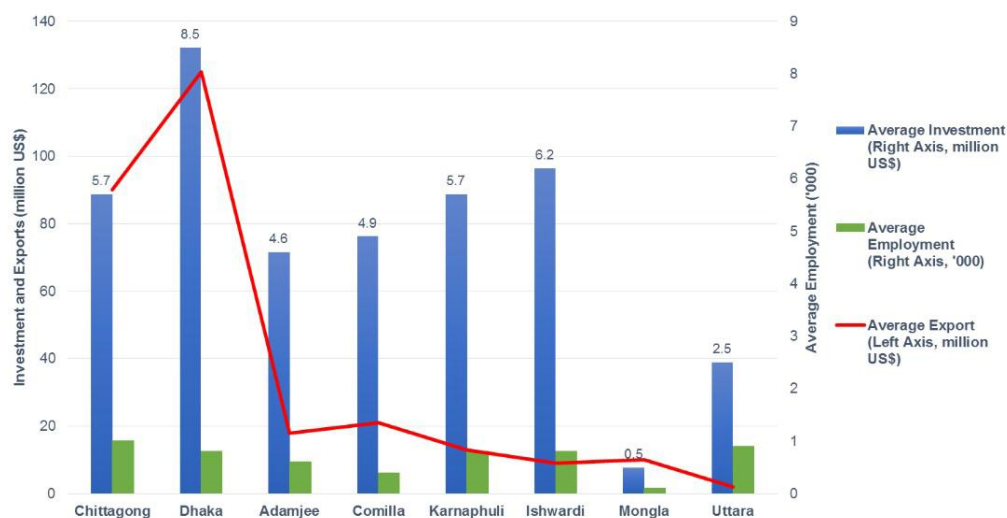
Figure 2.2.1.3-2: Manufacturing Sector Exports from and Investment Growth in EPZs (2002-2011)



Note that up to June 2012, the average investments, exports and employment per operating unit (406 units in 6 EPZs) are US\$6.1 million, US\$73.0 million and US\$0.8 thousand, in that order²⁰⁷(Figure 2.2.1.3-3).

²⁰⁶Source: The Ministry of Finance, *Op., Cit*, 2013, p. 134

²⁰⁷Source: The Ministry of Finance, *Op., Cit*, 2013, p. 133

Figure 2.2.1.3-3: Average EPZ Investment, Export and Employment in Aggregate (2002-2011)

2.2.1.4 Brief Description of Major Sectors

The current situation of major manufacturing sectors and their future prospects are briefly described below in the context of relevancy to the three EZs.

Garment and Textile Sectors

Bangladesh is the second largest exporter of garments in the world with its share of 4.8%. China, the market leader with over 37% of world trade, is now facing rapidly rising labour costs, which already reached the level for existing garment companies currently operating in China to consider shifting manufacturing bases. If garment manufacturing, equivalent to 5% of world garment trade is shifted from China to Bangladesh, garment production in Bangladesh will double by simple arithmetic. This is not some remote possibility, it is the situation now under way.

Fabrics for knitwear are mostly made domestically, but woven fabrics are mostly imported now. Domestic production will supply around 40% of woven fabric consumed in the garment sector. There are around 100 large textile mills whose land lot exceeds 20 hectares. Although they have huge potential demand in front, they are not able to expand production, constrained by the availability of land with good access to power and natural gas. Large companies are ready to expand if such land were available.

Garments and textiles produced in Bangladesh have been mainly concentrated in low end products. Garment and textile companies are eager to produce more value added products, facing increasing labour cost²⁰⁸. In the middle of garment manufacturing being shifted from China, they plan to not

²⁰⁸ Labor cost in the case of EOS Textile Mill in the Dhaka Export Processing Zone increased by around 10% annually over the last five years: Daily wage increased from Tk 70 in 1998 to Tk 300 in 2013. The current paycheck for workers including basic salary, allowance, and fringe benefits is Tk 5,000 (US\$ 64) per month for unskilled workers, Tk 11,000 (US\$ 142) per month for supporting staff, and Tk 30,000 (US\$ 386) per month for professional staff. Wage increases are being accelerated recently due to the rising demand for workers in the sectors.

only increase sales volume, but also to penetrate into upmarket products so that they can improve the profitability of their investment.

Ceramics

The Bangladeshi ceramic sector produces export quality porcelain. Monno, the industry leader of table ware with 50% domestic market share, is exporting its products to over 150 countries. There are fifteen ceramic table ware manufacturers in Bangladesh, geographically concentrated mainly in the Dhaka region with a few factories in Chittagong. FARR Ceramics is another major manufacturer in this sector with a domestic market share of around 25%. Shinepukur Ceramics produces mainly for export markets.

The competitive edge of ceramic table ware is the low price for quality products which are derived from low cost skilled labour and natural gas. Major companies are carrying a backlog of orders and therefore they are ready to expand production capacity. However, the availability of a large plot of land and natural gas becomes a serious constraint for expansion.

Other major subsector of ceramics covers tiles and sanitary ware. Bangladesh has 14 manufacturers in this sector, geographically concentrating mainly in the Dhaka region with a few factories in Chittagong. Leading companies are RAK Ceramics, Star Ceramics and AKIJ. Their products are predominantly tailored to domestic markets. Facing rapidly increasing domestic demand, many companies of this sector have a strong appetite for new plots of land with good access to natural gas supplies. Star Ceramics was established in 2012. After construction of Star's ceramic factory, no construction of ceramic factory has been reported in Bangladesh due to the new government order restricting new gas connections for industrial use - now lifted.

Food Processing

Frozen food, primarily shrimp, has been a large export item after garments and textiles. Bangladesh is also exporting various food processing products worldwide including juice, jam, jelly, bakery goods, mustard oil, etc. The food processing sector is finding more market opportunities in domestic markets as the country's income has been increasing. In this business environment, many food processing companies emerged and have grown to large scale companies. Major food processing companies are Pran Foods, ACI Food, and Square Consumer Products, etc.

The next decade is the period that Bangladesh will be transformed to be a middle income country. Capturing this opportunity, food processing companies plan to further increase sales at domestic markets as well as overseas markets. Many companies are now looking for land and raw materials for their expansion.

Shipbuilding

Bangladesh has a long history of shipbuilding because of the extensive water networks running through the country. This generated a large body of skilled workers in shipbuilding, who find opportunities to work in overseas dockyards in Singapore, the Middle East, and India. This sector used to serve domestic markets alone. However, after Ananda Shipyard & Slipways (Ananda) successfully delivered two 2,900 DWT multipurpose vessels to Danish Stella Shipping in 2008, Western Marine Shipyard (WMS) followed soon afterwards. They have been shifting resources to overseas markets. So far twenty vessels were exported from Bangladesh with a value of over US\$100 million.

Ananda and WMS are the only shipbuilders that have built and exported vessels to date. But there are other shipbuilders along the Karnaphuli River who are capable of producing export quality vessels. They formed the export oriented shipbuilders association which has ten members at present. If the eight other members follow Ananda and WMS in exporting vessels, it is not unrealistic to achieve the current objective of the association to capture 1% of the \$200 billion global small vessel markets.

Export-oriented shipbuilders are now constrained by the availability of land to achieve this objective. The banks of the Karnaphuli River where shipbuilders are concentrated are fully occupied and no land is available for their expansion. It is an imminent task for shipbuilding companies to find new sites to expand operation. Many large shipbuilders envisage building middle size vessels in the medium term. But to do so, they need to find some place along the Bengal Bay since the middle size vessels cannot pass the Shah Amanat Bridge, which is the first bridge from the mouth of the Karnaphuli River.

Although several shipbuilders started ventures to manufacture shipbuilding components, all steel sheets and almost all shipbuilding components are imported from various countries such as Japan, Korea, China, Singapore, etc. at present. Stock management and transportation costs in connection with the import of these shipbuilding components cause significant cost to shipbuilding companies to offset certain advantages created by the low cost of skilled labour available in Chittagong. The export-oriented shipbuilding industry is facing challenges to reduce reliance on imported components. This is the important issue to overcome along with another challenge to procure working capital at a reasonable cost so that the shipbuilding industry will grow to form an export-oriented shipbuilding cluster in the future.

Steel Products

The steel demand in Bangladesh is estimated at around 3 million tons, which are mostly MS bars. A leading steel company is BSRM with the production capacity of 0.7 million tons, followed by KSRM (0.4 million tons) and AKS (0.4 million tons). BSRM will increase its capacity to 1 million tons in 2014. The main source of scrap steel comes from ship breaking which is conducted on the north shore of Chittagong. All major steel makers are located near Chittagong.

Pharmaceuticals

Bangladeshi pharmaceutical companies now supply nearly 100% of generic drugs consumed in the country. Accumulating technologies and expertise through the development, some of the companies started exporting generic drugs in 2006. Those companies see further business opportunities in overseas markets and expand their operation in the coming period when many patents for high-demand drugs will expire.

Foreseeing hard competition with India which is currently providing active pharmaceutical ingredients (API), key materials for generic drug makers, to Bangladeshi pharmaceutical companies, the pharmaceutical association recently entered into an agreement with the government to develop a 200 acre API park in Munshiganj, 50 Km south of Dhaka. The pharmaceutical sector is expected to grow at an annual rate of 15% to 20% for the coming decade. Pharmaceutical companies need to find locations for their capacity expansion. This will be likely to occur in the Dhaka region since highly educated and skilled manpower, likely to be a key factor, will be available only there in the timeframe envisaged for the project. The business outsourcing process in the IT industry, another knowledge intensive sector expecting high growth, will also find venues for their expansion in the Dhaka region for the same reasons.

Motorcycles

The number of registered motorcycles is reported at 1 million as of September 2013 according to the Bangladesh Road Transport Authority (BRTA). It doubled over the last four years. The ownership of motorcycles is still very low at just over 6 vehicles per 1,000 persons, as compared to the cases of ASEAN countries with a range of 200 to 300 vehicles per 1,000 persons. As the number of middle income people increases and their disposable income rises, annual sales is expected to increase remarkably from the current level of 0.2 million to 1.4 million units in the near future.

The motorcycle market used to be dominated by imports of Indian made products such as Bajaj and Hero-Honda. Responding to rapidly growing demand and huge potential markets, Walton, a manufacturer and retailer of electric appliances, started motorcycle production in 2008, and has already captured 7% of the domestic market. Runner is another local motorcycle manufacturer in Bangladesh. Many foreign motorcycle manufacturers are interested in development of the Bangladesh motorcycle market. Honda planned to start motorcycle production in Bangladesh in 2013. Suzuki and Mahindra recently announced their intention to step into the local market. Many more foreign direct investments are expected to come in this sector.

Automobile

The number of registered automobiles in Bangladesh is 249,900 for passenger cars and 55,500 for pick-ups as of September 2013. Registered automobiles are mostly of Japanese manufacture, in which Toyota has a dominant share. Over 80% of registered vehicles are reconditioned (used) ones. The overall tariff structure is currently favourable for importation of used cars rather than new ones.

Table 2.2.1.4-1: Number of Registered Motor Vehicles in Bangladesh

(‘000)

Vehicle Type	Total as of end 2009	Annual Registration			Total as of September 2013
		2010	2011	2012	
Private Passenger Car	196.9	23	13	9.2	249.9
Pick-up	23.3	9	10.5	7.6	55.5
Bus	26	1.8	1.8	1.4	31.9
Truck	73.3	9.5	7.3	4.3	98.4

Source: Bangladesh Road Transport Authority (BRTA)

The current car ownership in Bangladesh is less than 2 vehicles per 1,000 persons, 186th in the world. This is very low as compared to 18 vehicles for India, 30 vehicles for the Philippines, and 165 vehicles for Thailand. Applying comparable indicators in the projection of future demand, the total number of automobiles is calculated at 3.4 million at the end of 2024 in Bangladesh. Bangladesh’s annual sales of automobiles are expected to be over 0.3 million in 2014. This calculation is based upon the assumption that Bangladesh will be able to prepare urban road infrastructure at the same level of India and other comparable countries. If this is achieved, annual automobile sales will increase over ten times during the next decade. However, this size of the market is still small for foreign automobile companies to seriously consider investments in Bangladesh domestic markets alone.

Bangladesh has one small state-owned knockdown plant of PRAGOTI near Chittagong. It assembles less than 1,000 units of Mitsubishi Pajero, minibuses of Tata and Eicher. There are no automobile parts manufacturers in Bangladesh and thus all parts and components required for the repair and maintenance of automobiles are imported. Mitsubishi announced a plan to manufacture Mirage type small cars for local markets. Walton also announced a plan to manufacture pick-ups and small-size vehicles in 2015. The level and types of their investments would be unlikely to lead to automobile manufacturing clusters as those found in Thailand. International automobile companies would have to come to Bangladesh in great force.

Given the size of Bangladesh’s domestic market, international companies would come only if those investors see manufacturing in Bangladesh from the perspective of the manufacturing base for the regional or global markets. In order to make that happen, a development policy towards creating an automobile industry would play a critical role. There are already good precedents for such action in countries such as Thailand, South Africa, etc. By implementing the development policy successfully,

Bangladesh would be able to establish automobile clusters, which will bring fundamental changes to the industrial structure of Bangladesh.

Electric Appliances

Bangladesh witnessed rapid growth of consumer electric appliances as the number of middle income people increases. But the ownership level is still very low and there is huge potential demand to be realized in the coming decade. The ownership per 1,000 persons is 1.4 for refrigerators and 0.5 for air-conditioners at present. Based upon the figures of comparable countries, the number of both refrigerators and air-conditioners is calculated to grow fourfold over the next decade - 0.8 million refrigerators and 0.3 million air-conditioners by the end of 2024.

To capture the increasing markets, Walton started manufacturing refrigerators in 2008 and air conditioners in 2010. Utilizing its extensive dealer network, Walton successfully increased sales in domestic markets. Its market share of refrigerators was reported to have reached 70% of the domestic market in 2012. Currently key parts and components of electric appliances are all imported. As its production increases, Walton is expected to increase the ratio of local manufacturing in electric appliances to reduce manufacturing cost and to increase value addition.

2.2.1.5 Next 20 Year Industrial Land and Economic Zone Land Demand

Current Investment Trend of Bangladesh

Table 2.2.1.5-1: Investment & FDI for the Past 10 years

Financial Year	Number of Local Investors	Amount	Number of FDI & JV	Amount	Number of Registered Companies	Amount
		US\$ (millions)		US\$ (millions)		US\$ (millions)
2001-02	2,875	1,531	89	302	2,964	1,833
2002-03	2,101	2,027	104	359	2,205	2,386
2003-04	1,624	2,356	130	460	1,754	2,816
2004-05	1,469	2,319	120	864	1,589	3,183
2005-06	1,754	2,730	135	3,794	1,889	6,524
2006-07	1,930	2,825	191	1,711	2,121	4,536
2007-08	1,615	2,798	143	785	1,758	3,584
2008-09	1,336	2,467	132	2,123	1,468	4,509
2009-10	1,470	3,931	160	890	1,630	4,821
2010-11	1,746	7,748	196	5,104	1,942	12,852
2011-12	1,735	6,679	220	4,470	1,955	11,148

Source: BOI Annual Report of 2012

The investment used to be from \$3 to \$5 billion per year from 2003 to 2009 but the investment jumped from 2010 to over \$10.0 billion and remains at a high level until now. Taking the average of the two years (2010 and 2011) as the base - domestic investment was \$7.2 billion and FDI was \$4.8 billion.

Among the total investment, the manufacturing sector has attracted 76% of domestic investment and 11% of FDI investment respectively. The total manufacturing investment in 2012 is estimated at \$6.0 billion.

Industrial sector growth was 9.5% for the 2011-2012, and the study team assumes that level of growth will continue into 2015. Manufacturing investment will reach at \$7.8 billion by 2015.

Assuming the Economic Zone (EZ) program will start from 2014-2015; manufacturing investment will increase from the current 9.5% to 12% during the period 2015-2020, 15% during 2021-2025, and 15% during 2026-2030, and slow down a bit to 12% during 2031-2035.

Investment for manufacturing is predicted to increase to \$13.74 billion by 2020, \$27.64 billion by 2025, \$68.40 billion by 2030, and \$137.6 billion by 2035.

Average investment of the EPZ is \$6.1 million, land requirement is 1.5 hectare with 800 workers and export of \$73 million/y. Land demand from manufacturing sector will be estimated.

Development Scenario for Bangladesh Manufacturing (2015 to 2035)

Base Case: Assuming the stability of the Bangladesh economy, and, that the Economic Zone Program constructs several coal-fired power plants to assure stable power supplies from 2015 onward, rapidly expands its number of EZs to reach 50 EZs by 2030, the growth of the manufacturing sector should continue the past trend of 9.5% in the period 2013-2015, start to accelerate to 12% during the 2016-2020 years, and reach 15% for the 10 years period 2021-2030. After the peak period of 10 years, the growth will slow down to 12% for the 2031-2035 years, and to 10% during the years 2035-2040.

Pessimistic Case: Assuming the stability of the Bangladesh economy, but that the Economic Zone Program fails to develop power plants or a stable power supply anytime soon, but expand slowly to build only 10 EZs by 2030, the growth of the manufacturing sector will continue the past trend of 9.5% for 2013-2015, start to increase to 10% during 2016-2020, and reach 12% during the 2021-2030 period. After the peak period of 10 years, the growth will slow down to 10% for 2031-2035, and remain at 10% for 2035-2040.

Optimistic Case: Assuming the stability of the Bangladesh economy, the Economic Zone Program constructs over 10 coal power plants assuring stable power from 2015 onward, and successfully builds 100 EZs by 2030, the growth of the manufacturing sector will continue the past trend of 9.5% for the 2013-2015 period, jump to 13% during 2016-2020, reach 16% during 2021-2025, and reach a peak of 18% during 2026-2030. After that peak period of 5 years, the growth will slow down to 16% for 2031-2035, and return to 13% for the years 2035-2040.

Table 2.2.1.5-2: Basic assumptions for three Manufacturing Development Scenarios

Period	2012	2015	2020	2025	2030	2035
Base Case (%)	9.5%	12%	15%	15%	12%	10%
Pessimistic (%)	9.5%	10%	12%	12%	10%	10%
Optimistic (%)	9.5%	13%	16%	18%	16%	13%

Base Case**Table 2.2.1.5-3: Manufacturing investment and EZ Land Demand in Hectares for the Base Case**

Period	2012 (Base)	2015	2020	2025	2030	2035
Manuf. Invest. (Bil.US\$)	6.0	7.8	13.74	27.64	68.4	137.6
Base Case (%)	9.5%	12%	15%	15%	12%	10%
Factory Number	984	1,278	2,252	4,529	9,110	16,052
Land Demand	1,476	1,917	3,378	6,794	13,665	24,078
Share of EZ		50%	60%	80%	80%	80%
EZ Demand (Ha)	738	959	2,027	5,435	10,932	19,262
EZ Land D for 5 year period (Ha)	2012-15 1697	2016-20 7,465+(849) 8314 () is back log of 5 y	2021-25 18,655	2026-30 40,917	2031-35 75,485	

- (1) Number of factories: 984 in 2012, 1,278 in 2015, 2,252 in 2020, 4,529 in 2025, 9,110 in 2030 and 16,052 in 2035.
- (2) Industrial land demand (Assuming an average factory is 1.5 ha) is 1,476ha in 2012 and increases to 1,917 ha by 2015, 3,378 by 2020, 6,794 by 2025, 13,665ha by 2030 and 24,078 ha by 2035.
- (3) Assuming the share of EZ is starting at 50% and gradually increases to 80% by 2025 and remains at 80% as other ASEAN countries.
- (4) Then, EZ land demand is estimated to be 738 ha in 2012, 959 ha by 2015, 2,027 ha by 2020, 5,435 ha by 2025, 10,932 ha by 2030 and 19,262 ha by 2035.
- (5) For a 5 year period, land demand is estimated taking average of 5 years multiplied by 5. For 2015, it was considered that backlog of EZ land demand (849 ha) is 50% of the 2012-2015 period, EZ land demand to be added due to the backlog which was not implemented due to a shortage of suitable EZ or other industrial land.
- (6) Based on the above assumptions, the EZ land demand for 2015-2020 is estimated to be 8,314 ha, for 2021-25 to be 18,655 ha, 2026-30 to be 40,917 ha, and for 2031-35 to be 75,485 ha respectively. Even now, in the 2012-2015 period, 1,697 ha is the potential demand for EZ. It is urgent for Bangladesh to seriously take necessary actions to implement the EZ Program as soon as possible.

Pessimistic Case

Using the same methodology, the pessimistic case is estimated below:

Table 2.2.1.5-4: Pessimistic Case Manufacturing investment and EZ Land Demand in hectares

Period	2012 (Base)	2015	2020	2025	2030	2035
Manuf. Invest. (Bil.US\$)	6.0	7.8	13.74	27.64	68.4	137.6
Growth (%)	9.5%	10%	12%	12%	10%	10%
Factory Number	984	1,278	2,059	3,628	6,392	10,298
Land Demand	1,476	1,917	3,089	5,442	9,588	15,447
Share of EZ	50%	50%	60%	80%	80%	80%
EZ Demand PS (Ha)	738	959	1,853	4,354	7,670	12,358
EZ Land D for 5 year period (Ha)	2012-15 1697	2016-20 7,030+(849) 7,879 () is back log of 5 y	2021-25 15,518	2026-30 30,060	2031-35 50,070	

Optimistic Case

Using the same methodology, the pessimistic case is estimated below:

Table 2.2.1.5-5: Manufacturing investment and EZ Land Demand in hectares

Period	2012 (Base)	2015	2020	2025	2030	2035
Manuf. Invest. (Bil.US\$)	6.0	7.8	13.74	27.64	68.4	137.6
Growth	9.5	13%	16%	18%	16%	13%
Factory Number	984	1,278	2,354	4,943	11,310	23,752
Land Demand	1,476	1,917	3,531	7,415	16,965	35,628
Share of EZ	50%	50%	60%	80%	80%	80%
EZ Demand OP (Ha)	738	959	2,119	5,932	13,572	28,502
EZ Land D for 5 year period (Ha)	2012-15 1697	2016-20 7695+(849) 8,544 () is back log of 5 y	2021-25 20,128	2026-30 48,760	2031-35 105,185	

Summary of the projected three cases of EZ land demand in Bangladesh for 2015-2035 is shown in the Table 2.2.1.5-6 below. For our EZ land demand for 2015-2035, we shall use the base case as the most likely scenario.

Table 2.2.1.5-6: Economic Zone (EZ) Land Demand in hectares

Year	2012-2015	2016-2020	2021-2025	2026-2030	2031-2035
Pessimistic	1697	7,879	15,518	30,060	50,070
Base Case	1697	8,314	18,655	40,917	75,485
Optimistic	1697	8,544	20,128	48,760	105,185

Source: WB Study Team

2.2.2 Current Situation

Chittagong is the gateway to the rest of the world for Bangladesh. Chittagong port is the only large scale port in the country at present and handles over 80% of total trade. Chittagong is also the birthplace of Bangladeshi industrialization. Hosting many state-owned enterprises in the country's early stage after independence, it functioned as the centre of many manufacturing activities until Bangladesh started the liberalization of its economy in mid-1980.

The first EPZ opened in Chittagong in 1984. It was successfully completed in 2000 to host over 180 companies from many countries with an accumulated investment level of over US\$1 billion. The Chittagong EPZ set a precedent to show the direction of the country's economic development. Now Bangladesh has eight EPZs.

Despite this success of industrial development, Chittagong has not necessarily kept up to speed to the country's economic development as garment sector has burgeoned and as Dhaka became the centre of growth attracting many labour intensive light industries as well as knowledge based industries. Chittagong's garment sector has now grown to 500 factories. But the garment sector of the entire country increased even more over the same period, already exceeding 5,000 factories. Similar things happened in many other sectors as economic activities have shifted to Dhaka.

Even in this changing environment of manufacturing sectors, heavy industries still stand fast in Chittagong, expanding and developing new lines of business in both export and domestic markets. Major steel companies such as BSRM, KSRM and AKS are all in Chittagong, expanding and modernizing their production facilities. Ship breaking, which started by accident on the north shore of Chittagong as a result of a ship stranded by a cyclone, has become an important source of supplying scrap steel to steel rolling mills there.

Shipbuilders are clustered in Chittagong, providing a large pool of skilled workers, marine engineers and other professionals. The shipbuilding sector had been confined to domestic markets for a long time. However, starting in the mid-2000's, two major shipbuilders spearheaded vessel exports to European markets, finding more business opportunities in overseas markets and creating many jobs in Chittagong. With such revitalizing activities, Chittagong is still an important centre of heavy industries for the country.

The imminent issue for Chittagong is the securing of energy supplies. Bakhrabad natural gas fields, the vital energy source of Chittagong, has not made a new discovery of substantial additional reserves for some time. With increasing economic activities, gas reserves have been depleted and the pressure of wells has been cautiously controlled and has curtailed the gas supply occasionally. KAFCO, which was established in the early 1990's to export urea fertilizer, has suffered several interruptions to its operations this year. Over 80% of electric power is generated from natural gas in Bangladesh. Under this situation, there has been no construction of a large-scale power plant at least over the last decade in the Chittagong region. Power plants recently constructed there were all small scale diesel based plants to meet urgent demand and are very costly. As economic activities intensify, Chittagong industries are strained by this energy situation.

To alleviate this difficulty, installation of a large scale coal-fired power plant is now under consideration. A 1,200MW coal-fired power plant will be constructed in Matarbari near Cox's Bazar with the assistance of the Japan International Cooperation Agency (JICA). The project includes construction of a deep sea port (14 metre deep) for the unloading of imported coal. A large coal storage site will also be constructed at the site to function as a coal supply centre for power plants to be constructed along the coast as well as the power project on site. Coal will be transported to other plant sites by barges (3 - 10,000 tonne size), which will unload coal at small jetties (6 metre deep) connected to power plants. The project is scheduled to commence operations in 2020.

2.2.3 Target Sectors

The Mirershorai zone is an exceptionally large scale development of this sort in Bangladesh. The entire leasable land exceeds 1,700 ha, which is more than ten times as large as the Dhaka Export Processing Zone and is by far larger than the other two candidate sites - more than two times larger than the proposed Anwara EZ and seventeen times larger than the proposed Sherpur EZ. This amount of land is not and will not easily be available in the areas near Dhaka and Chittagong. The feature of the vastness of the land can be better utilized to host industries which require a wide range of supporting sectors and which operate through extensive industrial linkages. The Team recommends the automobile industry to be selected as the primary target since it consists of many supporting components and parts supply sectors. The automobile industry will also bring fundamental changes into the industrial structure of Bangladesh - destined to become a middle income country. In the case of Thailand, there were 16 automobile assemblers, 690 Tier 1 suppliers and 1,700 Tier 2 suppliers as of the end of 2010 according to the Thai Automotive Industry Association.²⁰⁹

The automobile industry is the industry for the future of Bangladesh. In the current Bangladesh, there is no automobile assembly which could create a cluster envisaged above. There are no automobile parts and component manufacturers and thus all parts and components are currently imported for the repair and maintenance of automobiles running in the country. Walton announced it will set up an automobile assembly line in 2015. But it seems that no international automobile manufacturers currently view the Bangladesh market automobiles with seriousness. Domestic markets are growing and have huge potential, but are not large enough even after the next decade to justify their large investments.

If investments from those international automobile assemblers and related companies should come to Bangladesh, it would be an investment which sees the regional and global markets in their perspective. Starting from a pool of abundant low-cost labour, there are many advantages in Bangladesh which could make those international companies choose Bangladesh to be a manufacturing base in their global strategies. There are also many disadvantages for foreign direct investment currently in the country, including a lack of basic infrastructure, the regulatory burdens of doing business, the lack of policy consistency, and the limited availability of land, etc. In order for foreign investors in the automobile industry to consider Bangladesh seriously, a lot of effort should be made to this trough of disadvantageous issues and render those issues into advantages – perceived or otherwise. In this, a development policy for the automobile industry would play a critical role.

Until the Mirershorai project is under consideration, the availability of land has been a bottleneck to host such a large number of companies even if the right policy is in place. But now the Mirershorai EZ will be able to provide foreign investors with a sufficient and reliable supply of electric power, access to the Chittagong port etc. in addition to the good pool of low cost labour, particularly with many skilled workers, available in Chittagong. Together with the development policy in place, the Mirershorai would be able to make foreign investors seriously consider itself as a regional and global base for automobile and parts manufacturing. The vast area of Mirershorai which could accommodate many investors of parts and components companies will provide industrial linkages, from which they could derive more benefits. The vast area of Mirershorai, which is very scarce in Bangladesh, can be utilized for that purpose.

Mirershorai will not function without a continuous reliable power supply. The plan includes installation of a 600MW coal-fired power plant. The power plant would be able to source imported coal from the coal storage centre to be constructed in Cox's Bazar. If this project is delayed, the Mirershorai power plant will need to import coal directly from other countries for the time being.

²⁰⁹ Tier 1 suppliers are those who supply parts directly to assemblers. Tier 2 suppliers are those who do not have direct transactions with assemblers, supplying parts to Tier 1 suppliers and among Tier 2 suppliers.

The reliable and sufficient supply of electric power from the new coal-fired power plant will enable garment and textile sectors to invest in the Mirershorai²¹⁰ EZ. There is huge demand in those sectors, whose expansion has been constrained by the inavailability of land and energy. The Mirershorai will provide an ideal place for expansion. The reliable supply of electric power will enable the sectors to invest in upgraded machinery to manufacture upmarket products in the first time in Bangladesh which will lead to further value addition to the sectors. As the cluster of garment and textile businesses are being formed, many garment accessories companies will invest in the Mirershorai EZ. The Team considers these labour intensive sectors with requirement of reliable power as further target sectors especially during the early development stage of 2016-2020. These investments are expected to come in earlier because of the demand of these products already existing in Bangladesh, while investments in connection with the automobile industry will be further in the future.

The table below shows the determining factors for hosting the target sectors and the often cited major industrial sectors in Bangladesh. Besides the automobile industry and the garment and textile industries, the Team recommends motorcycle assembly and other machinery and parts supply industries as targets for the Mirershorai. Motorcycle assembly already started in Bangladesh. A few international motorcycle assemblers already invested or announced their investment plan. The number of registered motorcycles is expected to become thirty fold to over 30 million within the next decade. More investment will come to capture rapidly increasing domestic markets in this sector. The Mirershorai will be a good place to host such investments because of similar reasons to the automobile industry. Domestic manufacturing of motorcycles, various electric appliances and other consumer goods will prompt manufacturing of mechanical and electronic parts and precision machinery etc. Investment in the automobile sector will help accelerate further investment of other parts and machinery sectors. They can expect synergies from the cluster of the automobile industry to be created.

Ceramic and urea fertilizer manufacturers, which require large volumes of natural gas, are not suitable for location in the Mirershorai EZ. Food processing businesses could invest in the Mirershorai EZ because of the availability of electric power, water, and easy access to Chittagong markets. But since this sector cannot expect much synergy from the cluster of the automobile industry, the Team does not recommend this to be included as target sectors in the earmarked zone. Leather products sector is not selected since this sector needs to find a strictly ring-fenced area to contain pollution in a designated area. The Mirershorai EZ will not be equipped with such facilities.

²¹⁰ Steam required for the dyeing process will be provided either from a coal-fired power plant or a coal-fired steam plant to be jointly established by a group of textile mills.

Table 2.2.3-1: Determinant Factors for Selected Industrial Sectors

Sectors	Industrial Linkage	Access to Natural Gas	Access to Port	Access to Low Cost Labour	Knowledge Intensive Labour	Anti-pollution measures
Garments				⊙		
Garment Accessories				⊙		
Textile		1)				
Motorbike Assembly	⊙		○	○		
Automobile Assembly	⊙		○	○		
Automobile Parts	⊙		○	○		
Other Parts and Machinery	⊙		○	○		
Coal-fired Power Plant						○
Steel Mill (Electric Furnace)						○
Ceramics		⊙		○		○
Urea Fertilizer		⊙				
Pharmaceuticals					⊙	
ICT BPO					⊙	
Food Processing				○		
Leather Products				⊙		⊙

⊙Indispensable; ○ relevant; blank space indicates irrelevance.

1) Textile companies can have access to a stable supply of electric power from the coal-fired power plant.

Many investments in the Mirershorai zone will be foreign direct investment (FDI) due to the nature of the target sectors and the fully serviced EZ which guarantee a stable and reliable power supply. It is expected that families of technical and management people will also come from overseas. In order to meet the needs of those expatriates and professionals, amenities such as residential and commercial complexes especially suited to their lifestyle are proposed to be included in the plan.

2.3 Market Assessment

2.3.1 Demand Forecast by Macro Approach

The Mirershorai EZ Land Demand Projection was made based on the investment trend and future development scenarios (detailed methodology is shown in the overall section).

Table 2.3.1-1: EZ Land Demand (Hectare) of Chittagong Region and Mirershorai EZ

Period	2016-2020	2021-2025	2026-2030	2031-2035
Pessimistic	7,879	15,518	30,060	50,070
Base Case	8,314	18,655	40,917	75,485
Optimistic	8,544	20,128	48,760	105,185
Chittagong%	20%	20%	20%	20%
Mirershorai EZ %	50%	50%	30%	20%
(Mirershorai EZ Share)	10%	10%	6%	4%
Pessimistic Case	788	1,552	1,804	2,002
Base Case	831	1,866	2,455	3,019
Optimistic Case	854	2,013	2,926	4,207

The potential Mirershorai land demand for the base case scenario is estimated to be 831 hectares for 2015-2020 and 1,866 hectares for the period of 2021-2025. Assuming several EZ projects will be initiated in Chittagong Division in the future; the Mirershorai EZ is expected to have a few competitors reducing the share of EZ land demand for 50% in the 2015-2020 and in the 2021-2025 period. Yet, the sufficient demand for Mirershorai is likely to be available and if BEZA/Developer is able to construct a fully serviced EZ with all necessary infrastructure such as power, water, access road, and telecommunications, based on the Macro Demand Approach, the Mirershorai EZ will be able to attract investors to fill up the EZ within a 10 year period (2015-2025). Especially the coal-fired power plant of 600MW with jetty is likely to attract investors assuring stable and sufficient power in the Mirershorai EZ area. Actual development & marketing of the Mirershorai EZ land will determine the actual filling up of the Mirershorai EZ. The Macro Approach demand analysis indicates that sufficient potential land demand for Mirershorai EZ (7,340 hectares for 2015-2035 for the Base Case, and 5,358 hectares even for the Pessimistic Case) exist well above (3-4 times) the projected EZ land marketing schedule of 1,798 hectares from 2016 to 2035.

2.3.2 Demand Survey: the Results

A demand survey was conducted. The narrative in the following is structured as follows. We discuss next the sampling methodology. We then briefly discuss how size of enterprise is defined in Bangladesh. That discussion is in context as the statistical universe that ought to underlie the demand survey on hand is presumed to comprise large and perhaps medium-sized manufacturing enterprises in Bangladesh. Finally, we present one table of results about the demand for developed land at the Mirershorai EZ.

2.3.2.1 Sampling methodology

The following table presents an idea of the size of the universe of all manufacturing enterprises in Bangladesh. The second column shows the seventeen industrial sectors that were represented in the demand survey. The third column presents the Bangladesh-wide number of manufacturing enterprises in each of those industry categories as of the year that the last Business Registry of industrial enterprises were published in Bangladesh in the year 2006.

Table 2.3.2.1-1: The overall size of the Bangladeshi manufacturing sector

Sl. No	Name of the industry sector	Total number of manufacturing firms (cottage, small, medium or large scale) in Bangladesh, 2007
1	Auto-assembly and –parts making firms	341
2	Cement-making firms	63
3	Ceramics and non-metallic minerals	19,861
4	Electronic and electrical products	20,262
5	Number of firms in the extractive industries	20
6	Food & beverage	123,169
7	Furniture	71,034
8	Integrated textile mills/ready-made garments	110,536
9	Leather goods manufacturers	5,358
10	Motor cycle makers	6
11	Other parts manufacturers	67,128
12	Paint and Chemical producing firms	80
13	Paper and Packaging firms	6,304
14	Pharmaceutical firms	250
15	Plastics products making firms	2,365
16	Ship-building firms that are registered	124
17	Steel mills, and other firms making different steel product	990
	Total	427,891

Quoted from the publication “Efficient, Proactive and Inclusive SME Development in Bangladesh: Issues, Methods and Results”, published by SMESDP project, SME Cell, The Ministry of Industries, Government of Bangladesh. The original source had been the BBS, The Business Registry, 2007. The total number of manufacturing enterprises according to a later version of the Economic Census, reporting for 2013, has been put at 450,348.

2.3.2.2 Definition of Small & Medium Enterprises

A variety of definitions concerning small and medium enterprises exists in Bangladesh.

BBS definition:

BBS uses a definition of size based on ‘employment size.’ Establishments employing between 1 and 9 workers are called ‘micro;’ establishments employing between 10 and 49 workers are called ‘small;’ those employing between 50 and 99 workers are called ‘medium;’ and, finally, those employing between 100 or more workers are called ‘large.’ It is this definition that was used both in the BBS’ Economic Census of 2001/2003, whence came the Business Registry – 2005/6. It is also used in the updated BR of 2007, which, authorized by the RFP from ADB, our team is using.

Ministry of Industries definition:

The erstwhile Small and Medium Enterprise Task Force (SMETF) enunciated a second definition of size. This was subsequently adopted in the issuance of the Cabinet-approved SME Policy Strategies 2005---the muse for all SME policies of the Government of Bangladesh.

The definition formulated by the Bangladesh Better Business Forum (BBBF)

That said, the BBBF has recently issued another definition of small and medium enterprises in various realms of production. This is presented below:

Table 2.3.2.2-1: Definition mooted by the BBBF, in 2008

Enterprise	Sector	Asset size	No. of employees
Small	Service	Total fixed asset excluding land & building between Tk. 50,000-Tk. 5 Million	Up to 25
	Trade	Total fixed asset excluding land & building between Tk. 50,000-Tk. 5 Million	Up to 25
	Manufacturing	Total fixed asset excluding land & building between Tk. 50,000-Tk. 15 Million	Up to 50
Medium	Service	Total fixed asset excluding land & building between Tk. 5 Million -Tk. 100 Million	Up to 50
	Trade	Total fixed asset excluding land & building between Tk. 5 Million -Tk. 100 Million	Up to 50
	Manufacturing	Total fixed asset excluding land & building between Tk. 15 Million -Tk. 200 Million	Up to 150

Most analysts follow the definition that is based on employment size per firm. The existing definition of BB uses either of the 'employment size' or 'fixed investment brackets:' "In the BBBF definition as adopted by the government and BB, *both* fixed assets excluding land & building and the number of employees has been taken into consideration while defining SMEs. In the new Industrial policy (IP) 2010, *both* of these criteria have been retained (emphasis added)." A definition based on employment size is, chronologically, more stable (and therefore more 'robust'), than one using fixed investment. Any measure of size of enterprise based on the replacement cost of plant and machinery will vary based on geography, for instance. We have used the definition using employment size (i.e. number of jobs created). The replacement of the same collection of (imported) plant and machinery will be the lowest in Bangladesh's port city of Chittagong, somewhat (at least 7-8%) higher in Dhaka due to the spatial arbitrage cost, and at least 15-17% in Thakurgaon compared with Chittagong. The same 'package' of plant and machinery could conceivably pass for a billing of 'medium firm' while failing the 'test for medium' in Dhaka and Thakurgaon, merely due to geography. Put differently, geography could get conflated with the true measure of *industrial* size, as long as one is measuring thing using *monetized units*. There is therefore a *lack of purity* in the size measures based on fixed investment. As well as chronological instability, already demonstrated, this definition also betrays spatial instability. A definition based on headcount does not suffer, at least as egregiously, from those two counts, as one based on fixed investment. Thus have we preferred using headcount compared with fixed investment as our empirical measure of 'size.'

The statistical universe of the demand survey must be comprised of the firms that populate the top of the firm size-structure found in Bangladesh. That points to the firms in the class of large and medium-sized firms. The Bangladesh Bureau of Statistics (BBS) typically processes the data from the economic censuses for compiling the portions of the national accounts data relate to manufacturing as a sector. Towards that end, however, the BBS clubs medium-sized enterprises along with large enterprises, small enterprises being clubbed with cottage-scale enterprises. The number of large enterprises is not typically reported as a standalone item. There is some suggestion in the numbers presented along with the preliminary results of the 2013 Economic Census that the number of large and medium manufacturing enterprises in Bangladesh is about 7,000 as of 2013.

2.3.2.3 Survey Results

The JDI team sampled a total of 107 enterprises including 28 (twenty-eight) foreign ones and 4 joint-ventures. Of the total number of enterprises, foreign firms account for some 26%. Thus, one in four enterprises sampled happens to be a firm with foreign ownership. It is certain that the matched percentage of foreign firms in the manufacturing economy of Bangladesh at large would be much smaller. We have therefore oversampled foreign-owned firms on our sample. Three of these firms

were actually interviewed in Japan. One indo-Nepalese firm with substantial operations in both of those countries was interviewed in India. Executives representing the remaining foreign-owned firms were interviewed in Bangladesh. Annual turnover of the firms on the sample in the year was estimated to be in excess of US\$40 million.

Thirty nine (out of the 107) firms have evinced strong demand for buying into Mirershorai EZ. The total demand for land/factory-rentals at Mirershorai EZ happens to be 445 hectares.

Many foreign investors outside are still sceptical about the ability of Bangladesh Economic Zones Authority (BEZA) to implement fully-featured economic zones. It is quite understandable that foreign investors will display a ‘show-me’ attitude until such time that BEZA can successfully roll-out an economic zone with all promised infrastructure and smoothly-functioning one stop service (OSS). Despite the still difficult situation in Bangladesh, three of the four foreign companies interviewed in Japan and India are very seriously considering investing in Bangladesh’s prospective economic zones only if BEZA is able to deliver a fully serviced EZ. The Indian company (hailing from food processing) is interested to market in Bangladesh. Another Japanese company - the KPF Corp. - is also seriously considering investing in either Anwara or Mirershorai.

The demand survey with a fairly large sample of 107 industries engaged in manufacturing different range of products indicates strong demand for serviced plots at the Mirershorai Economic Zone. Interest shown by different types of industries along with the amount of land demanded by each industry is shown in the following table. Considering the total manufacturing sector of Bangladesh, the ultimate demand for fully serviced designated industrial land is now very high and will continue to be high in the future.

Table 2.3.2-1: Industrial demand for Mirershorai EZ

Sl. No	Industry Category	2015-2019	2020-2024
1	Automobile parts manufacturing fac.		120,234
2	Cement Factories	40,469	
4	Food & beverage	1,648,744	
5	Integrated textile fac./ Big garments industries	1,938,221	149,047
6	Motor cycle industries	60,000	
7	Other parts manufacturing industries	30,000	
8	Paint and Chemical industries	70,000	
9	Paper and Packaging industries	178,062	
10	Plastic industries	36,422	
11	Ship Building Industries	100,000	
12	Steel Mills-making different steel product	80,937	
	Total sq. m.	4,182,855	269,281
	Total hectares	418.29	26.93

2.3.3 Demand Forecast

2.3.3.1 Major Assumptions

The following are assumed in making demand projections for the Mirershorai Economic Zone:

1. All proposed land (public and private land) should be acquired for the project by the end of 2016;
2. All permits including, amongst others, access rights to water supply, license to generate electricity and to connect power transmission lines should be granted by the end of 2016;
3. A private entity (Mirershorai Economic Zone Company) will be selected for investment of the zone, and the investment agreement between such an entity and the government will be entered into

by the end 2016.

4. The coal-fired power plant in the zone will start construction in 2018 and commence operation at the end of 2021 (1st Unit of 300 MW). The power plant will start expansion in 2022 and the whole power plant will be completed in 2025. At full build-out, the power plant will be able to supply 600MW in total which will cover the full demand of the economic zone. The capacity of power will be kept larger than the demand of Mirershorai Economic Zone in order to ensure the stable power supply and any excess power shall be sold to the national power company through the national grid; Also BEZA should consider the option of using three coal power plants are initiated by Bangladesh Government now (Total of nearly 4,000 MW: One by JICA finance and 2 other by Chinese IPP developers).

5. The Bangladesh automobile industry development policy will be formulated and implemented by the end of 2019;

6. The initial unit price of land will be \$50 per square meter and the land price should be increased as the market demand pick up in the future as the most of SEZ projects are practiced.

7. The resettlement land should be made before the construction start.

8. However, any reasons, the above initial tasks are delayed; the implementation should be delayed as much the initial delay as any other projects.

2.3.3.2 Micro Approach for Demand Projection

Based on the Market Demand Survey of 107 interviews, 28 companies with the requirement of 225 hectares are interested to lease the Mirershorai EZ plots within a short time span (2-5 years). The Macro Demand estimation for the Mirershorai for the period from 2016-2020 is 788 hectares in the Pessimistic case. Macro Demand projection indicates that the demand for Mirershorai EZ for the phase 1 is larger than the available leasable land of 570.41 hectares (industry plot) for the phase 1. However, the Micro Market Demand Survey shows that the demand (225 hectares) is less than the available leasable industrial land for the phase 1. The market demand survey is only a 107 sample survey and the actual possible demand is likely to be at least several times larger. Considering both Macro and Micro land demand surveys plus other pieces of evidence, the potential market demand for the Mirershorai EZ plots is likely to be much higher than the planned plots. Based on the market survey and industry development scenario for the Mirershorai EZ, the base case demand forecast is projected and summarized in the next table. According to the project development schedule of phase 1, most utilities are completed in 2020 and the 300 MW capacity of the power plant will commence its operation in 2021 (Figure 3.5.2-1 Construction Schedule of Mirershorai Economic Zone). In 2021, the phase 1 of the Mirershorai EZ is equipped with full infrastructure together with a functionally efficient OSS service, and pro-active marketing program will be carried out. According to this, all the industry plots of land (570.41 hectares) are likely to be sold out by 2023.

The key result is that for the first five years (2016-2020), currently existing industries mix in Bangladesh such as motorbike, garment, textile, food & beverage, chemical & other products (chemical, paint, paper, plastic, etc.) will be the main industries, and then labor intensive automobile parts and other machinery parts may be targeted as new industries. Other parts and machinery companies will invest to meet increasing domestic demand for electric and electronic appliances, motorcycles, etc. Consequently, the total land sold/leased during the first five year period will be above 600 hectares including industry plots, the residential zone, the commercial zone, and others.

Most investments from automobile supporting companies will come after an international automobile assembler decides its investment in the Mirershorai Economic Zone. Local companies will join this investment as second and tertiary supporting companies. Over 60% of the investment during the second five year period is projected to be related to the automobile industry. This is the period that the Mirershorai Economic Zone will clearly appear as an automobile related cluster. This visibility will

further promote investments from other automobile parts and components companies to choose Mirershorai as the location of their investment.

One of the key strategies is the introduction of an automobile assembler in the beginning of the third five year period from 2026 to 2030. This investment can be made by one of the major international automobile companies. Prior to this, in a possible scenario, automobile parts and components companies will start investing late in the first five year period from 2016 to 2020, continuing into the second five year period from 2021 to 2025, responding to implementation of the automobile development policy and easy access to the Chittagong port. This scenario is possible and likely considering the size of the population and increasing automobile domestic demand of Bangladesh. All ASEAN countries like Thailand, Malaysia, Philippines, Indonesia, and Vietnam have had auto assemblers from the early 1980s and even in Myanmar, two automobile assemblers - SUZUKI and NISSAN - agreed to build auto assembly plants in 2013.

The virtuous cycle of investment will spread to other machinery and parts companies which will find certain synergies from an automobile cluster. The industrial development scenario for the Mirershorai Economic Zone is based on the cases of the Eastern Sea Board of Thailand which began from the middle of the 1980s and Bekasi Industrial City of Indonesia which began at the end of 1980s. The current market analysis is limited by time and number of samples, therefore, further market analysis should be carried out in the future and an adjustment made in the industrial mix accordingly just as should be the case with any this type of projects.

Considering all this analysis and facts, the demand projection is shown.

Table 2.3.2.2-1: Projected Demand and Timeframe of Investment (Base Case)

Sector	Area per investment (ha)	2016-2020		2021-2025		2026-2030		Total	
		Number of investments	Total areas for investment (ha)	Number of investments	Total areas for investment (ha)	Number of investment	Total areas for investment (ha)	Number of investments	Total areas for investment (ha)
Coal-fired power/Jetty	290	1	290					1	290
Garment	1	32	32	68	68			100	100
Garment accessories	1	14	14	28	28			42	42
Integrated textile	4	8	32	17	68			25	100
Motorcycle assembly	10	1	10	1	10			2	20
Automobile assembly	150					1	150	1	150
Automotive parts	2	25	50	133	266	94	188	252	504
Other parts and machinery	2	10	20	63	126	42	84	115	230
Chemical & Other Products	2	7	14	18	36	3	6	26	56
Food & Beverage	4	4	16	10	40			14	56
Rental Factory Zone									10
Commercial Area									20
Residential									68
Warehouse									18
Others (Medical College, Training Center, etc.)									41
Total		102	478	338	642	140	428	580	1,705

2.4 Employment Estimate

Employment in Mirershorai has been estimated using the average jobs per hectare measure of the existing industries in Bangladesh. For the industries which don't exist in Bangladesh was estimated from industries of Asian countries. Based on the planned land use of Mirershorai EZ, the estimated employment created will be 476,678 workers when the Mirershorai EZ is fully occupied. Once these 476,678 jobs are created in Mirershorai EZ, an additional 238,339 indirect jobs (normally about 50% of direct employment) are likely to be created in the surrounding area also mainly various services such as transport, retail, health, food, and housing services. The total employment of direct and indirect employment may reach 715,017 workers. Probably the Mirershorai area will be a new industrial city of over 1.0 million including the existing population when the EZ will be fully occupied and the industrial city matures 20-30 years into the future. Average employment in the newly built EZ is expected to become 280 jobs/hectare - about 45% that of Dhaka EPZ and 28% that of Chittagong EPZ.

Table 2.4-1: Employment Estimate for Mirershorai Economic Zone

Industry & Com	Land Area (Ha)	Jobs /Ha	Job Sub-totals
Garment	100	800	80,000
Garment Accessory	42	500	21,000
Integrated Textiles	100	400	40,000
Motorbike Assembly	20	300	6,000
Automobile Assembly	150	100	15,000
Auto Parts & Components	504	350	176,400
Machinery Parts & Components	230.56	350	80,696
Chemical & Others	56	300	16,800
Food & Beverages	56	250	14,000
Rental Factory	10.46	500	5,230
Commercial	19.86	200	3,972
Resident/Housing	67.93	100	6,793
Warehouse	17.83	50	892
Others (Clinics & Training , Services)	41.02	100	4,102
Coal-fired Power Plants & Jetty	289.67	20	5,793
Total	1,705.33	280 (Average)	476,678

Source: WB Study Team

* is estimated from the Existing Bangladesh Industry and Asian examples

We have checked the Bangladesh employment condition of existing EPZs and found out that due to the limited number of EPZ/Industrial Parks in Bangladesh, occupying factories are economizing on space. As a result, employment figures are much higher than the other countries of South East and South Asia. Taking into consideration the special condition of Bangladesh, we estimated the employment based on the final Master Plan and type of industries.

Table 2.4-2: Average employment of existing EPZ and Proposed Three EZs

EPZ/EZ	Total Area (ha)	Estimated Employment (Jobs in 2013)	Jobs/hectare
Dhaka EPZ	142.48	88,536	621
Chittagong EPZ	183.37	186,064	1,014
Comilla EPZ	108.28	14,966	138
Karnaphuli EPZ	83.6	41,659	498
Sherpur EZ*	88.68	25,446	287
Anwara EZ*	431.62	47,539	110
Mirershorai EZ*	1,705.33	476,678	280

Source: WB Study Team * is proposed estimation.

Sherpur and Mirershorai EZ are expected to produce 287 jobs per hectare and 280 jobs per hectare respectively - still well below that of the Dhaka and Chittagong EPZ figures. Anwara EZ is being planned to be more specialized in Shipbuilding & related industries. Therefore, the employment per hectare figure is a bit lower at 110 at the fully occupied and matured stage (normally requiring 10 to 15 years of time).

It has been demonstrated in many cases in other Asian countries that a special economic zone (SEZ) is a strong policy tool to break through the complicated situation of various constraints and obstacles. This study is the first attempt at providing a design of an EZ and analysing the types and magnitude of potential investors in the selected sites. Learning from other countries' experiences, Bangladesh could have 100 economic zones for its economic development over the next two decades. The area required for the zones will be 50,000 hectares - approximately 0.03% of the total agricultural land of the country. If achieved, such a magnitude of economic zones could create 10 million new jobs.

Table 2.4-3: Planned Economic Zones and Job Creation

Items/Year	2015	2020	2025	2030	2035
Number of Economic Zones	1	10	40	70	100
Land Area to be Developed	200	5,000	20,000	35,000	50,000
Job Creation	4,000	1,000,000	4,000,000	7,000,000	10,000,000

*all figures are accumulated ones

**figures are calculated under the assumption that an average size of EZ is 500 hectares and an average job creation is 100,000 persons per zone

2.5 Pieces of Evidence for the Strong Potential Demand for the Fully Serviced & Efficiently Operated Economic Zone (EZ) Land in Bangladesh

The first three sections (Comparative Analysis, Industry Assessment, and Marketing Assessment) showed much strong evidence here and there for the potential demand for fully serviced Economic Zones in Bangladesh. We consider it as the most important assessment of the possible market demand of EZs since the viability of three EZs depend on the possible market demand from all possible angles and factors and not just one or two sources. The major evidence for strong demand for EZ land is summarized below.

(1) The interview survey result is overwhelmingly positive for EZ development.

The study team made market surveys in Dhaka, Chittagong, Thailand, and Japan for possible EZ land demand by conducting (1) 107 personal interviews, (2) 7 interviews with industrial associations, (3) 3 with EPZs and BEPZA headquarters, (4) with Investment Promotion Agencies (as BOI, JETRO and JICA), and 5 with Local Chambers of Commerce. Nearly all interviews and meetings indicated that fully serviced industrial land is very scarce in Bangladesh since several years, and each interview subject, without exception, requested BEZA to develop fully serviced industrial land as soon as

possible. In fact, the most important request/message received during this process of discovery was delivery of “fully serviced EZs” as soon as possible!

(2) Every month, more than 100 potential investors have been visiting BEPZA asking for additional EPZ industrial land plots. Requests have been increasing every year. BEPZA is now allowing factory expansion vertically upwards into multi-story buildings as no additional EPZ land is available.

(3) JETRO has been receiving more than 200 enquiries per month in their Dhaka and Tokyo offices for possible investment in Bangladesh. These enquiries were received in 2013 especially for relocation of factories from China and Thailand to Bangladesh.

(4) A JICA survey of Japanese companies (179 companies are seeking relocation from China out of 1,462 companies) who are operating factories in China indicate 8% of those companies are interested in relocating their factories to Bangladesh in the near future. This evidence is significant since Bangladesh never appeared on the destination list previously. JICA is now proposing to support the EZ Project by carrying out a Feasibility Study/Master Plan as soon as possible.

(5) Macro Demand Approach indicates 3 to 7 times of requirement of the planned three EZ industrial land available:

- (a) Sherpur EZ: 574 ha during 2016-2020 and 645 ha during 2021-2025,
- (b) Anwara EZ: 499 ha during 2016-2020 and 1,119 ha during 2021-2025 and
- (c) Mirershorai EZ: 831 ha during 2016-2020 and 1,866 ha during 2016-2025.

In order to expand the industrial sector, additional industrial land is essential and the result of the demand analysis show how badly additional fully serviced industrial land is needed in Bangladesh.

(6) All EPZ Land Plots have been nearly occupied recently (by 2013):

Some years back, three remote EPZs (in Uttara, Ishwardi, and Mongla), had difficulty in attracting investors. However, since 2010, nearly all the plots in the three remote EPZs have been leased out (93% leased out) at the end of 2013 - indicating a strong demand for industrial land even in faraway remote locations.

(7) New phenomena of multi-story factory buildings in the EPZs and major cities of Dhaka and Chittagong have been taking place since the past several years - indicating a severe shortage of industrial land. The factory buildings have been raised to 5 stories and in some cases to even 10 stories which created a collapsing problem of some poorly built factory buildings as the tragedy of Rana Plaza case in 2013. Speedy development of the three EZs is likely to reduce this type of tragedy by guiding factories to safer EZ locations.

(8) Increase in the demand of fully serviced EZ land in Bangladesh due to the global economic changes:

Besides the many internal evidence, due to the global economic changes made, Bangladesh, as a possible investment destination of international companies - especially labour intensive industries from Japan, Korea, Taiwan, Thailand, and even from China in the recent years - mainly due to (1) rapid increase of wages in Asian countries, particularly China, and (2) policy changes in Japan & other Western/Asian countries for investment policy shifting from China to other countries due to political risk factors. Many companies are looking at countries which have lower production costs than either China or Thailand. Naturally, Bangladesh is one of lowest wage countries and the potential demand has increased dramatically in the past few years.

(9) Several SEZ/EZ international developers and operators are showing keen interest in the EZ business. So far potential developer/operators from UAE, Japan, China, Korea, Malaysia, and

Singapore have shown keen interest in investing in EZ projects if proper conditions are met. The main reason is that these potential developers smell an opportunity in the EZ business by the new EZ Act and the global economic changes favouring Bangladesh - especially highly competitive wage levels due to the large labour force and limited employment opportunities in Bangladesh.

(10) Comparative Analysis of various factors indicates that if BEZA/developers are able to develop fully serviced EZs at the proposed cost, (1) Mirershorai EZ is ranked No 1, (2) Sherpur EZ is ranked No 2, and, (3) Anwara EZ is ranked No 5 out of 7 well known SEZs in Asia and India. The reason is the wage cost of Bangladesh is far lower than any competitor along with the planned fully serviced EZ infrastructure carrying a relatively lower cost than that of other countries. Lower ranking of Anwara EZ is due to high cost of construction of Super Dike and reclamation/channel development cost pushing the overall development cost up.

(11) Japan emerged as a strong destination for garment exports from Bangladesh:

The export of garments to Japan increased from \$173 million in 2010 to \$478 million in 2013 which is a 2.76 times increase within 4 years!

Table 2.5-1: Garment Exports to Japan (in \$ million)

Year	2010	2011	2012	2013
Export	173.3	247.5	403.6	478.5

Source: EPB

This rapid increase of garment exports to Japan is due to two major factors - first, the cost of production in China, which had been a major garment supplier, increased dramatically in the past several years. The average wage in China is now 5-6 times higher than that in Bangladesh (as of 2013). It is but natural to shift production of garments from China to Bangladesh. The second reason is the worsening of the Japan/China political relationship. The Japanese Government and Japanese private sector initiated a China + 1 policy encouraging Japanese companies to shift supply of manufactured products from China to other Asian countries because of political risk affecting economic affairs. For Example, Uniqlo Co., which is the biggest garment retailer in Japan, started ordering garment products to Bangladeshi suppliers since 2010. This action by Uniqlo paved the way for many other companies to look at Bangladesh as a garment supplier country. This trend is likely to promote investments from Japan. That is the reason that Sumitomo Trading Co. started searching for possible EZ land in 2013 in Bangladesh, since many Japanese companies had been inquiring about possible investment sites (in EPZ or EZ). For the same reason, JICA also started to investigate possible EZ projects in Bangladesh in 2013. It is clear that if BEZA/Developers are able to develop fully serviced EZs, many Japanese companies are likely to come to Bangladesh to cope with the China +1 and Thailand +1 policies.

All of the above 11 pieces of evidence indicate that there is a strong demand for fully serviced EZ land by both domestic and foreign investors. The key point for strong demand is based on the fact that BEZA/private developers are able to deliver the promised fully serviced infrastructure with efficient OSS. If BEZA/private developers are able to develop fully serviced EZs with an efficient OSS system at a competitive sales/leasing price from \$50 (Year 2017-2019) to \$80 (Year 2026-2028) per square metre²¹¹, the investors (both FDI and DI) are likely to be attracted to the proposed three EZs and occupy the plots in a relatively short time (of 3-5 years for Sherpur and Anwara EZ and about 10-15 years for Mirershorai EZ - due to the large lead time needed to develop and market). Based on overwhelming evidence for demand for fully serviced EZ land, BEZA should promote at least 10-15 more EZs in the coming years; not just implementing the proposed 3 EZs under the PPP scheme by

²¹¹Detail on land price can be found in section 6.1.6 (Chapter 6)

mobilizing the private sector but also creating EZ land market where EZ land can be transferred freely as any real estate land.

Considering the above strong evidence of potential demand for fully serviced EZ land, BEZA should finalize the “EZ Guidelines” for developer/operators and implement the proposed three EZs as soon as possible as the Pilot EZ “national” projects of Bangladesh. Several more EZs should be considered ASAP even during the initial pilot project implementation because of the large demand for fully serviced EZ land. These three EZ projects should be test cases for BEZA/developers to deliver fully serviced EZs quickly and operate them effectively adopting an OSS system equal to or better than Asian OSS standards.

Recognizing a strong potential demand for three EZs, a Master Plan will be prepared.

2.6 Marketing Strategy

In this chapter, an overview of the marketing strategy describing how EZs in Bangladesh should be packaged and promoted and the type of materials needed for their start-up are discussed. The four important questions on marketing strategy relate to:

- Overall strategy, timing and implementation framework, and responsibilities;
- Target markets, countries, and investor profiles;
- Types of promotional tools and materials required;
- Opportunities to coordinate with other promotional agencies in Bangladesh

2.6.1 Overall Strategy

The term marketing is composed of several related concepts such as product, price, distribution, promotion etc., but it has a crucial connotation, which is sometime un-focused, that of whether there is a sure market for the products to sell. In practice, therefore, the most important element in “marketing” is to provide customers with what the market needs rather than what it already has. In the EZ project, even though state-of-the-art infrastructure and services are supplied in the EZ, if there is no identified and/or prospective market for products to sell in Bangladesh, no customer will be interested in investing. Consequently, a demand-side approach, rather than a supply-side approach becomes crucial. More so than physical installations or legal systems in an EZ, the creation of a business environment that assists investors in their market needs is the most fundamental element to achieve success in any EZ marketing strategy.

Deciding on the contents of the marketing strategy and a timetable for implementation, it is clear that the length of time taken to implement the marketing strategy will vary according to the following three elements:

- The type of marketing strategy
- The number of activities involved
- The resources available

Strategy is regarded as “a method or plan to attain and maintain a position of advantage over rivals through the successive exploitation of available or evolving resources rather than committing to any specific fixed plan designed at the outset.” As the global economy and industrial development have been dramatically changing in structure, the type of strategy to be employed for the marketing of EZs in Bangladesh should be elastic and reflectional in choosing the ideal context for pursuing marketing targets. In order to capture the ever-changing business and industrial environment, phased elements with multiple ‘rounds’ of feedback should be embedded in the flexible marketing strategy to provide

room for updates and additions. The strategy should incorporate reflection on the current changes in the surrounding industrial and business environment.

Figure 2.6.1-1: Diagram of Market Strategy

Therefore, the following sections include the implementation framework outlining the marketing activities to be employed and the extent of involvement of resources in the context of Bangladesh, together with the investment promotion agencies' responsibilities. In this study, the proposition is in line with the reference from OECD investment promotion and facilitation guidance, which contains international best practices of investment promotion. Success in promotion of the EZ requires a careful calculation of how to employ resources most effectively. It also requires consideration of how to organize investment promotion and marketing activities within the government so that the overriding goal of economic development through improvements in the investment climate remains at the forefront of policymaking.

2.6.1.1 Requirements for BEZA for Formulation of the Marketing Strategy for EZs

A successful marketing strategy to promote investment in each EZ, the following factors need to be elaborated within BEZA.

- Information gathering (what ways, how effectively, improvement measures)
- Stakeholder consultations (policy formulation process to have feedback from relevant stakeholders and government agencies; efficiency and transparency of the process; improvement measures; implementation; gathering of public comments; electronic dissemination tools; timely feedback; availability of an appeals process from business communities)
- Inter-government communication
- Clear, up-to-date information provision on laws and regulations
- Up-to-date database of the target marketing industries

Information Gathering

Marketing strategy formulation requires a responsible agency having various sources of information in relation to investment. This task can be accomplished even if new information sources have not been established, but many other government agencies like BOI and BEPZA should have the conventional information gathering sources. An information sharing channel needs to be established for effective use of information sources. Then improvement measures for gathering and using information and a feedback system should be employed within BEZA.

Stakeholder Consultations

A system of regular contact with business communities would enable BEZA to spot business and industrial needs and trends early and begin taking necessary actions. Through this system, the need for a change in marketing strategy would become clear and the process of renewing the strategy could

be carried out efficiently. The strategy should be sufficiently flexible to allow the responsible stakeholder, which includes other government agencies, to respond to new developments in the EZs.

Inter-government Communication

BEZA's ability to resolve problems effectively, in communication with other government agencies, is related to its legal status, mandate and location within government. Political support is critical in overcoming vested challenges, in the provision of leverage for BEZA to impose EZ policy on line ministries and other government agencies. BEZA should be given clear responsibility on behalf of the Prime Minister's Office, as well as other ministries, to develop and perform a sound strategy for investment and to create streamlined procedures for dealing with various business and administrative affairs.

Clear Up-to-Date Information Provision on Laws and Regulations

Laws and regulations may frequently have unintended consequences and confuse business operation. If this is the case in the development of EZs, the situation may become dynamic and sometimes obstructive for prospective investors. Framing good regulatory responses to business activities in the EZs requires clear, up-to-date information provision, including through direct communication with existing and potential investors.

Up-to-Date Database of the Target Marketing Industries

BEZA should maintain an up-to-date database of the various representative bodies and major players in each industrial and business market. Sufficient time is needed for interested parties to study the situation and trends properly and for BEZA to consider all inputs and comments of concerned business parties.

2.6.1.2 Activities and Implementation Framework

International experience suggests that the following four main elements should be considered as the marketing activities of the implementation agency.

- **Policy advocacy** among government bodies to seek necessary approvals or urge the removal of obstacles to investment;
- **Image building** through attending trade fairs, organizing seminars, information dissemination via website and publications (advertising and promotional materials) to the business community in the country as well as abroad, promoting the country as an investment destination;
- **Investor servicing or facilitation** to help solve problems faced by existing or prospective investors;
- **Targeting investment generation** by actively seeking out investors based on national development plans or other criteria.

Policy Advocacy

Since the implementation agency, leading investment promotion, and marketing strategy will be the focal point of contacts from investors, co-ordination among many ministries concerned with business affairs and regulation surely remains in the hands of the implementation agency. Different agencies have different points of view and responsibilities and hence might not all see investment proposals in the same way. However, when obstacles arise in the path of investment projects, the implementation agency must act as a diplomat within government, conveying to government the concerns of business and balancing these against the different regulatory imperatives in different agencies. Clear responsibility and power should be assigned to the implementation agency to streamline regulatory procedures for dealing with regular business and management issues.

Image Building

The marketing strategy should be reflected in the implementation agency's mission, with image building, which includes advertising, producing promotional materials and attending trade fairs etc. The implementation agency often does not have as much funding and outreach staff as they might desire. So establishing priorities in methodologies of image building is important. Consequently, as the investment climate becomes sound, attracting investors will require less effort in image building and the need for promotion, servicing, and targeting can be reduced at later stage.

Investor Servicing or Facilitation

The implementation agency is the front-line in hearing about adverse perceptions or practical business problems from investors and thus should have a role as an advocate/solution provider for investors within government. Therefore the implementation agency should seek approvals of permits or request fundamental changes to laws and regulations to produce the best investment climate.

Targeting Investment Generation

The implementation agency's primary role, in the end, is to attract and promote investment to the country. Arrangement of meetings with each individual potential investor is an important activity, but it may make sense to prioritize such meetings toward strategic sectors that are focused on or that can immediately target existing and prospective markets. The set of priority sectors ought to be agreed widely within the government but allow flexibility for investors to explore market accessibility. Also gathering of investors in one meeting through investment seminars or tours would be cost effective.

The responsibilities of each marketing activity are described below.

2.6.1.3 Responsibilities of Marketing Activities

The responsibilities of each marketing activity should lie with respective agencies that engage in implementation of the project, require funding and budget allocation, evaluate performance, and improve with supporting measures. Each of the described activities is examined, but in the each case of a different EZ, different levels of responsibilities, even among provincial implementation agencies, need to be addressed.

Policy Advocacy

BEZA has the responsibility for the disseminating information on new developments of EZ registration and legalities among different but concerned government ministries and agencies. Different authorities concerned with business administration would, in the early stage of implementation, hesitate to cooperate with the implementation agency in streamlining the business administration, since they feel their privileged position is taken by BEZA. In relation to this, political intervention must be employed to impose the new set of registration and regulatory framework, which only brings advantage to EZs. Sustaining this political interest has proven to be a challenge, especially under changing political circumstances. In practical terms, international experience suggests that to be most effective as an advocate within government and to be able to remove obstacles to particular investments, an implementation agency should report directly to the prime minister, so that performance evaluation and improvement measures for better proceeding of investment projects is directed and supported by the top political leader of the country. Exchanging experience with other countries, to learn how to effectively conduct and advocate reform as well as maintain good relations with government departments, can be accomplished through peer networking with investment promotion agencies. This will be presented in a later section.

Image building

While policy advocacy is supposed to be an internal affair within the government, image building is an external affair addressing business and industrial communities both at home and abroad. BEZA should employ qualified staff with sufficient training in presentation and investor relations to conduct seminars, trade fairs, international conferences, and media broadcasting. This activity is rather time-consuming and costly but should be a continuous process. Hence definition of cost and benefit analysis and evaluation should be carefully developed so that selective image building approaches can be elaborated with funding and budget allocation. The best practices in other countries involve great use of electronic and media instruments in its cost effectiveness. Collaboration with other investment promotion agencies should cast positive synergy in image building.

Investor Servicing or Facilitation

BEZA is pledged to be established to act as a one-stop-shop for approvals and licensing, but investment projects often require approval from many government agencies and local governments in such areas as land use, labour practices, safety, taxes and customs and the environmental impact. In relation to this, BEZA is expected to help to expedite decisions in these cases and even investment counselling services in (i) securing raw materials; (ii) market access (national or regional); (iii) seeking efficiency; and, (iv) gaining strategic elements for investors may need to be integrated. These are important marketing activities for EZs. The one-stop-shop aims to cater to the needs of both prospective and already-settled investors dealing with access to information on investment permits and licenses, clearance formalities, application forms and other business administration affairs such as tax, labour and environment clearance. At this stage of the functionality of BEZA, in particular, service provision through a one-stop-shop is not necessarily meant to be a one-stop-clearance-shop. Due to the pending legal jurisdictional set-up among other departments and authorities, delegation of power to the one-stop-shop at BEZA seems to be still in the processing stage. The competency level of BEZA staff would need to be further upgraded to perform such clearance functionality. BEZA should first focus on the provision of investor service at headquarters. This would provide a single window of information provision and facilitation and monitoring of business administrative applications on EZ related affairs. To withdraw the delegation of power from BEZA, a substantial backup would be required and then it would only be possible to appoint representatives situated in either BEZA headquarters or each EZ local office for provision of one-stop-clearance-service. However, this function would depend on the volume of applications and requests from investors. Investors tend to see BEZA as their mediator for processing required business administration. BEZA should comply with the promise to complete all investment approvals within a certain time of license provisions and a system to meet the promise should be installed.

Institutional Setup and Coordination

There are several government institutes, which have been performing marketing activities to promote investment into Bangladesh since before the establishment of BEZA. Those institutes are, namely, the Board of Investment (BOI) and the Bangladesh Export Processing Zone Authority (BEPZA). In fact, their experience in marketing activities and networking among peer investment promotion agencies is better than the status of BEZA. As a member of World Association of Investment Promotion Agencies (WAIPA), BEPZA has good exposure to the investor market through interaction with the community of investment promotion agencies. Furthermore the staffs of BOI and BEPZA has been trained in the field of marketing service provision through participating in overseas business missions, training programmes provided by the peer network association and going through actual and practical interactions with prospective and already-settled investors.

Cooperative institutional coordination among BEZA, BOI and BEPZA is required to maximise the opportunities for promotion and marketing of EZs and to minimise the duplicate mandate for investment promotion through redundant marketing activities, considering the limited resources available. First of all, a training programme for BEZA staff should be considered. Having a good

exposure to the networking of peer investment promotion agencies and being a nodal point of contact for investors, BEPZA should be the good organisation for BEZA staff to transfer to, temporarily, for training. Acquisition of the sense of investor-centred work ethic through this kind of orientation is indispensable to carrying out staff of EZ management and operation. The role of BOI should be as it exists, but should incorporate effective marketing activities for the EZs. BEZA should focus on dissemination of information about EZs among BEPZA and BOI and then function as the nodal point of contact for investors considering investment in the EZs.

Targeting Investment Generation

This activity is directly linked with how effectively BEZA uses image building channels, plays an intermediary role between the government and targeted investors and how successfully it helps to streamline administrative procedures involved in both establishment and operation phases of investment. But effective target marketing is technically based on a continuous effort of gathering business and industrial needs, trends and information through exchanging views with prospective and existing investors. Investors come to the country not because of the good investment environment as perceived by the government but because of the actual business chances and market needs, which can be enhanced by the investment environment. Government's efforts to improve the investment environment should be accompanied with provision of information where such needs for the market lie and how government can assist investors with target policies to satisfy them. BEZA also needs to understand that the efforts are always exposed to international competition and can be improved by feedback of the views from investors.

Funding

Operation of an effective implementation agency is expensive. Hiring well-qualified staff (ideally with private sector experience) and actively engaging in image building, such as through communications programmes, advertising and trade fairs, are all costly. How BEZA is funded and the budget allocation decided is the crucial element in carrying out effective marketing activities. BEZA needs well qualified staff members who can only be hired with the salary range equivalent to that in the private sector. It is the responsibility of the government to ensure the conditions which provide enough motivation for the staff members of the investment agency.

Regular Evaluation

Regular evaluation is needed of investment agency performance in terms of attracting investment. The performance of BEZA in marketing activities can be evaluated using the following factors; 1) overall investment flow, 2) the form of investment, i.e. portfolio investment, Merger and Acquisition, exposition of existing projects, investment in sales and marketing facilities and greenfield projects, 3) investment by sector, 4) job creation, 5) linkages and additional purchase of inputs and services, 6) technology transfer, and, 7) net tax benefits from corporate taxes, customs duties and employment taxes paid. This evaluation process should be linked with incentive and salary for staff members of BEZA, so that continuous improvement efforts can be expected.

2.6.1.4 Timing of Marketing

For the implementation timing of marketing strategy, it is important that staff members within BEZA have a clear understanding of how to divide their time between advocacy work (and its associated research), image building and promotion, servicing and targeting activities. At different EZs, the proportion of time spent on each activity may change and the particular tactics and coordination within government should be taken into account.

2.6.2 Target Markets, Countries, and Investor Profiles

In the marketing strategy, selection of target markets should be based on a factual study and analysis of the current situation, the investment environment, and its opportunities and challenges. Clear, reasonable and realistic target sectors should be identified for marketing for investment in each EZ. Clear goals and sectoral targets need to be defined so that BEZA staff members know their priorities. Sufficient and appropriate number of staff and resources need to be identified to achieve these goals.

In order to screen the marketing target of industries, countries, and companies, a study was conducted on the investment environment using SWOT analysis, conducting a series of interviews with prospective investor enterprises in Bangladesh and selective overseas countries. These comparative analyses directly support the next steps in decision making on positioning and strategic policy alternatives of each EZ. Accordingly, surveys of prospective investors are at the core of identification of target markets.

The shortlisting of the companies for interview was conducted taking into consideration industry and market assessment of each three EZ sites. Moreover, the methodology of shortlisting was expected to expedite the process of identifying target markets in relatively large numbers of the study population. The shortlisting took into consideration both national and international companies operating in Bangladesh as well as abroad. This exercise was carried out for the identification of companies and their motivation for wishing to invest in EZs. In this sense, the extent of their interests and expectations can be enhanced with provision of relevant information and with efforts to meet their requirements. The shortlisted companies were visited by the marketing expert together with a local consultant and interviews conducted to find out the intent of the companies and to evaluate their prospects as investors in EZs.

Criteria for Selection of Target Market

After visiting the shortlisted companies, the project team proposed the following criteria for evaluation and selection.

- i. **Willingness:** whether the industrial group/companies are willing to consider investment in EZs and to expand/shift their factories there;
- ii. **Readiness:** whether the industrial group/countries will be ready to invest in EZs within the time frame of EZ's development scheduling;
- iii. **Capacity:** whether the industrial group/companies have sufficient capacity to expand/shift their factories;
- iv. **Potential:** whether the industrial group/companies have the potential to grow their business after expanding/shifting their factories to EZs;
- v. **Demonstrative:** whether the industrial group/companies can be a demonstrative case to other companies in and outside Bangladesh after investing in EZs.

The target market was conducted in discussion within the consultant group together with BEZA officials. The shortlisted companies were evaluated after field surveys and personal interviews with those responsible for business development and marketing of the companies. The above criteria were agreed to be important in formulation of an appropriate marketing strategy and for the success of the EZ project. Since BEZA policy is to include some involvement of private enterprises in EZ development and operations, interviews with potential EZ developers were also carried out. The target group of industries is discussed in the market strategy for each EZ.

2.6.3 Type of Promotional Tools and Materials Required

Required promotional tools and materials for marketing of EZs should match the needs of investors. Furthermore, due to the lack of knowledge about investors, investment promotion agencies sometime tend to present too much superfluous information while providing little on what potential investors really want to know. For example, a typical presentation structure of an investment promotion mission contains the main economic indicators and statistics on FDI, ODA, trade and tourism. Bilateral information featuring the country they are visiting is also given, including the types of investment (wholly foreign owned, joint venture, or business cooperation contract), the number of invested projects, registered capital, number of jobs created by the investment from that country, and so on. Such information can be useful to potential investors, but they need more specific information on how they can start a business operation in the country, what incentives they are given, how the government assists them to solve difficulties in doing business etc. This kind of information is not usually provided in presentation materials. Moreover, the most useful international comparisons in labour costs, business start-up costs, and utilities cost between rival countries are rarely provided. If the implementation agency just presents the country profile, policy, and potential of its own, it might not meet the requirements of potential investors. The implementation agency must understand the needs of investors and promotion tools and marketing materials must be produced with clear concepts of the following; 1) what products they intend to bring to market (Product), 2) the strength and weakness of the products in comparison with competitors' products (Positioning), 3) the target group of customers (Target Audience), 4) the services provision to be involved together with marketing the products (Scope of services), and, 5) how the strength of the products can be conveyed to the target group (Scope of Communications). The explanation of the five strategic marketing attributes is given below.

Product

The product of BEZA is not the land of the EZ itself but the investment environment of the EZ.

Positioning

For effective positioning, BEZA must objectively know the present strengths and weaknesses of the EZ vis-à-vis those in rival countries and define a realistic direction toward which Bangladesh can proceed in order to dramatically improve its investment environment in the minds of investors. "Appropriate positioning" is more important than "high positioning." Setting goals that are too ambitious will reduce feasibility in implementation and credibility to the prospective investor pool.

Target Audience

Since national and foreign investors are not uniform, they must be categorized into different segments. They can be divided into groups by country of origin, by industry, by company type (MNCs or non-MNCs), or by the strategy they follow (domestic market-oriented versus globally-oriented). The government cannot satisfy all investors at the same time. The benefits of the investment environment should be addressed to the targeted national and foreign investors.

Scope of Services

The scope of services should be understood as the investment services where facilitation of investors' business start-ups and implement of their investment projects in EZs should be addressed.

Scope of Communications

The scope of communications is how and where positioning is delivered to the target audience. As noted above, foreign investors comprise different groups. After deciding on the target audience, the

government should work out a communication programme that delivers its message regarding the investment environment to the target audience. Communication programmes must be consistent with and supportive to the positioning statement. Referring to the best practices of Asian countries, the attitude of pro-activeness, rather than just waiting for investors to come to the authority office, must be employed.

Furthermore, investors are very demanding in terms of detailed information of not only the physical infrastructure of the EZ but also many other socio-economic related information including availability of labour forces, international schools, hospitals, shopping areas, amenities, legal and regulatory frameworks, etc. Pricing of EZ land (sale, lease, and rent) is an important negotiation item. In order to promote EZs and appeal to the potential investors, the overall advantages of the EZs in Bangladesh compared with other countries especially with potential competitors such as Cambodia, Myanmar, India, and Vietnam, must be shown clearly in the promotional tools with facts and objective figures. Therefore, we intend to prepare a list of contents to be required in promotional tools and materials to comply with the best practices of other countries for each of the three EZs.

2.6.4 Opportunities to Coordinate with Other Promotional Agencies in Bangladesh

Many international organizations work with investment agencies to facilitate the exchange of the best practices on investment promotion strategies and assist in building capacity. These advisory services can be extremely useful in improving the effectiveness of investment promotion but should not divert attention from the broader policy environment in which the implementation agency operates.

In order to perform effective and timely investment promotion, we consider the establishment of an international investment promotion network to be crucial and we propose that BEZA join the OECD (Organisation for Economic Co-operation and Development) Investment Promotion Association - World Association of Investment Promotion Agencies (WAIPA). They should also make contacts with the other investment promotion offices, United Nations Industrial Development Organization (UNIDO), United Nations Conference on Trade and Development (UNCTAD), IFC, Multilateral Investment Guarantee Agency (MIGA), ADB and other international agencies dealing with investment promotion directly and indirectly. BEZA should also be able to establish good peer networks with bilateral investment promotion agencies such as JETRO, Trade and Development Agency (TDA), Malaysian Investment Development Authority (MIDA), Indonesia Investment Coordinating Board (BKPM), BOI of Thailand and Philippines etc. We consider this network would become a valuable resource for BEZA. JETRO has already shown a preliminary yet positive response to establishing a peer relationship with BEZA for investment promotion and marketing of EZs in Bangladesh and Japan.

Also a bilateral chamber of commerce would also provide an important and unique network for promotion of investment into EZs. The Bangladesh German Chamber of Commerce & Industry is one of the active bilateral business and investment promotion agencies in Bangladesh and it has an investment promotional office in Berlin to promote investment from Europe to Bangladesh. The Nordic Chamber of Commerce and Industry (NCCI) is another chamber of commerce in Bangladesh, which is also promoting investment from Nordic countries. Both chambers have shown interest in cooperating with BEZA on promotion of European investors to EZs.

Various organizations can assist BEZA, however, simply joining a network does not guarantee that Bangladesh derives the full potential benefit. BEZA also needs to ensure that they have adequate funding and staff to make membership meaningful. Networks provide a variety of conferences, referral services and best practice guides. Using these effectively requires that the agency dedicates staffs to studying best practices and to reaching out to peers and policy advisors.

2.6.5 Investment Promotion is Different from the Textbook

Business marketing is, in reality, different from the general information found in textbooks. The competence required for business marketing is rather specific and unique depending on the nature of the individual enterprises and must also be comprehensive. The issues currently facing the investor for optimal operation in EZs are mingled and interlinked with other issues. These range from resources management, logistics, manpower, materials, utilities, equipment or machines, manufacturing processes, customers, sales, claims, transports, cash, accounting to marketing, etc. There is a need, to localise the real issues in the context of EZs through exchange of information and interaction with executives of the prospective investment enterprises and sometimes employees. In this way, the real issues can be identified, confronted and appropriately addressed with trouble-shooting measures in the content of marketing tools, with a demand-driven approach.

2.6.6 Implications

One of the objectives of formulating a marketing strategy for EZs is to enable BEZA officials to understand the true nature of the business administration and operation of the zones and to demonstrate the findings and trouble-shooting mechanisms involved. Yet another aspect of the objective is to enable BEZA officials to provide tailor-made professional services to investor enterprises, utilizing the BEZA officials' own business administration knowledge, experience and network.

With the presence of an international and national investment promotion network which has rich experience in coaching and marketing services for private companies in other countries, it is important for BEZA officials to absorb the marketing skill and knowhow and become performers of on-site lively marketing and to gain confidence as a business marketing agency. Consequently it should be our ultimate aim after providing a marketing strategy, that BEZA officials have enough competence to perform marketing services for investor enterprises, in turn investor enterprises would recognize the value of their marketing service. In other words, recipient enterprises can be prospective clients for BEZA. Then the potential is there to create an investor-friendly environment in EZs. Together with the mission approach of BEZA to extend their business administrative and operational capacity, the project can be regarded as a new venture for BEZA

2.7 Marketing Strategy for Mirershorai

The marketing strategy for Mirershorai EZ, Chittagong is presented in consideration of its situation analysis. It then describes positioning to clarify target markets and action programmes together with strategic policy alternatives.

2.7.1 Situation Analysis

The one of the characteristics of Mirershorai EZ lies in its large amount of available land along the Bay of Bengal coast. There are few places in the region where such large amounts of land are still available and the project site is near the national road of country's industrial corridor connecting Dhaka and Chittagong. The accessibility to this national road will be attractive to prospective investors, who may consider that logistics from/to the site to be favourable. Also, since Mirershorai site is exposed to the sea, waterfront industrial infrastructure, such as jetty development, can be planned, taking into account oceanographic evaluation for selection of a suitable site. In summary, the site's comparative advantages are twofold - the availability of a large area of land along the national road between Dhaka and Chittagong, and, the possibility of port development, catering for the need of industries to use the site as an alternative gateway to Chittagong for the import and exports of goods.

2.7.2 Positioning

According to the interview surveys carried out in Bangladesh and Thailand, an interest in the proposed Mirershorai site was cited. The strategic location of land in a relatively close proximity to both Dhaka and Chittagong was seen as one of the attractive decisive factors for industries to consider their investment in the region. In particular for foreign companies, the land availability issue is the critical challenge for investment in the country. Current options are mainly to look into possibilities to find a local partner who possesses land and to form a Joint Venture Company to cater for the needs of industrial land developers. However, the designated site for Mirershorai EZ is basically unproductive land, where there is no industrial infrastructure developed. As it is located on land, which is exposed to the seafront, proper banks, a dike system, and storm water treatment facilities must be developed from the beginning. Furthermore the location has no accessibility established so far with the national road. Connectivity to the national road junction needs to be developed. A captive jetty development plant at the site would cast new light on the diversification of industries to be attracted to the site. Development of the coal-fired power plant along with the jetty development would create vast potential for attracting many manufacturing industries, such as electronics and automotive parts (sheet, glass, tyres, wire harness, motor, battery and antennae), as well as the first priority target industries of relatively high-end garment, textile manufacturing and their supporting industries. The provision of a large area of land in conjunction with Chittagong and Dhaka is of importance in attracting investment.

Consequently, as a positioning statement for Mirershorai EZ, the following points are suggested:

- Mirershorai EZ aims to be the preferred expansion/relocation destination of manufacturing industries in relation to its large available land, jetty and coal-fired power plant to be developed in the project site. Large scale garment and textile industries including knitting and weaving need a stable power supply and a large factory space.
- Mirershorai EZ shall provide the most reliable power supply in the region.
- Mirershorai EZ shall become the ideal manufacturing cluster where favourable policy and fiscal mechanisms can be accessible for the related industries operating in the zone.

2.7.3 Strategic Policy Alternatives

A strategic policy alternative is regarded as a programme to describe and integrate the five strategic marketing attributes (product, positioning, target audience, scope of distribution, and scope of communications). Several such alternatives must be constructed for consideration by BEZA. BEZA needs to agree on the one mutually agreed strategic policy alternative, then, a concrete action programme should be formed. The forthcoming policy advocacy and image building activities must comply with the positioning statement targeting certain potential investors to the Mirershorai EZ.

Table 2.7.3-1: Evaluation Criteria to be used for making Marketing Strategic Policy Alternatives

Criteria	Positive norm	Negative norm	Marketing strategic policy alternatives
Land/Location			
✓ Land	Waterfront area with low population and vast area is available. Conversion of the land into an industrial zone can be expedited without causing a large number of housing relocations.	Project site is non-agricultural unproductive land so that industrial infrastructure and connection with utility network must be developed from scratch. Storm prone area where cyclones bring surges, high precipitation and strong winds to the area.	Industrial operations at waterfront with utilization of full-fledged utilities and large area can be of interest to investors. However, strong storm water drainage management system needs to be installed to guarantee continuous industrial operations in the zone.
✓ Location	Location has good connectivity to both Dhaka and Chittagong.	Poor land transportation accessibility as well as isolation from national utility network	Establishment of backward linkage and supply chain logistics between Dhaka and Chittagong can be of importance for attracting investors.
Utility Services			
✓ Power	Captive jetty facility would become available at the zone for enabling coal import for power generation	There are no alternative energy sources nearby, hence merely depending on the national grid or imported coal	Captive power generation plant at its own zone should be promoted
✓ Water	Industrial water can be collected from upstream of nearby Feni River and supplied after treatment.	Salinity of groundwater is the critical issue of the site. Flood control, storm water and surge protection measures must be properly installed.	Accessibility to industrial water is one of the challenge points, together with adequate flood control and risk management measures must be well presented
✓ Telecomm unications	High speed data transaction will be provided	No major negative parameters	Backup system of telecommunications should be highlighted
✓ Access	The zone is near to a national highway and sea	Access to road and highway transport are presently limited	Road connectivity and logistics channel must be well developed in connection with Dhaka and Chittagong
✓ Industrial Waste Water Treatment	International standard industrial waste water treatment plant will be available	No major negative parameters	International standard waste water treatment is important for the products to be sold to international markets
Accessibility to Raw Material			
Accessibility to raw material	Scrap steel is available from ship dismantling industries located adjacent to the project site	Most raw materials for industrial usages need to be supplied either from Dhaka or Chittagong port or other areas	Procurement of raw materials with supply chain logistics management should be promoted in consideration of time and cost by showing reference in comparison with other industrial hubs in Dhaka area. Usability of scrap steel should be well presented.
Type of Workers			
✓ Managem ent class	No major advantage at this time	Though the standard of facilities in Chittagong is inferior to the ones in Dhaka	Recreation facilities need to be offered for management class/expatriates in the zone

Criteria	Positive norm	Negative norm	Marketing strategic policy alternatives
✓ Factory workers	There are nearly 330,000 population in the region	Potential labour force in the region is engaged in fishery and agricultural activities, hence not familiar with industrial/manufacturing operations	Pre-occupational vocational training may be required for the workers in the zone
Business Environment			
✓ Licensing and administration	OSS shall be operated	Long distance from central government in Dhaka	OSS should be properly functional, it must be appealing point to investors
✓ Customs clearance	Customs office shall be opened in the zone.	Long distance from central government in Dhaka	Satellite customs operation must be functional
✓ Availability of finance	Fiscal incentive shall be granted for investors in the zone	Average interest rate for business is rather high in Bangladesh	Banking system in zone may need to be relaxed

Investment promotion agencies like BOI, BEPZA, and BEZA should agree to a formulated position statement and run integrated national marketing campaigns for targeted potential investors. Each agency should have coherent and clear information for investors to plan their investment decisions. Needless to say, all this must be done consistently within the national framework set by the Prime Minister's Office and other ministries.

As an example of a strategic policy alternative at Mirershorai EZ, the policy can be illustrated as follows.

The investment environment of Mirershorai EZ is positioned as one of the most ideal destinations in Bangladesh for diversification and/or expansion, targeted to knitting and weaving textile industries, automotive parts, electronics, and precision machinery factories. These opportunities can be communicated in Bangladesh and ASEAN countries by workshops and seminars in Dhaka, Singapore, Thailand, Taipei and Shanghai; advertisements in business newspaper, TV commercials and reportage on international broadcasting networks like CNN; an investment promotion website linked to websites of counterpart countries; and brochures distributed through current factory operators in Bangladesh. Investors can register their investments online or at the Bangladesh embassies in respective countries, or at the investment representative office of Bangladesh in these cities. The Bangladesh government ensures that investors can commence investment projects in Mirershorai EZ within 45 days of the date of receiving applications. The Bangladesh government guarantees to effectively provide necessary utilities services and continues to improve the legal and business administration system and its offsite infrastructure.

2.7.4 Action Programmes

Action programmes should be designed with each step of activities along with the necessary policies for attracting investors and tasks and responsibilities of implementation agencies should be specified. Policies must be clear, tangible, proactive and mutually-agreed among investment promotion agencies. The following table presents the necessary content of investment promotion action programmes for Mirershorai EZ.

Table 2.7.4-1: Investment Promotion Action Programmes

Part 1. Policy Advocacy	
1. Policy Advocacy	<ul style="list-style-type: none"> - Creating image on investment environment - Attaining political leaders' supports - Organizing workshop for EZ development - Learning best practices from other countries from peer network
2. Coordination and Cooperation	<ul style="list-style-type: none"> - Establishing cordial relations with licensing authorities in both central and provincial government. - Streamlining number of licenses required for newly invested projects - Reducing amount of time for processing business licenses - Having dialogue with Indian government for international trade and market potentials
Part 2. Image Building	
3. Image Building Measures	<ul style="list-style-type: none"> - Preparing investment brochure, video and website for Mirershorai EZ in line with five strategic marketing attributes (product, positioning, target audience, scope of distribution, and scope of communications) - Planning and proceeding with media exposure of EZ development (newspaper, international business/industrial magazines, exhibition screen at airport etc.) - Building constructive relationships among enterprises, organizations and governments - Organizing and attending overseas investment seminars and forums - Developing a proactive investment promotion peer network
Part 3. Investor Servicing or Facilitation	
4. Investment Service Measures	<ul style="list-style-type: none"> - Coordinating policy dialogue between policy makers and businesses - Making business directories of private companies like names, business field, address of office, person directly involved in, products list, and future business plan for business match-making - Conduct coordinating with local and international financial entities - Providing and improving business support facilities - Assisting investors for acquiring licenses
Part 4. Targeting Investment Generation	
5. Investment Generating Measures	<ul style="list-style-type: none"> - Focusing on investors who are already in Bangladesh, - Meeting with target audience set forth in strategic policy alternative
6. Representative Offices of Other Countries and International Organizations in Bangladesh	<ul style="list-style-type: none"> - Disseminating EZ development through representative offices in other countries and through international organization in Bangladesh - including bilateral chambers of commerce
7. Overseas Offices of Bangladesh Organizations and Bodies	<ul style="list-style-type: none"> - Identifying business and industrial trend through dialogue with international investors who can be accessible through overseas offices of Bangladesh organizations and bodies (Information to be collected would be names, functions, head of office, person directly involved in FDI, current cooperation, direction for future coordination)
Part 5. Funding	
8. Fund Generation and Allocation Measures	<ul style="list-style-type: none"> - Conduct coordination with Prime Minister's office together with Ministry of Finance for budget allocation for activity implementation and for collaborative organizations networking
Part 6. Regular evaluation	
9. Measurement and Adjustment by Implementing Organization	<ul style="list-style-type: none"> - Consulting with BOI, BEPZA, Prime Minister's Office and other related ministries for criteria, results, causes of success and failure, etc. - Conducting survey of newly emerging factors and conditions and supportive tools to be continued

Possible Schedule for the Action Programme is shown in the next page.

Table 2.6.4-2: Possible Schedule for Investment Promotion Action Programme

Project Schedule	1. Policy Advocacy	2. Coordination and cooperation	3. Image building measures	4. Investment service measures	5. Investment generating measures	6. Representative offices of other countries and international organizations in Bangladesh	7. Overseas offices of Bangladesh organizations and bodies	8. Fund generation and allocation measures	9. Measurement and adjustment by implementing organization	
1Q 2015	Organise dissemination workshops at Dhaka on EZ development and operation among related lined ministries and	Establishing cordial relation with licensing authorities in both central and provincial government.	Having dialogue with representatives of bilateral chamber of commerce in Bangladesh to understand business trend and prospects on EZ development	Coordination of policy dialogue between policy makers and businesses	Development and opening of web site on EZ development and operation	Organise meetings with individual target audience set forth in strategic policy alternative	Dissemination of EZ development and operation among overseas representative offices of Bangladesh like embassies	Dialogue with international investors to identify business and industrial trend	Funding and allocation for marketing activities for a piscal year	Consulting with BOI, BEPZA, Prime Minister's Office, and other related ministries for marketing activities
2Q 2015										
3Q 2015										
4Q 2015										
1Q 2016	Detail Design	Streamlining number of licenses required for newly invested projects								Conducting survey of newly emerging factors, and conditions and supportive
2Q 2016										
3Q 2016										
4Q 2016										
1Q 2017	Construction Phase 1	Opening of one stop window desk at BEZA, Dhaka	Planning and proceeding media exposure of EZ development	Assisting investors for acquiring licenses						
2Q 2017										
3Q 2017										
4Q 2017										
1Q 2018		Organize international training trips to other ASEAN or European countries to learn the best practices of marketing activities	Material preparation of marketing (power point presentation, image video, brochure, booklet of investment/ market information)	Investment promotion seminar among key cities set forth in strategic policy alternative	Developing proactive investment promotion peer network					
2Q 2018										
3Q 2018										
4Q 2018										
1Q 2019	Construction Phase 2	Organize international training trips to other ASEAN or European countries to learn the best practices of marketing activities	Development and operation of electronic single window application submission	Providing and improving business support facilities						
2Q 2019										
3Q 2019										
4Q 2020										

*Note: Marketing activities of Mirershorai will continue up to the end of Phase 3 of Mirershorai EZ.

2.7.5 Promotional Tools and Materials

In the promotional tools and materials for Mirershorai EZ, the following data and information set are expected to be integrated.

Figure 2.7.5-1: Proposed Contents of Promotion Material for Mirershorai EZ

Products (Investment Environment)	
✓ Message from <i>Hon'ble</i> Prime Minister	✓ Message from <i>Hon'ble</i> Minister of Finance
✓ Message from <i>Hon'ble</i> Minister of Industry	✓ Message from <i>Hon'ble</i> Minister of Commerce
✓ Message from Executive Chairman of BEZA	
Positioning	
✓ Characteristics of Mirershorai EZ	✓ Land use/plan
✓ Price of land in comparison with other rival EZ in Asia	✓ Comparison chart with other rival countries' SEZs - the total cost and time required for approvals of business licenses and permits
✓ Distance and location between access to major logistics centres (major cities, port and airport)	✓ Incentives to be considered - system of investment incentives; tax concessions and customs duty waivers; work permits for foreign senior staff and technicians
Target Audience	
✓ Industrial growth outlook of textile/garment sector in Bangladesh	✓ Economic and market outlook of garment, textile, automotive, electronics, and precision machinery markets in Bangladesh
✓ Electric power and water development prospect	✓ Specification description of power and wastewater treatment plant
Scope of Services	
✓ Application procedure - The number and details of procedures for establishing a new investment project	✓ Time framework of the procedure - Average length of time required to complete a process
✓ General payment terms	✓ Permits from national and local governments
✓ Specification of utilities - electric power; water; telecommunication; wastewater treatment; access road	✓ Function of OSS - Provision of enquiry point for information regarding the administrative procedures required to establish a new investment
✓ Unit price indicators for utilities	✓ Business support facilities - including availability of social and recreation facilities; Provision of assistance/support for new investors if they are faced with difficulties during this process
✓ Process of EIA - environmental impact assessments and agreements on mitigating and monitoring environmental impacts	✓ Labour availability - Various facets of labour law and pension provisions
✓ Land titling process - Approvals to purchase or lease land or change the zoning restrictions on use of particular pieces of land	✓ Foreign exchange regulation or restrictions on capital and dividend repatriations
✓ Insurance regulations for transported goods	✓ Dispute resolution systems
✓ Investor's voice feedback system - Mechanism of integrating investor's complaints into the proposal or advocacy for reform	

Scope of Communications

- | | |
|---|--|
| ✓ Contact address of BEZA | ✓ Contact address of the Steering Committee - Hotline in the investment agency for registering complaints by established investors |
| ✓ Contact address of other business related ministries and agencies - Cooperation mechanism with other relevant state agencies to address investor's complaints | ✓ Website platform information - Website and interactive platform between investment agency and investors |
-

2.8 Transport Assessment

Sandwiched from three sides by India to the North, West and partly to the East (sharing 193 Km with Myanmar), Bangladesh has a 4,246 Km long land border line. On the Southern side is the Bay of Bengal with a 580 Km coastline. There are 2 ports handling international traffic, namely the Ports of Chittagong and Mongla, with Chittagong handling the majority of the nation's Ex-Im trade. In the year 2011-2012, Chittagong port handled over 41 million tons of cargo including 1.34 million TEUs, or about 92% of the total maritime trade of Bangladesh.

Conditional modes of transport for carrying goods from/to the Mirershorai EZ including the multimodal aspects of transportation are discussed here. Each mode of transport is described below separately and in the last section, transportation of goods using a multimodal transport platform is detailed, not only of the operation of current system, but consideration has been given to future projected developments. General constraints of the present transportation system are addressed, specific to the sectors - road, waterways, air and gateway port and infrastructure recommendation is made. International Multimodal Transport concepts, advantages, systems and their relevance to Bangladesh are also described in the following pages. Comparative evaluation of import/export container and air freight is provided with analysis. In addition, a 40 ft. Container traveling to/from Yokohama is also provided as a benchmark reference, inclusive of the freight to/from Dhaka.

It is relevant to note here that the concept of ICD has been localized in Bangladesh, whereby ICD generally refers to Inland Container Depot (as the Dhaka ICD that handles containerized rail traffic) and the term ICT (Inland Container Terminal) is referred to a river port handling containers as the Pangaon ICT.

2.8.1 Current Status of Different Modes of Transport in Bangladesh

Road

Road transport is the dominant mode of transport for carriage of freight and passenger traffic. Bangladesh has about 1.5 million motorised and over 3 million non-motorised vehicles²¹² traversing its roads. Out of the motorised vehicles about 65% are 2 & 3 wheeler vehicles and the rest are vehicles of different categories as cars, jeeps, buses, trucks, pick-up trucks, etc. The number of vehicles is steadily increasing along with the increase of mileage in the road inventory. Traffic on Bangladesh roads is characterised by the presence of both motorised and non-motorised vehicles plying on all roads creating serious problems of traffic jams. The road network in the country is bisected by water courses. Bridges and ferry systems are provided to maintain the traffic flow on the road network. Bangladesh has about 40,344 Km of paved roads and all the ports and important centres are connected by roads.

²¹² <http://www.unescap.org/ttdw/common/Meetings/TIS/EGM-Roadsafety-2011/Status/Countries/Bangladesh-Add-Info-1.pdf>

There are 98,928 trucks; 3,422 tankers; 250,984 private passenger cars and 31,991 buses registered in Bangladesh²¹³ (as of October 2013). About 30% of trucks run on CNG (mostly for shorter distances deliveries) and 70% on diesel. Petrol vehicles have the option of switching from CNG to petrol as and when required, but the trucks can only use either CNG or diesel. The price of diesel is 68.6 BDT per litre. Petrol costs 95 BDT per litre, and, CNG costs 30 BDT per cubic metre (as of November 2013).

Rail

Bangladesh Railways, is the state-owned rail transport agency of Bangladesh. It operates and maintains the entire railway network of the country. BR is controlled by the Directorate General of Bangladesh Railways under the Ministry of Railways along with Bangladesh Railway Authority (BRA) which works for policy guidance of BR.

Key features of BR are the coexistence of several gauges, broad gauge, metre gauge and dual gauge and the separation of the system by the Jamuna River (Brahmaputra) into a Western and Eastern Zone of operations with only one bridge, the 2003 Jamuna Bridge, connecting the two zones. Bangladesh Railways employs 34,168 people. BR operates international, inter-city and suburban rail systems on its multi-gauge network. It also owns coach production facilities.

Bangladesh Railways has a total of 2,877 route Km at the end of 2011-2012. East Zone has 1,273 route Km of MG and 35 route Km of DG track; and West Zone has 535 route Km of MG, 659 route Km of BG and 375 route Km of DG track. The total length of running track including track on double line, in yards and sidings is 3,976 Km²¹⁴. The country is divided into East and West Zones by the Jamuna/ Meghna River for railways demarcation.

In the Eastern Zone, 8 goods trains are placed in the circuit, out of which 4 dedicated trains, used for carrying containers, are placed in the Dhaka – Chittagong Container circuit (called Container Express trains); and 4 Tank Special Trains between Chittagong Port Yard and Sylhet, Sreemangal, Parbatipur and Dhaka Cantonment. In the Western Zone, 7 Express Goods trains are serving various inland destinations between Khulna – Parbatipur; Darshana – Ishwardi; Khulna – Ishwardi; Noapara – Darsana; Ishwardi – Santahar; Santahar – Parbatipur; and Ishwardi Rohanpur. All these trains follow a fixed schedule²¹⁵ as detailed in the annex.

In the Container Express trains plying between Dhaka – Chittagong, 32 wagons are attached to the locomotive and takes about 12 hours. There is always a backlog of import load from Chittagong to Dhaka with waiting time of about 10 -15 days.

Railways Expansion and Modernisation Projects

Under the Line of Credit (LoC)²¹⁶ from the Government of India, the following railways equipment is being procured for expansion, up gradation and modernisation of the Bangladesh Railways. The current status and price is given below for reference.

- i. 180 BG tank wagons and 6 brake vans (US\$17.38 million) - procured
- ii. 50 MG flat wagons and 5 brake vans for carrying containers (US\$2.9 million) -procured
- iii. 10 BG diesel locomotives (US\$21.29 million) - procured
- iv. 81 MG tank wagons and 5 brake vans (US\$7.43 million) - procured
- v. 170 MG flat wagons and 11 brake vans for carrying containers (US\$9.49 million) – transaction to be completed by April 2014

²¹³ http://www.brta.gov.bd/images/files/bangladesh_1.13-10.13.pdf

²¹⁴ Bangladesh Railway – Information Book 2012

²¹⁵ http://www.railway.gov.bd/good_tsrain_schedule.asp.

²¹⁶ Excerpts from “Contract for all 13 projects under LoC awarded “- Financial Express, 22nd November 2013

- vi. 30 BG diesel locomotives (US\$60.95 million) – to be completed by April 2014

Besides the above, contractors have been appointed for construction of Dhaka – Tongi Rail Line, Khulna – Mongla Port Rail Line and 2nd Bhairab and 2nd Titas Bridges with approach rail lines.

Air

Bangladesh has 3 International airports (Hazrat Shahjalal International Airport in Dhaka, Shah Amanat International Airport in Chittagong and Osmani International Airport in Sylhet). Shahjalal International Airport is the principal airport of the country. In addition, there are 12 domestic airports out of which 5 are operational at Cox's Bazar, Rajshahi (Shah Makdum), Jessore, Saidpur and Barisal. Regular international flights from South, East and South East Asia, Middle East, and Europe are directly connected to Bangladesh by 17 International Airlines.

There are regular flights from these airports to international destinations world-wide. Domestic air travel is served by Biman Bangladesh Airlines, Novo Air, GMG, United Airways connecting with Jessore, Cox's Bazar, Rajshahi, Saidpur and Barisal, Ishwardi, and Tejgaon.

All of the top 10 international routes are served by at least two carriers with the Kolkata market particularly competitive as all three Bangladeshi carriers are joined by Air India Express, Jet Airways. Low-cost airlines have a presence at the airport as Air Asia which is one of five airlines serving Kuala Lumpur and Air Arabia that operates a daily flight to Sharjah. Other carriers operating at the airport include Afriqiyah (to Tripoli), China Eastern (to Kunming), China Southern (to Guangzhou), Druk Air (to Bhutan), Etihad (to Abu Dhabi), Gulf Air (to Bahrain), Malaysia Airlines (to Kuala Lumpur), PIA (to Karachi), Qatar Airways (to Doha), Saudi Arabian (to Dammam, Jeddah and Riyadh), Singapore Airlines (to Singapore) and Thai Airways (to Bangkok). Analysis of the schedule data for Dhaka airport reveals that Dubai is the busiest route with Emirates offering 17 weekly departures. Biman Bangladesh, GMG Airlines and United Airways Bangladesh also serve the route. United Airways flights carry on to stop at London, Gatwick.²¹⁷

Hazrat Shahjalal International Airport in Dhaka is designed to handle 8 million passengers per year. The airport handles about 99.5% of all import and export load and about 6 million passengers every year. This airport has a dedicated cargo terminal (called Cargo Village) with a floor area of 200,000 sq. ft. managed by Biman Bangladesh Airlines. Almost all of the air freight shipments destined for/from Bangladesh arrive at/depart from this terminal. (Refer to the box below for excerpts of the Cargo Village).

Excerpts from The Bangladesh Monitor on Cargo Village, HSJIA

Quote.....

The freight side of the aviation industry has over the years, assumed great importance, because of its significant contribution to the profitability of the airlines. The future of market potential of airfreight is also considered to be really great. In Bangladesh the rate of growth is comparatively very healthy. Hazrat Shah Jalal International Airport (HSJIA, Dhaka) is virtually the only airport, handling entire volume of air freight through international passenger flights and some scheduled and chartered freighter flights. This only gateway of the country this far is achieving nearly double digit growth every year on an average-7.77 per cent between 1991 and 2005. In 2006-2007 HSJIA handled 69,302 tons of export cargo.

In 2007-2008 the volume increased by 68.33 per cent to 1, 16,660 tons. Due to global recession, the volume of cargo increased to 1, 21,127 tons in 2008-2009-- a growth of modest 3.82 per cent. With import air cargo of 48,738 tons, HSJIA handled 1.69,865 tonne of cargo in fiscal 2008-2009.

Market share

²¹⁷ <http://www.anna.aero/2010/04/07/bangladeshs-main-airport-and-airline-begin-2010-with-new-name-and-look/>

Of the total export air cargo in 2008-2009, Biman enjoyed a market share of only 16.74 per cent. It was followed by Saudi Arabian Airlines with 13.88 per cent; Emirates with 12.40 per cent; Qatar Airways 9.07 per cent; Etihad with 8.91 per cent and all other carriers 39 per cent. Of the imported cargo Biman carried only 7.75 per cent and the rest 92.25 per cent was carried by foreign airlines.

Poor Ground handling

It may be recalled that Biman Bangladesh Airlines Ltd. is providing Ground Handling facilities in the entire airport in Bangladesh and to all the airlines since 1972. It is enjoying monopoly to handle both passenger and cargo-- operating on commercial basis.

Until 2003 Dhaka airport was serviced by passenger aircrafts. Cargo was sharing belly capacities with passenger baggage. There was no scheduled freighter operation to and from Dhaka. During peaks some shippers and freight forwarders used to bring chartered freighters to help exporters save from cancellation damage.

In recent years the capacity situation from Bangladesh has witnessed a significant improvement due to the increase in frequency of foreign airlines and has resulted in a significant boost of belly hold capacity as well as operation of scheduled freighters by a number of airlines. Saudi Arabian Airlines is operating twice weekly Boeing 747 freighter with 110 tonne capacity each. Emirates operates thrice weekly freighter with 40 tonne each. Etihad and Qatar also operates freighter similar to Emirates-both in frequency and capacity. British Airways, Singapore Airlines and Malaysia Airlines operate once a week freighter with 40 tonne capacity each. Cathy Pacific operates twice weekly freighter with 110 tonne capacity each. The freighter operation of Air France is now suspended. In addition there are non-scheduled chartered freighters serving the air cargo sector in Bangladesh

Apart from the lack of modern cargo handling facilities, the cargo complex is also suffering from a shortage of critical equipment. The pallet build-up area is insufficient. There is no stack yard for containers. There is no dedicated space for build-up cargo.

With no infra-structure, logistics and a lack of proper equipment, Biman as a ground handling agent is facing tremendous problems. The working conditions are very bad indeed. There is an acute shortage of space. The entire cargo complex is in a mess. Due to inadequate waiting space at the Cargo Complex, before handing over to airlines, shipments are kept in the open, exposed to sun and rain.

Sometimes, even that open space becomes insufficient. Theft and pilferage are rampant at cargo complex. Shippers and forwarders are the ones paying claims for such pilferage or losing business.

As the ground handler, the national flag carrier is earning solid revenue from cargo operation. Biman earned Taka 207 crore in 2005-2005; Taka 243.06 crore in 2005-2006; Taka 230.03 in 2006-2007; Taka 258.12 crore in 2007-2008 and Taka 298.02 crore in 2008-2009. The actual revenue earnings in all these years are much higher than the target.

Despite ever growing substantial income, the condition in the cargo complex has remained really bad in terms of working conditions and proper handling of cargo.

Unquote.....

Source: *The Bangladesh Monitor*, Nov 16 -30 (Volume: XXIII, Issue No. 07)

Inland Waterways

Bangladesh has one of the largest inland waterway networks in the world. Situated in the lower end of 3 great rivers namely the Brahmaputra, the Ganges, and the Meghna, Bangladesh is situated in a flood plain criss-crossed by a network of several rivers and their tributaries. About 800 rivers including tributaries flow through Bangladesh making it a riverine country. A network of important rivers of which the Padma, the Jamuna, the Teesta, the Brahmaputra, the Surma, the Meghna and the Karnaphuli and their tributaries, numbering 230, constitutes around 24,140Km. Total inland navigational area is about 24,000 Km varying during monsoon (5,986 Km) to dry season (3,865

Km)218. Navigability of rivers in Bangladesh has been deteriorating steadily over the years. The withdrawal of water beyond the border and within Bangladesh for irrigation and other purposes has resulted in decreased navigability of rivers during dry season resulting in gradual channel decline.

The river network connects almost all the country's major cities, towns and commercial centres. Moreover, being cheap, safe and environmentally friendly, inland water transportation is often the only mode that serves the poor, proving especially useful during periods of widespread flooding.²¹⁹

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

Chittagong Port mainly handles food grain, cement clinker, sugar, salt, fertilizer, general cargo, iron materials, chemicals, coal, and edible oil, etc. as import commodities and readymade garments, knitwear, fertilizer, jute & jute products, hides and skins, tea, naphtha, molasses, frozen foods, etc. make up the general export.

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

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

In addition to the Pangaon ICT, the Government of Bangladesh granted approval to establish a container port on the bank of the Meghna River in Narayanganj District to the Ananda Group in November 2013. It will be the fifth inland container terminal (ICT) in the private sector. Approvals for establishing ICTs have already been granted to the Rupayan Group, Kumudini Welfare Trust, AK Khan and Company and Cemcor. Meanwhile, the Ministry of Shipping, GoB, is finalising a draft of guidelines for establishing ICTs under private sector investment²²⁰.

2.8.2 Existing Conditions of Mirershorai

Road

Mirershorai EZ covers a very large area compared with other proposed EZ sites. It is situated on the eastern part of the Sonagazi Upazila and western part of Mirershorai. On the northern side is the Feni River. It lies about 67 Km from Chittagong Port and about 66 Km from the District headquarters. It is about 2 Km from the Azampur Bazar. The site is accessible by access road that is 10 Km from the National highway (via DC Obaidullah Road). This road is in a dilapidated condition and presently only 4 wheel-drive vehicles can access the site. For accessing the sea front, one has to cross small watery bodies, ponds, and ditches inside the EZ area (ref to photo). Currently, there is no truck traffic movement to the site. For movement of trucks and trailers, heavy load bearing wide roads would have to be developed.

²¹⁸<http://cmsdata.iucn.org/downloads/navigation.pdf>

²¹⁹<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/SOUTHASIAEXT/EXTSARREGTOPTRANSPORT/0,,contentMDK:20674801~menuPK:868784~pagePK:34004173~piPK:34003707~theSitePK:579598,00.htm>

²²⁰ Ref to article in the Financial Express of 21st November, 2013: Ananda Group gets approval for building container port.



Water body at the site with sea- front behind the trees



On the way to site



Stream on the way to site



Dirt road to site



Narrow brick-layered road leading to site



Discussing with the local authorities at the site

Rail

The closest railway station, Borotakia RS is located at about 11.5 Km from the site. This rail station lies between Chittagong and Dhaka rail link.

Air

Chittagong International Airport (Shah Amanat International Airport) is located at about 79 Km by road from the site.



Chittagong International Airport

Port

Chittagong Port is about 67 Km from the site by road and can also be accessed by sea by covering a distance of about 85 Km. Being a waterfront EZ, there is potential for development of a captive port for catering to the industries proposed inside the site as well as for other traffic and serving as the alternate port.

Table 2.8.2-1: Summary of Transportation Connections in Mirershorai

Site Name	Road Connectivity	Rail Connectivity	Air Connectivity	Port Connectivity
Mirershorai	a. 10 Km from the Dhaka – Chittagong highway (via DC Obaidullah Road) and b. 7 Km (via Muhuri Project Road) c. District Headquarter @66 Km d. Azampur Bazar @2 Km	Closest Rail Station at Borotakia RS @ a distance of 11.5 Km	Chittagong International Airport @ 79 Km (Shah Amanat International Airport)	a. Chittagong Port (CPA) @67 Km by road b. Chittagong Port (CPA) @85 Km by sea route

2.8.3 Constraints

Roads

- As roads play the most vital role in transportation in Bangladesh, their relevance need not be elaborated. Constant traffic jams and restrictions on movement due to limited roads and increasing vehicles plying makes it almost impossible to guarantee travel time of passengers and goods. In addition, the slow progress in development of the construction of the Dhaka – Chittagong Highway (the main artery) makes travelling to Dhaka or Chittagong extremely time consuming. Even the roads inside the 2 major cities are mostly congested with long queues of vehicles.
- The limitation in the number of pumps providing CNG forces vehicles to line up for hours to fill up. Though the vehicles have provision of using other fuel such as petrol and diesel, they do not use it due to the current price which is about 3 times the cost of CNG.

- The trucking industry needs a further injection of modern trucks and trailers as the current fleet is limited to old trucks and trailers mostly unsuitable for carrying containers.

Waterways

- The limitation for using riverine routes for plying larger cargo vessels is further constrained due to the limitation of drafts and lack of dredging of the channels. Until now, only one riverine port is constructed at Pangaon which is yet to be operational. The opening of this Port may soften the current pressure on the Chittagong Port where import cargo is stranded for 10 -15 days awaiting its turn to catch the train to Dhaka.
- Though blessed with such large rivers, transportation by river is not a common means of transport. Among many reasons, the frequency of service, easy availability of ferry services, the status of the river jetties and the limited riverine ports (Chittagong and Mongla) and the adjoining road connectivity to reach to the main destinations make it less attractive for the users.
- Though private ICTs are being developed by the private sector, they are yet to be opened for handling traffic. Though the government has given approval and is currently working on the guidelines, it may be a little tricky as the guidelines should have been drafted first and then approvals given.
- Another problem may be the number of container feeder vessels between CPA and these five private ICTs. Vessels required for inland waterways movement are yet to be seen except for the three deputed by CPA and in operation between the Pangaon ICT and CPA. In the case of Pangaon, though the ICT was developed in early 2013, it had to wait for about six months before the opening of the terminal for business. The CPA had the resources for purchasing the three feeders, but in the case of the private ICTs, it is yet to be seen how they will operate and manage their terminals.
- Though Pangaon ICT opened in early November, it remains idle due to many reasons. Many likely users and institutes have their own versions of why it could not be used, but primarily it seems that lack of awareness, security in the waterways, non-mention of ‘Pangaon’ as final delivery destination in the shipping document, insurance coverage issues, seaworthiness and the number of vessels deputed in the Chittagong – Pangaon circuit along with lack of guarantee of time and cost could be the major factors.

Port

- GoB has yet to sign an inter-governmental agreement on “dry ports” to promote international recognition, facilitating investments in their infrastructure, improving operational efficiency and enhancing the environmental sustainability of transports. In the first round of signing in Bangkok (at UN- ESCAP on November 7 – 8, 2013) 14 countries signed including Armenia, Cambodia, China, Indonesia, Iran, Lao PDR, Mongolia, Myanmar, Nepal, Republic of Korea, Russia, Tajikistan, Thailand and Vietnam. Failing to sign this agreement has compelled the identified and potential Dry Ports of Bangladesh (Akhaura, Brahmanbari, Benapole, Jessore, Bibirbazar, Comilla, Burimari, Lalmonirhat, Hili, Dinajpur, Kamlapur ICD, Dhaka, Sonamasjid, Chapainawabganj, Teknaf, Cox’s Bazar, Banglabandh, Panchagarh) short of international recognition. Hence these destinations cannot be mentioned in the shipping documents as the “final place of delivery” and in turn losing out on the advantages of through movement of the consignment.
- As Chittagong Port is the key gateway for accessing overseas markets, its relevance is crucial and discussed. Traffic jams on most of the highways, including within cities, is very rampant and frequent and all those transporters interviewed complained about the slow progress of the road expansion project that is underway. Shipping lines and freight forwarders revealed the following facts associated with the operations at the Chittagong Port.

- Shipping lines (commercial operations) were facing the problem of sharing the channel with the Bangladesh Navy. This caused unnecessary delay in the delivery and pick-up of containers from the Chittagong Port. This was crucial, especially as the turning points of the channel are narrow, with lots of meanders and have to be shared with the naval vessels, which are given priority. One solution would be for naval vessels and the commercial vessels to have their own dedicated channels.
- The following are the drafts and the deficiencies of each of the container berths:
 - GCB (General Cargo Berth) – draft 8.53 Metres: As this berth lacks Gantry Cranes, only those vessels with their own gears can berth for unloading and loading. Hence vessels without gears have to wait their turn for berthing at CCT.
 - CCT (Chittagong Container terminal) – draft 9.15 Metres: Though there are 4 Gantry Cranes here, there is insufficient back-up area/facility.
 - NCT (New Mooring Container terminal) – 9.15 Metres: Here too, this berth lacks Gantry Cranes and so only those vessels with their own gears can berth for unloading and loading. Hence vessels without gears have to wait their turn for berthing at CCT.
- During budget time, the Port is under pressure, as there are large shipments of imports causing port congestion and delays. The current delay for import containers for Dhaka ICD is about 10 - 15 days.
- Though there are 19 Off-Dock (CFS, ICDs operated by Private Sector) facilities surrounding the Port, these dedicated places are only allowed to handle 29 import items. In the month of August 2013, all the depots combined handled about 35,000 TEUs of export load and about 15,000 TEUs import load only. Some of the ICDs are closed (Iqbal enterprise and Saved Timber Container Yard) due to supply - demand imbalance in the trade. The government has already withdrawn restrictions on 29 items (imported) items to be handled at the off-docks. For the rest of the cargo, the Chittagong Port must be used.
- Out of the total Import Cargo, 60% is de-stuffed inside the Port, only about 30% sent to the off-docks for de-stuffing and the balance 10% is sent to the Merchant's/ Importer's Premises and to Dhaka ICD (which is under the purview of the CPA – Chittagong Port Authority). Due to availability of limited cargo for Off-dock facilities, some of them are closed. Active Shipping Lines in Bangladesh include Maersk, APL, Hapag Lloyd, MSC, Hanjin Shipping, Hyundai, K-Lines, MOL and OSK Lines etc.
- No time line specified for de-stuffing of delayed boxes: Though the Customs rules states that if a box/container is not de-stuffed after 30 days of arrival, the Customs has the authority to de-stuff the box/container and release the boxes/containers to the liners. Though in real practice, this is not happening. Currently about 3,000 TEUs are lying idle. The problem is more rampant in case of Reefer boxes as the Port charge on supplying electricity (@ US\$9 per day) that is levied up to the time when the boxes are released. This charge is to the account of the Shipping Lines owning the boxes.
- Chittagong Port has a shortage of equipment to continuously serve the clients for taking delivery of the containers/cargo. Hence cargo is stranded awaiting loading and dispatch.
- Though the depots located in Chittagong are charging the same tariff for 40 ft. and 40 HC, the CPA is charging 1.5 times higher. Same is the case with the Railways carrying containers to Dhaka- they charge a higher rail freight fee for HC.
- Chittagong Port is served by feeder vessels operated from Singapore, Colombo, and Port Kelang. This increases the ocean freight as it is not a hub port. The Pilot time is about 1 hr. to the Port covering about 9 nautical miles from the outer anchorage.
- There is an official restriction by the Chittagong Port on weights of the 20 ft. and 40 ft. containers. As per CPA, the gross weight of 20 ft. containers shall be less than 24,000 kg.; and,

that of 40 ft. containers shall not exceed 30,480 kg. This official restrictions imposed by CPA should be withdrawn and international practices imposed (i.e. load should be as per the weights allowed in the boxes.)

