Chapter 5 Formulating the Master Plan for Mid-term Economic Zone Development

Executive Summary of Master Plan for the Medium-term EZ development

This survey has been conducted along with the framework and in the following order:

1. Formulation of the Development Vision and Identification of potential industries for Medium-term EZ development,
2. Selection of candidate sites for the Medium-term EZ development,
3. Environmental and Social Consideration Study for the Medium-term EZ developmentand
4. Formulation of the Master Plan for the Medium-term EZ development.

The candidate sites for the Medium-term EZ development were finally provided based on "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" conducted by JICA which was endorsed by the survey team after approval by the Joint Coordination Committee (JCC) meeting held on May 24, 2016 at the BEZA office. There are two (2) candidate sites; one for the Seaboard EZ and one for the General EZ. The Project site for the Seaboard EZ is located at the southern bank of the proposed Coal Transfer Terminal (CTT) in Maheskhali Island, and other site for the General EZ is located just south of where the power station plants under development by BPDB will be, as shown in Option 1' which was recommended by the JICA survey team. However, the facilities plotted in Option 1 was not a final decision of Bangladesh government but was shown as an advance to next step (formulating master plan on ports). It is requested to pay attention to what the master plan was formulated based on such assumption.

【Seaboard EZ】

The Project site of the Seaboard EZ is designated to be on the western coast of Maheskhali Island, directly opposite Matarbari Island, and is approximately 570 hectares. The proposed site consists of swamp lands, salt pans and farmland, and certain areas that are submerged at high tide. Presently, the land is used for farming, salt production, shrimp farming, and fallowing. Agricultural productivity is low, and there are a number of petty fishermen. The level of economic development is obviously low compared to that of neighboring Upazilas, thus the effects of regional development by the EZ development is quite high.

1. Development Concept of the Master Plan and Potential Industries to be promoted

1.1 Development Concept:

"Environmental Harmonized Heavy and Chemical Industrial Complex"

Investment, with an emphasis on heavy and chemical industries with due consideration paid to environmental protection and the reduction of CO2, shall be targeted to establish a foundation of industrialization to develop manufacturing in Bangladesh.

1.2 Potential Industries to be promoted and its characteristics

Characteristics of Industry to be targeted:

a. Capital intensive industries (mostly apparatus industries) shall be targeted,
b. Basic material industries (iron and steel, ship scrap, non-iron metal, chemical, chemical products) shall be targeted,
c. Upstream industry (iron and steel, ship scrap, chemical) shall be targeted,
d. Mass production and high technology are required, thus large scale investment is necessary,
e. Countermeasures for maintaining safety and reducing environmental burden are necessary, and strategic activity targeting core industry investment is necessary.

Potential Industries to be promoted:

(1) Heavy Industry Zone:

a. Iron and steel (electrical furnace, steel rolling mill, steel process mill)

b. Shipyard (shipbuilding, ship repair and maintenance)
c. Ship scrap, ship recycling (harmonized with environmental and labor safety)
d. Non-iron metal
e. Heavy machinery, construction machinery

(2) Chemical Industry Zone:
a. Chemical processes and chemical products (Synthetic Fibers)
b. Tire

2. Brief Profile of the Master Plan and the proposed Off-site Infrastructures Development

2.1 Brief Profile of the Master Plan of the Seaboard EZ

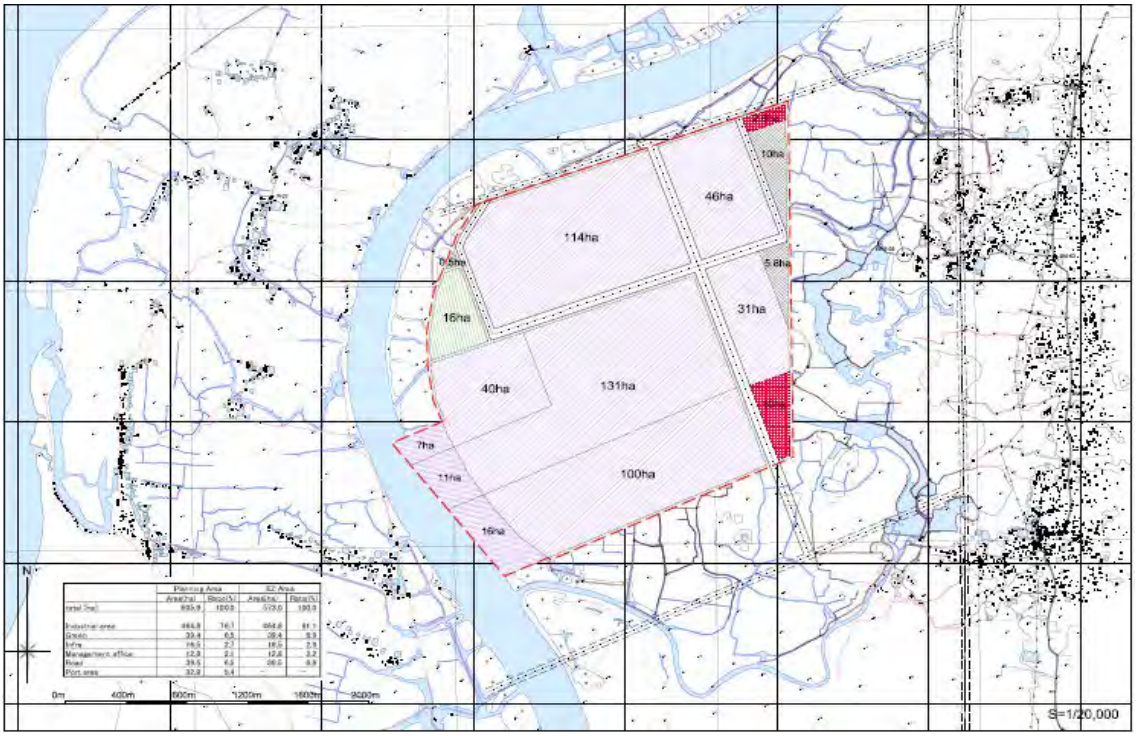
The land use plan for the Seaboard EZ has been prepared so as to provide suitable industrial zones for heavy industry and chemical industry for the adjacent industrial port. The plan also includes details about access roads and infrastructure facilities in consideration of the location, the shape of the area, altitude and inclination of the land, existing land use and the development plan on the whole core zone which was proposed by "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" conducted by JICA.

With regard to the infrastructure for the Seaboard EZ development, the disaster prevention structures, access roads from the truck highway, the internal road network, storm water drainage network, flood retention pond (including pumping system), water supply system, waste water treatment system, sub-station and power distribution system, gas distribution system, telecommunication system, etc., have been planned in the EZ area. The proposed land use allocation plans at the Seaboard EZ are as shown in the following table.

Land Use Allocation Plan at the Seaboard EZ

	Land Use	Area (ha)	Ratio (%)
A	Industrial Area	464.8	81.1%
B	Road Network	39.4	6.9%
C	Other Infrastructures	16.5	2.9%
D	Management/Commercial Area	12.8	2.2%
E	Green Area	39.5	6.9%
	Total	573.0	100.0%
F	Special Industrial Port Area	32.9	-

The land use plan for the Seaboard EZ development is illustrated in the following figure:



However, the management and commercial facilities for a management office, administration, business operation and training, accommodation, restaurants, etc., shall be minimized because of environmental conditions which may be affected by the heavy and chemical industries in the Seaboard EZ area, and also by the surrounding environmental conditions by coal power stations, coal terminals and heavy industries to be planned by "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" conducted by JICA.

2.2 The proposed Off-site Infrastructure Development

In order to perform the functions of the Seaboard EZ, various Off-site Infrastructure and Utility facilities such as roads, railways, water supply, electric and gas supply, and telecommunications shall be developed.

3. Development Costs and Matters to note in the implementation of the Project

3.1 Development Costs for the Seaboard EZ

Based on the Land Use Plan and Infrastructure Development Plan mentioned above, the development cost for the Seaboard EZ are calculated as shown in the following table.

Summary of Project Cost for the Seaboard EZ Development

No		Description	Unit	Quantity	Seaboard EZ (605Ha)			unit: US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				240,576,189	231,220,882	471,797,071	
	1	Preparation Works	L.s	1	2,210,275	2,173,975	4,384,250	
	2	Embankment Filling (Access Road and Site)	m3	29,267,000	129,663,559	85,695,786	215,359,345	
	3	Access Road Construction	m	1300	739,755	1,243,482	1,983,237	
	4	Road Construction	m2	137,500	6,874,714	4,522,727	11,397,441	
	5	Seawall (11,200m)	m	11,200	77,400,960	95,728,640	173,129,600	
	6	Sea Dike (0 m)	m	0	0	0	0	
	7	Storm Water Drainage Works	L.s	1	1,079,601	719,734	1,799,334	
	8	Sewer Water Drainage Works	L.s	1	1,392,830	928,553	2,321,384	
	9	Water Distribution Line & Fire Fitting Line	L.s	1	160,306	641,222	801,528	
	10	Electric Power Distribution & Lighting	L.s	1	2,104,102	8,416,409	10,520,511	
	11	Gas Pipe line Distribution	L.s	1	90,088	360,353	450,441	
	12	Common Plant for water and sewer	ton	56,000	17,800,000	29,200,000	47,000,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	24,533,448	60,390,025	84,923,473	
Construction Cost					265,109,637	291,610,907	556,720,544	
C	Contingency and Taxes		%	10 %+ 6% of FC	24,057,619	36,995,341	61,052,960	
D	Consultants Services		%	4	5,944,643	13,870,834	19,815,477	
Total Project Cost (A+B+C+D)					295,111,899	342,477,082	637,588,981	
Common Dredging Works								
	1	Access Channel Dredging	m3	7,940,000	10,242,600	23,899,400	34,142,000	
	2	Port Bsin Dredging	m3	7,846,000	10,121,340	23,616,460	33,737,800	
	3	Disposal (improvement) of Deredgied material	m3	15,786,000	36,465,660	85,086,540	121,552,200	
Total Common Dredging Works for Port					56,829,600	132,602,400	189,432,000	
EZ Portion for Dredging Works (BEZA、EZ Developer、EZ Tenants)			%	10%	5,682,960	13,260,240	18,943,200	

Major development costs came from the Embankment Filling and the Construction of the Seawall (11.2 km).

3.2 The Matters to note in the implementation of the Project

In implementing the development of the Seaboard EZ, the following matters shall be well noted.

a. A new independent organization authorized by the government for an integrated development of the entire core areas of Matarbari/Maheskhali Islands shall be established. The organization has strong leadership and initiatives to make and implement the plan, adjust and develop relevant plans within the integrated development of the core areas of Matarbari/Maheskhali Islands, thus leading the development toward optimum efficiency and effect.
b. Development of a regional trunk road connecting with National Road NR-1,
c. Development of water reservoir dams, water supply plant(s) and main distribution pipelines to the project sites along the regional road,
d. Development of an electrical power supply grid line (125KV Power Line) and a sub-station and high voltage lines (33KV power lines) along the regional road,
e. Development of a gas supply distribution station and pipelines along the regional road,
f. Development of an access road/ bridge to Deep Sea Container Port,
g. Development of an access channel and port basin (Main waterway dredging) (initial and maintenance dredging), and
h. Development of a ship turning basin and berth boxes in front of the Seaboard EZ (Initial and maintenance dredging).

【General EZ】

The project site of the General EZ is designated to be just south of the coal-fired power station complex which will be developed on a PPP basis under the initiatives of BPDB at the western

coast of Maheskhali Island, within a plot of approximately 400 hectares of land, which is a part of some 2,000 hectares of land designated to BEZA. The geographic conditions and the present land use are same as that of the Seaboard EZ. Thus, the level of economic development is obviously low compared to that of neighboring Upazilas, thus the effects of regional development by the EZ development is quite high.

1. Development Concept of the Master Plan and Potential Industries to be promoted

1.1 Development Concept:

"Center of Excellence in General Manufacturing Industries"

Emphasizing the investment of FDIs in the assembly industry, while also striving to develop supporting industries, which results in an industrial cluster. The location of the site was considered with the aim of developing a supply chain and industrial linkage among the Seaboard EZ, the General EZ, and surrounded areas. While developing the General EZ, community and residence at urban area are to be developed in an integrated approach under government initiatives, leading to integrated regional development.

1.2 Potential Industries to be promoted and its characteristics

Characteristics of Local Industry:

a. Labor intensive,
b. Intermediate processing and downstream industry,
c. Supporting industry (framework parts and members, etc.),
d. Production goods, intermediate goods,
e. Goods related to living, general consumer goods,

Strategic activity targeting FDI of anchor industry in assembling manufacture is key element.

Potential Industries to be promoted:

[Transport machine zone]

Automobile/parts, motor cycle/parts, railroad wagon

[Machinery and ITC zone]

a. General machinery, production machinery
b. Electrical and electric goods/parts
c. IT device, communication equipment

[Food, medicine, medical goods zone]

a. Food, agro-processing (including halal food)
b. Medicine, medical goods, nutrition, healthy food, cosmetics

[Consumer products zone]

a. RMG/apparel, apparel accessories
b. Bicycles, paper processing, printing, daily commodities, etc.

2. Profile of the Master Plan and Off-site Infrastructures

2.1 Brief Profile of the Master Plan of the General EZ

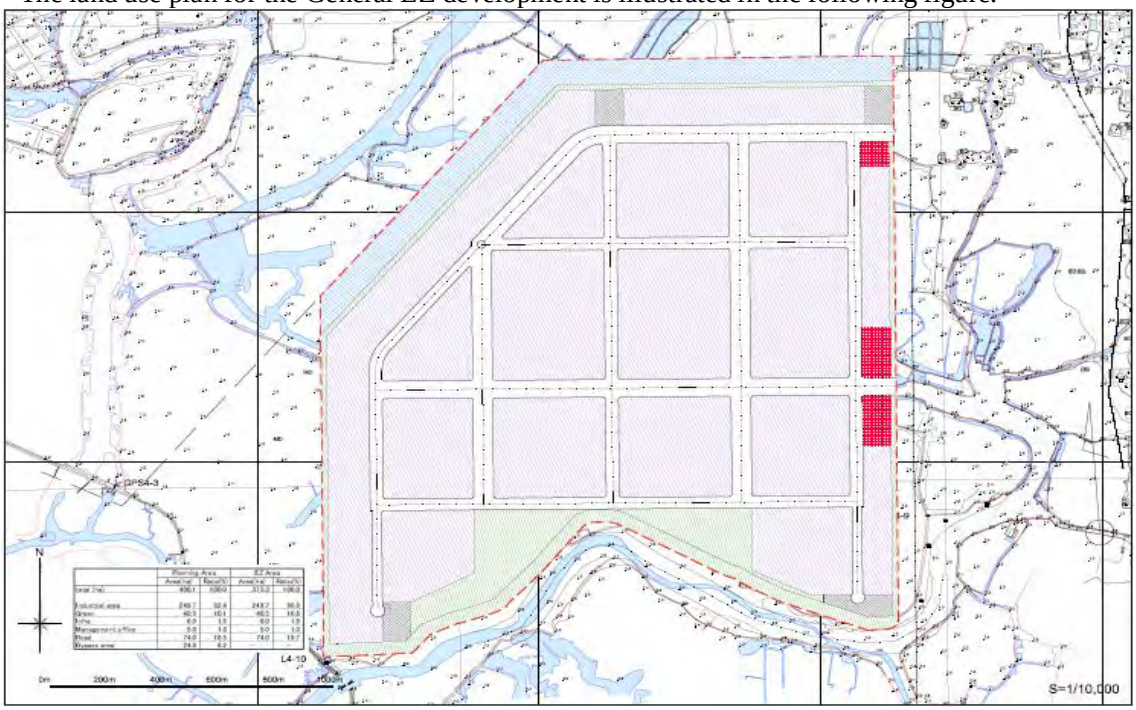
The land use plan for the General EZ has been prepared so as to provide suitable industrial zones for general manufacturing industries for the commercial port in the neighborhood area, proper access roads and infrastructure facilities in consideration of the location, the shape of the area, altitude and inclination of the land, existing land use, and other development plan in the whole core zone which was proposed by "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" conducted by JICA.

With regard to the infrastructure and utility development at the General EZ, the same facilities such as disaster prevention structures, the access road from the truck highway, the internal road network, storm water drainage network, flood retention pond (including pumping system), water supply system, waste water treatment system, sub-station and power distribution system, gas distribution system, telecommunication system, etc., have been planned in the EZ area. The proposed land use allocation plans at the General EZ are as shown in the following table.

Land Use Plan Allocation at the General EZ

	Land Use	Area (ha)	Ratio (%)
A	Industrial Area	249.4	66.5%
B	Road Network	74.0	19.7%
C	Other Infrastructures	6.0	1.6%
D	Management/Commercial Area	5.0	1.3%
E	Green Area	40.8	10.9%
	Total	375.3	100.0%
F	Bypass Area	24.8	-

The land use plan for the General EZ development is illustrated in the following figure.



The management and commercial facilities such as management office, administration, business operation and skill development, medical center, investors' club, accommodation and restaurants shall be minimized because of surrounding environmental conditions caused by coal power stations which are planned by BPDB to be located near the project site. The commercial area which consists of a residential complex, hotel/condominiums, vocational training facilities, public and amusement parks, educational, and medical facilities, will be located in either: a) the eastern side of the north–south trunk highway in Maheskhali Island which was proposed by "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" conducted by JICA. and/or, b) the sub-urban center of Chakaria and Cox's Bazar.

2.2 The proposed Off-site Infrastructure Development

In order to perform the functions of the General EZ, various Off-site Infrastructure and Utility facilities such as roads, railways, water supply, electric and gas supply, telecommunications shall be developed.

3. Development Costs and Matters to note in the implementation of the Project

3.1 Development Costs for the General EZ

Based on the Land Use Plan and Infrastructure Development Plan mentioned above, the development cost for the General EZ are calculated as shown in the following table.

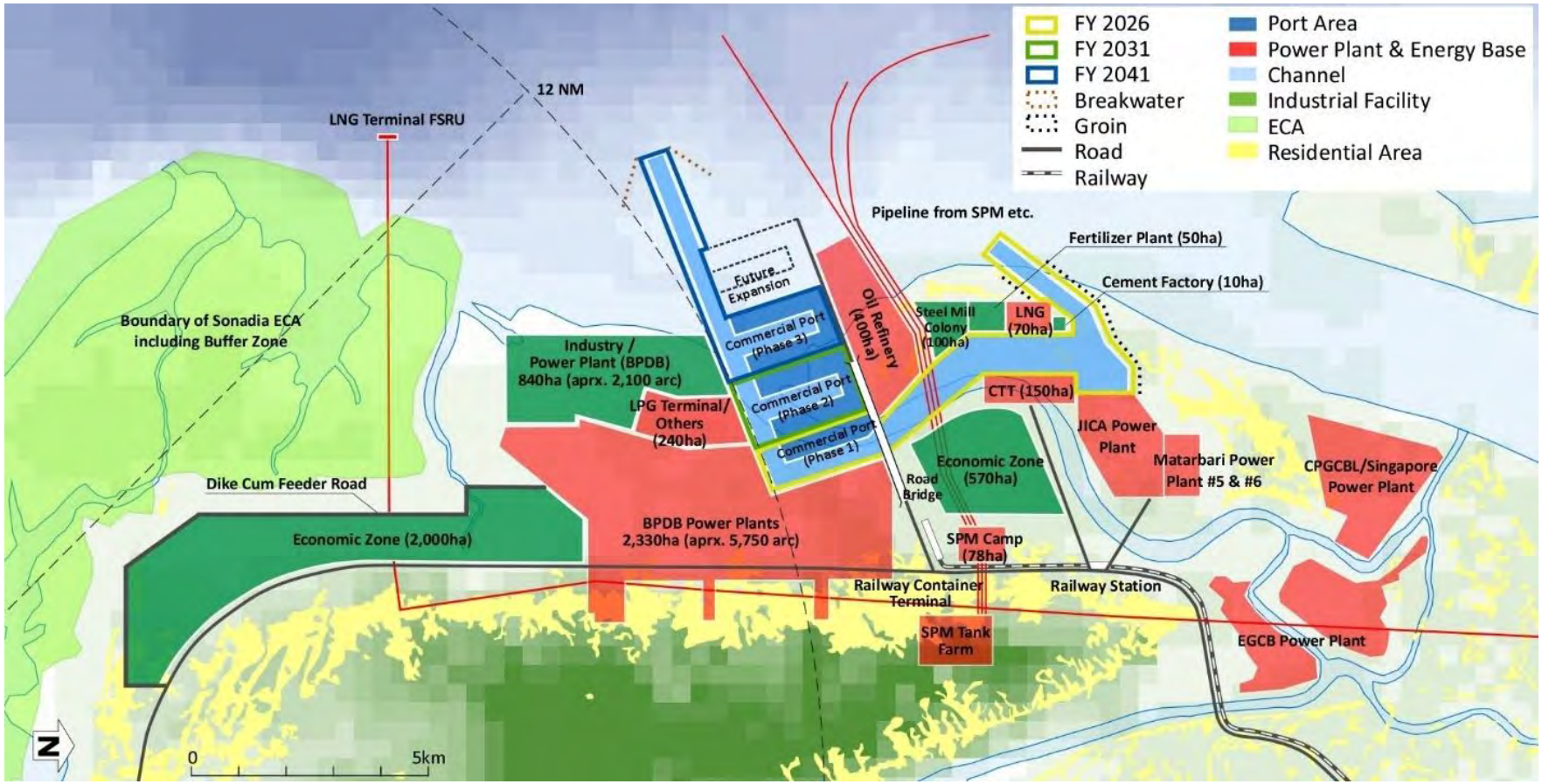
Summary of Project Cost for the General EZ Development

No		Description	Unit	Quantity	General EZ (400Ha)			unit : US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				187,298,567	158,275,318	345,573,885	
	1	Preparation Works	L.s	1	1,590,358	1,644,168	3,234,525	
	2	Embankment Filling (Access Road and Site)	m3	22,334,000	99,946,570	65,592,297	165,538,867	
	3	Access Road Construction	m	60	42,419	52,249	94,668	
	4	Road Construction	m2	310,000	14,656,620	9,635,096	24,291,716	
	5	Seawall (6,100m)	m	6,100	42,155,880	52,137,920	94,293,800	Total Seawall & Sea Dike = 8,400m
	6	Sea Dike (2,300 m)	m	2,300	17,224,700	9,374,800	26,599,500	
	7	Storm Water Drainage Works	L.s	1	1,905,576	1,270,384	3,175,960	
	8	Sewer Water Drainage Works	L.s	1	1,931,211	1,287,474	3,218,686	
	9	Water Distribution Line & Fire Fitting Line	L.s	1	197,288	789,152	986,440	
	10	Electric Power Distribution & Lighting	L.s	1	1,144,575	4,578,301	5,722,876	
	11	Gas Pipe line Distribution	L.s	1	63,369	253,477	316,846	
	12	Common Plant for water and sewer	ton	14,000	5,380,000	10,070,000	15,450,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	17,969,842	44,233,457	62,203,299	
Construction Cost					205,268,409	202,508,775	407,777,185	
C	Contingency and Taxes		%	10% +4.5% of FC	18,729,857	22,949,921	41,679,778	
D	Consultants Services		%	4	4,354,231	10,159,872	14,514,103	
Total Project Cost (A+B+C+D)					228,352,497	235,618,569	463,971,066	

Major development costs came from the Embankment Filling and Construction of the Seawall and Sea Dike (8.4 Km).

3.2 Matters to note in the implementation of the Project

The same matters which are stated in the case of the Seaboard EZ, except for the access road/bridge to deep sea port, the access channel, and the ship turning basin, shall be thoroughly considered.



South Chittagong Regional Development Plan: Core Area Development Plan Option 1'

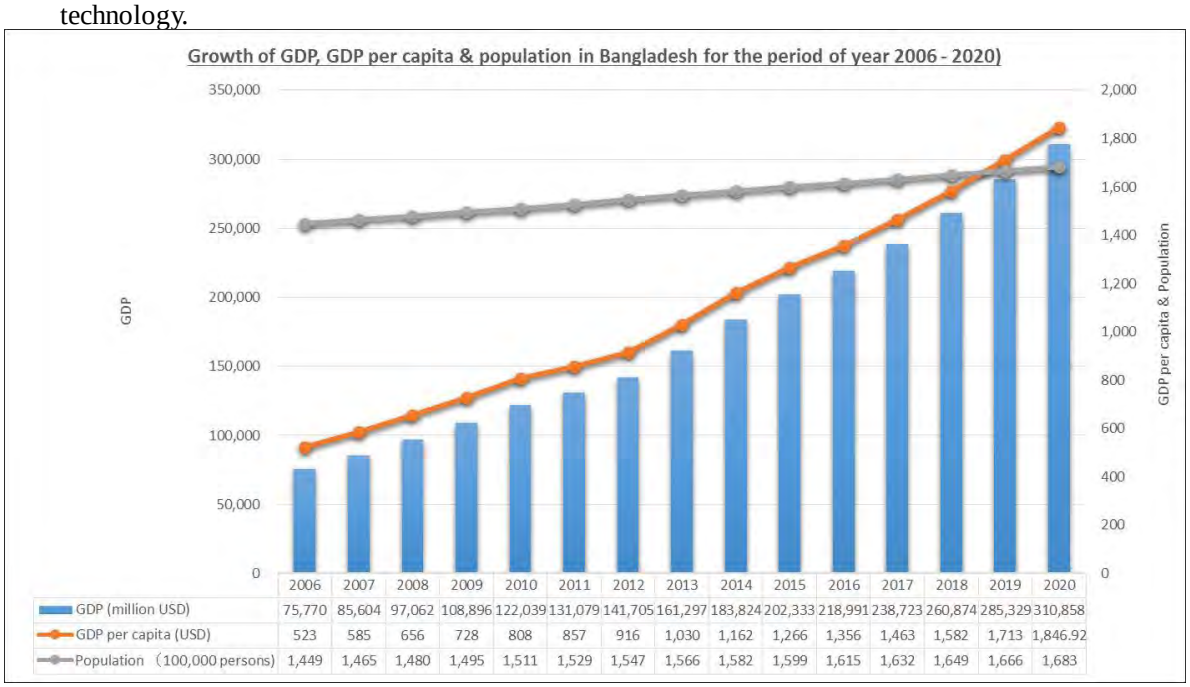
Source: "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh" by JICA

5.1 Establishing a vision for Medium-term EZ development and identifying the target industries.

5.1.1 Background and Potential of Development

(1) The status quo and the issues from viewpoint of mid-term economy

a. Bangladesh has been achieving an annual average economic growth of 6.14% over the last 12 years from 2003 to 2014. This means the growth performance has been spectacularly stable. The deviation of growth rate was so low that its economy is prospected to develop stably in the future. This is the reason why world investors are now considering Bangladesh as the next hot spot for investment in infrastructure, energy, housing, education, and technology.



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP (million USD)	75,770	85,604	97,062	108,896	122,039	131,079	141,705	161,297	183,824	202,333	218,991	238,723	260,874	285,329	310,858
GDP per capita (USD)	523	585	656	728	808	857	916	1,030	1,162	1,266	1,356	1,463	1,582	1,713	1,846.92
Population （100,000 persons)	1,449	1,465	1,480	1,495	1,511	1,529	1,547	1,566	1,582	1,599	1,615	1,632	1,649	1,666	1,683

Figure 5.1.1-1 Change of GDP growth rate and GDP per capita growth rate in Bangladesh

Source: JICA survey team based on IMF World Economic Outlook Database 2014.

The manufacturing sector accounts for 19% of the GDP of all industrial sectors in Bangladesh. The Bangladesh economy depends on export of RMG and textile products very highly (86.7%). The destination of export of the RMG and textile products from Bangladesh are advanced countries such as USA and EU. GSP Plus status and duty free export is applied to RMG and textile products to EU, which makes Bangladesh more competitive. However, as the economy grows, there is a possibility that GSP Plus will no longer be applied. The government of Bangladesh attempts move away from overdependence on RMG and textile products, becoming more diversified and upgrading its industries. Cotton and wool as clothing materials are imported, and most woven materials and fabrics are also imported. In particular, synthetic fabrics and blended fabrics (synthetic and natural fabric) for highly functional uses are imported mainly from East Asia. Also, synthetic fibers/cloths manufacturers in China are overproducing, exporting at low prices and continuing loss-making operations. Thus, domestic production of synthetic fabrics in Bangladesh cannot compete with such synthetic fabrics imported from China in terms of price. Under the circumstances, there are almost no trends of FDI in the synthetic cloth industry sector in Bangladesh[1].

[1] Overseas investment of Japanese synthetic cloths industries: Major synthetic products are acrylic and polyester. The manufacturers are segmentalized by each area of specialty. Comprehensive manufacturers of synthetic fiber are: Toray Industries, Inc.; Mitsubishi Rayon Co., Ltd.; Toyobo Co., Ltd.; Teijin Limited; etc. Toray established a joint

b. The labor intensive industries in Bangladesh are competitive in comparison to that of neighboring countries due to low labor wages. There are traditional manufacturing, technologies and skills in Bangladesh, but modern manufacturing and technologies are underdeveloped. Modernizing, diversifying and improving of technologies, skills, productivity, and quality are the main issues currently facing industrialization. In particular, the development of a basic materials industry, and heavy and chemical industries (steel and iron, petrochemical) in Bangladesh lag far behind that of advanced countries in ASEAN. As general manufacturing industries develop, the demand for materials produced in heavy and chemical industries increases. Therefore, it is necessary to promote investment in heavy and chemical industry sectors by domestic and foreign investors for industrial development through import substitutes and industrial linkages. The potential of the steel industry and petrochemical industry is described in "5.1.3 Development Vision for the Medium-term EZ development."

c. Bangladesh has a large population and the middle class has increased along with economic development. Additionally, overseas money remittance from migrant workers has increased. This elicits increased domestic demand, creating a large potential for the domestic market.

d. The data shown in Figure 5.1.1-2 "Comparison of Economy – Bangladesh and ASEAN countries in 2011" and Figure 5.1.1-3 "Comparison of Economy – Bangladesh and ASEAN countries in 2020", comparing the economy of Bangladesh and ASEAN countries is analyzed below:

GDP of Bangladesh in 2011 was 131 billion US dollars, which is less than one tenth of the GDP of India (1.843 trillion US dollars). Similarly, GDP of Bangladesh is smaller than that of Vietnam (134 billion US dollars), but larger than that of Myanmar (56 billion US dollars). It is projected that in 2020, GDP of Bangladesh will become 310.8 billion US dollars, which is still less than one tenth of the GDP projected for India in the same year (3.4435 trillion US dollars). However, the GDP of Bangladesh in 2020 will become larger than that of both Vietnam (287.2 billion US dollars) and Myanmar (106.2 billion US dollars). In 2011, the GDP per capita of Bangladesh was 817 US dollars which was less than that of India (1,514 US dollars), and lower than even less developed countries in ASEAN such as Vietnam (1,532 US dollars), and Myanmar (1,118 US dollars). It is projected that in 2020, the GDP per capita in Bangladesh will become 1,847 US dollars, which is less the GDP per capita projected for Vietnam (2,978 US dollars), India (2,495 US dollars), and Myanmar (1,977 US dollars).

It is pointed out that the GDP per capita and dissemination rate of durable consumer goods are highly correlated. It is generally known that where GDP per capita exceeds 3,000 US dollars, durable consumer goods (such as electric appliances) become popular, and that where GDP per capita exceeds 5,000 US dollars, automobiles become popular. Regarding this point, it is assumed that it would take a period of time until full-fledged dissemination of durable consumer goods and, in particular, automobiles become common throughout Bangladesh. However, it is noted that the population that has purchasing power, among the wealthy class and in general, is very large when compared to other ASEAN countries.

The population of Bangladesh in 2011 was 157 million. It is projected to increase to 168 million by 2020. The population of Vietnam in 2011 was 88 million in 2011, and is projected to increase by 8 million to 96 million by 2020. The population of Myanmar in 2011 was 50 million, while it is projected to increase by 4 million to 54 million by 2020. In terms of population, Bangladesh has a high future potential for consumption and labor force.

e. The infrastructure (such as electricity, gas, land, roads, and water), which is the foundation of industry, is weak in Bangladesh. Investment climates for foreign direct investment

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venture with AK Khan Company Limited in Bangladesh, which produces highly functional synthetic fiber products exclusively for UNIQLO Bangladesh. Accordingly, outside observation suggests that production capacity is limited in scale, as the amount of customers is limited. While Kuraray Company Ltd., has invested in Thailand, and Nisshinbo Holdings Inc., has invested in Indonesia, it is said that Japanese synthetic fiber manufacturers are generally oriented to domestic markets and are not so open to overseas investment.

(FDI) are not good[2]. It is necessary to improve the infrastructure and investment environment, and to develop economic zones for promoting FDI to Bangladesh. In addition, increased population and industries have been concentrated to Dhaka and its outskirts, along with the development of the economy. For this, problems characteristic to urban area have occurred, such as the deterioration of the living environment, traffic jams, and loss of business activity time. Furthermore, river pollution and soil pollution caused by factory effluent and industrial waste have become environmental problems. In Bangladesh, transfer and decentralization of population and industries from the capital to local regions, as well as industrial development and urban development in rural areas, and the development of road and distribution networks are continuing to be important issues for the nation.

[2]According to World Bank "Doing Business 2015" the problems in investment climates in Bangladesh are Starting a Business, Dealing with Construction Permits, Registering Property, Enforcing Contracts, etc. According to World Economic Forum "Global Competitiveness Report", Corruption, Inadequate supply of infrastructure, Government instability/coups, Access to financing, Policy instability, Inadequately educated workforce, etc., are most problematic factors.

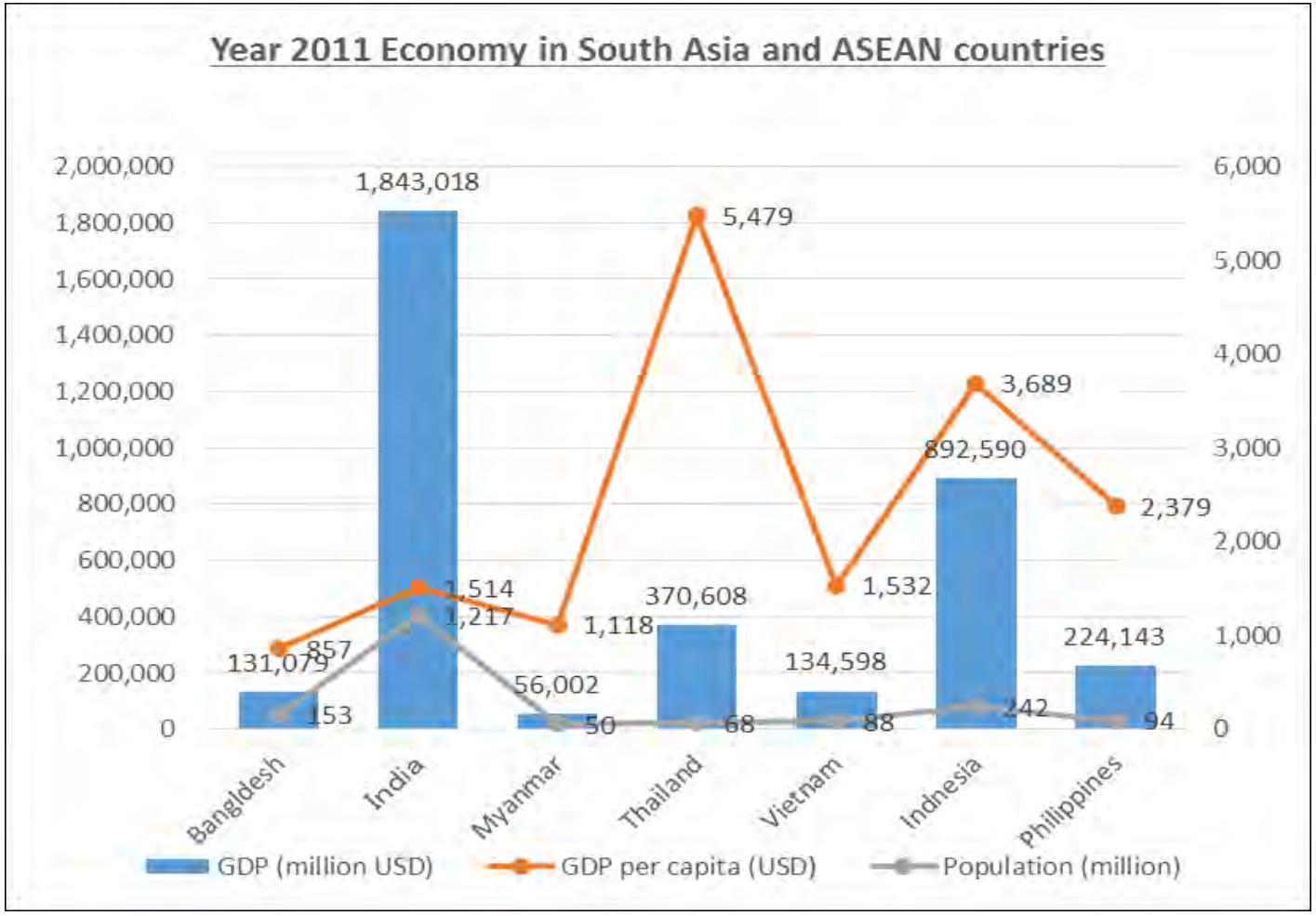


Figure 5.1.1-2 Comparison of Economy – Bangladesh and ASEAN countries in 2011

Source: JICA survey team, based on IMF World Economic Outlook Database

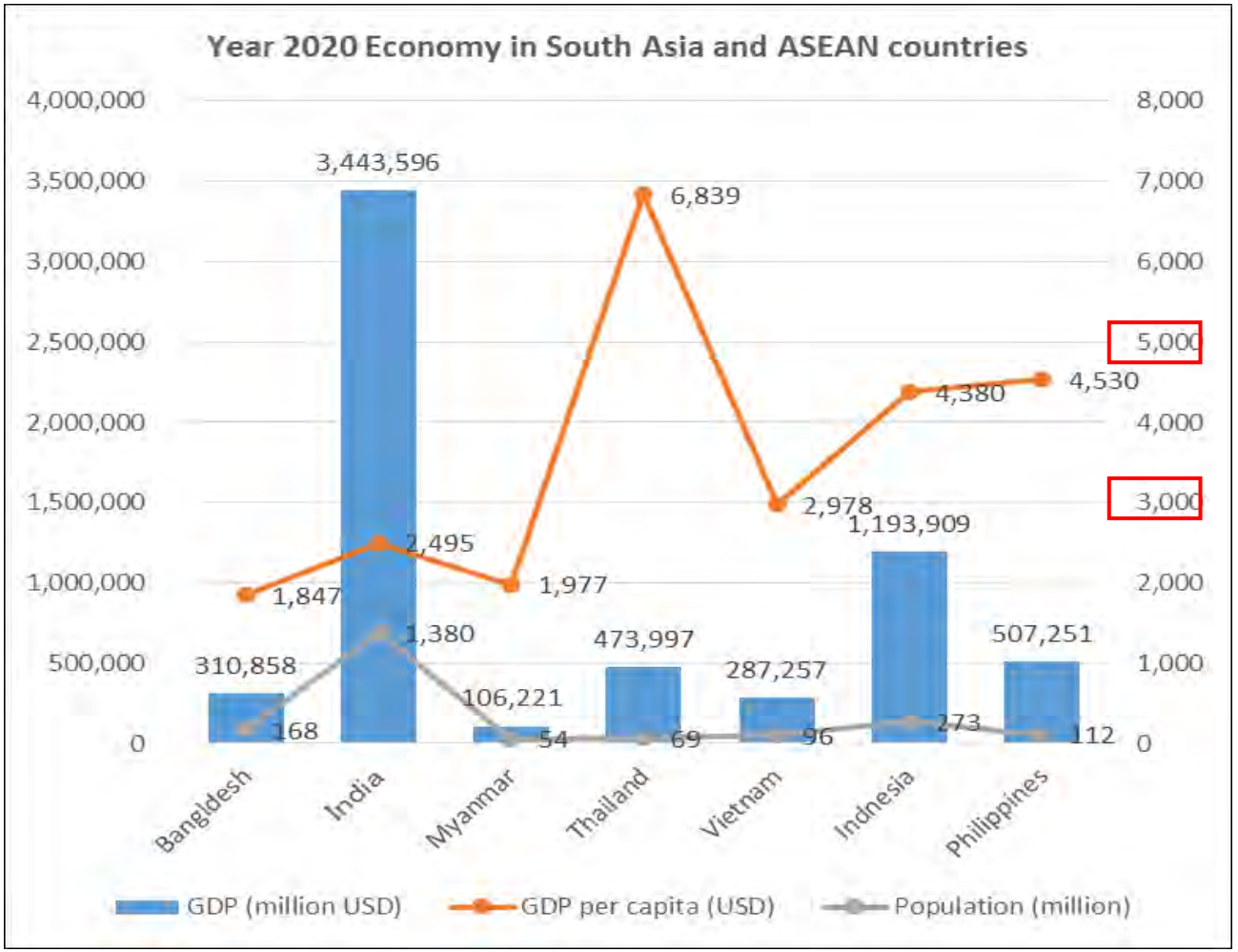


Figure 5.1.1-3 Comparison of Economy – Bangladesh and ASEAN countries in 2020

Source: JICA survey team, based on IMF World Economic Outlook Database

(2) The ground design and roadmap of the development

The Japanese government proposed the BIG-B (The Bay of Bengal Industrial Belt) plan to the Bangladesh government, which is the development of an industrial belt covering Chittagong district, Dhaka district and others. A survey on the grand design to develop Matarbari/Maheskhali, and Cox's Bazar region is detailed in JICA "Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh". In the government of Bangladesh, the Committee for Developing Matarbari/Maheskhali and Cox's Bazar Region was formed to discuss development plans for the region, to which JICA supported through said survey. In Matarbari/Maheskhali, land development of economic zones, coal fire plants, coal centers, deep sea ports (both "commercial ports" for container vessels and "industrial ports" for vessels carrying coal, fertilizer, cement, and other breakbulk cargo), oil refinery, iron and steel, fertilizer industries, LNG terminal and oil pipelines, etc., are also included in the plan. A coal fire power plant (7,000MW) in the first phase will be completed in 2025, while the construction of a commercial port under the first phase is assumed to be completed in 5 years' time from 2021 to 2025.

If a deep sea port is constructed, large vessels can enter the port, achieving mass sea transport of crude oil, petroleum products and LNG from Middle East to Bangladesh. This means that the basic infrastructure to support development of petro-chemical industries will be formed, which enables domestic production to meet domestic demand for import substitution. Meanwhile, petroleum, petro-products, and the petro-chemical industry are upstream, apparatus industries, which are capital intensive, and require large scale investment. As the economy of scale makes the industry competitive, it is requisite for the investment that the industry is located where there is a large domestic market and/or where there is good access to overseas markets.

From above viewpoints, the development of economic zones to utilize the merits of a single deep sea port in Bangladesh was studied.

(3) The process of economic and industrial development and FDI (Analysis of the case in ASEAN countries)

In this section discusses comparative analysis of some past cases in the industrial development/industrialization process in ASEAN countries. Examples discussed review protectionism and import substitute, FDI implementation and export promotion, and general industry and heavy chemical industry, under the development policy. These industries sometimes developed with bumps and detours. Those experiences will be used as reference for the industrialization in Bangladesh.

In the 1950s, most developing Asian countries adopted closed and protective industrial policy, embracing an import substitution strategy. However, in the 1980s, they experienced significant economic development and they gradually shifted to an open industrial policy, forming strategy for export oriented industrialization. In developing countries, industrialization policy is said to be synonymous with the development policy of manufacturing industries. The purpose of industrialization policy is based on the development of manufacturing, but its policy instrument varies depending upon three factors (1) the development stage of the country, (2) given economic conditions, imparted resources, and (3) political interference to the market and capacity of interference by public administration.

The initial industrialization implemented in the period from the 1950s to the 1970s is the one for domestic consumer products for end users, called "import substitution" (initial industrialization). The policy instruments were basically import restriction (import quota, high import duty, etc.) and foreign currency exchange control (foreign exchange allocation, multiple foreign currency exchange rates, and overvaluation of exchange rate). Simultaneously, various tax breaks, subsidy devices, development measures, incentives and restrictions were implemented to foster domestic industry, expand production and sales, and stabilize employment, private domestic investment, and technology development.

On the other hand, the import substitution policy caused inefficient corporate management,

wasteful resource allocation, lowered performance in the macro economy, difficulty to achieve an economy of scale, and a persistent trade deficit. In the 1980s, most developing countries turned to trade liberalization by reducing trade barriers which are market driven policies, and introducing foreign investments and export oriented industrialization strategies. As a result, the economy grew and an investment boom occurred. Against this background, ASEAN member countries embarked on domestic production in the heavy and petro-chemistry sectors from the latter half of the 1970s to the early the 1980s.

[Thailand]

It was Thailand that attempted to develop heavy and petro-chemical industries earlier than any other country in ASEAN. In Thailand, in accordance with the Investment Promotion Act of 1962, the machinery assembly industries, such as for home electric appliances, automobiles, and agricultural machinery, were nominated as the Promotion Industry, while the steel industry and automobile industry were nominated to the Vital Promotion Industry. Thereafter, the chemical industry, chemical products industry, general machinery industry, etc., were nominated as well. The government's orientation to drive nationalization and export were strengthened. Taking this opportunity, inflow of foreign investment to Thailand sharply increased but the boycott against foreign investment occurred in 1972, and then the military coup occurred in 1976. As a result, foreign investors withdrew from Thailand and foreign capital escaped to other countries. The new government which started after the coup attempted to drive the development of heavy and chemical industries based on commercializing the natural gas found in Thailand Bay and petro-chemical industry on the eastern seaboard development under the 4th 5 years plan (1977 – 1982). However, due to worldwide recession in the 1980s, it was difficult to secure foreign investment capital, and accordingly the lengthy delay was caused to implementation of the project.

[Philippines]

In the Philippines, under a 5 years development plan (1978 – 1982) announced in 1977, industrialization oriented toward export was promoted, and FDI was implemented under an economic open-door policy. Development of export industries which are labor intensive and national resources oriented, as well as the industry of import substitution for intermediate goods were set in place. In September 1979, there were mega manufacturing projects that included copper smelting, phosphate fertilizer, diesel engines, cement, chemicals, aluminum smelting, paper pulp, petrochemicals, heavy machinery, and integrated steel works. It was a plan in which the investment capital depended on FDI and international debt. However, these mega projects were suspended and changed due to escalated international issues in the Philippines, and due to efforts to renovate the industrial structure led by World Bank. Thereafter, the mega projects disappeared as there was turmoil in the politics and economy of the Philippines.

[Indonesia]

In Indonesia, in accordance with Foreign Investment Act of 1967 and Domestic Investment Act of 1968, import substitution started for the domestic production of daily essentials, achieving near perfect self-subsistence of the essentials. During this period, the Indonesian government kept an eye on the market that was strengthened by foreign enterprises, and enhanced regulation on foreign investment in order to foster and protect indigenous enterprises. Furthermore, the government started full-fledged import substitution to shift the candidate industry of import substitution from that of consumable goods to durable consumer goods, basic material industries, and capital equipment industry. Indonesia has earned abundant income from petroleum exports, and industrialization programs were formulated based on that. There are full-fledged programs for domestic production in key industries such as basic chemical industries (fertilizer, petro-chemistry, cement, sheet glass, paper, metallurgy, tires, etc.), basic metals, heavy machinery (steel, diesel engine, machine tool, construction machinery, etc.), transport machinery (automobile, shipbuilding, airplane, etc.). The most stable sector is the petrochemical industry which includes a urea factory, olefin center, aromatic center, plastics factory, fibrous materials factory, pulp and paper factory, steel sheet and tin plate factory, pellet factory, shipbuilding factory, etc. Those projects were operated by state-owned and/or public owned enterprises or foreign investors. In 1982, the Ministry of Industry of Indonesia announced a construction project

which amounted to 11billion US dollars covering 52 major basic industries (mainly basic industry and basic chemical). Those projects were decided to be implemented initially by the concentrated investment of government (funds which depended on overseas aids and implementation of export credit) but the execution of most projects was postponed due to financial deterioration of the government as the oil boom ceased.

[Malaysia]

In Malaysia, focus was placed on the development of heavy and chemical industry In the 1980s, (at the time of the Mahathir regime), falling behind the other three countries. The focus of industrialization was government produced automobiles, factory of direct reduction iron, cement, methanol, pulp and paper, urea ammonia, and liquefied natural gas. They aimed for an export substitute of domestic natural resources. The funds necessary for the planned project totaled to 80 billion US dollars. In Malaysia, the projects were executed mainly from state capital in the same manner as Indonesia, while technology from foreign enterprises was being implemented. The objective was to shift the industry from that of a labor intensive industry to a capital and technology intensive industry, increasing linkages with other industries, thus achieving a new industrial development. Further, it was attempted to expand the opportunity at a stroke that Bhumi Putra (Malay capital) can participate in industrial sector in the process of developing heavy and chemical industries. In the 1980s, the Malaysian government established Heavy and Chemical Corporation, 100% owned by the government, in order to promote the development of heavy and chemical industries. The scope of its business was planning, execution, management and operation, establishing new companies (including joint ventures with foreign enterprises). Each provincial government also established a public corporation and started new projects.

[Lessons learned from the experience in cases of ASEAN]

In consideration of the investment and development of heavy and chemical industries (mainly basic material industry) in Bangladesh, the lessons learned other ASEAN countries' experiences are as follows:

a. Basic material industries and heavy and chemical industries such as steel and petrochemical are apparatus industries, requiring intensive capital technology. It is essential that such industries have a customer and market basis of a certain size, because large scale production increases cost competitiveness.
b. More strategic industries shall be selected to meet environmental characteristics of each country. Feasible industrial development plans, and financial plans to support their execution are necessary.
a. It takes years to develop and attract FDI in a heavy and chemical industrial park. There are risks that are influenced heavily by fluctuations in global business and long term changes in the economy. It is also necessary for developing countries to build a financial infrastructure which does not excessively depend upon loans from foreign countries or international donors.
c. In the cases of Indonesia, Malaysia and Thailand, they attempted to utilize abundant and cheap domestic oil and gas production to develop chemical industries.
d. In Indonesia and Malaysia, governments took vital initiative to develop heavy and chemical industries.

Table 5.1.1-1 Process of Industrial Development in ASEAN countries (1) the 1950s to 1970s

	Years	1960	1965	1970
Malaysia	(1) National Development Plan	1st Malaya Plan (56-60)	2nd 5 Years Plan (61-65)	1st Malaysian Plan (66-70)
	(Average GDP growth during the period)			6%
	(2) Industrial policy	Export substitution	1st Import substitution	
		(Resouce processing)	(Depending on resources, consumarable goods industry)	
	(3) FDI policy	Start up business ordinance (58)	Start up business ordinance (65)	
	Investment policy			Investment Promotion Act (68)
	(4) Vital economic matter		Federation of Malaysia inaugurated (63)	
			Singapre independence (65)	
			Federal Industrial Development Authority (66)	
Thailand	(1) National Development Plan		1st Economic Development Plan (61-66)	2nd Development Plan (67-71)
	(Average GDP growth during the period)		7.3%	7.2%
	(2) Industrial policy	Government initiative	Private sector initiative 1st Import substitution	
		Import substitute	Consumarable goods	
	(3) FDI policy	Industry Promotion Act (54)	Industry Promotion Act (60)	
	Investment policy	BOI established (59)		
	(4) Vital economic matter			Protection for domestic car industry (69)
Phippines				Economic Developmen Plan under Marcos
	(1) National Development Plan	1st 5 Year Plan (57-61)	Socio Economy 5 Years Plan (63-67)	Economy 4 Years Plan (67-70)
	(Average GDP growth during the period)			3.4%
	(2) Industrial policy	Import substitution	Import substitution / Export substitution	
		(Consumarable goods / essential goods)	(Intermediate goods / capital goods)	
	(3) FDI policy	Basic industy Act (61)		Investment Promotion Act (67)
	Investment policy			Export processing zone act (69)
	(4) Vital economic matter		President Marcos regime started (65)	
Indonesia	(1) National Development Plan		Integrated 8 Years Plan (61-68)	1st 5 Years Plan (69-73)
	(Average GDP growth during the period)			
	(2) Industrial policy			Initial Import Substitution
				(Essential industry /
	(3) FDI policy			FDI Act (67) Domestic Investment Act (68)
	Investment policy		President Sukarno brought down & Presiden Suharto regime established (65)	
	(4) Vital economic matter			

Source: JICA survey team based on "High development of Industries in East Asia and Japanese industries" by Institute of Developing Economies, Japan External Trade Organization

Table 5.1.1-2 Process of Industrial Development in ASEAN countries (2) after 1970s

		1975			1980			1985				
2nd Malaysian Plan(71-75)			3rd Malaysian Plan(76-80)			4th Malaysian Plan (81-85)			5th Malaysian Plan (86-90)			
	7.4%			8.6%			5.2%			6.9%		
1st Export oriented indusry						2nd Import substitution			2nd Export Industialization			
(Resouce processing Labor intensive)						(Heavy petrochmical)			(Mid-long industiralization M/P)			
	Guideline for FDI (74)		Industy Adjustment Act(74)									
Special promotion to electronics industry (71)												
New economic policy (71-90)												
FTZ act (71)						HICOM established (80)		Proton established (83)				
							PM Mahathil inaugurated					
3rd Development Plan (72-76)			4th Development Plan (77-81)			5th Development Plan (82-86)			6th Development Plan (87-91)			
	6.2%			7.2%			5.4%					
Import substitution Export oriented					Export oriented 2nd Import substitution							
(Agricaltural processing / labor intensive)					(Heavy and Petro-chemical industry)							
Industry Promotion Act (72)				Industry Promotion Act (77)								
FDI regulation act (72)			Export promotion act (72)									
Industry Protection Act (69)			Military coup (76)									
	Boycott movement against Japan products by students (72)											
									83-87 Review of 5 years plan			
4 Year Development Plan (71-74)			4 Year Development Plan (74-77)			5 Yeard Development Plan (78-82)			Development Plan (84-87)			
	6.1%			5.9%			4.7%			-1.4%		
			Export industry			Import substitution Export Industry						
							11 major industries project					
								Structure adjustment policy				
Export promotion act (70)								Omnibus investment law (81)				
Martial law proclaimed (72)		Philippine- USA Trade Agreement expired (74)							Investment Promotion Policy (83)			
		World Bank & IMF Structure adjustment policy							Former senator Akino killed (83)			
		2nd 5 Years Plan (74-78)			3rd 5 Years Plan (79-83)			4th 5 Years Plan (84-88)				
8.8%			6.9%			7.0%			5.2%			
			Full-fledged import substitution			Heavy & chemical industy			Export oriented industry			
Agriculture related industry)			(Industrialization in upstream sector)			(Strategic key industries)						
		Ristriction on FDI strenghthened (74)										
	Oil price boosted (73)				Oil price boosted (79)			Oil price slumped (833)				
The 1st IGGI (Crediors' conference against Indonesia) (69)								Mega projects put on the shelf				

Source: JICA survey team based on "High development of Industries in East Asia and Japanese industries" by Institute of Developing Economies, Japan External Trade Organization

[Reference] The case of Eastern Seaboard Development in Thailand

In Thailand, agriculture had been the principal industry until the 1950s. In the 1960s, import substitution industries was fostered and infrastructure was improved by the government, which was followed by the textile industry being sharply developed by FDI. In the 1960s, Japanese car manufacturers also made investments in Thailand.
In the 1970s, export promotion area was established for the development of export oriented industry where FDI was promoted.
In latter half of the 1970s, natural gas development started and production of petrochemical products and chemical fertilizer increased. In the 1980s, FDI was promoted and, due to yen appreciation, the investment to Thailand from Japan and NIES sharply increased by which the industry was diversified within Thailand. Priority sectors were agro-processing, textile/apparel, metal/electronic devices, petro-chemical, and steel.
In 1990, the industrial policy was fostering high value added industry and the priority sectors were automobile, electrical/electronic goods, and general machinery, by which the industry was diversified and upgraded. However, Thailand faced economic crisis caused by plunging value of the Thai Baht.
In the mid-2000s, the Small and Medium Enterprise Development Act was established, aiming at human resource development, poverty eradication, and the improvement of quality in nation and society. During this period, the Japanese automobile industry increased their local procurement of parts and, accordingly, supporting industries developed in Thailand.
(Please refer to "Table 5.1.1-3 FDI and stage of industrial development in Thailand")

[Development of the Eastern Seaboard Industrial Zone in Thailand]

The Thailand Eastern Seaboard Development Plan was planned and developed based on the Japanese model of a coastal industrial zone facility. The Eastern Seaboard Development Plan was implemented in the fifth National Economic and Social Development Plan. Using this opportunity, Thailand implemented a policy shifting to an export oriented industrial structure.
The Eastern Seaboard Development Plan was formulated as an integrated development plan in which the Eastern Seaboard Industrial Zone would become the export base to reduce the unemployment rate and securing employment.
The Japanese government placed priority on industrial development in Map Ta Phut and Laem Chabang, with an ODA for construction of an international port, a water supply, and railways.

Major development business under Eastern Seaboard Development Program

Outline of program)
Total investment of 11.5 billion US dollars (1997).
Construction of 40 industrial estates/parks, creating 400,000 jobs (directly and indirectly).
Specific development is as follows:

- Natural gas pipeline from Gulf of Thailand to Map Ta Phut district
- Map Ta Phut Estate Industrial Estate in Rayong province:
  Map Ta Phut Industrial Estate is seaboard industrial estate for heavy and chemical industry, being located close to Map Ta Phut port (multipurpose port) and near electric power station. In its hinterland, there are plenty of general industrial estate/park for general industry. Originally it was planned to make use of natural gas for chemical industries in the estate, which is produced offshore at Gulf of Thailand.
- Laem Chabang deep sea port and Laem Chabang industrial zone in Chonburi province
- Chachoengsao industrial zone at Chaochaoengsao and general industrial estates
- Great traffic network (the Outer Bangkok Ring Road, Bangkok – Chonburi road,

Chonburi- Pattaya road)

This plan is intended to construct new infrastructures in the Eastern Seaboard Area (three provinces: Chachoengsao, Chonburi, and Rayong) 80 to 200 km east-south of Bangkok, which avoids the excessive concentration of population and industries in Bangkok. This project was initiated in the framework of the Fifth Five Year Plan (1982 – 1986). In the Sixth Five Year Plan also, this plan was given priority in terms of development strategy, thus it was one of the main plans economic and social development in Thailand from the 1980s to the early the 1990s.

The Eastern Seaboard Development Plan was predominantly carried out in two districts: Map Ta Phut Area, which is a core district with heavy industries utilizing natural gas from the Gulf of Thailand; and, Laem Chabang Area, which has a new international commercial port and aims to be a hub for export oriented light industries. In Map Ta Phut area in Rayong province, where petrochemical enterprises congregate, has been developed to be the greatest base of petrochemical industries in the country. Laem Chanang Area, located in the western coast district of Chonburi province, and the inland district of this area, gathers automotive, electric and machinery enterprises in one place and has been developed to become a nucleus of general industries in Eastern Seaboard district; owing to its proximity to the newly constructed Laem Chabang Commercial Port.

In Map Ta Phut Industrial Estate, the 380 ha of land under the first phase was sold out over 20 years. There were also environmental and public problems caused by the unpleasenet smells that were blown down from the factory.

The lesson learned from the development of Map Ta Phut Industrial Estate are:

a. It takes a long time to develop a heavy and chemical industrial estate.
b. In the case of large scale industrial or regional development projects, the project components, investment scale, and timing need to be reviewed repeatedly, and it may be necessary to change the project scope, including the reduction of project scale and extension of the implementation period.
c. Careful attention must be paid to the environment.

Table 5.1.1-3 FDI and Stage of Industrial Development in Thailand

Economic Growth Stage	1960s (1961～1971)	1970s (1971～1981)	1980s (1981～1991)	1990s (1991～2001)	2000s (2001～)
Major Economic Policies	・Development of Import substitute industries ・Infrstructure Development	・Development of exxport oriented industry ・Establishing export promote Area (Industrial Estate)	・Expanding export industry by FDI ☆After 1985 onwards, FDI from Japan and NIES increased due to yen depreciation	・Development of human resouces ・Development of high value added industries ☆ In 1998, sharp fall of Thai Bahts against US$, Asian monetory crisis	・SME development ・Fostering human resouces, ・Povery reduction ・Improving quality of life and society
Major industries, Priority sectors	Rapid growth of textile products Early 1960, Japanese car industries started to invest to Thailand	76－'78, development of natural gas, petroleum products, chemical fertilizer	Priority sectors: Prosessed food, textile & apparel, metal, electric devices, petrochmical, Steel	Priority sector: Automobiles, Electrical goods, Electric goods, general machinery, Communication	Auto parts for Japanese car manufactures Increase of local cntents ratio
GDP growth rate per annum (substantial)	8.4% (1965～1971)	7.0% (1971～1981)	8.1% (1981～1991)	3.8% (1991～2001)	4.1% (2001～2011)
GDP per Capita (Current US$)	194 (1971)	721 (1981)	1,122 (1988) 1,717 (1991)	1,822 (2001)	5,167 (2011)
Agriculture ratio of GDP	31.9% (1965)	26.9% (1975)	15.8% (1985)	9.5% (1995)	10.3% (2005)
Manufacturing ratio of GDP				29.6%(1995)	33.4%(2000)
	Bangladesh GDP per Capita (US$)	760 (2010)	1,093 (2014)		
	Agriculture ratio of GDP		15.9%(2014)		

(Note: In view of the GDP per capita, Bangladesh lags behind Thailand by more than 30 years.)

Source: JICA Survey Team

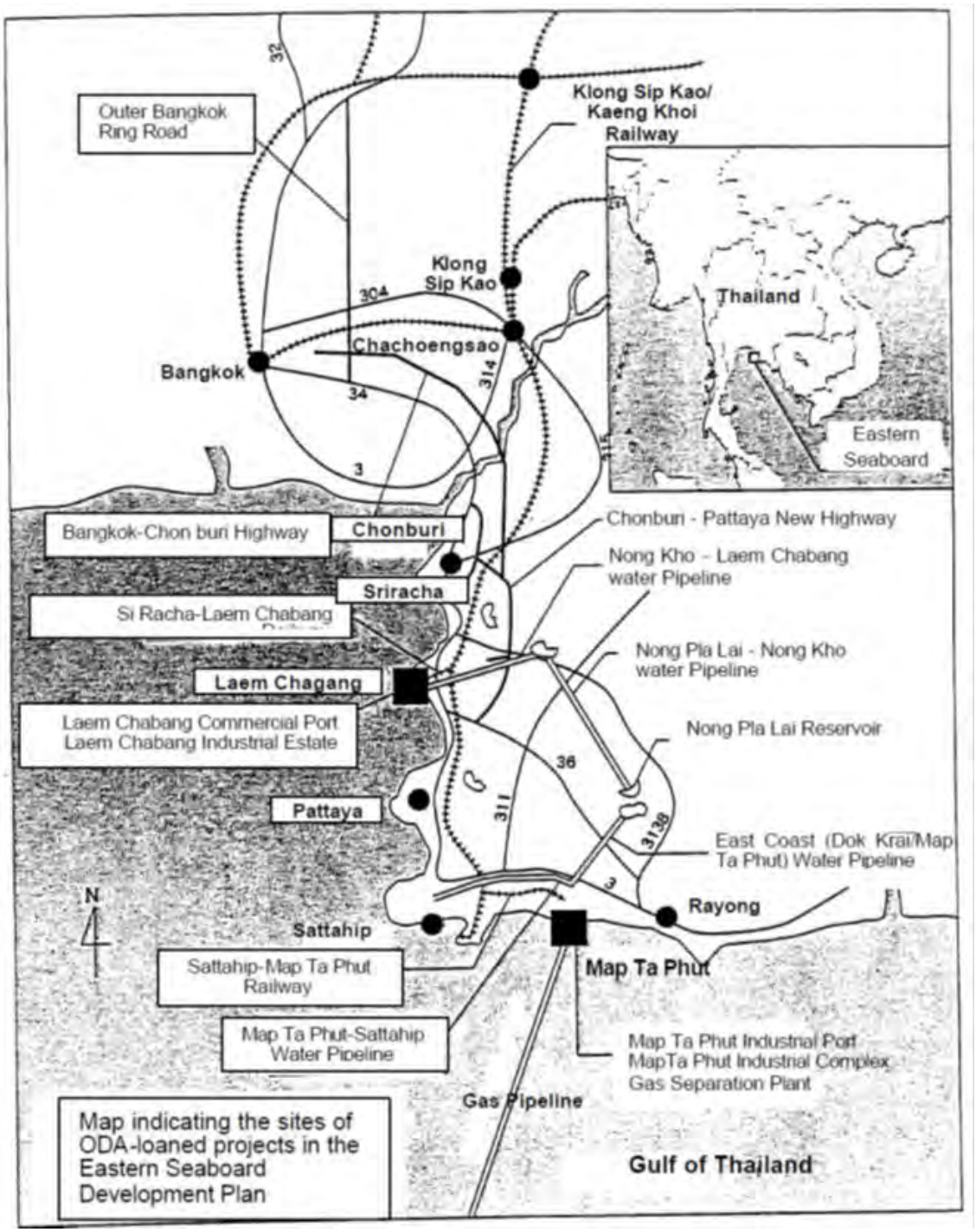


Figure 5.1.1-4 The location of Eastern Seaboard Development Program

Source: JABIC Eastern Seaboard Development Plan, Total Impact Assessment

[Outline of Map Ta Phut Industrial Estate]
Location: Map Ta Phut, Rayong province, 190 km distance from Bangkok to south east Industries

Local company	Investor	Products
Bangkok Polyethylene Co., Ltd.	Mitsubishi Corporation, Mitsubishi Chemical	polystyrene
HMT Polystyrene Co., Ltd.	Mitsui & Co.,Ltd.	high-density polyethylene
Monsanto Premier Kasei Co., Ltd.	Monsanto	ABS resin, SAN resin
Pornpat Chemials Co., Ltd.	Tokuyama Corporation	silicon dioxide
Siam Tinplate Co., Ltd.	Nippon Steel & Sumitomo Metal Corporation Mitsubishi Corporation, Sumitomo Corporation	tinplate
Siam Yamato Steel Co., Ltd.	Yamato Kogyo Co., Ltd. Mitsui & Co., Ltd Siam Cement Group Co., Ltd. Sumitomo Corporation	hot rolled steel
Thai Epoxy and Allied Products Co., Ltd.	Sojitz Corporation	epoxy resin
Thai GCI Resitop Co., Ltd.	Sojitz Corporation	phenol-formaldehyde
Thai Plastic & Chemicals Public Co., Ltd.	Mitsui Chemical	vinyl chloride monomer
Tuntex Petrochemicals (Thailand) Co., Ltd.	Mitsuo & Co	terephthalate compound

Plan and performance in development of Map Ta Phut Industrial Estagte

Scope of business	Plan	Performance
Ground levelling (Industrial esate / urban area)	380.8 ha / 40 ha	Same as left
Water purification	10,000m3 / day	5,100m3 / day
Seawage treatment (industry / uaban)	4,000 m3 / 2,400 m3 per day	Same as left
Other facilities	Road, storm drainage system	Same as left
Consulting service	175 M/M	124 M/M
Construction period		
Civil engineering / constuction work (from start to completion)	April 1986 - March 1988	Dec. 1987 - May 1990
Consulting service	June 1985 - March 1988	Dec. 1987 - May 1990

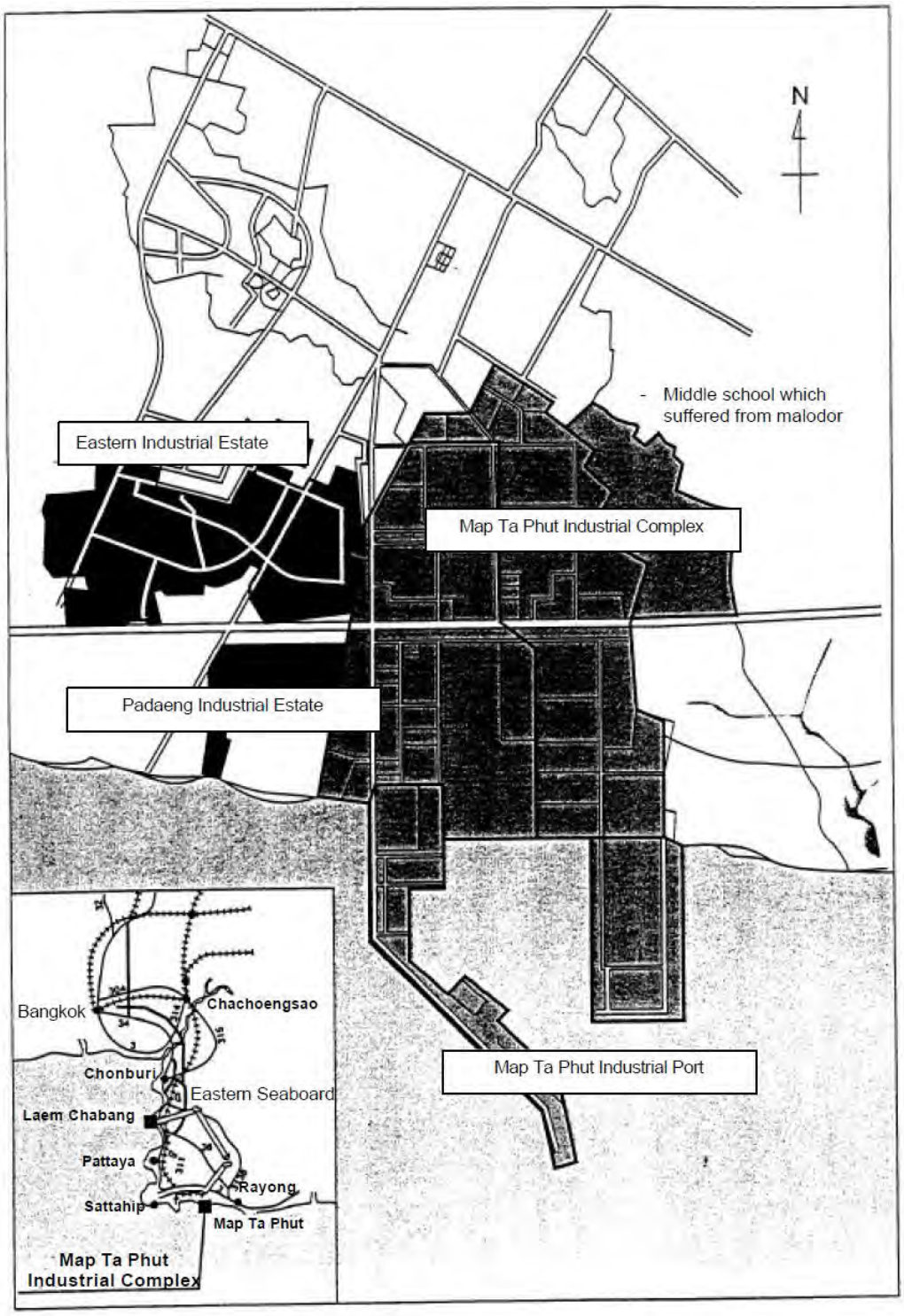


Figure 5.1.1-5 Map Ta Phut Industrial Complex
Source: JABIC Eastern Seaboard Development Plan, Total Impact Assessment

5.1.2 Potential for Medium-term Industrial Development

(1) The potential to target investment

This section shows how the potential industries, which are the target of the Economic Zone developed in the mid-term master plan, were analyzed, and how the feasibility of attracting Japanese enterprises was considered. The industrial sectors considered are general industries including automobile, electrical and electronic goods, machinery, etc., as well as heavy and chemical industries including steel, shipbuilding, ship-recycling and petro-chemistry, etc.