- The currently used road within Chittagong Port area is public. This causes traffic jams and undue delays in delivery. If the CPA can develop separate ‘Buffer Parking Areas’ inside the Port gate where trucks can come inside and park instead of waiting and jamming the gates and the roads, it would not only decongest the gates but also give relief to the traffic jams on the VIP road. This ‘Buffer Parking Area’ is a common user facility inside the open gates where trucks can line up and get inspected as per the gate entry requirement and then finally enter the controlled port premises.
- There is no EDI connectivity between different relevant agencies as the Port, Customs and Depots etc. making it paper based for processing.
- The Port, Customs and the Depots use their own software hence there is no compatibility in their operation.
- Due to an inadequate number of scanners, delivery is delayed as the trucks have to wait their turn to get scanned prior to exit from the gates.
- The same gate is used for both entry and exit causing congestion. If separate gates were earmarked, it would solve the gate jams to a certain extent.
- The Port does not have adequate export slots. So the vessels ready for loading containers have to call the Depots to send the containers directly to the Vessel which takes 2-4 hours and sometime due to traffic, the container is stranded and when it arrives, the vessel is gone and again, it has to return back to the depot.
- So basically, the CPA has space constraints, equipment shortages, and requires better management for optimal use of its facilities adhering to the needs of the market (market driven approach).

Railways

- The Railway system is comprised of three gauges – broad, metre, and dual lines which involve transshipment at the break of gauge points. Transshipment causes delay and increases chances of pilferage.
- The number of available wagons for plying between Dhaka and Chittagong (on metre gauge track) for carrying containers is limited. This is the reason behind 10 - 15 day back log at the Chittagong Port. Though the rail freight may be cheaper, this backlog is forcing the importers to shift their cargo from rail to road.
- The limited number of wagons (32) per train/ per rake (64 TEUs) is not sufficient to cater to the growing rail transport business between Dhaka and Chittagong Port. There is a big demand and supply gap and not much is being done to take advantage of this opportunity. In neighbouring India and even serving Nepal, all the container special trains (rakes) carry 45 wagons/ 90 TEUs and even double deck container service has started in certain routes in India. This is probably possible due to the tracks – gauge-size. Bangladesh is operating in metre gauge tracks, whereas in India, the trains are running on broad gauge.
- Transit time: Though ideally it should take about 8 hours from Chittagong to Dhaka, it takes about 15 hours due to the constant breakdowns and sharing of tracks.
- Though railway transportation is cheaper, there is not much development attraction in expanding the network. The laying of new tracks is almost stagnant with focus on the existing tracks.

2.8.4 Customs Clearance System

The Customs were using the “ASYCUDA ++” software now but had plans of upgrading to the “ASYCUDA World” – probably in September 2013. Pilot project was already underway as of now. They were using the “red” and “yellow” button system for cargo clearance now, but with the introduction of “ASYCUDA World” They shall also use the “Green” button system for Customs examination of cargo.

Under “Red” button, 100% cargo is to be examined, under “Yellow” button, 20% cargo is to be examined and under the “Green” button, no examination is required. Under the present system, Customs did not have access to other Customs Office declaration verification system elsewhere in Bangladesh, but with “ASYCUDA World”, they shall have this access – clearing way for simplification of cargo clearance and also on-line filing of document. In addition, with the implementation of “ASYCUDA World”, electronic filing of document shall take place whereas of now, both manual and electronic filing of document is taking place.

2.8.5 Multimodal Transport

Article 1.1 of the United Nations Multimodal Convention (which has not yet been ratified) defines multimodal transport as follows: 'International multimodal transport' means the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place in one country at which the goods are taken in charge by the multimodal transport operator to a place designated for delivery situated in a different country".

2.8.5.1 Advantage of Multimodal Transport Operation

Multimodal transport is the carriage of goods by at least two modes of transport under a single contract operated by one carrier. It involves the usage of more than one means of transport in a combination of ship, truck, rail, or airplane in succession. When a multimodal transport operator (MTO) signs a contract, he assumes the responsibility for the execution of the assigned transportation using several individual operators, but these subcontractors would not affect his obligation to the consignor for the performance and liability arising under the contract.

Any consignment coming from overseas and destined inland will be travelling on multi modes of transport utilizing sea, rail, air, or road. The only difference with appointing an MTO is that he assumes the responsibility and is liable for the complete chain of transportation.

Minimises time loss at trans-shipment points

Multimodal transport, which is planned and coordinated as a single operation, minimises the loss of time and the risk of loss, pilferage and damage to cargo at trans-shipment points. The multimodal transport operator maintains his own communication links and coordinates interchange and onward carriage smoothly at trans-shipment points.

Provides faster transit of goods

The faster transit of goods made possible under multimodal transport reduces the disadvantages of distance from markets and the tying-up of capital. In an era of globalization the distance between origin or source materials and consumer is increasing thanks to the development of multimodal transport.

Reduces burden of documentation and formalities

The burden of issuing multiple documentation and other formalities connected with each segmented of the transport chain is reduced to a minimum.

Saves cost

The savings in costs resulting from these advantages are usually reflected in the through freight rates charged by the multimodal transport operator and also in the cost of cargo insurance. As savings are passed onto the consumer, demand increases.

Establishes only one agency to deal with

The consignor has to deal with only the multimodal transport operator in all matters relating to the transportation of his goods, including the settlement of claims for loss of goods, or damage to them, or delays in delivery at destination.

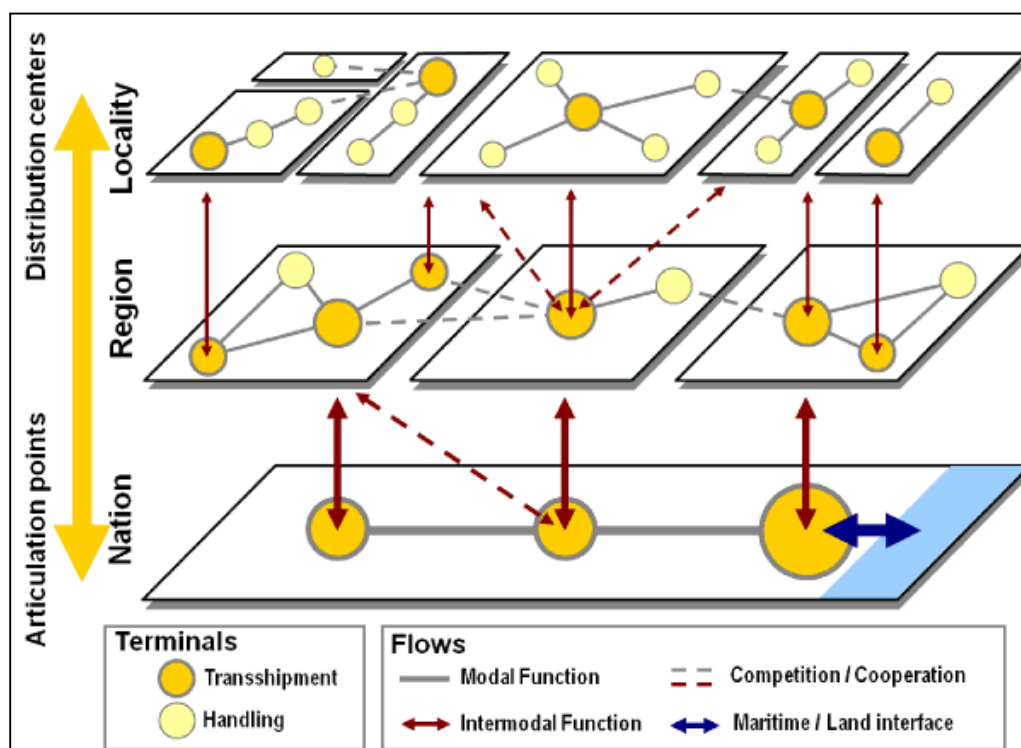
Reduces cost of exports

The inherent advantages of multimodal transport system will help to reduce the cost of exports and improve their competitive position in the international market.

Source: <http://www.unescap.org/ttdw/CapBuild/Module%20-Multimodal%20Transport%20 Operations.pdf>

Multimodal transportation is the result of containerization where one single unit (container) was to be carried from the place of origin to the place of delivery without breaking bulk. This resulted in the development of containerization throughout the world and the development of modern container terminals and the equipment associated with carrying, loading and offloading the container. However it is to be noted that other cargo can also be carried and delivered on the concept of multimodal transport –i.e. without changing its original form, but with the change of mode of transportation.

Figure 2.8.5.1-1: Function of Multimodal Transportation



Source: <http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/multimodal.html>

2.8.5.2 The Case of Bangladesh

MTD (Multimodal Transport Document) is not used as there is no legislation in place for authorizing MTOs. Neighbouring countries like Nepal and India have the Multimodal Transport Act in place.

There are about 840 Freight Forwarding Companies in Bangladesh, out of which about 40 are Multi Nationals.

In the context of Bangladesh, multimodal transport is very relevant as the government of Bangladesh is trying to increase its Ex-Im trade. This is possible by introducing more economic zones that may cater to the investors needs of basic infrastructural facilities from/ to the place of their manufacturing base. As smooth connectivity through the gateway ports and to the rest of the world is the key for setting up economic zones in inland locations, any such large investments should first consider the cargo evacuation system and methods using multimodal transport operations.

Multimodal Systems and Options of Cargo evacuation to/from the Mirershorai EZ

a. Land – Sea (using road and ocean going ship)

Access for cargo evacuation is envisaged through the Port of Chittagong by developing a road route. Chittagong Port is located at about 67 Km from the site. Once any export goods arrive at the Port, it shall be put “on board” and shipped out. Reverse order prevails for import cargo.

b. Land – Air (using road and airplane)

The site is about 79 Km from the Shah Amanat International Airport at Chittagong. Any parcel originating or destined for the EZ can use this gateway for sending or receiving air consignments. Road transportation shall be used for accessing the airport.

2.8.6 Analysis of Freight Benchmark, Trading Across Border and Trade Connectivity

Analysis of ocean freight, air freight, trade connectivity and Bangladesh’s position on the Doing Business index was undertaken and is given below. It could be seen that Bangladesh’s position is more or less same without much significance improvement. The cost and time to import is much higher than the regional average. Hence the GoB needs to take some drastic measures to improve its positioning in the global index. There is room for intra-regional trade that Bangladesh should explore. It’s FDI in stock GDP was below regional average in 2012.

A. Road Freight

It is expected that all goods heading for domestic deliveries from the EZ shall be using covered vans²²¹ and trucks; whereas the movement of import/ export traffic shall include containers loaded on trucks and trailers when exiting from the EZ or arriving to the EZ to/from the Chittagong Port.

On the basis of taking a 20 ft. container (with 20 tonne load) and a 40 ft. container (with 30 tonne load) from Chittagong to Mirershorai and comparing it with similar loads from Chittagong to Dhaka, we arrive at the per tonne per Km freight cost as per the figures mentioned below. Though the cost is slightly higher on that basis (of per tonne per Km), it is reasonable at this stage as there is no big volume of traffic movement and there is no competitive forces acting for fulfilling the demand. Calculations of similar destinations are also provided as reference.

Table 2.8.6-1: Benchmark – Road Freight

Sector	Distance	20 ft. (20 tonne) Freight	40 ft. (30 tonne) Freight	Per tonne cost (20 ft.)	Per tonne/Km cost (20 ft.)	Per tonne cost (40 ft.)	Per tonne/Km cost (40 ft.)

²²¹ In the context of Bangladesh, small pick-up delivery vans upto 3 tons are normally referred as “covered vans” followed by mini trucks (upto 8 tons), trucks (upto 20 tons includi) and trailers (above 20 tons).

Sector	Distance	20 ft. (20 tonne) Freight	40 ft. (30 tonne) Freight	Per tonne cost (20 ft.)	Per tonne/Km cost (20 ft.)	Per tonne cost (40 ft.)	Per tonne/Km cost (40 ft.)
Chittagong - Mirershorai	39 Km	Tk 15,000	Tk 18,000	US\$9.37	US\$0.240	US\$7.5	US\$0.19
Chittagong - Anwara	28 Km	Tk 12,000	Tk 15,000	US\$7.5	US\$0.267	US\$9.375	US\$0.33
Chittagong - Dhaka	319 Km	Tk 30,000	Tk 35,000	US\$18.75	US\$0.058	US\$14.58	US\$0.045
Chittagong - Sherpur	435 Km	Tk 50,000	Tk 60,000	US\$31.25	US\$0.071	US\$27	US\$0.062
Kathmandu - Kolkata	1200 (by road)	US\$2300	US\$3300	US\$115	US\$0.095	US\$132	US\$0.11
Kathmandu - Kolkata	900 (by road-rail)	US\$1800	US\$2800	US\$90	0.1	US\$112	US\$0.124

*Above information is based on interview with 'Homebound Logistics' and a local transporter from Chittagong and info from Nepal from Inter State Multimodal Transport Pvt. Ltd- Kathmandu, Nepal

B. Ocean Freight to/from Chittagong Port

An analysis is made for comparing the freight of a 20 ft. and 40 ft. container originating/destined from/to Chittagong port and other major destinations worldwide. Ocean Freight rates for the major ports from/to the Chittagong Port are given below. From the freights provided, it is seen that import and export to Hong Kong & Dubai are most economical. For import & export cargo in general, Australia, followed by New Zealand, Rotterdam, New York & Los Angeles are in economical order with Canada having the costliest ocean freight. It is to be noted here that most of the sectors have big differences in the import and export freight. Ocean freight rate is volatile and is governed by the demand and supply theory as well as the availability of containers. The freight rates can go up substantially during peak season.

Table 2.8.6-2: Benchmark – Ocean Freight

Export / Import	20 ft. (in US\$)	40 ft. (in US\$)	20 ft. (in US\$)	40 ft. (in US\$)
Ocean Freight to International Destinations (from Chittagong Port)	EXPORT		IMPORT	
Major European Ports (Rotterdam)	1,300	2,600	1,500	3,000
USA - East Coast (New York)	3,000	4,000	3,000	4,000
USA - West Coast (Los Angeles)	3,000	4,000	3,000	4,000
Canada (Toronto/ Montreal)	3,500	4,500	3,500	4,500
Australia (Melbourne)	1,200	2,400	1,100	2,200
New Zealand	1,200	2,400	1,500	3,000
Hong Kong	1,000	2,000	1,200	2,400
UAE (Dubai)	1,100	2,200	1,200	2,400

Source: National Agencies, Dhaka, Bangladesh

C. Air Freight to/from the Shahjalal (R.) International Airport, Dhaka

Air freight rates to/from Dhaka to several destinations are given below. Similarly to ocean freight, air freight shipments to/from Dubai, Hong Kong and Shanghai are comparatively cheaper in comparison to Melbourne, London, Rotterdam, and Montreal. The cheaper freight to Dubai, Hong Kong, and Shanghai is due to the fact that there are many scheduled flights to those nearer destinations (with belly-hold capacity in the passenger crafts) as well as the availability of freighter services to those destinations. Shipments to other destinations as London, Montreal, New York and Los Angeles etc.

have to use transit route with lesser frequency resulting in costlier freights. The greater the distance and transit, the freight will be costlier.

Table 2.7.6-3: Benchmark – Air Freight

Air Freight (Export /Import from Dhaka Airport)	Up to 1 kg(US\$)	Up to 10 Kg(US\$)	Up to 50 Kg(US\$)
Dubai	50/100	4.50/3.5	3.70/3.2
London	50/100	7.50/3.5	3.70/3.2
Rotterdam	50/100	7.87/3.5	3.70/3.2
Montreal	75/100	9.50/5.5	7.10/5.1
Melbourne	50/100	6.50/3.5	3.70/3.2
Hong Kong	50/100	4.50/3.5	3.70/3.2
Shanghai	50/100	4.50/3.5	3.70/3.2
New York	75/100	9.50/5.5	7.20/5.1
Los Angeles	75/100	9.50/5.5	7.20/5.1

Source: National Agencies, Dhaka, Bangladesh

D. Ocean Freight – Comparative Analysis

The table below provides the benchmark on how 2 major cities from OECD countries (Yokohama and Los Angeles) fare from a developed country's perspective. The table provides the status of Bangladesh's ocean freight standing in terms of import and export to/from Japan (Yokohama Port) and to the US – West Coast (Los Angeles). It can be noted from the above table that other ports/cities like Seoul, Kuala Lumpur, Beijing and other Chinese cities are paying less than or about US\$700 per 40 ft. box for their export shipment, Batam with about 800 whereas Bangladesh is paying US\$900 followed by Bangkok, Phnom Penh, Batam and Yangon. The most expensive ocean freight seems to be from Danang and Hanoi which is above US\$2,000.

Except for Dalian, other Chinese cities are enjoying cheap ocean freight within/about US\$ 900 for their import shipment from Yokohama. It is followed by KL, Singapore, Cambodia and Bangladesh. Indian and Vietnamese import freights are near/above US\$2,000.

In the case of export to Los Angeles, again, Bangladesh's position is in the lower section with Seoul and Beijing's fares within US\$ 2,000 followed by other Chinese cities, Jakarta and Singapore. Bangladesh is almost at par with Bangkok but costlier than Mumbai, Chennai, Ho Chi Minh and Guangzhou.

Table 2.7.6-4: Benchmark - Ocean Freight of 40 ft. Container to/from Yokohama (Japan) & to Los Angeles (USA)

Country	City	Export to Yokohama (US\$)	Import from Yokohama (US\$)	Export to Los Angeles (US\$)
1. Bangladesh	Dhaka	900	2000	3675
2. Cambodia	Phnom Penh	1500	1400	4000
3. India	a. Mumbai	500	2450	3000
	b. Chennai	979	2803	2817
	c. New Delhi	1566	2878	3968
4. Indonesia	a. Jakarta	800	1200	2600
	b. Batam	1850	1800	4000
5. Myanmar	a. Yangon	1600	2400	6500
6. Vietnam	a. Danang	2500	3000	5000

Country	City	Export to Yokohama (US\$)	Import from Yokohama (US\$)	Export to Los Angeles (US\$)
	b. Ho Chi Minh	500	650	2600
	c. Hanoi	2000	2500	4500
7. Thailand	a. Bangkok	1162	1322	3863
8. Malaysia	Kuala Lumpur	643	1008	2878
9. Singapore	Singapore	900	1100	3000
10. China	a. Hong Kong	700	100	2900
	b. Dalian	50	2400	227
	c. Shenzhen	400	995	2700
	d. Guangzhou	650	895	3000
	e. Shanghai	564	775	2938
	f. Beijing	1005	671	1945
11. South Korea	Seoul	480	200	1823

Source: (http://www.jetro.go.jp/en/reports/survey/pdf/2013_05_01_biz.pdf): The 23rd Survey of Investment Survey Related Costs in Asia and Oceania (FY 2012 Survey) May, 2013 –Overseas Research Department, Japan External Trade Organisation (JETRO)

2.8.7 Bangladesh's Position in Doing Business 2013

In the country table provided in *Doing Business 2013*, Bangladesh ranks 119 out of 185 countries under the 'Trading Across Border' heading. The table below provides a glimpse of Bangladesh's standing compared to its neighbours and also to the developed countries in the world. Documents required for export are fewer in Bangladesh than in India, but the time it takes to export and import is more than any other country in the list given below. Ideally, Bangladesh's import and export container costs should be below the US\$1,000 benchmark, but it is not. This may be because of it not being a hub port and relying on feeder services serving the hub port, adding costs. With the development of the proposed Sonadia Deep Sea Port, as a hub port, the scenario may change.

Table 2.8.7-1: Benchmark – Doing Business (Trading Across Border)

Country	Trading Across Border (rank)	Documents to export (number)	Time to export (days)	Cost to export (US\$/container)	Documents to import (number)	Time to import (days)	Cost to import (US\$/container)
Bangladesh	119	6	25	1,025	8	34	1,430
India	127	9	16	1,120	11	20	1,200
Sri Lanka	56	6	20	720	6	19	775
Cambodia	118	9	22	755	10	26	900
Thailand	20	5	14	585	5	13	750
Indonesia	37	4	17	644	7	23	660
China	68	8	21	580	5	24	615
Japan	19	3	10	880	5	11	970
USA	56	6	20	720	6	19	775

Source: *Doing Business 2013*

2.8.8 Bangladesh's Position in Trade Connectivity: UN Report²²²

In a UN-ESCAP report published some time ago, Bangladesh took 137th position out of 179 in the ESCAP International Supply Chain Connectivity (ISCC) Index. Bangladesh's progress in enhancing

²²² *Financial Express*, 24th Nov 2013

supply chain connectivity from 2006 to 2012 has been similar to other countries in the South and South West Asian regions. The latest data from the ESCAP database suggests that Bangladesh has made limited progress in reducing trade costs with its South and South-West Asian neighbours, and relatively more progress with East and North East Asian countries.

With the exclusion of tariff cost, trade between Bangladesh and the USA is only slightly higher than those between Bangladesh and some other South Asian countries, suggesting room for intra-regional trade facilitation.

As per ESCAP, the country's export growth was slightly above average for the Asia-Pacific region, while imports fell by over 5% compared to 2011. This improved the trade balance deficit of 11% of GDP in 2011 to 8% in 2012.

Though foreign investment increased from US\$700 million in 2009 to under US\$1 billion in 2012, the country could do a lot more to attract investment as the share of inward FDI stock in GDP was far below the regional average in 2012.

2.8.9 Recommended Infrastructure for Transport Accessibility

Table 2.7.9-1: Future Recommended transport infrastructure for Mirershorai

Road	Rail	Air	River/Port
Phase – I: New Access Road to the highway to be developed.	Phase – I: Rail access to Chittagong Railway station from Borotakia RS is available and also may be used in future.	Existing @ Chittagong Airport. Hence no new airport recommended.	No Port planned in this EZ.

2.8.10 Development of a Warehouse Zone inside the EZ

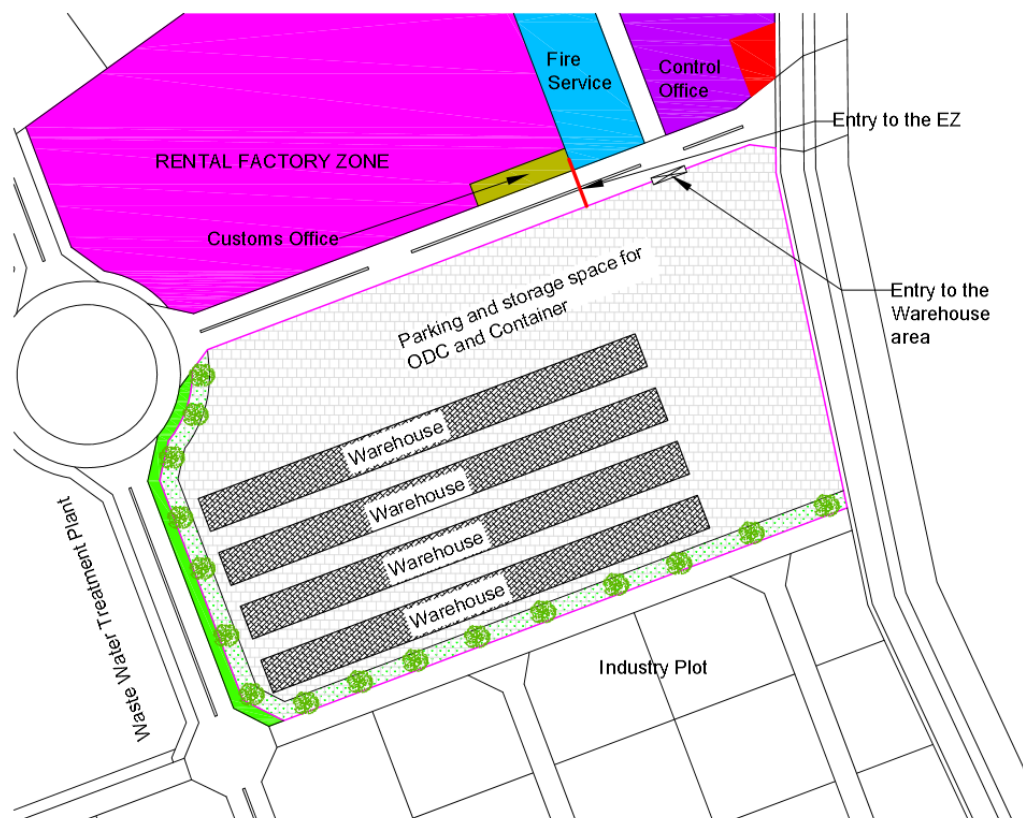
Renting a warehouse in the economic zone helps to manage the export operations itself without having to entrust the work to another companies. Then, by carrying out customs clearance only on the amount for which an order has been received (split clearance), the company manages to ensure delivery in a short span of time, while minimizing customs duties, value-added tax (VAT) and shipping costs. The warehouse will be built and operated by the IPP.

The image of the warehouse is shown. The picture is of a modern large-sized warehouse built in Nepal recently. The dimension of the warehouse is about 400 m x 26.5 m.

Figure 2.8.10-1: Example of Warehouse

As for the warehouse zone in the Mirershorai Economic Zone, a similar type of superstructure to that in the figure is recommended. The next figure shows the probable layout of warehouses in the Mirershorai Economic Zone.

Figure 2.8.10-2: Layout of a Warehouse Zone in Mirershorai Economic Zone



In general, for a warehouse to be efficient, the ratio of the covered shed and the open area should not be more than 25:75 (i.e. shed: open). The maximum shed (covered warehouse; 25%) area should also cover the area for storage of handling equipment and office building that is used in the shed. The open area (i.e. 75%) is to be used not only for parking, but also for storage of ODC and other non-perishable consignment including containers.

As with the warehouse zone in the Mirershorai Economic Zone, the ratio of the warehouse and the open space is designed to be about 25:75. The cost estimate table is shown next.

Table 2.8.10-1: Cost Estimate of the Warehouse Zone in the Mirershorai Economic Zone.

Scope	Description	Quantity	Cost (BDT)	Cost (US\$)
Boundary Wall	Boundary Wall	1,700 rm	9,945,000	124,313
Warehouse	400m x 30m @4 = 48,000m ²	48,000 m ²	888,000,000	11,100,000
RCC Work for Open Space	Parking, Storage of ODC and other non-perishable consignment including containers	138,991 m ²	1,414,233,429	17,677,918
Security Post	Security Post	8 set	800,000	10,000
Area Lighting with High Mast Pole with Light	High Mast Light	35 set	17,500,000	218,750
Total			2,330,478,429	29,130,980

CHAPTER 3

MASTER PLANNING AND INFRASTRUCTURE

(COMPONENT 2)

3.1 Site Assessment

The section 3.1 is composed from following three major issues:

Section 3.1.1 Site Visit Report Section

3.1.2 Natural Condition Section

3.1.3 Land and Utility Condition

Specifically the section 3.1.2 is set aside for basic engineering analysis which determines ground elevation, foundations of plant and super-structures, dike system, and drainage system. All these figures are used for the later section of engineering design.

3.1.1 Site Visit Report

As a startup activity for the Feasibility Study, the team of consultants (expatriates and local personnel) visited the Mirershorai site from July 9 until July 10, 2013. The purpose of the visit was to observe and explore existing site conditions, investigate off/on site infrastructure and available facilities, land acquisition and resettlement issues, environmental and social aspects, etc. Details of that visit are provided in Chapter-3, Inception Report. The power point presentation given to the World Bank on the Field Visit is shown in an Annex of that inception report.

Subsequently while preparing the Master Plan, the Consultant Team (Local Personnel) visited the site again from July 23 to July 25, 2013. During this period, the Team also visited various offices. These include the DC office, Upazila Parishad office, RHD Office, BWDB Office, BPDB Office, and the Gas office etc. in Chittagong and Mirershorai. Relevant documents were collected, for example location maps of the sites, information regarding assessment of cost of compensation and relocation of affected persons, and the list of the affected properties, etc. and other information related to the project. The team discussed the previous activities related to the project (EZ sites) with engineers and others conversant with the features of the sites.

3.1.1.1 Location and Physical Aspects of Mirershorai EZ

The Mirershorai EZ site is situated in Mirershorai Upazila (Chittagong District) about 13 Km to the west from Upazila Headquarter and about 66 Km from Chittagong District Headquarters. Dhaka-Chittagong National Highway is about 10 Km east of the project site at BWDB Embankment which is aligned almost parallel to the Dhaka-Chittagong National Highway. The nearest township from the proposed site is about 5 Km away while the nearest two rail stations namely Chinki Astana and Borotakia are both at about 12 Km from the project site.

The Project site is 6,615.12 acres (2,678.19 hectares) of which private land is 2,944.06 acres (1,191.93 hectares) and public land is 3,671.06 acres (1,486.26 hectares). The whole area is situated in plan longitudinally about 15 Km north-southwards and its width varies east-westwards from about 1 Km to 3 Km. Furthermore, the area may be divided into 2 (two) parts named as **Part-1 and Part-2 (refer to Figure 3.1.1.2-1 for Location Map of Mirershorai EZ site)**.

Part-1 (area \approx 4,726.10 acres): most of the area of this part (\approx 3,145.21 acres) is protected by dikes at four sides (BWDB embankment, Muhuri Project embankment, CDSP embankment). This has formed a pocket of comparatively safer land and is used mostly for agriculture and fish culture. A small portion of land is found to be at the western part of the BWDB embankment. The remaining two small portions of this part about 781.01 acres (316.20 hectares) and about 799.88 acres (323.74 surveyed recently) lie beyond the CDSP Embankment to the south-west and are open to the forest and the Bay of Bengal.

Part-2 (area \approx 1,888.90 acres): This part of the project area is bounded to the east by the BWDB Embankment and to the north by the CDSP Embankment. The other two west and south sides are

open to the forest and the Bay of Bengal. This area takes a more or less regular shape being narrow in the east and west. This area is relatively low and there are a large number of ponds, ditches, and khals.

This location is already fixed by BEZA as the EZ site. The Consultant Team visited the site and investigated off/on-site infrastructure and available facilities, land acquisition and resettlement issues, environmental and social/gender aspects, sources of water and power, etc. from their own point of assessment. The detail of the site visit report is prepared based on existing conditions/facilities. During the visit, the Team collected information from interviews with local people, hydrological data at the site like Highest Flood Level (HFL), Normal Flood Level (NFL), water level (WL) at low tide and high tide (Full moon), tidal system (tidal oscillations) at and near the site, information regarding cyclonic surges etc. Information on the existing embankments, at and near the site, on the Bamon Sundar and Ichhakhali Khal flowing across the BWDB Embankment and through the proposed site was also collected. The Team visited the Bamon Sundar Forest and up to the 'Char' (acreated land) on the Bay of Bengal by boat along this Khal; observed Muhuri/Feni River coming from upstream and flowing across the Muhuri Project Embankment at the extreme north of the EZ site and falling to the Bay of Bengal near the project site to the west. The flow and water level of the river, controlled by a regulator at the intersection of the river and Muhuri Project Embankment, were also observed.

During the site visit importance was given to the investigation of road connectivity of the proposed site to the Highway. Regarding this, there was discussion with the LGED engineers and the Consultant Team was informed that they (LGED) had investigated several access roads from the Highway to the project site. However, the Consultants investigated the existing two approach/access roads from the site to the Highway and the Railway. The possibilities and constraints of the existing two access roads are tabulated for better understanding.

3.1.1.2 Approach Roads for the Mirershorai EZ Site

During the site visit on July 23 and 25, 2013, the Consultants Team investigated the two approach/access roads. One is from Dhaka-Chittagong old highway, with the intersection to the highway at Borotakia Bazar. The distance from Borotakia Bazar to the site is about 9.30 Km and another approach/access road is from Zorarganj intersection to Muhuri Project Embankment. The distance from Zorarganj to Muhuri Project Embankment is about 7 Km and from the Dhaka-Chittagong Highway through Old Trunk Road is about 10 Km (refer to Fig.3.1.1.2-1 for Location and Layout of Access Roads).

Access Road (i):

Approaching from Zorarganj, the junction is at Muhuri Project Embankment on the northern side of the project site. The existing road width is 5.5 m with bituminous carpeting. There is a possibility of increasing the approach/access road up to 4-lanes from Highway-Zorarganj to Muhuri Project Embankment, without any need for a bypass. Most of the settlement is residential. There are two markets along the road, Zorarganj Bazar and Azampur Bazar, which has a mosque. There are some ponds, ditches (water bodies), a graveyard, a mosque and a temple along the road. This road was initially constructed by the Bangladesh Water Development Board (BWDB) as an approach/access road to Muhuri Project Embankment. Now LGED has taken responsibility for the road including maintenance. The existing Dhaka-Chittagong Railway line is about 3Km away from the Zorarganj intersection.

The following table shows the possibilities and constraints of the existing road from the Highway (through Old Trunk Road)-Zorarganj to Muhuri Project Embankment (Access Road - i).

Table 3.1.1.2-1: Possibilities and Constraints of an Access Road (i)

Possibilities	Constraints
<ol style="list-style-type: none"> 1. Widening the road is possible up to 60 ft. (18.30 m) to make a 4-lane road. 2. Most of the road is straight with minimal curve. 3. No by-pass is required. 4. The cost for acquisition of land for road widening would be cheaper due to pond, ditches (water body). 5. The resettlement cost would be minimal. 6. The Muhuri Project Embankment and BWDB Embankment would be used for road network in an extended way. 7. The CDSP Embankment constructed in 2005 is very close to this approach/access road. 	<ol style="list-style-type: none"> 1. Not possible to widen to accommodate rail connectivity. 2. The land filling cost would be more due to ponds or ditches (water body) along the road.

Access Road (ii)

Approaching from Barotakia Bazar, the existing road meets the project site at the southern end, the local name of the junction being Noapara in Roypur union. The width of the road is 5.50 m, some with RCC (rigid pavement) surface and some with Bituminous Carpeting (BC). There are two tidal water canals along the road. There is a possibility to extend the road up to 18.30 m with 4-lanes.

One bypass will be required at Abu Torab Bazar. Most of the settlement along the road is residential. There are two markets along the roads, Abu Torab Bazar and Moghadia Bazar. The road was reconstructed in May, 2008 under the Eastern Bangladesh Rural Infrastructure Development Project (EBRIDP) of LGED. The name of the road is DC Obaidullah Road. The reconstruction cost for this, DC Obaidullah Road, was funded by JBIC at a cost of BDT 22,376,929.

The following table shows the possibilities and constraints of the existing access road from Borotakia Bazar to Noapara, Roypur union (Access Road - ii).

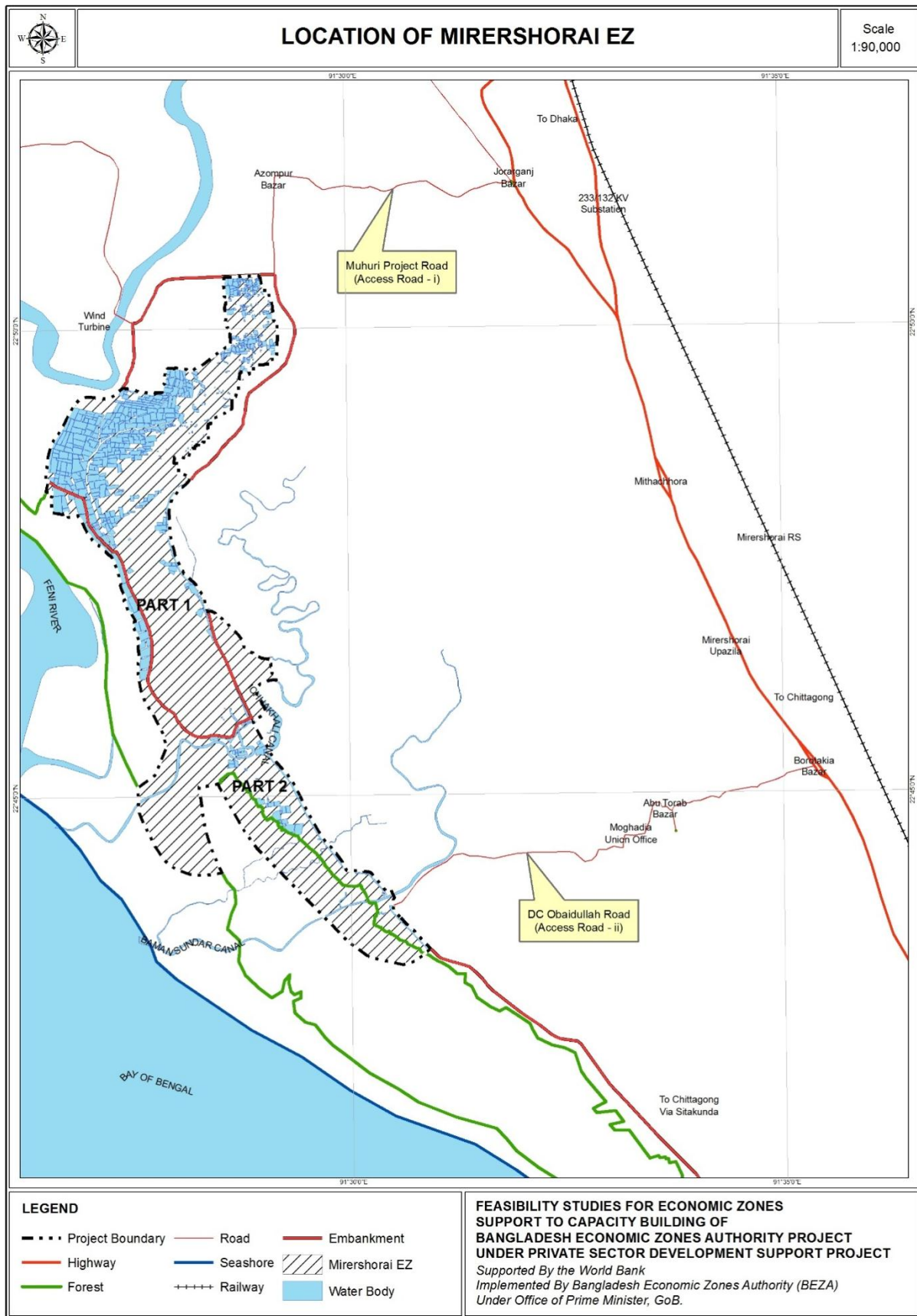
Table 3.1.1.2-2: Possibilities and Constraints of Access Road (ii)

Possibilities	Constraints
<ol style="list-style-type: none"> 1. The present road width is 5.5 m with some RCC rigid pavement and some bituminous carpet (BC). 2. Widening the road is possible up to 60 ft (18.30 m) to make 4-lanes with filling of existing canals. 3. Along the road about 1/3 portion is paddy land. The resettlement cost would be minimum. 4. The existing railway station Borotakia is about 1 km apart from the Borotakia Bazar intersection. 	<ol style="list-style-type: none"> 1. The borrow pit is used as canal for flow of the tidal water. 2. The provision for canal to be made for flowing tidal water. 3. A by-pass would be required at Abu Torab Bazar. 4. The road is not straight at present; but with widening to 4-lane, it can be straightened. 5. The roadway and railway should not be proposed at the same alignment due to non-availability of land along the existing road. 6. The intersection point of the old Dhaka Chittagong highway and Borotakia Bazar is not wide. The intersection point should be widened after demolishing some shops, houses etc.

Recommendation

The infrastructure expert, with the support of the team, suggests that both roads should be developed as access roads to the site. The existing road should be upgraded to a 4-lane highway. If the site needs to be connected via railway then a more detailed study should be done on how to connect the zone with the existing railway network.

Figure 3.1.1.2-1: Location Map of Mirershorai EZ



3.1.1.3 Possible Social Implications

As a huge amount of land to be acquired at the site for establishing the largest economic zone in Bangladesh, some social issues may create problems to the project. The social expert looked into those issues and suggested a possible resettlement plan which is described in detail in Section 4.1 of Chapter 4.

During the field visit various consultation meetings were held with Upazila level government officials, union parishad officials, People of different ages, various occupational groups including farmers, shopkeepers, transport workers, students, small businessmen, fishermen. During these consultations people mentioned their problems of life at present and lack of employment opportunities. They are aware of the EZ project and are looking to work on it or enjoy some benefits from its impact on the local economy. They're looking to hand over the land to the EZ authority with appropriate and quick compensation. They also said that it'll be better for them if the authority provide land and compensate for resettlement. For agricultural and fishery lands, compensation will be enough.

The consultants didn't find any problem of acquiring land for the EZ. The lands are mainly abandoned and not much agricultural activities can be found due to the shortage of sweet water nearby. A grievance redress mechanism has been proposed in Chapter 4 to solve the possible acquisition issues. Still if the acquisition takes more time than estimated in this feasibility study, the whole construction process can be shifted. Some increase in construction costs will be a result of the delay. So it will be advisable to complete the land acquisition process swiftly to achieve the best outcome.

Following photographs shows some of the views of the project site with access roads and surroundings.



View of access road -i (DC Obaidullah Road) from Dhaka-Chittagong old Highway (Borotakia Bazar intersection point) leading to BWDB Embankment at Noapara in Roypur Union, Mirershorai Project site at southern part.



View of Mirershorai EZ site (Southern part) as seen from the end of access road (DC Obaidullah Road) at Noapara Point with BWDB main Embankment to the left towards Sitakunda and to the right towards Baman Sundar Forest Office.



Another view of the Project site at southern part as seen from the BWDB Embankment.



View of access road - i (DC Obaidullah Road) as seen on the way to site.



Photograph showing access road - i (DC Obaidullah Road) at Abu Torab Bazar



View of BWDB main Embankment as seen from Embankment-DC Obaidulla Road Intersection towards Baman Sunder Forest area to the north.



View of the Project site near Baman Sunder Forest area.



Downstream view of Baman Sunder Khal at site flowing to the Bay of Bengal as seen from regulator at BWDB main Embankment.



View of the Project site as seen from Baman Sundar khal on the waterway to Bay of Bengal.



View of Baman Sundar khal near Bay of Bengal.



View of entry to Old Trunk Road from Dhaka-Chittagong Highway (Dhaka-Chittagong Highway to Muhuri Project Embankment access road). Zorargonj Intersection is about 3Km ahead



View of access road -ii (Dhaka-Chittagong Highway to Muhuri Project Embankment) as seen from Zorargonj Intersection



Another view of access road -ii (Dhaka-Chittagong Highway to Muhuri Project Embankment) as seen on the way to site with Bishumiar hat ahead.



Dhaka-Chittagong Highway to Muhuri Project Embankment access road - ii at Azampur Bazar. EZ site is about 1.8Km ahead



View of BWDB main Embankment leading towards Sitakunda to the south keeping the EZ site to the right. Photograph taken from main Embankment-Muhuri Project Embankment Intersection.



View of Muhuri Project Embankment with very mild side slope to the Bay side near the project starting point. Project site (northern part) is seen to the left.



View of the Project site (shallow ponds for fish culture) at northern part with CDSP Embankment inside the EZ site. Photograph taken from Muhuri Project Embankment.



View of Muhuri Project Embankment near Regulator (behind) at intersection of Feni River and Embankment with CDSP Embankment joining to the Muhuri Project Embankment ahead.



Sluice gate (Regulator) at intersection of Feni River and Muhuri Project Embankment at north of the project site with upstream view of Feni River to the right.



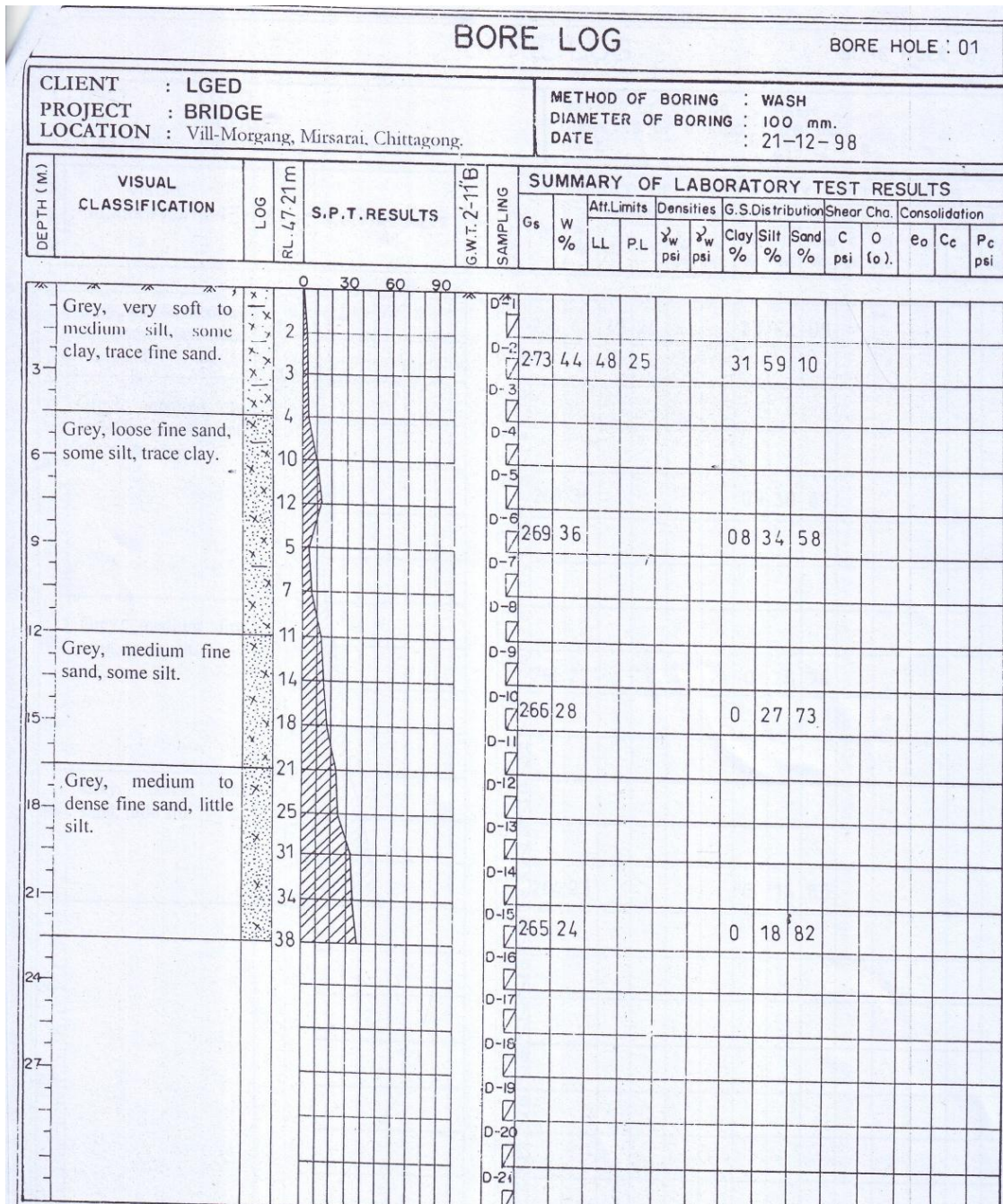
Feni River at downstream as seen from the regulator flows towards south-west and falls to the Bay of Bengal near the project site.

3.1.2 Natural Condition

3.1.2.1 Description of Sub-soil Condition of the Site

The top soil near the EZ is mainly very soft to medium silt with clay or clay-laden silt and with a trace of fine sand. According to the sub-soil investigation record of this area (north-west of Chittagong District) the soil profile at shallow/beyond shallow depth is mainly dominated by non-cohesive soil with a comparatively low SPT (Standard Penetration Test) value at the upper level. However, for better understanding, a field bore log data of a bridge site (bore hole location on the land) near Mirershorai EZ project (Morgang Khal on Morgang Road near Azampur Bazar) is presented next. This information is for the basic design of foundations of plants and buildings to be built inside the economic zone. A detailed study of the sub-soil condition of the site drilling more bore holes is required for before beginning the actual construction here.

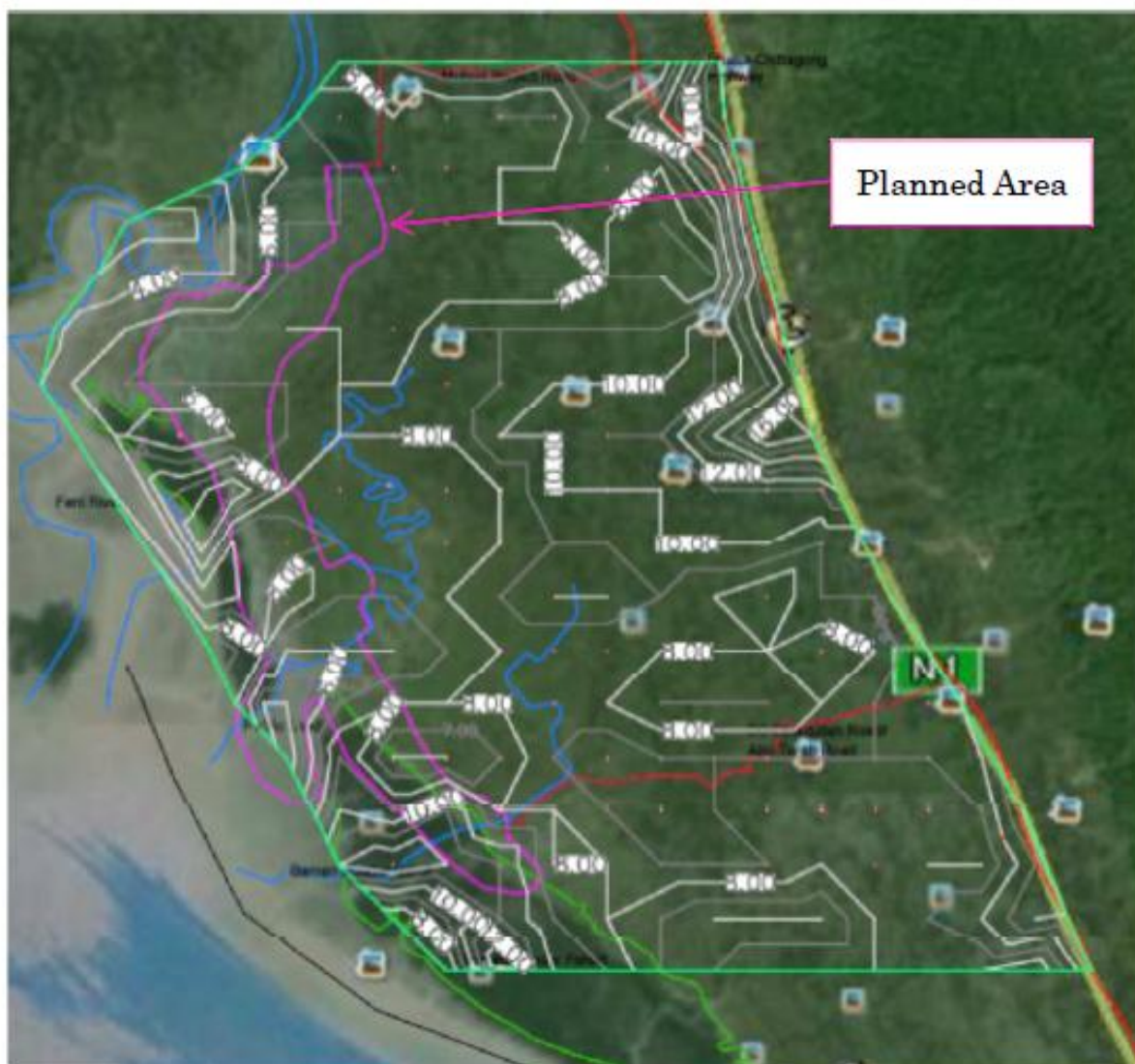
Figure 3.1.2.1-1: Soil Bore Log Data Sheet



3.1.2.2 Topographical Condition

The following figure shows topographical conditions in the project area. The contour information is for designing the ground level, height of dike, and drainage system. Details are explained in the section of engineering design.

Figure 3.1.2.2-1: Topographical Map of Mirershorai EZ



The existing ground elevation inside the planned area shows between El+6.0m~El+10.0m. The planned finishing level is designed to be El+8.0m in order to keep the balance between the filling volume and the excavation volume. With a suitable dike in front of the sea, the economic zone is expected to be safe. The details of the dike are explained in the Annex -3.

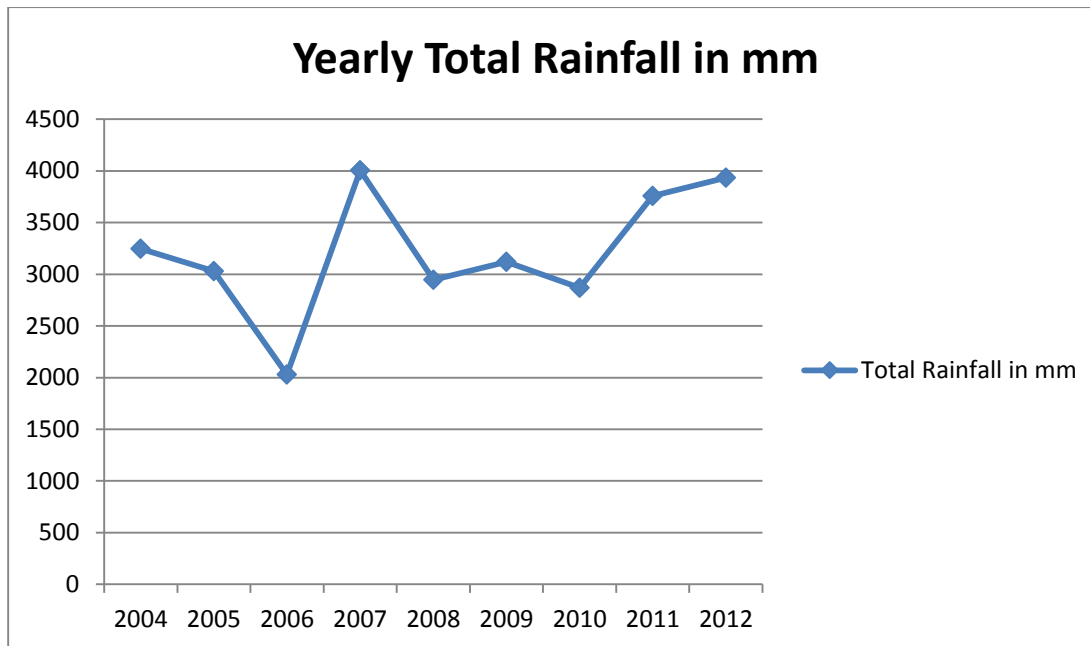
3.1.2.3 Rainfall Data

The following data is used for investigating the rain intensity on site.

Rainfall in millimeter.txt, Bangladesh Meteorological Department
Climate Division, Agargaon, Dhaka-1207

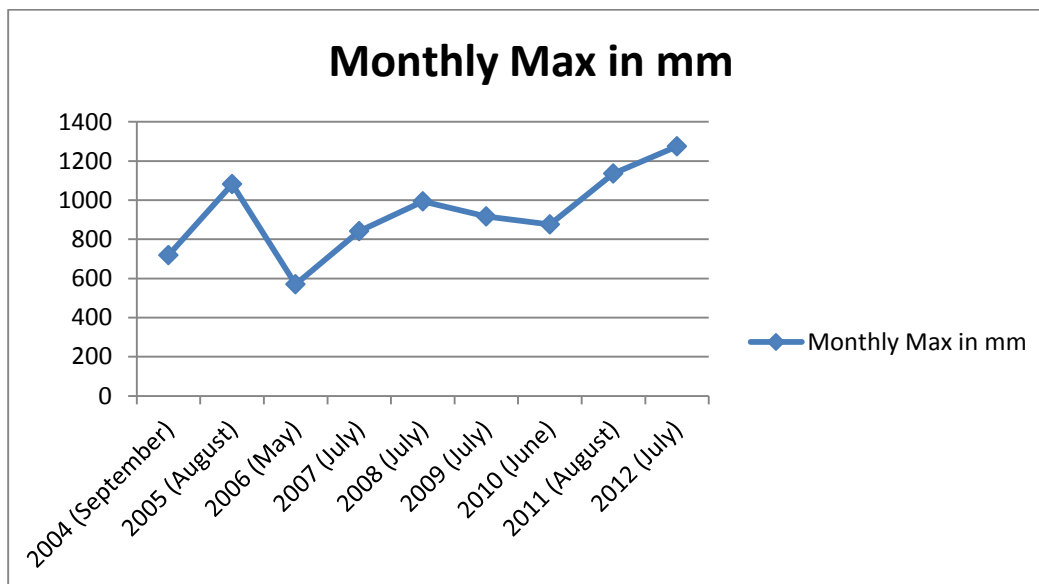
Data (Station: Sitakunda)

Table 3.1.2.3-1: Yearly Total Rainfall in mm



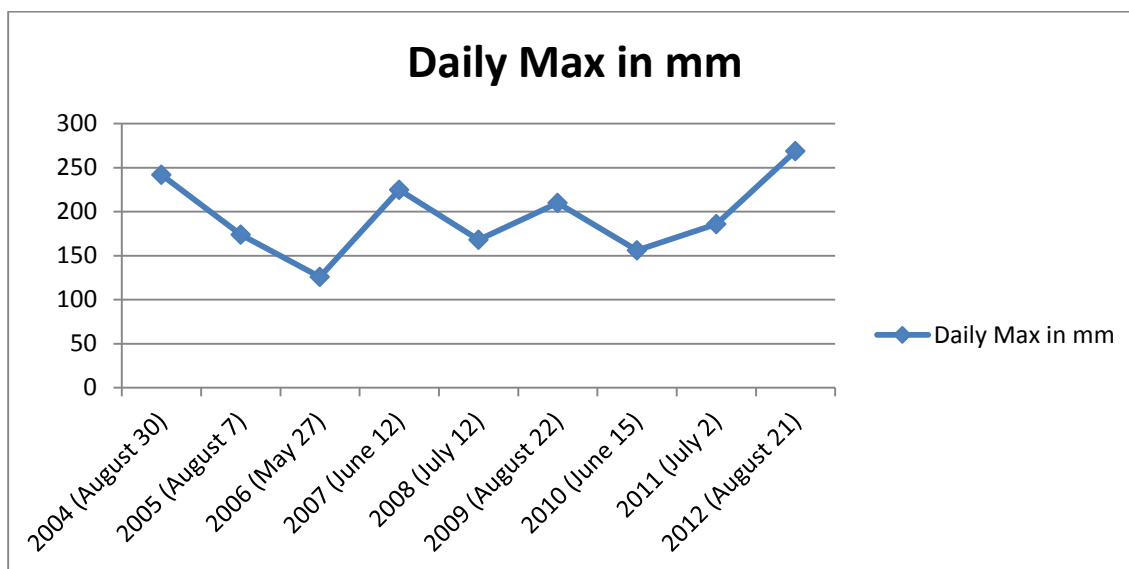
The data shows that the average yearly rainfall (in mm) in the past years (2004~2012) is about 3,215mm.

Table 3.1.2.3-2: Monthly Max Rainfall in mm



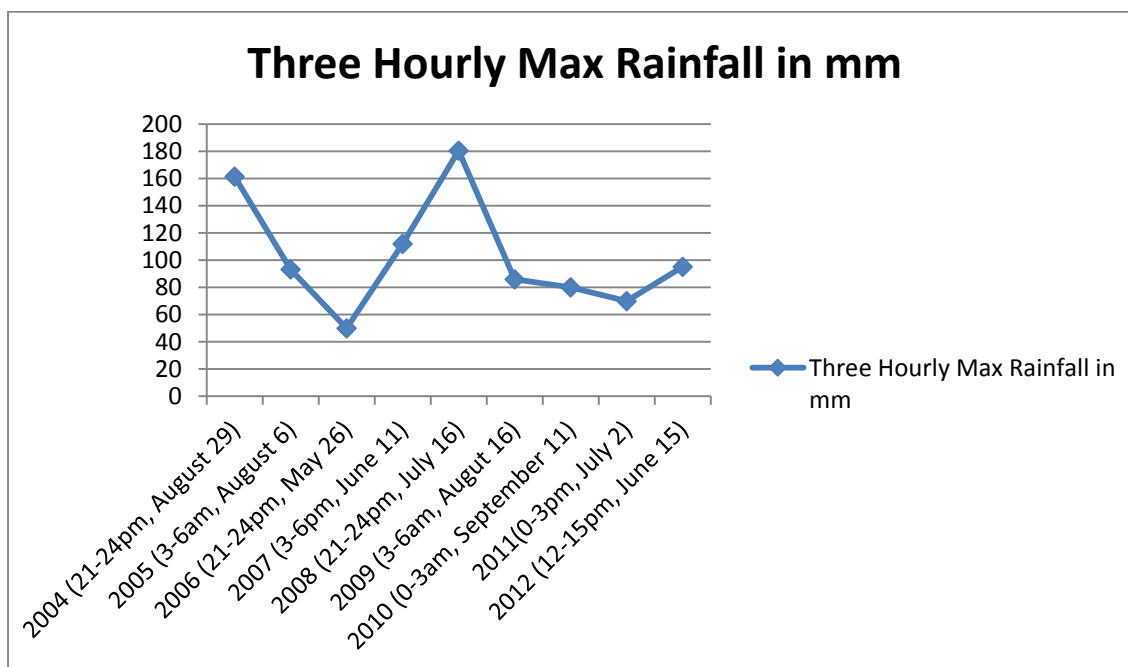
The recent monthly max data shows that June, July and August are the highest rainy months in this region. In 2012, there was 1,274 mm in July.

Table 3.1.2.3-3: Daily Max Rainfall in mm

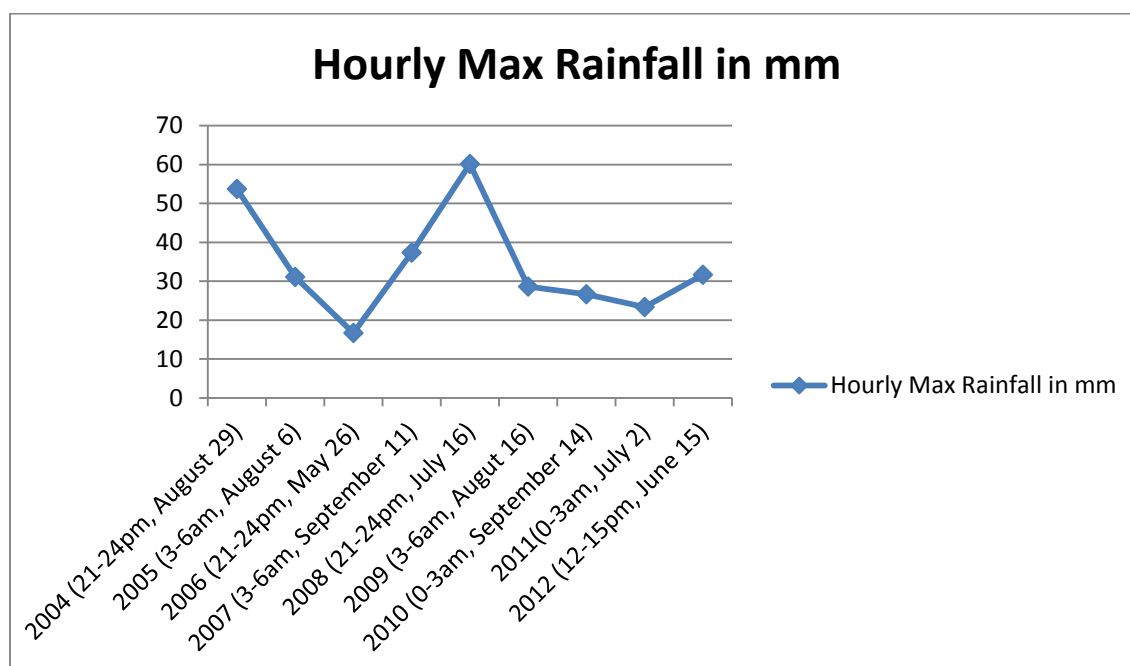


The data shows that average daily max is 195.1mm and the highest figure is 269mm. The figure of 269mm (August 21, 2012) is used for the drainage design.

Table 3.1.2.3-4: Three Hourly Max Rainfall in mm



The average rainfall in three hours was about 103.1mm and relatively high figure (180.5mm) was recorded in 2008.

Table 3.1.2.3-5: Hourly Max Rainfall in mm

The hourly maximum rainfall data shows that about 34.4mm/hour was the average intensity. The figure of 2008 shows relatively high intensity (60.17mm/hour). This figure will be used for drainage design specifically for the dimension of U-shape channel (Section of Engineering Design).

3.1.2.4 River Condition

Bangladesh has about 24,000 Km of rivers, streams and canals that together cover about 7% of the country's surface. Most parts of the country are linked by a complex network of waterways which reaches its maximum size in the monsoon period. Out of 24,000 Km of rivers, streams, and canals only about 5,970 Km are navigable by mechanized vessels during the monsoon period and this shrinks to about 3,870 Km during the dry season.

Feni River originates in the eastern hills of Tripura and enters Bangladesh at Belchhari of Matiranga Upazila of Khagrachhari District. It flows through Ramgarh (Khagrachhari), Fatikchhari (Chittagong) and then flows along the border of Chittagong (Mirershorai Upazila) and Feni (Chhagalnaiya, Feni, Sonagazi Upazilas) districts, before discharging into the Bay of Bengal near Sonagazi. The length of the river is 108 Km.

The principal tributary of the Feni River is the Muhuri River, which drains the Feni plain. Lemua canal is also a tributary to this river.

Past Maximum Water Surface Level

During the monsoon for the period 2000-2004, the mean and maximum ranges of the tide in the Feni estuary have been found to be 3.50m and 5.50m respectively. The tides have also been studied on the basis of annual maximum High Water Level data collected over the periods 1985 to 2004 at the gauge downstream of the Feni regulator in the Feni River. The maximum high water level and mean of annual maximum high water level of Feni River, near Feni regulator, is about 6.0m and 5.276m (SOB-Survey of Bangladesh) respectively over the 20 years period. The seasonal mean high water level of the Feni River near the Feni regulator for the period 2000-2004 is also shown in Table 3.1.5.1-1. From this table it has been found that the average mean high water level during pre-

monsoon, monsoon, post-monsoon and the dry period are 3.47m, 4.14m, 3.61m and 2.69m respectively. Analysis of the daily mean high water level of Feni River downstream of the Feni regulator from 2000-2004 shows that the monsoon high water level exceeds 4.50m (PWD-Public Works Department) elevation few times a year (PWD= SOB + 0.46).

Table 3.1.2.4-1: Mean High Water Level of Feni River Downstream of Feni Regulator for the Period 2000-2004

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

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

Figure 3.1.2.4-1: Past Maximum River Surface Level at Ramgarh

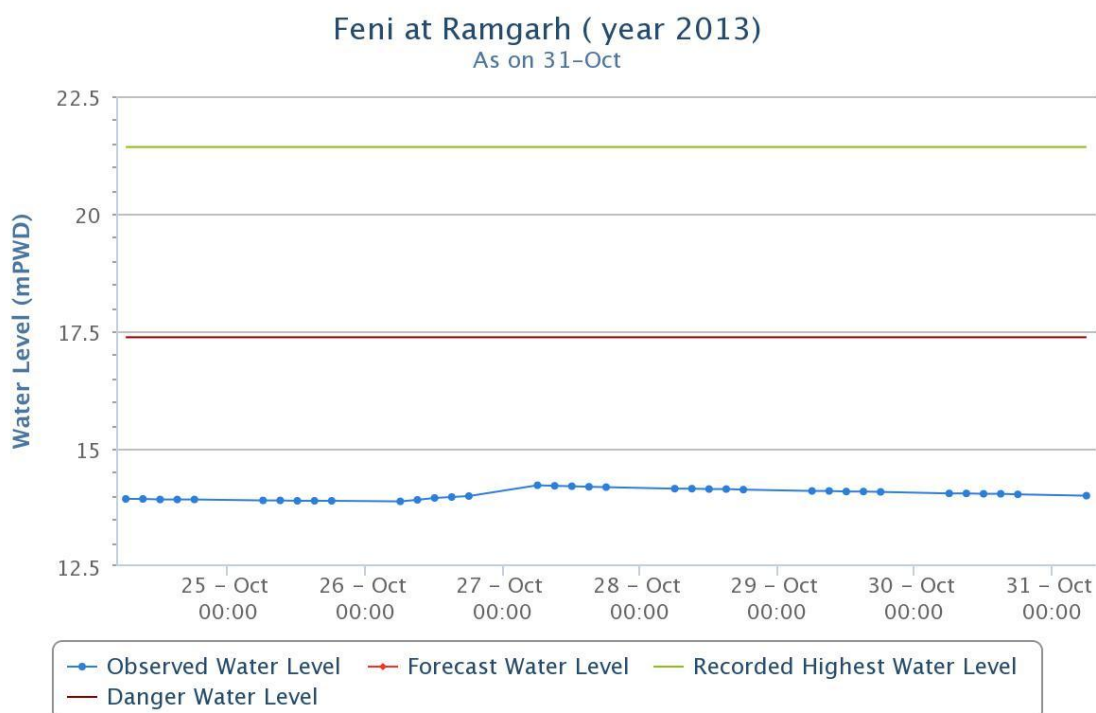
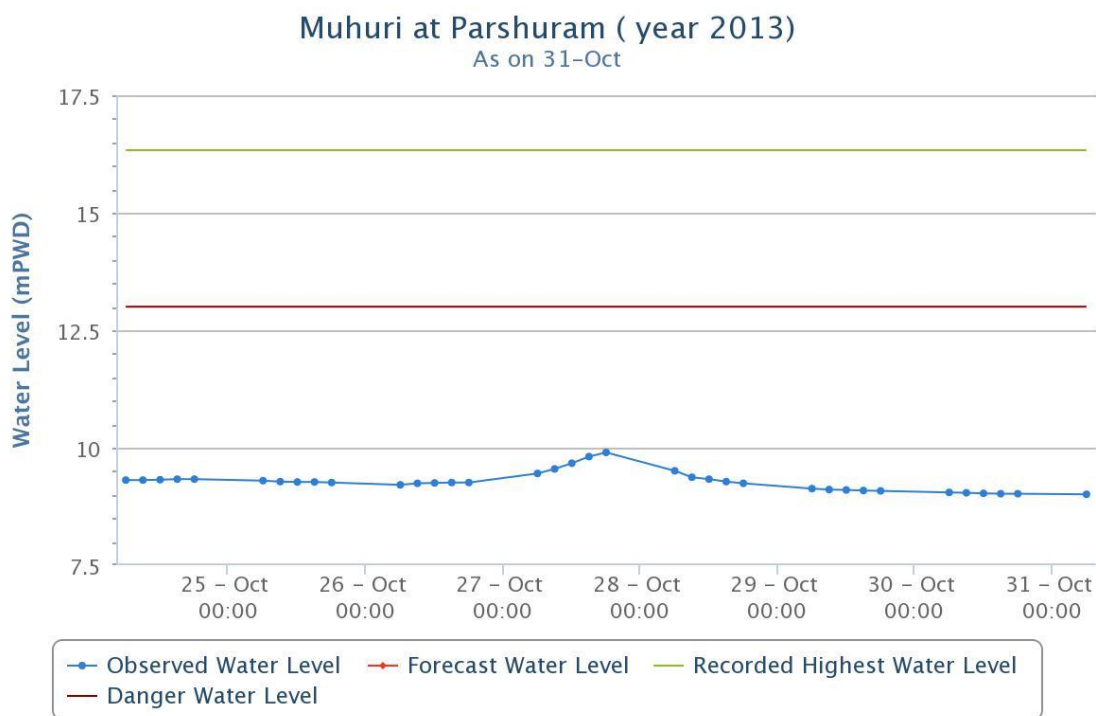
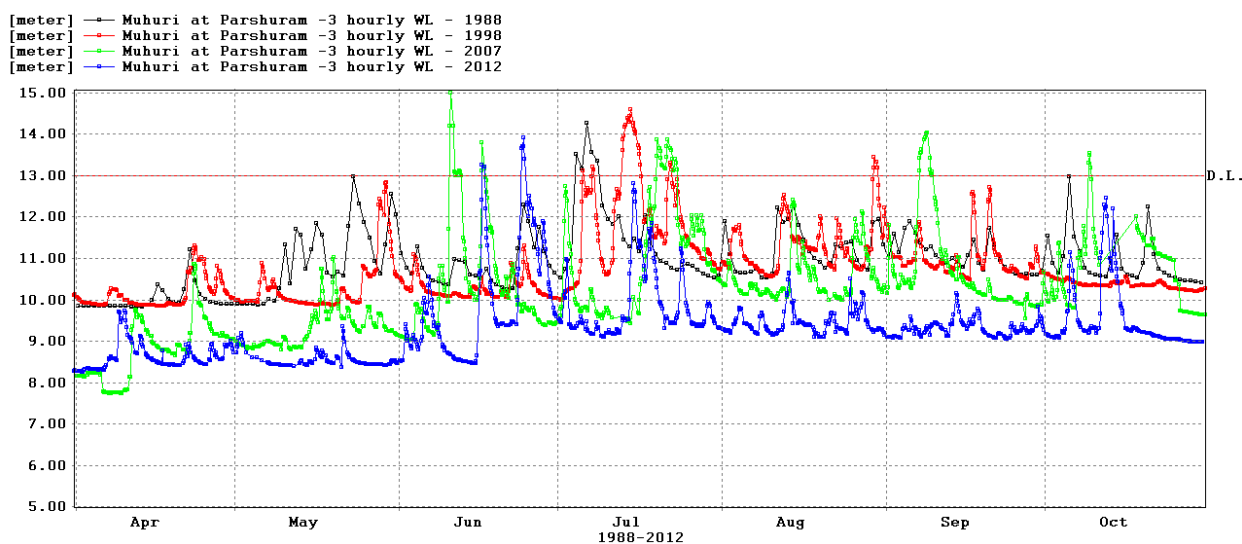


Figure 3.1.2.4-2: Past Maximum River Surface Level at Parshuram



The comparison of the hydrograph of Muhuri River is given in the following figure.

Figure 3.1.2.4-3: Comparison of Hydrograph for Muhuri River



Sedimentation Volume

The Muhuri and Feni River of Muhuri Irrigation Scheme carry a heavy concentration of silt loads, on the order of 2 million tons per year. But due to the construction of the closure dam and Feni regulator, a major portion of this sediment is now trapped in the reservoir. Only a small quantity is carried by the discharge through the Feni regulator. Therefore the contribution of upland sediment discharge downstream of the closure dam is very small. The major source of sediment in the Feni estuary is silt carried by the sea water. It is found that the concentration towards the regulator site is gradually

reduced and average sediment concentration near the regulator site during high water flow is about 400 mg/l. At the outfall of the estuary, a higher value of sediment concentration is observed.

3.1.2.5 Sea Condition

As a maritime country, Bangladesh has about 9,000 sq. nautical miles of territorial waters and 20,000 sq. nautical mile of economic resources zone in the sea. The bottom topography of the coastal waters in Bangladesh is very shallow having several detached shoals with shifting sand banks. Therefore, navigation by the ocean-going ships in these waters is hazardous and demands regular hydrographic surveys and studies of the area.

General

The Japan International Cooperation Agency (JICA) collected gauge data from the Karnaphuli River mouth and determined the MSL value as 3.486 m. JICA determined the above MSL value using an observation period from 1600 hours January 28, 1993 to 2300 hrs. November 30, 1994. The data as mentioned in their report (Tidal observation reference data 1, no determination of the Mean Sea Level, March 1995) are shown in the table below:

Table 3.1.2.5-1: Mean Sea Level Measured by JICA

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

JICA's computed MSL value in the mouth of the Karnaphuli River differs about 1 (one) metre from the BIWTA's computed MSL value at Sadarghat, Chittagong. The tidal levels in different stations are found to be different as measured.

Past History

The maximum height experienced by the coastal belt in the Chittagong area was during the 1991 cyclone. It was among the deadliest tropical cyclones on record. Wind velocity was around 250 Km/h (155 mile/h) which caused the highest storm surge in the area with 6 metres (20 ft.) height. The death toll was 138,000 with approximately 40,000 in Anwara and Banshkhali area. The storm caused an estimated 1.5 billion US\$ in damage. The high velocity wind and the storm surge devastated the coastline. The extensive damage caused a huge increase in the price of building materials. The land level in Mirershorai region is quite high because it is located very close to the hilly areas of Sitakunda. That's why the damage here was not as much as the damage in the Anwara area.

Recommended Finishing Level of Dredging

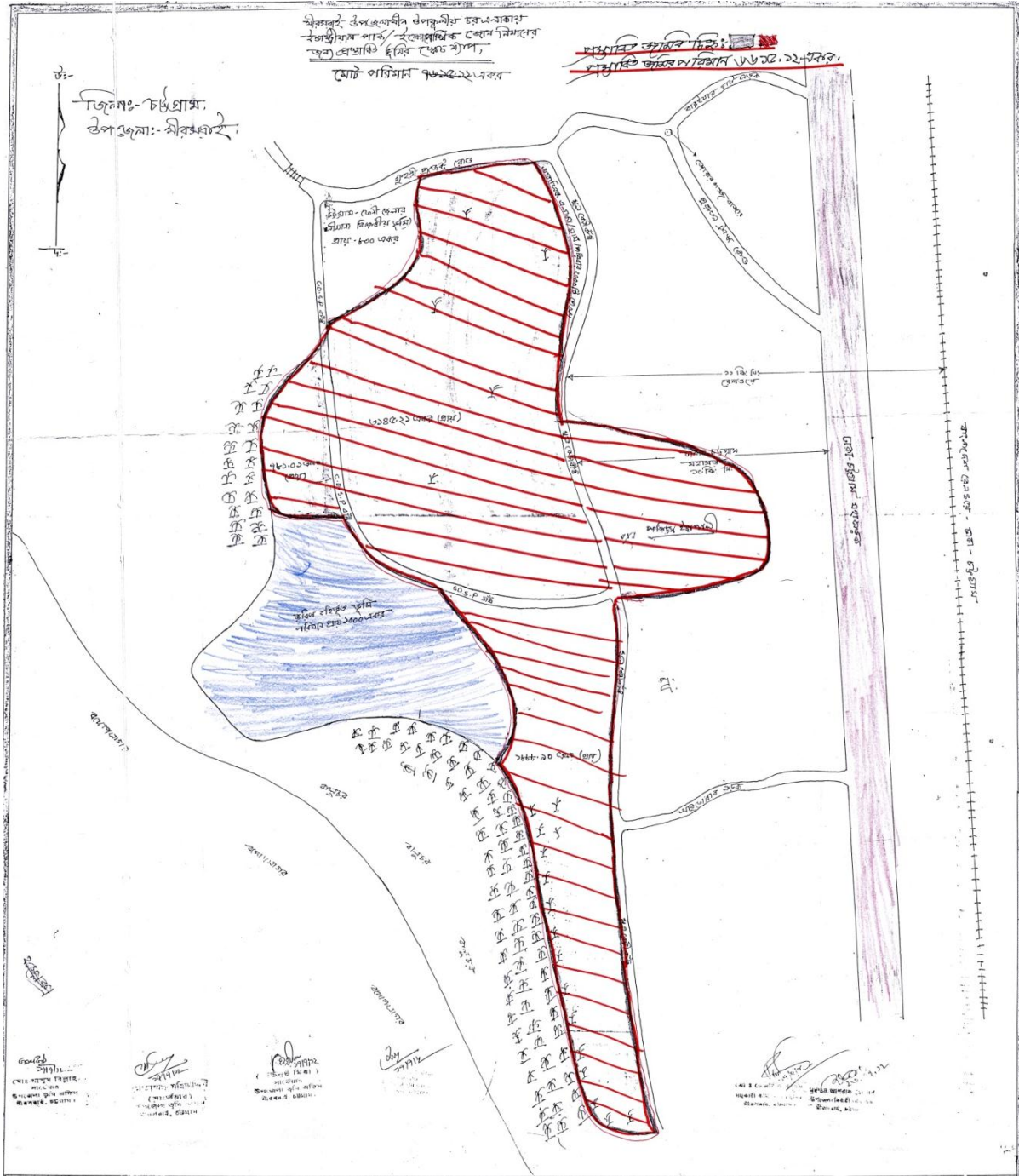
Going through the collected data on tide levels of different years in the coastal areas of Bangladesh, it was found that the tidal height is about 3.5 metre in average. On normal occasions the tidal height varies from 3-4.5 metres. The highest surge height was found during the 1991 cyclone, about 6 metres. So the formation level for the EZ site at Mirershorai will be 8 metres and the height of the dike should be 9 metres predicting the highest projected tidal surge of 8 metres. This dike can be a traditional dike without much heavy protection.

3.1.3 Land and Utility Condition

3.1.3.1 Cadastral Map

No cadastral map has been collected for Mirershorai EZ. The DC Office of Chittagong provided the following map to use in preparation of the project boundary. From this map the project boundary is defined.

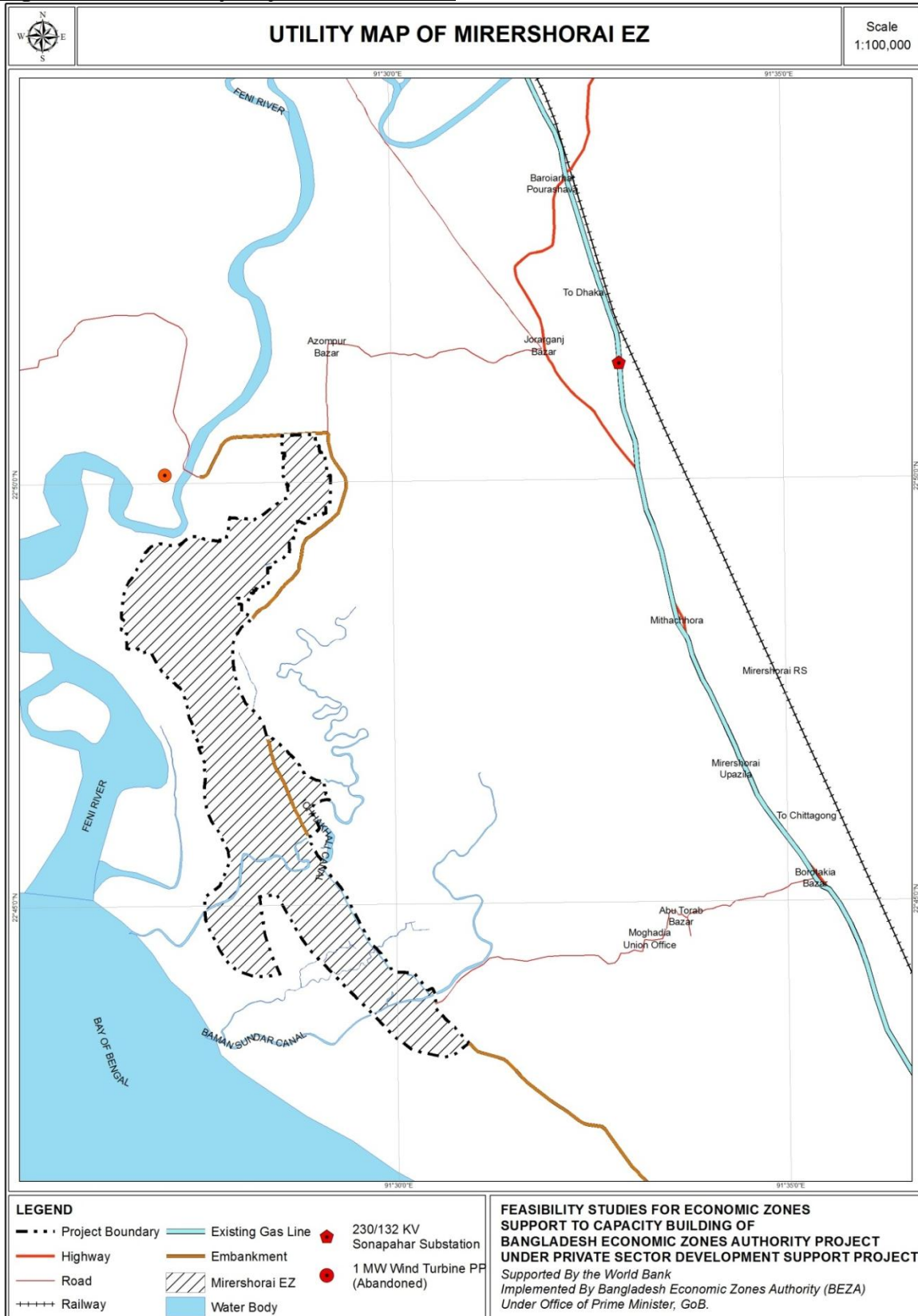
Figure 3.1.3.1-1: Conceptual Project Boundary Map of Mirershorai EZ (Collected from DC Office, Chittagong)



3.1.3.2 Utility Map

The present condition of utilities in and around the Mirershorai EZ is shown in the figure below.

Figure 3.1.3.2-1: Utility Map of Mirershorai EZ



3.1.3.3 SWOT Analysis of Mirershorai EZ

On completion of the visits and proper study, it may be said that the proposed Mirershorai EZ as an EZ site has both strengths and weaknesses, as well as opportunities and threats. But, compared to weaknesses and threats, its strengths and opportunities are great, and as such, this EZ has been proposed for implementation. Following are the lists of strengths, weaknesses, opportunities, and threats:

Table 3.1.3.3-1: SWOT Table

Strengths	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • A huge amount of public land is available at site. • It has the potential to become the largest seafront EZ of this country. • Land is low and flat. • Land reclamation from sea is possible by dredging. • Not much agrarian activities to be found and very little production. • Most part of this site is protected by embankments. • Elevating the land using dredged sand from the sea is possible. • Direct access to the sea and the nearby Feni River may help bring construction material quickly. • Sweet water is available at 1000-1200 ft depth. • Condition of Muhuri Project Embankment at site is very good and can be used to protect the site from the northern part. • People living at site are impoverished and willing to give their land for acquisition. • Total needed resettlement is comparatively low. • Less number of structures and trees 	<ul style="list-style-type: none"> • Amount of private land proposed for this site is very high and may increase the time for land acquisition. • A complex dike system will be needed for protecting the whole site. • Use of dredged sand may increase the time for land compaction and thus increase construction time. • Deep piling will be required for construction; which will increase the construction cost. • No existing water, telecom and gas supply facility. • Very low voltage electric connection adjacent to sit. • Surface water is saline. Need to collect sweet water from 16 Km upstream of the Feni River. • No local and regional facilities regarding product and market. Limited product economy. • No urban living and recreational facilities. • A small mangrove forest is present at the boundary of the site. Establishment of EZ may prove harmful for it. Well-focussed environmental care will be needed. 	<ul style="list-style-type: none"> • Site is located along the strategic Dhaka-Chittagong industrial corridor and at the end of the eastern side of the Bay of Bengal. • Opportunity to become the largest EZ of Bangladesh. • Setting up of all infrastructure will create a township. • Creation of flood protection infrastructure and EZ will protect the whole Mirershorai EZ. • Road Transportation of cargo to Chittagong Port is only 67 Km. • Nearest ODF (Optical Distribution Frame) is located about 12 Km from the site. • Chittagong port is only 85 Km by sea. • A 230/132KV substation is located within 10 Km from the site; which can be used to connect the site with the national grid. • Access roads connect the site directly to the Dhaka-Chittagong Highway; the most important highway of Bangladesh. • Dhaka-Chittagong Highway is going to be upgraded to a 4-lane highway. • The BWDB embankment protecting 	<ul style="list-style-type: none"> • The site is exposed to natural calamities, hence needs better protection. • Busy Dhaka-Chittagong Highway will increase time to bring construction materials to the site and hence increase the construction time. • Construction of access roads may prove to be difficult as land acquisition and resettlement will be needed. • The site is 182 km from Dhaka City. • Lack of proper infrastructure in the region. • Absence of urban living and recreational facilities in nearby areas. • No possibility of obtaining gas connection as the national production is very low. • Suitable soil for construction is not available at or near the site. This fact will increase the construction time.

Strengths	Weaknesses	Opportunities	Threats
<p>will make the land clearing task easier and less costly.</p> <ul style="list-style-type: none"> • Wind, solar and hydropower may be used for electricity production. Detail study will be needed. • Mobile phone network is available at site 	<ul style="list-style-type: none"> • Soil quality is not very good. Bringing extra soil from outside will prove to be costly. • Tidal effect of the canals at site may hamper the drainage system. 	<p>this site continues up to Sitakunda. Constructing a road on top of it may directly connect this site with the Chittagong port.</p>	

Based on the above it is proposed that, to ensure at least optimum (if not maximum) utilization of the strengths and opportunities of the proposed EZ, the weaknesses of the same need to be overcome and the threats need to be eliminated or at least controlled (brought in to effective control of the EZ management), and it is possible only when the concerned management takes into active consideration the above characteristic features and addresses them in an appropriate way and timeframe.

3.2 Best Practice Master Plan

This chapter describes the primary planning and engineering considerations required to achieve the best practice master planning for Mirershorai Economic Zone.

3.2.1 General Land Use and Concept of Master Plan

The project site is located close to the Feni River and the Bay of Bengal with a large area of land for new bases servicing a variety of different kinds of industry. The site is strategically located closer to the key transportation nodes of Chittagong for export and import. Figure 3.2.1-1 shows the current geographical condition between the project site and Chittagong. Relatively flat land exists between them and at the same time, the Dhaka – Chittagong Highway and Railway are running parallel to the seashore. The land between these lines (railway, highway, and seashore) is able to form large sized EZs at several places between the Feni River and Chittagong. The seashore along this line is relatively shallow in nature therefore possessing great potential to create a new land area by simple reclamation. In this sense, the entire area exhibits a definite potential to form an EZ corridor between the Feni River and Chittagong, in the future.

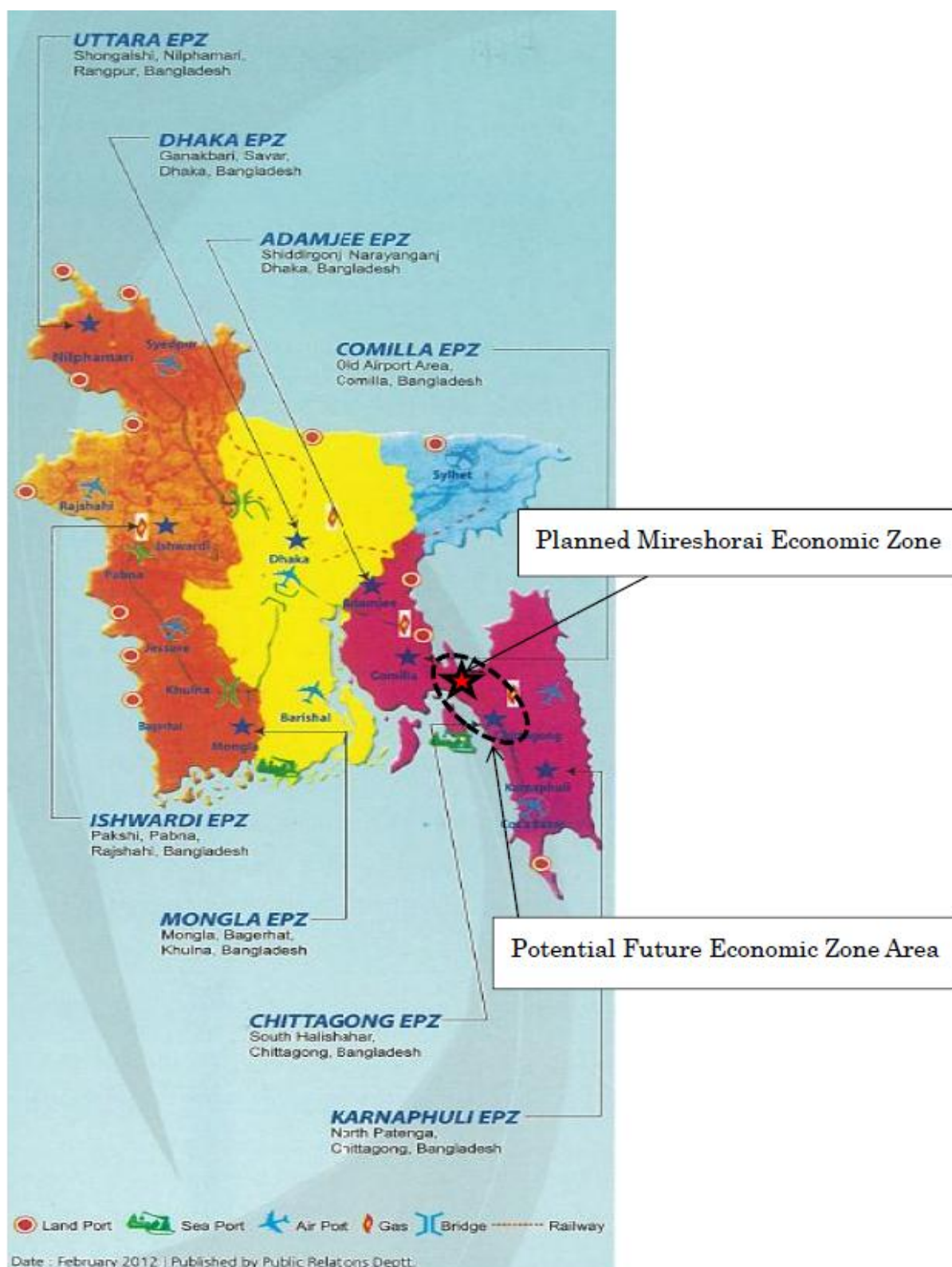
If the Mirershorai EZ is completed near the Feni River, the first economic zone link will be created between the new Mirershorai EZ and the existing Chittagong Export Processing Zone and this link will be merged into the future EZ network in Bangladesh shown in Figure 3.2.1-2.

In this situation, the main role of the Mirershorai EZ will be to act as a trigger creating the economic corridor in this region for creating new industries and industrial chains among the economic zones.

Figure 3.2.1-1: Site Condition between the Mirershorai EZ and the Chittagong EPZ



Figure 3.2.1-2: Existing Economic Zones in Bangladesh



3.2.2 Similar Projects in Other Countries

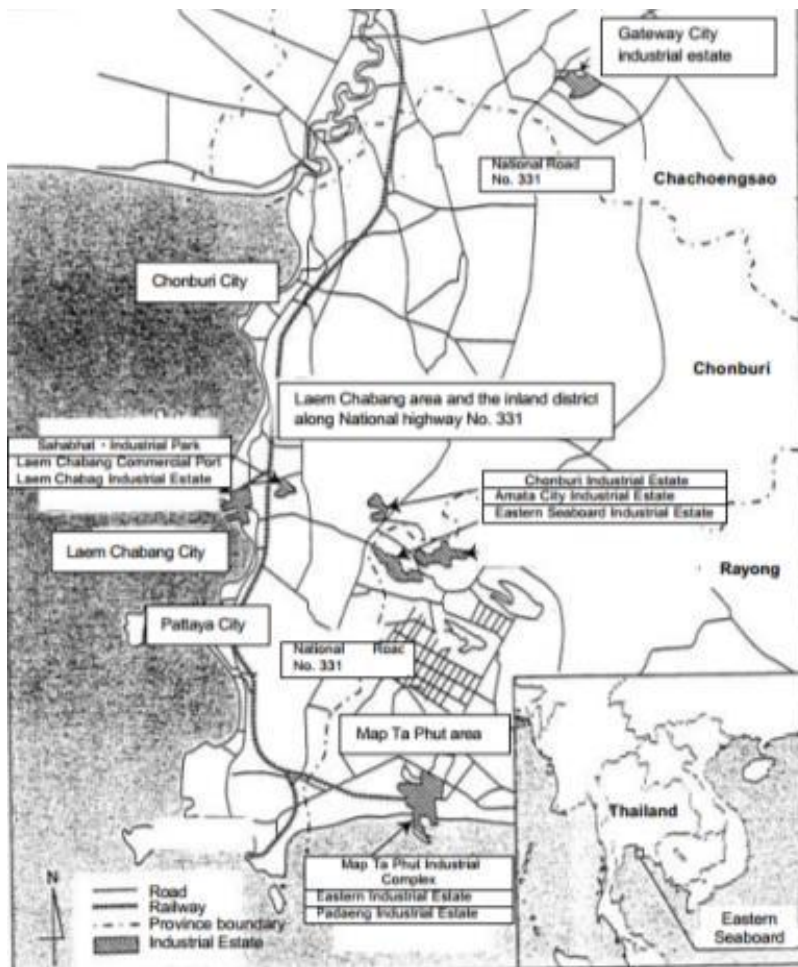
Eastern Sea Board in Thailand

The Eastern Seaboard Area is very famous for agglomerated automobile industries in Thailand and is sometimes called the Asian Detroit. The area is located along the eastern sea board from Bangkok and its length is about 75 Km. It used to be a wetland without utilities or infrastructure.

Figure 3.2.2-1: Location of Eastern Seaboard in Asia



The Eastern Seaboard Development Plan was one of the largest infrastructure development projects in Thailand. The development area is located along the seafloor, centred on the two major port facilities of LaemChabang in Chonburi province and Map Ta Phut in Rayong province and covers wide-ranging infrastructure including transportation, water utilities, and industrial estates. The plan was initially designed in the late 1970s by the National Economic Social Development Board and was financed mainly by the World Bank and the government of Japan. The wide-ranging infrastructure in the plan contributed to Thailand's remarkable industrialization since the mid-1980s and functioned as a central platform for the Thai economy.

Figure 3.2.2-2: Location of Eastern Seaboard in Thailand

The largest industry is an automobile manufacturer. A hospital, schools, shopping centres, golf course and other facilities were built around the industrial estates, which contributed to the development of the community.

This kind of development growth can be expected in the Mirershorai EZ.

3.2.3 Best Practice Master Plan

As far as the particular and ‘best practice’ Master Plan of the Mirershorai EZ is concerned, certain new industries such as automobile mechanical parts manufacturing are eagerly welcomed as a first step. Following that, some automobile assembly industries would be welcomed, resulting in an industrial chain to provoke a self-growing industrial zone. This kind of development approach will generate new industries and produce huge positive impacts on Bangladesh within a relatively short period. Since the present land of Mirershorai EZ is parallel to the shallow Bay of Bengal, it can be expanded by the relatively simple process of reclaiming the shallow seashore of the Bay.

On the other hand, it is a fact that the site is vulnerable to cyclones and tidal surges. Given this situation, the dike system is planned along the Bengal Sea shore in order to increase the safety level.

A small jetty is planned to import the coal for the energy source of the planned coal-fired power plant adjacent to the jetty. Water will be taken from upstream of the Feni River. The water will be retained in the reservoir pond and flow into the water treatment plant. The water will be supplied to the industrial zones through the tower and tank connecting from the water supply treatment plant. The drainage system is linked to the water supply system. Rainwater can be directed into the reservoir pond and would be treated through the treatment process and would be used for industrial purposes. Waste water treatment plants are planned. Waste water will be collected into the RC pipes under the road separately from the rain drainage channels. The treated final water will be recycled for maintaining green areas. By applying these kinds of unique technical designs, the industrial zone itself will grow in a suitable manner.

As a whole, the Mirershorai EZ will have a safe dike and modern infrastructure such as an efficient drainage system, a reliable and clean coal power supply plant, a water supply treatment plant replenished by river water and rain water as source, a waste water treatment plant and communication systems equipped to international standards. These strategically designed infrastructure elements are ready for receiving advanced foreign industries and will hopefully provoke new industrial chains in Bangladesh. “A New Gateway to Bangladesh” is the development concept recommended for recognition as a future industrial development for Bangladesh.

According to the cadastral map information, the private land is 2,944.06 acres (1,191.93 hectares) and public land is 3,671.06 acres (1,486.26 hectares). An additional of 580.18 acres (233.64 hectares) is planned to be reclaimed for the power plant and coal stock yard with jetty. The reclamation is expected to be done by dredging the front side of the sea. A 6m deep channel will be made to maintain the shipping route for importing coals for the power plant.

The drawing of the present land condition, Figure 3.2.3-1 and the Master Plan drawing, 3.2.3-2 are shown below.

Figure 3.2.3-1: Present Land Conditions (Mirershorai EZ Site)

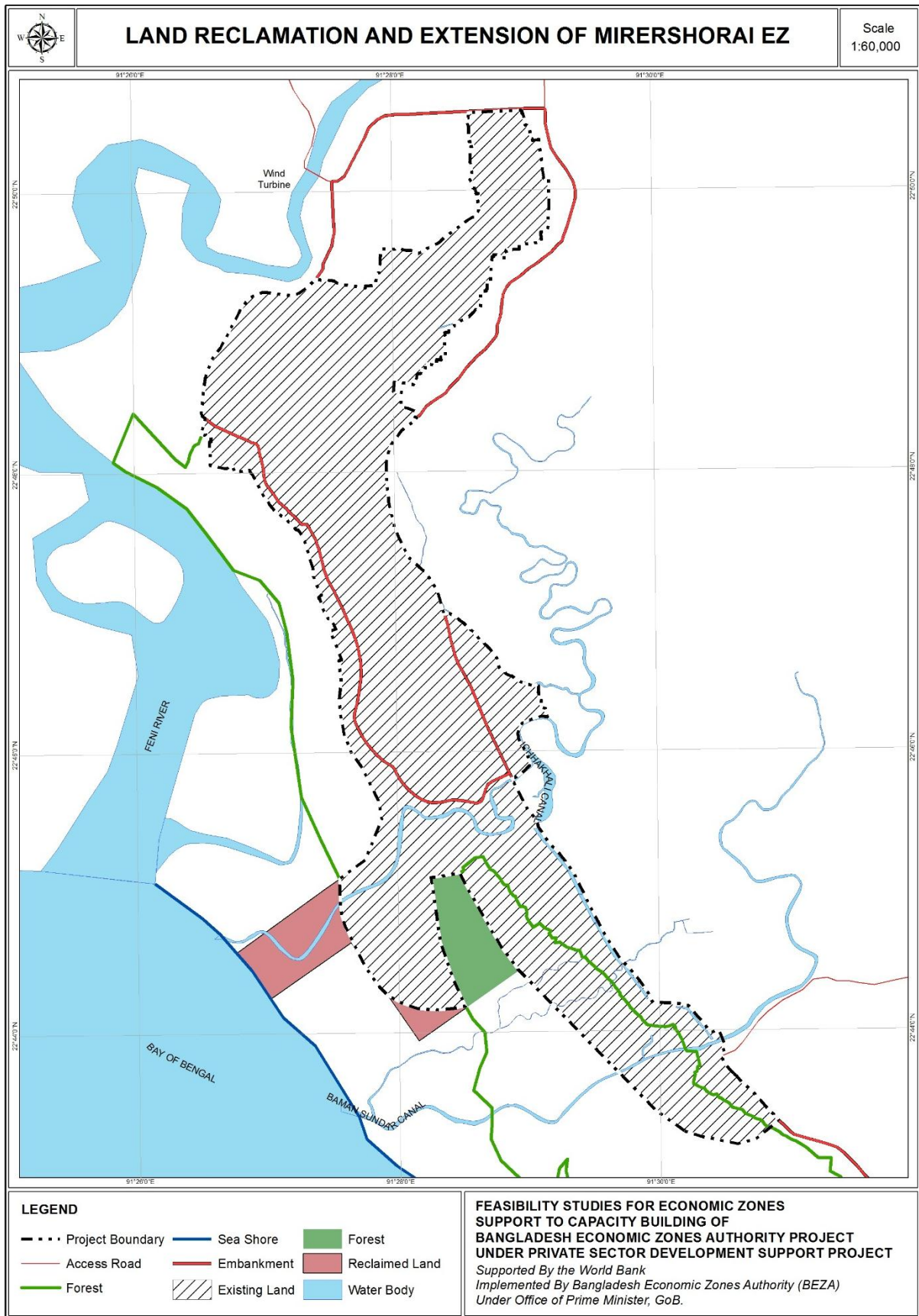
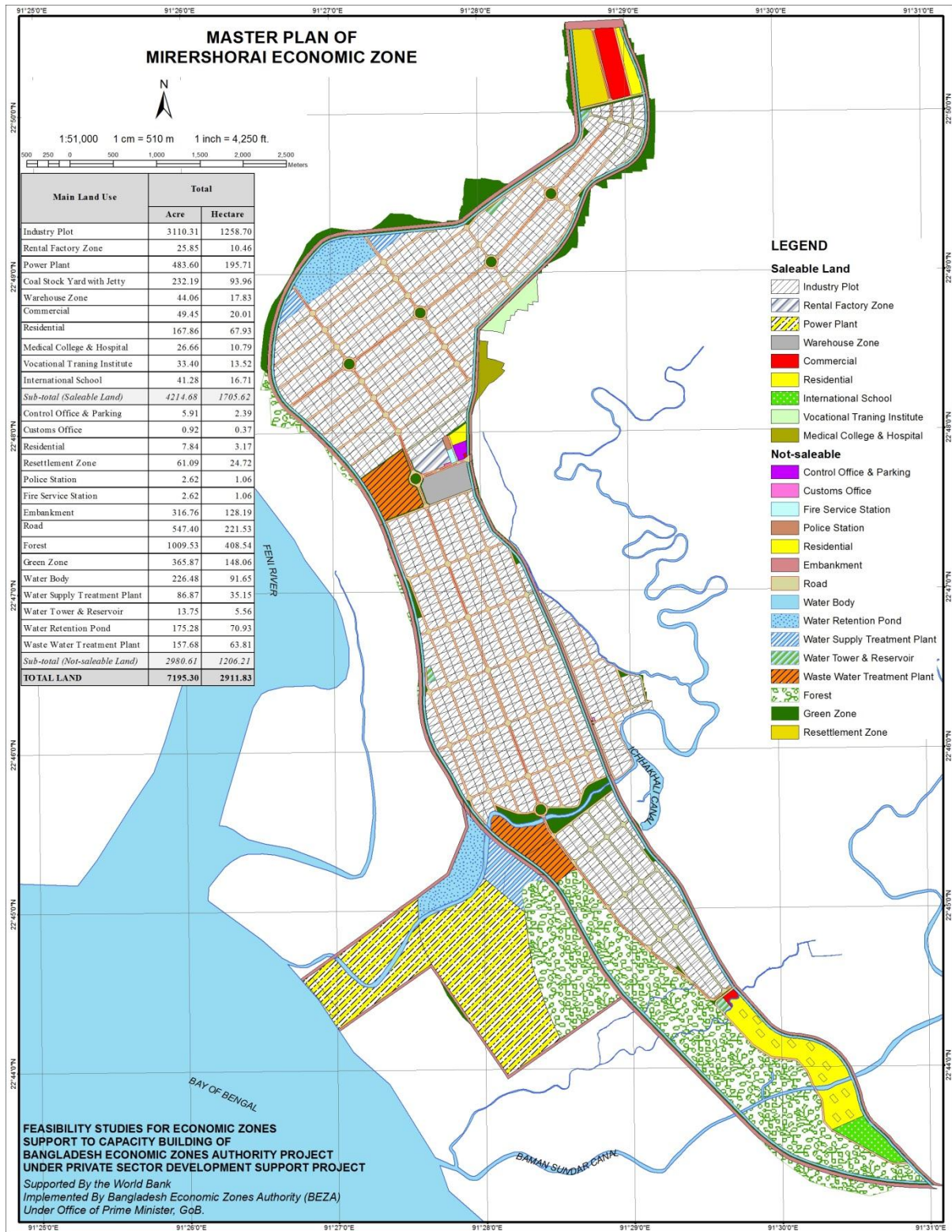


Figure 3.2.3-2: Master Plan (Mirershorai)



3.2.4 Gate System

The gate system is carefully considered and the following items are the key:

- Carefully reviewed the suitable place for the Main Office.
- One main entrance with one control office located at the convenient geometrical center of the zone will ease access to the all parts of the zone.
- The location merit of the center is the highest.
- The new gate layout is planed with phasing.
- The Gate 1 (MAIN GATE) to be built in phase1 and control operations in phase 1 & 2.
- The Gate 2 (MINOR GATE) to be built in phase 2 and control operations in the eastern side EZ (small EZ area).
- The Gate 3 (MINOR GATE) to be built in phase 3 and control operations in phase 3. It does not allow direct entry from the luxury housing area to the industrial area.
- The Gate 4 (MINOR GATE) to be built in phase 1 and control operations in phase 1. It does not allow direct entry from the residential/commercial/resettlement areas to the industrial area.
- The MAIN GATE (Gate 1) has MAIN Custom Office, Administration Office for handling all the administration for the entire zone upon completion of all phases.
- The MINOR GATES (Gate 2, Gate 3, and Gate 4) have small custom offices just for facilitating exit/egress.
- The green zone surrounding the waste water treatment plant is placed (Width is 10m).
- There is green zone inside the roundabout (diameter is 160 m) in front of the waste water treatment plant as well as the green area along the main road (width is 33 m) in front of the waste water treatment plant.
- These green arrangement increases park image.
- The direct distance between the MAIN ENTRY to the waste water treatment plant is about 700 m.
- Current environmental technology reduces emissions from the waste water treatment plant.
- Therefore, the MAIN ENTRY and the waste water treatment plant are able to coexist.

The following figures shows the proposed gate system of the Mirershorai Economic Zone.

Figure 3.2.4-1: Gate System and Phasing

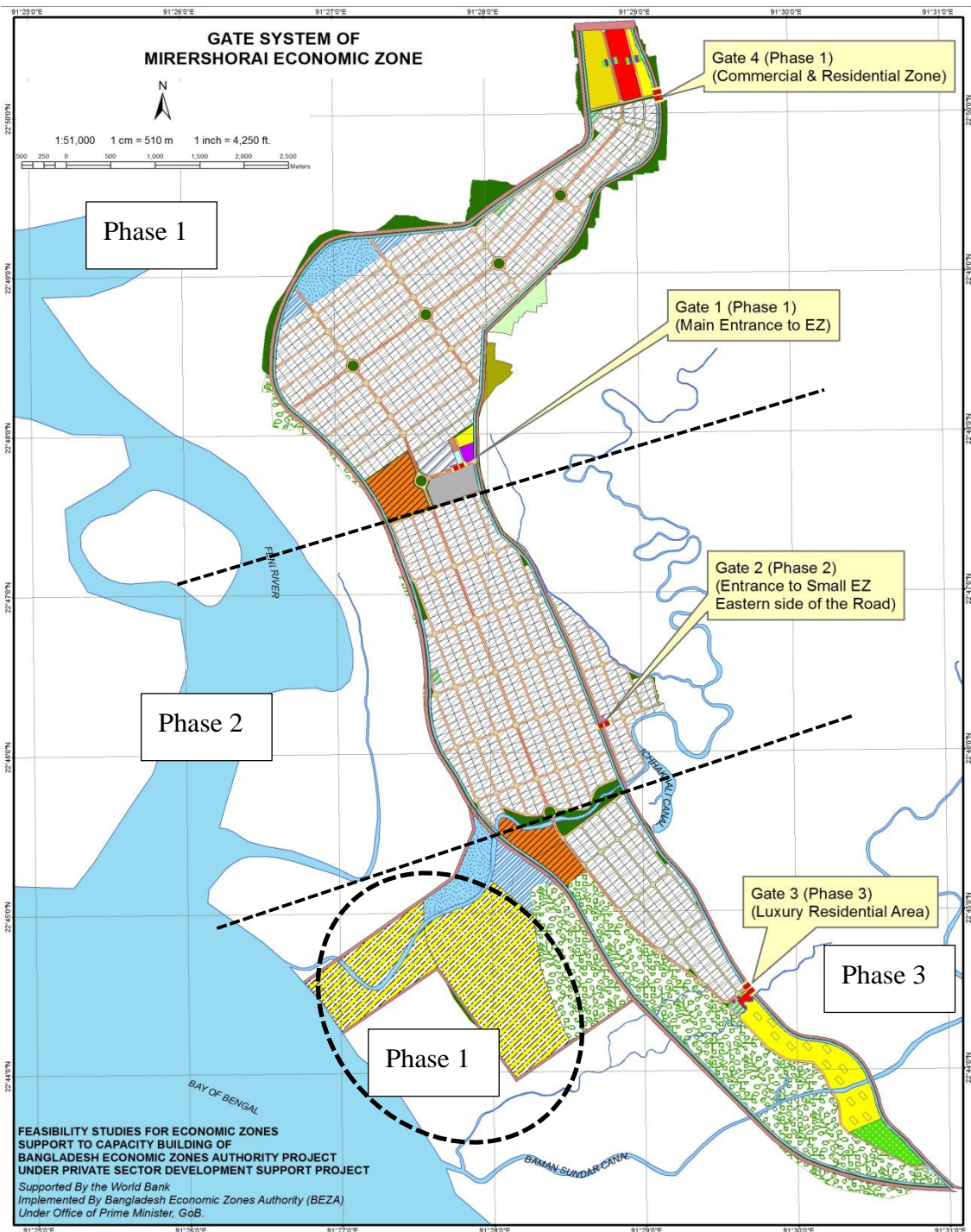


Figure 3.2.4-2: Gate 1 (Main Entry)

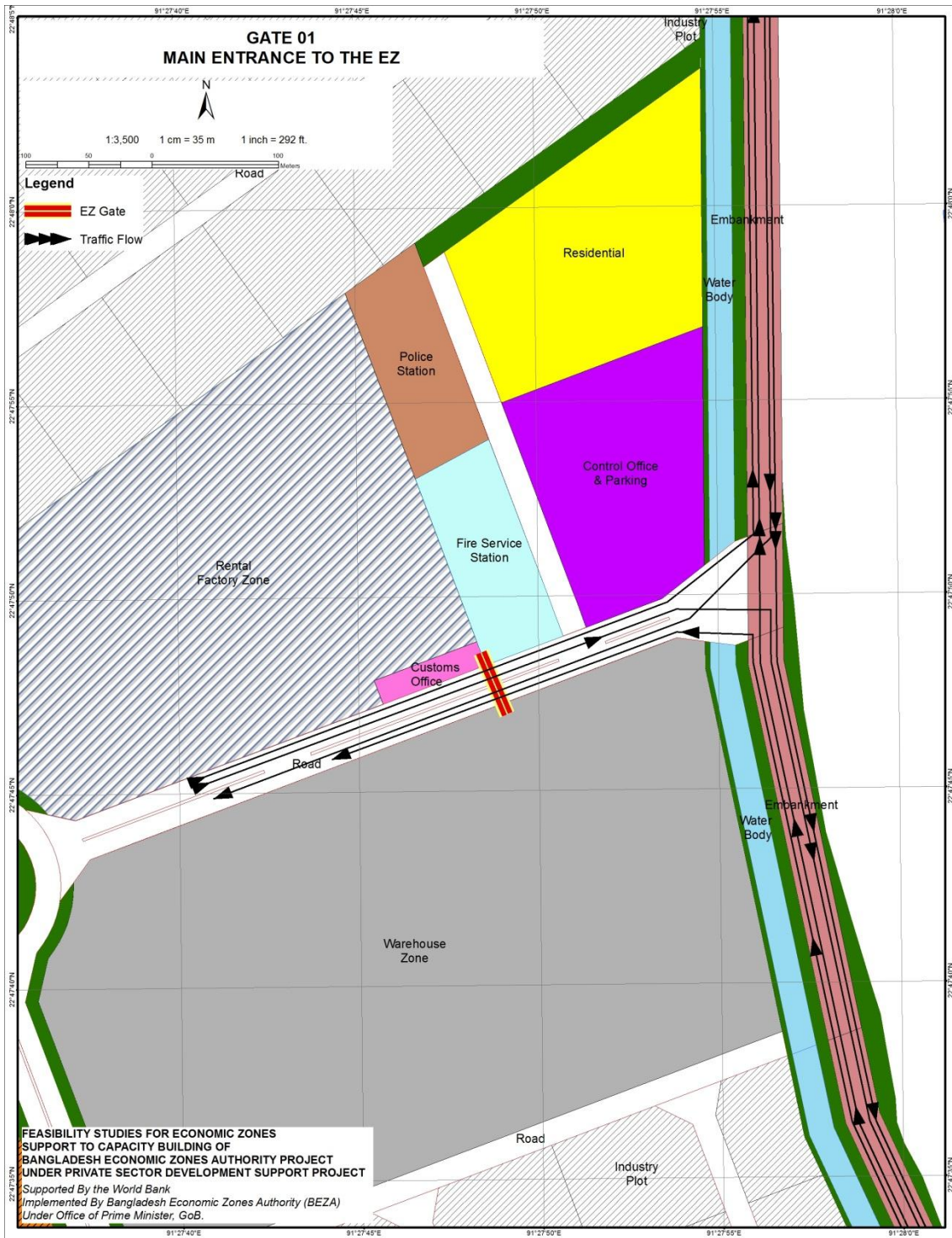


Figure 3.2.4-3: Gate 2 (Minor Entry)

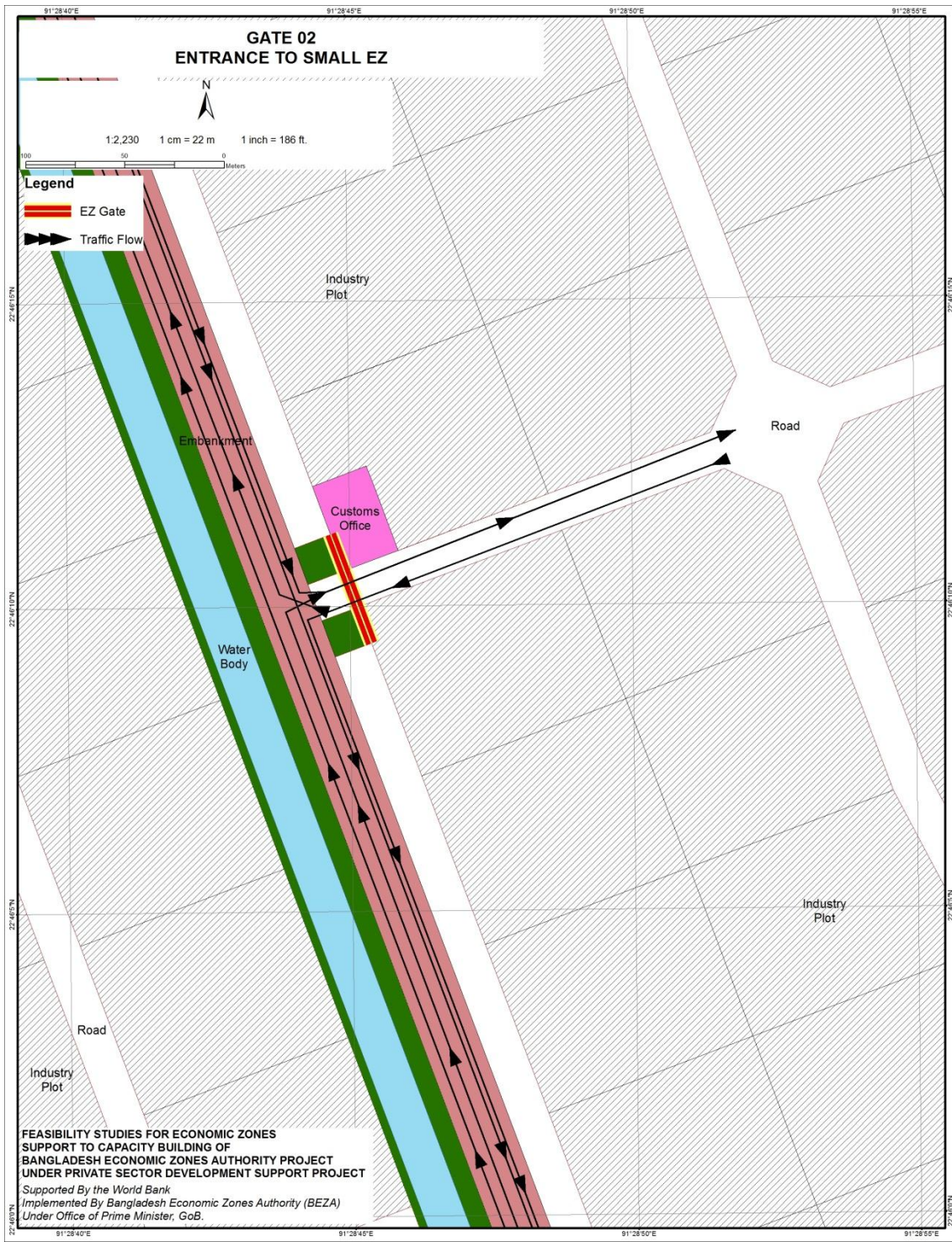


Figure 3.2.4-4: Gate 3 (Minor Entry)

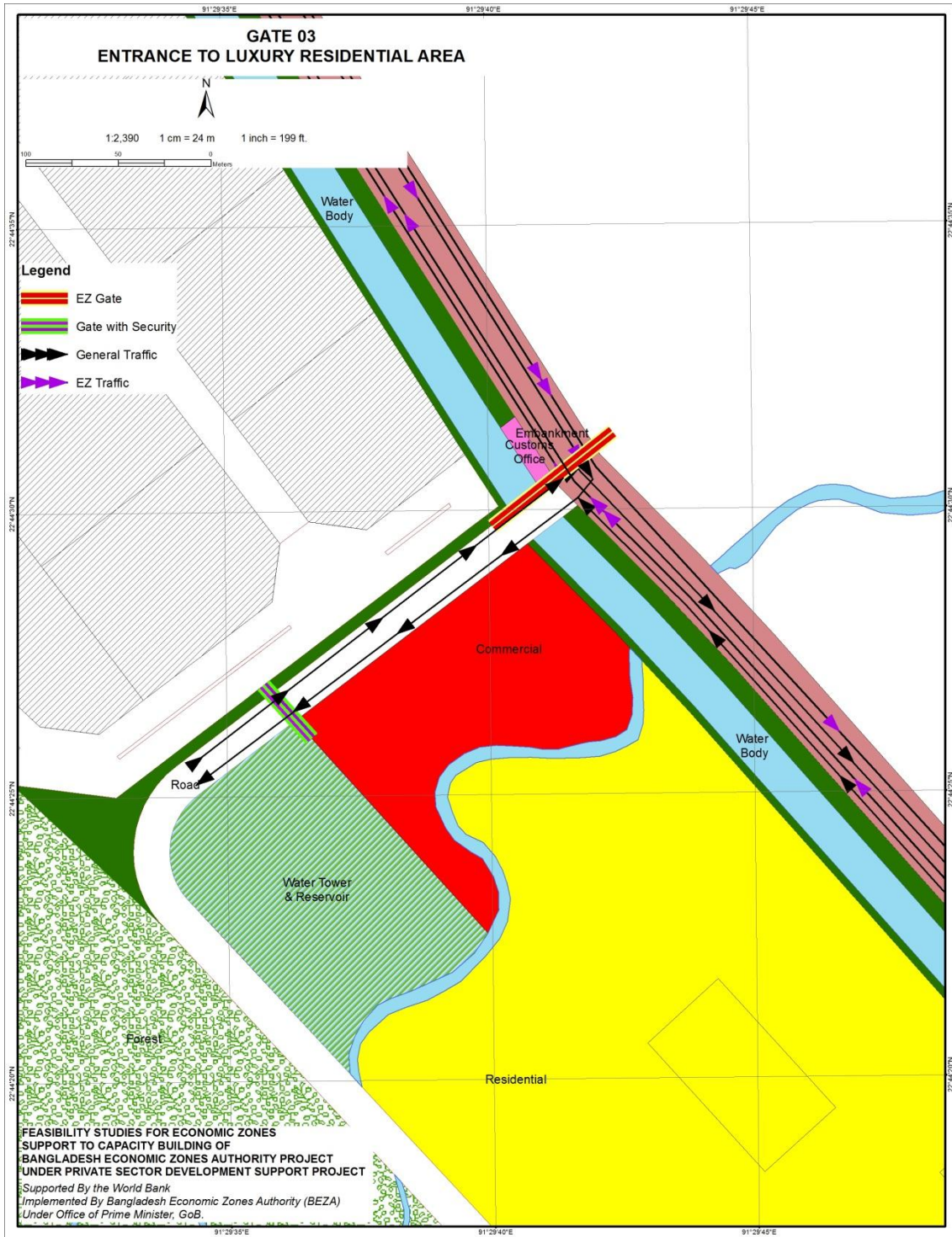


Figure 3.2.4-5: Gate 4 (Minor Entry)



3.2.5 Basic Land Use

The total development area of the Mirershorai EZ is planned to be about 3,000 hectares inclusive of seashore reclamation, and, this size will be the first large scale EZ in Bangladesh, although EZs of equivalent size are a normal occurrence in other countries. The width of the planned land will allow the creation of new industries with some production chain links inside the EZ. This would offer huge economic impacts to the surrounding regions and to the nation itself. The mechanical parts industries

are expected in phase 1 and some assembling industries are expected in phase 2 and phase 3. Residential zones are planned in phase 1 and phase 3.