Characteristics, industrial location and feasibility of attracting each industry to the economic zone is summarized as below:

Summary on Characteristics, industrial location and feasibility of attracting each industry to the Economic Zone
a. Automobile
i **Characteristics**: Automobile assembly is a labor intensive industry. One car consists of approximately 30,000 parts. It is more advantageous if a car assembling factory is located near automobile industry cluster with respect to ease of procuring auto parts. Auto parts manufacturers are classified as fist tear, second tear and third tear. ii **Conditions of location**: Generally, if the automobile industry is domestic market oriented, the factory shall be located near the market in inland. However, if the industry is export oriented, it is advantageous that the factory is located near the sea port. iii **Feasibility of attraction**: In Bangladesh, the domestic automobile market is small, and is mostly built around used cars. Presently, there is little possibility for Japanese car manufacturing to invest in Bangladesh, but there is a possibility for the auto-parts industry may be targeted. The domestic market for motorcycles is growing. Investment in the motorcycle industry in Bangladesh is feasible.
b. Electrical goods and electronic goods
i **Characteristics**: Generally in developing countries, low priced electrical goods that have only a few functions and those that are low quality are popular markets- as is the case with Bangladesh. As GDP per capita in Bangladesh is low, electric home appliances and PCs are not common in most homes, except the middle class or those that live in big cities. ii **Conditions of location**: Basically, the factory is located near where the products are sold to the consumer, or close to a port, in the case of export market. iii **Feasibility of attraction**: The Bangladesh market generally has low prices and it is difficult for Japanese electric manufactures to compete in such a market. However, investment in the electric parts industry may be possible.
c. Machinery
i **Characteristics**: There are various kind of machineries ranging from transport machinery, calculating machinery, farm machinery, textile machinery, construction machinery, industrial machinery, medical machinery, etc. Most production is labor intensive. In Bangladesh, Japanese brand machinery is highly regarded but the price is also very high. ii **Conditions of location**: It is desirable that the factory be near where the products are sold to the customer, or close to a port if it is an export market. iii **Feasibility of attraction:** Japanese brand production machinery and medical machinery are trusted. However, the demand for such machinery is not enough to justify mass production locally. As demand for infrastructure improvement in Bangladesh grows, the needs for assembling and maintenance of construction machinery may increase.
d. Steel and Iron
i **Characteristics:** The steel and iron industry as well as the raw materials industry are heavy industries. There are two main methods to produce crude steel: a shaft furnace (in which iron ore and coke are used), and an electric furnace (in which scrap iron is used). Downstream from crude steel production are rolling mills and iron factories that produce various steel and iron products. Electric furnaces are small and investment costs are comparatively low. In the

steel sector in Bangladesh, induction furnaces are widely prevalent, which are smaller in both size and output capacity than electric furnaces. Productivity using an induction furnace is low, and the main product is steel bar.

ii **Conditions of location**: It is suitable to be located in a seaboard region.

iii **Feasibility of attraction**: Ship recycling is a popular industry in Bangladesh, where steel bar for construction is produced from scrap iron. There is a possibility of attracting electric furnace factory.

e. Shipbuilding

i **Characteristics**: This is heavy industry which needs large facility investment and large employment. A shipbuilding enterprise has business linkages with many supporting industries (called "cooperation factories" and/or "subcontracting enterprises").

ii **Conditions of location**: A shipbuilding industry shall be located in a seaboard region.

iii **Feasibility of attraction**: It is possible to attract this industry to Bangladesh but it is necessary to develop certain conditions first. According to Dr. Engr. Abudullahel Bari, Chairman of Ananda Group and President of Association of Export Oriented Shipbuilding Industries of Bangladesh, if a Japanese shipbuilder invests in Bangladesh in the future, it will help the development of the shipbuilding sector and it is welcome.

f. Ship recycling (Ship breaking)

i **Characteristics**: This industry is typically labor intensive. Bangladesh imports old vessels, and breaks them down to iron scrap, which is then melted in an induction furnace to produce steel and iron. This iron and steel is used to produce steel bars for building construction. Steel is cut from the ship and processed to be reused for construction materials or for small river vessels, while marine equipment and navigational instruments removed from the ships are recycled and sold as used goods.

ii **Condition of location**: Seaboard region

iii **Feasibility of attraction**: In case that shipbreaking companies should work to break down the ships in accordance with the ship recycling guidelines as per the Ship Recycle Convention 2009, business might collaborate with that of the Japanese shipbreaking industry.

g. Petro Chemical industry

i **Characteristics**: This is usually a capital intensive and technology intensive facility industry. In this industrial sector, there are long value chains starting from crude oil, and progressing to naphtha, basic petro-chemical products, and petro-chemical inducers for petroleum products, which have various products in many stages therein.

ii **Condition of location**: Seaboard region. It is desirable to be located at adjacent land to the quay at which vessel is docked, but it is possible to be located at the point distant from the dock and have delivery performed through pipelines.

iii **Feasibility of attraction:** It is an important issue to develop a petro-chemical industry in the mid- and long-term, but market scale in petro-chemicals is small in Bangladesh now. The Bangladesh Petroleum Corporation used to have a plan to target investment in an oil refinery from the Middle-Eastern oil industry.

1) Automobile and auto parts

Characteristics of industry

Automobile assembly is a labor intensive industry. One car consists of approximately 30,000 parts. It is more advantageous if a car assembling factory is located near automobile industry cluster with respect to ease of procuring auto parts. Auto parts manufacturers are classified as fist tear, second tear and third tear. Thus, automobile assembly manufacturers have linkages with many supporting industries. Some advanced factories are mechanized with robots and production methods are more innovated with a large equipment investment.

Automobile market in Bangladesh

In the automobile market in Bangladesh (2014), there were 2.08 million registered motor vehicles and motorcycles. They are classified as: Private passenger vehicles- 261,000; Taxicabs- 45,000; Total Passenger vehicles excluding buses- 456,000; cargo and commercial vehicles- 210,000; Auto rickshaws 206,000; Motorcycle 1,151,000.

Most of 4 wheel vehicles are imported used cars from overseas, being refurbished to CNG fuel cars. Such number of car is estimated to be 20,000 units or so, although there is no reliable statistics on number of imported used cars. There is a 100% import duty imposed on used cars, while an import duty of over 200% is imposed on new cars. Regarding passenger vehicle production, Pragoti Industry Limited (state-owned company) produces 270 to 500 units annually, depending on the year. Mitsubishi Pajero, etc., is manufactured by contract with Mitsubishi Motor Thailand. CKD is imported from Thailand, and final assembly is done at Progati's Chittagong factory. Most of the cars are purchased by the government to be used as office cars.
In contrast, car production amounts in major ASEAN countries (including those for domestic market and export) are as follows: Thailand- 2.45 million (passenger- 1.07 million, commercial- 1.39 million); Malaysia- 0.60 million (passenger- 0.54 million, commercial- 57,000); Indonesia- 1.2 million (passenger- 0.87 million, commercial- 0.33 million). There is a very large disparity between Bangladesh and other ASEAN countries in terms of the number of registered cars as well as that of vehicle production.

In Bangladesh, import duty and other taxes imposed on complete built-up (CBU) cars is high, as shown below:

Category	Tax rate ranging from low to high
New car (sedan)	From 104.79% to 366.06%
Reconditioned car (used cars)	From 104.79% to 104.798% for,
CKD	From 20.57% to 104.79%

(Example)

HS Code 8703.23.11	Reconditioned Motor Cars and other vehicles, including station wagons, CBU, capacity >1,500 cc, but = < 2,000cc
CD (Custom Duty)	25
SD (Supplementary Duty)	100
AIT (Advance Income)	15
RD (Regulatory Duty)	5
ATV (Advance Trade VAT)	3
TTI (Total Tax Incident)	4
Total	212.37

Table 5.1.2-1 Registration Units of Motor Vehicles and Motorcycles in Bangladesh

Motor Vehcile registered in Bangladesh in 2014			Nuber of Units	
4 wheels	Passenger vehicle	Private Passennger	261,675	456,571
		Taxicab	45,052	
		Jeep	39,173	
		Microbus	80,324	
		Minibus	26,573	
		Ambulance	3,774	
		Bus	33,573	
		Sub-total		490,144
	Cargo & commercial vehicle	Truck	107,798	
		Cargo Van	5,588	
		Covered Van	5,588	
		Delivery Van	20,911	
		Pick up	66,432	
		Tanker	3,806	
		Sub-total		210,123
Others	Special purpose vehicle		7,392	1,385,633
	Auto Rickshow		206,325	
	Motor cycle		1,151,954	
	Others		19,962	
Total			2,085,900	

Source: JICA survey team based on Statistic Year Book of Bangladesh 2014

Conditions of location

Generally, if the automobile industry is domestic market oriented, the factory shall be located near the market in inland. However, if the industry is export oriented, it is advantageous that the factory is located near the sea port. Sometimes, cars can be scratched easily during land transport via car carrier from the production site to the sales destination, in which case the commercial value of said car is reduced. There is a very high risk for this devaluation in Bangladesh due to poor road traffic conditions. Countermeasures to maintain safe transportation and traffic conditions are necessary.

Feasibility of attraction

In Bangladesh, the domestic automobile market is small, and is mostly built around used cars. Besides traffic, damage to cars is extremely bad due to delays in road maintenance and improvement. Thailand is said to be “Detroit in Asia”, where there is an export oriented industrial cluster of automobiles. Global automobile companies have strategically invested in India, which neighbors Bangladesh. Bangladesh is located between these two countries. Presently, there is little possibility for Japanese car manufacturing to invest in Bangladesh from a business strategy perspective.

For instance, Japanese manufactures of auto parts (non-key device products that are labor intensive, such as car seats, batteries, etc.) have made investments in Bangladesh. It is possible that manufacturers of wire harnesses, interior materials, dash boards and car accessories may be targeted.

The domestic market for motorcycles are growing. Motorcycles are convenient vehicles for transit in Dhaka City, which has significant traffic congestion. A motorcycle costs less than a 4 wheel passenger vehicle, and is therefore more accessible. There are local motorcycle manufacturers in Bangladesh. Foreign companies such as Honda (Japan) and Mahindra (India) have also made investments in Bangladesh. It is possible that the Japanese motorcycle industry, known for high quality and performance, will be attracted to

Bangladesh.

2) Electric and electronic goods

Characteristics of the industry

The electronic goods industry, producing such things as TVs and radios, is labor intensive. Versatile, low priced parts are used for popular devices. Generally in developing countries, low priced electrical goods that have only a few functions and those that are low quality are popular markets- as is the case with Bangladesh. As GDP per capita in Bangladesh is low, electric home appliances and PCs are not common in most homes, except the middle class or those that live in big cities.

Electric and electronic goods market in Bangladesh

According to statistics, electric and electronics goods were produced in Bangladesh in 2012 -2013 are as follows: radios- 4,000; televisions- 2.37 million; electrical appliances 220,000; wire cables- 22,000; electric lamps- 53,000; batteries- 278,000; electrical apparatus - 255,000.

In Bangladesh, there are 2,500 electric goods manufacturers, most of them being SMEs. Subsector industries manufacture electric fans, electrical wires, lighting equipment, back lights, electric motors, generators, transformers, and distribution boards. Walton, the leading local electronics producer, consigns design and production of parts to overseas companies and using those imported parts and components, assembles electrical products. However. retail sales are made through their own distribution channels and network. Also, electrical goods with competitive low prices are imported from China. Major distributers and retailers feel that price is more important than quality.

[SWOT Analysis of the electrical sector in Bangladesh]

(Strength)

a. Large local market.
b. Availability of workshop for light engineering support.
c. Some local products have achieved a global standard.
d. Huge economical manpower is available.
e. Small fixed capital required.
f. Skilled marketing system.

(Weakness)

a. Absence of electrical lab.
b. Current investment is very low.
c. Absence of much electrical infrastructure
d. Inability to import materials from small investors within sector.
e. Complex tax and VAT payment system.
f. Lack of training facilities for labor force in this sector.

(Opportunities)

a. Local demand for sub-standard products.
b. Huge export potentials.
c. Duty free and quota free export facilities for LDC.
d. Massive technical educated people.
e. Unaware buyer community.
f. It may get quota facilities in public procurement of the government.

(Threats)

a. Availability of cheap imported goods.
b. Under-invoicing during import of foreign products.
c. Imbalances in duty structure.
d. Raw materials dependent on import.

Table 5.1.2-2 Domestic Production of Electrical Products

			(Units)	
	2010-2011	2012-2013		
Electrical Machinery Parts	7,854	7,148	metric tons	
Electrical Machinery Parts	298,912	240,688	No	
Radiio	304,962	4,000	No	
Television	73,366	2,372,369	No	
Telephone Set	34,129	-	No	
Electrical Appliances	235,896	221,603	No	
Wire & Cables (Elec.)	10,180	22,569	metric tons	
Electric Lamps	-	53,854	No	
Batteries	112,430	278,200	No	
Electrical Apperatus	26,096	255,279	No	

Source: JICA survey team based on Statistics Year Book of Bangladesh 2014

Conditions of location

Basically the factory is located near consuming area.

Feasibility of attraction

Walton, the local manufacturer expands sales of products designed by foreign enterprises and assembled from imported parts. Further, low price electronic goods are imported from China. There can be seen no sign that major Japanese electrical enterprises, which are known for expensive, high quality products would be able to invest in such a market.

Despite this, there is a Japanese SME who produces LED parts for import to Japan. Accordingly, there is a possibility for investment in the electrical parts industry.

3) General machinery (excluding transport machinery and electrical machinery)

Characteristics of industry

There are various kind of machineries ranging from transport machinery, calculating machinery, farm machinery, textile machinery, construction machinery, industrial machinery, medical machinery, etc. Mostly production is labor intensive. The business side of the machinery industry consists of designing products, manufacturing and procuring parts, an assembly. The parts may be manufactured within the company or may be procured from subcontractors. In Bangladesh, Japanese brand machinery is highly regarded but the price is also very high.

Machinery market in Bangladesh

According to Bangladesh statistics, domestic production of general machinery excluding vehicle and electronic goods include pumping equipment, metal fabrication, non-electric machinery, diesel engines and centrifugal pumps.

Table 5.1.2-3 Domestic Production of General Machinery

items	2010-2011	2011-2012	Unit
Pumping Equipment	-	277,054	Dozen
Fabricated metal	7,532	-	Dozen
Machinery Non-electric	277,615	-	
Diesel Enging	441,503	-	No
Centrifugal Pumps	46,699	-	No

Source: JICA Survey Team based on Statistic Year Book of Bangladesh 2014

Conditions of location

It is desirable to be located near where the products are consumed.

Feasibility of attraction

RMG is the biggest industry sector in Bangladesh, the industrial cluster of which is developed. There is much demand for industrial sewing machines and knitting machines. The Japanese manufacturers of which have representative offices or sales offices/agents in Bangladesh, and export to Bangladesh, but do not directly invest in production in Bangladesh. Japanese brand production machinery and medical machinery are trusted. However, the demand for such machinery is not enough to justify mass production locally. In Japan, there is a decreased labor force and also an increasing cost of labor, which are problems for SMEs. Therefore Japanese SMEs may have potential needs to invest directly in Bangladesh, with respect to the issue of skilled labor. As demand for infrastructure improvement increases in Bangladesh, their may be a need for construction machinery assembly and maintenance.

4) Steel and related industry

Characteristics of steel industry

The steel and iron industry as well as the raw materials industry are heavy industries. There are two main methods to produce crude steel: a shaft furnace (in which iron ore and coke are used), and an electric furnace (in which scrap iron is used as its raw material). Downstream from crude steel production are rolling mills and iron factories that produce various steel and iron products. There are many kinds of steel and iron products used in every industry. Iron ore and coal(coke) are have high mass volume and historically, shaft furnace factories had been located near the source of iron ore or coal, but as the industry developed, new iron ore localities were exploited while the cost of ocean freight drastically decreased with the construction of large ore carriers. Accordingly shaft furnace factories are nowadays located in seaboard regions in existing steel producing countries and steel consuming countries. Shaft furnaces are large scale facilities, requiring huge investment (capital expenditure) and are capital incentive businesses. Electric furnaces are small and investment costs are comparatively low. In the steel sector in Bangladesh, induction furnaces are widely prevalent, which are smaller in both size and output capacity than electric furnaces. Productivity using an induction furnace is low, and the main product is steel bar. High quality steel is imported to Bangladesh from China, Korea, India, Japan, etc. Currently, China produces iron in excess, pushing down the export price of steel products worldwide. This causes adverse effects to the steel industry in advanced countries. China has heightened the sense of uncertainty about the future market of steel.

[Current situation of steel industry]

a. World production of crude steel:

Total 1.67 billion tons of crude steel were produced globally in 2014.

Country wide production (unit- million tons): China 820, Japan 110, USA 90, India 90, Korea 70, Russia 70, Germany 40, Turkey 30, Brazil 30, Ukraine 30

Production by enterprise (unit- 10,000 tons): Arceelor Mittal (Luxembourg) 9,800, Hesteel (China) 4,700, Nippon Steel and Sumitomo Metal Corporation (NNSMC, Japan) 4,900, POSCO (South Korea) 4,100, Baosteel Group (China) 4,300, Shagang Group (China) 3,500, Ansteel (China) 3,400, JFE Steel Corporation (Japan) 3,100, Shougang Group (China) 3,000, Tata Steel (India) 2,600

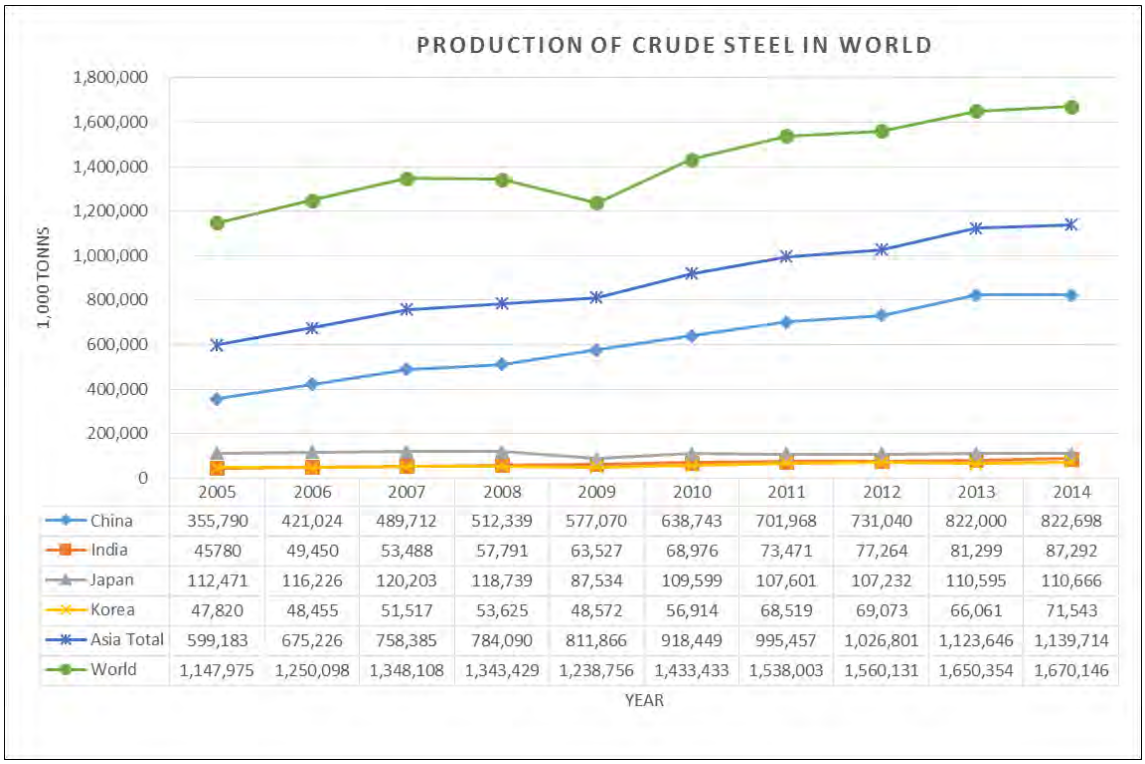
b. Total production of crude steel in Japan in 2014 was 110 million tons, while employment in that industry was 174,000 people.

In the steel industry in Japan, 100% of iron ore and coal used as raw materials are imported. Steel factories (shaft furnace) are located at deep sea ports where large ore carriers coming from Australia, Brazil and other countries can enter and dock to discharge cargo.

c. There are typically two methods of producing steel - shaft furnace and electric furnace. Another method is the induction furnace which is similar to an electric furnace but has lower productivity than the other two types mentioned above. In Japan, there are 4 shaft furnace steel companies, 10 specialized steel companies and 32 electric furnace steel companies. In Japan, steel export accounts for 5.4% (3.96 trillion yen) of total export, ranking 2nd, following automobiles export.

d. In the global steel market, production capacity was 23 billiontons, 650 million tons of which is excess production. Production in China in 2014 was prospected to be 1.6 times that of 2008, in only 7 years time. This was attributable to the increased production by Chinese companies, which is not regulated by the central government of China. In recent years, in China each steel company had built shaft furnace mills in many localities.

A Japanese steel company made investments in a shaft furnace factory under construction in Vietnam by Formosa Plastics Group.



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
China	355,790	421,024	489,712	512,339	577,070	638,743	701,968	731,040	822,000	822,698
India	45780	49,450	53,488	57,791	63,527	68,976	73,471	77,264	81,299	87,292
Japan	112,471	116,226	120,203	118,739	87,534	109,599	107,601	107,232	110,595	110,666
Korea	47,820	48,455	51,517	53,625	48,572	56,914	68,519	69,073	66,061	71,543
Asia Total	599,183	675,226	758,385	784,090	811,866	918,449	995,457	1,026,801	1,123,646	1,139,714
World	1,147,975	1,250,098	1,348,108	1,343,429	1,238,756	1,433,433	1,538,003	1,560,131	1,650,354	1,670,146

Figure 5.1.2-1 Trend of Crude Steel Production in the World (year 2005 – 2014)

Sources: JICA survey team based on World Steel Association "Steel Statistical Yearbook 2015.

<u>Current situation of steel industry Bangladesh</u>

According to "Bangladesh, unknown industrial country" (IDE-JETRO), annual production of steel and iron in Bangladesh is assumed to be approximately 2.2 to 2.5 million tons. It is estimated that 1.2 million tons of steel are supplied domestically and that the balance 1.2 – 1.25 million tons of steel are supplied by ship-recycling. Domestic demand for steel is estimated to be 5 million tons annually. In Bangladesh, steel from ship-recycling is an important resource (260 vessels were scrapped in 2012). Such business reuse and process scraped steel and reproduce steel by melting the scrap in electric furnaces and induction furnaces.

In the electric furnace and induction furnace sector in Bangladesh, a few major manufacturers occupy 30% share of domestic market. The remaining 250 – 300 companies produce low quality steel. Some major steel companies have electric furnaces but the rest of companies only have induction furnaces. The steel made in induction furnaces are mainly used to make steel bar for construction. (Note: The maximum capacity of output in induction furnace is 50 tons. The furnace is not fit for melting large amounts of steel.)

The major steel companies are as follows: BSNR Steel Limited (the largest steel company in Bangladesh with annual production of 400,000 tons), Apollo Ispat Complex Limited (corrugated iron sheet, galvanized sheet iron), PHP Group (sheet rolling), and Rangpur Foundry Limited (cast iron).

Meanwhile, according to interviews with local business persons in the industry, the steel market in Bangladesh is 4 million tons per annum, out of which 50% (2.17 million) is imported. The breakdown of the import is hot rolled coil 36%, galvanized iron, cold rolled steel and steel bar 18%, half finished products 30%, and bulb and other materials. Domestic products are: billet- 0.52 million tons; pipes- 0.6 - 0.7 million tons; scrap steel- 0.6 million tons; and, other half finished products.

[Overseas investment from the Japanese steel industry]
A Japanese electric furnace steel company (Company A) made investments in southern Vietnam. The subsidiary factory in Vietnam has a capacity of producing 0.9 million tons of steel per annum, which is estimated to be 10% of the total steel production in Vietnam. There is an electric furnace factory and rolling mill at the site, which is 17-18 ha in total. Company A has another rolling mill in northern Vietnam, where 0.25 million tons of steel are produced per annum on a site that is 25 ha.
Another Japanese electric furnace steel company (Company B) has developed overseas business very actively, and currently has expanded investment to USA, Thailand, Korea, Bahrain, and Saudi Arabia where steel is produced and sold locally.
Another Japanese electric furnace steel company (Company C) has made investments in Indonesia.

Value chain of steel industry sector in Japan (in 2013) is shown in Figure 5.1.2-2

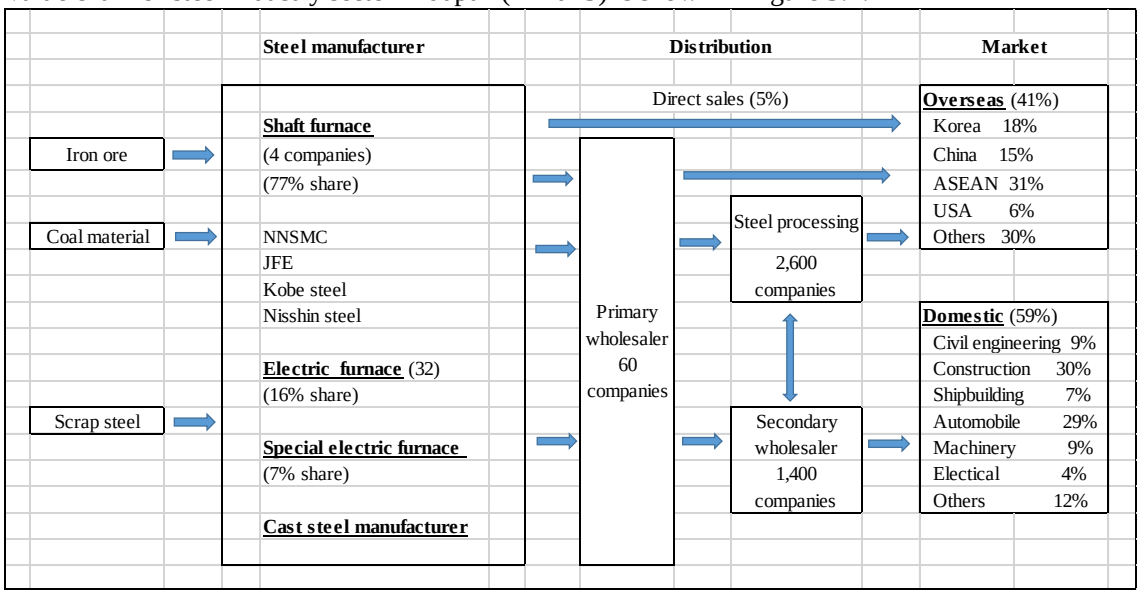


Figure 5.1.2-2 Structure of Japanese Steel Industry Sector and Distribution and Market
Source: JICA survey team based on data of Japan Steel Federation

Conditions of location
It is suitable to be located at seaboard region, where it is convenient for procuring imported material from overseas and for exporting products to overseas.

Feasibility of attraction
Ship recycling is a popular industry in Bangladesh. Scrap steel from shipbreaking produces an abundant amount of iron material. Ship recycling and electrical furnaces meet supply and demand. There is a possibility of attracting an electric furnace factory. One electric furnace maker in Japan is interested in investing in Bangladesh.
However, following study is required before such an FDI is targeted.

[Example of appropriate on site conditions]

1. Logistics (road, seaport for import of materials and export of products):
   It is assumed that handysized bulk carriers of 20,000 DWKT type are used for the import of scrap from overseas
2. Improvement and maintenance of industrial park:
   a. Adequate site dimensions- 20 ha is necessary to build an electric furnace
   b. Ground strength to support a heavy load
   c. Electricity: large capacity electricity supply; back power which is 40 times of transformer capacity; and, high voltage power supply (77000V, 22000V),
   d. It is normal for electricity consumption to go up and down dramatically during factory operations.
   e. Available industrial water.
   f. Available natural gas and fuel.
   g. Environmental laws and environmental regulations (regulations regarding powder dust and dioxin, water management criteria, and emissions).
   h. To secure principal materials (scrap iron, DRI), to secure supply route for auxiliary material
   i. Workers' skill level, work behavior, labor union.

5) Shipbuilding and related industry

Characteristics of industry

This is a heavy industry which needs large facility investment and large employment. Shipbuilding enterprises have business linkages with many supporting industries which are referred to as "cooperation factories" and/or "subcontracting enterprises". In Japan, most shipbuilding enterprises are located in Setouchi (Seto inland sea) and Kyushu where there are clusters of maritime industries.

The shipbuilding sector of Bangladesh mostly produces river cargo vessels (of less than 2,000 DWKT) and ferry boats. In recent years, ocean cargo vessels of 5,000 DWKT were built for export to EU. Larger shipbuilding docks are necessary to build larger vessels of handysize and Panamax size. The Japanese shipbuilding industry is now involved in fierce competition with Chinese and Korean shipbuilders. Particularly, Chinese shipbuilders produce versatile typed bulk carriers, while Japanese shipbuilders produce high quality vessels requiring high technology. Korean shipbuilders go between the two. In Japan, the shipbuilding industry constantly faces labor shortages and cost reductions. From this viewpoint, it is now a possibility to invite a labor force from developing countries to Japan to compensate for the labor shortages.

[Current situation of shipbuilding industry]

a. Shipbuilding tonnage in the world

In 2014, 2,839 vessels with a gross weight of 64.66 million tons were built, which was a decreased in comparison with the previous year.

Year	Number of vessels	Total gross tonnage (million)
2014	2,839	64.66
2013	3,089	70. 48
2012	3,696	95.575

Country specific data for 2014:

Country	Number of vessels	Total gross tonnage (million tons)	% of global production
China	906	22.68	35
Korea	341	22.45	34.
Japan	522	13.42	20.8

Top 3 countries account for 90.8% of total world production.

Order backlog in 2014: 2,694 vessels, 82.58 million gross tonnage

China Korea Japan Europe Others

(Unit: Million gross tonnage)

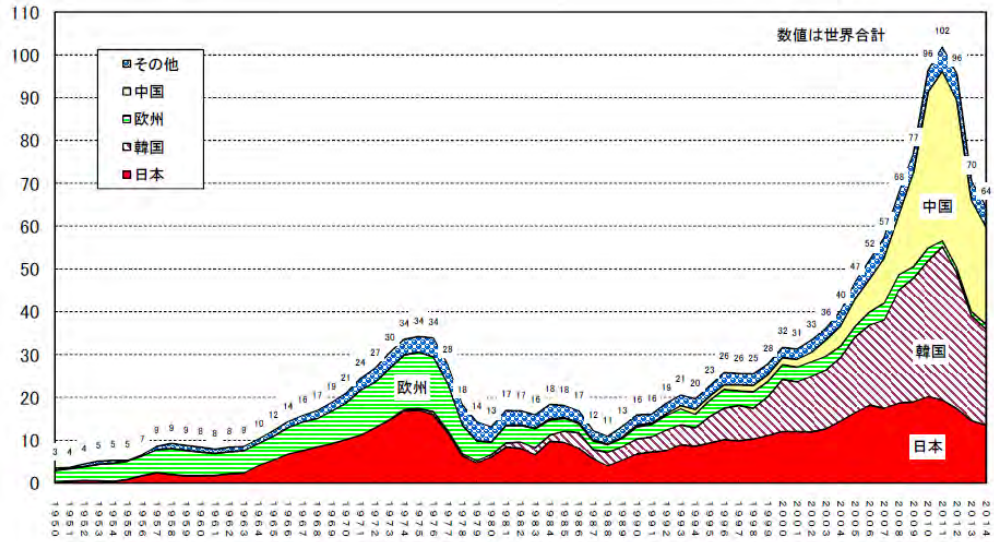


Figure 5.1.2-3 Trend of shipbuildin tonnage in the world 1950-2014

Source: Japan Shipbuilders Association

b. Current situation of Japanese shipbuilding industry

Japanese shipbuilding industries export ships which account for 81% of whole ships (gross tonnage) built in Japan. The industry has maintained a high export ratio, competing to receive orders in the international market. The Lehman Shock in 2008 triggered the decrease of the demand for newly built vessels, and Japan, China and Korea engaged in severe competition repeatedly to receive new orders. However, after 2013, it seemed that Japanese shipbuilders had recovered, and it even seemed that their order volume was increasing, securing consistent business. From that time on, it will be shifted to new phase that each shipbuilding company will maintain the new order so as to meet each building capacity and/or each production plan. In addition, in a medium- and long-term perspective, the shipbuilding market will be expanded, along with the increase in seaborne trade.

In order for Japan to maintain growth along with the global economy which is linked with development, it is indispensable that Japanese the shipbuilding industry be continually competitive. It is necessary for the industry to keep winning international contests with China and Korea for even greater prospected development in the shipbuilding industry.

The Ministry of Land, Infrastructure, Transport and Tourism of the Japanese government is now tackling various enforcement of policies with a “Three Pillar System”: 1. “Enforcement of capacity to secure backlog of order”; 2. “Promotion of coalition and business integration in the industry”; and, 3. “Evolution to new market and new business”.

(Source: Maritime report 2015. Ministry of Land, Infrastructure, Transport and Tourism)

c. Value chain in shipbuilding sector

Shipbuilding is an assembly business within the heavy industry sector. In Japan, a wide range of high quality related industries have supported shipbuilding companies which use advanced technology, developing new technology, and enhancing cost competitiveness.

The industries related to shipbuilding are as below:

1. Materials- Steel products, pipe material, welding material, wood, thermal insulation material, copper products, paint, casting and forging, electric wire
2. Marine equipment- Boilers, propellers, ladders, reverse reduction gear, pumps for fuel oil and lubricant oil
3. Engine auxiliary machinery- Pumps, small diesel engine, heat exchanger, oil purifier, air compressor

A shipbuilding company (assembler) has many subcontracting companies which indirectly sustains large employment in the local economy. For instance, one Japanese shipbuilding company has overseas subsidiary factories which directly employs 700 persons, while the employment in affiliate factories (subcontractors) amounts to 10,000 persons locally.

d. Overseas investment and advancement by Japanese shipbuilding company

In the past, Japanese shipbuilders had made investments in overseas manufacturing bases in various manners, but now many companies have already withdrawn, as in the case of IHI Marine United in Brazil. The examples of the remaining ventures are a few- Kawasaki Heavy Industry base in China (NACKS), and Tsuneishi shipbuilding bases in the Philippines, China, and so on. Many manufacturing companies have accelerated the to shift to overseas manufacturing bases as a countermeasure against yen depreciation, and to reduce labor costs. However, domestic production ratio in shipbuilding is still high. In the meantime, technical cooperation and licensing are also overseas advance strategy in different way.

Shipbuilding in Bangladesh

In Bangladesh, there are three great rivers and river transport has developed. Accordingly, building small river vessels is a common business. There are 103 shipbuilding companies, and employ 4,699 persons. Most of them are small companies that employ 45 persons on average. 65% of this total is concentrated in and around Dhaka and Narayanganj, in Dhaka District. 19% of the remaining companies are located in the Barisal District, and 12% in Chittagong District.

Steel and marine equipment used for inland vessels are reused/recycled from materials supplied from shipbreaking in Chittagong. Most of the steel to be used for building oceangoing vessels is imported from China, India, Singapore, etc. There is no facility to carry out a ship inspection in the country. Inspection of ocean going vessels is carried out at inspection facilities abroad. Approved design drawings for such vessels are purchased from overseas shipbuilding companies. Ananda shipyard received the first ever direct order of 5,000 DW vessels from a Danish company in 2008. Since then, the company has built 34 international class vessels and 300 other vessels, including inland vessels. Western Shipping also has received orders from overseas. The accumulated ship orders, which 6 shipbuilding companies received up to 2013, amount to 4.78 billion US dollars.

It is reported that Bangladesh has well trained and skilled welders who can build good quality vessels. The wage of such labor is low when compared internationally, which makes Bangladesh more cost competitive. There have been abundant shipbuilding workers for many years in Bangladesh. However, there were not many jobs in the domestic shipbuilding industry but there are many workers causing qualified welders and ship fitters to move abroad for jobs in shipyards in Singapore and Dubai over the past 20 years. Currently, there are 50,000 Bangladeshis that work outside Bangladesh in the shipbuilding industry. It is estimated that 10% of them work in Singapore, 10% in the Middle East, and 35% in India. It is said that 10% of shipbuilding engineers and 50% of designers who work in shipbuilding factories in Singapore are Bangladeshi.

SWOT analysis on shipbuilding industry in Bangladesh

1) Internal Managerial Environment Assessment

Strengths:

- Skilled and cost competitive workforce in the industry.
- Flexible and English-speaking workforce with high capacity for learning.
- Many Bangladeshi workers are employed at many shipyards abroad.

- There is a possibility that they would return to Bangladesh to work, if a large shipbuilding factory were constructed.

Weaknesses:

- Higher capital costs and difficulty in accessing loans.
- The scale of shipyards is rather small and there is a lack of vocational education in the shipbuilding sector.
- Lack of Ship Classification Society.
- Most shipyards are located at riversides. There is no factory that is capable of building a vessel exceeding 20,000 DWKT.

2) External Managerial Environment Assessment

Opportunities:

- Both the domestic market and the overseas market (EU, Denmark, Africa) are expanding
- Expected large replacement demands caused changes in IMO Regulations regarding Hull Systems; single hull to double hull
- Introduction of Export Incentives of 5%, introduction of the Preferential Tax Relief for promoting Ship Export (5% of Corporate Income Tax for non-registered firms, and 10% of Corporate Income Tax for registered firms shall be applied for the next 12 years)
- Commercial banks changed their funding policies/attitudes about the industry and are now more positive
- Supporting organizations such as FBCCI are quite positive to help supporting the industry

Threats:

- Currently, there is no recognized in the shipbuilding sector because the majority of production is for small inland vessels and the target market for ship export is a niche market of small ocean vessels that are less than 10,000 DWKT

Conditions of location

The shipbuilding industry should be located in a seaboard region.

Feasibility of attraction

As a whole, the shipbuilding industry in Bangladesh is growing, and there is an abundance of skilled workers that offer cost competitiveness as their strength. Japanese shipbuilding companies are confronted with difficulty in recruiting young workers in Japan. This may be possible that Japanese shipbuilders investing in Bangladesh can make up for their shortage of cost competitive labor.

According to Dr. Engr. Abudullahel Bari, Chairman of Ananda Group and President of Association of Export Oriented Shipbuilding Industries of Bangladesh, if a Japanese shipbuilder invests in Bangladesh in the future, it will help the development of the shipbuilding sector and it is welcome.

Nevertheless, in the international market, medium and large size vessels (like handysize and Panamax size vessels) are prevailing and are universal. In order to target those markets in the future, direct investment or introduction of techniques from large shipbuilding companies in foreign countries, as well as large shipbuilding facilities at deep sea ports and/or in a seaboard region are necessary.

Several years ago, many Japanese shipbuilders and related industries made investments in Brazil, but they suffered from huge losses caused by default of payment for ship sales, and ultimately withdrew from Brazilian business. In background of this case, there occurred corruption case of Petrobras, and then the financial institutions suspended loan to Petrobras. In this timing, Japanese shipbuilding industries are careful to invest to overseas. On the other, one shipbuilding company is interested in investment in Bangladesh in the future in view of long term business plan.

6) Ship recycling

Characteristics of industry

This industry is typically labor intensive. Bangladesh imports old vessels, and breaks them down to iron scrap, which is then melted in an induction furnace to produce steel and iron. This iron and steel is used to produce steel bars for building construction. Steel is cut from the ship and processed to be reused for construction materials or for small river vessels, while marine equipment and navigational instruments removed from the ships are recycled and sold as used goods.
In Bangladesh, ships are scrapped with the beaching method, which often results in oil spillage and asbestos contamination to the ocean. These are the major causes of environmental pollution in the area. Further, laborers work at dangerous heights to break down the ship without using safety shoes, helmets, gloves and safety ropes. Many accidents have occurred many times and labor safety is an issue but there have not been any clear countermeasures taken to ensure safety. According to the Ship Recycle Convention 2009 adopted by IMO, the beaching method is no longer acceptable; however, Bangladesh has not ratified the Convention yet. It is requested for the Bangladesh government to ratify the Convention and to conform to the ship recycling facilities guidelines in the Convention. There is also a draft of domestic law, "The Ship Recycling Act 2015", but it had not been enacted yet.

Ship recycling in Bangladesh
In Bangladesh, as well as in India, ship recycling is a popular industry. Old ships are broken down to steel scrap. Some of them are cut and processed for reuse as steel bar for construction. Others are melted in an inducted furnace (or electric furnace) to reproduce steel bar and other products. The iron recycling system has been established for years. However, steel is in short supply and steel scrap is imported from abroad to be used as iron material in inducted furnace.
Shipbreaking has been criticized internationally due to causing environmental pollution and because the work is often very dangerous. If the current situation does not improve, it will become difficult to continue the current method of shipbreaking. In May, 2009, "HONG KONG INTERNATIONAL CONVENTION FOR THE SAFE ANDENVIRONMENTALLY SOUND RECYCLING OF SHIPS, 2009 (hereinafter referred to as "Ship Recycling Convention 2009)" was adopted. Under this convention, the merchant vessels exceeding 500GT registered in the country which ratified the convention must be furnished with a list of harmful substances on board. The recycling facility in the country ratifying the convention shall be inspected to be sure that it satisfies the requirements under the Ship Recycling Convention 2009. If the shipbreaking yard and facility does not meet the guidelines, it is not permissible for the ship to be broken down in such yard/facility. EU have their own regulations, inspecting the list of harmful substances on board vessels that are scheduled to enter EU ports as well as the vessels themselves. If there is a harmful substance found on board is not described in the list, the departure of the vessel is forbidden and it is detained at the port by authorities. Meanwhile, the demand for shipbreaking since 2009 has been increasing sharply, due to the worldwide deflationary spiral. It is foreseen that demand for ship recycling continue to increase in the future. The total ship breaking capacity of the three major ship recycling countries, India, China, and Bangladesh, is estimated to be 25 million DWKT. Demand for shipbreaking is forecasted to increasingly exceed ship breaking capacity. The issues on ship recycling have become large with respect to international safety at sea and environment protection.
At present, Bangladesh has not ratified the convention, but it is stipulated in the Bangladesh Industrial Policy 2015 that "Environment standard ship re-processing industry" is defined as a "Priority Industry". Further, at the domestic stage of the legislative process, there is a draft of "The Ship Recycling Act 2015". It will attract the attention of the future stream.

Condition of location Seaboard region, Seaboard Economic Zone

Feasibility of attraction
In case that shipbreaking companies should work to break down the ships in accordance with the ship recycling guidelines, investment in the facility is necessary, which means a decrease in the profitability of the shipbreaking industry in Bangladesh.

In the Japanese shipbreaking industry, work is done in accordance with the guideline. It is a domestically oriented business is not very interested in international expansion. Should the Bangladesh government and shipbreaking industry conform to the guidelines, they might seek out collaboration with other countries and there might be a chance of business collaboration with the Japanese shipbreaking industry. However, facility investment costs and profitability of the business would be a bottleneck for business cooperation.

7) Petro chemical industry

Characteristics of industry

This is usually a capital intensive and technology intensive facility industry. Petrochemical products are discharged from tanker to the factory on shore through pipelines. The cargo are dangerous goods. In the process of distribution, storage and processing, the cargo might be spill out in the event of an accident, which would cause environmental pollution, and might cause an explosion and/or fire. Therefore, facilities and layout of the factory should be carefully designed to maintain safety and properly prevent disaster. In this industrial sector, there are long value chains from crude oil, naphtha, basic petro-chemical products, and petro-chemical inducers for petroleum products, which have various products in many stages therein. It is said that the profitability of the chemical industry in Japan is low. The industry has keen competition with overseas industries while demand in Japan is decreasing. Overseas investment is considered to be one strategy to alleviate this, but it may vary from product to product, or by the corporate strategy of each enterprise.

[Current situation of petro chemistry industry]

In the petro-chemical industry, oil and natural gas are used as raw materials to produce synthetic resin, synthetic dyestuff, synthetic rubber and other various chemical products through various production processes. In Japan and Europe, naphtha (called as crude gasoline) is used as a main material for producing chemical products. Chemical products as finished goods are used for nearly every purpose in daily life; in particular, high grade Japanese manufacturing industries such as automobiles, computers, electric goods and electronic goods which are highly appreciated globally. High quality and high functionality petrochemical products have an important role for all of these products.

[Petrochemical and value chain with related industries]

The value chain from naphtha to various petrochemical product is as follows:

Materials	Naphtha
⇩	
Basic Petrochemical	Ethylene, propylene, butadiene, benzene, toluene, xylene
⇩	

Chemical Inducer	Related industry
Plastics material	Plastic product manufacturing
Synthetic fiber material	Textile industry
Synthetic rubber material	Rubber product industry
Paint material, solvent	Paint manufacturing
Detergent material	Synthetic detergent, interfacial active agent manufacturing
Others	Adhesives, synthetic dyestuff, colorant, chemical fertilizer, agricultural chemical, drug/medicine,

⇩

	plasticizing material, antifreeze liquid

Related industry	Finished goods found in:
Plastics product industry	Automobiles, ships, railway cars, electric machinery, information telecommunication/electronic parts, other machinery, housing, construction, civil engineering, agriculture, fishery, medical care, child care, nursing care, packing, container, daily goods, grocery
Textile industry	Apparel, home furnishings, industrial material
Rubber goods industry	Automobiles, motorcycle, various industry, everyday products
Paint manufacturing industry	Automobiles, railway wagon, ship, building, electric and other machinery, woodwork, household uses
Synthetic dyestuff, interfacial active agent manufacturing	Household use, industrial use

In the petrochemical industry, up stream is comprised of apparatus industry which requires enormous capital incentive and is based on the economy of scale. Downstream, there are many small capital industries at small sites. In general, it is said that in each stage of the supply chain shown above, the size of factory is 1/10 that of the level above it. Further growth rate of the petrochemical industry business is thought to proportional to GDP growth rate.

Petro-chemical Industry in Bangladesh

Annual demand for petroleum products is reported to be 5.5 million tons. Eastern Refinery, a state-owned company, produces 1.5 million tons, and other government-linked companies and private companies produce 0.3 million tons. The balance 3.7 million tons are supplied by import.

The Bangladesh government is planning to set up an oil refinery and petrochemical complex in the seaboard area at Maheskhali and Matarbari which is located opposite the candidate site of the Seaboard Economic Zone dedicated for heavy and petrochemical industry under the master plan. Therefore, the petrochemical industry in the Economic Zone may be supplied by related petrochemical products from the oil refinery and petrochemical complex or alternatively chemical materials/products may be imported from overseas via chemical tankers.

The demand for petrochemical products is increasing in Bangladesh. If the intermediate material/products are procured by import substitute and domestic production, the lead time for procurement of them will be shortened and therefore more flexible production activity will be realized. On the other hand, Bangladesh enterprises are lacking in technology and capital. FDI from overseas advanced industry is necessary. The government's industrial development policy in the petrochemical industry shall be clarified under the long the term plan in relation to targeting FDI.

The typical petroleum and petrochemical industry in Bangladesh is listed below:

- Eastern Refinery (Oil refinery, State-owned company)
- Energy Group (Petroleum and gas)
- CVO Petrochemical Refinery Limited (Oil refinery, engine fuel, chemical)
- National Polymer Industries Limited (PVC, chloromethane)
- Shurwid Industries Limited (PVC film, polypropylene film)

Table 5.1.2-4 Domestic Production of Petroleum Products in Bangladesh

Petroleum Products				
Year	2011-2012	2012-2013	2011-2012	2012-2013
	Quantity	Quantity	Value	Value
Naptha	111,267	137,099	1,267	2,820
Motor Spirit	32,813	54,802	3,750	5,027
High Octane Blending Compound	30,402	15,283	3,484	2,729
Special Boiling Point Solvent	841	715	109	96
Mineral Turpentine	7,389	10,251	509	752
Jet Petrol-1	3,907	-	420	-
Superior Kerosene Oil	226,093	286,004	14,329	20,942
Light Diesel Oil	2,206	2,099	141	289
High Speed Diesel	307,690	312,104	20,088	20,166
Jute Batching Oil	25,224	24,571	1,545	1,758
Furnace Oil	90,822	70,706	5,411	3,562
L.P.G.	12,788	14,112	566	624
Reduced Crude Oil	314,797	373,014	2,992	3,932

Source: JICA survey team based on Statistical Year Book of Bangladesh 2014

Condition of location

Seaboard Region: It is desirable to be located at land adjacent to the quay at which vessels dock, but it is possible to be located at the point distant from the dock and receive materials via pipeline.

Feasibility of attraction

It is an important issue to develop a petro-chemical industry in the mid- and long-term, but the market scale in petro-chemicals is small in Bangladesh now. Further, infrastructure is not well maintained, and investment in Bangladesh in the chemical sector appears to have little merit and low priority in the eyes of Japanese investors. However, oil companies in petroleum producing countries might be interested in investing in Bangladesh. The Bangladesh Petroleum Corporation used to have a plan to attract investment in an oil refinery from the Middle-Eastern oil industry.

5.1.3 Development Vision for the Medium-term EZ development

(1) Viewpoints for considering Medium-term EZ development

1) The first viewpoint: In developing countries, industrial development and industrialization first started from the production of consumer goods and then proceeded to the production of durable consumer goods and then to producer goods, step by step. Firstly, an import substitute policy was implemented followed by an export processing industry from FDI and the development of an export oriented industry. Thereafter, governments made a shift aspiring to develop of heavy and chemical industries as well as material production industries. In Bangladesh, the economy, RMG, and related industry have a high proportion of government attempts for diversification of industry and/or sophistication of industry. Heavy and chemical industry and material production industry are the foundation industries that supports the development of other industries. From a long- and mid-term perspective, the development of heavy and chemical industry and material production industry is important. To realize this, it is necessary to prepare the industrial zone to attract FDI of such industry.
2) The second viewpoint: In Bangladesh, concentration of population and industry at Dhaka

and the outskirts is very high, resulting in a large population and development gap between the Dhaka area and other local areas. The Government of Bangladesh aims to balance development across the country, but Dhaka and outskirts area are expanding while the development of local areas are delayed. BEZA has a vision to develop 100 EZs which mainly focus the development of short-term industrial parks/EZs. In mid-term EZ development, regional and social development with a view toward both community, urban development, and industrial development will be required.

(2) A draft of Development Vision for Medium-term EZ development

1) Industrial development and regional development will be achieved in Maheskhali and Matarbari and the surrounding area (Cox's Bazar region) within the scope of Bangladesh "Vision 21" and "Industrial Policy and Economic Zones Act", 2010.
2) Along with the development of deep sea port in this coast, "Seaboard Economic Zone" will be developed for attracting and locating heavy industry and Petro-chemical industry, which is underdeveloped or delayed in development in Bangladesh but are the most fundamental industries supplying feedstock and material to downstream industry and supporting the development of all manufacturing industries.
3) **Seaboard Economic Zone** shall be located at or near **Industrial Port** in the coastal area, where ocean bulk carrier and chemical tanker can lie alongside the berth equipped for directly discharging cargo and supplying raw imported material to and/or loading export products from the industry located within the industrial park. The "Seaboard Economic Zone" will be a **"Heavy industry and Petro-chemical Industrial Park"** such as iron and steel, shipyard, environmentally friendly ship recycling, chemicals and chemical products, lubricant oil, tires, etc. The "General Economic Zone" will be a "General Industrial Park" which will include the fields of transport machinery (automobile and parts, motorcycle and parts, railroad wagon), machinery, electrical/electric goods/parts, IT devices, food and agro-processing, medicine and medical goods, nutrition, textiles/RMG, bicycle, etc. The General Economic Zone shall be located either inland or in coastal areas within 30 km from **International Commercial Port** where container ships enter.
4) FDI to EZ will be promoted and creation of new industries and transfer of new technology will be attempted.
5) The development strategy shall be focused to promote industrial cluster development along with EZs as follows[3]:
   a) **"Vertical extension of the textile and garment industrial cluster**" for achieving a value chain of synthetic fiber, textile, apparel (Readymade Garment: RMG);
   b) **"Ship-breaking (Ship recycling), Steel Re-rolling and Shipbuilding industrial**

[3] Three kinds of industrial clusters are selected to be suitable for this survey in accordance with following reasoning:

- **The industrial cluster of vertical supply chain from Petro-chemical industry to synthetic fiber and textile of synthetic fiber and RMG** has an effect on strengthening the international competitiveness in the sector, in terms of stable cost and short lead time, which has long been an earnest desire of textile and RMG industry in Bangladesh. RMG is listed in High-priority industry and home textiles and polymer manufacturing industry are listed in Bangladesh Industrial Policy (2016-2020).
- **Ship-breaking, Steel Re-rolling and Shipbuilding industrial cluster** has been a unique and existing cluster and in the value chain of steel and iron, and is competitive. Attraction of foreign direct investment to Seaboard Economic Zone (Heavy and Petro-chemical Industrial Park) will contribute to rapid expansion of the industrial sector. Shipbuilding and Ship-recycling (Ship-breaking) are listed as priority industry in Bangladesh Industrial Policy (2016-2020).
- The development of **Agro-fishery processing and halal foods industrial cluster** stems from the utilization of agro products which are locally abundant resources in the south Chittagong area, creating new value. Especially in the halal food industry which is expected to increase export to Middle-east and other Islamic countries. Agricultural and food processing industry is listed as highest among the High Priority sectors in Bangladesh Industrial Policy (2016-2020).

cluster", for achieving a value chain of iron and ship; and,

c) **"Agro-fishery processing and halal foods industrial cluster"** for utilizing local agricultural resources, producing processed food in view of processing and export to the Middle East and other Islamic countries, as well as domestic sales.

4) The Seaboard EZ will be developed in a plot which is approximately 604 ha and located just south of the coal-fired power station which is funded by JICA. The Seaboard EZ is marked in green in the map shown below(Figure 5.1.3-1).
5) The General EZ will be developed in a plot which is approximately 400 ha and located just south of the power station complex which will be developed on a PPP basis under the initiatives of BPDB. The General EZ is marked in green in the map shown below(Figure 5.1.3-1).
6) Transfer of population and industry in Dhaka and its outskirts to Maheskhali and Matarbari and the surrounding area (Cox's Bazar region) will be attempted to contribute to alleviate the problem of population and industry concentration in Dhaka and the outskirts, as well as industrial and regional development in Cox's Bazar region.

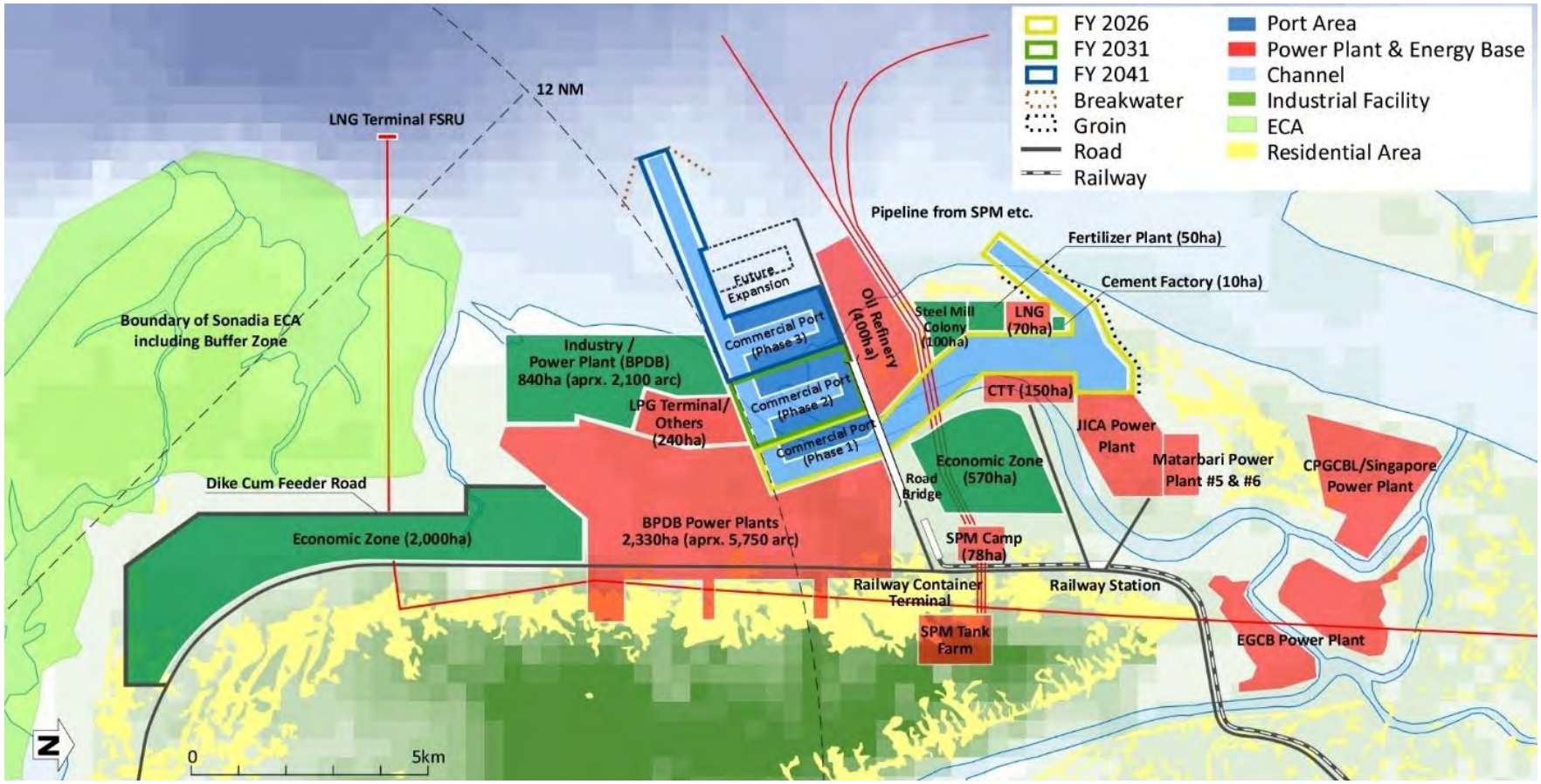


Figure 5.1.3-1 Location map of the Seaboard EZ and the General EZ

Source: JICA survey team for the project Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh

(3) Outlines of medium-term EZ development

In developing medium-term EZ, an outline considered for the Seaboard EZ (heavy and chemical industry) and the General EZ (general manufacturing) is shown below:

1. Seaboard EZ (heavy and chemical industry)	
Basic concept	Environmental Harmonized Heavy and Chemical Industry Complex
	Investment of heavy and chemical industry, in which due consideration is made to environmental harmony and the reduction of CO2, are attracted to establish a foundation of industrialization to develop manufacturing.
Condition of location site	(1) EZ is located at the industrial port area where large ocean bulk carriers and chemical takers can berth and discharge imported raw material products. (2) The candidate site: the seaboard area next to the site of the JICA power plant, directly accessible to port/seaway.
Available dimension of prospected site	Approximate 600 ha is available. (Initially 400 ha was prospected.) Dimensions of site at port area and directly connected to seaway: Approximate 250 ha - 300 ha is required.
Industrial sectors located at the site	(1) Heavy Industry Zone a. Iron and steel (electrical furnace, steel rolling mill, steel process mill) b. Shipyard (shipbuilding, ship repair and maintenance) c. Ship scrap, ship recycling (harmonized with environment and labor safety) d. Non-iron metal e. Heavy machinery, construction machinery (2) Chemical Industry Zone a. Chemical, chemical products, lubricant, oil b. Tires (Notes: Oil refinery, fertilizer and cement are planned at other locations under another project plan, and are outside of the scope of the EZ development)
Characteristics of located industry	a. Mostly apparatus industry which is a capital intensive industry b. Basic material industry (iron and steel, ship scrap, non-iron metal, chemical, chemical products) c. Upstream industry (iron and steel, ship scrap, chemical) d. The scale of investment is large. Mass production has the merit of scale. High technology is required. e. Countermeasures for safety and less environmental load. f. Strategic plan and promotion to attract FDI in core industry is strongly required by government initiatives.
Development method	Government EZ: developed from strong initiative from the Government of Bangladesh. The candidate site is located at low land which is almost the same sea level. It is a difficult and risky business to develop oceanfront areas in terms of civil engineering technology and cost/economy of land reclamation. Integrated development is required in coordination with

	development of ports and seaways, roads, railways, water supply, electricity supply and neighboring electric power plant projects, oil refinery projects, countermeasures to protect from high tide and flood during cyclones, and so on. Thus, it is difficult for a private developer to create an EZ. It is most suitable for a government to develop EZ site as government project.
Function, facility and equipment	a. Cargo handling machinery and carrier devices (such as pipelines and belt conveyer systems) are to be installed at the berth location and adjacent land where the vessel carrying raw materials can approach and lie. b. Safety equipment and firefighting systems in case of accident. Equipment and neutralization to protect against oil pollution. c. Effluent treatment system, regulating pond. d. Management office (developer's office, security, customs, disaster prevention, firefighting, emergency rescue, environmental inspection, conference rooms, accommodation, and medical clinic). Strict security control is required.
Special remarks	No evaluation on costs of acquiring land and land reclamation is included in assessment of candidate site.
Countermeasure protecting environmental impact and safety- Since heavy industry and chemical industry are located at the seaboard area, technical and financial evaluation is necessary to study in consideration of following points: (1) Impact on sea water environment caused by construction work on EZ land, port, dredging seaway, and other works within the project area. (2) Spill and/or disposal of oil, chemical, chemical product and/or other raw materials into the seawater, and/or pollution to seawater in the case of accident during discharge of raw materials, distributing them to factories and manufacturing in factory, which may cause environmental impact on the area. Such impact and protective countermeasures shall be studied. (3) Safety precautions in chemical factories and furnace plants to guard against disaster arising from fire and explosion shall especially be reviewed. Further, the location of each factory shall be designed to ensure a safe space, distance, and location in relation to other factories (4) Elevation at EZ site and tide embankment/tide barrier shall be designed adequately and constructed to protect the site from flood caused by high tide and cyclone. (5) Research and inspection of ground and soil strength, upon which heavy plants and factory are constructed.	

2. The General EZ (General manufacturing)	
Basic concept	General manufacturing industry
	(1) Mainly FDI of the assembly industry is promoted to develop supporting industries, forming an industrial cluster. (2) Industrial site location is considered in view of developing supply chain and industrial linkage between the Seaboard EZ (heavy and chemical), EZ (General industry) and surrounded area.

	(3) Concurrently with developing an inland EZ, local communities and residences are to be developed in an integrated approach under government initiatives, leading to regional development. In this respect, it is difficult to develop a new community close to the General EZ due to limited availability of land, such as is the case with the General EZ in Maheskhali Island (West coast) being located at seaboard area.
Condition of location site	(1) The EZ site is to be located within 30 km distance from the commercial port where oceangoing large container vessels enter. The site location shall be selected through comprehensive assessment of ease of access to inland transport, land cost, land developing cost, environmental conditions, employment of good workers, residence and traffic conditions, etc. (2) The candidate site is prospected to be at seaboard area or in inland area, which will be selected at JCC.
Prospected dimension of development site	Total dimension of area for prospected development is approximately 400 – 500 ha.
Industrial sectors located at the site	[Transport machine zone] Automobile/parts, motor cycle/parts, railroad wagon [Machinery and ITC zone] a. General machinery, production machinery b. Electrical and electric goods/parts c. IT devices, communication equipment [Food, medicine, medical goods zone] a. Food, agro-processing (including halal food) b. Medicine, medical goods, nutrition, health food, cosmetics [Living goods zone] a. RMG/apparel, apparel accessories b. Bicycles, paper processing, printing, daily commodities, etc.
Characteristics of located industry	a. Labor intensive b. Intermediate processing, downstream industry c. Supporting industry (such as parts, member of framework) d. Production goods, intermediate goods e. Homewares and goods related to living, general consumer goods f. Strategic plans and activities to attract FDI from anchor industries in assembly manufacturing are key elements to lead to successful development of the EZ
Development method	Development by PPP (Public-Private-Partnership), by Government, or by G2G. GOB takes initiative the comprehensive development. Governments develop the land and perform land reclamation, while the EZ developer develops EZ onsite and the real estate developer develops new homes.

Function, facility and equipment	a. Management office (developer's office, conference room, accommodation, medical clinic, security, customs) b. Bank, ATM, mail, BDS office c. Effluent treatment system, fire extinguishers, regulating pond d. Logistic center etc.
Special remarks	No evaluation on costs of acquiring land and land reclamation is included in assessment of candidate site.

Note 1. "Industrial sectors located at the site" are selected with the aim of diversification and upgrading of industry in mind, which will contribute to the increase of export, employment, and meeting the needs of the domestic market and industry. It is not based on quantified future projections on domestic market demand.
Note 2. Both economic zones (Seaboard EZ and General EZ) aim at attraction of FDI from any country, as long as it is investment for good quality.

Supplement 1
Dimension of the Seaboard EZ (heavy and chemical industry)

A. Dimension of the Seaboard EZ (heavy and chemical industry) 400 ha (Initial prospect)
B. Dimension of site at the port area and adjacent area, 240 ha of the 400 ha mentioned above.

Dimension of Seaboard EZ (Heavy and chemical industry)

Sector	Zone dimension (ha)	Type of factory	ha	Nos of mills	Total dimension (ha)
Iron & steel	131	Electical furnace and rolling mill	20	5	100
		Steel processing	1	10	10
			0.5	30	15
		Stock yard for materials	5	1	5
		Warehouse for products	1	1	1
		Total			131
Ship scrap /ship recycle	40	Scraping yard	2	20	40
Shipyard	100		50	2	100
Chemical	100	Connected with pipeline to feed liquid chemical from port to factory			
Others	30				
Gross Total	401	Dimension of site at the port area and adjacent area			240

[Reference: Grounds for estimated dimension of candidate site]

(1) Iron and steel: In the case of typical electric furnaces and rolling mills (Japanese enterprise, in Vietnam), the dimensions of the factory which produces 900,000 tons annually is 20 ha. In the future, it is assumed that there will be 5 factories total, including foreign and local investors.
(2) The size of the shipyard may vary from company to company, or from shipbuilder to shipbuilder. It may also depend upon what size vessel is built, what type of vessel is build,

how the vessel is built and how many vessels are built at one time. In Japan, the size of the shipyard is comparatively smaller than overseas. For instance, Imabari Shipbuilding Co., Ltd. is the largest shipbuilding company in Japan and has 8 shipbuilding factories domestically with total shipyard area of 510 ha. The smallest of these is 14 ha (it is the company's first and is now the headquarters), and the largest one is 170 ha (which have built vessels between 100,000 - 310,000 DW). Tsuneishi Shipbuilding Co., Ltd. has its head office/factory in Japan, the dimensions of which are 49 ha, but it also has a subsidiary shipyard in Cebu, Philippines with an area of 147 ha, and a subsidiary shipyard in China with an area of 120 ha. In 10 years from now, shipbuilding in Bangladesh will grow faster than it is now. It is assured that both FDI and local shipbuilders may invest in the new 100 ha shipyard, which is expected to be an appropriate size for the site of shipbuilding factories.

(3) Regarding the petrochemical industry, Mitsui Chemicals has 7 factories in Japan. The total area of all the factory sites is 776 ha- the smallest is 31 ha (Kashima) and the largest is 270 ha (Oomuta). Presently, investment in petro-chemistry factories with site dimensions exceeding 100 ha in Bangladesh over the next 10 years is unforeseeable. In case of advanced overseas example, it took 20 years to sell out first phase development site 320 ha in Map Ta Phut Industrial Estate (Petrochemical industry) despite the remarkable economic growth in Thailand. In the Deep C site of the Dih Vu Industrial Zone (Chemical complex), the first phase development (164 ha) started in 1997 and 92% of land has been sold to date, while the second phase (377 ha) started in 2008 and only 10% has been sold.

Supplement 2

Portion of industrial zone used in each sector of the General EZ (General manufacturing industry)

Industrial sector zone	Portion	Industrial sector
Transport machinery	25%	Automobiles / parts
		Motorcycle / parts
		Railroad wagon
Machinery, Elec. ITC	40%	General machinery, Product machinery
		Electric goods, electrical goods
		IT devices and communication
		Metal (non-iron)
Food and medicine	10%	Food, Agro-processing, halal food
		Medicine, medical goods, nutrician, cosmetics
Living industry	25%	RMG, accessary, home textile
		Bicycle, Paper processing, printing, daily products

[Reference] Industrial development under Bangladesh Industrial Policy and FDI

The underlying goal of the most significant National Development Plan "Outline Perspective Plan of Bangladesh 2010-2021" is that of turning Bangladesh into a middle income country

by 2021. The National Sustainable Development Strategy – NSDS-2010-2021 emphasizes sustaining the balanced development of the country by maintaining economic growth, social justice, and environmental safety.

The Bangladesh Industrial Policy 2010 considers the SMEs as a thrust sector that act as the engine of growth for the planned and balanced development of these labor-intensive industries.

Further, the planned development of manufacturing industries and labor intensive industries are the major activities. Simultaneously, the development of large enterprises and service sectors are positioned as important activities. In Bangladesh, Industrial Policy 2015 (draft at May 2015 covering the period from 2015 to 2021), 13 top priority industries and 22 priority industries are selected. Bangladesh government approved the new Bangladesh Industrial Policy 2016 in February 2016, which was written in Bengali. However, even a provisionary English version has not yet been released (as of November 2016).

As the top priority on the industry list of Bangladesh Industrial Policy 2016, manufacturing industry sectors are selected. They are divided into Seaboard EZ industries and General EZ industries and then analyzed to identify whether it is classified as new industry sector, anchor industry, export oriented, domestic market oriented, labor intensive or linkage with global supply chain. The results of this analysis are the selection of the industries feasible to be attracted to the Seaboard EZ and the General EZ, and are shown in "**Table 5.1.3-1 Evaluation and Selection of Industrial Sector desirable to be invested in Economic Zones**".

In the interview survey to the Ministry of Industry, it is asked if some incentives will be applied to top priority industries and priory industry. The reply was that as to each industry, the government and the private sectors will together discuss about whether the incentives will be applied or not. On the other hand, there are a lack of concrete measures/plans of government to support the development of industries. Upon considering industrial development and FDI promotion, basic data, numeric values, and indicators about the industry are essential, but there are few which are stored in the relevant policy making organization of government. Sometimes, numeric values on recorded in statistic data logs published by the Bureau of Statistics are vague or not accurate. This is more or less the same as in the private sector, such as in each enterprise, industrial sector association, and chamber of commerce and industry.

From viewpoint of FDI promotion, firstly, it is important that current data and indicators are properly collected, analyzed and organized, and become open to public. Secondly, a concrete plan and policy over the medium and long term are demonstrated, which becomes a useful basic information reference for overseas investors.

Currently, JICA delegates a JICA expert as Senior Advisor (Industrial Policy) to the Ministry of Industry, who cooperate and assist capacity development with the officers of the Ministry. As a result, the capacity seems to be improved. JICA also delegates a JICA expert as Senior Advisor (Investment Climate Improvement) to BOI.

From now on, the following two countermeasures are expected to become integral in FDI promotion to the Medium term EZ development:

- Concrete industrial policy is implemented on the basis of "Public and Private Dialogue", in consideration of which FDI promotion policy is formulated.
- Attractive Investment Climate is improved.

Table 5.1.3-1 Evaluation and Selection of Industrial Sector desirable to be invested in Economic Zones

	Sectors	Seaboard EZ	General EZ	Industrial Policy (2016-2020)		New sector /technology	Anchor Industry	Export oriented	Demestic Market	Labor Intensive	Global supply chain
				High Prior	Priority						
[Listed in policy]]											
1	Agro-based and food processing		○	○				○		○	○
2	Agricaltural machinery		○	○					○	○	
3	Readymade Garment		○	○				○		○	○
4	ICT/Software		○	○		○		○	○	○	○
5	Pharmaceutical		○	○		○		○		○	○
6	Leather and Leather goods		○	○				○	○	○	○
7	Light engineering		○	○				○		○	
8	Jute and jute goods		○	○				○		○	○
9	Plastics		○		○		○		○	○	○
10	Shipbuilding	○			○			○	○	○	○
11	Ship recycling	○			○				○	○	○
12	Frozen Fish		○		○			○		○	○
13	Home textile		○		○			○		○	○
14	Rnewable energy		○		○	○			○	○	○
15	API		○		○	○			○	○	○
16	Herbal medicine		○		○				○	○	
17	Polymer manufacturing	○			○	○			○	○	○
18	Automobiles		○		○				○	○	○
19	Handicraft		○		○			○		○	
20	Energy saving equipmen		○		○	○			○	○	○
21	Tea		○		○			○	○	○	○
22	Seed Industry				○				○	○	○
23	Jewellery		○		○					○	○
24	Toys		○		○				○	○	○
25	Cosmetic and toiletries		○		○				○	○	○
26	Furniture		○		○			○	○	○	○
27	Cement				○						
[Unlisted in policy]										○	○
	Steel	○				○	○		○	○	○
	Chemical	○				○	○		○	○	○
	Electrical		○					○	○	○	○

Source: JICA survey team

5.2. Selection of Candidate Sites for Medium-term EZ Development

The development vision and possible industries for investment promotion have been analyzed in the previous section for the medium-term EZ development from macro-economic points of view, covering both the Bangladesh macro-economy and macro-economic development in the ASEAN countries with case studies. In this section, the medium-term EZ development is examined from regional development points of view to analyze possible industries to locate in the future EZs including indigenous industries and to select candidate sites for EZ development.

Since the Government policy to accelerate the economic growth is to develop indigenous industries by promoting linkages with export industries, the medium-term EZ development should be planned in anticipation of indigenous industries to be developed both inside and outside the EZs in association with export industries located in the EZs. This in fact is the rationale for establishing BEZA in 2010 to pursue the EZ development.

In this section, characteristics of the broad region where EZs should be located are examined, promising industries to be developed in the medium-term in association with the EZ development are suggested including indigenous industries, candidate sites for the medium-term EZ development are assessed, and the medium-term EZ development plan is prepared for the selected sites.

5.2.1 Basic Requirement for the development of Medium-term EZs

The seaboard EZ should be established in the hinterland of the deep sea port as close as possible. It is desirable for the general EZ to establish close to the port, but its location within a 30km range from the port is acceptable as the transport cost of imported raw materials and intermediate goods and export of products from/to the EZ constitutes only 2~3% of the total cost.

The general EZ should be developed in such a scale that will make the unit cost of related infrastructure competitive as the cost of infrastructure development will have to be shouldered by the EZ as a whole. In view of similar cases in ASEAN and other countries, a minimum of 500ha should be secured for the EZ. The seaboard EZ is developed in association with large scale seaboard development so that the cost of basic infrastructure is shared with other functions just like the case of Southern Chittagong regional development. In this case, the EZ may become competitive at such a smaller scale as 200ha more or less.

The region where the Medium-term EZ development is sought are Matabari/Maheskhali and its surrounding areas (Cox's Bazar region). Bearing in mind that port construction is under planned in Marabari/Maheskhali areas, it is considered that Seaboard Industrial Zone (which is Seaboard Economic Zone where heavy and petrochemical industries are located) as well as General Industrial Zone (where general and light Industries are located) are to be developed. The above two industrial zones are assumed to be developed in mid-term span of 10 to 20 years after now onward (years 2025-2035), in view of the situation that coal thermal power station and first phase of deep sea port are planned to be constructed nearby in around 2025.