The main concern of the development is to create a safe and full infrastructure equipped to accommodate a large scale industrial park on the site. Suitable zoning and efficient phasing are proposed in order to put the master plan into practice.

The following table shows the Area of Requirement of the Master Plan.

Table 3.2.5-1: Area of Requirement of Master Plan (Mirershorai EZ)

Sale Status	Land Use Category	Land Use Sub-category	Phasing								Total	
			Phase 1		Phase 2		Phase 3		Existing			
			Acre	Hectare	Acre	Hectare	Acre	Hectare	Acre	Hectare	Acre	Hectare
Saleable	Industry Plot	Garments	248.09	100.40							248.09	100.40
		Garment Accessories	103.33	41.82							103.33	41.82
		Integrated Textile	247.13	100.01							247.13	100.01
		Motorbike Assembly	49.68	20.11							49.68	20.11
		Automobile Assembly			371.54	150.36					371.54	150.36
		Automobile Parts	386.88	156.57	597.86	241.95	261.05	105.64			1245.79	504.15
		Other Parts & Machinery	148.78	60.21	315.80	127.80	104.22	42.18			568.80	230.18
		Chemical & Other Products	107.05	43.32	30.50	12.34					137.55	55.66
		Food & Beverage	118.58	47.99	19.82	8.02					138.39	56.01
		<i>Sub-total (Industry Plot)</i>	<i>1409.53</i>	<i>570.41</i>	<i>1335.52</i>	<i>540.47</i>	<i>365.27</i>	<i>147.82</i>			<i>3110.31</i>	<i>1258.70</i>
	Rental Factory Zone	Rental Factory Zone	25.85	10.46							25.85	10.46
	Power Plant	Power Plant	483.60	195.71							483.60	195.71
		Coal Stock Yard with Jetty	232.19	93.96							232.19	93.96
	Warehouse Zone		44.06	17.83							44.06	17.83
	Commercial	Convenient Retail	0.39	0.16							0.39	0.16
		Market					3.84	1.56			3.84	1.56
		Other Commercial	45.23	18.30							45.23	18.30
	Residential	Industry Housing	18.36	7.43							18.36	7.43
		Luxury Residential					149.51	60.50			149.51	60.50
	Medical College & Hospital		26.66	10.79							26.66	10.79
	Vocational Training Institute		33.40	13.52							33.40	13.52
International School						41.28	16.71			41.28	16.71	
	<i>Sub-total (Not-saleable Land)</i>	<i>2319.27</i>	<i>938.57</i>	<i>1335.52</i>	<i>540.47</i>	<i>559.90</i>	<i>226.58</i>			<i>4214.68</i>	<i>1705.62</i>	
Not-saleable	Control Office & Parking		5.91	2.39						5.91	2.39	
	Customs Office		0.50	0.20	0.33	0.13	0.09	0.04		0.92	0.37	
	Residential	Administrative Staff Quarter	7.84	3.17						7.84	3.17	
	Resettlement Zone		61.09	24.72						61.09	24.72	
	Police Station		2.62	1.06						2.62	1.06	
	Fire Service Station		2.62	1.06						2.62	1.06	
	Embankment		272.78	110.39	24.10	9.75	19.88	8.04		316.76	128.19	
	Road	Main Road	102.14	41.33	33.06	13.38	25.08	10.15		160.27	64.86	
		Median	4.41	1.79	1.62	0.66	1.30	0.52		7.33	2.97	
		Minor Road	141.76	57.37	173.66	70.28	64.38	26.05		379.80	153.70	
	Forest							1009.53	408.54	1009.53	408.54	
	Green Zone		280.48	113.51	48.88	19.78	36.50	14.77		365.87	148.06	
	Water Body		123.07	49.81	25.00	10.12	24.36	9.86	54.05	21.87	226.48	91.65
	Water Supply Treatment Plant		24.46	9.90	29.97	12.13	32.45	13.13		86.87	35.15	
	Water Tower & Reservoir		6.16	2.49	3.53	1.43	4.05	1.64		13.75	5.56	
	Water Retention Pond		89.40	36.18	85.88	34.75				175.28	70.93	
	Waste Water Treatment Plant		78.12	31.61	44.07	17.83	35.49	14.36		157.68	63.81	
	<i>Sub-total (Saleable Land)</i>	<i>1203.37</i>	<i>486.99</i>	<i>470.09</i>	<i>190.24</i>	<i>243.58</i>	<i>98.57</i>	<i>1063.58</i>	<i>430.41</i>	<i>2980.61</i>	<i>1206.21</i>	
TOTAL LAND		3522.63	1425.56	1805.61	730.71	803.47	325.15	1063.58	430.41	7195.30	2911.83	

3.2.6 Standard Plot Size

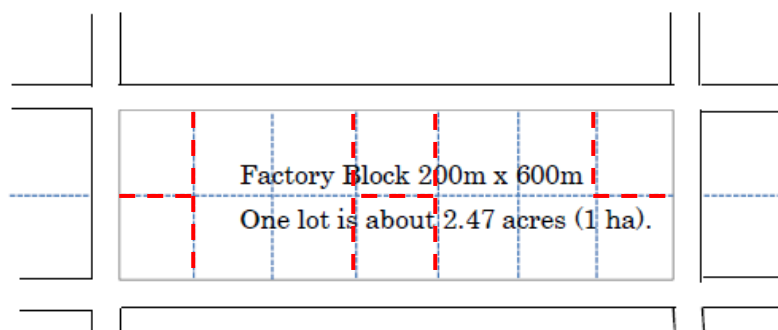
The road network is planned in order to divide the factory lot block by approximately 200m x 600m, on average, for optimizing the traffic flow inside the economic zone.

The standard factory lot is designed to have an average area of 2.47 acres (1 ha). The standard dimension of the standard lot is 90m x 111m. The factory lot dimension excluding the front setback

(main road: 20m, minor road: 15m) becomes approximately square which forms a desired factory wall line.

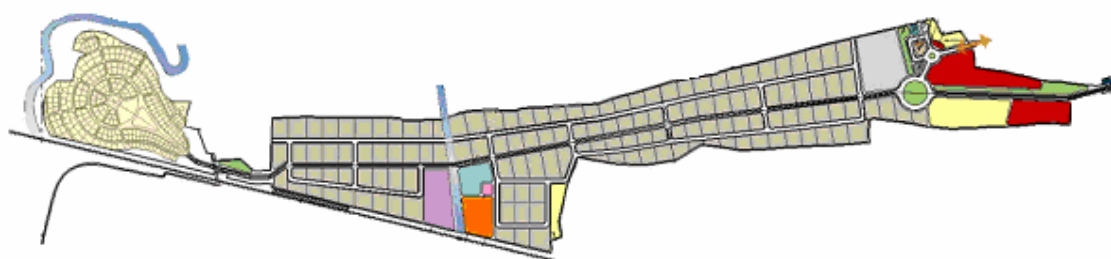
In addition, the plot layout is designed to be adjustable for increasing or decreasing, as desired. Tenants will be able to purchase any large lot by adding a standard lot or, any small sized piece by dividing the standard lot into smaller pieces of 2,000 m².

Figure 3.2.6-1: Standard Factory Block and Road Network



This approach has been applied to the Phnom Penh Special Economic Zone in Cambodia which was built recently and enjoys good reputation from foreign direct investors. This allows flexible plot layout and has been accepting frequently changing real demand of tenants when the land leasing contract was signed. The following figure shows the master plan layout of Phnom Penh Special Economic Zone in Cambodia. The total development area is about 360ha. The average standard plot size is 1 ha as explained before.

Figure 3.2.6-2: Example of Plot Layout



This layout has accepted variety of tenant's need such as 1ha, 3ha, 5ha, 10ha, or even 2000m². Therefore, the same layout can be applied to the EZs in Bangladesh.

3.2.7 Main Functions inside Mirershorai Economic Zone

A brief explanation follows of the major functions inside the Mirershorai Economic Zone.

1) Main Functions

Focal Point Main Gate

An attractive monumental main gate should be built. It should be an eye catching structure with a unique design and be visible from the access road.

One-Stop Service Centre

The facility will provide advocative information to economic zone tenants for their continuous operation, as well as providing clear and transparent supportable guidance. This facility could be located inside the administration building. It has been the traditional that investors were required to submit documents and proposals to several ministries when they need to build their factory or to export/import goods, and they often complained of rampant corruption, or the requirement of 'under-table-money,' among ministry officials, as well as long delays in processing necessary paperwork. The One-Stop Service Centre will simplify paperwork and cut out traditional redundancy. Ministries' offices are collected in one building and highly motivated officials will support application procedures for potential investors in the zone.

Control Office and Parking (Administration Building)

A sales office and administration building will be located adjacent to the focal point. The facilities should have administrative functions as well as promotion and sales functions. The audio visual briefing room should be available for the interested investors to gain more knowledge about the facilities and the attractiveness of the economic zone. A small space is planned for a clinic which provides basic medical treatment to any person in the economic zone, inclusive of workers. The following figure shows a probable layout for the control office zone in Mirershorai.

Customs Office

A customs office is built adjacent to the focal point for controlling the flows of goods into and out of the economic zone. The custom officers normally check for appropriate documentation and verify that a good or a resource is entitled to enter the economic zone. Any goods or resources not yet cleared through the custom are held near the customs office until processed.

Green Space and Landscape

All along the dike and main road, inside the industrial zone, trees will be planted to create a park. The small park and garden space would be provided, as a buffer zone all along the dike shown in Annex - 3 (section 3.2 and 3.3). This green space can be used as a recreation playground and a pleasant environment for the industrial community.

Factory Lots

Sufficient numbers of lots are designated for occupation by garments and textile and mechanical parts industries for phase 1 development and assembly industries for phase 2 developments. Tenants will have freedom to design their factories conforming to the building set-backs specified by the economic zone. A normal rectangular shape of lot is designed with approximately 1 ha (2.47 acres) area inclusive of the building set-backs from the front road. Forming a factory block surrounded by the internal road will give tenants a variety of land purchasing options. Tenants are able to purchase continuous lots or able to reduce the lot size accordingly.

Rental Factory

A total of 25.84 acres (10.46 ha) of space is kept for rental factory zone. I will provide industrial space to the investors who do not have long-term production plan or sufficient initial investment sources.

Commercial Zone

The commercial zone will be established in the economic zone by private investors. It will provide daily goods to the tenants and workers. Some entertainment facilities such as a cinema, theater, and restaurants will give a change of ambiance and increase the value added of the economic zone itself.

Housing Zone

The residential area includes three types of accommodation - industrial staff quarters, administrative staff quarters and a luxury residential area. Industrial staff quarters will be sold to industrial tenants. They will build their own residential quarters. On the other hand, administrative staff quarters are intended to house the administrative staff members of the economic zone and these will be built by the economic zone developer. The luxury residential area will be sold to people to build residential facilities.

Warehouse Zone

Renting a warehouse in the economic zone helps to manage the export operations itself without entrusting the work to another company, within which the products it exports from abroad can be stored temporarily as stock. Then, by carrying out customs clearance only on the amount for which an order has been received (split clearance), the company manages to ensure delivery in a short span of time, while minimizing customs duties, value-added tax (VAT) and shipping costs. The warehouse will be built and operated by the IPP.

Power Plant/Stockyard with Jetty

The 600 MW coal-fired power plant is planned to supply sufficient power to the economic zone and outside regions. The jetty is planned to import coal from the main coal stock yard at Cox's Bazar. The investment and operation are expected to be carried out by the IPP.

2) On-Site Infrastructure

All on-site infrastructure design with cost is described in Section 3 of Annex-3.

Roads

There will be two types of concrete surface roads in the economic zone. One is a main road with 33m right of way and the other, a secondary road with a 19.5m right of way. The total length of the main road is planned to be 20,941 m (phase 1: 13,106 m, phase 2: 4,317 m, phase 3: 3,519 m) with the secondary road to be 75,825 m (phase 1: 27,569 m, phase 2: 35,205 m, phase 3: 13,052 m). The road network is designed in order to provide smooth traffic flow inside the zone. An asphalt surface road is expected on the dike along the economic zone. All utility lines such as electrical distribution, communication lines, water supply pipes, waste water pipes and drains are built along the roads.

Figure 3.2.7-1: Typical Cross Section of Main Road

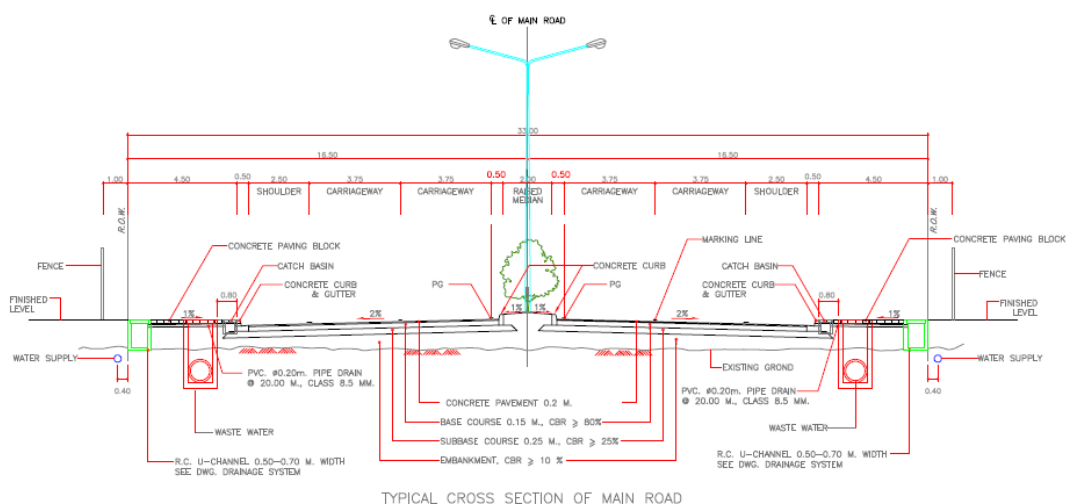
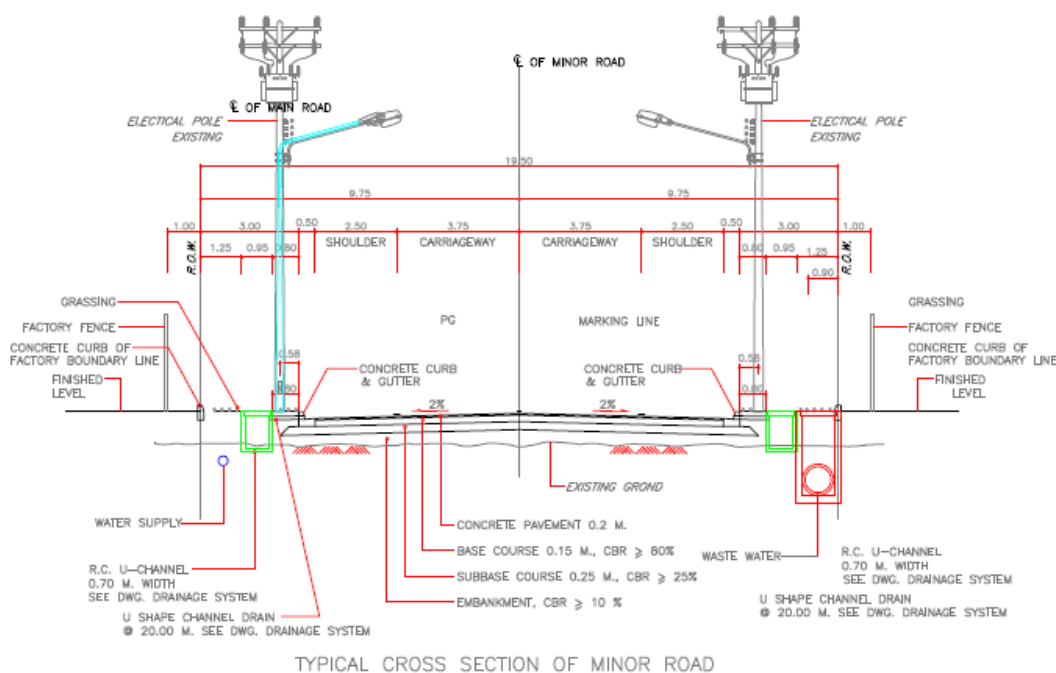


Figure 3.2.7-2: Typical Cross Section of Minor Road



Dike

Major emphasis is placed on the design of a protection system from the potential natural hazard of a high wave during a monsoon or hurricane. The dike is built along the Bengal Sea side to block an unexpected high wave. The dike is also built along the inner land side to block an unexpected high rain stream. The details are discussed in Annex – 3.

Figure 3.2.7-3: Standard Cross Section of Dike (Sea Side)

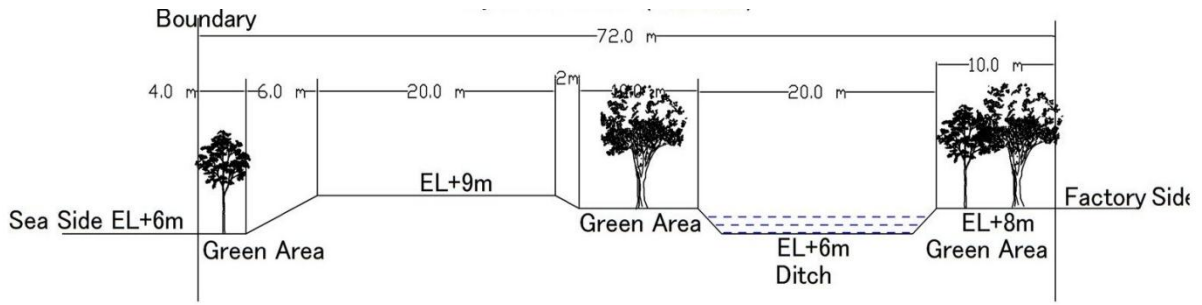


Figure 3.2.7-4: Standard Cross Section of Dike (Inner Side)

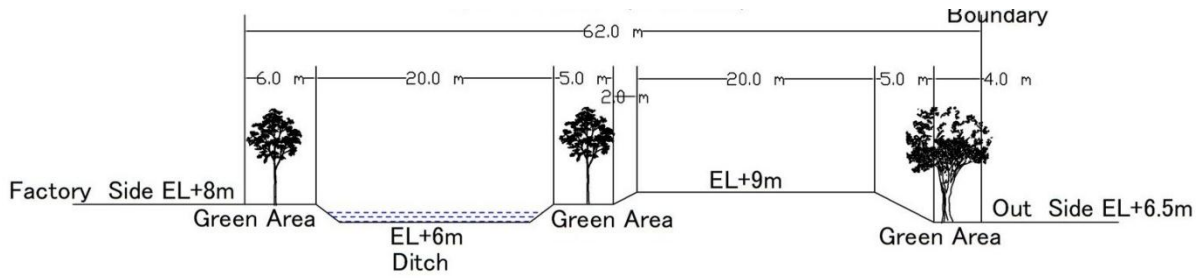
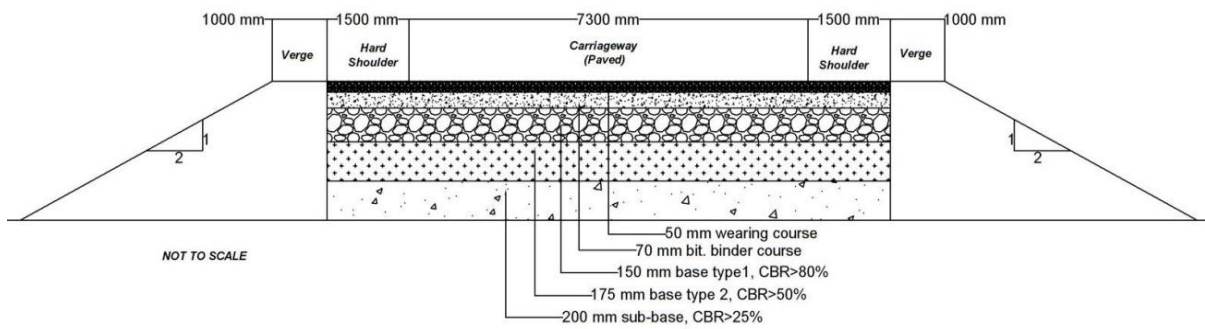


Figure 3.2.7-5: Cross section of proposed road (2-lane) on top of dike at inner side



Protection on Seaside at Jetty

The dike is not proposed along the seafront near the proposed jetty. This part will be protected by sheet piling. The drawing is provided below.

Figure 3.2.7-6: Section and Elevation of Sheet Pile

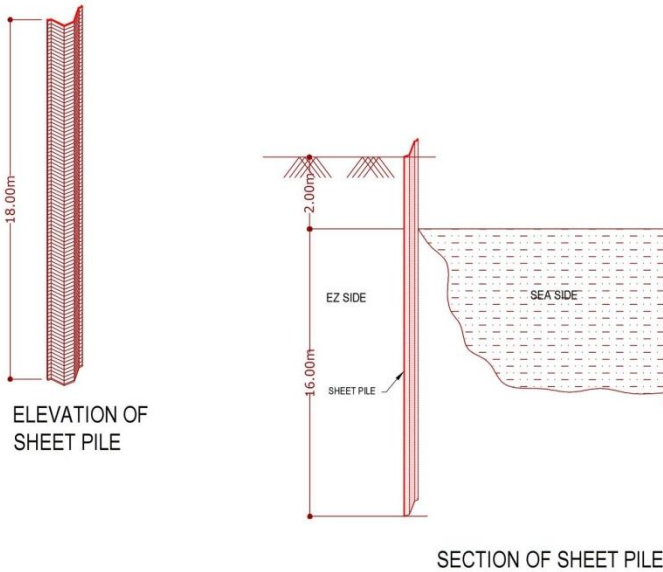


Figure 3.2.7-7: Sectional Plan of Sheet Pile

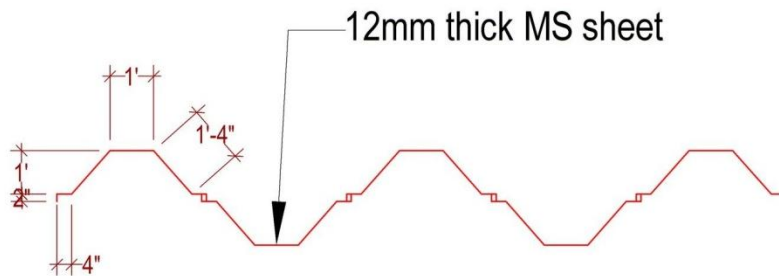
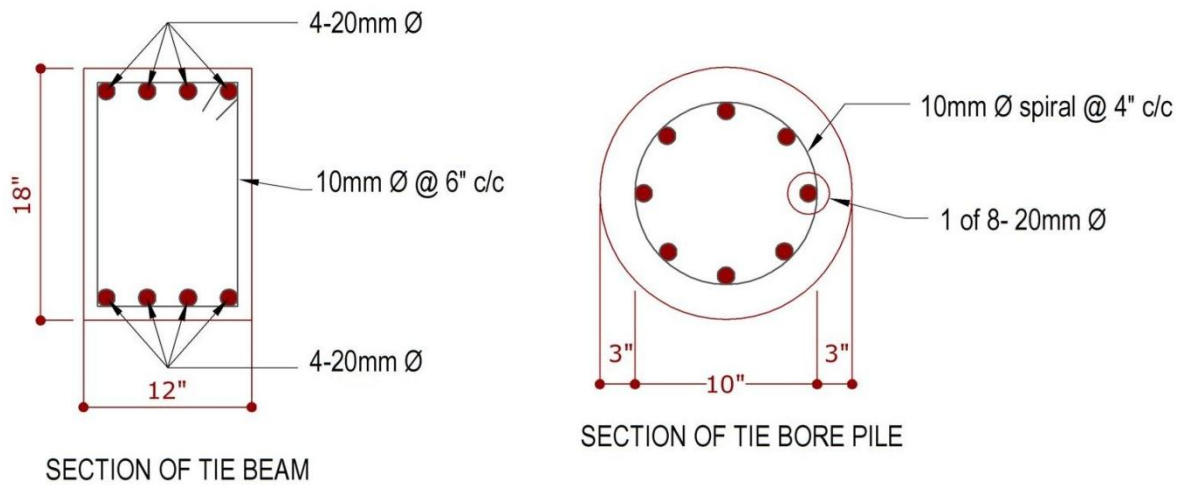


Figure 3.2.7-8: Cross Section of Bored Pile and Tie Beam Showing Reinforcement



Retention Pond

A retention pond is built at the centre of the economic zone to catch suitable water for recycling, especially for water supply during the rainy season. A retention pond is able to catch rainwater during the rainy season and the river water during the dry season by controlling the gates.

Water Supply Plant

Water from the Feni River will be used as the water supply source for the Project. The place of water intake is to be at about 16 Km up-stream of the river that is free from salinity.

Waste Water Treatment Plant

Central wastewater treatment plants will be provided. A wastewater system will consist of a gravity sewer pipe, sewer manhole, lift station and pressurized sewer pipe to collect wastewater generated within the project, to be treated by a central wastewater treatment plant. Pre-treatment for toxic waste must be provided in each factory prior to discharging that waste to the sewer system outside the factory area. The final treated water will be used for recycling purposes and for maintaining the green zone.

3) Off-Site Infrastructure

Off-site infrastructure are explained in section 3.3.

The dimensions and cost estimates of all on-site infrastructure are shown in Annex -3.

4) Clean Coal Power Plant inside the EZ

Basic information about the proposed clean coal-fired power plant project is as follows.

The proposed capacity of the plant: 600MW (2x300 MW)

Mode of operation: Base load

Fuel: Imported coal

- **Cooling Water Requirement Source and System**

The source of water for the project is saline water drawn from the sea beside the site. This is primarily black-water.

Fresh water required for meeting the potable water, plant service water, cycle makeup (DM water) etc. Requirements of the EZ will be produced using a desalination process. It is proposed to adopt a reverse osmosis process for desalination of saline water.

Make up water requirement for this project would be about 4,500 m³/hr. It is observed that the water has a very high silt content. In a once-through system, a huge quantity of work will be required. De-silting of such a huge quantity of water would not be economical. In a cooling tower system, only make up water needs to be provided and can be de-silted. Therefore, a re-circulating type water cooling system with cooling towers and open intake channel has been envisaged for the project.

- **Coal Requirement, Availability and Linkage**

The coal shall be imported coal having GCV as 6,000 Kcal/kg with maximum. 15% ash and max 0.6% sulphur. The daily coal requirement for 2X 300 MW units shall be about 12,000 tonnes on average gross calorific value of 6,000 kcal/kg at 100% plant load factor.

- Coal Transportation

The coal asreceived by barges at jetty near the power plant and shall be unloaded through rail mounted grab bucket type ship unloaders and shall be conveyed to the plant end by single conveyor system stream of 2,000 TPH capacity. From jetty to the power plant, the coal will move on a conveyor system.

- The landed cost of coal per tonne at the plant end is considered to be US \$145.
- Cost of jetty and unloading facilities is about US\$30 million
- Coal stock: Coal stock for 90 days is envisaged.
- Ash pond: Ash pond of 138 acres is assumed. The Ash dike will require ground improvement.
- Steam generator technology:

The steam generator will be a super critical once through type, water tube, direct pulverized coal fired, top supported, balanced draft furnace, single reheat, radiant dry bottom type suitable for outdoor installation.

The gas path arrangement shall be single pass (Tower type) or two pass types. Steam pressure and temperature at the superheater outlet will be 256 kg/cm² and 568°C and the temperature at the reheater outlet will be 596°C.

The boiler design will be suitable for variable pressure operation from 30% to 100% BMCR with and without a 5% throttle margin.

- Steam Turbines

The steam turbines shall be of proven design directly coupled to a 50 HZ generator. Design criteria shall be applied for a long creep life, cyclic duty and fast start-up. Last stage blade materials and exhaust steam wetness shall be selected with an objective to minimize blade erosion. The Steam turbine shall be installed with an acoustic, ventilated enclosure. If provided, the turbine house shall incorporate fire detection & protection facilities.

The steam turbine exhaust and condenser will be in accordance with the manufacturer's standard design.

- Chimney

One twin flue steel lined reinforced concrete chimney will be provided for the 2x300MW units of the project. The flue gas emission point shall be at a height above the plant grade level meeting the requirement of the environment standard. The RCC for the chimney shell, other super structure, foundation and grade level slab shall be of M-30 grade. The external portion shall be coated with alternate bands of red and white colors, fitted with aviation obstruction lighting to meet the aviation safety requirements. The chimney shall have a suitable foundation fitted with electrical power, other necessary operation and protection fittings.

- Generators

Generators should comply with IEC 34:1994 and shall be rated to match steam turbine and the steam turbine output over the full range of ambient temperatures. Generator and exciter windings shall possess insulation that is non-hydroscopic and class F type in accordance with IEC 85 standard or any other class /standard acceptable. The generator shall be capable of operating within 48.5 Hz and 51.5 Hz and +/- 10% of nominal rated voltage within the power factor range 0.85 lagging on 0.95 leading at this delivery point.

- Water Treatment Plant

A water treatment plant will be provided to treat raw river water that will provide plant cooling water, service water, and de-mineralized water. The water treatment plant will comprise both primary (sand and activated carbon filters or micro filtration) and secondary treatment (combination of reverse osmosis, mixed bed and/or ion exchange)

- Power Transmission

Power generated from this coal-fired power plant will be delivered to the 132KV switchyard to be constructed near the power station. From this switchyard 15 Km long 132 KV transmission line on towers will be constructed (along with power transformers of required capacity including switch gears, protection system etc.) to connect it with the 230/132 KV Sonapahar Grid Substation. This will ensure its connectivity to the national grid system of Bangladesh. Internal networking will be done within the EZ to provide electricity to the customers.

- Environmental Requirements

The facility will be designed to be capable of complying with the laws of Bangladesh and the Environmental guidelines as applicable.

The construction of the planned coal-fired power plant will start in 2018 when the demand is almost zero and can be supplied by the national grid. At the end of 2021 when the demand is about 10 MW the power plant will start production (300MW). After completion of its construction (additional 300MW) in 2025 the total demand for power in the EZ will be 264 MW. Total power demand will rise to 574 MW in 2031 when the full capacity of the power plant can be utilized in the zone.

Figure 3.2.7-9: A Typical Cross Section of a Coal-fired Power Plant

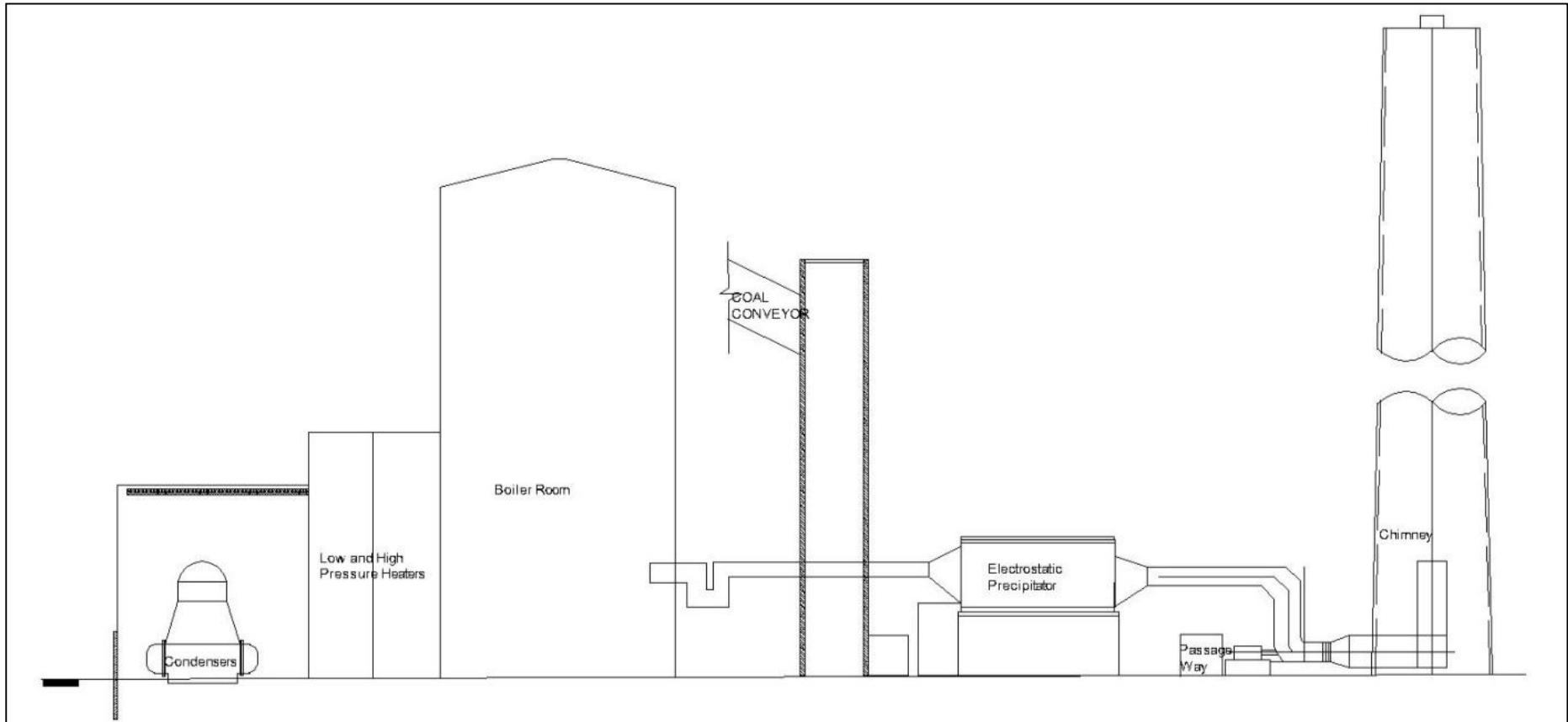


Figure 3.2.7-10: Typical Water Balance Diagram for Coal-fired Power Plant

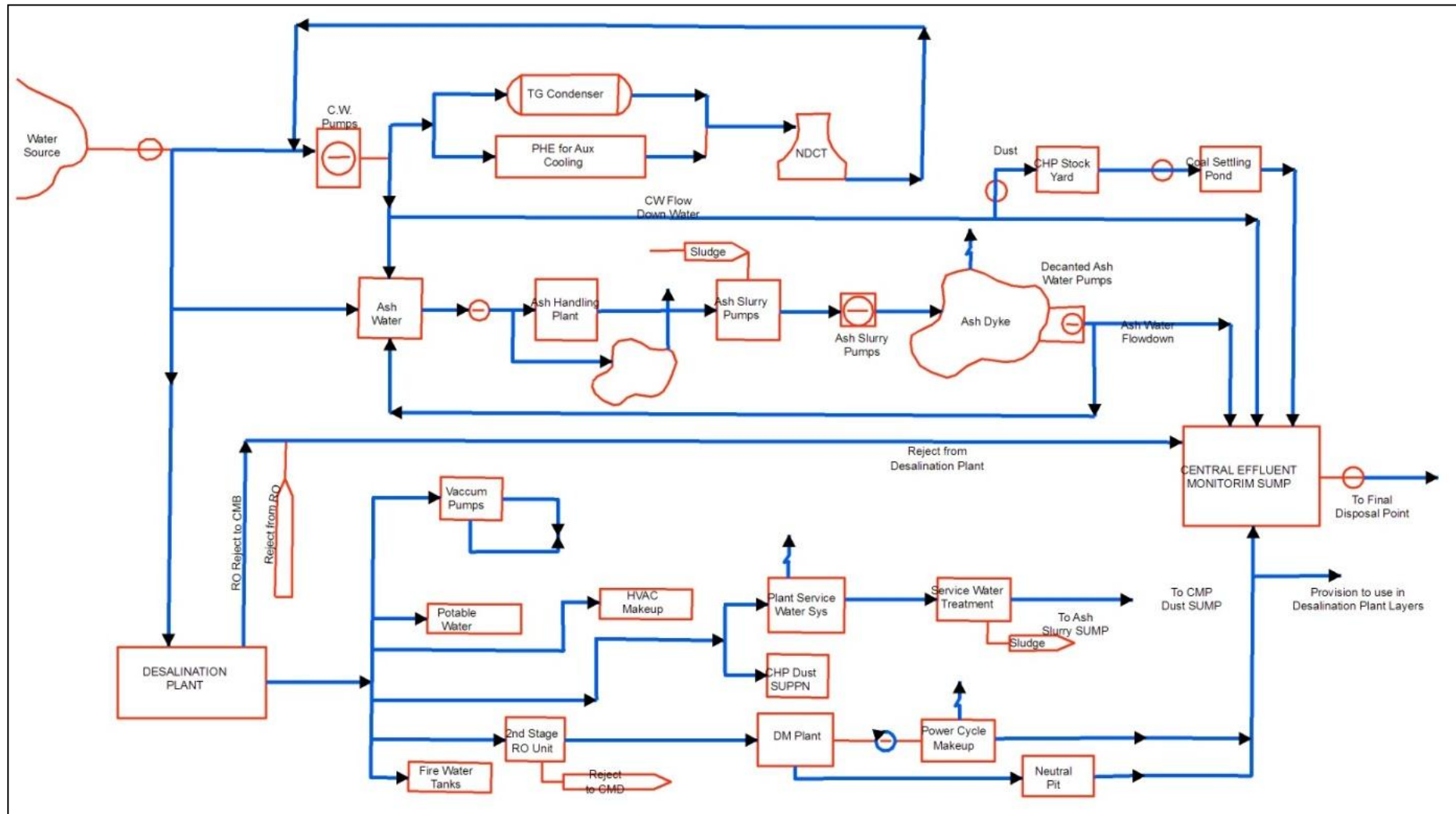


Figure 3.2.7-11: Single Line Diagram of the Power Plant

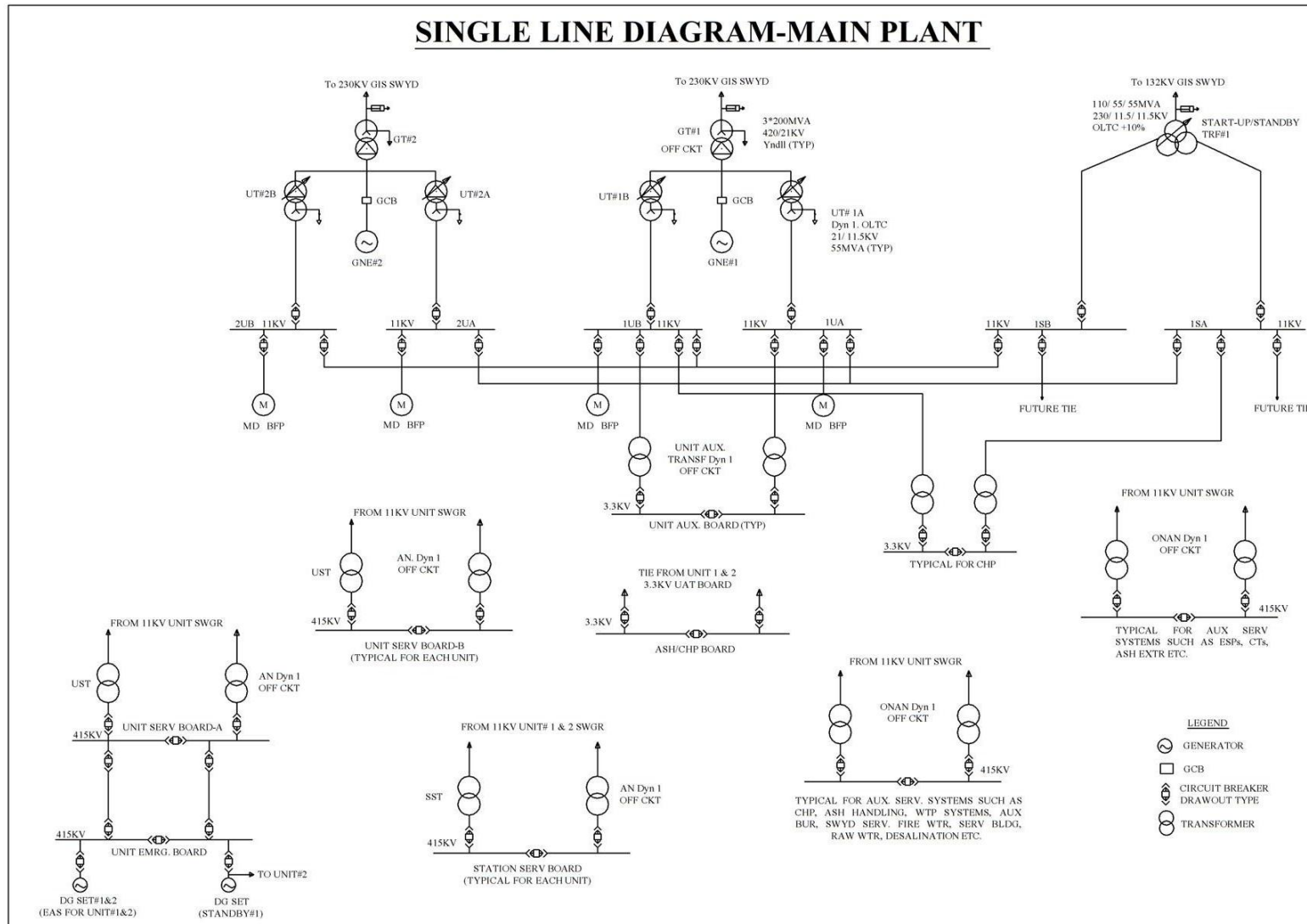


Figure 3.15.2-4: Layout of Power Plant Showing Stockyard and Jetty



3.2.8 Investment Structure

The proposed investment structure for Mirershorai EZ is given below. Details are described in Chapter 5.

Table 3.2.7-1: Proposed Investment Structure on the Planned Land Use

Location	Sale-Status of Land	Main Land Use	Investor
Proposed Area	Saleable Lease	Industry Plot	PI
		Coal-fired Power Plant	IPP
		Commercial	PI
		Residential	PI
		International School	PI
		Vocational Training Institute	PI/GOB
		Medical College and Hospital	PI/GOB
	Not-saleable Lease	Control Office & Parking	EZD
		Fire Service Station	EZD
		Police Station	EZD
		Customs Office	EZD
		Residential	EZD
		Resettlement Zone	EZD
		Remaining Land	EZD
		Internal Road	EZD
		Embankment	EZD
		Water Body	EZD
		Water Retention Pond	EZD
		Water Tower & Reservoir	EZD
		Water Supply Treatment Plant	EZD
		Waste Water Treatment Plant	EZD
		Forest	EZD
		Green Zone	EZD
Offsite Infrastructure		Access Road (i)	RHD/GoB
		Access Road (ii)	RHD/GoB
		Water Connection	PHED
		Communication	BTCL/ISP/EZD
		Electricity	PDB/EZD

<i>Note</i>	<i>EZD</i>	<i>Economic Zone Developer</i>
	<i>PI</i>	<i>Private Investor</i>
	<i>GOB</i>	<i>Government of Bangladesh</i>
	<i>BR</i>	<i>Bangladesh Railway</i>
	<i>PDB</i>	<i>Power Development Board</i>
	<i>BTCL</i>	<i>Bangladesh Telecom Communication Ltd</i>
	<i>RHD</i>	<i>Road Highway Department</i>
	<i>PHED</i>	<i>Public Health Engineering Department</i>
	<i>IPP</i>	<i>Independent Power Producer</i>
	<i>BWDB</i>	<i>Bangladesh Water Development Board</i>
	<i>ISP</i>	<i>Internet Service Provider</i>

This table shows the investors that will be responsible for the lands. EZD will be responsible for the whole zone but will not be the investor for the industrial plots. Funding options for the GoB are discussed herein Chapter 5. Without proper and adequate funding these kinds of project will never succeed. This type of remote location, with vulnerability to cyclone/tidal surges, will require infrastructure that carries a higher cost. Without proper and adequate infrastructure the tenants will not be convinced as to the safety of their investment. The higher cost infrastructure will ensure greater safety and thus quick and larger investment increments.

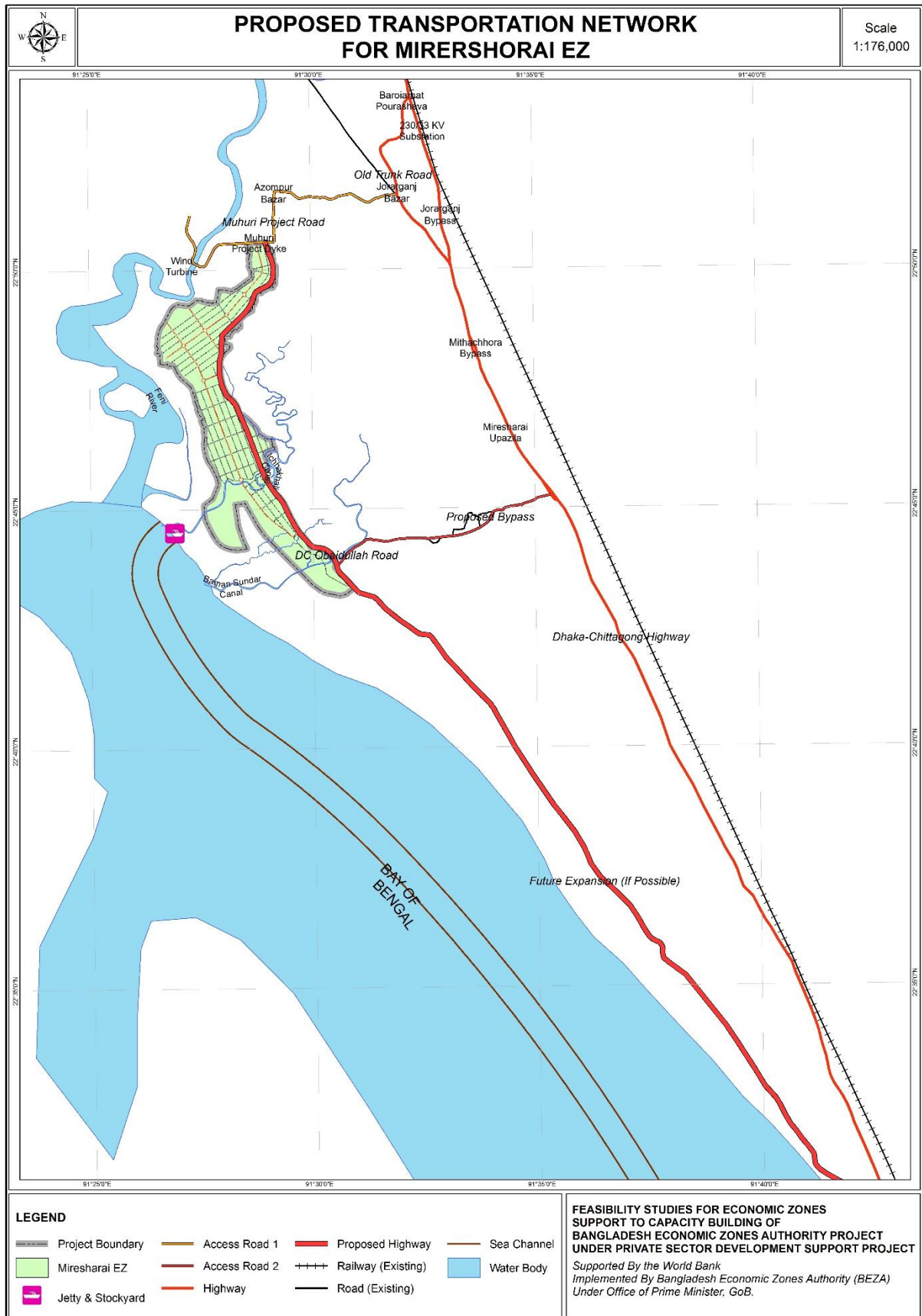
3.3 Offsite Infrastructure Requirement

3.3.1 Proposed Transportation System

Highways have been proposed to connect Mirershorai EZ site with other parts of the country. The two proposed access roads, connecting the EZ site with the existing 4-lane Dhaka-Chittagong Highway, have already been described in the site visit report (Section 3.1.1.2). A jetty will be established to transport coal directly to the proposed 600MW coal-fired power plant. A channel route is proposed to connect this site with the deep sea, in order to import coal.

There is also a proposal to connect the EZ with the Port Link Road in Chittagong by constructing a new 4-lane highway on the existing BWDB dike, by improving it. It will also be constructed if the demand for industries rises higher and there is a need for a direct alternative connection to the Chittagong Port and Chittagong City. The following figure shows the transportation system proposed for Mirershorai EZ.

Figure 3.3.1-1: Proposed Transportation Network for Mirershorai EZ



An access road (i) of about 10 Km in length will be the road connecting the Dhaka-Chittagong Highway at the Dhaka-Chittagong Highway and Old Trunk Road Intersection with the Mirershorai EZ site at Muhuri Project Embankment (extreme north-east corner) of the EZ site. This road is proposed to have 4-lanes. Access road (ii), DC Obaidullah Road will be the connecting road from the Dhaka-Chittagong Highway (Borotakia Intersection) to the EZ site at the BWDB main embankment at Noapara, Roypur Union (near the end of the EZ site towards the south). The road is about 10 Km long (refer to Figure 3.3.1-1 for location and layout of access roads).

Cross section of access roads (existing and proposed) are given in the following figures.

Figure 3.3.1-2: Existing Section of the Access Roads

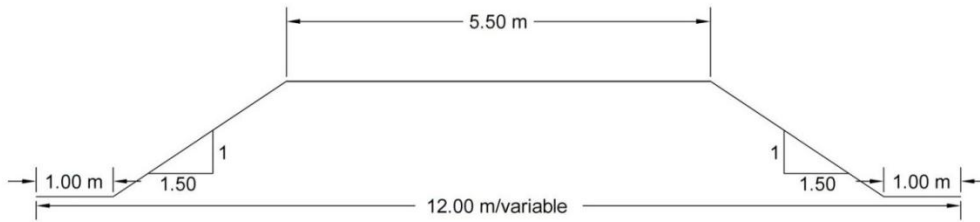


Figure 3.3.1-3: Cross Section of Proposed 4-Lane Access Roads

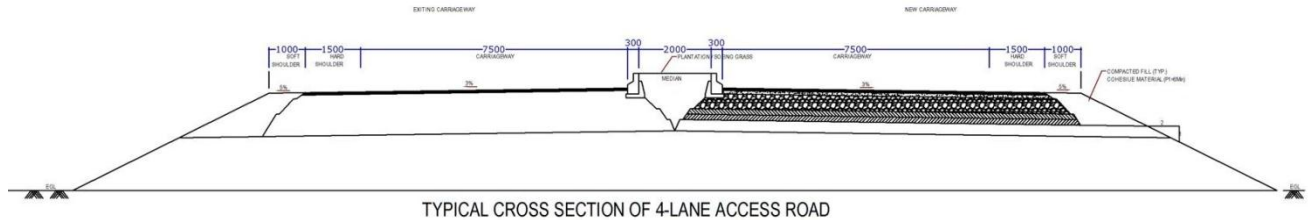
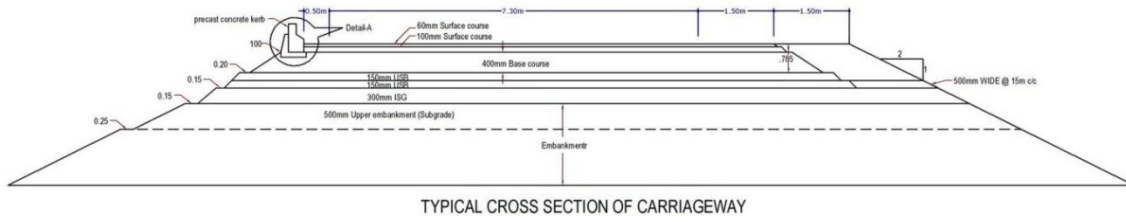


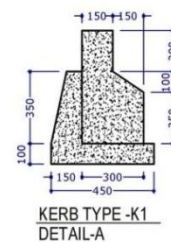
Figure 3.3.1-4: Section of Carriageway (Bituminous Carpeting) of Proposed Access Roads



LAYER	THICKNESS	WIDTH	COMPACTION (%)	CBR (%)
Surface course	50mm	9.30	98	98
Blinder course	100mm	9.31	98	98
Base course	400mm	10.26	11.06	98
Upper subbase	150mm	11.46	11.39	98
Lower subbase	150mm	11.78	12.06	98
Improved subgrade	300mm	13.92	14.62	95
Upper embankment (Subgrade)	500mm	14.97	16.42	95
Embankment	Varies	16.72	98	9

Note:

- 1: All Project width is 0.12m, or $\frac{1}{2}$ thickness of the above layer, whichever is greater
- 2: Side slope of all layer is 1:1, except the other embankment which is 2:1
- 3: 500mm of extended LSB layer up to the embankment slope to be wrapped with Geo-textile at every 15m interval
- 4: In case of kerb K2 and K6, the widths of the different layers will be adjusted according to the sizes of respective kerbs



In some sections, near a Bazar like Abu Torab Bazar on DC Obaidullah Road, Azampur Bazar and Bishumiar Hat on Muhuri Project Road, a concrete (rigid) pavement is proposed. This is because the market areas are always congested and roads passing through the markets often become inundated due to poor drainage systems.

Figure 3.3.1-5: Section of Carriageway (Concrete Pavement) of Proposed Access Roads

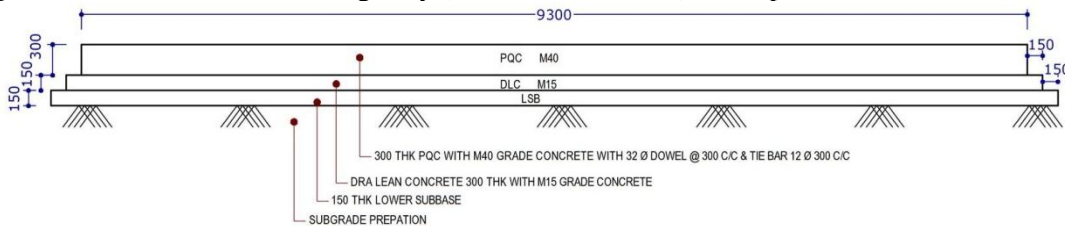


Figure 3.3.1-6: Plan of Box Culvert on Proposed Access Roads (Offsite)

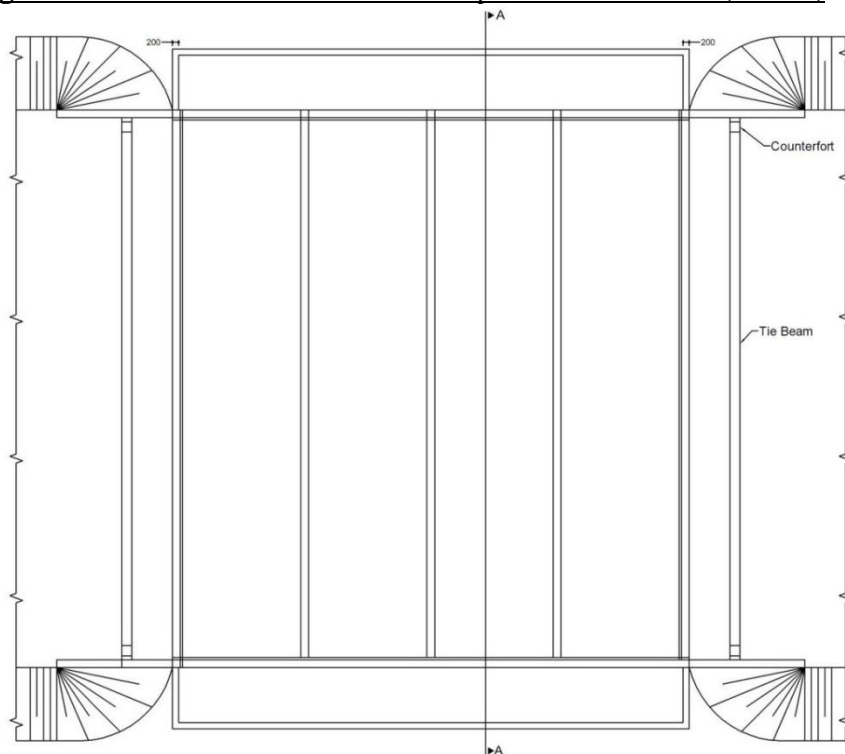
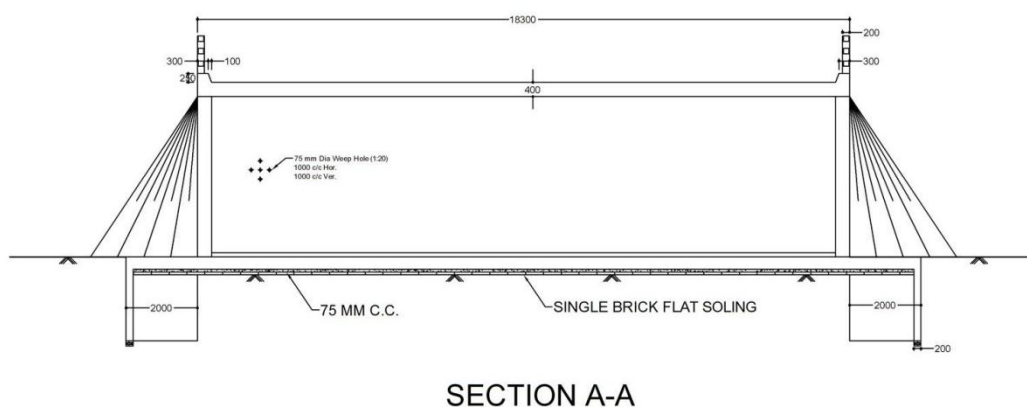


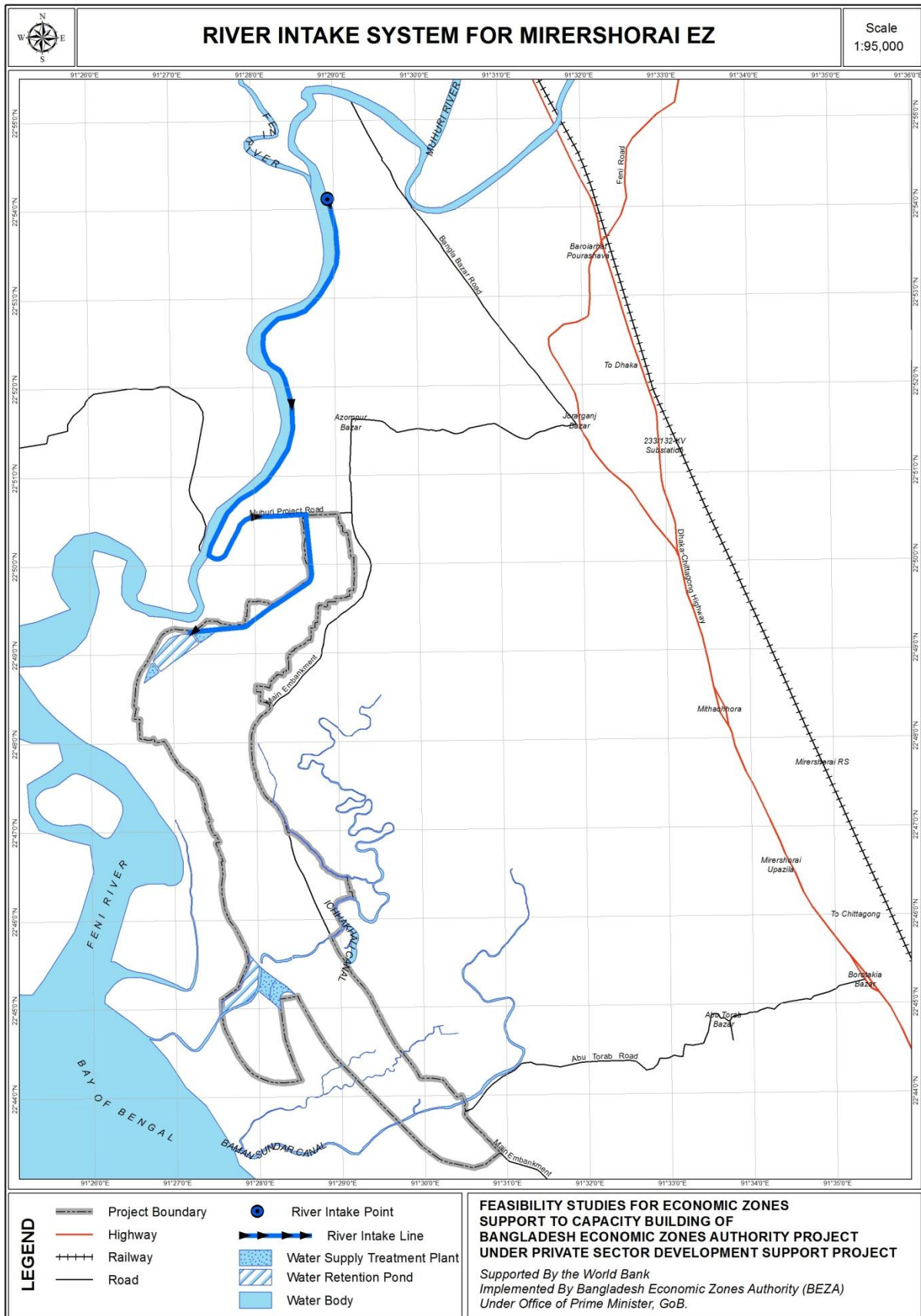
Figure 3.3.1-7: Cross Section of Box Culvert on Proposed Access Roads (Offsite)



3.3.2 River Intake for Water Supply System

The river water near the EZ site is saline. For this reason, sweet water will be collected from upstream. The proposed river intake for Mirershorai EZ will be located on the Feni River, 15.74 Km upstream from the site. It will be at a converging point of the Muhuri and Feni River. This way the water availability will be higher. It will be connected to the retention area located inside the water supply treatment plant. Figure 3.3.2-1 shows the river intake location and connection to the site.

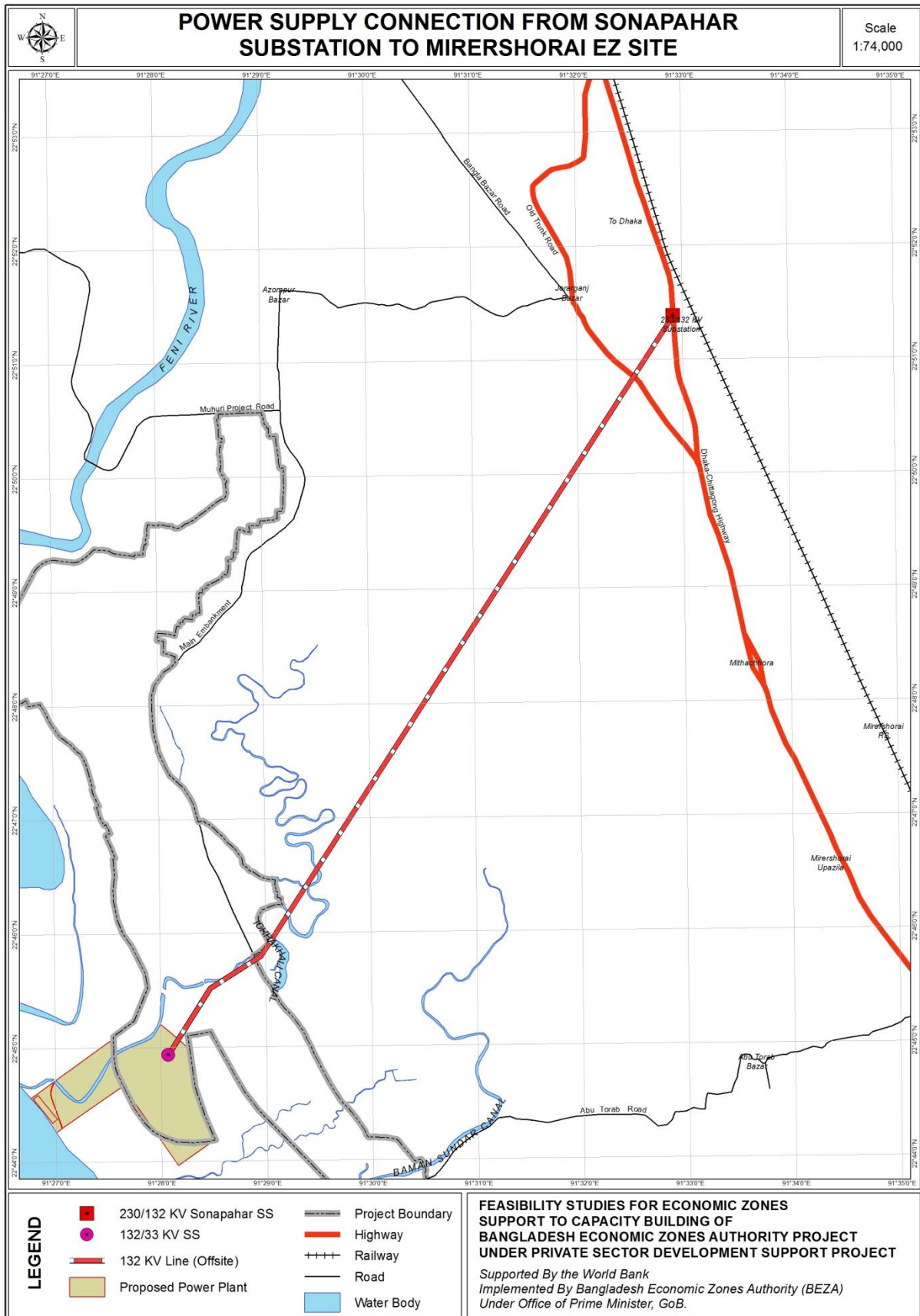
Figure 3.3.2-1: Proposed River Intake System for Mirershorai EZ



3.3.3 **Power Connection to the Proposed Coal-fired Power Plant (Offsite)**

- A 230KV grid transmission line from Comilla north sub-station connected to Chittagong Hathazari 230KV substation passes over Mirershorai alongside Comilla to Chittagong Highway at a place named Sonapahar.
- The above 230 KV line will be made in and out at Sonapahar for BSRM (Basundhara Steel Re-rolling Mills) by PGCB (Power Grid Company of Bangladesh). One 230/132KV sub-station is now being built there, capacity 2x150MVA to supply power to BSRM Steel Mills. Provision has been kept to supply power to other consumers. The construction of the sub-station is now going on with the expected commissioning in 2014-2015. The cost of the sub-station will be borne by BSRM. After construction of the sub-station it will be handed over to PGCB for normal operation and maintenance. For the sub-station and steel mills BSRM has purchased 70 acres (28.34 hectares) of land.
- BSRM will also construct a 150MW coal-fired power plant at Sonapahar within the next four years. 10% of the generated power will be sold to BPDB and 90% will be consumed by their own steel mills at different places, by dispatching power through PDB/PGCB installations paying a wheeling charge. BSRM will construct their 2nd 150MW coal-fired power plant immediately after the 1st.
- Lahmayer International (Indian part) is working for construction of the plant as a consultant. The power project is in the design stage.
- Coal for the power plant to be purchased from Indonesia, peat commercial coal having heating value 5,500-5,700 kcal/kg. About 1,600 tonne/day coal will be required for the 150MW power plants.
- Coal to be imported by sea going vessels up to deep sea, then transported by feeder vessels to Chittagong port jetty to be allotted for coal of the BSRM project. For this, negotiation is now going with CPA. There is also a possibility of constructing a jetty for coal at Foujdarhat sea side nearer to the Sonapahar site about 35 Km away. From the jetty, coal will be carried to the site by trucks.
- A lower purchase agreement with the PDB and contract with PGCB for construction of 230KV sub-station is in the process of finalization with Government approval.
- The proposed, under construction, 230KV sub-station and BSRM power station is about 15 Km away from the Mirershorai EZ area. To connect with this sub-station could be the 1st option for the power supply to Mirershorai EZ. From this sub-station there can be an extension of 132KV line about 15 (fifteen) Km to the proposed EZ power station site and install 132/33KV sub-station of requisite capacity for power supply to EZ area. In future, when the EZ will have its 2x300 MW coal power stations constructed, it can have 230KV transmission line connections with PGCB 230KV National Grid.

Figure 3.3.3-1: Power Supply Connection From Sonapahar Grid Substation to Mirershorai EZ

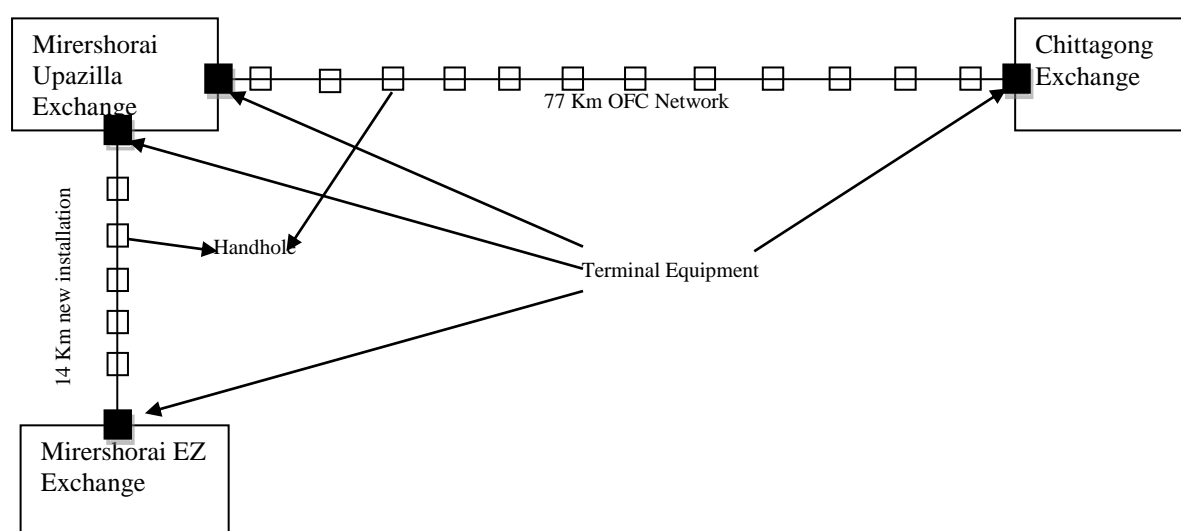


3.3.4 Telecommunications (Off-site)

If Bangladesh Telecommunication Company Limited (BTCL) Fixed Phone network is to be installed in Mirershorai EZ site, a Fibre Optic Cable (FOC) connection will be established between Mirershorai EZ site and Chittagong main Exchange. Also Telephone Exchange/exchanges of BTCL shall be installed at EZ site and the local network will be expanded according to need. Mirershorai EZ area is very large. Local network by copper cable will be difficult with single Exchange. To cover the network by copper cable, a minimum of two BTCL Exchanges need to be installed. Because by copper cable, subscribers can be connected up to a maximum distance of 4 Km. If only one Exchange is installed, OFC network would have to be expanded for the local network.

The cost of a telecommunications system is calculated most modern soft switching (SS) technology, as in near future technologies are being changed very rapidly. Since power transmission lines in the EZ site will be overhead, the FOC line can be hung overhead to reduce the local network expansion cost.

Figure 3.3.4-1: Connection Diagram (Offsite)



3.4 Existing Utility Condition

3.4.1 National Conditions

The following sections describe the present condition of utility services such as electricity and telecommunications in Bangladesh.

3.4.1.1 Electrical Power

At present only 60% of the people have access to electricity (including from renewable power sources). Per capita generation is 321KWH (including captive), which is one of the lowest in the region. Every year the demand is increasing at a rate of 10%. Present generation capacity is 10,213MW. Out of this total capacity 800-1,000MW could not be generated due to the shortage of natural gas. As a result, about 800-1,000MW load shedding was experienced during peak hours last summer.

Table 3.4.1.1-1: Present Power Condition in Bangladesh at a Glance

Type	Capacity
Installed capacity (Derated)	10,213 MW
Demand (Summer)	7,600 MW
Generation Capacity (Summer)	6,000-6,800 MW
Maximum Generation (August 4, 2012)	6,350 MW

About 13,000 MW of new generation addition has been planned to come online from 2013 to 2017. A number of HFO (Heavy Furnace Oil) based peaking plants, in the public and private sector, has been undertaken as a short term plan. Large coal and gas based combined cycle power plants have been considered for base load plants in the future.

Table 3.4.1.1-2: Planned Power Generation Project up to 2017

Sector	Planned Annual Growth in Electric Power Generation (MW) Capacity					
	2013	2014	2015	2016	2017	Total
Public	662	960	1,813	1,260	1,950	6,645
Private	895	1,028	888	1,654	1,300	5,765
Import	500					500
Total	2,057	1,988	2,701	2,914	3,250	12,910

Generation Plan from 2017 to 2021 is 11,655MW. So the total power generation in the year 2021 will be 24,565MW.

Long Term Generation Plan (2010-2030)

The Government has prepared a Power Sector Master Plan, 2010 (PSMP 2010). According to the PSMP 2010, the maximum demand in 2015, 2021 and 2030 will be 10,000, 19,000 and 34,000MW respectively. To meet the demand with reliability, installed capacity needs to be increased to 24,000MW and 39,000MW by the year 2021 and 2030 respectively. Generation capacity from different primary fuels in the year 2030 is planned to be as follows.

Table 3.4.1.1-3: Planned Generation Capacity from Different Primary Fuels in 2030

Fuel	Generation Capacity
Domestic and imported coal based ST (Station Turbine)	19,650 MW
Nuclear Power	4,000 MW
Gas and LNG	8,850 MW
Regional Grid	3,500 MW
Liquid Fuel, Hydro and Renewable	2,700 MW
Total	38,700 MW

3.4.1.2 Communications Network

In Bangladesh there are two Types of National Network; Radio Link Network and OFC Link Network BTCL has both the types. The network diagrams are shown in the following two figures.

Figure 3.4.1.2-1: BTCL Microwave Links

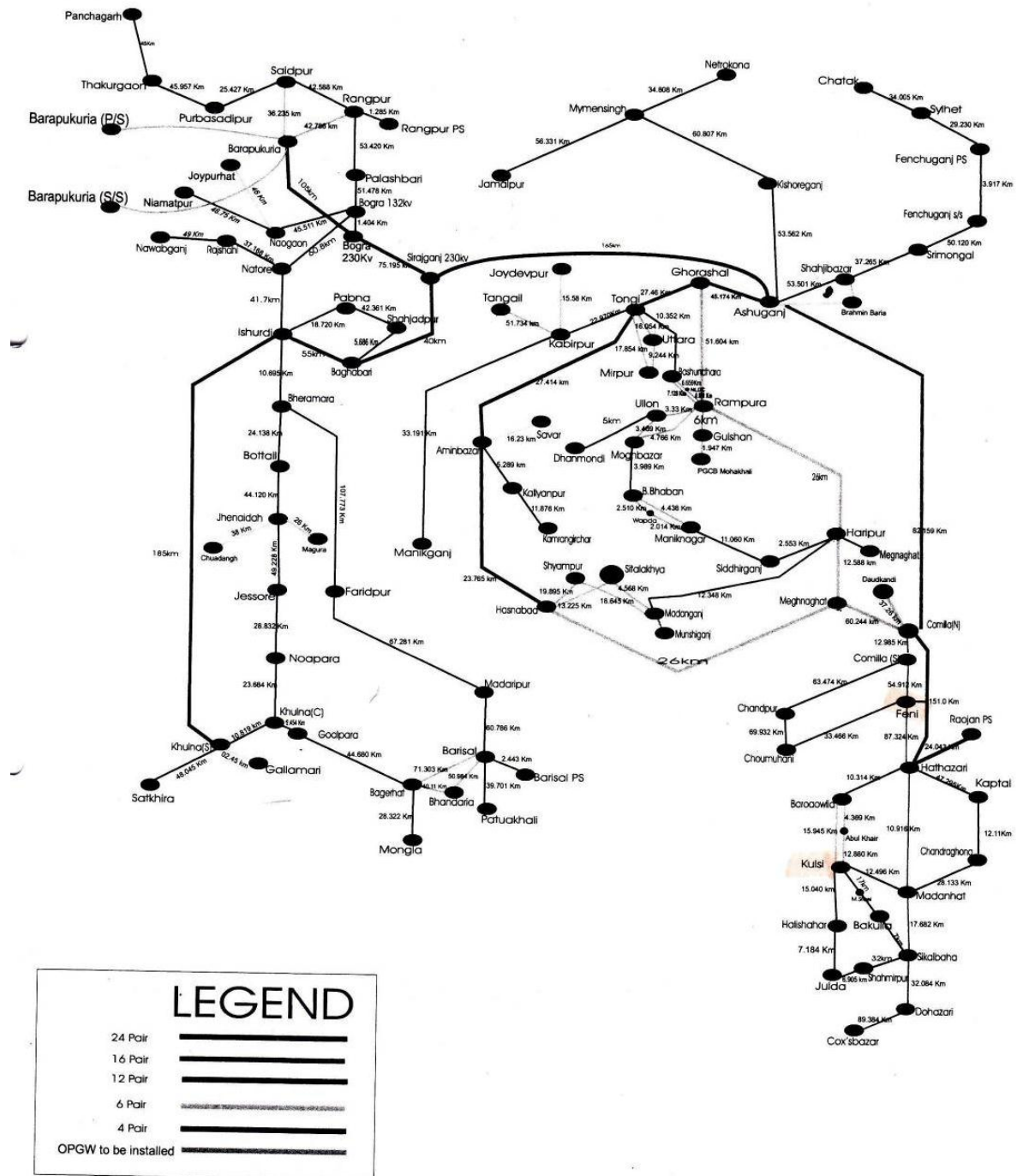


Figure 3.4.1.2-2: BTCL Optical Fibre Links (OFC)



The Power Grid Company Bangladesh also has an OFC overhead Network throughout Bangladesh along the High Tension power transmission Towers, shown below in figure 3.4.1.2-3.

Figure 3.4.1.2-3: Optical Fibre Backbone of PGCB



From various discussions to some service providers in the telecommunications sector in Bangladesh, the communication network has been evaluated. The following is a brief of these visits.

Visit to the Bangladesh Telecommunication Regulatory Commission (BTRC), Dhaka

It was reported that BTRC has given license/permission for telecom operation of PSTN to a good number of Operators. Most of them could not become successful in fixed/land phone network service. Among the private operators, Ranks Tel started with a land/fixed phone service. But a few days ago

their service also became non-standard. Most of the Mobile Operators successfully promoting their business.

Visit to Bangla Phone (BP)

Another operator, Bangla Phone (BP) is giving service, under a completely different concept. They are working only in the Sylhet Region and also in some rural areas. BP claims that their leased Optical Fibre network, leased from PGCB, is spread throughout Bangladesh. They have only one switching centre in Dhaka. Wherever service is requested, they drop an FOC line, from the nearest junction to create a Termination Point (TP) and connect the required service from the TP. They can provide telephone service, internet service and point-to-point data communication service throughout Bangladesh and internationally. They achieve worldwide international connection through POPs of BTCL.

Visit to Power Grid Company Bangladesh (PGCB)

It is found that the Power Grid Company of Bangladesh (PGCB) is a primary owner of FOC throughout Bangladesh. PGCB has High Tension power line with HT power transmission towers throughout Bangladesh. Also, they have constructed FOC and an overhead network for their own communications and are also leasing their FOC to other Telecom Operators.

Information of other FOC networks

The primary owners of FOC networks in Bangladesh are BTCL, PGCB, Grameen Phone(GP) and some others. The FOC network of GP was initially purchased from Bangladesh Railways. At a later stage they laid and expanded their network.

Visit to Dhaka EPZ

This EPZ has a total of 356 acres of land in two phases with a total number of 451 plots (each plot 2,000 sq m). Some of the bigger factories occupy more than one plot. The total number of factories is 102. The EPZ Zone has a BTCL Telephone Exchange of 3,000 lines. Primarily, the Exchange was installed by BTCL by contributory work, i.e. Dhaka EPZ has established a BTCL fixed Phone network through contributory work. At a later stage, the exchange was expanded by BTCL to connect with outside subscribers. The EPZ factories are connected with about 600 telephones only. Other telephone connections are with the other BTCL subscribers.

Though there is internet facility with the BTCL exchange, the EPZ factory owners prefer to use private internet services. It is found in Dhaka EPZ, that, internet facilities are provided by several private Internet Service Providers (ISPs). About 4 to 5 ISPs have set up their network in the Dhaka EPZ. The EPZ authority mentioned only one name 'AMRA.' The EPZ Authority did not have to pay for the internet service. The ISPs connected their facilities to the factories and offices of the Zone by overhead FOC network along the electric poles, for which they are paying a yearly rent to the EPZ Authority. They have no underground FOC network. Factory owners have their internet connection from more than one ISP, so that, in case one ISP is interrupted, service can continue.

3.4.2 Local Conditions

3.4.2.1 Electrical System

At present, electricity is supplied to the area by the Rural Electrification Board (REB) by 11 KV line connected to REB's 33 KV sub-station at Mithachara, capacity 20 MVA. But it can only deliver 10MW due to the limited power supply. Grid supply in the area is not available now. Some Solar Home systems are available.

Figure 3.4.2.1-1: 230 and 132KV Grid Network of Chittagong Region

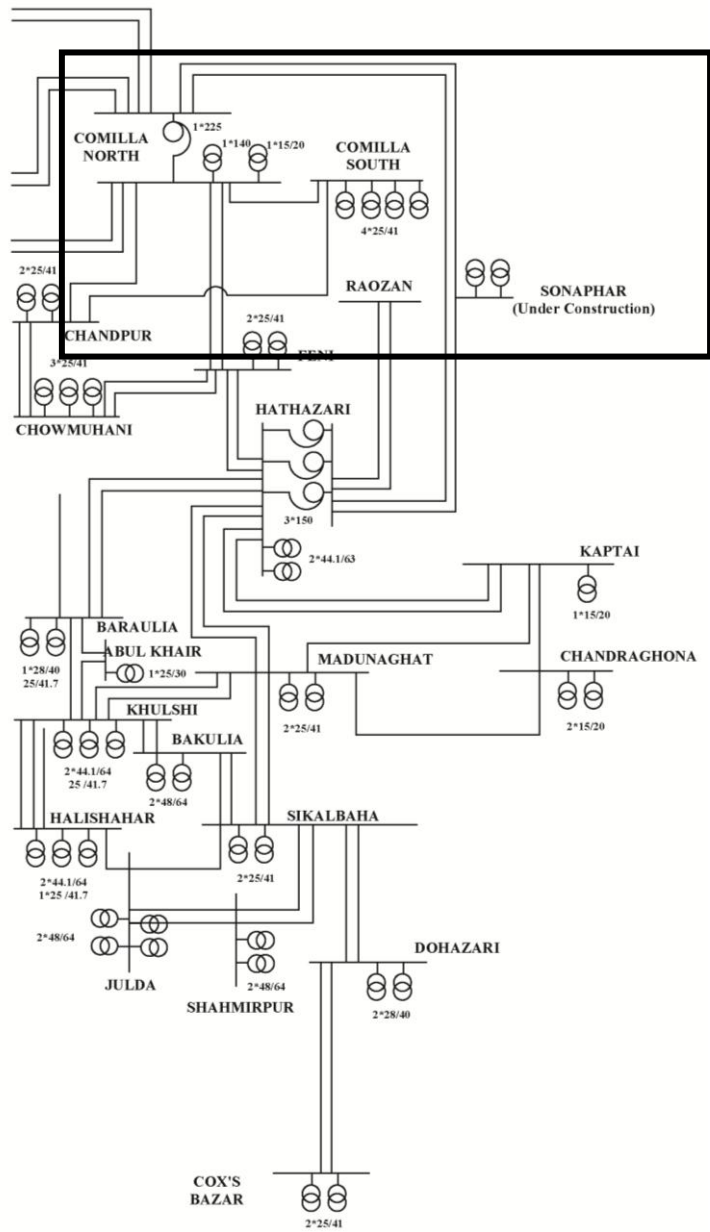
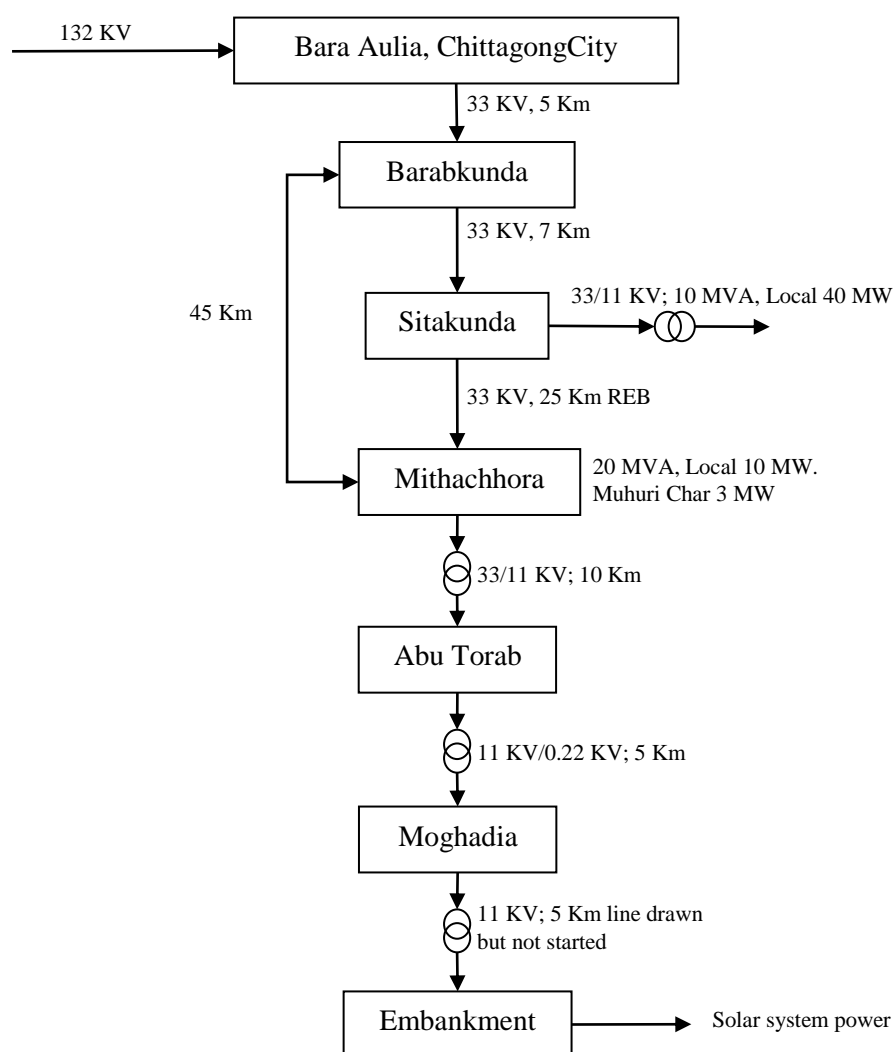


Figure 3.4.2-2: Present Power Supply Situation at Mirershorai

3.4.2.2 Water Supply

The Mirershorai project site, situated in the coastal belt, is 49 Km from Chittagong City. The proposed project site is about 10 Km from the Chittagong.-Dhaka Highway. The proposed site area is about 6,615 acres. There is no big river flowing through the project area. Only one river (Feni River) is flowing by the side of project. This is connected to the sea and contains saline water ranging from 10,000 ppm to 35,000 ppm. People of the locality are using fresh water from ponds and beels (marshy land) which is replenished by rain and they also use tube-well water. The quantity of pond water (surface water) accumulated from rain is not sufficient for a large rate of consumption.

The only nearby available source of surface water is from the Muhuri River which is approximately 40 Km from the project site. Water can be extracted from upstream of the Muhuri River, through a river intake and piped to the project area for treatment, with the help of a boosting station. The treatment plants should be located at a suitable place in the project area.

The retention pond is preferred to be nearer to the river intake to avoid sedimentation inside the transmission main by fine suspended particles, which reduce the flow of water in the retention pond. Frequent cleaning of the pipe will be necessary.

There is no running water supply in the project area or near to the site. The water is extracted from deep tubewells at a depth of 900 feet or more. Most of the shallow tube well water is saline which is not suitable for drinking and industrial purposes. As a large quantity of water will be required and it is not permitted to extract that volume of ground water, the cost of extraction of water from deep aquifers would be high and there'll be environmental consequence. Considering these points, it is considered feasible to use surface water. The only source of fresh water is from the Feni River which is about 16 Km from the project area.

3.4.2.3 Telecommunications

At the Mirershorai EZ (Economic Zone) site, mobile connection from almost all mobile companies is available. There is no fixed network. It is recommended to install BTCL (Bangladesh Telecom Company Limited) Fixed Phone network, as this is the only reliable network in Bangladesh. The EZ site is 14KM from the telephone exchange at Mirershorai Upazilla. Mirershorai Upazilla Exchange is connected by FOC to the Chittagong main Exchange.

Mirershorai Upazilla Exchange is 77 Km from Chittagong City Headquarters Exchange, which is an ICX (Inter Connection Exchange) of BTCL. From this Exchange national and International connectivity will be available. For connectivity to the EZ exchange, the OFC should be laid between the proposed Exchange of the EZ site to Mirershorai Upazilla Exchange. From the Mirershorai Upazilla Exchange to the Chittagong main Exchange, a BTCL FOC optical core or required bandwidth can be rented. The rental cost will be added to the operation cost. Mirershorai is the nearest ODF (Optical Distribution Frame) of BTCL for the EZ site. If there is a possibility of a nearer ODF, the cost of laying the FOC (Fibre Optic Cable) may be reduced.

3.5 Development Schedule and Cost

3.5.1 Development Process

The development of Mirershorai Economic Zone is divided into three phases with the consideration of market demand which is described in Chapter 2 and the natural land shape. The amount of investment in each phase is the key factor to determine the phasing boundary.

Phase 1:

Phase 1 covers the area from the entrance to the south boundary of the warehouse area, inclusive of the resettlement area, the commercial zone, the industrial zone, the vocational training zone, the residential area, the administration area, and the rental factory zone. The coal-fired power plant, jetty and the dike along the sea side are included in phase 1 because the tenants in that area will need power for their operation. A water supply treatment plant and waste water treatment plant are also planned.

Phase 2:

Phase 2 mainly covers the industrial zone which is to be between the warehouse zone and the river stream crossing the forest zone.

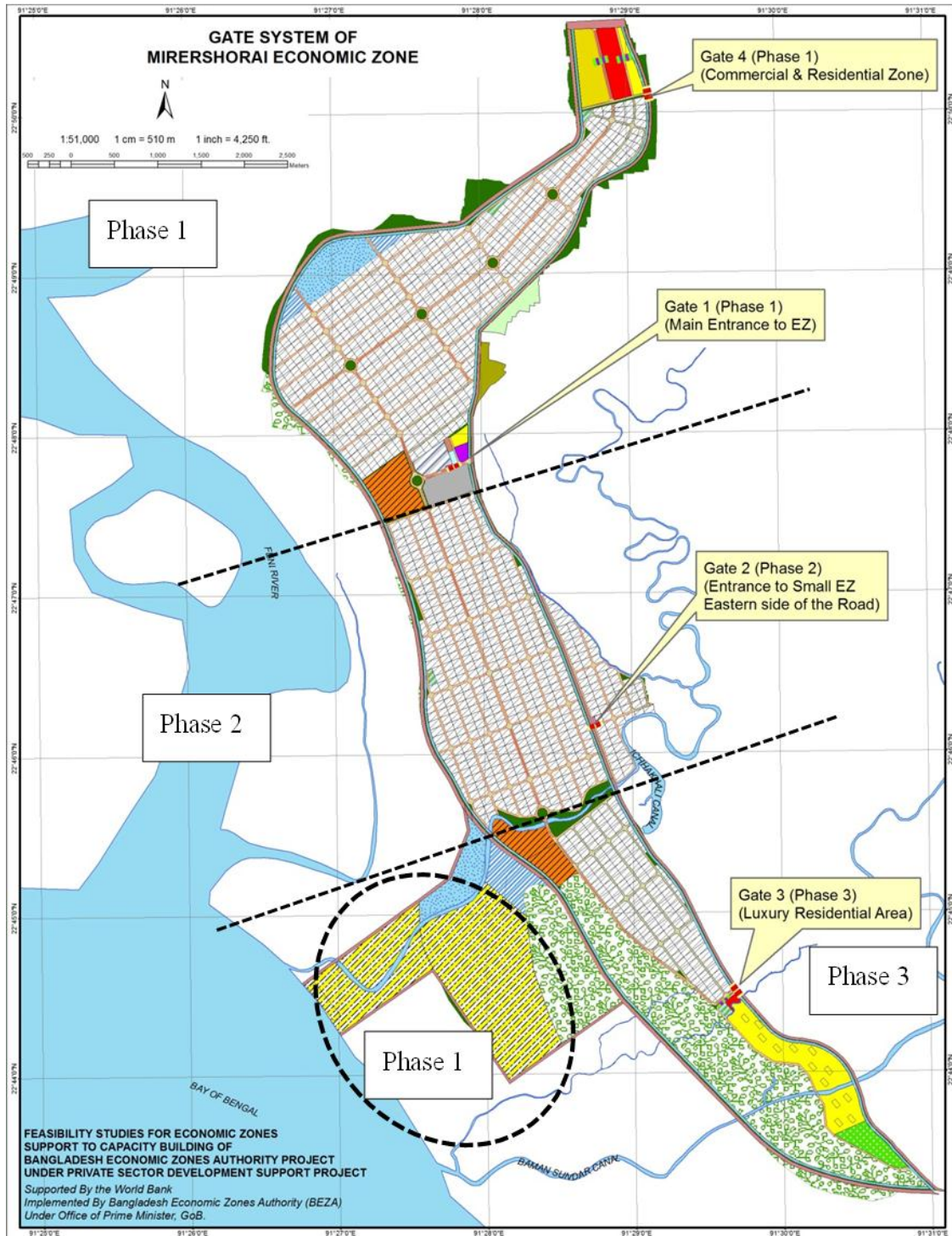
Phase 3:

Phase 3 covers the industrial zone as well as the school zone, small market zone, and a luxury housing area close to the green zone with existing natural streams. The main role of this zone is to increase the value added of the entire economic zone.

The Phasing is explained in the following drawing. The special attention should be paid to the seaside area to be covered in the phase 2. The following development items will be included in the phase 1.

- Reclamation
- Coal-fired Power Plant
- Coal Stock Yard
- Jetty
- 6m deep chanel for importing coal

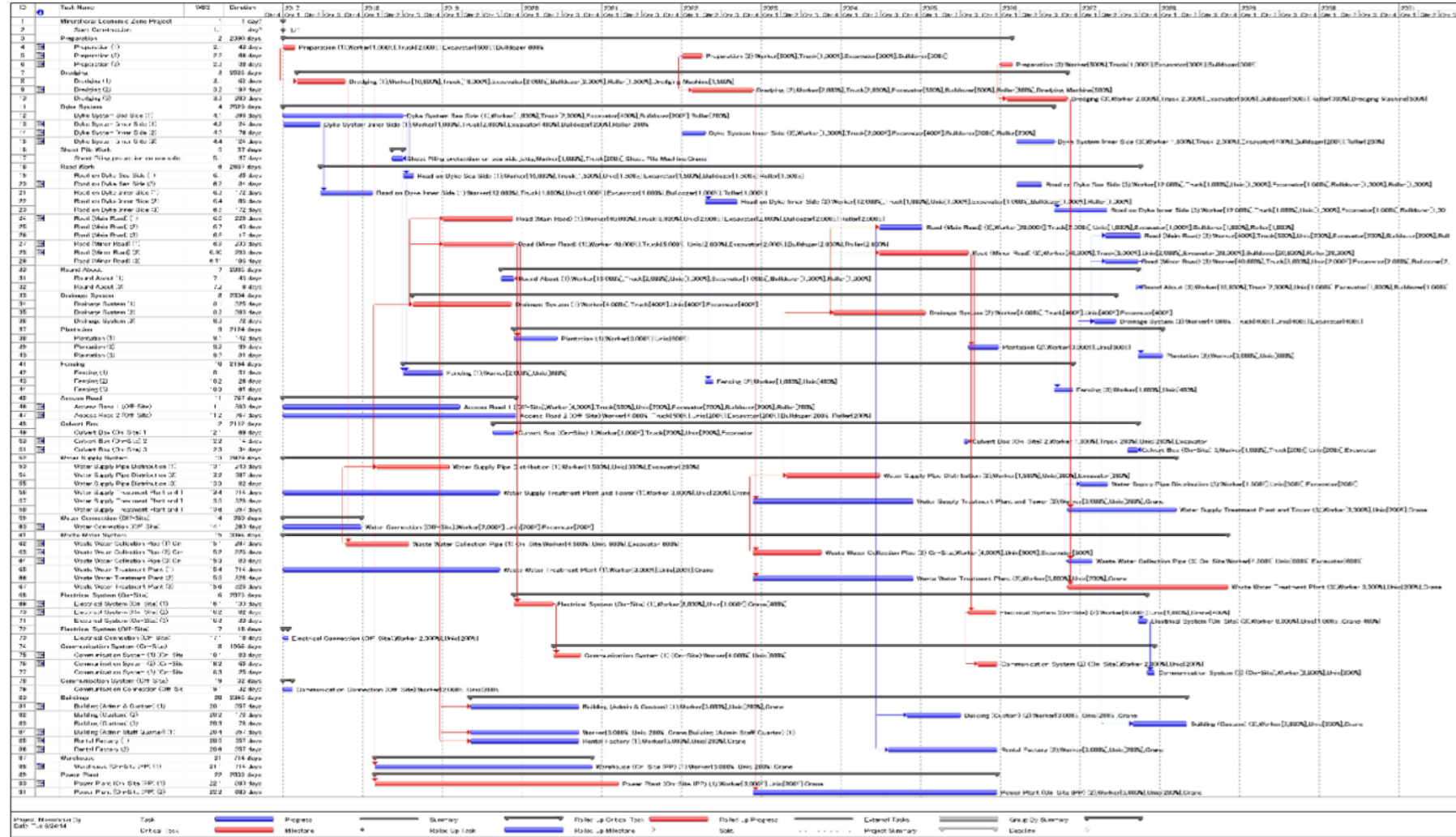
Figure 3.5.1-1: Phasing of Mirershorai Economic Zone



3.5.2 Construction Schedule

It is assumed that the land acquisition is anticipated to take about two years. The tender and detailed design will be carried out by the end of 2016. The construction of the phase 1 area will start in 2017 and will be finished by the first quarter of 2021 when the power will become available. The design review for the phase 1 and the detailed design for the phase 2 and 3 will be done between the completion of the first phase and the beginning of the second. The construction of the phase 2 work items will start in the beginning of 2022 and will be completed by the end of 2025. Phase 3 construction will start in 2026 soon after the completion of the phase 2 work items, and will be finished by the end of 2028. The whole schedule is shown in the following Gantt chart.

Figure 3.5.2-1: Phasing of Mirershorai Economic Zone



Footnote

- (1) Scope of Works of Phase 1
- (2) Scope of Works of Phase 2
- (3) Scope of Works of Phase 3

3.5.3 Construction Cost

Construction cost is outlined in the following tables. Detail of the cash flow can be found in Annex 3.

Table 3.5.2-2: Summary of Cost by Year

Phase	Phase 1 and Design Review (2021)					Phase 2				Phase 3			Total Cost	
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total (BDT)	Total (USD)
On-site Cost	12,522,066,987	4,437,389,241	7,623,608,419	2,271,787,739	0	4,210,962,488	2,414,690,167	4,594,680,552	2,819,117,109	2,897,921,254	3,300,366,290	406,204,460	47,498,794,706	593,734,934
Off-site Cost	1,567,959,895	459,725,922	265,678,590	0	0	0	0	0	0	0	0	0	2,293,364,407	28,667,055
IPP/Independent Developer	0	7,351,338,561	8,748,425,528	8,610,714,340	1,620,000,000	840,000,000	7,800,000,000	7,860,000,000	7,500,000,000	0	0	0	50,330,478,429	629,130,980
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,079	1,620,000,000	5,050,962,488	10,214,690,167	12,454,680,552	10,319,117,109	2,897,921,254	3,300,366,290	406,204,460	100,122,637,542	
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	155,683,507	128,988,964	36,224,016	41,254,579	5,077,556		1,251,532,969

Table 3.5.2-3: Summary of Cost by Phase

Phase	Phase 1	Phase 2	Phase 3	Total Cost	
	2017-2021	2022-2025	2026-2028	Total (BDT)	Total (USD)
On-site Cost	26,854,852,386	14,039,450,316	6,604,492,004	47,498,794,706	593,734,934
Off-site Cost	2,293,364,407	0	0	2,293,364,407	28,667,055
IPP/Independent Developer	26,330,478,429	24,000,000,000	0	50,330,478,429	629,130,980
Total (BDT)	55,478,695,222	38,039,450,316	6,604,492,004	100,122,637,542	
Total (USD)	693,483,690	475,493,129	82,556,150		1,251,532,969

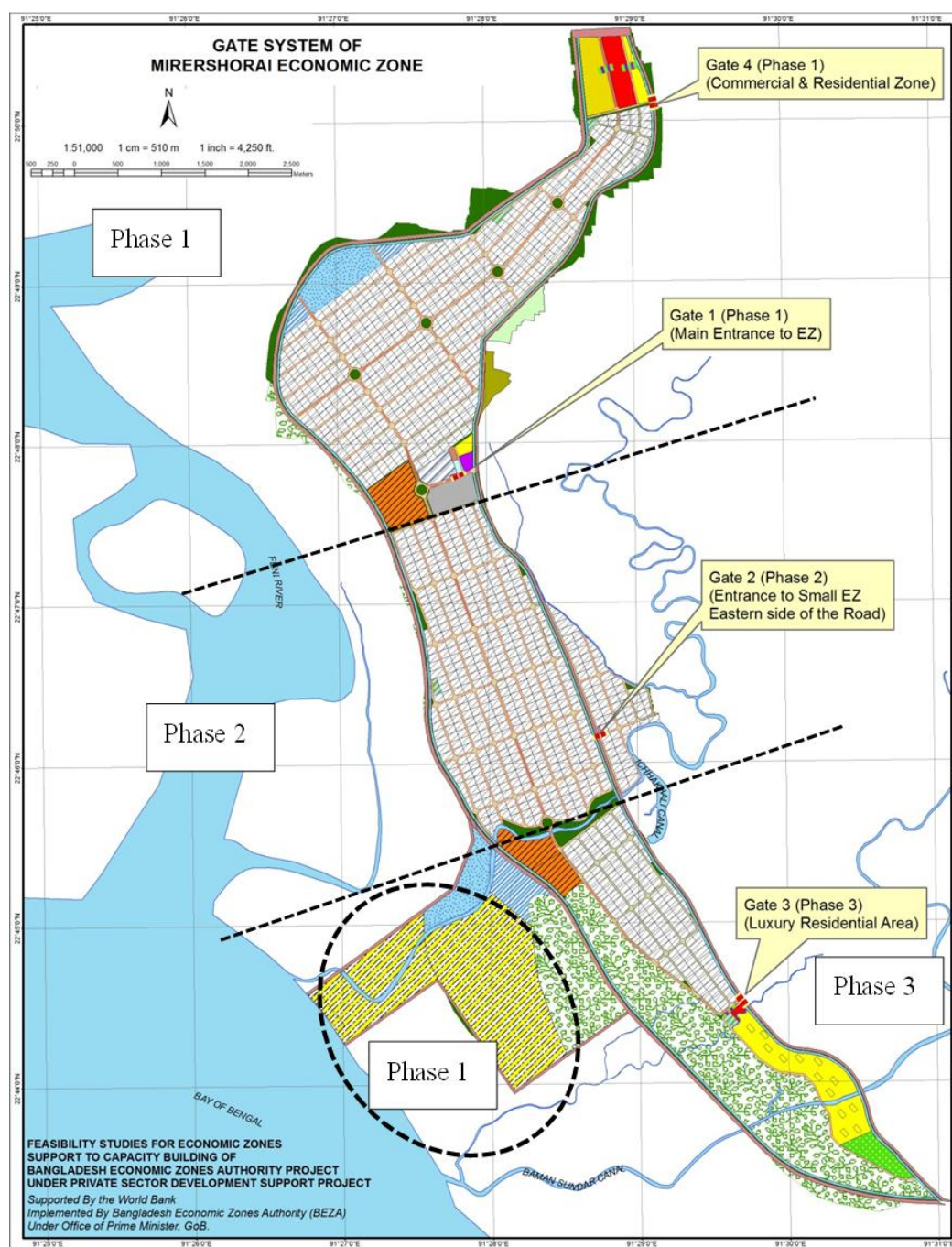
3.5.4 Comparative Scenario of Land Sale, Industry Operation, Utility Demand and Construction Schedule

The comparative scenario of construction schedule with land sale, industry operation and utility demand is shown.

3.5.4.1 Review of Phasing Areas in Mirershorai Economic Zone

The entire area of the project is divided into three development zones by phase in order to respond to market demand.

Figure 3.5.4.1-1: Review of Master Plan (Phasing and Gate System)



3.5.4.2 Notes from the Gantt Chart

Phase 1

- 2017 Construction begins.
- 2018 Dredging and Dike are completed. Most underground utilities are installed.
- 2019 Roads are completed.
Industry Plots become leasable.
- 2021 Power Plant (1st unit of 300MW) is completed.
- 2022 Reviewing market and detail design for phase 2 and pahse 2.

Phase 2

- 2022 Construction begins.
- 2023 Most underground utilities are installed.
- 2024 Drainage system is completed. Most roads are completed.
Industry Plots become leasable.
- 2025 Power Plant (2nd unit of 300MW, 600MW in total) is completed.
Infrastructure of the phase 2 are completed.

Phase 3

- 2026 Construction begins.
- 2027 Most underground utilities are installed.
Drainage system is completed. Most roads are completed.
Industry Plots become leasable.
- 2028 All infrastructure are completed.

3.5.4.3 Schedule of Land Development

Summarizing the construction schedule mentioned above, the the time frame of the land development is shown.

Table 3.5.4.3-1: Developed Area for Land Lease

Land	Land Use	Area Construction Phase Year	Developed Area for Land Lease (Hectares)													Total Area		
			Phase 1				DR	Phase 2				Phase 3			Operation	Hectares	Acres	
			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029			
Developed Land	Industry Plot		0	0	570.41	0	0	0	0	540.47	0	0	0	147.82	0	0	1,258.70	3,108.99
	Rental Factory		0	0	10.46	0	0	0	0	0	0	0	0	0	0	0	10.46	25.84
	Warehouse Zone		0	0	17.83	0	0	0	0	0	0	0	0	0	0	0	17.83	44.04
	Stock Yard, Jetty		0	93.96	0	0	0	0	0	0	0	0	0	0	0	0	93.96	232.08
	Coal-fired Power Plant		0	195.71	0	0	0	0	0	0	0	0	0	0	0	0	195.71	483.40
	Commercial Area		0	0	18.45	0	0	0	0	0	0	0	1.56	0	0	0	20.01	49.42
	Residential Area		0	0	7.43	0	0	0	0	0	0	0	60.50	0	0	0	67.93	167.79
	International School		0	0	0	0	0	0	0	0	0	0	16.71	0	0	0	16.71	41.27
	Vocational Training		0	0	13.52	0	0	0	0	0	0	0	0	0	0	0	13.52	33.39
	Medical College and Hospital		0	0	10.79	0	0	0	0	0	0	0	0	0	0	0	10.79	26.65
Total Area (Hectares)			0.00	289.67	648.89	0.00	0.00	0.00	0.00	540.47	0.00	0.00	226.59	0.00	0.00	1,705.62		
Cumulative Total (Hectares)				289.7	938.6	938.6	938.6	938.6	938.56	1,479.03	1,479.03	1,479.03	1,705.62	1,705.62	1,705.62			
Total Area (Acres)			0.00	715.48	1,602.76	0.00	0.00	0.00	0.00	1,334.96	0.00	0.00	559.68	0.00	0.00		4,212.88	

Note: DR is the design review.

3.5.4.4 Schedule of Land Sales

Considering the land demand projection, the developed land will be acquired by tenants. The projection is shown.

Table 3.5.4.4-1: Estimated Land Area (Year-wise sales schedule)

Land	Land Use		Area Year	Demanded Land Area (Hectare)												Total Area			
				2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Hectares	Acres	
Demanded Land	Garment & Textile	Garment	0	0	11	21	32	25	11.40	0	0	0	0	0	0	100.40	247.99		
		Garment Accessories	0	0	5	9	13	10	4.82	0	0	0	0	0	0	41.82	103.30		
		Integrated Textiles	0	0	11	21	32	25	11.01	0	0	0	0	0	0	100.01	247.02		
	Auto & Machine Parts	Motorbike Assembly	0	0	10	0	0	0	10.11	0	0	0	0	0	0	20.11	49.67		
		Automobile Assembly	0	0	0	0	0	0	0	0	0	150.36	0	0	0	150.36	371.39		
		Automobile Parts	0	0	16	34	50	40	16.56	64	96	81.95	60	45.64	0	504.15	1,245.25		
		Other Parts & Machinery	0	0	6	14	20	12	8.20	34	52	41.80	26	16.18	0	230.18	568.54		
	Industry Plot	Chemical and Other Products		0	0	4	10	14	10	5.32	2	4	6.34	0	0	0	55.66	137.48	
		Food & Beverage		0	0	4	12	16	12	3.99	4	4.02	0	0	0	0	56.01	138.34	
		Sub-Total (Industry Plot)		0	0	67	121	177	134	71.41	104	156.02	280.45	86	61.82	0	1,258.70	3,108.99	
		Demanded Areas in Each Phase	Phase 1	year-wise	0	0	67	121	177	134	71	0	0	0	0	0	570.41	1,408.91	
				cumulative	0	0	67	188	365	499	570.41	570.41	570.41	570.41	570.41	570.41	570.41		
				%	0	0	12	33	64	87	100	100	100	100	100	100	100		
			Phase 2	year-wise	0	0	0	0	0	0	0	104	156	280	0	0	0	540.47	1,334.96
				cumulative	0	0	0	0	0	0	0	104	260.02	540.47	540.47	540.47	540.47		
				%	0	0	0	0	0	0	0	19	48	100	100	100	100		
			Phase 3	year-wise	0	0	0	0	0	0	0	0	0	0	86.00	61.82	0	147.82	365.12
	cumulative			0	0	0	0	0	0	0	0	0	0	86	147.82	147.82			
	%			0	0	0	0	0	0	0	0	0	0	58	100	100			
	Rental Factory		0	0	0	5.23	0	0	0	0	5.23	0	0	0	0	10.46	25.84		
Warehouse Zone		0	0	0	17.83	0	0	0	0	0	0	0	0	0	17.83	44.04			
Stock Yard, Jetty		0	93.96	0	0	0	0	0	0	0	0	0	0	0	93.96	232.08			
Coal-fired Power Plant		0	195.71	0	0	0	0	0	0	0	0	0	0	0	195.71	483.40			
Commercial Area		0	0	18.45	0	0	0	0	0	0	0	1.56	0	0	20.01	49.42			
Residential Area		0	0	7.43	0	0	0	0	0	0	0	60.50	0	0	67.93	167.79			
International School		0	0	0	0	0	0	0	0	0	0	16.71	0	0	16.71	41.27			
Vocational Training		0	0	13.52	0	0	0	0	0	0	0	0	0	0	13.52	33.39			
Medical College and Hospital		0	0	10.79	0	0	0	0	0	0	0	0	0	0	10.79	26.65			
Total Area (Hectares)		0	289.67	117.19	144.06	177.00	134.00	71.41	104.00	161.25	280.45	164.77	61.82	0.00	1,705.62				
Cumulative Total (Hectares)				406.86	550.92	727.92	861.92	933.33	1,037.33	1,198.58	1,479.03	1,643.80	1,705.62	1,705.62					
Total Area (Acres)		0.00	715.48	289.46	355.83	437.19	330.98	176.38	256.88	398.29	692.71	406.98	152.70	0.00		4,212.88			

Assumptions**Areas in Phase 1**

(1) Five years are needed for most industries to acquire the plots after the plots become leasable. (2) In 2022, the acquired land reaches more than 80% (87%) of the total industry plot area in the phase 1 and the next construction of phase 2 begins.

Areas in Phase 2

(1) Three years are needed for most industries to acquire the plots after the plots become leasable. (2) In 2026, the acquired land reaches 100% of the total industry plot area in the phase 2 and the next construction of phase 3 begins.

Areas in Phase 3

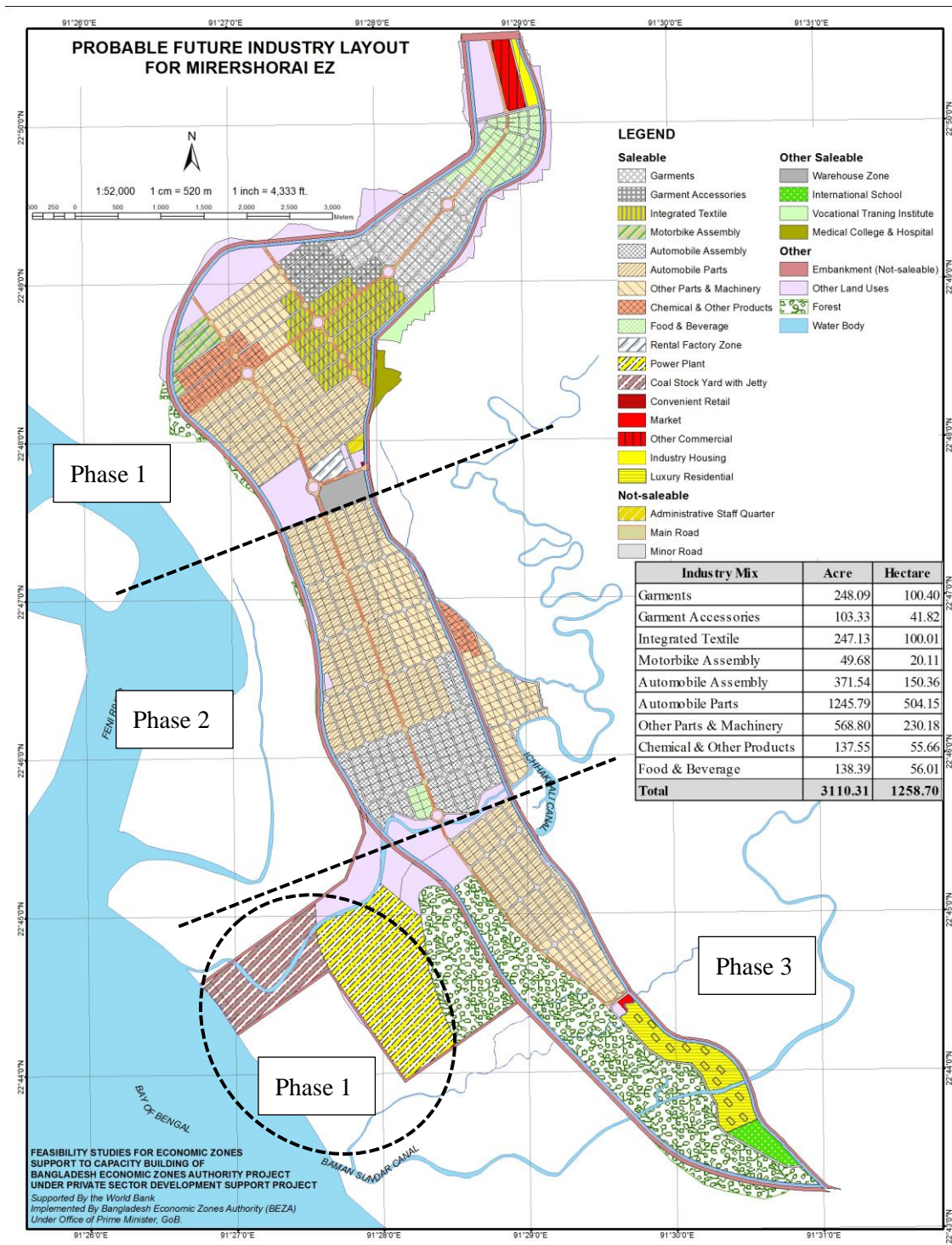
(1) Two years are needed for most industries to acquire the plots after the plots become available for lease.

These demands are reflected in the following probable industry layout.

3.5.4.5 Probable Industry Layout

With consideration of the schedule of land sales and the land availability in each phase, the probable industry layout is determined. The probable industry layout for Mirershorai EZ is given next. The existing industries such as garments and textiles, automobile parts, and motorbikes are expected to locate in the phase 1 area. The automobile assembly industry is expected to come in the phase 2 area. Other parts and machinery industry are expected to come in the phase 3 area.

Figure 3.5.4.5-1: Probable Industry Layout



3.5.4.6 Land under Operation

The following table shows the probable land area under operation.

Table 3.5.4.6-1: Land under Operation

Land	Land Use		Area Year	Operating Land Area (Hectare)														Total Area		
				2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Hectares	Acres
Demanded Land	Industry Plot	Garment & Textile	Garment	0	0	0	0	0	32	29	27.95	9.1	2.85	0	0	0	0	0	100.40	247.99
			Garment Accessories	0	0	0	0	0	13.5	11.75	11.66	3.71	1.2	0	0	0	0	0	41.82	103.30
			Integrated Textiles	0	0	0	0	0	32	28.5	27.76	9	2.75	0	0	0	0	0	100.01	247.02
		Auto & Machine Parts	Motorbike Assembly	0	0	0	0	0	5	2.5	7.56	2.53	2.52	0	0	0	0	0	20.11	49.67
			Automobile Assembly	0	0	0	0	0	0	0	0	0	0	75.18	37.59	37.59	0	0	150.36	371.39
			Automobile Parts	0	0	0	0	0	50	45	43.28	14.14	84.14	80.98	60.49	73.31	26.41	26.40	504.15	1,245.25
		Other Parts & Machinery	0	0	0	0	0	20	16.00	17.1	5.05	45.05	42.40	31.95	31.54	10.55	10.54	230.18	568.54	
		Chemical and Other Products	0	0	0	0	0	14	12	12	3.83	4.33	4.67	3.09	1.58	0	0	55.66	137.48	
		Food & Beverage	0	0	0	0	0	16	14	13	4	5.01	2.00	2	0	0	0	56.01	138.34	
	Sub-Total (Industry Plot)	0	0	0	0	0	182.50	158.25	160.47	51.36	147.85	205.23	135.12	144.02	36.96	36.94	1,258.70	3,108.99		
	Rental Factory	0	0	0	0	2.615	1.31	1.31	0	0	2.615	1.31	1.31	0	0	0	10.46	25.84		
	Warehouse Zone	0	0	0	0	8.92	4.46	4.45	0	0	0	0	0	0	0	0	17.83	44.04		
	Stock Yard, Jetty	0	0	0	0	46.98	0	0	0	46.98	0	0	0	0	0	0	93.96	232.08		
	Coal-fired Power Plant	0	0	0	0	97.85	0	0	0	97.86	0	0	0	0	0	0	195.71	483.40		
	Commercial Area	0	0	0	0	9.23	4.61	4.61	0	0	0	0	0	1.56	0	0	20.01	49.42		
	Residential Area	0	0	0	0	3.72	1.86	1.85	0	0	0	0	0	30.25	15.13	15.12	67.93	167.79		
	International School	0	0	0	0	0	0	0	0	0	0	0	0	8.36	4.18	4.17	16.71	41.27		
Vocational Training	0	0	0	0	6.76	3.38	3.38	0	0	0	0	0	0	0	0	13.52	33.39			
Medical College and Hospital	0	0	0	0	5.4	2.7	2.69	0	0	0	0	0	0	0	0	10.79	26.65			
Total Area (Hectares)	0.00	0.00	0.00	0.00	181.47	200.82	176.54	160.47	196.20	150.47	206.54	136.43	184.19	56.27	56.23	1,705.62				
Cumulative Total (Hectares)	0.00	0.00	0.00	0.00	181.47	382.29	558.83	719.30	915.50	1,065.97	1,272.50	1,408.93	1,593.12	1,649.39	1,705.62					
Total Area (Acres)	0.00	0.00	0.00	0.00	448.23	496.03	436.05	396.36	484.61	371.65	510.15	336.98	454.95	138.99	138.89		4,212.88			

Assumptions**Industries****Areas in Phase 1**

- 2020 All utilities and roads are completed.
- 2021 Coal-fired Power Plant (1st unit of 300 MW) is completed.
The occupancy permit is issued. Tenants start factory construction.
- 2022 Tenants start operation which covers the 50% of their leased land.
- 2023 Tenants expand their operation which covers the remaining 25% of their leased land.
- 2024 Tenants expand their operation which covers the remaining 25% of their leased land.

Areas in Phase 2

- 2025 All utilities and roads are completed. The expanded power plant is completed (2nd unit of 300MW, 600MW in total). The occupancy permit is issued. Tenants start factory construction.
- 2026 Tenants start operations which covers the 50% of their leased land.
- 2027 Tenants expand their operations which covers the remaining 25% of their leased land.
- 2028 Tenants expand their operations which covers the remaining 25% of their leased land.

Areas in Phase 3

- 2028 At the end of 2028, all infrastructure including utilities and roads are completed. The occupancy permit is issued. Tenants start factory construction.
- 2029 Tenants start operations which covers the 50% of their leased land.
- 2030 Tenants expand their operations which covers the remaining 25% of their leased land.
- 2031 Tenants expand their operations which covers the remaining 25% of their leased land.

Other Functions**Rental Factory and Warehouse**

Rental Factory (1) and Warehouse:

Three years are needed for the development of full operations (2021 – 2023) after the completion of the Power Plant.

Rental Factory (2):

Three years are needed for the development of full operations (2026 – 2028)

Commercial**Inside phase 1 zone:**

Three years are needed for the development of full operations (2021-2023) after the completion of the power plant.

Inside phase 3 zone:

One year is needed for the development of full operation (2029).

Residential**Inside phase 1 zone:**

Three years are needed for the development of full operation (2021-2023).

Inside phase 3 zone:

Three years are needed for the development of full operations (2029-2031).

International School

Inside phase 3 zone: Three years are needed for the development of full operations (2029-2031).

Vocational Training

Three years are needed for the development of full operations (2021-2023)

Medical College and Hospital

Three years are needed for the development of full operations (2021-2023)

Coal-fired Power Plant and Stock Yard with Jetty

50% of land is in operation in 2021 (300MW), and another 50% of land is in operation in 2025 (300MW).

3.5.4.7 Utility Demand

Table 3.5.4.7-1 shows the per hectare demand for utilities for the industry mix proposed for Mirershorai EZ which are collected data through marketing reserach.

Table 3.5.4.7-1: Unit Rate of Utility Demand (Per Hectare) For Mirershorai EZ

Industry Type	Power (MW)	Water (m ³)
Garment	0.09	399
Garment Accessories	0.17	302
Integrated Textile	1.38	1921
Motorbike Assembly	0.35	70
Automobile Assembly	0.42	56
Automobile Parts	0.42	18
Other Parts & Machinery	0.42	18
Chemical and Other Products	0.08	700
Food & Beverage	0.04	33
Commercial, Residential and Supporting	0.25	20

Considering the forecast land area under operation and using the above unit rate of the utility demand, the power demand is shown next.

Table 3.5.4.7-2: Utility Demand by Industries (Power)

Land Use			Unit Rate (MW/ha)	Demanded Power (MW)														Total (MW)	
				2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030		2031
Industry Plot	Garment & Textile	Garment	0.09	0.00	0.00	0.00	0.00	0.00	2.88	2.57	2.52	0.82	0.26	0.00	0.00	0.00	0.00	0.00	9.04
		Garment Accessories	0.17	0.00	0.00	0.00	0.00	0.00	2.30	2.00	1.98	0.63	0.20	0.00	0.00	0.00	0.00	0.00	7.11
		Integrated Textiles	1.38	0.00	0.00	0.00	0.00	0.00	44.16	39.33	38.31	12.42	3.80	0.00	0.00	0.00	0.00	0.00	138.01
	Auto & Machine Parts	Motorbike Assembly	0.35	0.00	0.00	0.00	0.00	0.00	1.75	0.88	2.65	0.89	0.88	0.00	0.00	0.00	0.00	0.00	7.04
		Automobile Assembly	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.58	15.79	15.79	0.00	0.00	63.15
		Automobile Parts	0.42	0.00	0.00	0.00	0.00	0.00	21.00	18.90	18.18	5.94	35.34	34.01	25.41	30.79	11.09	11.09	211.74
		Other Parts & Machinery	0.42	0.00	0.00	0.00	0.00	0.00	8.40	6.72	7.18	2.12	18.92	17.81	13.42	13.25	4.43	4.43	96.68
	Chemical and Other Products		0.08	0.00	0.00	0.00	0.00	0.00	1.12	0.96	0.97	0.31	0.35	0.37	0.25	0.13	0.00	0.00	4.45
	Food & Beverage		0.04	0.00	0.00	0.00	0.00	0.00	0.64	0.56	0.52	0.16	0.20	0.08	0.08	0.00	0.00	0.00	2.24
	Sub-Total (Industry Plot)				0.00	0.00	0.00	0.00	0.00	80.49	70.39	70.81	22.82	59.40	83.40	54.61	59.82	15.52	15.51
Rental Factory			0.46	0.00	0.00	0.00	0.00	1.20	0.60	0.60	0.00	0.00	1.20	0.60	0.60	0.00	0.00	0.00	4.81
Warehouse Zone			0.25	0.00	0.00	0.00	0.00	2.23	1.12	1.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.46
Stock Yard, Jetty				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Coal-fired Power Plant				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00
Commercial Area			0.25	0	0.00	0.00	0.00	2.31	1.15	1.15	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.00	5.00
Residential Area			0.25	0	0.00	0.00	0.00	0.93	0.47	0.46	0.00	0.00	0.00	0.00	0.00	7.56	3.78	3.78	16.98
International School			0.25	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.09	1.05	1.04	4.18
Vocational Training			0.25	0	0.00	0.00	0.00	1.69	0.85	0.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38
Medical College and Hospital			0.25	0	0.00	0.00	0.00	1.35	0.68	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.70
Total (MW)				0	0.00	0.00	0.00	9.71	85.34	75.23	70.81	22.82	60.60	84.00	55.21	69.87	20.35	20.34	574.28
Cumulative Total (MW)				0	0.00	0.00	0.00	9.71	95.05	170.28	241.10	263.91	324.51	408.51	463.72	533.59	553.94	574.28	

Assumptions

Utility demand is proportional to the land area under industrial operation.

Unit rate of rental factory is the average of all industries.

Considering the forecasted land area under operation and using the above unit rate of the utility demand, the water demand is shown next.

Table 3.5.4.7-3: Utility Demand by Industries (Water)

Land Use		Unit Rate m ³ /day/ha	Demanded Water (m ³ /day)															Total m ³ /day	
			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031		
Industry Plot	Garment & Textile	Garment	399	0.00	0.00	0.00	0.00	0.00	12,768.00	11,371.50	11,152.05	3,630.90	1,137.15	0.00	0.00	0.00	0.00	0.00	40,059.60
		Garment Accessories	302	0.00	0.00	0.00	0.00	0.00	4,077.00	3,548.50	3,521.32	1,120.42	362.40	0.00	0.00	0.00	0.00	0.00	12,629.64
		Integrated Textiles	1921	0.00	0.00	0.00	0.00	0.00	61,472.00	54,748.50	53,326.96	17,289.00	5,282.75	0.00	0.00	0.00	0.00	0.00	192,119.21
	Auto & Machine Parts	Motorbike Assembly	70	0.00	0.00	0.00	0.00	0.00	350.00	175.00	529.20	177.10	176.40	0.00	0.00	0.00	0.00	0.00	1,407.70
		Automobile Assembly	56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4,210.08	2,105.04	2,105.04	0.00	0.00	8,420.16
		Automobile Parts	18	0.00	0.00	0.00	0.00	0.00	900.00	810.00	779.04	254.52	1,514.52	1,457.64	1,088.82	1,319.58	475.38	475.20	9,074.70
		Other Parts & Machinery	18	0.00	0.00	0.00	0.00	0.00	360.00	288.00	307.80	90.90	810.90	763.20	575.10	567.72	189.90	189.72	4,143.24
	Chemical and Other Products	700	0.00	0.00	0.00	0.00	0.00	9,800.00	8,400.00	8,512.00	2,681.00	3,031.00	3,269.00	2,163.00	1,106.00	0.00	0.00	0.00	38,962.00
	Food & Beverage	33	0.00	0.00	0.00	0.00	0.00	528.00	462.00	429.00	132.00	165.33	66.00	66.00	0.00	0.00	0.00	0.00	1,848.33
	Sub-Total (Industry Plot)		0.00	0.00	0.00	0.00	0.00	79,927.00	70,941.50	69,616.37	22,562.84	9,284.12	6,430.92	3,768.96	3,992.34	665.28	664.92	267,854.25	
Rental Factory	397	0.00	0.00	0.00	0.00	1,038.16	519.08	519.08	0.00	0.00	1,038.16	519.08	519.08	0.00	0.00	0.00	0.00	4,152.62	
Warehouse Zone	20	0.00	0.00	0.00	0.00	178.40	89.20	89.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	356.60	
Stock Yard, Jetty		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
Power Plant		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00	
Commercial Area	20	0.00	0.00	0.00	0.00	184.50	92.25	92.25	0.00	0.00	0.00	0.00	0.00	0.00	31.20	0.00	0.00	400.20	
Residential Area	20	0.00	0.00	0.00	0.00	74.40	37.20	37.00	0.00	0.00	0.00	0.00	0.00	0.00	605.00	302.60	302.40	1,358.60	
International School	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	167.20	83.60	83.40	334.20		
Vocational Training	20	0.00	0.00	0.00	0.00	135.20	67.60	67.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	270.40	
Medical Collage and Hospital	20	0.00	0.00	0.00	0.00	108.00	54.00	53.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	215.80	
Total (m³/day)		0.00	0.00	0.00	0.00	1,718.66	80,786.33	71,800.23	69,616.37	22,562.84	10,322.28	6,950.00	4,288.04	4,795.74	1,051.48	1,050.72	274,942.67		
Cumulative Total (m³/day)		0.00	0.00	0.00	0.00	1,718.66	82,504.98	154,305.21	223,921.58	246,484.42	256,806.70	263,756.69	268,044.73	272,840.47	273,891.95	274,942.67			

Assumptions

Utility demand is proportional to the land area under industrial operation.

Unit rate of rental factory is the average of all industries.

Table 3.5.4.7-4: Operating Land and Utility Demand

Operating Land and Utility Demand	Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Items	Project Stage	LA & DD	Phase 1					DR	Phase 2					Phase 3			Operation	
Cumulative Land under Operation (Hectares)	Hectare	0.00	0.00	0.00	0.00	0.00	0.00	181.47	382.29	558.83	719.30	915.50	1,065.97	1,272.50	1,408.93	1,593.12	1,649.39	1,705.62
Cumulative Power Demand (KW)	Unit	KW	0.00	0.00	0.00	0.00	0.00	9,709.15	95,048.73	170,283.30	241,095.40	263,910.40	324,510.60	408,507.25	463,721.30	533,588.60	553,939.30	574,276.60
Cumulative Water Demand (m ³ /day)	Unit	m ³ /day	0.00	0.00	0.00	0.00	0.00	1,718.66	82,504.98	154,305.21	223,921.58	246,484.42	256,806.70	263,756.69	268,044.73	272,840.47	273,891.95	274,942.67

Notes

LA & DD: Land acquisition and detail design

DR: Design Review

The summary of the utility demand is shown with graphs.

Figure 3.5.4.7-1: Cumulative Land under Operation

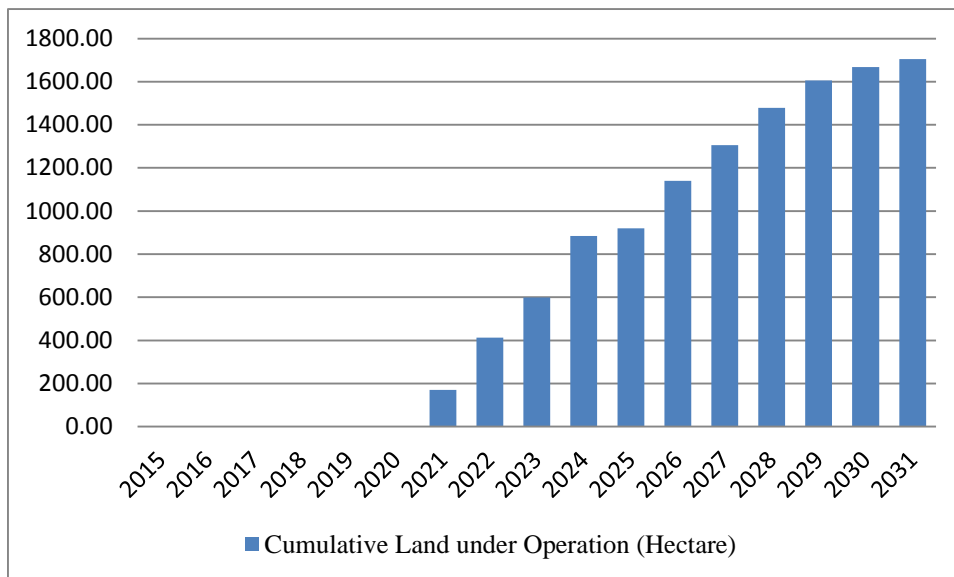
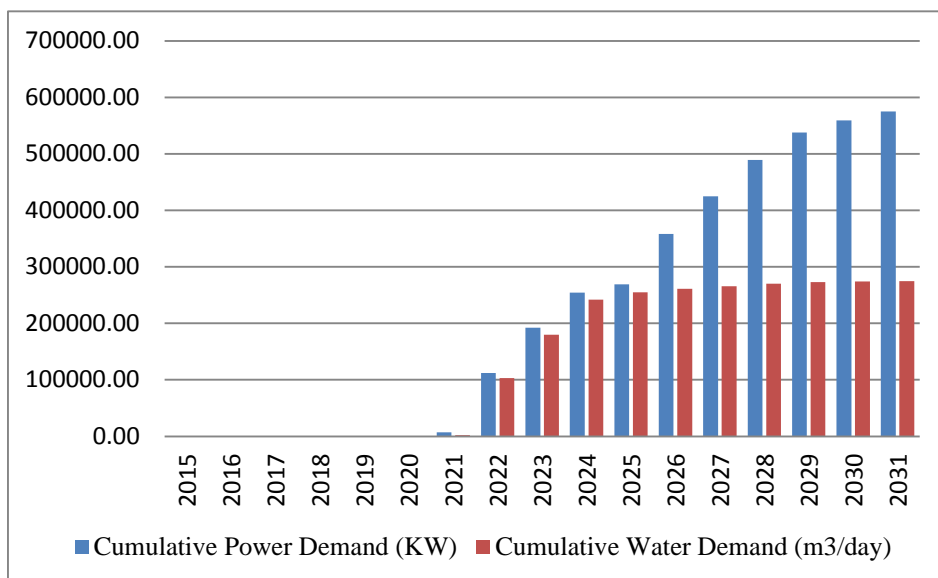


Figure 3.5.4.7-2: Cumulative Utility Demand



To validate the estimation of utility demand for the Mirershorai EZ, it was compared with utility use of Dhaka EPZ and Chittagong EPZ. It was also compared with some proposed future EZs (Sherpur and Anwara).

Table 3.5.4.7-5: Comparison of Daily Utility Demand (Per Hectare) Among Industrial Zones in Bangladesh

Utility	Dhaka EPZ	Chittagong EPZ	Sherpur EZ	Anwara EZ	Mirershorai EZ
Water (m ³ /day/ha)	516.72	1,677.00	663.04	85.98	161.20
Power (MW/ha)	0.51	0.48	0.37	0.24	0.34
Gas (m ³ /day/ha)	3,720.00	5,349.00	7,363.06	NA	NA

NA: Not Applicable

The utility data of Dhaka and Chittagong EPZ presented here represents the month of May and June 2013. From the table it can be seen that the utility requirement estimated for Mirershorai EZ is lower than the existing EPZs and about the same as that of other planned EZs. This is because of the different mix of industry in the EZ.

3.6 Building Guidelines

Key items of building guidelines required to make the economic zone a high quality environment, are described.

3.6.1 Architectural Plans

1. The tenants of plot/plots desiring to construct his building in the economic zone shall submit the architectural plans/area layouts for the proposed building and other ancillary structures.
2. Enlarged plans of the plot/plots shall be submitted giving dimensions of the plot and indicating the location of the building/buildings, parking areas, lawn, walk-ways, loading/unloading areas, vehicular and pedestrian approaches from the road, septic tank, guard house, pump-house, electric sub-station, boiler house, generator house, and surface drains, etc.
3. Special attention shall be paid to site plans and section drawings of the ground level. Directions and connection of the drainage system shall be clarified to connect the economic zone utilities.
4. Number of stories of buildings can be unlimited.

3.6.2 Compulsory Open Space Requirement

3.6.2.1 Ground Coverage and Setbacks

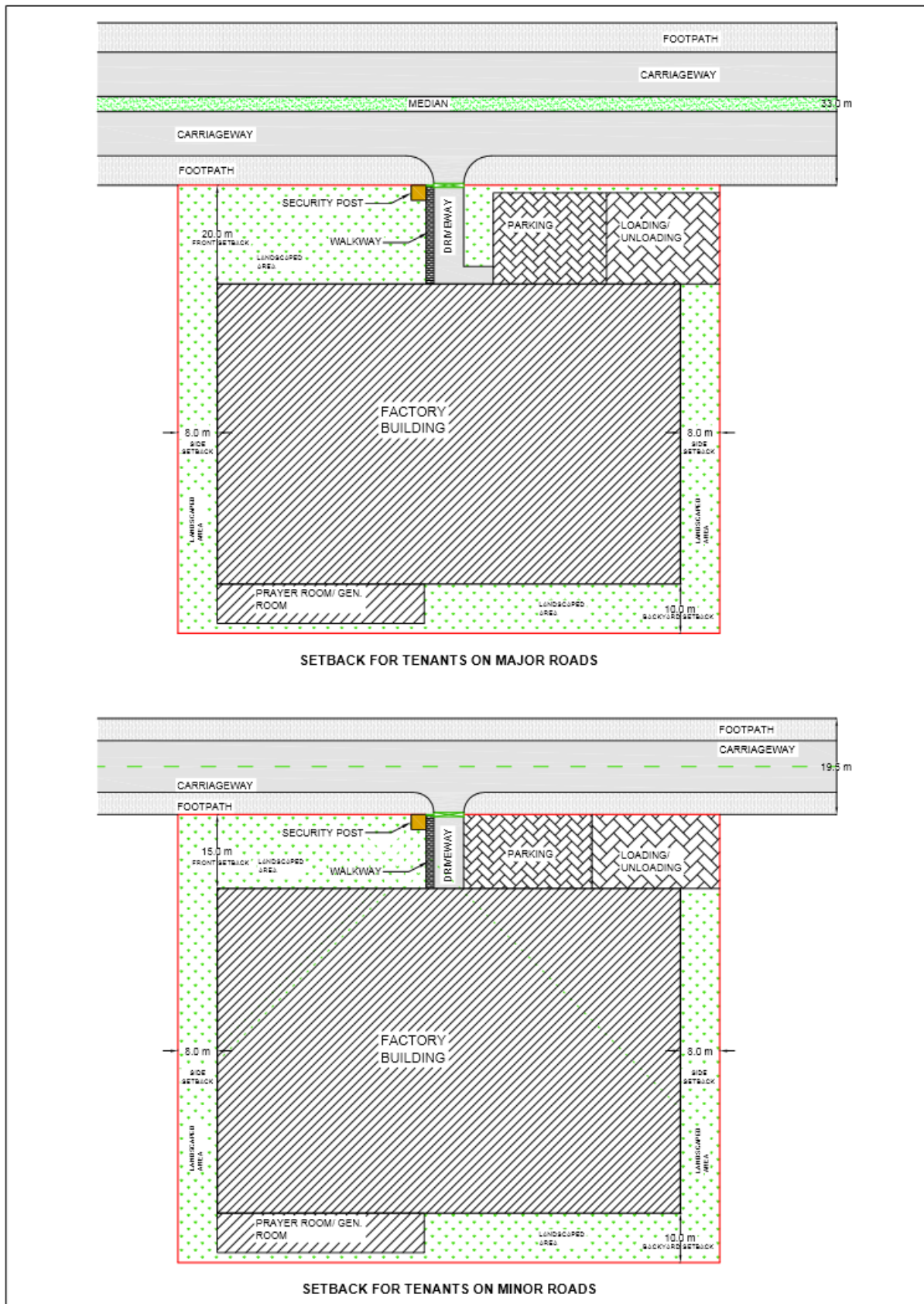
The setback areas are determined as in the flowing patterns shown in Figure 3.6.2.1-1.

- Minimum Setback from Plot boundary are as follows:
 - Frontage: 65.57 feet (20 m) for the main road (width = 33 m), 49.2 feet (15 m) for the minor road (width =19.5 m)
 - Side Yard: 26.2 feet (8 m) (on both sides)
 - Back Yard: 32.8 feet (10 m)

The followings are regulations on the ground coverage.

- Nothing can be constructed on the setback area on the side of the building for the firefighting. It should be properly landscaped with small sized trees.
- 30% of the setback area on the back yard can be used for services (generator room, prayer room, etc.)
- 65% of the frontage can be used for parking, loading unloading, security booth, walkway, and driveway etc.
- 35% of the setback at the frontage should be landscaped with trees and properly grassed.

Figure 3.6.2.1-1: Setbacks for Tenant Buildings on Major and Minor Roads



3.6.2.2 Parking

- Parking for industries and other facilities is to be developed within the plot. No on-street parking will be allowed within the EZ.
- 30% of the setback area on the front can be used as open parking.
- 30% of the setback area on the front can be used for loading and unloading.
- All plots will have a minimum parking space allocation of 1 standard sized automobile (2.5mx4.6m) per 200 m² of floor space.
- An extra 5% of ground coverage is permissible for construction of automated multi-level/multi-level parking with ramp parking structures for additional needs.
- In the case of basement parking, it cannot exceed the set back line and maximum 20% of the ground coverage. It should be kept as service area (prayer room, generator room etc.).
- Space Standard for parking:

Table 3.6.2.2-1: Equivalent Car Space (ECS) in Different Type of Parking

Parking Type	Area in m ² Per ECS
Open shed	23
Basement	32
Multi-level with ramp	30
Automated multi-level	16

- For bicycle parking, 1 space per 500 sqm floor space is to be provided.
- The dimension of parking area and turning radius will be fixed in accord with the following table below:

Table 3.6.2.2-2: Recommended Dimensions for Parking Area Design

Type of vehicle	Parking width (m)	Parking length (m)	Internal turning radius (m)	External turning radius (m)
Car	2.5	4.6	-	-
Truck	3.6	10.0	8.7	12.8
Trailer	3.6	18.0	6.9	13.8

3.6.2.3 Landscape

- All plant materials shall be watered with an automatic irrigation system.
- Sprinkler layout should be designed in a way that it minimizes the amount of spray that falls on sidewalks, neighbouring properties and buildings (no overspray onto hardscape or on landscaped areas).
- All grass areas should be mulched to a depth of 2 inches.
- The plant design shall address sight distance (no landscape improvements shall be placed so as to obstruct the vision of drivers and/or pedestrians).

3.6.3 Compulsory Exterior Requirements

3.6.3.1 Entrance/Exit of the Plot

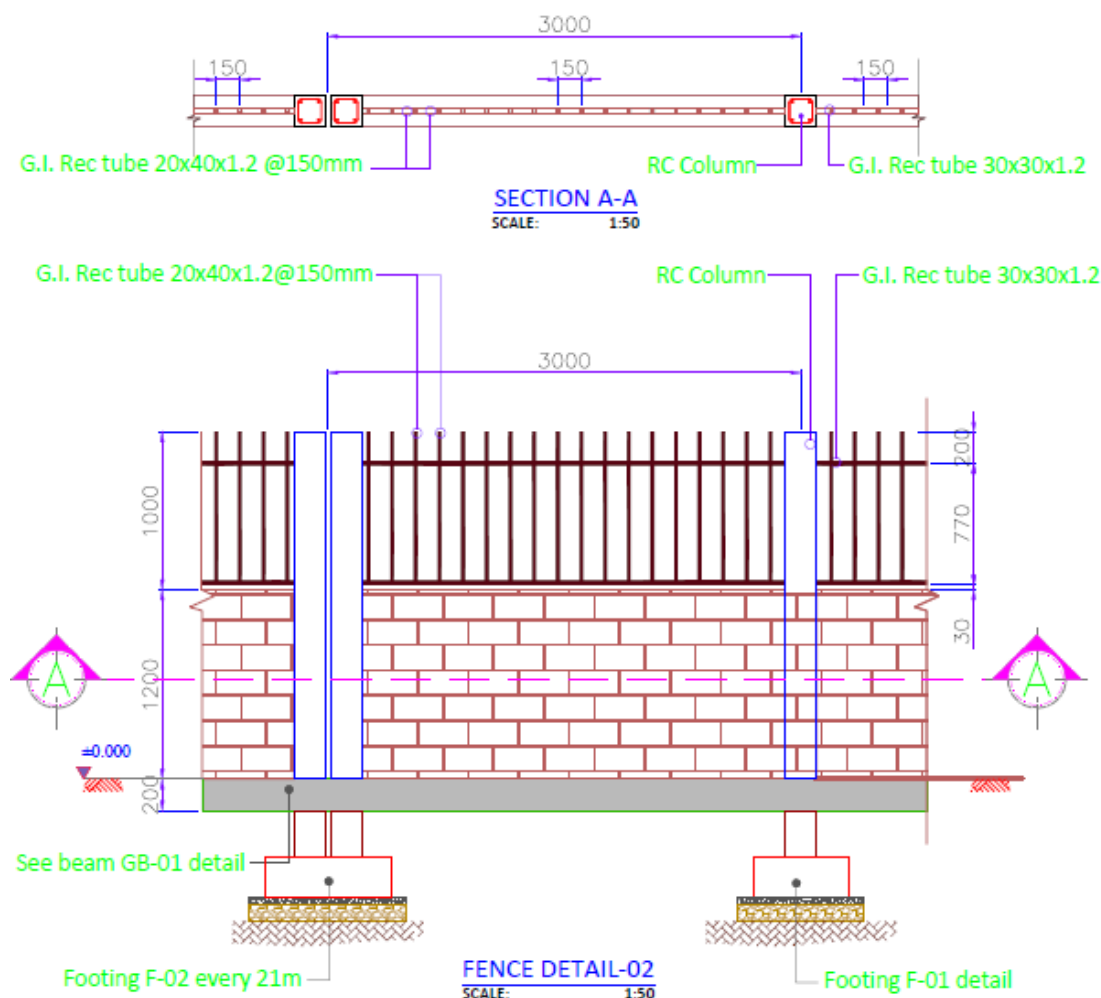
- 1) The gate of entrance/exit shall be located along the main or minor (secondary) road.
- 2) One main entrance/Exit gate has to be built for each plot. The main entrance gate has to face the road.

- 3) For safe and smooth and efficient traffic flow, the main entrance gate must be located at least 20 metres from major intersections.

3.6.3.2 Fence

- 1) The maximum height of fences, if any, shall be 7.2 feet (2.2 m) from the ground level. For the front side, the upper half portion should be open type and the lower half portion should be closed type. The standard sample is shown.

Figure 3.6.3.2-1: Standard Front Fence



- 2) The Fences facing the front road shall be open-type fences made of iron bars or galvanized chain-link fencing material framed with galvanized pipes and other similar types of fences. Details of colour and material should be discussed with the economic zone administrators.
- 3) No concealing fences shall be erected facing the roads for transparent purpose. On the other hand, the structure of the side and back fence should be closed type for security purpose.
- 4) The fence between two adjoining plots could be built rightly on the plot division line with agreement of both tenants of plot and the cost of the fencing could be shared by the two tenants.
- 5) The setback of 3.281 feet (1m) is required between the u-channel and the fence. This is for the necessary maintenance of the fence foundation in the future. The setback should be grassed for the landscape purpose.

3.6.3.3 Signage

The purpose of the Special Signage Regulations is to allow the Economic Zone Area to have sufficient signage for business purposes, while avoiding clutter and maintaining the character of the surrounding region.

1) Entrance of Office and Industrial Zone

One (1) entrance monument sign that is up to ten (10) feet in height (measured from the grade of the street centreline) and one hundred (100) square feet at each entrance to the zone from a public street are permitted. Such monument signs shall only announce the name of the economic zone.

2) Industrial Lots within the Economic Zone

One (1) monument sign shall be permitted at maximum of eight (8) feet tall and forty-eight (48) square feet in area. The amount of permitted building mounted signage shall be determined by the area of the building covering area or tenant space.

Over 40,000 square feet: Individual building users or tenant spaces shall be permitted one building mounted sign on each facade that faces a public street or main development driveway. However, no more than two such signs shall be permitted. The permitted size of the building mounted signs shall be two square feet for each lineal foot of building or tenant space width on which the sign is mounted but shall not exceed two hundred and fifty (250) square feet.

40,000 square feet in area or smaller: Individual buildings users or tenants spaces shall be permitted one building mounted sign for each facade that faces a public street or main development driveway. However, no more than two such sign shall be permitted. The permitted size of the building mounted sign shall be two square feet per each lineal foot of building or tenant space width on which the sign is mounted but shall not exceed one hundred fifty (150) square feet in area.

Monument Signs

The base and sides of the sign shall be constructed with a masonry product (excluding smooth or textured concrete block). The top of the sign shall have an architectural feature representing the concept of the economic zone. Single panel plexi-faced cabinets shall not be permitted.

Building Mounted Signs

Board signs, graphics painted directly on the building, manually changeable copy, electronically changeable copy, plexi-faced panels, internally illuminated awnings, firmly structured awnings with an “inflated” or plastic appearance and similar signs shall not be permitted unless specifically approved through a Design Review Meeting with the economic zone administrates.

3) Commercial Zone

3-1) COMMERCIAL/RETAIL/SHOPPING CENTERS

A group of retail and/or service establishments planned, developed and managed as a single site with common off street parking provided on the property.

One (1) architectural freestanding sign is permitted at the main development entrance where it meets a public street. The architectural freestanding sign shall include only the name of the centre and the major anchor tenant unless the conditions below are met. The maximum size of such a sign shall be two hundred (200) square feet in area. The maximum height of such a sign shall be proportional to the road frontage along which the sign is to be located: up to two hundred (200) feet of frontage allows a fifteen (15) foot tall sign and more than two hundred (200) feet of frontage allows a twenty (20) foot tall sign. Multi-tenant signs may be permitted with one tenant panel per 100,000 square feet of gross

floor area in the retail centre with a maximum of four such panels per retail centre. These multi-tenant panels shall be accessory to the main development identification portion of the sign.

3-2) INDIVIDUAL TENANT SPACES WITHIN COMMERCIAL/RETAIL/SHOPPING CENTRES

Anchor tenants over 40,000 square feet in area shall be permitted one building mounted sign on each facade that faces a public street or main development driveway. However, no more than two such signs shall be permitted. The permitted size of the building mounted signs shall be two square feet for each lineal foot of tenant space width on which the sign is mounted but shall not exceed two hundred and fifty (250) square feet.

Individual tenants spaces that are 40,000 square feet in area or smaller are permitted one building mounted sign. The permitted size of the building mounted sign shall be two square feet per each lineal foot of tenant space width on which the sign is mounted but shall not exceed one hundred (100) square feet in area. Corner tenant spaces can break their permitted square footage up and display it on the front and side facades if the side facade is visible from a public street or main development driveway. In such a case, the permitted signage can be broken into one sign area on the front facade and one sign area on the side facade.

3-3) FREESTANDING COMMERCIAL LOTS AND OUTLETS WITHIN COMMERCIAL/RETAIL/SHOPPING CENTERS

One building mounted sign shall be permitted on each facade that faces a public street or main development driveway. However, no more than two such signs shall be permitted. The permitted size of the building mounted signs shall be two square feet per each lineal foot of building or tenant space width on which the sign is mounted but shall not exceed two hundred (200) square feet in area. One monument sign shall also be permitted at maximum of eight (8) feet tall and twenty-four (24) square feet in area.

4) Administration of the Signage

As stated previously, all proposals that meet the Special Sign Regulations can proceed directly to the Sign Permit Review Process of the Economic Zoning Regulations. Proposals that do not meet the Special Sign Regulations shall be reviewed and suitable modifications will be advised by the Economic Zone Administrates.

3.6.4 Utility Connections

3.6.4.1 Electricity

The tenant shall apply to the economic zone administrates in prescribed form at least 30 days before the actually designated service connection. The following documents shall be submitted in triplicate with the application.

- Site map drawn to a suitable scale, showing the location of the tenant's sub-station within his premises and the location of the economic zone's 11KV line and incoming cable to be consumer's sub-station.
- Copies of the manufacture's test certificate and manual of the transformer as per BSS or IEC standard.
- Copy of the oil test report of the transformer (the oil test report is to be prepared after the transformer is brought to the site. Such tests may be conducted by Bangladesh Power Development Board or any expert recognized by the Chief Electrical Inspector of the economic zone.

3.6.4.2 Waste Water

- 1) Waste water drainage and rain water drainage system shall be designed separately.
- 2) The pre-treatment for toxic and chemical constituent elimination from each factory is required prior to discharging to the wastewater system.
- 3) The connection of water, electricity shall be carried out in consultation with the economic zone administrator.

3.6.4.3 Water Supply

- 1) The application in the prescribed form shall be submitted at least 30 days before the date of actual requirement of water.
- 2) Tenants have to construct their own over-head reservoir, pump and float valve etc. at their own cost before applying for construction.
- 3) The water metre has to be approved by the economic zone administrators and has to be arranged by the tenants at their own cost. The water metre shall be kept sealed and it shall always be available to the representative of the economic zone for checking and billing purpose. Without a metre, water connection can be given with the condition that the tenants agree to pay by a pre-determined flat rate for their consumption.
- 4) In case any unauthorised water connection is detected, the economic administrators may cut off the said connection without any notice. Reconnection of the defaulting consumer shall be allowed after payment of outstanding bill, reconnection fee and other charges as determined by the economic zone administrators.

3.6.5 Approval of the Contractor

Foreign investors interested in constructing factory buildings in the zone do not usually know the rates of construction materials in Bangladesh. As a result investors may be misguided or cheated by the local contractors or a person who is not concerned about the construction work and therefore adverse reactions may be created among the investors.

In order to construct their own factory buildings with reasonable rates, investors are advised to take approval for appointment of contractors using a specified form prepared by the economic zone administrators before starting the work. It may be mentioned here that no work shall start before the approval of the plan of the factory building and approval of the contractor.

CHAPTER 4

ENVIRONMENT & SOCIAL REVIEW

4.1 Environmental Review

4.1.1 Background

In Bangladesh, the proposed EZ Projects will provide a new approach in association with the existing EPZ functional establishments, both in management and in investment. The proposed EZ should function as a test field for reforms and the emergence of an open economy that would provide experience that can be replicated and promoted nationwide. The Economic Zone Act, passed in the Parliament in August 2010, provided the overall framework for establishing EZs throughout Bangladesh. Subsequently the government of Bangladesh has initially selected three locations for setting up economic zones. One is at Sherpur in Sylhet division, and, the other two are at Mirershorai and Anwara in Chittagong Divisions. The Bangladesh Government has also decided to prepare feasibility studies of the three projects.

The objective of the study is to provide clear-cut data, information and analysis about the feasibility status of the proposed three EZs at the three initially selected locations, including Transport Assessment, Industry/Market Assessment, Demand Forecast, Master Planning, Infrastructure Requirements, Environmental and Social Review and Institutional Framework.

This Initial Environmental Examination (IEE) has been prepared as part of the GoB assistance in undertaking the project appraisal of the Mirershorai EZ Development Project for the Bangladesh Economic Zone Authority (BEZA). The project proponent is BEZA under the Prime Minister's Secretariat. The objective of the study is to help the Government prepare a detailed EZ Project suitable for World Bank financing.

As such, this IEE was prepared based on field reconnaissance, coordination with BEZA, BEPZA, Department of Environment (DoE), and Water Resources Planning Organization and stakeholder consultations. This report covers the description of existing environmental conditions, assessment of qualitative environmental impacts of the land filling activities and associated economic zone project components, recommended mitigation measures and environmental monitoring. The environmental impact was considered for activities during pre-construction, construction and operation phases of the Project. Further, this IEE is an updated self-standing companion document of Component 2 (Master Planning, Infrastructure Requirements, Environmental and Social Review) of the Feasibility Study of the Project.

4.1.2 Environmental Clearance Requirements

4.1.2.1 Overview

The following sections review the relevant legislative, regulatory, and policy requirements of the Government of Bangladesh (GoB). Environmental assessment to determine the positive and negative potential impacts of the proposed project must be carried out within the framework and according to current GoB environmental policies, rules, and regulations for obtaining environmental clearance of the Mirershorai EZ Project.

Environmental issues in the country are legislated by different sectoral policies and law, such as those relating to land use, water and air pollution, toxic chemicals, noise, solid wastes, wildlife protection, forest conservation, environmental health, sanitation, and industry. The sectoral laws dealing with different environmental issues in Bangladesh were enacted at different periods. The environmental concerns and priorities of the country have changed considerably in recent years. For environmental management in particular, the need for updating of the legislative requirements has been identified and is currently being undertaken by the Bangladesh Department of Environment (DoE).

The legal system of Bangladesh is potentially strong, but generally lacks specific enforcement mechanisms to enable legislation to be really effective. Hence, ownership conflicts, claims and counter claims regarding the private and public domains are common. Further, the lack of enforcement mechanisms for water pollution control, such as industrial and wastewater effluent discharged into natural water bodies is a major issue for environmental management within the water sector.

In accordance with the Environmental Management Framework (EMF) of PSDSP project, safeguard policies of The World Bank and Environmental Assessment Requirements of Infrastructure Projects, an Initial Environmental Examination (IEE) and Summary Initial Environmental Examination (SIEE) will be presented to BEZA. Further BEZA will submit this IEE to Department of Environment (DoE) of the Government of Bangladesh for site clearance and World Bank to review. An EA of the project, will, however, be carried out by the Developer in line with the EMF of PSDSP and Environmental Regulations of GOB.

4.1.2.2 GoB Environmental Laws, Regulations and Guidelines

The EZ, with associated industrial development, is subject to the environmental requirements of the GoB. Section 7 of the Environmental Conservation Rules of 1997 mandates that an Environmental Clearance Certificate (ECC) shall be obtained for specific types of projects. The documents to be submitted to the concerned Divisional Officer of the DoE for Orange B Category and Red Category are the following:

- (i) Accomplished Form-3: Application for Environmental Clearance Certificate
- (ii) Report on the feasibility of the project;
- (iii) For Orange B Category: a) an IEE Report of the project b) layout Plan and design of the EZ Project;
For Red Category: a) an IEE relating to the project and also the terms of reference for the Environmental Impact Assessment (EIA) of the unit or the project; b) A Process Flow Diagram; c) EIA report prepared on the basis of terms of reference previously approved by the Department of Environment, along with the Layout Plan (showing location of Effluent Treatment Plant), Process Flow Diagram, design and time schedule of the Effluent Treatment Plant of the unit or project, (these are applicable only for a proposed project)
- (iv) Report on the Environmental Management Plan (EMP) for the project, including the Process Flow Diagram, Layout Plan (showing location of Effluent Treatment Plant), design of the Effluent Treatment Plant (ETP) and information about the effectiveness of the ETP of the unit or project, (these are applicable only for an existing project);
- (v) No objection certificate from the local authority;
- (vi) Emergency plan relating adverse environmental impact and plan for mitigation of the effect of pollution; and
- (vii) Outline of the relocation, rehabilitation plan (where applicable).

The National laws, regulations, ordinances and policies reviewed during the development of this IEE. The list and description of current legal and regulatory framework related to EZ Project development are presented in table below.

Table 4.1.2.2-1: Relevant Laws and Regulation on EZ Project

Reference	Description
Bangladesh Climate Change Strategy and Action Plan (BCCSAP) 2009	
	The Government of Bangladesh prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008, revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. It is built around the following six themes:
Coastal Zone Policy, 2005	
	Coastal zone policy initiated as a harmonized policy that transcends sectoral perspectives. The policy provides general guidance so that the coastal people can pursue their livelihoods under secured conditions in a sustainable manner without impairing the integrity of the natural environment. The policy framework underscores sustainable management of natural resources like inland fisheries & shrimp, marine fisheries, mangrove and other forests, land, livestock, salt, minerals, sources of renewable energy like tide, wind, and solar energy.
National Agricultural Policy, 1999	
	The overall objective of the National Agriculture Policy is to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable food security system for all.
Standing Orders on Disaster, 2010	
	The 'Standing Orders on Disaster, 2010' is a substantial improvement over the previous edition (English 1999) New features introduced in this edition include, among others, the following: i) an outline of disaster management regulative framework, ii) an introduction of core groups for emergency response at various levels, iii) multi-agency disaster incident management system, iv) risk reduction roles and responsibilities for all committees and agencies, v) new outlines for local level plans, vi) revised storm warning signals, and, vii) a report on cyclone shelter design.
Environment Policy of 1992	
Section 3.3: Health and Sanitation	Requires prevention of harmful impacts in all areas and development activities in the country
Section 3.5: Water Development, Flood Control and Irrigation	Requires environmentally sound utilization of all water resources Requires prevention of adverse environmental impact of water resource development projects and irrigation networks Requires sustainable, long term, environmentally sound and scientific exploitation and management of the underground and surface water resources Requires conduct of Environmental Impact Assessment before undertaking projects for water resources development and management
National Environmental Management Action Plan of 1995	
Unsustainable land use	Development of sustainable land use management
Pollution and degradation of open waters	Inclusion of water treatment plants should be made obligatory by all new projects; Dumping of sewage and other human wastes as well as other raw organic wastes into the open waters should be discontinued
Environment Conservation Act of 1995 (Amendment 2000 & 2002)	
Section 12: Environmental Clearance Certificate (ECC)	Requires all industrial units or projects to obtain an ECC from the DoE prior to implementation
Environment Conservation Rules of 1997	
Section 7: Procedures for issuing ECC	Describes procedures and documentation requirements for obtaining ECC for different project category
Schedule 1	Classification of industrial units or projects based on location and impact on the environment
Schedule 3	Standards for ambient water quality and drinking water quality
Schedule 10	Standards for effluent from industrial units and projects
National Policy for Safe Water Supply and Sanitation of 1998	
	Provide safe water in urban, slum, squatter settlements. Setting tariffs, reducing non-revenue water.

Reference	Description
East Bengal Embankment and Drainage Act, 1952	
	Concerning construction, maintenance, management, removal and control of embankment and water courses for the better drainage of lands and for their protection from floods, erosion or other impacts by water.
The Protection and Conservation of Fish Act, 1950	
	Concerning the protection and conservation of fish in Bangladesh
Water Supply and Sewerage Authority Ordinance, 1963	
	Concerning construction, improvement, expansion, operation and maintenance of water and sewerage work and other facilities relating to environmental sanitation and for construction authority.
Groundwater Management Ordinance, 1977	
	Regarding management of groundwater resources for drinking and agricultural purposes

Source: Modified, *Environmental Policies, Rules & Regulations, DoE, 1992-1997*

4.1.2.3 Other Acts and Regulations of Bangladesh

Titles of the relevant literature, Acts and regulations were also reviewed and applied where applicable during the course of this process are listed below:

- Bangladesh Wildlife (Preservation) Order 1973 (Amended in 1994);
- The Environmental Court Act 2000 (Amendment 2002);
- The Forest Act, 1927 and the Forest (Amendment) Act 2000;
- Bangladesh Electricity Act 1910 and Regulations;
- Fifth Five Years Plan;
- National Energy Policy, 1995;
- River Dredging Conditions of BIWTA

4.1.2.4 International Conventions, Treaties and Protocols

- The Convention on Biological Diversity, 1992;
- The Convention on the Conservation of Migratory Species of Wild Animals, 1979

4.1.3 World Bank Environmental Requirements

The Bank requires Environmental Assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable. The World Bank's environmental assessment policy and recommended processing are described in Operational Policy (OP)/Bank Procedure (BP) 4.01: Environmental Assessment. This policy is considered to be the umbrella policy for the Bank's environmental "safeguard policies." The policy includes: Natural Habitats (OP 4.04), Pest Management (OP 4.09), Physical Cultural Resources (OP 4.11), Forests (OP 4.36) and Safety of Dams (OP 4.37). The Operational Policies (OPs) are the statement of policy objectives and operational principles including the roles and obligations of the Borrower and the Bank, whereas Bank Procedures (BP) are the mandatory procedures to be followed by the Borrower and the Bank.

4.1.3.1 OP/BP 4.01: Environmental Assessment

The EMF for PSDSP will facilitate compliance with the World Bank's environmental safeguard policies and also with the policies, acts and rules of the Government of Bangladesh. Ensuring the long-term sustainability of benefits from "EZ Subprojects" by adjusting interventions with the natural resource on which they are dependent. The main objectives of the EMF is "to outline a framework for environmental screening procedures and methodologies for the "EZ Subprojects" and guideline for

preparation of environmental management (mitigation, monitoring and compensation) and reporting at the concept, design, construction and operational and stages of the project.

The Bank requires Environmental Assessment (EA) of projects proposed for Bank support to ensure that they are environmentally sound and sustainable and thus to improve decision making. EA is a process whose breadth, depth, and type of analysis depend on the nature, scale and potential environmental impact of the proposed project. EA evaluates a project's potential environmental risks and impacts in its area of influence; examines project alternatives; identifies ways of improving project selection, siting, planning, design and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts; and includes the process of mitigating and managing adverse environmental impacts throughout project implementation. The borrower is responsible for carrying out the EA and the Bank advises the borrower on the Bank's EA requirements.

The Bank classifies the proposed project into three major categories, depending on the type, location, sensitivity and scale of the project and the nature and magnitude of its potential environmental impacts. Projects with multiple components or with multiple subprojects (other than projects using FIs) are categorized according to the component with the most serious potential adverse effects. Dual categories may not be used. However, the depth and breadth of EA and choice of EA instrument(s) for each component or each subproject is decided on the basis of its respective potential impacts and risks.

Category A: The proposed project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works.

Category B: The proposed project's potential adverse environmental impacts on human population or environmentally important areas-including wetlands, forests, grasslands, or other natural habitats- are less adverse than those of Category A projects. These impacts are site specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than Category A projects.

Category C: The proposed project is likely to have minimal or no adverse environmental impacts.

4.1.3.2 OP/BP 4.04: Natural Habitats

The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance and rehabilitation of natural habitats and their functions in its economic and sector work, project financing and policy dialogue. The Bank supports and expects borrowers to apply a precautionary approach to natural resource management to ensure opportunities for environmentally sustainable development. The Bank promotes and supports natural habitat conservation and improved land use by financing projects designed to integrate into national and regional development the conservation of natural habitats and the maintenance of ecological functions. Furthermore, the Bank promotes the rehabilitation of degraded natural habitats. The Bank does not support projects that involve the significant conversion or degradation of critical natural habitats.

4.1.3.3 OP/BP 4.36: Forests

Forest is defined as an area of land of not less than 1.0 hectare (2.47 acre) with tree crown cover (or equivalent stocking level) of more than 10% that have trees with the potential to reach a minimum height of 2 metres at maturity *in situ*. A forest may consist of either closed forest formations, where trees of various stories and undergrowth cover a high proportion of the ground, or open forest.

However, the Bank's forests policy aims to reduce deforestation, enhance the environmental contribution of forested areas, promote afforestation, reduce poverty and encourage economic development. Where forest restoration and plantation development are necessary to meet these objectives, the Bank assists borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The Bank also assists borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial and economically viable forest plantations to help meet growing demands for forest goods and services.

4.1.3.4 OP/BP 4.11: Physical Cultural Resources

Physical cultural resources are defined as movable or immovable objects, sites, structures, groups of structures and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Their cultural interest may be at the local, provincial or national level, or within the international community. Physical cultural resources are important as sources of valuable scientific and historical information, as assets for economic and social development and as integral parts of a people's cultural identity and practices. The Bank assists countries to avoid or mitigate adverse impacts on physical cultural resources from development projects that it finances. The impacts on physical cultural resources resulting from project activities, including mitigating measures, may not contravene either the borrower's national legislation, or its obligations under relevant international environmental treaties and agreements. The borrower addresses impacts on physical cultural resources in projects proposed for Bank financing, as an integral part of the Environmental Assessment (EA) process. The following projects are classified during the environmental screening process as Category A or B and are subject to the provisions of this policy: (a) any project involving significant excavations, demolition, movement of earth, flooding, or other environmental changes; and (b) any project located in, or in the vicinity of, a physical cultural resources site recognized by the borrower. Projects specifically designed to support the management or conservation of physical cultural resources are individually reviewed and are normally classified as Category A or B. When the project is likely to have adverse impacts on physical cultural resources, the borrower identifies appropriate measures for avoiding or mitigating these impacts as part of the EA process. These measures may range from full site protection to selective mitigation, including salvage and documentation, in cases where a portion or all of the physical cultural resources may be lost.

The above WB safeguard documents were reviewed in preparing this IEE for the proposed Mirershorai EZ Project.

4.1.4 Description of the Project

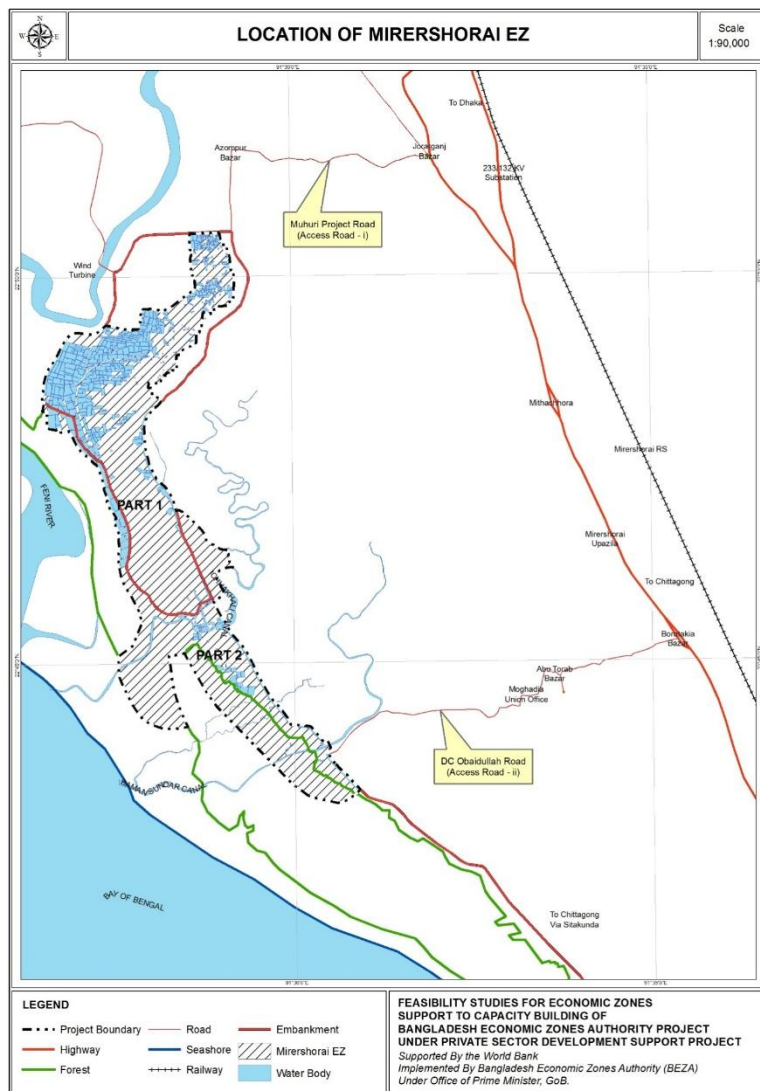
4.1.4.1 Overview

The initiative of the GoB is to establish economic zones in all potential areas including backward and underdeveloped regions and development, operation, management and control thereof, including the matters ancillary with a view to encouraging rapid economic development through increase and diversification of industry, employment, production and export. Likewise, the Bangladesh Export Processing Zones Authority (BEPZA), is expected to stimulate rapid economic growth of the country, particularly through industrialization. The government has adopted an 'Open Door Policy' to attract local and foreign investment to Bangladesh. The BEPZA is the official organ of the government to promote, attract and facilitate foreign investment in the Export Processing Zones. Similarly, the primary objectives of an EZ are to provide special areas where potential investors would find a congenial investment climate, free from cumbersome procedures. Industrial agglomeration suggested in the EZ includes coal-fired power plant, garments, garment accessories, integrated textiles, motorcycle assembly, automobile assembly, automotive parts, other parts and machinery. There is also provision for the establishment of residential complex.

4.1.4.2 Project Location

The proposed EZ site is located in Mirershorai Upazila (Chittagong District) about 13 km to the west of Upazila Headquarters and about 66 km from Chittagong District Headquarters. The following map shows the location of Mirershorai EZ project. Detailed description of project location can be found in Section 3.1.1 of Chapter 3.

Figure 4.1.4.2-1: Location of Mirershorai EZ



4.1.5 Objectives of the Project

The project’s objectives are as follows: (a) to establish central treatment plant and treated wastewater reuse facilities in the Economic Zone, and (b) to strengthen regulation, enforcement, and environmental monitoring of the EZs to promote pollution control, to improve public wellbeing in the neighboring areas, and to promote investments and capability in the planning of BEZA.

4.1.6 Description of the Proposed Project Components

The total project area is 7,195.30 acres (2,911.83 hectares), of which, 580.18 acres (233.64 hectares) is to be reclaimed from the sea. The summary of the project components are given below. Detail can be found in Chapter 3 and Annex-3.

1) Main Functions

- Focal Point Main Gate
- One-Stop Service Centre
- Control Office and Parking (Administration Building)
- Customs Office
- Green Space and Landscape: Green space along the road and dike and in 365.87 acre (148.06 hectare) green zone. Existing forest land of 1,009.53 acre (408.54 hectare) falling within the EZ boundary will be untouched.
- Factory Lots: Total 3,110.31 acre (1258.70 hectare) industrial land is divided into 1 hectare size plots.
- Rental Factory Land Area: 25.85 Acre (10.46 hectare); Total number of structure 36; Each structure is 2 storied with 2000 m²/floor.
- Commercial Zone: Total area 49.45 acre (20.01 hectare)
- Warehouse: 44.06 acre (17.83 hectare)
- Housing Zone: Total 236.80 acre (95.83 hectare) including resettlement zone.
- Power Plant/Stockyard with Jetty: 600 MW coal-fired power plant with captive jetty and stockyard. Total area 715.79 acre (289.67 hectare)
- Medical College & Hospital, Vocational Training Institute, International School etc.

2) On-Site Infrastructure

- Roads: Main Road: width 33 m, length 20,941 m; Minor Road: width 19.5 m, length 75,825 m
- Dike: 9 m high traditional dike on seaside and 8 meter high on the inner side. Total length is about 36 km.
- Retention Pond: for rainwater harvesting and drainage system.
- Water Supply Plant: Source is Feni River. Total capacity 280,000 m³.
- Waste Water Treatment Plant: Total capacity 224,000 m³.
- Others: Telecommunications, Electrical connection etc.

3) Off-Site Infrastructure

- Road Connectivity: Two 4-lane access roads of 10 km and 7 km length.
- River intake for water supply: Water on Feni River near site is saline. Sweet water from this river will be collected from 17 Km upstream.
- Electrical Connection: 132KV electrical connection from Sonapahar substation at 10 Km from the site.
- Telecommunication: 13 Km new offsite FOC connection along the access road named DC Obaidullah Road (Figure 4.1.4.2-1).

4) Utility Requirements:

- Power: 574.28 MW
- Water: 274,942.67 m³/day

The following figures show the site location and proposed Master Plan for the zone.

Figure 4.1.6-2: Location and Existing Condition of Mirershorai EZ

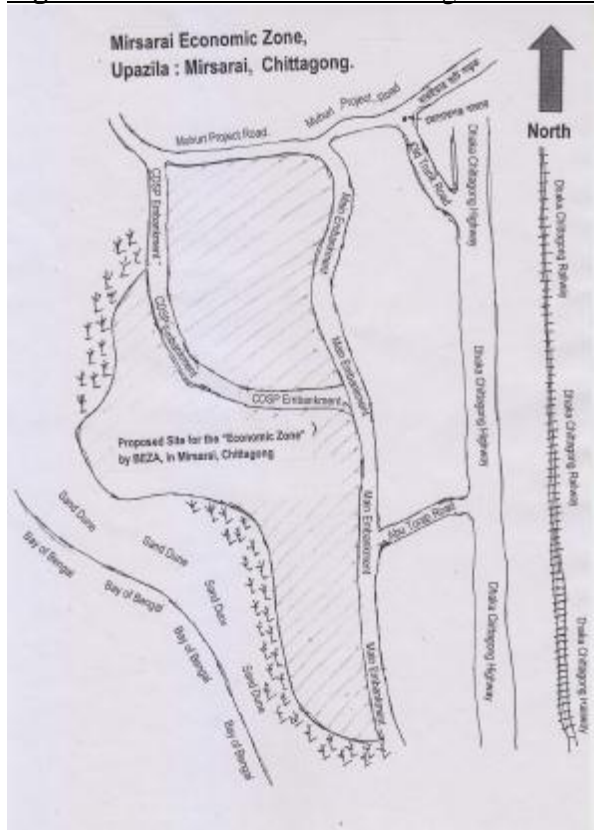
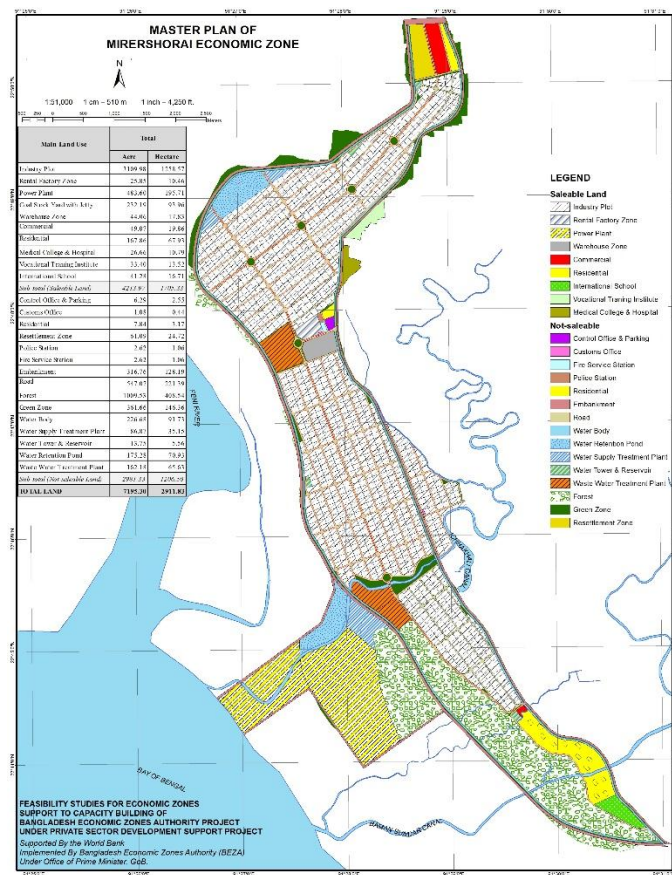


Figure 4.1.6-2: Master Plan of Mirershorai EZ



4.1.7 Methodology

This IEE report, prepared during the study period, has considered and reviewed of data from the following disciplines:

- Engineering design
- Surface and groundwater
- Aquatic and terrestrial ecology
- Public participation

Additionally, this IEE is based on field reconnaissance, coordination with BEZA, BEPZA and stakeholder consultations. Thus, the following activities were undertaken during the preparation of this report:

1. Review of initial and secondary data for the environmental component of the project;
2. Meeting with concerned agencies;
3. Reconnaissance field visit;
4. Public consultation within the project area;
5. Analysis and presentation;
6. Preparation of the review Report; and
7. Feedback and quality check.

4.1.7.1 Stakeholders' Engagement

Participation of local people and other stakeholders has now been recognized as a key element to ensure sustainable results of both environment and development projects. Participation enables different socioeconomic interest groups in an area to develop their capabilities and to play a dynamic role in developing initiatives. It also strengthens the commitment of a wide cross-section of stakeholders, such as the Association of Readymade Garments (RMG) Manufacturers of Bangladesh, government employees, professional groups, and voluntary groups including NGOs and community-based organizations, by giving them an opportunity to share responsibility in key decisions. Finally, it enables project planners to make use of local knowledge of the environment, of specific land and water regimes and land and water use by different socio-economic groups. Initial public consultations were conducted during the field visit in Mirershorai. Peoples' concerns basically focused on the construction impacts, land acquisition, and resettlement issues which will be addressed during detailed EIA if the client approves the study. However, consultation outcomes are expressed in the following table.

Table 4.1.7.1-1: Public Opinion

Issues	Participants' Opinion, and Comments Suggestions	Response to Questions and Concerns	Action Points during Detailed Design of EZ
General perception about the project and the awareness about the proposed project.	Most of the participants are in favour of the project	N/A	The project site is not required to be relocated at this stage
Support of local people for the proposed project?	Almost everybody said that they will support the project and advised the Consultant to take precautions in the environmental mitigation to avoid wetlands, flora, and religiously sensitive locations,	Explained possible mitigation measures	N/A

World Bank and Department of Environments' Environmental Considerations for Category A and Category B projects require the conduct of public consultation during the project preparation stage. Initial public Consultations were conducted involving stakeholders according to WB Environmental Guidelines. The consultation also involved with participants representing local people, farmers, and business groups.

4.1.7.2 Secondary Baseline Data Collection Literature Review

During this stage, further review was conducted of the physical, ecological, and legal issues relevant to the Project. The review of secondary sources and field reconnaissance was used to prepare a qualitative assessment of the physical environment, biodiversity and conservation significance of the Project site. This preliminary literature review assists in identifying the baseline situation, which ultimately forms the basis for the impact assessment component of the Rapid Environmental Assessment (REA). The following activities have been undertaken:

- Data were collected from secondary sources comprising ecological information, including habitats, ecosystems, flora, fauna, vertebrates, fish and invertebrates for the prospective site's terrestrial and fresh water environments (Ref: interim environment report);
- As discussed in Chapter 2, an appraisal was made of all legislation having direct and indirect relevance to the environmental conditions and biodiversity within the study areas;
- Information was collected on current local conservation management practices; and,
- An information gap analysis and identification of the areas where further field work is required to be undertaken was completed.

4.1.8 Description of the Environment

4.1.8.1 Overview

Mirershorai Upazila of Chittagong District has an area of 482.88 km², is bounded by Tripura State of India, Chhagalnaiya and Feni Sadar Upazilas on the north, Sitakunda and Sandwip Upazilas on the south, Fatikchhari Upazila on the east, Sonagazi and Companyganj (Noakhali) Upazilas on the west. The main river is Feni; Sandwip Channel is notable for enhancing transportation with the western districts. There are 30 canals, most noted of which are Ichhakhali, Mahamaya, Domkhali, Hinguli, Koila Govania and Mayani Khal. The hills range on the northern and eastern side of this Upazila along the bank of the Feni River extended up to Chittagong and the Chittagong Hill Tracts. Cyclonic surges in the area are also natural risks with wind effects of cyclones also affecting areas further inland. The region is also at medium risk from seismic events as it lies at the junction of three tectonic plates (Annex4).

4.1.8.2 Topography and Soils

The topography varies in altitude from the Lalmai Hills (30 metre MSL) and the base of the Tripura Hills (7–8 metre MSL) to the bank of the Meghna (1–2 metre MSL). The floodplain varies in between 1 to 5 metre MSL. Tidal effects along the coast are generally up to 2 m above mean sea level on the floodplain and are generally masked by the depth of river flooding. This region occupies the northern edge of the young Meghna Estuarine Floodplain. It comprises smooth, almost level, floodplain ridges and shallow basins. The soils of Mirershorai EZ are sandy loam to clay loamy soils in some areas. Most of the farmlands are on sandy loams with some black cotton soils in the low lands. Black cotton soils characteristically host Acacia wood plant. Soils change to more sandy and gravel texture all the way to the foot of the escarpment. Likewise, the soil patches of sandy soil can be seen between Mirershorai EZ and Muhuri flood plain.

Silt loam soils predominate on the higher lands and silt clay to clay in lowlands. Non-calcareous Dark Grey Floodplain soils are the only general soil type of the area. The land slopes from the north-west to south-east. Approximate elevation of the site and its area of influence vary from 10 to 50 metres (m) above sea level. The significant geological feature of the project area is the alluvium deposit. The depth of such deposits may vary up to several thousand metres and are of Pleistocene (50,000 years) to Recent (few hundred years) origin.

4.1.8.3 Geology

The geology of the project area can generally be classified as sedimentary with metamorphic rocks such as limestone including travertine. These occur as either of the following: quartzite, graphitic schist, chlorite, amphibone, mica and kyalite schist, hornblende, bitite and garnet, gneiss, acid gneiss, granulate, or charnokite.

4.1.8.4 Climate

The Mirershorai EZ traverses through moderate to high monsoon climatic areas with an average annual rainfall of 500 mm. The averages day time temperatures varies from 20° to 25°C, while night temperatures are between 15° and 17°C.

4.1.8.5 Water Resources

The Muhuri River is the only fresh water source for Mirershorai economic zone and it is a trans-boundary river between India and Bangladesh. Rising in Tripura, it flows into Bangladesh where it merges with the Feni near the latter's mouth to the Bay of Bengal. The Muhuri is also known as the Little Feni. The Muhuri rises in the Lushai Hills of Tripura and flows west into Bangladesh which it enters through the Parshuram Upazila of Feni District. In Bangladesh, the river separates the Feni and Chittagong districts before flowing out into the Bay of Bengal. In Bangladesh, the Muhuri basin covers an area of 40,080 hectares spread across the Upazilas of Feni Sadar, Sonagazi, Chagalnaiya and Parshuram in Feni District and the Mirershorai Upazila of Chittagong district with a total irrigable area of a little over 23,000 hectares. The river is known for its wild nature and flash floods and its frequent changes in course. For the most part, the Muhuri has a width of 150 to 200 metres as it approaches the sea with increasing influence of tidal action.

The project area is characterized by canals and distributaries. Irrigation is mostly done from canal water and also by adding tube-well water. Water is available for construction activities. Water is generally muddy and saline in nature. The depth of the water table varies from a few metres to 20 metres. The ground water is not fit for drinking purposes. There are signs of water logging pockets in the project area. Soil salinity is moderately observed in many patches.

4.1.8.6 Water Quality

The proposed project is surrounded by a riparian environment, falling under the estuarine and coastal areas, with rivers rising and falling under the natural system of high and low tides. There are small and medium ponds, which are used for multiple purposes. Ground and river water are both saline. People usually boil pond water and harvested rain water for drinking purposes. There is a scarcity of drinking water in the dry season consequently people suffer from lack of potable water as pond water level declines.

4.1.8.7 Flooding and Drainage

The selected area falls under the plain land type. According to the information collected through focus group discussions (FGD), the area is affected in normal floods. But during heavy rainfall and sometimes during high tide cause water stagnation in the area for some time. Drainage is good; as water drains out quickly through canal lines with insignificant water logging problem.

In many parts along the coast of this region brackish/saline water of marine origin renders the groundwater unsuitable for irrigation and potable water supply. In addition, extensive areas are found in the central and western parts of the region where the groundwater salinity exceeds 1000 μ s/cm, and 2000–8000 μ s/cm locally²²³. Groundwater with EC²²⁴ values in excess of 2000 μ s/cm is unsuitable for irrigation of rice.

4.1.8.8 Flora and Fauna Diversity

The natural flora of the region is based mainly on tree crops and indicates the regional distribution of types according to various limiting factors, such as soil types, historical and current salinity in the estuarine zone, depth of flooding and topography. In most of the region, the mixed areas of home and field vegetation show comparatively little variation in species composition. However, different floral habitats include river banks, permanently water logged swampy and marshy ground, seasonally waterlogged marshy ground, cultivated fields, uncultivated field borders and sides of embankments, stagnant ponds and standing water bodies, flowing minor drainage channels, major flowing streams, and river channels, etc.

Throughout the project area there is a distinct habitat in the immediate vicinity of homes, comprising a managed agro-forestry and pond environment. These residential areas are of particular environmental importance, as they provide the home and the main environment for children, livestock, minor nutritional and medicinal crops and tree crops. The habitat provides nesting, breeding and feeding grounds for a host of locally important insects, birds, and other small fauna. The greatest source of terrestrial bio-diversity is often associated with the natural habitats. The main agricultural areas coincide with the wetland and lowland areas, although some higher dry land systems do exist. During the monsoon, agricultural fields become a seasonal part of the aquatic ecosystem linking wetlands and the main rivers.

Further, the region is characterized by availability of several species of amphibians, reptiles, mammals, and birds. The proposed area does not have a notified wildlife habitat within a 5 Km radius. Some migrant and local birds; animals like wild boar, jungle cats, jackals, monkeys, squirrels, mongoose and rodents like rats and snakes are reported. Bird landing sites were not found in the proposed area except on the mudflats beside the coastal strip. Some birds in common Bengali name found include House Sparrow (*Chorui*), Dove (*Doel*), Bank Myna (*Shalik*), Kite (*Chil*), Brown Hawl Owl (*Pecha*), Crow (*Kak*), *Tuntuni*, White-throated Bulbul, Ashy Bulbul, Olive Bulbul (*Bulbuli*), Cuckoo (*Kokil*) etc.

The project area does not have any notified reserve forests within a 5 Km radius. The major tree species found in this area are (in Bengali and colloquial) *Simul*, *Sishu*, *Arjun*, *Kul*, *Minjiri*, *Jarul*, *Hizal*, *Sheaora*, *Khaer*, *Siris* etc. No endangered floral species were reported. The dominant fruit-

²²³ Chapter Vol-3 of Vol-4; FAP-5, WARPO, 1992-1994

²²⁴ Electrical conductivity (EC) is the most common measure of soil salinity and is indicative of the ability of an aqueous solution to carry an electric current. Plants in the coastal zones of Bangladesh are detrimentally affected, both physically and chemically, by excess salts in some soils and by high levels of exchangeable sodium in others. Soils with an accumulation of exchangeable sodium are often characterized by poor tilth and low permeability making them unfavorable for plant growth. By agricultural standards, soils with an EC greater than 4 dS/m are considered saline.

bearing trees available are mango, jackfruit, bananas and coconut. However, common and Economically Important trees and other available vegetation are provided in Annex 4.

Biological/Ecological Resource:

The projected area for proposed EZ construction displays existence of flora and fauna of negligible amount. No particular endangered animal species has been observed and animals in general would not be affected due to the construction work.

Fisheries:

Most of the people of Mirershorai are dependent on fishing in the Bay of Bengal. It is reported that, fish availability in the Bay of Bengal is gradually reducing. The preferred species for fishing are major and minor saline water species. In general, the country has 296 species of fish in sweet water and saline water and 511 species of sea fish, including shrimp. Since abundant of fishes were in the rivers and water bodies, it is a very good resource for fish production, but population explosion during the past decades and use of huge waters for cultivation, widespread use of pesticides in agriculture and pollution of waters by industrialization had a great impact in the decline of fish. However, the total species of fishes, 54 species were endangered critically and 12 species are designated vulnerable. In the project area, specific information on fisheries habitats and catch assessment will be further elaborated if EIA study is allowed as recommended.

Aquatic Biology (Aquatic Flora and Fauna):

The aquatic environment includes river, canals, water bodies and ponds. As stated, the entire agricultural land is inundated during monsoon season and dries up in the dry season every year. When cyclone strikes near the coast the whole proposed area is inundated by tidal wave result in intrusion of saline water in the locality. The biological characteristics indicated presence of moderate variety of species and aquatic plants. Blue green algae and planktons are also found in ponds, water bodies and canals. The wet land flora as found in the project area listed in Bengali includes *Helenchra*, *Hejol*, *Kudipana*, *Kuchuripana*, *Shapla*, *Shaluk*, *Lotus*, *Nol*, *Sola*, *Kalmi* etc. Aquatic fauna reported in the area includes crabs and oyster/ear shell, etc.

4.1.8.9 Other Features

Mirershorai (Town) consists of two mouzas. It has an area of 10.12 sq. Km. the town has a population of 10,856; male 51.49% and female 48.51%; population density per sq. Km = 1073. Literacy rate among the town people is 32%. The town has two dak-bungalows.

In 1983 Mirershorai Thana was turned into an Upazila, the Upazila consists of 16 union parishads, 100 mouzas and 207 villages.

The Archaeological heritage and relics consist of Hinguli Court Parr (embankment) built by Arakani Moghs, Valukia Dighi, Chuti Khan Mosque, Poragol Khan Dighi, Nai Duari (nine-door) Mosque, Daulat Bibi Mosque and Mahania Mosque.

4.1.8.10 Additional Information on Mirershorai

Religious Institutions:

There are 640 Mosques, tomb 50, temple 128 and Buddhist temple 9, most noted of which are Chhuti Khan Mosque (16th century), Daulat Bibi Mosque (16th century), Mahadia Mosque (1780), Nai Duari Mosque (18th century), Hamidullah Khan Mosque (19th century), Mazars of Shah Zayed (R) (806 AH), Awal Kazi Moakkel (R), Hazrat Shah Badal (R), Hazrat Chinki Mostan (R), Hazrat Mia Noor Ali Shah (R), Sufi Noor Mohammad Nizampuri (R) and Hazrat Mir Gaffar Khan; Jagannath Mandir (Abu Torab Bazar), Kali Mandir (Karerhat), Hazisharai Mandir and Newanpur Mandir.

Population:

325,712; males, 49.97%, females, 50.03%; Muslim, 84.9%, Hindu 13.97% and others 1.13%.

Literacy and Educational Institutions:

Average literacy 37.2%; male 45.1% and female 29.3%. Educational institutions: colleges 4, high schools 46, junior schools 4, madrasas 38, government primary schools 145, non-government primary schools 55, madrasas 1, satellite schools 8 and kindergarten schools 8.

Main Occupations:

Agriculture 34.06%, forestry 2.23%, agricultural labourer 15.86%, wage labourer 3.39%, commerce 10.8%, service 16.89%, fishing 1.32%, transport 2.37% and others 11.26%.

Land Use:

Total cultivable land 22,896.40 hectares, fallow land 147713 hectares; single crop 38.91%, double crop 42.46% and treble crop land 18.63%. Cultivable land under irrigation is 6,917.85 hectare.

Main Crops:

Paddy, potato, bean, tomato, pumpkin, and radish.

Extinct or Nearly Extinct Crops:

Sugarcane, jute, *araha*, mustard, pulse, linseed, *kalai* sesame and peanut.

Main Fruits:

Mango, black berry, jackfruit, banana, papaya and litchi.

Fisheries, Dairy, Poultry:

Fishery 100, poultry 131 and hatchery (fish) 1.

Communications Facilities: Roads: pucca 193 Km, semi pucca 119 Km and mud road 1500 Km; railways 16 Km; waterways 11 nautical mile. Traditional transport are palanquin, *Shampan* boat and bullock cart. These means of transport are either extinct or nearly extinct.

Manufacturing facilities: Carpet industry, pipe mill, ice factory etc. Cottage industries consists of weaving 903, goldsmith 110, blacksmith 100, potteries 100, *bidi* 4, tailoring 250, wood work 150, bamboo work 200 and sanitary 20.

Markets, Hats, Bazars and Fairs: Hats and bazars are 30, most noted of which are Mohajan Hat, Abu Torab Bazar, Kamar Ali Bazar, Boro Daroga Hat, Karer Hat, Baroia Hat, Shantir Hat, Jorarganj, Mithachara, Fakir Hat, Abur Hat and Bamonsundar Daroga Hat; fairs 5.

Main Exports: Bamboo, wood, fish, paddy, potato, banana, and vegetables.

NGO Activities: Operationally important NGOs are Proshika, BRAC, ASA, Sheba, Grameen Bank, ICDDR,B; CARE, Hunger Project, DORP, Bais Opka, IPSA, Fatema Palli, Swasthya Shikkha Centre and Eva.

Health Centres: Upazila health complex 1, family planning centre 16, sub health centre 11.

4.1.9 Screening Environmental Impacts & Mitigation Measures

4.1.9.1 Soils and Geology

During the construction period, the main impacts on the land will be from the excavation of soil from different locations to raise the EZ Project site and associated land and access road development. Possible impacts include the loss of top soil, damage to local existing roads during transportation of construction material and equipment, erosion of stockpiles during rain and re-suspension of dust during the dry weather. The construction process will potentially remove vegetation and disturb the upper soil layer making it more susceptible to erosion and increased runoff. However the areas that will be subject to disturbance will be very small and so the potential impacts associated with the development of EZ Land are not considered significant, provided basic environmental management measures are implemented.

During the operational period, it is possible that contamination of soil could occur from spillage of hazardous materials and wastes from the different industrial operations in the EZ premises. However the impact of such an event would be localized. In order to mitigate against such an event the following measures will be implemented as: (a) all hazardous wastes and hazardous materials, like lubricating oil, solvents and fuels, shall be stored within concrete or brick buildings properly designed for such storage facilities, (b) oil spill clean-up materials (sorbent pads, loose sorbent material etc.) will be made available, (c) it will be ensured that the industrial operators are trained in repair and maintenance of machines and equipment and also on how to clean up the spill and dispose of contaminated materials using treatment technologies.

Likewise, the potential impacts associated with geology may include the loss of and damage to geological, paleontological, and physiographic features of the geological environment. Seismicity related potential impacts would include any change to the frequency or severity of earthquakes or impacts to earthquake preparedness and response capabilities.

Considering the Project features, there are no specific potential impacts related to geology and seismicity that have been identified as having the potential to result from the site establishment stage of the Project and subsequent EZ Industrial set up.

4.1.9.2 Air Quality

During construction, air quality is likely to be degraded by initial earth work for excavation of soils and subsequent dumping to raise the EZ site, exhaust emissions from the operation of construction machinery; fugitive emissions from aggregate and dust generated from earth works, approach roads, exposed soils and material stock piles. Air quality is expected to be less impacted by any activity during operations by the industrial operators subject to compliance of EMP and DoE regulations.

In order to mitigate these, the following shall be implemented: (i) Construction equipment will be maintained to a good standard and idling of engines discouraged. Machinery causing excessive pollution (e.g. visible smoke) will be banned from construction sites. (iii) Spraying of water on the soil excavation and dumping site at EZ, access roads if dust is being generated and the covering of loads with tarpaulins.

4.1.9.3 Noise and Vibration

The noise and vibration sources for the EZ Site construction phase only as operation of heavy machinery (Bulldozer, Excavator, Dump truck, Loader, Roller, Asphalt paver, Water tanker, Concrete Mixer, Car/Passenger vehicle movement etc.) generate high noise levels. To prevent noise and vibration, work will be restricted to between 6 am and 9pm. Additional management and mitigation measures should be considered as: (a) Noise generated during the construction should aim to comply with the noise standards of the Government of Bangladesh; (b) Establish a code of conduct for field personnel to reduce the potential for impacts to nearby communities, such as avoidable noise generation; (c) Undertake noise monitoring at the nearest sensitive receivers if complaints about noise are received etc.

4.1.9.4 Surface Water and Hydrology

Water is an essential resource which sustains all life on earth. Surface water is made up of standing water such as ponds, lakes and dams, and watercourses such as streams, rivers, and wetlands. Hydrology is the study of precipitation, evapo-transpiration and the interaction between surface water, soil water, and groundwater.

Potential impacts to surface water and hydrologic systems due to EZ developments are usually centred on changes to the water quality and water quantity of the Feni River and associated networks in the project area of influence. Potential water quality impacts may result from changes to the physical and chemical composition, while potential water quantity impacts may result from changes to the storages and flows of water. This section identifies the potential impacts from the Project on surface water and hydrology.

There is the potential that the following impacts related to surface water could result from the site-establishment stage of the Project:

- The dewatering of waterlogged dredged materials may contribute to increased turbidity in the Feni River (If dredged material is used for the EZ land development)
- Dredging operations may disturb sediments and contribute to the volume of turbidity in the Feni River
- There is the potential that vehicle movement and land development could lead to erosion and sedimentation
- Accidental spillage, mismanagement or leaks of hazardous materials (such as fuels, oils, and solvents) may pollute surface waters
- Waste generated by the accommodation of personnel living and working on the EZ site could pollute surface waters if improperly managed
- Dredged areas may present changes to bathymetry promoting changes to the velocities of flows and erosion/accretion cycles (if dredged material from the Feni River is used for EZ land development)
- Drainage preferred flow paths may be modified by the construction of the raised EZ site
- Construction of the raised EZ pad may impact flooding and ponding conditions in the local area.

Management and mitigation measures include the following:

- Major earthworks should be planned within the dry season to reduce the potential for runoff and sedimentation of adjacent waterways
- A progressive sediment and erosion control plan should be developed prior to construction (or prior to disturbance of soils) and subsequently implemented and maintained throughout construction
- Storage stockpiles and dewatering stockpiles should only be placed in designated areas

- Regularly check and maintain erosion and sediment controls and during the Project construction phase.

4.1.9.5 Flora

Flora relates to all aquatic and terrestrial based plants. Plants are vital for ecosystem function and are used as resources for human food, shelter, clothing, and other products. Developments often have the potential to impact flora. These potential impacts may be felt at several different levels including individuals, communities, populations, species, ecosystems, or habitats.

Potential impacts to flora could include a reduction in diversity, change in species composition and the destruction of individuals, species or communities or, changes to species population distributions or health. This section identifies the potential impacts to flora that may occur as a result of the Project.

The majority of impacts to local flora species and communities will occur within the site establishment phase of the project. In summary, potential impacts could include:

- Dredging could impact aquatic plants due to increased turbidity and sediments in the Feni River water (if dredged material is used for EZ land development);
- Agricultural plants are likely to be removed as a result of the formation of the EZ raised pad, stockpile areas, roads and tracks; and
- Existing roadside vegetation may be lost if new or existing roads need to be constructed and widened or improved.

Agricultural land

Agricultural land covers a small percentage of the candidate EZ study area, therefore minimal impacts on flora are likely to occur in this ecosystem. The most important induced impact will be the land use change of grazing or agricultural land to a raised pad area. Agricultural areas provide little habitat for local flora species and thus, this change will not constitute a significant loss to potential habitat for plant species.

Village Forest and Home Plantation

Removal of native and significant vegetation within and around the EZ raised pad site, connecting roads and other possible service points has the potential to be the most significant impact on terrestrial flora. The significance of the potential impact depends largely on the species composition to be removed.

Management and mitigation measures include:

- Stabilization, e.g. re-vegetation/compaction of disturbed areas, should be undertaken as soon as possible following works.
- Stabilization, e.g. any re-vegetation of disturbed areas, should be staged where possible.

4.1.9.6 Fauna

At the time of construction, potential impacts are destruction of habitat from the trimming or cutting of the trees in the vicinity, disturbance of individual animals, localized decline in the quality of habitat (removal of original plants) and poaching of edible animals and birds by construction workers using equipment and machines. During the operational years the most common impact is the reduction of faunal habitats with infrastructure development and associated industrial activities.

Management measures includes, development of alternative wildlife habitat sites by plantation of native flora leading to support a wide range of species including birds.

4.1.9.7 Coal-fired Power Plants

Mercury emitted into the air from coal-fired power plants in Mirershorai EZ will be the leading man-made source of mercury deposit into the lakes, rivers, and streams of the Mirershorai Upazila region. While other such plants outside the region contribute to the problem, a significant portion of mercury and other air toxics can be removed by air pollution controls. The issue is further detailed in Annex 4.

Ignoring Public Health:

Bangladesh has large reserves of coal and consequently may produce cheap electricity in meeting the rising energy demand. However, only by ignoring its very serious health and environmental impacts, can coal-fired power be considered a low-cost energy source. Setting aside the fact that coal has little practical utility as a transportation fuel, coal will have a negligible impact on our nation as an addition to oil. Conventional coal-fired power plants are one of the most polluting methods of generating electric power in the world today. This is particularly true when compared to renewable energy resources such as wind, geothermal, and solar radiation used generate electric power.

NOx and Ozone Pollution:

Coal-fired power plants are the second largest source of NOx pollution caused by automobiles. The health effects of NOx exposure range from eye, nose and throat irritation at low levels of exposure to serious damage to the tissues of the upper respiratory tract, fluid build-up in the lungs and death at high exposure levels. In addition to the adverse effects of direct exposure, NOx emissions from coal plants also pose a very serious health risk as ozone precursors. Ozone pollution, also known as smog, is formed when NOx reacts with Volatile Organic Compounds (VOCs) in the presence of sunlight. Smog is a powerful respiratory irritant that can cause an array of health problems. At low levels of exposure, ozone can cause coughing, wheezing, shortness of breath and chest pain. At higher concentrations, breathing ozone can lead to more serious effects, including lung tissue damage, reduced lung capacity, asthma exacerbation, as well as increased risk of hospitalization for asthma, bronchitis, and other chronic respiratory diseases. Recent studies demonstrate that ozone exposure also may lead to premature death.

The management and mitigation measures should focus on Emission Regulation and Compliance - (i) undertake a desk top study of SO₂ emission regulation policy implementation in Bangladesh; (ii) assess alternative regulatory options based on international experience; and (ii) conduct site visits to relevant stakeholders to assess compliance issues within existing regulatory frameworks.

4.1.9.8 Dredging of Feni River

Following appropriate planning and design associated with the bathymetric survey of the Feni River supported by BWDB, IWM and BIWTA, the river can be targeted for dredging to maintain or deepen navigation channels, anchorages or berthing areas for the safe passage of boats and ships enhancing Mirershorai EZ as a port and harbour status.

Dredging is necessary because of the natural process of sedimentation; sand and silt that washes downstream gradually fills the Feni River's tributaries and channels. As such, sedimentation is a problem everywhere from small estuary to the proposed EZ harbour complex, causing a wide range of detrimental effects to the adjacent floodplain including aquatic and terrestrial ecology. Managing dredged material in an environmentally sound manner is not just environmentally responsible -- *It's The Law*. Before dredged material is authorized for disposal, it must satisfy, among many other

things, a review in accordance with the applicable statutes and regulations (follow DoE or International Standard) as:

- First, there must be a demonstrated need for the dredging;
- Second, there must be a comprehensive analysis of all reasonable methods of and places for disposal of the dredged material;
- Third, testing must be performed to ensure that the material to be placed will not harm the environment into which it is placed.

However, this proposed Mirershorai EZ harbour and neighbourhood environment is not natural but will be man-made. It needs to enhance a free permanent stable connection (Muhuri Estuarine gut-tidal inlet) with the Bay of Bengal, allowing required navigability in all seasons.

4.1.9.9 Other Impacts and Mitigation

Other Impacts and Mitigation measures are Presented in Annex 4 as anticipated environmental impacts, corresponding mitigation measures related to the pre-construction (pertaining to project location and design), construction and operation of the Mirershorai EZ project as well as the responsible entity for implementation.

Potential environmental impacts have been assessed according to magnitude (I-insignificant, M-moderate or S-significant) and impact duration (T-temporary or P-permanent) and are presented in a manner that shows magnitude and duration of a particular impact, e.g., I/T means the impact is insignificant and is temporary in nature.

4.1.10 Institutional Requirement for Environmental Management

The Environmental Management Plan (EMP) was prepared to provide an outline of measures likely to be needed to mitigate the potential adverse environmental and social impacts due to proposed EZ development project. A detailed EMP covering all significant environmental and socio-economic issues would be developed as part of a full scale Environmental Impact Assessment (EIA). This EMP will form the primary mechanism for management, accountability and reporting on the project's social and environmental performance.

This report has been based upon the project description as provided by BEZA at the time of initial project commencement. In the event that any details of the project's implementation are changed it will be necessary to appropriately update this plan.

Project Management Office (PMO):

The Project's management will comprise an executive committee, an interagency working group, a Project Management Organization in the BEZA (BEZA-Project Director) and PIU in Mirershorai or Chittagong.

Executing Agency (EA):

The PMO in association with the Prime Minister's Office will be responsible for the overall technical supervision and execution of the project. The staffing of the PMO will include expertise in project management, civil engineering, institution and finance, environment, socioeconomic, land acquisition and resettlement aspects. The mitigation measures that are incorporated into the design will be verified by the PMO before providing technical approvals. The mitigation measures that form part of the Contract Documents will also be verified by Project Consultant (JDI-Maxwell, Sheltech) before getting the contract signed between the PMO and the contractor.

The mitigation measures identified in the IEE will be incorporated into the project cycle. Environmental controls pertaining to design and location will be incorporated into the detailed design by the project Construction Supervision Consultant (CSC). Mitigation measures during construction stage shall form part of the Contract Documents and will be implemented by the contractor.

Project Implementation Unit (BEZA-PIU):

In Mirershorai or Chittagong, a PIU will be established as soon as the Executing Agency (EA) enters into a project agreement with the funding agency (GoB, WB). The PIU will be headed by a Chief Engineer and will comprise the following sections: (i) Construction Section, (ii) Environment and Social Development Section, (iii) Operations and Maintenance Section and (iv) the Project Accounts Section. The PIU will be located within the Chittagong District office and with the assistance of CSC, will be responsible for construction supervision, local level procurement activities, contracting local contractors, and implementing the engineering and environmental controls.

The responsibilities of the PIU with support from project supervision consultants, shall include (i) construction supervision and management; (ii) assessment of works carried out by the contractor; and (iii) preparation of quarterly reports on the implementation of environmental mitigation measures and monitoring plan at the construction stage.

The contractor will provide the BEZA (PIU) with monthly reports on the implementation of mitigation measures. The reports prepared by the contractor along with quarterly monitoring reports to be prepared by the Project Consultant will be consolidated and submitted to the PIU for review.

During the operation stage of the Project, the responsibility of monitoring environmental performance of Project components should be delegated to either the external monitoring consultant, or BEZA in association with O&M Contractor and Consultants will undertake routine and random monitoring of specific environmental plans addressed in this IEE.

4.1.11 Environmental Management and Monitoring Plan

4.1.11.1 Environmental Management

The Executing Agency of the Project is BEZA-PMO and the Prime Minister's Office and thus has overall responsibility for ensuring that all standards and procedures are followed during construction activities. BEZA also has responsibility for ensuring that all monitoring requirements, including progress reporting are fulfilled. The Construction Contractor under General and Special Conditions of Contract of the GoB will be responsible for the construction of the EZ site and associated works. On completion of construction, the O&M Contractor will be responsible jointly with the BEZA for maintenance of the EZ establishment and all project management aspects, including oversight of environmental pollution, mitigation and monitoring (subject to approval of additional O&M Contract).

4.1.11.2 Environmental Monitoring Programme

Environmental monitoring is a very important aspect of environmental management during construction and operation stages of the project to safeguard the protection of the environment. An environmental monitoring programme for the construction and operation stage of the Project will be undertaken to monitor environmental impacts of the Project, to determine conditions requiring remedial measures and to assess compliance with national and WB environmental safeguard policies. The contractor will be responsible for implementing the monitoring programme and preparation of monthly progress reports regarding implementation. The Project Consultant will undertake the

environmental monitoring programme during the construction stage and will also monitor compliance of the contractor with the implementation of required mitigation measures and contract provisions pertaining to environmental aspects.

The following activities will also be carried out and cross-checked in association with the implementation of a monitoring programme:

- **Pre-construction:** updating of EMP during the detailed design phase and inclusion of environmental clauses in bid and contract documents.
- **Construction:** environmental performance of contractors with regard to control measures pertaining to erosion, material storage, location of work site, noise, waste disposal, traffic management, workers' safety etc.
- **Operation:** O&M practices and environmental effects including soil erosion, soil contamination, surface water and groundwater quality.

Further details can be found in the following table and in Annex-4.

Table 4.1.10.2-1: Environmental Monitoring Programme

Impact	Location	Means of Monitoring	Frequency of Monitoring
Construction Phase			
Pollution of water courses and flow obstruction due to improper stockpiling of excavation spoils and construction materials	Throughout project raised area (and its influence area)	Site inspection	Regular Monitoring
Flooding or accumulation of construction run-off due to inadequate drainage and improper stockpiling of excavation spoils and construction materials	Throughout project area	Site inspection	Quarterly
Excessive dust emission	Throughout project area	Site inspection, interviews/consultation with adjacent households/occupants of nearby schools and other structures	Regular site specific instrumental monitoring
Excessive noise emission	Throughout project area	Site inspection, Interviews/consultation with adjacent households/occupants of nearby schools and other structures	Quarterly
Health and safety hazards (workers and community) associated with construction activities	Throughout project area	Site inspection, interviews with workers and communities	Quarterly
Pollution due to improper disposal of wastes and excavation spoils	Treated water	Measurement of pH, iron, manganese etc.,	Quarterly
Operational Phase			
Health hazards due to distribution of unsafe water	Treated water	Measurement of pH, iron, manganese etc.,	Quarterly
Pollution due to improper disposal of sludge from industrial establishments	Disposal site, Receiving body of water for	Site inspection; Interviews with	Quarterly

Impact	Location	Means of Monitoring	Frequency of Monitoring
	supernatant water drained from the sludge tank	pump operator, staff and communities; Measurement of total suspended solids	
Odour emission and fly/vermin proliferation	Compost/sludge pit	Site inspection	Weekly
Pollution due to sewage overflows from filled-up septic tanks/pit latrines and bypassing of soak pits	Sanitation facilities (e.g., public and community latrines) throughout the Mirershorai EZ area	Site inspection	Monthly

Source: *Environmental Analysis, October, 2013*

The Construction Supervision Consultant (CSC) in cooperation with PIU during project implementation will be required to develop an environmental auditing protocol for the construction period, formulate a detailed monitoring and management plan, supervise the environmental monitoring regularly and submit quarterly reports based on the monitoring data and laboratory analysis. The PIU shall submit the following environmental reporting documentation to the GoB and funding agency (World Bank):

- a) Baseline Monitoring Report
- b) Bi-annual Environmental Monitoring Reports
- c) Project Completion Environmental Monitoring Report: Three years after completion

4.1.12 Conclusions

Findings of the IEE reveal that no major negative environmental impacts are likely to occur due to construction and operation of the Mirershorai EZ Project. The potential negative environmental impacts associated with the construction activities are relatively minor in comparison to the significant environmental and economic benefits resulting from project operation. The implementation of the EMP which deals with mitigation measures, implementation responsibilities and monitoring plan as defined in the IEE will result in minimal adverse impacts.

During construction, the contractor will implement the mitigation measures identified in the IEE while project consultants will conduct regular monitoring to ensure the contractor's compliance with applicable provisions of the EMP. The project consultant will also assist the PIU in preparing contractual documents so that bidding documents, bills of quantity and other contractual obligations of the contractor clearly identify environmental responsibilities and describe penalties for non-compliance.

In conclusion, the Project will have overall beneficial impacts and will have minor negative impacts, which will be carefully monitored and adequately mitigated. As such, the completion of this IEE fully meets the GoB and World Bank standards at this stage.

However, it is recommended that a detailed EIA study should be undertaken considering alternative EZ site options and seasonal data collection undertaken through a multidisciplinary team (wildlife expert, limnologist, fisheries biologist, terrestrial and aquatic ecologist etc.) to precisely record the baseline situation and to refine designs and specifications necessary for the parameters.

The tentative ToR for the international environmental specialist and the ToR for the local environment specialist to be employed by the Project Consultant are as follows:

Environmental Training Specialist – International

The proposed ToR for the training consultant is as follows:

- (i) review prevailing DoE and WB regulations and guidelines governing the assessment and management and mitigation of environmental impacts of EZ project;
- (ii) identify the procedures and tasks required to be performed by BEZA to meet the requirements of these regulations and guidelines;
- (iii) review the skills of relevant BEZA officials and personnel and assess the need for training to establish the capability to meet requirements for preparing environmental assessments, environmental monitoring and implementation of mitigation measures of EZ and associated infrastructure development projects;
- (iv) prepare a short-term staff training plan and associated materials to meet immediate needs;
- (v) undertake training workshops that will include the following topics:
 - Environmental assessment requirements of GoB EZ Projects
 - WB requirements and procedures on project cycle, project categorization, IEE/EIA process, preparation of summary IEEs/EIAs, including formats and reporting requirements
 - Assessment of environmental impacts
 - Identification of mitigation measures
 - EMP formulation, implementation and monitoring
 - Review of IEE/EIA/ reports to comply with WB requirements
 - Incorporation of mitigating measures in the project design and contracts
- (vi) evaluate the effectiveness of the training, measuring improvements in attitudes and skills achieved.

Environment Specialist – Local

Below is the proposed ToR for the environment specialist to be employed by the BEZA during the construction stage:

- (i) develop an environmental auditing protocol for the construction period;
- (ii) conduct quarterly monitoring (through site inspection, review of the contractor's monthly reports, review of related documents and interviews/consultations with village people and community, PIU staff, on-site workers/employees, etc.) of the contractor's performance regarding implementation of mitigation measures;
- (iii) based on the monitoring findings, recommend additional mitigation measures, as necessary;
- (iv) in close coordination with the PIU, prepare and submit monthly and quarterly monitoring reports;
- (v) assist the international environment specialist and in the needs assessment, preparation of training materials, as well as coordination and conduct of training.

Thus, the EIA is intended to include a wide range of Important Environmental Components (IECs) such as:

- (i) Identification of Impacts (IECs'), Quantification of Impacts and Valuation of Impacts to ensure appropriate monitoring for Project sustainability.
- (ii) Increase and ensure the physical safety of the proposed Mirershorai EZ Site combined with social security of the inhabitants of the study area;
- (iii) Enhance and strengthen operational knowledge of hydraulic and morphological processes in the Feni River, lower Meghna estuary and Bay of Bengal;
- (iv) Find suitable land reclamation and bank protection methods;
- (v) Further explore an assessment of the physical behaviour of the Feni River and dynamic morphological processes along the estuary;
- (vi) Generate reliable data and further analyse to serve as a supplement to results and data from other sources, such as the Institute of Water Modelling, BWDB, BIWTA and Department of

Meteorology, as well as an analysis of a series of satellite imagery and historical data, notably from the Survey of Bangladesh, Land Reclamation Project and the Cyclone Shelter Preparatory Study.

- (vii) Other existing and proposed projects and studies in the area of influence of the Mirershorai EZ must be investigated including the impact of a coal-fired power plant. Annex 4 highlights the impact of such an establishment
- (viii) Likewise, detailed monitoring including management training procedures and costs will be presented in the EIA.

4.2 Social, Gender and Resettlement Issues

4.2.1 Introduction

Social and gender aspects and resettlement issues are crucial in the planning and implementation of any development project. EZs on the one hand require land acquisition which will cause loss of property, home and livelihood sources and on the other hand will provide significant opportunities for economic activities, commerce and trade. These activities are likely to have an impact on the landownership, poverty issues, food security, economic status, social status, and gender relations. The social and gender aspects and the resettlement issues discussed here, cover the impact of the proposed EZ on both the EZ itself and adjacent areas. These are based on the current socio-economic scenario of the locality and take into account whether the proposed project will affect lives, livelihoods, structures, institutions, historic sites, ethnic and religious minorities and the resettlement of the displaced population for the proposed EZ.

4.2.2 Methodology

- Review of relevant documents and data including World Bank policies related to social, gender and resettlement aspects and Bangladesh Government Acts;
- Meeting with concerned agencies;
- Reconnaissance field visit;
- Public consultation within the project area and adjacent areas;
- Preparation of the review Report including secondary and primary data and incorporation of Feedback.

4.2.2.1 Secondary Data Collection and Literature Review

The literature review is done to identify the current socio-economic scenario of the EZ and adjacent areas and the Project Affected People (PAP). This will provide the basis in formulation of the Resettlement Action Plan (RAP). However during feasibility stage, further review will be conducted on social, economic and legal issues relevant to the project.

The following activities have been undertaken:

- Data were collected from secondary sources comprising demographic composition, occupational status and sources of livelihood, educational status, household structures and access to basic physical facilities.
- An assessment of all legislation including World Bank and Bangladesh Government policies was done.
- A list of social, cultural, religious and academic institutions and sites was made.
- An information gap analysis and identification of the areas where further field work is required to be undertaken was carried out.

4.2.2.2 World Bank Policies and Acts and Regulations of the Bangladesh Government

The World Bank's social safeguard policies were analysed. These are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for the World Bank and borrower staff in the identification, preparation and implementation of programmes and projects. Safeguard policies have often provided a platform for the participation of stakeholders

in project design and have been an important instrument for building ownership among local populations. The following policies and legislation were reviewed:

- World Bank OP 4.12 Requirements for Involuntary resettlement
- World Bank Gender Policy: OP 4.20 - Gender and Development (Revised March 2012)
- Specific Funding Requirement of the World Bank's Policy OP 4.10.
- World Bank policy on Physical and Cultural resources: OP4.11
- Bangladesh Government Acquisition and Requisition of Immovable Property Ordinance, 1982.

4.2.2.3 Meeting with Relevant Agencies:

Meetings were held with the ADC at the Chittagong District DC office and several government officials. There was a meeting with the Engineer at BSRM in Chittagong. In Mirershorai Upazila, meetings were held with government officials and the local Union Parishad Chairman.

4.2.2.4 Public Consultation in Project Area and Adjacent Areas

A participatory approach is an essential part of projects dealing with development in order to ensure sustainability. Participation of local people and other stakeholders enables different socio-economic interest groups in enhancing their capabilities to play an effective role in development initiatives. It also ensures commitment and a sense of ownership of various stakeholders beyond the locals and direct project beneficiaries. Government agencies, people's representatives, professional groups and voluntary groups including NGOs and community-based organizations, could be actively engaged to share responsibility in key decisions. It also enriches project planners with local/indigenous knowledge.

As part of the public consultation of social, gender, and resettlement issues, we carried out a series of consultations with people from a range of categories within the proposed EZ and the nearby areas including proposed approach roads. These meetings were held between 23 July and 25th July 2013 and 11-12 February 2014. Consultations took the forms of individual interviews, focus group discussions – mostly informal, and visits of local shops and restaurants in Boro Takia., Nawapapra, Bamon Sundor Village, Muhuri Dam areas areas. Consultation with local people included home owners, agricultural land owners, fishermen, landless people, women, school-going children, local traders, transport workers, shopkeepers, restaurant owners and workers, and firewood-collectors from the nearby forest.

Meetings were held with the ADC and government officials at the Chittagong District DC office and government officials, Union Parishad chairman of Mirershorai in Mirershorai UNO office.

Consultations were conducted with local people including home owners, private land owners, fishermen, shopkeepers, and restaurant owners and workers, women, elementary school children and local small-scale traders.

Table 4.2.2.4-1: Brief of Public Consultations

Date	Stakeholders	Location	No of persons
24 th and 25 th July 2013	Interviews with the ADC and other government officials	Chittagong District	
24 th July 2013	Interviews with the government officials and engineers	Mirershorai Upazila	
23 th July 2013 and	Youth, students, fishermen, van pullers, shop owners, farmers, businessmen, transport workers, shop	Mirershorai: Boro Takia, Abu Torab hat, Maghadia, Bamon sundor viallge, Nawapara, Maghadia	7 fishermen, 3 van pullers, 15 shop owners/workers, 16 youth, 12 adults, 14 children
23 th and 25 th July 2013	Affected households.	EZ and adjacent area	19 home owners' place, 18 children in the adjacent area, 2 women
25 th July 2013	fishermen, businessmen, shopkeepers, vendors, youth , local men	Zoragonj- Azampur bazaar, Muhuri Dam area	14
11-13 February	Youth, students, fishermen, van pullers, shop owners, affected households.	Mirershorai EZ and adjacent area	Several spot discussions with many locals and affected people (PAPs)in their homes and shops
11-13 February	Survey on affected HH, commercial spaces, Social, educational and religious Institutions	Mirershorsai EZ area, approach roads	All affected HH, shops, insituions

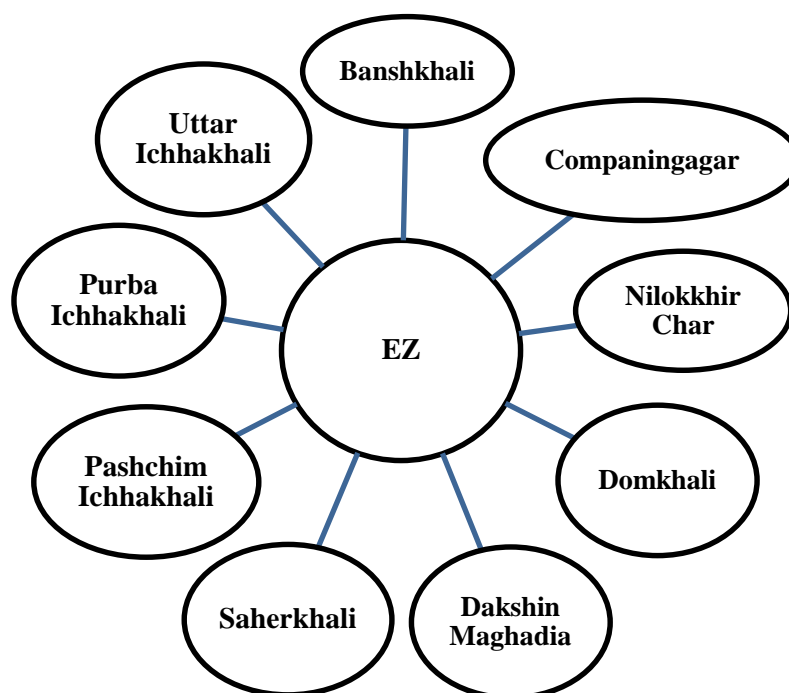
4.2.3 Information on Mirershorai EZ site

A. On-site:

The following section provides the current socio-demographic and economic conditions of the people of the mouzas where the proposed EZ will be established and provides an overview of the locality. Information on affected population and structures in the approach roads to the EZ also included in the survey.

Population distribution:

The proposed EZ area is under Osmanpur, Saherkhali, and Ichhakhali UPs and will cover parts of Banshkhali, Nilokkhir Char, Companingagar, Uttar Ichhakhali, Pashchim Ichhakhali, Purba Ichhakhali, Saherkhali, Domkhali, and Dakshin Maghadia Mouzas. The population in the proposed EZ fall only partly into these mouzas, thus, the number of people displaced by the EZ is much less than the total population of these mouzas.

Figure 4.2.3-1: Mirershorai EZ's locationLand patterns:

Private land ownership includes agricultural lands, homes, and ponds. No detailed data of land patterns are available as the survey has not been done by the Ministry of Land yet. A survey to collect first hand information on the structures was conducted in February 2014 in the proposed EZ area and the approach roads. The results are presented in the report. As the population that will be displaced by the EZ will be provided with accommodation adjacent to the EZ area, no one is likely to be adversely affected by the EZ.

Institutions, Structures, and Settlements around the proposed EZ:

It is to be noted that during the field visit and consultation, it appeared that approximately 897 (455 in private lands +442 in government lands) households will be affected by the establishment of the EZ and will need to be resettled. The following table summarizes the location and other relevant details of the households and structures that are likely displaced by the project and would need resettlement and number of ponds and trees to be affected.

Table 4.2.3-1: Household Structures in EZ Area and Adjacent to the Approach Roads to EZ

Village, Parishad	Mouza, Union	Total No of Houshold	Household Structure Type			Ponds	Trees	HH in Govt. Land
			Pucca/ pucca	Semi Tin-shed	Hut/ Earthen			
6 No. West Ichakhali Union Village- Cunimijhir Tak Word No-7		97	6	91		34	398	57
6 No. Uttar Ichakhali Union Village: Charsarat Word No-9		19		8	11	7	980	12
16 No. Shaherkhali Union Village- South Moghadia Word No-1		9		7	2	1	105	9
16 No. Shaherkhali Union Mouza - South Moghadia Word no-1		26		23	29			26

Village, Mouza, Union Parishad	Total No of Houshold	Household Structure Type			Ponds	Trees	HH in Govt. Land
		Pucca/ Semi pucca	Tin-shed	Hut/ Earthen			
Mouza: Companinagar Village: companinagar	3		3				3
Mouza: Domkhali Village: Domkhali Beribadh Union: Shaherkhali	17		17	6	3	29	
Mouza: West Bashkhali Village: Bashkhali Union: 5 No. Osmanpur	37		34	3	5	150	1
5 No. Osmanpur	12	4	10		8	30	
Bashkhali	25	4	16	10	21	135	5
Osmanpur Union	12	4 Room House	10	9	7	25	
6 No. West Ichhakhali	40	13	27	57	53	640	297
Mouza- East Ichhakhali Union: 6 No South Ichhakhali	8		2	17	2	135	8
Mouza:East Ichhakhali Union: 6 No South Ichhakhali	23		9	42	17		23
Boro Takia bazaar to Maghadia and Abu Torab right side of road	39	5	25	8			Temporary-1
Boro Takia bazaar to Maghadia and Abu Torab left side of road	84	Pucca - 29, Semi pucca 12	43				
Azampur bazaar to Muhuri project -left side	2	1	1		26		
Azampur to Muhuri Project Road -Right Side	2	2			21	487	
Total	455	80	326	200	258	3114	442

Table 4.2.3-2: Breakdown of Structures Likely to be displaced

Location	No. Of Household structures	Type of structure	Type of land
EZ area private HH	455	Pucca-80 Tinshed-326 Hut/kutchha-200	Home
EZ area HH in Government areas	442	Hut/Kutchha-442	Home
Shops in EZ areas	31	Pucca=4 Tinshed=27	Commercial
Access Road 1 (Zorargonj to Muhuri dam)	48	Pucca=11+3 Tinshed=3+31	Commercial
Access Road 2 (Boro Takia to Abu Torab market)	102	Pucca=22+25 Tinshed-40+ 15	Commercial
Ponds	258		Private
Trees	3114		Private

Source: Field survey, February, 2014

Note: Though during survey each HH mentioned of 1 structure but in the Focus group discussion it came out that some of them belong to one Household though identified them in separate households, on the other hand, there are some households living jointly in one large structure, and few living in government land nearby their own homestead. The number of such households is low but during the resettlement and compensation strict checking of number of private land ownership with dag no., suggested to be done by a committee including DC, UNO, AC Land, local UP representatives. An NGO may be employed to do the detailed checking and supporting during the resettlement process.

The project plans to resettle families from living on their privately-owned lands in the EZ area to other lands in houses with modern amenities. However, the population who will benefit most from the positive impact of the job creation by industrialization would be much higher and will go beyond the Upazila as the Mirershorai EZ will provide employment opportunities for 476,678 workers.

B. Off-site

Land Needed for the Access Roads:

Although there are several institutions, structures and settlements in the Mouzas of the EZ area, due to the location of the EZ, there is vast government khas land on one side and on other side it ends in Muhuri project dam area. Therefore, this area is the least densely populated. None of the institutions or structures is likely to be disturbed or damaged by the EZ.

However, extra land acquisition will be needed for the extension of approach roads to connect the EZ areawith the Dhaka-Chittagong Highway, for transportation of the necessary raw materials and finished goods for the Industrial Zone.

Institutions and Settlements around the proposed approach road:

Approach Road 1: Zorwargonj to Osmanpur proposed extension of road: The existing road would be widened for a 4 lane highway which is 7 km long and will require 33 acres of extra land.

In Zorwargonj, there are Union Parishad Head Quarter (UPHQ), a post office, at the beginning of Zoawargonj to Osmanpur approach road - a textile engineering college, three mosques, one temple, two graveyards, and one community centre. Osmanpur Union Parishad Head Quarter (UPHQ) is in Osmanpur and Osmanpur is connected via the approach road to the Muhuri Project Dam near the proposed EZsite. Chowdhury hat has a growth centre, and academic institutions. A small portion of Chowdhury Hat may be affected by the road extension but no other institutions will be affected. A few of the adjacent homes and shops along the roadside of the Zorargonj to Chowdhury Hat which may be affected by the EZ, are surveyed and information on them is provided in the report. The extension of road is designed to avoid the concentration of shops and houses.

Compensation for any land acquired will be provided and rehabilitation provision for all the families is included in the EZ plan. Survey detailed is provided in the report to ensure efficient resettlement and reallocation of the affected people. However only one third or less shops along the roadside is expected to be affected though in compensation package almost all shops are counted to make sure none of the affected people is excluded from the compensation coverage.

Approach Road 2: BoroTakia to Nawapara, Maghadia via Abu Torab market: The BoroTakia to Nawapara existing road would be widened to a 4 lane highway which is 10 km long and will require 45 acres of extralands. The extension is designed to by passing the market to avoid destruction of existing commercial, social institutions and structures.

In BoroTakia, at the beginning of the road there are bus-stands, a long market, several shops, and a mosque. It goes towards Ez area through Abu Torab Hat where there is a college, a primary school, a health complex, a long bazar and a cyclone shelter. It goes through Maghadia where there is UP HQ, a small Bazar, a growthcentre, a healthcentre, a primary school. To avoid the destruction of current institutions and structures, the proposed approach road 2 is bypassing Abu Torab hat and other densely oncentrated market of Boro Takia to save these institutions and the bazars.

Most areas of the roadside extension will require agricultural land but a few homes and shops.

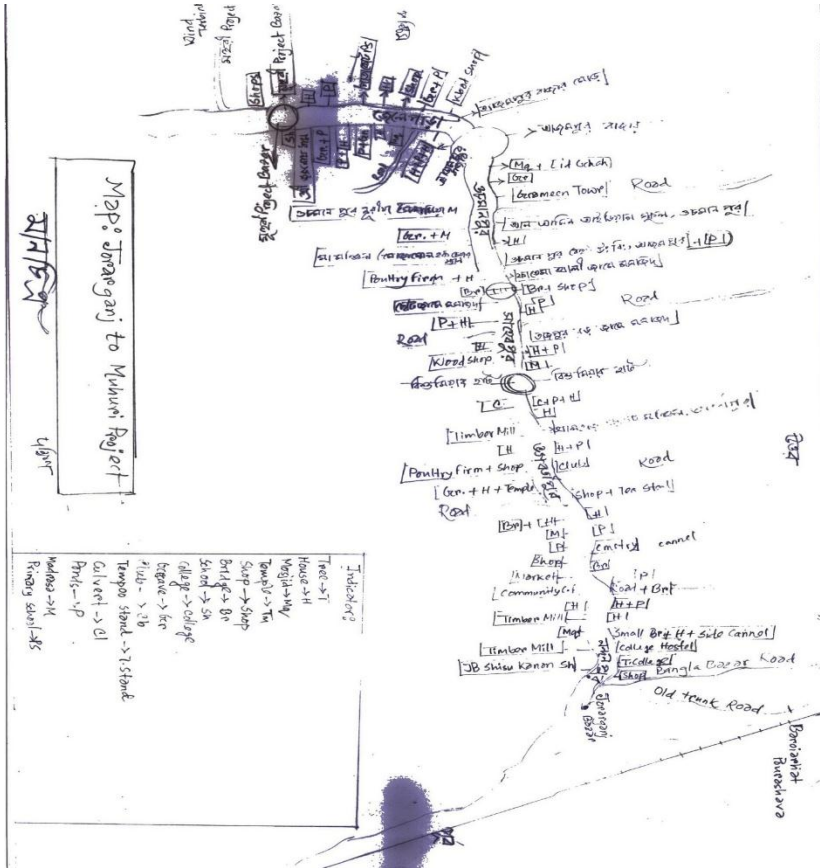
Table 4.2.3-4: Types of Structures at the Side of the Approach Roads

Village, Mouza, Union Parishad	Total No of Houshold	Household Structure Type			Ponds	Trees	HH in Govt. Land
		Pucca/semi pucca	Tin-shed	Hut/earth made			
Boro Takia bazaar to Maghadia and Abu Torab right side of road	39	5	25	8			Temporary-1
Boro Takia bazaar to Maghadia and Abu Torab left side of road	84	Pucca- 29, semi pucca 12	43				
Azampur bazaar to Muhuri project -left side	2	1	1		17		
Azampur to Muhuri Project Road -Right Side	2	2			21	487	
Total	127	49	69	8	38	487	

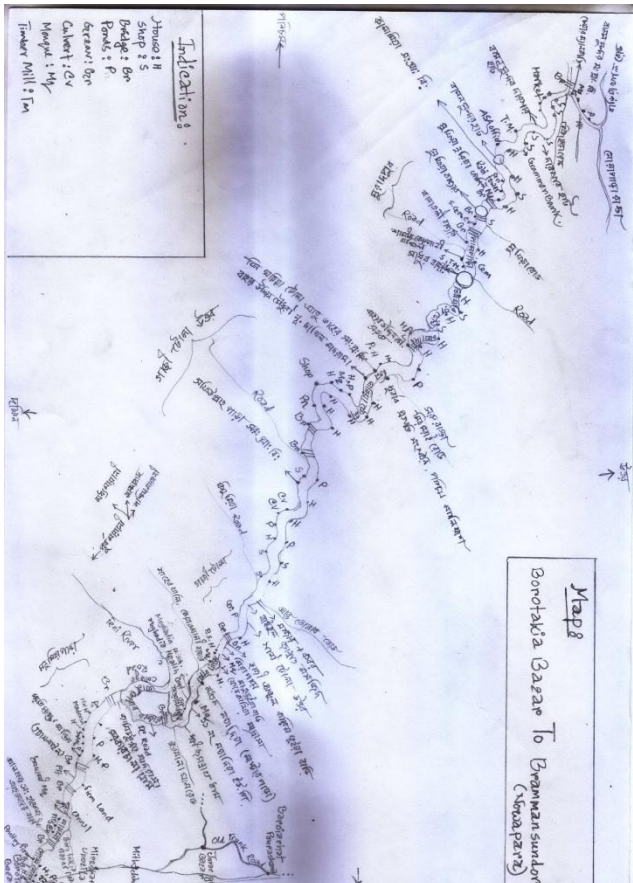
Source: Field survey, February 2014.

Figure 4.2.3-2: Field maps of 2 approach roads

Access Road 1



Access Road 2



4.2.4 Information on Mirershorai EZ and Surroundings

The following section presents the population composition and the background of the population including the occupational status, housing patterns and sanitation facilities in the 9 mouzas where the proposed EZ will be established.

Table 4.2.4-1: Male and Female Population

Sl	Name of Mouza	Household	Population
1	Banshkhali	543	2,537
2	Nilokkhir Char	-	-*
3	Companingagar	**20	115
4	Uttar Ichhakhali	2,625	13,897
5	Pashchim Ichhakhali	1,562	8,374
6	Purba Ichhakhali	998	5,594
7	Saherkhali	1,171	6,599
8	Domkhali	1,146	6,169
9	Dakshin Maghadia	732	4,144
	Total	8,797	47,429

*No private land in Nilokkhir char will be acquired and no population living there currently. **No private land in Companingagar will be acquired, thus these population will not lose land.

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

The household numbers in the mouzas are 8,797 and the total population is 47,429. The average family size of the area is 5.4.

Table 4.2.4-2: Household Type and Gender-Based Population Distribution

Sl	Name of Mouza	HH				Population			Sex Ratio
		Total	General	Institutions	Other	Both	Male	Female	
1	Banshkhali	543	543			2,537	1,189	1,348	88
2	Nilokkhir Char								
3	Companingagar	20	20	0	0	115	58	57	102
4	Uttar Ichhakhali	2,625	2,620	2	3	13,897	6,378	7,619	82
5	Pashchim Ichhakhali	1,562	1,560	0	2	8,374	3,749	4,625	81
6	Purba Ichhakhali	998	996	0	2	5,594	2,707	2,887	94
7	Saherkhali	1,171	1,164	2	5	6,599	2,957	3,462	81
8	Domkhali	1,146	1,142	1	3	6,169	2,760	3,409	81
9	Dakshin Maghadia	732	732	0	0	4,144	1,859	2,285	81
	Total	8,797				47,429			

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

As Table 4.2.4-2 indicates, women out-numbered men in all of the mouza's except Companingagar. Thus, it appears that increased job opportunities within the localities for women will lead to women's economic empowerment and the economic up-grade of their families and the locality as a whole.

Table 4.2.4-3: Age-Wise Population Distribution

Sl	Name of Mouza	Population	Percentage of Population in the Age Groups									
		All ages	0-4	5-9	10-14	15-19	20-24	25-29	30-49	50-59	60-64	65+
1.	Banshkhali	2537	11.0	11.7	12.3	10.9	9.3	8.3	21.6	6.1	2.6	6.1
2.	Nilokkhir Char	.*										
3.	Companingagar	115	12.2	13.9	16.5	4.3	8.7	2.6	28.7	2.6	2.6	7.8
4.	Uttar Ichhakhali	13897										
5.	Pashchim Ichhakhali	8374	10.8	12.6	14.1	11.1	8.3	7.3	21.1	6.2	1.6	5.9
6.	Purba Ichhakhali	5594	12.6	15.2	11.9	10.0	8.5	7.6	20.8	6.0	2.8	4.5
7.	Saherkhali	6599										
8.	Domkhali	6169	10.3	12.7	12.2	10.2	8.5	8.0	21.9	6.1	3.6	6.4
9.	Dakshin Maghadia	4144	12.5	12.5	11.5	9.4	10.2	8.8	19.7	6.7	3.2	5.6
	Total	47429										

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

Age Distribution: As observed from the above table, the majority of the population in different mouzas belong to the age group of 30-49. The table also shows that the percentage of young people is much higher than that of the older population while the employment rate in the locality appears low. Thus, the EZ will play a very positive role for employment generation for the youth and indeed, for all other ages including women, in various industrial sectors established within the EZ.

Table 4.2.4-4: Employment Status of the Population

Sl	Name of Mouza	Population not attending school			Employment Status							
		Both	Male	Female	Employed		Looking for Work		Household Work		Do not Work	
					Male	Female	Male	Female	Male	Female	Male	Female
1	Banshkhali	763	317	446	223	7	20	0	3	344	71	95
2	Nilokkhir Char											
3	Companingagar	33	15	18	12	1	0	1	1	12	3	5
4	Uttar Ichhakhali											
5	Pashchim Ichhakhali	2,034	815	1219	504	8	33	3	74	966	204	242
6	Purba Ichhakhali	399	168	231	112	2	1	0	1	181	54	48
7	Saherkhali	1,324	506	818	410	5	7	0	19	670	70	143
8	Domkhali	711	294	417	222	6	9	1	17	502	71	121
9	Dakshin Maghadia	587	244	343	190	1	1	1	4	274	49	67
	Total	5,851	2,359	3,482	1,673	30	71	6	119	2,949	522	721

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

Education: As reported in the above table, the total number of people 7 years and older but not attending school is 5,851 comprising 2,359 male and 3,482 female. This number, 5,851, represents the number of school-age children not attending school out of a population of 47,429. Employment opportunities leading to higher incomes for the youth and also for adult, many of whom are parents,

are expected to contribute to higher attendance levels of children including girls at schools leading to overall higher education for all.

Employment Status: Turning to the employment status shown in the table, it appears that out of 3,482 females, only 30 women (less than 1%) are employed. This is disappointing. Out of 2,359 men, 1,673 are employed (around 70%). Women are predominantly engaged in the household work category. Compared to 2,949 females, only 119 males are involved in this activity. Of those not having jobs, the number of women is higher than that of men (male: 522, female: 721) which indicates that women's domestic labour may not be counted in the labour force.

From direct consultation during field visits, it was found that in regard to occupations, the area is, predominantly agriculture-based and partly fisheries-based.

Women's Empowerment: Less than 1% of women are employed in the proposed EZ area. Among the currently employed population, a very negligible proportion of women is employed. Most of them are engaged in household work or do not work at all, which cannot bring them economic solvency or self-reliance and will not empower them economically. The employment rate for males is also very low. This indicates an urgent need for employment generation. During consultation with locals of various ages and occupations, the urgency for the expansion of economic opportunities was repeatedly mentioned and felt.

Thus, employment opportunities for women created by the proposed EZ are expected to provide them with a better socio-economic status and thus, empowerment.

Table 4.2.4-5: Population Not Attending School and Employed, by Field of Activity

Sl	Name of Mouza	Population not attending school and employed			Field of activity					
		Both	Male	Female	Agriculture		Industry		Service	
					Male	Female	Male	Female	Male	Female
1	Banskhali	230	223	7	166	1	10	4	47	2
2	Nilokkhir Char									
3	Companingagar	13	12	1	10	1	0	0	2	0
4	Uttar Ichhakhali									
5	Pashchim Ichhakhali	512	504	8	331	5	9	1	164	2
6	Purba Ichhakhali	114	112	2	101	1	2	0	9	1
7	Saherkhali									
8	Domkhali	228	222	6	142	3	2	0	78	3
9	Dakshin Maghadia	191	190	1	181	1	0	0	9	0
	Total	1288	1263	25	931	12	23	5	309	8

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

Field of activities: The total number of people not attending school and employed is 1,288, among whom 1,263 are males and only 25 are females. In Agricultural activities 931 males and only 12 females are involved. Very few are employed in industry, only 23 males and 5 females. Men's involvement in the service sector is noticeable, 309 males are working in this sector compared to only 8 females. The employment status clearly shows that the majority are dependent on agriculture related activities. The number of people in the service sector is almost one-third of the number who are involved in agriculture. The very low number of people employed in industry is due to lack of opportunity.

Thus, the EZ which will generate 532,440 job opportunities, will not only change the scenario of the Upazila but also that of the neighbouring Upazilas and will contribute to a reduction in migration to the large cities such the capital, Dhaka and the nearby mega-city of Chittagong. This locality is expected to become a new hub for business the service sector with all urban facilities.

Women's presence in all the major fields of activities: Women's presence is very poor in all the major fields of activities such as agriculture, industry and service sectors. One of the reasons may be that when women work as domestic labourers in agriculture, their economic contribution is not counted. It is rather counted as domestic work which seriously undermines women's productive role. Women's involvement in the EZ industrial zone will not only make their contributions visible in the productive sector, it will also empower them in all senses and will eventually have a positive impact on their own lives and that of their family members, particularly their children.

Table 4.2.4-6: Household Structure and Sanitation Facilities

Sl	Name of Mouza	Number of Households	Type of structures (%)				Toilet Facility (%)			
			Pucca	Semi-pucca	Kutchha	Jhupri	Sanitary-water sealed	Sanitary -non water sealed	Non sanitary	None
1	Banskhali	543	4.4	6.1	84.9	4.6	9.4	65.7	16.8	8.1
2	Nilokkhir Char									
3	Companingagar	20	0.0	0.0	100.00	0.0	0.0	50.0	50.0	0.0
4	Uttar Ichhakhali	3620	6.6	9.3	81.9	2.2	13.5	72.1	11.1	3.2
5	Pashchim Ichhakhali	1560	4.4	7.9	83.4	4.2	13.1	58.1	25.2	3.6
6	Purba Ichhakhali	277	4.3	3.2	89.5	2.9	0.7	60.3	31.0	7.9
7	Saherkhali	1164 (293+304+ 411+156)	6.4	8.4	84.8	0.3	5.6	79.5	14.9	0.1
8	Domkhali	805	5.3	6.3	87.7	0.6	12.2	72.2	15.2	0.5
9	Dakshin Maghadia	444	0.9	4.5	87.8	6.8	0.0	74.8	22.1	3.2

Source: BBS, Population and Housing Census 2011, Community Report, Chittagong Zila

Household structure and Sanitation facilities: The household pattern, sanitation facilities and behavior shows a grim picture of poverty in the proposed EZ area. Most of the households have kutchha houses in all the mouzas including all in Companinagar. A very low percentage of households have pucca houses. The number of people using proper sanitary toilets is small - most people having non-water sealed sanitary ones. Fifty percent of households in Companinagar and 15%-30 % in other areas either have non-sanitary toilets or no toilets at all.

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

1. Land details:

Land details for Mirershorai Upazila are given below.

- a) 6,053 acres (2,451 hectares) agriculture land (in Muhurir Char approximate khas land is 50,000 acres (20,243 hectares), not yet surveyed), cultivation: 64,000 acres (25,911 hectares)
- b) Total vested property: 1,985.67 acres (804 hectares)
- c) Home: 46,080 acres (18,656 hectares), forest and hill areas: 49,222.16 acres (19,928 hectares), huge coastal island areas not surveyed yet
- d) Ideal village: 2, rehabilitated families: 80
- e) Housing projects: 2 (Alinagar), total families - 400, rehabilitated families - 300

For this section, data was collected from the UNO office, during a field visit to Mirershorai.

As the EZ will create many jobs in the Mirershorai Upazila and adjacent areas, an overview of the Upazila is presented here for its socio-economic and civic status.