5.2.2.1 Characteristics of medium-term EZ development areas

Candidate sites for Medium-term EZ development may be found in both the core area adjacent to the proposed deep sea port and its surrounding area. The core area consists of the Matarbari Island and the Maheskhali Island, and its surrounding area fall in the administration of the Cox's Bazar district. The latter consists of three Upazilas of Maheskhali, Chakaria and Cox's Bazar Sadar in the Cox's Bazar District.

(1) Characteristics of the Cox's Bazar Region

Socio-economic characteristics of the three Upazilas constituting the Cox's Bazar region are summarized in Table 5.2.1-1. The following characteristics are seen from the table.

1) The region is basically rural and agricultural with the agricultural income in 2001 accounting for 61.9% of the total income in Maheskhali, 53.1% in Chakaria and34.0% in Cox's Bazar Sadar.
2) The urbanization ration is low in Maheskhali and Chakaria, but in Cox's Bazar Sadar, it increased rapidly from 14.9% in 2001 to 36.5% in 2011. The population density is also low in Maheskhali and Chakaria, but the population density in Cox's Bazar Sadar is comparable to that in Dhaka vicinities.
3) The sex ratio is higher than 100 in the three Upazilas, but has been decreasing in recent years reflecting transition from the traditional society to out-migrating society.
4) For the sex ratio over 100, the labor force coefficient is comparatively small and family size is rather large, indicating large shares of young people. In fact, the share of population in the age 0-14 years old is 42.9% in Maheskhali, 42.7% in Chakaria and 39.4% in Cox's Bazar Sadar as compared to the Bangladesh average of 34.6% in 2011.
5) The literacy rate is significantly lower than the average of 51.8％ in Bangladesh and 54.2% in Dhaka District, and the rate is particularly low at 30.8% in Maheskhali.

Table 5.2.1-1 Comparison of Three Upazilas in the Cox's Bazar Region by Selected Socio-economic Indices

Upazila	Population	Population	Land area	Population density	Population growth	Urbanization rate	Household size	Sex ratio	Labor force coefficient	Literacy rate	Economic structure	Industries	Agriculture	Main exports
	2001 census	2011 census	(km^2)	2011 ($/km^2$)	2001–11 (%p.a.)	2001 2011 (%)	2001 2011	2001 2011	(%)	2001 2011 (%)	2001 (%)			
Maheshkhali	256,546	321,218	362.18	887	2.27	9 8.5	5.95 5.52	111.5 106.5	53.6	22.5 30.8	Agriculture 61.9 industry 7.8 Services 30.3 (Rent & remittance 0.45)	Salt making, fish processing, flour mill, ice mill Cottage industries: weaving, potteries, handicrafts	Betel, paddy, betel nut Mango, jackfruit, litchi, banana, papaya, coconut	Salt, shrimp, sea-fish, dry fish
Chakaria	319,142	474,465	970.32	489	4.05	16.0 15.3	5.96 5.35	106.7 101.7	53.8	33.5 47.6	Agriculture 53.1 Industry 9.7 Services 37.3 (Rent & remittance 1.13)	Flour mill, rice mill, saw mill, ice factory, salt factory, printing press, welding factory Cottage industries: Goldsmith, blacksmith, potteries, weaving, fish preservation centre, bamboo work, wood work	Paddy, potato, mustard, sweet potato, chili, corn, sugarcane, wheat, peanut, betel leaf, tobacco, cauliflower, tomato, cabbage, brinjal, lady's finger, barbati, felon Mango, jackfruit, litchi, banana, papaya, pine-apple, guava, lemon, watermelon	Shrimp, salt, tobacco, peanut, mustard, flour, watermelon, wood
Cox's Bazar Sadar	348,075	459,082	228.23	2,011	2.81	14.9 36.5	5.96 5.33	115.0 111.1	58.0	39.7 49.2	Agriculture 34.0 Industry 8.1 Services 57.9 (Rent & remittance 4.95)	Garments industry, fish processing industry, fish feed mill, salt mill, ice factory, flour mill, rice mill, saw mill, printing press, welding factory Cottage industries: Goldsmith, blacksmith, weaving, potteries, conch industry, wood work, bamboo work	Paddy, potato, betel leaf, vegetables Mango, jackfruit, papaya, banana, pineapple, betel nut	Betel leaf, betel nut, jackfruit, banana, papaya, pineapple, timber, frozen shrimp, dry fish

Sources: District Statistics 2011, Cox's Bazar, December 2013
Population & Housing Census – 2011, Community Report: Cox's Bazar, Bangladesh

(2) Development Planning for the Core Area of Matarbari/Maheskhali Islands

1) South Chittagong Regional Development Plan

A large scale sea side development complex is conceived as the South Chittagong Regional Development Plan in the core area utilizing the Matarbari Island and part of the Maheskhali Island immediately opposite of the Matarbari Island. The development comprises the construction of a deep water sea port by utilizing the water channel between the two islands, establishment of an import base for energy resources and large scale power generating plants in the immediate hinterland to make this area the major power supply center of Bangladesh as a whole.

Associated with these facilities, a Seaboard EZ and a General EZ are planned to utilize the port and the power plants together with related urban development and major infrastructure development serving these facilities and areas. The Medium-term EZ development

planned by the present JICA study will have to be promoted in line with the South Chittagong Regional Development Plan through a close coordination.

The South Chittagong Regional Development Plan characterizes the development of the Matarbari area toward 2031 by the following roles:

i) Power and energy hub of Bangladesh as a whole,
ii) Provision of incubation function and model characteristics for Bangladesh manufacturing sector,
iii) Gateway for production and supply chains linked with neighboring countries, and
iv) Receiving area for existing industries to be transferred from the Dhaka and the Chittagong areas.

The characteristics 1) and 3) will be supported by the deep water sea port and the large scale power plants. Cooperation with neighboring countries, especially ASEAN countries, through the international division of works for production and the supply chains will facilitate upgrading of the Bangladesh manufacturing sector to justify the characteristic 2) for incubation function and model characteristics. Transfer of key industries from the Dhaka and the Chittagong areas will be facilitated by 1) availability of ample and inexpensive labor force, especially youth trainable for skills, 2) ample land spaces, and 3) linkages with the Seaboard EZ.

2) Socio-economic framework for regional development

The South Chittagong Regional Development Plan has been pursued as part of the major development initiative of Bangladesh called the Big-B initiative, which aims at developing industrial accumulation and logistic hubs in the "economic growth belt zone" linking Dhaka, Chittagong and Cox's Bazar. The socio-economic framework for the Big-B Area has been worked out by another JICA team, which serves as a framework for the EZ development in the Matarbari/Maheskhali areas.

The socio-economic framework for the Big-B Area with Cox's Bazar is summarized in Table 5.2.1-2. As seen from the table, the Cox's Bazar Zone is expected to grow faster than the rest of the Big-B Area and much faster than Bangladesh as a whole. Consequently, the per capita GRDP in the Cox's Bazar Zone is projected to increase from 69.7% in 2011 to 92.3% in 2031 of the respective per capita GRDP in the Big-B Area as a whole, far exceeding the per capita GDP of Bangladesh in 2031.

Table 5.2.1-2 Socio-economic Framework for Big-B Area Development and Cox's Bazar

(1) Population (Unit: 1,000)

Zone/Area	2011	2026	2031
Cox's Bazar Zone	2,290	3,298	3,810
Big-B Area	47,513	56,903	61,841

(2) GDP/GRDP (Unit: billion Taka in 2014 prices)

Zone/Area	2011	2026	2031
Cox's Bazar Zone	111	634	1,003
Big-B Area	3,104	12,492	17,693

(3) Per capita GDP/GRDP (Unit: Taka in 2014 prices)

Zone/Area	2011	2026	2031
Cox's Bazar Zone	62,905	192,330	263,966
Big-B Area	80,619	219,523	286,099

Source: JICA, Data Collection Survey on Integrated Development for Southern Chittagong Region, 2016.

The Cox's Bazar region defined in this chapter is part of the Cox's Bazar Zone defined by the Big-B initiative. In fact, the rapid development of the Big-B Area depends partly on the

development of the Cox's Bazar region with EZs. From the socio-economic framework for the Big-B development, the population in the Cox's Bazar region is expected to grow from 1,255,000 in 2011 to some 2 million in 2031 as a modest estimate. This population corresponds to labor force of some 1.2 million, which will require employment opportunities of 700,000 in 2031 at least. Most employment opportunities are expected to be generated by EZ development directly and indirectly.

Also, urban area should be much expanded to accommodate the increased population induced by the EZ development in the core areas. EZ development for 1,000 ha may generate employment opportunities of some 40,000 directly, benefitting their family members of some 200,000 household population. Including service household population, a total of some 500,000 people may settle around the EZ sites in Matarbari/Maheskhali Islands. This will require significant land development around the EZ sites including new cities development. According to the socio-economic framework for South Chittagong Regional Development Plan, urban population in the Cox's Bazar Zone will increase by 368,000 during 2011-31. Most increase should occur around the EZ sites in Matarbari/Maheskhali Islands.

(3) Possibilities of industrial cluster development along with EZs

The Bangladesh Government is promoting EZ development to attain high economic growth through the development of domestic industries by effective linkages with export oriented industries mainly by foreign capital. To establish and strengthen linkages between domestic and export industries, promotion of industrial clusters is effective. Also, industrial clusters may effectively link livelihood activities by local people, through indigenous industries to export industries, thus serving for poverty alleviation in the region as well.

i) Vertical extension of the textile and garment industrial cluster

In Bangladesh, an industrial cluster has been developing centering on textile and garment related industries. The cluster may be deepened by strengthening upstream industries such as spinning and textile, mechanization of weaving, dying and printing, and other related activities. Since Bangladesh textile and garment industries are totally depending upon the supply of raw fabric from abroad, it is much advisable to develop back-ward linkages to create an industrial cluster which manufactures the petro-chemicals and synthetic yarn products.

It is also desirable to promote value-added by promoting a forward-linkage towards design industry and brand development. Thus the textile and garment industrial cluster development should be pursued encompassing research and development functions as well.

2) Ship-breaking, Steel Re-rolling and Shipbuilding industrial cluster

Possibility exists also to establish another industrial cluster based on an integration of the existing ship breaking, steel re-rolling, ship repairing and ship building as well. Skills and expertise accumulated through ship breaking may be combined with existing steel making and re-rolling to establish relatively small steel manufacturing and ship building within a Seaboard EZ. The cluster may be deepened by developing small machinery and parts manufacturing, light engineering and other related industries.

3) Agro-fishery processing and halal foods industrial cluster

Of the promising industries identified, halal industry is particularly promising for cluster development. As interests in Islamic culture are raised worldwide, halal industry has been promoted even in some non-Muslim countries in view of large and expanding market for various halal products. It is quite natural to promote halal industry in Bangladesh having 90% plus Muslim population. The halal industrial cluster should be pursued to promote private halal business under the Government support. The cluster should encompass quality

control of halal products, halal certified laboratory for the analysis of ingredient and nutrition composition, hygiene control laboratory for quality control of local products, and a food processing experimental factory for development of new local agro-fish foods.

Another vertical industrial integration may be promoted based on integrated farming of livestock and feed production. Production increase of cattle/poultry and feed will contribute to halal industry, and fertilizer manufacturing may be incorporated in the cluster as well. In the further future, the cluster may be extended to leather and its products manufacturing. By effectively utilizing skills and expertise accumulated by textile and garment industries, the cluster can be naturally extended to leather and chemical shoes manufacturing.

In addition to these resources, Bangladesh is rich in fishery resources. Deep-sea fishing and aquaculture of shrimps at the coastal areas are promising, since they have bases of skills and human resources. They may be developed into another industrial cluster by including fish-processing, ice making and frozen products manufacturing. The cluster may be deepened by incorporating multi-trophic aquaculture with multi-layer food chains. Aquaculture of fish and shrimps by feeding, seaweed cultivation by non-organic nutrient supplements, and shell fish cultivation by organic nutrients may be combined to establish an environmentally sound, economically stable and socially acceptable cluster.

(4) General Geographic Information at Core Area and Cox's Bazar Region

Candidate sites for medium term EZ development are assessed first in a macroscopic way for seven broad areas with respect to seaboard and general EZs. More detailed assessment of specific sites follow.

1) Matarbari Island

According to the South Chittagong regional development planning, a deep sea port will be constructed by utilizing the water channel between the Matarbari Island and the Maheskhali Island, and on the Matarbari Island, complex facilities related to the port will be established in the port hinterland. To allow land use of high quality, large scale land reclamation will be necessary to raise the land level to avoid flooding under any foreseeable conditions. Resultant high cost land will justify high value use.

2) Immediate opposite side of Matarbari Island on Maheskhali Island

On the Maheskhali Island on the opposite side of the Matarbari Island, related facilities are planned by the South Chittagong regional development planning. In addition to the deep sea port and energy related facilities, it is possible to establish a seaboard EZ. As large scale land reclamation is necessary for the port and energy related facilities to raise the land level to protect these high value facilities, the seaboard EZ may be located behind the raised land to save the land reclamation cost to a certain extent. Even in this case, the EZ should be planned with limited area for carefully selected industries of high value-added to minimize the conflict in land use with other high value uses.

3) Hilly land on Maheskhali Island

On the hilly inland area of the Maheskhali Island beyond low land area, it seems possible to delineate a sizeable land practically without land reclamation. This hilly land with high elevation, however, has been designated as protection area by the Ministry of Environment and Forestry since 1953. Limited flat land area are used for paddy cultivation and settlement. Use of this area for the EZ is subject to dissolution of the protection designation, but it is considered extremely difficult in Bangladesh to convert forest land for other uses.

4) Northern lowland on Maheskhali Island

Salt farms extend in the northern lowland area of the Maheskhali Island, where subsistence

fisher folks are engaging also in shrimp farming. The access road from the main land passes through this area to reach the Matarbari Island. This area is expected to be developed in relation to the seaboard development by the South Chittagong regional development. The land along the road is generally lower than the road level by 2m more or less.

5) Southern lowland on Maheskhali Island

Lowland extends in the Kutubion area and on the Sonadia Island opposite of Kutubjon separated by a water channel from the southern part of the Maheskhali Island. Sonadia was once designated as a protection area in 1999, but the designation as Environmentally Critical Area (ECA) has been dissolved except a part of the protection area. As the land consists of the government land and char land, no land acquisition will be necessary, but land reclamation to raise the land level by at least 5m is necessary. There are more than 100 illegally settled families along the southern coast of Kutubjon, and about 150 Hindu minority people who suffered from disasters have settled in the northern part of the coastal road.

6) Coastal area of the mainland

The national road extending from the Chakaria city to the Cox's Bazar city runs largely on ridges in south-north direction, along where many people live. In the western side of the national road, small streams drain the land toward the Maheskhali channel, which support the paddy cultivation in generally low and wet land. The southern part of the area is hilly, where a new bridge to link to the southern part of the Maheskhali Island has been conceived. In this hilly area, a General EZ may be developed if effects of high tides from the channel on the land are prevented by the road on embankment together with land reclamation to raise the land level by more than 5-6m above the sea level. Land prices are on the higher side, although the area is located in some distance from the Cox's Bazar city.

7) Chakaria area

The national road linking the Cox's Bazar city and the Chakaria city extends to the north and enters hilly areas, where extensive farmland is mixed with wasteland in lowland and a part of the hilly land. It seems possible to delineate sizeable land for a General EZ in the north of Chakaria Upazila. The elevation there is in the range of 5-6m above the sea level, and the land is inclined toward the north. These conditions will make land reclamation necessary with land raising by 5.0~5.5m to ensure adequate drainage.

5.2.2 Evaluation of Candidate Sites for Medium-term EZ Development

5.2.2.1 Locations, Conditions and Screening of Medium-term EZ Candidate Site

(1) Approximate Locations and Areas of Medium-term EZ Development Candidate Sites

BEZA and JICA Survey Team have, through the joint reconnaissance surveys, identified and nominated nine (9) of medium-term EZ candidate sites in and/or around the Moheshkhali Island which are shown on Table 5.2.2-1. ① ~ ③ done by EZ study team and ④ ~ ⑦ done by BEZA. ⑧ and ⑨ locate within or adjacent to a Matabari industrial complex which were planned by Chittagong team. In respect of site areas and locations, see **Table 5.2.2-1** and **Figure 5.2.2-1** respectively.

The nine (9) candidate sites around Moheshkahali Island which have been recommended by BEZA and JICA Team are as follows: ①～③ was recommended by the JICA EZ Study Team, ④～⑦was done by BEZA, and ⑧ ~ ⑨ was proposed by the JICA South Chittagong Survey Team.

Table 5.2.2-1 Medium-term EZ Development Candidate Sites

No.	Name of EZ Development Site	Proximate Area	Remarks (Type of EZ)
①	Moheshkhali South	1,075 ha	General (Inland) EZ
②	Cox's Bazar North	800 ha	General (Inland) EZ
③	Chakaria North	800 ha	General (Inland) EZ
④	Moheshkhali East (EZ-1)	575 ha	General (Inland) EZ
⑤	Moheshkhali North (EZ-2)	300 ha	General (Inland) EZ
⑥	Moheshkhali West (EZ-3), Dholghata	271ha	Occupied by a planned container port
⑦	Cox's Bazar Free Trade Zone	3,976 ha	Seaboard EZ
⑧	Moheshkhali-2 EZ	400 ha → 400 ha (Final)	General (Coastal) EZ
⑨	Moheshkhali-1 EZ	600 ha → 605 ha (Final)	Seaboard EZ

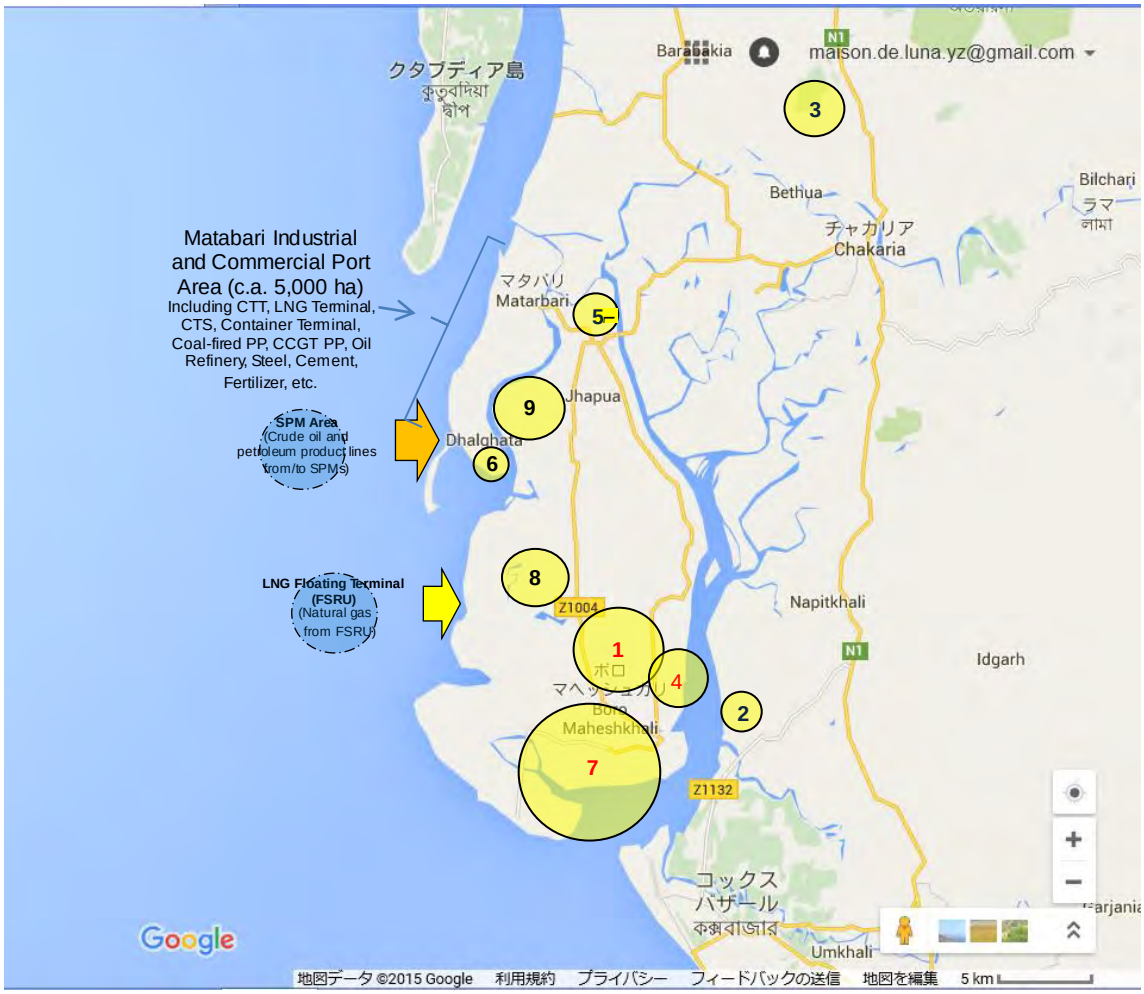


Figure 5.2.2-1 Locations of EZ Medium-term Development Candidate Sites in/around Moheshkhali Island

(**Source:** JICA Study Team)

(2) Site Conditions and Screening on Medium-term EZ Development Candidate Sites

In/around the Moheshkhali Island, nine (9) EZ development candidate sites have been finally proposed by both BEZA, JICA EZ study team and South Chittagong survey team. Locations, site conditions, etc. on these candidate sites are shown in **Figure 5.2.2-1** and tabulated on **Table 5.2.2-2**. Candidate sites, which have such sudden death conditions as shown below, will be exempted from candidate sites. The description in the table corresponding to sudden death condition are written in red and exempted candidate sites are written in red. .

Table 5.2.2-2 Medium-term EZ Candidates (Around Meheshkahli Island) and their Site Conditions

項目	Location/Name of Candidate Economic Zone (EZ)									
	① Moheshkhali South	② Cox's Bazar North	③ Chakaria North	④ Moheshkhali East (EZ-1)	⑤ Moheshkhali North (EZ-2)	⑥ Moheshkhali West (EZ-3) (Dhalghata))	⑦ Cox's Bazar Free Trade Zone (Kutubjom))	⑧ Moheshkhli-2 General EZ	⑨ Matabari-1 Seaboard EZ	⑩ Zero Option)
1. Location and Site Conditions of the project										
1.1 Scale, Shape and Land Owners of , Magnitude of the EZ	*1,075 ha (Khash land)*	*288 ha (Mixed private and Khash lands, but almost private land)*	*362 ha (Almost private land)*	*575 ha (Almost Khash land, but, shape of land is longwise and near to mangroves. Therefore it is not suitable for EZ.)*	*331 ha (Khash land near to the proposed industrial complex (Deep-sea ports and industrial areas)*	*271 ha Within the proposed industrial complex (Khash land, sandbars, private land and BWBD-owned land)*	*3,976 ha (A vast land extends over Kutubjun, Ghatibhanga and Sonadia Island. A deep-sea port is planned in here as well.)*	*40 ~1,000 ha (Almost tidal areas, south of the site of coal-fired station plants by BDPD)*	*570 ha (Adjacent to the site of the Matabari Industrial Port)*	
1.2 Access to existing main roads and distance from main cities and towns	*The local road (Z1004) passes near the site.*	*The local road (Z1132) passes near the site connecting to the national highway (N1). However, the local road needs to be widened.*	*A road crosses the site to connect to the national highway (N1).*	*A road runs along the site, however, needs to be widened.*	*The road (R172) passes through the site to connect to the national highway.*	*The roads planned in the proposed industrial complex will be made use of or new roads must be provided for the EZ.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	
1.3 Nearest Rivers and Seas – Potential of water logging, proximity to sand dredging/unloading points, etc.	*The site exists in the reserved forests on hills far away from the Moheshkhali Channel, therefore sand filling and banking are not required to escape from flood.*	*Dredged materials suitable for filling and banking are available from the Moheshkhali Channel.*	*Matamuhuri River*	*Moheshkahali Channel*	*Kohelia River (However, the deep-sea ports are planned in here.)*	*Bay of Bengal*	*Moheshkahali Channel (Good and proper sand borrow pits)*	*There is no suitable sands and aggregates for construction. Therefore, it must be imported from foreign countries.*	*Same as in the left.*	
1.4 Other site conditions – Climate, terrain, geology, flood & water logging, storm surge by cyclone , geography, neighborhood population, fishery rights and peccaries, reserves, protected species and properties	*Sub-tropical (Reserved forests on hills, Population: 450,000 (in total of Kutubdia, Matabari and Moheshkhali Islands)*	*Sub-tropical (Rice paddy near to mangroves, salt farms, shrimp farm, Population: 120,000 (Cox's Bazar)*	*Sub-tropical (Rice paddy, Population: 410,000 (チャカリア))*	*Sub-tropical (Near to planted mangroves ,reserved forest in the north of the site, Population: 450,000 (in total of 3 islands))*	*Sub-tropical (Shrimp farm, salt farms, population: 450,000 (in total of 3 island)*	*Sub-tropical (Salt farms, population: 450,000 (in total of 3 island) However, the site is planned to be developed as a deep-sea container port.*	*Sub-tropical, (Salt farms. Mangroves, tidelands, etc. population: 450,000 (in total of 3 islands). The Sonadia Island is designated as an ECZ (Ecological Critical Zone))*	*Same as in the left.*	*Same as in the left.*	
2. Plants and Facilities envisaged in the project site and needed infrastructures										
2.1 Onsite plants and facilities	*Rainy drain, regulating pond, water supply and sewerage, water wells, (power plants), buildings, roads, etc.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	
2.2 Offsite facilities and infrastructures – Access roads and utilities such as power, gas, waters, etc.	*Supplied by the proposed industrial complex.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	
3. Contribution to Bangladeshi Economics and Social life (Wide-area and mid-to-long term environmental and social impacts)										
3.1 Industrial development and employment promotion	*Many foreign enterprises advance to Bangladesh to Bangladesh to encourage industrial development and employment.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	*(No industrial promotion and impacts to environment)*
3.2 Enhanced standards of life	*Standards of life are improved and enhanced.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	*(No impacts to environment)*
3.3 National and reginal development	*Energy and social infras will be well provided.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	*(No impacts to environment)*
3.4 International contribution – Global warming protection, etc.	*As many industries and factories advance to Bangladesh, consumption of electric power and fossil fuels increases to emit*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same in the left.*	*Same as in the left*	*Same as in the left*	*Global warming will be depressed if EZ development*

項目	Location/Name of Candidate Economic Zone (EZ)									
	① Moheshkhali South	② Cox's Bazar North	③ Chakaria North	④ Moheshkhali East (EZ-1)	⑤ Moheshkhali North (EZ-2)	⑥ Moheshkhali West (EZ-3) (Dhalghata))	⑦ Cox's Bazar Free Trade Zone (Kutubjom))	⑧ Moheshkhli-2 General EZ	⑨ Matabari-1 Seaboard EZ	⑩ Zero Option)
	GHG such as CO_2 to accelerate global warning → Sea level will raise to lose a lot of lands. *Especially in a delta country of Bangladesh located at the downstream mouth of large rivers such as the Gangs River and the Bramaputra River, etc. will be affected adversely. impacted affected (60 cm of sea level rise loses 10% of Bangladeshi lands) → By energy saving and shifting to renewable energies such as solar, wind , etc. Low carbon society shall be realized in future.*								*projects are no realized.→ Therefore, zero option is the most environmentally-friendly option.*
4. Environmental and Social Impacts										
4.1 Pollutions – Envisaged tenants which emit and discharge pollutants, etc. (Light industries and/or heavy industries)	*Light industries such as garments, textiles, food processing, machineries, electronic components, machinery parts, etc.*	*Same in the left.*	*Same in the left.*	*Public facilities such as laboratories, cultural facilities, hospital, etc.*	*From the reason that it is near to the proposed industrial complex and deep-sea port, industries related to heavy industries such as crude oil refining, cement, steelmaking, petrochemical, etc. will be envisaged in the proposed EZ.*	*Same in the left.*	*As exposed to the Ocean (the Bay of Bengal), it is easy for big ships and boats to enter into and out. Therefore, heavy industries and related factories will advance.*	*Same as in the left.*	*Same as in the left*	*(Pollutions will be limited.)*
4.2 Natural environment – Rice paddy, tideland, marsh, mangroves, choral, etc. (Disaster risks such as erosion, siltation, flood & water logging, and any other adverse environmental impacts)	*Reserved forests*	*Rice paddy*	*Same in the left.*	*In scattered and spotted reserved forests near to planted mangroves*	*Shrimp farm, Salt farms*	*Salt farms*	*Salt farms, tideland. The Sonadia Island is a hatchery for sea turtles and designated as an ECC (Ecological Critical Zone). Storm surge protection is needed. → Difficult to obtain an ECC from the Bangladeshi DoE. NGOs' opposition campaign is expected.*	*Same as in the left*	*Same as in the left*	*(No impacts to environment.)*
4.3 Social impacts – Involuntary resettlement & relocation of people and houses, ethnic minorities, etc.	*No squatters and no involuntary resettlement*	*No squatters, but, a minority group of Buddhists is living.*	*20 families are living, but, they agree about their resettlement or relocation.*	*In the north, a minority group of Hindu is living, difficult to negotiate with them about their resettlement and relocation.*	*No involuntary resettlement and not any minority group living.*	*Same as in the left.*	*Some squatters (more than 100 families9 and a minority group of about 50 Hindu) living. Increasing squatters in the Sonadia Island.*	*No people living.*	*No people living*	*(No impacts to environment)*
4.4 Others – Environmental impacts during construction such as nuisance to residents, etc. (Noise & vibration, odor, etc.)	*Noise, dust, traffic jam, etc. due to transportation dredged materials, etc.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*Same as in the left.*	*(No impacts to environment)*

(注) a) → : Consequent results and mitigations (or countermeasures), b) Red letters: Sadden death (Killer) condition or equivalent (e.g. Issues, actions, and events which are envisaged as JICA's screening category A and more impactive, etc.)

■ **Site Conditions of nine (9) medium-term EZ development candidate sites**

① **Moheshkahali South (Fakiragaon) :** The candidate site locates in Pahar (Mouza) of Fakiragaon (Upazila), and belongs to Chittagong reserved forests (c.a. 12,000 ha)。 Therefore, it is not preferable as an EZ development candidate site.

② **Cox's Bazar North (Chaufaldandi):** The area is c.a. 388 ha in total. About 21 ha belong to the Ministry of Land (Khash Land), 11 ha to other governmental organization and the remaining lands of c.a. 356 ha to private lands. The candidate site is 2 km away from Parishad (Union) and 10 km from Sadar (Upazila). There are paved roads in Eidgaon connecting to the Chittagong-Cox's Bazar Road (N1) at the point of 5 km far away from the candidate site. There are also asphalt paved and brick paved road from Cox's Bazar Sadar to the candidate project site. However, this road is narrow and there are many settlements along the both sides of this road.

The infrastructures within the candidate project area are well developed. There is no permanent settlement, but, 25 to 30 temporary thatched, bamboo or tin roofed houses exist adjacent to the road.

Main occupation are salt manufacturing, shrimp farming and dried fish and agriculture. There is no potable water between 600 and 700 feet depth causing salinity problem. Water between 800 and 900 feet depth has no salinity but includes high concentrate of iron.

The project site is about 4 feet lower than the existing roads but the land is plain and flat. There is a forest in Cox's Bazar which is away from 1.5 km from the south corner of the project area.

③ **Chokoria North:** The area consists of 3 mouzas viz. Harbang (in Harbang Union), Baraitali (in Harbang Union), and Pahar (in Baratitali Union). The area in total is about 360 ha. Among them, about 331 ha of private land and about 29 ha of khash land. The Chittagong-Cox's Bazar Road (N1) passes along the project area. There is a road of 22 feet wide in the project area. The land must be filled by sand to prepare EZ sites.

④ **Moheshkhali East (EZ-1:Kalarmarechara):** The area is about 575 ha compromising about 215 ha of Khash land and about 360 ha of sandbar. The project area compose 4 mouzas, viz. "Choto Moheshkhaki", "Pahar Thakurtola", "Thakurutota", and "Gorokghata". The site is about 1 km away from Parishad (Union), 3.5 km from Moheshkahali (Upazila) , and about 40 km (road distance) away from Cox's Bazar. There is 4 km away from Sadar Cox's Bazar Sadar by a channel . There are no permanent structures , but some illegal squatters and 250 to 300 families are living in the project site. Here are some hills and sandbars. To be free from flood, the land must be filled by materials.

There are various power plants operated by the government in the Moheshkhali Island. Therefore, electricity is available here. Cement and sand are available about 3.5 km way from Moheshkhali Sadar (Upazila) and bricks are available within 1 km north away from the clay mines.

⑤ **Moheshkhali North (EZ-2:Kalarmarchara):** The area is about 331 ha and in North Nobila Mouza (in Kalamarchahara Union). Among them, 74 ha of Khash land and 257 ha of private land. The project area is mainly cultivated by shrimps and farmed by salt fields. There is no permanent structures, therefore, no problem for land acquisition. The site is about 5 to 6 feet lower than the main land; however, not so much land filling is required. Here is a road network developed well. Therefore, easy to access to the whole country by roads through Moheshkahali via Chakoria.

⑥ **Meheshkhali West (EZ-3:Dhalaghata) :** The project site belongs to Dhalghata (Mouza) in the Moheshkhaki Island. The area is about 271 ha in total. Among them, about 90 ha of the Ministry of Land, 66 ha of other governmental organization of WPDB (Water Power Development Board) and the remaining 115 ha for private land. Land filling is required to raise the land up to flood free level. The project site is near to the proposed industrial development zone with industrial port and commercial port. The site is also **vulnerable and** susceptible to **disasters such as storm surge tide, flood, etc. T**he project site is also near to the proposed super critical coal-fired power plants, therefore, electricity will be available easily in future.

However, the project site overlaps the proposed industrial development zone, therefore, it is necessary to discuss with the study team for the Integrated Development for Southern Chittagong Region.

⑦ **Cox's Bazar Free Trade Zone (Kutubjiom):** The EZ development candidate site comprises 4 mouzas, viz. "Hamidardia", "Kutubiomu", "Ghoti Bhanga" and "Sonadia". About 1,251 ha of Hamidardaia and Kutubjom, about 2,263 ha of Ghotibanga, and about 462 ha. About 3,976 ha in total.

The area is about 50 km away from Cox's Bazar by car and 6 km away by boat. About 5 km away from Moheshkhali Sadar and about 35 km from Choloria via Badharkahali. Land filling is required to flood-free level. Here are sandbars developed and no permanent structures.

BEZA is keen on development of the candidate site. According to BEZA, the site was designated as an ECA but at present or in future exempted from ECAs. Therefore, it is not preferable to develop the site because in fact, there exists valuable animals and plants within or adjacent to the site.

If the Bangladesh stakeholders manage to realize EZ development in here, they must adjust the occupied area with the Kombinat area including industrial and commercial ports area planned at the Matabari and Moheshkhali Islands. In addition, they must confirm whether an ECC will be available or not from an environmental competent authority of the Department of Environment (DoE) in Bangladesh.

At the end of 2015, the Paris Agreement promising that all countries shall take actions to reduce CO_2 emission, has been adopted in the COP 21 in Paris. From strategic (i.e. global and mid-and-long term) environmental viewpoints, Bangladesh is desired to limit fossil-fired power plants especially coal-fired power plants or oblige them to capture and storage CO_2 to head for consuming area dispersed

power generation, low carbon society, and de-carbonization gradually.

⑧ **Mohesshkahli-2 General EZ** : At the north of the site, coal-fired power plants are planned by the BPDP. The project site is almost salt farms and tidal zones. Facing to the Bay of Bengal, mangrove is growing. High dikes are needed because storm surges generated by cyclones are envisaged.

⑨ **Moheshkahli-1 Seaboard EZ:** The Moheshkahli-1 Seaboard EZ is finally selected as a final medium-term EZ development candidate site. The site is almost salt farms. Only a few of shanties exists, but nobody lives. Therefore, resettlement of people and houses occurs. There are a plenty of mangroves growing at the shoreline planned for a construction site of Matabari Industrial Port.

■ Environmental Site Screening of medium-term EZ development candidate sites

In/around the Moheshkhali Island, nine (9) EZ development candidate sites have been finally proposed by both BEZA, JICA EZ study team and South Chittagong survey team. Locations, site conditions, etc. on these candidate sites are shown in **Figure 5.2.2-1** and tabulated on **Table 5.2.2-2** respectively. Candidate sites, which have such sudden death conditions as shown below, will be exempted from candidate sites. The description in the table corresponding to sudden death condition are written in red and exempted candidate sites are written in red.

The process and final results for environmental screening are shown in **Figure 5.2.2-2**.

a. More impactive than JICA's Screening Category A (e.g. people to be resettled (**About 200 and more**), deforesting (About **100 ha and more**), reclamation (**About 50 ha and more**) and any other loss of abundant natural environments such as mangroves, tidal lands, etc.;

b. Lands not suitable for EZs judging from shapes, etc. of lands; and
c. Lands which are overlapped by other projects

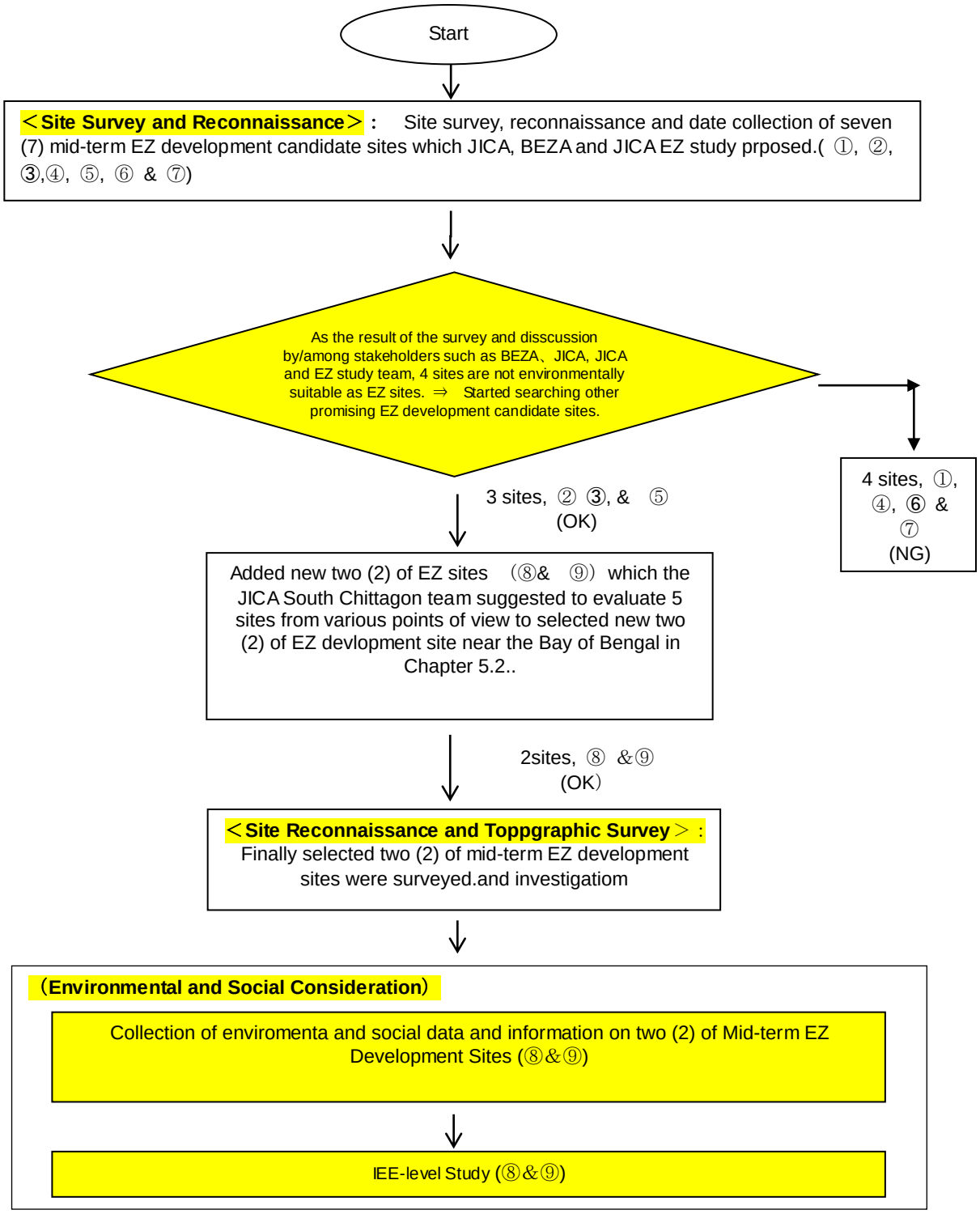


Figure 5.2.2-2

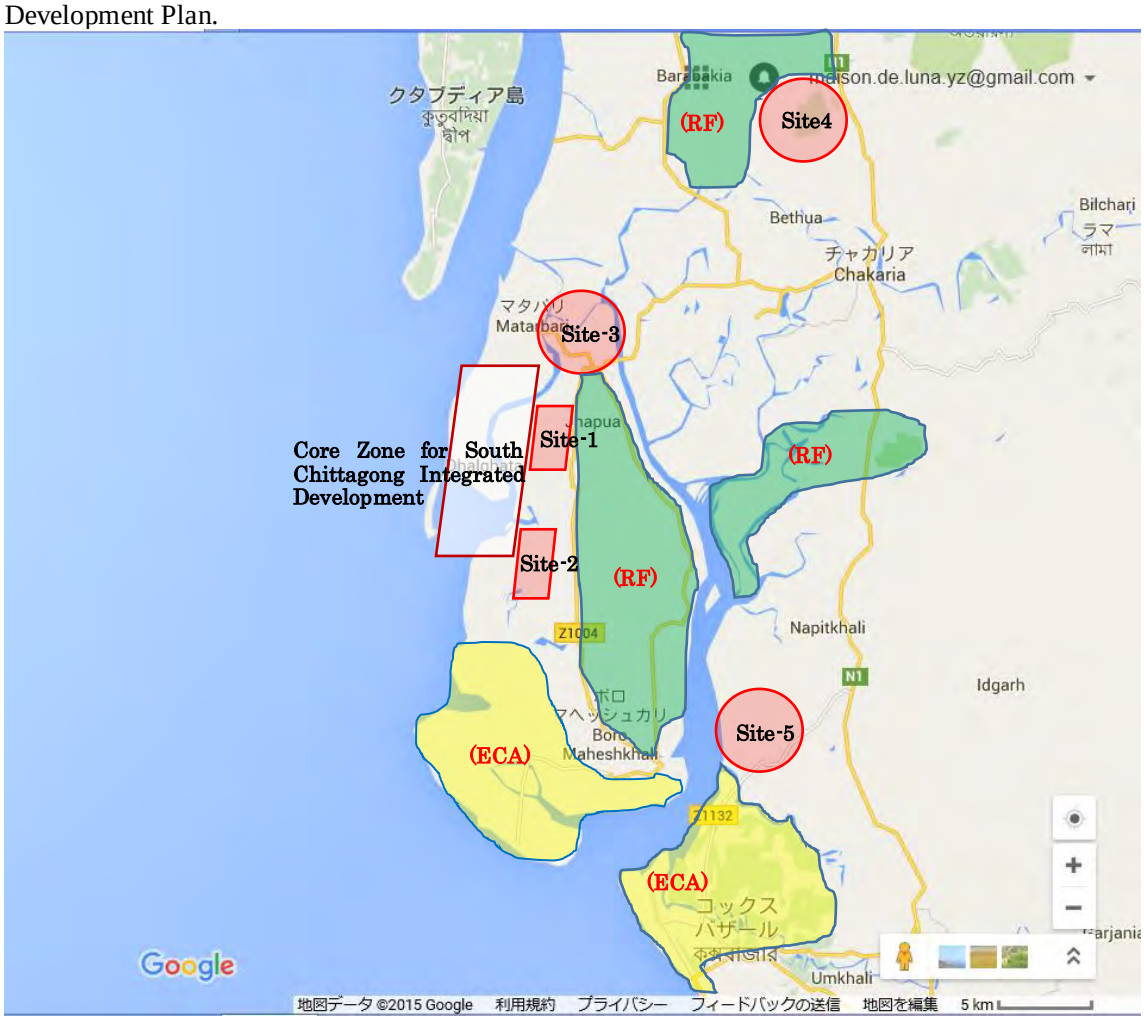
Process Flow of Site Selection of Medium-term EZ Development Sites

5.2.2.2 Assessment of the Short-listed Candidate Sites

Following the screeing of the candidate sites on the physical and environmental conditions, following five (5) possible sites were selected for the Medium-term EZ development:

1） Hinterland of core zone in Maheskhali Island for Seaboard EZ (Site-1),
2） Hinterland of core zone in Maheskhali Island for General EZ (Site-2),
3） North lowland in Maheskhali island（Site-3),
4） Chakaria North（Site-4),
5） Cox's Bazar North（Site-5)

Against these five (5) possible sites, initial assessments including environmental and social conditions have been carried out by the Study Team. Land information for Matarbari Island and around Maheskhali Island including the location of these five (5) candidate sites are shown in Figure 5.2.2-3. As explained in the Section 5.1, Site-1 is classified as a Seaboard EZ and the other four (4) sites are classified as General EZs As for a Seaboard EZ, an integrated development with ports, navigation channels and basins by the cooperation with other development agencies is essential. Among five (5) candidate sites, only the Site-1 is suitable for a Seaboard EZ development considering surrounding conditions planned in the South Chittagong Integrated Development Plan.



Note）ECA: Ecologically Critical Area, RF: Reserve Forest

Figure-5.2.2-3 Location Map for Five (5) Medium-term EZ Development Sites around Maheskhali Island

For the above recommended five (5) possible sites for Medium-term EZ development around Maheskhali Island, the comparative study with the qualitative evaluation shall be done to be selected for formulation of a Medium-term EZ development plan. The qualitative evaluation will be done with the following five (5) items.

1) Conditions of site location
2) Convenience from main road/port
3) Regional development impact
4) Risk of flood/storm surge
5) Land development

For each item, the following grades are qualitatively evaluated.

A: Good, B: Fair, and C: Poor

The results of quantitative evaluation are shown in Table 5.2.2-3.

Table 5.2.2-3 Comparative Study with Qualitative Evaluation

Comparative Items	Site-1: Maheskhali -1 (Seaboard EZ)	Site-2: Maheskhali -2 (General EZ)	Site-3: Maheskhali North (General EZ)	Site-4: Chakaria North (General EZ)	Site-5: Cox's Bazar North (General EZ)
(1) Conditions of EZ Location	・The land consists of swamp, salt firm and farmland, and certain area is submerged with sea level. (+) ・Development area is about 600 ha. A little resettlement in salt firm is required. (+) ・The site locates behind the port area in the core area of south Chittagong integrated development, where BEZA starts land acquisition. (+) Totally "good" conditions of EZ location.	・The land consists of swamp, salt firm and farmland, and certain area is submerged with sea level. (+) ・Development area is about 400 ha. A little resettlement in salt firm is required. (+) ・The site locates behind the port area in the core area of south Chittagong integrated development, where BEZA starts land acquisition. (+) Totally "good" conditions of EZ location.	・The land consists of swamp, salt firm and shrimp culture, and always is submerged with sea level through the year. (+-) ・Development area is about 300 ha. Some resettlement in salt firm and shrimp culture is required. (+-) ・The site locates in north low land in Maheskhali island where BEZA makes the plan. (+-)	・The land consists of farmland with less than one cropping pattern and field. The vicinity along the river stream is flooded in the rainy season. (+-) ・Development area is more than 800 ha. No resettlement is required. (+) ・The site locates in Chakaria of the main land as surrounding area of south Chittagong integrated development. (+-)	・The land consists of farmland with less than one cropping pattern and field. The most land is flooded in the rainy season. (+-) ・Development area is more than 800 ha. A little resettlement is required. (+) ・The site locates in Cox's Bazar of the main land as surrounding area of south Chittagong integrated development. (+-)
	A	A	B	B	B
(2) Convenience from main road/port	・Along the future trunk road for south Chittagong integrated development. (+) ・Behind a new industrial port. (+) Totally "good" access to	・Along the future trunk road for south Chittagong integrated development. (+) ・Behind a new commercial port. (+) Totally "good" access to	・Along the future trunk road for south Chittagong integrated development. (+) ・Within 8km direct distance from a new commercial port. (+-)	・Along the regional trunk road from N1 Highway. (+) ・Within 26km direct distance from a new commercial port. (+-)	・6km rural road distance from N1 Highway. About 4km new access road is required. (+) ・Within 22km direct distance from a new commercial port. It

	EZ.	EZ.			requires new bridge to the Maheskhali island. (+-)
	A	A	B	B	B
(3) Regional development impact	・Land use: Cultivable land 5,275. 36 ha, salt production 2,073.4 ha, shrimp cultivation 2,105.69 ha, fallow land 1,715.21 ha. ・Manufactories: Salt mill 6, flour mill 1, ice mill 5. Cottage industries: Weaving 178, other industries 480. ・There is no manufacturing industries except cottage industries. The productivity of agriculture is also low, and there are a lot of petty fishermen. The level of economic development is obviously low compared with neighbor Upazila, and the effect of regional development of the EZ development is high. EZ development will highly contributes to the region.	・Land use: Cultivable land 5,275. 36 ha, salt production 2,073.4 ha, shrimp cultivation 2,105.69 ha, fallow land 1,715.21 ha. ・Manufactories: Salt mill 6, flour mill 1, ice mill 5. Cottage industries: Weaving 178, other industries 480. ・There is no manufacturing industries except cottage industries. The productivity of agriculture is also low, and there are a lot of petty fishermen. The level of economic development is obviously low compared with neighbor Upazila, and the effect of regional development of the EZ development is high. EZ development will highly contributes to the region.	・Land use: Cultivable land 5,275. 36 ha, salt production 2,073.4 ha, shrimp cultivation 2,105.69 ha, fallow land 1,715.21 ha. ・Manufactories: Salt mill 6, flour mill 1, ice mill 5. Cottage industries: Weaving 178, other industries 480. ・There is no manufacturing industries except cottage industries. The productivity of agriculture is also low, and there are a lot of petty fishermen. The level of economic development is obviously low compared with neighbor Upazila, and the effect of regional development of the EZ development is high. EZ development will highly contributes to the region.	・Land use: Cultivable land 27,142 ha, fallow land 180 ha; single crop 27.6%, double crop 61.7%, triple crop 10.7%. Cultivable land under irrigation 79.2%. ・Manufactories: Flour mill 2, rice mill 243, saw mill 60, ice factory 33, salt mill 10, printing press 6. Cottage industries: Weaving 330, welding 37, fish preservation center 85, bamboo work 8320, goldsmith 105, blacksmith 98, potteries 53, wood work 351, and tailoring 1250. ・The primary industry is thriving, it function as a productive center of farm commodities including the supply to the surrounding area. The regional development that considers the necessity of the industrial	・Land use: Cultivable land 8,881 ha, land for salt production 1,012 ha, land for shrimp cultivation 1,214 ha, forest area 7,703 ha, fallow land 271 ha; single crop 32.6%, double crop 65.6%, triple crop 1.77%. Rubber dam has been installed on the Bakkhali and Idgah rivers for irrigation purposes. ・Manufactories: Fish processing 31, fish feed mill 1, salt mill 20, ice factory 20, flour mill 5, rice mill 3, saw mill 10, printing press 12. Cottage industries: Garments 200, weaving 150, conch 50, welding 120, wood work 250, goldsmith 20, blacksmith 20, potteries 150. ・There is the airport, and it is developed to some degree as the tourism

				land conversion of the farmland shall be formulated.	spot. The development of this area shall be integrated with the urban function.
	A	A	A	B	B
(4) Risk of flood /storm surge	・Since planned site suffers the damage of storm surge by cyclone, coastal dike is to be constructed by the Government.	・Since planned site suffers the damage of storm surge by cyclone, coastal dike is to be constructed sharing with the neighbor area.	・Since planned site suffers the damage of storm surge by cyclone, coastal dike is to be constructed sharing with the neighbor area.	・Only storm water drainage system for EZ development area and surrounding catchment area can be considered because of enough elevation of 5-6m above the sea level and land inclined toward inland. Risk of storm surge is low.	・Only storm water drainage system for EZ development area and surrounding catchment area can be considered because of enough elevation of 5-6m above the sea level and land inclined toward inland Risk of storm surge is low.
	B	C	C	A	A
(5) Land development	・4-5m height reclamation with 8-10 m dike are required.	・4-5 m height reclamation with 8-10 m coastal dike are required.	・4-5 m height reclamation with 8-10 m coastal dike are required	・3-4m filling is required.	・4-5m height reclamation is required.
	C	C	C	B	B
Total Evaluation	**Priority A**	**Priority B**	**Priority C**	**Priority B**	**Priority B**

As shown in Table 5.2.2-3, the comparative study with qualitative evaluation resulted in the following ranking;

Site-1：Maheskhali -1： Priority A
Site-2：Maheskhali -2： Priority B
Site-4：Chakaria North： Priority B
Site-5：Cox's Bazar North： Priority B
Site-3：Maheskhali North： Priority C

From the comparative study results as shown above, the following site is recommended for medium-term EZ development (Seaboard EZ) with Priority A.

Site-1：Maheskhali -1（600ha）

For the General EZ, the following candidate sites are recommended with Priority B.

Site-2：Maheskhali -2（400ha）
Site-4：Chakaria North（800ha）
Site-5：Cox's Bazar North（800ha）

5.2.2.3 Final Decision on the Candidate Sites for Medium-term EZ Development

The Second (2nd) JCC meeting was held on May 24, 2016, for the discussion and making the decision on the candidate site for the Medium-term EZ development in Core Areas in Matarbari/Maheskhali Islands. BEZA has requested South Chittagong Regional Development Survey Team of JICA to find at least 2,000 ha of land for Medium-term EZ in the core area of Maheskhali Island. The Chittagong Survey Team has came back with several numbers of Options. BEZA has, based on the recommendation from the Industrial Development Committee being formed by the Prime Minister's Office and other competent authorities, officially selected one site located at the southern bank of the proposed Coal Transfer Terminal (CTT) in the Maheskhali Island for the Seaboard EZ and another site for General EZ where is located just southern part of power station plants to be developed by BPDB, based on the Option 1' which was recommended by the said JICA Survey Team. Layout plan under the Option 1' is as shown in the Figure5.1.3-1 Location map of Seaboard EZ and General EZ.

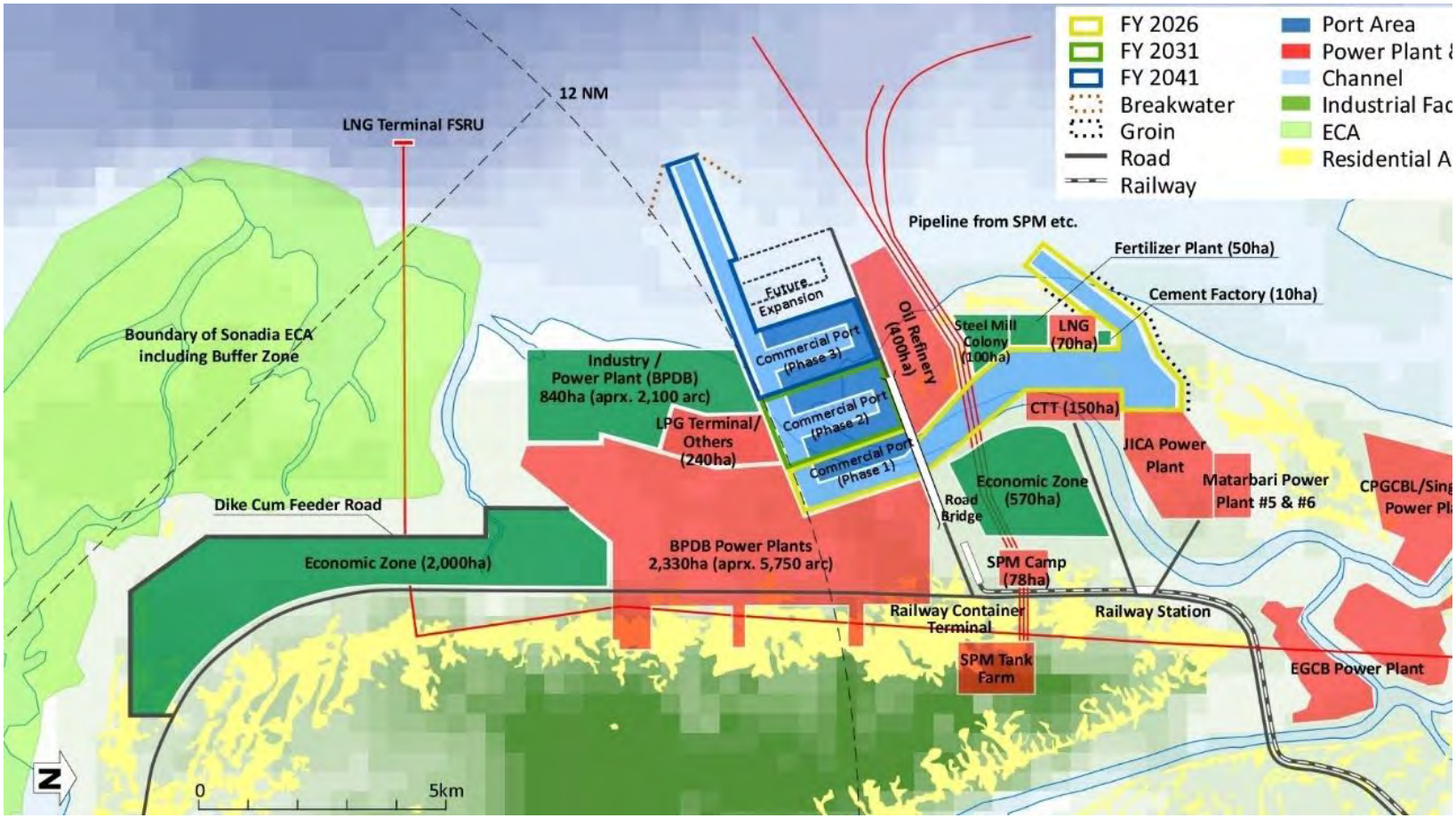


Figure 5.1.3-1 Location map of Seaboard EZ and General EZ

Source: JICA survey team for the project Data Collection Survey on Integrated Development for Southern Chittagong Region of Bangladesh

In the JCC meeting, the JICA Survey Team has also explained the development vision, the basic concept for Medium-term EZ Development and the characteristics of the candidate sites of EZ together with the priority in its assessment. The development vision and the basic concept for Medium-term EZ Development studied by the JICA Survey Team were described in the Chapter 5.1. The pros and cons of the candidate sites are summarized as follows:

	Site 1 & 2 : Core Area in Maheskhali	Site-4 : Chakaria North Site-5 : Cox's Bazar North
Pros	1) Lower land acquisition costs because of government land 2) Closer integration between apparatus industries and other industries 3) Shorter traffic path of industrial materials/products to/from the proposed port 4) Closer to Energy Sources (Electricity/Oil/Gas)	1) Better access from the regional center of Cox's Bazar and Chittagong. 2) Lower risk of storm surge 3) Lower development costs for disaster prevention. 4) Shorter distance from water source
Cons	1) Higher development costs for disaster prevention (storm surge) 2) Longer access from the regional center of Cox's Bazar and Chittagong. 3) Longer distance from water source	1) Less integration with the apparatus industries and facilities in the Core Area. 2) Higher land acquisition cost due to more private lands 3) Longer distance from Energy Sources (Electricity/Oil/Gas) 4) Higher flood risks

After the discussion among JCC members, the Committee has decided two (2) sites for formulation of the master plan for Medium-term EZ Development as follows:

(1) Site-1: Maheskhali -1 for Seaboard EZ (600ha)
(2) Site-2: Maheskhali -2 for General EZ (400ha)

5.2.3 Particular Site Conditions to be addressed

(1) Storm Surge Protection Plan

1) Procedure of Offshore Wave Analysis

In the EZ candidate site vicinity, because the wave and wind observation record for a long period of time is not available, the GPV (Grid Point Value) data provided by the Japan Weather Association were used. The GPV is (Lon/Lat.) 0.5 ° (Approx. 50 km) intervals, and the estimated value at one hour intervals have been used. In this rough analysis, N21.0 ° E91.0 °point as offshore waves was used, and the GPV of Jan. 2010 for five years until Dec 2014. (See Fig.5.2.3-1 Yellow point).

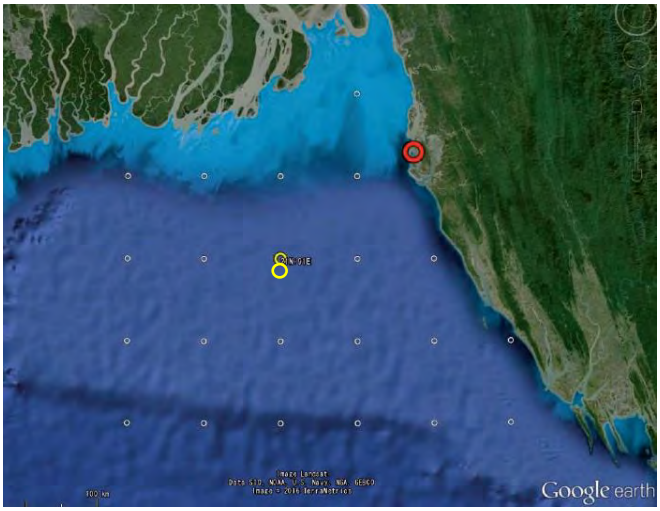


Fig. 5.2.3-1 PGV Point for Offshore Wave Determination

In addition, in the GPV data, since there is a possibility to underestimate the maximum wave position and the time interval is large as described above, SWAN (Simulation Waves Nearshore) for the 10 years of the Bay of Bengal cyclone of from 2005 to 2014 was carried out wave hindcasting. The estimated results of the cyclone information and cyclone waves of this period are summarized in Tables 5.2.3-1 and 5.2.3-2.

The trace of cyclone courses for 2007 is indicated in Fig. 5.2.3-2.

Fig. 5.2.3.-2 Trace of subject Cyclone course in 2007

Table5.2.3-1 Results of Cyclone Wave Hindcasting (2005 – 2014)

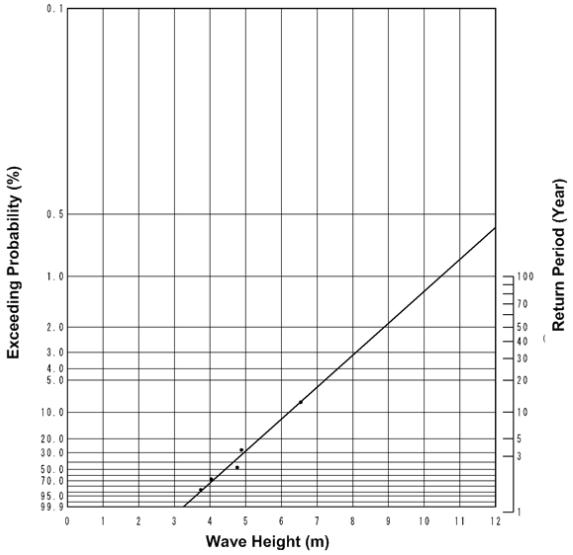
Cyclone Data							Offshore Hindcasting Point (21.00N 91.00E)					
Year	CY	Rise (Data/Time)	End (Date/Time)	Duration	Max Wind Speed (msec)	Central Pressure (hPa)	Wave Height (m)	Wave Period (sec)	Wave Direction (degree)	Wind Speed (m/sec)	Wind Direction (degree)	Date & Time
2005	3	10/01 06:00	10/03 06:00	2 days	20.6	994	2.09	10.2	243.1	5.5	4.5	2005/10/03
2005	7	12/14 18:00	12/24 00:00	9 days	23.1	991	0.60	10.6	210.9	0.5	279.8	2005/12/24
2006	2	04/24 06:00	04/29 12:00	5 days	61.7	922	2.85	12.7	168.3	4.8	221.8	2006/04/28
2006	5	09/28 00:00	09/30 00:00	2 days	18.0	997	0.57	6.4	224.2	0.5	310.7	2006/09/29
2007	1	05/13 00:00	05/15 00:00	2 days	33.4	976	4.86	12.5	135.7	16.2	197.7	2007/05/14
2007	3	06/20 18:00	06/27 12:00	6 days	25.7	985	0.51	6.8	201.9	0.3	319.8	2007/06/22
2007	4	06/27 00:00	06/30 06:00	3 days	23.1	988	1.79	10.0	226.6	2.1	333.3	2007/06/29
2007	6	11/10 06:00	11/16 00:00	5 days	72.0	918	10.19	12.6	206.4	31.8	25.8	2007/11/15
2008	1	04/25 12:00	05/04 00:00	8 days	59.2	937	2.22	11.8	204.3	2.6	258.2	2008/05/01
2008	2	09/15 06:00	09/18 12:00	3 days	20.6	993	1.04	7.7	240.5	3.8	340.5	2008/09/16
2008	4	10/24 06:00	10/27 06:00	3 days	23.1	989	6.19	10.7	222.4	20.2	25.5	2008/10/26
2009	1	04/14 00:00	04/18 00:00	4 days	25.7	985	8.69	11.7	229.9	28.4	43.3	2009/04/17
2009	2	05/22 18:00	05/26 06:00	3 days	33.4	974	4.57	11.8	215.3	12.4	1.2	2009/05/25
2010	4	10/19 12:00	10/24 00:00	4 days	69.4	922	3.09	11.1	124.2	11.6	202.5	2010/10/22
2011	2	10/17 00:00	10/19 18:00	2 days	18.0	996	3.07	8.4	157.6	14.0	236.3	2011/10/19
2012	3	11/16 00:00	11/23 06:00	7 days	18.0	996	0.93	8.2	196.7	1.1	278.9	2012/11/18
2013	1	05/09 18:00	05/16 12:00	6 days	23.1	989	8.13	11.5	217.3	26.3	31.4	2013/05/16
2013	2	10/07 12:00	10/13 12:00	6 days	72.0	918	3.18	12.6	173.0	3.1	276.2	2013/10/10
2013	4	11/18 00:00	11/23 06:00	5 days	36.0	970	1.40	10.1	226.4	0.6	314.1	2013/11/22
2014	3	10/06 06:00	10/13 12:00	7 days	59.2	937	2.25	11.6	203.1	1.5	302.1	2014/10/11

As described above, GPV and SWAN were used in this wave hindcasting analysis. It summarizes the top five wave heights of each year on the results in the following Table 5.2.3-2

The largest wave in the review period described above is the wave with the height of 10.19m recorded on November 10, 2007, the period 12.6m, wave direction N-206 ° (Approx. SSW). This was calculated as the probability of occurrence for the largest waves on the basis of the data of GPV. The results are shown in Fig.5.2.3-3 In this result the 100-year probability expected value is 10.4 m. The 2007 Cyclone waves described above are believed to be substantially close to the 100-year probability waves.

Table 5.2.3-2 Top 5 waves in each year

Year	Ranking	Rise Date	Wave Height (m)	Wave Period (sec)	Wave Direction (degree)	Remak
2007	1	20071110	10.19	12.6	206	SWAN
	2	---	3.71	7.8	201	※
	3	---	3.71	7.8	201	※
	4	---	3.71	7.8	201	※
	5	---	3.71	7.8	201	※
2008	1	20081024	6.19	10.7	222	SWAN
	2	---	3.71	7.8	201	※
	3	---	3.71	7.8	201	※
	4	---	3.71	7.8	201	※
	5	---	3.71	7.8	201	※
2009	1	20090414	8.69	11.7	230	SWAN
	2	20090522	4.57	11.8	215	SWAN
	3	---	3.71	7.8	201	※
	4	---	3.71	7.8	201	※
	5	---	3.71	7.8	201	※
2010	1	20101008	3.74	7.3	192	GPV
	2	20100725	3.30	7.3	210	GPV
	3	20100626	3.19	7.6	207	GPV
	4	20100526	3.19	7.5	209	GPV
	5	20101015	3.09	6.6	147	GPV
2011	1	20110616	6.54	9.1	215	GPV
	2	20110808	4.04	8.4	210	GPV
	3	20110721	3.82	7.3	205	GPV
	4	20111018	3.78	9.0	168	GPV
	5	20110803	3.58	7.8	201	GPV
2012	1	20120621	4.03	7.6	203	GPV
	2	20120626	3.60	7.2	232	GPV
	3	20120728	3.49	7.7	210	GPV
	4	20120804	3.47	8.0	201	GPV
	5	20120811	3.28	7.8	196	GPV
2013	1	20130516	8.13	11.5	217	SWAN
	2	20131012	4.76	10.5	194	GPV
	3	20130624	4.22	7.5	192	GPV
	4	20130530	3.91	7.3	197	GPV
	5	20130727	3.84	7.6	218	GPV
2014	1	20140721	4.88	8.3	203	GPV
	2	20140804	4.11	7.7	199	GPV
	3	20140620	4.05	8.0	214	GPV
	4	20140629	3.94	8.2	215	GPV
	5	20140831	3.50	7.9	181	GPV



Correlation Coefficient 0.988

Return Period (Year)	Expected Value
1	3.09
3	4.84
5	5.38
10	6.22
20	7.22
30	7.90
50	8.88
100	10.47

Fig. 5.2.3-3 Cyclone Waves and Exceeding Probability

2) Transformation of Shallow Water Waves

Based on the study results in the previous section of the offshore wave, the shallow waves in the EZ candidate sites were examined.

Study conditions are as follows.

- Tide Level: MSL+2.20 m
- Maximum Cyclone Tide Deviation Height (η_0): 3.00 m

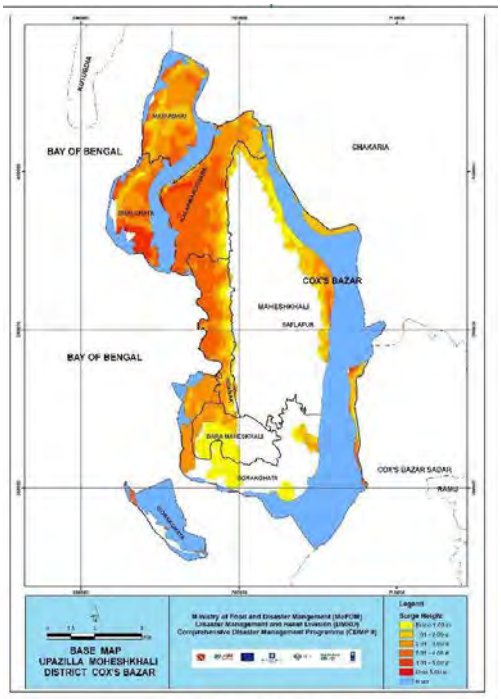
$$\eta_0 = a(1010 - P) + bU^2 \cos\theta + c \qquad (6.3.3)$$

where

η_0 : maximum amount of storm tide (cm)
P : lowest atmosperic pressure (hPa)
U : maximum wind velocity (m/s)
θ : angle between the predominant wind direction that causes the highest storm tide and the wind direction at the time of maximum wind speed U (°)

Source: "Technical Standards and Commentaries for Port and Harbor Facilities in Japan"(pp.130)

Note: Above maximum cyclone tide deviation height was assumed referring the Japanese ports with known coefficient such as Ports of Kushimoto, Shimotsu, Kagoshima, etc., and the value of inundation depth indicated in the following Fig. 5.2.3-4.



Maheshkhali upazila

Fig. 5.2.3-4 Inundation Depth Map in Cox's Bazar District

Source: Disaster Management Information Center (DMIC)

- Offshore wave height: 10.19 m
- Wave period: 12.61 sec
- Wave direction: N 206.4 °
- Storm Tide: (MSL2.2m)+(Cyclone deviation3.0m)= MSL+5.2m (CDL+7.6 m)
  (Note CDL: Chart Datum Level, Chittagong SOB datum)

Wave direction is indicated in Figs. 5.2.3-5, and 5.2.3-6
Water depth is indicated in Fig 5.2.3-7
The ratio of wave refraction(Kr) and diffraction(Kd): Kr·Kd is indicated in Fig. 5.2.3-8
As a result, the equivalent deep water wave height (Ho') is summarized in Fig. 5.2.3-9

Note)
The above mentioned sea water level (MSL 2.2 m) was referred to "mean monthly –highest water level" which was utilized for the Matarbari ultra-supercritical coal-fired power plant plan as shown below. For the purpose of the Master Plan Study stage, the average high tide level (complies with HWL):MSL+2.20 m will be enough.
A more precise tide level will be obtained during the detailed design stage by tidal observation to make sure.

Tide Level utilized for Matarbari Ultra-supercritical Coal-fired Power Plant Project

(mean monthly –highest water level) HWL:	MSL	+2.20 m
(mean sea level) MSL:	MSL	±0.00 m
(mean monthly-lowest water level)LWL:	MSL	-2.13 m
(chart datum level) CDL:	MSL	-2.68 m

The top elevation of the existing sea dikes for Matarbari Island were designed based on the tide observation station located along the creek between Maheshkhali Island and Mainland. The top elevation is PWD+7 m, PWD (Public Works Datum). The datum level used here as the reference surface for the PWD ± 0.00 m is considered lower than MSL ±0.0 m by 0.5 m approimately, by which PWD+7.00 m corresponds to the MSL+6.5 m.