Mirershorai is surrounded by Tripura in India in the northeast, Fatikchhari of Chittagong District in the east, Sitakundu in the south and Shwmdwip channel in the west. The Upazila area is 482.88 km. There are 16 Unions, 2 Pourashavas, 113 Mouzas and 209 villages in the Upazila.

Population:

2011 Census on Population and Housing:

Households: 79,545, Total population: 398,716, population density: 826 per m², members per household: 5.1 persons, 2001 census: Number of households: 69,184.

Population: 368,950; Male: 183,358; Female: 185,592; Members per household: 5.3 persons; Population density: 764 per Km² (1,979 per mile²)

Education: education rate - 52.01% (Aged 7+ population)

- School-going students: 80,455 (5-24 aged)
- Government primary schools: 145
- Government registered primary schools: 23
- Community primary schools: 14
- Private unregistered primary schools: 12
- Primary school attached with high school: 1
- Private high schools: 44 (including 5 girls' schools)
- Kindergartenschools: 12
- Madrasas: 24 (1 women's madrasa)
- Independent abtedia madrasas: 17
- Private degree colleges: 3
- Intermediate colleges: 2 (1 girls' college)
- Textile engineering college: 1

Health:

- Hospital: 1 (50 bed)
- Family Welfare Centre: 14
- Union Health Centre: 7
- Private clinic: 3
- Community clinic: 18
- Mother and child welfare centre: 1

Other organizations:

- Sub-Registrar's office:2 (Sadar and Zorwargonj)
- Post office: 30
- Cyclone sheter:73
- Bank: 24 branches of several banks
- Registered organizations and clubs: 93
- Public library:1 (run by the ZilaParishad)
- Telephone exchange:1
- Rail station: 4
- Registered orphanage: 16
- Officer's club: 1
- Press club:1
- Local newspapers:3
- Sluice gates: 5
- Hat/Bazars:38
- Hilsha reproduction centre: Out of a total of 4 such centres in Bangladesh, one is in Mishorai coastal area in Shaherkhali
- Drinking water: almost 90% water has excessive arsenic and iron.

Small Ethnic communities/Adivasi/Tribal Population: There are few Tripura people in the hilly areas of Mirershorai, Karerhat, Khayachhara and Wahedpur Union which is quite far from the EZ zone, there is no tribal population living within 20 km of the EZ area according to some of the locals, a Union Parishad member and a few government officials.

None of tribal population lives in the proposed EZ area or adjacent areas and no tribal lands will be acquired for the purpose of development of EZ and proposed approach roads, thus there is no foreseeable risk of any of them being displaced by the project.

NGO activities: Operationally important NGOs include Proshika, BRAC, ASA, Sheba, Grameen Bank, ICDDRB; CARE, Hunger Project, DORP, BaisOpka, IPSA, FatemaPalli, SwasthyaShikkha Centre and Eva.

Population of Chittagong District and Division:

Population in Chittagong District: 7,616,352 (Male: 3,838,854; Female: 3,777,498)

Population living in rural areas: 4,463,723

Population in Chittagong Division: 28,423,019

(Male: 13,933,314; Female: 14,489,705)

Population living in rural areas: 21,517,539

The population in both Chittagong district and the division will benefit from the huge number of industrial jobs created by the Mirershorai EZ.

4.2.5 Overall Social Impact

Regarding the social indicators, the following are likely to impact the social lives of the local population due to EZ:

Table 4.2.5-1: Social Issues, Their Impacts and Strategies for Risk Mitigation

Sl. No.	Issues	Impact	Strategies for Risk mitigation
1.	Poverty alleviation and diversification in livelihood:	Vast employment opportunities potentially created by the EZ will reduce poverty via increased income through various livelihood options. By means of industrialization and related trades, diversification of livelihood will occur for all strata of people. Diverse livelihood options for the locals and better wages for the employees of the industrial zone will reduce poverty for many poor households and will contribute to reducing the poverty level in the locality. A total of 715,017 (direct= 476,678+ indirect= 238,339) jobs are expected to be created by the Mirershorai EZ. The Zone will house many textiles and garments industries which are very suitable for women employment. Machinery parts and auto-industry will be able to employ youth males. So, this will enormously benefit cross section of population and both gender	Skill training programs by relevant government agencies and NGOs will be needed for efficient utilization of this huge manpower.
2.	Food security:	With increased income the families will be able to ensure food security for their families. The small landowners are not able to cover their food security by their production. As these earnings are not enough for the small farmers, seasonal workers, food security for them or a standard livelihood, they prefer a better livelihood and secure earning options. The EZ will provide them with that opportunity.	As agricultural lands will be acquired, special care needed for the small and marginal farmers who are solely or mainly dependent on these lands. Better livelihood options and food security should be ensured for them.
3.	Awareness and accessibility regarding health:	Better access to health facilities due to increased ability and better communication and access to health services is expected. WATSAN behaviour which is mixed at current stage is expected to be much better due to affordability of sanitary toilets and attitudinal change due to increased earning.	Issue of health hazards caused by the EZ industries need to be identified. If there are any, steps need to be taken to prevent and minimize such hazards.
4.	Education for children including Girls' Education:	Due to the establishment of the EZ and better economic changes in the locality, the child education rate is likely to increase leading to a reduction in children's informal or agriculture-based labor.	During construction and while the EZ gets operational, children's safety needs to be ensured. Local community needs to be sensitized and NGOs can be engaged with them.
5.	Access to civic amenities and communication	1,047 households that will be resettled adjacent to the EZ area will access better civic amenities. However, due to the EZ construction overall traffic may be congested over the years. But industrialization will ensure better livelihood and increase ability to access better civic facilities.	
6.	Social mobility:	With improved employment opportunities and higher and secured income, impoverished people will be able to move up the social ladder.	
7.	Women's empowerment:	Women are mostly in household work category. Thus, employment opportunities for women created by the proposed EZ directly or indirectly are expected to provide them better socioeconomic status. Through employment women will be empowered economically by being self-reliant and may become more socially aware. This could lead to their having more decision making power in their respective families and communities. This will also encourage the parents to send their children to schools and withdraw them from wage earning activities. At the same time girl's education due to parents'	Measures should be taken to ensure women of the households who are losing agricultural land do not face vulnerable situation of losing livelihood options of their HH heads or of themselves. While dealing with land transfer and compensation, the gender issue should be taken care of sensibly as women in Bangladesh do not usually possess land in their own names

Sl. No.	Issues	Impact	Strategies for Risk mitigation
		better economic condition and awareness will prevent early and child marriage as girls' education will automatically retain them in school and will make social awareness and pressure of not marrying them off at early age and drop out for that.	but in the male household members' names. If cash compensation is given, it could also be handled as a joint account transfer, so women are not deprived of any benefit and also do not bear the loss alone. For households headed by females, special packages could be provided.
			Preferences of their males and themselves in job opportunities created by the EZ.

At the macro-level, employment opportunities, social and economic commitment of development efforts and public-private partnership will be the outcomes of the project.

More detailed consultation/survey at the EZ site and adjacent areas may be needed to assess detailed socio-cultural effects.

4.2.6 Resettlement Issues and Plan

The policy objective conforms to the government's policy to reduce poverty and meet the Millennium Development Goals (MDGs). The basic plan is to avoid land acquisition as much as possible. The guiding principles are:

- to minimize and mitigate adverse impacts;
- to ensure compensation payment according to the World Bank OP 4.12 and GoB rules and regulations;
- to establish a grievance redress mechanism with representatives from stakeholders to suggest institutional and monitoring arrangement for compensation payment.

4.2.6.1 People likely to be affected

The private home owners who will lose their homes will be placed in an area adjacent to the EZ, which is included in the plan. Private land owners of agricultural lands, ponds and owners of shops will be compensated according to standard provisions. The EZ will create around 476,678 jobs which will cover all the affected people of the Upazila mouzas and manpower will also be needed from the neighbouring Upazilas, in huge numbers. As the EZ will provide job opportunities and better wages, the poor population will benefit. The project can make provision so that the affected agricultural landowners and agricultural laborers will be given priority in employment and recruitment in the EZ. Because of the better connectivity for the proposed approach roads and rail-tracks, more business and income earning opportunities will also be available for all strata of people. Due to the forest reserve and the sea channel, this area also has potential for tourism.

During consultations with the poorest of local people including women and students, agricultural farmers and labourers, shopkeepers and fishermen, all opined that the EZ will bring more economic benefits both to the population of the EZ and adjacent areas. As there are no industries established or income generating activities undertaken at the moment, the poorest strata of the locality have very limited job opportunities in the locality and nearby areas. Thus, vast economic activities in the locality will bring more opportunities and diverse livelihood options for all of them.

However, while the construction activities are being carried out, including the establishment of the EZ, widening approach roads and rail-tracks and dam improvements if needed, outside workers are

likely to be present in the locality for a long period. Thus, necessary measures need to be taken to prevent any harassment or violence against women, and public health related issues including the potential threat of sexually transmitted diseases such as HIV-AIDS.

Based on the planned land use of Mirershorai EZ, the estimated employment created will be 476,678 workers when the Mirershorai EZ is fully occupied. Once these jobs are created in Mirershorai area, an additional 238,339 indirect jobs (normally about 50% of direct employment) are likely to be created in the Mirershorai area mainly because of various services such as transport, retail, health, food, and housing services. The total employment of direct and indirect employment may reach 715,017 workers. Probably the Mirershorai area will be a new industrial city of over 1.0 million including the existing population when the EZ is fully occupied and the industrial city matures after 20-30 years.

Table 4.2.6.1-1: Employment Estimate for Mirershorai Economic Zone

Industry & Com	Land Area (Hectare)	Employment /Ha	Jobs
Garment	100	800	80,000
Garment Accessory	42	500	21,000
Integrated Textiles	100	400	40,000
Motorbike Assembly	20	300	6,000
Automobile Assembly	150	100	15,000
Auto Parts & Components	504	350	176,400
Machinery Parts & Components	230.56	350	80,696
Chemical & Others	56	300	16,800
Food & Beverages	56	250	14,000
Rental Factory	10.46	500	5,230
Commercial	19.86	200	3,972
Resident/Housing	67.93	100	6,793
Warehouse	17.83	50	892
Others (Clinics & Training , Services)	41.02	100	4,102
Coal-fired Power Plants & Jetty	289.67	20	5,793
Total	1,705.62	280 (Average)	476,678

Source: WB Study Team

* is estimated from the Existing Bangladesh Industry and Asian examples

4.2.6.2 Resettlement Plan

Within the EZ's 2,911.83 hectares (7,195.30 acres) of land in the area, 2,887.11 hectares (7,134.20 acre) will be utilized for the Proposed EZ site. In the additional space, there will be 24.72 hectares (61.09 acres or 0.85% of the total EZ area) for rehabilitation of the displaced and affected households due to private land acquisition in the EZ and on the two approach roads. Thus, displaced families both on-site and offsite will be rehabilitated with ease.

The shop-keepers, farmers, fishermen and people from other affected occupational groups will receive compensation for loss of livelihood options and income at twice the current market value. Private tree owners will also be compensated.

4.2.6.3 Consultations with Local People

At the Mirershorai Upazila all relevant government officials and Union Parishad Chairmen were consulted. People of different ages, various occupational groups were consulted during the field visit including farmers, shopkeepers, transport workers, students, small businessmen, fishermen. In the consultation, various stakeholders mentioned a positive impact of the EZ on the lives, livelihoods of the people of that area or adjacent areas. They consider that in the current reality of unemployment and low return from agriculture, lack of jobs in industrial sectors and service sectors, low food security is a problem. Industrialization will ensure more jobs both in the context of quantity and quality. The increased opportunities will have positive impacts on poor people through various occupational and income generating opportunities even in addition to the EZ employment. The probable spillover effects of the EZ would be tourism, small trading, supplies of raw materials to the related small factories, better transportation and transportation related businesses, women's entrepreneurship and children's education. As there is a reserve coastal forest and the seaside, there is likely to be tourism development in the area.

Due to the location, Mirershorai is likely to affect the urbanization pattern in the nearby Chittagong Mega-city. As Chittagong is a regional hub for trade and commerce and is the commercial and the major port city of Bangladesh, an Industrial zone in this area will provide an alternative opportunity for migrant workers other than the city and will also make this place another regional hub for business and commerce.

Issues covered in Consultation:

During consultations, issues covered are current socio-economic conditions of the population living inside the EZ area and the locality, women's employment, children's education and health facilities; how EZ will affect the lives and livelihoods of the people living inside and adjacent areas, what are the expected projects for socio-economic development in the area due to the EZ and if there is any probable negative problems related to the establishment of the EZ, what should be the resettlement compensation and grievance redress.

4.2.6.4 Compensation and Entitlements

People will be compensated for their affected structure, trees, cropping fields, ponds, and business. Compensation is based on entitlements including: (i) replacement value for structures, trees, etc. and (ii) other resettlement assistance as required such as transfer grants, re-installation grants (except replacement value) and compensation for loss of business/wage due to dislocation. Vulnerable households will be eligible for further cash assistance for relocation and resettlement to improve their living conditions. The entitlements as per loss category are presented in table below.

Table 4.2.6.4-1: Resettlement Matrix and Compensation Package:

	Type of loss	Type of compensation suggested
1.	Home Approximately HH (around people)	Resettlement of displaced households in the government land adjacent to the EZ and resettle them
		Cash compensation at twice current market price and relocation costs for those who do not choose to move to the EZ area
		Preference in the jobs created by the EZ
2.	Private land ownership Total land:	Cash compensation at 1.5 times the current market price for the actual loss of crops where applicable
		Preference in the jobs created by the EZ
		Legal owner(s), including mortgagors, as determined by DC during Compensation under law (CUL) payment, or by court in cases of legal disputes.
		Co-sharers/ to be determined by title deeds/records by DCs.

	Type of loss	Type of compensation suggested
		Transition allowance (TA) for income loss from productive lands.
3.	Shop owners, restaurant owners (total no)	compensation allowance for shifting of materials compensation for loss of income
4.	Ponds (total no)	1.5 times of market price
5.	Trees (total no)	Market price and in the case of fruit trees one season of earnings from fruit sales
5.	Livelihood loss	Preference in the jobs created by the EZ Compensation of 2 months of earnings and relocation costs
6.	Vulnerable groups	A special compensation for the most vulnerable people such as female headed families, people with disabilities, and orphans.
7.	Training needs assessment	Government's youth department, women's affairs department, NGOs can do needs assessment on training and provide technical training related to employment at EZ industries.
8.	Temporary/short term problems for construction period	Compensation to the affected people Employ their household members in construction jobs or other relevant works
9.	Social, educational and Economic organizations	The project is avoiding any destruction of such institutions and minimizing such loss, thus approach roads were carefully designed to avoid this loss.
10.	Public property	In case any such public property is affected during the construction or operational phase, these services and facilities will be compensated and rehabilitated properly before implementing work.
11.	Historical, cultural or religious sites	None fall in the project area. In case any such sites are affected, compensation or relocation cost should be paid.
12.	Closing/obstructing of access to natural resources	Mirershorai EZ is near the Muhuri project area beside the river. However, it will also be extended to nearby sea channel and reserve forest. But the EZ is not closing or obstructing any access for communication or livelihood to the natural resources.

Land replacement costs, dislocation allowance, transfer grants, reconstruction grants, one time special assistance, income and livelihood restoration grants will be included in the compensation package so that the economic condition of the PAPs will be improved.

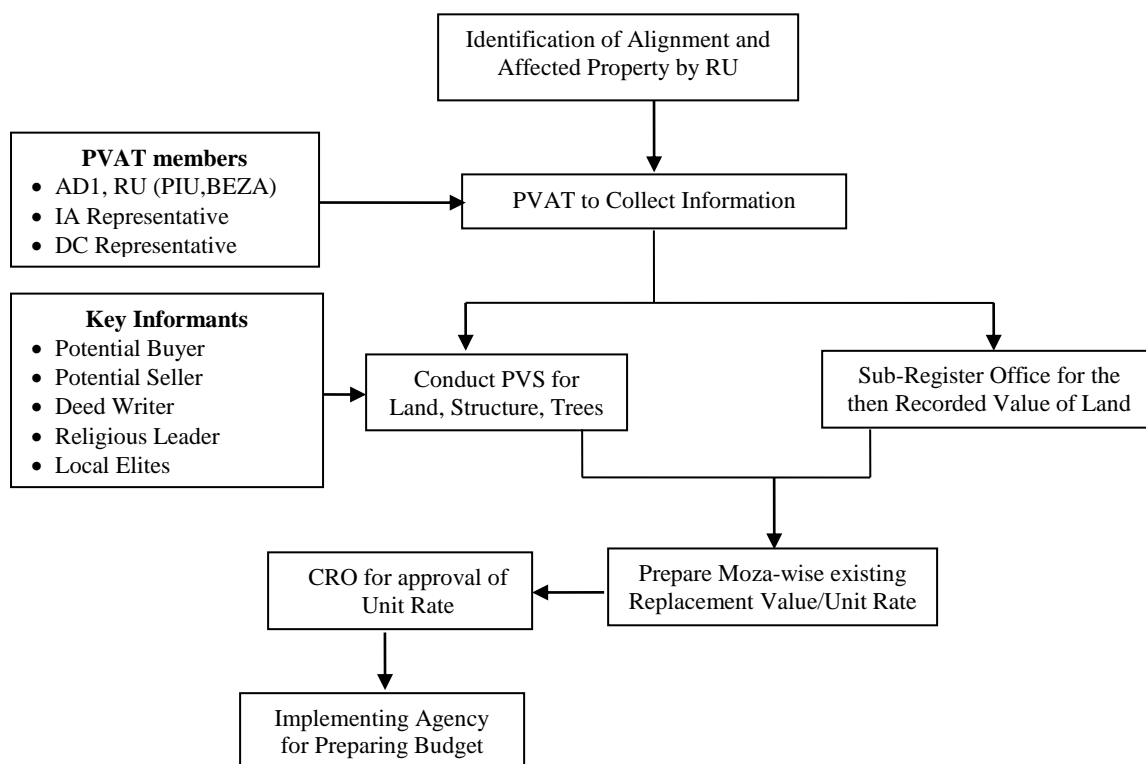
The Project construction activities will require many unskilled labourers and skilled staff for earthwork in the EZ development, approach roads & rail-track, offices and management work. Provision should be made in the contract with the contractors for employment of qualified PAPs and their dependents in the recruitment of local labour, including affected women. Employment in the project construction will act as an added source of income in the livelihood restoration processes of PAPs.

Table 4.2.6.4-2: Institutional Responsibilities in Resettlement Process

Related Activities and Responsibilities	Responsibility
A. Preparation of Updated RAP	
Preparation of land acquisition plans	RU/Eng Firm
LA process and land acquisition	DC/RU
Recruitment of ERS and NRS	RU/WB
Recruitment of Implementing Agency	PIU
Design and reproduction of RAP Information Brochures	RU/NRS
Disclosure and public consultations	RU/IA
Selection of members for resettlement advisory bodies	RU/IA
Design and carry out census for joint inventory of losses	RU/IA
Market survey on prices of lands, structure, crops and trees.	IA/PVAT
Establishment of unit prices	PVAT/RU
Processing the Census and socioeconomic data of APs	IA/NRS
Assessing AHs to be relocated and any vulnerable APs	IA/RU

Related Activities and Responsibilities	Responsibility
Determination of entitlements and consultations with individual APs	RU/IA
Consultation of Draft RAP to EA, APs and stakeholders	ERS/RU
Incorporate suggestions and finalizing the RAP	ERS
Review and concurrence of RAP	SS(National)/WB
B. RAP Implementation	
Mobilization of GRC	RU/IA
Establishment of internal monitoring and hiring of EMA	MOHW/DCs/PIU
Budget approval for compensation and resettlement	PIU
Release of funds for compensation	BEZA/RU
Filing and resolution of complaints APs,	RU/GRCs/IA
Assess needs, identify sites and develop relocation sites	RU/IA/APs
Consultation with APs on schedule of clearing the lands	RU/IA
Clearing of lands	APs
Confirmation of “No Objection” for the award of civil works contract	WB
Relocation and livelihood restoration assistance	IA/RU/LIRP
C. Monitoring and Evaluation	
Internal monitoring	RU/ERS/NRS/IA
Independent external monitoring and evaluation	EMA/WB

Figure 4.2.64-3: Procedure of Determining Valuation of Property



4.2.6.5 Grievance Redress

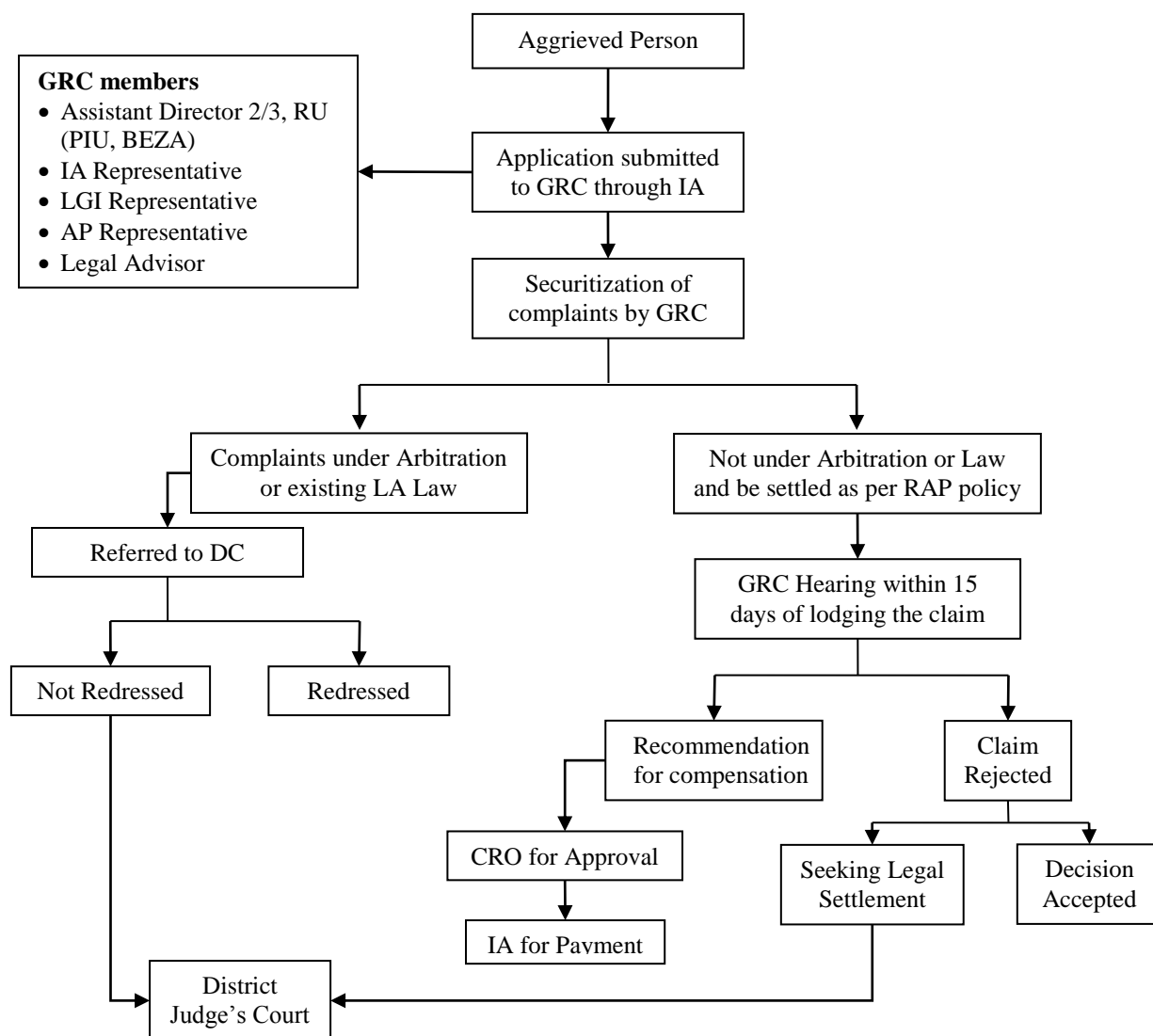
A grievance redress mechanism should be developed prior to the compensation provided and during the resettlement period.

The land acquisition and resettlement will be done during mid-2014 to early 2016. A local body incorporating the Local Governance (LG) representatives and the government administration at the local level, with a cell at central level, could be established to take care of this.

The aggrieved person will apply to GRC (Grievance Redress Committee). The grievance redressing mechanism is shown in the following figure. GRC will review the application and if the application is under arbitration then it will be referred to the DC. If the application is not under arbitration then the grievance will be settled by RAP policy. If the application is rejected then the person can apply to the district judge for legal settlement.

It should be remembered that grievance redress is a very time consuming matter and should be given priority so that the minimum possible time is required for it.

Table 4.2.6.5-1: Grievance Redress Mechanism



4.2.6.6 Disclosure of Information

According to WB OP 4.12, people's participation in the project planning and implementation phases is essential. People have the right to information about what will happen in their surroundings. They must be informed about the positive and negative impacts of the proposed project and their opinion, suggestions feedback must be incorporated into the project design. People in the area where the EZ, approach roads and rail-track extension will be constructed must be informed so that they can take protective measures or can get compensation for the loss of their structures. They can also take measures for their safety. Since the proposed EZ area is under Osmanpur Union Parishad, Saherkhali Union Parishad, Ichhakhali Union Parishad and will extend to parts of Banskhali, Nilokkhir Char, Companingagar, Uttar Ichhakhali, Pashchim Ichhakhali, Purba Ichhakhali, Saherkhali, Domkhali, Dakshin Maghadia Mouzas, people in the area must be informed so that they can take protective measures or can get compensation for the loss of their structures.

4.2.6.7 Resettlement Compensation Needed for the Project

Table 4.2.6.7-1: Total Compensation

Type of HH	No. of Structures	average area/unit	Price (BDT)/Katha/ Unit	Budgeted Compensation (BDT)	Premium Rate	Compensation with premium (BDT)
Structures (Pucca/Semi Pucca)	73	1	90000	6,570,000	200%	13,140,000
Structure (Tin Shed)	315	1	70000	22,050,000	200%	44,100,000
Structure (Hut)	262	1	40000	10,480,000	200%	20,960,000
Ponds	338	1	60000	20,280,000	100%	20,280,000
Trees	7231	1	1000	7,231,000	100%	7,231,000
Shops	211	1	100000 - 250000	25,060,000	150%	37,590,000
Institutions	4	1	2500000	10,000,000	300%	30,000,000
Sub Total						173,301,000
Adm. Expense 2%						3,466,020
Cost for Implementation and Monitoring & Valuation					Lumpsum	40,000,000
Grand Total						BDT 216,767,020
						US\$ million 2.71

Locality	Cost (BDT)
6 No West Ichhakhali Union Village- Cunimijhir Tack Word No-7	20,338,000
6 No South Ichhakhali Union Village: Charsarat Word No-9	3,400,000
16 No Shaer Khali Union Village- South Moghadia Word no-1	1,305,000
Mouza-south mogadia Up_16 no Saherkhali Ward no-1	5,540,000
Companinagar Mouza: company Nagar Village: Companinagar	420,000
Mouza: Domkhali Village: Domkhali Beribadh UP: Saherkhali	3,069,000
6 No uttor Ichhakhali Union Village: Charsarat Word No-9	3,400,000
Mouza: Domkhali Village: Domkhali Beribadh UP: Saherkhali	3,069,000
Mouza: West Bashkhali Village: Bashkhali Union: 5 No. Osmanpur	5,450,000
No. 5 Osmanpur, Bashkhali	5,910,000
Bashkhali	4,495,000
Mouza- East Ichhakhali UP 6 No South Ichhakhali	11,008,000
6 No. West ichhakhali.	14,140,000
Mouza:East Ichhakhali UP 6 No South Ichhakhali	5,640,000
Boro Takia Bazaar to Maghadia and Abu Torab right side of road	4,200,000
Boro Takia Bazaar to Maghadia and Abu Torab left side of road	10,340,000
Azampur Bazaar to Muhuri Project -Left side	1,880,000
Azampur to Muhuri Project Road -Right Side	2,107,000
Grand Total	105,711,000

Note: See Annex-4 (Section 5: Detailed Cost of Resettlement) for detail

Table 4.2.6.7-2: Land Price (BDT)/Decimal* According to the Category

Name of Mouza	Nal	Shops Place (Dokan Vity)	HH (Bari Vity)	Agricultural Lands (Vity)	Ponds/K hai	Ponds Side	High Land (Tila)	Acrcated land (Char/Baluchar)	Tree Gardens	Chhankhola	Village Road (Path)
Bashkhali Salno-39	25,427	38,900	35,313	3,750	45,285	32,400	29,240	2,000			
Compani Nagar	1,400	1,000	465	250	390		312	545			
Uttor Ichakhali	21,910	2,57,848	34,364	1,702	31,715	2,83,155	8,221	10,000	15,637	17,094	15,000
Poschim Ichakhali	47,866	10,000	13,334	32,854	33,571	4,932	4,000	4,286	6,800	4,188	54,006
Purbo Ichakhali	6,562	9,000	7,883	16,546	15,126	1,855	2,000	4,348		4,545	20,000
Dakshin Mogadia	15111	15,000	11,587	6,060	11,789	10,345	13,637	4,00	6,286	7223	
Saher Khali	14,793	2,67,405	32,609	15,321	18,795	15,278	5,464	3,000	8,525	15,514	
Domkhali	17,277	25,000	22,654	16,226	27,929	12,000	6,250	2,500	10,833	8,777	1,000

* Decimal is locally used 1 Decimal = 1/100 acre or 40.47m².

Source: Land price is collected from the Land Office, Mirershorai Upazila.

4.2.6.8 Institutional Arrangements and Problems Related to it

There may be problems regarding institutional arrangements among several government departments which will be involved in the EZ implementation. Lack of manpower, lack of training, lack of coordination, administrative problems for transfers, trust building and rapport with local people are the major problems which may be faced during implementation of the project.

During consultation with the relevant stakeholder government agencies, it appeared that while the PPP agency had some considerable amount of money to undertake new ventures, due to lack of experience, in practice, the money could not be spent. Also the regulatory frameworks and coordination issues were mentioned as major obstacles.

Government Ministries and agencies likely to be the stakeholders are among others: the Prime Minister’s Office, the Ministry of Finance (Finance Division and Economic Relations Division), the Ministry of Land, the Customs Authority, the Board of Investments (BOI), the Bangladesh Economic Zone Authority (BEZA), the Bangladesh Export Processing Zone Authority (BEPZA), the Ministry of Industries, the Ministry of Commerce, the Ministry of Power, Energy and Mineral Resources, the Ministry of Communications, the Ministry of Water Resources, the Ministry of Railways, the Ministry of Law, the Ministry of Environment and Forest.

A cell could be established under the PM office but working independently headed by a "Steering committee" or "Project Advisory Committee" to identify the problems prior to implementation and be proactive in determining a strategic direction for the zone and pulling all government agencies in to support the project.

Land will be acquired by the Ministry of Land where other activities will be carried out by other ministries and agencies, so good coordination is needed and will be a major challenge.

More consultations are needed in this regard. In the PPP section of this report, details of the institutions, agencies’ roles, and responsibilities are presented.

Figure 4.2.6.8-1: Institutional Arrangements at the Central Level

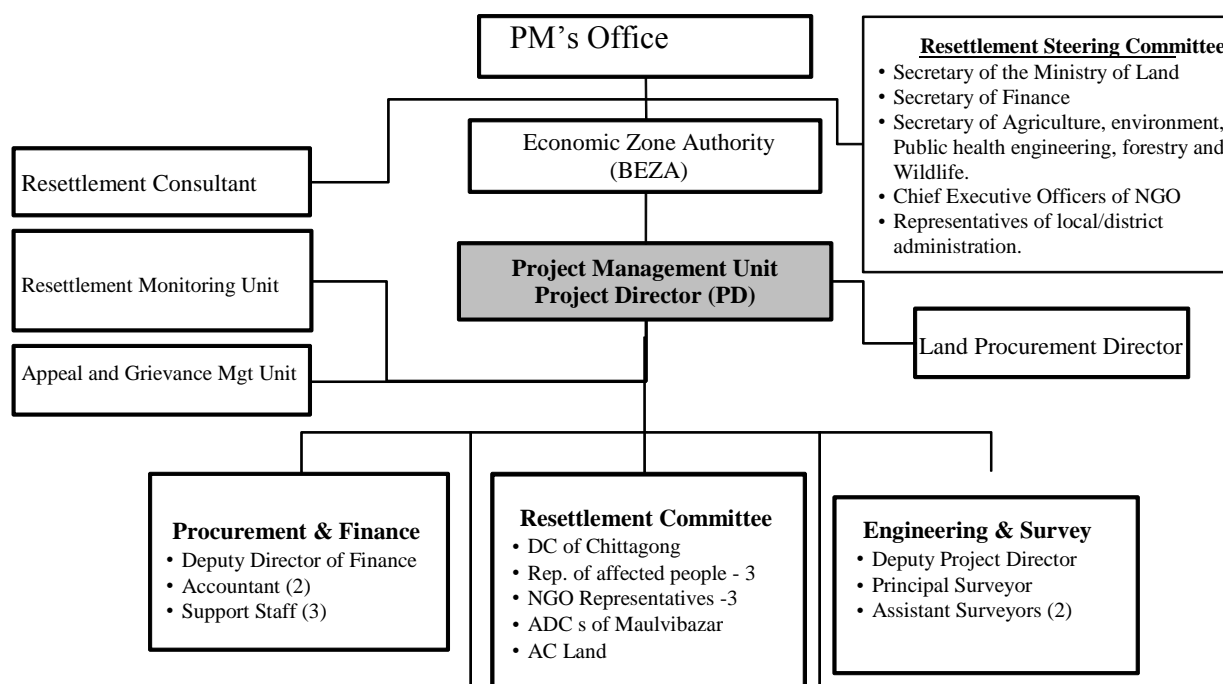


Figure 4.2.6.8-2: Details Resettlement Unit for BEZA up to EZ Level

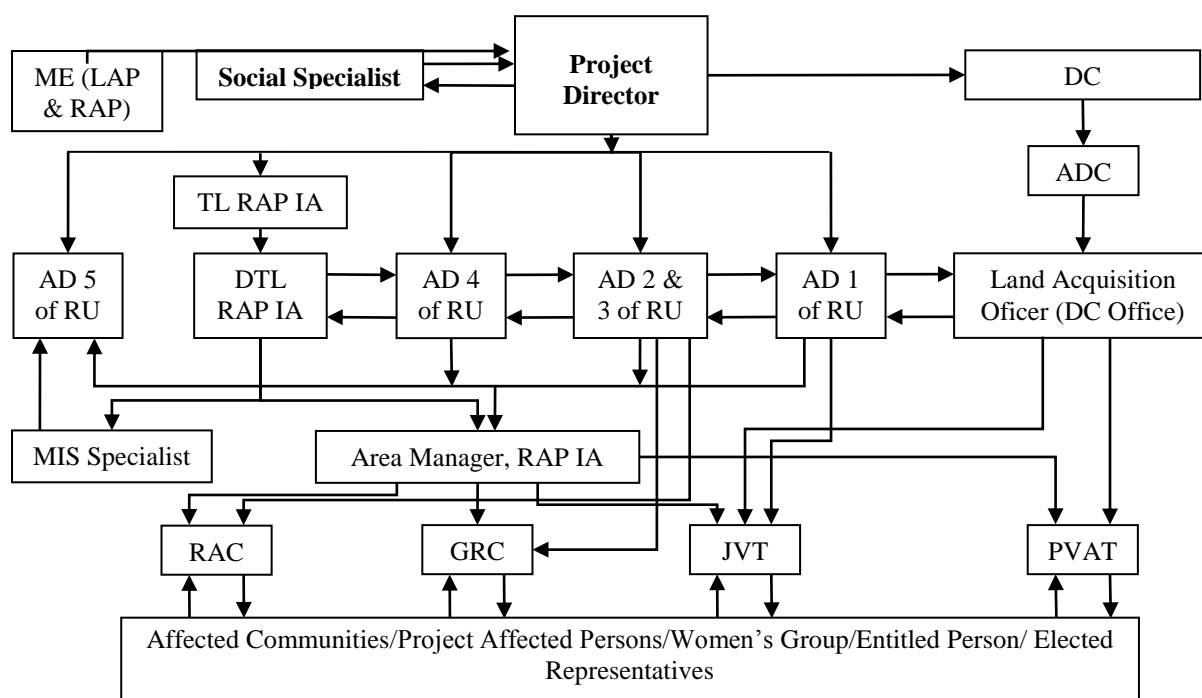
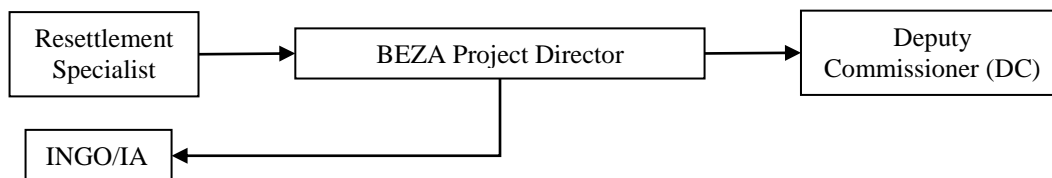


Figure 4.2.6.8-3: Resettlement Unit (RU) for BEZA

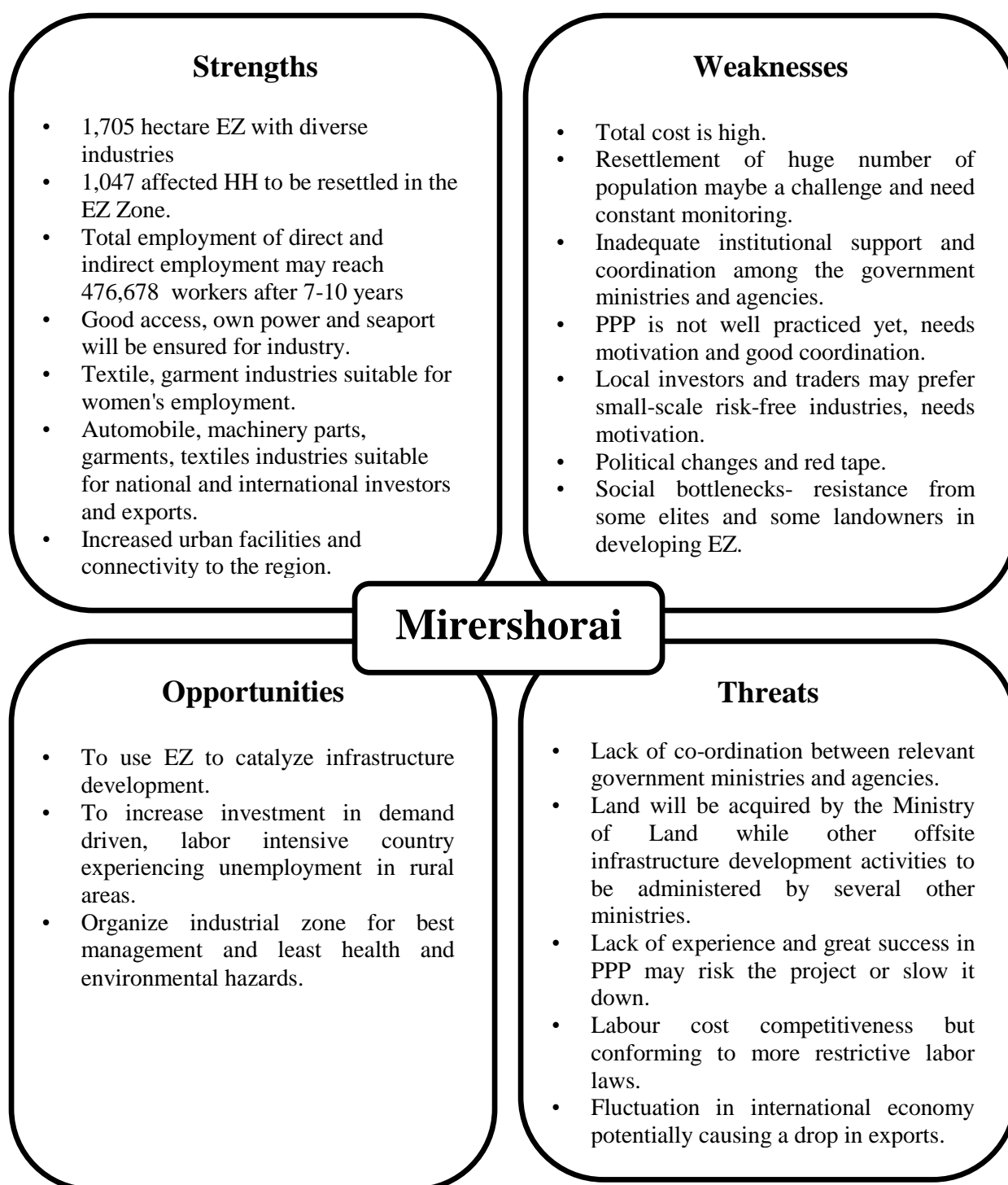


An INGO needs to be involved in the process of resettlement for transparency and effect land acquisition and resettlement and grievance redress process for timely completion of this phase to move on to construction of EZ and allocation of industrial plots.

In the section 5 on Institution and PPP, details of the institutions, agencies’ roles and responsibilities are presented.

4.2.7 SWOT Analysis for Mirershorai

Figure 4.2.7-1: SWOT Analysis for Mirershorai EZ



4.2.8 World Bank Policy on Involuntary Resettlement, Gender and Indigenous/Tribal Population and the Bangladesh Government's Acquisition and Requisition of Immovable Property Ordinance

4.2.8.1 World Bank OP 4.12 Requirements for Involuntary Resettlement

The primary objective of the World Bank policy on 'Involuntary Resettlement' is to explore all alternatives to avoid or at least minimize involuntary resettlement. Where resettlement is unavoidable, the resettlement activities should be conceived and executed as sustainable development programmes, providing sufficient resources to enable affected persons to share in project benefits and assisted in their efforts to improve their livelihood and standard of living, or at least to restore them to pre-project level. The policy also requires that affected people are meaningfully consulted and should have opportunities to participate in planning and implementing resettlement programmes. The policy applies to the taking of land and other assets when involuntary resettlement results in the loss of shelter, the loss of all or part of productive assets, or access to them and the loss of income sources or means of livelihood, with or without physical displacement.

Measures required ensuring that resettlement has a positive outcome include:

- Providing Project-Affected Persons with options;
- Permitting their participation in planning and selecting these options;
- Prompt compensation at full replacement cost for losses;
- Choosing relocation sites that provide, at a minimum, the same benefits as the sites they replace;
- Providing allowances and other assistance to make a smooth transition after displacement;
- Identifying vulnerable groups and providing and special assistance to these groups; and,
- Implementing an institutional structure that supports the process to a successful end.

Bank's policy on Involuntary Resettlement requires payment of compensation and other assistance to Project Affected People before they are displaced from their existing locations. Further, the policy requires income rehabilitation assistance to those affected severely due to the loss of their productive assets or loss of incomes and livelihood.

Absence of legal title does not exclude individuals from eligibility to receive compensation and/or other assistance. The displaced or affected population eligible for compensation for losses include: those who have formal legal rights to land or other assets and those who initially do not have formal legal rights to land or other assets but have a claim to legal rights based upon the laws of the country. The Policy also requires that those without legal title should be given assistance to meet the objectives of the policy. The genesis of these rights may come from continued possession of public land where the government has not sought their eviction. World Bank policy also recognizes that stakeholders who illegally occupy project-affected areas after the established cut-off-date for any components are not eligible for compensation and other assistance provided that adequate measures are taken for information dissemination to the people.

The gaps in the existing legal framework of Bangladesh and the objectives and requirements of the World Bank and other multilateral agencies are well recognized. Therefore, institutional or project specific policies are prepared to address these gaps and to meet the requirements of multilateral agencies in projects funded by them.

Following basic categories of issues/impacts are foreseen under this entitlement framework:

- a. Loss of land;
- b. Loss of structure;
- c. Loss of source of livelihood;

- d. Loss of access to common resources and facilities;
- e. Loss of standing crops, trees and perennial trees; and
- f. Loss of public infrastructure.

Data on the various land patterns, structures, Institutions are provided in the report for further assessment of whether the proposed EZ follows the World Bank's criteria. In the proposed EZ financial and economic plans, financial compensation is counted for all the affected people living inside the proposed EZ area and along the proposed approach roads and rail-track.

The project will compensate for the displaced households adjacent to the proposed EZ area. The local people who will lose their agricultural lands will be compensated at the standard rate of government provision. Since there is no public infrastructure affected, the only loss of structures will be small homes, whose owners are going to be resettled in the EZ adjacent area. This site will not cause the loss of their livelihoods. There will be no hindrance to common resources either on-site or off-site of the EZ.

There will be no negative impact or displacement of any historic and religious sites as none is situated on the site or proposed offsite approach roads. Rather there are many such sites in nearby Sitakunda and Chittagong city which are likely to have more attention and visitors due to improvement of communication.

From the secondary data, it seems people in the area of the EZ site are mostly impoverished, so resettlement and financial compensation along with job opportunities will benefit them enormously, compared to the amount of land they will lose to the EZ.

4.2.8.2 World Bank Gender Policy: OP 4.20 - Gender and Development (Revised March 2012)

The objective of the World Bank gender and development policy is to assist member countries to reduce poverty and enhance economic growth, human well-being and development effectiveness by addressing the gender disparities and inequalities that are barriers to development and by assisting member countries in formulating and implementing their gender and development goals.

As the EZ has all the facilities and resources available for the industrialization and viability of the EZ, the study proposed various industries including both heavy and light, where various types of skills will be needed. These industries are likely to have huge manpower needs with employment opportunities for many, including women and youth. Thus, expectations for improved livelihood, food security, health and nutrition of the workers are likely to be fulfilled.

No gender disparity will occur as a result of the proposed EZ implementation. Rather it will contribute to the progress towards gender parity and women's empowerment by their involvement in the income generation activities and employment in the industries proposed in the EZ. The proposed industries in these areas are suitable for women's employment. As stated earlier, garment industries, proposed for these areas and through this women will benefit immensely from the EZ. As this EZ is expected to provide employment for many local people of various ages and social status including the poorest segments of the population, it will contribute to poverty alleviation of the respective families. This in turn is expected to bring positive changes in gender relations both in the family and society and will contribute to women's empowerment for women of all ages. Due to higher incomes, food security, better health seeking behaviour and nutritional status will be ensured. New industries and economic and social development in the locality will bring diversity in livelihood options for the lower income groups.

The EZ is expected to contribute to reducing child labour in the poorest households and there is also a possibility of a higher level of school attendance of both boys and girls, thus reducing child marriage. Overall better economic well-being and social mobility is expected, directly and indirectly.

4.2.8.3 Specific Funding Requirement of the World Bank Policy OP 4.10

Policy document OP4.10 of the World Bank contributes to the World Bank's mission of poverty reduction and sustainable development by ensuring that any development activity and accompanying processes fully respects the dignity, human rights, economies, and cultures of indigenous people. Hence, it is a requirement that all projects which are proposed for financing by the World Bank are assessed to see whether the policy needs to be triggered keeping in mind the geographic location, nature and scope of activities.

The policy requires client governments to seek the broad community support of indigenous people through a process of free, prior and informed consultation before deciding on development projects affecting indigenous people. The policy requires that indigenous people benefit from the commercial development of natural resources. Projects must include measures to (a) avoid potentially adverse effects on the indigenous people's communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects. Bank-financed projects are also to be designed and structured in a manner to ensure that the indigenous people receive social and economic benefits which are culturally appropriate and gender and inter-generationally inclusive.

The Mirershorai EZ project does not have any indigenous/tribal land acquisition and there is no tribal population inhabiting the project area, thus there will be no adverse impact on such a population. Rather the indigenous population in the neighbouring Upazilas will benefit by job creation in the EZ.

Regarding poverty alleviation, as previously stated, the project will contribute tremendously by creating jobs for people of various social strata particularly for the impoverished population and women and will reduce poverty and contribute to the solvency of the families within the area. This will also contribute to an improvement in education and health. This project conforms to various MDGs and has no conflict with the World Bank's aim of poverty alleviation and development.

4.2.8.4 OP/BP 4.11 on Physical and Cultural Resources

The objective of OP/BP 4.11 on Physical Cultural Resources is to avoid, or mitigate, adverse impacts on cultural resources from development projects finance by the World Bank. Cultural resources are important as sources of valuable historical and scientific information, as assets for economic and social development and as integral parts of a people's cultural identity and practices. The loss of such resources is irreversible, but fortunately, it is often avoidable.

Taking OP 4.11 into consideration the project is planned to avoid any such resources being affected by the project and alternative routes are proposed to avoid destruction of any cultural resources, minimising any displacement of physical resources.

4.2.8.5 Legal Context of Land Acquisition in Bangladesh

Currently the only legal framework that governs land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance, 1982. However, its provisions are not adequate to address adverse impacts associated with land acquisition and involuntary displacement and do not fully satisfy the requirements of the Bank's Operational Policy (OP 4.12) on Involuntary Resettlement or that of the international practices.

The project suggests following the World Bank policy OP 4.12 Requirements for Involuntary resettlement where there is gap between the government's and World Bank's policy regarding resettlement issues.

4.2.9 Information on Land to be Acquired

Table 4.2.9-1: Information on Land to be acquired

Sl No.	Mouza name	Government khas land (Acre)	Private ownership (Acre)	Proposed land (Acre)
1	Banshkali	109.83	31.87	141.70
2	Nilokkhir Char	781.01	-	781.01
3	Companingagar	684.34	-	684.34
4	Uttar Ichhakhali	650.6	58.44	709.04
5	Pashchim Ichhakhali	545.51	1312.40	1857.91
6	Purba Ichhakhali	166.17	961.49	1127.66
7	Saherkhali	51.95	86.00	137.95
8	Domkhali	124.92	301.64	426.56
9	Dakshin Maghadia	556.73	192.22	748.12
	Total	3671.06	2944.06	6615.12

No detailed survey is available yet.

4.2.10 Mirershorai Meetings and Consultation, Views of EZ Adjacent Areas and Approach Roads



Consultation with ADC Mr Rabbi Miah in Chittagong



Consultation in Mirershorai Upazila office



Consultation and checking information in DC office at



Meeting with BSRM Engineer at Chittagong

Chittagong



Consultation in Mirershorai Upazila office



Consultation and site visit in Muhuri dam area.



Consultation at Chittagong DC office with officials from Land department



Consultation in Borotakia



Children in Nawapara collecting woods from the reserve forest



Children in Nawapara having fun after school



Site visit and consultation in the coastal forest area



Wind power pilot project at Muhuri project area



Consultation at Nowapara



Nowapara discussion with children



Consultation with shopkeeper at Boro takia



Consultation at Nowapara



Muhuri project area



Consultation at Nowapara



Muhuri project area



Nowapara reserve forest coastal area



Nowapara reserve forest coastal area



Nowapara reserve forest coastal area



Consultation with government officials and Union Parishad Chairman at Mirershorai Upazlia office



Consultation with youth at Nowapara



UP office at Maghdia



Sluice gate in BamonSundor village near coastal forest



Consultation at Muhuri project area



Consultation with locals at Nowapara



Community centre at Zorwargonj



Textile Engineering college at Zorwargonj



Mosque at Zorwargonj



Temple at Zorwargonj



Muhuri project area



Fisherman in the sea



Muhuri project area



Muhuri Project area



Solar pannel in Bamon Sundor village near Reserve forest



children at leisure in Nowapara



Consultation at Nowapara



Boro Takia near Dhaka-Chittagong Highway



A boy collecting wood from reserve forest in Nowapara



children at leisure in Nowapara



Consultation at Nowapara



Nowapara coastal side of village



Borotakia at the Dhaka-Chittagong Highway side



Borotakia at the Dhaka-Chittagong Highway side

CHAPTER 5

INSTITUTIONAL FRAMEWORK & PPP

(COMPONENT 3)

5.1 Background

The Government of Bangladesh passed the Bangladesh Economic Zones Act in 2010 and established the Bangladesh Economic Zone Authority (BEZA). The Economic Zones (EZ) Act allows various institutional frameworks with a special focus on Public Private Partnership (PPP) arrangement involving the private sector, to implement EZs. For a successful PPP EZ, technical assistance, Viability Gap Financing (VGF) and infrastructure investment funds are allotted. A number of PPP EZ projects are in the pipeline including the Mirershorai site, in Chittagong Division.

5.2 Findings of Field Visits & Consultations

PPP Expert of the Team met with representatives of the following organisations:

1. Infrastructure Development Company Limited (IDCOL).
2. Bangladesh Infrastructure Finance Fund Limited (BIFFL).
3. Summit Assets Limited.
4. Korean EPZ
5. Shamsul Alamin Real Estate Limited.
6. Building for Future Ltd.
7. Summit Power Limited
8. Ananda Group

During discussions with IDCOL, it was found that this financial institute has a track record in financing some components of running EPZs including the Chittagong Export Processing Zone (CEPZ) in Chittagong and a power plant in Dhaka EPZ. It has no plans to fund green field EZs, i.e. land & on-site development of future EZs, for example the Korean EZP and Savar Leather Industrial Park, as they feel that these projects are uncertain. On the other hand, the Bangladesh Infrastructure Finance Fund Limited (BIFFL) has the scope to finance some components of running EPZs and future EZs. At the same time, it has plans to finance green field EZs provided the projects are good and balance sheets of their sponsors are sufficiently sound.

The country's only private EZ development company, Summit Assets Limited stressed the importance of quick approval of EZ projects by the government and access to low cost long term loans to carry the PPP economic zone forward. Summit informed the team that became the Design-Build-Finance-Own-Operate-Transfer (DBFOOT) model for the World Bank suggested concession PPP model for Kaliakoir Hi-Tech Park. The private Korean EPZ, now under construction, has recognised the importance of a multimodal transport system including port facilities on its adjoining river front.

Real estate companies indicated that they are interested in building and operating PPP EZs if they are provided with conditions similar to those enjoyed by Indian real estate companies, i.e. particularly quick approval of projects and availability of low cost long term funding. If real estate companies will not take up the full project, single components (housing & commercial zone in economic zones) will be taken up on the basis of PPP models. They suggest that the one stop service (OSS) centre at BEZA will coordinate with relevant government agencies in simplifying paperwork for fast track approval of economic zones under PPP models. That will create an enabling environment for effective private sector participation in the country's EZ programme.

Private investors in power sector, Summit Power Limited, placed emphasis on the importance of low cost foreign currency loans for the country's EZ programme. Summit Power has collected loans from the International Finance Corporation (IFC), the Asian Development Bank and foreign commercial banks at a lower rate of interest compared to local financial markets. Its financial controller feels that the private sector of the EZ programme will try to arrange funds from those financial institutions. EZ

private investors need the World Bank's PRG facility in order to collect loans easily from international financial markets. The Chairman of the Ananda Group emphasised that the right type infrastructure facilities must be available for the Anwara EZ to attract private ship building and related industries investors.

5.3 Institutional Frameworks and PPP Schemes

Economic zones have been implemented across the world using a variety of institutional structures, ranging from fully public (government operator, government developer, government regulator) to 'fully' private (private operator, private developer, public regulator). In many cases, the public sector, in partnership with private investors, formed pseudo-corporate institutional structures to develop and operate economic zones. Under this arrangement, the public sector provides some level of support including initial land acquisition and provision of off-site infrastructure, while the private sector arranges funding, develops on-site infrastructure, sells industrial plots and takes up Operation and Management (O&M). PPP economic institutional structures and PPP schemes must be tailored to accommodate the existing conditions and achieve project development objectives. The following institutional frameworks and PPP options for implementation of the selected economic zones are evaluated to facilitate a comparative analysis.

5.3.1 Option A: Government-Led Model

Under Option A, BEZA would be responsible for land acquisition, arranging funds, development of on-site infrastructure, regulation, and operation & management of EZs. BEZA would promote EZs and lease ready plots to industrial units.

5.3.2 Option B: Operating and Managing Outsourcing Model

BEZA would request the concerned government organization to acquire land on its behalf and fill the land. BEZA would develop the on-site infrastructure such as roads, electricity connections, sewerage networks, etc. In parallel, they would invite tenders from potential private investors to operate and maintain the selected 3 EZs. The private operator would then obtain a lease over the land for the concession period through a concession agreement. It would pay a royalty to the government and sub-lease plots to industrial units.

5.3.3 Option C: Concession PPP Model

BEZA would award control and development rights over the land (acquired by a government organisation) to a private economic zone developer under a long term lease through competitive public bidding. After completion of the land bidding, the private developer would form a Special Purpose Vehicle (SPV), responsible for preparing detailed concepts, layouts, and detailed designs; arranging financing, land filling & on-site development, and preparing plots for sub-lease to industrial units for 99 years. The SPV would provide operation and management services throughout the lease term.

5.3.4 Option D: Private Ownership PPP Model

Under Option D, BEZA would be responsible for regulation of the zone and land acquisition. The SPV would pay the land price upfront. In parallel, the SPV would be responsible for preparing detailed concepts and layouts; arrange financing; prepare detailed designs; carry out land filling,

develop on-site infrastructure, prepare plots for outright sale to different categories of entrepreneurs; and manage O&M of the zone area. As per the Bangladesh Economic Zones Act of 2010, the SPV will impose minimum standards for the zones, criteria for plot design and development control guidelines for on-site infrastructure and common facilities, etc.

5.3.5 Various PPP Options in Summary

Table 5.3.5-1: Summary of PPP Schemes

Options	Land Acquisition	Off-site	Financing	Land filling and On-site	O & M	Regulation
Option A: Government-Led Model	BEZA	BEZA	BEZA	BEZA	BEZA	BEZA
Option B: Operating and Managing Outsourcing Model	BEZA	BEZA	BEZA	BEZA	Private operator	BEZA
Option C: Concession PPP Model (Design-Build-Finance-Own-Operate-Transfer)	BEZA	BEZA	i)BEZA –Initial land acquisition ii)SPV procures land and funding up front development	Private operator	Private operator	BEZA
Option D: Private Ownership PPP Model	BEZA	BEZA	Private operator	Private operator	Private operator	BEZA

5.4 Components of the EZ as PPP Entities

After field trips to the three sites and the drawing up of best practice master plans of the sites, it has been identified that implementation of the sites requires substantial investment. It is envisaged that there will be two categories of projects such as core infrastructure of the zone (land and on-site infrastructure) and individual components (commercial zone, inland cargo depot, IPPs, water treatment plant, CETP, etc.).

According to the Best Practice Master Plan, the EZ will involve the following components.

Table 5.4.1-1: Investment Structure of Mirershorai EZ

Location	Lease-Status of Land	Main Land Use	Investor	PPP Scheme
Proposed Area	Leasable	Industry Plot	PI	DBFOOT
		Coal-fired Power Plant	IPP	BOO
		Commercial	PI	BOT
		Residential	PI	BOT
		International School	PI	
		Vocational Training Institute	PI/GOB	BOO
		Medical College & Hospital	PI/GOB	BOO
	Not-leasable	Control Office & Parking	EZD	
		Fire Service Station	EZD	
		Customs Office	EZD	
		Police Station	EZD	

Location	Lease-Status of Land	Main Land Use	Investor	PPP Scheme
		Residential	EZD	
		Resettlement Zone	EZD	
		Remaining Land	EZD	
		Mosque	EZD	
		Internal Road	EZD	
		Embankment	EZD	
		Water Body	EZD	
		Water Retention Pond	EZD	
		Water Tower & Reservoir	EZD	
		Water Supply Treatment Plant	EZD	DBFOOT
		Waste Water Treatment Plant	EZD	DBFOOT
		Forest	EZD	
		Green Zone	EZD	
Off Site Infrastructure		Access Road (1)	RHD/GOB	
		Access Road (2)	RHD/GOB	
		Water Connection	PHED	
		Communication	BTCL/ISP/EZD	
		Electricity	PDB/EZD	

Some of the major services could be split as separate component PPPs in the case of the Mirershorai EZ. PPPs would be governed by their respective concession agreements. The Private zone developer will be free to ‘outsource’ the above components to other private organizations as PPP entities. The basic revenue and cost model envisaged for implementation through component PPP is presented in the table above.

Non-core infrastructure viz. Commercial Zone, Coal-fired Power Plant, Water Treatment Plant and Waste Water Treatment Plant can be done on PPP based on following criteria:

1. Projects being with range of minimum economic size as an independent investment.
2. Establish revenue model that is typically viable.

The Private zone developer cum operator will take up core infrastructure development of the zone (land & on-site development, preparing plots and O&M) along with individual components of the project or separate can be proposed for individual components, under PPP entities.

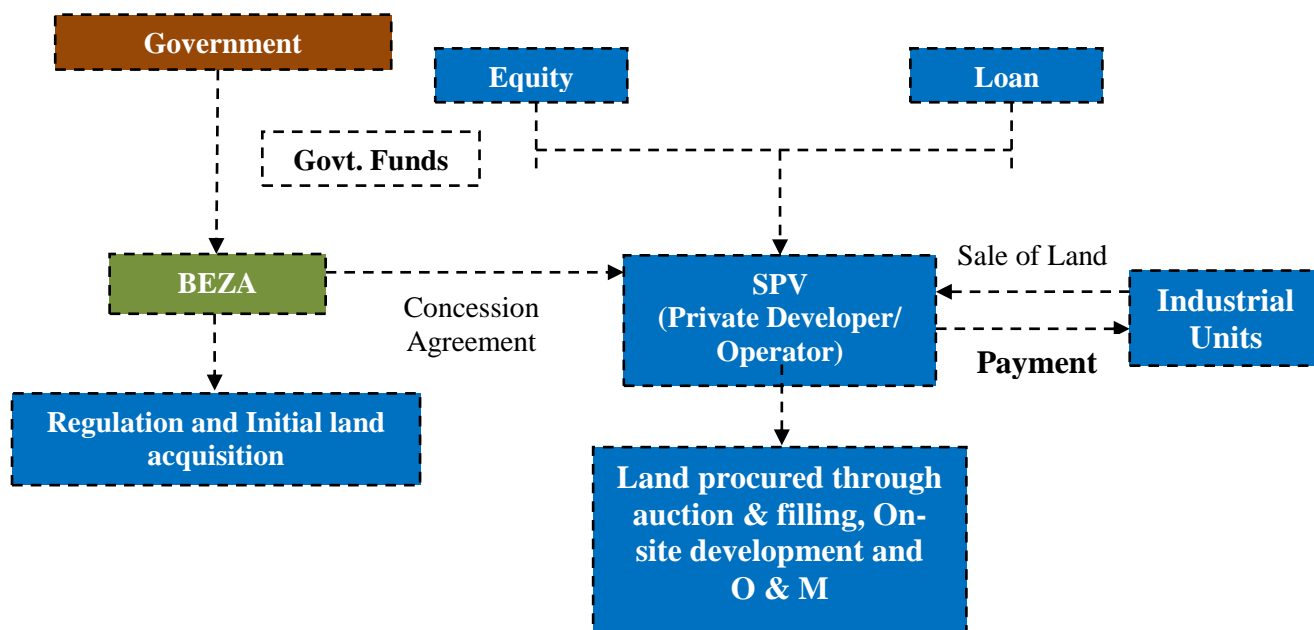
5.5 Business Model of Mirershorai EZ

The Concession PPP Model (DBFOOT) - **Option C** is proposed as the preferred modus operandi of the private developer cum operator in implementing Mirershorai EZ. This EZ is one of the most suitable large sites along the strategic Dhaka-Chittagong Industrial corridor. The Mirershorai EZ is not only contributing for the economic development attracting FDI & DDI but also establishing a Gateway and allows establishing new waterfront industries by creating new industrial land by land reclamation of shallow seashore area. If this land reclamation industrial development is successful, the neighbouring seashore can be converted to new industrial land in the future.

Under the concession PPP Model (DBFOOT), regulation of the EZs will be the responsibility of the BEZA and licensed under the Bangladesh Economic Zones Act, 2010. The business of the SPV set up for pursuit of the Mirershorai Economic Zone is to arrange finance and procure land on 99-year lease through competitive public bidding at auction, develop plots and lease these plots to industry entrepreneurs. The SPV Company of the EZ will provide required infrastructure and facilities such as stable power supply, commercial facilities, vocational training centre, water supply and waste water treatment plant. Off-site infrastructure which includes connectivity infrastructure like includes power transmission line, telecom network, access road and rail line outside the EZ’s premises, will be borne

by BEZA. The social infrastructure is also very important and ensures proper living conditions for the people inside the zone and could include administrative buildings, low cost housing for workers, a clinic, a mosque and public toilets. These will be the part of BEZA's initiatives. The social infrastructure like the mosque, clinic etc. are not expected to generate revenue.

Figure 5.5-1: Business Model for Mirershorai EZ



The advantages of this model are as follows:

1. Private sector efficiency in operating and maintaining the EZ is achieved.
2. Government needs substantially less investment, if Option C-Concession PPP Model (BOT) chosen, in the EZs compared to other options- Government-Led Model and Operating and Managing Outsourcing Model.
3. Government has strong control through the concession agreement of regulation of the selected EZ.

The disadvantages of this model are as follows:

1. There is no clear source of government funding for making the initial land acquisition cost of Mirershorai EZ.
2. Private operator interest in operating and managing the EZs is uncertain at this point and has to be tested in the market following the completion of the feasibility study.

5.6 Delineation of Responsibilities under Option C-Concession PPP Model

The responsibilities of BEZA and the private developer/operator under the concession PPP model are given in the table below.

Table 5.6-1: Responsibilities of BEZA and EZ Developer/Operator

BEZA	Private Developer/ Operator
<ol style="list-style-type: none"> 1. Initial Land acquisition. 2. Conduct competitive land auction bidding for private investors. 3. Guideline for developing the zone. 4. Defining terms and conditions defining the interrelationships within the PPP, between private and the public sector. 5. BEZA and BOI will jointly formulate and implement marketing of EZ through information gathering, stakeholder consultation, intra-govt. communication and clear up-to-date information provision on law and regulations. 6. Development of infrastructure, which includes an access road, rail, dike, telecom network and power transmission line. 	<ol style="list-style-type: none"> 1. Prepare master plan of the zone. 2. Receive land on lease basis through competitive bidding. 3. Develop on-site infrastructure and sub-leasing industrial plots. 4. Environmental and social impact mitigation. 5. Side by side, zone developer with BEZA and BOI will market the zone to the potential entrepreneurs for setting units in the zones. 6. Reporting to BEZA. 7. Payment of license fees to the Government.

5.7 Need for Change in Present Land Lease Regulations

The current BEZA Land regulation stipulates a 30 year lease (extendable twice up to 90 years). However, the study team strongly recommends changing to 99 years lease, and, render the lease both renewable and transferable as enabled in most Asian countries. If the land lease is only 30 years and not transferable, just as the BEPZA land regulation, then the PPP scheme is not likely to attract many developers/investors and the BEZA EZ Programme may have to use Option Case 1 requiring BEZA to develop and operate the site just as the current BEPZA programme.

Table 5.7-1: Land Regulations for Asian Countries and Bangladesh

Country	Bangladesh	Thailand	Philippines	Malaysia	Cambodia
Land Ownership	NO	Yes For Industrial Park	Yes For Industrial Park	Yes	No
Land Lease Extension	30 years Yes	Any period Yes	Any period Yes	Any Period Yes	50-99 years Yes
Transferable	No	Yes	Yes	Yes	Yes
Recommended	50-99 years Plus Transferable & Extendable				

Source: WB Study Team

Without changing the present land regulation to enable term extension and lease transference, the BEZA EZ project is not likely to be promoted as a PPP scheme as originally considered. It is strongly recommended the land lease regulation be changed immediately before starting the BEZA EZ programme.

5.8 Institutional Framework: Implementing Mirershorai EZ

Fundamental to the institutional framework is the question of implementation route. It has been proposed in the study that Mirershorai site will be developed and operated as a coastal EZ under PPP arrangement. A four-tier system, as institutional framework for the implementation of Mirershorai EZ is outlined below:

- An Apex body, headed by the Principal Secretary to the Prime Minister’s Office with the concerned head of line agencies (BEZA, PPP office, Department of Labour, customs, power, Roads & Highway, DoE) as Members for overall guidance, planning and approvals.
- In this project, BEZA, headed by a full time project director, is to be responsible for initial land acquisition and transfer of land to private investors through competitive bidding for site development. The Project director will ensure infrastructure development of the zone within a specified period through monitoring the own activities and of EZ development.
- Various government agencies will be involved in the process of implementation of the Mirershorai EZ. Each and every agency will want to regulate Mirershorai EZ. Due to involvement of various government agencies, problems can be created during the pre-operational and operational level of Mirershorai EZ. In order to deal with these problems immediately, a Steering Committee (SC) will be formed for this zone. Problems may relate to technical or legal aspects or issues under the joint jurisdiction of ministries or the SPV Company and beyond the competence of BEZA or the SPV Company. The SC has the further duty of being a mechanism to receive any complaints and of finding solutions to such complaints filed by the Zone Developer as well as by Zone Investors. The Mirershorai EZ Steering Committee will meet once in a month. The composition of the Mirershorai EZ SC is as follows:
 1. A member nominated by the Prime Minister.
 2. Chairman of BEZA.
 3. Heads of Relevant Government Agencies.
 4. Project Director of Mirershorai Economic Zone.
 5. Deputy Commissioner of the District Relevant to Mirershorai Economic zone.
 6. Chairman of SPV Company, Mirershorai Economic zone.
- The Mirershorai site will be developed as a large seafront EZ. Its development and operation is a new area of business in Bangladesh. It will be critical for local single private investors to develop and operate this large planned EZ. In this background, a joint venture between a globally reputed EZ developer and local company has been proposed. The SPV Company of Mirershorai EZ is the “One-Stop Service” organization in charge of the development and management of operations of the zone. The SPV Company will arrange equity and debt fund from local & foreign markets. Other formations of the SPV have been explored for development and O&M activities of the Mirershorai Economic Zone :
 - Private Shareholding Company governed by a board of directors and owned through a joint venture partnership between the Government and private investor.
 - 100% single foreign investor-owned SPV.
 - Multiple SPVs will be formed to develop and manage the Zone development and operation and non-core individual components (Zone development & operation, commercial zone, coal-fired power plant, water treatment plant and waste water treatment plant).

5.9 One Stop Service (OSS) for Mirershorai EZ

OSS of the EZ will have an impact in reducing the cost of doing business and increasing the flow of investments through improved service delivery. BEZA may, if the Government directs, set up, maintain and manage centres of Custom Department and Office of Chief Controller of Imports and Exports (CCI&E) in the zone area for facilitating exports, imports and supplying the local market. Apart from custom facilities, investors will receive all types of services required for investment. In the meantime, the Export Processing Zones of Bangladesh are running this type of OSS from where the investors can receive all types of services required for investment.

Tentative OSS System for BEZA is described below.

Table 5.9-1: Delineation of Responsibilities in OSS

Item	BEZA	Other Agency
Investment License	Yes	
Construction & Operation Permit	Yes	
Import & Export License	Yes	Custom Office
Tax Registration	Yes	Tax Office
Working Permit	Yes	Ministry of Labour
Multi Visa Issues	Yes	Immigration
Incentive Arrangement	Yes	
Environmental Issues & Permit	Yes	Ministry of Environment

The above OSS operation is based on the BEPZA practice now which is considered as a fairly good system and BEZA should be able to improve upon the existing OSS system of BEPZA. Further improvements are suggested below:

- 1) One customs official should be posted full time under BEZA to facilitate activities of bond permission and renewal of bond licenses every year.
- 2) One representative from the Home Ministry may be posted to BEZA headquarter for security clearance of BEZA investors.

Comprehensive and high-standard infrastructure:

- Reliable power and gas supply
- Independent water supply system
- Common Effluent Treatment Plant
- Reliable and modern telecommunications system
- Multi-modal transport system

"On-site, one-stop" services in partnership with relevant government agencies listed here:

- Bangladesh Economic Zone Authority.
- The Custom Department
- Office of Chief Controller of Imports and Exports (CCI&E)
- The Ministry of Commerce
- The Ministry of Labour and Vocational Training

Other on-site services provided by Mirershorai EZ:

- Investment registration
- Import/Export permits
- Customs clearance
- Business: Bank, Courier, Post office, C&F Agent, Shipping Agent and commercial complex etc.
- Workers' recruitment support
- Labour management assistance in cooperation with the Ministry of Labour

- 24 hours security and fire station.
- Garbage collection and disposal
- Canteen and Medical Centre for workers.
- Legal, Administrative and accounting consultation

5.10 Financing Plan of Mirershorai EZ

Using the Concession PPP Model (BOT) in the private development and implementation of the Mirershorai EZ, the SPV Company will mobilise internal & external equity and debt funds to procure land on long term lease at competitive auction, develop on-site infrastructure and prepare industrial plots.

Using Option C (Concession PPP Model), sources of finance for developing Mirershorai EZ from the perspective of two parties should be considered i.e. government/BEZA and private developer/operator.

5.10.1 Government/BEZA Financing

Potential sources of finance for government/ BEZA for initial land procurement and developing off-site of the zone are assumed to be as follows:

▪ Government's own funding

To gain the confidence of private investors regarding the government's eagerness and strong position in the PPP initiative, US\$30 billion is kept aside for the Public-Private Partnership (PPP) programme for the fiscal year 2013-14 in the national budget. Part of the PPP fund will be used to finance off-site development and initial land procurement costs. Later, the cost will be realised from private investors through competitive bidding. BEZA will use the expertise of the PPP Office under the Prime Ministers' Office to enter into a PPP agreement with a private zone developer.

▪ Funding provided by different donor agencies (IDA, ADB, JBIC, JICA etc.)

The terms and conditions of financing provided by different donor agencies are discussed below:

○ **International Development Association (IDA)**

IDA credits are given only to governments with a maturity of 40 years including a 10-year grace period. IDA credits have no interest, but carry an annual service charge of 0.75% on the disbursed and outstanding credit. The commitment charge on IDA credit and grants is set annually within a range of 0–0.5% and is determined by the Executive Board before the start of a financial year. IDA is financed by a partnership of donors who come together every three years to agree on the resources required to fund IDA's lending programme and to determine the policy objectives that guide IDA's activities. As a result, IDA's resources, unlike the resources of a regular lending institution, must be regularly replenished through contributions if the agency is to continue in business.

○ **Asian Development Bank (ADB)**

The ADB provides two types of loans - Asian Development Fund (ADF) and Ordinary Capital Resources (OCR). ADF is a concessional loan while OCR attracts near market rates for the borrowers. Bangladesh joined the ADB in 1973 and became one of the largest borrowers of concessional Asian Development Fund (ADF) resources. For project loans from the ADF

window (i.e. other than quick-disbursing programme loans) the terms are: 32-year maturity including an 8-year grace period, 1% interest charge during the grace period and 1.5% during the amortization period and equal amortization. For quick-disbursing programme loans, the terms are: 24-year maturity including an 8-year grace period, 1% interest charge during the grace period and 1.5% during the amortization period and equal amortization. There is no commitment fee associated with ADF-financed loans. Most lending from OCR has been as per London interbank offered rate (LIBOR)-based loans (LBL). LBL may be denominated in US dollars, euros, yen or other foreign currencies in which ADB can efficiently intermediate. Initially, LBLs carry a floating lending rate consisting of the 6-month LIBOR or another relevant floating rate benchmark and an effective contractual spread and, where applicable, a maturity premium fixed over the life of the loan. For OCR loans the terms are: 20-year maturity including a 5-year grace period. There is a commitment fee associated with OCR-financed loans.

○ **Japan Bank for International Cooperation (JBIC)**

JBIC is a government financial institution that provides long-term, low-interest project loans for development projects and programmes. Since independence, JBIC extends soft loans to Bangladesh which carries an interest rate of 0.01% and repayment period of 40 years with 10 years grace period.

○ **JICA ODA Loan (Long term, Low Interest)**

Since establishing diplomatic relations, JICA has been giving ODA loans in development of much-needed physical infrastructure in Bangladesh. For example, JICA recently finalised modalities of the \$2.1 billion credit under its 33rd Official Development Assistance (ODA) package for a metro-rail project with tenure of 13 years. BEZA and private investors are looking for a similar soft loan facility for the country's EZ programme with particular focus on offsite development.

Table 5.10.1-1: Major Conditions of JICA ODA Loan

Project Type	Government Project
Financing Tool	Loan
<u>Terms of Loan</u>	
- Interest Rate	Normal ODA loan: 1.4% Special Condition: 0.2%
- Repayment Period	Normal ODA loan: 30 years Special Condition: 40 years (Revised periodically)
- Grace Period	10 years
- Maximum Share	85%
Procedure	-Initiated by official request of the government of recipient countries
Security	-Sovereign guarantee or Government borrowing

5.10.2 Private Developer/Operator Financing

Financing options for a private operator may be one or a combination of equity source and debt sources. External equity and debt financing for the Mirershorai EZ developer/operator, is expected to be obtained from the following sources:

5.10.2.1 External Equity Financing

(i) IFC's Equity Financing

As the demand for infrastructure grows, governments are increasingly looking to public private partnerships as an innovative way of financing infrastructure projects. IFC investments typically range from \$5 million to \$100 million, with a limited number of investments in the \$100,000 to \$5 million range. To ensure the participation of investors and lenders from the private sector, IFC typically finances no more than 25% of the total estimated project costs

- For new projects, the maximum limit is 25% of the total estimated project costs, or on exceptional basis, up to 35% in smaller projects.
- For expansion projects, IFC may provide up to 50% of the project cost, provided its investments do not exceed 25% of the total capitalization of the project of the company.

(ii) Equity Fund from Asian Development Bank

The ADB may invest directly in an enterprise. It offers financing through equity investments, including direct equity investments in the form of common shares, preferred stock, or convertibles. Equity investments in enterprises, especially financial institutions, occur before an initial public offering. ADB does not seek a controlling interest in an investee company and will not assume any management responsibilities. It will, however, typically wish to reserve the right to appoint a nominee or an observer in the board of directors of each of its investee companies and to selected board committees and will exercise voting rights as a shareholder. It will maintain regular contact with company management and require periodic reports on the progress of capital projects, operating performance, financial condition of the enterprise and economic value added. The ADB also requires reports on specific indicators for development outputs and outcomes and monitors continued compliance of its environmental and social safeguards. Potential ADB participation in the Mirershorai EZ will help the private sector of Bangladesh to mobilize additional investment from top tier international partners in the days to come.

(iii) Private Sector Investment Finance(Equity Funding), JICA

In April 2008, the government announced its “New Strategies for the Enhancement of Collaboration between ODA programmes and Japanese Companies: PPP for Growth Acceleration”.

Major Conditions: Equity Finance (Investment)

- Investees
JICA invests in commercially viable projects (or fund) e.g. PPP infrastructure project company (SPC), individual project sponsors.
- Share of Equity
JICA cannot take majority share, maximum 25% of the total capital
- Exit Policy
Pre-arrangement of exit plan required for successful transition to sustainable private business.

5.10.2.2 Debt Financing

(i) Investment Promotion and Financing Facility (IPFF)

The Government, through the Bangladesh Bank (BB), has come forward with an Investment Promotion and Financing Facility (IPFF) project with the assistance of the World Bank to make partial debt financing available for private infrastructure projects. The Mirershorai EZ operator can take advantage of such loans through participatory financial institutions (BB approved financial intermediaries).

The Bangladesh Bank provides loans to a Participating Financial Institution (PFI) upon the request of private investors to the PFI for such loans. PFI upon receiving a request from the private investor makes an application to the facility, for funding. The BB considers the application based on the operational directives of the facility and disburses the fund to the PFI. The PFI then extends a loan to the private investor. The loan is received by PFI from the BB under this facility. Syndication among PFIs and with non-participating institutions is permitted but the PFIs are responsible for credit administration and recovery.

The private sector promoter needs at least 30% equity contribution to access an IPFF loan, whereas PFIs need to finance at least 14% of the project cost and of the rest 56% may be financed by IPFF. The maximum term of the loan repayment is 20 years with 3-10 years grace period. The interest rate for PFI is a weighted average yield of 1 year Treasury bill plus 50 basis points (if a floating loan). A Facility loan can also be taken in dollars or other currencies with a rate 50 basis points above the relevant interbank rate.

(ii) Debt Fund from the Asian Development Bank

ADB supported PPP modalities projects range from build–operate–transfer, build–own–operate–transfer, concession, private independent power producers (IPP), joint ventures, service contracts, build–own–operate, design–build–finance–operate, financing facility and purely private sector investments such as direct loans to SPVs of PPP projects.

Interest rates and other terms vary, depending on companies' or projects' needs and risks.

- **Rates** - In pricing its loans, the ADB considers prevailing market rates in the relevant country and sector, factoring in country and transaction risks. The ADB provides floating rate loans at a spread above the London interbank offered rate (LIBOR) or Euro interbank rate, depending on the currency. It also offers fixed rate loans at the fixed-rate swap equivalent of floating-rate loans.
- **Fees** - Market-based fees are charged. Typically, on floating-rate loans, the ADB charges a once-only front-end fee as well as an ongoing commitment fee on the undisbursed balance. We may also charge a fee to cover upfront costs associated with due diligence. Project sponsors or clients will reimburse out-of pocket expenses, such as travel and external advisory services (i.e., legal counsel, technical consultants and environmental and insurance advisors, if any).

(iii) JICA Debt (Concessional Loan for Private Sector)

Private Companies are gaining access to the JICA debt fund to build infrastructure that previously had been reserved for the public sector.

Major Conditions

- Fixed rate (Base rate : GOJ bond plus), JPY – denominated
- Long tenor up to 20 years with grace period (up to 10 years)
(Exceptionally up to 25 years dependant on necessity)
- JICA provides loan up to 70% of the total project cost
(Exceptionally up to 80% dependant on necessity)
- Future possibilities of providing Private Sector Investment Finance (PSIF) in US\$

(iv) IDA Guaranteed Loan

Partial Risk Guarantees (PRG) supports private sector investment projects, including PPP projects, green-field and rehabilitation/expansion projects and concession and privatization transactions. PRG can be structured to protect lenders of limited-recourse project finance debt, or to protect the project company (“Letter of Credit” or “Deemed Loan” PRGs). Country eligibility: PRGs are available to all IBRD (International Bank for Reconstruction and Development) and IDA countries, PCGs (Partial Credit Guarantee) and PBGs (Policy-Based Guarantee) only to IBRD-eligible countries. IBRD may provide PRGs for enclave projects in IDA-only countries. IDA would make payments under its Guarantee in accordance with the amortization schedule pre-agreed with commercial lenders or prepay the loan, at its option. Partial Risk Guarantees (PRG) will help the private developer/operator SPV Company of Mirershorai EZ to receive long term international financing. The successful financial closure of Mirershorai EZ through the deployment of the IDA Guarantee will serve as an important milestone in establishing a track record for facilitating financial capital flows to the country’s EZ programme.

(v) Offshore Financing

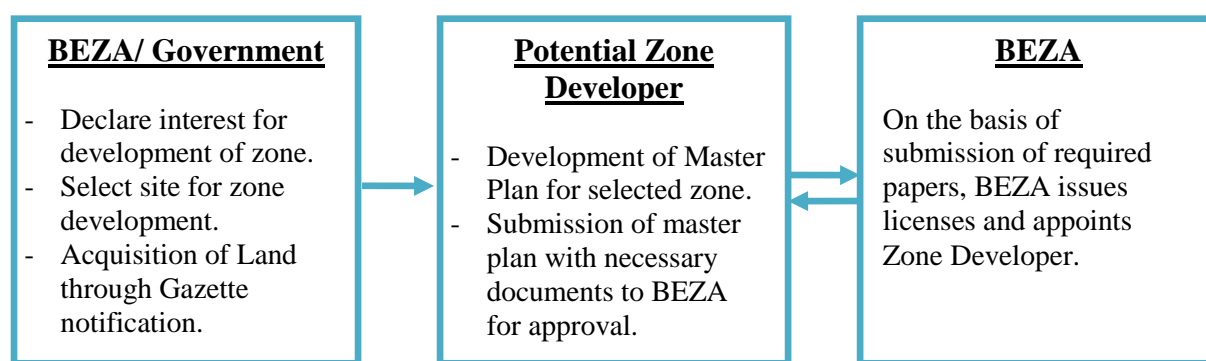
With the rising foreign exchange reserve of Bangladesh Bank and remittance encouraged, offshore banking units of foreign and local private banks can arrange a long term lower interest rate fund for private sector EZ investors. For this purpose, banks will collect resources from remittance, borrowing from foreign banks, deposits of foreign banks and EPZs and foreign exchange reserves.

5.11 Approval Process of EZ

The Bangladesh Economic Zones Act 2010 has opened up a new window and will allow the private sector to own, develop and manage EZs and establish infrastructure and services for the companies there. In the backdrop of the Bangladesh Economic Zones Act, the process of approval of zone developer is presented in the following exhibit:

According to Bangladesh Economic Zones Act 2010, BEZA or any government agency will develop EZs or specialised zones for industrial or particular sector development. In this regard, BEZA will seek expression of interest for prospective zone developers under a suitable PPP model. After receiving proposals with all required documents from interested zone developers, BEZA will approve proposals.

Figure 5.11-1: Process of Approval of EZ



CHAPTER 6

FINANCIAL AND ECONOMIC MODELLING

(COMPONENT 4)

6.1 Financial Analysis

The Government of Bangladesh will allow the private sector to participate and bear the burdens and rewards of developing infrastructure including power generation, bridges, and economic zones in partnership approaches to a great extent. It is therefore assumed in the study that the economic zones will have a large degree of private sector participation especially when the local private sector and foreign investors have shown interest in developing economic zones. The Mirershorai EZ will be designed fulfilling the condition of having (i) stable and sufficient power, (ii) a good water supply, (iii) common waste water treatment facilities built to international standards, and (iv) a truly functional One Stop Services (OSS), reducing the administrative red tape. If this is the case, Mirershorai EZ will become the first well equipped EZ for attracting new industries and FDI in Bangladesh, in fact, a model EZ. Accordingly, this part analyzes the financial viability of the Mirershorai, Chittagong EZ based on net financial benefits under the different degree of participation of private sectors and cash flows accruing to investors who provide equity in developing economic zones.

The analysis is based on the demand for serviced industrial land set out in the section on demand projections and construction and development costs detailed in Annex-5. Assumptions on the operation and maintenance (O&M) costs, and phasing of development are also presented. The model developed proceeds to analyze revenues generated by the zone, and the IRR (both for the zone and equity investors), and the NPV of the project. Table 6.1-1 presents key assumptions.

Table 6.1-1: Overview of Key Assumptions

Category	Key Assumptions
Land	7,195.30 acres or 2,911.83 gross hectares of land, 4,212.83 acres (1,705.60 hectares) of industrial plots
Sales Revenue	Service Land (\$50/m ²) or (Tk. 4000 /m ²) initially in Phase-1 & then price increase to \$60/m ² for 2021 in phase 1 and 2022 in Phase-2, to \$70/m ² for 2023, 2024 and 2025 in phase-2 and to \$80/m ² for 2026, 2027 and 2028 in phase-3.
Service Revenue	Full charge fee for water & waste water and other service revenue equivalent to 15% of applicable utility rent/bill
EZ Service Fee	\$1.92 /m ² /year
Depreciation	25 years (Infrastructure & Buildings) 5 years (Equipment)
Govt. Partial Guarantee	For availing soft long term loan by SPV company but No Grant (VGF)
Debt/Equity Ratio	70% (70% LTD, 30% Equity or Reinvested Cash)
Long-Term Loan	Loan arrangement fee equal to 2% of the maximum credit line

The project's sensitivity to various factors is examined in the financial model. In addition, the key issues are discussed, for example, who should provide and bear the cost of - the land, land preparation and dredging, coal-fired power plant, water supply and waste water supply, off-site access roads, water connections to the border, and the electricity connection to the border. The question of whether this “provider” should be Government, or the private sector, or a combination of both are analyzed in terms of different PPP models. All these issues are run through the financial model to see what the impact would be on the final IRR if the government develops them or the private sector or a combination of both.

6.1.1 Methodology

The financial assessment enables us not only to assess the financial viability of the project, but also to guide any pricing and timing issues that may be able to influence the profitability of the project, and identify any requirements for public support. A model was developed in a spreadsheet to calculate projected revenue streams, and capital and O&M costs, to enable the testing of a number of parameters for their effects on the finances of the Mirershorai EZ. The primary outputs of the model are estimates of the Internal Rate of Return (IRR) and Net Present Value (NPV) of the net benefits flow generated by the Mirershorai EZ for the project. The analysis is based on the Base Case, which considers demand projections presented in this report and assumes land costs, relocation and compensation costs, all on-site infrastructure development costs including the costs of the provision of a dike system, being provided by the private sector, while the coal-fired power plant is provided through IPP.

The financial viability of the Mirershorai Economic Zone is assessed through the following estimation criteria:

1. Costs of public land
2. Capital costs of acquiring the EZ inclusive of Relocation and Compensation Costs
3. Capital costs of developing/constructing the zone
4. Capital costs of provisioning dike system
5. O&M costs of operating and maintaining the zone
6. Revenues accruing to the zone owner/operator
7. Government support necessary to make the project viable for private sector ownership, development, and/or operation

It is proposed that the Mirershorai EZ should, to a great extent, fund almost all capital expenditures through debt financing. This soft long-term debt is secured through partial government guarantee and the use of all the assets of the project as collateral. The equity share of initial capital expenditures is funded by investors. Subsequent requirements are funded from investors through the use of retained cash whenever possible, and additional injections of external equity from investors whenever necessary.

6.1.2 Assumptions

In light of the master plan, development cost estimate, and demand projections, certain non-financial assumptions are made in this feasibility study and are listed in Table 6.1.2-1.

The financial analysis of Mirershorai EZ covers only the capital costs of acquiring the EZ inclusive of relocation and compensation costs, the cost of public land, on-site infrastructure development costs, and O&M costs and revenues of the economic zone. It is assumed that the government of Bangladesh will develop all off-site infrastructure expected to cost only \$28.67 million. This includes two access roads, plus communications and utility (water and electrical) connections to the border of the economic zone. It is also assumed that the government will be responsible for the acquisition of land.

Table 6.1.2-1: Mirershorai Economic Zone Financial Model Assumptions

Variables	Assumed Value	Notes
Size of gross land	29,102,500 square meters + 2,336,428 square meters for coal stockyard and jetty	Suitable large site along the strategic Dhaka-Chittagong Industrial corridor in Mirershorai, of which 26,781,900m ² to be acquired and purchased by the Govt/owner and 2,336,428 m ² land to be reclaimed at the ending of project's phase-3 for establishment of the coal stockyard and jetty of the coal-fired power plant.
Gross/net land ratio	58.58%	43.23% of gross land will be serviced industrial land to be saleable lease ²²⁵ and 14.99% of gross land will be residential, commercial and educational land use, and coal-fired power plant and warehouse plots to be saleable lease; 0.36% will be for rental factory. 40.58% will be devoted to road, utilities, green space, and common zone facilities, and 0.85% of gross land will be kept for settlement.
Embankment (On-Site)	1,281,887 square meters	Purchased, developed, owned and operated by the private sector as a part of On-site costs.
Earth filling requirement	2.25 meters	Average depth shown.
Average market price (\$/m ²)	\$4.9/m ²	The average price is for land, other than water bodies, and may be fully/partially provided by government under some PPP arrangements.
Relocation and land acquisition & compensation costs	\$2.71 million + \$45.83 million \$48.54 million (using \$1 = Tk 80)	Information provided by UNO office, Mirershorai, cost may be borne by the government under some PPP arrangements. This includes a 50% premium over current market prices as required by law.
Corporate tax/VAT	0%	Assumed government will waive corporate tax and VAT for the developer as an incentive
Phasing of Development	Phase 1: 1,425.56 gross hectares Phase 2: 730.71 gross hectares Phase 3: 325.15 gross hectares Existing Forest and Water body: 430.41 hectares	Infrastructure development in the zone is phased. Phase 1 starts in 2017 and completes in 2021; Phase 2 starts in 2022 and completes in 2025 and Phase 3 starts in 2026 and completes in 2029. In the base case, this occurs in Year 3, while phase 2 is built in Year 8 to Year 11 and phase 3 is built in Year 12 to Year15.

6.1.3 Capital Costs

Capital costs are based on the market value of the land including the cost of the public portion of land, estimated relocation and compensation costs to be paid to landowners and residents, and the costs of on-site infrastructure for the zone. These include land preparation and dredging, roads, the dike system, road on dike, drainage system, roads, warehouse, jetty (IPP), coal-fired power plant (IPP), institutional buildings, electrical system, water supply treatment plant, and waste water treatment plant in line with the master plan. According to the master plan, these items are disaggregated from the estimated cost of developing each phase. So, the phased development costs include costs related to the construction of all necessary infrastructure other than roads for residential and common buildings, site preparation costs (filling, leveling, and compaction), dredging and initial landscaping for these items. The costs of the on-site coal-fired power plant are on an IPP and therefore these costs are not considered in the financial analysis. However, the impact of the power plant upon the IRR of the project and IRR of the investors (Equity IRR) is shown as a separate scenario.

²²⁵ Saleable lease implies the lease on sale rather than lease on rent having transferability conditions for our purpose.

Land is assumed to become available for lease in the third year after construction begins, underground utilities are installed, drainage, and most roads are completed. The full annual break down of site development and building costs is provided in Annex 5.

In the base case, all the three phases are developed and completed by 2029 (about 14 years). The total fixed costs for the development of the Mirershorai EZ over the 20 year period in the Base Case is projected to be approximately US\$735.39 million except for off-site costs in terms of 2014 prices. The cost is divided as follows:

- Public Land, Land Acquisition and Compensation, and Relocation US\$112.53 million
- Land Development — Preparation and Dredging US\$182.49 million
- Dike System On-site — US\$38.07 million
- Water Supply Treatment Plant and Waste Water Treatment Plant — US\$132.66 million
- Other Site development, infrastructure, and common building — US\$268.64 million

The Off-site costs amounting to US\$28.67 million are as follows:

- Off-site utility connection costs — US\$12.83 million
- Other Off-site infrastructure costs — US\$15.84 million

6.1.4 Phasing of Development

In line with best practice in economic zone development, Mirershorai EZ is conceived as a development in three phases. While the entirety of the land will be acquired at the beginning of the project, the infrastructure should be constructed to accommodate the outcome of the Demand Forecast and after the completion of phase 3, the additional land of 233.64 hectares will also be required to be reclaimed for establishment of the coal stockyard and jetty of the coal-fired power plant. Thus, Phase 1 of the Mirershorai EZ project includes enough land and infrastructure to satisfy the first five years of expected demand. The phased development concept is incorporated into the financial model.

The analysis captures a 22-year period of the Mirershorai EZ project, with 20 years of actual operation. Once the first phase is complete, in the five-year period beginning in year 3 (2017), construction for the second phase is begun in year 8 (2022), and construction for the third and final phase is begun in year 12 (2026) and completed in year 15 (2029).

The sizing of each phase is detailed in Table 6.1.4-1. It is assumed that developed sites in a new phase become available for lease in the third year after the construction takes place. The estimated timing of the development of each phase is matched to the demand projections given in Chapter 3.

Table 6.1.4-1: Mirershorai EZ Phase Sizing and Period

Period	Phasing	Gross Area	Net Area (Plot Area)
2017-2020	Phase 1	1,425.56 hectares (14,255,600 m ²)	933.33 hectares (9,333,300 m ²)
2022-2023	Phase 2	730.71 hectares (7,307,100 m ²)	540.45 hectares (5,404,500 m ²)
2024-2026	Phase 3	325.15 hectares (3,251,500 m ²)	147.82 hectares (1,472,820 m ²)

6.1.5 Operation and Maintenance Costs

Operation and Maintenance costs (O&M) regarding Mirershorai EZ are assumed for four areas — administration/staffing costs, promotion costs, provision of costs for operating and maintaining utility services, and provision of security services.

Administration costs are based on 4 upper level managers, 4 mid/low level officers, 16 technical workers, and 60 unskilled workers including security personnel initially. Based on the level of human resources, the initial wage bill for the Mirershorai EZ administration and security personnel would be US\$0.102 million (just above Tk. 8.16 million). Annual marketing and promotion costs are set to Taka 10 million (US\$0.125 million), which will continue for the first seven years and taka 5 million for remaining periods. Annual provision of O&M costs is assumed to be two per cent of capital costs other than land and its development, which amounts to US\$4.32 million initially.

6.1.6 Prices for Lease on Sales of Land

Assuming that the Mirershorai EZ will provide all necessary facilities and OSS service needed for Foreign Direct Investment and Domestic Direct Investment, the demand for the Mirershorai EZ Land is expected to be very high well beyond the supply of land (Phase 1:740 ha, Phase 2:540 ha and Phase 3: 147 ha). We predict that each phase could be sold out within 2 to 3 years judging by the sellers' market now and the foreseeable future.

The price level for lease on sale of serviced land was considered by analyzing prevailing rates in the region in the context of competing free zones, industrial estates, and commercial space, and in terms of the provision of stable & sufficient power, sufficient water supply, common waste water treatment facilities with international standards, jetty, and OSS while the Mirershorai EZ is being planned and constructed. The Mirershorai EZ is intended to be well equipped with all necessary infrastructure, services, and administration mechanisms to be internationally competitive and to provide OSS to its tenants. In order to attract investors, the developer/operator should start leasing at an attractive leasing price of US\$50/m² for 2017 to 2019 (Phase 1) and increase the price by US\$10 to US\$60/m² for 2020 to 2022 (Phase 1 and 2) and further increase the price by US\$10 to US\$70/m² for 2023 to 2025 (Phase 2) and further increase the price by US\$10 to US\$80/m² for 2026 to 2028 (Phase 3). For the sale lease of industrial land for the coal-fired power plant and jetty, the sale lease price of industrial plots is reduced by US\$5/m² for the cost of provision of a distillation plant in order to supply water for the coal-fired power plant. For the commercial and residential plots, the land sale lease price would be US\$70/m² for 2018 to 2019 in Phase 1, and increase by US\$10 to US\$80/m² for 2020 to 2022 (Phase 1 and 2), and then increased by US\$10 to US\$90/m² for 2023 to 2025 (Phase 2).

A full charge for the provision of water and treatment of waste water and other service charges are assessed on all the occupants of the EZ under the financial model. This service charge depends on the consumption of utility services by the occupants of the EZ and is equivalent to 15 percent of the applicable utility bill. In addition, an EZ service fee of US\$1.925/m²/year is assessed to be charged on all occupants depending on the usage of the land and covers the provision of common services to the occupants of the Mirershorai EZ. This EZ service fee ensures that the owners/operators of the Mirershorai EZ have a continuing solid basis for management of the zone when all the developed land has been passed on to investors.

6.1.7 Capital Structure

The development of Mirershorai EZ is assumed to require at least a 30 percent share of equity to secure any needed loans. All capital expenditures are assumed to be leveraged at a 70 percent debt-equity ratio to maximize returns to investors. Equity requirements are funded, if possible, through retained cash from operations of the Mirershorai EZ. When retained cash is not available (such as for the initial investment), the model assumes that equity is provided from an external source (the investor). The sole investor in the development of the Mirershorai EZ is assumed to be the developer/operator—herein referred to as Mirershorai Special Purpose Vehicle (SPV) Company.

The model assumes that all new borrowing must be fully repaid within 7 years of the issuance of debt. The interest rate on soft long term commercial loans (with partial guarantees of government) is assumed to be 6 percent. For the first two years after new borrowing, there is a moratorium on

principal and interest repayments. For years 3-7 after borrowing, it is assumed that the Mirershorai SPV Company pays its annual interest obligations and annually repays 20 percent of the principal borrowed. It is also assumed that Mirershorai SPV Company must pay upfront a one-time loan arrangement fee equivalent to 2 percent of the size of credit facility.

Mirershorai SPV Company may not be able to meet its debt service obligations during early years of operations. If the SPV Company is unable to meet its debt obligations, it is assumed that additional equity provided to clear the deficit. Debt considerations may require Mirershorai EZ to lower its debt-equity ratio from 70 percent to provide for better debt service coverage ratios. These issues are explored for each PPP scenario in the Results section.

6.1.8 Public Private Partnership Structure

As part of the financial analysis, several PPP structures are assessed to determine impact on the viability of the Mirershorai EZ.

1. The first scenario is the *base case* scenario, where it is assumed that land costs, relocation and compensation costs and all on-site infrastructure development costs, would be borne by the private sector owner/developer/operator. The private entity would:
 - acquire all land through the government's right of domain, following all necessary stipulations required under Bangladeshi law and pay for the acquisition of land and bear costs of public land as well.
 - bear relocation costs associated with acquiring the land
 - pay for all on-site infrastructure including the costs of provision of dike/access roads
 - pay all O&M costs throughout the life of the project
 - retain all profits
 - bear responsibility and risk for any and all losses

The government, for its part in the base case scenario, provides the following:

- Off-site infrastructure such as off-site railway, access roads, communication, and utility connectivity—water and electricity— to the border of the zone
- Waiver of corporate and VAT taxes for the zone developer/operator

Other scenarios are also considered where government involvement/support in developing the zone is increasingly felt. These range from acquisition of land, provision of government land at no cost, provision of a partial guarantee enabling private investors to access soft long term debt, to bearing the costs of the premium for compensation associated with land acquisition, etc. for the purpose of viability of the project.

2. Scenario 2 is defined by the increased government involvement in the acquisition of land and differs in that the government bears the costs of the premium required for the compensation provided to private land owners – 50% premium over current market prices as required by law, and provides government land at no cost to the private developer. The private entity would:
 - bear compensation costs only without premium for the acquisition of private land.
 - bear relocation costs associated with acquiring the land
 - pay for all on-site infrastructure
 - pay all O&M costs throughout the life of the project
 - retain all profits
 - bear responsibility and risk for any and all losses

The government, for its part in scenario 2, provides the following:

- Land acquisition and premium costs associated with the acquisition of land
- Government land at no cost to the private developer
- All off-site infrastructure such as access roads, railway, communication and utility connectivity—electricity and water— to the border of the zone
- Waiver of corporate and VAT taxes for the zone developer/operator

6.1.9 Net Present Value

The results of the financial analysis of the Mirershorai EZ using the base-case scenario are presented below. For the purpose of this model, discount rates of 12%, 15% and 20% were used. NPV is calculated according to the formula:

$$NPV = \sum_{t=0}^{n_t} Net\ Cash\ Flow_t / (1 + rate)^t$$

Where, the time period, n_t is 20 years. Detailed capital costs, O&M costs and revenue calculations to support the project cash flow analysis are provided in Annex 5.

6.1.10 Results of Base Case and Scenario 2

Key financial indicators for the Mirershorai EZ are presented in Table 6.1.10-1 below in terms of US dollars including the NPV of the project under each discount rate, the project's IRR, equity IRR, average debt load, the maximum debt load in a single year, and the equity required to fund development.

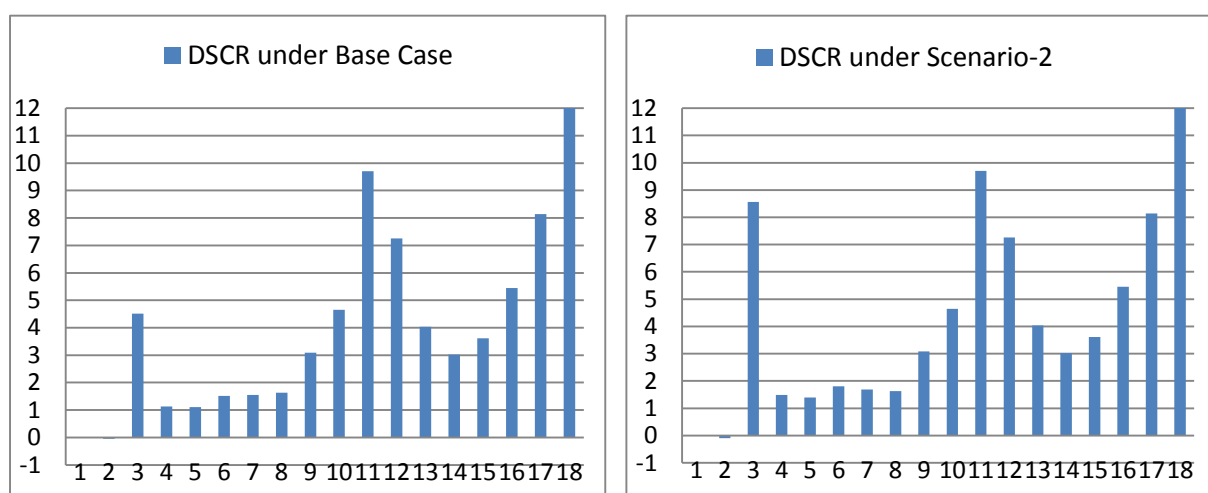
Project IRR of 21.24% in the base case scenario is estimated, in which the government bears and provides the costs of Off-Site infrastructure amounting to US\$28.67 million. A base-case FIRR of 21.24% is viable but in order to allure private investors, Scenario-2, in which the government provides public lands at no costs and bears the premium costs associated with the acquisition of land, is carried out. Scenario-2 shows the IRRs of 28.43% and positive NPVs at different discount rate of 12%, 15% and 20%.

The project IRR implies that the IRR of 21.24% and 28.43% in the base-case and scenario-2 respectively could be achieved by funding all capital expenditures through cash rather than debt. It can be said here that with the debt/equity ratio utilized by the Special Purpose Vehicle (SPV) Company, equity investors could prospectively secure a rate of return (Equity IRR) higher than the project IRR in both scenarios, as the project IRR is above the interest rate on soft long-term commercial debt. Equity IRR comes to 34.14% and 59.31% respectively in the base case and scenario-2. Mirershorai SPV Company's ability to repay its debt servicing obligations under each scenario is best shown by debt service coverage ratio (DSCR) defined in below that is calculated on annual basis (See figure 6.1.10-1).

$$Debt\ Service\ Coverage\ Ratio\ (DSCR) = \frac{EBITDA}{Annual\ Debt\ Service\ Requirement}$$

Table 6.1.10-1: NPV, IRR, Debt and Equity for the Mirershorai EZ (US \$ Million)

	Base Case Scenario (Scenario-1)	Scenario-2
Project IRR	21.24%	28.43%
Project NPV @ 12%	233.93	308.95
Project NPV @ 15%	128.74	202.84
Project NPV @ 20%	18.80	91.46
Equity IRR	34.14%	59.31%
Equity NPV @ 12%	284.85	350.99
Equity NPV @ 15%	195.39	257.03
Equity NPV @ 20%	101.84	157.20
External Equity Required	126.88	89.56
Average Debt Balance	102.96	91.86
Maximum Debt Balance	246.59	218.84

Figure 6.1.10-1: Debt Service Coverage Ratio

As shown in figure above, Mirershorai SPV Company does have a strong ability to repay its debt in any of the two scenarios. Typically, a bank would feel comfortable lending to a developer whose debt service coverage ratio (DSCR) remains above 1 throughout debt repayment period.

Therefore, BEZA should provide support in terms of (1) acquisition of land and (2) arrangement of soft long term soft commercial loans guaranteed by the GoB, and (3) financing the off-site infrastructure by public funding.

6.1.11 Results of Simulation of different scenarios and Sensitivity to Capital Costs and Prices

The purpose of doing a simulation of different scenarios and sensitivity to lease price of serviced land and/or capital costs, is to identify the critical factors responsible for failure of the viability of the EZ.

- ***Impact of Lease price reduced by 10% and EZ service fee reduced by 10% upon the IRR***
 If the lease price of serviced land is reduced by 10%, the project IRR and equity IRR declines from 21.24% and 34.14% to 19.29% and 29.58% respectively in the base case scenario and from 28.43% and 59.31% to 25.57% and 49.07% respectively in scenario 2. The impact of the reduction of the lease price by 10% coupled with the EZ service fee reduced by 10% would reduce the project's IRR and equity IRR to 19.09% and 29.29% respectively in the base-case, and to 25.35% and 48.78% respectively in scenario-2.
- ***Impact of Water Supply System being developed by the Government***
 If the water supply system is developed by the government, the project IRR and equity IRR would increase to 22.72% and 37.03% respectively in the base-case and to 30.96% and 66.46% respectively in scenario-2. If the water supply system was developed by the government and private sector equally, the project IRR and equity IRR would increase to 21.97% and 35.57% respectively in the base-case, and to 29.66% and 62.81% respectively in scenario-2. The impact of the water supply system being developed by the government coupled with the reduction of the lease price by 10% and of the EZ service fee by 10% would be a project IRR and equity IRR of 20.52% and 31.95% respectively in the base-case, and of 27.67% and 55.08% respectively in scenario-2. The impact of the water supply system being developed equally by the government and the private sector, coupled with the reduction of the lease price by 10% and of the EZ service fee by 10% would be to bring the project IRR and equity IRR of 19.79% and 30.60% respectively in the base-case, and of 26.48% and 51.84% respectively in scenario-2.
- ***Impact of Waste Water System being developed by the Government***
 If the waste water system was to be developed by the government, the project IRR and equity IRR would increase to 22.30% and 36.22% respectively in the base-case, and to 30.23% and 64.46% respectively in scenario-2. If the waste water system was being developed by the government and the private sector equally, the project IRR and equity IRR would increase to 21.77% and 35.17% respectively in the base-case, and to 29.32% and 61.84% respectively in scenario-2. The impact of the waste water system being developed by the government coupled with the reduction of the lease price by 10% and of the EZ service fee by 10% would be a project IRR and equity IRR of 20.12% and 31.20% respectively in the base-case, and of 27.01% and 53.28% respectively in scenario-2. The impact of the waste water system being developed equally by the government and the private sector, coupled with the reduction of the lease price by 10% and of the EZ service fee by 10% would be a project IRR and equity IRR of 19.60% and 30.24% in the base-case, and of 26.16% and 50.98% respectively in scenario-2.
- ***Impact of Incorporation of the Cost of the Coal-fired Power Plants upon the IRR***
 When the cost of the coal-fired power plants is considered to be incorporated, the IRR comes down to 19.45% and 23.07% in the base case and scenario-2, taking the revenue of sale of electricity and operation cost of the power plants into account. It needs to be mentioned that the financial analysis of the EZ for 20 years of operation includes the impact of first and second cost runs of the coal-fired power plants respectively for 15 years and 11 years of its operation only as electricity generated by the power plants is presumed to be sold respectively in the beginning year of 2021 and 2025, and forward up to the end of 2035.

Table 6.1.11-1: Impact of Cost of Coal-fired Power Plant upon IRR and NPV (In US\$ million)

	Base Case	Scenario-2
	(Scenario-1)	
Project IRR	19.45%	23.07%
Project NPV @ 12%	322.07	397.09
Project NPV @ 15%	152.35	226.45
Project NPV @ 20%	(13.33)	59.33
Equity IRR	29.67%	41.35%
Assumption regarding rate of sale of electricity ²²⁶	Tk 6.7 kwh or US \$ 0.08375 kwh	

6.1.12 Conclusions from Financial Analysis

The results of the financial analysis show that the Mirershorai EZ is a financially feasible project for a developer &/or operator. Both in base case and scenario-2, the project generates an IRR of 21.24% and 28.43% respectively, much higher than the cost of capital (assumed to be 10-12% for such an infrastructural industrial development site)—making it a good investment choice.

The Mirershorai EZ project is suitable for a PPP in which the private sector is expected to contribute equity with soft long term commercial debt arrangement having partial guarantees of government, as it could provide a rate of return (equity IRR) of 34.14% in the base case and of 59.31% in scenario-2 to equity investors higher than targeted/benchmark equity IRR of 18-20 percent for investment. The conclusion made for the Mirershorai EZ project is robust as the equity IRR in the base case remains above 25 percent even after considering either an increase of all costs by 10% or a reduction of lease price and EZ service fee by 10% or a combination of both. BEZA may provide support in terms of acquisition of land and arrangement of soft long term commercial loans partially guaranteed by the GoB and financing the off-site infrastructure by public funding.

²²⁶ This rate is recently agreed by PDB under MOU for the purchase of electricity from coal based power plant.

6.2 Economic Analysis for Mirershorai EZ

The objective of this subsection is to present the methods used and results obtained from carrying out the economic analysis of the Mirershorai economic zone (EZ).

It answers the following questions - what is the economic internal rate of return (EIRR), based on a base-case involving a number of core assumptions on both the cost and the benefits side compliant with the requirements of the World Bank's comments on an earlier draft, and measured by using 'economic' prices? How robust are its IRRs in the face of negative economic shocks, whether related to benefits-contraction or cost-push, in compliance with the requirements of the terms of reference (TORs)?

6.2.1 The Highlights of the Methods Used

At the very outset of this section, the highlights relating to the methods used in calculating the economic internal rates of return are presented.

All values in market prices were obtained from the JDI engineering team/calculations in financial modelling in the foregoing Section 6.1. Apportionment of all on-site project costs into net of relevant taxes and 'para-tariffs' (such as supplementary duties and the like), and government's tax yield has been done, with the latter being added to the government revenue from the implementation of the economic zone in question. Allowance has been made for subsidies provided by the government for a very tiny percentage of all capital outlays involving energy-sensitive inputs, assumed to be especially important for equipment or vehicle rentals.

All off-site costs are incorporated net of tax and para-tariff(s), with the difference that such taxes are *not* deemed to be government revenue. The details regarding the conversion of values as determined by using market prices are presented subsequently in this narrative.

The zone's benefits are assumed to equal the sum of

- ✓ (i) the direct economic benefits represented by all manners of sale of land;
- ✓ (ii) second-order benefits to the economy and/or society arising from sources of induced income growth outside the zone itself;
- ✓ (iii) a measure of dynamic, agglomeration, economies, arising from the fact of the inception of the zone, assumed to equal 2% of direct benefits;
- ✓ (iv) second-order benefits arising from major forms of transfers from the private-sector to the government by way of tax-yields at the borders or value-added tax (VAT), etc.²²⁷
- ✓ (v) The government revenue loss arising from companies relocating totally to the zone after its establishment and becoming eligible to enjoy a tax holiday (whereas they would not be tax-exempt were they to remain outside the zone) is also taken into account.

The Government's exchequer is assumed to gain revenue arising from (i) the issuance of registration rights by new start-up companies; (ii) the payment of fees for renewing trade licenses by new start-up companies; (iii) incomes taxes paid by employees of new start-up companies; (iv) company income taxes paid by new start-up companies. Estimates to be made wherever necessary in this context were made in consultation with the Bangladesh Export Processing Zones Authority (BEPZA).

²²⁷ To reiterate, all off-site capital costs enter into our calculations net of relevant taxes and 'para-tariffs'. The keyword is 'relevant': the average combined tax and para-tariff rates on "tradables" is assumed to be 22%.

6.2.2 The Policy and Institutional Framework Conditioning the Formation of Prices

The pricing of investment goods has an abiding influence on what building the EZ will cost. The prevailing policy and institutional framework, within which such pricing takes place naturally, influences the price determination process. It is therefore necessary to introduce the policy interventions that shape the pricing of investment goods in the domestic markets, especially relative to their international or border prices. Three strands of policies will be seen to inform this discussion, namely, the nominal protection policy pursued by the government, the exchange rate policy pursued by the Bangladesh Bank, and the policy of (modest) subsidization of various kinds of fuel.

The following policy interventions drive a wedge between domestic prices of goods and their opportunity costs to the society.

- ✓ The border taxation regime.
- ✓ Second, the on-going management of the float of the Taka using Bangladesh Bank's interventions in the US Dollar exchange-rate markets. The Taka remains slightly over-valued. According to recent research published by BIDS analysts Drs. Hossain and Ahmed (2009), the Taka is overvalued by about 3%. That means that the standard conversion factor (SCF) which is usually used to convert financial prices of largely non-tradable production goods and services would have the value of $1/(1 + .03)$ or 0.97.
- ✓ Both policies raise the unit costs to domestic users of imported goods, raw materials, parts, and components, and harbor a well-known bias against exports. Both policies raise domestic prices higher compared with their 'social opportunity costs.' For the most part, the users of tradable inputs and resources are implicitly taxed - they pay prices which overstate the overall economy's opportunity costs at the margin. There is then a need to apply a downgrade to the financial costs of implementing investment projects to obtain parity with the 'economic prices.' It is necessary to find out conversion factors to complement the SCF found in the earlier paragraph.
- ✓ On the other hand, Bangladesh subsidizes the use of diesel, petrol, natural gas, and electricity in certain uses. Fuel or interest-rate subsidies pull in the opposite direction, warranting a scaling-up of the financial costs in economic analysis. We make an appropriate allowance for this fact in the economic analysis to follow.

Besides policy interventions, institutional rigidities matter to the pricing of primary factors of production, such as unskilled-worker labour input. Wage-setting typically allows certain degree of influence of *institutional factors*. Market wages in construction or manufacturing do not clear the market. The adjustment between the demand for and supply of labour don't really push the market wages rates to the 'equilibrium' wage rate. The equilibrium wage rate is, by definition, the wage rate that will drive the unemployment rate to zero, signalling the achievement of full employment. Under those circumstances, market wages overstate the opportunity cost of hiring people to the society. A correction on this score would be necessary in an economic analysis.

6.2.3 The Border-taxation Regime

Customs duties (CDs) levied in Bangladesh range from between 0 and 5 per cent on primary commodities and raw materials, to intermediate rates of between 10 and 15% on parts and components, finally to rates that equal or exceed 25%. The diversity of customs duties betrays the cascading characteristic of the structure of protection found in many a developing country that is evolving through cycles of import-substituting industrialization. Within the given broad grouping of Harmonic-systems (HS) codes, higher CDs are levied on import substitutes that are the subject of strong producer interest, whether actual or perceived, of domestic manufacturers than elsewhere within the HS grouping.

When imports arrive at the Chittagong port, they carry with them a *cost & freight* (C & F) tag, which typically have been foisted as a result of *pre-shipment inspection*---a service that can sometimes be bought into by the importers. If the customs authorities accept the PSI-induced C & F valuation as legitimate, a 1% charge over and above the C & F unit valuation is triggered preparatory to the assessment of customs duties payable. However, the import trade is stigmatized by an allegedly long-standing and previously wide-spread practice of *under-invoicing* of C & F costs as an instrument of shielding oneself from CD liabilities. The customs authorities very often brush aside the PSI results, and resort to their own assessment. When this happens, then the 1% charge of the customs duty on account of the PSI is waived, and the unit assessed value becomes the one and the same thing as the unit C & F value as assessed by the customs. Regulatory Duty (RD), Supplementary Duty (SD) and value-added taxes (VAT) are three additional levies upon imports. Even though VAT belongs strictly speaking to the category of indirect taxes and not border taxes, it is so ubiquitous that it is convenient to cluster it along with the RD and SD. Then there are para-tariffs, to be covered below. The total tax incidence, which is closely related to the nominal rate of protection (NRP), is in fact typically much higher compared with customs duties, because the supplementary duties and the para-tariffs raise the actual tax incidence considerably more.

The RD rate for FY2012/13 was 5.0% applied almost uniformly on all products subject to the top rate of 25%, thus making the effective top customs duty (CD) rate to be at least 30%, when supplementary duty (SD) is applied. The base for computation of RD is the same as CD, i.e. assessable value (AV) of imports. For all practical purposes, RD is an additional CD applied on all goods subject to the highest CD rate of 25%. Historically, RD has been applied intermittently, having been eliminated in some years in response to the requirement for simplification of the tariff structure under the World Bank's budget support facility, Development Support Credit, but re-emerging once the obligation was no longer binding.

Supplementary Duty (SD) was introduced in 1991 under the VAT Act, and was meant to be a trade-neutral tax. However, increasingly it has come to be applied in a non-neutral fashion, i.e. it is not applied equally on imports as well as domestic sales. Indeed it has become an expedient instrument of protection through its differential application (higher rates on imports; lower or zero rates applied to import substitutes). The VAT authority also issues exemptions on SD through SROs, betraying the discriminatory nature of the intervention. SD was applied as a percentage of "assessable value" (AV) but, from 1997-98, SD is levied on the basis of duty paid value (assessable value plus customs duty plus regulatory duty).

We estimate that the average total tax incidence (TTI) for tradable capital costs applicable for Mirershorai calculations is 128%. This is a result of central importance.

Any reasonable analysis of an investment project warrants calculating internal rates of return (IRR) using economic prices. To be systematic, it is necessary to know beforehand the *structure of investment costs in gross fixed capital formation*. This is because the relative share of labour versus non-labour varies a great deal across different kind of investment activities. Site clearing and dredging, will have very different composition compared with works involving reinforced concrete casting (RCC), and RCC will have very different composition of tradable versus non-tradable investment goods. The spending data needs to be disaggregated in terms of its components because the motivating interventions that evaluate the various conversion factors differ from one kind of tradable investment good compared with another. In this study, all financial-price capital cost estimates have been broken into a five-way disaggregation --- 'labour', 'non-tradable construction', 'tradables,' 'rentals,' and finally 'financial overheads.' The weight for each such category was obtained in coordination with consultants, in the know, to the World Bank on this project. Conversion factor for labour at Mirershorai site was calculated at 0.95. The tradable component of investment outlays was downgraded by good-specific conversion factors whose values (relative to 1) were pivoted by the value(s) of the total tax incidence (TTI). The TTIs themselves are the sum-total of both levels of tariff (customs duties, regulatory duty, supplementary duty and the para-tariffs). Para-tariffs are represented by advance income taxes, VAT and two other specimens. Some of the statutory

border-taxes are applied on *ad valuation* basis that incorporates compounding. Some of the para-tariffs also involve a valuation-base that involves compounding.

Our estimates of nominal rates of protection (NRP) build on the estimated TTI, but in addition, measuring them to equivalent values for the Mirershorai EZ by taking into account what it will take to transport tradable goods from Chittagong port to the Mirershorai project site. Our NRP estimates are therefore specific to the EZ site. Finally, for non-tradable capital and maintenance costs and other non-tradable but non-labour costs, we use the assumption that the shadow exchange rate factor is 1.03. To reiterate, the associated SCF is estimated to be 0.97.

Likewise, when it comes to costs other than capital ones, such as the organization & management (O & M costs), we took the same componential approach of disaggregation. This is because the non-capital cost is a hodge-podge, too, and comprises (i) wages and salaries paid to blue-collar and white-collar workers, (ii) marketing and promotional costs; and (iii) other odds and ends.

The conversion factors in Table-6.2.2-1 are obtained by dividing unity by an expression equal to 1 plus the total tax incidence expressed as a fraction. Roughly speaking, the TTI can be expressed as equivalent to the nominal rate of protection (NRP). In adjusting downwards the market-price spending on all tradable capital costs, whether on or off-site, arising from outlays on various investment goods, we multiply the former by 0.78. We calculate the applicable average value of the TTI to 128%. We obtain the value of 0.78 by dividing unity by 1.28. The only case where the conversion factor is greater than 1 is subsidized sources of energy - there is still a modest subsidy on most kinds of fuel used in running machinery and transport equipment, which are mostly rented.

For all capital costs of a non-tradable nature (such as on account of locally-procured construction items, various kinds of rental payments, etc.) the incidence of VAT is about 4%, with proceeds from VAT being appropriated as indirect benefits of the zone. The rest is assumed to equate the economic cost.²²⁸

O & M costs were divided up into two broad categories - personnel costs and others. For the first, the conversion factor used to convert market values into their economic counterparts is 0.95. The resultant values were multiplied further by 0.97 before retention in our calculations. The conversion factor for the second ('others') is 0.97, this being the standard conversion factor.

Table 6.2.3-1: The Conversion Factors Used

	Tradable goods		Tradable goods	
	Names of the production inputs	Conversion factor	Names of the production inputs	Conversion factor
1	Cement	0.511	Electrical sub-stations	0.765
2	PVC pipes	0.712	Power-distribution lines	0.712
3	Mild-steel (MS) rods	0.712	Water-treatment plant	0.765
			Waste-water treatment plant	0.765
4	Galvanized iron wires	0.712	Shadow wage rate factor	0.95
5	Transformers	0.511	Shadow Exchange rate factor	0.97
6	Pipes carrying natural gas	0.712	Fuel conversion factor	1.098

Sources: World Bank Study Team, 2014.

²²⁸ We might have multiplied this left-over term by 0.97 before accounting for them as economic costs, but we didn't do so intentionally. Given the several sources of uncertainty surrounding our estimates of both costs and benefits, we elected to err on the side of conservatism when it comes to measuring costs in economic terms.