Verification will be required on the difference between MSL and PWD, since elevation datum varies by region

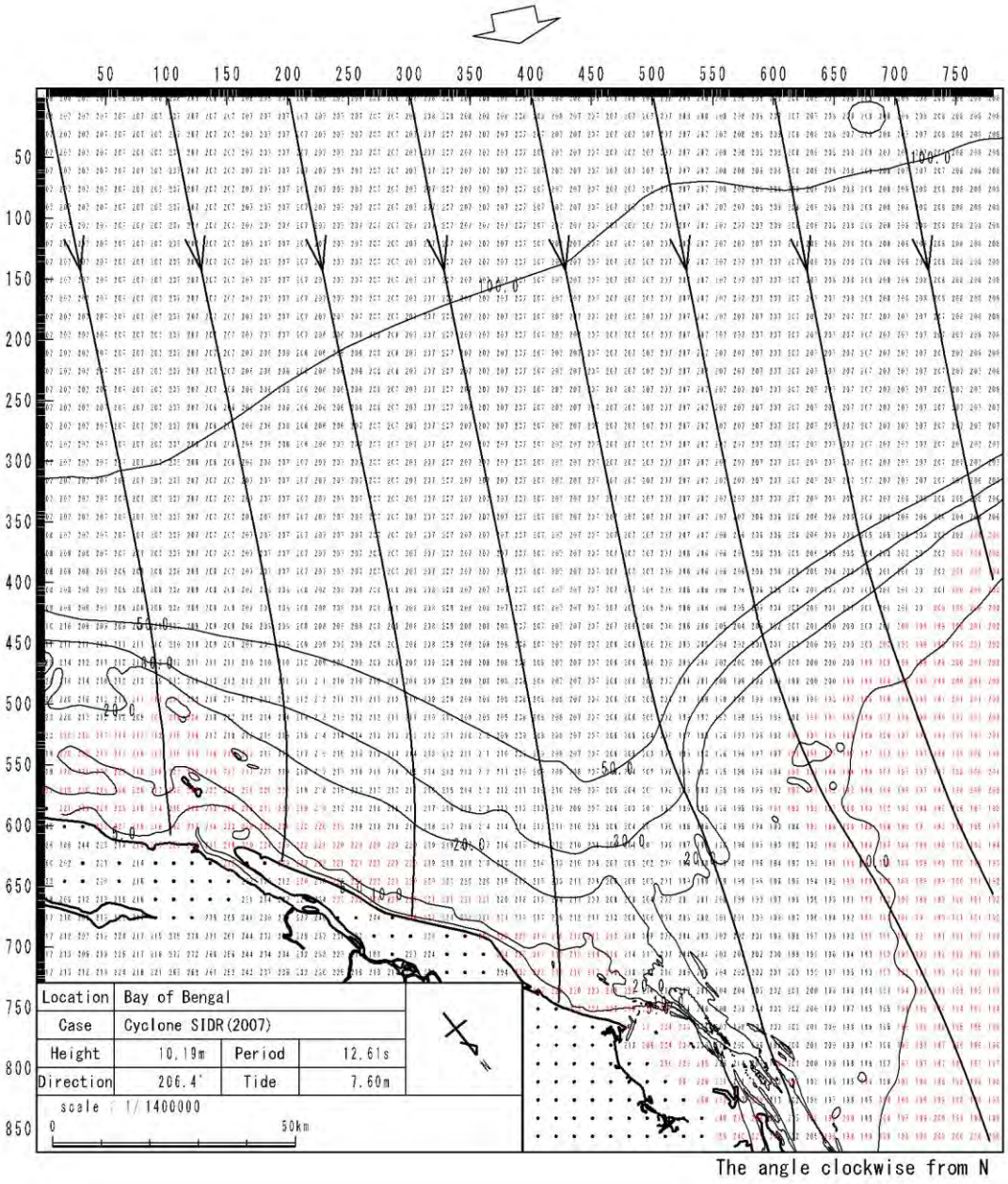


Fig. 5.2.3-5 Wave Direction (Offshore side)

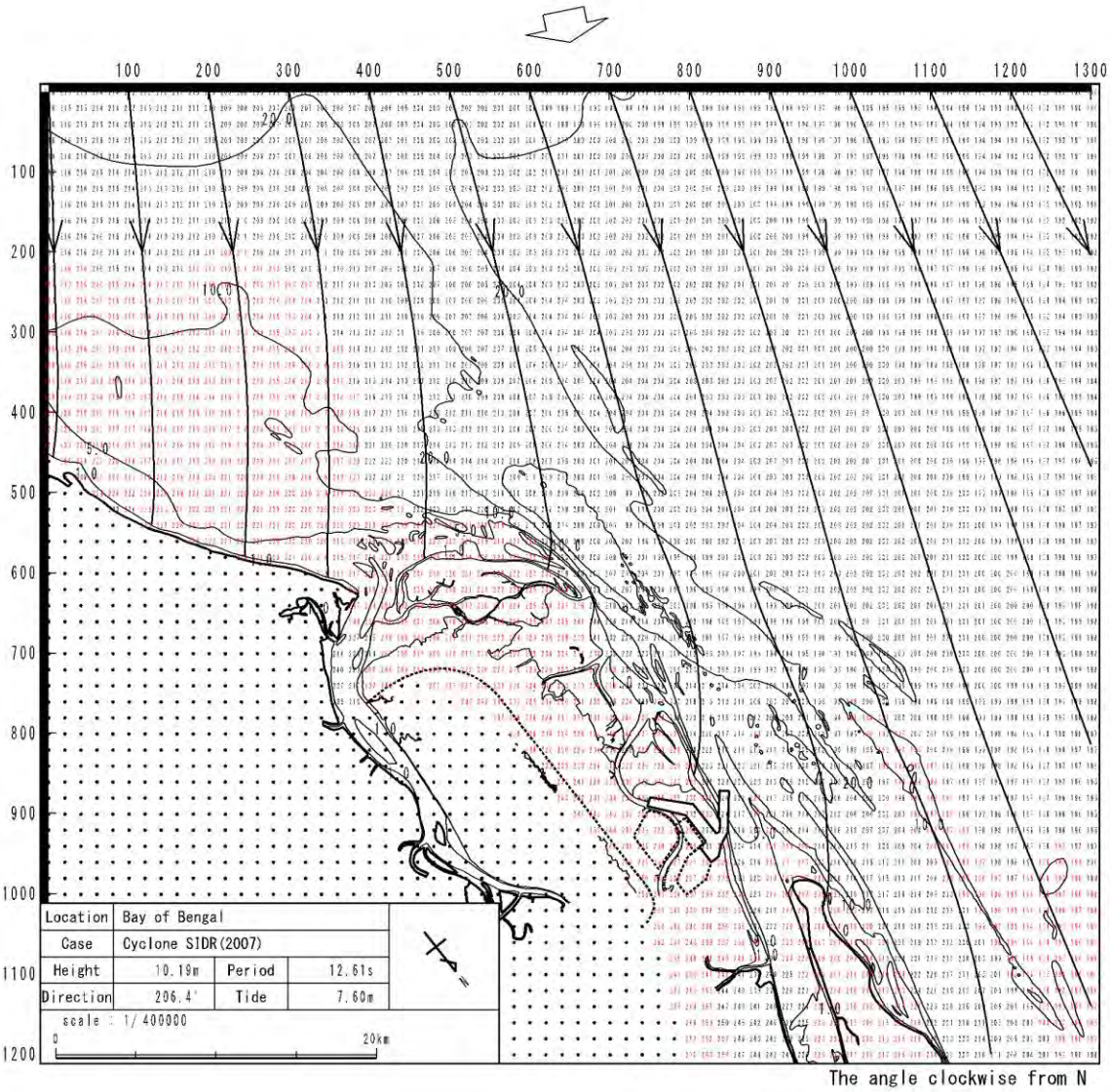


Fig. 5.2.3-6 Wave Direction (Nearshore side)

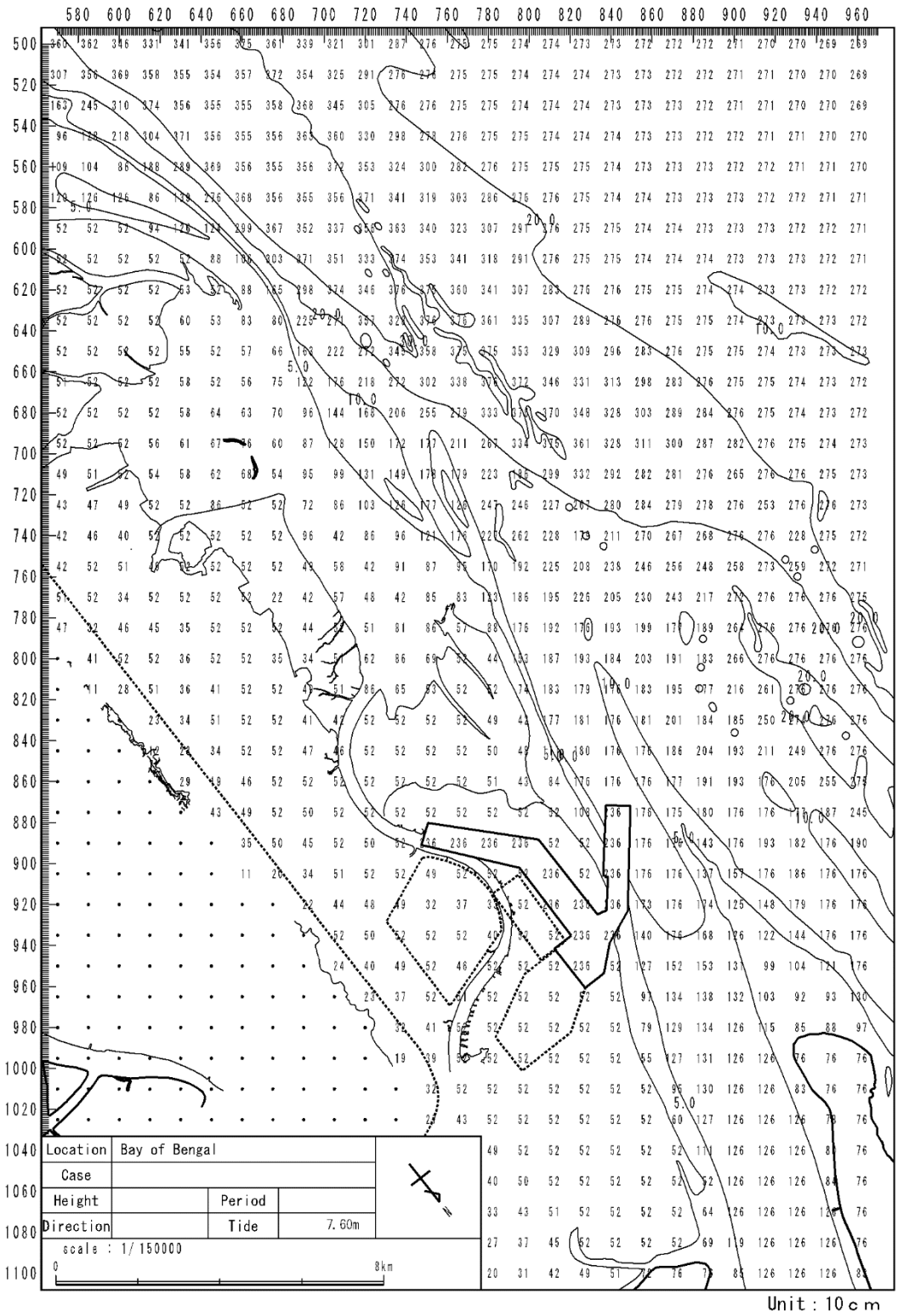


Fig. 5.2.3-7 Water Depth

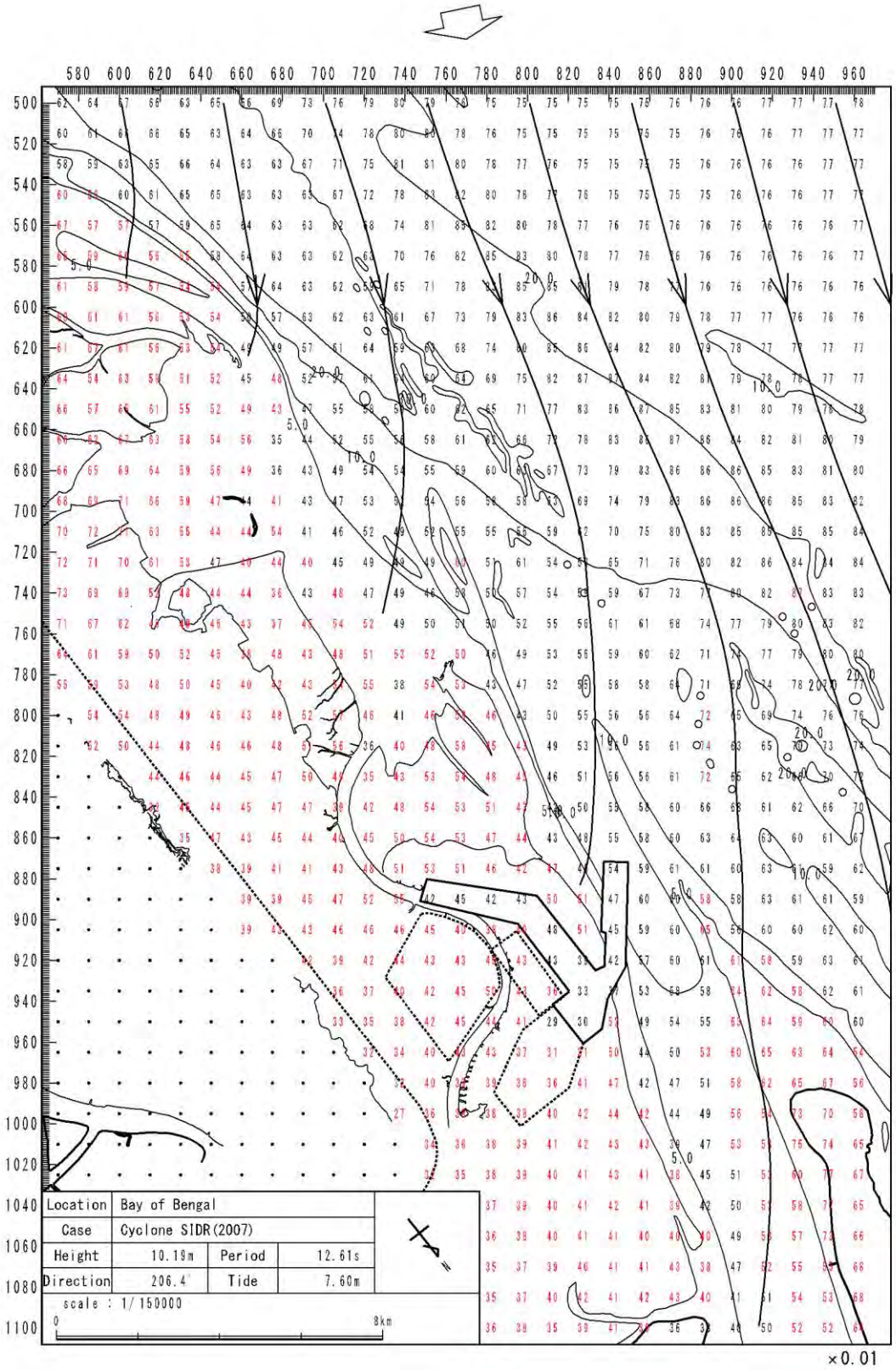


Fig. 5.2.3-8 Wave Refraction (Kr) and Diffraction (Kd): Kr·Kd

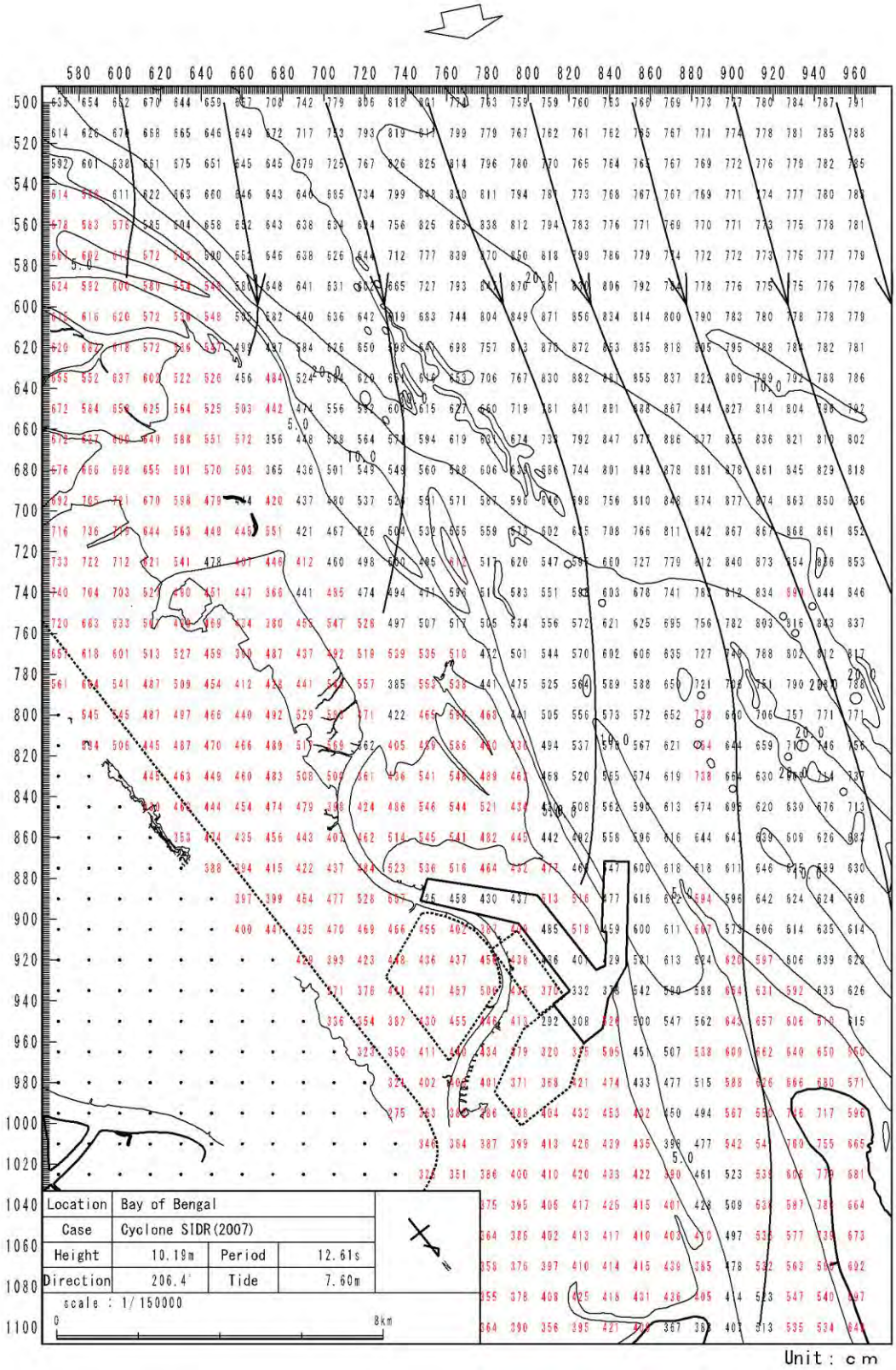


Fig. 5.2.3-9 Equivalent Deep Water Wave Height (Ho')

3) Top Elevation of Seawalls

In order to prevent overtopping of the embankment by the above-mentioned storm surge completely, the top height requirement of both the general EZ and seaboard EZ should be a height of more than MSL + 13m. However, in order to reduce the construction cost of the seawall, top height of seawall may be reduced to MSL + 10.0 m, allowing a certain degree of overtopping amount (about 0.020 ㎥/ m/sec).

Note)

The shallow water wave will be changed by artificial structures such as sea dikes in addition to the ground configuration of the EZ candidate site. At the moment in the General EZ candidate area, only low soil dikes exist on the west (seaward)side of the salt pan area. The top elevation of the dike is only MSL +1.5 m to +3 m.

In addition, the existing sea dike built along the Mtarbari in the western area of the Seaboard EZ candidate area seemed damaged by sea waves according to the comparison review of Google Earth's past images. It seemed that sea water intrudes the land side behind the sea dike.

Possible future construction of port access channels planed by the Matarbari power plant and commercial ports, can be dredged at these existing dikes, and waves will enter through these openings. Also according to the Southern Chittagong Data Collection Survey, the top elevation of the Commercial port quay will be MSL+5 m, and cyclone surge waves will enter across the quay.

General EZ

Water Level:	HWL	5.20	m				
Wave Height:	H(Ho')	4.61	m				
Wave Period:	To	12.61	sec				
Wave Length:	1.56T^2	248.058876		Ho'/Lo	0.0185843		
Water Depth:	h	3.2					

Extraction "Technical Standards and Commentaries for Port and Harbour Facilities in Japan"

Table 4.3.5 Threshold Rate of Wave Overtopping for Inducing of Damage

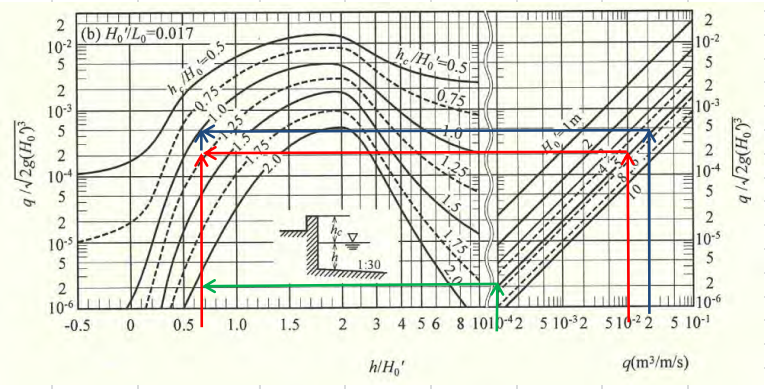
Type	Armor Layer	Wave Overtopping Rate (m³/m/s)
Seawall	Paved behind	0.2
	Not paved behind	0.05
Levee	Covered with concrete on 3 sides	0.05
	Crown paving/rear slope non constructed	0.02
	Crown not paved	0.005 or less

Table 4.3.6 Allowable Wave Overtopping Rate in view of State of Land Use

User	Distance from dike	Wave overtopping rate (m³/m/s)
Pedestrian	Land right in back (50% degree of safety)	2×10^{-4}
	Land right in back (90% degree of safety)	3×10^{-5}
Automobile	Land right in back (50% degree of safety)	2×10^{-5}
	Land right in back (90% degree of safety)	1×10^{-6}
House	Land right in back (50% degree of safety)	7×10^{-5}
	Land right in back (90% degree of safety)	1×10^{-6}

Table 4.3.7 Permissible Wave of Overtopping Rate in view of Degree of Importance of Hinterland (m³/m/s)

Districts where significant damage is expected particularly by the invasion of wave overtopping and spray due to a dense concentration of residential houses and public facilities in the rear.	Around 0.01
Other important districts	Around 0.02
Other districts	0.02 – 0.06



h/Ho'=	0.694143167					
h c /Ho'=	1.22					
h c =	5.6242	+HWL		**10.8242**	m	q=0.01m3/m/s
h c /Ho'=	1.02					
h c =	4.7022	+HWL		**9.9022**	m	q=0.02m3/m/s

Fig.5.2.3-10 Required top Elevation of Seawall for General EZ

Seaboard EZ

Water Level:	HWL	5.20	m				
Wave Height:	H（Ho')	4.76	m				
Wave Period:	To	12.61	sec				
Wave Length:	1.56T^2	248.058876			Ho'/Lo	0.019189	
Water Depth:	h	3.2					

Extraction "Technical Standards and Commentaries for Port and Harbour Facilities in Japan"

Table 4.3.5 Threshold Rate of Wave Overtopping for Inducing of Damage

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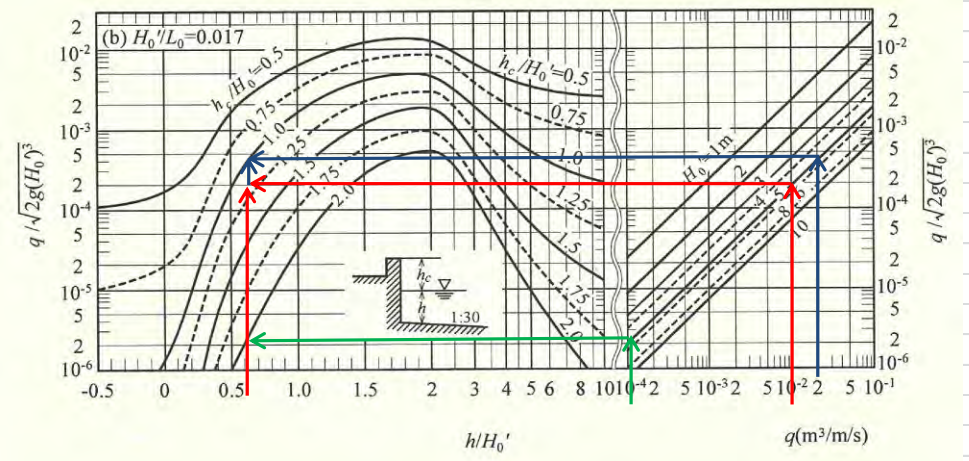
Automobile	Land right in back (50% degree of safety)	2×10^{-5}
	Land right in back (90% degree of safety)	1×10^{-6}
House	Land right in back (50% degree of safety)	7×10^{-5}
	Land right in back (90% degree of safety)	1×10^{-6}

Table 4.3.7 Permissible Wave of Overtopping Rate in view of Degree of Importance of Hinterland (m³/m/s)

Districts where significant damage is expected particularly by the invasion of wave overtopping and spray due to a dense concentration of residential houses and public facilities in the rear.	Around 0.01
Other important districts	Around 0.02
Other districts	0.02 – 0.06



h/Ho'=	0.672268908					
hc/Ho'=	1.12					
hc＝	5.3312	＋HWL		**10.5312**	m	q=0.01m3/m/s
hc/Ho'=	1.00					
hc＝	4.76	＋HWL		**9.9600**	m	q=0.02m3/m/s

Fig. 5.2.3-11 Required top Elevation of Seawall for Seaboard EZ

4) General Sections of Seawalls

From the assumptions of the structure study, the necessary considerations are as follows.

- In order to cope with overtopping, protected inland crest protection, there is a need for facilities such as drainage (drainage ditch, reservoir pond, drainage pump station). It should be noted that the necessary amount of discharge water is not only to accommodate overtopping waters when a heavy storm surges hit as shown in the previous section, there is also a need to cope with a large rainfall drainage.
- The sub-soil conditions at the planned embankment areas deemed to be soft layer for some extent which causes land sliding at the embankment, it is required to prevent lateral movement.
- Slope protection at the outside of embankment for resistance to the waves, or, it is assumed that the provision of the wave dissipating works.
- Consideration of a better landscape at the seawall, higher structure will give negative impact to the human, it is preferable to consider to adopt the slope frame construction method, planting trees, and mounting of the transparent window frame of the concrete wall.
- In the detailed design stage later, depending on the timing of the project implementation of other sectors, it is desirable to re-examine the bank before wave conditions and structure of the seawalls.
- As for a road connecting with the bank to the external area, it is desirable to keep the gradient less than 3% for the trucks loading and unloading of heavy cargo,. If the transition slope distance between the watersides of the road can't be secured, it is taken into consideration to have a land gate.

Note) According to BEZA's sub-soil data taken at existing dikes, soft layers exist from an earth surface to depth more than 5 to 6m, and it is determined that soil improvement such as soil replacement will be necessary. However, the sub-soil conditions of the proposed EZ sites are difficult to identify because of the distance of around 3-4km away

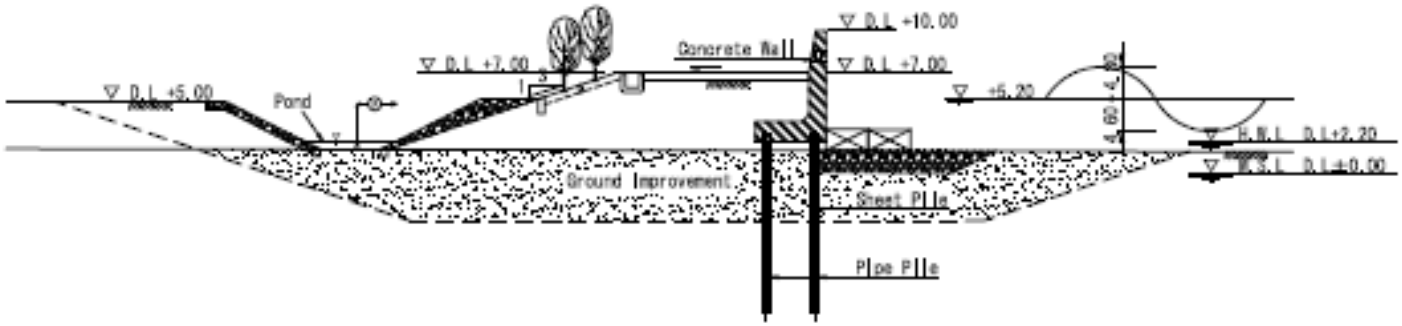


Fig. 5.2.3-12 Case 1 Typical Section of Seawall type

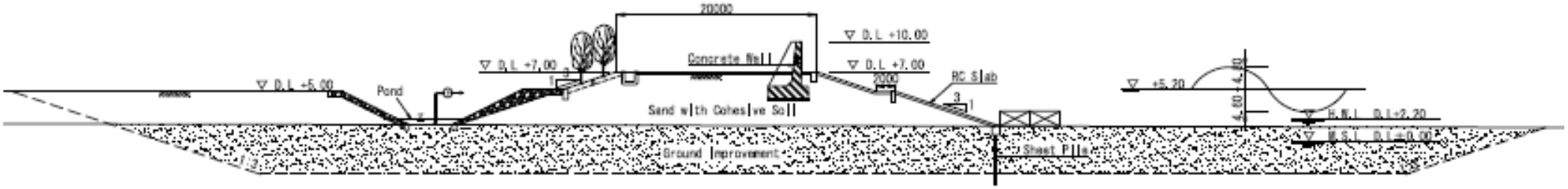


Fig 5.2.3-13 Case2 Typical Section of Embankment Type

5.3. Environmental and Social Consideration at the Medium-term EZ Development Sites

Based on the selection of the candidate sites for the Medium-term EZ development at the core areas of Matarbari and Maheskhali, details of which are as shown in Chapter 5.2 above, the survey team has conducted the baseline surveys on the environmental and social aspects and an IEE level environmental and social consideration studies at the sites of Maheskhali 1 and Maheskhali 2, respectively. The environmental baselines data and information has been collected on the bases of literature survey, but water quality, noise, soil, seabed materials, etc. for the proposed EZ development project sires could not be available from the literature survey.

5.3.1 Descriptions of the proposed Medium-term EZ Development Sites

The locations and profiles of the proposed Mid-term EZ Development Sites are shown in Figure 5.3.1-1 and Table 5.3.1-1.

Two (2) project sites have been selected in Chapter 5.2 among five (5) candidate sites after frequent discussion with Bangladeshi stakeholders such as BEZA, environmental competent authorities, etc. The other three (3) candidate sites are alternative sites. Zero potion of mid-term EZ development projects have been described on Table 4.6.4-1 in Chapter 4.6.

Environmental Category of the JICA Guidelines for Environmental and Social Considerations for the both proposed EZ development projects will be considered as A.

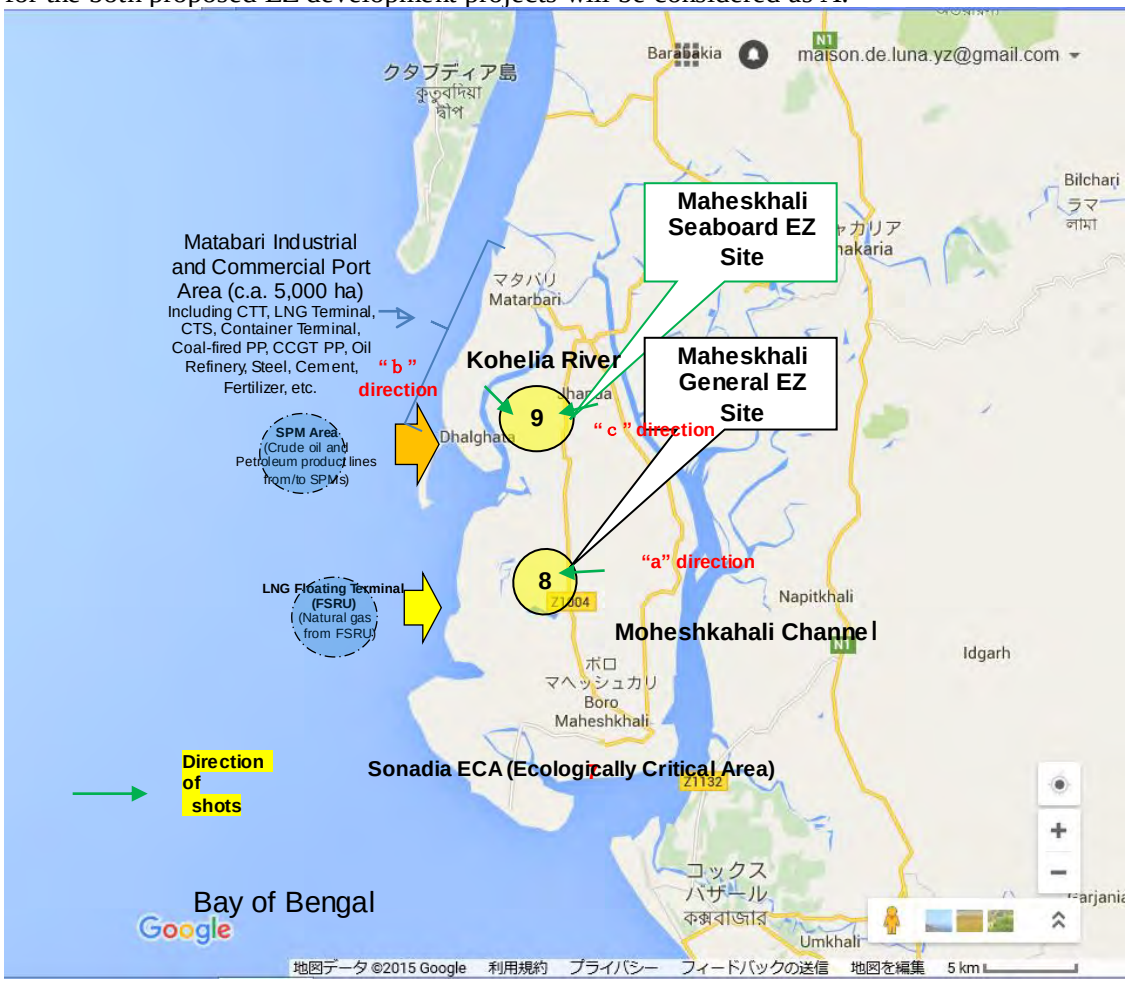


Figure 5.3.1-1 Locations of the Proposed MI-term EZ Development Sites

Source: JICA Survey Team

<Photo-1> Proposed General EZ Development Site 「a」 direction）:
View from the national road（Z1004） to the EZ development project site.

<Photo-2> Proposed Seaboard EZ Development Site, 「b」 direction）:
View from Kohelia River to the project sites.

<Photo-3> Proposed Seaboard EZ Development Site 「c」 direction :
View from the national road (Z1004) to the project site.

Table 5.3.1-1 Profiles of the Proposed Mid-term EZ Deployment Sites

Items	Maheskhali General EZ (Site-2: Maheskhali-2)	Maheskhali Seaboard EZ (Site-1: Maheskhali -1)
(1) Conditions of EZ Location	-The land consists of swamp, salt firm and farmland, and certain area is submerged with sea level. -22 km road distance with 35 min. travel time from Chakaria. -Development area is about 400 ha. -A little resettlement in salt firm is required. -The site locates behind the port area in the core area of south Chittagong integrated development,	-The land consists of swamp, salt firm and farmland, and certain area is submerged with sea level. -25 km road distance with 40 min. travel time from Chakaria. -Development area is about 600 ha. A little resettlement in salt firm is required. -The site locates behind the port area in the core area of south Chittagong integrated development, where BEZA starts land acquisition.

	where BEZA starts land acquisition.	
(2) Convenience from main road/port	-Along the future trunk road for south Chittagong integrated development. -Behind a new commercial port.	-Along the future trunk road for south Chittagong integrated development. -Behind a new industrial port.
(3) Regional development impact	-Land use: Cultivable land 5,275. 36 ha, salt production 2,073.4 ha, shrimp cultivation 2,105.69 ha, fallow land 1,715.21 ha. -Manufactories: Salt mill 6, flour mill 1, ice mill 5. -Cottage industries: Weaving 178, other industries 480. -There are no manufacturing industries except cottage industries. -The productivity of agriculture is also low, and there are a lot of petty fishermen. -The level of economic development is obviously low compared with neighbor Upazila, and the effect of regional development of the EZ development is high.	-Land use: Cultivable land 5,275. 36 ha, salt production 2,073.4 ha, shrimp cultivation 2,105.69 ha, fallow land 1,715.21 ha. -Manufactories: Salt mill 6, flour mill 1, ice mill 5. -Cottage industries: Weaving 178, other industries 480. -There are no manufacturing industries except cottage industries. The productivity of agriculture is also low, and there are a lot of petty fishermen. -The level of economic development is obviously low compared with neighbor Upazila, and the effect of regional development of the EZ development is high.
(4) Risk of flood /storm surge	-Since planned site suffers the damage of storm surge by cyclone, coastal dike is to be constructed by the Government.	-Since planned site suffers the damage of storm surge by cyclone, coastal dike is to be constructed by the Government.
(5) Land development	-4-5 m height reclamation with 8-10 m coastal dike are required.	-4-5m height reclamation with 8-10 m dike are required.

Source: JICA Survey Team

According to the development vision for the Medium-term EZ Development, the following plants and facilities shall be developed at the sites. Table 5.3.1-2 shows brief description of the EZs.

Table 5.3.1-2 Plants, Facilities and Earthworks at the Proposed Mid-term EZ Development Sites

Item No.	Plants, Facilities and Earthworks	General EZ (Site-2: Mahaskali-2)	Seaboard EZ (Site-1: Maheskhali-1)
	Site area	400 ha	605 ha
1.	Preparation works	1 lot	1 lot
2.	Embankment and filling (Access road and site)	22,334,00 m3	29,267,000 m3
3.	Access road construction	60 m	1,300 m
4.	Road construction	310,000 m2	137,500 m2
5.	Sea wall	61,000 m	11,200m
6.	Sea dike	23,000 m	0 m
7.	Storm water drainage works	1 lot	1 lot
8.	Sewer water drainage works	1 lot	1 lot
9.	Water distribution line and firefighting line	1 lot	1 lot
10.	Electric power & distribution and lighting	1 lot	1 lot
11.	Gas distribution pipeline	1 lot	1 lot

12.	Common plant for water and sewer	14,000 t	56,000 t
13.	Common buildings	3,500 m2	3,500 m2

Source: JICA Survey Team

With regard to the industries which are to be located, the development vision recommends the following industries. Table 5.3.1-3 shows Industrial Sector and Characteristics of Industry to be located.

Table 5.3.1-3 Industrial Sector to be located and Characteristics of the Industries

1. For the Seaboard EZ	
Industrial sector to be located	1. Heavy Industry Zone a. Iron & Steel (electrical furnace, steel rolling mill, steel process mill) b. Shipyard (shipbuilding, ship repair and maintenance) c. Ship scrap, ship recycling (harmonized with environment and labor safety) d. Non-iron metal e. Heavy machinery, construction machinery 2. Chemical Industry Zone a. Chemical, chemical products, lubricated oil b. Tire
Characteristics of located industry	a. Mostly apparatus industry which is capital intensive industry b. Basic material industry (Iron & Steel, ship scrap, non-iron metal, chemical, chemical products) c. Upstream industry (Iron & steel, ship scrap, chemical) d. The scale of investment is large. Mass production causes merit of scale. High technology is required. e. Countermeasure for safety and less environmental load. f. Strategic activity to attract the investment of core industry needed.
2. For the General EZ	
Industrial sector to be located	[Transport machine zone] Automobile / parts, motor cycle / parts, railroad wagon [Machinery & ITC zone] a. General machinery, production machinery b. Electrical and electric goods / parts c. IT device, communication equipment [Food, medicine, medical goods zone] a. Food, agro-processing (including halal food) b. Medicine, medical goods, nutrition, healthy food, cosmetics [Living goods zone] a. RMG/apparel, apparel accessary b. Bicycle, paper processing, printing, daily commodity etc.
Characteristics of located industry	a. Labor intensive b. Intermediate processing, downstream industry c. Supporting industry (such as parts, member of framework) d. Production goods, intermediate goods e. Goods related to living, general consumer goods f. Strategic plan and activity to attract FDI of anchor industry in assembling manufacture are key element to lead successful development of EZ

Source: JICA Survey Team

5.3.2 Results of the Baseline Survey at the proposed EZ Sites

In order to thoroughly understand environmental and social conditions of the candidate sites, the survey team has conducted baseline surveys. The results of the survey are as follows;

(1) Current Situation of Pollution Control

■ **Ambient Air**

The following table shows that the air quality of Maheshkhali is within the ambient air quality standard as there are no significant pollution sources within the close proximity. Moreover, frequent rainfall clears the regular air, and air pollutants are not detectable in rainy seasons. Secondary data sources revealed that no significant amount of SPM, SOx and NOx were detected during assessment in July, 2012.

Table 5.3.2-1 Summary of Air Quality Measured during July, 2012

Sampling Location	SPM (µg/m^3)	SPM (µg/m^3)	SOx (µg/m^3)	NOx (µg/m^3)
Moheshkhali Municipality	ND	ND	ND	ND
Sonadia eastern Zone	ND	ND	ND	ND
Kalarmar Chara Bazar	ND	ND	ND	ND
Hoanok Primary School	ND	ND	ND	ND
Cox's Bazar Sea Beach	ND	ND	ND	ND
Standard Limit	**Below 200**	**Below 80**	**Below 80**	**Below 80**
ND= Not Detected				

Source: Department of Environment, Bangladesh, Measured at different CAMS (Continuous Air Monitoring Stations)

■ **Surface Water**

There are few rivers namely Matamuhuri River, Moheskhali Channel, Kohelia Channel around the EZ candidate sites and plenty of water bodies with small creeks and channels are available. The rivers originated from the Chittagong hill tracts moving westward and reaching at the Bay of Bengal. The nearest river is Kohelia Channel which is less than 1 km. away from the Moheskhali EZ site 1 and from Moheskhali Channel. The Moheskhali EZ site 2 is only 500 meters' distanct. Both of the river and channel originated from Matamuhuri River and flows towards South and falls into the Bay of Bengal.

■ **Ground Water**

Weathering, deforestation, hill cutting, landslide, debris falls, land use change and erosion of the hills are accelerating the sediment deposition on the foothills especially the western part of Maheskhali. The high porosity of surface soil and huge rainfall make opportunities to reserve enough fresh water. Geographically the average rate of recharge is about 600 mm per annum. Ground water is available from 100 ft to 450 ft for using hand tube well that may fluctuate with temporal and spatial variation. The level of salinity in ground water remains zero all around the year.

The deep well boring in the foothills plain land of Maheskhali facilitates to the communities with continuous release of fresh water. About 500ft to 800ft boring is necessary to get this highly pressured fresh water reservoir on the plain land. In addition, 1200ft to 1500ft boring is required to obtain deep ground water because of land elevation and aquifer status. This deep ground water is flowing continuously but the volume varies with seasonal changes. Most of the agricultural field especially betel leaf garden (bozra) depend on this water. The tidal influence is

dominated with silty clay with significant slope gradient. However, saline water penetration and contamination of the ground water are not found in Maheshkhali Island.

■ **Soil and Sediment**

In Chittagong and Chittagong Hill Tracts, the Upper Tertiary sandy - argillaceous sediments have been folded into a series of long sub-meridional (NNW - SSE) anticlines and synclines represented in the surface topography by elongated hill ranges and intervening valleys. The sedimentary sequence developed consists mainly of the alteration of shales, clays, clay stones, siltstones and sandstones with occasional intra-formational conglomerates. The adjacent parts of the island were developed through the fluvial deposition with mostly coarse sediments. The area is characterized by a series of parallel structures which is the continuation of Arakan Yoma Anticlinorium and started to develop during Oligocene.

■ **Noise and Vibration**

There are no noise and vibration sampling specified in Maheshkhali. Very limited manufacturing activities exist in the Cox's Bazar region, and the existing industries are cottage industries in Maheshkhali and wooden furniture manufacturing in Chakaria and Cox's Bazar which generate few noise and vibration.

(2) Natural Environmental Conditions

■ **Meteorology and Climate (Temperature)**

The responsible authority for collecting climate data is Bangladesh Meteorological Department and the department has several data collection station that collects data for temperature, rainfall, wind speed etc. The nearest climatic data collection points of the project areas are three: Cox's Bazar, Kutubdia and Teknaf. Based on these stations, the data was achieved for assessing the climatic condition of selected project site.

■ **Meteorology and Climate (Temperature)**

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Bangladesh has six seasons and based on these seasons, its temperature varies. The average minimum and maximum range of temperature in winter (dry season) is 15°C to 30°C. March and April are considered as pre-monsoon season when reaching the highest temperature, average 32°C. The normal maximum and minimum temperature of Cox's Bazar, Kutubdia and Teknaf are shown in the following table.

Table 5.3.2-2 Normal Maximum & Minimum Temperature (°C)

Station Name	January		February		March		April		May		June	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
Bangladesh	26.7	15.0	28.5	17.0	30.9	20.7	32.1	23.9	32.3	25.1	30.7	25.2
Cox's Bazar	25.5	14.9	27.4	17.3	29.9	21.2	31.5	24.0	32.3	25.1	30.9	25.2
Kutubdia	27.2	15.1	28.8	17.1	30.8	20.6	31.9	23.9	32.1	25.2	30.3	25.2
Teknaf	26.7	15.0	28.5	17.0	30.9	20.7	32.1	23.9	32.3	25.1	30.7	25.2
	July		August		September		October		November		December	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min

Bangladesh	30.0	25.1	30.2	25.0	30.9	25.0	31.6	24.3	30.0	21.1	27.5	16.5
Cox's Bazar	30.1	25.3	30.5	25.5	31.0	25.3	31.3	24.3	29.2	20.7	26.3	16.6
Kutubdia	29.8	25.0	30.0	24.9	30.7	24.9	31.4	24.0	30.2	21.1	28.1	17.0
Teknaf	30.9	25.4	31.3	25.4	31.6	25.2	31.4	23.4	29.6	18.7	26.6	13.3

Source: Bangladesh Meteorological Department

■ **Meteorology and Climate (Rainfall)**

The rainy season is prominent in the region. The data collection points of Bangladesh Meteorological Department near the EZ candidate sites revealed that in the month of May to September, rainfall is more frequent due to the presence of monsoon air and around 85% rainfall occurs in these months. The monthly normal rainfall for the stations adjacent to the EZ site is shown in the table below.

Table 5.3.2-3 Monthly Normal Rainfall in mm for midterm EZ candidate sites

Station	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Bangladesh	9.0	25.5	52.4	130.2	277.3	459.4	523.0	420.4	318.2	160.3	42.3	9.6
Cox's Bazar	4.1	17.0	34.7	121.8	286.8	801.9	924.6	667.1	330.1	213.6	109.4	13.0
Kutubdia	6.5	24	51.4	85.5	215.6	638.3	763.7	488.9	299.8	169.3	71.9	9.3
Teknaf	1.9	16.5	15.3	73.0	259.9	968.1	1,029.7	898.9	402.1	207.4	75.7	5.9

Source: Bangladesh Meteorological Department

■ **Meteorology and Climate (Cyclone)**

Due to the geographical setting of the country, storm surges and cyclones is more frequent in the coastal region of Bangladesh. The coastal regions of Bangladesh are subject to be damaged by cyclones almost every year. They generally occur in early summer (April-May) or late rainy season (October-November). Cyclones originate from low atmospheric pressures over the Bay of Bengal. In the Bay of Bengal, a unique combination of high tides, a funneling coastal configuration, the low flat coastal terrain and a high population density have produced some of the highest mortality figures associated with storm surges. A list of recent cyclones and storm surges in Bangladesh are shown in the following table.

Table 5.3.2-4 List of Recent Cyclones and Storm Surges

Date of Landfall	Nature of Phenomenon	Landfall Area	Max. Wind Speed in kph	No. of Death	Surge Heights
26.10.1996	C.S	Sundarban	70	9	1.5-2.0 m
20.05.1998	S.C.S with core of hurricane winds	Chittagong Coast near Sitakundu	173	14	0.9m
28.10.2000	Deep Depression (probably Cyclonic Storm)	Sundarban coast near Mongla	50-60	3	0.6-1.2m
12.11.2002	C.S	Sundarban coast near Raimangal river	65-85	2	1.5-2.1m
19.05.2004	C.S	Cox's Bazar & Akyab Coast	65-90	-	0.6-1.2m
15.05.2007	C.S "AKASH"	Chittagong & Cox's Bazar	83	-	-
15.11.2007	S.C.S "SIDR"with a core of hurricane winds	Khulna-Barisal coast near Baleshuvar river	223	3	4.6-6. l m
26.10.2008	C.S "Rash."	Khulna-Barisal coast near Patharghata	-	-	1.5-2.lm
17.04.2009	C.S "BIJII"	Chittagong-Cox'sBaz ar	90	-	-

Date of Landfall	Nature of Phenomenon	Landfall Area	Max. Wind Speed in kph	No. of Death	Surge Heights
		coast near Ctg.			
25.05.2009	C.S "AHA"	West Bengal-Khulna coast near Sagar inland of India.	92	190	2.1-2.4m
16.05.2013	C.S "VIARU"	Crossed Bangladesh coast between Chittagong and Feni	85	17	-
29.07.2015	C.S "COMEN"	Crossed over the Chittagong coast	75	132	
21.05.2016	C.S "ROANU"	Crossed over the Chittagong coast	100	26	

Source: Bangladesh Meteorological Department [C.S= Cyclone Storm, S.C.S= Severe Cyclone Storm, V.S.C.S= Very Severe Cyclone Storm]

■ **Topographic Conditions**

Maheskhali is the only hilly island in Bangladesh with an area of 362.18 sq km. Total length of the island is 30 km in N-S direction with a width of 12 km in E-W direction. The length of N-S align hilly ranges is almost 27 km. About 13,684 ha of Maheskhali Island are covered by hills and hillocks with an elevation of 60 to 100 m. The plain land covers an area of 10,803 ha which extends mostly N-S and western side of Maheskhali Island with elevation ranging from 10 to 15 m above mean sea level. Remaining about 4,013 ha of Sonadia Island and the southwestern part of the Maheskhali Island are regularly flooded with 2-3 m tidal effects. The western and south-western on shore line of this island is vastly covered with mangrove forest which is reducing year after year. Shrimp farmers or salt farmers are encroaching to the mangrove forest of the islands.

There are few rivers namely Matamuhuri River, Maheskhali Channel, Kohelia Channel around the EZ candidate sites and plenty of water bodies with small creeks and channels are available. The rivers originated from the Chittagong hill tracts moving westward and reaching at the Bay of Bengal. The nearest river is Kohelia Channel which is less than 1 km away from the Moheshkhali EZ Site 1 and from Maheskhali Channel the Maheskhali EZ Site 2 is only 500 meters' distance. Both of the river and channel originated from Matamuhuri River and flows towards South and falls into the Bay of Bengal.

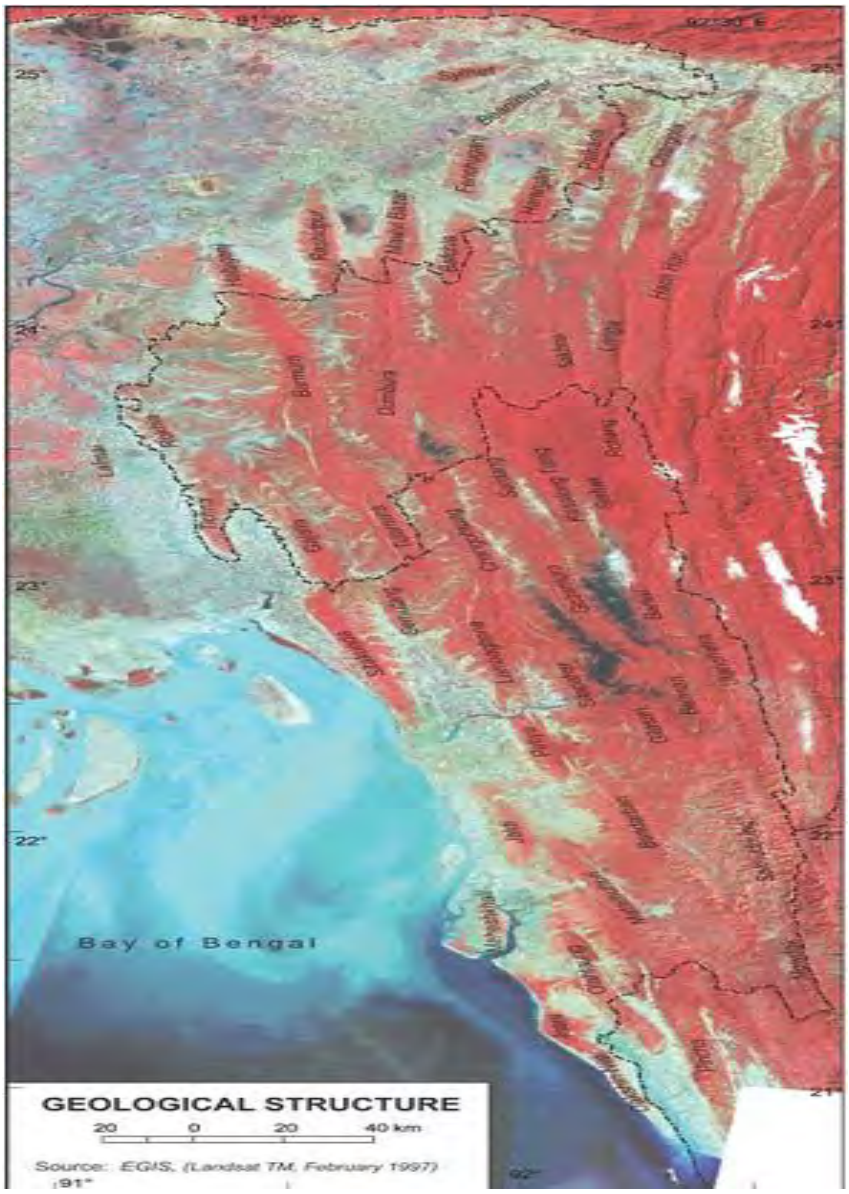

Figure 5.3.2-1 Geological Structures of the eastern part of Bangladesh and surroundings

■ **Ground Water**

Weathering, deforestation, hill cutting, landslide, debris falls, land use change and erosion of the hills are accelerating the sediment deposition on the foothills especially the western part of Maheskhali. The high porosity of surface soil and huge rainfall make opportunities to reserve enough fresh water. Geographically the average rate of recharge is about 600 mm per annum. Ground water is available from 100 ft to 450 ft for using hand tube well that may fluctuate with temporal and spatial variation. The level of salinity in ground water remains zero all around the year.

The deep well boring in the foothills plain land of Maheskhali facilitates to the communities with continuous release of fresh water. About 500ft to 800ft boring is necessary to get this highly pressured fresh water reservoir on the plain land. In addition, 1200ft to 1500ft boring is

required to obtain deep ground water because of land elevation and aquifer status. This deep ground water is flowing continuously but the volume varies with seasonal changes. Most of the agricultural field especially betel leaf garden (bozra) depend on this water. The tidal influence is dominated with silty clay with significant slope gradient. However, saline water penetration and contamination of the ground water are not found in Maheshkhali Island.

■ **Sonadia ECA Area**

According to Department of Environment (DoE) in Bangladesh ecologically sensitive areas are designated as ECAs (Ecologically Critical Areas) under the Environmental Conservation Act (ECA) 1995. The ECA area encompassed by the site contains biodiversity of global significance because the ecosystem or biodiversity of these ECAs are considered to be threatened to reach to a critical state.

In April 1999, the Director General of the Department of Environment (DOE) officially declared nearly 40,000 ha, within seven separate wetland areas, as ECAs. These sites are Hakaluki Haor, Sonadia Island, St Martin's island, and Teknaf Peninsula (Cox's Bazar Sea Beach) but not their buffer zones. Tanguar Haor, Marjat Baor (Oxbow Lake), and outside of Sundarbans Reserved Forest at 10 km.

The ECA site at Cox's Bazar lies at the extreme southeastern corner of Bangladesh that consists of three component areas: (i) the western, coastal zone of Teknaf Peninsula (10,465 ha area), (ii) St Martin's Island (590 ha), a sedimentary continental island located 10 km south of Teknaf Peninsula, and; (iii) Sonadia Island (4,924 ha), a barrier island a few km north of Teknaf Peninsula.

Sonadia Island (ECA Site 40 on the Map) supports the last remaining remnant of mangrove forest in southeast Bangladesh, which once stretched along much of the coastline of Chittagong and Cox's Bazar. The distance between Sonadia Island (4,924 ha/ 49.2 km2) and Cox’s Bazar District is only 25 km via Maheskhali Channel.

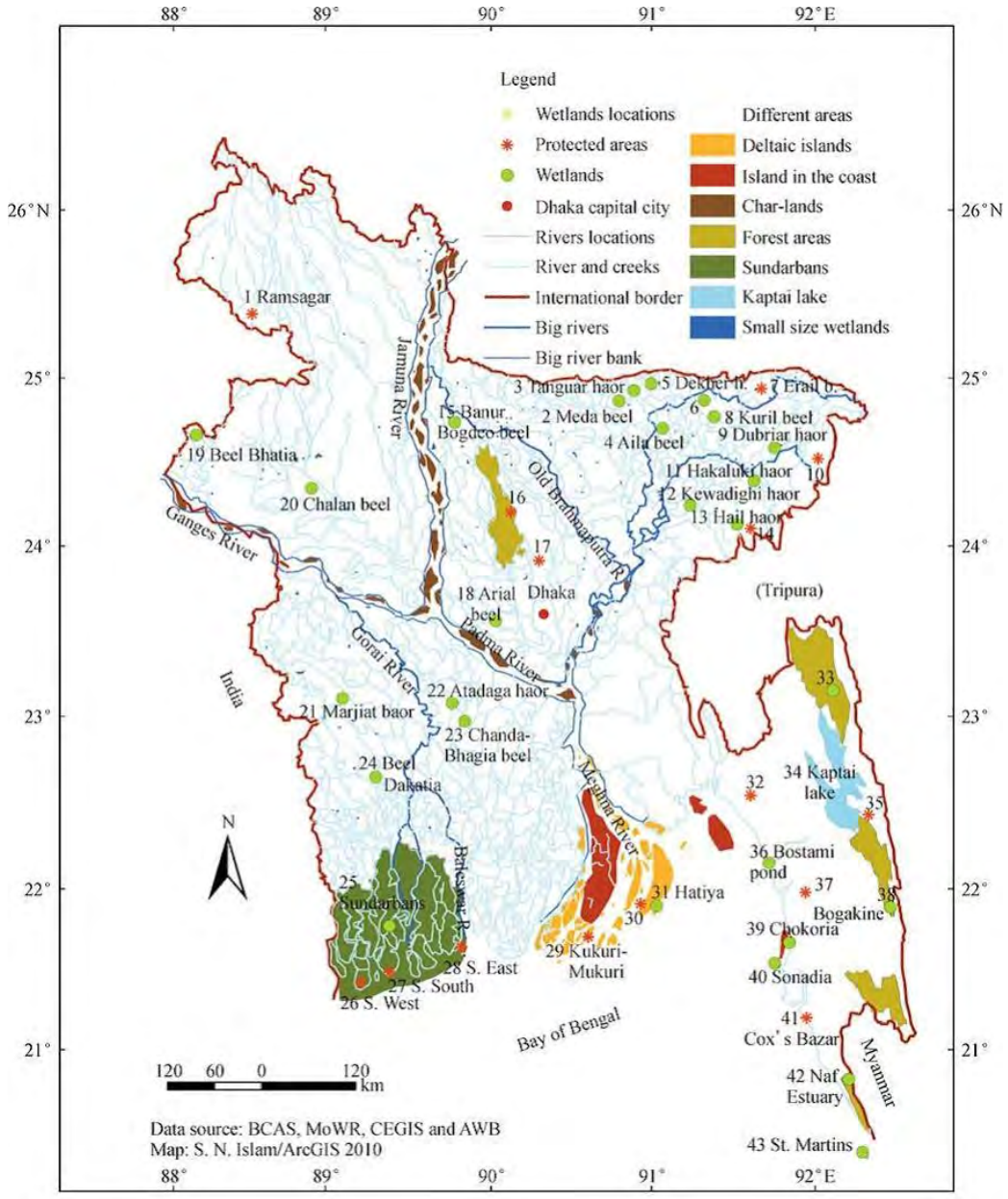

Figure 5.3.2-2 Location of Ecologically Critical Areas (ECA) in Bangladesh Sonadia (location 40)

（**Note:** Biodiversity: mangrove vegetation of 27 species including Avicennia. officinalis, A. marina, A. alba, Sonneratia apetala (Note: Sonadias mangrove are distinct from the Sundarbans).

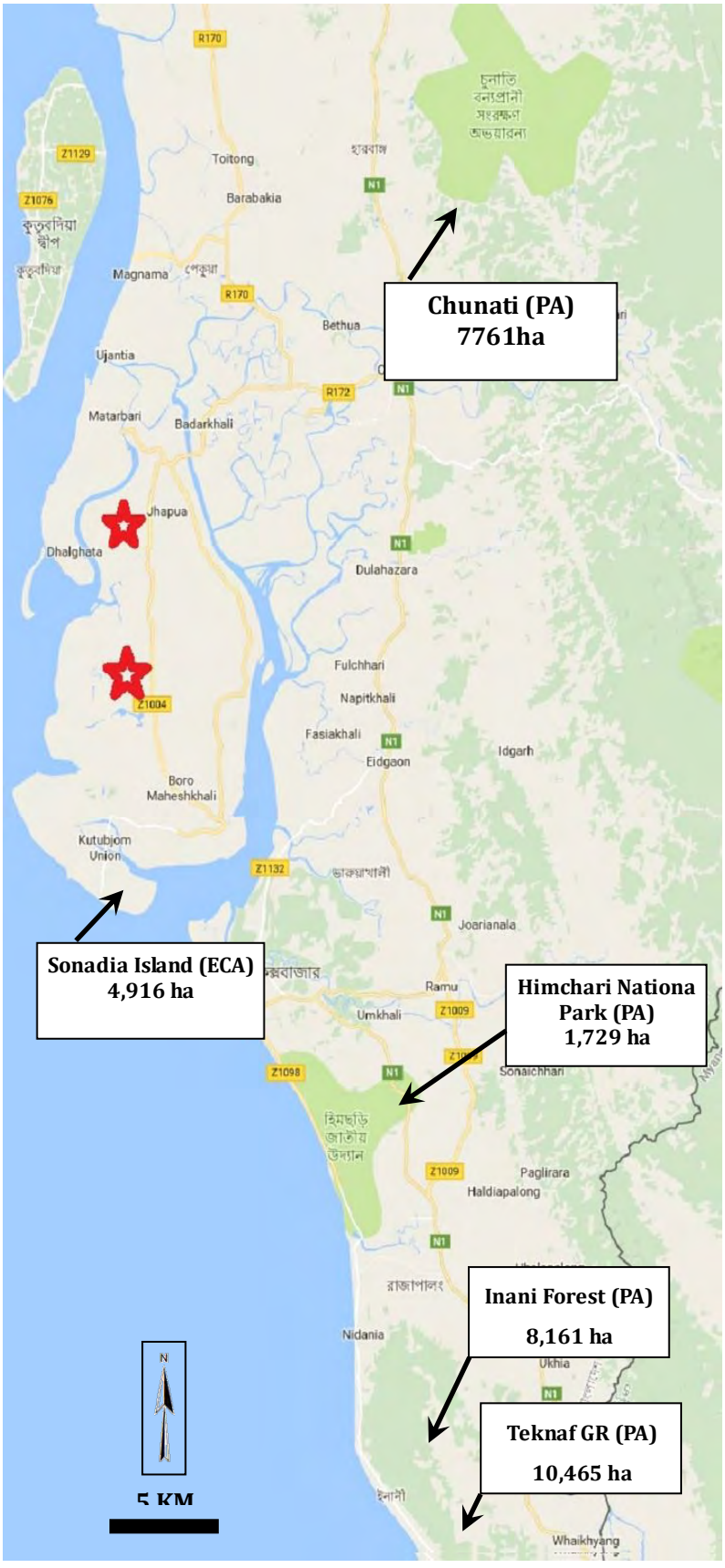

Figure 5.3.2-3 ECAs (Ecologically Critical Areas) and PAs (Protected Areas)

Table 5.3.2-5 Distance of Sonadia (ECA), Chunati (PA:WS), Himchari National Park (PA) and Inani Forest (PA) from EZ Sites

Name	Area (in Ha)	Category	Distance
Sonadia Island (Moheshkhali Upazila)	4,916	ECA (DoE)	EZ 1 = 14 km EZ 2 = 20 km
Inani Protected Area (Ukhia Upazila)	8,161	PA (IUCN) & Forest Department	EZ 1 = 47 km EZ 2 = 53 km
Himchari National Park (Ukhia Upazila)	1,729	PA (NP Cat V: IUCN' 94)	EZ 1 = 38 km EZ 2 = 44 km
Chunati Wildlife Sanctuary (Chakaria Upazila)	7,761	PA (WS Cat IV: IUCN' 94)	EZ 1 = 48 km EZ 2 = 42 km
Teknaf Game Reserve (Teknaf Upazila)	10,465	PA(GR Cat VI: IUCN' 94)	EZ 1 = 70 km EZ 2 = 76 km

■ **Maheskhali Mangrove Forest**

In Bangladesh, the total forest area including unclassed state forest land is about 2.25 million ha. Various types of forest like Reserve forest, protected forest, acquired forest, stated owned forest and vested forest are distributed among inland, hilly area and littoral areas.

Under Cox's Bazar District there are about 17, 214 acares (6970 ha) of land coved by Mangrove Forest (distinct from the Sudarbans) of the total area Maheskhali accounts for more than 12,991 acres, Chokoria 595 acres, Cox's Bazar Sadar Upazila 1,258 acres, Kutubdia 578 acres, Teknaf 883 acres and Pekua 909 acres . Whereas, among the reserved and protected forest in Cox's Bazar, 104,103 ha area is under reserved forest and 12,430 ha is designated as protected forest respectively. Sonadia's mangroves are distinct from the well-known Sundarbans in Southwest Bangladesh, due to their development in a coastal lagoon setting rather than in a delta.

■ **Biodiversity**

The biodiversity condition of the selected sites is poor and the species diversity is also low because of the absence of forest covered in and at the 15 km radius of both sites. Most of the people in Maheskhali area 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. Out of the total fish species, 54 species were endangered critically and 12 species are designated vulnerable.

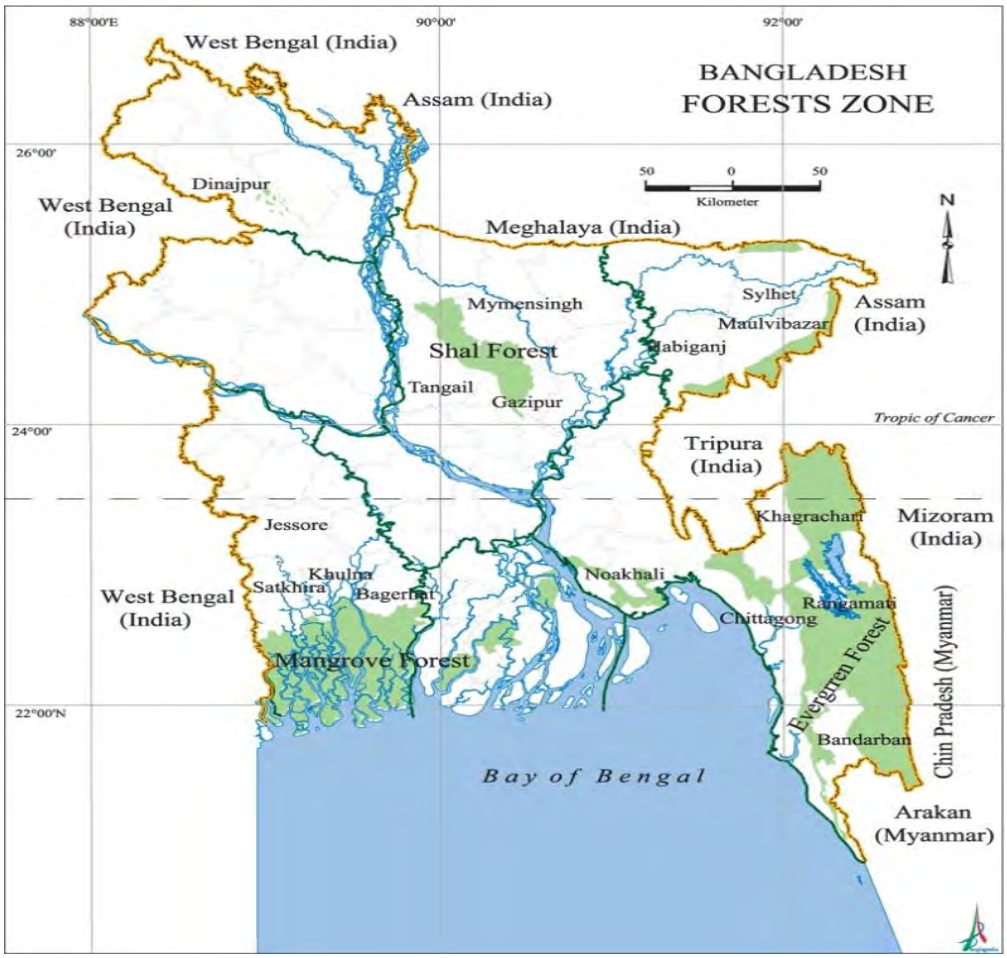

Figure 5.3.2-4 Bangladesh Forests Zone

Source: Bangladesh Prime Minister's Office

Table 5.3.2-6 List of Fish at Maheskhali EZ Site1 & 2

Scientific Name	**Common Name**	***Scientific Name***	**Common Name**
Liza subviridis	*Bata*	*Thunnus albacores*	Tuna
Sardinella fimbriata	Khaira	*Harpodon nehereus*	Loittya
Stolephorus tri	Kata Phasa	*Protonibea diacanthus*	Kala Poa
Rynchorhamphus	Ek Thute	*Euthynnus affiniss*	Bom Maitta
Pampus chinensis	Rup Chanda	*Dasyattis kuhlii*	Sapla Pata
Aetomylaeus nichofii	Shankachile	*Thryssa setirostris*	Phasa

Source: Site observation and consultation of local people

According to IUCN (International Union for Conservation of Nature), a total of 77 species of birds in the rainy season and 103 species of birds in the dry season recorded in the Maheskhali Island, no threatened species have been identified. Birds unusually seen in the Sonadia Island and Maheskhali Island are Spoon-billed sandpiper and Nordmann's greenshank, two endangered species were spotted at Sonadia Island. Alokardia and Belekardia in Sondia Island and Taziakatarchar and Paikdia in Maheskhali Island are considered as habitats of these bird species.

Table 5.3.2-7 List of Bird Species seen in Candidate EZ Sites

Scientific Name	Common Name	*Scientific Name*	Common Name
Corvus splendens	Crow	*Alcedo atthis*	Machranga
Passer domesticus	Charui	*Ardeola grayii*	Pond heron
Orthotomus sutorius	Tuntuni	*Cuculus microplerus*	Cuckoo
Acridotheres tristis	Bhat Shalik	*Oriolus xanthornus*	Haldey pakhi
Copsychus saularis	Doel	*Amaurorinus phoenicurus*	Dahuk
Streptopelia chinensis	Tila ghugu	*Picus myrmecophoneus*	Kath thokra
Psillacula krameri	Tia	*Tringa guttifer*	Nordmann's greenshank
Haliaster indus	Kite	Calidris pygmaea	Spoon-billed sandpiper

Source: Site observation and consultation of local people

Mammals, such as Bat, Jackal, Mongoose, Rat, House mouse, Fishing Cat, Jungle Cat, Gibbon etc. are mostly seen within the Proposed EZ sites. Also, reptiles water snake, cobra, Gharghiri snake are mostly seen within the areas.

Table 5.3.2-8 List of Mammals seen in Candidate EZ Sites

Scientific Name	Common Name	*Scientific Name*	Common Name
Morenia peterci	Bengal-eyed turtle	*Hemidactylus brooki*	House lizard
Chelonia mydas	Green turtle	*Pelamis platurus*	Yellow-bellied sea snake
Lepidochelys olivacea	Olive Ridley	*Hydophis obscurus*	Estuarine sea snake
Lissemys puctata	Indian flap shell turtle	*Hoplobatrachus tigerinus*	Bull frog
Calotes versicolor	Garden lizard	*Euphlyctis cyanophlyctis*	Skipper frog
Mabuya carinata	Common skink	*Kaloula pulchra*)	Climber frog
Gekko gecko	Common gecko		

Source: Site observation and consultation of local people

(3) Social Environment Conditions

Moheskhali is an Islan Upazila of Cox's Bazar. It was upgraded as upazila on 16 December, 1982. Nothing is definitely known about the origin of upazila name. But it is said that the name of upazila has been originated from the name of an influential man named Mohesh who came to this island first and started habitation. The island is separated from the main land by the Moheskhali Channel.