6.2.4 Benefits Evaluation

Our calculations make allowance for the following static benefits:

- ✓ Revenue from selling developed industrial and commercial land.
- ✓ Second-order benefits to the economy and/or society arising from sources of induced income growth outside the zone itself;
- ✓ a measure of dynamic, agglomeration economies arising from the fact of the inception of the zone;
- ✓ second-order benefits arising from major forms of transfers from the private-sector to the government by way of tax-yields at the borders, value-added tax (VAT), etc.²²⁹
- ✓ The government revenue loss arising from companies relocating totally to the zone after its establishment and becoming eligible to tax holiday (whereas they would not be tax-exempt were they to remain outside the zone) is also accounted for.²³⁰

In addition, the calculations will make allowance for the following dynamic benefits attendant upon the formation of the EZ:

- ✓ the gains in technical and economic efficiency within the EZ and its attendant diffusion to the rest of the economy through technology spill-over.
- ✓ Encouragement of entrepreneurship.

Technical efficiency is about producing goods at leaner unit costs measured physically (such as in man-hours, or tonnes of iron ore mined). Economic efficiency additionally brings prices into the fray. If the EZ is able to attract one or more *practice-leaders* into tenancy, and if tenant-enterprises are well-integrated in the domestic economy, the EZ is likely to create waves of technology spill-over benefit to the rest of the country. The occurrence and the fall-out from such a spill-over effect is usually an empirical question.

When it comes to evaluating the benefits stream, we mostly take the same benefit stream that the financial model takes, that is, without probing further into whether the tenant represents an act of FDI or an investment by a domestic investor. We recognize two broad kinds of benefits: (i) the direct benefits, and (ii) the second-order benefits. The category (i) comprises benefits that will stem from selling/enforcing, as appropriate:

- ✓ the zoned land that the EZ will render saleable;
- ✓ the residential and commercial land whose supply will grow;
- ✓ a tenant user-charge;
- ✓ a charge for piped water;
- ✓ a charge for the services of the waste-water treatment plant;

Second-order benefits are assumed to arise from two broad sources that have already been mentioned.

²²⁹ To reiterate, all off-site capital costs enter into our calculations net of relevant taxes and 'para-tariffs.' The keyword is 'relevant' - average combined tax and para-tariff rates on tradables is assumed to be 22%.

²³⁰ We have accounted for direct employment effect due to the zone as one element of our calculation of second-order benefits. We have not included our team's estimate of indirect increases in employment levels in the economy. As well, we have not made any effort to claim the alleged benefit on account of an incremental 'export-penetration' benefit. This actually adds credence to our estimates of EIRR being conservative underestimates.

6.2.5 Taking into Account Other Static Benefits of an EZ

Some enterprises that move to the EZ will be those that have already been in existence, who plainly re-locate to the EZ site in search of agglomeration benefits, technology spill-over benefits, and the benefits of skills-pooling. Unless better recruitment terms and social protections were to be wrung from the employers on the EZ, the act of establishment through re-location means that *incremental employment due solely to the creation of the EZ is zero*. The remainder of the enterprises on the EZ will be start-ups going in. For this second category, the moot issue is whether the marginal product of this bunch of workers in their alternative employment is zero or not. However, one thing that is sure is that the direct value-added that tenant-enterprises generate on the EZ cannot be attributed in its entirety as a benefit of the EZ. This is due to the following:

- ✓ The assumption that the entire work-force of start-up enterprises that find employment on the Mirershorai economic zone (EZ) has a marginal product of zero in the alternative, ‘without-Mirershorai EZ,’ situation. Many of the textile mills on the Mirershorai EZ will be dealing with complex, high-value, manufacturing processes with more intricate requirements that would require more customized machine-handling. The test of skills is very demanding not only for production workers ‘in the trenches,’ but also for the line-supervision and quality-control staff. The significantly greater skill requirements of high-end, high-value, apparel production are an open secret. Clearly, the recruitment of both the white-collar and the blue-collar workers by the firms that become tenants on the EZ will heavily factor in skills of the applicants. Clearly, skills, prior job-references, and strong performances in the job interviews will drive recruitment. These workers would have been working at some other firms in the ‘without-project’ situation. Their marginal product in that alternative employment would decidedly be positive, not zero. The issue is - what were the ‘net’ benefits from employing workers on the EZ. Only the *additionality* should be ascribed as a benefit of the EZ.
- ✓ Some of the re-locators into the EZ will have left behind their own manufacturing premises on rented space elsewhere in the economy in favour of their industrial leases on the EZ. Most of the value-added per worker they would typically generate on their new premises would be carried over from their incarnation in the ‘without-Mirershorai’ EZ situation. Of course, compared with the rest of the economy, there would be capital-deepening, represented by more modern machinery being brought into use. There would be more attention paid to total quality-control, reducing wastages. All of that is likely to raise labour and capital productivity of the workers in the zone. As a result, the value-added per worker in the new situation in the Mirershorai EZ would be expected to out-perform what existed in the ‘without Mirershorai’ situation. This additionality will be included in the benefits of the EZ.
- ✓ New evidence suggests the appearance of a relative scarcity of labour in rural areas of Bangladesh compared with urban areas. The evidence involves quite sharply divergent real-wage trends across both a rural-urban divide and a gender-divide (IFPRI, 2012). Rural real wages have out-performed urban real wages since about 2005. Women’s real earnings have out-grown the corresponding male earnings, on a Bangladesh-wide basis---erasing a considerable part of the gender-gap in earnings. Madani’s observation (1999), “for workers, the alternative to EZ employment is often unemployment, underemployment, or a return to village subsistence life.” This is a caricature for Bangladesh. For a female worker employed by one of the textiles factory, according to a report published in the mass-circulation daily *The Prothom-Alo* in August 2013, the alternative is most probably an unregistered partnership among several such female returnees to a peri-urban location in Syedpur in Nilphamari district that sews apparel for sale across the border. That alternative is almost certainly not returning to village subsistence life. We would do well to disabuse ourselves of some pointed misperceptions of alternatives open to female workers in Bangladesh’s textiles industry;

- ✓ What percentage of the tenant enterprises are mere re-locaters? The minimum size of plots prospectively coming to the market in Mirershorai happens to be one hectare, or about 2.471 acres. Most of today's medium or large-scale manufacturing enterprises in Bangladesh started off on more modest land-areas than that. A majority of the tenant-enterprises would be of the 're-locator' variety. This would redound to the validity of the argument, previously made, that the additionality of second-order benefits to be attributed to the EZ *per se* should be less than 1. Perhaps, this ought to be deemed to be well less than one.

6.2.6 Agglomeration Efficiencies

The TORs speak of gains in allocative efficiencies. Typically, allocative inefficiencies are caused by mis-pricing of capital or labour. Because the various incentives accorded by the BEZA will very largely leave the factor pricing regime intact, the EZ will not have any perceptible effect upon any prevailing allocative inefficiencies on the ground. However, EZs will trigger agglomeration efficiencies that will likely be notable initially and fairly powerful in the long-run.

These efficiencies will stem from:

- ✓ labor market pooling--- skilled laborers entering the area and are able to lower the cost of doing business through stimulating the informal exchange of capabilities and practical knowledge. The more firms there are in this area, the greater the competition is to obtain workers and therefore results in higher wages for the workers.
- ✓ facilitating access to specialized goods and services provided for the clustering firms, and,
- ✓ most importantly, from technological spill-over effects.

The agglomeration benefits of an EZ are undeniable, even if it requires a great deal of reliable data to accurately gauge their extent. Despite an extensive search on the Web, we have not been able to locate a single study containing an actual estimate of the percentage positive effect that owed to a living special economic zone or an industrial park. Anecdotal evidence about the quite palpable favorable effect that the coming of Suzuki to India had on the techno-managerial efficiency of the automotive operations in India exists, but that happens to be true of India. In Bangladesh, no similar evidence, anecdotal or otherwise, seems to exist to our knowledge. We assume that agglomeration economies translate into a fixed step-up of roughly 2% over and above the direct economic benefits (not counting the incremental benefits from the stream of wages and salaries paid on the EZ).

6.2.7 Benefits from Enhanced Company- and Personal-Taxation

The tax holiday accorded to the investors in the Mirershorai economic zone has been taken to be 10 years. The effect of the tax holiday has been thus calculated. In Mirershorai, the first batch of sales of industrial land takes place in 2017. We allow two years for a gestation lag between land sale and the investor's company becoming a 'resident' for purposes of profit taxation. Therefore, calculation of the effect on tax-holiday on government's tax-yield for new start-up firms who set up operations on the economic zone begins as of 2019 for Mirershorai. The Government's tax yield registers a positive entry on account of new start-up firms in 2029. Companies that relocate entirely from outside the zone into the zone have been treated differently, as required by the World Bank. In this particular case, these companies were assumed to be paying taxes on profits. After moving to the zone, they become profit-tax exempt for the first 10 years. Profit taxes that they were paying before moving to the zone have been *deducted from the government's tax yield*.

A certain percentage of the white and blue-collar workers in the new start-up enterprises will of course contribute to the public revenue from taxes to be imposed on personal incomes above the threshold of taxability of such incomes. These additional benefits are also accounted for, on an informed basis, in the calculation of EIRR.

The economic internal rates of return (EIRR) are presented in four definitive scenarios, presently narrated.

The effect of the gains in the agglomeration efficiencies is inserted in the base-run iteration, to the describing of which we now turn.

We have calculated two sets of economic IRR results. One set takes no account of the cost and benefits of having coal-fired power plants in the calculations. The second set does.

The base-run: In the base-run, we cluster all categories of costs---including land, whether privately or publicly owned. To reiterate, all outlays and benefits have, ultimately, been corrected for the shadow-exchange rate being greater than 1, by using Standard Conversion Factor (SCF) of 0.97. We assume that the entire regime of the border-taxation is binding on the level and structure of domestic prices, and that there is no ‘water-in-the-tariff’. We also assume that the Standard Conversion Factor (SCF) to be used is 0.97. (This is also the assumption underpinning the other subsequent run).

Iteration-1: In this set of iterations, there will in fact be **three** sub-iterations. In the first of these sub-iterations we assume, as offered in the JDI proposal, a 10% ratcheting of all capital and other costs. In the second of these sub-iterations, we assume a 10% roll-back of all benefits while costs stay the same. In the final of these sub-iterations, we assume both a 10% roll-back of all benefits while costs gain by 10%.

6.2.8 The Internal Rates of Returns

Table 6.2.8-1 presents the IRRs in economic prices.

Table 6.2.8-1: Presenting the Economic Internal Rates of Return, and Economic Net Present Values of the Mirershorai Economic Zone exclusive of a Coal-fired Power Plant

Iteration	Assumptions underpinning the iterations	EIRR (%)	ENPV (r=0.12) (US \$ million)	ENPV (r=0.15) (US \$ million)	ENPV (r=0.20) (US \$ million)
Base-run	All costs clustered, first- and second-order benefits all included	30.66	670.59	443.86	211.88
Iteration-1	Base-run, modified by 10% gains in costs	28.24	624.96	402.60	176.19
Iteration-2	Base-run, modified by 10% roll-back in benefits	28.59	597.44	386.01	171.13
Iteration-3	Base-run, modified by 10% gains in costs <i>plus</i> 10% roll-back in benefits	26.33	551.81	344.75	135.43

Note: The Standard Conversion Factor (SCF) underlying the computations in the table is everywhere equal to 0.97; the Shadow Wage Rate Factor is everywhere 0.95.

Source: World Bank Study Team

Table 6.2.8-2 presents the IRRs in economic prices.

Table 6.2.8-2: Presenting the Economic Internal Rates of Return, and Economic Net Present Values of the Mirershorai Economic Zone inclusive of a Coal-fired Power Plant

Iteration	Assumptions underpinning the iterations	EIRR (%)	ENPV (r=0.12) (US \$ million)	ENPV (r=0.15) (US \$ million)	ENPV (r=0.20) (US \$ million)
Base-run	All costs clustered, first and second order benefits all included	28.41	822.72	523.93	225.80
Iteration-1	Base-run, modified by 10% gains in costs	25.97	750.471	460.03	172.45
Iteration-2	Base-run, modified by 10% roll-back in benefits	26.22	707.74	435.44	166.00
Iteration-3	Base-run, modified by 10% gains in costs <i>plus</i> 10% roll-back in benefits	23.92	635.50	371.54	112.65

Note: The Standard Conversion Factor (SCF) underlying the computations in the table is everywhere equal to 0.97; the Shadow Wage Rate Factor is everywhere 0.95.

Source: World Bank Study Team

6.2.9 Major Conclusions

- ✓ The Mirershorai Economic Zone is economically justified as it has a base-run EIRR of 30.7%, when the coal-fired power plant (CPP) is not accounted for in the calculations. Inclusive of the CPP, the EIRR is found to be 28.4%.
- ✓ If all costs were to gain, and if those gains were allowed to work their way through to make a difference to the EIRRs based on base-run, the EIRR was seen to come down to 28.2%. Whereas if costs held but benefits were squeezed downward by 10%, the EIRR was found to be 28.6%.
- ✓ Finally, when both cost-push and benefits-contraction both come to pass simultaneously, the EIRR is found to fall to 26.3%. The EZ at Mirershorai remains economically viable even in the midst of the combination of benefit-contraction and cost-push.

Annex

ANNEX 1

PRESENTATION SLIDES FOR THE THIRD STAKEHOLDER WORKSHOP AND SUPPORTING DOCUMENTS

Presented by – Dr. Shoichi Kobayashi

Date – 23 February 2014

Location – The Westin, Dhaka

**Workshop on Draft Final Report of the Feasibility Study of Three Proposed Economic Zones
(Sherpur of Maulvibazar District and Mirershorai and Anwara of Chittagong District).**

PROGRAMME

- 09:30 : Registration
- 10:20 : Guests take their Seats
- 10:25 : Arrival of the Chief Guest and Special Guests
- 10:30 : Recitation from the Holy Quran
- 10:35 : Welcome Address by Mr. Fakhru Islam (Secretary in Charge), Executive Chairman, BEZA.
- 10:45 : PowerPoint Presentation on Draft Final Reports by Dr. Shoichi Kobayashi, Team Leader, Feasibility Study Team.
- 11:30 : Address by the Special Guests.
- 11:45 : Address by the Chief Guest Engr. Mosharraf Hossain, MP, Honorable Minister, Ministry of Housing and Public Works.
- 12:00 : **Tea/Coffee Break**
- 12:10 : Statement by the Representative from the World Bank
- 12:20 : Open Discussion on Draft Final Reports
- 13:25 : Address by Dr. Mashiur Rahman, Adviser to the Honorable Prime Minister, Economic Affairs.
- 13:30 : Vote of Thanks by Dr. Md. Nurannabi Mridha, Project Director, BEZA Project.
- 13:45 : Closing Session & Lunch

Technical Advisory Services for Feasibility Studies for Economic Zones (3rd Stakeholders Workshop)

23 February 2014

Dr. Shoichi Kobayashi, Team Leader
PSDSP (World Bank) – BEZA Project



Background & Objective of EZ

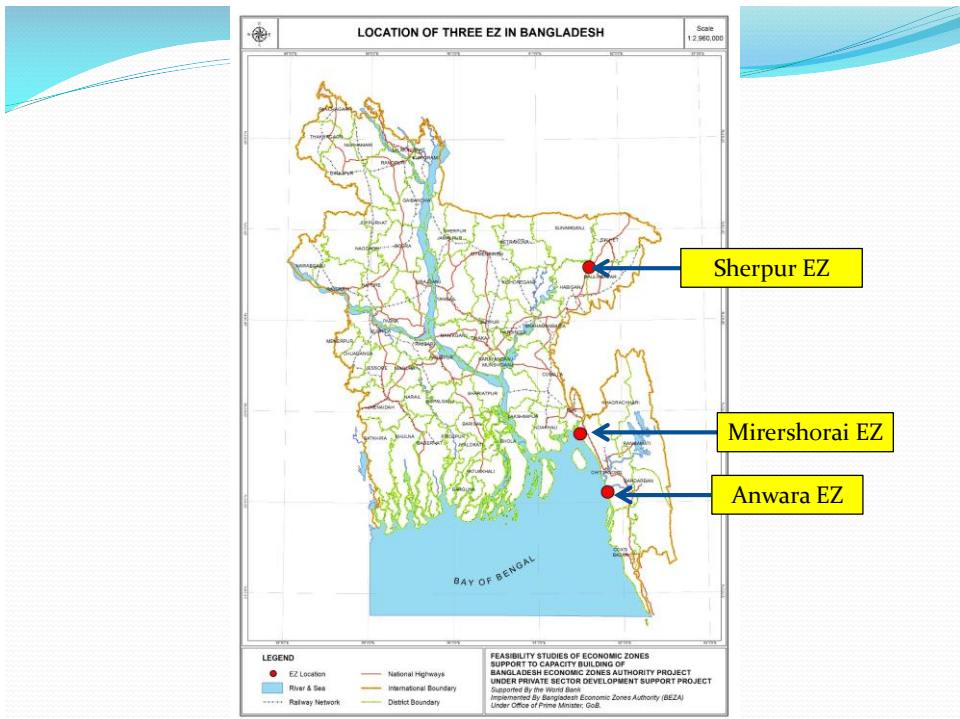
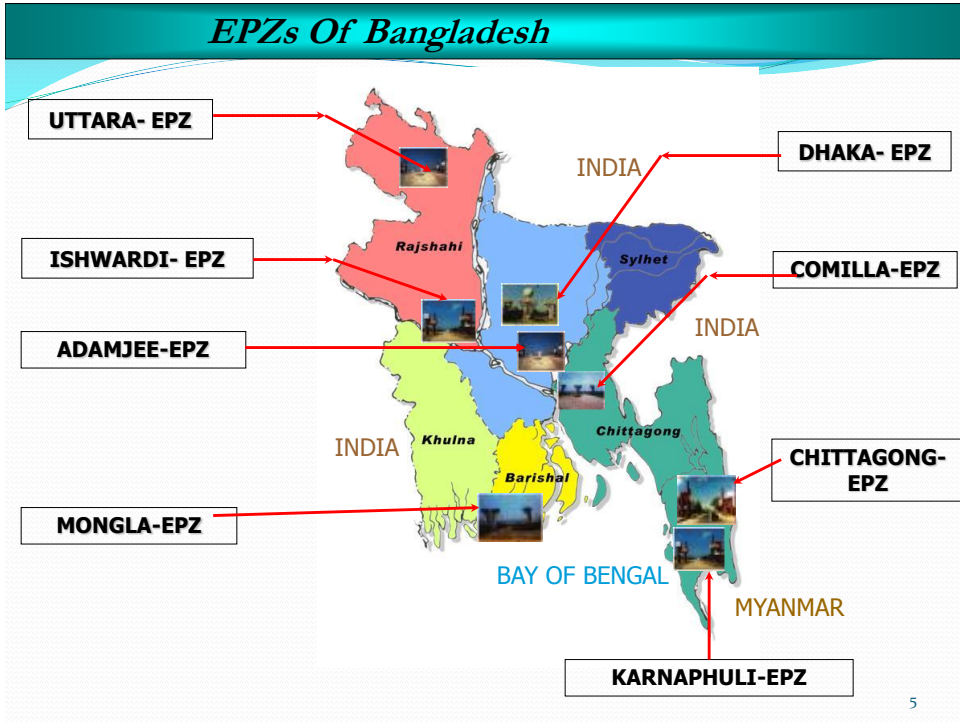
1. Bangladesh Economy is growing well at 6.3% in the Past 5y.
2. However, need to accelerate GDP growth to 8% -10% to reduce the poverty level from 40% now to 15% and targeting to be a Middle Income Country by 2021 .
3. In order to achieve the above goals, private investment must increase to 32% of GDP from just 19% now.
4. Economic Zone (EZ) program is aiming to achieve the above goals by attracting private investment (FDI & DI), accelerating GDP growth & creating 10 millions of new employments .
5. EZ Act was approved in August 2010 and now WB & DFID is supporting this EZ Master Plan Study as pilot EZ Projects.
6. Three EZs: Sherpur, Mirershorai and Anwara are selected by BEZA as pilot EZ projects under PPP Scheme.

Type of Economic Zones in Bangladesh (Only 8 EPZ s are in operation now- Needs More!)

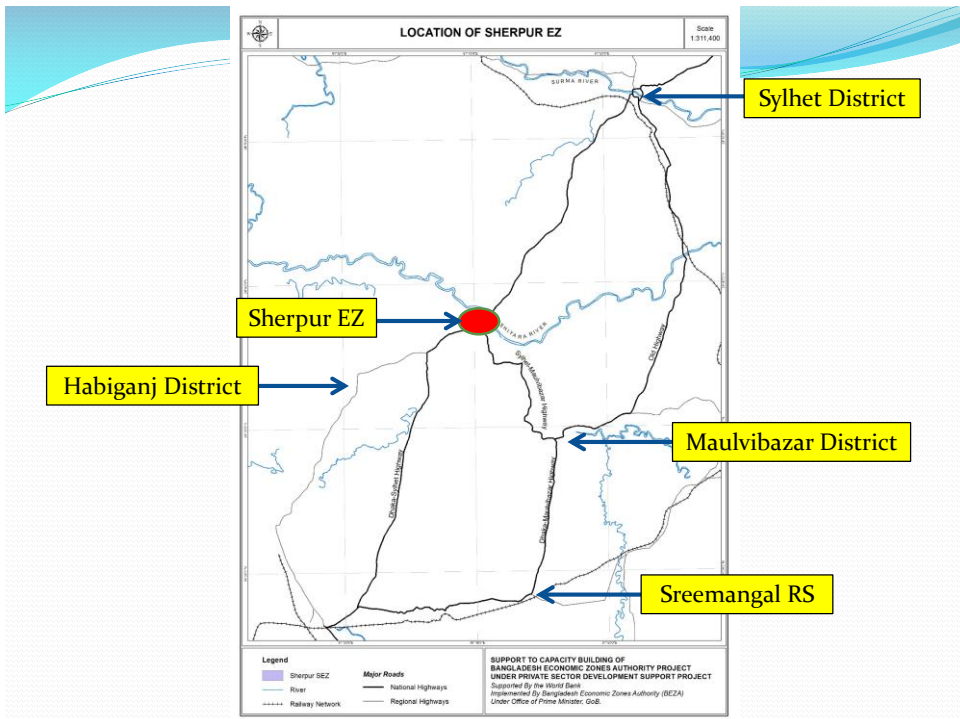
Type of Industrial Park	Characteristics
1. <u>Export Processing Zone (EPZ)</u> (8 EPZ: 2,572 Acre: 1042 hectare 354,722 Employees (2013): Nearly Sold out! Only 7% (20 hectare) at three remote area EPZs are still vacant.	<ol style="list-style-type: none"> 1. Export Oriented Industry (100%) 2. BEPZA Administration Office 3. One Stop Service (OSS) 4. 5 EPZs are already full & only 3 remains : but 93% are already filled! Net 900 hectare
2. <u>Private Export Processing Zone (PEPZ)</u> (Korean EPZ)	<ol style="list-style-type: none"> 1. Export Oriented Industry (100%) 2. BEPZA Administration Office 3. One Stop Service (OSS) 4. One KEPZ is partially operating
3. <u>Economic Zone(EZ) Program (BEZA)</u> (Just starting with a big hope: May start from this year 2014 using PPP scheme)	<ol style="list-style-type: none"> 1. Both Export Oriented Industry & Domestic Oriented Industry 2. BEZA Administration Office setup 3. One Stop Service (OSS) 4. Ready to start soon.
4. <u>Industrial Estate (IE)</u> (Domestic Industries for SME in nearly each major district)	<ol style="list-style-type: none"> 1. Domestic SME 2. BSCIC Office 3. Small IP in nearly all provinces accommodating SME.

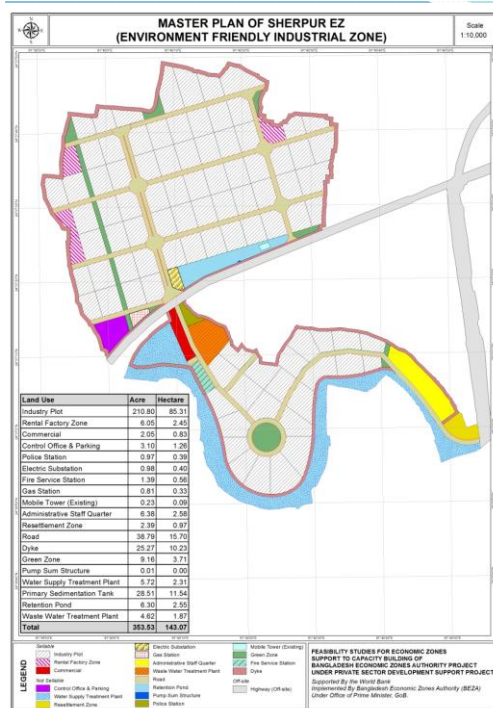
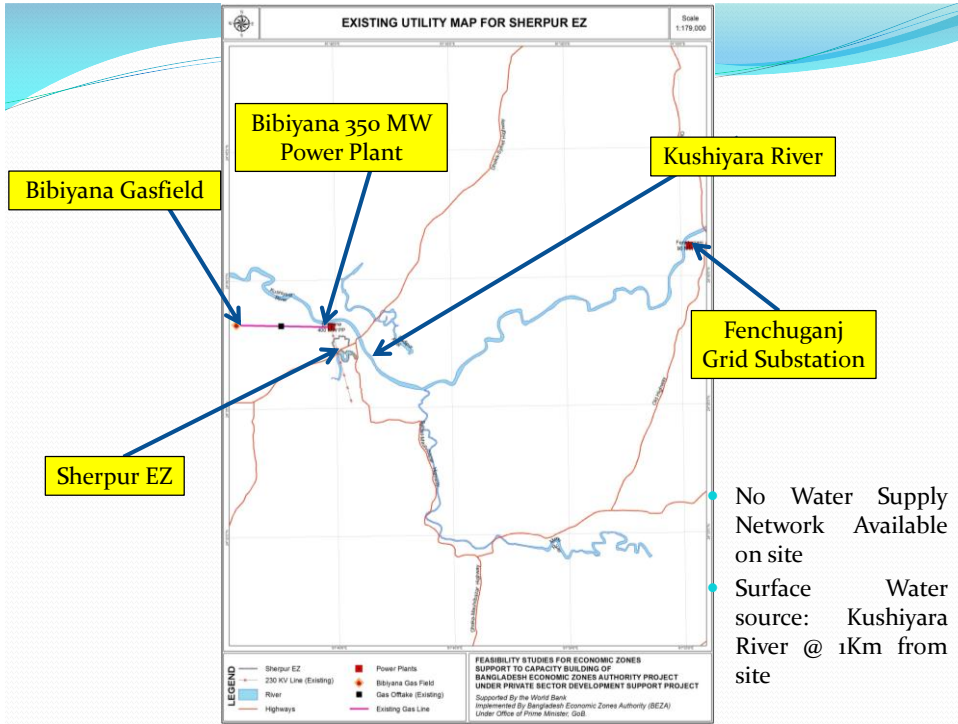
BEPZA History & Current Condition (93% is Occupied & Only 74 Acres Remain !)

EPZ	Year Area (Ac)	Plots	Occupied Period	Remaining Plots
1. Dhaka	1993 361	442	1993-2008	0
2. Chittagong	1983 453	502	1983-2005	0
3. Comilla	2000 267	213	2001-2011	0
4. Adamjee	2006 293	234	2006-2013	0
5. Karanaphuli	2006 222	254	2006-2011	0
6. Uttara	2001 212	202	2001-	13 (6%)
7. Ishwadi	2001 309	158	2004- Original Occupied	116 (2 nd Phase) (73%)
8. Mongala	1999 255	124	2008-	18 (15%)
Total	2372 (Gr) 1779 (Net)	2103	1956 (93%) 147 (7%)	147 (74 Ac)



SHERPUR ECONOMIC ZONE





Land Use	Total		Percentage
	Acres	Hectares	
Leasable Land	218.90	88.59	61.92
Land for Administration	11.84	4.79	3.35
Infrastructure	82.73	33.48	23.40
Green Zone & Other	37.67	15.24	10.65
Resettlement Zone	2.39	0.97	0.68
Total	353.53	143.07	100.00

Sherpur: Consultation with Stakeholders



Sherpur: Site



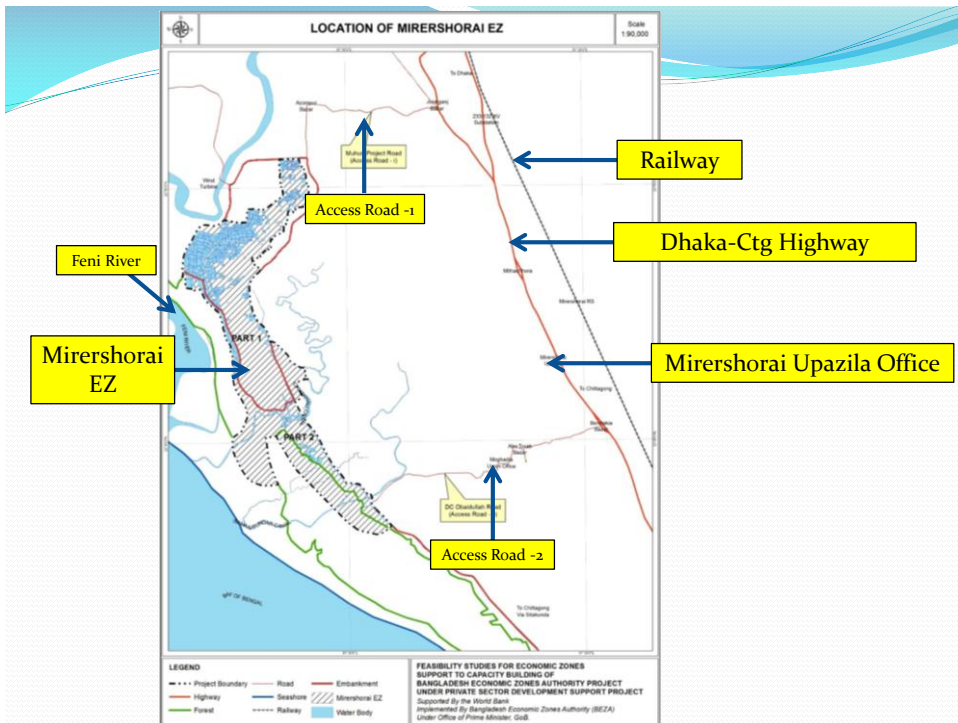
Sherpur: Sreemangal Railway Station

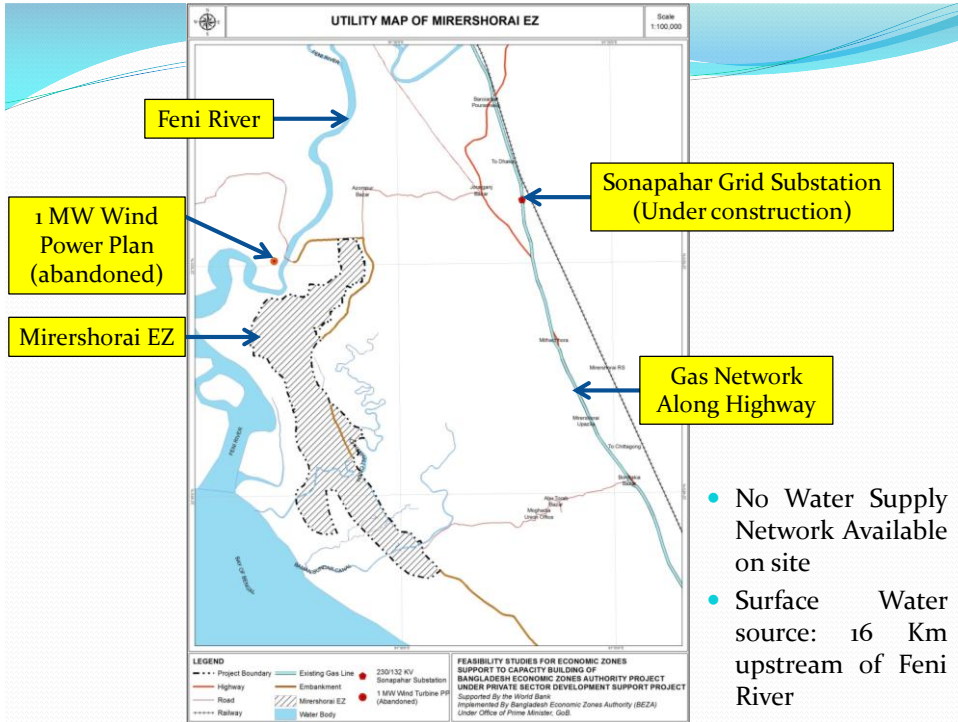


Profile of Sherpur EZ

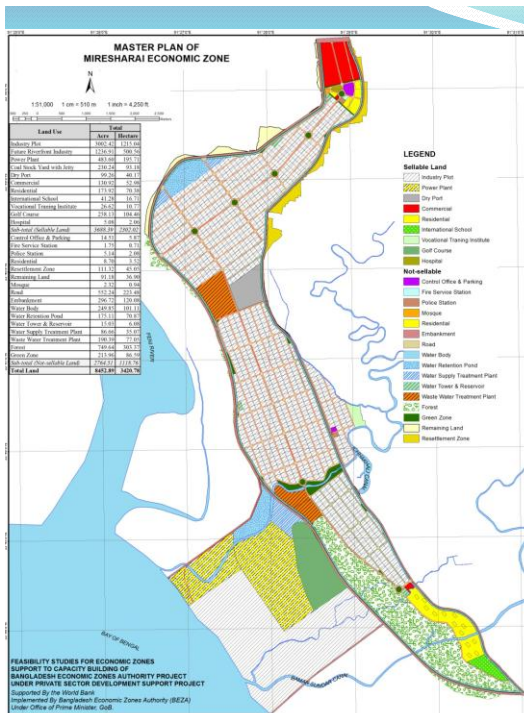
Item	Detail Comments
Access & Utility	55 Km Airport, 435 Km to Chittagong Port and 208 Km to Dhaka
Land Gross & Net	Gross Area: 143.09 ha and Net Area for Sale: 88.59 ha
Type of Industry	<i>Textile, Ceramics, Pharmaceuticals, Food processing</i>
Price of Land Lease	\$50 per Sqm
Cost for On & Off Site	\$ 82.87 million for On-Site and \$7.7 million for Off-Site
Financial & Economical IRR	Financial IRR Base Case: 21.13% & 26.44% for Case 2 Economical EIRR 47%
Competitiveness	Considering the current shortage of well equipped EZ, Sherpur EZ Power and Gas supply will be competitive. Benchmark Analysis indicates No 1 out of 7 Asian EZ.
Employment Creation	Employment creation is expected to be 40,706 workers
Expected Schedule	Construction start from 2016 and complete by 2019
Market Demand	169 ha (18 Firms) out of 103 Surveyed : Exceed Supply.

MIRERSHORAI ECONOMIC ZONE





- No Water Supply Network Available on site
- Surface Water source: 16 Km upstream of Feni River



Land Use	Total		Percentage
	Acres	Hectare	
Leasable Land	4211.26	1704.24	49.82
Future Development	1261.53	510.53	14.92
Land for Administration	32.42	13.12	0.38
Infrastructure	1098.49	444.55	13.00
Green Zone & Others	1737.87	703.30	20.56
Resettlement Zone	111.32	45.05	1.32
Total Land	8452.89	3420.78	100.00

- Existing Land: 6615.12 acre
- Reclaimed: 1836.59 acre

Mirershorai: Consultation with Stakeholders



Mirershorai: Site



Mirershorai: Access Roads



Access Road (i): Muhuri Project Road

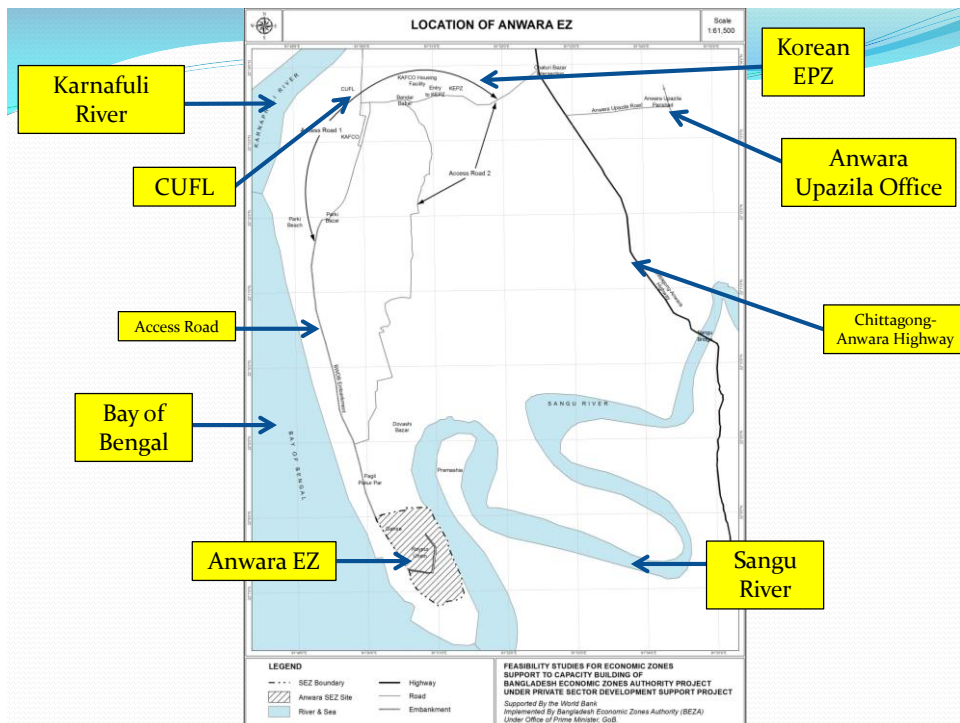


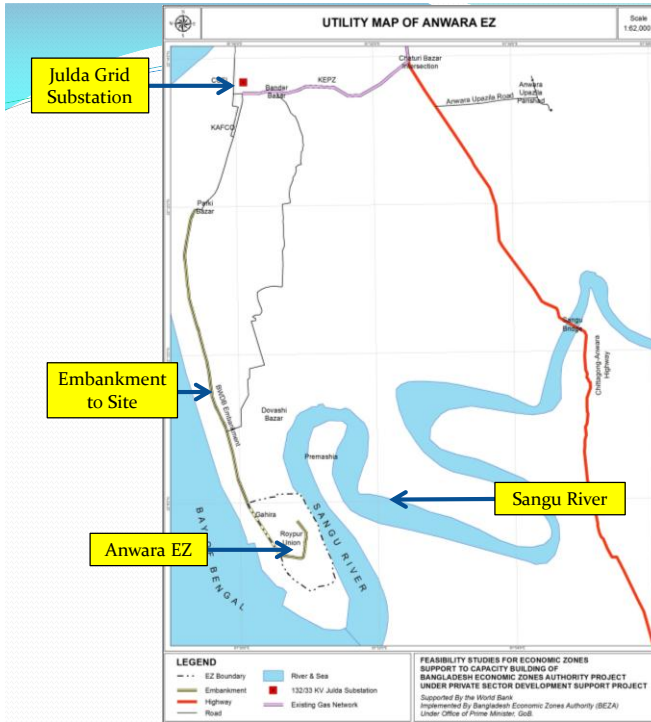
Access Road (ii): Abu Torab Bazar Road

Profile of Mirershorai EZ

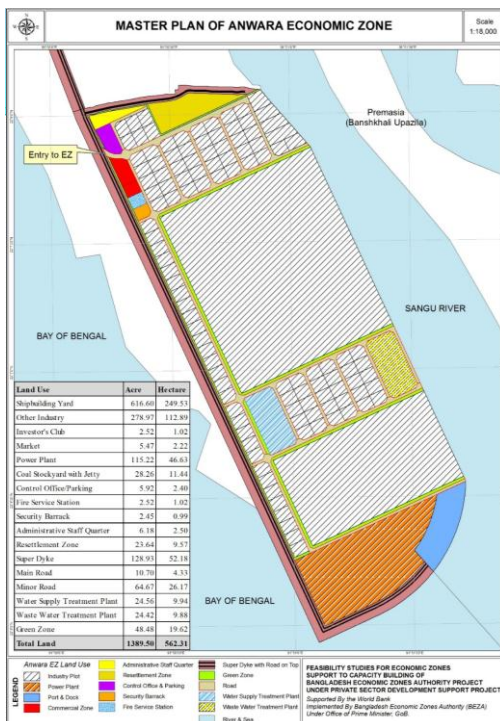
Item	Detail Comments
Access & Utility	182 Km fm Dhaka, 66Km to Chittagong, 79Km Airport, 67 Km to Sea Port: Own Port & Coal Power (600MW)
Land Gross & Net	Gross: 3420 ha and Net Saleable Land: 1704 ha
Type of Industry	Garment, G. Accessory, Textile, Machinery Parts , Bike & Automobile Assembly later.
Price of Land Lease	\$50/sqm (2016-2020) \$70/sqm (2023-2024) \$80/sqm after 2024
Cost : On & Off-Site	\$818 million for On-Site & \$29 Million for Off-Site
Financial IRR	Financial IRR 28.0% and Economic EIRR is 49.85%
Competitiveness	Along the Dhaka-Chittagong Corridor with own power & other infrastructure, Mirershorai EZ will be competitive.
Employment s	578,751 Workers
Expected Schedule	Construction start from 2017 and Phase 3 will end 2025
Market Demand	275 ha (28 Firms) of 103: If include FDI and Universe : 10 times More ? 2750 ha which is likely to exceed the demand for 17-25.

ANWARA ECONOMIC ZONE





- No Water Supply Network Available on site
- Surface Water source: 26 Km upstream of Sangu River
- Gas line up-to CUFL



Land Use	Total Land		Percentage
	Acres	Hectares	
Leasable Land	1047.04	423.72	75.35
Land for Administrative Purposes	17.06	6.91	1.23
Land for Infrastructure Development	253.28	102.50	18.23
Land for Green Zone & Others	48.48	19.62	3.49
Resettlement Zone	23.64	9.57	1.70
Total	1,389.50	562.31	100.0

- Existing Land: 611.47 acre
- Reclaimed: 778.03 acre

Anwara: Consultations with Stakeholders



Anwara: Site



Anwara: Embankment & Access Road



Profile of Anwara EZ

Item	Detail Comments
Access & Utility	45Km to Chi.Port, 28Km to City and 46 Km to Airport W, Ws, Tel, Own Port and Power (300MW)
Land Gross & Net	Gross: 562 ha and Net: 423 ha
Type of Industry	Shipbuilding, Steel, Power plant, Leather Products, Auto Parts
Price of Land	\$60 - \$70/sqm
Cost	On-Site cost of \$172.87 Mill. & Off-Site cost of \$67 Mill.
Financial IRR & Economic ERR	Financial IRR 35.2% with 15% VGF Economic EIRR is 32.16% with 15% VGF
Competitiveness	Anwara EZ has advantage of Sea access directly able to attract the waterfront industries such as shipbuilding, steel and cement and supporting industries.
Employment Creation	53,420 workers
Expected Schedule	Start construction from 2017 and complete by 202
Market Demand	170 ha (24 Firms) out of 103: actual demand may be 5-7 times.

Summary of 3 EZ: Sherpur, Anwara and Mirershrai

EZ and Item	Sherpur	Anwara	Mirershrai
1. Gross & Net Area	143.0 ha & 88.6 ha	562 ha & 423 ha	3420 ha & 1704 ha
2. Utilities	P, W, Ws, Gas, Tel	P, W, Ws, Tel, Jetty	P, W, Ws, Tel, Jetty
3. Type of Industry	Textile, Ceramics, Pharmaceuticals, Food processing	Shipbuilding, Steel, Power plant, Leather, Auto Parts	Garments, Textiles, Machinery Parts, and Auto-industry
4. Cost : On& Off	\$82& \$7.7 million	\$172 & \$67 Million	\$818 & \$29 Million
5. Land Price/sqm	\$50	\$50-80	\$60-70
6. Financial & Economical Re.	FIRR 21.13% EIRR 47.0%	FIRR 28% w VGF EIRR 49.85% w VGF	FIRR 35.2% EIRR 32.16%
7. Schedule Plan	2016-2019	2017-2020	2017-2025
8. Employment	40,706 workers	53,420 workers	578,751 Workers
9. Competitive	Power & Gas No1 out 7 EZs	Direct Access to Sea Port	Own Power & Sea Port & Good Acc.
10. Key Points	Plenty W, P & G First Pilot Project!	Own Port & Power Access to Sea . VGF may be used:	Large size (3420h) Own P & Port First Sea Board EZ
11. Market Demand	169 ha (18) by Survey	170 ha (24) by survey	275 ha (28) by survey

Social & Environment Aspects

EZ	Sherpur EZ	Mineshtorai EZ	Anwara EZ
Social Aspect: Family Relocation Employments	5 households 40,706	650 households 578,750	980 households 46,600
Environment Aspect Natural Physical	Loss of paddy Minor risk of de- Gradation	Erosion Loss of paddy	Erosion Loss of paddy

- Detailed EIA (Environmental Impact Assessment) is proposed for the three sites

Other Consultations: 1st Workshop



Other Consultations: 2nd Workshop



Other Consultations: Meeting with Chambers



Prospect of BEZA & EZ Program

- Successful EZ Program quickly is needed for Bangladesh because creating millions of new employments will be needed for coming years.
- Need a strong top level **political support & political will** for successful implementation.
- Three related institutions: BEZA, BEPZA and Private EZP needs to be simplified, strengthened and perhaps unified in the future.
- BEZA Capacity must be improved with experienced professional staffs.
- Clear Future Vision, Targets and Road Map will be needed to convince Government and the developers/investors.
- Market Driven & “A to Z” Approach in all process will be needed.
- First EZ project should be implemented successfully with all support by everyone by PPP scheme. Then, Expand!
- Land acquisition process/implementation scheme need to improved allowing (1) PPP Scheme and/or (2) Private- Private Scheme.
- Trouble Shooting Mechanism must be established from the beginning.

Guidelines for BEZA (EZ): More Specific Environment Control Guideline is needed!

1. Guidelines and Regulations for EZ is also one of the key factors.
2. BEZA guidelines is drafted and pending for an approval .
3. Proposed BEZA guidelines are fairly good except lacking specific guidelines for pollution control at the pre-treatment and final treatment stages.
4. Infrastructure connection & Green Zone Guideline may be improved .
5. For BEZA, EZ Guidelines should be the improved the best practice of Asian country leaning from other EZs.

Guidelines & Regulations of EZ

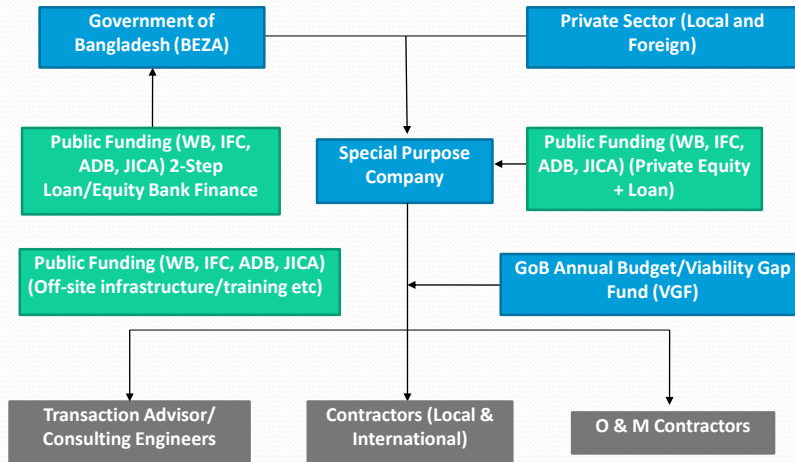
1. Architectural Plans guidelines
2. Open Space Requirement
3. Architectural Requirements : Setback & height etc.
4. Ventilation & Sanitation Guidelines
5. Structure Guidelines
6. Facilities for Workers : Canteens & clinics etc.
7. Anti -pollution Measure
8. Power, water, waste-water, gas connection
9. Approval of Contractors

One Stop Service (OSS) System (One of Keys for Successful EZ)

1. Nearly all permits and approvals will be given at EZ OSS Office.
2. BEZA inherit the best practice of BEPZA and other EZ /SEZ in Asia.
3. BEZA to adopt the best practice & improve OSS further in the areas of (1) Renewal of Bond license, (2) Gas Operation and (3) Security clearance for investors.

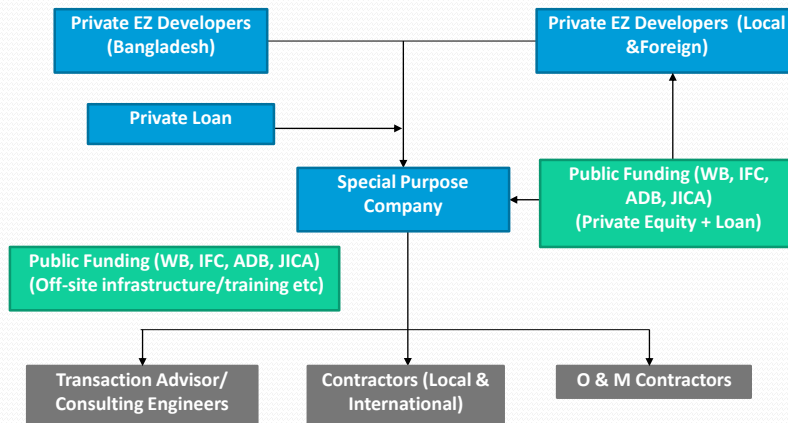
Item	BEPA	Other Agency
Investment License	Yes	
Construction & Op/Permit	Yes	
Import & Export License	Yes	Custom Office
Tax Registration	Yes	Tax Office
Working Permit	Yes	M of Labor
Multi Visa Issues	Yes	Immigration
Incentive Arrangement	Yes	
Environmental Issues & Permit	Yes	M of Environment

Public, Private Partnership (PPP) Funding Scheme



Data Collection Survey in EZs Bangladesh

Private, Private Partnership Funding Scheme



Data Collection Survey in EZs Bangladesh

Possible EZ Implementation Scheme: PPP supported by Public F

1. BEZA implement & operate EZ themselves (Just as BEPZA)
 - Old style system up to 1980's and not recommended now.
2. Private -Public Partnership (PPP: P & G JV)
 - Land can be acquired by BEZA, Local Government or other Government agencies and form a JV and develop /operate EZ. (e.g. some SEZ/IP in Vietnam, China and Thailand)
3. Private and Private (Local Alone or JV with Foreign)
 - This scheme has been the case of most of Asian countries since 1980's successfully. Land acquisition & off site infrastructure : coordination are the key for success.
4. Start from the Case 2 and swiftly shift to the Case 3 just as other Asian countries.
5. Set up a Package Loan Scheme for the BEZA Program mainly Off Site infrastructure/Acquiring of Land purpose.

Some Evidences for Demand for Fully Serviced EZ land for Bangladesh

- Bangladesh is 10th destination in Japanese investors' poll in 2013 by JETRO.
- 200 Investors/m are visiting JETRO & 100 investors/m are visiting BEZA for suitable land indicating many potential investors are waiting.
- Due to higher wages in China and Asean, many labor intensive investors are looking for cheaper production countries (Myanmar and Bangladesh are competing in)
- Nearly all Bangladesh Industry associations have future expansion plan but difficult to find suitable industrial land where all requirements (Power, Energy, water and access) are met.
- Bangladesh Textile Mills Association (BTMA) alone requires over 100 hectare industrial land immediately and Pharmaceuticals Association is trying to develop own SEZ of 200 acre.
- 8 EPZs by BEPZA is nearly filled with factories(93%): only 117 Plots (7%) remain indicating huge demand for EPZ/EZ but no plots available.
- Over 100 visitors to BEPZA per month asking possible plots in the recent years.
- ED land demand is estimated fro 2025-2035 is 66,560 ha for Base Case & 52,034 ha for pessimistic Case. Market Survey indicates sufficient demand for three EZs: 64% of Surveyed Yes.
- Sherpur EZ: 169 ha (18 Firms) ; Anwara EZ: 170 ha (24 Firms): and Mirershrai : 275 ha (28 firms)
- Strong potential demand for fully serviced EZ exist and If BEZA prepares fully serviced EZs with competitive Guidelines & OSS, large number of investors (Domestic and Foreign) are likely to be attracted to these EZs.
- Several potential developers from Japan, China, Singapore and Korea and Thailand have shown interest to invest in EZ projects if the conditions are met.
- These evidences are only potential not real demand: BEZA/PPP developers must shown ability to implement the fully serviced and competitive EZs quickly.

EZ Program will solve 5 problems?

Considering all of Macro-Micro Problems faced by Bangladesh,

- Major problems:
 - 1) Shortage of Meaningful Employments,
 - 2) Weak Infrastructure (Especially Power & Energy),
 - 3) Weak Business Competitiveness (114 out of 144),
 - 4) Serious major urban area congestions and
 - 5) Limited Government budget.

Proper EZ Program may solve all of the above problems as other ASEAN countries achieved.

Is it possible to attract Investors to Bangladesh in large number?

Yes and No!

Yes! You can!

If BEZA with Government & Private sector work together with strong **Peoples & Political will** : Orchestrated way.

EZ should provide full serviced EZs to Investors are looking for and solve any problems arises Development & Operation period : Need a **Trouble Shooting Mechanism.**

No!

If every one goes own way selfishly as “Business as usual” and creating only a big smoke but no fire.

It is not easy to successfully attract investors at new EZs without knowing what investors are looking for and everyone work hard enough for developing attractive EZs .

The Key is how BEZA/Government together able to develop fully serviced EZs which is equal or better compared with ASEAN countries.

Suggestions for Bangladesh EZ

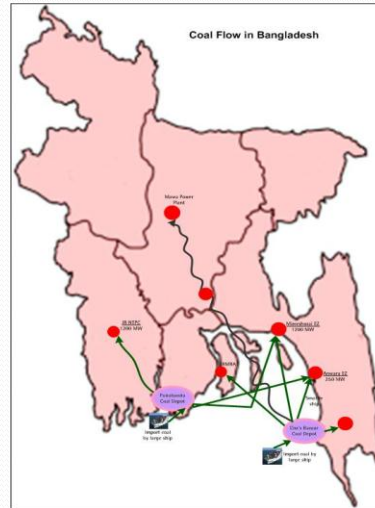
- Initiating one Pilot EZ project (one EZ out of 3 at least) ASAP & implement successfully.
- Formulate a clear EZ Vision & Target: 10 Million Job Creation! By 2030 by developing at least 100 EZs.
- EZ Guidelines & Regulations including OSS system should be approved and make operational ASAP.
- Packaged EZ with Key infrastructure such as Power, Port and access road at several key regions stabilizing power. Mirershorai EZ can be one of such case.
- EZ Authority should delegated power to each EZ to operate efficiently by OSS reducing Red Tapes.
- Once EZ is operational, Manpower skill program based on Market Driven should be initiated and implemented quickly.

Specific Recommendations for BEZA Program

1. **Start Sherpur EZ first** fully supported by the Prime Minister Office with **Strong Political-Will** and demonstrate BEZA is able to implement EZ quickly and successfully. Then follow Mirershorai and Anwara.
2. Remember: **No Fully Serviced Industrial Land! No Investment!** Without Investments, No Jobs /Income in Bangladesh.
3. Backlog of well prepared EZ industrial land is building up to nearly 2,000 hectare now and 7465 hectare for coming 2015-2020 period projected based on both Macro projection and Market Survey support the Macro Demand Projection.
4. Achievement of National Goal of 2021 is heavily depend on successful implementation of EZ Program by BEZA.
5. **Get on Asian Express Bus!** Now and Move on AFASP.
6. BEZA has a full mandate to develop EZ. So, develop as many EZs and as fast as possible with **“Can Do Spirit!**

Critical Pass for EZ Program

1. Power & Energy Stabilization is needed.
2. Ports & Highway should be developed as well.
3. Use of more River Waterway is recommended.
4. Package Approach of Power/Port/EZ is needed.
5. Use of Clean Coal & LNG gas Power is a solution.



Thank you!

Meeting Minutes: 23rd February, 2014

Workshop on Draft Reports of the Feasibility Study of the Three Proposed Economic Zones

(Sherpur of Maulvibazar District and Mirershorai and Anwara of Chittagong District)).

Date & Time: Sunday, 23 February, 2014 at 10:30 AM

Venue: Ball Room, The Westin

Gulshan, Dhaka.

The third and final workshop was held on February 23, 2014 at the ball room of The Westin Hotel with Honourable Minister, Ministry of housing and public works Engr. Mosharraf Hossain as the chief guest. Honourable State Minister, Ministry of Land Mr Saifuzzaman Chowdhury (Javed), Honourable Economic Adviser to the Honourable Prime Minister Dr. Mashiur Rahman and Secretary, Prime Minister's office Mr Abul Kalam Azad and FBCCI President Mr Kazi Akram Uddin Ahmed were present in the meeting as special guests. The meeting was presided over by the Executive Chairman, BEZA Mr Fakhrul Islam.

The program started with the recitation from the Holy Quran with large number of distinguished participants both from the private and public sector.

With a short introduction of the distinguished guests, BEZA chairman has delivered the welcome address to the attending guests. In his speech Mr Islam expressed that it is high time for developing economic zones in the country and attract potential investors. In order to create facilities for potential investors, full support and co-operation from the government is needed. He sought guidance and blessings from the chief guest and special guests' for successful implementation of the Economic Zones.

Dr. Kobayashi presented his speech followed by power point presentation. While presenting the draft final report on Technical Advisory Services for Feasibility Studies for the proposed Economic Zones he mentioned that to obtain national goal of becoming a middle-income country's status by 2021, depend mainly on successful operation of EZs in the country. Dr. Kobayashi has also observed that Bangladesh presently requires more EZs for providing job opportunities to its unemployed and under-employed people who are still living in poverty. Many Asian countries have come out of poverty by developing EZs. Bangladesh can solve many of its problems such as poverty and unemployment to a great extent, by following the same path.

President FBCCI Mr Kazi Akram Uddin Ahmed supported to create more economic zones in Bangladesh. He made strong commitment to provide full support and co-operation needed from FBCCI to implement economic zones.

Mr Abul Kalam Azad, Secretary Prime Minister's Office appreciated the work carried out by Dr. Kobayashi and his team and drew attention of the guests to the "Critical Pass" shown in the power point presentation of the EZ project. He stated that all those issues are being addressed by the Government of Bangladesh and moreover government has identified six projects as fast track projects and Economic Zone project is among those projects.

Saifuzzaman Chowdhury Javed, State Minister for Land, said attracting foreign direct investment would not be a problem if the country can set up economic zones. He stated that all the indicators are very positive in the present context and to accelerate economic growth, the economic zones are needed to be established.

The following points were raised and discussed in the open discussion session. The session was conducted by Mr Abul Kalam Azad, Secretary, Prime Minister's Office.

Mr Arastoo Khan, additional secretary of the Economic Relations Division has lauded the presentation of the feasibility study of Dr. Kobayashi and presumed that the points which were raised by the World Bank on draft final reports have been already incorporated in the report. He also mentioned that BEZA's capacity building shall have to be increased to shoulder higher responsibility of implementing projects as the feasibility study is going to be completed very soon. He also mentioned the possible amalgamation of the two authorities (BEZA and BEPZA) to increase the capabilities to undertake the huge task of construction and management of the zone. In answering to this question, Dr. Kobayashi said that most of the points have been taken into consideration in the final version of the report. Regarding amalgamation Dr. Kobayashi also recommended the same as he also thinks these two organizations should merge together.

Mr A F M Afzal Hossain, Joint Secretary, Privatization Commission, mentioned that Sherpur is located far away from Dhaka and two port city of Mongla and Chittagong. Thus the cost of carrying goods discourages investors in setting up industries there. He referred that a state owned textile mills was offered for sale and a tender was invited to the public but the response was not positive. The study made Sherpur EZ project viable which is located far from the Sylhet city centre. He also questioned whether the price of land to be US \$ 50 per square meter is not in the very high side? In reply Dr. Kobayashi pointed out that the demand survey was conducted, the responses from the potential investors were very positive. It is mentionable Ceramic industries, Textiles sector, Paint and Chemicals, Food processing and leather goods manufacturing industries show have keen interest to make investment in Sherpur EZ. Dr. Kobayashi also said the proposed EZ in Sherpur has the potential to become one of the top seven economic zones in Asia and advised the government to roll out the Sherpur Economic Zone first with required infrastructure such as power, water and gas etc. So, it has the potential to attract investors. Regarding the cost of the land, Dr. Kobayashi pointed out that the cost of land in Sherpur EZ is still less than other neighbouring countries; hence the price of US \$ 50 per square meter is justified at the initial stage.

Mr Kaikobad Hossain, Member BEZA asked a question to Dr. Kobayashi regarding IRR. He wanted to know how the FIRR 28% and EIRR 49% for the Anwara project can be viable? In reply, Dr. Kobayashi stated that since the rate is above the present opportunity cost of capital and also higher than the present bank interest rates, the project is therefore has been considered viable.

Mr Md. Abdul Mannan DC Chittagong appreciating Kobayashi's effort and his team for the study mentioned that public land which remains as 'khas land' will not be any problem but for acquisition of the land those are under private ownership, there might be disputes and the process may become complex. He ensures to do everything possible and expects full support from the government and the related authority.

Mr Md. Kamrul Islam DC Maulvibazar raised a question to whether the study conducted considered the fact that Sherpur area is under high risk of earthquake area in Bangladesh. The point mentioned shall be taken into consideration at the time of developing the economic zones and in the construction stage Dr. Kobayashi replied.

Another speaker wanted to know whether the Kushiya River can be used for transportation of the goods of the proposed economic zones? In regard to this, Dr. Kobayashi explained that there is no possibility of transporting goods through Kushiya River. In another question he pointed out that in Sherpur EZ how food processing, ceramic and pharmaceuticals industries can be set up side by side. In regard to this Dr. Kobayashi mentioned that in designing the master plan of the EZs this issue has been addressed and will be accommodated accordingly.




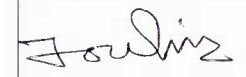

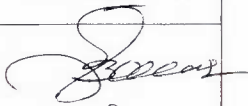

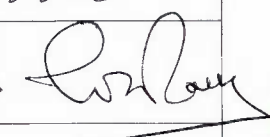

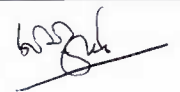
Bangladesh Inland Water Transport Authority (BIWTA) representative raised the point of analysing the prospects of Ashuganj river port. Dr. Kobayashi stated that this issue has been addressed in the report. The Ashuganj river port will be used by the EZ companies.

Special guest Honourable Advisor Economic Affairs to the Honourable Prime Minister Dr. Mashiur Rahman expressed the need for setting up economic zones in the proposed locations and indicated that he personally visited the Mirershorai location along with the local MP who is eventually the chief guest of the function. He personally convinced that the location is ideally suited for establishment of Economic Zone at Mirershorai. He however, stressed the need for making required infrastructure development on the offsite as explained by the team leader. Dr. Mashiur Rahman emphasized for setting up a complete township in the proposed economic zones to give workers a better life and their families' better access to education and health.

Dr. Md. Nurannabi Mridha Project Director BEZA in his thanks giving speech mentioned all investments for EZ will come from both local and foreign investors. Since there were no other questions from the participating guests he expressed his thanks to all the attending guests including the chief guest and special guests in the chair.

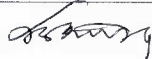


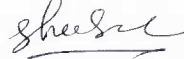
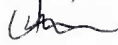



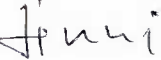
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Date: 23 February, 2014

Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
31	SALIFUZZAMAN CHOWDHURY	STATE MINISTER FOR LAND AND MINING		01711723456	SZCHOWDHURY@gmail.com	
32	Kazi Akram Uddin Ahmad	President FBCZ				
33	MD. ABUL KALAM AZAD	SECRETARY DMO			azad2113@gmail.com	
34	MD. TOUHID HOSSAIN	FFAVP STANDARD BANK		01716951693	touhid-77@Yahoo.com	
35	Salahuddin Bablu	Business Editor	SA TV	01552302510	salahuddinbablu@yahoo.com	
36	MA Basor	ManobKanta Staff Reporter	ManobKanta	01773527237	basardhara@gmail.com	
37	Ismail Ali	Staff Reporter	Bonik Banta	01915604734	ismail-eco@yahoo.com	
38	Kazi. Amin	Act. Secretary		0192-474-4704	kazimardiat@gmail.com	
39	Rajat Raj	Staff Correspondent	daily sun	01673-688114	6_raj1726@yahoo.com	
40	Wazir Ahmad	Staff Reporter				



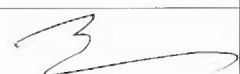

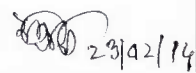

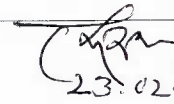

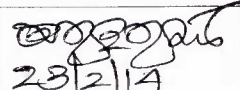
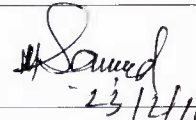
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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
40.	Ratan Kumar Hazumder	Deputy Chief Conservator of Forests	Forest Department	01738360221	ratanzumder@ gmail.com	
41	Nila Hasnat	Staff Reporter	Business Arise TV	01744969161	nila-hasnat@ yahoo.com	
42	MD. CHAN MIAH	P.L.D				
43	Md. Nurul Mozfar	PO	Ministry of Housing & Public Works			
45	MD. Shamsuzzaman	A.S.I	S. B	01719-550558	—	
46	Ahad Hossain Tutul	Staff Reporter	SA.TV	01716027665	ahad-tutul@yahoo.com	
47	Mofizul Khan Sarker	Minister or Member (P)		01929108074		
48.	MD. ALI HOSAIN	MLLS	BE2D Proj.	01763782010		
49.	Salahuddin Bablu	Business Editor	SA TV	01552302510	salahuddinbablu@ yahoo.com	
50.	Jinni	Reporter	BTV	01684588147		

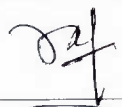

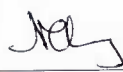

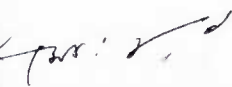

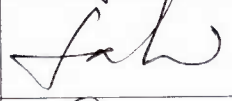

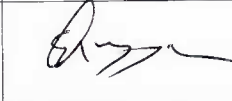

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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
01.	S. A. Hasan	Env Spl	BEZA	01818530750	shorowda us @ gmail	
02	Md. Abizul Haq	Member Finance	BPDB	01819225947	Mem fino @ bpdb.gov.bd	
03.	Md. Delwar Hossain	Consultant	Shelltech.	01730326225	dhdelwarhossain @ gmail.com	
04.	Shyamsunder Sikder	Chairman	Bseic	01718334640	SS. Sikder @ Yahoo.com	
05	Mohammad Abul Kashem	EMember, BEZA (P&D)	BEZA	01715172448	abul Kashem1565 @ Yahoo.com	 23/02/14
06	SU & GJ	FMS	BEZA			
07	Md. Selim Akhter	Manager (law)	BEZA	01749.306080	Selim286 @ gmail.com	 23.02.14
08	Md. Shamsul Karim Bhuiyan	Joint Chief	Ministry of Shipping	01819939519	Karim.eco @ hotmail.com	
09	AHM AFZAL HOSSAIN	JE. SECY	PRI. COMMI	9563767	afzal @ Ymail.com	 23/2/14
10	Mohammad Abedus Samad	secy, BEZA	PMO	8180119	masamad7 @ Yahoo.com	 23/2/14









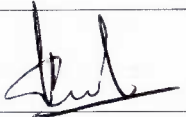
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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
11.	Akram Siddiq Chowdhury	M-D	Thair Baylon Halchey Ltd	01819313712	stah@gmail.com	
12.	Jagodish Roy	Mem (AdRF) BEZA	BEZA	01190-258149	jagodishroy@gmail.com	
13.	Nazem Chowdhury	MSL				
14.	MD. AL-AMIN	URBAN PLANNER	SHELTECH	01671020876	alamin.spl@gmail.com	
15.	MD. SHAH JAHAN	Additional Director General	DOE	01819258177	shahjahan@doe-bd.org	
16.	MD. RUHUL AMIN	D.G. Food (Ex)	Ministry of Food	01720343863	ruhul3130@gmail.com	
17.	Farrane Ahmed	Ex President	by the chamber of com	01711922072	fa.MISBAH.	
18.	SUDDU	CEO	APB o Kwila	01943791592	ceo@apb.org.bd	
19.	Shah Naw Quayyum	Financial Sector Specialist	FPD World Bank	01713017132		
20.	Caroline Smith	Economist	USAID			


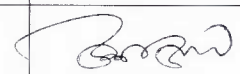
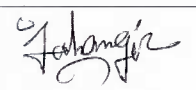
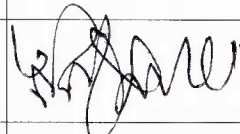

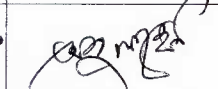


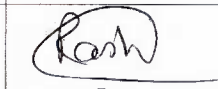

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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
21.	Md. Shafiqul Islam	SE	BZA	01711-64101	shafia.bba65@gmail.com	
22.	Kamaluddin Ahmed	Add. Secy	ICT Division	01552-309-185	kamalrahman2009@yahoo.com	
23.	Obaidur Rahman	Director	FBCCI	01199-850935	trade@dozasc.com	
24.	HARUN-UZ-ZAMAN	JOINT SECRETARY	MINISTRY OF COMMERCE	01711-905818	mhuzbhuiyan@yahoo.com	
25.	S. M. MAHMOUD RAHMAN	DG	HTD EPD	01923612851	mahbubor_r@yahoo.com	
26.	MAHMUD HASAN SALIM	Director (Planning)	BHATA (MOS)	01911914636	dpl@binta.gov.bd	
27.	Md. Kaifbad Hossain	Member BEZA	BEZA	01711-175575	Kaifbadh@gmail.com	
28.	Md Kubirul Islam	Prof, BUET	CIVIL	01819282200	rajag44@gmail.com	
29.	CRKasah	Consultant	B	01943217846		

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30.	Dr. M. Mahmudun Rahman	Director General	PMO	9140331	enumahmud@yahoo.com	
31	MJ. Shoab	Manager	BEZA	-	-	
32	Sheikh Jahangir Alam	Reporter	ATN Times	01914022544	sagor.jrn@gmail.com	
33.	AKM Hossain	Consultant	MAXWELL BEZA	01726293476	-	
34.	Arsalan Zaman	Project Support Officer	Maxwell Stamp Ltd.	01674777778	arsalan.zaman@gmail.com	
35.	Abu Lahel	Asst. Manager (Admin) BEZA	BEZA	01718201856	lahel_jubd@yahoo.com	
36	RIFAT RASHID	Director CCIFB		028821450	ccifb@gwbce.maf.com.bd	
37	S. TI Rashidul Islam	Senior Reporter	BSS	01712946211	sharik_rashid@yahoo.com	
38	Rasheed Rahim	Manager (dog)		01819532508		
39	S. M. Shahab Ullah Noor	Asst. Manager HR	Maxwell Stamp	01817520309	sunoor@maxwellstamp.com	



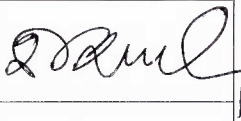
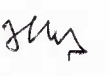



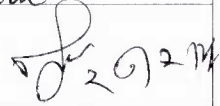
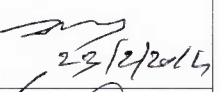
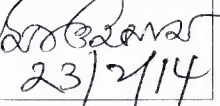
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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
01	Sabana Akter	Professor, Socials DU, 1	Mapwell ST-IP Ltd	01816380118	Sabnaakter3@ hotmail.com	Sabana
02	Kamal Krishna Bhattacharyya	Additional Secretary	M/o Railways	01715018512	bhattacharyya.kamal @yahoo.com	
03	Abu Seleh Md. Sulaidullah	Urban Planner	Sheltech (Pvt) Ltd.	01720240158	abu-saleh40@ yahoo.com	
04	Shimul Sarkar	Urban Planner	Sheltech (Pvt) Ltd	01717232615	planner.shimul0304 @gmail.com	
05	md. Kamrul Hasan	DC, Moulvibazar,	GOV	01715171786	demoulvibazar@nopa. gov.bd	
06	Md. Muayyaz Hossain	Addl. Secy	M/o Land	01716201100	hossainmuayyaz @ymail.com	 23.2.14
07	Zeenat Nahreen	Director Planning	Sheltech Pvt Ltd	01715008953	zeenat.nahreen@gmail .com	 23.02.14
08	A. H. M. Jahangir	Deputy Chief	ERD	01713199932	ajahangir@TC Yahoo.com	
09	Swapan Kumar Saha	Member Distribution	BPDB	01819229805	memBPDB@yahoo.com	
10	Md. Abdul Mannan	Deputy comm ssioner c&g	D.C	01713104332		



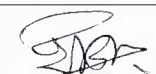

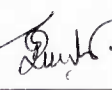
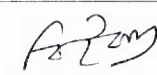

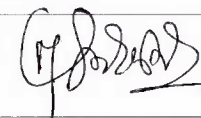


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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
11.	G. C. Subradhar	Chief Planning	BWDB	9580957	gplan2006@yahoo.com	
12	Mr. Abdul Quader Alam	Resettlement and Rehabilitation Expert	Shushilm	01216681456	kaderm@gmail.com	
13	HABIBUL A212	Procurement Specialist	BEZA Project	01712521991	vibubdoyahv.com	
14	MD. BOW, AMIN BIN HASHEM	Manager Admin BEZA Project	BEZA Project	0172180066	bowamin1919@gmail.com	
15.	Mr. Moniruzzaman Manager (Dr. Sec) BEZA	Manager (BEZA)	BEZA	0172-628360	monirani610@gmail.com	
16	Dr. Md. Nuannabi Mridha P.D. BEZA, PMO.	P.D. BEZA	BEZA	01554633192	bezaproject.gov@gmail.com	
17	Mika Saito	Chittagong chamber		01991319290	mk.saito23@gmail.com	
18	Mr. Nazrul Islam	Member (AEP) CPA	CPA	01199375278	map@cpa.gov.bd	
19	K-K. ROY.	Member (Admin)	BTC L	01550151047	khagenkroy@gmail.com	
20	Dr. Mahmood Osman Osman	Financial Analyst, Study	Maxwell Ltd	01713036211	osman@du.ac.bd	

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Sl. No.	Name	Designation	Department	Phone No.	Email ID	Signature
21.	Fazlur Rahman	Reporter	Daily Star	01732424548		
22	Arunto Khan	Member.	ERD	01711837003		
23	Dr. Khondaker Abu Jalor	Consultant	Sheltech	01674835212		
24.	M. A. Kalam	Consultant	"	01817505820		
25.	G.M. Jinal Abedin Bhuiya	Additional Secretary	Mo Industries	01755558880	Ja_bhuiya@yahoo.com	
26.	Bijon Kumar Baisya	Addl. Secretary	RJSC M/O Commerce	8189401	bijon.kumar@ hatmail.com	
27	Sivant Davies	Economist	DFID	0171 314 9930	S-davies@dfid. gov.uk	
28	Md. Mahbul Sarwar	General Manager	Petrobangla	01190591460	pm@petrobangla. org.bd	
29	Md. Monower Zahid Khan	Assistant Engineer	BPDB	01718228830	monower.khan@ gmail.com	
30.	Toufiqul Alam	Urban planner	Sheltech	01818-366574		

ANNEX 2

CHAPTER 2: COMPETITIVE ADVANTAGE AND INDUSTRY ASSESSMENT (COMPONENT 1)

1. Competitiveness analysis of Mirershorai Economic Zone (Annex to the section 2.1)

Before launching into the sources used themselves, there are several preliminaries to be noted.

First, the employment number for Mirershorai EZ shown is based on the industrial saleable land in hectares. For the other SEZs and IPs, they are, as far as practicable, estimates about the direct employment generated by the enterprises there. That said, the quotation from Ms. Kim, of the Amata City Bien Hoa Industrial Park, cited in the body of the report must be accounted for. Because that account has already provided in the Annex-1 of the report on the Sherpur EZ, it is not repeated here.

The following exchange rates are used in this chapter (all to United States dollar): 4104 Cambodian Riel; 58 Indian rupees; 21,000 Viet Nam Dong; 30 Baht; 9,765 Indonesian Rupiah and 857 Myanmar kyat.

The estimates for the availability of electricity supplied to the EZ/IPs that we have presented will once again not really be comparable. The literature at times only presents the maximum capacity of the transmission lines used to carry power to the industrial park(s), but not the total availability of electricity in question. For Mirershorai and several other IPs, we have had access to the desired latter kind of information, and have included them in the material. However, for several other IPs, we have had limited, despite our best efforts, in the range of information available in the public square, and been forced to only merely re-cycle them. As a result, the information presented on the important aspect of the availability of power is not strictly comparable across the comparator EZs/IPs.

Placeholders relating to several dimensions of tax incentives have been included. As far as practicable, they have been defined so that they can be enumerated in chronological units such as years. They are: (1) length of tax-holidays; (2) tenure of lower tax rates, if any, after tax-holidays have expired

Two international cargo rates are included. Cargo rate-1 denotes shipping costs between the port nearest to the EZ/IP in question and the Japanese port of Yokohama. Cargo rate-2 denotes shipping costs between the port nearest to the EZ/IP in question and the Japanese port of Los Angeles. Telecoms rates are measured using (i) one-time charge to be paid to the national incumbent telecoms service provider for the basic connectivity; (ii) basic monthly charge for using a fixed-line telephone from the national incumbent telecoms service provider.

All prices, whether they are unit values or total values, are provided in US dollars. The rates of exchanges have already been provided in the foregoing. Two indicators, both from IFC's Doing Business-2011, are selected to denote the rigidity of working hours. They are (i) premium for night-work as % of hourly wage; (ii) premium for work on weekly rest-day, as % of hourly wage. Four indicators, from the same source, are selected to denote the difficulty in hiring workers. They are (i) are fixed-term contracts prohibited for permanent tasks; (ii) maximum length of fixed-term contracts in months; (iii) minimum-wage of a 19-year-old worker or an apprentice to be hired; and (iv) ratio of minimum wage to value-added per worker.

2. Details of the calculations driving the competitiveness benchmarking ranking

Multivariate competitive benchmarking across ten EZs/IPs										
Benchmarks	Bangladesh			Cambodia	India	Indonesia	Myanmar	Vietnam		Thailand
	Sherpur	Anwara	Mirershorai	Phnom Penh	Mahindra City	MM2100	Mingalado	Amata	VSIP	Amata
Zone Size (ha)	143	562	2911	360	607	805	90	700	500	1353
Lease Duration (Year)	30	30	30	99	99	70	49	50	50	50
Power-charges (kWh)	0.066	0.066	0.066	0.28	0.105	0.1354	0.12	0.077	0.078	0.15
Water-charges (cu.-m)	0.3	0.3	0.3	0.3	0.6	0.4	0.05	0.383	0.31	0.65
Waste-water charges (cu.-m/mth)	0.35	0.35	0.35	0.26	0.06	0.55	0.05	0.364	0.19	0.233
Land-lease Charges	56	60	56	60	65	175	58	90	117	125
Cargo rates (40 Container):										
Export to Yokohama	900	900	900	1500	979	800	1600	500	500	1162
Export to Los Angeles	3675	3675	3675	4000	2817	2600	6500	2600	2600	3863
Telecoms rates (min)	1.12	1.12	1.12	5	21	6.28	0.67	1.05	1.05	3.16
Wage rates:										
Mgmt wage rates	578	578	578	700	1510	995	600	1146	1146	1565
Skilled wage rates	251	251	251	180	607	414	145	521	521	641
Semi-skilled wage rates	78	78	78	120	264	209	92	128	128	286
Water-treatment plant capacity (per hectare)	419.58	12.00	96.19	14.72	37.78	52.17	55.56	60.00	60.00	13.30
Waste-water treatment plant capacity (per hectare)	335.66	9.60	76.95	11.11	29.06	46.96	55.56	10.00	36.00	10.35
Is school provided	0	0	1	0	1	0	0	1	1	1
Tax holiday length (yr)	7.00	5.00	5.00	9	5	7.5	5	0	4	8
GCI Index ranking of country	110.00	110.00	110.00	88.00	60.00	38.00	139.00	70.00	70.00	37.00
Benchmarked rank_version2	0.698	0.557	0.648	0.548	0.500	0.473	0.545	0.561	0.608	0.425
Benchmarked rank_version1	0.658	0.534	0.668	0.521	0.481	0.460	0.513	0.541	0.581	0.426

Note: version1 is based on all indicators. Version 2 excludes land area of the zones/lps

3. Transport Assessment

1. Goods Train Schedule

A. EAST ZONE (East of Jamuna/Meghna River)

Train No	Name	From	Departure	To	Arrival
801	Container Express	Ctg Port Yard	02:00	Dhaka ICD	12:05
802	Container Express	Dhaka ICD	10:50	Ctg Port Yard	01:10
803	Container Express	Ctg Port Yard	11:00	Dhaka ICD	23:10
804	Container Express	Dhaka ICD	13:00	Ctg Port Yard	05:55
805	Container Express	Ctg Port Yard	17:00	Dhaka ICD	03:00
806	Container Express	Dhaka ICD	20:30	Ctg Port Yard	05:55
807	Container Express	Ctg Port Yard	19:00	Dhaka ICD	04:05
808	Container Express	Dhaka ICD	23:45	Ctg Port Yard	09:30
951	Tank Special	Ctg Port Yard	23:30	Sylhet	16:20
952	Tank Special	Sylhet	01:00	Ctg Port Yard	18:20
961	Tank Special	Ctg Port Yard	23:30	Srimongal	00:20
962	Tank Special	Srimongal	04:40	Ctg Port Yard	03:50
971	Tank Special	Ctg Port Yard	22:30	Dhaka Cantonment	11:45
972	Tank Special	Dhaka Cantonment	01:00	Ctg Port Yard	14 :40
981	Tank Special	Ctg Port Yard	22:30	Parbatipur	03:10
982	Tank Special	Parbatipur	20:30	Ctg Port Yard	04:40
JT	Express Goods	Ctg Port Yard	22:30	Tejgaon	11:45
TJ	Express Goods	Tejgaon	01:30	Ctg Port Yard	01:55
JB	Express Goods	Ctg Port Yard	12:00	Dewangonj Bazar	06:00
DJ	Express Goods	Dewangonj Bazar	12:10	Ctg Port Yard	20:30

B. Goods Train Schedule WEST ZONE (West of Jamuna/ Meghna River)

Train No	Name	From	Departure	To	Arrival
KP-1	Express Goods	Khulna	22:45	Parbatipur	12:35
Pk-2	Express Goods	Parbatipur	17:45	Khulna	07:35
DI-1	Express Goods	Darsana	07:00	Ishardhi	10:20
ID-2	Express Goods	Ishardhi	02:00	Darsana	05:20
KI-1	Express Goods	Khulna	10:00	Ishardhi	14:10
IK-2	Express Goods	Ishardhi	03:30	Khulna	15:25
ND-1	Express Goods	Noapara	02:30	Darsana	08:00
DN-2	Express Goods	Darsana	19:30	Noapara	00:15
IS-1	Express Goods	Ishardhi	02:30	Santahar	06:10
SI-2	Express Goods	Santahar	17:30	Ishardhi	22:05
SP-1	Express Goods	Santahar	22:15	Parbatipur	02:50
PS-2	Express Goods	Parbatipur	23:00	Santahar	04:10
IR-1	Express Goods	Ishardhi	22:00	Rohanpur	06:35
RI-2	Express Goods	Rohanpur	09:45	Ishardhi	18:50

Source: http://www.railway.gov.bd/good_tsrain_schedule.asp

2. Statistics of Chittagong Port Authority

A. Cargo Handled

Calender Year	Import (Tonnes)	Export (Tonnes)	Total (Tonnes)
2006	2,39,36,103	30,89,550	2,70,25,653
2007	2,42,36,261	33,92,974	2,76,29,235
2008	2,44,92,707	37,04,862	2,81,97,569
2009	3,05,86,680	39,57,894	3,48,44,574
2010	3,66,70,356	45,12,439	4,11,82,795
2011	3,82,66,480	48,73,562	4,31,40,042

B. Containers Handled

Calender Year	Chittagong Port (TEUs)	Cargo (Tonnes)	Dhaka ICD (TEUs)	Cargo (Tonnes)
2006	8,76,186	85,17,130	77,567	3,25,305
2007	9,58,020	96,06,032	80,714	3,31,216
2008	10,69,999	102,16,055	82,458	4,34,628
2009	11,61,470	12,27,321	63,780	4,94,525
2010	13,43,448	1,43,70,217	64,369	4,83,039
2011	13,92,104	1,47,62,762	69,723	5,56,781

C. Vessels Handled

Calender Year	No. of Vessels
2006	1957
2007	1945
2008	2099
2009	2167
2010	2249
2011	2248

D. Cargo Handling Including Inland & ICD

Calender Year	Import (Tonnes)	Export (Tonnes)	Inland (Tonnes)	ICD (Tonnes)	Grand Total (Tonnes)	Growth
2006	2,39,36,103	30,89,550	26,33,565	4,80,439	3,01,39,657	1.93%
2007	2,42,36,261	33,92,974	26,77,509	4,92,644	3,07,99,388	2.19%
2008	2,44,92,707	37,04,862	25,18,564	4,34,628	3,11,50,761	1.14%
2009	3,08,86,680	39,57,894	28,30,025	4,94,525	3,81,69,124	2.53%
2010	3,66,70,356	45,12,439	37,30,829	4,83,039	4,53,96,663	18.93%
2011	3,82,66,480	48,73,562	55,77,114	5,56,781	4,92,73,937	8.54%

Source: http://cpa.gov.bd/portal/home.php?option=article&page=82&link=statistical_info&item=cargo_handle_1#

3. List of items to allowed to be handled at the Off –docks:

As per Customs Circular - REF: CPA Circular # 01/06 DD 04-11-06/ Circular #3/07 DD 22-01-07 REF: NBR File #3 (1) Customs Export & Bond/96/545 (6) DD02-09-10 called Items to be unstuffed outside CPA Premises.

- | | | |
|-----------------------------------|----------------------------|---------------------|
| 1. Raw Cotton | 10. Hard Coke | 20. Staple Fiber |
| 2. Metal Scrap | 11. Carbon Block | 21. Round Log |
| 3. Wheat | 12. Marble Chips | 22. Dates |
| 4. Rice | 13. Ball Clay (Bulk) | 23. Sugar |
| 5. Lentils | 14. Onion (Dry Container) | 24. Bitumen |
| 6. Mustard Seeds | 15. Ginger (Dry Container) | 25. Cane |
| 7. Waste Paper | 16. Garlic (Dry Container) | 26. Marble |
| 8. Chick Peas | 17. Fertilizer | 27. Sodium Sulphate |
| 9. Animal Feed (Meat & Bone Meal) | 18. Soda Ash | 28. Wood Pulp |
| | 19. PVC Resin | 29. Salt |

Freight, Charges, Container Cycles and Off Dock Facilities

Location	Distance from Chittagong	20 ft. Container	40 ft. Container	10T/30 CBM truck
Anwara	40 Km	10,000/-	12,000/-	7 – 8,000/-

Source: based on interview with a transporter from Chittagong who owns 15 trucks and trailers

✓ CHA/ Clearing Agent Fees

Customs Clearance Charge levied by Clearing Agents: The Clearing Agents charge their fees on the basis of percentage of the value of the cargo and not on box basis.

Value (in Taka)	Charge basis
Upto 500,000 taka	1%
5 -15,00,000 take	0.75%
1.5 million to 20 million	0.50%
Above 20 million	To be negotiated

Source: Interview with a forwarding agency

✓ IMPORT Cycle

➤ Port to Off-docks (ICDs):

Load Port--> CY (Port Container Yard) --> ICD -->Delivery (either de-stuffed or FCL out): in this case, all payments from hook to delivery a/c. Importer

➤ Cargo Clearance and Delivery

➤ Sea Cargo

1. Preparation of Data Sheet
2. Noting by Customs
3. Examination of Papers by Customs & Physical Inspection
4. Assessment
5. Payment of Duty
6. Indent Placement (Placement of Vehicles)
7. Delivery

- Under normal circumstance, with complete documentation, import clearance and delivery takes about 3 -4 days for import
- For export, 1 – 2 days is required.

➤ Air Cargo

1. Documentation as above
 - Import clearance takes about 2-3 days (for urgent and perishable cargo – 1 day)
 - Export clearance takes about 1-2 days.

✓ **EMPTY Container Cycle at Off-dock ICD**

2. Empty container arriving from Import de-stuffing
3. Empty container coming from Port (export CY) as per MLO instruction
4. Repositioning from hook or CY
5. Factory de-stuffed containers
6. As per instruction of MLOs – by internal repositioning.

Off-Dock: The team visited K & T Logistics Ltd. Located inside the Chittagong Export Processing Zone (CEPZ) and discussed about the services provided by this Off-dock facility.

✓ **Facilities at the K&T ICD: (Off-dock)**

1. There are 14 reefer points at the facility, but K&T not interested in handling reefers
2. EDI connectivity with Maersk Line
3. MLOs want data of their container on 24-hr cycle
4. K&T ICD covers an area of 8 Acres (44,000 sq. ft = 1 Acre)
5. Capacity: Ground slot of 400 (can handle about 2000 TEUS @ 5 high)
6. In operation since 1st May, 2001.
7. ICD on lease for 30 years, now running 13th year
8. Throughput: (annual about 1,20,000 TEUs)

On an average, container stays about 10 days at the

Container Tariff at the K & T Logistics ICD –CEPZ Facility

Container size	IMPORT	EXPORT
20 ft.	5,000/- (remove container from port and cargo delivery to consignee)	3,000/- (stuffing and despatching to port)
40 ft.	6,000/-	4000/-
Other charges as per Port Tariff		

7. Ocean Freight

EXPORT	20 ft. (in US\$)	40 ft. (in US\$)
Ocean Freight to International Destinations (from Chittagong Port)		
Major European Ports (Rotterdam)	1,300	2,600
USA - East Coast (New York)	3,000	4,000
USA - West Coast (Los Angeles)	3,000	4,000
Canada (Toronto/ Montreal)	3,500	4,500
Australia (Melbourne)	1,200	2,400
New Zealand	1,200	2,400
Hong Kong	1,000	2,000
UAE (Dubai)	1,100	2,200

Source: National Agencies, Dhaka, Bangladesh

IMPORT	20 ft. (in US\$)	40 ft. (in US\$)
Ocean Freight from International Destinations (to Chittagong Port)		
Major European Ports (Rotterdam)	1,500	3,000
USA - East Coast (New York)	3,000	4,000
USA - West Coast (Los Angeles)	3,000	4,000
Canada (Toronto/ Montreal)	3,500	4,500
Australia (Melbourne)	1,100	2,200
New Zealand	1,500	3,000
Hong Kong	1,200	2,400
UAE (Dubai)	1,200	2,400

Source: National Agencies, Dhaka, Bangladesh

8. Air Freight:

Air Freight (Export from Dhaka Airport)	Upto 1 kg(US\$)	Upto 10 Kg(US\$)	Upto 50 Kg(US\$)
Dubai	50	4.50/kg	3.70/kg
London	50	7.50/kg	3.70/kg
Rotterdam	50	7.87/kg	3.70/kg
Montreal	75	9.50/kg	7.10/kg
Melbourne	50	6.50/kg	3.70/kg
Hong Kong	50	4.50/kg	3.70/kg
Shanghai	50	4.50/kg	3.70/kg
New York	75	9.50/kg	7.20/kg
Los Angeles	75	9.50/kg	7.20/kg

Source: National Agencies, Dhaka, Bangladesh

Air Freight (Import to Dhaka Airport)	Upto 1 kg(US\$)	Upto 10 kg(US\$)	Upto 50 kg(US\$)
Dubai	100	3.50/kg	3.20/kg
London	100	3.50/kg	3.20/kg
Rotterdam	100	3.50/kg	3.20/kg
Montreal	100	5.50/kg	5.10/kg
Melbourne	100	3.50/kg	3.20/kg
Hong Kong	100	3.50/kg	3.20/kg
Shanghai	100	3.50/kg	3.20/kg
New York	100	5.50/kg	5.10/kg
Los Angeles	100	5.50/kg	5.10/kg

Source: National Agencies, Dhaka, Bangladesh

Similarly, air freight shipments to/from Dubai, Hong Kong, Shanghai followed by Melbourne, London, Rotterdam and Montreal are in order of the freight charges.

ANNEX 3

CHAPTER 3: MASTER PLANNING AND INFRASTRUCTURE (COMPONENT 2)

A. ENGINEERING DESIGN

1. ANALYSIS OF FLOOD CONTROL SYSTEM

1.1. Analysis of Rainfall Volume

According to the rain data of Sitakunda (Section 3.1.4), the following figures are selected for the drainage design.

Table 1.1-1: Rain Data for Drainage Design

Rain Data of Chittagong(Maximum Figures)			Reference (PPSEZ in Cambodia)
Yearly data	4,004 mm/year	Year of 2007	2010
Monthly data	1,274 mm/year	July of 2012	
Daily data	269 mm/day	August 21 in 2012	147.2 mm/day
3 hourly data	180.5 mm/3 hours(60.2mm/hour)	21-24pm, July 16 in 2008	
Hourly Max	60.2 mm/hr	July 16, 2008	32 mm/hour

The rain intensity pattern (147.2mm/day, October 2000 was the maximum data in past 10 years, when PPSEZ was designed), which was applied to PPSEZ design, is shown in right hand side column for reference.

From the above data analysis, 60.2 mm/hour and 269 mm/day are chosen for the design criteria of the Mireshorai Economic Zone.

1.2. Basic Discharging System

Once the Economic Zone is developed and whole area is covered by the factory roofs, rain water accumulates inside the Economic Zone within a very short period since the rain fall pattern occurs within 2~5 hours in nature. It is quite normal that the Economic Zone has a retention pond to retain a certain volume of rain water inside the zone. The retention pond system includes Retention Pond itself, Pump Sum Structure and RCP.

Since the rain intensity is relatively high, this results in a high rain volume inside the entire economic zone.

Table 1.2-1: Rain Volume inside the Economic Zone

Zone	Area (m ²)	Rain Intensity (mm / day)	Rain Volume inside the Zone(m ³ / day)
Phase 1	13,031,400	269	3,505,446.60
Phase 2	6,667,200		1,793,476.80
Phase 3	3,855,000		1,036,995.00

Note: Reclaimed area is excluded.

Since the planned ground elevation is about EL+ 8.00m, the rain water fallen inside the zone is basically designed to be discharged directly into the adjacent sea by gravity. The system is designed so that all rain flows into the u-channel and flows into the ditches along the dike. Most rains are directly discharged into the sea except necessary volumes for water supply during the rainy season.

1.3. Water Recycling System during the Rainy Season

Two water reservoirs are planned in both zones of phase 1 and phase 2. The dimension is as follows:

Phase 1

Area: 411,631.63 m²

Depth: 4.5m

Reservoir Volume: 1,852,342.30 m³

Catchment Area: 1,852,342.30 m³ / 0.269 m/day = 6,886,031 m²

This is almost half area of the total area of phase 1.

Phase 2

Area: 300,728.06 m²

Depth: 4.5m

Reservoir Volume: 1,353,276.20 m³

Catchment Area: 1,353,276.20 m³ / 0.269 m/day = 5,030,767 m²

This is almost the same area as the industrial lot area in phase 2.

The retained water can be used for the resource of water supply systems especially during the rainy season, resulting in a contribution to energy conservation.

1.4. U-Channels Along the Road

The dimension of U-channel (width 0.7m ~2.0m, average depth 1m) is selected through engineering analysis.

Investigation of U-channel Dimension

As a first step, the rain flow route needs to be planned in order to decide the dimension and alignment of the u-channel. As explained previously, the road was designed in order to divide the factory block by approximately 1,000m x 220m for case 1 where main roads are crossed in phase 1 area and 700m x 220m for case 2 for other areas.

The discharging velocity of u-channel “V” is given by Manning Equation.

$$V = 1/n \times R^{2/3} \times I^{1/2}$$

Where

n (roughness factor) = (concrete case: 0.013)

R (hydraulic radius) = A (flow cross section) /S (wetted perimeter)

I (slope) = (assumed 1/1000)

The discharging volume (Q) is given by Q = A x V. The discharging volume of each u-channel is shown in the following table.

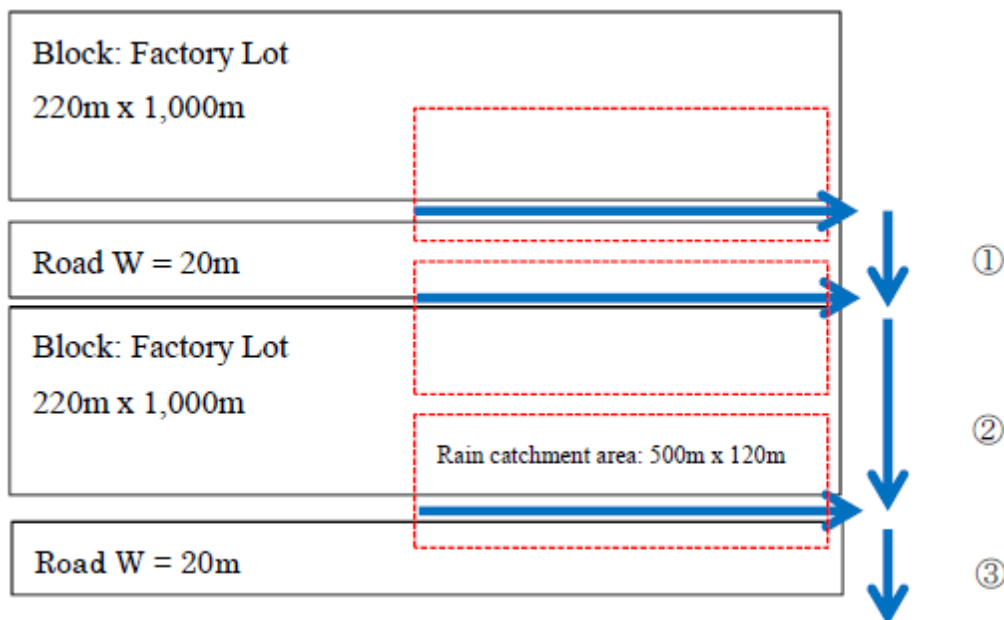
Table 1.4-1: Discharging Volume of U-channel by Manning Formula

Type of u-channel Height is assumed 1m. Water Depth is assumed 80cm.	V (m/s)	Q (m ³ /h)
W = 70cm	0.948	1,912.00
W = 1m	1.109	3,193.00
W = 1.2m	1.192	4,120.00
W = 1.5m	1.292	5,581.00
W = 2.0m	1.416	8,154.35
W = 2.5m	1.508	10,855.72
W = 3.0m	1.577	13,625.15
W = 3.5m	1.631	16,439.56
W = 4.0m	1.674	19,286.72
W = 4.5m	1.711	22,176.28
W = 5.0m	1.742	25,083.82
Water depth is assumed 2m.		
W = 5.0m	3.086	111,101.30
For reference: RCP, Diameter 1m	0.965	2,182.355

Case 1

By making a slight slope from the centre of the factory block and covering half the area of the road, the basic rain catchment area becomes 500m x 110m approximately.

Figure 1.4-1: Rain Flow Route (Case 1)



From the rain intensity pattern, the maximum intensity is 60.2mm/h. From the rain catchment area, the rain volume on the red rectangular becomes;

$$60.2\text{mm/h} \times 500\text{m} \times (110\text{m} + 10\text{m}) = 3,612\text{m}^3/\text{h}$$

From figure 1.4-1

At point ① :

Rain Volume $3,612\text{m}^3/\text{h} < 4,120.00\text{m}^3/\text{h}$, if u-channel $W = 1.2\text{m}$ is used.

At point ② :

Rain Volume $3,612 + 3,612 = 7,592\text{m}^3/\text{h} < 8,154.35\text{m}^3/\text{h}$, if u-channel $W = 2.0\text{m}$ is used.

At point ③ :

Rain Volume $7,592 + 3,612 = 11,204\text{m}^3/\text{h} < 13,625.15\text{m}^3/\text{h}$, if u-channel $W = 3.0\text{m}$ is used.

Following the same process, the next points ④ and ⑤ are investigated.

At point ④ :

Rain Volume $11,204 + 3,612 = 14,816\text{m}^3/\text{h} < 16,439.56\text{m}^3/\text{h}$, if u-channel $W = 3.5\text{m}$ is used.

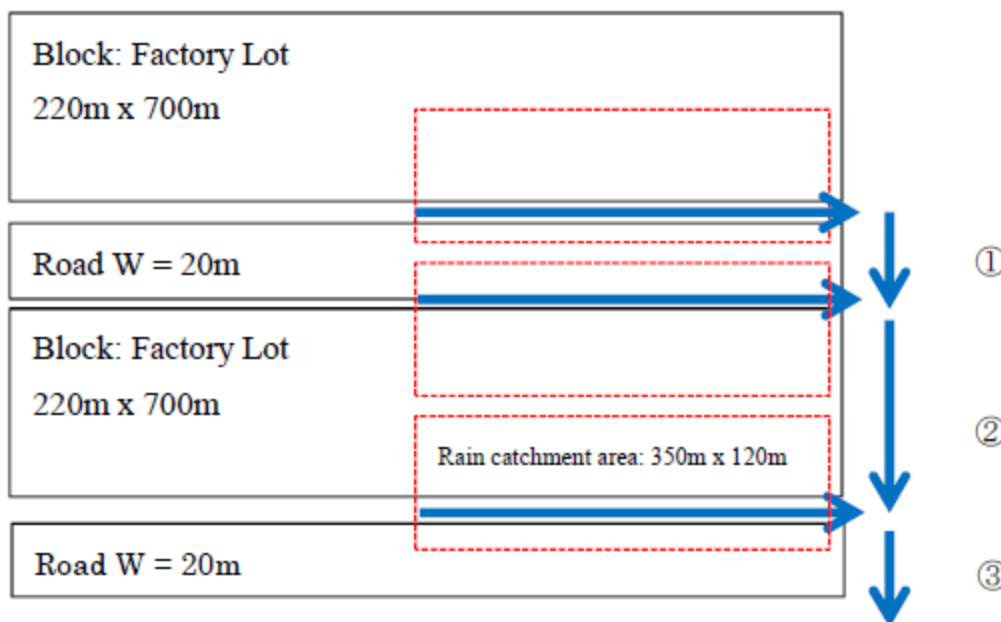
At point ⑤ :

Rain Volume $14,816 + 3,612 = 18,428\text{m}^3/\text{h} < 19,286.72\text{m}^3/\text{h}$, if u-channel $W = 4.0\text{m}$ is used.

Case 2

By making a slight slope from the centre of the factory block and covering half the area of the road, the basic rain catchment area becomes $350\text{m} \times 110\text{m}$ approximately.

Figure 1.4-2: Rain Flow Route (Case 2)



From the rain intensity pattern, the maximum intensity is 60.2mm/h. From the rain catchment area, the rain volume on the red rectangular becomes;

$$60.2\text{mm/h} \times 350\text{m} \times (110\text{m} + 10\text{m}) = 2,528\text{m}^3/\text{h}$$

The discharging velocity of u-channel “V” is given by Manning Equation.

$$V = 1/n \times R^{2/3} \times I^{1/2}$$

Where

n (roughness factor) = (concrete case: 0.013)

R (hydraulic radius) = A (flow cross section) /S (wetted perimeter)

I (slope) = (assumed 1/1000)

The discharging volume (Q) is given by $Q = A \times V$.

The previous table is used for calculating the discharging volume of each u-channel.

At point ① :

Rain Volume $2,528\text{m}^3/\text{h} < 3,193.00\text{ m}^3/\text{h}$, if u-channel W = 1.0m is used.

At point ② :

Rain Volume $2,528 + 2,528 = 5,056\text{m}^3/\text{h} < 5,581.00\text{ m}^3/\text{h}$, if u-channel W = 1.5m is used.

At point ③ :

Rain Volume $5,056 + 2,528 = 7,584\text{m}^3/\text{h} < 8,154.35\text{ m}^3/\text{h}$, if u-channel W = 2.0m is used.

Following the same process, the next points ④ and ⑤ are investigated.

At point ④ :

Rain Volume $7,584 + 2,528 = 10,112\text{m}^3/\text{h} < 10,855.72\text{ m}^3/\text{h}$, if u-channel W = 2.5m is used.

At point ⑤ :

Rain Volume $10,112 + 2,528 = 12,640\text{m}^3/\text{h} < 13,625.15\text{ m}^3/\text{h}$, if u-channel W = 3.0m is used.

2. DESIGN OF WATER SUPPLY TREATMENT PLANT

$$\begin{aligned} \text{Total Plant Capacity} &= 280,000 \text{ m}^3/\text{day} \\ &= (50,000 \times 5) + 30,000 \text{ m}^3/\text{day} \end{aligned}$$

So a total of 5 Nos. of 50,000 m³/day capacity treatment plants and one 30,000 m³/day capacity treatment plant will be needed.

Mixing basin

- Plant Capacity 50,000m³/day

Considering the capacity of the treatment plant is about 50,000m³/day i.e. 24 hrs. Total quantity will be treated in 3 shifts; 8 hr in one shift. Treating volume is 13,207,810 gallon/day.
In 8 hrs 4,402,603 gallon.

Flow per minute: 17,657,650 cuft/day~ 1226 ft³ (cuft)/min~9,170gallon/min
Considering the mixing period to be 30 min,

The capacity of the mixing tank is 1226x30 = 36,780 cuft.

In order to prevent sedimentation in the mixing tank, the velocity of flow should preferably be somewhat greater than 1 fpm.

If minimum velocity considered as 1 fpm and length is 30 ft. then the required cross section is 36,780/30 = 1,226 sq. ft.

This could be supplied by a section 12 ft depth and 102 ft width. Because it is desirable to have velocity somewhat greater than 1 fpm then the width of the tank maybe reduced to 45 ft and depth 12 ft.

Desired velocity of flow $\frac{45}{30} = 1.5$ fpm, which is satisfactory.

Then the length of the tank will be 68 ft.

- Plant Capacity 30000m³/day

Considering the capacity of the treatment plant is about 30,000m³/day i.e. 24 hrs. Total quantity will be treated in 3 shifts; 8 hr in one shift. Treating volume is 186,865 gallon/day.

In 8 hrs 62,288 gallon

Flow per minute: 736 cuft/min

Considering the mixing period to be 30 minutes,

The capacity of the mixing tank 736x30 = 22,072 cu.ft.

In order to prevent sedimentation in the mixing tank, the velocity of flow should preferably be somewhat greater than 1 fpm (foot/minute).

If minimum velocity considered as 1 fpm and length is 30 ft. then the required cross section is 22,072/30 = 736 sq. ft.

This could be supplied by a section 12 ft depth and 61 ft width. Because it is desirable to have velocity somewhat greater than 1 fpm then the width of the tank maybe reduced to 40 ft and depth 10 ft.

Desired velocity of flow $\frac{40}{30} = 1.33$ fpm, which is satisfactory.

Then the length of the tank will be $\frac{61}{1.33} = 46$ ft. which is the desired velocity of the flow.

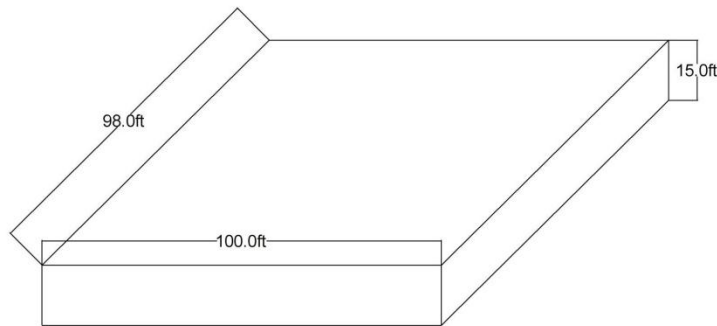
Sedimentation Tank

- Plant Capacity 50,000m³/day

Since the estimated flow 1226 cu. ft/min = 73560 cu.ft/hr and the detention for settling time is 4 hrs. The required capacity of the sedimentation tank must be 73,560x4 =294,240 cu. ft.

In order to provide flexibility of control, there must be at least two sedimentation tanks, in which each basin will have a capacity of 147120 cu. ft. Since the rate of flow is 0.4 fpm and then the maximum permissible length of each tank would be 60 x 4 x 0.416 = 96 ft ~ 100ft, considered the velocity of flow will be 0.416 fpm which is satisfactory. The cross sectional area will be $\frac{147120}{100} = 1471$ sq. ft. A width of 98 ft. and depth 15 ft the capacity of each tank will then be 100'x98'x15' = 147,120 cu. ft. 2 Units will be required.

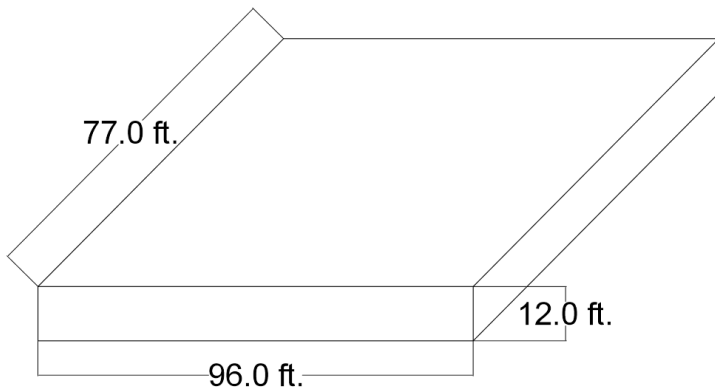
Figure 2-1: Typical Dimension of Sedimentation Tank Unit



- Plant Capacity 30,000m³/day

Since the estimated flow 736 cu. ft/min = 44,144 cu.ft/hr and the detention for settling time is 4 hrs. The required capacity of the sedimentation tank must be 44,144x4 =176,575 cu. ft.

In order to provide flexibility of control, there must be at least two sedimentation tanks, in which each basin will have a capacity of 88,288 cu. ft. Since the rate of flow is 0.4 fpm and then the maximum permissible length of each tank would be 60 x 4 x 0.416 = 96 ft, considered the velocity of flow will be 0.416 fpm which is satisfactory. The cross sectional area will be $\frac{88288}{96} = 920$ sq. ft. A width of 77 ft. and depth 12 ft the capacity of each tank will then be 77'x96'x12' = 88,704 cuft. 2 Units will be required.

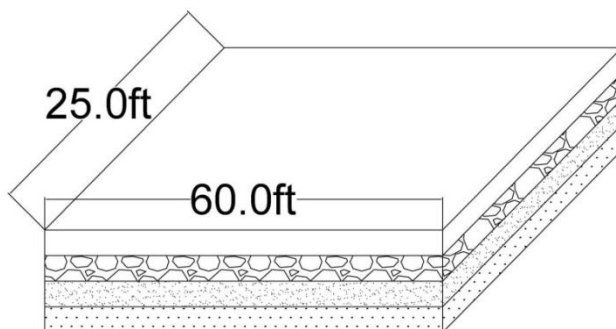
Figure 2-2: Typical Dimension of Sedimentation Tank UnitFilters

- Plant Capacity 50000m³/day

Since the flow is 9,170 gpm and the rate of filtration is 2 gallon/ sq. ft of filter area the required filter area is $\frac{9170}{2} = 4,585$ gallon/sqft. Every filter plant should have at least three filtering unit and if three

unit are provided in this plant the minimum area of each unit will be $\frac{4585}{3} = 1528$ sq. ft.

For purpose of design it will be assumed that a filter unit wash, drained and return to service in 15 minute which is about 3% of 8 hrs run. Since not more than one filter will be washed in any one day, it may be assumed that all three units will be out of service only $\frac{3}{3} = 1$ % of the time and the surface area of the filters should be about 1% greater than that required for full time operation. Therefore 1,512 sq. ft represents 99% of the required area of the filter unit. If each unit is made 60x 25 = 1,500 sq. ft, this is slightly less than the required area which may be taken into consideration.

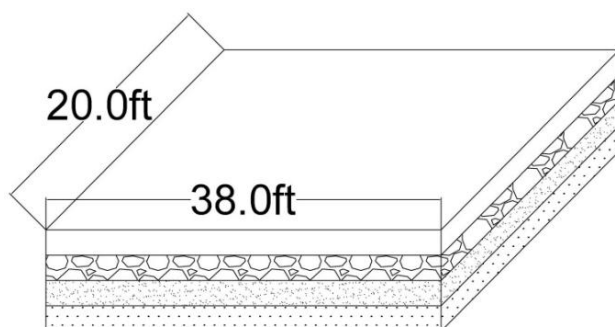
Figure 2-3: Typical Diagram of a Filter Basin

- Plant Capacity 30,000m³/day

Since the flow is 4,583 gpm and the rate of filtration is 2 gallon/ sq. ft of filter area the required filter area is $\frac{4583}{2} = 2,291$ gallon/sqft. Every filter plant should have at least three filtering unit and if three unit are provided in this plant the minimum area of each unit will be $\frac{2291}{3} = 764$ sq. ft.

For purpose of design it will be assumed that a filter unit wash, drained and return to service in 15 minute which is about 3% of 8 hrs run. Since not more than one filter will be washed in any one day, it may be assumed that all three units will be out of service only $\frac{3}{3} = 1\%$ of the time and the surface area of the filters should be about 1% greater than that required for full time operation. Therefore 764 sq. ft represents 99% of the required area of the filter unit. If each unit is made $38 \times 20 = 760$ sq. ft, this is nearer to 764 sq. ft. which may be taken into consideration.

Figure 2-4: Typical Diagram of a Filter Basin



Clear Water Reservoir

A clear water reservoir should be constructed after the filter bed. It may be rectangular or circular having a capacity of 50,000 m³ of water (for water supply treatment plant of total 280,000 m³/day capacity). The pipe gallery should be placed between the filter or at the end of the filter bed and connected to clear water reservoir. From clear water reservoir the delivery pipe will deliver water through pumping system to the distribution network directly or to the elevated tank for supply to the basement of the customer.

Back Wash Water Tank

Washing to filters require 15 gpm per sq. ft. If for this surface area i.e. $1500 \times 15 = 22,500$ gpm of water is required for 50,000 m³/day capacity plant and for 30,000 m³/day capacity plant the required water for back wash water tank will be $760 \times 15 = 11,400$ gpm. The wash water should not enter the filter with a velocity greater than 10 fps and the pressure at the strainer should be about 15 psi. This is equivalent to 35 ft of head. Thus the wash water tank in which the low-water level should be 40ft above the filter will provide satisfactory pressure. The wash water tank must have a capacity of at least $0.04 \times 4,402,603 = 176,104$ gallon tank (50,000 m³/day WSTP) and $0.04 \times 2,201,300 = 88,852$ gallon tank (30,000 m³/day) may be used or this amount of water to be pumped out from the clear water reservoir. Since the low water level of the wash water in the tank is to be 4' above the water surface in the filters, the tank will have to be mounted on supports. An elevated tank of standard type will be provided.

3. ON & OFFSITE INFRASTRUCTURE REQUIREMENT

The design concept, principle and costs are shown in the following sections. All the construction costs have been derived from the latest cost schedule of LGED and PWD. It is common practice in Bangladesh to obtain estimation.

3.1. Preparation (Land Clearing, Dredging and Grading)

The development area is basically flat and simple clearing work might be necessary. It is assumed that surface soil is stripped by 30cm. According to the topographical analysis (section 3.1.3), the designed elevation for soil grading is supposed to be EL+8.0m. This finishing elevation will be adjusted by clearing and levelling. Dredging is necessary for filling the existing water pond and finishing up to the designed level. In order to expand the area close to the coal based fire power plant, land reclamation is necessary by dredging.

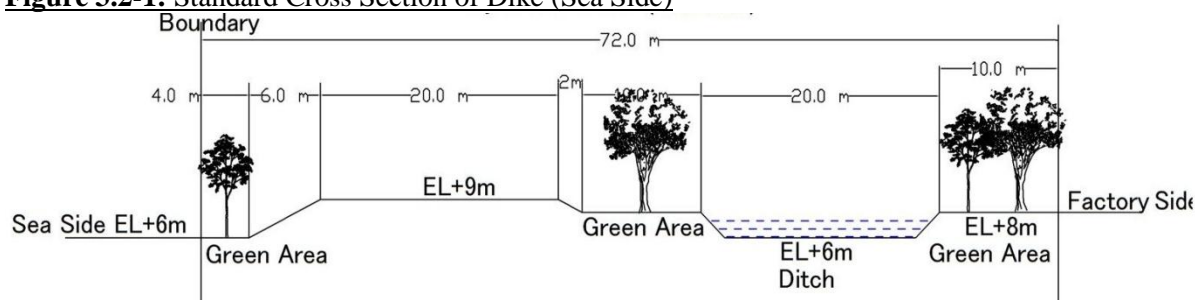
3.2. Dike/Embankment System (Sea Side)

The dike is necessary to block the high waves from the Bay of Bengal. According to the site assessment in Section 3.1.6.3 the past maximum sea wave height is 6m. Since the existing ground elevation is between EL+4m ~ EL+10m, the finishing elevation of the economic zone is designed as EL+8m which is 2m higher than the past maximum sea wave height. There are forestry areas between the sea and the economic zone and this increases the safety of the zone. In order to protect the whole economic zone from an unexpected sudden high wave, the top elevation is designed to be EL+9m with standard earth fill type dike.

To justify this design, the embankment of the Chittagong Export Processing Zone was investigated. The Chittagong Export Processing Zone built the dike with the average height of 6m after the heavy cyclone attack in 1991 and since then no inundation happened.

The dike is embanked by the excavated soils from the ditch in order for the soil volume to be balanced. The excavated soils from retention pond will also be used. In the case of shortage of available soils in the economic zone, high quality soils have to be imported from outside. The sea side slope should be 1:5 and the other side can be 1:2. A wide width of ditch is necessary to discharge the rain water. Two lanes of road are planned on top of the dike.

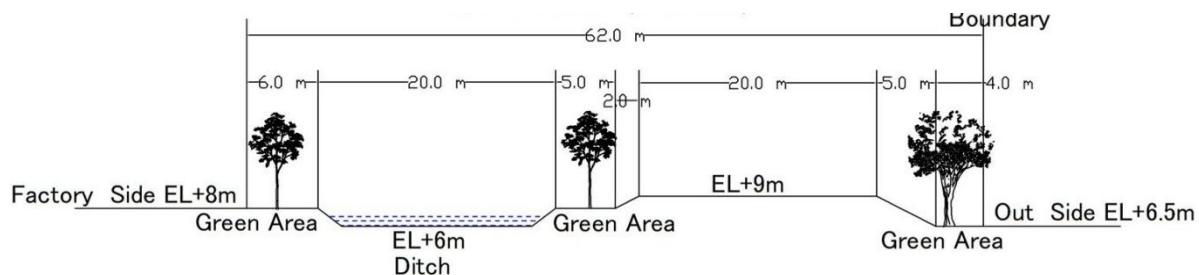
Figure 3.2-1: Standard Cross Section of Dike (Sea Side)



3.3. Dike/Embankment (Inner Side, On-site)

Since this side does not have the storm surge wave, the top elevation of the dike is designed to be +9m. The slope of both sides is 1:2. Four lanes on the road are planned on the dike. The cross section is shown.

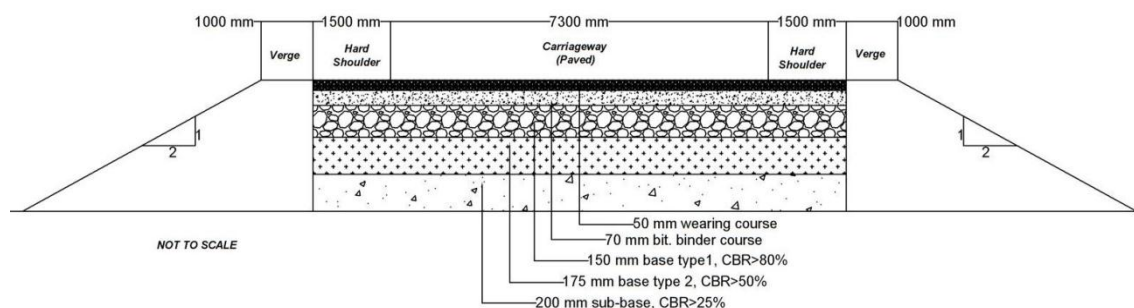
Figure 3.3-1: Standard Cross Section of Dike (Inner Side)



3.4. Road on Top of Dike (Sea Side)

The road on top of the sea side dike will be a 2-lane with 8 m carriageway width. Truck trailers are expected to ply the road for carrying material for industries, power plant etc. located inside the EZ (refer to figure 3.3.1-1 for transportation network for Mirershorai EZ). This road will be used by trucks, trailers of the industries and the power plant located inside the EZ.

Figure 3.4-1: Cross section of proposed road on top of dike (2-lane)



3.5. Road on Dike (Inner Side)

This road will be a 4-lane highway. It will be the main road connecting the EZ with the proposed two access roads and is expected to be the direct road to connect Mirershorai EZ with Chittagong Port via Sitakunda. The cross section of this road and access road 1, 2 connecting EZ with Highway will be the same and given in figure 3.3.1-1 of the report.

3.6. Protection on Sea Side at Jetty

The dike is not proposed along the seafront near the proposed jetty. This part will be protected by sheet piling. The drawing is provided below.