■ **Area Location**

The upazila occupies an area of 362.18 sq. km including 57.47 sq. km forest area. It is located between $21^{0}28'$ and 21046' north latitudes and between $91^{0}51'$ and $91^{0}59'$ east longitudes. The upazila is bounded on the north by Pekua Upazila and Kutubdia Upazila, east by Moheskhali channel and Chakoria Upazila and Cox's Bazar Upazila, south and west by the Bay of Bengal.

■ **Population and Demography**

The total population of Cox's Bazar district is 459,082 (Male- 241,637 and Female- 217,445), sex ratio 111:100, population density 963/Sq Km and annual growth rate is 2.76%. Whereas in Moheshkhali Upazila total population is 321, 218 (Male 165,693 and Female 155,525), sex ratio 107:100 with average size of 1946 populations in one village. The annual population growth rate for the upazila is 2.24%.

The number of Upazilla in Cox's Bazar district is 08, named Chakoria, Cox's Bazar, Kutubdia, Moheshkhali, Pekua, Ramu, Teknaf, Ukhia containing 67 Unions, 189 Mauzas and 984 Villages (BBS 2011) and in Moheshkhali Upazila total number of Municipality 01, unions 09 and 151 villages (BBS 2011).

Table 5.3.2-9 Broad classification of area (in Sq. Km) (BBS-2011)

Upazila	Total area	Reserve forest
Cox's Bazar	228	92.60
Chakoria	503.83	207.76
Kutubdia	215.79	4.46
Moheshkhali	362.18	57.47
Pekua	139.61	--
Ramu	391.71	185.76
Teknaf	388.66	156.42
Ukhia	261.80	176.64
Total	2491.58	881.11

Table 5.3.2-10 Population and literacy rate of 1981, 1991, 2001 & 2011

Upazila	Population (000)		Literacy Rate (%)	
	2001	2011	2001	2011
Cox's Bazar	348075	459082	39.7	49.2
Chakoria	503390	474465	32.0	47.6
Kutubdia	107221	125279	28.4	34.0
Moheshkhali	256546	321218	22.5	30.8
Pekua	171538	178135	35.3	---
Ramu	211615	276885	26.0	36.6
Teknaf	209787	274871	24.4	26.7
Ukhia	155187	207379	28.4	36.3

■ **Indigenous Peoples**

There is no evidence of indigenous community has been identified in Moheshkhali Upazila, as well as nearby the EZ Sites. However few indigenous community peoples live in Cox's Bazar, Ukhia and Chakaria Upazila. Tanchangya is one of the indigenous community people who live in Chakaria and Ukhia Upazila. Another indigenous community is Rakhaing who also lives in Cox's Bazar.

■ **Livelihood and Poverty**

Agrarian economy prevails almost in all the corners of the district. Out of total 56316 acres of land about 47% holdings are performing agricultural activities. Farmers mainly produces varieties of HYD rice Aus, Aman and Boro, potato, sweet potato, plenty of vegetables for example, tomato, reddish, pumpkin, and other minor crops. Fruits like mango, litchi, papaya, guava, jackfruit, coconut etc. are also produces a lot. Dry fish, salt industry, fish processing industry, ice mill and brittle leaves etc. are also mentionable industries.

Table 5.3.2-11 Land utilization (temporary cropped area) BBS 2008

Upazila	Current Fellow	Temporary Cropped Area					
		Single	Double	Tripple	Net	Gross	Productivity of Crop
Chakoria	68	16,104	12,359	3,391	31,854	50,995	160
Cox's Bazar	54	7,210	7,488	430	15,128	23,476	155
Kutubdia	87	1,120	4,412	408	6,940	12,168	175
Moheshkhali	170	11,505	2,990	1,040	25,535	20,605	133
Pekua	149	4,122	5,414	51,581	11,054	19,504	126
Ramu	195	15,444	6,362	2,143	23,949	34,597	144
Teknaf	115	12,004	1,280	704	13,991	16,679	119
Ukihia	254	6,043	5,745	920	12,708	20,293	160
Total	1,092	74,555	46,050	10,554	131,159	198,317	151

Table 5.3.2-12 Number of Selected Industry (Small & Medium) 2011

Upazila	Hand-loom factory	Dying facilities	Salt processing	Pottery	Dry fish processing	Rice mill	Auto rice mill	Flour mill	Wooden furniture
Chakoria	70	120	0	20	10	20	7	4	400
Cox's Bazar	0	0	38	10,000	40	32	0	0	155
Kutubdia	0	0	0	0	0	0	0	22	55
Moheshkhali	100	150	3	100	50	0	150	20	160
Pekua	0	0	0	0	0	50	30	0	150
Ramu	8	0	0	0	20	12	0	0	120
Teknaf	0	0	0	12	6	10	0	0	70
Ukihia	0	0	0	0	0	20	17	0	150
Total	178	270	41	10,132	126	144	204	46	1,260

Table 5.3.2-13 Number of Fishermen and Production of Fish in 2009-10 & 2010-11 (Production in Metric Ton)

Upazila	2010-2011		2009-2010	
	Number of Fishermen	Production (Mt.Ton)	No. of Fishermen	Production (Mt.Ton)
Chakoria	870	5	860	4
Cox's Bazar	5895	25700	5483	24125
Kutubdia	5500	659165	5400	626579
Moheshkhali	4000	15000	35000	14000
Pekua	3250	659	3185	499
Ramu	450	600	450	566
Teknaf	22000	860	21500	8597
Ukhia	6000	4870	520	4710
Total	78565	7026859	72398	679080

Table 5.3.2-14 Number of Establishments and Persons Engaged by Activity in Moheshkhali Upazila

Industry	Total Person
Flour Mill	40
Pottery	195
Bakery	100
Rice mill	250

Handloom	950
Cottage industry	1000

■ **Resettlement**

The both EZ site are locate in a salt pan area and no settlement has been identified within the project site. The identified EZ site would be excluded existing settlements that mean no resettlement would be required.

5.3.3 IEE-level Surveys at the Selected Medium-term EZ Development Sites

Under the IEE-level Survey, the Environmental Scoping, Mitigations of Environmental Impact and Environmental Monitoring on the two proposed EZ Development Sites were conducted. Evaluation Criteria for Environmental Scoping are as shown in the Table 5.3.3-1 below. The both proposed EZ development projects are categorized into JICA category of A.

Table 5.3.3-1 Environmental Scoping Criteria

＜A＞ or **<Major＞ :** Clearly and heavily impactive to environments and societies. However, projects and activities shall be reviewed or reconsidered. Or by taking enough countermeasures, it enables environmental and social impacts to be depressed to small or natural remediable and recoverable impacts. For example, more impactive than JICA's Screening Category A (e.g. people to be resettled (**About 200 and more**), deforesting (About **100 ha and more**), reclamation (**About 50 ha and more**) and any other loss of abundant natural environments such as mangroves, tidal lands, etc.);

＜B＞ or **＜Small＞ : Smaller impactive than <A >. Slight environmental and social impacts and within a naturally remediable and recoverable range. Even if not remediable and recoverable, it shall be limited to within a certain range as mentioned in Category A**. By taken conventional proper countermeasures, it can be limited within ranges of environmental criteria and exhaust gas/waste water emission/discharge criteria.

＜C＞ or **＜Unclear＞ : Magnitudes and extents of impacts are unclear and needed to clarify them in the subsequent full-scale EIA by detailed field surveys, numerical simulation studies, etc. by specialists, experts and scientists.**

＜D＞ or **＜None＞ : Not impactive or nil**

Source: JICA Study Team

5.3.3.1 Prediction and Evaluation of Environmental Impacts

In this chapter, the two (2) propose mid-term EZ development sites is discussed by using environmental scoping matrixes to clarify the TOR in full-scale EIA as much as possible.

"Prediction and Evaluation of Environmental Impacts", "Mitigation (Avoidance, Minimization, Compensation)", and "Environmental Impact Monitoring" for the two candidate sites have been conducted by applying the Environmental Scoping Matrix. Results of the analysis for the proposed General EZ are illustrated in the Table 5.3.3-2 to Table 5.3.3-4 respectively. The both of selected EZ projects are categorized into JICA category of A.

Table 5.3.3-2 Environmental Scoping Matrix（Prediction and Evaluation of Environmental Impacts）for General EZ

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
Pollution	1	Air Quality	B-	B-	（Before and during construction） Temporary air pollution due to exhaust gasses and dusts arisen from constructional machines and vehicles will be anticipated. （During operation） Air is anticipated to be polluted by vehicles in and out to EZ and tenant industries in EZ.
	2	Water Quality	B-	B-	（Before and during construction） Rivers and channels are anticipated to be polluted by rain water and waste water issued from construction sites. （During operation）Polluted effluent issued from tenant factories and industries are anticipated.
	3	Wastes	B-	B-	（Before and during construction） Constructional soil spoils, wastes from constructional facilities and equipment are anticipated. In addition, wasted produced from constructional camps are anticipated. （During operation）Wastes produced from tenant factories and industries are anticipated.
	4	Soil Contamination	B-	B-	（Before and during construction）The project site almost in salt farms, therefore, soil pollution by heavy metals, pesticides, human wastes, etc. are not anticipated. （During operation） Soil is anticipated to be polluted by heavy metals, etc. in wastes issued from tenant factories and industries.
	5	Noise and Vibration	B-	B-	（Before and during construction） Noise and vibration are anticipated when constructional equipment and vehicles operated and driven. （During operation） Noise and vibration generated by tenant factories and industries are anticipated.
	6	Subsidence	B-	B-	（Before and during construction） The project site is almost in salt farms, therefore, large subsidence due to operation of constructional vehicles, etc. is anticipated. （During operation） Large subsidence is anticipated to be caused by thick and large soil filling, heavy structures installed, pumping a large amount of ground water, and so on. In addition, soil liquefaction is anticipated when a large earthquakes happens.
	7	Odor	B-	B-	（Before and during construction） Odor is anticipated during construction. If happen, localized and temporary. （During operation） Odor issued from EZ tenants is anticipated , however, can be mitigated to a minimum.

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
Natural Environment	8	Protected Areas	D-	D-	There is no national parks, reserved areas near the project area. However, there is the Sonadia island exists about 10 km away south from the site, it is designated as an ECC (Ecological Critical Area) which should be protected from effluent issued from the construction and project sites.
	9	Ecosystem and Biota	B-	B-	The proposed EZ site locates in salt farms. There will be no special and valuable flora and fauna.
	10	Hydrology	D-	D-	A large volume of earthwork is anticipated, however, proper countermeasures will be taken to be able to minimize environmental impacts.
	11	Topography and Geology	D-	D-	Ditto.
Social Environment	12	Resettlement and Land Acquisition	B-	D-	（Before and during construction ）: There is no relocation or resettlement of people and houses in the project. However, salt farmers shall be fully compensated because they must part with their own lands.
	13	Living and Livelihood	B-	B-	As far as EPC contractors, EZ operators and tenant factories and industries comply with environmental and emission/discharge criteria, impacts on inhabitants are not anticipated.
	14	Heritage	D-	D-	There are no heritages in and near the project site.
	15	Landscape	A-	A-	A lot of clean and calm shorelines and salt farms are lost for the EZ development.
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	There are no ethnic minorities and indigenous peoples in the project site.
	17	Labor Environment	D-	D-	As far as EPC contractors, EZ operators and tenanted factories and industries comply with law and environmental laws and rules, harsh and poor working environments and situations are not anticipated.
Other	18	Project includes access roads, railways, bridges	D-	D-	In the project, large roads, railways, bridges, etc. are not envisaged, however, short roads to trunk roads are envisaged . Trunk roads and railways will be provided by other projects.
	19	Project includes telecommunication cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	In the project, large scaled power transmission and distribution plants and facilities are no envisaged.

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	B-	Operation of EZs needs a large amount of fossil fuels and electric power. It leads to accelerate global warning indirectly so far as proper countermeasures are not taken. As a result, Bangladesh vulnerable to climate change may lose a lot of land due to sea level rise. Factories and industries advance to Bangladesh, energy consumption in Bangladesh to increase greenhouse gasses (GHC) such as CO_2, etc. Operation of EZs needs a large amount of fossil fuels and electric power. **It leads to accelerate global warning indirectly so far as proper countermeasures are not taken.** However, only the mid-term EZ development project will not contribute to global warming so much.

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;
c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

Table 5.3.3-3 Environmental Scoping Matrix (Mitigation (Avoidance, Minimization, Compensation) for General EZ

（Maheskahali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Mitigations and countermeasures to be envisaged	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Pollution	1	Air Quality	B-	B-	Dust arisen from operation by constructional vehicles, etc. : Spraying water, temporary road paving, Exhausted gas from constructional equipment and vehicles: Complying with environmental criteria and emission criteria exhausted gas to teat exhausted it.	Air pollutants emitted from tenant factories and industries: Tenant entities shall treat exhausted gas to emit it to ambient.

（Maheskahali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Mitigations and countermeasures to be envisaged	
			Before construction /During construction	During operation	Before construction /During construction	During operation
	2	Water Quality	B-	B-	Polluted and turbidity water from construction sites: Treating settling basins, etc. to discharge it to public waters such as seas, rivers, and channels. In addition, protected areas such as ECA (Ecological Critical Areas), it may need to deploy silt fences to protect such areas from turbidity water.	Harmful substances in waste water from tenant factories and industries: The tenants shall remove harmful substances to discharge the treated water to public waters.
	3	Wastes	B-	B-	Constructional wastes: Reuse or disposal of wastes in disposal site, etc.	Solid wastes from tenant factories and enterprises: The tenants shall teat it by themselves or subcontract it to the specialists.
	4	Soil Contamination	B-	B-	Polluted soils with heavy metals, etc.in exiting soil: To remove heavy metals, etc. to dispose in disposal sites.	---
	5	Noise and Vibration	B-	B-	Noise and vibration by constructional equipment and vehicles: Sound insulation panels and sheets, operation and application of low noise and vibration constructional equipment and construction methods.	Noise and vibration generated by tenant factories and industries: Installation of soundproof walls and vibration absorption foundations, and enclosement in soundproof wall buildings and rooms.
	6	Subsidence	B-	B-	Enough safety countermeasures shall be taken against the subsidence during the construction.	Subsidence due to pumping a large amount of ground water: Do not pumping a large amount of water and widen well spacing, Subsidence due to soil liquefaction: Soil replacement and pile foundation for structures and buildings.
	7	Odor	B-	B-	---	To be treated by tenanted factories and industries.
Natural Environment	8	Protected Areas	D-	D-	---	---
	9	Ecosystem and Biota	B-	B-	Impacts on ecosystem and biota: *Ecosystem and biota shall be, if possible, transplanted or immigrated to other places after discussion with local stakeholders.*	Impacts on ecosystem and biota: *Ecosystem and biota transplanted and mitigated shall be, if possible, maintained well in other places after discussion with local stakeholders.*
	10	Hydrology	D-	D-	---	---
	11	Topography and Geology	D-	D-	---	---

（Maheskahali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Mitigations and countermeasures to be envisaged	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Social Environment	12	Resettlement and Land Acquisition	B-	D-	At present, resettlement of people and houses are not envisaged, however, land acquisition shall be done in accordance with rules and regulation of the Ministry of Land.	Same as in the left.
	13	Living and Livelihood	B-	B-	Ditto.	Ditto
	14	Heritage	D-	D-	---	---
	15	Landscape	A-	A-	---	In the EZ project site, greenbelts and parks shall be provided.
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	---	---
	17	Labor Environment	D-	D-	---	---
Others	18	Project includes access roads, railways, bridges	D-	D-	---	---
	19	Project includes telecommunication cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	---	---
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	D-	---	By implementing plans and countermeasures as shown in Chapters 4.6.3 and 5.3.6., global warning can be reduced and mitigated.

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;
c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

Table 5.3.3-4 Environmental Scoping Matrix (Environmental Impact Monitoring)
For Maheskhali General EZ

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ① Sampling items ; ② Monitoring points ; ③ Monitoring Frequency ; and ④ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Pollution	1	Air Quality	B-	B-	① Dust and air pollutants in exhausted gas from constructional vehicles; ② Construction sites and routes of transportation materials, etc. ; ③ As required by EPC contractors/ employers and unannounced by competent authorities; and ④ EPC contractors/ employers and unannounced by competent authorities;	① Air pollutants issued from EZ; ② Within and around the EZ site; ③ Periodically and unannounced.; and ④ Tenants in the EZ/Operators of the EZ and competent authorities.
	2	Water Quality	B-	B-	① Harmful substances in waste water discharged from construction sites;、 ② Outlet of water treating facilities such as settling basins, near protected areas such as ECA, etc.;， ③ As required and unannounced; and ④ EPC contactors/Employers and competent authorities.	① Human wastes, sewage, harmful substances in waste water discharged from tenanted factories and industries; ② Outlets of all waste effluents discharged from tenants in the EZ; ③ Periodically by EZ tenants/and EZ operators and unannounced by competent authorities; and ④ EZ tenants/and EZ operators and unannounced by competent authorities.
	3	Wastes	B-	B-	① Constructional wastes, wastes, harmful substance in human wastes, sewage from camps and site offices; ② Construction sites, offices, camps, etc.; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities	① Harmful substances in solid wastes, waste waters, etc. generated in tenants in the EZ; ② Outlets of treating plants and facilities in tenants; ③ Periodically and unannounced; and ④ EPC contactors/employers and competent authorities.

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ① Sampling items ; ② Monitoring points ; ③ Monitoring Frequency ; and ④ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
	4	Soil Contamination	B-	B-	① Harmful substances such as heavy metals, pesticides, oils, etc. in disposed in-situ soils , imported soils, etc. ; ② Construction sites, borrow pits, etc. ; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Harmful substances such as heavy metals, pesticides, oils, etc. in soils within tenanted factories and industries in the EZ; a ② Within tenanted factories and industries; ③ Periodically and unannounced; and 抜打ち ④ EPC contactors/employers and competent authorities.
	5	Noise and Vibration	B-	B-	① Noise and vibration; ② Construction sites and route of transportation of materials, etc.; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Noise and vibration; ② Within tenants in the EZ; ③ As required and unannounced; and ④ EZ tenants/operators and competent authorities.
	6	Subsidence	B-	B-	① Subsidence; ② Construction sites and route of transportation of materials, etc.;、 ③ As requited; and ④ EPC contactor/employers.	① Subsidence and ground water levels; ② Within and around the EZ ; ③ Periodically; and ④ EZ tenants/operators and competent authorities.
	7	Odor	B-	B-	① Odor; ② Construction sites and route of transportation of materials, etc.; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Odor; ② Within and around the EZ; ③ Periodically and unannounced; and ④ EZ tenants/operators and competent authorities.
Natural Environment	8	Protected Areas	D-	D-	---	---
	9	Ecosystem and Biota	B-	B-	① Odor; ② Construction sites and route of transportation of materials, etc.; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Odor; ② Within and around the EZ; ③ Periodically and unannounced; and ④ EZ tenants/operators and competent authorities.
	10	Hydrology	D-	D-	---	---

（Maheskhali General EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ① Sampling items ; ② Monitoring points ; ③ Monitoring Frequency ; and ④ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
	11	Topography and Geology	D-	D-	---	---
Social Environment	12	Resettlement and Land Acquisition	D-	D-	① Inhabitant' living environments, conditions and their changes; ② Inhabitants around the EZ; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Inhabitant' living environments, conditions and their changes; ② Inhabitants around the EZ; ③ As required and unannounced; and ④ EZ Tenants/operators and competent authorities.
	13	Living and Livelihood	B-	B-	Ditto.	Ditto.
	14	Heritage	D-	D-	---	---
	15	Landscape	A-	A-	---	---
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	---	---
	17	Labor Environment	D-	D-	① Working environment ; ② Construction sites; ③ As required and unannounced; and ④ EPC contractors/employers and competent authorities	① Working environment; ② Tenants' factories, etc. ③ As required and unannounced; and ④ EZ tenants, EZ operators and competent authorities
Others	18	Project includes access roads, railways, bridges	D-	D-	---	---
	19	Project includes telecommunication cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	---	---
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	B-	---	① Greenhouse Gasses (GHG) such as CO_2, etc. generated in Bangladesh; ② Within Bangladesh; ③ As required; and ④ Government of Bangladesh （GoB）/United Nation (UN).

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;
c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

The similar exercise has been conducted for the proposed Seaboard EZ development and the results thereof are as shown in the Table 5.3.3-5 to Table 5.3.3.7 below.

Table 5.3.3-5 Environmental Scoping Matrix (Prediction and Evaluation)
For Maheskhali Seaboard EZ

（Maheskhali Seaboard EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
Pollution	1	Air Quality	B-	A-	（Before and during construction） Temporary air pollution due to exhaust gasses and dusts arisen from constructional machines and vehicles will be anticipated. （During operation） Air is anticipated to be polluted by vehicles in and out to EZ and industries in EZ.
	2	Water Quality	B-	A-	（Before and during construction） Rivers and channels are anticipated to polluted by rain water and waste water issued from construction sites. （During operation） River and channels are anticipated to be polluted by effluent issued from tenants in EZs.
	3	Wastes	B-	A-	（Before and during construction） Constructional soil spoils, wastes from constructional facilities and equipment are anticipated. In addition, wasted produced from constructional camps are anticipated. （During operation） A large amount of wastes is anticipated to be produced by tenant factories and industries.
	4	Soil Contamination	B-	A-	（Before and during construction）The project site almost in salt farms, therefore, soil pollution by heavy metals, pesticides, human wastes, etc. Are not anticipated. （During operation） Heavy metals, etc. in wastes produced from tenant factories and industries are anticipated.
	5	Noise and Vibration	B-	A-	（Before and during construction） Noise and vibration are anticipated when constructional equipment and vehicles operated and driven. （During operation） Noise and vibration generated by tenanted factories and industries are anticipated.

（Maheskhali Seaboard EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
	6	Subsidence	B-	A-	（Before and during construction） In the site, heavy structures such as large tanks, etc. will be installed. The project site is almost in salt farms, therefore, large subsidence due to operation of constructional vehicles, etc. is anticipated. （During operation）Large subsidence is anticipated by large and thick soil filling, heavy structures installed, pumping a large amount of ground water, and so on. In addition, soil liquefaction is anticipated when a large earthquakes happens.
	7	Odor	B-	B-	（Before and during construction） Odor is anticipated during construction. If happen, localized and temporary. （During operation）Odor from EZ tenants is anticipated , however, can be mitigated to a minimum. Especially odor caused by painting works in shipbuilding will be serious.
Natural Environment	8	Protected Areas	D-	D-	There is no national parks, reserved areas near the project area. However, there is the Sonadia island exists about 10 km away south from the site, it is designated as an ECC (Ecological Critical Area) which should be protected from effluent issued from the tenant factories and industries.
	9	Ecosystem and Biota	B-	B-	The project site locates near the planned industrial port for the Matabari Industrial Complex (Kombinat). Here are shoreline mangroves. However, by being transplanting to other shorelines, Bangladeshi natures will be compensated and maintained.
	10	Hydrology	D-	D-	Coastal change and change flow regime of exiting rivers and channels are anticipated by large earthworks construction such construction high storm surge barriers, excavation, embankment, etc. . However, their magnitude will be governed by an adjacent projects of Matabari Industrial Complex (Konbinat). The EZ development project will be not so impactive.
	11	Topography and Geology	D-	D-	Ditto.
Social Environment	12	Resettlement and Land Acquisition	B-	D-	（Before and during construction ）: There are only some small shanties in the project site which nobady lives. Thus, there is no relocation or resettlement of people and houses occurred in the project. However, salt farmers shall be fully compensated because they must part with their own lands.
	13	Living and Livelihood	B-	B-	As far as EPC contractors, EZ operators and tenant factories and industries comply with environmental and emission/discharge criteria, impacts on inhabitants are not so serious.
	14	Heritage	D-	D-	There are no heritages in and near the project site.
	15	Landscape	A-	A-	A lot of clean and calm shorelines and salt farms are lost for the EZ development.
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	There are no ethnic minorities and indigenous peoples in the project site.
	17	Labor Environment	D-	D-	As far as EPC contractors, EZ operators and tenanted factories and industries comply with law and environmental laws and rules, harsh and poor working environments and situations are not anticipated.

（Maheskhali Seaboard EZ）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Reasons for Evaluation
			Before construction /During construction	During operation	
Others	18	Project includes access roads, railways, bridges	D-	D-	In the project, large roads, railways, bridges, etc. are not envisaged, however, short roads to trunk roads are envisaged . Trunk roads and railways will be provided by other projects.
	19	Project includes telecommunication cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	In the project, large scaled power transmission and distribution plants and facilities are no envisaged.
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	B-	Operation of EZs needs a large amount of fossil fuels and electric power. It leads to accelerate global warning indirectly so far as proper countermeasures are not taken. As a result, Bangladesh vulnerable to climate change may lose a lot of land due to sea level rise. Factories and industries advance to Bangladesh, energy consumption in Bangladesh to increase greenhouse gasses (GHC) such as CO_2, etc. Operation of EZs needs a large amount of fossil fuels and electric power. **It leads to accelerate global warning indirectly so far as proper countermeasures are not taken.** However, only the mid-term EZ development project will not contribute to global warning so much.

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;
c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

Table 5.3.3-6 Environmental Scoping Matrix (Mitigation (Avoidance, Minimization, Compensation) for Maheskhali EZ

（Maheskhali Seaboard EZ)）

Classification	No.	Environmental Item	Significance of Environmental Impacts		Mitigations and countermeasures to be envisaged	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Pollution	1	Air Quality	B-	A-	Dust arisen from to operation by constructional vehicles, etc. : Spraying water, temporary road paving,. Exhausted gas from constructional equipment and vehicles: Complying with environmental criteria and emission criteria exhausted gas to treat it.	Air pollutants emitted from tenant factories and industries: Tenanted entities shall treat exhausted gas to emit it to ambient.
	2	Water Quality	B-	A-	Polluted and turbidity water from construction sites: Treating settling basins, etc. to discharge it to public waters such as seas, rivers, and channels. In addition, protected areas such as ECA (Ecological Critical Areas), it may need to deploy silt fences to protect such areas from turbidity water.	Harmful substances in waste water from tenanted factories and industries: The tenants shall remove harmful substances to discharge the treated water to public waters.
	3	Wastes	B-	A-	Constructional wastes: Reuse or disposal of wastes in disposal site、etc.	Solid wastes from tenanted factories and enterprises: The tenants shall teat it by themselves or subcontract it to them to the specialists.
	4	Soil Contamination	B-	A-	Polluted soils with heavy metals, etc.: To remove heavy metals, etc. to dispose in disposal sites.	Pollutants and harmful matters which may generated in tenants to contaminate the soil: It shall be subcontracted to the specialists to be treated and disposed.
	5	Noise and Vibration	B-	A-	Noise and vibration by constructional equipment and vehicles: Sound insulation panels and sheets, operation and application of low noise and vibration constructional equipment and construction methods.	Noise and vibration generated by tenanted factories and industries: Installation of soundproof walls and vibration absorption foundations, and enclosement in soundproof wall buildings and rooms.
	6	Subsidence	B-	A-	Enough safety countermeasures shall be taken against the subsidence during the construction.	Subsidence due to pumping a large amount of ground water: Do not pumping a large amount of water and widen well spacing, Subsidence due to soil liquefaction: Soil replacement and pile foundation for structures and buildings.
	7	Odor	B-	B-	---	To be treated by tenanted factories and industries.

(Maheskhali Seaboard EZ))

Classification	No.	Environmental Item	Significance of Environmental Impacts		Mitigations and countermeasures to be envisaged	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Natural Environment	8	Protected Areas	D-	D-	---	---
	9	Ecosystem and Biota	D-	D-	Impacts on ecosystem and biota: *Ecosystem and biota including mangroves shall be, if possible, transplanted or immigrated to other places after discussion with local stakeholders.*	Impac ts on ecosystem and biota: *Ecosystem and biota transplanted and mitigated shall be, if possible, maintained well in other places after discussion with local stakeholders.*
	10	Hydrology	D-	D-	---	---
	11	Topography and Geology	D-	D-	---	---
Social Environment	12	Resettlement and Land Acquisition	B-	D-	At present, resettlement of people and houses are not envisaged, however, land acquisition shall be done in accordance with rules and regulation of the Ministry of Land.	Same as in the left.
	13	Living and Livelihood	B-	B-	Ditto.	Ditto.
	14	Heritage	D-	D-	---	---
	15	Landscape	D-	D-	---	In the EZ project site, greenbelts and parks shall be provided.
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	---	---
	17	Labor Environment	D-	D-	---	---
Others	18	Project includes access roads, railways, bridges	D-	D-	---	---
	19	Project includes telecommunicati on cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	---	---
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	B-	---	By implementing plans and countermeasures as shown in Chapters 4.6.3 and 5.3.6., global warning can be reduced and mitigated.

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;
c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

Table 5.3.3-7 Environmental Scoping Matrix (Environmental Impact Monitoring)
For Maheskhali Seaboard EZ）

（Maheskhali Seaboard EZ））

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ⑤ Sampling items； ⑥ Monitoring points； ⑦ Monitoring Frequency；and ⑧ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Pollution	1	Air Quality	B-	A-	① Dust and air pollutants in exhausted gas from constructional vehicles; ② Construction sites and routes of transportation materials, etc.; ③ As required by EPC contractors/ employers and unannounced by competent authorities; and ④ EPC contractors/ employers and unannounced by competent authorities	① Air pollutants issued from EZ； ② Within and around the EZ; ③ Periodically and unannounced；and ④ Tenants in the EZ/Operators of the EZ and competent authorities.
	2	Water Quality	B-	A-	① Harmful substances in waste water discharged from construction sites;、 ② Outlet of water treating facilities such as settling basins, etc.; ③ As required and unannounced; and ④ C contactors/Employers and competent authorities.	① Human wastes, sewage, harmful substances in waste water discharged from tenanted factories and industries； ② Outlets of all waste effluents discharged from tenants in the EZ； ③ Periodically by EZ tenants/and EZ operators and unannounced by competent authorities; and ④ EZ tenants/and EZ operators and unannounced by competent authorities.
	3	Wastes	B-	A-	① Constructional wastes, wastes, harmful substance in human wastes, sewage from camps and site offices; ② Construction sites, offices, camps, etc.; ③ As required and unannounced.; and ④ EPC contactors/emplyers and competent authorities。	① Harmful substances in solid wastes, waste waters, etc. generated in tenants in the EZ； ② Outlets of treating plants and facilities in tenants; ③ Periodically and unannounced; and ④ EPC contactors/employers and competent authorities

(Maheskhali Seaboard EZ))

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ⑤ Sampling items ; ⑥ Monitoring points ; ⑦ Monitoring Frequency ; and ⑧ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
	4	Soil Contamination	B-	A-	① Harmful substances such as heavy metals, pesticides, oils, etc. in disposed in-situ soils , imported soils, etc.; ② Construction sites, borrow pits, etc. ; ③ As required and unannounced.; and ④ EPC contactors/employers and competent authorities.	① Harmful substances such as heavy metals, pesticides, oils, etc. in soils within tenanted factories and industries in the EZ; ② Within tenanted factories and industries; ③ Periodically and unannounced; and ④ EPC contactors/employers and competent authorities.
	5	Noise and Vibration	B-	B-	① Noise and vibration; ② Construction sites and route of transportation of materials, etc.; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities;	① Noise and vibration;; ② Within tenants in the EZ; ③ As required and unannounced; and ④ EZ tenants/operators and competent authorities.
	6	Subsidence	B-	A-	① Subsidence; ② Construction sites and route of transportation of materials, etc.;、 ③ As requited; ④ EPC contactor/employers.	① Subsidence and ground water levels; ② Within and around the EZ ; ③ Periodically;; and ④ EZ tenants/operators and competent authorities.
	7	Odor	B-	B-	① Odor; ② Construction sites and route of transportation of materials, etc.; ③ As required and unannounced; and ⑤ EPC contactors/employers and competent authorities.	① Odor; ② Within and around the EZ; ③ Periodically and unannounced; and ④ EZ tenants/operators and competent authorities.
Natural environment	8	Protected Areas	D-	D-	---	---
	9	Ecosystem and Biota	B-	B-	① Growth of mangroves; ② Shorelines which mangroves are transplanted ; ③ Periodically; and ④ EPC contractors/employers and competent authorities.	① Growth of mangroves; ② Shorelines which mangroves are transplanted;; ③ Periodically; and ④ EPC contractors/employers and competent authorities.
	10	Hydrology	D-	D-	---	---
	11	Topography and Geology	D-	D-	---	---

（Maheskhali Seaboard EZ））

Classification	No.	Environmental Item	Significance of Environmental Impacts		Environmental Impact Monitoring ⑤ Sampling items ; ⑥ Monitoring points ; ⑦ Monitoring Frequency ; and ⑧ Monitors	
			Before construction /During construction	During operation	Before construction /During construction	During operation
Social Environment	12	Resettlement and Land Acquisition	B-	D-	① Inhabitant' living environments, conditions and their changes; ② Inhabitants around the EZ; ③ As required and unannounced; and ④ EPC contactors/employers and competent authorities.	① Inhabitant' living environments, conditions and their changes; ② Inhabitants around the EZ; ③ As required and unannounced; and ④ EZ Tenants/operators and competent authorities.
	13	Living and Livelihood	B-	B-	Ditto.	Ditto
	14	Heritage	D-	D-	---	---
	15	Landscape	A-	A-	---	---
	16	Ethnic Minorities and Indigenous Peoples	D-	D-	---	---
	17	Labor Environment	D-	D-	① Working environment ; ② Construction sites; ③ As required and unannounced; and ④ EPC contractors/employers and competent authorities	① Working environment; ② Tenants' factories, etc. ③ As required and unannounced; and ④ EZ tenants, EZ operators and competent authorities
Others	18	Project includes access roads, railways, bridges	D-	D-	---	---
	19	Project includes telecommunication cables, electric power transmission & distribution lines and oil & gas pipelines, etc.	D-	D-	---	---
	20	Impacts to transboundary or global environmental issues such as transboundary wastes, acid rain, destruction ozone layers and global warning	D-	B-	---	① Greenhouse Gasses (GHG) such as CO_2, etc. generated in Bangladesh; ② Within Bangladesh; ③ As required; and ④ Government of Bangladesh （GoB）/United Nation (UN).

Notes:
a) +/- : Significant positive and negative impact is expected;
b) B+/- : Positive/negative impact is expected to some extent;

c) C+/- : Extent of positive/negative impact is unknown (A further explanation is needed, and the impact could be clarified as the study progresses); and
d) D: No impact is expected ¥Explanatory Notes:

In terms of Zero Option for EZ development projects, it shall be referred to Table 4.6.4-1 in Chapter 4.6.

5.3.4 Strategic (Global and Medium--and-Long Term) Environmental Impact Protection and Control - CO_2 Reduction at Coastal EZs in the vicinity of Industrial Complex (Kombinat) and Industrial/Commercial Ports

In Bangladesh, risks will not be inevitable, global warming arisen from CO_2 emission caused by increased population and industrialization (EZ development, etc.) Bangladesh locates at the inner part of Bengal Bay will suffer from sever environmental impacts such as sea level rise by global warming, storm surge by cyclone. That is to say, global environmental impacts, in other words, global and mid-and-long termed environmental impacts.

CO_2 emitted from power sector, cement industries in Bangladesh, etc. can be reduced directly and indirectly by the following methods and technologies:

a. Carbon dioxides capture and Utilization (CCU): In the area where coal-fired power and cement plans are installed, CO_2 emitted from such plants can be used together with lime stones and cement to manufacture precast concrete products such as pipes, piles, poles, brock, etc. The concrete is called "CO_2 absorbing concrete [4] to absorb CO_2 as a part of raw materials for concrete when concrete cures. Therefore, CO_2 emitted from plants can be absorbed and consumption of cement can be saved. The CO_2 absorbing concrete cannot absorb all CO2 emitted from plants but save consumption of cement. Therefore it will contribute to reduction of CO_2 emitted from cement plants and global warning protection in the world. Fossil fuel-fired power plants shall be equipped with CCS to dispose properly and reuse as raw materials from now on.

b. Fly ash cement manufacturing: Fly ash is a byproduct produced from coal-fired power plants. By mixing fly ash into cement, CO_2 emitted from cement plants can be depressed.

c. Establishment of local consuming and dispersed power generation system in Bangladesh which is flexible to reception of power generated by renewable energies: Local consuming and dispersed power generation system has been already established in Bangladesh because natural gas pipelines, etc. are well developed in the country. The system can depress power transmission. In Bangladesh, renewable and environmental-friendly energies such as solar (Especially in Bangladesh, floating solar), wind power, natural gas, etc. are promising (See Figure 5.3.4-1.). If lands for solar power plants are acquired in lakes, inner bays, water logging areas, remaining salt farms, etc., floating solar + power + battery power (or fuel cell) generation is preferable. Natural gas-fired power (CCGT) plants can be installed at a power consuming area by pipelining natural gas to the power consuming area.

d. Slug cement manufacturing: By mixing a lot of sub product (slugs) produced from

[4] Consumption of cement will decrease to 1/3 by CO_2 absorbing cement and the amount of absorption is about 0.1/m^3-concrete (or 0.05t/t-concrete). All CO_2 emitted from 1,200 MW (Utilization factor = 80%) of Ultra Super Critical (USC) coal-fired power plants (About 7 MMt-CO_2/y) requires about a production of 300,000 t-precast concrete/y.

steelworks into ordinary cements to raise a composition ratio of clinker (crushed cement), consumption of cement can be decreased. As the result of that, consumption of cement decrease, therefore, CO_2 emitted from cement industries can be reduced.

e. Cement manufacturing using refuse incineration ash: Like slug from steelworks, in place of slug, by mixing refuse incineration ash into cement, consumption of cement decrease, therefore, CO_2 emitted from cement industries can be reduced.

f. CO_2 capture and storage (CCS): By injecting CO2 emitted from power plants into the existing oil and gas fields, CCS can be done. In addition, recovered crude oil and natural gas increase in such a way. CO_2 can be disposed into aquifers and salt domes.

Coastal Industrial complex (Smokestack industries or Heavy and petrochemical industries) proposed in Matarbari and Maheskhali Island will emit a large amount of CO_2. The enterprises and factories shown on Table 5.3.4-1 can contribute to CO_2 reduction. The following enterprises and factories will advance to such a coastal industrial complex.

- Enterprises and factories supporting Smokestack industries. Supporting enterprises and factories of packing materials such as cans, bags, etc. for products and semi products produced from smokestack industries, gas stations, car repair shops, etc.
- Manufacturing industries using raw materials, semi products and products from smokestack industries
- Carbon dioxides capture and utilization (CCU) industries which can contribute CO_2 reduction
- Industries exporting smokestack materials such as cement, steel, etc.
- Industries supporting visiting ships and boats at deep-sea port – Fuel oil supply, water supply, docks, tug service, ship chandlers, etc.
- Industries manufacturing imported goods and materials.

Table 5.3.4-1 Environmental friendly Industries, Factories and Products near/within Coastal EZs adjacent to Industrial Complex and Industrial/Commercial Ports

Smokestack and Petrochemical Industries	Industries, factories and products to contribute to global warming protection	Supporting industries to smokestack and petrochemical industries
■ Power (Coal)	① CO2 absorbing concrete manufacturing ② Fly ash cement manufacturing	
■ Power (LNG)	③ CCGT power plants with Cryogenic power generation)	
■ Power (Renewable energies)	③ Floating solar + wind + battery (or fuel cell) in lakes, inner bays, water logging areas → Captive power in EZs、on etc.	
■ Crude oil refining		Docks and repair shops for coastal oil tankers, tank lorries, etc.
■ Petrochemical		LPG and/chemical coastal tankers, plastics industries, packing/bagging materials (resin, etc.) in, etc.
■ Fertilizer		Bagging industries
■ Steel (Blast and electric	④ Slug cement manufacturing	Reinforced steel, shaped steel,

furnace)		shipbuilding, ship dismantling industries, etc.
■ Cement		Packing/bagging materials for cement
■ Refuse incineration	⑤ Incinerated refuse cement manufacturing	

（Note） ①～⑤ to be referred to previous descriptions.

Like Philippines, Sri Lanka, Vietnam, Pacific Ocean insular countries, etc., Bangladesh is one of climate change vulnerable countries who will be affected directly by sea level rise and land loss, increased cyclones and disasters, and so on cause by global warming. Bangladesh shall not only promote industries but also make an effort to reduce CO2 emission as a member of CVF (Climate Vulnerable Forum) as well.

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5.4 Formulation of Master Plan for Medium-term EZ Development

5.4.1 Preparation of Topographic Map by Digital Mapping

(1) Digital Mapping

Digital mapping of candidate sites in Maheskhali Island in Cox's Bazar district was carried out through sub-contract works. The existing aerial photographs, taken from an altitude of about 8,000 m in 2010−2011, were used as input data for the digital mapping process. Then a topographical map was prepared by using xy-coordinates and elevation of ground control points collected by ground survey.

Among 4 priority EZ candidate sites, digital mappings were carried out for two sites (Maheshkhali-1 and Maheshkhali-2) which were concurred by BEZA (Bangladesh Economic Zone Authority) in 2nd JCC Meeting.

(2) Survey Area

The target areas of each EZ development candidate site were determined not only by EZ development plan areas, but also by considering the following two points.

a) Making an infrastructure improvement plan based on ensuring consistency of ground elevation and a deployment plan of infrastructure facilities after the expansion of the EZ development plan area.
b) Understanding the relationship between the connection of EZ development candidate sites and the main highway as well as the surrounding environment, such as rainwater drainage to surrounding rivers and creeks.

1) Maheshkhali-2 (General EZ)

The survey area of Maheshkhali-2 in Figure 5.4.1-1 includes the EZ target area and the area required for other infrastructure. The survey area was a total of approx.3, 000 ha in accordance with the following items.

a) EZ survey area : 2,150 ha within Green line (see Fig. below)
b) Others : Surrounding marginal area and ground elevation of valleys of hilly area and existing houses at the east side of existing local road (Zila Road)

Figure5.4.1-1: Maheshkhali-2 Digital Mapping Site

2) Maheshkhali-1 (Seaboard EZ)

The survey area of Maheshkhali-1 in Figure 5.4.1-2 includes the EZ target area and the area required for other infrastructure. The survey area was a total of approx. 2,000 ha in accordance with the following items.

a) EZ target area : 570 ha within inner red line. (See Fig. Below)

b) Others : Marginal area indicated by outer red line, covering the area between west creek and existing local road (Zila Road).

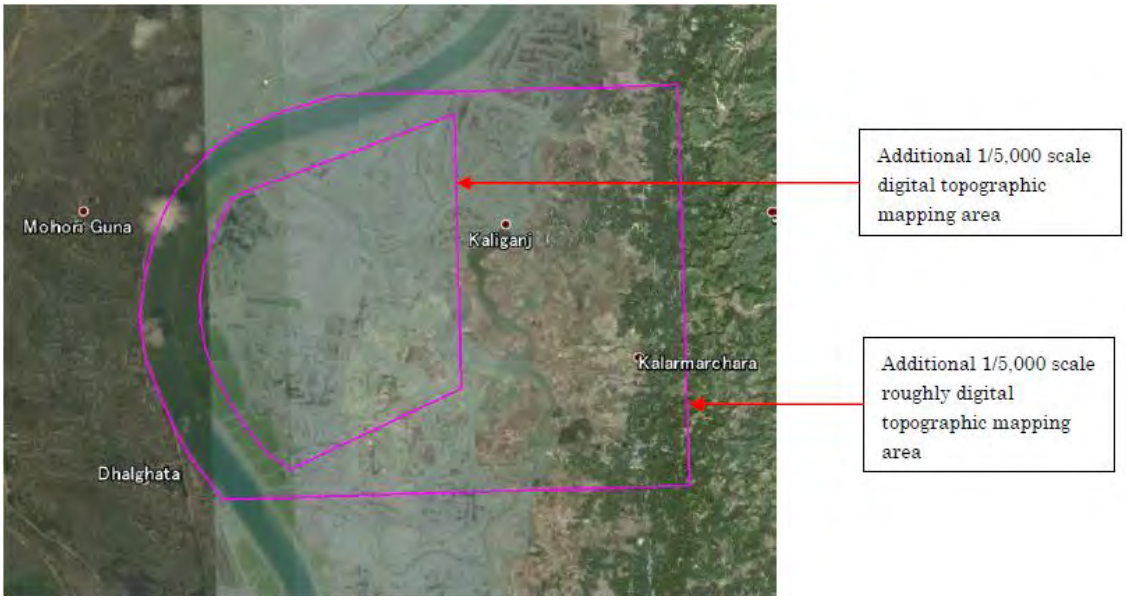


Figure5.4.1-2: Maheshkhali-1 Digital Mapping Site

In addition to above digital mapping target areas, the west sand bar (Matarbari Island)

and southern area between Maheshkhali-1 and 2 sites were also indicated as a part of the mapping output.

(3) Work Process

The field works, such as installation of the benchmark (BM), GPS surveying, leveling and map digitizing or generation of digital terrain data, were carried out in the period from February to March and May to July 2016 for Maheshkhali-2 and 1 respectively. Then data were summarized in the topographic map with the scale of 1: 5,000.

(4) Terrestrial Surveying and Digital Mapping

1) Projection of Topographic Map

Survey criteria are as follows

- Coordinate System (Projection) BUTM2010
- Ellipsoid WGS-84
- Datum of Elevation Bangladesh mean sea level at Chittagong (MSL±0.00m) (Bangladesh national height datum for land map)
- Unit Metric system
- Mapping Scale 1 : 5,000
- Plot out sheet size A-1 size for 1:5,000 scale Topographic maps
- Print Scale of A-3 Size (297 mm x 420 mm)Map 1:10,000

2) Ground Control Point

The coordinates of ground control points were determined by GPS surveying. Basic survey points and relevant coordinates were established applying GCP (Ground Control Point), BUTM2010, Benchmarks MSL (m) by GPS/level survey and air triangulation survey. Position, coordinates and elevation of ground control points at Maheskhali 2 and 1 are shown below in Figure 5.4.1-3 to 6 and Table 5.4.1-1 to 7.

Maheskhali 2 (General EZ)

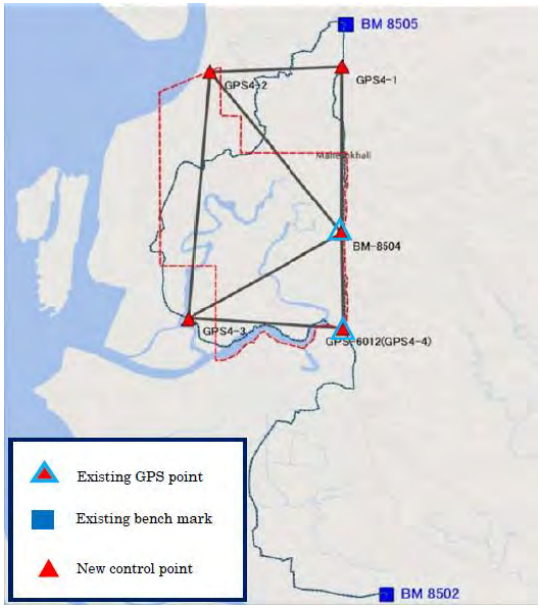


Fig.5.4.1-3 Location of Existing National GPS Points BM and Control Points

Fig.5.4.1-4 Location of Leveling Points

Table 5.4.1-1 Horizontal coordinates and elevations of the existing national GPS points used as given points

Point No.	Horizontal coordinates (WGS-84)		H (m)
	Latitude	Longitude	
BM 8505	-	-	8.582
BM 8504	21°36'09.65959"N	91°55'24.27503"E	4.486
GPS 6012	21°34'52.01224"N	91°55'25.52009"E	4.013
BM 8502	-	-	2.340

Source: SOB (Survey of Bangladesh)

Table 5.4.1-2 Horizontal Coordinates and elevation of Control Points and GPS Point

Point Name	Horizontal coordinates (BUTM2010, WGS-84)		Elevation (m)	Note
	E (m)	N (m)		
GPS 4-1	699062.946	2394258.068	7.096	New ground control point
GPS 4-2	695929.315	2394088.473	3.491	New ground control point
GPS 4-3	695494.750	2387906.861	3.624	New ground control point
BM 6012 (GPS 4-4)	699177.029	2387693.601	4.013	Existing GPS point

Source: SOB (Survey of Bangladesh)

Table 5.4.1-3 Elevation of levelling Points

Point Name	Elevation (m)	Point Name	Elevation (m)
L4-7	8.918	L4-14	3.123
L4-8	4.185	L4-14/1	1.481
L4-9	2.612	L4-15	2.932
L4-10	2.905	L4-16	5.849
L4-11	2.318	L4-17	8.133
L4-12	1.710	L4-18	5.556
L4-13	2.220	L4-19	6.933

Maheskhali 1 (Seaboard EZ)

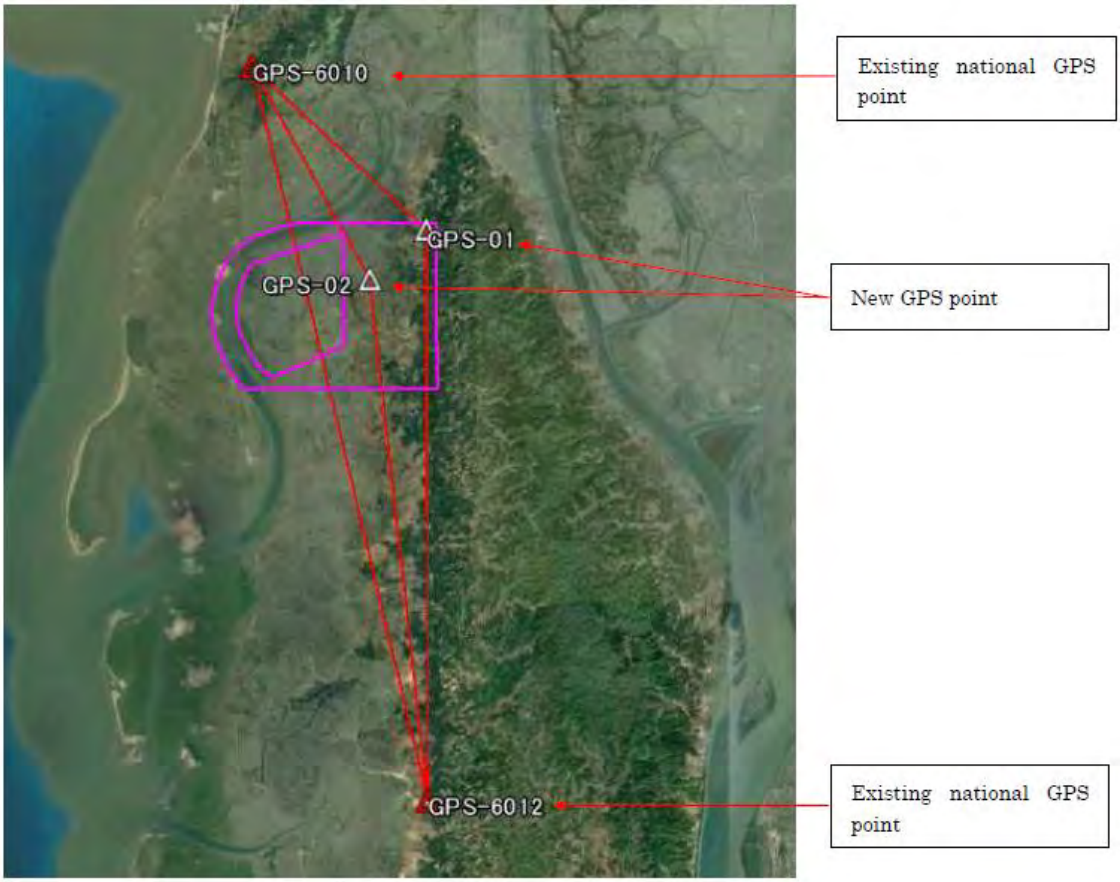


Fig 5.4.1-5 GPS Observation Points

Table 5.4.1-4 Existing GPS Points used as given Points

Point No.	Latitude	Longitude	Elevation
GPS-6010	21-43-41.44	91-53-05.27	-----
GPS-6012	21-34-52.07	91-55-25.52	-----

Source: SOB (Survey of Bangladesh)

Table 5.4.1-5 Coordinates and Elevations of new GPS

Point No.	Spherical coordinates		BUTM2010		Elevation
	Latitude	Longitude	Easting (m)	Northing (m)	(m)
GPS-01	21-41-44.80409	91-55-22.43271	698931.027	2400388.933	5.463
GPS-02	21-41-08.40855	91-54-37-98350	697667.137	2399253.691	1.840

Maheskhali 1　(Seaboard EZ)

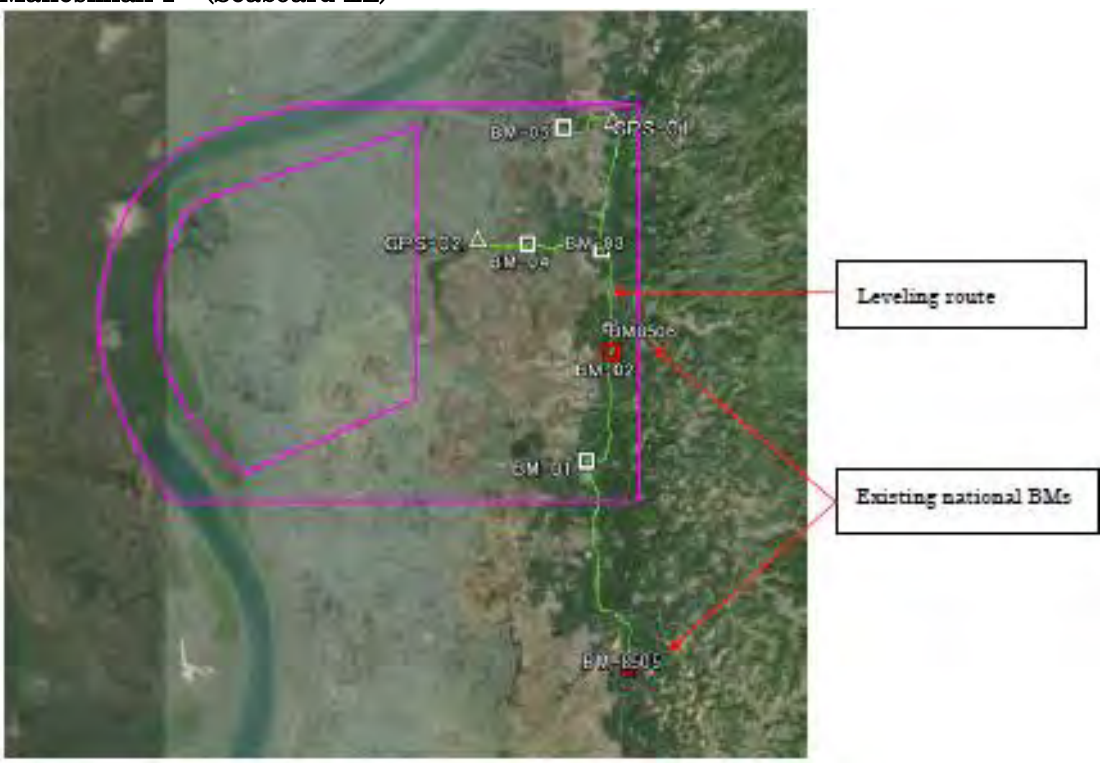


Fig 5.4.1-6 Leveling Routes and BM

Table 5.4.1-6 Existing BMs used as given points for leveling

Point No.	BUTM 2010		Elevation
	Easting (m)	Northing (m)	(m)
BM-8505	699151	2395303	8.582
BM-8506	698908	2398450	7.715

Source: SOB (Survey of Bangladesh)

Table 5.4.1-7 Coordinates and elevations of new BMs

Point No.	BUTM 2010		Elevation (m)
	Easting (m)	Northing (m)	
BM-01	698719	2397205	6.578
BM-02	698945	2398220	8.036
BM-03	698827	2399172	7.337
BM-04	698122	2399207	2.535
BM-05	698445	2400294	2.629

(5) Map Digitizing and Output

Digital topographic maps were prepared based on the existing aerial photograph data and an aerial triangulation process using a map-digitizing tool. Spot heights are displayed in 0.1 m units. The MSL + 4 m contour is indicated in black color to facilitate interpretation of data.

Products of the map-digitizing process are shown in the following list. Digital topographic maps of the A-3 size shown in this list are summarized in the accompanying "Digital topographic maps.

1) List of 1:5000 Scale Digital Topographic Maps for Maheskhali 2

Tag No.1	Maheskhali Reduced Scale 1/38,000 (A3 paper size)
Tag No.2	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.2-1	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.3	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.3-1	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.4	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.4-1	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.5	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.5-1	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.6	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.7	Maheskhali Reduced Scale 1/10,000 (A3 paper size)
Tag No.7-1	Maheskhali Reduced Scale 1/10,000 (A3 paper size)

2) List of 1:5,000 Scale Digital Topographic Maps for Maheskhali 1

- Seamless data 1 : Topographic map covering additional area
- Seamless data 2 ; Topographic map covering all area
- Sheet No. 1 Maheskhali Reduced Scale 1/10,000 (A3 paper size)
- Sheet No. 2 Maheskhali Reduced Scale 1/10,000 (A3 paper size)
- Sheet No. 3 Maheskhali Reduced Scale 1/10,000 (A3 paper size)
- Sheet No. 4 Maheskhali Reduced Scale 1/10,000 (A3 paper size)

(6) Ground Configuration of Candidate Sites

1) Maheskhali-2 (General EZ site)

The objective area of Digital mapping is the western side of central hilly area of Maheskhali Island as shown in the conceptual cross-sectional view of Fig 5.4.1-7, The east side of the area is below MSL + 1.5m following tidal zone covered with mangroves. The main part of the General EZ Site is a salt pan area at an altitude of about MSL + 1.5m to +2.0 m, at the time of high tide, there are many parts to flooding. Between the tidal zone and salt pan zone, small soil dike of about GL + 1.5 ~ 2m is provided. Within the salt pan zone, many of creeks to draw sea water are provided. East side of salt pan zone, altitude is up gradually, in between salt pan zone and local roads intermediate altitude MSL + 2m ~ 4m about the area, rice (paddy) has been carried out. In the rice paddies area, where underground water flowing from east hilly area, some artesian are seen. Ground height from paddy fields towards the local roads of the east side is further increased, it becomes the MSL + 5 ~ 10m about the altitude, and has a dry field farming land, such as betel garden and housings along the road. Local road, which passes through the west side of the area from north to south, the altitude is about MSL + 5m ~ 15m. Also on the east side of the road there are houses, further following the hilly woodlands of the east side of the 50m ~ 60m.

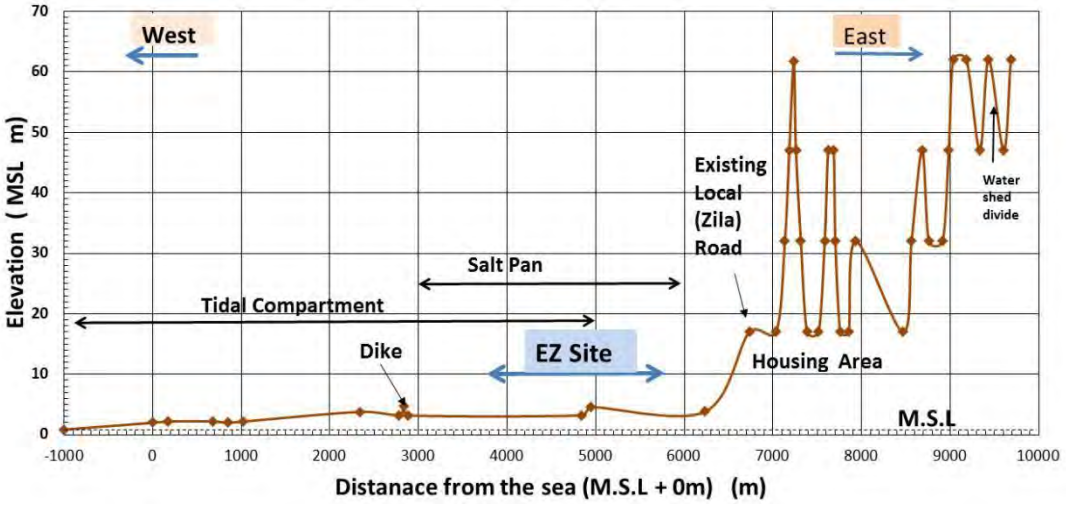


Fig. 5.4.1-7 Conceptual Cross Sectional Ground Height at EZ and Vicinity Area

2) Maheshkhali-1 (Seaboard EZ site)

Maheshukhali-1 candidate site is also located in the salt pan zones similar to Maheskhali 2. Across the creek, but there is a sandbar of Matarbari Island on the west side, the altitude is lower, at the time of storm surges, there are many parts to flooding. Water depth of the creek is about MSL-5 to -6m. In addition, the south side of the Seaboard EZ candidate sites is lowland of less than MSL +1.0 m to +2m and opens to the sea, at the time of storm surges, waves to enter.

5.4.2 Master Plan for Medium-term EZ Development (Seaboard EZ)

Outlines of Seaboard EZ Development Plan

Development Method	Government EZ developed by the initiative of Government of Bangladesh.
Basic Concept	Environmental Harmonized Heavy and Chemical Industry Complex Investment of heavy and chemical industry, in which due consideration is made to environmental harmony and reduction of CO2, are attracted to establish a foundation of industrialization to develop manufacturing.
Industrial Sectors to be Promoted	(1) Heavy Industry Zone a. Iron & Steel (electrical furnace, steel rolling mill, steel process mill) b. Shipyard (shipbuilding, ship repair and maintenance) c. Ship scrap, ship recycling (harmonized with environment and labor safety) d. Non-iron metal e. Heavy machinery, construction machinery (2) Chemical Industry Zone a. Chemical, chemical products b. Tire
Characteristics of Located Industry	a. Mostly apparatus industry which is capital intensive industry b. Basic material industry (Iron &steel, ship scrap, non-iron metal, chemical, chemical products) c. Upstream industry (Iron & steel, ship scrap, chemical) d. The scale of investment is large. Mass production causes scale merit. High technology is required. e. Countermeasure for safety and less environmental load. f. Strategic activity to attract the investment of core industry is needed.
Condition of Location Site	(1) The seaboard EZ must be adjacent to the industrial port. (2) The GOB shall ensure the land for the industrial port and candidate tenants
Prospected Size of Development Site	Total size of EZ: approximate 570 ha Total length of berth for EZ: approximate 300 m
Function, Facility and Equipment	(1) Disaster prevention structure (2) Road network with storm drainage system (3) Water supply & waste water treatment system (4) Power, gas & telecommunication distribution system (5) EZ management, custom clearance & OSS
Development of Off-site Infrastructure	(1) Industrial port (adjacent) (2) Access road from main highway & transport system (3) Water resource transmission (4) Power, gas & telecommunication supply system

(1) Land Use Plan

As for the Seaboard EZ development, the land use plan has been prepared so as to allocate suitable industrial zones for heavy industry and chemical industry over planning arrangement of the industrial port adjacent, proper access road and infrastructure facilities in consideration of the location, the shape of the area, altitude and inclination of the land, existing land use, integrated with the other development area in the core zone for the South Chittagong Integrated Development.

Regarding the infrastructure planning for the Seaboard EZ development, the disaster prevention structures, the access road from the truck highway, the

internal road network, storm water drainage network, flood retention pond including pumping system, water supply system, waste water treatment system, sub-station and power distribution system, gas distribution system, telecommunication system, etc. have been planned in the EZ area.

The land use plan for Moheshkhali-1 Seaboard EZ development is illustrated in Figure 5.4.2-1.

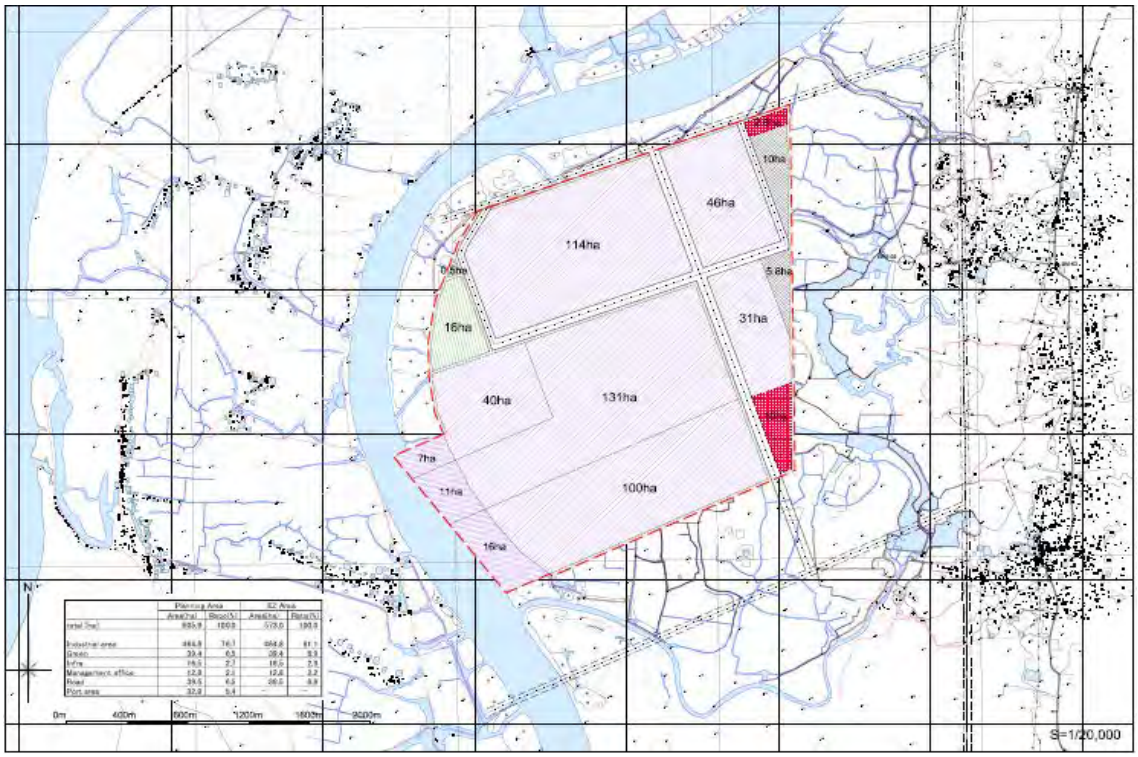


Figure 5.4.2-1 Land Use Plan for Moheshkhali-1 Seaboard EZ Development

The land use allocation of Moheshkhali-1 Seaboard EZ development is shown in Table 5.4.2-1.

The management and commercial area including management office, administration, business operation and training, accommodation and restaurants shall be minimized because of environmental condition by heavy and chemical industries in the Seaboard EZ area and surrounding environmental conditions by coral power stations, coal terminals and heavy industries in the core zone for the South Chittagong Integrated Development. Commercial area including residential complex, hotel/condominiums, vocational training facility, parks and amusement, public, educational and medical facilities are to be allocated in the eastern side of the north – south truck highway for south Chittagong integrated development in the Maheskhali island, and/or in the sub-urban center of Chakaria and Cox's Bazar.

Table 5.4.2-1 Land Use Allocation Plan at Seaboard EZ

	Land Use	Area (ha)	Ratio (%)
A	Industrial Area	464.8	81.1 %
B	Road Network	39.4	6.9 %
C	Other Infrastructures	16.5	2.9 %
D	Management/Commercial Area	12.8	2.2 %
E	Green Area	39.5	6.9 %
	Total	573.0	100.0 %
F	Special Industrial Port Area	32.9	-

(2) Disaster Prevention and Land Grading Plan

The land grading elevation for Moheshkhali-1 EZ development has been decided as follows:

It is necessary to consider storm surge measures to determine the land grading height, because the site is facing the sea and there is no river running through the site.

Basic considerations are as follows (refer 5.2.3 for details):

- Storm surge preventive measures must prevent flood damage by a single storm surge that occurs once every 100 years. MSL =+10.0 m has been set as a safe height for this approximately 100 year storm surge. (MSL: Mean Sea Level)
- As the project site is low land of MSL+1-2 m, land fill is required for the entire area. Considering the filling cost and procurement of fill material, it is natural to assume that the construction cost will be very high. Considering this situation, if we construct a high embankment surrounding the site, the overall height of the land grading could be suppressed.
- The top elevation of the bank is set at MSL+10.0 m
- Considering the high tide level, the land grading level inside the dike will be set at a height which allows natural drainage of rainwater; and also ensures a safe height considering storm surges in recent years (about once in several decades).

  More specifically, since the MHWS (Mean High Water Spring) of the project site is 1.790 m and the HAT (Highest Astronomical tide) is +2.334, the MSL must be set at more than +3.0 m height.

  Furthermore, as the surrounding settlements are built upon the ground with height of MSL +5.0 m or more, it is better to set the minimum ground level of the area within dyke at MSL+5.0 m.

  The survey team has conducted comparative analysis on the top elevation of EZ areas for the cases of MSL+3m and MSL+5m prior to make such recommendation and results of the said comparative study are briefly summarized as shown in the Annex 12. Regarding the estimation, the average height of the ground level has been set at MSL+5.5m based on the consideration of the rain water drainage slope within the premise.

  Although it is an important to consider the economic efficiency and make the ground level as low as possible, but if the ground level within the premise is kept lower than MHWS and HAT, the drainage conditions will be critical and huge pump facilities, reservoirs etc. will be required in the areas where the maximum rainfall intensity exceeds the level of 400 mm/day and 1,000 mm/month, Therefore, it is important to study in detail based on sufficient data for these areas.

(3) Onsite Infrastructure Planning

1) Road plan

2 types of internal roads that are planned:

- Type-1: Main roads with rainwater channels
- Type-2: Roads without rainwater channels

For driveways, 2.5 m side strips have been provided so that parked large scale vehicles do not interrupt traffic flow. Considering low speed vehicles and regular vehicles carrying heavy loads, and the commuter traffic in the morning and evening, a 4 lane road with 2 lanes in each direction has been proposed.

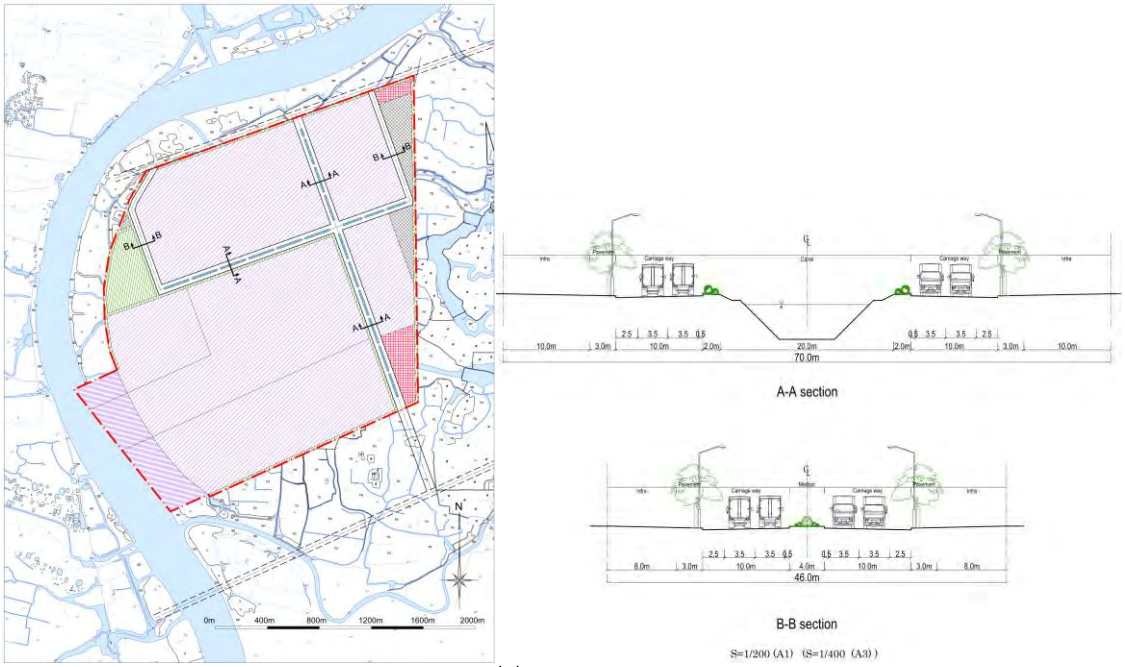


Figure 5.4.2(3)-1 Road plan of Seaboard EZ

2) Rainwater drainage plan

Considering the outer dike as a storm surge preventive measure, a pump based rainwater discharge system that will work when a storm surge strikes has been proposed.

The rainwater from each plot will be discharged to the front road towards the channel and then passed through the channel to the retention pond and finally discharged outside the dike. The project site is located beside the sea and there is no housing, etc. to be affected by the rain water drainage, so the retention channel will suppress the pump's capacity. As a result the cost for pump facilities can be decreased.