Figure 3.6-1: Section and Elevation of Sheet Pile

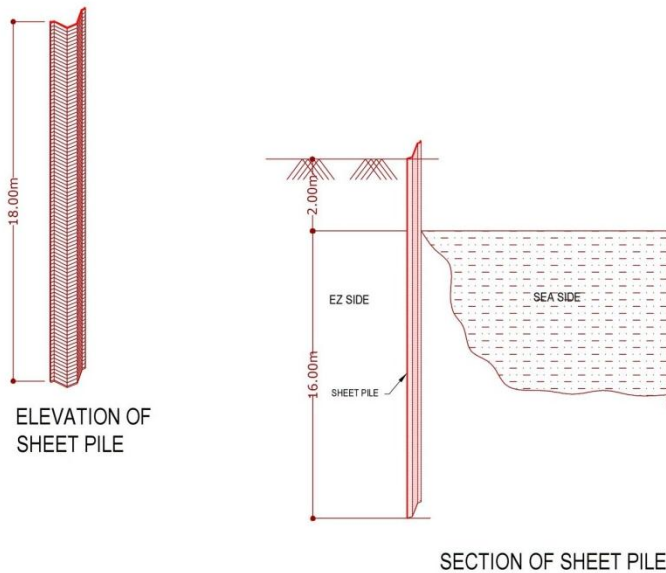


Figure 3.6-2: Sectional Plan of Sheet Pile

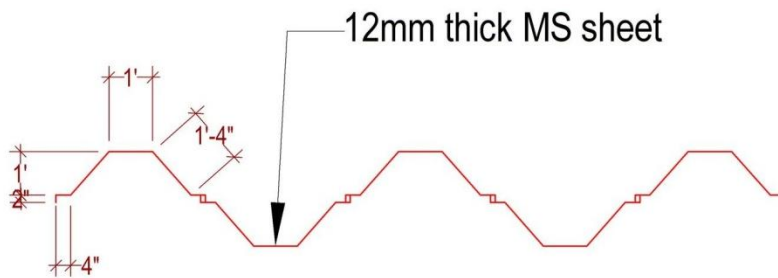
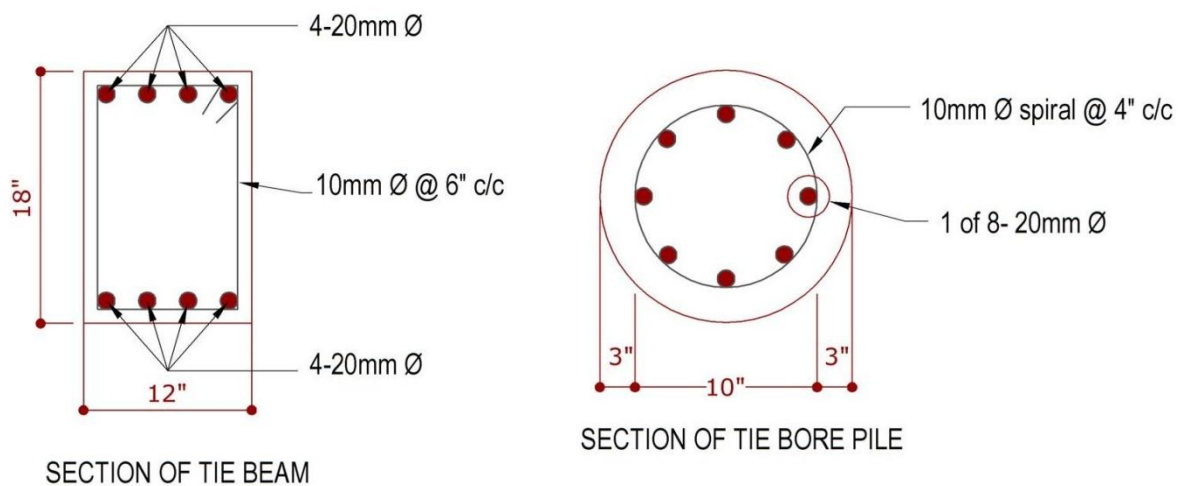


Figure 3.6-3: Cross Section of Bored Pile and Tie Beam Showing Reinforcement

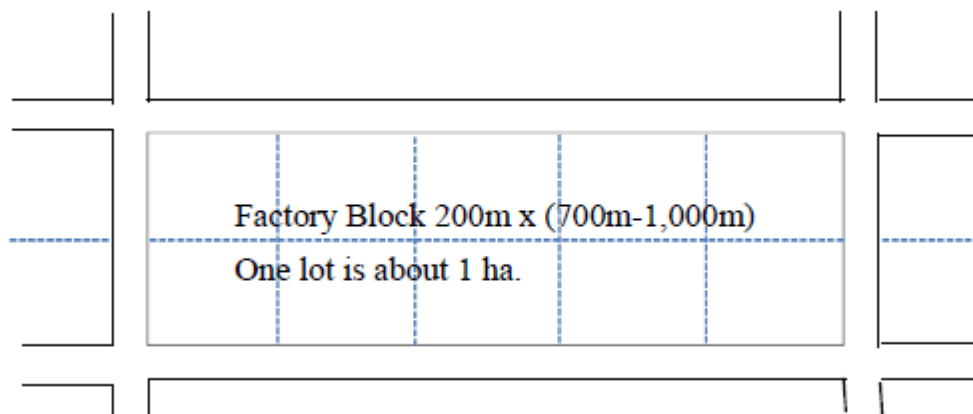


3.7. Road Network Inside the Economic Zone

A concrete surface road is selected for the internal road in the Economic Zone in terms of resistance against heavy rain and heavy truck load which is very common in economic zones. Two types are selected for the road network design; main Road (width: 33m) and minor Road (width: 19.5m). The main road is divided by the central median. The carriageway of each direction of traffic is 7.50 m. (3.75 m. per lane) with 2.50 m. shoulder. A 5.00 m. sidewalk is also provided on both sides of the

road beyond the shoulder. Plants are provided on the median and street lightings are provided on the median of the main road. The minor road is supposed to be an undivided 2-lane type. The carriageway of each direction of traffic is 3.75 m. with 2.50 m. shoulder. The 3.50 m. sidewalk is to be also provided on both sides of the road beyond the shoulder. Street lightings are to be provided on both sides of the sidewalk. The cross section of the main and minor road is shown in the following figures. The main road is planned from the entrance crossing into factory plots in the industrial zone. The road network is designed surrounding the factory lot block by approximately 200m x 700m for the minor road sections and 200m x 1,000m for the main road sections, on average, to optimize the traffic flow.

Figure 3.7-1: Standard Factory Block and Road Network



The typical road cross section is shown.

Figure 3.7-2: Typical Cross Section of Main Road

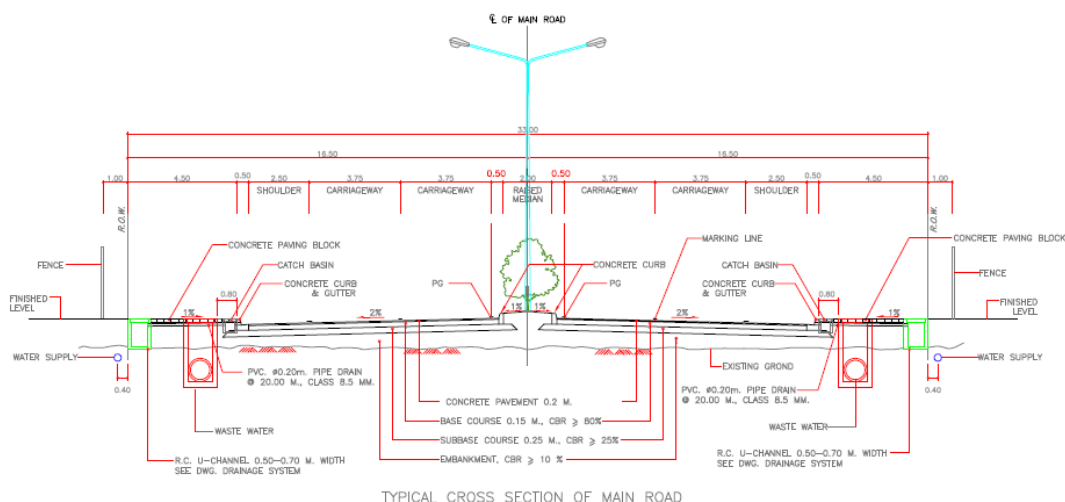
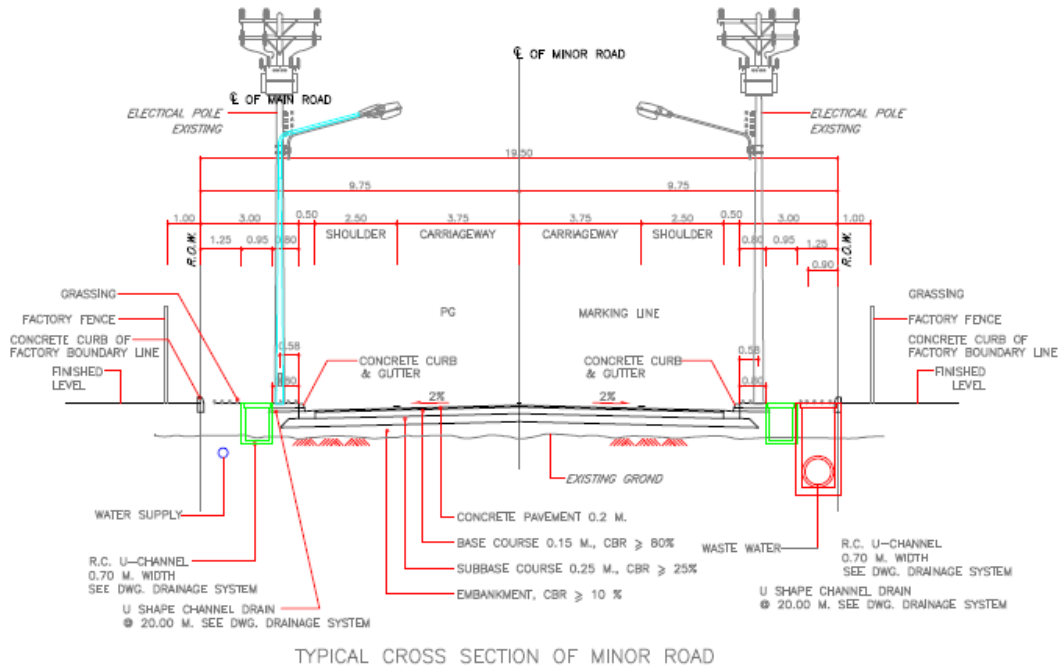


Figure 3.7-3: Typical Cross Section of Minor Road



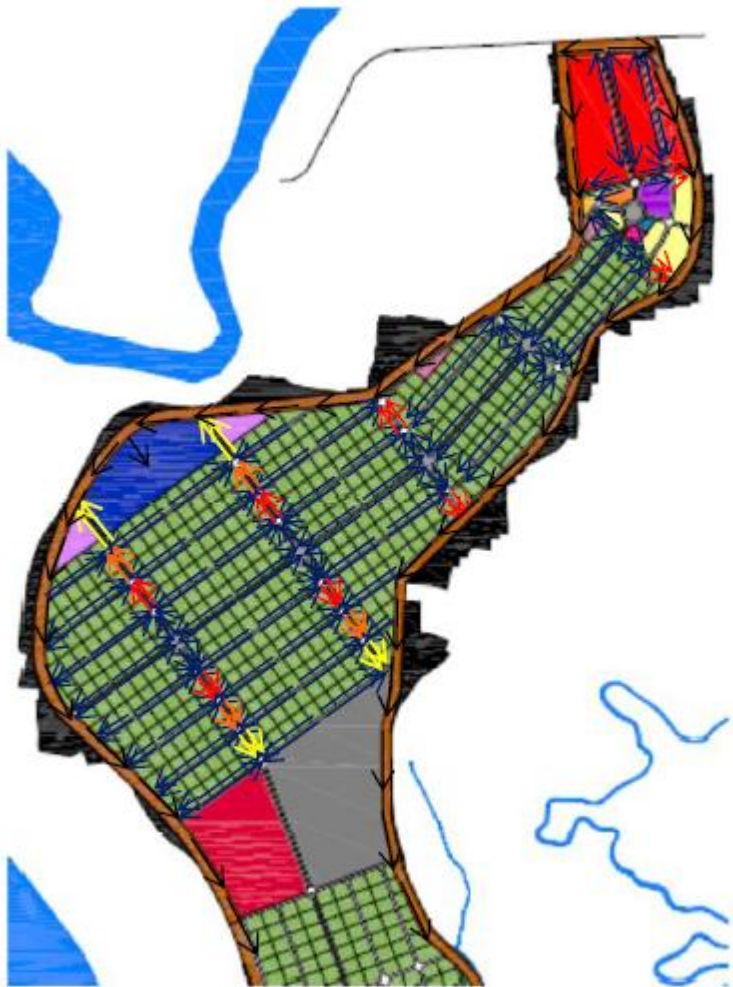
The construction costs of road work of each phase are summarized.

3.8. Drainage System

The rain discharging flow has been designed using the engineering analysis shown in Section 1 of Annex-3. As a first step, rain fallen on the ground and factory roofs is expected to flow into the u-channel along the road. Next, the rain water flows into the ditch along the dike. Finally, the rainwater flows into the retention pond and flows out to the sea. The flow system and dimensions of the u-channel drain are shown in the following Figures.

Figure 3.8-1: Drainage System

Phase 1



Phase 2 & 3



3.9. Water Supply System (Connection and Plant Design in EZ)

3.9.1. Standard of Water Supply

The following table shows the standard for industrial water in Bangladesh.

Table 3.11.1-1: Water Quality General Standard for Industrial Water

No.	Item	Unit	General Standard in Japan	General Standard in Bangladesh
1	Turbidity	NTU	20	
2	pH		6.5 – 8.0	6-9
3	Total Alkalinity	CaCO ₃ mg/L	75	120
4	Total Hardness	CaCO ₃ mg/L	120	500
5	Iron	mg/L	0.3	1.0
6	Mn	mg/L	0.2	5.0
7	Evaporation residual substance	mg/L	250	
8	Ion Chlorine	Cl ⁻ mg/L	80	600
9	Total Coli form	Count/100mL	0	
10	Arsenic	mg/l	0	0.05

No.	Item	Unit	General Standard in Japan	General Standard in Bangladesh
11	BOD	mg/l		50

Table 3.11.1-2: Water Quality Standard for Drinking Water

Test			WHO	Cambodia	Bangladesh
No.	Parameter	Unit			
I	Basic Measurement				
1	Color	TCU	‘1/15	‘1/5	15
2	Temperature	°C			20-30
3	Conductivity	μs/cm	400	1500	
4	pH		6.5 – 8.5	6.5 – 8.5	6.5-8.5
5	Turbidity	NTU	5	5	10
6	Suspended Solid	mg/l	1		10

3.9.2. River Water Intake and Connection

River Intake:

For extraction of good quality of water the river intake should be placed at a distance from habitation, so that less contamination of river water occurs and less turbid and suspended solid free water may be available.

The surface water contains organic and inorganic impurities. Both types of impurities may be in the form of suspended, colloidal and dissolved forms. Water analysis is to be carried out to ascertain various types of impurities present in it. It is the analysis of water which provides the outline for treatment of water. Analysis of the water which will show what types of impurities and to what extent they are present in water and what units are necessary. If the water level between the summer and the rainy season is too large and the river becomes almost dry in summer, work should be started by constructing a small weir across the river. When the level of the water in the river is fairly constant and the river bank is steep, the intake work can be constructed adjacent to the bank. In this case water is drawn from the river through a pipe laid horizontally.

The following points should be considered in the location of –

- Water intake should be located in a place where there no fast current which may endanger the intake causing interruption of the water supply.
- The ground near the intake should be stable. A straight section of the river is always preferable as the risk of erosion of the bank in this case in minimum.
- Approach to the intake should be free from obstacles.
- The intake should be well below the surface of the river for receiving colourless/clear water and for preventing the entry of floating matter. To prevent the entry of suspended matter near the bottom, the in-let point should also be well above the bottom of the water body.
- To avoid possible contamination of the bank, the intake should be located at some distance from the bank.
- The intake should be located on the upstream of the town.

The main current, lowest water level in the river and navigation facilities should be considered in locating intake. A curtain wall may be constructed for diverting water into the intake structure at the bank in order to draw clear water from the stream. The intake structure and course and fine screens

should be provided so that floating matter may not enter the supply system. Considering the fluctuation in water level, the intake is provided in the well at various levels.

Since the quality of water varies from source to source and also season to season, it is absolutely essential to take daily samples and for analysis to be carried out. The river intake and treatment plant should be set in such a way that can be run from time to time according to the demand.

It is suggested that the location of the water supply treatment plant should be chosen as close as possible to the river intake. This will avoid the clogging of the transmission main by the sedimentation of raw water. But as there is no space available near the river intake site, the water is to be transported to the site using the transmission main and then treated.

3.9.3. Basic Design of Water Supply Treatment Plant in EZ

Water Treatment

Water available from various sources contains various types of impurities. The raw water available from various sources cannot be used unless it is made safe for the purpose. The object of treatment of water is to eliminate all such impurities which cause troubles and make water unsafe. All the harmful impurities need not be fully eliminated, but should be reduced to such an extent that water becomes suitable for the intended use. Therefore, the nature of treatment to be given to raw water depends upon the initial quality of raw water and the desired degree of purity to be attained after treatment.

Impurities in Water

The impurities in water may be physical, chemical and bacteriological. Physical impurities which give colour, taste and odour, are the least important, though they assume importance from the point of view of the consumers. The chemical impurities may be either inorganic or organic. The bacteriological impurities are the most important from the public health point of views. The presence of the pathogenic variety of E. coli bacteria makes water unfit for human consumption.

Objectives of Treatment

The objectives of treatment processes are to remove all the undesirable impurities, to the extent where they do not cause any trouble to human health and water is available to the consumers as per health standards. The following are the objectives.

- (i) To remove colour, dissolved gases and murkiness of water.
- (ii) To remove objectionable taste and odour from the water.
- (iii) To kill the troublesome bacteria.
- (iv) To eliminate the corrosive and tuberculation properties of water. This treatment is essential from pipes, pipe fittings safety point of view.
- (v) To make water safe for drinking and domestic purposes and also for various industrial purposes like brewing, dyeing, steam boilers etc.

Treatment Process

Treatment processes are given below. It is not essential that all these processes will have to be employed at all the places, but it depends upon the quality of the raw water. In the case of raw water, obtained from rivers, aeration is generally not required. Similarly, in the case of water obtained from lakes, screening and sedimentation are not required because suspended and floating debris have already settled in the lake basin. But aeration is a must because lake waters generally have an objectionable odour. If raw water is obtained from deep wells, practically no treatment is required. Only disinfection may be needed before it is supplied to the consumers. Therefore, the character and degree of treatment directly depends upon the nature of water or in other words on the source.

1. **Screening:** It is used to exclude floating matter. This is accomplished just at the intake.
2. **Aeration:** This process is employed, where elements causing taste and odour have to be removed.
3. **Plain Sedimentation:** In this process suspended impurities like silt, clay and sand etc. are removed.

4. Sedimentation with coagulation: Fine suspended particles and some bacteria are removed.
5. Filtration: This process is employed to remove very fine particles and colloidal matter which may have escaped from sedimentation processes. Micro-organisms are also removed largely.
6. Disinfection: To render water safe against disease producing bacteria.
7. Other process: There are some processes which are used in some specific cases only.
 - (i) Removing hardness if it is beyond permissible limits.
 - (ii) Removing colour taste and odour if any.
 - (iii) Removing iron and manganese if present.
 - (iv) Maintaining fluorides between 1 to 1.5 ppm. By adding if in deficiency and removing if in excess.

Methods of Treatment

There is a whole list of treatment processes involved in the treatment of water. The sole aim of treatment of water is to render it safe for domestic and other purposes. There is no hard and fast rule in regard to the sequence of various treatment units in a water treatment plant. It actually depends on the nature of the raw water and the desired standard of treated water. All the treatment processes are not necessarily always required. For example, if raw water is being taken from a deep well, it will not require any treatment except disinfection or possibly softening along with disinfection. Similarly water obtained from a river requires treatments like screening, sedimentation, filtration and disinfection, but not aeration, softening etc. Lake water does not require screening and sedimentation, but may require aeration, coagulation, filtration and disinfection.

If ground water or surface water sources are well protected and turbidity of water is less than 10 JTU and the water is also free from odour and colour, plain disinfection by chlorination is considered adequate, before water is supplied to the consumers.

Where ground water contains excessive iron, dissolved CO₂ and odorous gases, aeration followed by flocculation and sedimentation, rapid gravity or pressure filtration and chlorination may be necessary. In case it contains only CO₂ or odorous gases, aeration followed by disinfection may be sufficient. If surface water contains turbidity not more than 50 JTU and where sufficient space is available, plain sedimentation followed by slow sand filtration and disinfection may be adopted.

Conventional treatments including pre-chlorination, aeration, flocculation and sedimentation, rapid gravity filtration and post-chlorination are adopted for highly polluted surface waters, laden with algae, or microscopic animals. Water with excessive hardness needs softening followed by rapid sand filtration and post-chlorination. For the removal of dissolved solids, de-mineralization by ion exchange may form a part of the domestic or industrial water treatment units.

Location of Treatment Plants

The correct location of the treatment plant plays a very important role in its success. Location of the treatment plant depends, to a great extent, on the relative position of the source of water. As far as possible, treatment plants should be located in a place from where water can be easily distributed. By such location, the treated water reaches the consumer immediately and chances of its contamination during transmission are reduced. Loss of head is also reduced and water at the top becomes available at more head. However, if the area is located near the bank of the river, the treatment plant should be located near the source. This will reduce the length of the rising main, in which wear and tear due to muddy water may be more.

If the source of the water supply is a tube-well, practically no treatment is required. However, if plant has to be set up for removal of hardness or for disinfection purpose, it should be located in the central area of the project. If the project area is quite large, water cannot be supplied from one tube well, the area may be divided into zones and each zone provided with a separate tube-well or well field system

with all the necessary treatment plant attached to it, but there should be inter connection in between them.

Layout of Treatment Plants

A complete water treatment plant consists of:

- (i) Intake works including pumping plant.
- (ii) Plain sedimentation.
- (iii) Sedimentation with coagulation.
- (iv) Filtration.
- (v) Disinfection.
- (vi) Pure water storage reservoir.
- (vii) Pumping plant for pumping purified water from clear water storage reservoir to the elevated service reservoir.
- (viii) If water is hard, sometimes, softening plant is used, before the filtration plant.
- (ix) Distribution system.

Around 30 acres of land will be required for construction of a complete water treatment plant.

While planning the layout of the treatment plant, the following points should be considered:-

1. All the processes should be located in such a sequence that water may be flowing from one process to the other, automatically.
2. Elevations of different processes should be such that no pumping is required and water keeps on flowing from one plant to the other, but for houses and flats pumping are necessary.
3. All the plants should be located in such a way that a minimum area is covered by it. Adequate place should remain available for future extension.
4. Residential areas should be located by the side of the water works. This facilitates better working and control of the different processes.
5. A well established laboratory should be located at the site, so that the quality of water may be checked, before treatment and after treatment. Turbidity, test for solids, hardness, pH values, chlorides, biological tests etc. can be carried out in the laboratory. Even research work may also be undertaken in order to suitably modify any process.

Quality of Water

Wholesome Water-It is not possible to find absolutely pure water in nature. Pure water is that which contains two parts of hydrogen and one part of oxygen (H₂O) and nothing else. Water drops just emitting from the clouds, may be considered pure water. But as the drops fall, certain gases are dissolved in it and make water impure. After falling over the ground, the water starts flowing, during which it dissolves certain minerals and salts and thus water becomes more and more impure. If this water, before being supplied to the consumer is to be completely purified, it will require a very exhaustive treatment. Absolute purification of water is not required, because certain dissolved salts are good for health and make water taste good. By purification of water, we mean that only those impurities which are not good for health are to be removed. Harmless impurities and some useful impurities are not to be removed during treatment. Water which does not contain harmful impurities and does contain other salts and impurities, either good for health or not harmful, is called potable or wholesome water. The degree of purity of water also depends upon its use. The purity of water required for civic purposes may not be enough for the water used in domestic purposes. Therefore, the term 'pure water' is a relative term and it has to be interpreted in relation to its use. The concept of pure water, potable water, or wholesome water, in relation to its various uses is described below:

1. Domestic Use: the degree of purity required for this purpose is highest in relation to other uses of water. Water for this purpose should be free from suspended impurities, dissolved harmful salts and disease producing bacteria. Water should not be very hard, but some hardness is tolerable.
2. Civil uses: water requirements for this purpose are large and the nature of use of water is such that any degree of impurity of water will do. But water mixed with waste and other refuse cannot be tolerated. Purified effluent from waste treatment plants which is more or less pure water, may be tolerated for this purpose. In other words, the water having a large amount of suspended and dissolved impurities may be allowed for this purpose.
3. Trade use: purity of water for this purpose depends upon the nature of trade. For example, water required for laundry should not be hard, but if required in stables for cattle etc., it may contain impurities.
4. Commercial use: for this purpose water should be chemically pure. Various manufacturing units require absolutely pure water because even a slight amount of impurity may considerably influence the final product. The nature of water required by different factories may be so variable that normally, factories install their own water supply plants, suiting their requirements.

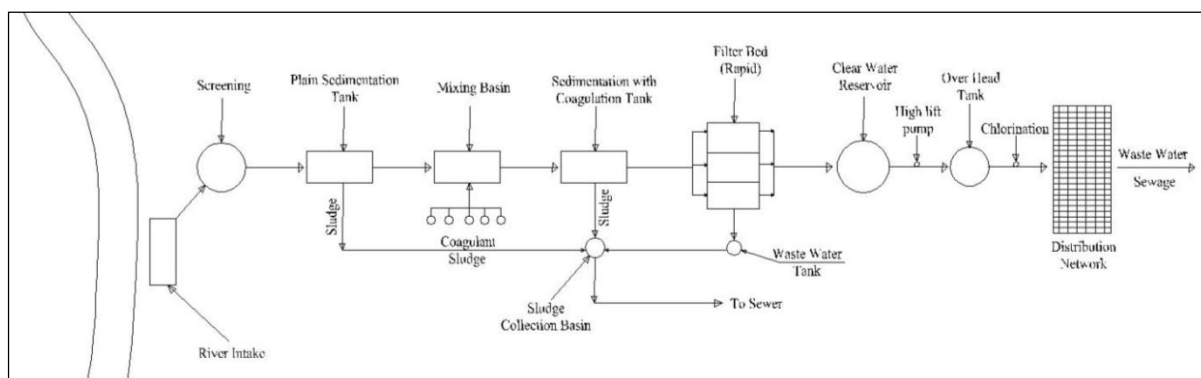
The following are the requirements of potable water for domestic use:

- (i) It should be free from disease producing bacteria.
- (ii) It should be colourless, odourless, and clear.
- (iii) It should be tasty.
- (iv) It should not corrode pipes and other fittings.
- (v) It should be free from harmful salts and other objectionable matter.

Design of Water Supply Treatment Plant

The total volume of demand for water is 274,942.67 m³/day. Capacity of WSTP is 280,000m³/day.

Figure 3.11.3-1: Diagrammatic Sketch (Flow Diagram) of Typical Water Supply System



Rainwater

Bangladesh is a tropical country and receives heavy rainfall due to north-easterly winds during the rainy season. Rainwater can be a potential source of water supply in Bangladesh. In the coastal districts, particularly in the offshore islands of Bangladesh, rainwater has been used for drinking purpose since time immemorial. The protected ponds annually replenished by rainwater are a main source of water supply in the coastal area. Since various uses and unhygienic practices pollute these ponds, rainwater harvesting can be an alternative option for good quality water supply. In some areas having a high salinity problem, as many as 36% of households has been found to harvest rainwater in the rainy season for drinking purposes. But the collection, storage and use of rainwater are not organized and need development through adoption of appropriate technologies.

The average yearly rainfall in Bangladesh varies from 2,200 to 2,800mm, 75% of which occurs between May to September. The highest rainfall occurs in the eastern part of Bangladesh, including the eastern part of the coastal area and highest rainfall occurs in the north-eastern region of the country. The low rainfall, less than 1,500 mm, occurs in the western part of Bangladesh. The coastal and hilly area with high source problem intensity lies in the high rainfall areas. The high rainfall intensity in these difficult areas provides good opportunity for rainwater harvesting. The unequal monthly rainfall distribution over the year indicates that a water supply system completely based on rainwater requires large rainwater storage reservoirs.

3.10. Water Supply System (Distribution Design in EZ)

Demand Forecast of Water

The maximum total water demand (274,942.67 m³/day) is estimated.

Water Supply Station

The water supply system has two functions. One is water supply treatment plant and the other is the water distribution network. River water is selected as the main water supply source. At the water intake station, the river water is pumped in and cleaned by passing the water supply treatment plant.

Water Distribution Networks

Water Distribution Networks deliver water to each factory along the roads, coming through the tower and tank at several places built inside the zone. The treatment system is composed of the following:

- River water intake
- Reservoir
- Treatment Plant
- Tank and Tower
- Distribution Pipe Network

A gravity feed system will be used to supply water to the water supply pipe line located along the footpath of the road inside the Project. The size of main water supply pipe will be from 150 mm. – 350 mm. and water supply pressure is in the range of 1.0 – 3.0 bars. Main water supply pipe will be of high density polyethylene (HDPE) if available, to avoid corrosion as well as breaking in the future.

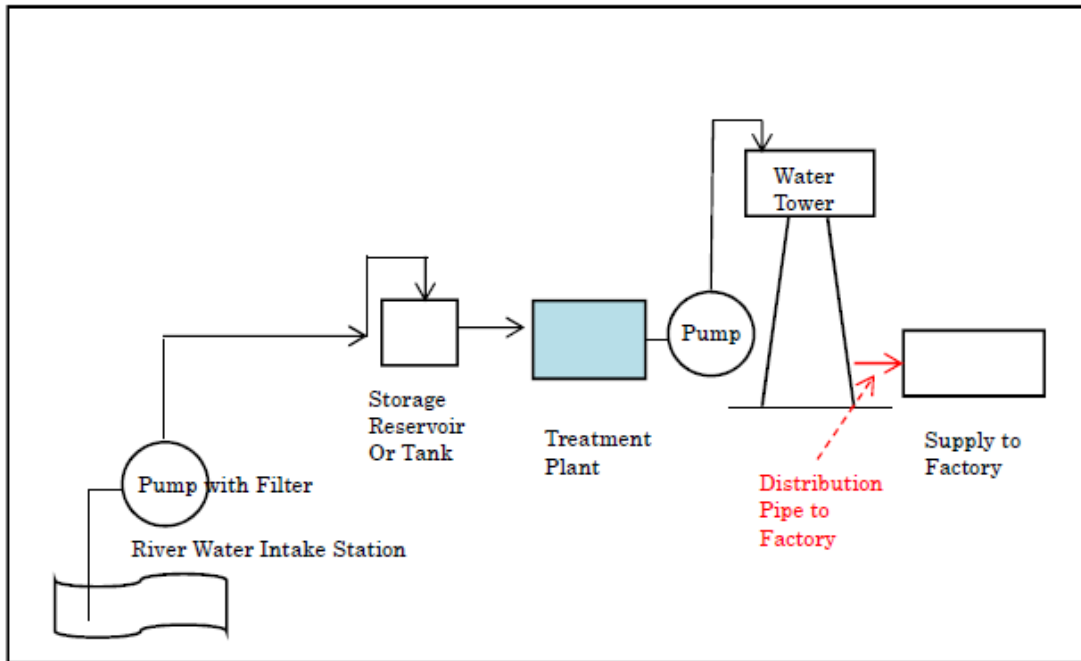
Fire Protection System

For the fire protection system, besides a fire station and a fire truck, fire hydrants will be provided along the project roads at intervals of approx. 200 metres or according to the local standard to supply water in case of fire protection need.

Basic Concept Drawing of Water Supply System

The basic water supply system is shown in the following figures.

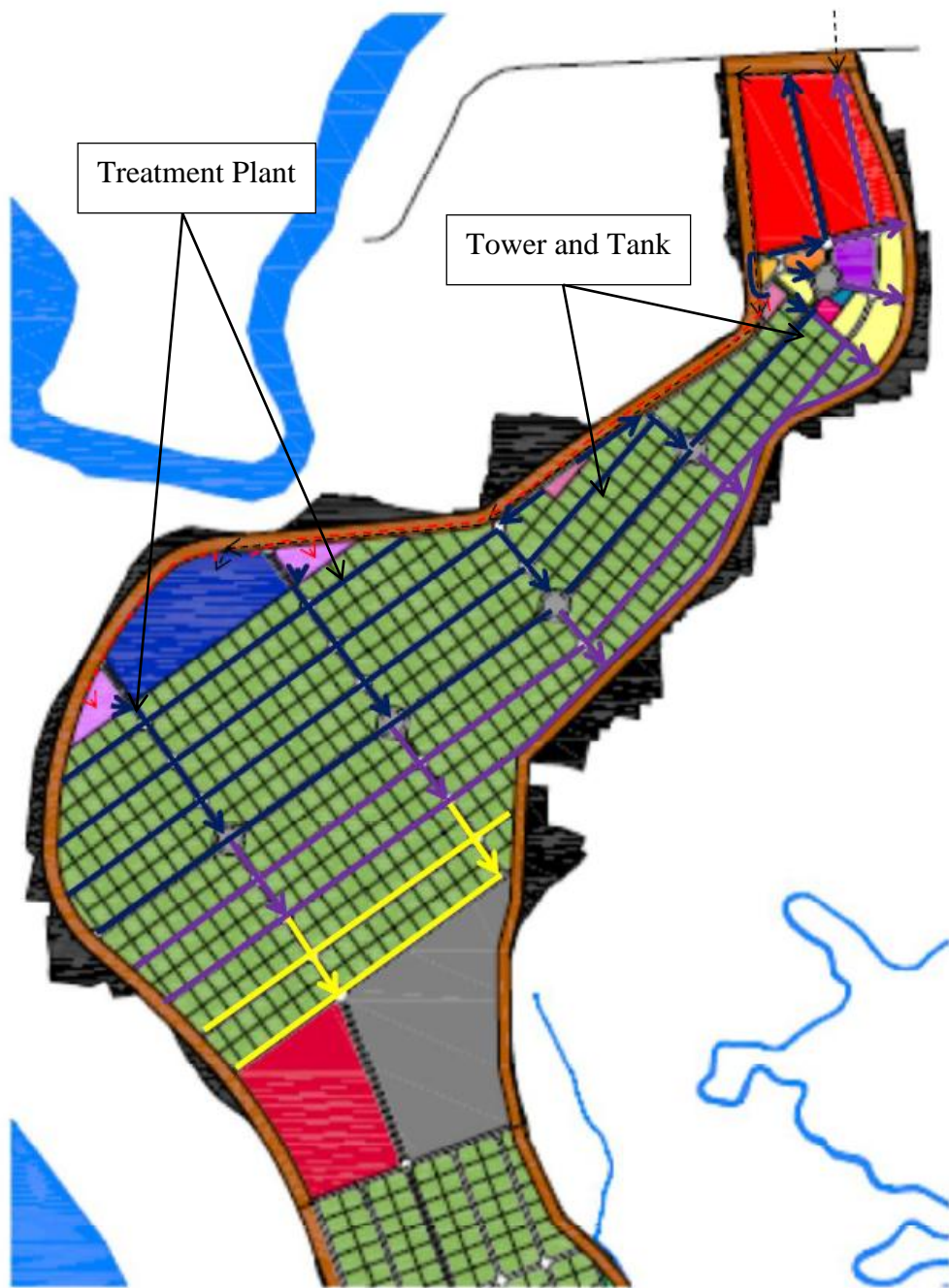
Figure 3.12-1 : Diagram for Water Supply System



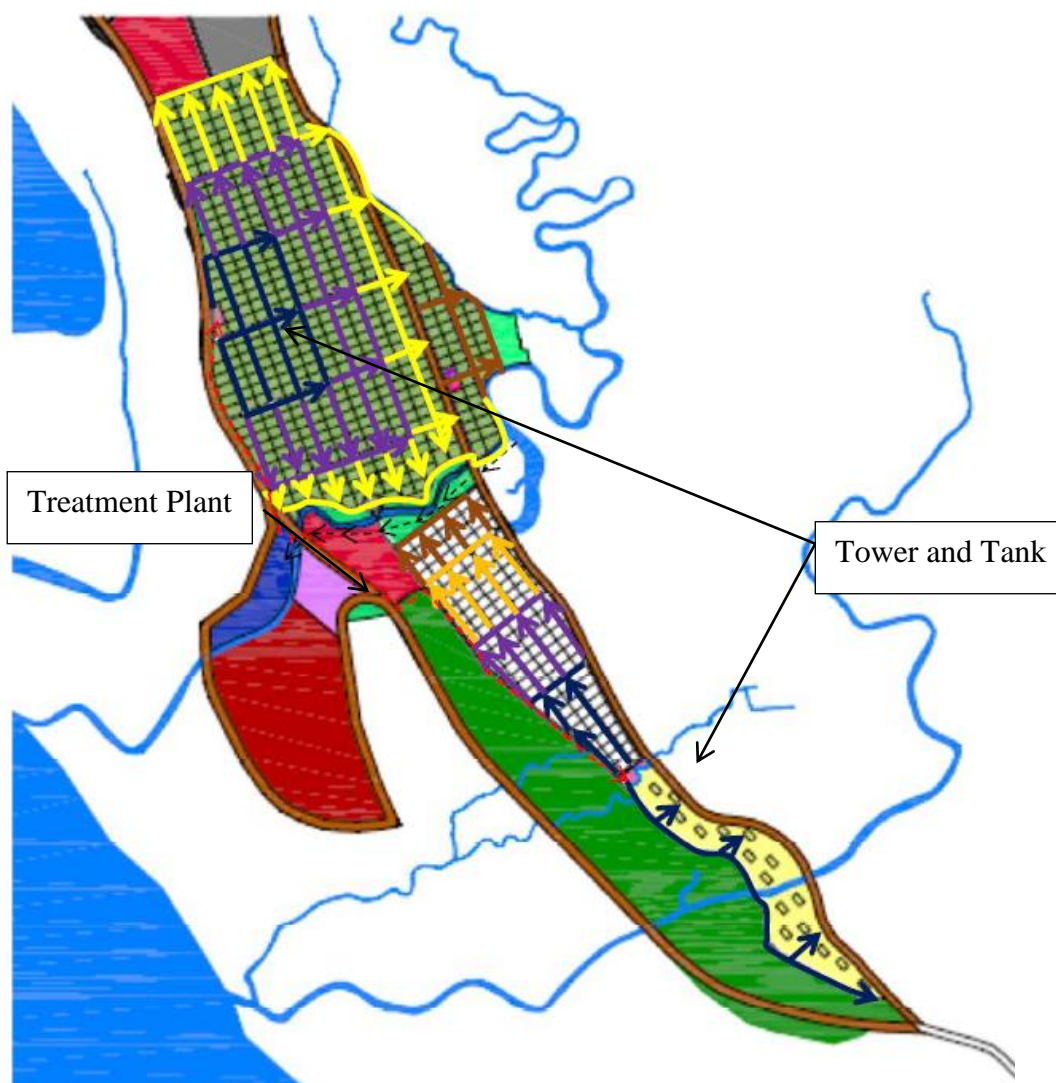
The supply system and cost estimates of the pipe network are shown in the following figure.

Figure 3.12-2: Water Supply Distribution Network

Phase 1



Phase 2 & 3



3.11. Waste Water and Sewage Treatment System

3.11.1. Standard of Waste Water

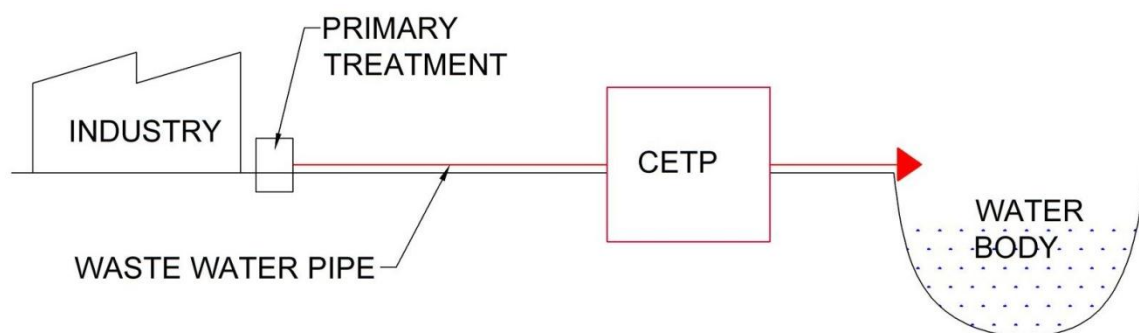
Table 3.13.1-1: Waste Water Effluent Standard

Sl. No	Parameters	Unit	Cambodia		Bangladesh
			Allowable limits for pollutant substance discharging to		
			Protected public water area	Public water area and sewer	
1	Temperature	°C	< 45	< 45	40
2	pH		6 – 9	9-May	9-Jun
3	BOD5 (5 days at 200 C)	mg/l	< 30	< 80	250
4	COD	mg/l	< 50	< 100	400
5	Total Suspended Solids	mg/l	< 50	< 80	150
6	Total Dissolved Solids	mg/l	< 1000	< 2000	2100
7	Grease and Oil	mg/l	< 5.0	< 15	10
8	Detergents	mg/l	< 5.0	< 15	
9	Phenols	mg/l	< 0.1	< 1.2	1

Sl. No	Parameters	Unit	Cambodia		Bangladesh
			Allowable limits for pollutant substance discharging to		
			Protected public water area	Public water area and sewer	
10	Nitrate (NO ₃)	mg/l	< 10	< 20	10
11	Chlorine (free)	mg/l	< 1.0	< 2.0	
12	Chloride (ion)	mg/l	< 500	< 700	600
13	Sulphate (as SO ₄)	mg/l	< 300	< 500	400
14	Sulphide (as Sulphur)	mg/l	< 0.2	< 1.0	2
15	Phosphate (PO ₄)	mg/l	< 3.0	< 6.0	5
16	Cyanide (CN)	mg/l	< 0.2	< 1.5	2
17	Barium (Ba)	mg/l	< 4.0	< 7.0	
18	Arsenic (As)	mg/l	< 0.10	< 1.0	0.05
19	Tin (Sn)	mg/l	< 2.0	< 8.0	
20	Iron (Fe)	mg/l	< 1.0	< 20	2
21	Boron (B)	mg/l	< 1.0	< 5.0	2
22	Manganese (Mn)	mg/l	< 1.0	< 5.0	5
23	Cadmium (Cd)	mg/l	< 0.1	< 0.5	0.05
24	Chromium (Cr)+3	mg/l	< 0.2	< 1.0	1
25	Chromium (Cr)+6	mg/l	< 0.05	< 0.5	1
26	Copper (Cu)	mg/l	< 0.2	< 1.0	3
27	Lead (Pb)	mg/l	< 0.1	< 1.0	1
28	Mercury (Hg)	mg/l	< 0.002	< 0.05	0.01
29	Nickel (Ni)	mg/l	< 0.2	< 1.0	2
30	Selenium (Se)	mg/l	< 0.05	< 0.5	0.05
31	Silver (Ag)	mg/l	< 0.1	< 0.5	
32	Zinc (Zn)	mg/l	< 1.0	< 3.0	10
33	Molybdenum (Mo)	mg/l	< 0.1	< 1.0	
34	Ammonia (NH ₃)	mg/l	< 5.0	< 7.0	5
35	DO	mg/l	> 2.0	> 1.0	4.5-8.0
36	Polychlorinated Biphenyl	mg/l	< 0.003	< 0.003	
37	Calcium	mg/l	< 150	< 200	
38	Magnesium	mg/l	< 150	< 200	
39	Carbon tetrachloride	mg/l	< 3	< 3	
40	Hexachloro benzene	mg/l	< 2	< 2	
41	DTT	mg/l	< 1.3	< 1.3	
42	Endrin	mg/l	< 0.01	< 0.01	
43	Dieldrin	mg/l	< 0.01	< 0.01	
44	Aldrin	mg/l	< 0.01	< 0.01	
45	Isodrin	mg/l	< 0.01	< 0.01	
46	Perchloro ethylene	mg/l	< 2.5	< 2.5	
47	Hexachloro butadiene	mg/l	< 3	< 3	
48	Chloroform	mg/l	< 1	< 1	
49	1,2 Dichloro ethylene	mg/l	< 2.5	< 2.5	
50	Trichloro ethylene	mg/l	< 1	< 1	
51	Trichloro benzene	mg/l	< 2	< 2	
52	Hexachloro cyclohexene	mg/l	< 2	< 2	

3.11.2. Recommendation for Waste Water Discharge Standard

The waste water will be collected from the industries through a waste water pipe network. The industries will be liable to do preliminary treatment for their waste and maintain the recommended standard in table 3.12.2-1. The following figure shows the sketch for preliminary treatment and Waste Water Treatment Plant treatment system.

Figure 3.13.2-1: Proposed treatment system for waste water**Table 3.13.2-1: Recommended first and second level standard for the EZ**

Sl. No.	Parameters	Unit	First Level Standards for the Industries	Standards for CETP
1	Temperature	°C	< 45	40
2	pH		10	8-Jun
3	BOD5 (5 days at 20 °C)	mg/l	<50	< 30
4	COD	mg/l	< 50	< 30
5	Total Suspended Solids	mg/l	< 50	< 30
6	Total Dissolved Solids	mg/l	< 1,200	< 1,000
7	Grease and Oil	mg/l	<10.0	< 5
10	Nitrate (NO3)	mg/l	< 15	< 10
12	Chloride (ion)	mg/l	<600	< 500
13	Sulphate (as SO4)	mg/l	<400	<400
14	Sulphide (as Sulphur)	mg/l	<1	< 0.75
15	Phosphate (PO4)	mg/l	<5.0	< 3.0
16	Cyanide (CN)	mg/l	<1	< 0.75
18	Arsenic (As)	mg/l	< 0.10	<0.03
20	Iron (Fe)	mg/l	<3.0	< 1.5
21	Boron (B)	mg/l	<2.0	< 1.0
22	Manganese (Mn)	mg/l	<5.0	< 3.0
23	Cadmium (Cd)	mg/l	< 0.1	<0.05
24	Chromium (Cr)+3	mg/l	<1.0	< 0.5
25	Chromium (Cr)+6	mg/l	<1.0	< 0.5
26	Copper (Cu)	mg/l	<2.0	< 1.5
27	Lead (Pb)	mg/l	<1.0	< 0.3
28	Mercury (Hg)	mg/l	< 0.005	<0.002
29	Nickel (Ni)	mg/l	<2.0	< 0.5
30	Selenium (Se)	mg/l	< 0.1	<0.05
32	Zinc (Zn)	mg/l	<15.0	<10.0
34	Ammonia (NH3)	mg/l	<8.0	<5.0
35	DO	mg/l	> 2.0	> 7.0

3.11.3. Basic Design of the Waste Water Treatment Plant in the EZ

Before taking up the execution of the sewerage project proper planning is essential. The following points should be considered:-

- i) Size of the area, when congested open or well planned.
- ii) The streets and road are narrow, broad, straight etc. to be considered.
- iii) Whether general topography of the area.
- iv) To estimate of industries and population.

- v) Average water supply quantity should be needed because volume of sewage is directly proportional to the water supply quantity.
- vi) General standard of the population nature, type of industry should be noted.
- vii) Proximity of water courses including sea, river, lagoon etc. should be noted.
- viii) General climate, annual average rainfall, distribution of rain fall and general temperature should be noted.
- ix) Position of sub soil water level should also be known.
- x) Possibilities of expansion of industry as well as human.
- xi) Feasibilities of installing sewerage system.
- xii) System of waste to be adopted; system may be separated, combined a partially combined.
- xiii) Quantity of waste to be expected in each sewer line and then total quantity of Waste to be handled at the out fall point.
- xiv) Disposal of waste on land a by dilution can be decided.

For industrial areas having international importance, a combined system can be adapted. Where rainfall is evenly distributed throughout the year, combined system is more desirable.

In Bangladesh separate system are not used. In this system one sewer for sanitary industrial waste another for storm waste are to be provided. Installing two sewers is a costly affair. Usually, sanitary industrial sewers continue to work as designed, but storm water sewers come into use only during the rainy season. Even during the rains their working is doubtful, because in dry days people dump garbage and other waste in the storm sewer through the openings. This may block the sewer line.

The best course will be to build a sewer line for sanitary industrial waste only, but with suitable allowance for rain water. During the dry season there is no problem, but during the rains these sewers start flowing full and within a matter of hours, the whole accumulated storm water is disposed of. Accumulation for some time can be allowed because it is not dirty and does create problems.

If plenty of land is available, the best method of waste disposal is by irrigation. This method is very economical because it may give good returns form the irrigation of crops. If a big river is flowing by the side of the project area (For example Anwara) waste can be disposed in the river. If the situation demands, a treatment may be given to the waste before its disposal by dilution. In this case, the aquatic life needs to be considered.

The waste obtained from spent water in different industrial and commercial establishments is known as industrial Waste. The quality and the degree of foulness depend upon the nature of the industry and processes involved. The nature of this waste is different from the domestic w and sometimes has to be treated before allowing it to be discharged into public sewers.

Waste Disposal

Waste starts purifying after about four or five hours of its development. If waste is disposed of within this period, the treatment required will be relatively less exhaustive. Scientific disposal of waste will protect the health of the community and save it from bad smells, mosquitoes, obnoxious gases and other foul conditions. This will also reduce the danger of the spread of diseases such as typhoid, cholera, dysentery, diarrhoea etc.

Methods of Waste disposal can be classified as follows:

1. Natural methods :
 - (i) By dilution and
 - (ii) Land treatment
2. Artificial methods :
 - (i) Primary treatment and
 - (ii) Secondary treatment

In artificial methods of Waste disposal, waste is given treatment which may be only primary or exhaustive before discharging the effluent into natural waters.

Disposal by Dilution

The disposal of waste, by discharging into water courses such as streams, rivers or large bodies of water such as lakes, sea etc. is called the dilution method or simply dilution. This method of disposal is only possible where the natural water, in required quantity, is available nearby area. While discharging waste in the body of water, it should be ascertained that the water is not polluted to such an extent that it becomes unfit for any other use. The waste to be disposed of may be raw or partially treated.

The waste in due course of time gets purified by what is known as the self-purification capacity of natural waters. The limit of waste discharge and the degree of treatment of waste are determined by the capacity of self-purification of natural waters. The important factor in determining, whether or not dilution is sufficient, is the relationship between the organic loads due to waste.

Methods of Waste Treatment

Waste contains minerals and organic matters (1) in suspension (2) in the colloidal state and (3) in solution. Living organisms notably bacteria and protozoa find in the organic constituents of waste an abundant source of energy. The activities of the organisms result in the decomposition of the organic matter. Uncontrolled decomposition of waste renders waste offensive to the senses of smell and sight. The presence of disease producing organisms makes waste dangerous. Removal or stabilization of organic matters is accomplished in treatment works by a number of different operations or by a suitable combination of these operations into effective treatment processes.

Removal of settleable solids by screening, skimming sedimentation and chemical precipitation filtration, stabilization of putrescible matter in suspension and sludge treatment is called primary treatment.

Further removal of solids with the aid of living organisms is called secondary treatment. The combination of primary and secondary treatments constitutes complete treatment.

Industrial wastes are the waste products, resulting from the factoring process. Industrial waste may be liquid, solid, in gaseous form. Gas wastes go directly into the atmosphere and are disposed of automatically. If gas wastes are large, they may pollute the atmosphere, but they do not pollute the physical environment much. Solid dry waste resulting from the manufacturing process, if stabilized, does not create any problem in disposal. But if it is in an un-stabilized state, they are generally mixed with water and converted into liquid form. Liquid wastes are the wastes which mostly result from industry and are creating problems. The resulting waste water or industrial waste therefore, varies in quantity and nature according to what use is has been used for in industry. It is not possible to lay down a common standard for the industrial waste, because the industrial waste differs widely from industry to industry.

The quantity and strength of waste water from an industry varies widely depending on the manufacturing process employed and the method of control in different plants.

There are two methods of disposing of industrial wastes. One is to discharge the waste into the normal sewer system. The other method is to design and construct a separate plant to treat the industrial waste alone. In the case of strong industrial waste, it is often given pre-treatment by the owners of industry before admitting it into the normal waste system. They may have to be neutralized for excess acidity, alkalinity, or other objectionable characteristics. Giving pre-treatment to industrial waste is generally the responsibility of the industry owners.

When the industrial waste and general waste are treated together, it may be assumed that the characteristic of the mixture of waste and industrial wastes are similar to domestic waste. Treatment

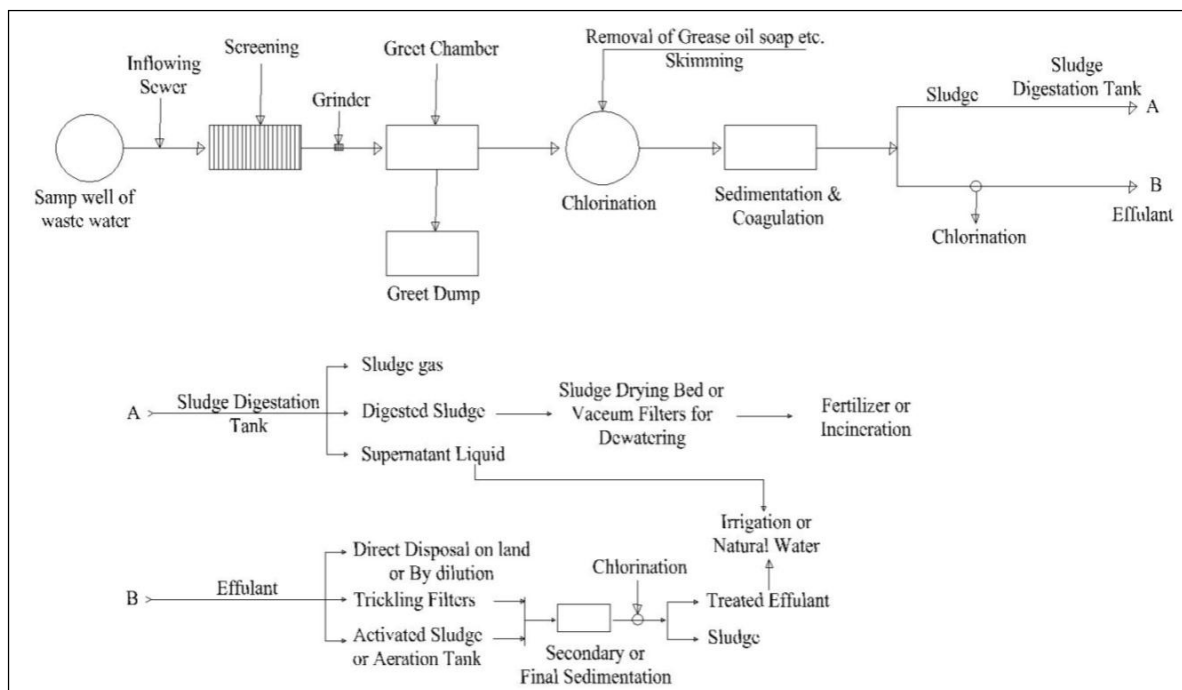
will therefore follow the general procedure in the treatment of the domestic waste. When separate treatment is provided for industrial waste some units of the treatment plant differ considerably in design from the units employed in waste treatment, though the same general method to be used.

The general methods are, screening grit removal, sedimentation and chemical participation, biological processes such as filter, neutralization and chlorination. In all sorts of industrial wastes, it is not necessary that all these methods have to be adopted.

- a) Screening
The solids suspended in industrial waste are often so coarse that screens and racks achieve a degree of removal.
- b) Skimming
Grease, traps and skimming tanks are used for the removal of grease, oil and from industrial Waste. Aeration and chlorination prove helpful in the removal of these substances.
- c) Sedimentation and coagulation
The sedimentation facilitation is often relatively simple. Lagoons settling ponds earth basin. Low laying areas may provide storage space for several years.
Coagulating chemicals are widely used. Draw and fill operation of tanks for the chlorination of chemically treated waste is commonly employed.
- d) Adsorption and Biological treatment
Some waste materials themselves possess useful adsorptive properties. Many industry is very rich in organic matter.
Their anaerobic decomposition at higher temperature is possible when the waste is especially thick.
- e) Irrigation
In the disposal of industrial wastes by irrigation in land for cropping is simple. Preliminary treatment may be required to handle the waste water.
- f) Sludge Disposal
Industrial sludge is sufficiently stable to be disposed of directly to the field or dumping area. Others may require digestion or incineration.
- g) Other treatment methods :-
The destruction of toxic metals in industrial waste water is normally achieved by chemical methods. There are various chemical methods. Its application for different chemicals is different.
- h) Radio-active waste
Radioactive waste is produced by the nuclear activities in that type of industry.
 - i) Storage for long time.
 - ii) Dilution in natural water course.
 - iii) Burial in ground
 - iv) Burial in sea.

Disposal by dilution in the natural bodies of water is not completely satisfactory as it needs a huge amount of water. If wastes are small they can be easily disposed by dilution. For larger amounts, disintegration is the only satisfactory method, but it takes a very long time. The requirement of land for sewage treatment plant is 24 acres for this EZ.

Figure 3.13.3-1: Waste Water Treatment Flow Diagram



Sewage Pumping

Necessity of Pumping

Although sewage flows in sewers under gravity only, still there are occasions where it may have to be lifted from lower levels to higher. The following conditions may be purposes for which sewage pumping is required:

- i) To lift the sewage of low laying area and put it into higher level.
- ii) If the out-fall sewer is at a lower level than the level of the disposal sewage, then it has to be lifted.
- iii) At treatment plants also, sewage may have to be lifted at certain places to make it possible for the sewage to flow to its various treatment units under gravity.
- iv) In modern treatment plants, recirculation of the effluent is very common to achieve better purification.
- v) Recirculation is possible only, if sewage is lifted after completion of each cycle.
- vi) Pumping is essential for transferring sludge to the sludge digestion tank etc.

Problem in Sewage Pumping

Pumping of sewage is not as simple as water. The following are some of its special characteristics:

- 1) Sewage has suspended and floating solids. The material causes very frequent clogging of pumps.
- 2) Sewage contains organic and inorganic wastes. They may act upon the pumping equipment and corrode and reduce its life.
- 3) The biological life of sewage including disease producing bacteria is dangerous for health. Any slackness with the sewage pumping or any other problem has to be attended to immediately.
- 4) The flow of incoming sewage is not constant and keeps on fluctuating. Due to this aspect, pumping has to be adjusted accordingly by operating different units of pumps having different pumping capacity.
- 5) Wet wells or sump wells are of smaller capacity. This to avoid prolonged detention times, which may otherwise cause deposits of grit and organic solids to coagulate. Deposited grit

and organic solids start putrefying and become a nuisance for the operating staff. Sump wells or wet wells are designed to give only a little effect and the rate of pumping has to be adjusted continuously to the rate of inflow of sewage.

- 6) A sewage pump has to be very reliable, otherwise, it will cause flooding and nuisance, since sewage also carries a number of disease-producing bacteria, it may prove even worse for public health if flooding is allowed to occur. Therefore, the reliability of pumps is of the utmost importance.

Preparation of Sewage for Pumping

It is desirable to remove as much of the coarser floating material as possible, before sewage is pumped. Such removal of coarser floating material is difficult at the lift station, because it involves screening out the large solids and removing and disposing of them daily. A lift station is a small pumping station, installed on the sewer line at a certain point where the depth of excavation for sewer laying has become prohibitive. From this point onward the sewer line is laid with a very small amount of excavation. When the sewer line again goes into heavy excavation, a similar lift station is again installed.

At large pumping stations, however, screens are commonly used in advance of pumps to reduce the possibility of the pump being clogged and damaged by large sticks and rags. Grit is also removed in advanced of pumping where possible. These measures reduce the wear and tear of pumps. A grit chamber and screening device are commonly included in the units of a sewage treatment plant.

Centrifugal Pumps – sewage contains rags, sticks and such other materials which cause problems to any pump. Therefore an important characteristic of a sewage pump should be its ability to operate without clogging.

As an added precaution, this inner side of the pump should be easily accessible for cleaning or removal of obstructions.

Centrifugal Pumps are almost exclusively used in the pumping of sewage. They are available in non-clog designs. It may have automatic and remote control and can be a large or small unit. Their operational cost is low and easy to maintain. They require less space for installation and produce less noise than other pumps.

These pumps are designed to avoid clogging. Clogging of the pumps can be partly avoided by adopting a large size. Smooth channels and the impellers permit the passage of solids through the pump. Various types of non-clogging impellers are available in the market. To prevent clogging, it is essential that the pump passages are as large or larger than the sanction pipe and that the discharge pipe be not smaller than the pump passage.

Sometimes it is specified that non-clog pumps are automatic and should pass through a 5 cm diameter ball and that combined domestic and industrial sewage should have a 6.5 cm ball. Ordinary sewage has very little corrosive action on various parts of a pump.

Priming of the centrifugal pump with sewage is a must; otherwise it will only pump air. Priming may be done by hand by pouring water on the sewage water in the pump. It can also be done by a self-priming device.

Setting of Centrifugal Pumps:

- i) Pump submerged below the sewage in the wet well.
- ii) Pump is dry well below the level of the sewage.
- iii) Pump set higher than the sewage in the wet-well.

A dry well is to be constructed adjacent to the wet well for installing pumps and other connected equipment. This location eliminates the need for priming of the pump.

This setting is commonly adopted for medium size plants. The driving units are kept one separate floor above, so that they are protected against dampness and there is no danger, due to accidental flooding of the dry well. The best of all positions for pump installation is probably the pump in a dry well but set above the level of sewage. A series of pumps of various sizes are needed, for example with a minimum flow of 10 million litres per day and a maximum flow of 60 million litres per day. It would be a good practice to install three pumps with capacities of 20 mld (million litres per day) each and two pumps with capacity of 10 mld each. One of the smaller pumps could handle the flow during most of the night hours. And other pumps would be put into service by float control or any other control as and when required.

3.12. Sewage Collection System (Distribution Design in EZ)

3.12.1. Treatment System

The following criteria will be used for designing the wastewater system:

- Wastewater quantity discharged to the system will be 80% of the water supply.
- Wastewater collection pipes shall not be used for rain water drainage purpose.
- Gravity flow will be used for the sewerage pipe design as much as possible. In case the pipe depth is more than 3.5 – 4.0 metres, wastewater lifting station will be required.
- Sewer manhole will be provided at an interval of approx. 40 metres.
- Wastewater pipe material will be selected with consideration of corrosion problem as well as optimum in cost. (RCP is recommended.)
- The pre-treatment for toxic and chemical constituent elimination from each factory is required prior to discharging to the wastewater system.
- Maximum value for some critical wastewater parameters that can be discharged to the central wastewater treatment plant will be set up to prevent overloading of the treatment operation.
- Suitable building guideline shall be prepared before beginning of the operation.
- Treated water can be used for recycled water for maintain trees or greens inside the zone through underground u-pvc pipes.

3.12.2. Forecast of Waste Water Volume

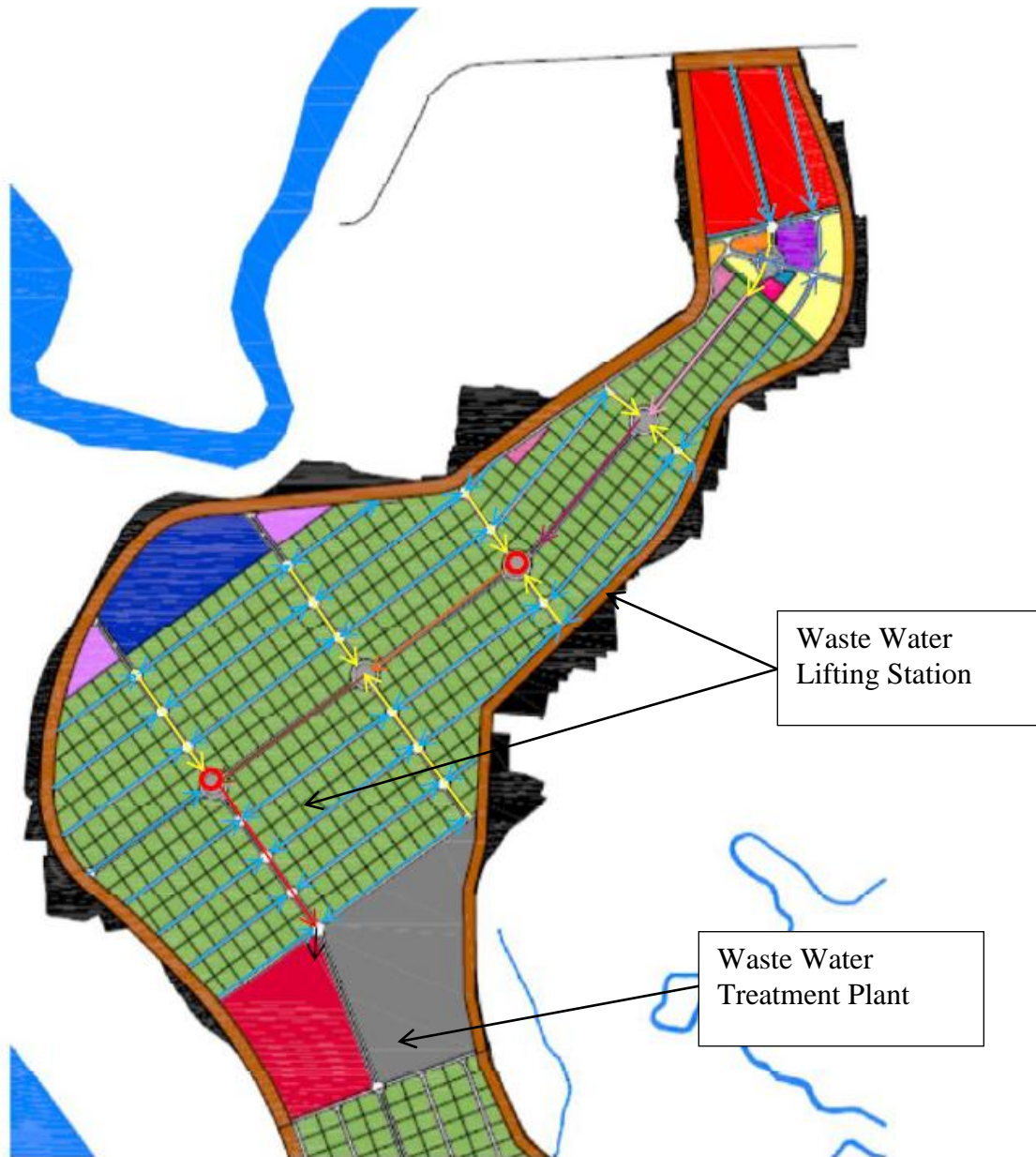
The wastewater flow volume has been estimated to be 219,954 m³/day.

3.12.3. Basic Diagram of Wastewater Collection System

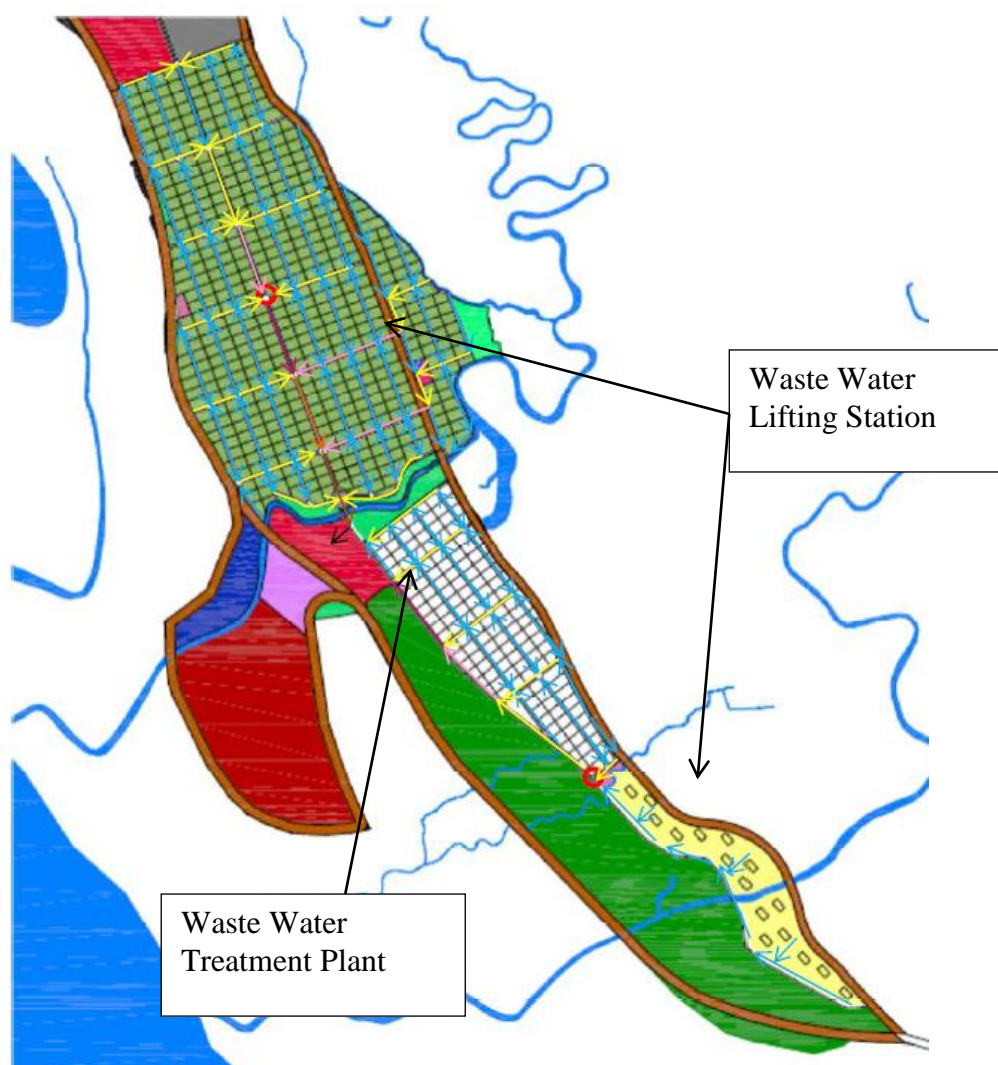
The basic process of waste water treatment was explained in the previous section (Sewerage System). Waste water should be treated at a primary treatment facility equipped by the tenants and the waste water flows into the underground pipes along the road. The lifting stations are necessary to lift the waste water to arrive at the central treatment plant. Eventually the dimension of the collection pipes is increased. The Waste water collection pipe network is shown in the following figure.

Figure 3.14.3-1: Waste Water Collection Network

Phase 1



Phase 2&3



3.13. Electrical System

3.13.1. Power Distribution inside the EZ

The EZ having a total of 7,191.36 acres (2,910.25 hectares) will be developed within the year 2027. First phase will be developed during the year 2017-2020 requiring almost zero power. In the 2nd phase cumulative power of about 265MW will be required. In the 3rd phase consisting of industrial plots, residential areas will be developed during the years 2026-2028 requiring cumulative power of about 464MW. Total power requirement for this site is 574.28MW.

All the three phases will be separately connected by 33KV lines from 132 KV/33kV sub-stations in the power station area and will have separate 33KV/11KV sub-stations of required capacity with 11KV distribution lines, 11/0.4KV substations and 0.4KV lines according to the load requirement, covering the whole area of the respective phase with the required capacity to meet the load demand.

Figure 3.15.1-1: Single Line Diagram of Sonapahar 230/132KV SS Showing Outgoing Proposed Double Circuit 2x132KV Line to Mirershorai EZ (Off-site)

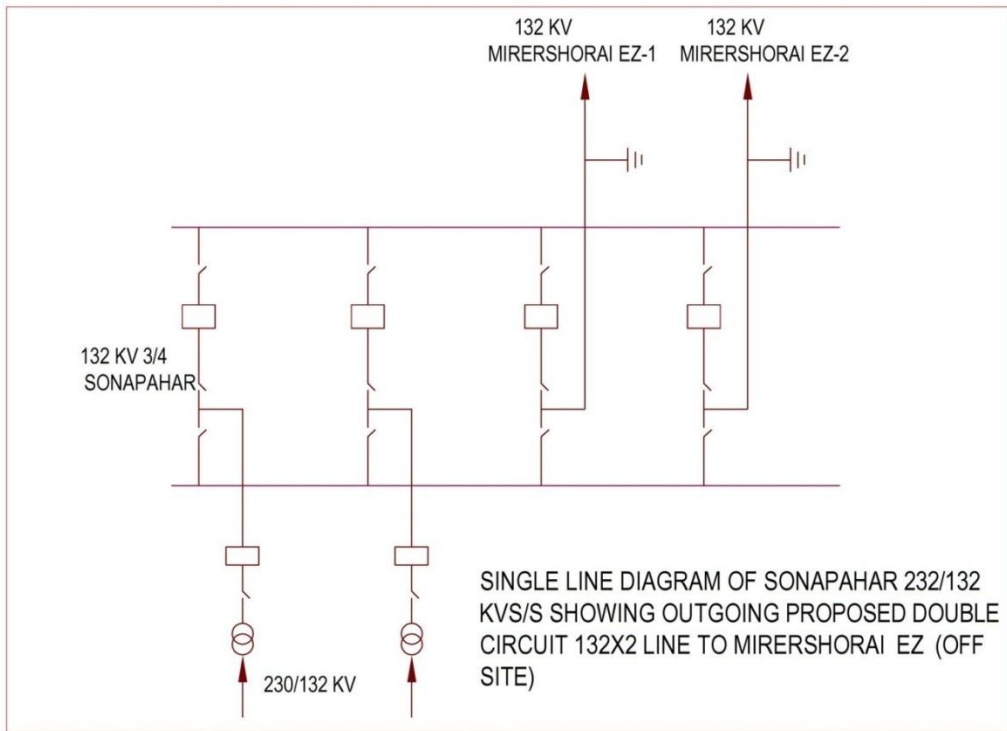


Figure 3.15.1-2: Single Line Diagram of Mirershorai EZ 132KV SS (On-site)

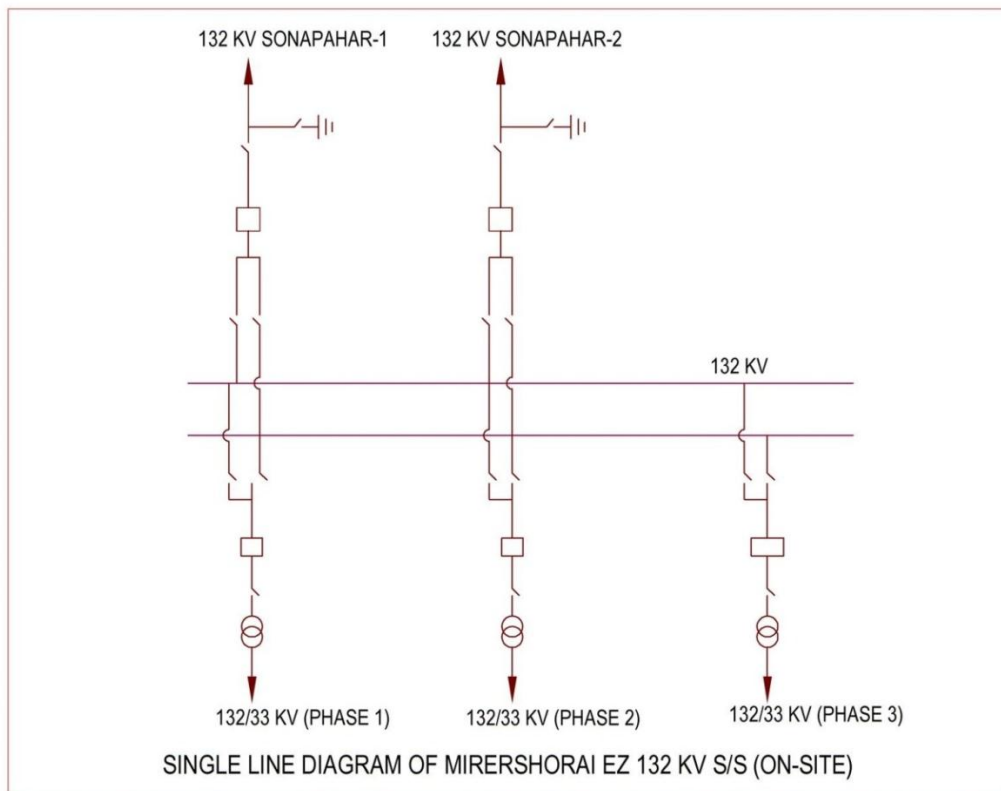
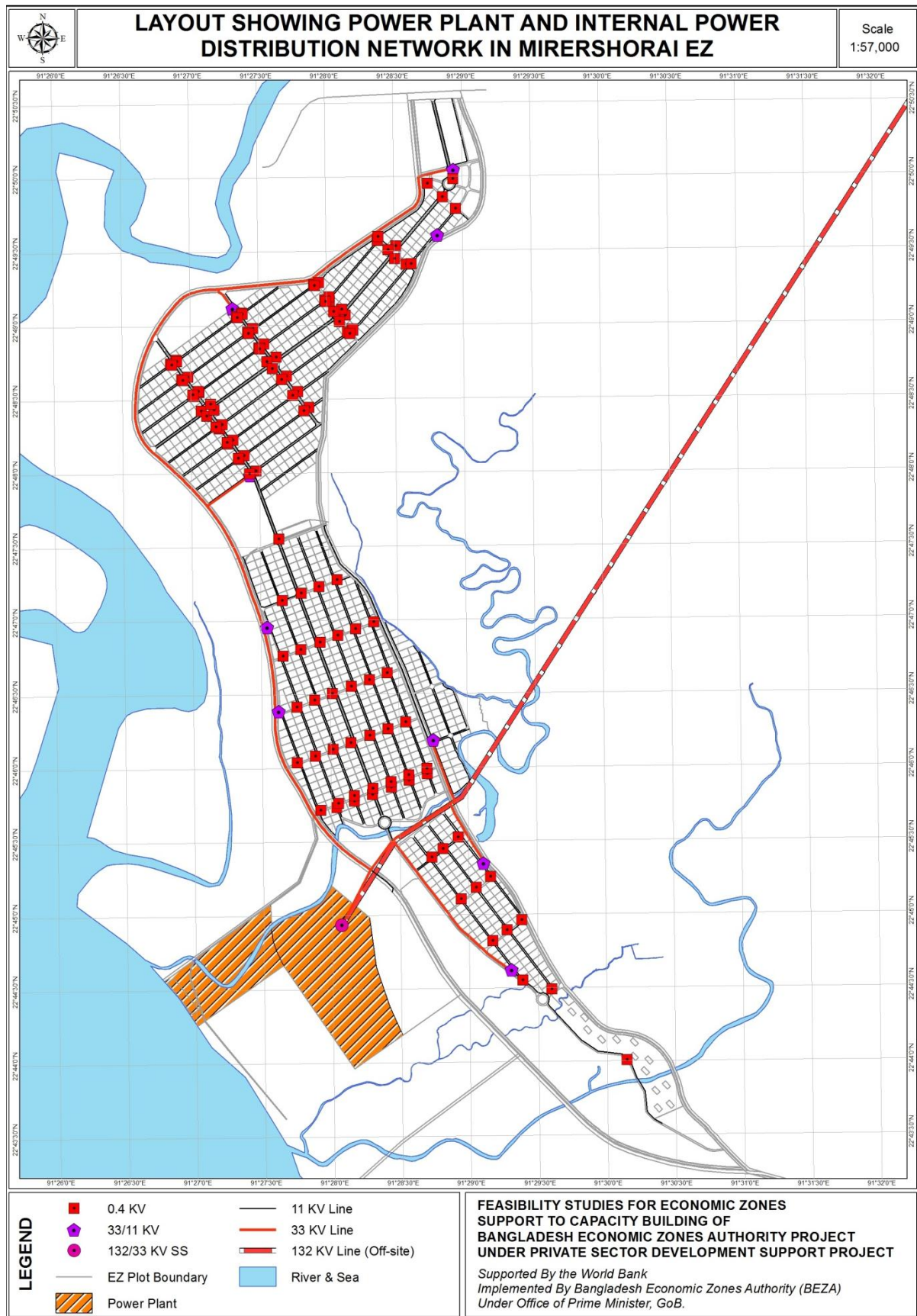


Figure 3.15.1-3: Layout Showing Power Plant and Internal Distribution Network



3.14. Telecommunication System

3.14.1. Connection (On-site)

The number of industries to have been estimated is 532 according to the number of plots in the Master Plan. Considering 6 telephone lines per industry and other connections, such as, connections in the BEZA (Bangladesh Economic Zone Authority) administrative office, customs office, proposed power plant, and power supply office and some residential connections, the total numbers of telephone connections is estimated to be 7,500 LU and the number of distribution points is considered to be 1,200 in 3 phases. The capacity of the telephone exchange, considering future expansion in the surroundings, is assessed to be 10,000 LU and effective number of connections in the 1stPhase will be 3,000LU, proportional internet connections. The number of industries may be more or less than the number of plots. Some of the big industries may sometimes need more than one plot. On the other hand, more than one small industry may sometimes share one plot.

Figure 3.16.1-1: Connection Diagram (On-site)

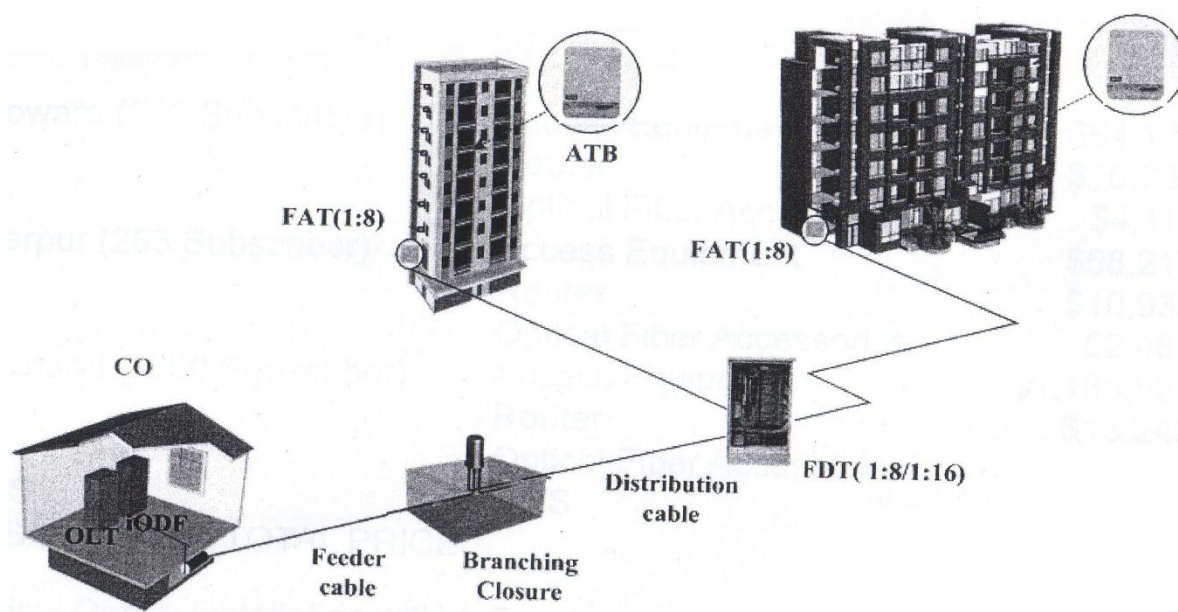
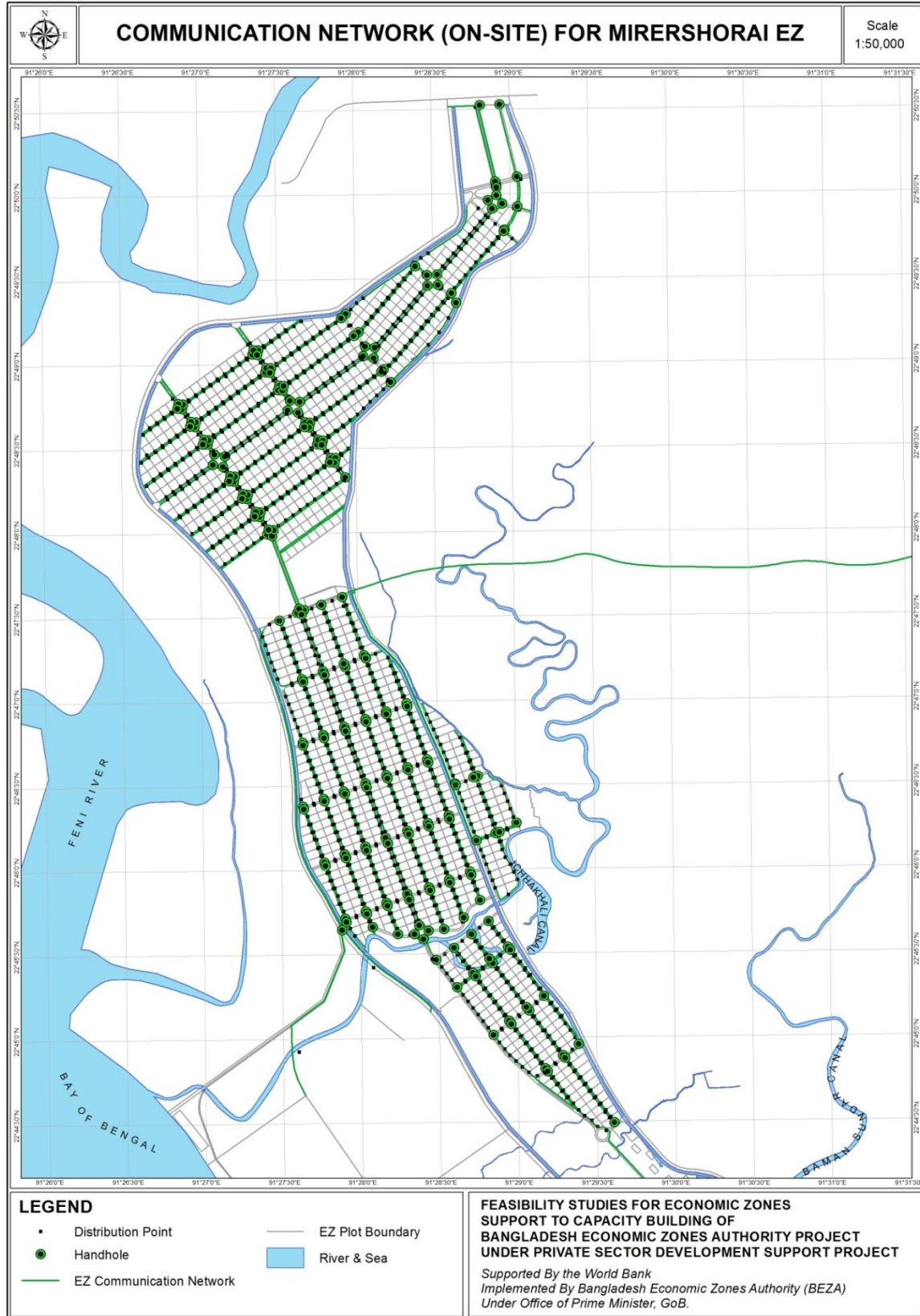


Figure 3.16.1-2: Telecommunication Network in Mirershorai EZ (On-site)



3.14.2. Recommendations

As in all EPZs in Bangladesh, BTCL have their PSTN network, it is recommended that Telecom development works in EZs shall be offered to BTCL. BTCL has two modes of financial systems, a) a Contributory work, and b) a Self financed work.

- a) **Contributory work:** When a corporate body asks BTCL to establish a telephone network, BTCL submits estimates for the contribution of funds. After placing of a fund by a corporate body, BTCL expands the network as required.
- b) **Self financed work:** when BTCL finds that an area is under development, BTCL includes expansion work in ongoing or in future and expands their network for expansion of own business from their own fund.
- c) Due to an abrupt fall of revenue rate of BTCL service, BTCL has become reluctant to do any self- financed work. One BTCL spokesman remarked that, if the government is interested in these works and place the required budget, BTCL can do them with their own finance.

Finally, it is proposed that, BEZA should write to BTCL through the Ministry of Telecommunications, informing them that ofing3 EZs going to be built, at (a) Sherpur, Maulavibazar in Sylhet Division, (b) Mirershorai, Chittagong in Chittagong Division and (c) Anwara (Gohira), Chittagong in Chittagong Division, as a part of the infrastructure development of Bangladesh. Finally, the Ministry should be requested to instruct BTCL to include the following places in their future expansion project.

As a matter of urgency and showing the demand of the EZ sites, BTCL should be asked, to submit an estimate for contributory work, particularly as Sherpur EZ is going to be developed on a priority basis, BTCL may be requested by BEZA to include the development work of telecoms in the future development work in an on-going Project of BTCL.

Information can also be given to the approved private PSTN Operators, Mobile Phone Operators and ISPs that they can expand their network for their own business expansion. It is recommended that Bangla Phone should be offered to the opportunity to establish their network without any conditions.

3.15. Administration/One-stop Service Building and Other Supporting Buildings

The Administration/One-Stop Service Building shall be built at the right side of the entrance with two (2) storied building having 4,000 m² (2000 m² on each floor).

The following functions shall be included:

- One-Stop Service Division (about 10 staffs)
- Economic Zone Administration Division (about 30 staffs)
- Security Office (10 staffs: 24 hours)
- Presentation/Seminar Room (50 people can be accommodated)
- Meeting Rooms (3 Rooms)
- Small Clinic for workers
- Bank

The estimate includes the following facilities:

- Basic room light
- Toilet / Shower (one place / 100 m², roughly)
- Room Air Conditioners (one place / 20 m², roughly)
- Office facilities (desk, chair, computer,) not included

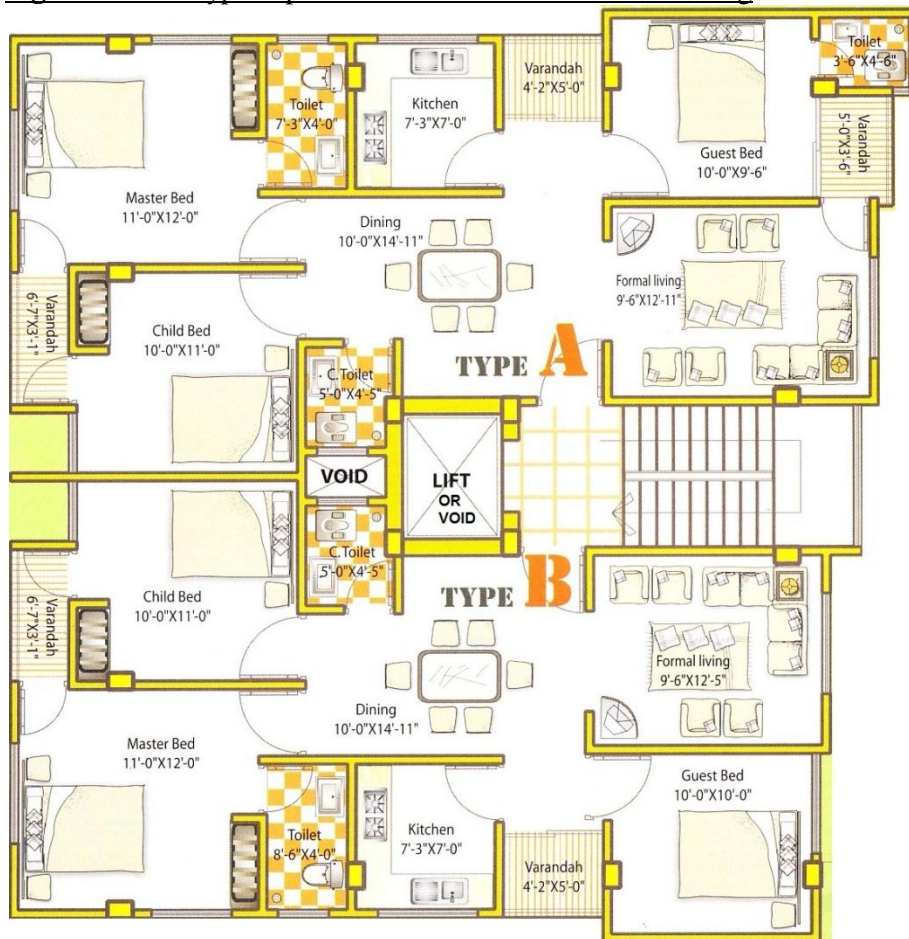
Supporting Buildings: Fire Station, Clinics and Police Station

In order to support the Mirershorai Economic Zone investors, in their measures to protect the workforce from fire, to prevent accidents and to provide healthcare, a fire station, a small clinic and a police station shall be constructed near the controlling building. All of these supporting buildings are one floor with the total area of 500 m².

The cost for inner facilities of fire station, Clinic and police station is not included. These facilities will be arranged when operation begins.

One building is for housing administrative staff of the economic zone. Its building structure is a 2,500 sq. ft, two storied bungalow.

Figure 3.17-1: Typical plan for a 1000 sft. Residential building



B. CALCULATION OF UNIT RATE OF UTILITY DEMAND

For the calculation of demand forecasting, the following data is used. The particular industries are selected from several samples of existing tenants in Bangladesh according to the industry mix chosen by the marketing investigation.

Hearing at Dhaka EPZ

Administrative Office (General Manager Mr. Ashraful Kabir) and Factories (Owners)

Date: 21-Sep-13

Integrated Textile Industry

Company Selected	Queen South Textile Mills Ltd (QST)	
EPZ	Dhaka EPZ	
Land Area	10,566.57 m ²	1.06 hector
Monthly Water Consumption	52,771 m ³ / month	
Daily Water Consumption	2,030 m ³ / day	
Unit Rate (m ³ /day/ha)	1,921 m ³ / day / ha	
Electrical Monthly Consumption	1,051,390.00 kwh/month	
Data	June 2013	
Daily Consumption	35,046.33 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	1460.26 kw	kw
Unit Rate (kw/ha)	1,381.97 kw/ha	
Unit Rate (MW/ha)	1.38 MW/ha	
Gas Consumption	Captive	74,548
	Industrial	449,266
	Total	449,266 m ³ /month
Daily Consumption	14,976 m ³ /day	
Unit Rate (m ³ /day/ ha)	14.173 m ³ /day/ha	

Spinning Industry

Company Selected	Adjusted Data from QST	
EPZ	Dhaka EPZ	
Land Area	10,566.57 m ²	1.06 hector
Monthly Water Consumption	52,771 m ³ / month	
Daily Water Consumption	2,030 m ³ / day	
Adjustment	203 10% of Integrated Industry	
Unit Rate (m ³ /day/ha)	192 m ³ / day / ha	
Electrical Monthly Consumption	1,051,390.00 kwh/month	
Data	June 2013	
Daily Consumption	35,046.33 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	1460.26 kw	kw
Unit Rate (kw/ha)	1,381.97 kw/ha	
Adjustment	207.29 15% of Integrated Industry	
Unit Rate (MW/ha)	0.21 MW/ha	
Gas Consumption	15% of the integrated textile industry	
Adjustment	15% of the integrated textile industry	
Unit Rate (m ³ /day/ ha)	2.126 m ³ /day/ha	

Weaving Industry

Company Selected EPZ	Adjusted Data from QST Dhaka EPZ	
Land Area	10,566.57 m ²	1.06 hector
Monthly Water Consumption	52,771 m ³ / month	
Daily Water Consumption	2,030 m ³ / day	
Adjustment	203	10% of Integrated Industry
Unit Rate (m ³ /day/ha)	192 m ³ / day / ha	
Electrical Monthly Consumption Data	1,051,390.00 kwh/month Aug. 2013	
Daily Consumption	35,046.33 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	1,460.26 kw	working hours are 24
Unit Rate (kw/ha)	1,381.97 kw/ha	
Adjustment	207.29	15% of Integrated Industry
Unit Rate (MW/ha)	0.21 MW/ha	
Gas Consumption Adjustment	15% of the integrated textile industry	
Unit Rate (m ³ /day/ ha)	2,126 m ³ /day/ha	

Dyeing / Finishing Industry

Company Selected EPZ	Adjusted Data from QST Dhaka EPZ	
Land Area	10,566.57 m ²	1.06 hector
Monthly Water Consumption	52,771 m ³ / month	
Daily Water Consumption	2,030 m ³ / day	
Adjustment	1,624	80% of Integrated Industry
Unit Rate (m ³ /day/ha)	1,537 m ³ / day / ha	
Electrical Monthly Consumption Data	1,051,390.00 kwh/month Aug. 2013	
Daily Consumption	35,046.33 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	1,460.26 kw	working hours are 24
Unit Rate (kw/ha)	1,381.97 kw/ha	
Adjustment	967.38	70% of Integrated Industry
Unit Rate (MW/ha)	0.97 MW/ha	
Gas Consumption Adjustment	70% of the integrated textile industry	
Unit Rate (m ³ /day/ ha)	9,921 m ³ /day/ha	

Ceramics

Hearing from Director of Mono Ceramic Ltd

Sep 15 2013

Hearing from Mr. Asif (Director of Great Wall Ceramic Ltd)

Nov 23 2013

Company Selected	Mono Ceramic Ltd	
Location	Dhaka	
Land Area	21 acres	4.00 hector
Monthly Water Consumption	9,600 m ³ / month	
Daily Water Consumption	320 m ³ / day	
Unit Rate (m ³ /day/ha)	80 m ³ / day / ha	
Electrical Consumption	Great Wall Ceramic Ltd	
Production Capacity	24,000 m ² /day	
Electrical Monthly Consumption	264,137.00 kwh/month	
Land Area	8.5 hector	
Daily Consumption	8,804.57 kwh/day assuming 30 days / month assuming 3 shifts / day,	
Hourly Consumption	366.86 kw working hours are 24	
Unit Rate (kw/ha)	43.16 kw/ha	
Unit Rate (MW/ha)	0.04 MW/ha	
Gas Consumption	Great Wall Ceramic Ltd	
	1,509,872 m ³ /month	
	58,072 m ³ /day	
Unit Rate (m ³ /day/ ha)	6,832 m ³ /day/ha	

Ceramics

Hearing from Engr Rezaul Karim (Engineer of China Bnglabangla Tiles Ltd)

Nov 24 2013

Company Selected	China Bnglabangla Tiles Ltd)	
Location	Dhaka	
Land Area	19 acres	4.00 hector
Monthly Water Consumption	1,800 m ³ / month	
Daily Water Consumption	60 m ³ / day	
Unit Rate (m ³ /day/ha)	15 m ³ / day / ha	
Electrical Consumption	Great Wall Ceramic Ltd	
Electrical Monthly Consumption	180,000.00 kwh/month	
Land Area	8.5 hector	
Daily Consumption	6,000.00 kwh/day assuming 30 days / month assuming 3 shifts / day,	
Hourly Consumption	250.00 kw working hours are 24	
Unit Rate (kw/ha)	29.41 kw/ha	
Unit Rate (MW/ha)	0.03 MW/ha	
Gas Consumption	Great Wall Ceramic Ltd	
	0 m ³ /month	
	0 m ³ /day	
Unit Rate (m ³ /day/ ha)	0 m ³ /day/ha	

Food Processing Industry

Hearing from Mr. Mohammad Kader (DGM of FU-WANG) 23-Nov-13

Company Selected	FU-WANG (Food Processing Company)	
Location	Gazipur	
Land Area	12,100 m ²	1.21 hecter
Monthly Water Consumption	1,200 m ³ / month	
Daily Water Consumption	40 m ³ / day	
Unit Rate (m ³ /day/ha)	33 m ³ / day / ha	
Electrical Monthly Consumption	38,400.00 kwh/month	
Data		
Daily Consumption	1,280 kwh/day	assuming 30 days / month assuming 3 shifts / day,
Hourly Consumption	53.33 kw	working hours are 24
Unit Rate (kw/ha)	44.08 kw/ha	
Unit Rate (MW/ha)	0.04 MW/ha	
Gas Consumption	1,400 m ³ /month	
	54 m ³ /day	
Unit Rate (m ³ /day/ ha)	45 m ³ /day/ha	

Packaging Industry

Hearing from Mr. Atikullah (MG of Alfa Packageing Ltd) Sep 21 2013

Company Selected	Alfa Packaging Ltd	
EPZ	Dhaka EPZ	
Land Area	2,000 m ²	0.2 hecter
Monthly Water Consumption	468 m ³ / month	
Daily Water Consumption	16 m ³ / day	
Unit Rate (m ³ /day/ha)	78 m ³ / day / ha	
Electrical Monthly Consumption	3,362.00 kwh/month	
Data		
Daily Consumption	112.07 kwh/day	assuming 30 days / month assuming 1 shifts / day,
Hourly Consumption	14.01 kw	working hours are 8
Unit Rate (kw/ha)	70.04 kw/ha	
Unit Rate (MW/ha)	0.07 MW/ha	

Hearing at ClassNK, Nippon Kaiji Kyokai
 E-2 (5th Floor), House #171, Road #5, Mirpur (DOHS)
 Dhaka-1216, Bangladesh
 Contact: Mr Mubasser A.M. (Surveyor)
 Date: 21-Nov-13

Shipbuilding Industry

Company Selected	Khina Shipyard Ltd (KSL)	
EPZ		
Land Area	70 acres	28.34 hector
Historical Data	Numbers of workers: 250	
Dayly Water Consumption	500 m ³ / day (Facility and workers)	
Unit Rate (m ³ /day/ha)	18 m ³ / day / ha	
Electrical Monthly Consumption	4,500,000.00 kwh/month	
Data	Data from ClassNK	
Dayly Consumption	150,000.00 kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	9375.00 kw	working hours are 16
Unit Rate (kw/ha)	330.80 kw/ha	
Unit Rate (MW/ha)	0.33 MW/ha	

Shipbuilding Parts Manufacturing Industry

Company Selected	Khulna Shipyard Ltd (KSL)	
EPZ		
Land Area	70 acres	28.34 hector
Historical Data	Numbers of workers: 250	
Dayly Water Consumption	500 m ³ / day (Facility and workers)	
Ratio (30% of Shipbuilding Ind.)	150 m ³ / day (Facility and workers)	
Unit Rate (m ³ /day/ha)	5 m ³ / day / ha	
Electrical Monthly Consumption	4,500,000.00 kwh/month	
Data	Data from ClassNK	
Dayly Consumption	150,000.00 kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	9375.00 kw	working hours are 16
Ratio (30% of Shipbuilding Ind.)	2812.50 kw	multiply by 0.3
Unit Rate (kw/ha)	99.24 kw/ha	
Unit Rate (MW/ha)	0.10 MW/ha	

Port / Stock Yard Industry

Company Selected	Khulna Shipyards Ltd (KSL)	
EPZ		
Land Area	70 acres	28.34 hector
Historical Data	Numbers of workers: 250	
Dayly Water Consumption	500 m ³ / day (Facility and workers)	
Ratio (10% of Shipbuilding Ind.)	50 m ³ / day (Facility and workers)	
Unit Rate (m ³ /day/ha)	2 m ³ / day / ha	
Electrical Monthly Consumption	4,500,000.00 kwh/month	
Data	Data from ClassNK	
Dayly Consumption	150,000.00 kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	9375.00 kw	working hours are 16
Ratio (10% of Shipbuilding Ind.)	937.50 kw	multiply by 0.1
Unit Rate (kw/ha)	33.08 kw/ha	
Unit Rate (MW/ha)	0.03 MW/ha	

Steel Mill

Hearing from Engr. Santosh (Chief Engineer)

Nov 23 2013

Company Selected	Rahim Steel Mills	
Location		
Land Area	150 acres	60.73 hector
Historical Data		
Dayly Water Consumption	2400 m ³ / day with 2 shifts	
Unit Rate (m ³ /day/ha)	40 m ³ / day / ha	
Electrical Monthly Consumption	kwh/month	
Data		
Dayly Consumption	kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	kw	working hours are 16
Ratio (10% of Shipbuilding Ind.)	55000.00 kw	multiply by 0.1
Unit Rate (kw/ha)	905.67 kw/ha	
Unit Rate (MW/ha)	0.91 MW/ha	

Cement using ashes + clinker

Nov 24 2013

Hearing from Mr. Hafizur Rahman (Chief Process Manager)

Company Selected	Cemex Cement Industry	
Location	Bandar Narayanganj	
Land Area	2.5 acres	1.01 hector
Production Capacity	1,800 ton/day	
Dayly Water Consumption	30 m ³ / day (Facility and workers)	
Unit Rate (m ³ /day/ha)	30 m ³ / day / ha	
Electrical Monthly Consumption	960,000.00 kwh/month	
Data		
Dayly Consumption	32,000.00 kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	2,000 kw	working hours are 16
Unit Rate (kw/ha)	1,976.00 kw/ha	
Unit Rate (MW/ha)	1.98 MW/ha	

Moto Bike & Components

Data from monthly bill of EPZ in Bangladesh (June 2013)

Company Selected	ALITA	
EPZ	Chittagong EPZ	
Land Area	0.5 acres	0.2 hector
Monthly Water Consumption	m ³ / month	
Dayly Water Consumption	14 m ³ / day (Data of June 2013)	
Unit Rate (m ³ /day/ha)	70 m ³ / day / ha	
Electrical Monthly Consumption	50,564.28 kwh/month	
Data	Monthly Report	
Dayly Consumption	1,685.48 kwh/day	assuming 30 days / month assuming 3 shifts / day,
Hourly Consumption	70.23 kw	working hours are 24
Unit Rate (kw/ha)	351.14 kw/ha	
Unit Rate (MW/ha)	0.35 MW/ha	

Auto, Electronics and Precision Machinery Parts Indutry

Company Selected	Meiji	
EPZ	Chittagong EPZ	
Land Area	4,000 m ²	0.4 hector
Monthly Water Consumption	210 m ³ / month	
Dayly Water Consumption	7 m ³ / day	
Unit Rate (m ³ /day/ha)	18 m ³ / day / ha	
Electrical Monthly Consumption	79,726.96 kwh/month	
Data	Monthly Report	
Dayly Consumption	2,657.57 kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	166.10 kw	working hours are 16
Unit Rate (kw/ha)	415.24 kw/ha	
Unit Rate (MW/ha)	0.42 MW/ha	

Auto Assembly Indutry

Company Selected		
EPZ		
Land Area	m ²	hector
Monthly Water Consumption	m ³ / month	
Dayly Water Consumption	m ³ / day	
Unit Rate (m ³ /day/ha)	56 m ³ / day / ha	Assuming 80% of Motor Bike Industry
Electrical Monthly Consumption	kwh/month	
Data		
Dayly Consumption	kwh/day	assuming 30 days / month assuming 2 shifts / day,
Hourly Consumption	kw	working hours are
Unit Rate (kw/ha)	kw/ha	
Unit Rate (MW/ha)	0.42 MW/ha	Assuming 120% of Motor Bike Industry

Textile (Spinning & Weaving) Industry

Company Selected	Queen South Textile Mills Ltd (QST)	
EPZ	Dhaka EPZ	
Land Area	10,566.57 m ²	1.06 hector
Monthly Water Consumption	52,771 m ³ / month	
Dayly Water Consumption	2,030 m ³ / day	
Adjustment	406 m ³ /day	20% of Integrated Industry
Unit Rate (m ³ /day/ha)	384 m ³ / day / ha	
Electrical Monthly Consumption	1,051,390.00 kwh/month	
Data		
Dayly Consumption	35,046.33 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	1460.26 kw	
Unit Rate (kw/ha)	1,381.97 kw/ha	
Adjustment	414.59 kw/ha	30% of Integrated Industry
Unit Rate (MW/ha)	0.41 MW/ha	

Garments (high Tech & Knitting) Industry

Company Selected	Ring Shine	
EPZ	Dhaka EPZ	
Land Area	74,000 m ²	7.4 hector
Monthly Water Consumption	442,381 m ³ / month	
Dayly Water Consumption	14,746 m ³ / day	
high tech and knitting	2,949	20%
Unit Rate (m ³ /day/ha)	399 m ³ / day / ha	
Electrical Monthly Consumption	2,276,394.89 kwh/month	
Data	Monthly Report	Multiply by 2 (gas use)
Dayly Consumption	75,879.83 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	3,161.66 kw	
Unit Rate (kw/ha)	427.25 kw/ha	
high tech and knitting	85.45	20%
Unit Rate (MW/ha)	0.09 MW/ha	

Garments (Supporting) Industry

Company Selected	YKK	
EPZ	Dhaka EPZ	
Land Area	22,000 m ²	2.2 hector
Monthly Water Consumption	19,949 m ³ / month	
Dayly Water Consumption	665 m ³ / day	
Unit Rate (m ³ /day/ha)	302 m ³ / day / ha	
Electrical Monthly Consumption	264,137.00 kwh/month	
Data	Monthly Report	
Dayly Consumption	8,804.57 kwh/day	assuming 30 days / month assuming 3 shifts / day, working hours are 24
Hourly Consumption	366.86 kw	
Unit Rate (kw/ha)	166.75 kw/ha	
Unit Rate (MW/ha)	0.17 MW/ha	

Commercial, Housing, Residential
Data from Phnom Penh Economic Zone in Cambodia (Aug 2013)

Economic Zone Selected	Phnom Phen Special Economic Zone (PPSEZ)
Water Consumption	
Unit Rate (m ³ /day/ha)	20 m ³ / day / ha
Electrical Monthly Consumption	
Unit Rate (MW/ha)	0.25 MW/ha

C. DETAILED INFORMATION ON THE MIRERSHORAI EZ PROJECT

Table C1: Cash flow of Construction Costs

Scope/Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total (BDT)	Total (USD)
Preparation														
Preparation (1)	79,961,000												79,961,000	999,513
Preparation (2)						66,672,012							66,672,012	833,400
Preparation (3)										38,550,012			38,550,012	481,875
Dredging														
Dredging (1)	8,811,467,388												8,811,467,388	110,143,342
Dredging (2)						3,578,988,533							3,578,988,533	44,737,357
Dredging (3)										2,023,460,000			2,023,460,000	25,293,250
Dike System														
Dike System Sea Side (1)	1,558,041,982	787,907,162											2,345,949,144	29,324,364
Dike System Inner Side (1)	267,638,500												267,638,500	3,345,481
Dike System Inner Side (2)						164,591,148							164,591,148	2,057,389
Dike System Inner Side (3)										267,426,088			267,426,088	3,342,826
Sheet Pile Work														
Sheet Piling protection on sea side jetty		386,522,646											386,522,646	4,831,533
Road Work														
Road on Dike Sea Side (1)		35,386,120											35,386,120	442,327
Road on Dike Sea Side (3)										45,890,964			45,890,964	573,637
Road on Dike Inner Side (1)	168,319,842	41,470,106											209,789,948	2,622,374
Road on Dike Inner Side (2)						126,540,044							126,540,044	1,581,751
Road on Dike Inner Side (3)										102,029,665	104,430,363		206,460,028	2,580,750
Road (Main Road) (1)			1,656,006,401										1,656,006,401	20,700,080
Road (Main Road) (2)								499,422,814	21,872,532				521,295,346	6,516,192
Road (Main Road) (3)											425,061,468		425,061,468	5,313,268
Road (Minor Road) (1)			2,155,166,586										2,155,166,586	26,939,582
Road (Minor Road) (2)								1,272,284,339	1,448,732,532				2,721,016,871	34,012,711
Road (Minor Road) (3)											1,008,738,036		1,008,738,036	12,609,225
Round About														
Round About (1)			225,738,820										225,738,820	2,821,735
Round About (3)											45,147,760		45,147,760	564,347
Drainage System														
Drainage System (1)		588,760,221	1,383,890,004										1,972,650,225	24,658,128
Drainage System (2)							143,125,700	1,499,957,336	91,600,448				1,734,683,484	21,683,544
Drainage System (3)											270,118,440		270,118,440	3,376,481
Plantation														
Plantation (1)			8,901,630	37,914,350									46,815,980	585,200
Plantation (2)									32,339,736				32,339,736	404,247
Plantation (3)											24,712,776	3,089,097	27,801,873	347,523
Fencing														

Scope/Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total (BDT)	Total (USD)
Fencing (1)		112,717,184	2,641,809										115,358,993	1,441,987
Fencing (2)						11,746,982							11,746,982	146,837
Fencing (3)										27,127,920			27,127,920	339,099
Access Road														
Access Road 1 (Off-Site)	232,043,322	230,278,734	52,055,346										514,377,402	6,429,718
Access Road 2 (Off-Site)	231,205,404	229,447,188	213,623,244										674,275,836	8,428,448
Culvert Box														
Culvert Box (On-Site) 1			87,400,023										87,400,023	1,092,500
Culvert Box (On-Site) 2									23,900,002				23,900,002	298,750
Culvert Box (On-Site) 3											55,699,990		55,699,990	696,250
Water Supply System														
Water Supply Pipe Distribution (1)		275,798,952	30,644,328										306,443,280	3,830,541
Water Supply Pipe Distribution (2)							201,669,728	146,153,904					347,823,632	4,347,795
Water Supply Pipe Distribution (3)										1,365,629	124,272,239		125,637,868	1,570,473
Water Supply Treatment Plant and Tower (1)	755,112,045	749,369,748	545,518,207										2,050,000,000	25,625,000
Water Supply Treatment Plant and Tower (2)						59,619,772	553,612,168	506,768,062					1,120,000,002	14,000,000
Water Supply Treatment Plant and Tower (3)										80,784,314	502,016,806	103,865,546	686,666,666	8,583,333
Water Connection (Off-Site)														
Water Connection (Off-Site)	800,892,001												800,892,001	10,011,150
Waste Water System														
Waste Water Collection Pipe (1) On-Site	330,070,565	912,195,016											1,242,265,581	15,528,320
Waste Water Collection Pipe (2) On-Site						165,695,600	1,171,704,600						1,337,400,200	16,717,503
Waste Water Collection Pipe (3) On-Site										255,624,054	249,537,767		505,161,821	6,314,523
Waste Water Treatment Plant (1)	551,455,665	547,262,086	398,390,024										1,497,107,775	18,713,847
Waste Water Treatment Plant (2)						37,108,397	344,577,971	315,421,374					697,107,742	8,713,847
Waste Water Treatment Plant (3)										55,662,608	345,903,350	295,541,942	697,107,900	8,713,849
Electrical System (On-Site)														
Electrical			289,507,365	1,104,416,985									1,393,924,350	17,424,054

Scope/Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	Total (BDT)	Total (USD)
System (On-Site) (1)														
Electrical System (On-Site) (2)									294,010,012				294,010,012	3,675,125
Electrical System (On-Site) (3)											111,300,000		111,300,000	1,391,250
Electrical System (Off-Site)														
Electrical Connection (Off-Site)	225,000,000												225,000,000	2,812,500
Communication System (On-Site)														
Communication System (1) (On-Site)				205,672,860									205,672,860	2,570,911
Communication System (2) (On-Site)									77,094,550				77,094,550	963,682
Communication System (3) (On-Site)											29,635,150		29,635,150	370,439
Communication System (Off-Site)														
Communication Connection (Off-Site)	78,819,168												78,819,168	985,240
Buildings														
Building (Admin & Custom) (1)			39,285,734	43,214,307									82,500,041	1,031,251
Building (Custom) (2)								1,980,342	5,519,677				7,500,019	93,750
Building (Custom) (3)											3,792,145	3,707,875	7,500,020	93,750
Building (Admin Staff Quarter) (1)			174,241,298	191,665,428									365,906,726	4,573,834
Rental Factory (1)			626,276,190	688,903,809									1,315,179,999	16,439,750
Rental Factory (2)								352,692,381	824,047,620				1,176,740,001	14,709,250
Warehouse														
Warehouse (On-Site IPP) (1)		721,338,561	858,425,528	750,714,340									2,330,478,429	29,130,980
Power Plant														
Power Plant (On-Site IPP) (1)		6,630,000,000	7,890,000,000	7,860,000,000	1,620,000,000								24,000,000,000	300,000,000
Power Plant (On-Site IPP) (2)						840,000,000	7,800,000,000	7,860,000,000	7,500,000,000				24,000,000,000	300,000,000
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,079	1,620,000,000	5,050,962,488	10,214,690,167	12,454,680,552	10,319,117,109	2,897,921,254	3,300,366,290	406,204,460	100,122,637,542	
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	155,683,507	128,988,964	36,224,016	41,254,579	5,077,556	1,251,532,969	

Table C2: Detailed Breakdown of Construction Costs of On-site Infrastructure (Phase 1)

Road Network Costs									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Minor Road (Phase 1)									
Replacing unsuitable soils	564,645	m ³	353	199,319,745	1	2019			Assuming thickness (1.5m), Required CBR Test > 11%
Subgrade	376,435	m ²	90	33,879,150					FDT (Field Density Test) > 95%
Sub-basecourse	376,435	m ²	746	280,820,510					Laterite, Required CBR Test > 30%
Basecourse	376,435	m ²	392	147,562,520					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	376,435	m ²	355	133,634,425					
Re-bar Works	376,435	m ²	930	350,084,550					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m ² for single layer (14.28 kg/m ² for double layer)
Concrete Works	75,287	m ³	8,858	666,892,246					Designed strength = 21N/cm ²
Labor	376,435	m ²	240	90,344,400					
Curb and Gutter	55,768	m	900	50,191,200					
Side Walk									Both sides
Clearing and Compacting Work	167,304	m ²	556	93,021,024					
Asphalt Pavement	167,304	m ²	654	109,416,816					
Sub-Total (Phase 1)				2,155,166,586					
Main Road (Phase 1)									
Replacing unsuitable soils	448,467	m ³	353	158,309,018	1	2019			Required CBR Test > 11%
Subgrade	302,855	m ²	90	27,256,950					FDT(Field Density Test) > 95%
Sub-basecourse	302,855	m ²	746	225,929,830					Laterite, Required CBR Test > 30%
Basecourse	302,855	m ²	392	118,719,160					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	302,855	m ²	355	107,513,525					
Re-bar Works	302,855	m ²	930	281,655,150					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m ² for single layer (14.28 kg/m ² for double layer)
Concrete Works	60,328	m ³	8,858	534,385,424					Designed strength = 21N/cm ²
Labor	302,855	m ²	240	72,685,200					
Curb and Gutter	27,422	m	900	24,679,800					
Median (Soil Filling)	8,227	m ³	292	2,402,284					
Side Walk									Both sides
Clearing and Compacting Work	84,686	m ²	556	47,085,416					
Asphalt Pavement	84,686	m ²	654	55,384,644					
Sub-Total (Main Road)				1,656,006,401					
Round About (Phase 1)									
Replacing unsuitable soils	148,484	m ³	353	52,414,844	1	2019			Required CBR Test > 11%
Subgrade	26,376	m ²	90	2,373,840					FDT (Field Density Test) > 95%
Sub-basecourse	26,376	m ²	746	19,676,496					Laterite, Required CBR Test > 30%
Basecourse	26,376	m ²	392	10,339,392					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	26,376	m ²	355	9,363,480					
Re-bar Works	26,376	m ²	930	24,529,680					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m ² for single layer (14.28 kg/m ² for double layer)
Concrete Works	5,275	m ³	8,858	46,725,950					Designed strength = 21N/cm ²
Labor	26,376	m ²	240	6,330,240					
Curb and Gutter	5,275	m	900	4,747,500					
Side Walk									Both sides
Clearing and Compacting	9,891	m ²	556	5,499,396					
Sand bedding	9,891	m ²	129	1,275,939					
Stone Placement	9,891	m ²	1,293	12,789,063					
Grassing	56,520	m ²	525	29,673,000					
Sub-Total (Round About)				225,738,820					
Road on Dike Sea Side (Phase 1)									
Subgrade	19,128	m ²	90	1,721,487	1	2018			
Basecourse and Asphalt Concrete Finishing	19,128	m ²	1,760	33,664,633					
Sub-Total (Road on Dike Sea Side)				35,386,120					
Road on Dike Inner Side (Phase 1)									
Subgrade	113,400	m ²	90	10,205,997	1	2017 ~ 2018			
Basecourse and Asphalt Concrete Finishing	113,400	m ²	1,760	199,583,951					
Sub-Total (Road on Dike Inner Side)				209,789,948					
Total				4,282,087,875					

Water Supply Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
41,940,000									
Water Supply Pipe Distribution (Phase 1)									
Pipe Laying φ 150	1,062	m	919	975,980	1	2018 ~ 2019			U-pvc φ 150, Class 8.5
Pipe Laying φ 200	9,432	m	1,225	11,554,200					U-pvc φ 200, Class 8.5
Pipe Laying φ 250	23,696	m	1,800	42,652,800					U-pvc φ 250, Class 8.5
Pipe Laying φ 300	36,190	m	2,200	79,618,000					U-pvc φ 300, Class 8.5
Connection Pipe between station and plant	2,589	m	2,700	6,990,300					U-pvc φ 350, Class 8.5
Ductile Pipe between entrance and plant	8,148	m	6,000	48,888,000					Ductile pipe φ 1000
Valve φ 150	2	ea	35,000	70,000					
Valve φ 200	9	ea	36,000	324,000					
Valve φ 250	15	ea	42,000	630,000					
Valve φ 300	26	ea	45,000	1,170,000					
Valve φ 350	35	ea	48,000	1,680,000					
Fire Hydrant φ 150	30	ea	245,000	7,350,000					
Fire Hydrant φ 200	67	ea	350,000	23,450,000					
Fire Hydrant φ 250	86	ea	435,000	37,410,000					
Fire Hydrant φ 300	91	ea	480,000	43,680,000					
Total (Water Supply Pipe Distribution)				306,443,280					
Water Supply Treatment Plant and Tower (Phase 1)									
Water Reservoir Tank	40,000	m ³	20,000	800,000,000	1	2017 ~ 2019			Reserving Volume 73,333 m ³
Water tower	6	set	50,000,000	300,000,000					Tower Reserving Volume 900 m ³
Water Supply Treatment Plant									
Office and Other Supporting Structure	1		51,445,986	51,445,986					650 m ² Office and 90 m ² Supporting Structure
Tanks	2		247,102,354	494,204,708					Total Capacity 306,322 m ³
Pumps, Electrical Works and Accessories	2		202,174,653	404,349,306					Aeration Pump, Centrifugal Pumps and Electrical Works
Sub-Total (Water Supply Treatment Plant)				950,000,000					
Sub-Total (Water Supply Treatment Plant and Tower) Phase 1				2,050,000,000					
Total				2,356,443,280					

Waste Water Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Waste Water Collection Pipe (Phase 1)									
RCP Laying	97,135	m	4,500	437,107,500	1	2017 ~ 2018			RCP φ 800
RCP Laying	21,905	m	5,500	120,477,406					RCP φ 1000
RCP Laying	1,490	m	7,000	10,431,190					RCP φ 1200
RCP Laying	1,005	m	8,000	8,040,000					RCP φ 1500
RCP Laying	1,041	m	9,500	9,889,500					RCP φ 1800
RCP Laying	1,055	m	11,000	11,605,000					RCP φ 2000
RCP Laying	1,047	m	15,000	15,705,000					RCP φ 2500
Sewerage Manhole	2,382	ea	150,000	357,300,000					For RCP φ 800
Sewerage Manhole	541	ea	200,000	108,200,000					For RCP φ 1000
Sewerage Manhole	35	ea	225,000	7,875,000					For RCP φ 1200
Sewerage Manhole	30	ea	250,000	7,500,000					For RCP φ 1500
Sewerage Manhole	26	ea	300,000	7,800,000					For RCP φ 1800
Sewerage Manhole	26	ea	330,000	8,580,000					For RCP φ 2000
Sewerage Manhole	26	ea	400,000	10,400,000					For RCP φ 2500
Lifting Station									
RC Structure	3	set	11,000,000	33,000,000					
Pumps	5	ea	150,972	754,860					900 m ³ /h/ea, Capacity 4,000 m ³ /h
Recycling Pipe	68,245	m	1,225	83,600,125					U-pvc φ 200
Recycling Tower and Tank/Pump	1	set	4,000,000	4,000,000					
Total				1,242,265,581					

Waste Water Treatment Plant

Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Structure and Facility</i>									
Office and Other Supporting Structures	1	set	748,553,886	748,553,886	1	2017 ~ 2019			650 m2 Office and 90 m2 Supporting Structure
Tanks	1	set	411,704,637	411,704,637					Total Capacity 245,058 m3
Pumps, Electrical Works and Accessories	1	set	336,849,252	336,849,252					Aeration Pump, Centrifugal Pump and Electrical Works
Total				1,497,107,775					

**Power Costs
(average voltage)**

Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Electrical System (Phase 1)</i>									
Sub Station (132/33kv line)	1	set	1,000,000,000	1,000,000,000	1	2019 ~ 2020			
Sub Station (33/11kv line)	4	set	15,000,000	60,000,000					
Transformer	78	set	2,000,000	156,000,000					11/0.4 Kv, 1 MVA / 5 MVA
Internal Line	14	km	3,000,000	42,000,000					33 Kv line
Internal Line	77	km	1,500,000	114,824,350					11 Kv line
Internal Line	25	km	800,000	20,000,000					0.4 Kv line
Testing and Commissioning	1	set	1,000,000	1,000,000					
Total				1,393,824,350					

**Electricity BT & Public Light
(Low Voltage)**

Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Street Lighting	20	set	5,000	100,000	1	2019 ~ 2020			
Total				100,000					

ICT Network Costs

Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Communication System (Phase 1)</i>									
FTTc	1	set	61,414,548	61,414,548	1	2020			FTTc: Fiber to the Cabinet Exchange (7,500 subscribers)
OFC Cable Networking	75,454	m	1,500	113,181,050					OFC: Optical Fiber Connection
DC (Router)	1	set	1,551,310	1,551,310					DC: Distribution Center
ODF, FDT Closure	1	set	533,760	533,760					ODF: Optical Distribution Framework FDT: Fiber Distribution Terminal
Power System	1	set	120,000	120,000					
NMS	1	set	28,072,192	28,072,192					NMF: Network monitoring system
AC Installation	4	set	150,000	600,000					AC: Air Conditioner
Room Preparation	1	set	200,000	200,000					
Sub-Total (Communication System: Phase 1)				205,672,860					
Total				205,672,860					