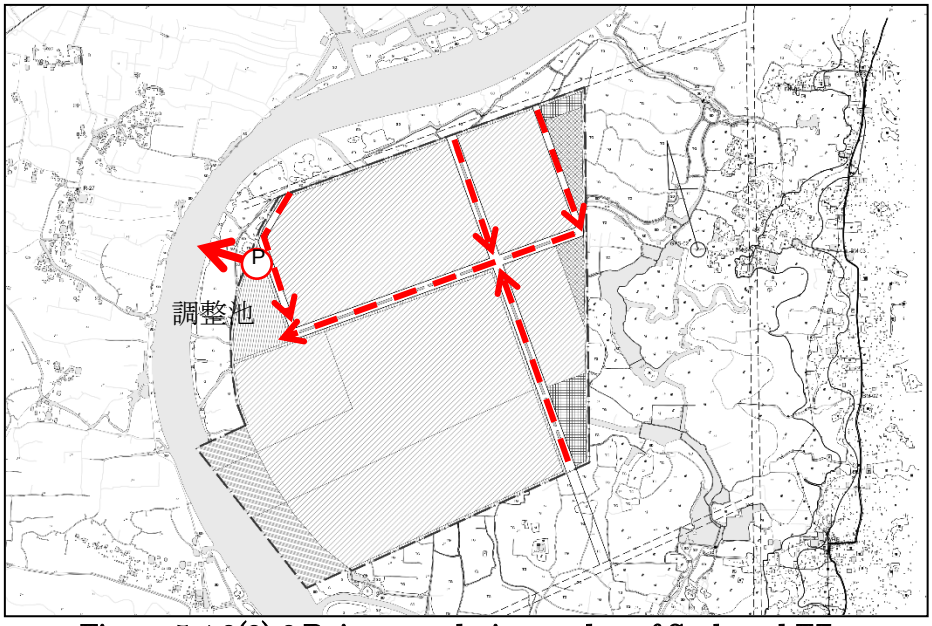


Figure 5.4.2(3)-2 Rainwater drainage plan of Seaboard EZ

3) Water supply plan

This EZ seems to attract heavy industries using electric furnaces. Therefore, it can be assumed that unlike the assembly industry, water demand will be very high.

In this case, considering the following example (specially, chemical, plastic, rubber products, electrical products etc.) and based on the assumption of 100 m^3 / ha day as the basic unit, a net demand (for approximately 570 ha) of 57,000 m^3/day could be derived. A water supply facility will be installed near the northern approach road.

Table: 5.4.2(3)-1 ASEAN Industrial utility usage per unit

Industry Type	Power (kVA/ha)	Water (m3/day/ha)
Food Processing	497	50
Textile	366	156
Garment	248	38
Furniture	205	25
Chemical	318	262
Plastics	704	162
Rubber Product	652	145
Ceramics	390	80
Non-Ferrous Metal	579	99
Metal Processing	299	54
Machinery	310	71
Electrical	693	111
Electronics	693	111
Transport	576	65
Precision	471	91
Others	417	50

Source: JICA Study Team based on the ASEAN industrial data

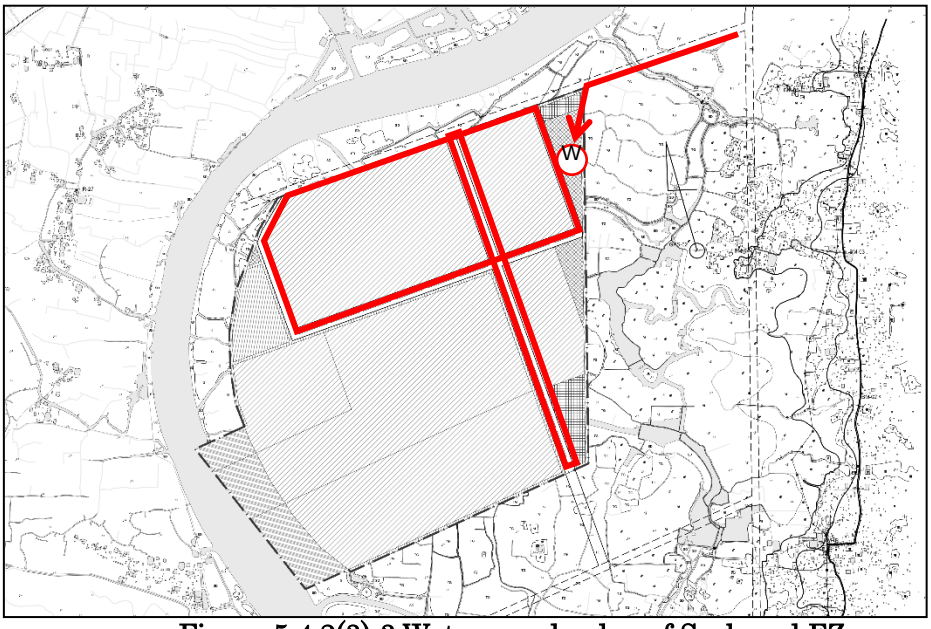


Figure 5.4.2(3)-3 Water supply plan of Seaboard EZ

4) Sewerage plan

The scale of the waste water treatment facilities will be set so that it can treat 80% of the quantity of water supplied, which is equal to 45,600 m^3/day. Considering the distance from various parts of the EZ, the location of the sewerage plat has been decided as shown in the following figure. After treatment, the waste water will be discharged outside of the dike on the

east side. But if it is difficult to develop the eastern lands, the sewerage will be discharged through a channel and retention pond and finally discharged to the outside channels on the west side.

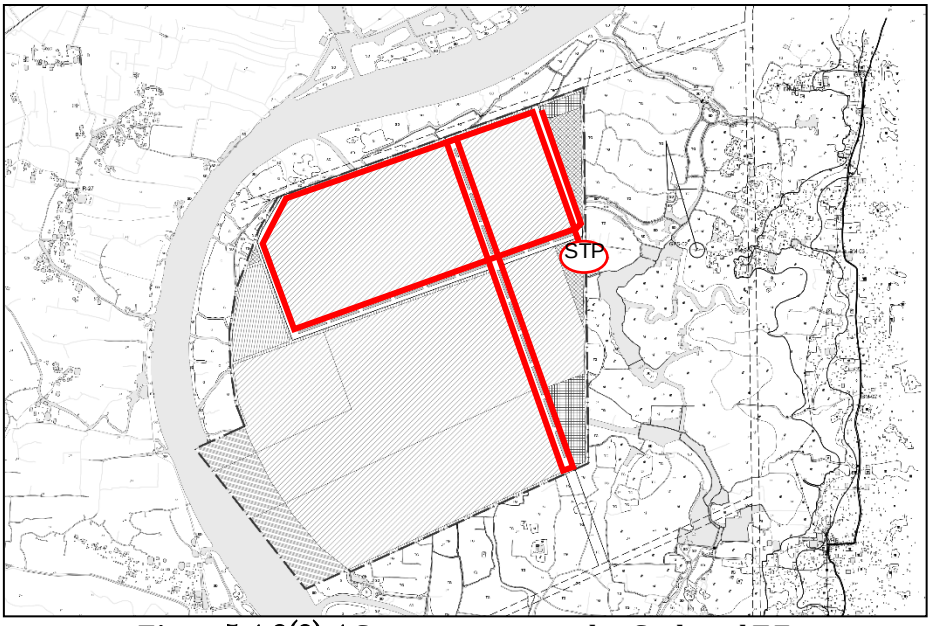


Figure 5.4.2(3)-4 Sewage treatment plan Seaboard EZ

5) Electric power supply plan

This EZ seems to attract heavy industries using electric furnaces. Therefore, it can be assumed that unlike the assembly industry, electricity demand will be very high.

In this case, considering the above mentioned table (specially, chemical, plastic, rubber products, electrical products etc.) and based on the assumption that the basic unit is 500 kVA/ha, a net demand of 285 MW can be derived.

The power supply facilities (substation site) will be placed near the approach road to the north.

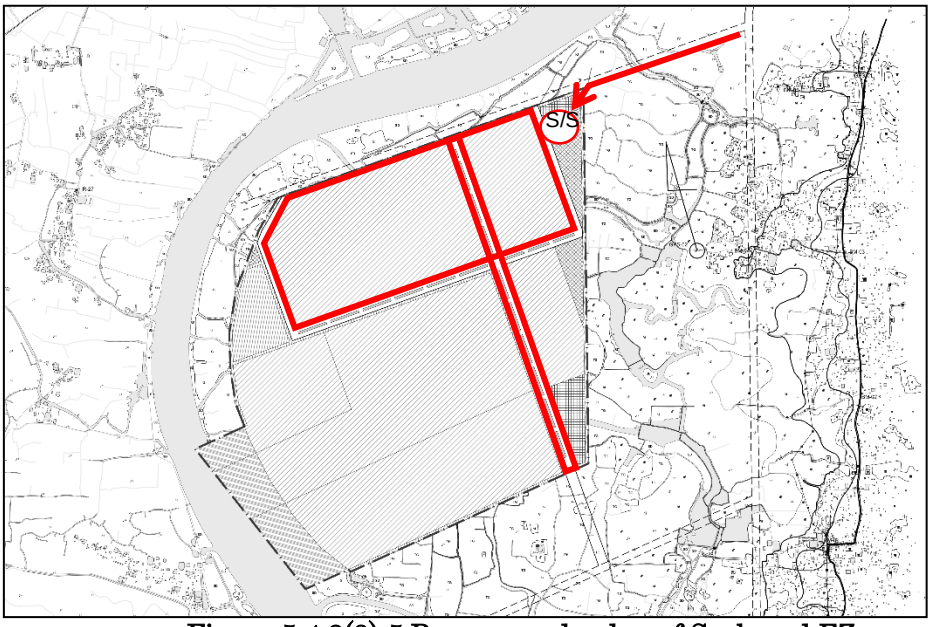


Figure 5.4.2(3)-5 Power supply plan of Seaboard EZ

6) Gas supply plan

General usage (such as cooking water heating etc.) but not for power generation or industrial usage of gas has been considered for gas supply planning.

The gas distribution facilities will be placed near the approach road to the north.

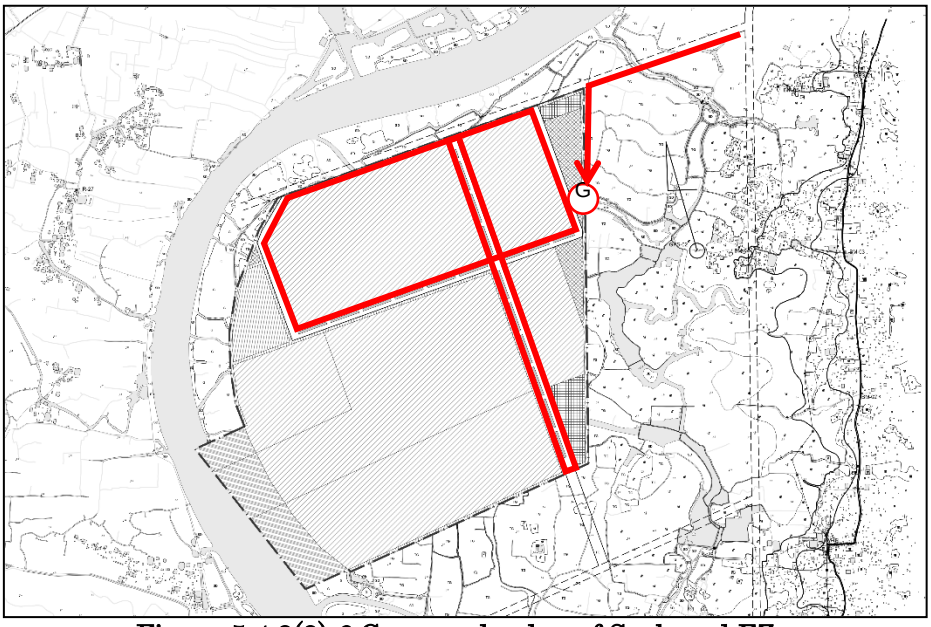


Figure 5.4.2(3)-6 Gas supply plan of Seaboard EZ

7) Solid waste treatment

In this EZ, each factory is to sign a contract with a treatment and disposal company and treat and dispose of solid waste within the EZ according to the policy that has been adopted. Therefore processing and disposal facilities for solid waste (general waste (garbage, etc.), industrial waste) have not been planned within the EZ.

8) Communication service

For the communication services of this EZ, each factory is to sign contracts with local companies to obtain fiber optic cable connections and to receive services. For wired connections, they have to consult with EZ administration and set up a pole or underground pipe on the infrastructure land preserved on both sides of the road.
ion and set up a pole or underground pipe on the infrastructure land preserved on both sides of the road.

(4) Off-site Infrastructure Planning

1) Road/Railway plan

The existing road access to the Maheskhali Island from Chittagong is through a connection from National Road 1 (NR-1) in Chakalia through the rregional highway to local (Zila) Z 1004, as shown in Figure 5.4.2(4)-1.

As for future plans, the construction of a 4-lane NR-1 and the extension of the regional road parallel to the existing Zila Road as shown in Figs. 5.4.2(4)-2 and 3 have been planned. As shown in Fig. 5.4.2(4)-4 access roads to the EZ Site share access from regional road to CTT (Coal Terminal) and Commercial Port, in consideration of the access road of the two places on the Seaboard EZ. The north side of the access to the EZ is directly linked to the access road of CTT. The south side of the branch access to the EZ is with 4-lanes (2-lanes in both directions) of the extension about 600 m to commercial port access road.

Elevation of the access road shall meet the external road level in the longitudinal gradient beyond the seawall top elevation. If the longitudinal slope length to the external access road height cannot be secured, the provision of a land gate will be assumed.

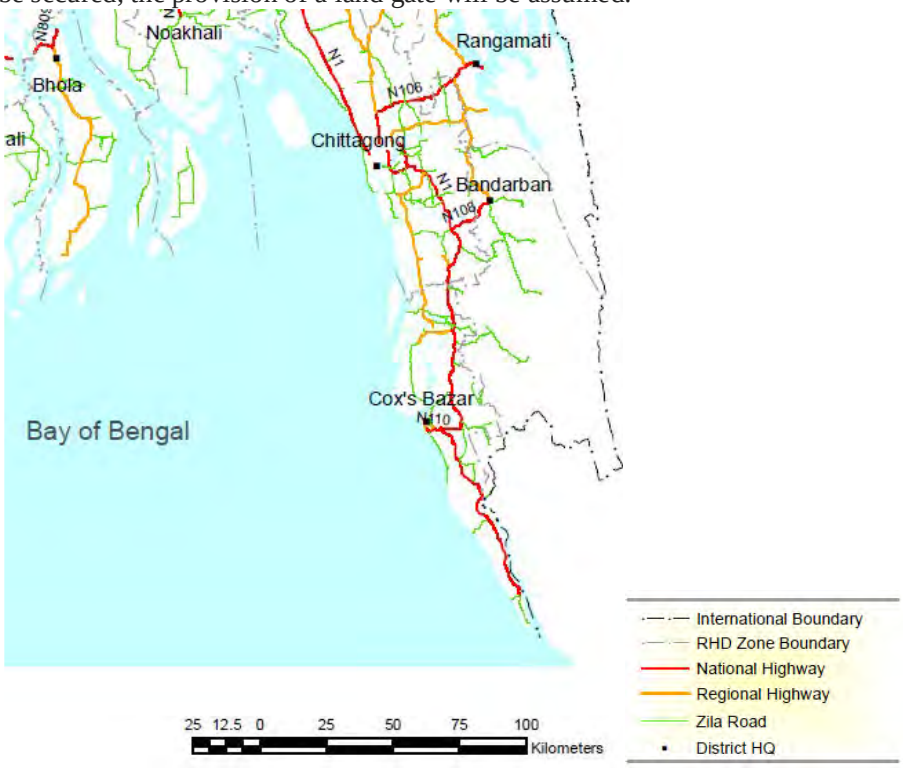


Figure. 5.4.2(4)-1 Existing Situation of Road/Highway

Source: RHD Road Network, "Road Master Plan" RHD

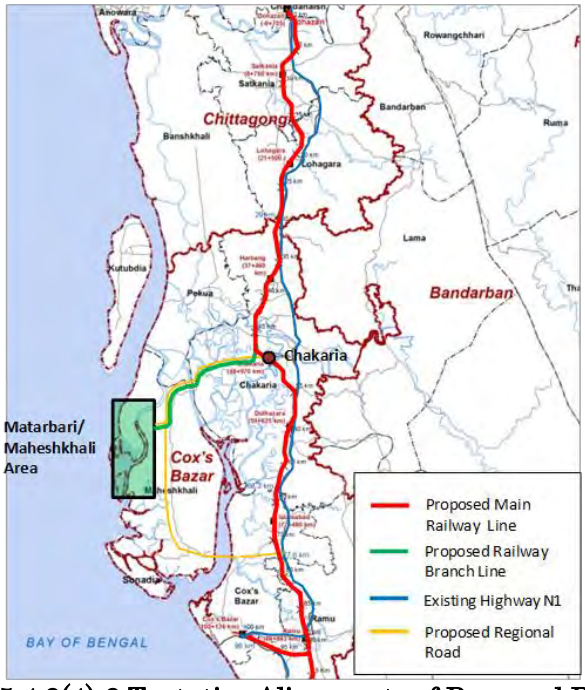


Figure 5.4.2(4)-2 Tentative Alignments of Proposed Road and Railway

Source: "Southern Chittagong Region Survey" (JICA)

The existing track of the Bangladesh Railway (BR) is laid to Dohazari of Bandarban in the vicinity of southern Chittagong, about 40km. In the future, as part of the the Matarbari deep-water harbor planning progress, the railway plan will be drawn. Both roads and railways, connected to a commercial port to be constructed in the future, it is considered that the road and railway ICD should be formed. Foreign trade goods of the EZ will be handled at the ICD of the port or brought directly to the commercial port yard, or, if necessary, import and export procedures are carried out through the bonded facility provided in each factory in the EZ.

Domestic cargo, which accounts for part of the Seaboard EZ, will also be handled by the road, railway, and through the inland and coastal waterway modes of transportation connecting Dhaka and other hinterland areas. Coastal cargo of the general EZ is mainly handled through the forthcoming commercial port.

The EZ candidate sites, roads and future railway plan, and water supply and water sources which will be described in the next section are indicated in Fig. 5.4.2(4)-3.

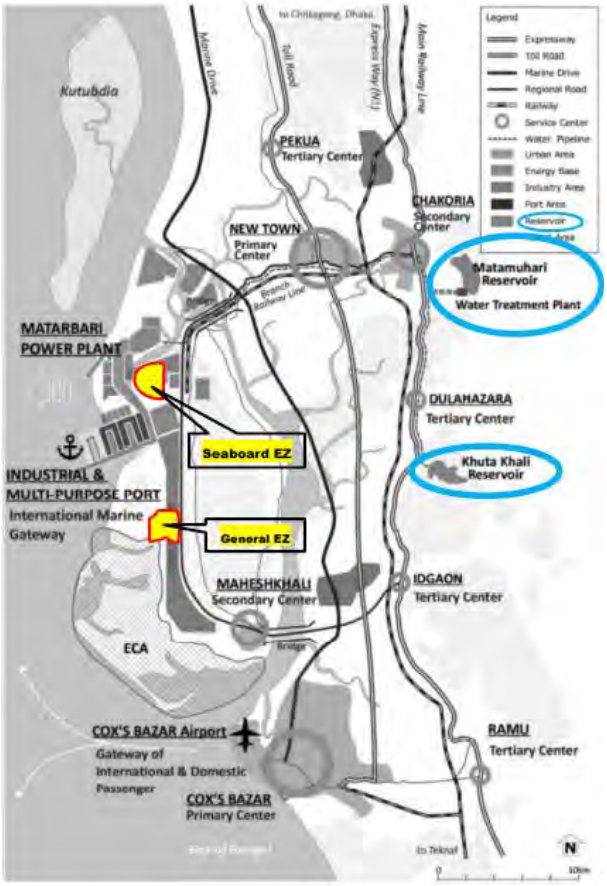


Figure. 5.4.2(4)-3 Location of EZ Sites, Transportation Plan and Water Supply System

Source: "Integrated Development for Southern Chittagong Region Survey (JICA)" and JICA Survey Team

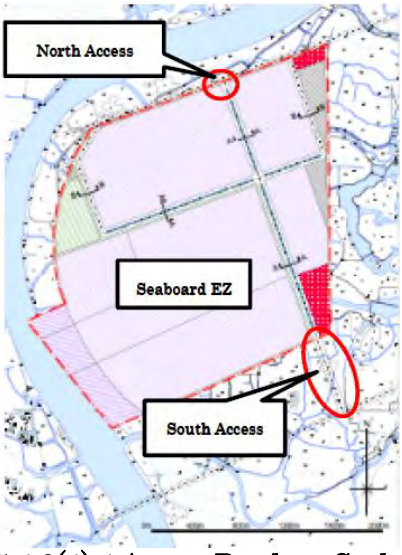


Figure. 5.4.2(4)-4 Access Roads to Seaboard EZ

2) Water supply plan

In order to supply a big volume of water demand, the surface water supply system by river water as a source is considered. The rainfall of Cox's Bazar and Chittagong are very large during the rainy season (June to September), as indicated in Fig 5.4.2(4)-5 and Tables 5.4.2(4)-1 and 2. The maximum daily and monthly rainfall are more than 400mm and 1,000 mm respectively. However, the difference of the precipitation between the rainy and dry seasons is substantial, therefore a large scale water reservoir with river dams are required.

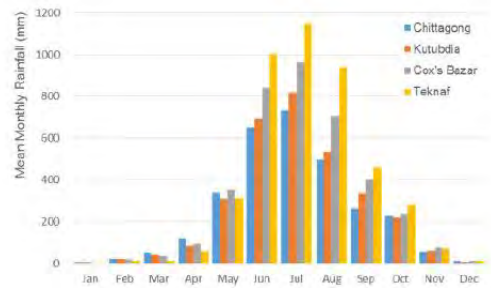


Figure.5.4.2 (4)-5 Mean Monthly Rainfall in Survey Area (1985-2014)

Table 5.4.2. (4)-1 Monthly Rainfall Record in Survey Area (1988-2010)

District	StationID	Station	Year	Annual Total Rainfall	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cox's Bazar	CL307	Coxs	1986	2701.50	0.00	0.00	0.00	50.80	139.90	836.20	738.70	323.80	267.70	231.30	113.10	0.00
	CL307	Coxs	1987	4680.60	0.00	17.00	8.90	200.60	34.70	674.50	1866.10	1286.40	404.30	87.30	100.80	0.00
	CL307	Coxs	1988	4247.90	0.00	20.80	12.90	165.80	302.40	1217.10	786.50	905.40	510.80	166.20	159.00	1.00
	CL307	Coxs	1989	3044.50	0.00	5.80	0.00	159.50	81.10	782.90	849.10	228.80	397.90	539.40	0.00	0.00
	CL307	Coxs	1990	3253.60	0.00	69.00	11.00	75.00	226.00	1328.00	1134.00	24.70	328.40	29.40	26.20	1.90
	CL307	Coxs	1991	3659.90	0.60	0.00	37.00	275.00	215.00	1544.00	91.30	711.00	503.00	252.00	18.00	13.00
	CL307	Coxs	1992	2880.30	0.00	24.00	0.00	0.00	141.80	763.00	821.50	454.00	328.00	237.00	103.00	8.00
	CL307	Coxs	1993	3293.50	34.00	0.00	112.00	96.00	610.00	717.00	651.50	698.50	245.50	103.00	26.00	0.00
	CL307	Coxs	1994	3178.10	5.00	1.20	23.90	237.00	259.00	1029.00	801.50	521.00	260.00	8.50	32.00	0.00
	CL307	Coxs	1995	3498.00	0.00	0.00	8.00	24.00	330.00	653.00	945.00	565.00	456.00	55.00	462.00	0.00
	CL307	Coxs	1996	3542.30	0.00	83.00	2.00	78.00	377.00	678.00	590.20	678.00	498.00	542.00	16.10	0.00
	CL307	Coxs	1997	3253.00	0.00	20.00	3.00	28.00	284.00	355.00	1278.00	613.00	672.00			
	CL307	Coxs	1999	3502.00				6.00	578.00	940.00	843.00	1135.00				
	CL307	Coxs	2000	1251.00								914.00	337.00			
	CL307	Coxs	2006													
	CL307	Coxs	2008													
	CL307	Coxs	2009													
	CL307	Coxs	2010													
	CL310	Dulahazar	1986	2525.90	0.00	0.00	0.00	31.70	100.50	794.00	679.60	437.40	175.40	205.70	101.60	0.00
	CL310	Dulahazar	1987	5026.40	0.00	68.60	7.60	195.70	66.10	522.20	1780.60	1422.80	564.00	372.10	21.60	5.10
	CL310	Dulahazar	1988	2662.00	0.00	25.40	5.10	184.10	269.50	1017.30	341.90	377.70	308.80	92.80	39.40	0.00
	CL310	Dulahazar	1989	2445.40	0.00	0.00	6.40	223.60	260.40	176.50	821.90	175.50	235.10	546.00	0.00	0.00
	CL310	Dulahazar	1990	3849.10	0.00	60.00	150.10	94.00	343.00	842.00	1428.50	278.50	241.00	221.00	170.00	21.00
	CL310	Dulahazar	1991	4755.90	7.00	0.00	13.00	295.30	437.90	1199.70	1081.40	672.70	608.70	332.70	100.50	7.00
	CL310	Dulahazar	1992	2421.00	15.00	95.00	53.00	0.00	43.00	537.00	642.00	408.00	283.00	245.00	63.00	37.00
	CL310	Dulahazar	1993	3998.30	55.00	0.00	0.00	105.00	431.00	1309.00	483.70	1040.60	322.00	167.00	85.00	0.00
	CL310	Dulahazar	1994	3379.00	10.00	97.00	160.00	226.00	170.00	969.00	876.00	512.00	167.00	129.00	63.00	0.00
	CL310	Dulahazar	1995	80.00	0.00	35.00	45.00									
	CL310	Dulahazar	1996	4835.00				65.00	250.00	1075.00	1430.00	770.00	548.00	640.00	57.00	0.00
	CL310	Dulahazar	1997	3561.00	0.00	75.00	110.00	46.00	185.00	550.00	1490.00	450.00	505.00	85.00	65.00	0.00
	CL310	Dulahazar	1998	4278.00	0.00	55.00	50.00	45.00	382.00	285.00	1245.00	1770.00	337.00	109.00	0.00	0.00
	CL310	Dulahazar	1999	3376.00	0.00	0.00	10.00	6.00	335.00	1000.00	680.00	966.00	379.00			
	CL310	Dulahazar	2000	993.00								764.00	229.00		0.00	0.00
	CL310	Dulahazar	2001	2096.00	0.00	5.00	14.00	32.00	334.00	881.00	407.00	160.00	190.00	59.00	14.00	0.00
	CL310	Dulahazar	2002	2611.00	0.00	0.00	32.00	56.00	618.00	396.00	987.00	290.00	49.00	103.00	80.00	0.00
	CL310	Dulahazar	2003	1829.00	0.00	0.00	13.00	14.00	157.00	1341.00	119.00		139.00	46.00		
	CL310	Dulahazar	2004	720.00							595.00	80.00	19.00	26.00	0.00	0.00
	CL310	Dulahazar	2005	2420.00	0.00	0.00	4.00	60.00	7.00	404.00	383.00	1218.00	210.00	99.00	25.00	10.00
	CL310	Dulahazar	2006	4438.00	0.00	0.00	0.00	0.00	1054.00	1610.00	980.00	794.00			0.00	0.00
	CL310	Dulahazar	2007	5374.00	0.00	54.00	0.00	290.00	822.00	982.00	1654.00	354.00	1010.00	174.00	34.00	0.00
	CL310	Dulahazar	2008	6340.00		0.00	0.00	16.00	578.00	1408.00	1948.00	1826.00	446.00	114.00	0.00	4.00
	CL310	Dulahazar	2009	2509.00	0.00	0.00	0.00	91.00	244.00	526.00	858.00	616.00	89.00	57.00	28.00	0.00
	CL310	Dulahazar	2010	2252.00	0.00	0.00	11.00	2.00	383.00	666.00	501.00	95.00	101.00	462.00	23.00	8.00
	CL310	Dulahazar	2011	78.00	4.00	0.00	47.00	27.00								
	CL316	Kutubdia	1986	875.30	0.00	0.00	0.00	25.30	43.30	331.90	175.80	112.00	140.70	44.30	2.00	0.00
	CL316	Kutubdia	1987	2610.20	0.00	6.10	0.00	116.10	0.00	142.30	953.20	702.30	508.70	34.90	139.70	6.90
	CL316	Kutubdia	1988	3316.20	0.00	53.10	0.00	134.70	358.00	802.00	550.40	548.40	562.70	187.50	119.40	0.00
	CL316	Kutubdia	1989	2368.00	0.00	0.00	0.00	91.50	67.90	432.00	735.20	79.10	472.30	490.00	0.00	0.00
	CL316	Kutubdia	1990	4774.80	0.00	59.70	199.10	357.30	715.00	1442.00	1344.10	98.70	158.50	220.10	139.30	41.00
	CL316	Kutubdia	1991	3239.40	34.40	0.00	25.90	184.70	214.20	966.90	668.70	740.80	355.00	31.00	6.20	11.60
	CL316	Kutubdia	1992	2389.40	0.00	125.50	10.00	0.00	131.50	880.50	455.70	217.40	183.40	335.20	25.20	25.00
	CL316	Kutubdia	1993	3321.50	60.00	69.50	75.90	50.60	342.40	1446.80	418.90	498.70	228.00	113.40	17.30	0.00
	CL316	Kutubdia	1994	2289.70	3.00	0.00	206.40	99.80	27.40	589.20	607.40	545.00	95.30	111.20	5.00	0.00
	CL316	Kutubdia	1995	3001.90	0.00	0.00	16.10	0.00	346.10	684.60	711.10	395.90	274.80	50.00	523.30	0.00
	CL316	Kutubdia	1996	3400.30	0.00	39.30	37.10	11.30	203.60	648.40	900.10	700.00	319.70	532.70	8.10	0.00
	CL316	Kutubdia	1997	3331.20	0.00			25.20	126.20	415.40	1345.20	414.70	931.10	45.10	18.10	10.20
	CL316	Kutubdia	1998	3880.30	0.00	15.20	25.30	114.30	481.20	117.40	1372.70	1333.90	185.20	112.00	123.10	0.00
	CL316	Kutubdia	1999	2605.30				0.00	389.20	1270.30	945.80					
	CL316	Kutubdia	2000	2442.60							649.00	725.50	680.00	388.10	0.00	0.00
	CL316	Kutubdia	2001	1356.20	0.00	0.00	0.00	25.00	456.40	753.60					121.20	0.00
	CL316	Kutubdia	2002	2515.50	23.10	0.00	66.10	97.30	446.70	408.60	922.60	261.50	67.40	37.10	185.10	0.00
	CL316	Kutubdia	2003	3557.00	0.00	0.00	30.00	55.00	198.60	1690.70		665.00	243.50	601.20	0.00	73.00
	CL316	Kutubdia	2004	3961.10	0.00	0.00	0.00	45.10	53.60	800.50	1308.50	385.50	1150.50	217.40	0.00	
	CL316	Kutubdia	2005	5928.70	0.00	0.00	98.10	199.30	384.40	943.60	1597.40	1864.20	496.60	291.10	0.00	54.00
	CL316	Kutubdia	2006	10379.90	0.00	0.00	0.00	0.00	2314.60	1983.20	3551.80		2267.00	263.30	0.00	0.00
	CL316	Kutubdia	2007	12917.50	0.00	154.30	0.00	262.20	570.60	2657.00	2841.00	3077.00	1312.40	1546.60	496.40	0.00
	CL316	Kutubdia	2008	12406.60	0.00	0.00	0.00	0.00	516.60	2355.40	3678.60	3642.80	1310.40	576.60	126.20	0.00
	CL316	Kutubdia	2009	3434.00	0.00	0.00	0.00	18.10	156.20	215.30	1433.40	936.40	252.40	422.20	0.00	0.00
	CL316	Kutubdia	2010	4665.00	0.00	0.00	24.00	0.00	483.30	1218.40	726.20	950.40	138.30	993.20	0.00	131.20

Table 5.4.2(4)-2 Maximum Rainfall in a day in Survey Area (1985-2014)

Observatory	Maximum Rainfall in a day	Date
Chittagong	463 mm	27 June 2012
Kutubdia	422 mm	16 August 1998
Cox's Bazar	360 mm	10 June 2008
Teknaf	481 mm	15 June 2010

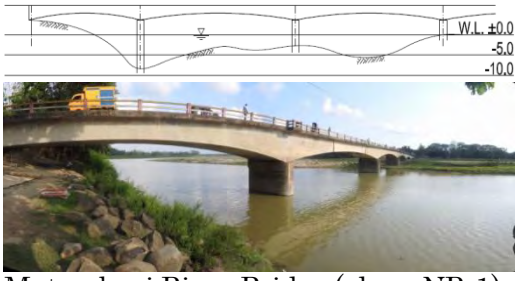
Source: BMD Climate Division/South Chittagong Survey (JICA)

The water demand of the EZ and other industrial sectors in Matarbari/Maheskhali area such as oil refinery, power plant, ports, etc., was estimated by the "Integrated Development for Southern Chittagong Region Survey (JICA)". For the year 2031 the total water supply demand will be 283,000 m^3 / day, of which the mid. term demand of EZ will be 144,000 m^3 / day for the year 2031 for the assumed area of 2,000 ha.

As a water source for the water demand, Fig. 5.4.3(4)-6 shows the location of

water resources such as the Matamhuri and Khuta Khali Chara Rivers. Industrial water piping connecting the reservoirs and Maheskhali are shown in Fig. 5.4.2(4)-3.

Water supply pipes as off-site infrastructure of the seaboard EZ and general EZ will be installed as a branch pipe from the industrial water piping which will be installed parallel to the proposed Regional Road. The target water supply amount of the Seaboard and General EZ medium-term plan are 57,000 m^3 / day and 14,000 m^3 / day.



Matamhuri River Bridge (along NR-1)

Photographs and sketches were taken on June 03, 2016 by Survey Team (Left side of photo. And sketches are Chittagong side)

Khuta Khali Chara Bridge (along NR-1)

Figure.5.4.2(4)-6 River System in Southern Chittagong

Note)BEZA considers that the water resources development plan for the catchment runoff water of the hilly area west of Maheshkhali Island, at two reservoirs. Coordination with the EZ water supply plan proposed in this report will be subsequently required.

< Water resource securing plan by BEZA;

To utilize rainwater, a drainage canal will be installed along the regional road between the north and south of Maheshkhali Island according to the concept of BEZA, the western hilly face of the island's rainwater catchment and the newly built reservoir on the south side of the Kohelia River and the General EZ candidate site.

Rain water collected in the two reservoirs has been planned to supply water to the core area, through water purification facilities, including economic zones such as industrial facilities (deep sea port, power plants, oil refineries, LNG facilities, etc) together with those supplied from the mainland.

3) Electric power supply plan

Power supply will be provided by the power sub-station(s) of REB (Rural Electrification Board) through the national power grid of PGCB (Power Grid Company of Bangladesh). The power demand for the seaboard and general EZ are 285 and 140 Mw respectively.

5.4.3 Special Industrial Port Plan for Seaboard EZ

The port navigation channels most likely developed by Commercial Port and Energy Sectors will be utilized as the water area for the seaboard EZ.
The water area for the Seaboard EZ is determined for the EZ sectors as described below and in the following Tables 5.4.3-1 and 2, and indicated with the color yellow in Fig.5.4.3-1

- The size of objective ships for each sector is Panamax size. However the required water depth is different by the purpose of the sectors such as the iron and steel industry in which the ship is utilized for steel cargo handling with a maximum water depth of MSL-11 m or deeper, while ships for other sectors such as ship breaking (scrapping) and ship building are for a ballast depth of MSL-5 m.
- Graving dock type facilities are determined for Ship Breaking and Building Sectors.
- The turning circles with a diameter of 600m which is equivalent to the doubled size of ship length, is required subject to the assistance of tug boat(s)
- The navigation channel which is supposed to be connected to the outer sea through the channel of energy sector will have to be half of the ship length 150m with the water depth of MSL-11.0m.

Table 5.4.3-1 Requirement on Water Areas for Seaboard EZ in Maheskhali

Sector	EZ Area Size			Maximum Objective Ship	Diameter of Ship turning Basin (m) (2xLOA)	Water Depth (m)			Width of Channel Bottom (m)
	Area (ha)	Length along water area (m)	Longitudinal Dimension (approx.) (m)			Channel	Basin	Berth Box (Ship bathing /Mooring Space)	
Ship breaking/ship recycle	40	200	2,000	Panamax	600	MSL-5.0	MSL-5.0	MSL-5.0	1/2 xLOA =150m
Iron & steel	131	400	3,275	Small Handy Max. (Panamax:Future)	600	MSL-11.0	MSL-11.0	MSL-13.0	
Ship Building	100	600	1,606	Panama	600	MSL-5.0	MSL-5.0	MSL-7.0	

Table 5.4.3-2 Maximum Objective Ship Size and Required Water Depth

Sector	Type of ship	Tonnage	Length	Beam	draft		Under Keel Clearance (m)	Tide Window (m)	Required Water Depth (m)	
		DWT	LOA (m)	B (m)	d full (m)	d ballast (m)			Channel/ Basin	Berth Box
Ship Breaking	Container Panamax	60,000	300	32.3	13.4	3	0.5	MSL ±0.0	MSL -5.0	MSL -5.0
	Oil Tanker	100,000	250	42.7	14.8	3	0.5	MSL ±0.0		
Iron & Steel	Small Handy Size	20,000	156	24.4	9.8	-	1.0	MSL ±0.0	MSL -11.0	MSL-13.0
Iron & Steel (Future)	Container Panamax	60,000	300	32.3	13.4	-	1.3	MSL+1.0	MSL-14.0 (Future)	MSL-17.0 (Future)
Ship Building	Container Panamax	60,000	300	32.3	13.4	3	0.5	MSL ±0.0	MSL -5.0	MSL -7.0
	Oil Tanker	100,000	250	42.7	14.8	3	0.5	MSL ±0.0		
	Source: Ship size, " Technical Standards and Commentaries for Port and Harbour Facilities in Japan"									

In order to secure safe and efficient implementation of the Seaboard EZ construction and operation, SPM pipeline alignment is required to relocate as indicated in Fig. 5.4.3-1.

Also for the required water area for EZ indicated in yellow in the figure below, the northern end of ship turning basin in front of EZ Quay and southern end of future expansion plan of coal jetty of CTT (Coal Terminal) should be adjusted between both parties.

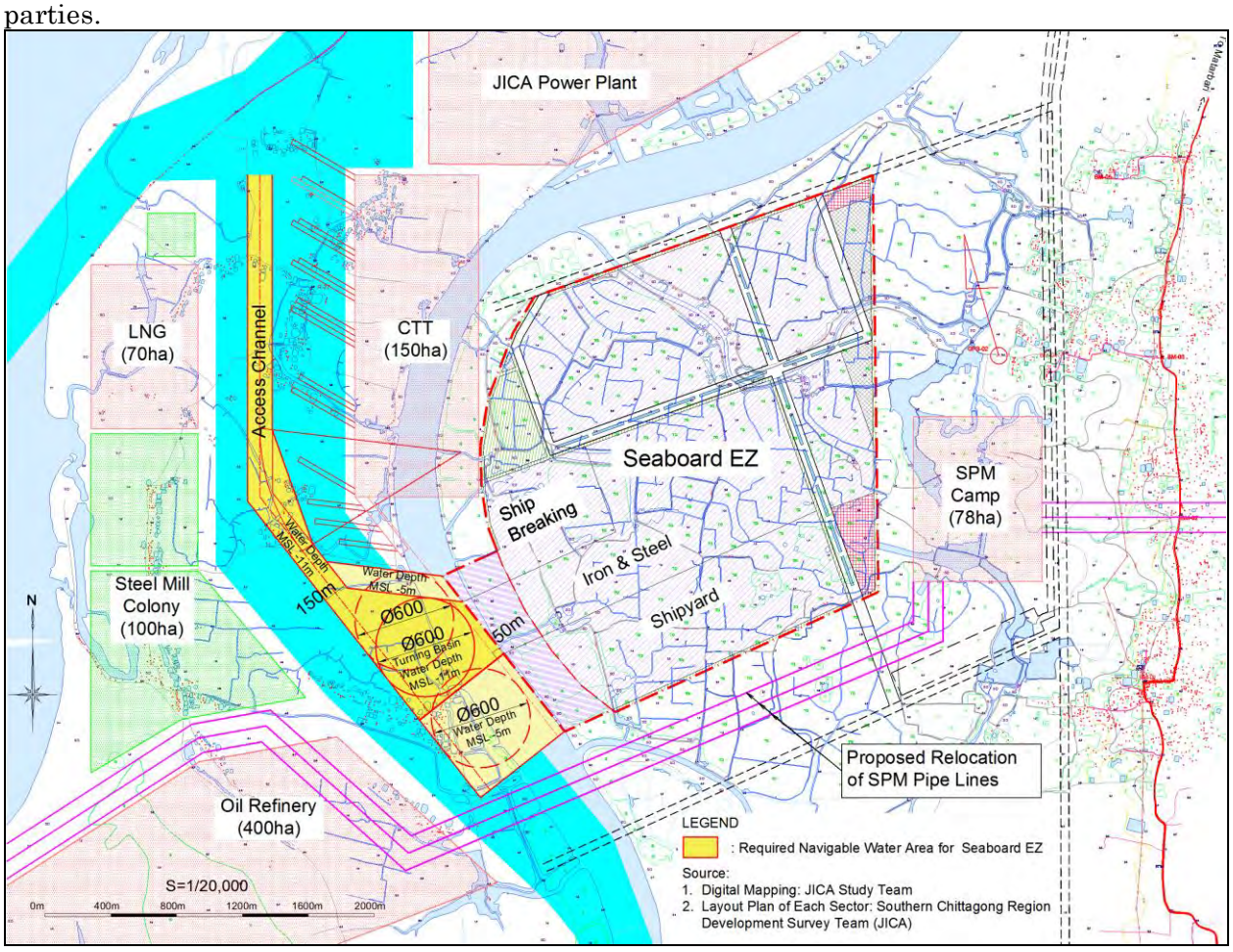


Figure 5.4.3-1 Required Water Area for Seaboard EZ Port and Proposed Relocation Plan of SPM Pipe Lines

Figure 5.4.3- 2　Perspective Drawing of the Seaboard EZ

5.4.4 Master Plan for Medium-term EZ Development (General EZ)

Outlines of General EZ Development Plan

Development Method	To be developed as one of the G to G EZs initiated by the Government of Bangladesh and Japan under PPP (Public-Private-Partnership) scheme by participating Japanese developer(s).
Basic Concept	General manufacturing industry
	(1) Mainly FDI of fabricated industry is promoted to develop supporting industry, forming industrial cluster. (2) Industrial site location is considered in view of developing supply chain and industrial linkage among seaboard EZ, inland EZ and surrounded area. (3) Concurrently with developing inland EZ, community and residence at urban area are to be developed in integrated approach under government initiatives, leading to reginal development.
Industrial Sectors to be Promoted	[Transport machine zone] Automobile / parts, motor cycle / parts, railroad wagon [Machinery & ITC zone] a. General machinery, production machinery b. Electrical and electric goods / parts c. IT device, communication equipment [Food, medicine, medical goods zone] a. Food, agro-processing (including halal food) b. Medicine, medical goods, nutrition, healthy food, cosmetics [Living goods zone] a. RMG/apparel, apparel accessary b. Bicycle, paper processing, printing, daily commodity etc.
Characteristics of Located Industry	a. Labor intensive b. Intermediate processing, downstream industry c. Supporting industry (such as parts, member of framework) d. Production goods, intermediate goods e. Goods related to living, general consumer goods f. Strategic activity to attract FDI of anchor industry in assembling manufacture is key element.
Condition of Location Site	(1) The general EZ is to be located within 30 km distance from the commercial port where oceangoing large container vessels enter. (2) The GOB is required to support the cost for land acquisition, land development and disaster prevention. (3) In the neighborhood area, urban (residential, public and commercial) development shall be available to be integrated.
Prospected Size of Development Site	Total size of EZ: approximate 400 ha for initial development. The urban development shall be integrated.
Function, Facility and Equipment	(1) Disaster prevention structure (2) Road network with storm drainage system (3) Water supply & waste water treatment system (4) Power, gas & telecommunication distribution system (5) EZ management, custom clearance & OSS
Development of Off-site Infrastructure	(1) Commercial port within 30 km distance (2) Access road from main highway & transport system (3) Water resource transmission (4) Power, gas & telecommunication supply system

(1) Land Use Plan

As for the General EZ development, the land use plan has been prepared so as to allocate general manufacturing industrial industries over planning arrangement of the commercial port in neighborhood area, proper access road and infrastructure facilities in consideration of the location, the shape of the area, altitude and inclination of the land, existing land use, integrated with the other development area for the South Chittagong Integrated Development.

Regarding the infrastructure planning for the General EZ development, the disaster prevention structures, the access road from the truck highway, the internal road network, storm water drainage network, flood retention pond including pumping system, water supply system, waste water treatment system, sub-station and power distribution system, gas distribution system, telecommunication system, etc. have been planned in the EZ area.

The land use plan for Moheshkhali-2 General EZ development is illustrated in Figure 5.4.4-1.

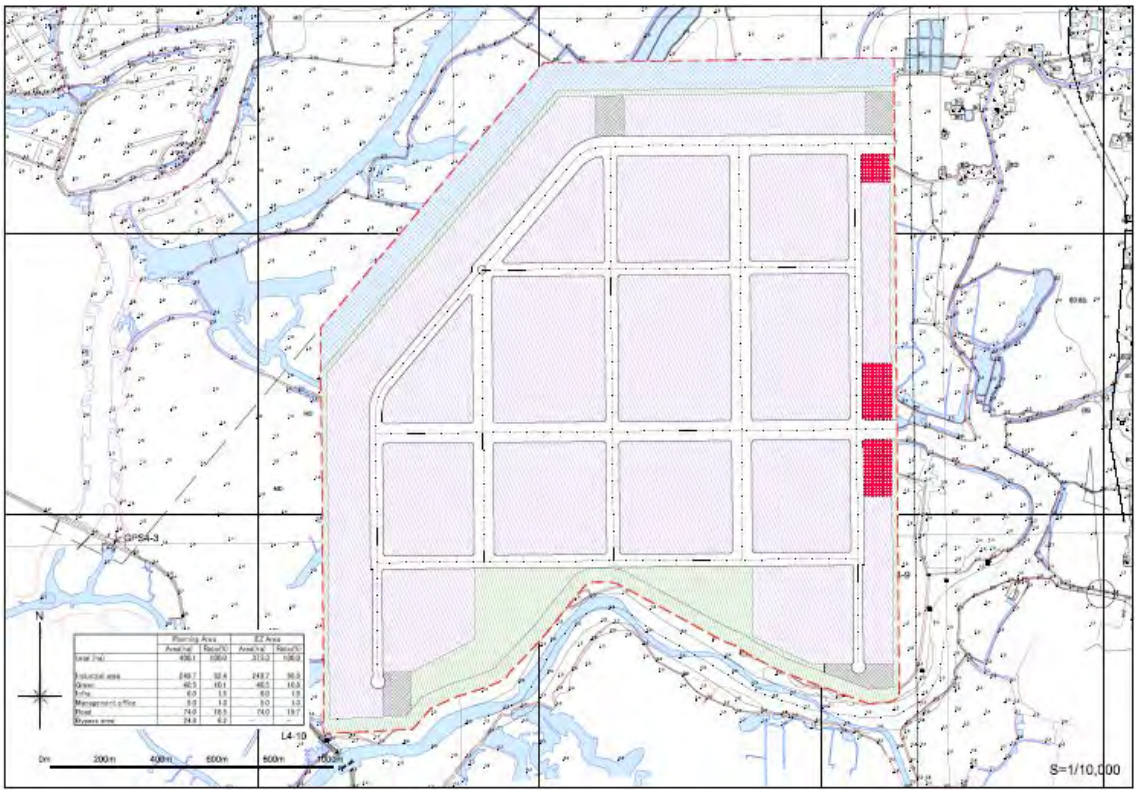


Figure 5.4.4-1 Land Use Plan for General EZ Development

The land use allocation of Moheshkhali-2 General EZ development is shown in Table 5.4.4-1.

The management and commercial area including management office, administration, business operation and skill development, medical center, investors' club, accommodation and restaurants shall be minimized because of surrounding environmental conditions by coral power stations, coal terminals and

heavy industries in the core zone for the South Chittagong Integrated Development. It is noted that low-cost housing for relocation program is not required because of no relocation nor resettlement of people and houses in the project as shown in Table 5.3.3-2.

Commercial area including residential complex, hotel/condominiums, vocational training facility, parks and amusement, public, educational and medical facilities are to be allocated in the eastern side of the north – south truck highway in the Maheskhali island which was recommended by South Chittagong Integrated Development Project, and/or in the sub-urban center of Chakaria and Cox's Bazar..

Table 5.4.4-1 Land Use Plan Allocation at General EZ

	Land Use	Area (ha)	Ratio (%)
A	Industrial Area	249.4	66.5 %
B	Road Network	74.0	19.7 %
C	Other Infrastructures	6.0	1.6 %
D	Management/Commercial Area	5.0	1.3 %
E	Green Area	40.8	10.9 %
	Total	375.3	100.0 %
F	Bypass Area	24.8	-

(2) Disaster Prevention and Land Grading Plan

The land grading elevation for Moheshkhali-2 EZ development has been decided as follows:

It is necessary to consider storm surge measures to determine the land grading height, because the site is facing the sea and there is no river running through the site.

Basic considerations are as follows (refer 5.2.3 for details):

- As storm surge preventive measures, it is assumed to be necessary to prevent the flood damage caused by a single storm surge that occurs once every 100 years. MSL =+10.0 m has been set as a safe height for the approximately 100 years storm surge. (MSL: Mean Sea Level)
- As the project site is om low land of MSL+1-2 m, land fill is required for the entire area. Considering the filling cost and procurement of fill material, it is natural to assume that the construction cost will be very high. Considering this situation, if we construct a high embankment surrounding the site, the overall height of the land grading could be suppressed.
- The top elevation of the bank is set at MSL+10.0 m
- Considering the high tide level, the land grading level inside the dike will be set at a height which allows natural drainage of rainwater and which also ensure a safe height considering the storm surges seen in recent years (about once in several decades).

More specifically, since the MHWS (Mean High Water Spring) of the project site is 1.790 m and the HAT (Highest Astronomical tide) is +2.334, the MSL must be set at more than +3.0 m height.

Furthermore, as the surrounding settlements are built upon the ground with height of MSL +5.0 m or more, it is better to set the minimum ground level of the area within dyke at MSL+5.0 m.

The survey team has conducted comparative analysis on the top elevation of EZ areas for the cases of MSL+3m and MSL+5m prior to make such recommendation and results of the said comparative study are briefly summarized as shown in the Annex 12. Regarding the estimation, the average height of the ground level has been set at MSL+5.5m based on the consideration of the rain water drainage slope within the premise.

Although it is an important to consider the economic efficiency and make the ground level as

low as possible, but if the ground level within the premise is kept lower than MHWS and HAT, the drainage conditions will be critical and huge pump facilities, reservoirs etc. will be required in the areas where the maximum rainfall intensity exceeds the level of 400 mm/day and 1,000 mm/month, Therefore, it is important to study in detail based on sufficient data for these areas.

(3) Onsite Infrastructure Planning

1) Road plan

3 types of internal roads are planned:

- Type-1: Main roads with the rainwater channels
- Type-2: Roads without rainwater channels
- Type-3 Cul-de-suc (when it is necessary)

For driveways, 2.5 m side strips have been provided so that parked large scale vehicles do not interrupt traffic flow. Considering low speed vehicles and regular vehicle carrying heavy loads, and the commuter traffic in the morning and evening, a 4 lane road with 2 lanes in each direction has been proposed. The Cul-de-suc type has been designed as a two lane road (one lane for each direction) due to its short length

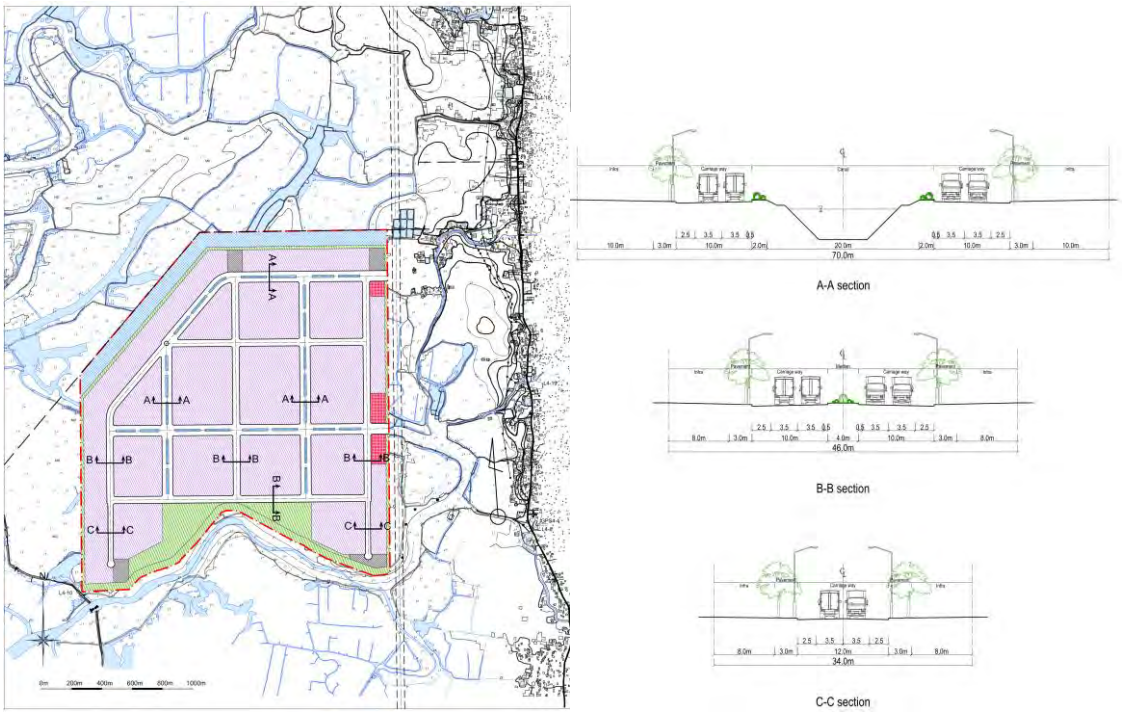


Figure 5.4.4(3)-1 Road plan of General EZ

2) Rainwater drainage plan

Considering the outer dike as the storm surge preventive measure, a pump based rainwater discharge system which will work at the time of a storm surge has been proposed.

The rainwater from each plot will be discharged to the front road towards the channel and then passed through the channel to the retention pond and finally

discharged outside the dike. The project site is located beside the sea and there is no housing, etc. to be affected by the rain water drainage, so the retention canal will suppress the pump's capacity. As a result, the cost for pump facilities could be decreased.

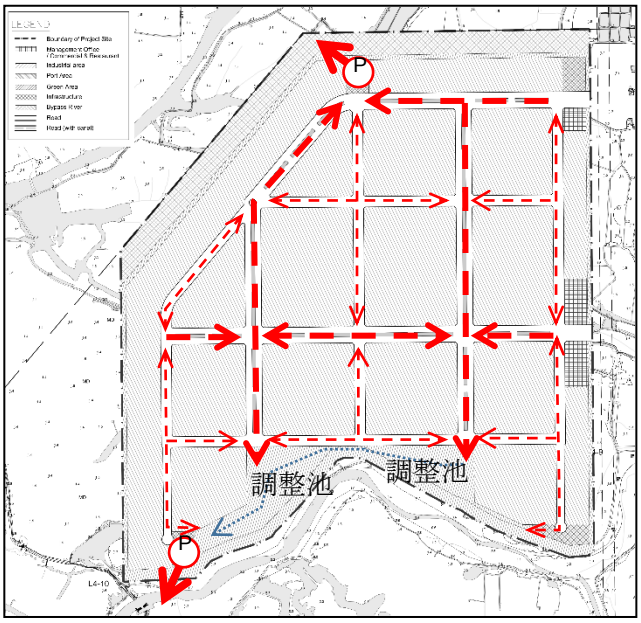


Figure 5.4.4(3)-2 Rainwater drainage plan of General EZ

3) Water supply plan

In this EZ a net demand of 14,000 m3/day (for about 400 ha) could be derived by assuming that assembly industries are the main locators and the same basic unit of 35 m3 / ha-day used in the short span development SEZ in chapter-4.

A water supply facility will be installed near the northern approach road.

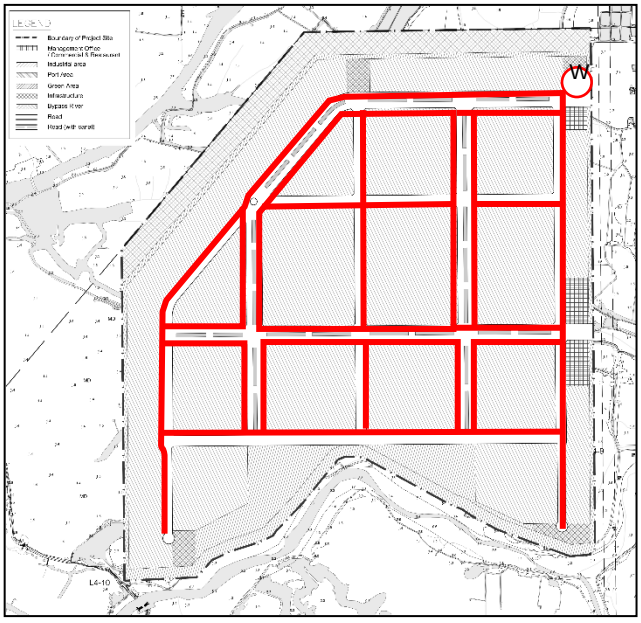


Figure 5.4.4(3)-3 Water supply plan of General EZ

4) Sewerage plan

The scale of the waste water treatment facilities will be set so they can treat 80% of the quantity of water supplied, which is equal to 11,200 m3/day. The treated sewage will be drained to the new waterway on the north side.

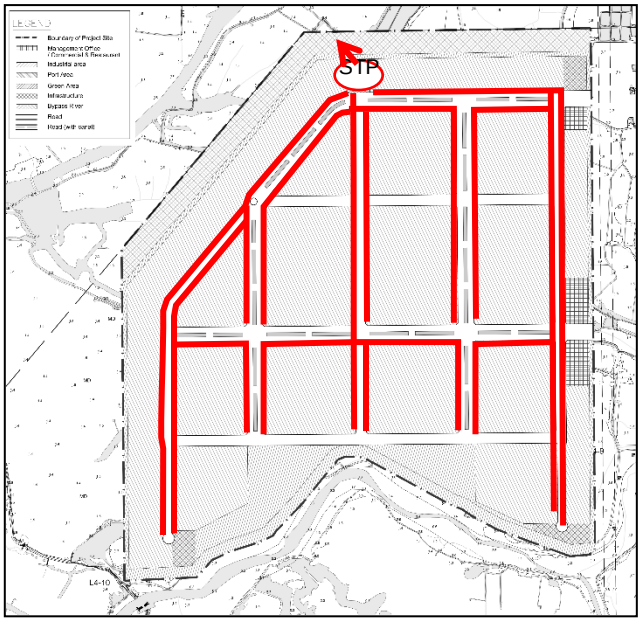


Figure 5.4.4(3)-4 Sewage treatment plan General EZ

5) Electric power supply plan

In this EZ, a net demand of 140 MW (for about 400 ha) could be derived by assuming that assembly industries are the main locators and the same basic unit of 350 kVA/ha used in the short span development SEZ in chapter-4.

The power supply facilities (substation site) will be placed near the approach road on the south.

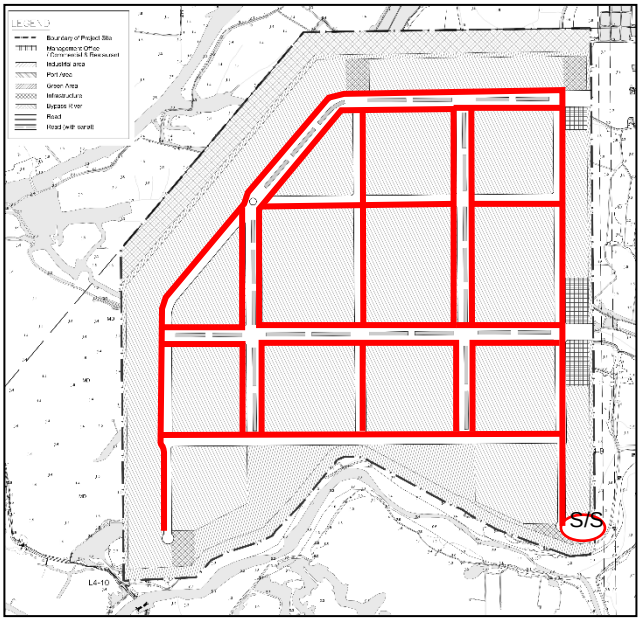


Figure 5.4.4(3)-5 Power supply plan of General EZ

6) Gas supply plan

General usage (such as cooking water heating etc.) but not power generation or industrial use of gas has been considered to enact the gas supply plan.

The gas distribution facilities will be placed near the approach road to the north.

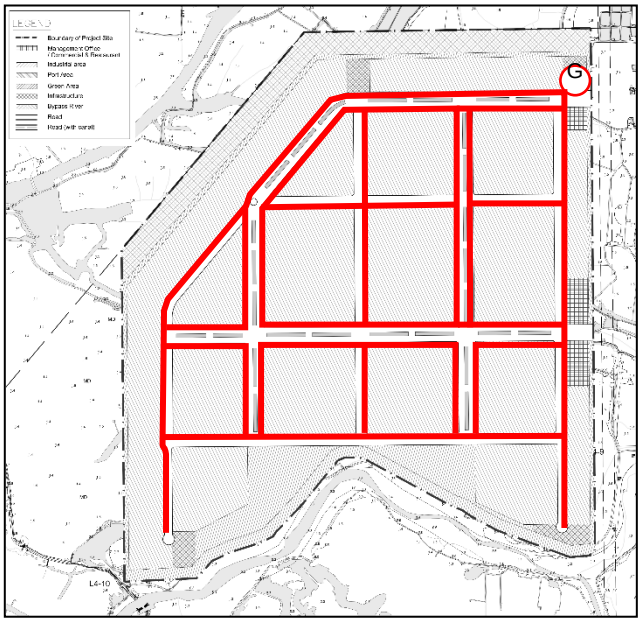


Figure 5.4.4(3)-6 Gas supply plan of General EZ

7) Solid waste treatment

In this EZ, each factory is to sign a contract with a treatment and disposal company and treat and dispose of its solid waste within the EZ according to the policy that has beenadoptted. Therefore processing and disposal facilities for solid waste (general waste (garbage, etc.), industrial waste) have not been planned within the EZ.

8) Communication service

For communication services in this EZ, each factory is to sign contracts with local companies to obtain fiber optic cable connections and to receive services. For wired connections, they have to consult with EZ administration and set up a pole or underground pipe on the infrastructure land preserved on both sides of the road.

(4) Off-site Infrastructure Planning

1) Road/Railway plan

Similar to the access road to Seaboard EZ as shown in Fig. 5.4.2, (4), 1), Access road for General EZ will be made by 2 (two) access points where will be directly connecting to the Regional Road along the east side of EZ area as indicated in Fig 5.4.4(4)-1below.

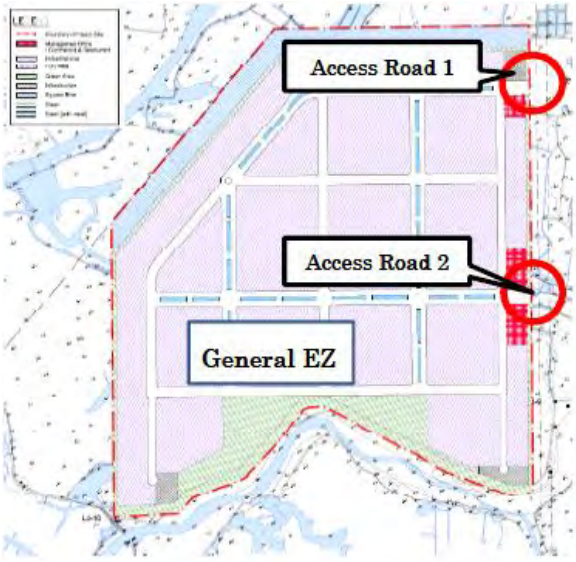


Figure. 5.4.4(4)-1 Access Roads to General EZ

2) Water supply plan

(Refer to Section 5.4.2, (4), 2))

3) Electric power supply plan

(Refer to Section 5.4.2, (4), 3))

Figure 5.4.4(4)-2　Perspective Drawing of the General EZ

(5) Future Expansion at General EZ

In the 2nd JCC meeting held on May 24, 2016, future expansion of General EZ up to around 2,000 ha in the Maheskhali Island was expressed by BEZA.

Although the South Chittagong Survey Team has confirmed the availability of EZ development land up to around 2,000 ha as indicated in their option plans, the JICA EZ Survey Team has found that proposed 2,000 ha EZ development in the Maheskhali Island will be separated by transmission pipeline for planned LNG project. Due to this situation, another 1,000 ha land in the Maheskhali Island could be developed independently for the EZ development, which is illustrated in the Figure 5.4.4(5)-1.

Figure 5.4.4(5)-1 Future Expansion Plan for General EZ Development

In case of 1,000 ha expansion plan as the General EZ development which is enclosed by the black broken line shown in Figure 5.4.4(5)-1, it is necessary to consider the defrayal for construction of the storm surge protection dike to prevent cyclone disaster for EZ. Since the disaster prevention expense of the storm surge protection dike is estimated to occupy 1/3 or more of the entire EZ construction cost as described later in the Section 5.4.5, it seems that it is difficult to keep the profit as the General EZ development.

As the alternative plan for the expansion of General EZ development, Chakaria North (Site-4) and Cox's Bazar North (Site-5) with the priority B are identified. The location of these proposed sites are illustrated in Figure 5.4.4(5)-2.

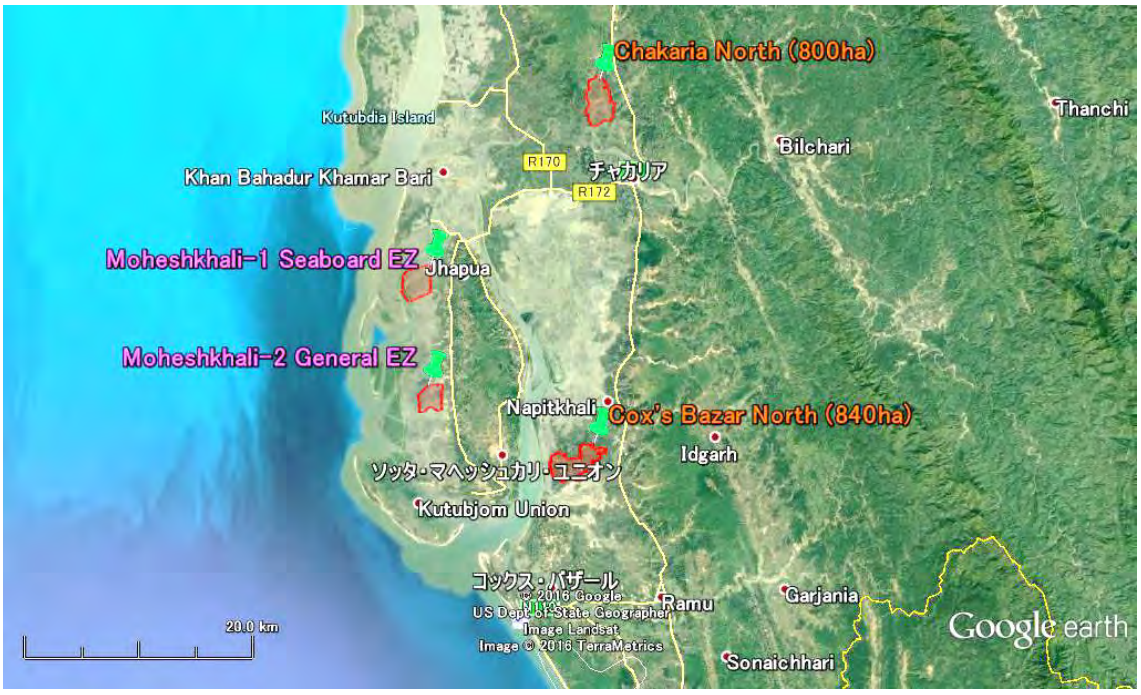


Figure 5.4.4(5)-2 Alternative Sites for expansion of General EZ

Both of the candidate sites at has more than 800 ha of land. The site locates within 30 km distance from the planned deep-sea commercial port in Maheskhali Island. It is recommended as the potential candidate sites for the expansion of General EZ with less costs than the proposed sites in Maheskhali, because of no storm surge protection structures.

Moreover, these candidate sites have enough 800 ha of land with good environmental conditions for the integrated development of the urban facilities including residential complex, hotel/condominiums, vocational training facility, parks and amusement, public, educational and medical facilities in each Upazila. The both of local (Upazila) governments show their interests for EZ development in the proposed areas.

5.4.5 Preliminary Project Cost Estimation for Medium Term Development

(1) Conditions for Preliminary Project Cost Estimation

A rough Project Cost is estimated for both the Seaboard EZ (Approx. 605 ha) and the General EZ (Approx. 400 ha) in site and off- side infrastructure construction to be executed by BEZA (the Bangladesh government). It was assumed that the Off-site Infrastructure (access road, water supply piping, power supply cable and gas supply piping) will be provided in the access road and connect with the main line at the regional road constructed by the City Government. The Project cost is estimated based on the following conditions.

1) Project Cost consists of Mobilization/Demobilization Cost, Direct Construction Cost and Cost of Temporary Works. For the Mobilization/Demobilization of the construction equipment, it will not be necessary to import any special equipment for the project. All of the equipment will be secured in Bangladesh. Therefore, these costs are determined based on the transportation and assembling of the equipment and the hire fee for its use during the transportation.
2) Unit cost of the construction works is based on the unit price of the manpower cost, material cost and equipment rental cost determined based on the unit cost of public works issued by the Ministry of Public Works in 2015. If there is no unit rate shown for the imported materials in the index, the materials referred to the imported unit cost from Thailand.
3) Foreign exchange rate is adopted from the bank in Bangladesh as of the September 2016 which is; 1US$ = 78.40 Taka.
4) Price escalation adopted for the construction cost is 5% (future 5 years escalation forecast for construction materials and manpower) of the direct construction cost.
5) Physical contingency adopted is 5% of the direct construction cost.
6) Site expenses adopted for the construction (site management cost) are 8 % of the direct construction cost and additionally 10% of the direct construction cost is adopted for the general managing expenses. Land acquisition fee is not included in the project cost because the funding for the land acquisition will come from the national budget.
7) The adopted consultant fee (detailed design and construction supervision) of the projects is 6% of the direct construction cost. The contingency of the consultant cost adopted is 5% of the consultant fee.
8) Import and Export duties, VAT, Company Tax and Personal Income Tax are based on the incentive to the EZ planned by BEZA. A part of the VAT is imposed on the imported materials, excluding electrical goods. Therefore, VAT (15%) is adopted on the 30% for the foreign portion of the project cost.
9) Administration Expenses of the project for BEZA. : Management cost and office expense of the project for BEZA is estimated and applied to the Consultant's Fee.
10) The electrical power supply to the EZ is basically provided in the form of 33 kV power by REB. The EZ is planned to install a sub-station receiving 33 kV and dropping the voltage to 11kV. Then, the 11kV power will be distributed throughout the EZ. Necessary distribution cables and transformers for the facilities in the project are planned to be installed in the EZ.
11) Reclamation sand for the EZ is planned to be extracted from sand quarries that lie about 30km to 60km from the EZ area based the previous survey at the region. Several sand quarries were found around rivers, river mouths and the seashore area south and the north of the region. Therefore, the reclamation cost is estimated based on the combined material cost to extract, transport and fill the sand in the quarries that averaged 40km from the EZ, as Plan 1. On the other hand, the possible reclaimed material is assumed that about a half of the reclaimed volume is utilized the material generated by the dredging works around the sites, as Plan2. For the Plan 1 and Plan 2, both plans are estimated the project cost.

12) For the flood control of the both EZs, the seawall or dike around the EZs is planned to construct. In accordance with the data of sub-soil investigation sent by BEZA, the very soft cray layer having 5m~6.5m thickness from the surface of ground has been found of which the soft layer is necessary to improve such as sand replacement. However, the location of the soil data is about 4km and 3km far from the Seaboard EZ and General EZ. Therefore, the sub-soil conditions of the base for the seawall /dike at EZs area could not confirmed in the study. Hence, the necessary improvement of the un-stable sub-soil under the seawall/ dike is executed as the Plan 1. The improvement is not necessary for the good sub-soil under the seawall/dike as the Plan 2. The both of plans are estimated the project cost into the same plans 11) above.

13) For the Seaboard EZ, the tenants (factories) will be required to construct their own seaport in the EZ water area. However, the access channel and its basin in the water area shall need to be dredged. Those dredging volume and dredging cost is only estimated and is presented for reference purpose. The access channel and basin shall be common facilities to be used by several industries around the area, not only the EZ factories. Therefore, the cost sharing of the dredging works shall be considered. However, BEZA informed that the common dredging cost would be budgeted at BWDB. Hence, the necessary dredging work in front of the EZ seaport is only appropriated to BEZA or EZ tenants as about 10% of the common dredging cost in the project.

(2) The Matter to note in the implementation of the Project

In accordance with the conditions of project cost estimation, BEZA and/or Bangladesh government shall consider with following tasks and to secure the necessary fund for the implementation of the tasks, as shown in Table 5.4.5-1.

Table 5.4.5-1 Common Task and Necessary Financing on BEZA (Government)

No	Common Task for Implementation of EZ Development	Necessary Measures	Implementation Agency (Discussion and Coordination with BEZA)	Rough Estimated Budget
1	New Independent Authority shall be established to develop Matarbari Region comprehensively , such as Matarbari Development Authority	Coordination between Sectors and Private Investors/ Financing Common Utilities	Bangladesh Government	Necessary Land Acquisition Fee/ Compensation Fee/National Budget Allocation for Development of Common Facilities
2	Matarbari Regional Trunk Road Construction to connect with National Road NR-1.	Coordination for Land Acquisition/ Planning and Design	Regional Highway Dep./RHD	180 Million US$
3	Water Reservoir Dams, Water Supply Plant and Main distribution Pipeline along the Regional Road	Coordination for Land Acquisition/ Planning and Design Coordination for construction of the water reservoir pond for Moheskhali Island	City Government /Private Water Company (Investor)	60 Million US$
4	Electrical Power Supply Grid Line (125KV Power Line)	Coordination for Land Acquisition/ Planning and Design	PGCB	30 Million US$
5	Electrical Power Sub-Station and High voltage Line (33KV Power Line along the Regional Road)	Coordination for Land Acquisition/ Planning and Design	REB	20 Million US$
6	Gas Supply distribution station and pipelines along the Reginal road	Coordination for Land Acquisition/ Planning and Design	GTCL/TITAS	15 Million US$
7	EZ Development (Seaboard and General)	Land Acquisition/ Planning and Design/Development Scope	BEZA/ Private Investor (Developer)	Estimated Project Cost
8	Access Road/ Bridge Construction for Deep Sea Container Port	Coordination for Land Acquisition/ Planning and Design	Ministry of Shipping	50 million US$
9	Access Channel and port basin (Main waterway dredging) (initial and maintenance dredging)	Coordination with BWDB and common (public) usage of waterway / Scope Shearing	BWDB and Relevant Stakeholders such as Energy Sectors, Oil refinery, Coal Terminal and Commercial Port	Budget allocation by BWDB 234 Million USD
10	Port turning basin and berth boxes in front of Seaboard EZ (Initial and maintenance dredging)	Scope Sharing /Planning and Design	BEZA/ Private Investor	23 Million US$

Source: Study Team.

(3) Preliminary Cost Estimation for two EZs

Based on the Land Use Plan, Infrastructure Plan mentioned in the previous chapter and the conditions of preliminary project cost estimation, the construction quantities for the projects are calculated for the Seaboard EZ and General EZ. The project costs of the Plan 1 and Plan2 explained as below for the Seaboard EZ (605 ha) and the General EZ (400 ha) are summarized in Table 5.4-2 and Table 5.4-3 for the Plan 1 and Table 5.4-4 and Table 5.4-5 for the Plan 2 respectively.

Plan 1: The reclamation cost is estimated based on the combined material cost to extract, transport and fill the sand in the quarries that averaged 40km from the EZ, the necessary improvement of the un-stable sub-soil under the seawall/ dike around the EZs is executed.

Plan 2: The possible reclaimed material is assumed that about a half of the reclaimed volume is utilized the material generated by the dredging works around the EZs site, the soil improvement is not necessary for the good sub-soil under the seawall/dike around the EZs.

Table 5.4.5-2 (Plan 1) Summary of Project Cost for Seaboard EZ Development

No		Description	Unit	Quantity	Seaboard EZ (605Ha)			unit: US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				316,911,189	272,254,882	589,166,071	
	1	Preparation Works	L.s	1	2,210,275	2,173,975	4,384,250	
	2	Embankment Filling (Access Road and Site)	m3	29,267,000	182,344,159	120,816,186	303,160,345	
	3	Access Road Construction	m	1300	739,755	1,243,482	1,983,237	
	4	Road Construction	m2	137,500	6,874,714	4,522,727	11,397,441	
	5	Seawall (11,200m)	m	11,200	101,055,360	101,642,240	202,697,600	
	6	Sea Dike (0 m)	m	0	0	0	0	
	7	Storm Water Drainage Works	L.s	1	1,079,601	719,734	1,799,334	
	8	Sewer Water Drainage Works	L.s	1	1,392,830	928,553	2,321,384	
	9	Water Distribution Line & Fire Fighting Line	L.s	1	160,306	641,222	801,528	
	10	Electric Power Distribution & Lighting	L.s	1	2,104,102	8,416,409	10,520,511	
	11	Gas Pipe line Distribution	L.s	1	90,088	360,353	450,441	
	12	Common Plant for water and sewer	ton	56,000	17,800,000	29,200,000	47,000,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	30,636,636	75,413,257	106,049,893	
Construction Cost					347,547,825	347,668,139	695,215,964	
C	Contingency and Taxes		%	10 %+ 6% of FC	31,691,119	43,560,781	75,251,900	
D	Consultants Services		%	4	7,423,492	17,321,482	24,744,975	
Total Project Cost (A+B+C+D)					386,662,436	408,550,403	795,212,839	
Common Dredging Works								
	1	Access Channel Dredging	m3	7,940,000	10,242,600	23,899,400	34,142,000	
	2	Port Bsin Dredging	m3	7,846,000	10,121,340	23,616,460	33,737,800	
	3	Disposal (improvement) of Deredgied material	m3	15,786,000	49,725,900	116,027,100	165,753,000	
Total Common Dredging Works for Port					70,089,840	163,542,960	233,632,800	
EZ Portion for Dredging Works (BEZA、EZ Developer、EZ Tenants)			%	10%	7,008,984	16,354,296	23,363,280	

Source : JICA Study Team

Table 5.4.5-3 (Plan 1) Summary of Project Cost for General EZ Development

No		Description	Unit	Quantity	General EZ (400Ha)			unit : US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				255,838,967	192,160,918	447,999,885	
	1	Preparation Works	L.s	1	1,590,358	1,644,168	3,234,525	
	2	Embankment Filling (Access Road and Site)	m3	22,334,000	140,147,770	92,393,097	232,540,867	
	3	Access Road Construction	m	60	42,419	52,249	94,668	
	4	Road Construction	m2	310,000	14,656,620	9,635,096	24,291,716	
	5	Seawall (6,100m)	m	6,100	55,039,080	55,358,720	110,397,800	Total Seawall & Sea Dike = 8,400m
	6	Sea Dike (2,300 m)	m	2,300	32,680,700	13,238,800	45,919,500	
	7	Storm Water Drainage Works	L.s	1	1,905,576	1,270,384	3,175,960	
	8	Sewer Water Drainage Works	L.s	1	1,931,211	1,287,474	3,218,686	
	9	Water Distribution Line & Fire Fighting Line	L.s	1	197,288	789,152	986,440	
	10	Electric Power Distribution & Lighting	L.s	1	1,144,575	4,578,301	5,722,876	
	11	Gas Pipe line Distribution	L.s	1	63,369	253,477	316,846	
	12	Common Plant for water and sewer	ton	14,000	5,380,000	10,070,000	15,450,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	23,295,994	57,343,985	80,639,979	
Construction Cost					279,134,961	249,504,903	528,639,865	
C	Contingency and Taxes		%	10% +4.5% of FC	25,583,897	27,863,333	53,447,230	
D	Consultants Services		%	4	5,644,799	13,171,197	18,815,995	
Total Project Cost (A+B+C+D)					310,363,656	290,539,433	600,903,090	

Source : JICA Study Team

Table 5.4.5-4 （Plan 2） Summary of Project Cost for Seaboard EZ Development

No		Description	Unit	Quantity	Seaboard EZ (605Ha)			unit: US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				240,576,189	231,220,882	471,797,071	
	1	Preparation Works	L.s	1	2,210,275	2,173,975	4,384,250	
	2	Embankment Filling (Access Road and Site)	m3	29,267,000	129,663,559	85,695,786	215,359,345	
	3	Access Road Construction	m	1300	739,755	1,243,482	1,983,237	
	4	Road Construction	m2	137,500	6,874,714	4,522,727	11,397,441	
	5	Seawall (11,200m)	m	11,200	77,400,960	95,728,640	173,129,600	
	6	Sea Dike (0 m)	m	0	0	0	0	
	7	Storm Water Drainage Works	L.s	1	1,079,601	719,734	1,799,334	
	8	Sewer Water Drainage Works	L.s	1	1,392,830	928,553	2,321,384	
	9	Water Distribution Line & Fire Fitting Line	L.s	1	160,306	641,222	801,528	
	10	Electric Power Distribution & Lighting	L.s	1	2,104,102	8,416,409	10,520,511	
	11	Gas Pipe line Distribution	L.s	1	90,088	360,353	450,441	
	12	Common Plant for water and sewer	ton	56,000	17,800,000	29,200,000	47,000,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	24,533,448	60,390,025	84,923,473	
	Construction Cost				265,109,637	291,610,907	556,720,544	
C	Contingency and Taxes		%	10 %+ 6% of FC	24,057,619	36,995,341	61,052,960	
D	Consultants Services		%	4	5,944,643	13,870,834	19,815,477	
Total Project Cost (A+B+C+D)					295,111,899	342,477,082	637,588,981	
Common Dredging Works								
	1	Access Channel Dredging	m3	7,940,000	10,242,600	23,899,400	34,142,000	
	2	Port Bsin Dredging	m3	7,846,000	10,121,340	23,616,460	33,737,800	
	3	Disposal (improvement) of Deredgied material	m3	15,786,000	36,465,660	85,086,540	121,552,200	
Total Common Dredging Works for Port					56,829,600	132,602,400	189,432,000	
EZ Portion for Dredging Works （BEZA、EZ Developer、EZ Tenants）			%	10%	5,682,960	13,260,240	18,943,200	

Source：JICA Study Team

Table 5.4.5-5 （Plan 2） Summary of Project Cost for General EZ Development

No		Description	Unit	Quantity	General EZ (400Ha)			unit : US$
					Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost				187,298,567	158,275,318	345,573,885	
	1	Preparation Works	L.s	1	1,590,358	1,644,168	3,234,525	
	2	Embankment Filling (Access Road and Site)	m3	22,334,000	99,946,570	65,592,297	165,538,867	
	3	Access Road Construction	m	60	42,419	52,249	94,668	
	4	Road Construction	m2	310,000	14,656,620	9,635,096	24,291,716	
	5	Seawall (6,100m)	m	6,100	42,155,880	52,137,920	94,293,800	Total Seawall & Sea Dike = 8,400m
	6	Sea Dike (2,300 m)	m	2,300	17,224,700	9,374,800	26,599,500	
	7	Storm Water Drainage Works	L.s	1	1,905,576	1,270,384	3,175,960	
	8	Sewer Water Drainage Works	L.s	1	1,931,211	1,287,474	3,218,686	
	9	Water Distribution Line & Fire Fitting Line	L.s	1	197,288	789,152	986,440	
	10	Electric Power Distribution & Lighting	L.s	1	1,144,575	4,578,301	5,722,876	
	11	Gas Pipe line Distribution	L.s	1	63,369	253,477	316,846	
	12	Common Plant for water and sewer	ton	14,000	5,380,000	10,070,000	15,450,000	
	13	Common Buildings	m2	3,500	1,060,000	1,590,000	2,650,000	
B	Other Construction Expenses		%	18	17,969,842	44,233,457	62,203,299	
	Construction Cost				205,268,409	202,508,775	407,777,185	
C	Contingency and Taxes		%	10% +4.5% of FC	18,729,857	22,949,921	41,679,778	
D	Consultants Services		%	4	4,354,231	10,159,872	14,514,103	
Total Project Cost (A+B+C+D)					228,352,497	235,618,569	463,971,066	

Source：JICA Study Team

The detailed project costs for Plan 1 and Plan2 for the Seaboard EZ (605 ha) and the General EZ (400 ha) are shown in Appendix .5.4（ Table 5.4-(1), Table 5.4-(2.), Table 5.4-(3.) and Table 5.4-(4.)

(4) Implementation plan for medium-term EZ development

1) Seaboard EZ development

In Section 5.1, a Seaboard EZ development for chemical and other heavy industries and a

General EZ for export oriented light industries were determined to be the EZ development models adapted to Bangladesh industrial development, and various conditions for the development of these EZs were compared. Also in Section 5.1, prospective industries considered promising in Bangladesh were identified. In the meantime, the existing industries of ship breaking and repair, steel and re-rolling should be strengthened, and technology should be upgraded. Since the Seaboard EZ development is conditional on the deep sea port, its implementation should be planned in conformity with the port development.

2) General EZ development

Of the industries promising for establishment in the General EZ, the proximity to the port is not so critical compare to that of Seaboard EZ. The industries can be located in the General EZ even before the Seaboard EZ is open. In the meantime, related industries diversified for textile and garment industry shall be further encouraged and deepen respective interindustry relations or industrial clusters at the General EZ.

APPENDIX 5.4

Table 5.4-(1) (Plan 1) Detailed Project Cost for Seaboard EZ

No		Description	Seaboard EZ (605Ha)						unit: US$
			Unit	Quantity	Unit Price	Local Portion	Foreign Portion	Total Cost	Remarks
A	**Direct Construction Cost**					**316,911,189**	**272,254,882**	**589,166,071**	
	1	Preparation Works				**2,210,275**	**2,173,975**	**4,384,250**	
		1.1 Mobilization/Demobilization	L.s	1	2,500,000	750,000	1,750,000	2,500,000	
		1.2 Temporary Works	L.s	1	350,000	280,000	70,000	350,000	
		1.3 Site Clearance/Grading Access Road	m2	6,000,000	0.20	1,080,000	120,000	1,200,000	
		1.4 Boundary Fencing	m	9550	35.00	100,275	233,975	334,250	
	2	Embankment Filling (Access Road and Site)				**182,344,159**	**120,816,186**	**303,160,345**	
		2.1 Sand Extraction	m3	29,267,000	1.16	20,398,032	13,598,688	33,996,719	
		2.2 Sand Transportation by Barge	m3	29,267,000	7.50	131,701,500	87,801,000	219,502,500	
		2.3 Sand Filling to Site (by Pump)	m3	29,267,000	1.55	27,218,310	18,145,540	45,363,850	
		2.4 Grading and Compaction	m2	6,000,000	0.70	2,928,682	1,255,149	4,183,831	
		2.5 Slope Protection in Canel	m2	34,400	2.00	61,920	6,880	68,800	
		2.6 Canal Excavation	m3	33,200	1.34	35,715	8,929	44,644	
	3	Access Road Construction				**739,755**	**1,243,482**	**1,983,237**	
		3.1 Drainage & Culvert	m	70	1,260	35,280	52,920	88,200	2mx1.5m x2units
		3.2 Top soil slope	m2	31,200	0.45	11,288	2,822	14,110	
		3.3 Sub-Grade Grading and Compaction	m2	26,000	0.48	7,525	5,017	12,542	
		3.4 Base Coarse	m2	19,500	27.58	322,630	215,087	537,717	300mm+150mm
		3.5 Surface Coarse	m2	19,500	38.05	5,377	593,519	598,896	50mm+40mm
		3.6 Concrete Curb	m	19,500	15.52	296,759	181,541	478,300	
		3.7. Green Sodding Top of Access Road	m2	6,500	0.45	2,646	294	2,940	
		3.8 Trees Planting (Land Landscape Work)	m2	6,500	1	6,612	735	7,346	
		3.9. Storm water drainage	L.S	1	15,000	6,000	9,000	15,000	
		3.11Gas Pipeline Installation and Connection	m	1,500	24.30	7,289	29,155	36,443	
		3.12 11KV cable Distribution Under Grand	m	1,500	25.35	7,604	30,418	38,022	
		3.13 Water Pipeline 300 dia Installation and Connection	m	1,500	102.48	30,744	122,976	153,720	
	4	Road Construction				**6,874,714**	**4,522,727**	**11,397,441**	
		4.1 Excavation for Canal	m3	173,000	1.34	139,580	93,053	232,633	
		4.2 Canal Culvert (large Triple Box)	m	380	4,200	957,600	638,400	1,596,000	
		4.3 Sub-Grade Grading & Compaction	m2	137,500	0.48	53,064	13,266	66,330	
		4.4 Base Coarse	m3	137,500	27.58	2,274,958	1,516,638	3,791,596	
		4.5 Surface Coarse	m2	137,500	38.05	3,138,800	2,092,534	5,231,334	
		4.6 Concrete Curb	m	23,500	15.52	218,780	145,853	364,633	
		4.7. Green Sodding	m2	115,000	0.45	41,607	10,402	52,008	
		4.8 Trees Planting (Land Landscape Work)	m2	55,660	1.13	50,325	12,581	62,906	
	5	Seawall (11,200m for Seaboard)				**101,055,360**	**101,642,240**	**202,697,600**	
		5.1 Excavation and Sand Replacement	m3	2,464,000	12.00	23,654,400	5,913,600	29,568,000	
		5.2 Piling Works	ton	44,800	1,700	22,848,000	53,312,000	76,160,000	
		5.3 Parapet R C Wall	m3	168,000	350.00	35,280,000	23,520,000	58,800,000	
		2.4 Concrete Blocks	m3	44,800	200.00	5,376,000	3,584,000	8,960,000	
		5.5 Basement of Wall	m3	11,200	28.00	188,160	125,440	313,600	
		5.6 Sand Backfilling	m3	1,120,000	9.00	8,064,000	2,016,000	10,080,000	
		5.7 Steel Sheet Pile wall	ton	13,440	1,400	5,644,800	13,171,200	18,816,000	
	6	Sea Dike (0 m)				**0**	**0**	**0**	
		6.1 Excavation and Sand Replacement	m3	0		0	0	0	
		6.2 Parapet R C Wall	m3	0.0		0	0	0	
		6.3 Concrete Blocks	m3	0.0		0	0	0	
		6.4 Basement Brick Stone	m3	0.0		0	0	0	
		6.5 Sand Filling	m3	0.0		0	0	0	
		6.6 RC Slope Protection	m3	0.0		0	0	0	
		6.7 Steel Sheet pile	ton	0.0		0	0	0	
	7	Storm Water Drainage Works	L.s	1		**1,079,601**	**719,734**	**1,799,334**	
	8	Sewer Water Drainage Works	L.s	1		**1,392,830**	**928,553**	**2,321,384**	
	9	Water Distribution Line & Fire Fitting Line	L.s	1		**160,306**	**641,222**	**801,528**	
	10	Electric Power Distribution & Lighting	L.s	1		**2,104,102**	**8,416,409**	**10,520,511**	
	11	Gas Pipe line Distribution	L.s	1		**90,088**	**360,353**	**450,441**	
	12	Common Plant for water and sewer				**17,800,000**	**29,200,000**	**47,000,000**	
		12.1 Water Reservoir Tank (56000m3)	L.s	1	3,700,000	1,480,000	2,220,000	3,700,000	
		12.2 Water Distribution Elevated Tank with Pump (200m3x 4)	L.s	4	450,000	720,000	1,080,000	1,800,000	
		12.3 Sewarage Treatment Plant (47000m3)	L.s	1	35,000,000	14,000,000	21,000,000	35,000,000	
		12.4 Fire Fighting Pump and House (1000m3)	L.s	1	1,500,000	600,000	900,000	1,500,000	
		12.5 Discharge Pumps and Gate Facility	Unit	10	500,000	1,000,000	4,000,000	5,000,000	
	13	Common Buildings				**1,060,000**	**1,590,000**	**2,650,000**	
		13.1 Park Center Administration Building	m2	2000	800	640,000	960,000	1,600,000	
		13.2 Rental Office, Crinic and Resturant Building	m2	1000	800	320,000	480,000	800,000	
		13.3 Utility Maintenance Shop	m2	500	500	100,000	150,000	250,000	
B	**Other Expenses**					**30,636,636**	**75,413,257**	**106,049,893**	
	1	Site Expenses	%	8		18,853,314	28,279,971	47,133,286	
	2	General Expenses and Profit	%	10		11,783,321	47,133,286	58,916,607	
C	**Contingency and Taxes**					**31,691,119**	**43,560,781**	**75,251,900**	
	1	Physical Contingency	% of A	5		15,845,559	13,612,744	29,458,304	
	2	Price Escalation	% of A	5		15,845,559	13,612,744	29,458,304	
	3	TAX and Duties (VAT for Import Goods exculuding Electrical Goods)	% of A	(15 x 0.4)% of FC		0	16,335,293	16,335,293	
D	**Consultants Services**					**7,423,492**	**17,321,482**	**24,744,975**	
	1	Detailed Design	% of A	2		3,534,996	8,248,325	11,783,321	
	2	Construction Supervision	% of A	2		3,534,996	8,248,325	11,783,321	
	3	Contingency	% of (D1+D2)	5		353,500	824,832	1,178,332	
Total Project Cost (A+B+C+D)						**386,662,436**	**408,550,403**	**795,212,839**	

Source：JICA Study Team

Table 5.4-(2) (Plan 1) Detailed Project Cost for General EZ

No		Description	General EZ (400Ha)						unit : US$
			Unit	Quantity	Unit Price	Local Portion	Foreign Portion	Total Cost	Remarks
A	**Construction Cost**					**255,838,967**	**192,160,918**	**447,999,885**	
	1	Preparation Works				**1,590,358**	**1,644,168**	**3,234,525**	
		1.1 Mobilization/Demobilization	L.s	1	2,000,000	600,000	1,400,000	2,000,000	
		1.2 Temporary Works	L.s	1	280,000	224,000	56,000	280,000	
		1.3 Site Clearance/Grading Access Road	m2	4,000,000	0.20	720,000	80,000	800,000	
		1.4 Boundary Fencing	m	4,415	35.00	46,358	108,168	154,525	
	2	Embankment Filling (Access Road and Site)				**140,147,770**	**92,393,097**	**232,540,867**	
		2.1 Sand Extraction	m3	22,334,000	1.16	15,565,984	10,377,322	25,943,306	
		2.2 Sand Transportation by Barge	m3	22,334,000	7.50	100,503,000	67,002,000	167,505,000	
		2.3 Sand Filling to Site (by Pump)	m3	22,334,000	1.55	20,770,620	13,847,080	34,617,700	
		2.4 Grading and Compaction	m2	4,000,000	0.70	1,952,455	836,766	2,789,221	
		2.5 Slope Protection in Canel	m2	36,000	2.00	64,800	7,200	72,000	
		2.6 Canal Excavation	m3	1,200,000	1.34	1,290,912	322,728	1,613,640	
	3	Access Road Construction				**42,419**	**52,249**	**94,668**	
		3.1 Drainage & Culvert	m	0	0	0	0	0	Box culvert 2x1.5m
		3.2 Top soil slope	m2	62400	0.45	22,576	5,644	28,220	
		3.3 Sub-Grade Grading and Compaction	m2	1200	0.48	347	232	579	
		3.4 Base Coarse	m2	900	27.58	14,891	9,927	24,818	300mm+150mm
		3.5 Surface Coarse	m2	900	38.05	248	27,393	27,641	50mm+40mm
		3.6 Concrete Curb	m	120	15.52	1,826	1,117	2,943	
		3.7. Green Sodding Top of Access Road	m2	300	0.45	122	14	136	
		3.8 Trees Planting (Land Landscape Work)	m2	180	1	183	20	203	
		3.9. Storm water drainage	L.S	1	1,000	400	600	1,000	
		3.11Gas Pipeline Installation and Connection	m	60	24.30	292	1,166	1,458	
		3.12 11KV cable Distribution Under Grand	m	60	25.35	304	1,217	1,521	
		3.12 Water Pipeline 300 dia Installation and Connection	m	60	102.48	1,230	4,919	6,149	
	4	Road Construction				**14,656,620**	**9,635,096**	**24,291,716**	
		4.1 Excavation for Canal	m3	192,000	1.34	154,909	103,273	258,182	
		4.2 Canal Culvert (large Triple Box)	m	560	4,200	1,411,200	940,800	2,352,000	
		4.4 Sub-Grade Grading & Compaction	m2	310,000	0.48	119,636	29,909	149,545	
		4.5 Base Coarse	m3	310,000	27.58	5,128,996	3,419,330	8,548,326	
		4.6 Surface Coarse	m2	310,000	38.05	7,076,568	4,717,712	11,794,280	
		4.7 Concrete Curb	m	60,000	15.52	558,586	372,391	930,977	
		4.9. Green Sodding	m2	259,000	0.45	93,706	23,426	117,132	
		4.10 Trees Planting (Land Landscape Work)	m2	125,000	1.13	113,019	28,255	141,273	
	5	Seawall (6,100m for General)				**55,039,080**	**55,358,720**	**110,397,800**	
		5.1 Excavation and Sand Replacement	m3	1,342,000	12.00	12,883,200	3,220,800	16,104,000	
		5.2 Piling Works	ton	24,400	1,700	12,444,000	29,036,000	41,480,000	
		5.3 Parapet R C Wall	m3	91,500	350.00	19,215,000	12,810,000	32,025,000	
		2.4 Concrete Blocks	m3	24,400	200.00	2,928,000	1,952,000	4,880,000	
		5.5 Basement of Wall	m3	6,100	28.00	102,480	68,320	170,800	
		5.6 Sand Backfilling	m3	610,000	9.00	4,392,000	1,098,000	5,490,000	
		5.7 Steel Sheet Pile wall	ton	7,320	1,400	3,074,400	7,173,600	10,248,000	
	6	Sea Dike (2,300 m for General)				**32,680,700**	**13,238,800**	**45,919,500**	
		6.1 Excavation and Sand Replacement	m3	1,610,000	12	15,456,000	3,864,000	19,320,000	
		6.2 Parapet R C Wall	m3	20,470.0	350	4,298,700	2,865,800	7,164,500	
		6.3 Concrete Blocks	m3	9,200.0	200	1,104,000	736,000	1,840,000	
		6.4 Basement Brick Stone	m3	57,500.0	28	966,000	644,000	1,610,000	
		6.5 Sand Filling	m3	529,000.0	9	3,808,800	952,200	4,761,000	
		6.6 RC Slope Protection	m3	36,800.0	200	5,888,000	1,472,000	7,360,000	
		6.7 Steel Sheet pile	ton	2,760.0	1,400	1,159,200	2,704,800	3,864,000	
	7	Storm Water Drainage Works	L.s	1		**1,905,576**	**1,270,384**	**3,175,960**	
	8	Sewer Water Drainage Works	L.s	1		**1,931,211**	**1,287,474**	**3,218,686**	
	9	Water Distribution Line & Fire Fitting Line	L.s	1		**197,288**	**789,152**	**986,440**	
	10	Electric Power Distribution & Lighting	L.s	1		**1,144,575**	**4,578,301**	**5,722,876**	
	11	Gas Pipe line Distribution	L.s	1		**63,369**	**253,477**	**316,846**	
	12	Common Plant for water and sewer				**5,380,000**	**10,070,000**	**15,450,000**	
		12.1 Water Reservoir Tank (14000m3)	L.s	1	1,000,000	400,000	600,000	1,000,000	
		12.2 Water Distribution Elevated Tank with Pump (200m3)	L.s	1	450,000	180,000	270,000	450,000	
		12.3 Sewarage Treatment Plant (11200m3)	L.s	1	8,500,000	3,400,000	5,100,000	8,500,000	
		12.4 Fire Fighting Pump and House (1000m3)	L.s	1	1,500,000	600,000	900,000	1,500,000	
		12.5 Discharge Pumps and Gate for Resorvior Tank	Unit	8	500,000	800,000	3,200,000	4,000,000	
	13	Common Buildings				**1,060,000**	**1,590,000**	**2,650,000**	
		13.1 Park Center Administration Building	m2	2000	800	640,000	960,000	1,600,000	
		13.2 Rental Office, Crinic and Resturant Building	m2	1000	800	320,000	480,000	800,000	
		13.3 Utility Maintenance Shop	m2	500	500	100,000	150,000	250,000	
B	**Other Expenses**					**23,295,994**	**57,343,985**	**80,639,979**	
	1	Site Expenses	%	8		14,335,996	21,503,994	35,839,991	
	2	General Expenses and Profit	%	10		8,959,998	35,839,991	44,799,989	
C	**Contingency and Taxes**					**25,583,897**	**27,863,333**	**53,447,230**	
	1	Physical Contingency	% of A	5		12,791,948	9,608,046	22,399,994	
	2	Price Escalation	% of A	5		12,791,948	9,608,046	22,399,994	
	3	TAX and Duties (VAT for Import Goods exculuding Electrical Goods)	% of A	(15x 0.3)% of FC		0	8,647,241	8,647,241	
D	**Consultants Services**					**5,644,799**	**13,171,197**	**18,815,995**	
	1	Detailed Design	% of A	2		2,687,999	6,271,998	8,959,998	
	2	Construction Supervision	% of A	2		2,687,999	6,271,998	8,959,998	
	3	Contingency	% of (C1+C2)	5		268,800	627,200	896,000	
Total Project Cost (A+B+C+D)						**310,363,656**	**290,539,433**	**600,903,090**	

Source：JICA Study Team

Table 5.4-(3) (Plan 2) Detailed Project Cost for Seaboard EZ

No		Description	Seaboard EZ (605Ha)						unit: US$
			Unit	Quantity	Unit Price	Local Portion	Foreign Portion	Total Cost	Remarks
A	**Direct Construction Cost**					**240,576,189**	**231,220,882**	**471,797,071**	
	1	Preparation Works				**2,210,275**	**2,173,975**	**4,384,250**	
		1.1 Mobilization/Demobilization	L.s	1	2,500,000	750,000	1,750,000	2,500,000	
		1.2 Temporary Works	L.s	1	350,000	280,000	70,000	350,000	
		1.3 Site Clearance/Grading Access Road	m2	6,000,000	0.20	1,080,000	120,000	1,200,000	
		1.4 Boundary Fencing	m	9550	35.00	100,275	233,975	334,250	
	2	Embankment Filling (Access Road and Site)				**129,663,559**	**85,695,786**	**215,359,345**	
		2.1 Sand Extraction	m3	29,267,000	1.16	20,398,032	13,598,688	33,996,719	
		2.2 Sand Transportation by Barge	m3	29,267,000	4.50	79,020,900	52,680,600	131,701,500	
		2.3 Sand Filling to Site (by Pump)	m3	29,267,000	1.55	27,218,310	18,145,540	45,363,850	
		2.4 Grading and Compaction	m2	6,000,000	0.70	2,928,682	1,255,149	4,183,831	
		2.5 Slope Protection in Canel	m2	34,400	2.00	61,920	6,880	68,800	
		2.6 Canal Excavation	m3	33,200	1.34	35,715	8,929	44,644	
	3	Access Road Construction				**739,755**	**1,243,482**	**1,983,237**	
		3.1 Drainage & Culvert	m	70	1,260	35,280	52,920	88,200	2mx1.5m x2units
		3.2 Top soil slope	m2	31,200	0.45	11,288	2,822	14,110	
		3.3 Sub-Grade Grading and Compaction	m2	26,000	0.48	7,525	5,017	12,542	
		3.4 Base Coarse	m2	19,500	27.58	322,630	215,087	537,717	300mm+150mm
		3.5 Surface Coarse	m2	19,500	38.05	5,377	593,519	598,896	50mm+40mm
		3.6 Concrete Curb	m	19,500	15.52	296,759	181,541	478,300	
		3.7. Green Sodding Top of Access Road	m2	6,500	0.45	2,646	294	2,940	
		3.8 Trees Planting (Land Landscape Work)	m2	6,500	1	6,612	735	7,346	
		3.9. Storm water drainage	L.S	1	15,000	6,000	9,000	15,000	
		3.11Gas Pipeline Installation and Connection	m	1,500	24.30	7,289	29,155	36,443	
		3.12 11KV cable Distribution Under Grand	m	1,500	25.35	7,604	30,418	38,022	
		3.13 Water Pipeline 300 dia Installation and Connection	m	1,500	102.48	30,744	122,976	153,720	
	4	Road Construction				**6,874,714**	**4,522,727**	**11,397,441**	
		4.1 Excavation for Canal	m3	173,000	1.34	139,580	93,053	232,633	
		4.2 Canal Culvert (large Triple Box)	m	380	4,200	957,600	638,400	1,596,000	
		4.3 Sub-Grade Grading & Compaction	m2	137,500	0.48	53,064	13,266	66,330	
		4.4 Base Coarse	m3	137,500	27.58	2,274,958	1,516,638	3,791,596	
		4.5 Surface Coarse	m2	137,500	38.05	3,138,800	2,092,534	5,231,334	
		4.6 Concrete Curb	m	23,500	15.52	218,780	145,853	364,633	
		4.7. Green Sodding	m2	115,000	0.45	41,607	10,402	52,008	
		4.8 Trees Planting (Land Landscape Work)	m2	55,660	1.13	50,325	12,581	62,906	
	5	Seawall (11,200m for Seaboard)				**77,400,960**	**95,728,640**	**173,129,600**	
		5.1 Excavation and Sand Replacement	m3	0	12.00	0	0	0	
		5.2 Piling Works	ton	44,800	1,700	22,848,000	53,312,000	76,160,000	
		5.3 Parapet R C Wall	m3	168,000	350.00	35,280,000	23,520,000	58,800,000	
		2.4 Concrete Blocks	m3	44,800	200.00	5,376,000	3,584,000	8,960,000	
		5.5 Basement of Wall	m3	11,200	28.00	188,160	125,440	313,600	
		5.6 Sand Backfilling	m3	1,120,000	9.00	8,064,000	2,016,000	10,080,000	
		5.7 Steel Sheet Pile wall	ton	13,440	1,400	5,644,800	13,171,200	18,816,000	
	6	Sea Dike (0 m)				**0**	**0**	**0**	
		6.1 Excavation and Sand Replacement	m3	0		0	0	0	
		6.2 Parapet R C Wall	m3	0.0		0	0	0	
		6.3 Concrete Blocks	m3	0.0		0	0	0	
		6.4 Basement Brick Stone	m3	0.0		0	0	0	
		6.5 Sand Filling	m3	0.0		0	0	0	
		6.6 RC Slope Protection	m3	0.0		0	0	0	
		6.7 Steel Sheet pile	ton	0.0		0	0	0	
	7	Storm Water Drainage Works	L.s	1		**1,079,601**	**719,734**	**1,799,334**	
	8	Sewer Water Drainage Works	L.s	1		**1,392,830**	**928,553**	**2,321,384**	
	9	Water Distribution Line & Fire Fitting Line	L.s	1		**160,306**	**641,222**	**801,528**	
	10	Electric Power Distribution & Lighting	L.s	1		**2,104,102**	**8,416,409**	**10,520,511**	
	11	Gas Pipe line Distribution	L.s	1		**90,088**	**360,353**	**450,441**	
	12	Common Plant for water and sewer				**17,800,000**	**29,200,000**	**47,000,000**	
		12.1 Water Reservoir Tank (56000m3)	L.s	1	3,700,000	1,480,000	2,220,000	3,700,000	
		12.2 Water Distribution Elevated Tank with Pump (200m3x 4)	L.s	4	450,000	720,000	1,080,000	1,800,000	
		12.3 Sewarage Treatment Plant (47000m3)	L.s	1	35,000,000	14,000,000	21,000,000	35,000,000	
		12.4 Fire Fighting Pump and House (1000m3)	L.s	1	1,500,000	600,000	900,000	1,500,000	
		12.5 Discharge Pumps and Gate Facility	Unit	10	500,000	1,000,000	4,000,000	5,000,000	
	13	Common Buildings				**1,060,000**	**1,590,000**	**2,650,000**	
		13.1 Park Center Administration Building	m2	2000	800	640,000	960,000	1,600,000	
		13.2 Rental Office, Crinic and Resturant Building	m2	1000	800	320,000	480,000	800,000	
		13.3 Utility Maintenance Shop	m2	500	500	100,000	150,000	250,000	
B	**Other Expenses**					**24,533,448**	**60,390,025**	**84,923,473**	
	1	Site Expenses	%	8		15,097,506	22,646,259	37,743,766	
	2	General Expenses and Profit	%	10		9,435,941	37,743,766	47,179,707	
C	**Contingency and Taxes**					**24,057,619**	**36,995,341**	**61,052,960**	
	1	Physical Contingency	% of A	5		12,028,809	11,561,044	23,589,854	
	2	Price Escalation	% of A	5		12,028,809	11,561,044	23,589,854	
	3	TAX and Duties (VAT for Import Goods exculuding Electrical Goods)	% of A	(15 x 0.4)% of FC		0	13,873,253	13,873,253	
D	**Consultants Services**					**5,944,643**	**13,870,834**	**19,815,477**	
	1	Detailed Design	% of A	2		2,830,782	6,605,159	9,435,941	
	2	Construction Supervision	% of A	2		2,830,782	6,605,159	9,435,941	
	3	Contingency	% of (D1+D2)	5		283,078	660,516	943,594	
Total Project Cost (A+B+C+D)						**295,111,899**	**342,477,082**	**637,588,981**	

Source：JICA Study Team

Table 5.4-(4) (Plan 2) Detailed Project Cost for General EZ

No		Description	General EZ (400Ha)						unit : US$
			Unit	Quantity	Unit Price	Local Portion	Foreign Portion	Total Cost	Remarks
A	Construction Cost					187,298,567	158,275,318	345,573,885	
	1	Preparation Works				1,590,358	1,644,168	3,234,525	
		1.1 Mobilization/Demobilization	L.s	1	2,000,000	600,000	1,400,000	2,000,000	
		1.2 Temporary Works	L.s	1	280,000	224,000	56,000	280,000	
		1.3 Site Clearance/Grading Access Road	m2	4,000,000	0.20	720,000	80,000	800,000	
		1.4 Boundary Fencing	m	4,415	35.00	46,358	108,168	154,525	
	2	Embankment Filling (Access Road and Site)				99,946,570	65,592,297	165,538,867	
		2.1 Sand Extraction	m3	22,334,000	1.16	15,565,984	10,377,322	25,943,306	
		2.2 Sand Transportation by Barge	m3	22,334,000	4.50	60,301,800	40,201,200	100,503,000	
		2.3 Sand Filling to Site (by Pump)	m3	22,334,000	1.55	20,770,620	13,847,080	34,617,700	
		2.4 Grading and Compaction	m2	4,000,000	0.70	1,952,455	836,766	2,789,221	
		2.5 Slope Protection in Canel	m2	36,000	2.00	64,800	7,200	72,000	
		2.6 Canal Excavation	m3	1,200,000	1.34	1,290,912	322,728	1,613,640	
	3	Access Road Construction				42,419	52,249	94,668	
		3.1 Drainage & Culvert	m	0	0	0	0	0	Box culvert 2x1.5m
		3.2 Top soil slope	m2	62400	0.45	22,576	5,644	28,220	
		3.3 Sub-Grade Grading and Compaction	m2	1200	0.48	347	232	579	
		3.4 Base Coarse	m2	900	27.58	14,891	9,927	24,818	300mm+150mm
		3.5 Surface Coarse	m2	900	38.05	248	27,393	27,641	50mm+40mm
		3.6 Concrete Curb	m	120	15.52	1,826	1,117	2,943	
		3.7. Green Sodding Top of Access Road	m2	300	0.45	122	14	136	
		3.8 Trees Planting (Land Landscape Work)	m2	180	1	183	20	203	
		3.9. Storm water drainage	L.S	1	1,000	400	600	1,000	
		3.11Gas Pipeline Installation and Connection	m	60	24.30	292	1,166	1,458	
		3.12 11KV cable Distribution Under Grand	m	60	25.35	304	1,217	1,521	
		3.12 Water Pipeline 300 dia Installation and Connection	m	60	102.48	1,230	4,919	6,149	
	4	Road Construction				14,656,620	9,635,096	24,291,716	
		4.1 Excavation for Canal	m3	192,000	1.34	154,909	103,273	258,182	
		4.2 Canal Culvert (large Triple Box)	m	560	4,200	1,411,200	940,800	2,352,000	
		4.4 Sub-Grade Grading & Compaction	m2	310,000	0.48	119,636	29,909	149,545	
		4.5 Base Coarse	m3	310,000	27.58	5,128,996	3,419,330	8,548,326	
		4.6 Surface Coarse	m2	310,000	38.05	7,076,568	4,717,712	11,794,280	
		4.7 Concrete Curb	m	60,000	15.52	558,586	372,391	930,977	
		4.9. Green Sodding	m2	259,000	0.45	93,706	23,426	117,132	
		4.10 Trees Planting (Land Landscape Work)	m2	125,000	1.13	113,019	28,255	141,273	
	5	Seawall (6,100m for General)				42,155,880	52,137,920	94,293,800	
		5.1 Excavation and Sand Replacement	m3	0	12.00	0	0	0	
		5.2 Piling Works	ton	24,400	1,700	12,444,000	29,036,000	41,480,000	
		5.3 Parapet R C Wall	m3	91,500	350.00	19,215,000	12,810,000	32,025,000	
		2.4 Concrete Blocks	m3	24,400	200.00	2,928,000	1,952,000	4,880,000	
		5.5 Basement of Wall	m3	6,100	28.00	102,480	68,320	170,800	
		5.6 Sand Backfilling	m3	610,000	9.00	4,392,000	1,098,000	5,490,000	
		5.7 Steel Sheet Pile wall	ton	7,320	1,400	3,074,400	7,173,600	10,248,000	
	6	Sea Dike (2,300 m for General)				17,224,700	9,374,800	26,599,500	
		6.1 Excavation and Sand Replacement	m3	0	12	0	0	0	
		6.2 Parapet R C Wall	m3	20,470.0	350	4,298,700	2,865,800	7,164,500	
		6.3 Concrete Blocks	m3	9,200.0	200	1,104,000	736,000	1,840,000	
		6.4 Basement Brick Stone	m3	57,500.0	28	966,000	644,000	1,610,000	
		6.5 Sand Filling	m3	529,000.0	9	3,808,800	952,200	4,761,000	
		6.6 RC Slope Protection	m3	36,800.0	200	5,888,000	1,472,000	7,360,000	
		6.7 Steel Sheet pile	ton	2,760.0	1,400	1,159,200	2,704,800	3,864,000	
	7	Storm Water Drainage Works	L.s	1		1,905,576	1,270,384	3,175,960	
	8	Sewer Water Drainage Works	L.s	1		1,931,211	1,287,474	3,218,686	
	9	Water Distribution Line & Fire Fitting Line	L.s	1		197,288	789,152	986,440	
	10	Electric Power Distribution & Lighting	L.s	1		1,144,575	4,578,301	5,722,876	
	11	Gas Pipe line Distribution	L.s	1		63,369	253,477	316,846	
	12	Common Plant for water and sewer				5,380,000	10,070,000	15,450,000	
		12.1 Water Reservoir Tank (14000m3)	L.s	1	1,000,000	400,000	600,000	1,000,000	
		12.2 Water Distribution Elevated Tank with Pump (200m3)	L.s	1	450,000	180,000	270,000	450,000	
		12.3 Sewarage Treatment Plant (11200m3)	L.s	1	8,500,000	3,400,000	5,100,000	8,500,000	
		12.4 Fire Fighting Pump and House (1000m3)	L.s	1	1,500,000	600,000	900,000	1,500,000	
		12.5 Discharge Pumps and Gate for Resorvior Tank	Unit	8	500,000	800,000	3,200,000	4,000,000	
	13	Common Buildings				1,060,000	1,590,000	2,650,000	
		13.1 Park Center Administration Building	m2	2000	800	640,000	960,000	1,600,000	
		13.2 Rental Office, Crinic and Resturant Building	m2	1000	800	320,000	480,000	800,000	
		13.3 Utility Maintenance Shop	m2	500	500	100,000	150,000	250,000	
B	Other Expenses					17,969,842	44,233,457	62,203,299	
	1	Site Expenses	%	8		11,058,364	16,587,546	27,645,911	
	2	General Expenses and Profit	%	10		6,911,478	27,645,911	34,557,389	
C	Contingency and Taxes					18,729,857	22,949,921	41,679,778	
	1	Physical Contingency	% of A	5		9,364,928	7,913,766	17,278,694	
	2	Price Escalation	% of A	5		9,364,928	7,913,766	17,278,694	
	3	TAX and Duties (VAT for Import Goods exculuding Electrical Goods)	% of A	(15x 0.3)% of FC		0	7,122,389	7,122,389	
D	Consultants Services					4,354,231	10,159,872	14,514,103	
	1	Detailed Design	% of A	2		2,073,443	4,838,034	6,911,478	
	2	Construction Supervision	% of A	2		2,073,443	4,838,034	6,911,478	
	3	Contingency	% of (C1+C2)	5		207,344	483,803	691,148	
Total Project Cost (A+B+C+D)						228,352,497	235,618,569	463,971,066	

Source : JICA Study Team

Chapter 6 Capacity Building for BEZA Employees

6.1 Abstraction of Issue related to the Organizational Systems of BEZA

(1) Conduct of Baseline Survey on the Functions and Capabilities of BEZA

A baseline survey was conducted to investigate the actual state of BEZA's functions and capacities. The main components of the survey were a confirmation of BEZA's vision and mission (which dictate BEZA's actions), confirmation of the organizational framework, and interviews with BEZA's senior officials. The results are shown below.

1) Confirmation of BEZA's Vision and Mission

BEZA's vision and mission were under discussion when the survey started in March 2015. A few months later, in July, BEZA completed its "Vision Document," a printed brochure that could be distributed to outside parties. According to the brochure, BEZA contributes by changing regulations and supporting investors and developers in line with the major goal of "joining the group of middle-income countries by 2021, the 40th anniversary of the foundation of the country," as described in the mid-term development plan (Vision 2021), the highest-level plan in Bangladesh. The Vision Document clearly states BEZA's vision, mission, objectives and core values, delivering a clear message to readers. However, there is no description of strategies as to how to implement such high-level concepts. Nor has any mid-term plan or annual plan been found for concretely implementing such concepts. BEZA, a body established in 2010 under the Bangladesh Economic Zones Act (BEZA), has never created an annual report of its activities and is now only working on its first annual report, "Annual Report 2014-2015."

2) Organizational Structure of BEZA

The Organogram of BEZA as of September, 2016 is shown in Figure 6.1-1. Twenty-two (22) posts out of 72 posts are classified as Senior Staff (Class 1 & 2) and 50 posts are regarded as Supporting Staff (Class 3 & 4). All the Senior Staff posts except one are assigned by Government Officials who will be reshuffled by the regular rotation program ordered by the Central Government. Since the term of Government Officials is quite short, it is anticipated that the occupation of major posts by these government officials might not contribute to the realization of long-term strategies of BEZA. Considering such circumstances, BEZA has introduced a policy to independently recruit these Senior Staff who are expected to perform managerial functions for BEZA as the permanent staff of BEZA. These permanent staff newly recruited by BEZA may be assigned to general manager or lower level posts, but they will not be assigned to posts such as BEZA Chairman and a few others in top management. Through this program, it is anticipated that BEZA's managerial post which is currently occupied by the Government Officials may be gradually replaced by the permanent officials who will be recruited by BEZA.

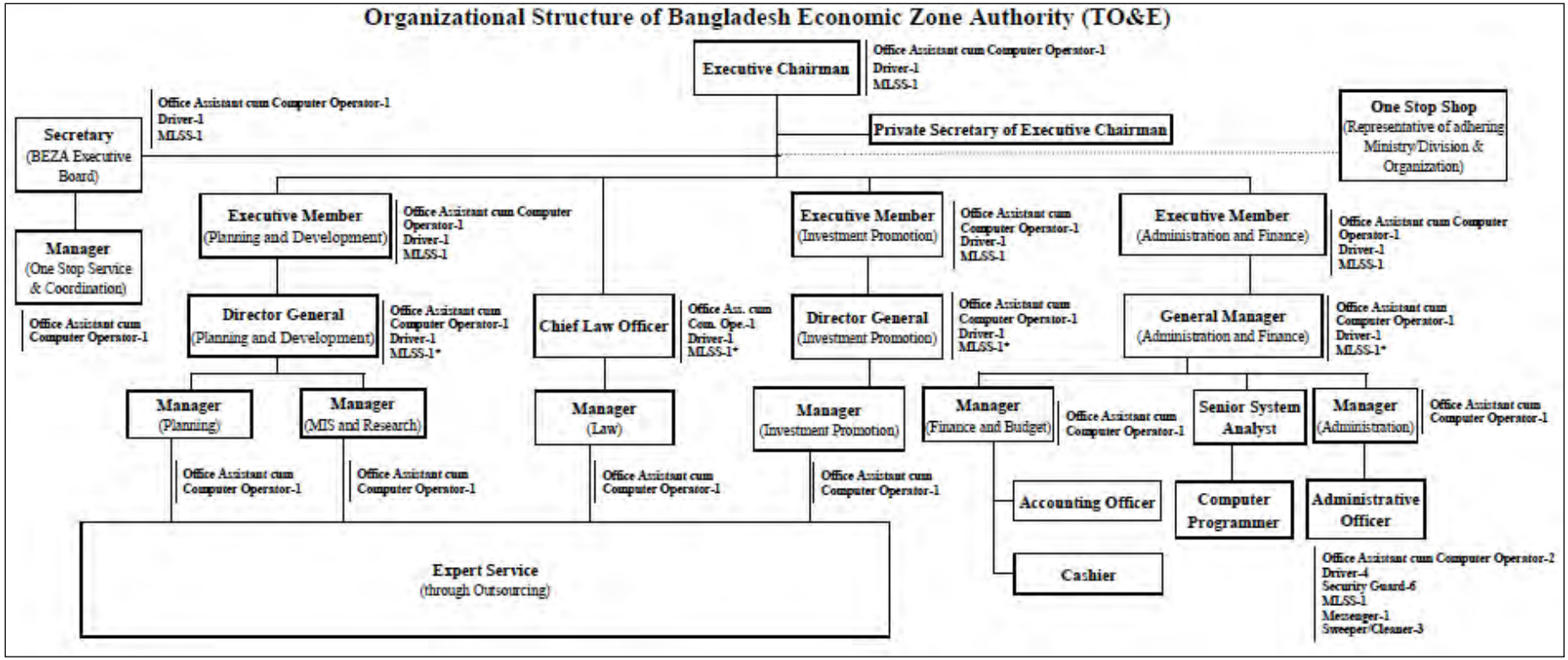


Figure 6-1-1 BEZA Organization Chart (as of July 2015)

Source: BEZA

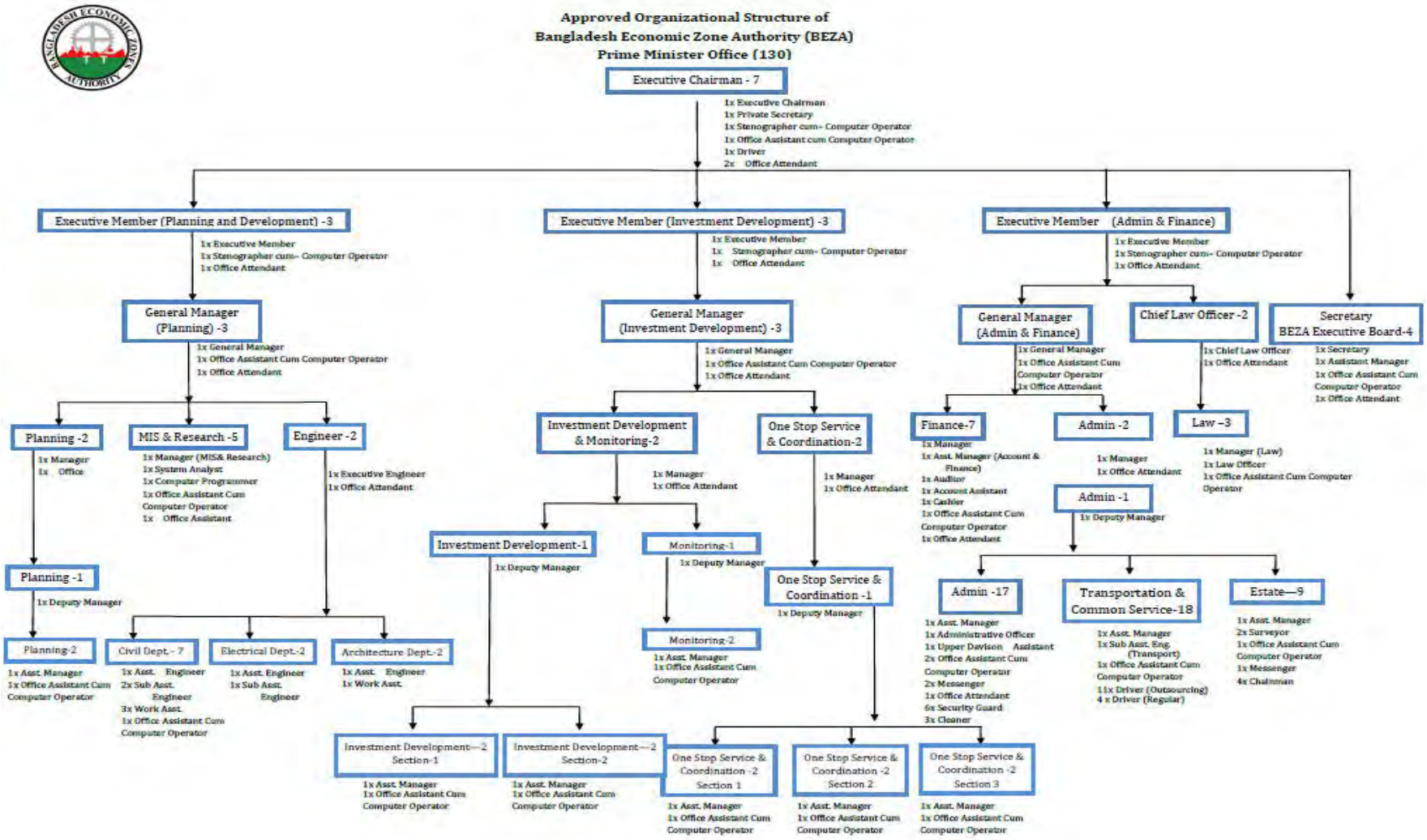


Figure 6.1-2 BEZA's Future Organization Chart (2016~2019)

Source: BEZA

3) BEZA's Decision-Making Process

As shown in Figure 6.1-3 above, BEZA's current organization is a 5-level structure. Its decision-making process, meanwhile, has only 3 levels, as shown in Figure 6.1-4 below. As there are separate management lines for routine work and work based on projects implemented by the International Development Authority (IDA), etc., the two lines have to be better coordinated.

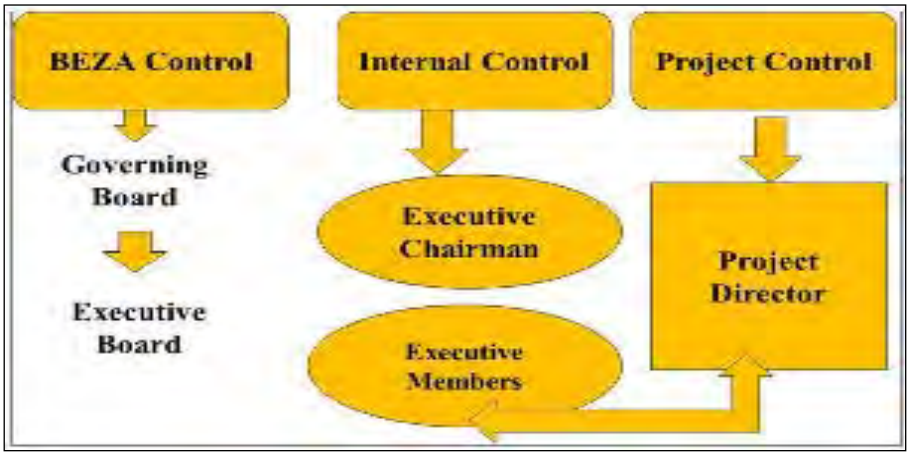


Figure 6.1-3: BEZA's Decision-Making and Management Control Systems

Source: BEZA website

The following are BEZA's internal decision-making bodies.

a. Governing Board

The Governing Board is BEZA's highest decision-making body. It consists of ministers/deputy ministers from 29 ministries and agencies, and representatives of 5 chambers of commerce and economic organizations under the leadership of the Prime Minister of Bangladesh as Chairperson. Its main roles are to discuss and decide upon policy matters. Board meetings are not held on a regular basis, but on an as-needed basis whenever matters important to the operation of BEZA are on the agenda.

b. Executive Board

The Executive Board consists of an Executive Chairman (Executive Chairman of BEZA) and three Executive Members (Administration & Finance, Planning & Development, and Investment Promotion). The board convenes for monthly meetings to make decisions necessary for BEZA's daily operations.

c. Secretariat

The Secretariat is an organization of all 72 members who carry out operations according to the policies determined by the Executive Board. It consists of a General Manager, two Project Directors, a Secretary, six Managers, and other staff. Actual operations are discussed and considered at Coordination Meetings and other meetings held in each division or among relevant members before implementation.

When EZ development by overseas private developers, etc., is well underway and BEZA itself starts taking the initiative in development projects and in giving permission and authorization for EZ development, quick decision-making will be required. Therefore, the organizational structure should be flattened and a better function to coordinate with project organizations should be introduced.

4) Routine Work and Project Teams

In addition to its staff for routine work, BEZA also has two project teams funded by the

Department for International Development (DFID) and managed and operated by IDA of the World Bank Group. Project Organization shall be defined as a temporary organization which is designed to effectively fulfil certain objectives and/or target and it will be dissolved once the objectives and /or targets are achieved. Neither of the project teams are indicated in BEZA's organization chart. The teams respectively implement the "Support Capacity Building of the Bangladesh Economic Zones Authority Project" and "BEZA Economic Zones Development Project Phase I." The former was implemented from November 2011 up to June 2016. The team members consist of a Project Director and Deputy Project Director from BEZA and 6 local experts from the outside.

The latter had been scheduled from January 2014 to June 2016 and the Project Director is an official of the government of Bangladesh and the other 13 staff are external experts employed on fixed-term contracts. This project has been extended until 2019 and they are currently assisting the implementation of preliminary feasibility study and feasibility study for several EZ development projects which are undertaken by BEZA. However, assistance work for OSS have been completed and they wish to receive similar assistance from JICA in the future. Nine engineers are stationed together with the above-described members at the site of the Mongla EZ Development Project, BEZA's first EZ development project.

5) Actual Status of BEZA's Authority and the OSS organization

Although BEZA's organization chart includes the OSS organization, this organization has yet to be established. BEZA is now considering to cover 31 activities to be covered by their OSS, and they have already introduced an electric on-line system for sanctioning the approval for 5 activities such as the Approval of Project, Import Approval, Export Approval, Recommendations for granting the Visa, and Recommendation for the Work Permits. In this survey, a comparative survey has been conducted on the performances at similar organizations in Bangladesh (BOI/BEPZA), as well as that of India and some other South-east Asian Countries.

6) Implementation of Training Programs for BEZA Staff

Under the support program to Capacity Building of Bangladesh Economic Zones Authority Project funded by IDA which was stated in 4) herein above, the following training programs have been implemented to date (June 2016).

a. Workshops held upon the completion of the feasibility study (F/S) of EZ candidate sites (3 workshops)
b. Workshops held to consider the OSS organization (2 workshops)
c. Overseas inspections (5 tours that went to India, Thailand, the Philippines, Vietnam, Malaysia, Singapore, Japan, and the USA)
d. Orientation programs for relevant government organizations (more than 20 programs)

(2) Issues Identified through Interviews and Establishing Implementation Systems for Solving the Issues.

1) Issues in the field of Organizational performance which were identified through Interview Surveys

The following issues have been identified through interviews with the Project Directors and Managers who play central roles in the actual operations of BEZA, as summarized in the table 6.1-1 below.

Table 6.1-1: Issues identified through the hearing with BEZA Officials

Organizational Structure	1. Simplified organization structure & quick decision-making
	2. Shifting from individual capability-based implementation systems to organizational task allocation and implmentation systems
	3. Enrichment of Marketing Department for active promotion of FDI
	4. Enrichment of Engineering Department for provision of better EZ development and management
Organizational Operation	5. Fair evaluation and payment systems commensurate with the performance of staff
	6. Enough compensation (inclusive of flinge benefits) sustainable to the life of staff
Business Processes	7. Establishing a solid business processes and introduction of computer-assisted business processesing
	8. Comprehensive EZ development plan for the entire Bangladesh

Source: JICA Survey Team

2) Functions of BEZA, capability to perform the functions and steps to improve capability

According to BEZA's Mission Documents, BEZA has declared to develop 100 EZ projects within the next 15 years and create 10 million employment opportunities. In order to achieve such objectives, 17 major functions must be performed by BEZA (listed below). Also, these functions may be summarized in 4 competency groups as shown in Table 6.1-2

As discussed in the previous chapter, BEZA has a broad range of functions. Although the Survey Team has requested to have a job description of BEZA, it has not been provided (there is a possibility of non-preparation of job description). Although there is a new proposal to increase BEZA staff in commensurate with the development of more EZs, details of placement and procurement of human resources are yet to be obtained. However, the employment conditions and steps for the staff promotion (draft) which is considered by BEZA are shown in Appendix 13-1: BEZA Officers Employees Services Regulations, 2012.

Table 6.1-2: Major Functions and Competency required under the Mission Documents of BEZA

No.	Functions under the Mission Documents of BEZA	Functions required	Dept.
1	・Selection of the priority industry, industrial sector and development site of EZs ・Land acquisition for EZs which will be developed either by BEZA or by PPP method ・Selection of EZ developers and permission for them develop and manage EZ and infrastructures ・Formulation of infrastructure development plan required for EZ development ・Implementing sale, lease and rental of the development site and facilities being built, and development rights to EZ developers and service providers ・Off-site infrastructure development through the ownership of BEZA or through indirect monitoring by appointing an EZ developer ・Promotion of EZ development and operation through PPP method,	-Understanding Industrial Development Policy, -Capability to select EZ development site, -Capability to plan and implement EZ development -Coordination capability to develop of Off-site infrastructure	Engineering Dept. Marketing Dept.
2	・Enlargement of employment opportunity through the promotion of back-ward linkage between in and out of EZ and development of workforce ・Establishing a solid procedure for promoting back-ward linkage in response to the needs of the regional economy. ・Contribute toward the realization of industrial policy adopted by the Government by promoting the development of reliable manufacturers and service industries through the development of the EZ. ・Promoting the region appointed as EZ to be the economic centers for the industrial city, agro-processing industry zone and commercial and tourism zones by promoting the functions of the financial sector and skilled labors and provisions of supporting services. ・Promote the relocation of polluting and unplanned industries from metropolitan cities to the EZ by developing EZs with specific development objectives	-Capability to understand the regional economic development policy and to put a development plan into an action plan -Capability to understand the industrial policy and create its implementation plan -Knowledge about the industrial cluster and planning capability	Planning Dept.
3	・Creating an effective land-use plan through the provision of infrastructure and regional resources and the development of environment-friendly EZs by attempting suitable industrial development ・Promoting an effective management and monitoring program for the realization of commitment towards environmental management and other social considerations.	-Knowledge about the environmental and social considerations, -Capability about environmental management planning and implementation	Engineering Dept.
4	・Implement necessary programs for the promotion of socio-economic commitment ・Implement necessary program for poverty reduction ・Promoting a sound relationship between employers and employees by respecting social rights of employees and promoting the welfare of employees,	-Planning capability for poverty reduction -Capability to understand the labor policy and to elaborate planning and implementation capability regarding human resources development	Planning Dept.

Source: Prepared by JICA Survey Team based on the information of BEZA

In order to fulfill these functions, BEZA is now proposing new organization structure consisting 179 members which shows increasing of 107 staff from that of present 72 members. Distribution of staff under the proposed organization structure by hierarchy is as shown in Table 6.1-3 below. According to this table, 40 members are increased from present number of 21 to 61 in the category of top management, managers and ordinary staff, while the staff in the supporting level will be increased from 51 to 118.

Table 6.1-3: Existing and proposed staff structures at BEZA

179members (Proposed)		72members (Current)	
Position for Managememt and Majyor Players		Position for Managememt and Majyor Players	
Executive Chaiman	1	Executive Chaiman	1
Executive Member	3	Executive Member	3
Secretary (BEZA Executive Board)	1	Secretary (BEZA Executive Board)	1
General Manager	3	General Manager	3
Chief Law Officer	1	Chief Law Officer	1
Manager	7	Manager	7
Chief Accountant	1		
Executive Engineer	1		
Deputy Manager	5		
Deputy Chief Accountant	1		
Human Relation Officer	1		
Medical Officer (Part Time)	1		
Assistant Manager	13		
Assistant Engineer	4		
Auditor	1		
Budget Officer	1	Accounting Officer	1
Account Assistant	1		
Administrative Officer	1	Administrative Officer	1
Computer Programaer	1	Computer Programmer	1
Law Officer	2		
Private Secretary	1	Private Secretary of executive Chairman	1
System Analyst	1	Senior System A	1
Sub Asst Eng (Transport)	1		
Sub Divisional Engineer	8		
Sub Total	61		21
Position for Supporting Staff		Position for Supporting Staff	
Casher	1	Cashier	1
Kanungor (land specialist)	1		
Surveyer (land specialist)	2		
Chainman (land Specialist)	4		
Stenographer & Computer Operator	8		
Office assistant & Computer Operator	1	Office Assistant cum Computer Operatoer	18
Office assistant & Stenographer	21		
Office Attendant	32		
Work Assistant	4	Member of Lower Subcordinate Staff	9
Head Assistnat	2		
Driver	22	Driver	13
Security Guard	10	Security Guard	6
Messenger	5	Messenger	1
Cleaner	5	Sweeper / Cleaner	3
Sub Total	118	Sub Total	51
Total	179	Total	72

Source: Prepared by Survey Team based on BEZA Data

According to the information gathered in January 2017, BEZA's proposal for new organizational structure and required budget was approved by the higher competent authorities such as the Prime Minister's Office (PMO) and the Ministry of Public Administration, only for the extent of a structure with 130 number of staff. The details of which are 58 number of staff who shall be directly hired by BEZA and 15 number of staff who shall be outsourced. The recruitment of these 58 posts will be done gradually; 30 posts in the years of 2016/2017, and 28 posts in the years of

2017/2018. Details of these new posts are shown in Table 6.1-4 below.

Table 6.1-4: Distribution of new staff at BEZA Headquarters

No.	Name of Position	Procurement by BEZA			Outsource	Total
		2016/17	2017/18	Total		
1	Deputy Manager	2	3	5	0	5
2	Executive Engineer	1	0	1	0	1
3	Assistant Manager	5	5	10	0	10
4	Assistant Engineer	1	2	3	0	3
5	Legal Office	1	0	1	0	1
6	Deputy Assistant Engineer	2	2	4	0	4
7	Administrative Officer	0	1	1	0	1
8	Auditor	1	0	1	0	1
9	Typist cum Computer Operator	2	2	4	0	4
10	Head Clerk	0	1	1	0	1
11	Surveyer	0	1	1	0	1
12	Accounts Assistant	1	0	1	0	1
13	Working Assistant	2	2	4	0	4
14	Office Assistant cum Computer Typies	0	2	2	0	2
15	Driver	4	0	4	0	4
16	Messenger	0	0	0	3	3
17	Chainman	0	0	0	4	4
18	Office Assitant	0	0	0	8	8
	Grand Total	22	21	43	15	58

Source: BEZA

According to BEZA, recruitment of these new posts will be commenced with an advertisement on public newspapers in March or April, 2017 and it is expected that 30 new staff will join BEZA after a series of selection processes. A model structure of BEZA organization with 130 members is shown in Figure 6.1-2 Future Organogram in 2016~2019. Besides the reinforcing organization at BEZA Headquarters, it is also approved that the permanent staff of BEZA will be assigned into the operations at eleven (11) Economic Zone sites. The total number of these newly procured staff for the Economic Zone sites will be 125, and details of these staff are shown Table 6.1-5.

Table 6.1-5: List of EZs where BEZA assigns their Staff

No.	Category	Name of Economic Zone	New Post		
			BEZA	Outsource	Total
1	Government	Habogonj Economic Zone	20	13	33
2	PPP	Mongla EZ	6	8	14
3		Mirshorai EZ	6	8	14
4		Srihotto EZ	6	8	14
5		Sabang Tourism Park	6	8	14
6	G2G	Anwara EZ	2	4	6
7		Veramara EZ	2	4	6
8	Private	A.K. Khan EZ	2	4	6
9		Abdul Monem EZ	2	4	6
10		Meghna Industrial EZ	2	4	6
11		Meghna EZ	2	4	6
		Grand Total	56	69	125

Source: BEZA

It is imperative that BEZA should elaborate a suitable organization structure in commensurate with the expansion of their activities from time to time and try to convince higher competent authorities.

Although BEZA wishes to add approximately 150 staff more in additional to hiring of the 130 staff which had been approved under the last application, details of which are yet to be discussed and determined.

3) Confirmation of Education and Training Needs

In order to ascertain the directive of these programs, a training needs assessment (TNA) to 10 BEZA middle-class managers has been conducted and confirmed the requirement of training. The results of TNA are briefly summarized as shown in the table 6.1-6 below.

Table 6.1-6: Results of Training Needs Assessment

No.	I. General Training Needs	Number of Request
1	Preparation of Project/Procurement Documents	3
	Evaluating Tender/Procurement Documents	3
3	Training on OSS	2
	Preparation of Business Plan and its Management	2
5	Reviewing Report and Appraising Applications	1
	Marketing Economic Zone Properties	1
	II. Specific Training Needs	
1	Practice on OSS	3
2	Operation and Maintenance of EZ	2
	Economic Zone Development Cycle	2
4	Public Private Partnership	1
	Monitoring & Evaluation of Project	1
	Public Investment Management	1
	Supply Chain Management	1
	Employment and Selection of Developer	1
	Preparation of Project/Procurement Document	1
	Evaluating Tender (Documents)	1
	Marketing Economic Zone Properties	1
	Legal Frameworks Exercise in the similar country	1

Source: JICA Survey Team

According to the results of the TNA survey, it is explicitly indicated that higher demand is placed upon knowledge related to the development processes of EZ and project management. Under this Survey, varied scope of services are undertaken by 12 professional members for activities such as, selection of candidate site, environmental and social consideration, investment demand surveys, formulation of EZ development concept, planning of on-site and off-site infrastructure facilities, project cost estimation, economic and financial analysis, project implementation plan, and capacity enhancement of BEZA staff. These activities by the Survey Team should be conducted jointly with managers and staff of BEZA; however, it is not verified that such joint activities are properly performed due to the lack of BEZA staff. Since the number of BEZA staff is insufficient for the workload required to fulfill the tasks assigned to BEZA, immediate approval for the enlargement of the organization and preparation of the budget thereto shall be granted.

6.2 Deliberation of BEZA Capacity Enhancement Program

1) Preconditions for deliberation of BEZA Capacity Enhancement Program

In the background of the globalization of the world economy, Bangladesh has, in the same manner with other developing countries, been developing EPZs under the administration of BEPZA in order to promote industrialization policy since the 1980s. However, BEZA has been established in 2010 as an entirely new organization and they have not received any know-how or other historical assets from BEPZA. Also, the posts of top management of BEZA who will be responsible for the administration and operation of BEZA are occupied by the officials from other

public organizations of Bangladesh and they will be moved out after 1 to 2 years of assignment in BEZA to other organization, thus there will be a structural defect that non-accumulation of managerial and operational know-how will be made. Although there is one ex-BEPZA official serving as an advisor to BEZA, there is no staff who has been involved in the planning, development, and operation of EZ and Industrial Parks in the past.

Since the staff of BEZA is required to deal not only with domestic investors but also with foreign investors and corporations, required resources and capability of BEZA staff shall be much higher than that of ordinary public officials in Bangladesh. Foreign language capability and knowledge of international business practices and legal systems for solving disputes are quite important. The scope of services is widely varied from incorporating entities, establishing of offices and production plants, procurement of human resources and their management, procurement of raw materials and funds, to the operations of production, distribution, marketing, financing and taxation. It is not easy to acquire knowledge related to these widely spread, highly specialized disciplines. On the other hand, BEZA does not have a budget that is well allocated enough to out-source such highly qualified human resources from the labor market.

2) Objectives of Human Resources Development and Education and Training

Capacity Enhancement Program for BEZA which will be implemented through certain human resource development, and education and training activities shall be deliberated while keeping in mind the constraints and environment that BEZA faces.

The human resources development in BEZA shall be similar to that of programs being undertaken by the private sector, and it may be thought of as a managerial activity for filling the gaps between the functions and tasks given under the mission of BEZA and the capability of BEZA staff. In such an environment, each BEZA staff member is required to set their own goals in accordance with the objectives of the organization (or department) and demonstrate their professional capability in close collaboration with other members, and eventually achieve their own goals.

As stated hereinabove, the daily work of BEZA is deemed to be operated by a limited number of top level managers. Considering this situation, capacity enhancement of the existing managers and recruitment of new managers (40 staff) will be most important. Since BEZA is a newly established organization, establishing proper functions and capabilities with existing human resources is difficult. It will be difficult to procure well-qualified human resources with experiences in the planning and development of EZs, both by the rotation of new human resources from other public authorities or by recruiting new employees from external market as BEZA's permanent staff. BEZA shall, in accordance with its expansion of roles and functions, procure new staff from external labor market. During the hiring process, it may be recommended to hire those who have been involved in the development and management of Export Processing Zones at BEPZA or those that have experience promoting transfer of knowledge by conducting exchange programs of BEZA and BEPZA staff. Such new employees shall undergo a verification processes to determine whether they are qualified enough to satisfy the requirements of BEZA. If they are recognized as less-qualified, they should go for capacity enhancement education and training programs.