Fencing, Open Spaces (Plantation), and Drainage System									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Fencing (Phase 1)									
Fencing (Phase 1)	26,218	m	4,400	115,358,993	1	2018 ~ 2019			
Sub-Total (Fencing)				115,358,993					
Plantation (Phase 1)									
High Trees along Dike	14,109	ea	1,200	16,930,380	1	2019 ~ 2020			
Low Trees along Road	18,770	ea	1,000	18,770,000					
Low Trees on Green Area	9,263	ea	1,200	11,115,600					
Sub-Total (Plantation)				46,815,980					
Drainage System (Phase 1)									
RC Type U-drain	-	m	14,850	0	1	2018 ~ 2019			U-channel Width = 1.0 m, Average depth 100 cm
RC Type U-drain	61,581	m	14,900	917,556,900					U-channel Width = 1.2 m, Average depth 100 cm
RC Type U-drain	-	m	15,000	0					U-channel Width = 1.5 m, Average depth 100 cm
RC Type U-drain	-	m	18,000	0					U-channel Width = 1.8 m, Average depth 100 cm
RC Type U-drain	14,240	m	25,000	356,000,000					U-channel Width = 2.0 m, Average depth 100 cm
RC Type U-drain	-	m	30,000	0					U-channel Width = 2.5 m, Average depth 100 cm
RC Type U-drain	1,265	m	38,000	48,070,000					U-channel Width = 3.0 m, Average depth 100 cm
RC Type U-drain	592	m	50,000	29,600,000					U-channel Width = 3.5 m, Average depth 100 cm
Sub-Total (Drainage System)				1,351,226,900					
Total				1,513,401,873					

Sheet Piling and Culverts									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Sheet Pile Protection on Sea Side Jetty (Phase 1)									
Driving Sheet Piles	3,000	m	120,000	360,000,000	1	2018			Pile length 18m, W = 30 cm
RCC Beams	1,080	m3	8,858	9,566,640					For Pile Cap
MS Bar	186	ton	81,000	15,066,000					400 mps
Form Works	5,400	m2	350	1,890,006					For Pipe Cap
Sub-Total (Sheet Piling)				386,522,646					
Culvert Box (Phase 1)									
Culvert (4 vent, 4.5 x 5 m) of 2 lanes	6	set	7,900,004	47,400,023	1	2019			
Culvert (4 vent, 4.5 x 5 m) of 2 lanes with Regulator	4	set	10,000,000	40,000,000					
Sub-Total (Culvert Box)				87,400,023					
Total				473,922,669					

Table C3: Detailed Breakdown of Construction Costs of Offsite Infrastructure

Road Network									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Access Road (1)									
Replacing Unsuitable Soils and Extra Soils	200,112	m ³	292	58,432,704	1	2017 ~ 2019			
Subgrade	126,001	m ²	90	11,340,070					
Mechanical Compaction of Soils	200,112	m ³	299	59,833,488					30 cm layer by layer
Base Course and Road Surface	93,276	m ²	1,760	164,165,760					Asphalt Concrete Road
Base Course and Road Surface	32,724	m ²	2,120	69,374,880					RCC Road
Culvert	5	set	16,000,000	80,000,000					4 vent, 4.5x5m, 4 lanes
Land Acquisition	33	acre	2,158,500	71,230,500					
Sub-Total (Access road (1))				514,377,402					
Access Road (2)									
Replacing Unsuitable Soils and Extra Soils	286,265	m ³	292	83,589,380	1	2017 ~ 2019			
Subgrade	171,000	m ²	90	15,390,001					
Mechanical Compaction of Soils	286,265	m ³	299	85,593,235					30 cm layer by layer
Base Course and Road Surface	115,110	m ²	1,760	202,593,600					Asphalt Concrete Road
Base Course and Road Surface	51,876	m ²	2,120	109,977,120					RCC Road
Culvert	5	set	16,000,000	80,000,000					4 vent, 4.5x5m, 4 lanes
Land Acquisition	45	acre	2,158,500	97,132,500					
Sub-Total (Access road (2))				674,275,836					
Total				1,188,653,238					

Other Infrastructure and Utilities for last mile connection									
DETAIL EACH UTILITY SEPARATELY									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Electrical Connection									
132KV Line from Sonapal	15,000	m	15,000	225,000,000	1	2017			
Sub-Total (Electrical Connection)				225,000,000					
Communication Connection									
OFC Connection	77	km	1,015,833	78,219,141	1	2017			OFC: Optical Fiber Connection
Terminal Equipment	4	set	150,007	600,027					
Sub-Total (Communication Connection)				78,819,168					
Water Connection									
River Intake Transmission Pipe	15,740	m	48,800	768,112,001	1	2017			Iron Ductile Pipe ϕ 1,000 mm
Intake Jetty	1	set	15,000,000	15,000,000					
Pump	18	set	960,000	17,280,000					500 m ³ /h
GI Suction Pipe	1	set	500,000	500,000					ϕ 200 mm
Sub-Total (Water Connection)				800,892,001					
Total				1,104,711,169					

Table C4: Cost Estimate of all Earth Works (Phase 1)

Land Leveling and Filling									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Preparation (Phase 1)									
Site Clearing	7,996,100	m ²	10	79,961,000	1	2017			
Sub-Total (Preparation)				79,961,000					
Dredging (Phase 1)									
Dredging (Sand)	27,694,260	m ³	182	5,040,355,320	1	2017			
Dredging (Water Body)	4,284,599	m ³	182	779,797,018					
Dredging (Jetty)	16,435,797	m ³	182	2,991,315,050					
Sub-Total (Dredging)				8,811,467,388					
Total				8,891,428,388					

Table C5: Cost Estimate of Dike (Phase 1)

Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Dyke System Sea Side (Phase 1)									
<i>Standard Dyke along EZ</i>									
Earth Fill	2,143,083	m ³	182	390,041,106	1	2017 ~ 2018			
Excavation	634,988	m ³	182	115,567,816					
Mechanical Compaction	2,778,070	m ³	299	830,642,930					
Sub-Total (Standard Dyke along EZ)				1,336,251,852					
<i>Dyke between EZ and Sea</i>									
Earth Fill	492,000	m ³	182	89,544,005					
Sheet Pile Work	6,000	m	120,000	720,000,000					
RCC Beam	2,160	m ³	8,858	19,133,280					
MS Bar	372	ton	81,000	30,132,000					
Form Work in Pipe Cap	10,800	m ²	350	3,780,000					
Mechanical Compaction	492,000	m ³	299	147,108,007					
Sub-Total (Dyke between EZ and Sea)				1,009,697,292					
Sub-Total (Dyke System Sea Side)				2,345,949,144					
Dyke System Inner Side (Phase 1)									
Earth Fill	357,477	m ³	182	65,060,813	1	2017			
Excavation	198,944	m ³	182	36,207,808					
Mechanical Compaction	556,421	m ³	299	166,369,879					
Sub-Total (Dyke System Inner Side)				267,638,500					
Retention Pond System (Phase 1)									
Retention Pond (Northern Area)	1,758,224	m ³	136	239,118,512	1	2018 ~ 2019			
Membrane (Northern Area)	369,430	m ²	250	92,357,500					
Pump Sum Structure	10	set	2,282,880	22,828,800					Foundation: RC with Piling
Pumps	50	set	500,000	25,000,000					Pump: 30m ³ /min/pump
RCP	50	set	60,000	3,000,000					D = 1m, L = 10m
Earth Work (Leveling)	1,758,224	m ³	136	239,118,512					
Sub-Total (Retention Pond System)				621,423,325					
	1,787,445								
Total				3,235,010,969					

Table C6: Cost Estimate of Power Plant and Warehouse (Phase 1)

Power Plant by IPP									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Power Plant by IPP (Phase 1)	1	set	24,000,000,000	24,000,000,000	1	2018 ~ 2021			Coal Power Plant 300 MW by IPP including small jetty and stockyard
Total				24,000,000,000					
Warehouse by IPP									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Warehouse by IPP (Phase 1)					1	2018 ~ 2020			
Boundary Wall	1,700	m	5,850	9,945,000					Boundary Wall
Warehouse	48,000	m ²	18,500	888,000,000					400m x 30m @ 4 = 48,000 m ²
RCC Work	138,991	m ²	10,175	1,414,233,429					Parking, Storage of ODC and other non-perishable consignment including containers
Security Post	8	set	100,000	800,000					Security Post
Area Lighting with High Mast Pole with Light	35	set	500,000	17,500,000					High Mast Light
Total				2,330,478,429					

Table C7: Cost Estimate of Buildings (Phase 1)

Pre-built Factory Costs				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Pre-Built Factories (Phase 1)	38,000	m2	34,610	1,315,179,999
Total				1,315,179,999

Administration and Custor				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Administration (Phase 1)	2,000	m2	33,750	67,500,000
Customs Building (Phase 1)	440.0000293	m2	34,091	15,000,041
Total				82,500,041

Residential Facilities and Building Costs (Both workers and resettlement)				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Administration Staff Quarter (Phase 1)	9,453	m2	38,708	365,906,726
Total				365,906,726

Table C8: Detailed Breakdown of Construction Costs of On-site Infrastructure (Phase 2)

Road Network Costs									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Minor Road (Phase 2)									
Replacing unsuitable soils	712,902	m3	353	251,654,472	2	2024 ~ 2025			Assuming thickness (1.5m). Required CBR Test > 11
Subgrade	475,269	m2	90	42,774,210					FDT (Field Density Test) > 95%
Sub-basecourse	475,269	m2	746	354,550,674					Laterite, Required CBR Test > 30%
Basecourse	475,269	m2	392	186,305,448					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	475,269	m2	355	168,720,495					
Re-bar Works	475,269	m2	930	442,000,170					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m2 for single layer (14.28 kg/m2 for double layer)
Concrete Works	95,054	m3	8,858	841,988,332					Designed strength = 21N/cm2
Labor	475,269	m2	240	114,064,560					
Curb and Gutter	70,410	m	900	63,369,000					
Side Walk									Both sides
Clearing and Compacting Works	211,231	m2	556	117,444,436					
Asphalt Pavement	211,231	m2	654	138,145,074					
Sub-Total (Minor Road)				2,721,016,871					
Main Road (Phase 2)									
Replacing unsuitable soils	146,748	m3	353	51,802,044	2	2024 ~ 2025			Required CBR Test > 11%
Subgrade	94,955	m2	90	8,545,950					FDT(Field Density Test) > 95%
Sub-basecourse	94,955	m2	746	70,836,430					Laterite, Required CBR Test > 30%
Basecourse	94,955	m2	392	37,222,360					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	94,955	m2	355	33,709,025					
Re-bar Works	94,955	m2	930	88,308,150					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m2 for single layer (14.28 kg/m2 for double layer)
Concrete Works	18,991	m3	8,858	168,222,278					Designed strength = 21N/cm2
Labor	94,955	m2	240	22,789,200					
Curb and Gutter	8,631	m	900	7,768,259					
Median (Soil Filling)	2,590	m3	292	756,280					
Side Walk									Both sides
Clearing and Compacting Works	25,897	m2	556	14,398,732					
Asphalt Pavement	25,897	m2	654	16,936,638					
Sub-Total (Main Road)				521,295,346					
Road on Dike Inner Side (Phase 2)									
Subgrade	68,400	m2	90	6,156,000	2	2022			
Basecourse and Asphalt Concrete Finishing	68,400	m2	1,760	120,384,044					
Sub-Total (Road on Dike Inner Side)				126,540,044					
Total				3,368,852,261					

Water Supply Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Water Supply Pipe Distribution (Phase 2)									
Pipe Laying φ 150	8,316	m	919	7,642,404	2	2023 ~ 2024			U-pvc φ 150, Class 8.5
Pipe Laying φ 200	29,674	m	1,225	36,350,650					U-pvc φ 200, Class 8.5
Pipe Laying φ 250	27,795	m	1,800	50,031,000					U-pvc φ 250, Class 8.5
Pipe Laying φ 300	15,866	m	2,200	34,904,178					U-pvc φ 300, Class 8.5
Connection Pipe between station and plant	4,582	m	2,700	12,371,400					U-pvc φ 350, Class 8.5
Ductile Pipe between entrance and plant	-	m	6,000	0					Ductile pipe φ 1000
Valve φ 150	15	ea	35,000	525,000					
Valve φ 200	45	ea	36,000	1,620,000					
Valve φ 250	38	ea	42,000	1,596,000					
Valve φ 300	32	ea	45,000	1,440,000					
Valve φ 350	31	ea	48,000	1,488,000					
Fire Hydrant φ 150	142	ea	245,000	34,790,000					
Fire Hydrant φ 200	148	ea	350,000	51,800,000					
Fire Hydrant φ 250	139	ea	435,000	60,465,000					
Fire Hydrant φ 300	110	ea	480,000	52,800,000					
Total (Water Supply Pipe Distribution)				347,823,632					
Water Supply Treatment Plant and Tower (Phase 2)									
Water Reservoir Tank	25,000	m ³	20,000	500,000,000	2	2022 ~ 2024			Reserving Volume 73,333 m ³
Water tower	3	set	50,000,000	150,000,000					Tower Reserving Volume 900 m ³
Water Supply Treatment Plant									
Office and Other Supporting Structure	1	set	51,445,986	51,445,986					650 m ² Office and 90 m ² Supporting Structure
Tanks	1	set	230,204,710	230,204,710					Total Capacity 306,322 m ³
Pumps, Electrical Works and Accessories	1	set	188,349,306	188,349,306					Aeration Pump, Centrifugal Pumps and Electrical Works
Sub-Total (Water Supply Treatment Plant)				470,000,002					
Sub-Total (Water Supply Treatment Plant and Tower) Phase 2				1,120,000,002					
Total				1,467,823,634					

Waste Water Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Waste Water Collection Pipe (Phase 2)									
RCP Laying	92,168	m	4,500	414,756,000	2	2022 ~ 2023			RCP φ 800
RCP Laying	41,367	m	5,500	227,518,500					RCP φ 1000
RCP Laying	648	m	7,000	4,536,000					RCP φ 1200
RCP Laying	664	m	8,000	5,312,000					RCP φ 1500
RCP Laying	662	m	9,500	6,289,000					RCP φ 1800
RCP Laying	352	m	11,000	3,872,000					RCP φ 2000
RCP Laying	-	m	15,000	0					RCP φ 2500
Sewerage Manhole	2,304	ea	150,000	345,600,000					For RCP φ 800
Sewerage Manhole	1,034	ea	200,000	206,800,000					For RCP φ 1000
Sewerage Manhole	16	ea	225,000	3,600,000					For RCP φ 1200
Sewerage Manhole	17	ea	250,000	4,250,000					For RCP φ 1500
Sewerage Manhole	17	ea	300,000	5,100,000					For RCP φ 1800
Sewerage Manhole	9	ea	330,000	2,970,000					For RCP φ 2000
Sewerage Manhole	-	ea	400,000	0					For RCP φ 2500
Lifting Station									
RC Structure	1	set	11,000,000	11,000,000					
Pumps	3	ea	150,972	452,916					900 m ³ /h/ea, Capacity 4,000 m ³ /h
Recycling Pipe	74,566	m	1,225	91,343,784					U-pvc φ 200
Recycling Tower and Tank/Pump	1	set	4,000,000	4,000,000					
Total				1,337,400,200					

Waste Water Treatment Plant									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Structure and Facility (Phase 2)									
Office and Other Supporting Structure	1	set	348,553,873	348,553,873	2	2022 ~ 2024			650 m ² Office and 90 m ² Supporting Structure
Tanks	1	set	191,704,628	191,704,628					Total Capacity 245,058 m ³
Pumps, Electrical Works and Accessories	1	set	156,849,241	156,849,241					Aeration Pump, Centrifugal Pump and Electrical Works
Total				697,107,742					

Power Costs (average voltage)									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Electrical System (Phase 2)									
Sub Station (132/33kv line)	0	set	1,000,000,000	0	2	2025			
Sub Station (33/11kv line)	3	set	15,000,000	45,000,000					
Transformer	74	set	2,000,000	148,000,000					11/0.4 Kv, 1 MVA / 5 MVA
Interval Line	2	km	3,000,000	6,000,000					33 Kv line
Interval Line	52	km	1,500,000	78,110,012					11 Kv line
Interval Line	21	km	800,000	16,800,000					0.4 Kv line
Testing and Commissioning	0	set	1,000,000	0					
Total				293,910,012					

Electricity BT & Public Light (Low Voltage)									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Street Lighting (Phase 2)	20	set	5,000	100,000	2	2025			
Total				100,000					

ICT Network Costs									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Communication System (Phase 2)									
FTTc	0	set	61,414,548	0	2	2025			FTTc: Fiber to the Cabinet Exchange (7,500 subscribers)
OFC Cable Networking	51,396	m	1,500	77,094,550					OFC: Optical Fiber Connection
DC (Router)	0	set	1,551,310	0					DC: Distribution Center
ODF, FDT Closure	0	set	533,760	0					ODF: Optical Distribution Framework FDT: Fiber Distribution Terminal
Power System	0	set	120,000	0					
NMS	0	set	28,072,192	0					NMP: Network monitoring system
AC Installation	0	set	150,000	0					AC: Air Conditioner
Room Preparation	0	set	200,000	0					
Sub-Total (Communication System: Phase 2)				77,094,550	77,094,550				
Total				77,094,550					

Fencing, Open Spaces (Plantation), and Drainage System									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Fencing (Phase 2)									
Fencing (Phase 2)	2,670	m	4,400	11,746,982	2	2022			
Sub-Total (Fencing)				11,746,982					
Plantation (Phase 2)									
High Trees along Dike	1,335	ea	1,200	1,602,336	2	2025			
Low Trees along Road	16,671	ea	1,000	16,671,000					
Low Trees on Green Area	11,722	ea	1,200	14,066,400					
Sub-Total (Plantation)				32,339,736					
Drainage System (Phase 2)									
RC Type U-drain	65,256	m	14,850	969,051,600	2	2023 ~ 2025			U-channel Width = 1.0 m, Average depth 100 cm
RC Type U-drain	-	m	14,900	0					U-channel Width = 1.2 m, Average depth 100 cm
RC Type U-drain	5,299	m	15,000	79,485,000					U-channel Width = 1.5 m, Average depth 100 cm
RC Type U-drain	-	m	18,000	0					U-channel Width = 1.8 m, Average depth 100 cm
RC Type U-drain	3,638	m	25,000	90,950,000					U-channel Width = 2.0 m, Average depth 100 cm
RC Type U-drain	1,585	m	30,000	47,550,000					U-channel Width = 2.5 m, Average depth 100 cm
RC Type U-drain	-	m	38,000	0					U-channel Width = 3.0 m, Average depth 100 cm
RC Type U-drain	-	m	50,000	0					U-channel Width = 3.5 m, Average depth 100 cm
Sub-Total (Drainage System)				1,187,036,600					
Total				1,231,123,318					

Sheet Piling and Culverts									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Culvert Box (Phase 2)									
Culvert (4 vent, 4.5 x 5 m) of 2 lanes	1	set	7,900,002	7,900,002	2	2025			
Culvert (4 vent, 4.5 x 5 m) of 4 lanes	1	set	16,000,000	16,000,000					
Culvert (4 vent, 4.5 x 5 m) of 2 lanes with Regulator	0	set	10,000,000	0					
Sub-Total (Culvert Box)				23,900,002					
Total				23,900,002					

Table C9: Cost Estimate of all Earth Works (Phase 2)

Land Leveling and Filling									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Preparation (Phase 2)									
Site Clearing	6,667,201	m ²	10	66,672,012	2	2022			
Sub-Total (Preparation)				66,672,012					
Dredging (Phase 2)									
Dredging (Sand)	17,649,024	m ³	182	3,212,122,397	2	2022			
Dredging (Water Body)	2,015,748	m ³	182	366,866,136					
Dredging (Jetty)	-	m ³	182	0					
Sub-Total (Dredging)				3,578,988,533					
Total				3,645,660,545					

Table C10: Cost Estimate of Dike (Phase 2)

Cost of Dike Construction									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Dike System Inner Side (Phase 2)									
Earth Fill	219,840	m ³	182	40,010,880	2	2022			
Excavation	122,346	m ³	182	22,266,972					
Mechanical Compaction	342,185	m ³	299	102,313,296					
Sub-Total (Dike System Inner Side)				164,591,148					
Retention Pond System (Phase 2)									
Retention Pond (Northern Area)	1,437,373	m ³	136	195,482,792	2	2023 ~ 2025			
Membrane (Northern Area)	423,410	m ²	250	105,852,500					
Pump Sum Structure	10	set	2,282,880	22,828,800					Foundation: RC with Piling
Pumps	50	set	500,000	25,000,000					Pump: 30m ³ /min/pump
RCP	50	set	60,000	3,000,000					D = 1m, L = 10m
Earth Work (Leveling)	1,437,373	m ³	136	195,482,792					
Sub-Total (Retention Pond System)				547,646,884					
Total	1,787,445			712,238,032					

Table C11: Cost Estimate of Power Plant (Phase 2)

Power Plant by IPP									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Power Plant by IPP (Phase 2)	1	set	24,000,000,000	24,000,000,000	2	2022 ~ 2025			Coal Power Plant 300 MW (Total 600 MW) by IPP including jetty and stockyard
Total				24,000,000,000					

Table C12: Cost Estimate of Buildings (Phase 2)

Pre-built Factory Costs				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Pre-Built Factories (Phase 2)	34,000	m ²	34,610	1,176,740,001
Total				1,176,740,001
Administration and Customs Building Costs				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Administration (Phase 2)	-	m ²	33,750	0
Customs Building (Phase 2)	220	m ²	34,091	7,500,019
Total				7,500,019

Table C13: Detailed Breakdown of Construction Costs of On-site Infrastructure (Phase 3)

Road Network Costs									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Minor Road (Phase 3)									
Replacing unsuitable soils	264,300	m3	353	93,297,876	3	2027			Assuming thickness (1.5m), Required CBR Test > 11%
Subgrade	176,192	m2	90	15,857,280					FDT (Field Density Test) > 95%
Sub-basecourse	176,192	m2	746	131,439,232					Laterite, Required CBR Test > 30%
Basecourse	176,192	m2	392	69,067,264					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	176,192	m2	355	62,548,160					
Re-bar Works	176,192	m2	930	163,858,560					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m2 for single layer (14.28 kg/m2 for double layer)
Concrete Works	35,238	m3	8,858	312,138,204					Designed strength = 21N/cm2
Labor	176,192	m2	240	42,286,080					
Curb and Gutter	26,103	m	900	23,492,700					
Side Walk									Both sides
Clearing and Compacting Works	78,308	m2	556	43,539,248					
Asphalt Pavement	78,308	m2	654	51,213,432					
Sub-Total (Minor Road)				1,008,738,036					
Main Road (Phase 3)									
Replacing unsuitable soils	119,658	m3	353	42,239,274	3	2027			Required CBR Test > 11%
Subgrade	77,426	m2	90	6,968,340					FDT (Field Density Test) > 95%
Sub-basecourse	77,426	m2	746	57,759,796					Laterite, Required CBR Test > 30%
Basecourse	77,426	m2	392	30,350,992					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	77,426	m2	355	27,486,230					
Re-bar Works	77,426	m2	930	72,006,180					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m2 for single layer (14.28 kg/m2 for double layer)
Concrete Works	15,485	m3	8,858	137,166,130					Designed strength = 21N/cm2
Labor	77,426	m2	240	18,582,240					
Curb and Gutter	7,039	m	900	6,335,100					
Median (Soil Filling)	2,112	m3	292	616,826					
Side Walk									Both sides
Clearing and Compacting Works	21,116	m2	556	11,740,496					
Asphalt Pavement	21,116	m2	654	13,809,864					
Sub-Total (Main Road)				425,061,468					
Round About (Phase 3)									
Replacing unsuitable soils	30,144	m3	353	10,640,832	3	2027			Required CBR Test > 11%
Subgrade	5,275	m2	90	474,750					FDT (Field Density Test) > 95%
Sub-basecourse	5,275	m2	746	3,935,150					Laterite, Required CBR Test > 30%
Basecourse	5,275	m2	392	2,067,800					Aggregate C30, Required CBR > 90%
Concrete Pavement									
Form Works	5,275	m2	355	1,872,625					
Re-bar Works	5,275	m2	930	4,905,750					Diameter of re-bar 12mm @ 250mm c/c both way weight = 7.14 kg/m2 for single layer (14.28 kg/m2 for double layer)
Concrete Works	1,055	m3	8,858	9,345,190					Designed strength = 21N/cm2
Labor	5,275	m2	240	1,266,000					
Curb and Gutter	879	m	900	791,100					
Side Walk									Both sides
Clearing and Compacting	1,978	m2	556	1,099,768					
Sand bedding	1,978	m2	129	255,162					
Stone Placement	1,978	m2	1,293	2,557,554					
Grassing	11,307	m2	525	5,936,079					
Sub-Total (Round About)				45,147,760					
Road on Dike Sea Side (Phase 3)									
Subgrade	24,806	m2	90	2,232,533	3	2026			
Basecourse and Asphalt Concrete Finishing	24,806	m2	1,760	43,658,430					
Sub-Total (Road on Dike Sea Side)				45,890,964					
Road on Dike Inner Side (Phase 3)									
Subgrade	111,600	m2	90	10,044,001	3	2026 ~ 2027			
Basecourse and Asphalt Concrete Finishing	111,600	m2	1,760	196,416,026					
Sub-Total (Road on Dike Inner Side)				206,460,028					
Total				1,731,298,256					

Water Supply Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Water Supply Pipe Distribution (Phase 3)									
Pipe Laying φ 150	3,874	m	919	3,560,206	3	2026 ~ 2027			U-pvc φ 150, Class 8.5
Pipe Laying φ 200	5,532	m	1,225	6,776,700					U-pvc φ 200, Class 8.5
Pipe Laying φ 250	5,448	m	1,800	9,806,400					U-pvc φ 250, Class 8.5
Pipe Laying φ 300	15,016	m	2,200	33,035,200					U-pvc φ 300, Class 8.5
Connection Pipe between station and plant	3,287	m	2,700	8,874,362					U-pvc φ 350, Class 8.5
Ductile Pipe between entrance and plant	-	m	6,000	0					Ductile pipe φ 1000
Valve φ 150	4	ea	35,000	140,000					
Valve φ 200	6	ea	36,000	216,000					
Valve φ 250	5	ea	42,000	210,000					
Valve φ 300	15	ea	45,000	675,000					
Valve φ 350	3	ea	48,000	144,000					
Fire Hydrant φ 150	19	ea	245,000	4,655,000					
Fire Hydrant φ 200	28	ea	350,000	9,800,000					
Fire Hydrant φ 250	27	ea	435,000	11,745,000					
Fire Hydrant φ 300	75	ea	480,000	36,000,000					
Total (Water Supply Pipe Distribution)				125,637,868					
Water Supply Treatment Plant and Tower (Phase 3)									
Water Reservoir Tank	8,333	m ³	20,000	166,666,666	3	2026 ~ 2028			Reserving Volume 73,333 m ³
Water tower	1	set	50,000,000	50,000,000					Tower Reserving Volume 900 m ³
Water Supply Treatment Plant									
Office and Other Supporting Structure	1	set	51,445,986	51,445,986					650 m ² Office and 90 m ² Supporting Structure
Tanks	1	set	230,204,708	230,204,708					Total Capacity 306,322 m ³
Pumps, Electrical Works and Accessories	1	set	188,349,306	188,349,306					Aeration Pump, Centrifugal Pumps and Electrical Works
Sub-Total (Water Supply Treatment Plant)				470,000,000					
Sub-Total (Water Supply Treatment Plant and Tower) Phase 3				686,666,666					
Total				812,304,534					

Waste Water Costs									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Waste Water Collection Pipe (Phase 3)									
RCP Laying	33,231	m	4,500	149,539,500	3	2026 ~ 2027			RCP φ 800
RCP Laying	15,719	m	5,500	86,454,500					RCP φ 1000
RCP Laying	690	m	7,000	4,830,000					RCP φ 1200
RCP Laying	677	m	8,000	5,416,000					RCP φ 1500
RCP Laying	-	m	9,500	0					RCP φ 1800
RCP Laying	-	m	11,000	0					RCP φ 2000
RCP Laying	-	m	15,000	0					RCP φ 2500
Sewerage Manhole	831	ea	150,000	124,650,000					For RCP φ 800
Sewerage Manhole	393	ea	200,000	78,600,000					For RCP φ 1000
Sewerage Manhole	17	ea	225,000	3,825,000					For RCP φ 1200
Sewerage Manhole	17	ea	250,000	4,250,000					For RCP φ 1500
Sewerage Manhole	-	ea	300,000	0					For RCP φ 1800
Sewerage Manhole	-	ea	330,000	0					For RCP φ 2000
Sewerage Manhole	-	ea	400,000	0					For RCP φ 2500
Lifting Station									
RC Structure	1	set	11,000,000	11,000,000					
Pumps	2	ea	150,972	301,944					900 m ³ /h/ea, Capacity 4,000 m ³ /h
Recycling Pipe	29,628	m	1,225	36,294,877					U-pvc φ 200
Recycling Tower and Tank/Pump	-	set	4,000,000	0					
Total				505,161,821					

Waste Water Treatment Plan									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Structure and Facility (Phase 3)									
Office and Other Supporting Structure	1	set	348,553,950	348,553,950	3	2026 ~ 2028			650 m ² Office and 90 m ² Supporting Structure
Tanks	1	set	191,704,672	191,704,672					Total Capacity 245,058 m ³
Pumps, Electrical Works and Accessories	1	set	156,849,278	156,849,278					Aeration Pump, Centrifugal Pump and Electrical Works
Total				697,107,900					

Power Costs (average voltage)									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Electrical System (Phase 3)									
Sub Station (132/33kv line)	0	set	1,000,000,000	0	3	2027			
Sub Station (33/11kv line)	2	set	15,000,000	30,000,000					
Transformer	25	set	2,000,000	50,000,000					11/0.4 Kv, 1 MVA / 5 MVA
Internal Line	0	km	3,000,000	0					33 Kv line
Internal Line	17	km	1,500,000	25,500,000					11 Kv line
Internal Line	7	km	800,000	5,600,000					0.4 Kv line
Testing and Commissioning	0	set	1,000,000	0					
Total				111,100,000					

Electricity BT & Public Light (Low Voltage)									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
Street Lighting (Phase 3)	40	set	5,000	200,000	3	2027			
Total				200,000					

ICT Network Costs									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Communication System (Phase 3)</i>									
FTTc	0	set	61,414,548	0	3	2027			FTTc: Fiber to the Cabinet Exchange (7,500 subscribers)
OFC Cable Networking	19,757	m	1,500	29,635,150					OFC: Optical Fiber Connection
DC (Router)	0	set	1,551,310	0					DC: Distribution Center
ODF, FDT Closure	0	set	533,760	0					ODF: Optical Distribution Framework FDT: Fiber Distribution Terminal
Power System	0	set	120,000	0					
NMS	0	set	28,072,192	0					NMF: Network monitoring system
AC Installation	0	set	150,000	0					AC: Air Conditioner
Room Preparation	0	set	200,000	0					
Sub-Total (Communication System: Phase 3)				29,635,150					
Total				29,635,150					

Fencing, Open Spaces (Plantation), and Drainage System									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Fencing (Phase 3)</i>									
Fencing (Phase 3)	6,165	m	4,400	27,127,920	3	2026			
Sub-Total (Fencing)				27,127,920	27,127,920	0			
<i>Plantation (Phase 3)</i>									
High Trees along Dike	3,083	ea	1,200	3,699,600	3	2027 ~ 2028			
Low Trees along Road	7,333	ea	1,000	7,333,000					
Low Trees on Green Area	13,974	ea	1,200	16,769,273					
Sub-Total (Plantation)				27,801,873					
<i>Drainage System (Phase 3)</i>									
RC Type U-drain	16,496	m	14,850	244,965,600	3	2027			U-channel Width = 1.0 m, Average depth 100 cm
RC Type U-drain	-	m	14,900	0					U-channel Width = 1.2 m, Average depth 100 cm
RC Type U-drain	1,677	m	15,000	25,152,840					U-channel Width = 1.5 m, Average depth 100 cm
RC Type U-drain	-	m	18,000	0					U-channel Width = 1.8 m, Average depth 100 cm
RC Type U-drain	-	m	25,000	0					U-channel Width = 2.0 m, Average depth 100 cm
RC Type U-drain	-	m	30,000	0					U-channel Width = 2.5 m, Average depth 100 cm
RC Type U-drain	-	m	38,000	0					U-channel Width = 3.0 m, Average depth 100 cm
RC Type U-drain	-	m	50,000	0					U-channel Width = 3.5 m, Average depth 100 cm
Sub-Total (Drainage System)				270,118,440	270,118,440	-			
Total				325,048,233					

Sheet Piling and Culverts									
Description of items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Culvert Box (Phase 3)</i>									
Culvert (4 vent, 4.5 x 5 m) of 2 lanes	3	set	7,899,997	23,699,990	3	2027			
Culvert (4 vent, 4.5 x 5 m) of 4 lanes	2	set	16,000,000	32,000,000					
Culvert (4 vent, 4.5 x 5 m) of 2 lanes with Regulator	0	set	10,000,000	0					
Sub-Total (Culvert Box)				55,699,990					
Total				55,699,990					

Table C14: Cost Estimate of all Earth Works (Phase 3)

Land Leveling and Filling									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Preparation (Phase 3)</i>									
Site Clearing	3,855,001	m2	10	38,550,012	3	2026			
Sub-Total (Preparation)				38,550,012					
<i>Dredging (Phase 3)</i>									
Dredging (Sand)	8,344,460	m3	182	1,518,691,736	3	2026			
Dredging (Water Body)	2,773,452	m3	182	504,768,264					
Dredging (Jetty)	-	m3	182	0					
Sub-Total (Dredging)				2,023,460,000					
Total				2,062,010,012					

Table C15: Cost Estimate of Dike (Phase 3)

Cost of Dike Construction									
Description of Items	Quantity	Unit	Unit price (Taka)	Total cost (with Taxes*)	List Phase of Project	List Years of Construction	First Year Construction Costs	Second Year Construction Costs	Specification
<i>Dike System Inner Side (Phase 3)</i>									
Earth Fill	357,194	m3	182	65,009,315	3	2026			
Excavation	198,786	m3	182	36,179,052					
Mechanical Compaction	555,979	m3	299	166,237,721					
Sub-Total (Dike System Inner Side)				267,426,088					
Total				267,426,088					

Table C16: Cost Estimate of Buildings (Phase 3)

Pre-built Factory Costs				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Pre-Built Factories (Phase 3)	-	m2	34,610	0
Total				0

Administration and Customs				
Description of Items	Total Size	Unit	M2 Cost (Taka)	Total cost (with Taxes*)
Administration (Phase 3)	-	m2	33,750	0
Customs Building (Phase 3)	220	m2	34,091	7,500,020
Total				7,500,020

Table C17: Master Planning Information (All Phase)

Master Planning					
	Phase 1	Phase 2	Phase 3	Total	Note
Number of Phases				3 Phase	
Total m2 per phase	14,255,591	7,307,056	3,251,540	24,814,187	
Year when each phase is to be developed	2020	2025	2028		
Total number of plots per phase	549	539	152	1,240	Industry Plot
Total leasable plots per phase	549	539	152	1,240	Total Number
Total m2 of leasable plots per phase	5,704,100	5,404,700	1,478,200	12,587,000	Industry Plot excluding Stock yard, Jetty and coal power plant
Total number of rentable plots per phase	1			1	
Total m2 of rentable plots per phase	224,921	72000		296,921	Rental Factory Zone and Warehouse space
Total non-leasable plots per phase	6	1	1	8	Total Number including Administration Functions and Residential
Total non-leasable plots per phase	326,000	1,300	400	327,700	Total m2
Yearly cost for maintenance of the project (US \$ million)	5.547	7.502	9.466	9.466	
Total number of households to be resettled	1047			1047	
Total cost of resettlement (US \$ million)	2.71			2.71	

Note: Detail Land Use is shown in the Table 3.2.5-1: Area of Requirement of Master Plan (Mirershoari EZ)

ANNEX 4

CHAPTER 4: ENVIRONMENT & SOCIAL REVIEW

1. Other Environmental Impacts and Mitigation Measures for the Mirershorai EZ Project Component

Impact Description	Magnitude - Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
Location impacts				
Effects of Port/Harbour on Environmental Resources and Values Fisheries reproduction zones; Fragile marine ecology; Coastal forest/mangroves and terrestrial ecology, Oil leakage and spills within the EZ etc.	S/P	Special care must be exercised in planning and designing the harbor & EZ to appropriate the needed control in the plan.	The PIU at Mirershorai/Chittagon, will prepare the Plan, with assistance from the project consultants. Implementation of the Plan will be undertaken by EA (BEZA).	Part of Planning costs
Coal-fired Power plants for electricity-generation typically withdraw and consume water from nearby water bodies, to create steam for turning their turbines. When water is drawn into a coal power plant, millions of fish eggs, fish larvae and juvenile fish may also come along with it. In addition, millions of adult fish may become trapped against the intake structures. Many of these fish are injured or die in the process. Surrounding air quality deterioration.	S/P	Apply appropriate planning and technology for carbon capture and storage (CCS) technology—equipment that would allow a plant to capture CO ₂ before it is released and then stores it underground.	The PIU at Mirershorai/Chittagon, will prepare the Plan, with assistance from the project consultants	
Design Impacts				
Groundwater contamination The installation of wells may lead to pollution of the aquifer from	I/P	Approved DOE and WHO guidelines and protocols will be strictly followed in the construction of EZ Site, approach road and associated industries. Establishment of a test or production well in order to ensure the integrity of the aquifer.	Incorporation of measures in the Project design - Project Consultant	Measures shall be integrated in the detailed design

Impact Description	Magnitude - Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
possible sources of contamination such as surface run-off, garbage dumps, latrines etc.				
Seismic hazards The EZ is located in the medium risk area (Zone-2) on the national Seismic Zoning Map	I/P	The EZ site including industrial establishment and facilities will be designed consistent with internationally accepted standards related to the seismicity risk of the area so to minimize or prevent damage to the structures during earthquakes.	Project consultant	Measures shall be integrated in the detailed design
Construction Impacts				
Health hazards due to construction activities	I/T	Standard environment health and safety guidelines of WB will be followed to ensure health hazards to workers and neighboring settlement. Exposure to dust, noise can be prevented by containment, regular inspections and proper precautions when working around or with the material.	Construction Contractor, Construction Supervision Consultant	Cost included in Contract
Pollution of water resources Direct discharge of construction run-off may cause siltation of surrounding surface water bodies.	M/T	Adequate run-off and drainage control in construction areas will be provided. Sediment laden construction water will be discharged into settling ponds prior to final discharge. Direct discharge into surface watercourses will not be allowed. Earth, stones and solid wastes will be properly stockpiled and disposed of so that these do not block rivers and streams, thereby avoiding adverse impact on water quality and flow regime	Contractor	-
Dust and noise from construction of EZ facilities. Elevated noise levels and dust emission may be experienced by nearby households	M/T	The following measures will be implemented to minimize impacts to local communities during construction of EZ and associated structures: (i) provision of cover on haul trucks transporting filling materials, gravel, excavated soil and other construction materials, (ii) water spraying on exposed areas to suppress dust emission, (iii) proper maintenance of equipment and use of mufflers, as appropriate, to minimize noise and (iv) scheduling of noise generating activities during daytime, as much as possible, to avoid disturbance to nearby households.	Contractor	minimal
Removal of vegetation The construction of an EZ as well as approach road will require	M/T	Much of the clearing will be undertaken along the roads where the dominant vegetation is various species of grasses. Although cutting of trees may be necessary in some areas, impacts may not be deemed significant as the Project will involve removal of common tree species	-	-

Impact Description	Magnitude - Significance of the Impact	Mitigation Measures	Implementation Responsibility	Preliminary Costing
vegetation clearing.		that are widely found in the area. There are no endangered or rare species of vegetation in the Project area that may be affected during construction. However, the proposed detailed EIA study will further address these issues including land acquisition.		
Safety hazards during construction This impact is considered negligible provided appropriate safety precautions are observed at all times.	I/T	Workers will be oriented on safe practices and will be provided with appropriate personnel protective gear (e.g., safety shoes, hard hats etc). There will be provision of adequate protection to the general public, such as safety barriers where excavation is being undertaken and other measures, as necessary.	Contractor	Orientation shall be undertaken by EHS Officer to be hired by the contractor
O & M Impacts				
Hazard of land subsidence Land subsidence may occur due to over extraction of groundwater.	I/P	Geotechnical investigations will be conducted to appropriately design the site stability and associated establishment	Project Consultants	Orientation shall be undertaken by EHS Officer to be hired by the contractor
Pollution due to improper treatment of wastes, sludge disposal methods	M/P	Impacts due to improper treatment of wastes, disposal of sludge will be avoided through the implementation of a sludge management plan.	BEZA	Formulation of sludge management plan

Note:

Magnitude: I-insignificant, M-moderate or S-significant and
Impact duration: T-temporary or P-permanent

2. Earthquake Zones of Bangladesh



Source: Geological Survey of Bangladesh

3. Coal-fired Power Plant

Coal-fired power plants continue to speed up global warming by filling the atmosphere with vast amounts of carbon dioxide. Coal burning leads to acid rain and smog and emits more than 60 different hazardous air pollutants such as a variety of toxic metals, organic compounds, acid gases, sulfur, nitrogen, carbon dioxide and particulate matter. As such, location of these plants should be more than 25 Km from sensitive areas (human settlement, forest, archaeology and cultural sites, game reserves etc). Emissions include the following:

Carbon dioxide (CO₂)

On average one 500-megawatt coal-fired power plant produces approximately 3 million tons/year of CO₂. Each plant's emissions depend on its size and efficiency. A single power station in Martins Lake, Texas emitted more than 21 million tonnes of CO₂ in 2006 - more CO₂ than Slovenia, Estonia, Bolivia or Afghanistan emitted in 2004.

Worldwide, the 25 most CO₂ polluting power plants all burn coal. According to Carbon Monitoring for Action (CARMA), these plants are responsible for over 570 million metric tonnes of CO₂ emissions, the equivalent to the UK's yearly fossil fuel related CO₂ emissions.

Other Gases

Coal-fired power plants are a significant source of Sulphur dioxide (SO₂) and nitrogen oxides (NO_x), which are major players in acid rain and ground level ozone (smog). Nitrogen oxides are also greenhouse gasses that react with organic compounds to form smog, which damages plant life, making it vulnerable to disease and extreme weather. They can also impair human health by causing increased risk of asthma, lung damage, and premature death.

Acid rain occurs when SO₂ and NO_x interact with water, oxygen and other chemicals in the air to form sulphuric acid and nitric acid. This toxin can fall from the sky in rain over a widespread area, killing fish and plants. Forests are also impacted via direct damage to foliage and where forest soils have been stripped of nutrients by acid rain. The shocking impacts of acid rain on forests around the world have led to progress in curbing toxic rain in the US and Europe for example, but it is estimated that acid rain still falls on 30% of the land in China and on hundreds of its cities.

The fact remains that coal is still by far the single biggest source of sulphur emissions caused by power generation. In 2004, 95% of the 10.3 million tons of SO₂ and 90% of the 3.9 million tons of NO_x, released into the atmosphere by US power plants came from ones fuelled by coal.

Mercury Poisoning

Burning coal releases large amounts of the neurotoxin mercury into the air. Globally, coal-fired power plants are the single largest emitter of mercury emissions, accounting for over 50% of the mercury pollution caused by humans.

Once released, mercury settles in streams, lakes and rivers and on the earth itself, where it infiltrates the groundwater. From there, it enters the food chain via algae and infects all life forms, from minnows to predator fish to birds and mammals, whose diets include fish. As it goes up the food chain, the concentration of mercury intensifies. Forty-nine US states have issued fish consumption advisories due to high mercury concentrations in freshwater bodies throughout the country.

Mercury is especially damaging to foetuses, infants and young children because it affects the development of the nervous system. Exposure to mercury can cause brain damage, mental retardation, blindness, seizures and the inability to speak. Every year, about 410,000 children are born having been exposed to dangerous levels of methylmercury in the womb. At any one time, 8% of women of

childbearing age have more mercury in their blood than is deemed safe by the US Environmental Protection Agency. Mercuric chloride and methylmercury have been classified as possible human carcinogens by the US Environmental Protection Agency.

Particle emissions

Coal-fired power plants release fine particles of sulphate, nitrates, ammonia, sodium chloride, carbon and mineral dust, smaller than the width of a human hair, that penetrate deep into the lung. Breathing these fine particles can decrease lung function, aggravate asthma and contribute to cardiovascular disease. They cause thousands of premature deaths. As the particles are so small, they are more likely to escape the cleaning mechanisms of coal power stations.

Every year, in the US alone, fine particle emissions from power plants are believed to cut short the lives of 30,000 people. Every year, 38,000 heart attacks, 12,000 hospital admissions and an additional 550,000 asthma attacks are a result of power plant pollution.

In India, a study in 2001 found that the inhabitants of 14 of India's 20 largest cities breathe air the government deems "dangerous". Particle emissions from coal power stations are a major contributor to the poor air quality.

The concerned agencies and Ministries of the Government of Bangladesh should review the information stated above before establishing Coal Power Plants in Chittagong and Rampal (10 Km away from the Sundarban) as well.

4. Environmental Management and Monitoring

A. Project Management

Sub-project Activity	Potential Environmental Impact(s)	Mitigation Measures	Location	Estimated Mitigation Cost	Responsibility	
					Implementation	Supervision
Site clearance	Vegetation removal	Tree clearances for easement establishment to only involve cutting trees off at ground level or pruning as appropriate, with tree stumps and roots left in place and ground cover left undisturbed.	Throughout the site	N/A	Construction Supervision Consultant	Contractor
Mechanized construction	Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Throughout the site	N/A	Construction Supervision Consultant	Contractor
Air Quality	-Emissions from vehicles -Emissions through burning of waste -Dust emissions	-Limitations of size, weight or axle loads of vehicles using particularly difficult roads. -Reduction of speed and limited movement of vehicles. -Routine service and regular maintenance of vehicles and machines to reduce engine emissions. -Burning of rubbish on site must be strictly forbidden. -Construction equipment shall be maintained to a good standard and idling of engines discouraged. -Machinery causing excessive pollution (visible smoke) shall be banned from construction sites. -Despite its dust reduction potential, access roads shall only be sprayed in exceptional cases due to scarcity of water	Throughout the site	N/A	Construction Supervision Consultant	Contractor
Waste Production	-Waste generation	-Development of a Waste Management Plan within the HSE Management Plan considering following principles: (i) waste management hierarchy of avoidance-minimisation-reuse-treatment-disposal; (ii) segregation of waste; (iii) minimisation of construction waste by good technical planning; (iv) training of staff. -Implementation of a Waste Management System. -Provision of construction sites and workers' camps with functional sanitary equipment. -Training of workers regarding proper waste and waste water handling according to environmental management requirements. -Solid waste and garbage will be collected in bins and disposed of daily, according to a brief and basic waste management plan prepared by the contractor and approved by BEZA-PMO, prior to commencement of civil	Construction yard, workers camp	N/A	Construction Supervision Consultant	Contractor

Sub-project Activity	Potential Environmental Impact(s)	Mitigation Measures	Location	Estimated Mitigation Cost	Responsibility	
					Implementation	Supervision
		works. - All solid waste will be collected and removed from the work camps and disposed of in local waste disposal sites -Any spoil generated by the construction activity should be disposed at an approved location. -Littering should be prevented by providing adequate number of containers which shall be emptied regularly. -After completion of construction the site shall be properly cleaned and properly rehabilitated or re-vegetated.				
Oil spillage	Contamination of soil and water bodies	Oil storage facilities and located within secure and impervious bunded areas with appropriate storage capacity. Safe handling and disposal of phased out equipments	Construction yard, workers camp	N/A	Construction Supervision Consultant	Contractor
Health and Safety	General Health and Safety impacts	Development of an EHS Policy for the construction phase. -Development of an EHS Management Plan for construction (shall include a Waste Management Plan). -Installation of an EHS Management System (EHS-MS) during the construction phase. -Clean work environment including good drainage around camp sites will be provided to avoid creation of stagnant water bodies -Provide adequate sanitation and waste disposal facilities at campsites -Provide education to the workforce on prevention of communicable	Construction yard, workers camp	N/A	Construction Supervision Consultant	Contractor

B. Monitoring Plan

Environmental Indicator	Parameters/ Units	Location	Means of Monitoring	Frequency/ Duration Standards	Responsibilities		Estimated Cost
Soil and Water Resources	-Removal of temporary infrastructure -Replanting of unneeded access roads, lay down areas, and other work sites -Provision of separate storage tanks for further treatment of oily wastewater	Throughout the project	-Visual control of downstream water quality (turbidity), -Regular measurements of upstream / downstream basic water parameters,	Regular/DoE-WB Regulations	Implementation	Supervision	N/A
Flora	Supervision of maintenance procedures	Specific sites	Visual (Quantity check)	Periodical Inspection	Implementation	Supervision	
Waste Production	Quality and quantity of solid and liquid wastes	Specific sites	Instrumental quality check	Regular monitoring	Implementation	Supervision	

Source: Review of environmental analysis, January 2014

References

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- The Bangladesh Economic Zones Act, 1st August 2010, Act No. 42 of 2010
- World Bank, Environmental Assessment Sourcebook, Volume II, Sectoral Guidelines, Washington DC, 1991

5. Detailed Cost of Resettlement

Type of HH	No. of Structures	average area/ unit	Price (BDT)/ katha/ unit	Budgeted Compensation (BDT)	Premium Rate	Compensation with premium (BDT)
6 No West Ichakhali Union						
Village-Cunimijir Tack						
Word-7						
Pucca/Semi Pucca	6	1	90,000	540000	200%	1080000
Tin Shed	91	1	70,000	6370000	200%	12740000
Hut	6	1	40,000	240000	200%	480000
Ponds	34	1	60,000	2040000	100%	2040000
Trees	3998	1	1,000	3998000	100%	3998000
Govt. Land	57	1		0		0
Sub-total				13188000		20338000
6 No South Ichakhali Union						
Village: Charsarat- Word						
No-9						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	8	1	70000	560000	200%	1120000
Hut	11	1	40000	440000	200%	880000
Ponds	7	1	60000	420000	100%	420000
Trees	980	1	1000	980000	100%	980000
Sub-total	12	1	0	2400000		3400000
16 no Saherkhali Union						
Village- South Moghadia						
Word no-1						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	7	1	70000	490000	200%	980000
Hut	2	1	40000	80000	200%	160000
Ponds	1	1	60000	60000	100%	60000
Trees	105	1	1000	105000	100%	105000
Sub-total	9	1	0	735000		1305000
Mouza-south Mogadia						
Up_16 no Saherkhali						
Ward no-1						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	23	1	70000	1610000	200%	3220000
Hut	29	1	40000	1160000	200%	2320000
Ponds	0	1	60000	0	100%	0
Trees	0	1	1000	0	100%	0
Sub total	26	1		2770000		5540000
Companinagar Mouza: Companinagar						
Village: Companinagar						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	3	1	70000	210000	200%	420000
Hut	0	1	40000	0	200%	0
Ponds	0	1		0		0
Trees	0	1		0		0
Sub-total				210000		420000
Mouza: Domkhali						
Village: Domkhali						
Beribadh						
UP: Saherkhali						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	17	1	70000	1190000	200%	2380000
Hut	6	1	40000	240000	200%	480000
Ponds	3	1	60000	180000	100%	180000
Trees	29	1	1000	29000	100%	29000
Govt. Land						

Type of HH	No. of Structures	average area/ unit	Price (BDT)/ katha/ unit	Budgeted Compensation (BDT)	Premium Rate	Compensation with premium (BDT)
Sub-total				1639000		3069000
6 No uttor Ichakhali Union						
Village: Charsarat						
Word No-9						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	8	1	70000	560000	200%	1120000
Hut	11	1	40000	440000	200%	880000
Ponds	7	1	60000	420000	100%	420000
Trees	980	1	1000	980000	100%	980000
Govt. Land						
Sub-total				2400000		3400000
Mouza: Domkhali						
Village: Domkhali Beribadh						
UP: Saherkhali						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	17	1	70000	1190000	200%	2380000
Hut	6	1	40000	240000	200%	480000
Ponds	3	1	60000	180000	100%	180000
Trees	29	1	1000	29000	100%	29000
Govt. Land						
Sub-total				1639000		3069000
Mouza: West Bashkhali						
Village: Bashkhali						
Union: 5 No. Osmanpur						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	34	1	70000	2380000	200%	4760000
Hut	3	1	40000	120000	200%	240000
Ponds	5	1	60000	300000	100%	300000
Trees	150	1	1000	150000	100%	150000
Govt. Land						
Sub-total				2950000		5450000
No. 5 Osmanpur, Bashkhali						
Pucca/Semi Pucca	8	1	90000	720000	200%	1440000
Tin Shed	20	1	70000	1400000	200%	2800000
Hut	9	1	40000	360000	200%	720000
Ponds	15	1	60000	900000	100%	900000
Trees	50	1	1000	50000	100%	50000
Govt. Land						
Sub-total				3430000		5910000
Bashkhali						
Pucca/Semi Pucca	4	1	90000	360000	200%	720000
Tin Shed	16	1	70000	1120000	200%	2240000
Hut	10	1	40000	400000	200%	800000
Ponds	10	1	60000	600000	100%	600000
Trees	135	1	1000	135000	100%	135000
Sub-total				2615000		4495000
Mouza-east ichkhali						
UP 6 No South Ichakhali						
Pucca/Semi Pucca	2	1	90000	180000	200%	360000
Tin Shed	17	1	70000	1190000	200%	2380000
Hut	2	1	40000	80000	200%	160000
Ponds	135	1	60000	8100000	100%	8100000
Trees	8	1	1000	8000	100%	8000
Govt. Land						

Type of HH	No. of Structures	average area/ unit	Price (BDT)/ katha/ unit	Budgeted Compensation (BDT)	Premium Rate	Compensation with premium (BDT)
Sub-total				9558000		11008000
UP:6 no West ichhakhali.						
Pucca/Semi Pucca	13	1	90000	1170000	200%	2340000
Tin Shed	27	1	70000	1890000	200%	3780000
Hut	57	1	40000	2280000	200%	4560000
Ponds	53	1	60000	3180000	100%	3180000
Trees	280	1	1000	280000	100%	280000
Govt. Land						
Sub-total				8800000		14140000
Mouza: east ichhakhali						
Up:6 no south ichhakhali						
Pucca/Semi Pucca	0	1	90000	0	200%	0
Tin Shed	9	1	70000	630000	200%	1260000
Hut	42	1	40000	1680000	200%	3360000
Ponds	17	1	60000	1020000	100%	1020000
Trees	0	1	1000	0	100%	0
Govt. Land						
Sub-total				3330000		5640000
Boro takia bazaar to maghadia and abu torab right side of road						
Pucca/Semi Pucca	8	1	90000	720000	200%	1440000
Tin Shed	5	1	70000	350000	200%	700000
Hut	25	1	40000	1000000	200%	2000000
Ponds	1	1	60000	60000	100%	60000
Trees	0	1	1000	0	100%	0
Govt. Land						
Sub-total				2130000		4200000
Boro takia bazaar to maghadia and abu torab left side of road						
Pucca/Semi Pucca	29	1	90000	2610000	200%	5220000
Tin Shed	12	1	70000	840000	200%	1680000
Hut	43	1	40000	1720000	200%	3440000
Ponds	0	1	60000	0	100%	0
Trees	0	1	1000	0	100%	0
Govt. Land						
Sub-total				5170000		10340000
Azampur bazaar to muhuri project -left side						
Pucca/Semi Pucca	1	1	90000	90000	200%	180000
Tin Shed	1	1	70000	70000	200%	140000
Hut	0	1	40000	0	200%	0
Ponds	26	1	60000	1560000	100%	1560000
Trees	0	1	1000	0	100%	0
Govt. Land						
Sub-total				1720000		1880000
Azampur to Muhuri Project Road -Right Side						
Pucca/Semi Pucca	2	1	90000	180000	200%	360000
Tin Shed	0	1	70000	0	200%	0
Hut	0	1	40000	0	200%	0
Ponds	21	1	60000	1260000	100%	1260000
Trees	487	1	1000	487000	100%	487000
Govt. Land						
Sub-total				1927000		2107000
Grand Total						105,711,000

ANNEX 5

CHAPTER 6: FINANCIAL AND ECONOMIC MODELING

(COMPONENT 4)

1. **Financial Modelling without including cost of Coal Power Plant**

Land	Land		Area Year	Demanded Land Area (Hectare)													Total Area	
				2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Hectare	Acres
Demanded Land	Garment & Textile	Garment		0	0	11	21	32	25	11	0	0	0	0	0	0	100.00	247.00
		Garment Accessories		0	0	5	9	13	10	5	0	0	0	0	0	0	42.00	103.74
Integrated Textiles			0	0	11	21	32	25	11	0	0	0	0	0	0	100.00	247.00	
Auto & Machine Parts	Auto & Machine Parts	Motorbike Assembly		0	0	10	0	0	0	10	0	0	0	0	0	20.00	49.40	
		Automobile Assembly		0	0	0	0	0	0	0	0	150.36	0	0	0	150.36	371.39	
		Automobile Parts		0	0	16	34	50	40	16	64	96	81.95	60	46	503.95	1,244.76	
		Other Parts & Machinery		0	0	6	14	20	12	8.41	34	52	41.80	26	15.82	230.03	568.17	
	Chemical and Other Products		0	0	4	10	14	10	6	2	4	6.34	0	0	56.34	139.16		
Food & Beverage		0	0	4	12	16	12	4	4	4	0	0	0	56.00	138.32			
Sub-Total (Industry Plot)			0	0	67	121	177	134	71.41	104	156	280.45	86	61.82	0	1258.68	3,108.94	
Industry Plot	Demanded Areas in Each Phase	Phase 1	year-wise	0	0	67	121	177	134	71	0	0	0	0	0	570.41	1,408.91	
			cumulative	0	0	67	188	365	499	570.41	570.41	570.41	570.41	570.41	570.41			
			%	0	0	12	33	64	87	100	100	100	100	100	100	100		
		Phase 2	year-wise	0	0	0	0	0	0	0	104	156	280	0	0	0	540.45	1,334.91
			cumulative	0	0	0	0	0	0	0	104	260	540.45	540.45	540.45	540.45		
			%	0	0	0	0	0	0	0	19	48	100	100	100	100		
		Phase 3	year-wise	0	0	0	0	0	0	0	0	0	0	86.00	61.82	0	147.82	365.12
			cumulative	0	0	0	0	0	0	0	0	0	0	86	147.82	147.82		
			%	0	0	0	0	0	0	0	0	0	0	58	100	100		
Rental Factory		0	0	0	5.23	0	0	0	0	5.23	0	0	0	0	10.46	25.84		
Warehouse Zone		0	0	0	17.83	0	0	0	0	0	0	0	0	0	17.83	44.04		
Stock Yard, Jetty		0	93.96	0	0	0	0	0	0	0	0	0	0	0	93.96	232.08		
Power Plant		0	195.71	0	0	0	0	0	0	0	0	0	0	0	195.71	483.40		
Commercial Area		0	0	18.45	0	0	0	0	0	0	0	1.56	0	0	20.01	49.42		
Residential Area		0	0	7.43	0	0	0	0	0	0	0	60.50	0	0	67.93	167.79		
International School		0	0	0	0	0	0	0	0	0	0	16.71	0	0	16.71	41.27		
Vocational Training		0	0	13.52	0	0	0	0	0	0	0	0	0	0	13.52	33.39		
Medical Collage and Hospital		0	0	10.79	0	0	0	0	0	0	0	0	0	0	10.79	26.65		
Total Area (Hectare)			0	289.67	117.19	144.06	177.00	134.00	71.41	104.00	161.23	280.45	164.77	61.82	0.00	1705.60		
Cumulative Total (Ha)					406.86	550.92	727.92	861.92	933.33	1037.33	1198.56	1479.01	1643.78	1705.60	1705.60			
Total Area (Acres)			0.00	715.48	289.46	355.83	437.19	330.98	176.38	256.88	398.24	692.71	406.98	152.70	0.00	4,212.83		
Assumptions		Areas in Phase 1																
		Five years are needed for most industries to acquire the plots after the plots become leasable when most utility works are done..																
		In 2022, the acquired land reaches about 80% (87%) of the total industry plot area of phase 1, the next construction of phase 2 begins.																
		Areas in Phase 2																
		Three years are needed for most industries to acquire the plots after the plots become leasable when most utility works are done.																
		In 2026, the acquired land reaches 100% of the total industry plot area of phase 2, the next construction of phase 3 begins.																
		Areas in Phase 3																
		Two years are needed for most industries to acquire the plots after the plots become leasable when most utility works are done.																

Table 3.5.3-7 Operating Land and Utility Demand

Operating Land and Utility Demand		Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Items	Project Stage	LA & DD	Phase 1				DR	Phase 2				Phase 3				Operation			
Cumulative Land under Operation (Hectare)	Hectare	0.00	0.00	0.00	0.00	0.00	0.00	0.00	181.47	382.29	558.83	719.30	915.50	1,065.97	1,272.50	1,408.93	1,593.12	1,649.39	1,705.62
Cumulative Power Demand (KW)	KW	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9,709.15	95,048.73	170,283.30	241,095.40	263,910.40	324,510.60	408,507.25	463,721.30	533,588.60	553,939.30	574,276.60
Cumulative Water Demand (m3/day)	m3/day	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,718.66	82,504.98	154,305.21	223,921.58	246,484.42	256,806.70	263,756.69	268,044.73	272,840.47	273,891.95	274,942.67
Notes		LA & DD: Land acquisition and detail design DR: Design Review If the land acquisition is overdue, the whole schedule will be shifted by the overdue years.																	

Rental Factory

Phase	Phase 1 and Design Review (2021)					Phase 2				Phase 3			Total (m2)
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Construction Period													
Floor Development (m2)					19,000	9,500	9,500			17,000	8,500	8,500	72,000
Cumulative Floor area of Rental Factory Space					19,000	28,500	38,000	38,000	38,000	55,000	63,500	72,000	

Assumption

Total floor area of phase 1 is 38,000 m2.
 Total floor area of phase 2 is 34,000 m2 (72,000 m2 in total).
 The rental area will be filled 50%, 25%, 25% in 3 years after the construction.

Warehouse Zone

Phase	Phase 1 and Design Review (2021)					Phase 2				Phase 3			Total (m2)
Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	
Construction Period													
Floor Development (m2)					24,000	12,000	12,000						48,000
Open Space Development (m2)					69,496	34,748	34,748						138,991
Total Development Area (m2)					93,496	46,748	46,748						186,991
Cumulative Area					93,496	140,243	186,991	186,991	186,991	186,991	186,991	186,991	

Assumption

Total development area is 186,991 m2.
 Total floor area of warehouse is 48,000 m2.
 Total floor area of open space is 138,991 m2.
 The are ratio of warehouse and open space is 26% : 74%.
 The open space is for parking, storage of ODC and other non-perishable consignment including containers.
 The floor of warehouse will be filled 50%, 25%, 25% in 3 years after the construction.
 Yard will be under operation 50%, 25%, 25% in 3 years after the construction.

Cash Flow of Mirershorai EZ project

Scope/Year	Phase 1 and Design Review (2021)					Phase 2				Phase 3				Total (BDT)	Total (USD)
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029		
Preparation															
Preparation (1)	79,961,000													79,961,000	999,513
Preparation (2)						66,672,012								66,672,012	833,400
Preparation (3)										38,550,012				38,550,012	481,875
Dredging															
Dredging (1)	8,811,467,388													8,811,467,388	110,143,342
Dredging (2)						3,578,988,533								3,578,988,533	44,737,357
Dredging (3)										1,922,287,000	101,173,000			2,023,460,000	25,293,250
Dike System															
Dike System Sea Side (1)	1,558,041,982	787,907,162												2,345,949,144	29,324,364
Dike System Inner Side (1)	267,638,500													267,638,500	3,345,481
Dike System Inner Side (2)						164,591,148								164,591,148	2,057,389
Dike System Inner Side (3)										267,426,088				267,426,088	3,342,826
Sheet Pile Work															
Sheet Piling protection on sea side jetty			386,522,646											386,522,646	4,831,533
Road Work															
Road on Dike Sea Side (1)		35,386,120												35,386,120	442,327
Road on Dike Sea Side (3)										45,890,964				45,890,964	573,637
Road on Dike Inner Side (1)	168,319,842	41,470,106												209,789,948	2,622,374
Road on Dike Inner Side (2)						126,540,044								126,540,044	1,581,751
Road on Dike Inner Side (3)										102,029,665	104,430,363			206,460,028	2,580,750
Road (Main Road) (1)			1,656,006,401											1,656,006,401	20,700,080
Road (Main Road) (2)								499,422,814	21,872,532					521,295,346	6,516,192
Road (Main Road) (3)											425,061,468			425,061,468	5,313,268
Road (Minor Road) (1)			2,155,166,586											2,155,166,586	26,939,582
Road (Minor Road) (2)								1,272,284,339	1,448,732,532					2,721,016,871	34,012,711
Road (Minor Road) (3)											1,008,738,036			1,008,738,036	12,609,225
Round About															
Round About (1)			225,738,820											225,738,820	2,821,735
Round About (3)											45,147,760			45,147,760	564,347
Drainage System															
Drainage System (1)		588,760,221	1,383,890,004											1,972,650,225	24,658,128
Drainage System (2)							143,125,700	1,499,957,336	91,600,448					1,734,683,484	21,683,544
Drainage System (3)											270,118,440			270,118,440	3,376,481
Plantation															
Plantation (1)			8,901,630	37,914,350										46,815,980	585,200
Plantation (2)									32,339,736					32,339,736	404,247
Plantation (3)											6,864,660	20,937,213		27,801,873	347,523
Fencing															
Fencing (1)		112,717,184	2,641,809											115,358,993	1,441,987
Fencing (2)						11,746,982								11,746,982	146,837
Fencing (3)										27,127,920				27,127,920	339,099
Access Road															
Access Road 1 (Off-Site)	232,043,322	230,278,734	52,055,346											514,377,402	6,429,718
Access Road 2 (Off-Site)	231,205,404	229,447,188	213,623,244											674,275,836	8,428,448
Culvert Box															
Culvert Box (On-Site) 1			87,400,023											87,400,023	1,092,500
Culvert Box (On-Site) 2									23,900,002					23,900,002	298,750
Culvert Box (On-Site) 3											55,699,990			55,699,990	696,250

Water Supply System																		
Water Supply Pipe Distribution (1)		275,798,952	30,644,328														306,443,280	3,830,541
Water Supply Pipe Distribution (2)								201,669,728	146,153,904								347,823,632	4,347,795
Water Supply Pipe Distribution (3)												125,637,868					125,637,868	1,570,473
Water Supply Treatment Plant and Tower (1)	755,112,045	749,369,748	545,518,207														2,050,000,000	25,625,000
Water Supply Treatment Plant and Tower (2)							59,619,772	553,612,168	506,768,062								1,120,000,002	14,000,000
Water Supply Treatment Plant and Tower (3)												482,782,446	203,884,220				686,666,666	8,583,333
Water Connection (Off-Site)																		
Water Connection (Off-Site)	800,892,001																800,892,001	10,011,150
Waste Water System																		
Waste Water Collection Pipe (1) On-Site	330,070,565	912,195,016															1,242,265,581	15,528,320
Waste Water Collection Pipe (2) On-Site							165,695,600	1,171,704,600									1,337,400,200	16,717,503
Waste Water Collection Pipe (3) On-Site												505,161,821					505,161,821	6,314,523
Waste Water Treatment Plant (1)	551,455,665	547,262,086	398,390,024														1,497,107,775	18,713,847
Waste Water Treatment Plant (2)							37,108,397	344,577,971	315,421,374								697,107,742	8,713,847
Waste Water Treatment Plant (3)												332,650,348	344,578,049	19,879,503			697,107,900	8,713,849
Electrical System (On-Site)																		
Electrical System (On-Site) (1)				289,507,365	1,104,416,985												1,393,924,350	17,424,054
Electrical System (On-Site) (2)										294,010,012							294,010,012	3,675,125
Electrical System (On-Site) (3)												74,200,000	37,100,000				111,300,000	1,391,250
Electrical System (Off-Site)																		
Electrical Connection (Off-Site)	225,000,000																225,000,000	2,812,500
Communication System (On-Site)																		
Communication System (1) (On-Site)					205,672,860												205,672,860	2,570,911
Communication System (2) (On-Site)										77,094,550							77,094,550	963,682
Communication System (3) (On-Site)													29,635,150				29,635,150	370,439
Communication System (Off-Site)																		
Communication Connection (Off-Site)	78,819,168																78,819,168	985,240
Buildings																		
Building (Admin & Custom) (1)				39,285,734	43,214,306												82,500,040	1,031,251
Building (Custom) (2)										1,980,342	5,519,677						7,500,019	93,750
Building (Custom) (3)												1,601,128	5,898,891				7,500,019	93,750
Building (Admin Staff Quarter) (1)				174,241,298	191,665,427												365,906,725	4,573,834
Rental Factory (1)				626,276,190	688,903,810												1,315,180,000	16,439,750
Rental Factory (2)										154,920,953	1,021,819,048						1,176,740,001	14,709,250
Warehouse																		
Warehouse (On-Site IPP) (1)		721,338,561	858,425,528	750,714,340													2,330,478,429	29,130,980
Power Plant																		
Power Plant (On-Site IPP) (1)			6,630,000,000	7,890,000,000	7,860,000,000	1,620,000,000											24,000,000,000	300,000,000
Power Plant (On-Site IPP) (2)							840,000,000	7,800,000,000	7,860,000,000	7,500,000,000							24,000,000,000	300,000,000
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,078	1,620,000,000	5,050,962,488	10,214,690,167	12,256,909,124	10,516,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503				100,122,637,540	
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	153,211,364	131,461,107	30,041,396	44,240,842	8,025,419	248,494				1,251,532,969	

TABLE: SUMMARY OF CASH FLOW OF MIRERSHORAI EZ PROJECT

Phase	Phase 1 and Design Review (2021)					Phase 2					Phase 3					Total Cost	
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total (BDT)	Total (USD)		
On-site Cost	12,522,066,987	4,437,389,241	7,623,608,419	2,271,787,738	0	4,210,962,488	2,414,690,167	4,396,909,124	3,016,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503	47,498,794,704	593,734,934		
Off-site Cost	1,567,959,895	459,725,922	263,678,590	0	0	0	0	0	0	0	0	0	0	2,293,364,407	28,667,055		
IPP/Independent Developer	0	7,351,338,561	8,748,425,528	8,610,714,340	1,620,000,000	840,000,000	7,800,000,000	7,860,000,000	7,500,000,000	0	0	0	0	50,330,478,429	629,130,980		
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,078	1,620,000,000	5,050,962,488	10,214,690,167	12,256,909,124	10,516,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503	100,122,637,540			
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	153,211,364	131,461,107	30,041,396	44,240,842	8,025,419	248,494		1,251,532,969		

TABLE: SUMMARY OF PHASE COST OF MIRERSHORAI EZ PROJECT

Phase	Phase 1	Phase 2	Phase 3	Total Cost	
	2017-2021	2022-2025	2026-2029	Total (BDT)	Total (USD)
On-site Cost	26,854,852,385	14,039,450,316	6,604,492,003	47,498,794,704	593,734,934
Off-site Cost	2,293,364,407	0	0	2,293,364,407	28,667,055
IPP/Independent Developer	26,330,478,429	24,000,000,000	0	50,330,478,429	629,130,980
Total (BDT)	55,478,695,221	38,039,450,316	6,604,492,003	100,122,637,540	
Total (USD)	693,483,690	475,493,129	82,556,150		1,251,532,969

Revenue from the Sale of Industrial Plots of Miresarhai, Chittagong																																																																		
Year/Item	Phase-1					Phase-2					Phase-3				\$ in million		Situation of Lease-serv																																																	
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total	2017		2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029																																					
Leasing Price per sq meter			50	60	60	60	70	70	70	80	80	80	90			1	1	50	50	50	60	60	60	70	70	70	80	80	80	90																																				
Vol. of Sale Lease of Ind. Plots (hectres)			67	121	177	134	71.41	104	156	280.45	86	61.82			1258.68	2	45	45	45	54	54	54	63	63	63	72	72	72	81																																					
Total Revenue from Industrial Plots			\$33.50	\$72.60	\$106.20	\$80.40	\$49.99	\$72.80	\$109.20	\$224.36	\$68.80	\$49.46			\$867.30																																																			
Revenue from the Sale of residential and Commercial Land																																																																		
Leasing Price per sq meter		70	70	80	80	80	90	90	90	100	100	100	110			1	1	70	70	70	80	80	80	90	90	90	100	100	100	110																																				
Vol. of Sale of Residential & Com. land (hectre)			25.88												87.94	2	63	63	63	72	72	72	81	81	81	90	90	90	99																																					
Total Revenue from Industrial Quarter, residential & Com. Land			\$18.12												\$80.18																																																			
Revenue from the Lease sale of land for Jetty & Coal Power Plant																																																																		
Leasing Price per sq meter			45	45	55	55	55	65	65	65	75	75	75	85			1	1	50	50	50	60	60	60	70	70	70	80	80	80	90																																			
Vol. of Lease Sale of Land for Stock yard, Jetty and Coal Power Plant			289.67												289.67	2	45	45	45	54	54	54	63	63	63	72	72	72	81																																					
Total Revenue from Stock yard, Jetty and CPP lands			\$130.35												\$130.35																																																			
Revenue from the Sale of Land for Int. School, Voc. Training, Golf Course & Market																																																																		
Leasing Price per sq meter			50	50	60	60	60	70	70	70	80	80	90																																																					
Vol. of Lease Sale of Land for Int. School, Voc. Training & Hospital			24.31												41.02																																																			
Total Revenue from the Sale of Land for Int. School, Voc. Training etc.			\$12.16												\$13.37																																																			
Total Revenue from sale of lands			\$130.35	\$63.77	\$72.60	\$106.20	\$80.40	\$49.99	\$72.80	\$109.20	\$224.36	\$144.23	\$49.46	\$0.00	\$1,103.35																																																			
			2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Thereafter																																																	
Revenue from the Rent of Rental Standard Factory Building Space and warehouse space																																																																		
Rate of Rent per sq meter per month					2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75	2.75																																																		
Vol. of Rental standard factory building space (sqm)					112,496	168,743	224,991	224,991	224,991	241,991	250,491	258,991	258,991	258,991	258,991	258,991																																																		
Total Revenue from Rent of Standard Factory Building Space and Warehouse Space					0.0000	3.7124	5.5685	7.4247	7.4247	7.4247	7.9857	8.2662	8.5467	8.5467	8.5467	8.5467																																																		
Utilities and Service Fees for Sherpur EZ																																																																		
Year/Item		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Thereafter																																																		
Land Occupied (Hectre)					181.47	382.29	558.83	719.30	915.50	1065.97	1272.50	1408.93	1593.12	1649.39	1705.62																																																			
Water Supply (cm/day)					1718.7	82505.0	154305.2	223921.6	246484.4	256806.7	263756.7	268044.7	272840.5	273892.0	274942.7																																																			
Surcharge for Water Supply (\$0.3 cm (300d/y)					\$0.1547	\$7.4254	\$13.8875	\$20.1529	\$22.1836	\$23.1126	\$23.7381	\$24.1240	\$24.5556	\$24.6503	\$24.7448																																																			
Waste Water (85% of Water Supply)					1461	70129	131159	190333	209512	218286	224193	227838	231914	232808	233701																																																			
Surcharge for Waste Water (\$0.35 cm (300d/y)					\$0.1534	\$7.3636	\$13.7717	\$19.9850	\$21.9987	\$22.9200	\$23.5403	\$23.9230	\$24.3510	\$24.4449	\$24.5386																																																			
Power Supply (KWh)					9709.2	95048.7	170283.3	241095.4	263910.4	324510.6	408507.3	463721.3	533588.6	553939.3	574276.6																																																			
Surcharge as service fees (0.15*5.325/80) kwh, 10h/d, 300 d/y					\$0.29	\$2.85	\$5.10	\$7.22	\$7.90	\$9.72	\$12.24	\$13.89	\$15.98	\$16.59	\$17.20																																																			
EZ Service Fee (\$1.92/sqm/y)					\$3.484	\$7.340	\$10.730	\$13.811	\$17.578	\$20.467	\$24.432	\$27.051	\$30.588	\$31.668	\$32.748																																																			
			1 acre =	0.4046863	hectre																																																													
			1 hectre =	2.47105	acre																																																													
			1 acre =	4046.863	sqm																																																													
			1 hectre =	10000	sqm																																																													

Capital Cost

	32.00	32.00															\$ in million	
Cost of Public lands	32.00	32.00	Phase-I					Phase-II					Phase-III					
Year/Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029			
Land Acquisition Costs/Compensation costs	22.91	22.91																
Relocation Costs:		2.71																
On-Site Inf. Costs:																		
Land Development - Preparation & Dredging			111.143					45.571				24.510	1.265					
Dike System, Sea Side			19.476	9.849														
Dike System, Inner side			3.345					2.057				3.343						
Sheet Piling protection on sea side jetty				4.832														
Road on the dike			2.104	0.961				1.582				1.849	1.305					
Road (main) Ind. Zone					20.700					6.243	0.273		5.313					
Road (minor) Ind. Zone					26.940	0.000				15.904	18.109		12.609					
Drainage System				7.360	17.299	0.000			1.789	18.749	1.145		3.376					
Round About					2.822								0.564					
Plantation					0.111	0.474					0.404		0.086	0.262				
Fencing				1.409	0.033			0.147				0.339						
Culvert Box					1.093						0.299		0.696					
Water Supply Pipe Distribution				3.447	0.383				2.521	1.827			1.570					
Water Supply Treatment Plant			9.439	9.367	6.819			0.745	6.920	6.335			6.035	2.549				
Waste Water Collection Pipe			4.126	11.402				2.071	14.646				6.315					
Waste Water Treatment Plant			6.893	6.841	4.980			0.464	4.307	3.943			4.158	4.307	0.248			
Electrical System (On-Site)					3.619	13.805					3.675		0.928	0.464				
Communications System (On-Site)						2.571					0.964			0.370				
Buildings					2.669	2.936				0.025	0.069		0.020	0.074				
Rental Factory					7.828	8.611				1.937	12.773							
Warehouse (IPP)				9.017	10.730	9.384												
Power Plant (IPP-1)																		
Power Plant (IPP-2)																		
Offsite inf. Costs																		
Electrical Connection																		
Water Connection																		
Access Road, Road 1																		
Access Road, Road 2																		
Communication Connection																		
Total Capital Costs	54.91	57.62	156.53	64.48	106.03	37.78	-	52.64	30.18	54.96	37.71	30.04	44.24	8.03	0.25			
			2.813															
			10.011															
			2.901	2.878	0.651													
			2.890	2.868	2.670													
			0.985															
Warehouse (on-site IPP)				9.017	10.730	9.384												
Power Plant (IPP-1)				82.875	98.625	98.250	20.250											
Power Plant (IPP-2)								10.50	97.50	98.25	93.75							
		Off-site costs		28.67 million														

Operation and Maintannace Cost

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	After
	6	8	10	16	20	20	24	24	30	30	36	36	36	36	36
		16	21	21	24	24	30	30	36	42	48	48	48	48	48
	45	60	90	150	180	210	250	250	280	300	300	300	300	300	300
	29940	36702	32020	87278	97580	97580	113971	113971	134576	134576	158459	158459	158459	158459	158459
		37670	49442	49442	56506	56506	70632	70632	84758	98885	113011	113011	113011	113011	113011
	48600	64800	97200	162000	194400	226800	270000	270000	302400	324000	324000	324000	324000	324000	324000
		0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
															0.00E+00
															\$ in millio
2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Afterward
	0.079	0.102	0.129	0.249	0.292	0.324	0.384	0.384	0.437	0.459	0.482	0.482	0.482	0.482	0.482
		0.125	0.125	0.125	0.125	0.125	0.125	0.125	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625	0.0625
		0.908	2.197	4.318	5.073	5.073	5.215	5.818	6.918	7.672	7.783	8.642	8.803	8.808	8.808
		0.038	0.049	0.049	0.057	0.057	0.071	0.071	0.085	0.099	0.113	0.113	0.113	0.113	0.113
	0.079	1.172	2.501	4.742	5.547	5.579	5.794	6.398	7.502	8.292	8.441	9.300	9.461	9.466	9.466

Financial IRR

	Year	Capital Costs	O&M Cost	Total Costs	Total Benefits	Net Benefits (Costs)	NPV @ 12%	NPV @ 15%	NPV @ 20%
0	2015	54.91		54.9093		-54.9093	(\$54.91)	(\$54.91)	(\$54.91)
1	2016	57.62	0.0785	57.6978		-57.6978	(\$51.52)	(\$50.17)	(\$48.08)
2	2017	156.53	1.1718	157.6977		-157.6977	(\$125.72)	(\$119.24)	(\$109.51)
3	2018	64.48	2.5010	66.9851	130.352	63.3664	\$45.10	\$41.66	\$36.67
4	2019	106.03	4.7416	110.7670	63.771	-46.9960	(\$29.87)	(\$26.87)	(\$22.66)
5	2020	37.78	5.5470	43.3282	72.600	29.2718	\$16.61	\$14.55	\$11.76
6	2021	0.00	5.5794	5.5794	113.995	108.4161	\$54.93	\$46.87	\$36.31
7	2022	52.64	5.7944	58.4314	110.945	52.5131	\$23.75	\$19.74	\$14.66
8	2023	30.18	6.3981	36.5817	100.901	64.3193	\$25.98	\$21.03	\$14.96
9	2024	54.96	7.5019	62.4633	141.395	78.9315	\$28.46	\$22.44	\$15.30
10	2025	37.71	8.2919	46.0030	186.290	140.2866	\$45.17	\$34.68	\$22.66
11	2026	30.04	8.4405	38.4819	308.565	270.0830	\$77.64	\$58.05	\$36.35
12	2027	44.24	9.3000	53.5409	236.441	182.8998	\$46.95	\$34.19	\$20.51
13	2028	8.03	9.4605	17.4860	146.991	129.5051	\$29.68	\$21.05	\$12.10
14	2029	0.25	9.4655	9.7140	104.024	94.3099	\$19.30	\$13.33	\$7.35
15	2030		9.4655	9.4655	105.902	96.4368	\$17.62	\$11.85	\$6.26
16	2031		9.4655	9.4655	107.779	98.3139	\$16.04	\$10.51	\$5.32
17	2032		9.4655	9.4655	107.779	98.3139	\$14.32	\$9.14	\$4.43
18	2033		9.4655	9.4655	107.779	98.3139	\$12.78	\$7.94	\$3.69
19	2034		9.4655	9.4655	107.779	98.3139	\$11.41	\$6.91	\$3.08
20	2035		9.4655	9.4655	107.779	98.3139	\$10.19	\$6.01	\$2.56
							\$233.93	\$128.74	\$18.80
						IRR =	21.24%		

Land Cost

FOR PUBLIC LAND					
Sl. No.	Mouza Name	Area (Acre)	Land Price (Tk.)/Acre	Total Price (Tk.)	US \$ in million
1	Banshkhali	108.44	2,158,500.00	234,067,740.00	
2	Nilokkhir Char	781.01	346,000.00	270,229,460.00	
3	Companingagar	684.34	140,000.00	95,807,600.00	
4	Uttar Ichhakhali	701.17	1,474,800.00	1,034,085,516.00	
5	Pashchim Ichhakhali	600.90	346,000.00	207,911,400.00	
6	Purba Ichhakhali	334.13	410,000.00	136,993,300.00	
7	Saherkhali	53.56	1,298,800.00	69,563,728.00	
8	Domkhali	329.33	855,000.00	281,577,150.00	
9	Dakshin Maghadia	576.44	398,100.00	229,480,764.00	
	Total	4,169.32		2,559,716,658.00	
	As the land price documented in Sub-registrar office is lowest; the price is fixed as twice =				
1	2559716658 x 2 =			5,119,433,316.00	63.99
2	Total			5,119,433,316.00	63.99

** Note 1: Land price is fixed according to the land classification of Bangladesh Survey (B.S.) record and the recorded land price of the year 2012 at the sub-registrar office

** Note 2: The land price of Nilokkhir Char Mouza is not recorded in the records of 2012 at Zorwarganj Sub-registrar office. This is why the land price of this mouza is fixed based on the land price of Pashchim Ichhakhali.

FOR PRIVATE LAND

Sl. No.	Mouza Name	Area (Acre)	Land Price (Tk.)/Acre	Total Price (Tk.)	US \$ in million
1	Purba Ichhakhali	157.00	363,818.61	57,119,522.00	
2	Domkhali	92.15	762,335.65	70,249,230.00	
3	Dakshin Maghadia	87.47	385,572.62	33,726,037.00	
4	Saherkhali	15.14	1,298,800.00	19,663,832.00	
5	Banshkhali	23.66	2,500,691.46	59,166,360.00	
6	Uttar Ichhakhali	33.97	1,611,140.06	54,730,428.00	
7	Pashchim Ichhakhali	1,235.61	723,044.50	893,401,020.00	
	Total	1,645.00		1,188,056,429.00	
	As the land price documented in Sub-registrar office is lowest; the price is fixed as twice =				
1	1188056429 x 2 =			2,376,112,858.00	
2	Compensation for business, fisheries and agricultural crops and relocation (apprx.)			20,000,000.00	
3	Total			2,396,112,858.00	
4	According to regulations 50% additional to be added to the cost			1,198,056,429.00	
5	Total			3,594,169,287.00	
6	Administrative expense 2% of Total			71,883,385.74	
7	Grand Total			3,666,052,672.74	45.83

** Note 1: Land price is fixed according to the land classification of Bangladesh Survey (B.S.) record and the recorded land price of the year 2012 at the sub-registrar office

** Note 2: Business, Fisheries, Agricultural Crops and Relocation expenses are fixed as approximate.

Income Statement of SPV Co. (\$ in million) (Base Case)																				
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total Revenue	0	0.000	130.352	63.771	72.600	113.995	110.945	100.901	141.395	186.290	308.565	236.441	146.991	104.024	105.902	107.779	107.779	107.779	107.779	107.779
Operating Costs/Expenses	0.079	1.172	2.501	4.742	5.547	5.579	5.794	6.398	7.502	8.292	8.441	9.300	9.461	9.466	9.466	9.466	9.466	9.466	9.466	9.466
Commercial LT Debt Expenses		17.87	12.60	14.80	13.58	9.89	8.55	6.75	6.87	6.55	6.34	6.72	5.33	3.69	2.22	1.21	0.51	0.07	0.00	(0.00)
Commercial ST Debt Expenses		0.010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation		0	3.38	7.52	12.89	14.38	14.38	14.78	17.06	20.25	21.74	21.96	24.66	25.63	25.66	25.66	25.66	25.66	25.66	25.66
Total Expenses	0.079	19.053	18.486	27.055	32.015	29.847	28.725	27.930	31.436	35.091	36.519	37.984	39.449	38.777	37.341	36.331	35.637	35.196	35.127	35.125
Net Profit	-0.079	-19.053	111.865	36.716	40.585	84.148	82.220	72.971	109.959	151.198	272.046	198.457	107.542	65.247	68.561	71.449	72.142	72.583	72.653	72.655
Depreciation (From Above)		0	3.38	7.52	12.89	14.38	14.38	14.78	17.06	20.25	21.74	21.96	24.66	25.63	25.66	25.66	25.66	25.66	25.66	25.66
EBDA	-0.08	-19.05	115.25	44.23	53.47	98.53	96.60	87.75	127.02	171.45	293.79	220.42	132.20	90.87	94.22	97.11	97.80	98.24	98.31	98.31
Interest from Above)	0	17.88	12.60	14.80	13.58	9.89	8.55	6.75	6.87	6.55	6.34	6.72	5.33	3.69	2.22	1.21	0.51	0.07	0.00	(0.00)
EBITDA	-0.08	-1.17	127.85	59.03	67.05	108.42	105.15	94.50	133.89	178.00	300.12	227.14	137.53	94.56	96.44	98.31	98.31	98.31	98.31	98.31

Cash Flow (\$ In million) of SPV Co. Base Case (Scenario 1)																						
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Revenue	0	0	0.00	130.35	63.77	72.60	114.00	110.94	100.90	141.39	186.29	308.56	236.44	146.99	104.02	105.90	107.78	107.78	107.78	107.78	107.78	
Operating Costs	0	-0.079	-1.172	-2.501	-4.742	-5.547	-5.579	-5.794	-6.398	-7.502	-8.292	-8.441	-9.300	-9.461	-9.466	-9.466	-9.466	-9.466	-9.466	-9.466	-9.466	
Capital Expenditures	(54.91)	(57.62)	(156.53)	(64.48)	(106.03)	(37.78)	-	(52.64)	(30.18)	(54.96)	(37.71)	(30.04)	(44.24)	(8.03)	0	0	0	0	0	0	0	
Net Project Cash Flow	-54.91	-57.70	-157.70	63.37	-47.00	29.27	108.42	52.51	64.32	78.93	140.29	270.08	182.90	129.51	94.56	96.44	98.31	98.31	98.31	98.31	98.31	
LT Loans	45.9	40.3	109.6	45.1	74.2	26.4	0.00	36.85	21.13	38.47	26.40	21.03	30.97	5.62	0	0	0	0	0	0	0	
LT Loan Arrangement Fee	-7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ST Loans		0.079	0																			
LT Debt Service	0	0	(25.56)	(28.36)	(52.46)	(60.28)	(71.43)	(67.69)	(57.83)	(43.40)	(38.28)	(30.92)	(31.29)	(34.11)	(31.29)	(26.71)	(18.04)	(12.07)	(7.42)	(1.16)	(0.03)	
ST Debt Service	0	0.0	-0.089	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Equity Drawn for Capex	16.47	17.29	46.96	19.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	
Annual cash																						
Surplus/Shortage	0.00	0.00	-26.82	99.49	-25.24	-4.56	36.99	21.67	27.62	74.00	128.41	260.20	182.58	101.02	63.27	69.72	80.27	86.24	90.89	97.15	98.28	
Retained Cash Used for Capex	0	0	0.0	0.0	31.81	11.334	0.000	15.791	9.055	16.488	11.313	9.012	13.272	2.408								
Equity Drawn to clear deficit	0	0	26.82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Retained Cash Used to Clear Deficits	0	0	0	0	0	0	-36.99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cash Balance	0	0.00	0.00	99.49	74.25	69.70	106.69	128.35	155.97	229.98	358.38	618.58	801.16	902.17	965.45	1035.17	1115.44	1201.68	1292.57	1389.73	1488.01	
Free Cash Flow to Equity Holders of SPV Co. (\$ in million)																						
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Equity Drawn	-16.47	-17.29	-73.78	-19.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Change in Retained Cash	0.00	0.00	0.00	99.49	-25.24	-4.56	36.99	21.67	27.62	74.00	128.41	260.20	182.58	101.02	63.27	69.72	80.27	86.24	90.89	97.15	98.28	
Net Cash Flow to E.H.	-16.47	-17.29	-73.78	80.15	-25.24	-4.56	36.99	21.67	27.62	74.00	128.41	260.20	182.58	101.02	63.27	69.72	80.27	86.24	90.89	97.15	98.28	
PV of Net CF to E. H. @12%	-16.47	-15.43	-58.81	57.05	-16.04	-2.59	18.74	9.80	11.16	26.69	41.34	74.80	46.86	23.15	12.95	12.74	13.09	12.56	11.82	11.28	10.19	284.87
PV of Net CF to E. H. @15%	-16.47	-15.03	-55.79	52.70	-14.43	-2.27	15.99	8.15	9.03	21.04	31.74	55.93	34.13	16.42	8.94	8.57	8.58	8.01	7.34	6.83	6.00	195.40
PV of Net CF to E. H. @20%	-16.47	-14.40	-51.23	46.38	-12.17	-1.83	12.39	6.05	6.42	14.34	20.74	35.02	20.48	9.44	4.93	4.53	4.34	3.89	3.41	3.04	2.56	101.85
Equity IRR	34.14%																					

2. **Financial Modelling including cost of Coal Power Plant**

TABLE: CASH FLOW OF MIRERSHORAI EZ PROJECT															
	Phase 1 and Design Review (2021)					Phase 2				Phase 3					
Scope/Year	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total (BDT)	Total (USD)
Preparation															
Preparation (1)	79,961,000													79,961,000	999,513
Preparation (2)						66,672,012								66,672,012	833,400
Preparation (3)										38,550,012				38,550,012	481,875
Dredging															
Dredging (1)	8,811,467,388													8,811,467,388	110,143,342
Dredging (2)						3,578,988,533								3,578,988,533	44,737,357
Dredging (3)										1,922,287,000	101,173,000			2,023,460,000	25,293,250
Dike System															
Dike System Sea Side (1)	1,558,041,982	787,907,162												2,345,949,144	29,324,364
Dike System Inner Side (1)	267,638,500													267,638,500	3,345,481
Dike System Inner Side (2)						164,591,148								164,591,148	2,057,389
Dike System Inner Side (3)										267,426,088				267,426,088	3,342,826
Sheet Pile Work															
Sheet Piling protection on sea side jetty		386,522,646												386,522,646	4,831,533
Road Work															
Road on Dike Sea Side (1)		35,386,120												35,386,120	442,327
Road on Dike Sea Side (3)										45,890,964				45,890,964	573,637
Road on Dike Inner Side (1)	168,319,842	41,470,106												209,789,948	2,622,374
Road on Dike Inner Side (2)						126,540,044								126,540,044	1,581,751
Road on Dike Inner Side (3)										102,029,665	104,430,363			206,460,028	2,580,750
Road (Main Road) (1)			1,656,006,401											1,656,006,401	20,700,080
Road (Main Road) (2)								499,422,814	21,872,532					521,295,346	6,516,192
Road (Main Road) (3)											425,061,468			425,061,468	5,313,268
Road (Minor Road) (1)			2,155,166,586											2,155,166,586	26,939,582
Road (Minor Road) (2)								1,272,284,339	1,448,732,532					2,721,016,871	34,012,711
Road (Minor Road) (3)											1,008,738,036			1,008,738,036	12,609,225
Round About															
Round About (1)			225,738,820											225,738,820	2,821,735
Round About (3)											45,147,760			45,147,760	564,347
Drainage System															
Drainage System (1)		588,760,221	1,383,890,004											1,972,650,225	24,658,128
Drainage System (2)							143,125,700	1,499,957,336	91,600,448					1,734,683,484	21,683,544
Drainage System (3)											270,118,440			270,118,440	3,376,481
Plantation															
Plantation (1)			8,901,630	37,914,350										46,815,980	585,200
Plantation (2)									32,339,736					32,339,736	404,247
Plantation (3)											6,864,660	20,937,213		27,801,873	347,523
Fencing															
Fencing (1)		112,717,184	2,641,809											115,358,993	1,441,987
Fencing (2)						11,746,982								11,746,982	146,837
Fencing (3)										27,127,920				27,127,920	339,099
Access Road															
Access Road 1 (Off-Site)	232,043,322	230,278,734	52,055,346											514,377,402	6,429,718
Access Road 2 (Off-Site)	231,205,404	229,447,188	213,623,244											674,275,836	8,428,448
Culvert Box															
Culvert Box (On-Site) 1			87,400,023											87,400,023	1,092,500
Culvert Box (On-Site) 2									23,900,002					23,900,002	298,750
Culvert Box (On-Site) 3											55,699,990			55,699,990	696,250

Water Supply System															
Water Supply Pipe Distribution (1)		275,798,952	30,644,328											306,443,280	3,830,541
Water Supply Pipe Distribution (2)							201,669,728	146,153,904						347,823,632	4,347,795
Water Supply Pipe Distribution (3)											125,637,868			125,637,868	1,570,473
Water Supply Treatment Plant and Tower (1)	755,112,045	749,369,748	545,518,207											2,050,000,000	25,625,000
Water Supply Treatment Plant and Tower (2)						59,619,772	553,612,168	506,768,062						1,120,000,002	14,000,000
Water Supply Treatment Plant and Tower (3)											482,782,446	203,884,220		686,666,666	8,583,333
Water Connection (Off-Site)															
Water Connection (Off-Site)	800,892,001													800,892,001	10,011,150
Waste Water System															
Waste Water Collection Pipe (1) On-Site	330,070,565	912,195,016												1,242,265,581	15,528,320
Waste Water Collection Pipe (2) On-Site						165,695,600	1,171,704,600							1,337,400,200	16,717,503
Waste Water Collection Pipe (3) On-Site											505,161,821			505,161,821	6,314,523
Waste Water Treatment Plant (1)	551,455,665	547,262,086	398,390,024											1,497,107,775	18,713,847
Waste Water Treatment Plant (2)						37,108,397	344,577,971	315,421,374						697,107,742	8,713,847
Waste Water Treatment Plant (3)											332,650,348	344,578,049	19,879,503	697,107,900	8,713,849
Electrical System (On-Site)															
Electrical System (On-Site) (1)			289,507,365	1,104,416,985										1,393,924,350	17,424,054
Electrical System (On-Site) (2)									294,010,012					294,010,012	3,675,125
Electrical System (On-Site) (3)											74,200,000	37,100,000		111,300,000	1,391,250
Electrical System (Off-Site)															
Electrical Connection (Off-Site)	225,000,000													225,000,000	2,812,500
Communication System (On-Site)															
Communication System (1) (On-Site)				205,672,860										205,672,860	2,570,911
Communication System (2) (On-Site)									77,094,550					77,094,550	963,682
Communication System (3) (On-Site)												29,635,150		29,635,150	370,439
Communication System (Off-Site)															
Communication Connection (Off-Site)	78,819,168													78,819,168	985,240
Buildings															
Building (Admin & Custom) (1)			39,285,734	43,214,306										82,500,040	1,031,251
Building (Custom) (2)								1,980,342	5,519,677					7,500,019	93,750
Building (Custom) (3)											1,601,128	5,898,891		7,500,019	93,750
Building (Admin Staff Quarter) (1)			174,241,298	191,665,427										365,906,725	4,573,834
Rental Factory (1)			626,276,190	688,903,810										1,315,180,000	16,439,750
Rental Factory (2)								154,920,953	1,021,819,048					1,176,740,001	14,709,250
Warehouse															
Warehouse (On-Site IPP) (1)		721,338,561	858,425,528	750,714,340										2,330,478,429	29,130,980
Power Plant															
Power Plant (On-Site IPP) (1)		6,630,000,000	7,890,000,000	7,860,000,000	1,620,000,000									24,000,000,000	300,000,000
Power Plant (On-Site IPP) (2)						840,000,000	7,800,000,000	7,860,000,000	7,500,000,000					24,000,000,000	300,000,000
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,078	1,620,000,000	5,050,962,488	10,214,690,167	12,256,909,124	10,516,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503	100,122,637,540	
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	153,211,364	131,461,107	30,041,396	44,240,842	8,025,419	248,494		1,251,532,969

TABLE: SUMMARY OF CASH FLOW OF MIRERSHORAI EZ PROJECT

Phase	Phase 1 and Design Review (2021)					Phase 2				Phase 3				Total Cost	
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total (BDT)	Total (USD)
On-site Cost	12,522,066,987	4,437,389,241	7,623,608,419	2,271,787,738	0	4,210,962,488	2,414,690,167	4,396,909,124	3,016,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503	47,498,794,704	593,734,934
Off-site Cost	1,567,959,895	459,725,922	265,678,590	0	0	0	0	0	0	0	0	0	0	2,293,364,407	28,667,055
IPP/Independent Developer	0	7,351,338,561	8,748,425,528	8,610,714,340	1,620,000,000	840,000,000	7,800,000,000	7,860,000,000	7,500,000,000	0	0	0	0	50,330,478,429	629,130,980
Total (BDT)	14,090,026,882	12,248,453,724	16,637,712,537	10,882,502,078	1,620,000,000	5,050,962,488	10,214,690,167	12,256,909,124	10,516,888,537	2,403,311,649	3,539,267,328	642,033,523	19,879,503	100,122,637,540	
Total (USD)	176,125,336	153,105,672	207,971,407	136,031,276	20,250,000	63,137,031	127,683,627	153,211,364	131,461,107	30,041,396	44,240,842	8,025,419	248,494		1,251,532,969

TABLE: SUMMARY OF PHASE COST OF MIRERSHORAI EZ PROJECT

Phase	Phase 1	Phase 2	Phase 3	Total Cost	
	2017-2021	2022-2025	2026-2029	Total (BDT)	Total (USD)
On-site Cost	26,854,852,385	14,039,450,316	6,604,492,003	47,498,794,704	593,734,934
Off-site Cost	2,293,364,407	0	0	2,293,364,407	28,667,055
IPP/Independent Developer	26,330,478,429	24,000,000,000	0	50,330,478,429	629,130,980
Total (BDT)	55,478,695,221	38,039,450,316	6,604,492,003	100,122,637,540	
Total (USD)	693,483,690	475,493,129	82,556,150		1,251,532,969

Financial IRR

	Year	Capital Costs	O&M Cost	Total Costs	Total Benefits	Net Benefits (Costs)	NPV @ 12%	NPV @ 15%	NPV @ 20%
0	2015	54.91		54.9093		-54.9093	(\$54.91)	(\$54.91)	(\$54.91)
1	2016	57.62	0.0785	57.6978		-57.6978	(\$51.52)	(\$50.17)	(\$48.08)
2	2017	156.53	1.1718	157.6977		-157.6977	(\$125.72)	(\$119.24)	(\$109.51)
3	2018	147.36	2.5010	149.8601	130.352	-19.5086	(\$13.89)	(\$12.83)	(\$11.29)
4	2019	204.65	4.7416	209.3920	63.771	-145.6210	(\$92.54)	(\$83.26)	(\$70.23)
5	2020	136.03	5.5470	141.5782	72.600	-68.9782	(\$39.14)	(\$34.29)	(\$27.72)
6	2021	20.25	5.5794	25.8294	155.640	129.8108	\$65.77	\$56.12	\$43.47
7	2022	63.14	6.0044	69.1414	175.013	105.8718	\$47.89	\$39.80	\$29.55
8	2023	127.68	8.5581	136.2417	164.970	28.7280	\$11.60	\$9.39	\$6.68
9	2024	153.21	11.6269	164.8383	221.481	56.6424	\$20.43	\$16.10	\$10.98
10	2025	131.46	14.2919	145.7530	292.003	146.2500	\$47.09	\$36.15	\$23.62
11	2026	30.04	14.4405	44.4819	436.702	392.2205	\$112.75	\$84.31	\$52.79
12	2027	44.24	15.3000	59.5409	364.578	305.0373	\$78.30	\$57.01	\$34.21
13	2028	8.03	15.4605	23.4860	297.741	274.2551	\$62.85	\$44.57	\$25.63
14	2029		15.4655	15.4655	254.774	239.3084	\$48.97	\$33.82	\$18.64
15	2030		15.4655	15.4655	256.652	241.1868	\$44.06	\$29.64	\$15.65
16	2031		15.4655	15.4655	258.529	243.0639	\$39.65	\$25.97	\$13.15
17	2032		15.4655	15.4655	258.529	243.0639	\$35.40	\$22.59	\$10.96
18	2033		15.4655	15.4655	258.529	243.0639	\$31.61	\$19.64	\$9.13
19	2034		15.4655	15.4655	258.529	243.0639	\$28.22	\$17.08	\$7.61
20	2035		15.4655	15.4655	258.529	243.0639	\$25.20	\$14.85	\$6.34
							\$322.07	\$152.35	(\$13.33)
						IRR =		19.45%	

	Income Statement of SPV Co. (\$ in million) (Base Case)																				
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Total Revenue	0	0	0.000	130.352	63.771	72.600	155.640	175.013	164.970	221.481	292.003	436.702	364.578	297.741	254.774	256.652	258.529	258.529	258.529	258.529	258.529
Operating Costs/Expenses	0	0.079	1.172	2.501	4.742	5.547	5.579	6.004	8.558	11.627	14.292	14.441	15.300	15.461	15.466	15.466	15.466	15.466	15.466	15.466	15.466
Commercial LT Debt Expenses			17.87	16.08	22.42	24.63	20.27	17.02	16.80	18.43	19.32	16.38	14.07	10.16	6.09	3.00	1.21	0.51	0.07	0.00	(0.00)
Commercial ST Debt Expenses			0.010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation			0	3.38	10.83	20.15	25.57	26.38	27.20	33.38	40.50	45.74	45.96	48.66	49.63	49.66	49.66	49.66	49.66	49.66	49.66
Total Expenses	0	0.079	19.053	21.967	37.993	50.328	51.417	49.405	52.556	63.445	74.111	76.561	75.336	74.281	71.177	68.129	66.331	65.637	65.196	65.127	65.125
Net Profit	0.00	-0.079	-19.053	108.384	25.778	22.272	104.224	125.608	112.414	158.036	217.892	360.141	289.242	223.460	183.596	188.524	192.199	192.892	193.333	193.403	193.405
Depreciation (From Above)			0	3.38	10.83	20.15	25.57	26.38	27.20	33.38	40.50	45.74	45.96	48.66	49.63	49.66	49.66	49.66	49.66	49.66	49.66
EBDA	0.00	-0.08	-19.05	111.77	36.61	42.42	129.79	151.99	139.61	191.42	258.39	405.88	335.20	272.12	233.22	238.18	241.86	242.55	242.99	243.06	243.06
Interest from Above)	0	0	17.88	16.08	22.42	24.63	20.27	17.02	16.80	18.43	19.32	16.38	14.07	10.16	6.09	3.00	1.21	0.51	0.07	0.00	(0.00)
EBITDA		-0.08	-1.17	127.85	59.03	67.05	150.06	169.01	156.41	209.85	277.71	422.26	349.28	282.28	239.31	241.19	243.06	243.06	243.06	243.06	243.06

Cash Flow (\$ In million) Base Case (Scenario 1)																						
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Revenue	0	0	0.00	130.35	63.77	72.60	155.64	175.01	164.97	221.48	292.00	436.70	364.58	297.74	254.77	256.65	258.53	258.53	258.53	258.53	258.53	
Operating Costs	0	-0.079	-1.172	-2.501	-4.742	-5.547	-5.579	-6.004	-8.558	-11.627	-14.292	-14.441	-15.300	-15.461	-15.466	-15.466	-15.466	-15.466	-15.466	-15.466	-15.466	
Capital Expenditures	(54.91)	(57.62)	(156.53)	(147.36)	(204.65)	(136.03)	(20.25)	(63.14)	(127.68)	(153.21)	(131.46)	(30.04)	(44.24)	(8.03)	0	0	0	0	0	0	0	
Net Project Cash Flow	-54.91	-57.70	-157.70	-19.51	-145.62	-68.98	129.81	105.87	28.73	56.64	146.25	392.22	305.04	274.26	239.31	241.19	243.06	243.06	243.06	243.06	243.06	
LT Loans	45.9	40.3	109.6	103.2	143.3	95.2	14.18	44.20	89.38	107.25	92.02	21.03	30.97	5.62	0	0	0	0	0	0	0	
LT Loan Arrangement Fee	-7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
ST Loans		0.079	0																			
LT Debt Service	0	0	(25.56)	(31.84)	(60.09)	(82.93)	(107.22)	(115.33)	(109.87)	(98.43)	(96.57)	(86.42)	(83.48)	(80.94)	(74.22)	(54.38)	(31.17)	(12.07)	(7.42)	(1.16)	(0.03)	
ST Debt Service	0	0.0	-0.089	0	0	0	0															
Equity Drawn for Capex	16.47	17.29	46.96	44.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	0	
Annual cash Surplus/Shortage	0.00	0.00	-26.82	96.01	-62.45	-56.69	36.77	34.74	8.23	65.46	141.71	326.83	252.53	198.93	165.09	186.81	211.90	230.99	235.64	241.90	243.03	
Retained Cash Used for Capex	0	0	0.0	0.0	61.40	40.809	6.075	18.941	38.305	45.963	39.438	9.012	13.272	2.408								
Equity Drawn to clear deficit	0	0	26.82	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Retained Cash Used to Clear Deficits	0	0	0	0	0	0	-36.77	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Cumulative Cash Balance	0	0.00	0.00	96.01	33.56	-23.13	13.64	48.39	56.62	122.08	263.78	590.61	843.14	1042.07	1207.16	1393.97	1605.86	1836.86	2072.50	2314.40	2557.43	
Free Cash Flow to Equity Holders (\$ in million)																						
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Equity Drawn	-16.47	-17.29	-73.78	-44.21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Change in Retained Cash	0.00	0.00	0.00	96.01	-62.45	-56.69	36.77	34.74	8.23	65.46	141.71	326.83	252.53	198.93	165.09	186.81	211.90	230.99	235.64	241.90	243.03	
Net Cash Flow to E.H.	-16.47	-17.29	-73.78	51.81	-62.45	-56.69	36.77	34.74	8.23	65.46	141.71	326.83	252.53	198.93	165.09	186.81	211.90	230.99	235.64	241.90	243.03	
PV of Net CF to E. H. @12%	-16.47	-15.43	-58.81	36.87	-39.69	-32.17	18.63	15.72	3.33	23.60	45.63	93.95	64.82	45.59	33.78	34.13	34.56	33.64	30.64	28.09	25.19	405.60
PV of Net CF to E. H. @15%	-16.47	-15.03	-55.79	34.06	-35.71	-28.18	15.90	13.06	2.69	18.61	35.03	70.25	47.20	32.33	23.33	22.96	22.64	21.47	19.04	17.00	14.85	259.23
PV of Net CF to E. H. @20%	-16.47	-14.40	-51.23	29.98	-30.12	-22.78	12.31	9.70	1.91	12.69	22.89	43.99	28.32	18.59	12.86	12.12	11.46	10.41	8.85	7.57	6.34	114.99
Equity IRR	29.67%																					

3. Economic Modelling without including cost of Coal-fired Power Plant

	Year	Cost		Benefits	Total Economic Costs	Incremental Wage Benefits	Dynamic Efficiency	Second Order Econ benefit	Total Economic benefits	Net (E-4)	NPV @12%	NPV @15%	NPV @20%
		Capital Cost	O&M										
							\$ 0.020						
0	2015	\$ 52.331	\$ -	\$ -	\$ 52.331		\$ 1.047	\$ 1.047	\$ 1.047	\$ (51.284)	\$ (51.284)	\$ (51.284)	\$ (51.284)
1	2016	\$ 54.960	\$ 0.072	\$ -	\$ 55.032		\$ 1.101	\$ 1.101	\$ 1.101	\$ (53.931)	\$ (48.153)	\$ (46.897)	\$ (44.943)
2	2017	\$ 159.523	\$ 1.126	\$ 6.030	\$ 160.649		\$ 3.213	\$ 3.213	\$ 9.243	\$ (151.406)	\$ (120.700)	\$ (114.485)	\$ (105.143)
3	2018	\$ 60.441	\$ 2.414	\$ 132.957	\$ 62.855		\$ 1.257	\$ 1.257	\$ 134.214	\$ 71.359	\$ 50.792	\$ 46.920	\$ 41.296
4	2019	\$ 93.275	\$ 4.581	\$ 73.686	\$ 97.857	\$ -	\$ 1.957	\$ 1.957	\$ 75.643	\$ (22.214)	\$ (14.117)	\$ (12.701)	\$ (10.713)
5	2020	\$ 32.063	\$ 5.360	\$ 74.768	\$ 37.423	\$ -	\$ 0.748	\$ 0.748	\$ 75.516	\$ 38.093	\$ 21.615	\$ 18.939	\$ 15.309
6	2021	\$ -	\$ 5.390	\$ 107.240	\$ 5.390	\$ 24.582	\$ 0.108	\$ 24.689	\$ 131.929	\$ 126.539	\$ 64.109	\$ 54.706	\$ 42.378
7	2022	\$ 48.320	\$ 5.596	\$ 105.815	\$ 53.916	\$ 36.608	\$ 1.078	\$ 37.686	\$ 143.501	\$ 89.585	\$ 40.524	\$ 33.678	\$ 25.002
8	2023	\$ 25.734	\$ 6.181	\$ 98.095	\$ 31.915	\$ 50.298	\$ 0.638	\$ 50.937	\$ 149.032	\$ 117.117	\$ 47.302	\$ 38.286	\$ 27.238
9	2024	\$ 46.457	\$ 7.253	\$ 140.997	\$ 53.710	\$ 70.326	\$ 1.074	\$ 71.400	\$ 212.397	\$ 158.687	\$ 57.224	\$ 45.109	\$ 30.755
10	2025	\$ 32.357	\$ 8.018	\$ 182.288	\$ 40.375	\$ 85.487	\$ 0.807	\$ 86.295	\$ 268.583	\$ 228.208	\$ 73.477	\$ 56.410	\$ 36.857
11	2026	\$ 27.604	\$ 8.161	\$ 297.958	\$ 35.765	\$ 94.914	\$ 0.715	\$ 95.629	\$ 393.587	\$ 357.822	\$ 102.865	\$ 76.911	\$ 48.159
12	2027	\$ 37.840	\$ 8.995	\$ 232.195	\$ 46.835	\$ 108.642	\$ 0.937	\$ 109.579	\$ 341.774	\$ 294.939	\$ 75.704	\$ 55.126	\$ 33.079
13	2028	\$ 6.740	\$ 9.150	\$ 142.030	\$ 15.890	\$ 129.235	\$ 0.318	\$ 129.553	\$ 271.583	\$ 255.693	\$ 58.598	\$ 41.557	\$ 23.898
14	2029	\$ 0.208	\$ 9.155	\$ 100.285	\$ 9.363	\$ 171.545	\$ 0.187	\$ 171.732	\$ 272.018	\$ 262.654	\$ 53.744	\$ 37.121	\$ 20.457
15	2030		\$ 9.155	\$ 102.587	\$ 9.155	\$ 198.744	\$ 0.183	\$ 198.927	\$ 301.513	\$ 292.358	\$ 53.413	\$ 35.929	\$ 18.976
16	2031		\$ 9.155	\$ 112.922	\$ 9.155	\$ 208.070	\$ 0.183	\$ 208.253	\$ 321.175	\$ 312.020	\$ 50.897	\$ 33.344	\$ 16.877
17	2032		\$ 9.155	\$ 112.892	\$ 9.155	\$ 208.070	\$ 0.183	\$ 208.253	\$ 321.145	\$ 311.990	\$ 45.440	\$ 28.992	\$ 14.062
18	2033		\$ 9.155	\$ 112.913	\$ 9.155	\$ 208.070	\$ 0.183	\$ 208.253	\$ 321.166	\$ 312.011	\$ 40.574	\$ 25.212	\$ 11.719
19	2034		\$ 9.155	\$ 112.892	\$ 9.155	\$ 208.070	\$ 0.183	\$ 208.253	\$ 321.145	\$ 311.990	\$ 36.224	\$ 21.922	\$ 9.766
20	2035		\$ 9.155	\$ 112.913	\$ 9.155	\$ 208.070	\$ 0.183	\$ 208.253	\$ 321.166	\$ 312.011	\$ 32.345	\$ 19.064	\$ 8.139
											\$ 670.592	\$ 443.860	\$ 211.881
		\$ 677.854	\$ 63.147	\$ 1,694.344							EIRR=	30.656%	

4. Economic Modelling including Cost of Coal-fired Power Plant

	Year	Cost		Benefits	Total Economic Costs	Incremental Wage Benefits	Dynamic Efficiency	Second Order Econ benefit	Total Economic benefits	Net (E-4)	NPV @12%	NPV @15%	NPV @20%
		Capital Cost	O&M										
							\$ 0.020						
0	2015	\$ 52.331	\$ -	\$ -	\$ 52.331		\$ 1.047	\$ 1.047	\$ 1.047	\$ (51.284)	\$ (51.284)	\$ (51.284)	\$ (51.284)
1	2016	\$ 54.960	\$ 0.072	\$ -	\$ 55.032		\$ 1.101	\$ 1.101	\$ 1.101	\$ (53.931)	\$ (48.153)	\$ (46.897)	\$ (44.943)
2	2017	\$ 159.523	\$ 1.126	\$ 6.030	\$ 160.649		\$ 3.213	\$ 3.213	\$ 9.243	\$ (151.406)	\$ (120.700)	\$ (114.485)	\$ (105.143)
3	2018	\$ 131.973	\$ 2.414	\$ 141.164	\$ 134.386		\$ 2.688	\$ 2.688	\$ 143.852	\$ 9.466	\$ 6.737	\$ 6.224	\$ 5.478
4	2019	\$ 178.401	\$ 4.581	\$ 83.453	\$ 182.982	\$ -	\$ 3.660	\$ 3.660	\$ 87.112	\$ (95.870)	\$ (60.927)	\$ (54.814)	\$ (46.234)
5	2020	\$ 116.865	\$ 5.360	\$ 84.498	\$ 122.225	\$ -	\$ 2.445	\$ 2.445	\$ 86.942	\$ (35.283)	\$ (20.021)	\$ (17.542)	\$ (14.179)
6	2021	\$ 17.478	\$ 5.390	\$ 149.641	\$ 22.868	\$ 24.582	\$ 0.457	\$ 25.039	\$ 174.680	\$ 151.811	\$ 76.912	\$ 65.632	\$ 50.841
7	2022	\$ 57.383	\$ 5.800	\$ 169.002	\$ 63.183	\$ 36.608	\$ 1.264	\$ 37.871	\$ 206.873	\$ 143.691	\$ 64.998	\$ 54.019	\$ 40.101
8	2023	\$ 109.888	\$ 8.277	\$ 169.897	\$ 118.165	\$ 50.298	\$ 2.363	\$ 52.662	\$ 222.559	\$ 104.394	\$ 42.163	\$ 34.127	\$ 24.279
9	2024	\$ 131.259	\$ 11.254	\$ 228.410	\$ 142.513	\$ 70.326	\$ 2.850	\$ 73.176	\$ 301.586	\$ 159.073	\$ 57.363	\$ 45.219	\$ 30.829
10	2025	\$ 113.275	\$ 13.838	\$ 294.114	\$ 127.112	\$ 85.487	\$ 2.542	\$ 88.030	\$ 382.144	\$ 255.031	\$ 82.113	\$ 63.040	\$ 41.189
11	2026	\$ 27.604	\$ 13.981	\$ 422.251	\$ 41.585	\$ 94.914	\$ 0.832	\$ 95.746	\$ 517.997	\$ 476.412	\$ 136.957	\$ 102.401	\$ 64.119
12	2027	\$ 37.840	\$ 14.815	\$ 356.488	\$ 52.655	\$ 108.642	\$ 1.053	\$ 109.696	\$ 466.184	\$ 413.529	\$ 106.143	\$ 77.292	\$ 46.380
13	2028	\$ 6.740	\$ 14.970	\$ 288.258	\$ 21.710	\$ 129.235	\$ 0.434	\$ 129.670	\$ 417.927	\$ 396.217	\$ 90.803	\$ 64.396	\$ 37.032
14	2029	\$ 0.208	\$ 14.975	\$ 246.513	\$ 15.183	\$ 171.545	\$ 0.304	\$ 171.849	\$ 418.362	\$ 403.178	\$ 82.498	\$ 56.981	\$ 31.402
15	2030		\$ 14.975	\$ 248.814	\$ 14.975	\$ 198.744	\$ 0.300	\$ 199.043	\$ 447.857	\$ 432.882	\$ 79.086	\$ 53.199	\$ 28.096
16	2031		\$ 14.975	\$ 259.150	\$ 14.975	\$ 208.070	\$ 0.300	\$ 208.369	\$ 467.519	\$ 452.544	\$ 73.820	\$ 48.361	\$ 24.477
17	2032		\$ 14.975	\$ 259.120	\$ 14.975	\$ 208.070	\$ 0.300	\$ 208.369	\$ 467.489	\$ 452.514	\$ 65.906	\$ 42.050	\$ 20.396
18	2033		\$ 14.975	\$ 259.141	\$ 14.975	\$ 208.070	\$ 0.300	\$ 208.369	\$ 467.510	\$ 452.535	\$ 58.847	\$ 36.567	\$ 16.998
19	2034		\$ 14.975	\$ 259.120	\$ 14.975	\$ 208.070	\$ 0.300	\$ 208.369	\$ 467.489	\$ 452.514	\$ 52.540	\$ 31.796	\$ 14.164
20	2035		\$ 14.975	\$ 259.141	\$ 14.975	\$ 208.070	\$ 0.300	\$ 208.369	\$ 467.510	\$ 452.535	\$ 46.913	\$ 27.650	\$ 11.804
											\$ 822.716	\$ 523.931	\$ 225.803
		\$ 1,195.728	\$ 86.907	\$ 2,639.719							EIRR=	28.412%	

Economic Modelling

Annex-1

World Bank's Consultant's comments on the Economic modeling work	JDI/MSL/Sheltech's observation
<p>1.1. Economic Model should be fully linked to Financial Model to integrate all financial model inputs that affect the economic model, and to allow user to compare EIRR and IRR for each scenario. This includes all capital, operating cost and revenues.</p> <p>1.2. Several links in the Summary (HR) sheet in Economic Model should be either corrected if this sheet is needed for the analysis, or delete it if the sheet is not used in the analysis (as mentioned in the notes).</p> <p>1.3. Economic analysis assumed all capital and operating costs (Adjusted for Conversion factors) whether paid by GoB or by Investor as a cost to the GoB and all project revenues (Adjusted for Conversion factors) as revenues to GoB.</p> <p>The analysis should have dealt with the economic effect of project revenue and construction cost factors as follows:</p> <ul style="list-style-type: none"> • Revenue indirect effect on the economy and taxes if any, • Cost paid by the government as direct cost (net of all taxes and duties), • Duties and taxes on cost paid by the developer on the construction of the zone as a benefit. <p>1.4. Studies didn't account for any revenues from government fees charged to businesses and staff in zones. The type of fees and revenues should be added to the government revenues from the zone and would include things like company registration and renewal fees, developer fees (to government), work permits for zone workers, government inspection fees for buildings along with other possible fees.</p> <p>1.5. Lost government revenue from local businesses relocation to the Zone should be addressed, such as the effect of tax holiday (if applicable).</p> <p>Added value from new businesses open in the zone should be addressed, such as using inputs from local market or taxes and duties on goods producing in the zone for local use.</p>	<p>It has been taken care of.</p> <p>It has been taken account of. It has been taken account of. It has been taken account of.</p> <p>Account has been taken of fees charged to businesses, and of liable personal income taxes against staff in zones, with appropriate assumptions. Effects of a 10-year tax-holiday have been correctly accounted for, as has been the lost government revenue from local businesses relocation to the zone. Added value from new businesses open in the zone has been addressed.</p>

Annex-2

This annex leads on to the sets of four spreadsheets each, containing the detailed calculations of the Economic Internal Rates of Returns (EIRRs) --- corresponding to 'without-CPP' and 'with-CPP'. The informational content of the various worksheets in the spreadsheets for the 'without-CPP' calculations only is now presented. The structure of the calculations is the same for the 'with-CPP' basis.

The first worksheet presents the on-site capital outlays, following the methods described in the main text, including enforcing the scheme to apportion the capital outlays using, broadly, a five-part decomposition into labor, non-tradables, tradables, rentals, and other overheads. Rentals are further divided up into energy-sensitive outlays and others.

The second worksheet presents the off-site capital outlays, all net of taxes, following the methods described in the main text, including enforcing the scheme to apportion the capital outlays using, broadly, a five-part decomposition, like for on-site costs.

The third worksheet presents the capital costs. These values have been taken from the financial modeler's financial costs at market prices.

The work-sheet titled 'economic conversion' is where we account for on-site and off-site differently. All off-site costs are net of appropriate taxes---tradable outlays being net of border taxes including 'para-tariffs'. Other outlays, being in the nature of expenditures on domestic, largely non-tradable, resources, are net of value-added taxes, of roughly 4% relative to the gross value of sales. All net-of-tax outlays thus obtained are again multiplied by 0.97, this being the standard conversion factor (SCF), in order to deal with the overvaluation of the currency. As pointed out already, rentals are divided up into energy-sensitive outlays and other. The distinction is important: outlays on energy-sensitive items draw forth a small subsidy from the public exchequer, while other outlays need to be adjusted downwards relative to market-values. As an assumption, one third of 'general overheads' are attributable to repair, maintenance, and other miscellaneous kinds of outlays. Two thirds of general overheads are assumed to comprise of gross profits of business carrying out the implementation of the on-site and off-site outlays, the latter being on behalf of the government. (Some government revenue is assumed to occur on account of profit taxation from the second part of 'overheads'.

The next worksheet is about revenues. Revenues include private developer's revenues from selling all manner of land, all other charges from the tenants in the zone. Revenues also include all direct and indirect revenues by the Government from a whole variety of fees, taxes, para-tariffs, trade licenses, signboard fees, work-permit fees, Board of Investment fees from investors who want to buy or lease land on the BEZA, taxes on profits, etc. However, subsidies and revenue losses from enterprises relocating from elsewhere into the zones and availing of the tax-holiday incentive are *deducted* from government revenue, as they ought to be.

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