3) Core Value for achievement of BEZA Vision/Mission

Prior to deliberating a human resources development program for BEZA, a human resources development philosophy and development system which shall be derived from the Vision Documents of BEZA, are required. According to the Vision Documents of BEZA, the following Core Values are identified for dissemination in order to achieve the goals given by the Vision and Mission.

a. Customer satisfaction

b. Team work
c. Free flow of information
d. Participation and involvement
e. Never stop learning
f. Networking
g. Effective Public Private Partnership

Although there is no explicit description regarding the level of professional knowledge and skills in the statement of Core Values, it clearly represents having an attitude of “Never Stop Learning” in order to achieve the substance of Customer Satisfaction and Team Work, Participation and Involvement and Networking, as well as other good practices in communication capability. Also, it is essential for BEZA staff to provide services with other competent authorities to both the developers of EZ and the tenant investors. In particular, such endeavors to deepen the collaboration with PMO (a supreme organization of BEZA), the newly established Bangladesh Investment Development Authority (BIDA), Ministry of Industry, Ministry of Commerce, Ministry of Environment and Forestry, Ministry of Power, Energy and Mineral Resources, National Board of Revenue, and enhancement of coordination capability shall be required.

4) Deliberation of Human Resources Development systems at BEZA

Assuming that the hierarchal organizational structure from top management to managers and ordinary staff in BEZA consists of five levels as shown in the following Figure 6.2-1, the Survey Team recommends the following education and training programs in commensurate with its hierarchy. Amongst the BEZA training program designed to get the basic managerial skills required of BEZA staff, it may be recommended to apply for the hierarchal training programs that are provided by the Bangladesh Government in the form of Off-JT. Regarding the training programs being provided by the Government of Bangladesh to Government officials are provided mainly by the Bangladesh Public Administration Training Center (BPATC) which is an affiliate organization of the Ministry of Public Administration, and the courses consists of a Core Course, a Special Course, Special Foundation Courses, Seminar/Workshops, Exchange/Visit Programs and others are the most established one in Bangladesh. In addition to the training programs from BPATC, Ministry of Foreign Affairs also has training programs (Bangladesh Economic Studies, Basic Concept of Economics, Macro and Micro Economics, International Economics, and others). Furthermore, Bangladesh Foreign Trade Institute under the Ministry of Commerce, has a rather pragmatic training courses in the fields of Rules & Procedures for Import, Export and Customs, and Managing Special Bonded Warehouse Facilities for Export Industries of Bangladesh. These training courses and programs are also open to the staff of BEZA.

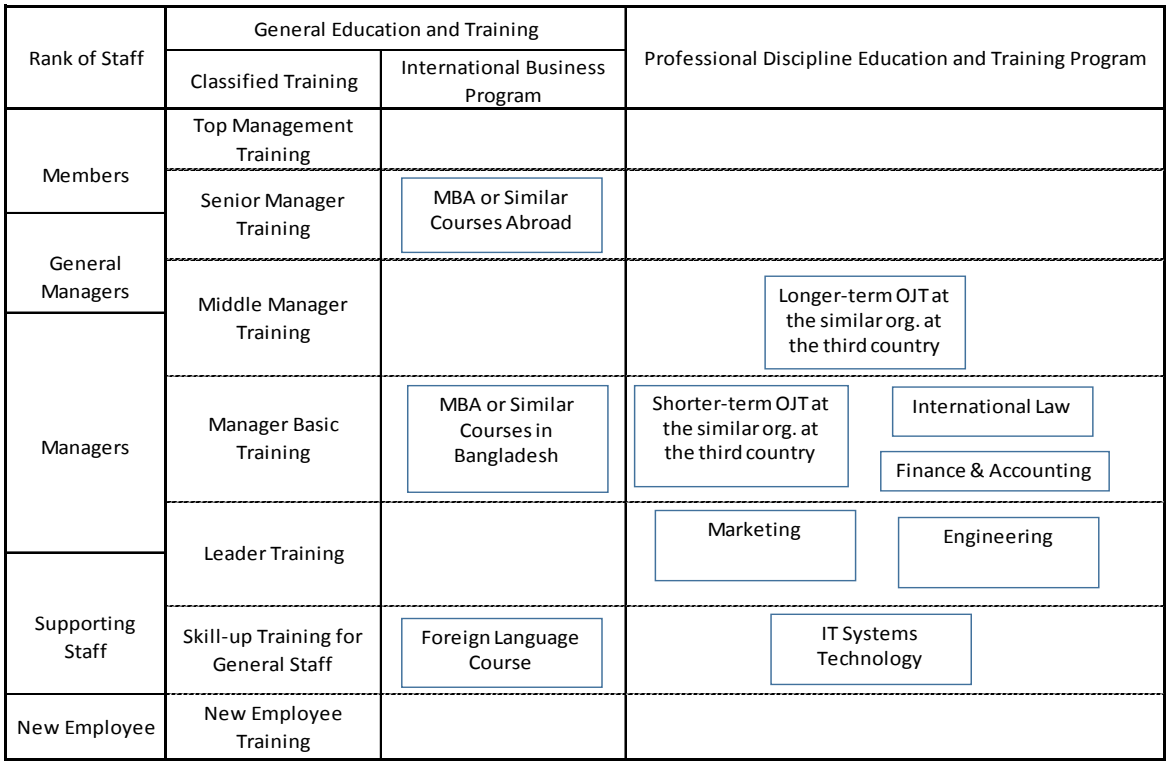


Figure 6.2-1: BEZA's Hierarchy and Proposed Education & Training Program for BEZA
Source: JICA Survey Team

In general, there are three different categories in organization; Management classes, Manager classes, and Ordinary Staff classes and the functional capabilities required for each level are different. There are three fundamental skills required for individual working in any organization; Technical Skills, Human Skills and Conceptual Skills.

Technical Skills, which can be thought of as "Task fulfillment capability" and refer to the specific knowledge and technical skills which are required to fulfill the designated tasks, and are important at the level of ordinary staff. Human Skills, which can be thought of as "Interpersonal capability" refer to the capabilities to communicate with superior and sub-ordinate staff, colleagues, clients and suppliers. This skill is important for the level of middle managers who are requested to perform business smoothly by facilitating interpersonal relationships. Conceptual Skills, which can be thought of as "Conceptualization capability", refer to the capability to structuralize the incidents and situations and grasp the substance of an issue which happened in and around the processes when a business is troubled. This capability is in particular important in management level and requires multi-dimensional capabilities to gather information, predict the future after grasping the entire picture, and to eventually deliberate a solution.

Although some of the major functions which are shown in Table 6.1-2: "Major Functions and Competency Required under the Mission Documents of BEZA" may be subjects to be covered by the training courses and programs from the training institutions of the Government of Bangladesh, there are no systematic training courses for these subjects so far. For instance, industrial development policy and/or industrial cluster policy are currently determined through discussion among the ministries concerned (by the balance of power), rather than through theories of economic development, thus acquisition of these theories shall be done through either the overseas learnings or training program at the developed countries. Also, it is desired that the

training programs for environmental and social considerations be provided for by the implementation agency concerned, but it is yet to be introduced and there are no training facilities for the outside officials such as that of BEZA. It is therefore recommended to actively use the training schemes provided by multiple or bilateral cooperation schemes in such disciplines.

In addition to these capabilities, BEZA's unique functions require that BEZA staff learn about "International Business" as they shall deal with varied types of foreign corporations which apply complicated practices of global business. Activities of international corporations are widely varied such as establishing basis of operations such as registration of a firm, construction of a plant and office, recruitment of managers and workforce and its administration, procurement of raw materials and financing sources, production, distribution, marketing, financing, and taxation; all of which are highly specialized. BEZA staff are required to have proven knowledge in the basic theories and codes of conduct in these fields. In order to learn this managerial knowledge systematically, it may be effective to study the body of knowledge related to the Master of Business Administration (MBA) at the graduate school in domestic or overseas universities. Besides this professional managerial knowledge, learning foreign languages (especially English) is a mandatory skill for BEZA staff and they shall be given an opportunity to learn soon after they are employed by BEZA.

Department-specific Professional Education and Training is regarded as the most important program, since it is related to the most important functions of BEZA such as knowledge of Approval and Authorization on the development of EZ, Supervision and Management, Planning, Project Management, and Operation and Maintenance. Since the Survey Team has been involved in the Site Selection for Short-term and Medium-term EZ development, Environmental and Social Considerations, Investment Demand Survey and deliberation of EZ Development Concept, Assistance in deliberation of EZ Development Guideline, Deliberation of Land Use Plan, Infrastructure Planning, Off-site Infrastructure Development Plan, Rough Estimation of Construction Cost, Preliminary Economic and Financial Analysis, and Implementation Schedule, this knowledge shall be shared with the BEZA staff. In addition to the subjects mentioned herein above, the following themes may be considered to be further enriched as the training programs.

- Proficiency training on computer operations for introduction of the proposed on-line application by applying information technologies.
- Presentation exercises for effective marketing activities.
- Training about International Procurement for the appointment of EZ Developers.
- Technical practices about Project Management.
- Training as a Representative of BEZA (Overall capabilities to be stationed as a representative of BEZA at each EZ).

5) Mode of Human Resources Development at BEZA

There are three patterns which have been established for a long time, as the means of human resources development in an organization.

a. On-the-Job Training (OJT)
b. Off-the-Job Training (Off-JT)
c. Self-enlightenment

There are two types of Training mentioned as OJT above; one is "Group Training" which is conducted by instructing participants by order to certain levels and/or posts of the staff in the Organization, and "Off-JT", which is to assign certain individuals to participate into a training organized by an outside organization. In the category of "Self-enlightenment", there are the systems for financial assistance in full or in part applied to distant learning and/or e-learning

tuition which may be conducted by an individual or by recommendation and selection by a firm. Regarding implementation of human resources development program in the organization, these three categories shall be flexibly mixed in accordance with the requirement of human resources development.

a. On-the-Job Training (OJT)

As to the distribution of human resources in BEZA, as stated in the previous chapter, it is almost impossible to expect the level of quality and quantity from existing human resources (capability), thus performance shall be dependent on the human resources dispatched from other public authorities and/or on recruitment of new staff from the market. Thus, one can recognize the limitation of OJT based human resources development activities conducted by the existing human resources.

b. Off-the-Job Training (Off-J T)

As stated hereinabove, contribution by training and education programs through OJT method is rather limited as BEZA lacks experienced human resources. In contrast, it will be effective human resources development for BEZA to send their staff to EZ development and management programs which are offered by organizations similar to BEZA, or international development institutions for shorter or longer periods.

Japan International Cooperation Agency (JICA) has started training programs designed for the development of Economic Zones in 2016. These programs are a good opportunity for BEZA staff to gain the necessary knowledge and skills. The brief training programs extended by JICA (two weeks in Japan and 1 week in a third country) are shown in the following table. The training programs cover the contents of “International Business Program” and “Professional Discipline Education and Training Program.” The program also covers exercises regarding country specific issues that the organizations responsible for the EZ development face for which the participants can delineate solutions, and create implementation methods and action plans in detail.

Table 6.2-1: Subjects under EZ development training by JICA

No.	Subjects on the Training	Method of Training (Lecture or Observation Site)
1	Globalization of Economy and Extension of International production systems	Lecture (University Professor)
2	Economic Zone Development in Asia and Support by ODA Program thereto	Lecture (University Professor)
3	Regional Integration of Economy and SEZ/IZ development	Lecture (Research Institution)
4	Industrialization Progress in Japan	Lecture (University Professor)
5	Major Functions of SEZ/IZ and its Characteristics	Lecture (Consultant)
6	Historical Transition of SEZ/IZ and Case Study on the Good Practices	Lecture (Consultant)
7	Functions of SEZ/IZ Developer and Pre-requisites for SEZ/IZ Development	Lecture (Developer)
8	Key Points in the Selection of Location by Investor	Lecture (Developer)
9	Scope and Quality of Services to be provided by SEZ/IZ Administrative Organization	Lecture (Consultant)
10	Preparation of Business Plan and Human Resources	Lecture

	Development at SEZ/IZ Administrative Organization	(Consultant)
11	Functions of OSS at SEZ/IZ Administrative Organization	Lecture (Consultant)
12	Analysis of Investment Potential for the Nations Promoting FDI	Lecture and Exercise (Consultant)
13	Development of Legal Systems for SEZ/IZ Development	Lecture and Exercise (Research Institution)
14	Planning & Development Processes of SEZ/IZ: ① Environmental & Social Considerations for SEZ/IZ Development	Lecture (University Professor)
15	Planning & Development Processes of SEZ/IZ: ② Evaluation, Selection and Land Acquisition of SEZ/IZ Site	Lecture(Consultant)
16	Planning & Development Processes of SEZ/IZ: ③ Method for Investment Demand Survey, Development Concept and Sales Price Strategy	Lecture (Consultant)
17	Planning & Development Processes of SEZ/IZ: ④ Method for Land Development, On-site Infrastructure and Off-site Infrastructure Facilities	Lecture (Consultant)
18	Planning & Development Processes of SEZ/IZ: ⑤ Feasibility Study Methods	Lecture (Consultant)
19	Planning & Development Processes of SEZ/IZ: ⑥ Development Method of SEZ/IZ and its Financing	Lecture (Consultant)
20	Planning & Development Processes of SEZ/IZ: ⑦ Marketing Methods for SEZ/IZ	Lecture (Consultant)
21	Planning & Development Processes of SEZ/IZ: ⑧ Operations and Management of SEZ/IZ	Lecture (Consultant)
22	Group Work for the Preparation SEZ/IZ Action Plan through a Case Study	Group Work (Exercise, Presentation, Evaluation) (Consultant)
23	Observation Tour to SEZ/IZ in Japan	Sites to visit: Local Government (Development Authority) Sites of SEZ/IZ, R&D Institutions, Tenant Investors
24	Observation Tour to International Container Terminal	Site to visit: International Container Terminal

Table 6.2-2: Subjects under the Supplemental Course at a third country

No.	Subjects on the Training	Method of Training (Lecturer or Observation Site)
1	Visit to Governmental Offices (Ministry of Planning)	Interview Survey
2	Visit to Governmental Offices (SEZ Administrative Organization)	Interview Survey
3	Developer of SEZ/IZ	Interview Survey
4	Tenant Investor at SEZ/IZ	Interview Survey
5	Amenities for Expatriates (Education & Medical	Observation Tour

	Facilities)	
6	Preparation of Action Plan on the Individual Task	Lecture, Exercise, Presentation & Evaluation

A model schedule for the supplementary training at a third country is shown in Appendix 13-2 (attached).
Upon the implementation of education and training programs in the fields of "Hierarchical Classified Training", "International Business Program", and "Professional Discipline Development Program", it is imperative to have a discussion and agreement thereupon and to confirm the availability and/or possibility of the necessary budget for the training.

In the meantime, it is necessary to organize the contents of the training for OSS depending upon the scope of OSS activities, which is still under the discussion by BEZA.

c. Self-enlightenment

In the fields of self-enlightenment, it is recommended to introduce systems which reimburse the expenses for the correspondence learning and/or e-learnings taken mostly by junior employees of BEZA in full or in part. It is recommended, either by direction of BEZA or by initiative of the staff themselves, that a support system be created to in order to obtain fundamental capabilities for such basic disciplines as English, Accounting, IT systems, and others which are necessary to work at BEZA.

6.3 Planning and Implementation of Capacity Enhancement Program and Formulation of Capacity Development Plans.

(1) Significance of Training Program conducted for the Capacity Enhancement of BEZA

As stated hereinabove, three distinct education and training programs which consist of "Hierarchical Classified Training", "International Business Program" and "Professional Discipline Development Program" are recommended as shown in Figure 6.2-1. In accordance with these recommended programs, the survey team has discussed certain capacity enhancement programs to improve knowledge in the fields of "Professional Discipline Development Program". Actual training programs in the fields of "Professional Discipline Development Program" have been done, keeping the scope of work undertaken by BEZA in mind.

(2) Capacity Enhancement Activities conducted for BEZA during the survey period

During the implementation period of this survey, activities for: 1) Training of BEZA staff in a third country; 2) Implementation of Workshops; and, 3) Assistance in preparation of Operation and Management Manual, have been conducted.

1) BEZA Staff Training at the Third Country

Third country training for the managers of BEZA and the Prime Minister's Office has been conducted for a period of 7 days from July 9, 2015 to July 15, 2015 in Viet Nam and Thailand. The schedule of the training is as shown in Appendix 13-3. Major objectives of this training are: ① Observing development practices and managerial systems on various types of Economic Zones and Industrial Zones in Viet Nam, ② Observing examples of success and failure in the development of Economic Zones and Industrial Zones in Viet Nam, and ③ Observing FDI promotion systems and managerial systems at the Economic Zone Administrative Organization in Thailand. In Viet Nam, training participants gain full understanding of important points in the development of Economic Zones, since they have visited three different types of Economic Zones; an Industrial Zone being developed by a Japanese developer and is full with many manufacturing industries, a large sized Economic Zone being developed by a Singaporean developer where large urban and commercial facilities are also located, and a large sized

Economic Zone near seaboard areas which is developed by a Belgian developer, in addition to the visit to the Vietnamese Government organizations involved in the development of Economic Zones.

2) Implementing Workshops

In order to share with the staff of BEZA the knowledge and skills being deployed by the survey team for the formulation of development plan for the short-term and medium-term EZ development, the survey team has conducted a series of workshop. The subjects covered by said Workshops are; ① Definition of EZ and practices of EZ development in South-East Asian countries, ② Outlines of BEZA Capacity Enhancement programs, ③ Environmental and Social Considerations in the EZ development, ④ Exploration of EZ candidate sites, Evaluation and Selection of EZ development site, ⑤ Key factors for a successful EZ development, ⑥ Frameworks for successful human resources growth at BEZA, ⑦ An effective EZ development guidelines and an attractive investment incentives, ⑧ Development of EZ Concept, and ⑨ How to prepare an effective development plan for EZ. Outlines of workshops are shown in Appendix 13-4.

All the feedback from the workshops shall be fully reflected toward the formulation of human resources development at BEZA.

3) Assistance in the preparation of Operation & Management Manual

An Operation and Management Manual has been prepared with an attempt to standardize the daily work and put it in the manual for the administration of daily routine works as well as to be used for the training of BEZA staff. The said manual consists of the following structure;

1. General (Definition, Terminology, Objectives of Manual)
2. Operation & Management Organization
3. Selection & Evaluation of Developer
4. Selection & Evaluation of Land
5. Investment Promotion
6. Land Allocation and Leasing
7. Operation, Maintenance and Management of Infrastructure and Facilities
8. Security and Safety Control
9. Fire Fighting
10. Environmental Control & Management
11. Collection System of Fees and Charges
12. Coordination with Provider for Primary Utilities
13. Administrative and Marketing office operation
14. Formats /Templates for Contracts and Agreement with Developer or Tenants
15. Relevant Laws and Regulations of Bangladesh

This manual was prepared with an assumption that BEZA will develop 10 EZs besides BEZA headquarters by the target year of 2020, and a total of 234 staff will be required. However, this operation and management manual has indicated a direction for BEZA staff for the preparation of new operation and management manual by themselves, thus contents of the manual does not correctly cover all the scope of work of BEZA in detail. It is therefore recommended to make a regular review on the manual whenever new legal systems are introduced, certain modifications are made on the rules and regulations related, and some modifications are deemed to be required through courses of the daily operations.

(2) Deliberation of BEZA Capacity Enhancement Action Plan

1) Competency of BEZA Staff and Training Needs Assessment

It is important that consistent human resources development in accordance with the organizational systems and education and training program (draft) as shown in Figure 6.2-1 is essential to resolve various issues that BEZA faces and to achieve the organizational goals of BEZA, and capability development along with the contents of operation and management manual is required. In particular, development of an organization which can steadily perform the tasks through the planning and implementing of departmental professional training by Off-JT and OJT practices led by external specialist based on daily routine work is essential as one of the short-term actions. The competency and educational and training needs along with the contents of operation and management manual are shown in Table 6.3-1.

However, procurement of suitable resources in Bangladesh and/or procurement of resources from abroad is required for the implementation of these programs, since the availability of qualified lecturer for the programs are yet to be confirmed in Bangladesh (in and out of BEZA).

Table 6.3-1: Analytical list of Competency and required Education and Training Activities based on the functions of BEZA

1. Objectives, Operations and Management of BEZA						
No.	**Course Title**	**Department responsible**	**Course Syllabus / Contents of Training**	**Competencies required**	**Mode of Education / Training**	**Resources available in Bangladesh**
1.1	Objectives and Major Functions of BEZA	General Affairs Department (Administration Section)	1) Objectives of BEZA - Legal basis of BEZA - Vision and Mission of BEZA 2) Major functions of BEZA - BEZA as the regulatory body - BEZA as the implementation body 3) General knowledge about EZs - Definition and varied types of EZs - Past and future trends in the development of EZs	- Knowledge about the BEZA fundamentals necessary for BEZA staff - Knowledge of EZ functions, varied types of EZ, and past and future trends in the development of EZs	Conduct training for all new officers employed by BEZA through Off-JT, or OJT by BEZA Expert(s)	Not yet confirmed
1.2	Operations and Management of BEZA	General Affairs Department (Administration Section)	Objectives and Roles of BEZA Operations and Management - Organization structure of BEZA (In-house duties & Outsourcing) - Roles and Responsibilities of Management Board - Roles and Responsibilities of Departments - Relationships with other competent agencies and coordination	- Knowledge about BEZA's organizational structure, roles and responsibility of management board and each department - Knowledge about the relationship with other competent agencies - Capability to facilitate good coordination with other competent agencies	Conduct training for all new officers employed by BEZA through Off-JT, or OJT by BEZA Expert(s)	Not yet confirmed

2. Selection & Evaluation of the Developer						
2.1	Methods of selection of developer	Engineering Department (Planning Section)	3 methods of selecting Developers and their respective processes: 1)Tender Basis -Preparation of Invitation Documents -Detailed flow of public tender process including necessary documents to be prepared -Setting up evaluation criteria -Pre-qualification of Developer 2)Negotiation Basis -Letter of Interest and proposal from Developer -Pre-qualification of Developer -Exchange of MOU with Developer which specify Developer's obligation 3)Private Developer's apply for EZ -Application from Private developer -Evaluation process of application	- Knowledge about the International Procurement Methods and Documentation (Legal Implications) - Capability to evaluate developers based on prequalification criterion - Capability to understand developer's plan for development of EZ	Conduct Training for officers in charge such as; - Project Management Seminars and/or OJT at a similar organization abroad, or OJT by Expert(s) employed by BEZA	Not yet confirmed

2.2	Criteria of Evaluation of Developer	Engineering Department (Planning Section)	1) Evaluation Items and Points to evaluate capability of Developer -Intention of Development -Financing Capability -Experiences of Similar Projects -Business Concept -Organization of Operation & Management -On-site Infrastructure (for Plan) -Co-operation to BEZA/local government -Social Contribution -Local Employment 2)Evaluation Procedures -Evaluation Procedures for selecting Developer -Understanding contents of common types of contract and variable items for each project	-Capability to understand the Evaluation Criteria and Procedures -Capability to conduct Evaluation of Developers -Capability to interact with International Tenderers throughout the entire bidding process -Capability to negotiate with a successful tenderer to reach an agreement while protecting the interests of BEZA -Capability to draw up and draft Contract Documents	Conduct Training for officers in charge, such as; - Project Management Seminars and/or OJT at a similar organization abroad, or - OJT by Expert(s) employed by BEZA	Not yet confirmed
3. Selection & Evaluation of Land						

3.1	Criteria of Evaluation	Planning Department Engineering Department	1) Knowledge about the Evaluation Criteria for the selection of candidate site such as; - low environmental and social impact to the community, - the location close to natural and social resources, infrastructure, availability of primary utilities, - low land acquisition cost, prevention of natural disaster, - availability of rich and competitive labors, etc. 2) Knowledge about the procedures for Site Selection Study - requirements under the laws/regulation of Environmental & Social Consideration - procedures to be followed under the related laws/regulations	- Capability to understand the Evaluation Criteria and Selection Procedures - Capability to conduct Evaluation of Candidate Site	Conduct Training for officers in charge, such as; - Environmental Seminars and/or OJT at a similar organization abroad, or OJT by Experts(s) employed by BEZA	Not yet confirmed
3.2	Land Clearance	Engineering Department (Planning Section)	1) Knowledge about how to formulate a Committee for Land Clearance such as: - selection of the right members for the Committee - creation of reasonable compensation fees for land clearance, etc. 2) To gain knowledge about how to implement land clearance operations to; - avoid unnecessary trouble with residents, - obtain support from the community for the project, etc.	- Capability to negotiate with land owners for procurement of land, - Capability to draw up draft land acquisition agreement	Conduct Training for officers in charge, such as; - Environmental Seminars and/or OJT at a similar organization abroad, or OJT by Expert(s) employed by BEZA	Not yet confirmed
4. Investment Promotion						

4.1	Role of Marketing	Marketing & Customer Care Department	Knowledge about various functions of BEZA in terms of Investment Promotion which may consist of; a) Promotion of EZ Developers b) Promotion of Tenant Investors	- Capability to understand the market functions of BEZA which may consists of: a) Promotion of EZ Development b) Promotion of Tenant Investors	Conduct training for officers in charge, such as; - FDI Promotion Seminars and/or OJT at a similar organization abroad, or OJT by Expert(s) employed by BEZA	Not yet confirmed
4.2	Knowledge and Implementing Practices about the Operations of Marketing Activities	Marketing & Customer Care Department	1) Knowledge about the practical skills for effective conduct of marketing activities such as; - Creating Marketing Policy, Strategy, Action Plan, and Implementation - Preparing various Marketing Materials and Tools, Data base, etc. - Planning and implementing Marketing Operations (Road shows, Workshops, Seminars, etc.) 2) Knowledge about various functions and activities related to the Marketing Operations such as; - Functions and activities of Marketing and Promotion as specified in 1) hereinabove	- Capability to make various policies, plans and implement programs in the investment promotion including planning and implementing road shows, workshops and seminars, - Capability to make various marketing materials & tools, data bases, etc. - Capability to operate and maintain all the activities which fall within the scope of responsibilities of the Marketing Dept. - Capability to review and improve the services and systems related to the	Conduct training for officers in charge, such as; - FDI Promotion Seminars and/or OJT at a similar organization abroad, or OJT by Expert(s) employed by BEZA	Not yet confirmed

				Marketing activities by observing the voices of customers.		
5. Customer Care and OSS						
5.1	Roles of Customer Care and OSS	Marketing & Customer Care Department	Knowledge about various roles and functions of BEZA in terms of Customer Care and OSS activities	- Capability to understand the functions and responsibility of customer care and OSS activities at BEZA	Conduct training for officers in charge, such as; - EZ Management Seminars and/or OJT at a similar organization abroad or OJT by Expert(s) employed by BEZA	Not yet confirmed

5.2	Knowledge and Implementing Practices about the operations of Customer Care	Marketing & Customer Care Department	1) Knowledge about the legal basis for provision of Customer Care services 2) Knowledge about the comprehensive Customer Care services within BEZA Headquarters & Regional Offices to; - implement effective provision of the Customer Care services for potential and located investors, - update and review Customer Care services and laws and regulations related to the matters of Customer Care Services 3) Skills for implementing comprehensive Customer Care services at the Visitor Center which consists of an Exhibition room, Conference rooms, Data Center and Consultation desks such as; - Regular Customer Services - On-site Customs Office - Logistic Services - Manpower Recruitment Services 4) Tenant Support Services - Trouble shooting processes and reporting - Regular meeting with tenant (Monthly Tenant Meeting, Quarterly Tenant Visit, Annual Tenant Survey)	- Capability to understand the contents of Customer Care services in order to design, organize and operate Customer Care office - Capability to operate and maintain all the activities which fall within the scope of the responsibility of the Customer Care services - Capability to review and to improve the services and systems related to the Customer Care by observing the voices of customers	Conduct training for officers in charge such as; - EZ Management Seminar and/ or OJT at a similar organization abroad, or OJT by Expert(s) employed by BEZA	Not yet confirmed

5.3	Knowledge and Implementing Practices about the Operations of OSS	Marketing & Customer Care Department	1) Knowledge about the legal basis for provision of OSS by BEZA 2) Knowledge about varied practices of OSS systems within BEZA Headquarters & Regional Offices to; - creat provisions for comprehensive OSS services for potential investors, - update and review OSS systems and to laws and regulations related to the matters of OSS. 3) Skills for implementing varied OSS services for; - Trade Licensing - VAT Registration, - Project Clearance, - Building Plan Approval, - Factory Plan Approval, - Water Plumbing Clearance, - Electricity Wiring Approval, - Fire Safety Approval, - Fire Clearance/License, - Building Completion Certificate, - Work Permit, - Boiler Registration, - Visa Recommendation, - Captive Power Plant/Gas Connection Clearance, - No Objection Certificate for loan/Approval of Foreign Borrowing Agreement	- Capability to understand the functions of OSS, to design, organize and operate OSS systems - Capability to operate and maintain all the activities which fall within the scope of responsibility of the OSS systems. - Capability to review and improve the services and systems related to the OSS by observing the voices of customers.	Conduct Training for officers in charge such as; - EZ Management Seminars and/or OJT at the similar organization abroad or OJT by Expert(s) employed by BEZA	Not yet confirmed
6. Land Allocation and Leasing						

6.1	Land Allocation	-Marketing & Customer Care Department -Engineering Department (Planning Section) -General Affairs Department (Legal Section)	1) Planning practices for an appropriate land allocation plan depending upon the results of market analysis and EZ Development Strategy for; - Industrial Zone, - Commercial Zone, - Residential and Green Zones. 2) Knowledge about establishing a policy to transfer development rights to another developer on a part of commercial zone.	- Capability to make an appropriate land allocation plan depending upon the market demand analysis and EZ Development Strategy - Capability to establish a policy for sub-leasing the EZ lands from one EZ Developer to other developers.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed
6.2	Leasing Procedures	-Marketing & Customer Care Department -General Affairs Department (Legal Section)	1) Knowledge about the correct procedures in the leasing out of the EZ properties to tenant investors either from BEZA or EZ Developers. These procedures include Quotation to potential tenant, Reservation agreement, Utilization agreement, and Land allocation agreement (hand-over minutes) 2) Knowledge about how to prepare standard agreement forms which will be used for leasing contract with the EZ Developer and tenant investor.	- Capability to understand and to guide the correct procedures to investors for arranging the correct leasing agreement. - Capability to prepare suitable standard agreement formats for leasing contract between BEZA, the EZ Developer and tenant investor.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed
7. Operation, Maintenance and Management of Infrastructure and Facilities						

7.1	Operation, Maintenance and Management of Infrastructure and Facilities	-Engineering Department -General Affairs Department (Legal Section)	Knowledge about the functions of and method of establishing a survey team that is responsible for regular inspection of infrastructure and utilities conditions such as; - Gates and Fences - Roads - EZ lots (EZ Structures, Drainage systems, Lighting Fixtures) - Water Supply - Electric Power Supply - Street Lighting - Administration Buildings (Roofing) - Air Conditioning Systems - Other weekly/daily cleaning & maintenance work	- Capability to understand the functions and responsibilities for sound operation, and maintain various infrastructure & utilities within EZ premises, - Capability to conduct the required operation and maintenance work within EZ premises with practical skills.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed
7.2	Operations of the Administrative office	General Affairs Department (Legal Section)	Knowledge about various functions and activities related to the operations of Administrative Office, which is responsible for sound operations and maintenance of; - Leasing Office Premises (short-term & long-term) - Restaurants, Canteens and Cafeterias - Banking facilities - Clinic (First Aid Treatment)	- Capability to manage the operations of Administrative office with regard to the affairs related to leasing of; office premises, restaurants, canteens & cafeteria, banking facilities, Clinic and other fundamental functions.	Conduct training for officers in charge through, OJT by Expert(s) employed by BEZA	Not yet confirmed

7.3	Coordination with Primary Utility Providers	- Engineering Department (Utility Provider Coordination Section) -General Affairs Department (Legal Section)	Knowledge about how to facilitate effective coordination with EZ Developers and competent Bangladesh Authorities to ensure a consistent supply of primary utilities such as Water, Electric Power, Gas and Telecommunications services. Necessary knowledge about; the requirements in regard to demand and quality of utilities, fee structure of the utility services, conditions of application and termination of services, and others.	- Capability to facilitate effective coordination with EZ Developers and competent Bangladesh Authorities to ensure a consistent supply of primary utilities	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed
8. Security, Safety Control and Fire Fighting						
8.1	Security and Safety Control	General Affairs Department (Security Management Section)	Knowledge about how to control and maintain the security and safety of the EZ which consists of; - Gate Control (In-Out, Deny In-Out), - Property Security Management to prevent theft, damage or misuse of property and equipment, - Traffic Safety (Pedestrians and Cars), - Information Security for BEZA and Tenants (IT Systems, Office Equipment, Conference Rooms, etc.)	- Capability to provide secure safe-guarding of property and equipment, and make proper reports about lost, stolen, damage, and impaired assets.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed

8.2	Fire Fighting	General Affairs Department (Security Management Section) Engineering Department	Knowledge about how to conduct Fire Fighting Operations in the EZ which consist of; 1) Legal basis for prevention measurement, 2) Formation of Fire Fighting Team with proper coordination with competent Government Authorities, 3) Rules and Regulations for emergency cases (Responsibility of the leader and members) 4) Functions of internal resources and coordinator for provision of first aid and maintenance of fire-fighting equipment, 5) Operation and Management of fire-fighting activities such as; - Fire-fighting equipment, communication systems within emergency team, - Prioritized activities during emergency, - Communication with media	- Capability to understand the requirements during emergencies under the civil defense code, and other rules and regulations, - Capability to Manage fire-fighting team with proper coordination with competent Government Authorities, - Capability to introduce and develop internal resources in the EZ for fighting emergency situations.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA	Not yet confirmed
9. Environmental Control & Management						
9.1	Environmental Control & Management	Engineering Department (LAB, Environmental Management Section)	Knowledge about comprehensive measures for control and management of the environment such as; 1) Legal basis for environmental control and management, 2) Policy and strategy for environmental management, and for the formation of an Environment Team,	- Capability to understand the requirements under the laws and regulations by the competent authorities of Government, - Capability to understand the requirements of	Conduct training for officers in charge such as; - Environmental Seminars and/or OJT at the Similar organization abroad, or OJT by Expert(s)	Not yet confirmed

			3) Requirements for environmental management by tenants such as; - Waste water treatment (connection to common drainage systems, preventive control, monitoring), - Air pollution (devices to be installed), - Noise pollution, - Solid waste - Others (Vibration control, control of Ozone-depleting substance, handling of dangerous and hazardous materials, management of garbage) 4) Preparation of Waste Management Plan by tenant and/or contractor which covers the policy, safe and proper handling measures for waste together with the provision of adequate systems for segregation, labeling and disposal in storage, movement, documentation and procedures to be adopted.	tenant and contractor with regard to environmental management in the EZ, - Capability to conduct monitoring activities of the tenant and contractor in regard to performance of environmental management in the EZ.	employed by BEZA	
10. Collection Systems for Fees and Charges						

10.1	Collection Systems for Fees and Charges	Financing & Accounting Department Marketing & Customer Care Department	Knowledge about the structures of fees, charges and collection systems applied to the tenant investors such as; - Reservation fees, - Land utilization charges, - Management fees, - Connection fees, - Water charges, - Electric power charges, - Rental fees for office and factory, - Deposit for the factory	- Capability to understand the structure of various fees and charges to be collected from the tenant investors, - Capability to understand an effective collection system regarding fees and charges from the tenant investors.	Conduct training for officers in charge through OJT by Expert(s) employed by BEZA.	Not yet confirmed

2) Capacity Enhancement Training Design

The necessity for human resources development and specific training needs have been discussed as mentioned in the previous chapters by reviewing the organizational performance of BEZA. It is recommended that a capacity enhancement training design shall be made along with the ADDIE Model, which consists of sequential, cyclical steps of Analysis, Design, Development, Implement, Evaluation (ADDIE), by developing specific training methods and evaluating the results and improving based on those results. The concept of the ADDIE Model is shown in Figure 6.3-1 below.

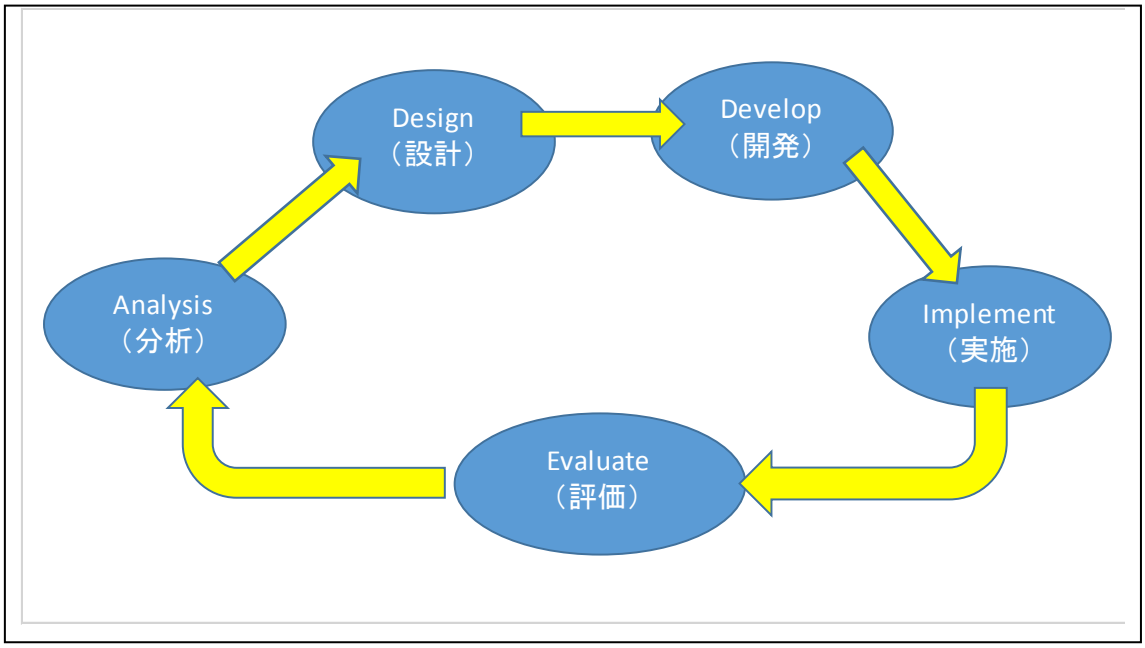


Figure 6.3-1: Concept of the ADDIE Model

Conceptual design summarizing the training contents, training subjects, and training methods for the “Professional Discipline Education and Training Program” which were prepared based upon the identified training needs as shown in Table 6.3-1, are shown in Figure 6.3-2. Three different training programs which consist of Entry Program (2 Weeks), Basic Program (3 Months) and Professional Discipline Development Program (6 Months) are recommended. The Entry Program shall be conducted for the first 2 weeks after the hiring of BEZA Staff, which will be followed by the Basic Program which shall be completed within 3 months. Following this, the staff who are assigned to any department shall undergo the Professional Discipline Education and Training Program. Completion time for the Professional Discipline Development Program will be approximately 6 months. Although the Professional Discipline Development Program is designed for three (3) different departments, staff may choose and undergo any course cross-disciplinary as necessary.

In the deliberation of Training Design, all aspects derived from organizational issues faced by BEZA, such as the required functions and competency, the results of training needs assessments, the contents of BEZA Operation and Management Manual, etc., are reflected. The training activities in the OJT, OFF-JT, and Self Enlightenment which are required to implement the proposed Professional Discipline Development Program are shown in Table 6.3-2. Also, specific training design by each department of BEZA is shown in Table 6.3-2 below.

ENTRY PROGRAM (2 Weeks)

Overall Department
1. Objectives and Major Functions of BEZA
2. Operations and Management of BEZA

BASIC PROGRAM (3 Months)

Financing & Accounting Dept.
1. Collection Systems for Fees and Charges
2. Financial Management
3. Business Planning/Budgeting

PROFESSIONAL DISCIPLINE DEVELOPMENT PROGRAM (6 Months)

General Affairs Department
1. Operations of the Administrative Office
2. Land Acquisition & Leasing from the Government
3. Leasing Procedures
4. Security and Safety Control
5. Coordination with Primary Utility Providers
6.Operations, Management & Maintenance of Infrastructure and Utilities
7. Fire-Fighting
8. Environmental & Social Management

Marketing & Customer Care Dept.
1. Marketing & Investment Promotion
2. Knowledge & Implementing Practices of Marketing
3. Knowledge & Implementing Practices on Customer Care
4. Role of Customer Care and OSS
5. Knowledge & Implementing Practices of OSS
6. Plot Allocation to the Tenant
7. Leasing Procedures
8. Collecting Systems for Fees and Charges
9. Environemtall & Social Management

Engineering Department
1. Selection of Developer
2. Electronic Government Procurement
3. Site Selection
4. EZ Development Planning
5. Plot Allocation
6. Operations, Management & Maintenance of Infrastructure and Utilities
7. Fire-Fighting
8. Coordination with Primary Utility Providers
9. Environmental & Social Management

Figure 6.3-2: Concept of Training Program Cluster at BEZA

Table 6.3-2: Training Design for each department at BEZA

1. All Departments					
Course Title	Targeted Achievement		Mode of Training		
			OJT	Off-JT	Self-Enlightenment
Objective and Major Functions of BEZA	Knowledge	1. Objectives of BEZA 2. Major functions of BEZA 3. General Knowledge about EZ	-Lecture -Group Work -Case Study -Bench Marking	—	-Visit BEZA Website -Reading Manuals & Regulations
	Skills/Technology	1. Capability to explain the Objectives and Major Functions of BEZA to visitors	-Group Work -Role Play	—	-Reading Manuals & Regulations
	Attitudes/Morale	1. Confident behavior toward visitors	-Action Learning	—	-Reading Reference Books
Operations and Management of BEZA	Knowledge	1. Objectives of BEZA Operations & Management 2. Organogram, Authority & Responsibility of each Department at BEZA 3. Decision-making & Communication cycles at BEZA	-Lecture -Group Work -Case Study	—	-Reading Manuals & Regulations
	Skills/Technology	1. Capability to perform the tasks as a member of BEZA in accordance with rules	-Group Work -Role Play	—	-Reading Manuals & Regulations
	Attitudes/Morale	1. Proactive behavior toward assignments given	-Action Learning	—	-Reading Reference Books

2. Administrative Department					
Operations of the Administrative Office	Knowledge	1. Functions of Administrative Office in conducting regular inspections of various infrastructure & utilities 2. Establishment and management of a survey team for the regular inspections	-Lecture -Group Work	—	-Reading Manuals & Regulations
	Skills/Technology	1. Capability to perform tasks as a member of Administrative Office in accordance with rules and manuals.	-Group Work -Role Play	—	-Reading Reference Books
	Attitudes/Morale	1. Proactive attitude to improve service level at Administrative Office	-Action Learning	—	-Reading Reference Books
Land Acquisition & Leasing from the Government	Knowledge	1. Knowledge about different legal Documents for effective acquisition of Government land	-Lecture -Group Work	-Lecture -Group Work -Share the best practices from other authorities	-Reading Manuals & Regulations
	Skills/Technology	1. Capability to understand the relevant legal documents to help support effective acquisition of Government land.	-Lecture -Group Work	-Lecture -Group Work -Share the best practices from other authorities	-Reading Manuals & Regulations
	Attitudes/Morale	1. Proactive attitude to learn the best practices for acquiring & leasing Government land.	-Action Learning	—	—
Leasing Procedures	Knowledge	1. Correct procedure in leasing out EZ lands; from quotation to potential tenant, reservation agreement, utilization agreement, then land allocation agreement	-Group Work	-Observation Tour -Share the best practices from other authorities	-Reading Manual & Reference Books

	Skills/Technology	1. Capability to prepare standard formats for different stages of leasing procedures	-Group Work -Role Play	-Observation Tour -Share the best practices from other authorities	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn the best standard formats for different leasing procedures	-Action Learning	—	—
Operations, Management &Maintenance of Infrastructureand Utilities	Knowledge	1. Knowledge about the functions of infrastructure and utility management 2. How to establish a survey team to perform best management of infrastructure and utility facilities	-Group Work	-Observation Tour -Share the best practices from other authorities	-Reading Manuals & Regulations
	Skills/Technology	1. Overall management skills for infrastructure and utility facilities owned by EZ	-Group Work -Role Play	-Observation Tour -Share the best practices from other authorities	-Reading Manuals & Regulations
	Attitudes/Morale	1. Proactive attitude to learn the best practices about infrastructure & utility management	-Action Learning	—	—
Coordination with Primary Utility Providers	Knowledge	1. Effective coordination with competent authorities for consistent provision of primary utilities to EZ 2. Effective requirement assessment for: demand and quality supply, understanding fee structure, and conditions of application and termination of utility services.	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books

	Skills/Technology	1. Coordination & negotiation skills for provision of primary utility services	-Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude for effective negotiation with primary utility providers	-Action Learning	—	—
Security and Safety Control	Knowledge	1. Knowledge about how to control and maintain the security conditions in the EZ	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Various skills for provision of sound safe-guarding on the properties and equipment	-Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn effective security and safety control in the EZ	-Action Learning	—	—
Fire-Fighting	Knowledge	1. Knowledge about how to conduct Fire-fighting operations in the EZ in accordance with civil defense codes, other rules & regulations 2. Knowledge about how to manage the Fire-fighting team	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand the requirements of Fire-fighting and coordination skills with other competent authorities	-Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn effective Fire-fighting operations in the EZ	-Action Learning	—	—
Electronic Government Procurement (e-GP)	Knowledge	1. Knowledge about the e-GP introduced by the Government of Bangladesh such as: Objectives, Goals, Procedures, Reporting, and others on the e-GP.	-Lecture -Group Work	-Lecture	-Reading Reference Books

	Skills/Technology	1. Capability to understand and prepare the required documentation for: Preparation, Tendering, Contract, Management, and Purchasing 2. Capability to understand and implement re-engineering of business processes at BEZA	-Group Work -Role Play	-Lecture -Group Work	-Reading Reference Books
	Attitudes/Morale	1. Proactive attitude to learn effective e-GPs in the EZ	-Action Learning	—	—
Environmental & Social Management	Knowledge	1. Knowledge about the comprehensive measures for environmental control and management, such as: legal basis for environmental control and management; policy and strategy development for environmental management; formulation of environmental management team; requirement to be observed by the tenant investors; and, preparation of waste management plan by tenant investor/contractor	-Lecture -Group Work	-Observation Tour -Lecture	-Reading Regulations & Reference Books
	Skills/Technologies	1. Capability to understand the requirements under the laws and regulations of the Bangladesh Government 2. Capability to understand and enforce the requirements to be observed by the tenant investor/contractor 3. Capability to conduct monitoring activities for the performance by the tenant investor/contractor	-Group Work -Role Play	-Group Work	-Reading Regulations & Reference Books
	Attitudes/Morale	1. Proactive attitude to fulfill the requirements under the laws and regulations of the Bangladesh Government, and to improve the monitoring systems for better practices	-Action learning	—	—
3. Financing & Accounting Department					

Collection Systems for Fees and Charges	Knowledge	1. Knowledge about the structure of fees and charges and how they are collected from tenant investors	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand fee and charge structures and how they are collected	-Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn attractive fee and charge structures and effective collection systems	-Action Learning	—	—
Accounting & Financing	Knowledge	1. Knowledge about the objectives and goals of accounting and financing practices on the business, 2. Knowledge about basic accounting methods and financial statement analysis 3. Knowledge about financial analysis methods for better decision-making	-Lecture -Group Work	-Lecture	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand and use double entry book-keeping systems and to prepare a trial balance, 2. Capability to analyze basic financial data and reach reasonable conclusions	-Lecture -Group Work	-Lecture	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn an accruals accounting and financing systems, and serve improved performance of BEZA	-Action Learning	—	—
Business Planning & Budgeting	Knowledge	1. Knowledge about the objectives and goals of the business planning and budgeting 2. Knowledge about the importance of business planning and budgeting and how these practices contribute to an effective management of BEZA	-Lecture -Group Work	-Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand key terminology in business planning and budgeting	-Lecture -Group Work	-Lecture -Group Work	-Reading Manual &

		2. Capability to identify sources of financial and operational data to prepare an effective business plan and budget 3. Capability to prepare business plan and budget and its monitoring processes for any department of BEZA			Reference Books
	Attitudes/Morale	1. Proactive attitude to learn an accruals business plan and budgeting systems, and serve improved performance of BEZA	-Action Learning	—	—
4. Marketing & Customer Care Department					
Marketing & Investment Promotion	Knowledge	1. Knowledge about the Marketing & Investment Promotion for EZ Developer 2. Knowledge about the Marketing & Investment Promotion for Tenant Investor	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand the major functions of Marketing and Investment Promotion activities at BEZA	-Group Work - Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to accept visitors at BEZA Offices	-Action Learning	—	-Reading Reference Books
Knowledge & Implementing Practices of Marketing/Investment Promotion	Knowledge	1. Knowledge about various marketing & Investment Promotion activities 2. Knowledge about how to prepare strategy, tactics, marketing tools/ materials, etc., for marketing & investment promotion 3. Knowledge about how to conduct marketing & investment promotion activities 4. Knowledge about how to review and improve operations of marketing & investment promotion	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books

	Skills/Technology	1. Capability to understand, implement, review various marketing & Investment Promotion activities	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to entertain visitors well and improve customer satisfaction	-Action Learning	—	-Reading Manual & Reference Books
Knowledge & implementing Practices on Customer Care	Knowledge	1. Knowledge about the legal basis for the provision of customer care services 2. Knowledge about the comprehensive customer care services within BEZA HQ/Regional Offices 3. Knowledge about the tenant support Services	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to deliver effective customer care services at BEZA HQ/Regional Offices	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1.Proactive attitude to entertain the tenant investor and to improve customer satisfaction	-Action Learning	—	-Reading Reference Books
Role of Customer Care and OSS	Knowledge	1. Knowledge about various roles of customer care 2. Knowledge about various roles of OSS	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Rules & Regulations
	Skills/Technology	1. Capability to understand the role and responsibility of customer care and OSS	-Role Play	-Group Work	-Reading Rules & Regulations
	Attitudes/Morale	1. Proactive attitude to entertain the potential investors at BEZA HQ/ Regional Offices and to improve customer satisfaction	-Action Learning	—	—

Knowledge & ImplementingPractices of OSS	Knowledge	1. Knowledge about the legal basis for provision of OSS2. Knowledge about varied practices of OSS systems	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Rules & Regulations
	Skills/Technology	1. Capability to implement various OSS practices	-Group Work -Role Play	-Group Work	-Reading Rules & Regulations
	Attitudes/Morale	1. Proactive attitude to entertain the potential investors at BEZA HQ/ Regional Offices and to improve customer satisfaction	-Action Learning	—	—
Plot Allocation to the tenant	Knowledge	1. Knowledge about planning practices for appropriate plot allocation depending upon the results of the market survey and EZ development strategy	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to make an appropriate plot allocation plan 2. Capability to establish the policy for sub-leasing to other	-Group Work - Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to serve developers and tenant investors and to improve customer satisfaction	-Action Learning	—	—
Leasing Procedures	Knowledge	1. Knowledge of the correct procedure in the leasing out EZ lands to tenant investor 2. Knowledge about how to establish a policy for transferring development rights to other developers	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to guide the correct procedures to investors for leasing arrangement with proper legal documents	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books

	Attitudes/Morale	1. Proactive attitude to serve developers and tenant investors and to improve customer satisfaction	-Action Learning	—	—
Collecting Systems for Fees and Charges	Knowledge	1. Knowledge about the structure of fees and charges and how they are collected from tenant investors	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand and implement the structure of fees and charges from tenant investor 2. Capability to understand and implement an effective collection systems of fees and charges	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to introduce fee and charge structures and try to get understand of the tenant investor	-Action Learning	—	—
Environmental & Social Management	Knowledge	1. Knowledge about the comprehensive measures for control and management of environment such as: legal basis for environmental control and management; policy and strategy development for environmental management; formulation of environmental management team; requirement to be observed by the tenant investors; and, preparation of waste management plan by tenant investor/contractor	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Rules & Regulation, Reference Books
	Skills/Technologies	1. Capability to understand the requirements under the laws and regulations of the Bangladesh Government 2. Capability to understand and enforce the requirements to be observed by the tenant	-Group Work -Role Play	-Group Work	-Reading Rules & Regulations, Reference Books

		investor/contractor 3. Capability to conduct monitoring activities for the performance by the tenant investor/contractor			
	Attitudes	1. Proactive attitude to fulfill the requirements under the laws and regulations of the Bangladesh Government, and to improve the monitoring systems for better practices	-Action learning	—	—
5. Engineering Department					
Selection of Developer	Knowledge	1. Knowledge about the three major selection methods for EZ developer; Tender basis, Negotiation basis, and Application by private developer 2. Knowledge about the evaluation criteria for selection of sound developer and on the evaluation procedures	-Lecture -Group Work	-Observation Tour -Share the best practices from other authority	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand the international procurement processes; invitation to the bid, evaluation of the bids, and negotiation with a successful bidder 2. Capability to understand the evaluation criteria, evaluation procedures 3. Capability to implement the selection processes, communicate and negotiate with successful bidder 4. Capability to prepare a draft contract document with successful bidder	-Lecture -Group Work	-Observation Tour -Share the best practices from other authority	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to understand and improve international bidding & evaluation systems, procurement processes for selecting a sound EZ developer for BEZA	-Action Learning	—	—
Electronic Government Procurement (e-GP)	Knowledge	1. Knowledge about the e-GP introduced by the Government of Bangladesh such as: Objectives, Goals, Procedures, Reporting, and others on the e-GP.	-Lecture -Group Work	-Lecture -Group Work -Share the best	-Reading Rules & Regulations, Reference

				practices	Books
	Skills/Technology	1. Capability to understand and prepare the required documentation for Preparation, Tendering, Contract Management and Purchasing 2. Capability to understand and implement re-engineering of business processes at BEZA	-Group Work -Role Play	-Lecture -Group Work -Share the best practices	-Reading Rules & Regulations, Reference Books
	Attitudes/Morale	1. Proactive attitude to understand and improve e-GP at BEZA	-Action learning	—	—
Site Selection	Knowledge	1. Knowledge about the site selection criteria 2. Knowledge about the site selection Procedures	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand the site selection criteria and site selection procedures 2. Capability to implement the site selection processes	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to understand and improve site selection processes for the successful site selection	-Action learning	—	—
EZ Development Planning	Knowledge	1. Knowledge about the objectives and goals of EZ development and engineering practices 2. Knowledge about the basic requirement for physical development and engineering practices for EZ premises 3. Knowledge about the project management and reporting systems for a better decision-making of	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books

		BEZA			
	Skills/Technology	1. Capability to make an attractive EZ development master plan/basic plan 2. Capability to make outline technical specifications for EZ development 3. Capability to assess the project development costs and conduct preliminary feasibility study 4. Capability to manage EZ development project as a project manager	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to prepare attractive development plans and serve to BEZA as well as to the private EZ developers	-Action learning	—	—
Plot allocation to the tenant	Knowledge	1. Knowledge about planning practices for the best land allocation	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to make an appropriate land allocation plan 2. Capability to establish sound policy for sub-leasing from EZ developer to other developer	-Group Work -Role Play	-Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to make an appropriate land allocation plan and sub-leasing policy and improve these practices	-Action learning	—	—

Operations, Management &Maintenance of Infrastructureand Utilities	Knowledge	1. Knowledge about the functions of infrastructure and utility management2. How to establish a survey team to perform best management of infrastructure and utility facilities	-Lecture -Group Work	-Observation Tour -Share the best practices from other authorities	-Reading Manual & Reference Books
	Skills/Technology	1. Overall management skills for infrastructure and utility facilities owned by EZ	-Lecture -Group Work	-Observation Tour -Share the best practices from other authority	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn the best practices on the infrastructure & utility management	-Action learning	—	—
Coordination with Primary Utility Providers	Knowledge	1. Effective coordination with competent authorities for consistent provision of the primary utilities to EZ 2. Effective requirement assessment for: demand and quality supply, understanding fee structure, and conditions of application and termination of utility services.	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Coordination & negotiation skills for provision of primary utility services	-Group Design -Role Play	-Observation Tour -Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude for effective negotiation with primary utility providers	-Action learning	—	—

Fire-Fighting	Knowledge	1. Knowledge about how to conduct Fire-fighting operations in the EZ in accordance with civil defense codes, other rules & regulations 2. Knowledge about how to manage the Fire-fighting team	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Manual & Reference Books
	Skills/Technology	1. Capability to understand the requirements of Fire-fighting and coordination skills with other competent authorities	-Group Work -Role Play	-Observation Tour -Group Work	-Reading Manual & Reference Books
	Attitudes/Morale	1. Proactive attitude to learn effective Fire-fighting operations at BEZA	-Action learning	—	—
Environmental Control &Management	Knowledge	1. Knowledge about the comprehensive measures for control and management of environment such as: legal basis for environmental control and management; policy and strategy development for environmental management; formulation of environmental management team; requirement to be observed by the tenant investors; and, preparation of waste management plan by tenant investor/contractor	-Lecture -Group Work	-Observation Tour -Lecture -Group Work	-Reading Rules & Guidelines, Reference Books
	Skills/Technology	1. Capability to understand the requirements under the laws and regulations of the Bangladesh Government 2. Capability to understand and enforce the requirements to be observed by the tenant investor/contractor 3. Capability to conduct monitoring activities for the performance by the tenant investor/contractor	-Group Work -Role Play	-Group Work	-Reading Rules & Guidelines, Reference Books

	Attitudes/Morale	1. Proactive attitude to fulfill the requirements under the laws and regulations of the Bangladesh Government, and to improve the monitoring systems for better practices	-Action learning	—	—

3) Public Education and Training Activities in Bangladesh

There are several Education and Training Institutions run by the public sector and some of them are available and are deemed to be useful for the capacity enhancement of BEZA. They are as follows:

a. Bangladesh Public Administration Training Center (BPATC)
   An education and training facilities designed for all Government officials of Bangladesh with comprehensive and broad training programs.
b. National Academy for Planning and Development (NAPD)
   A training institution which provides education and training programs in development planning.
c. Bangladesh Foreign Trade Institute (BFTI)
   A training institution that is an affiliate facility of the Ministry of Commerce and provides training programs mainly in the fields of foreign trade.
d. National Productivity Organization (NPO)
   A research institution that is an affiliate facility of the Ministry of Industry and is providing education and training programs in the fields of productivity improvement.

There are several public education and training institutions which Government officials can take, but few programs suitable to the needs of BEZA are available. A brief description of activities of major public education and training institutions are shown in Table 6.3-3.

It is recommended that BEZA shall positively explore and select useful education and training programs among the programs provided by these public education and training institutions, and incorporate them into the BEZA education and training programs in particular to the program in the fields of hierarchal classified training and international business training.

Table 6.3-3: Major public training institutions and their activities in Bangladesh

Sl. No.	Name of Training Institutions	Year of Establishment	Field of Specialization	Major Training Course provided
1	Bangladesh Public Administration Training Center (BPATC)	1984	Public Administration, Development	Policy, Planning and Management Course (PPMC), Senior Staff Course (SSC), Advanced Course on Administration and Development (ACAD), Foundation Training Course (FTC)
2	Bangladesh Institute of Administration Management (BIAM)	1992	Public Administration	Foundation Training Course of BCS Cadre Officials, Special Foundation Training Course for Health Cadre, Public Financial Management (For Admin Cadre Official), Department of Foundation Training Course (RAJUK), Department of Foundation Training Course (PGCB)
3	National Academy for Planning and Development (NAPD)	1980	Public Administration	Project Appraisal, EIA and Formulation of DPP, Project Appraisal Study, Public Financial Management, Development Planning and Project Management, Planning for Local Economic Develop, Monitoring and Evaluation of Development Projects, Public Private Partnership (PPP), Environmental Issues of Project Management, Financial and Economic Appraisal of Projects
4	Bangladesh Institute of Management (BIM)	1961	Organization Management (Financial, HR, Accounting, Office Management)	Financial Management for Executives, Internal Audit on HR, Intellectual Property Rights, Accounting Software Tally. ERP9, Total Quality Management (TQM), Human Resource Management For Executives, Practical Income Tax & VAT Management, Marketing Research for Effective Decision Making, Developing Management Skills, Training Of Trainers (TOT), Project Management: Principles, Tools & Techniques, Supply Chain Management, Project Monitoring and Evaluation
5	Financial Management Academy (FMA)		Audit and Accounts/ Office Management, Financial management	BCS Officers Departmental Training, SAS SRAS, Orientation Course, Modern Office Management, Financial Management course
6	Bangladesh Foreign Trade Institute (BFTI)	2003	Import, Export Rules, Procedure and Policy, international trade policy and trade lwas, Regional and Bilateral Trade Policies	Rules and Procedures for Import, Export and Customs, Electronic Traceability for Agricultural Trade Facilitation and Smallholder Integration, WTO and Other Trade Issues, Trade Flows and Trade Policy Analysis, Overview of Trade Policy Regime of Bangladesh, Computable General Equilibrium (CGE) Modeling and its Applications, The General Agreement on Trade in Services (GATS), Rules and Procedures for Import, Export and Customs, Trade Foundation Course for Commercial Counsellors, Trade Policy Regime of Bangladesh, Understanding WTO issues & its recent developments
7	National Productivity Organization (NPO)	1989	Productivity management, Quality Control	Basic Concept of Productivity. Productivity by Objectives. Improve Employee Productivity. Productivity Measurement and Analysis. 5s Technique. Suggestions Scheme(SS). Quality Control Circle(QCC). ISO-9000. Labor Management Co-operation(LMC). Entrepreneurship Development. Character and Challenge of Entrepreneurship. Value Added Productivity Measurement. KAIZEN Practice. Total Quality Management(TQM). Total Productive Maintenance(TPM). Human Resource Management(HRM). Customer Relation Management(CRM). Just in Time Manufacturing System(JIT). Material Flow and Cost Accounting(MFCA). Operation Management. Lean Manufacturing. Knowledge Management system. Industrial Engineering(IE).
8	Bangladesh Petroleum Institute (BPI)	1981	Gas transmission system and maintenances, Fire Safty	Material Engineering Codes & Standards, Gas Pipeline Welding & NDT, Corrosion Control and Cathodic Protection, Gas Network Analysis, Prepaid Metering Installation & Management, Reduction of POL Handling Loss, Design, Construction, Operation and maintenance of Gas Pipeline, Well Completion, Testing and Production Technology, Plant Operation and Maintenance, Design, Construction, Operation and Maintenance of Gas RMS, Advanced programmable Logic Control (PLC) and Trouble Shooting, Storage, Handling & Maintenance of POL Products, Geology for Non-Geologist
9	Bangladesh Institute of Capital Market (BICM)	2008	Financial Analysis, Securities, Investment	Investor Awareness Program, Securities Laws of Bangladesh, Securities Valuation, Financial Statement Analysis, Strategies of Portfolio Management, Operation of Mutual Fund in Bangladesh, Technical Analysis, Understanding Research Methodology, Applied Regression Analysis
10	Bangladesh Civil Service Administraion Academy (BCSAA)	1987	Governmen Administration	Course on Law & Administration, Orientation Course for Fit-listed Upazila Nirbahi Officer, Course on Computer, Course on Upazila Administration & Development, Course for the Executive Magistrates, Course on Development Administration & Management, Course on Public Procurement Management, Masters in Public Policy and Management (MPPM)
11	Bangladesh Institute of Bank Management (BIBM)	1997	Bank Management	Internal Control and Compliance in Banks, SME Financing and Entrepreneurship Development, Risk Management in Banks, Working Capital Financing, Computer Network Administraĉon and Security Management, Financial Analysis for Bankers, Human Resource Management in Banks, IT Security and Fraud Prevenĉon in Banks for Non - IT Execuĉves, Legal Aspects of General Banking andCredit, Risk Management in Banks, Working Capital Financing
12	Foreign Service Academy (FSA)	1996	Foreign Policy and Law, Diplomacy and Economics	Diplomacy and Foreign Policy, International Relations, International Law, History of Diplomacy, Bangladesh Foreign Relations, Bangladesh Studies, Basic Concepts of Economics Microeconomics, Bangladesh Economic Studies, International Economics, Diplomacy & Security, International & Regional Organizations, Media & Cultural Diplomacy, Office Management, Financial Management

(４)PDCA Activities on BEZA Training Program

As stated hereinabove, BEZA covers a broad range of activities and it is necessary to conduct many education and training programs to perform the activities as planned; direction and specific training methods have been described. Similar to other organizational activities in BEZA, education and training programs at BEZA shall also be performed dynamically by sensitively reflecting the changing phenomena in the external managerial environment. Therefore, the education and training programs which are initially designed and introduced, shall be continually managed, and regularly reviewed and improved through the PDCA processes (Plan, Do, Check, Action).

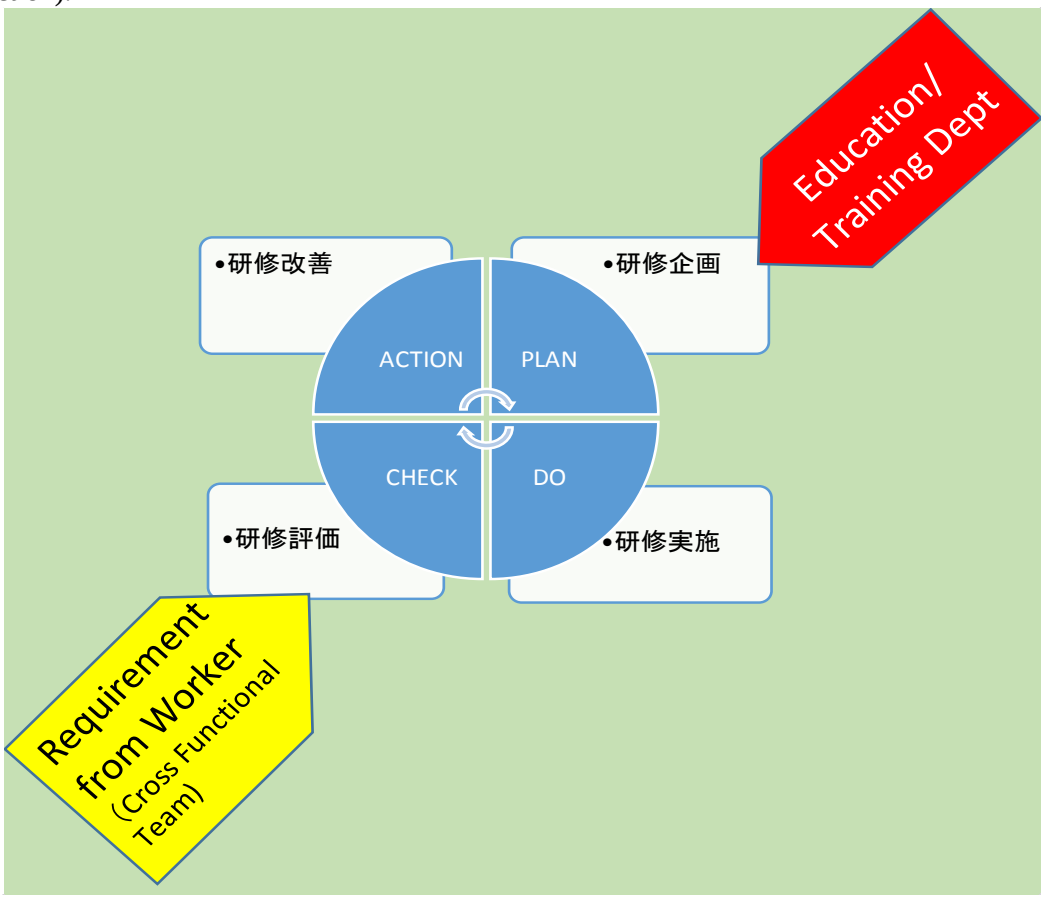


Figure 6.3-3: PDCA Cycle on Education and Training

Currently there is no section in BEZA which is responsible for education and training activities. However, it is apparent that the functions of the education and training section at BEZA will be more important as the organization grows. Thus, introduction of an education and training section is essential from medium- and long-term points of view.

On the other hand, education and training activities shall be recognized as one of the consistent managerial innovation activities, which shall be conducted by widely observing the environmental conditions and opinions at the work place, rather than by handling it as a special subject in the education and training department. In order to realize such objectives, it is necessary to properly reflect the demands and desires in the education and training at the work place to the processes of management. The Survey Team has discussed with several BEZA managers who are managing daily work themselves about how BEZA can establish appropriate implementation systems for tackling such challenges. As the results of the discussions, it has been agreed that a Cross Functional Team (CFT) within BEZA for solving issues shall be established.

The definition of a CFT is "A Team of many departments whose mission is to solve the issues which are difficult to solve by one department in charge alone", and its objectives are to solve the issues of "functional organizations" such as BEZA, while keeping the benefit of the entire organization in mind. Potential CFT members whom are currently being considered by BEZA are shown in Table 6.3-4.

Table 6.3-4: Proposed Cross Functional Teams at BEZA

	CROSS FUNCTIONAL TEAM-1		CROSS FUNCTIONAL TEAM-2	
No.	Name (Status)	Designation	Name (Status)	Designation
1	Md. Harunur Rashid (Joint Secretary)	Project Director (Support to Capacity BEZA	S M Shawakat Ali (Additional Secretary)	Executive Member (Investment Promotion)
2	Hariprasad Paul (Joint Secretary)	General Manager (Investment Promotion, Planning & Development)	Md. Shoab (Deputy Secretary)	Manager (Finance & Budget)
3	Selim Akther	Manager (Law)	Md. Moniruzzaman (Deputy Secretary)	Manager (Investment Promotion)
4	Mohammed Shoheler Rahaman Chowdhury (Deputy Secretary)	Manager (Planning, MIS & Research)	Malay Choudhury (Deputy Secretary)	Manager (One Stop Service & Contribution)
5	Md. Daud Maih (Senior Assistant Secretary)	Manager (Administration)	Saleh Ahmed (Deputy Chief)	Manager (Planning & Development)
6	Mohammaed Anamul Ahsan (Senior Assistant Secretary)	Deputy Project Director (Phase-1)	Nasrin Alam Shathe (Senior Assistant Secretary)	PS to Executive Chairman
7	Abu Lahel	Assistant Manager (Administration)	Md. Alauddin Ali (Senior Assistant Secretary)	Deputy Project Director
8	A K M Mahbubur Rahaman	Zone Development Consultant	Simon Kunta Biswas	System Analyst (IT Consultant-National)

Cross Functional Team 1 is designed with objectives for solving the challenges of the affairs for internal management of BEZA, such as administration and operation. Cross Functional Team 2 is designed with objectives for solving issues which may arise in the course of administrative activities related to the application and approval of the EZs, project development, supervising and management, and operations and maintenance of EZs owned or partly owned by BEZA.

Since functions and activities of CFTs at BEZA are still under discussion, competence and operation methods of CFTs must be discussed consequently and in detail. Also, it is understood that knowledge of project management is necessary to operate the CFTs, and systematic acquisition of knowledge among BEZA staff will be indispensable.

6.4 Supporting activities of public relations towards the investors

In developing Economic Zones under this study, the successful marketing of activities to overseas investors, particularly Japanese investors, becomes a key factor for the success of the EZ. Bangladesh as an investment destination is not well known in Japan. Accordingly the survey team supported the following public relations activities in consideration of the investors:

i Making publicity matter (Guide book for investment to EZs in Bangladesh) for Japanese enterprises
ii Making video presentation materials (Investment promotion video) for Japanese enterprises
iii Supporting BEZA's activities for FDI promotion to developers of EZs and investors in EZ sites
iv Organizing investment promotion seminars

6.4.1 Making publicity matter (Guide book for investment in EZs in Bangladesh) for Japanese enterprises

Outline of the Guidebook for Japanese enterprises is as below:

(1) Title of Guidebook: Economic Zones Development and Investment in Bangladesh

(2) Contents:
   a. Preface – Attractiveness of Bangladesh as a destination for investment
   b. Country overview (Geography, climate, population, religion, history, politics)
   c. Economy and Business (GDP, foreign currency, trade, investment, finance)
   d. Investment climate
   e. Major industrial sectors (industrial structure, major manufacturing sectors)
   f. Short term EZ development
   g. Medium term EZ development masterplan
   h. Legal systems and government organizations related to foreign direct investment
   i. A guide to EZ development
   j. Social consideration and Environment protection
   k. Current situation and development issues regarding infrastructure
   l. The issues during investment and points of concern
   m. Information for daily life in Bangladesh

(3) Deliverable
   Full color booklet with 30 pages

6.4.2 Making video presentation material (Investment promotion video) for Japanese enterprises

Outline of video presentation material (Investment promotion video) is as follows:

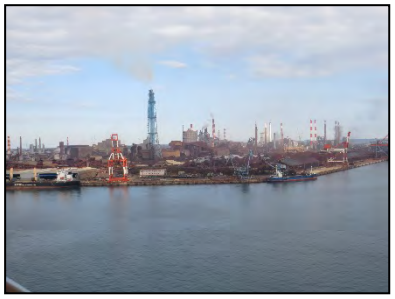
(1) Title of Video: Building the Future Through Investment in Bangladesh
   - Economic Zones Development for FDI promotion

(2) Contents: Video screen time is approximate 6 minutes
   a. Situation report of economic development in Bangladesh (GDP growth rate, stable development exceeding an average of 6% GDP growth rate per annum over many years, increase of export)
   b. The second largest exporter of Ready Made Garments in the world, diversified and developing industries
   c. The attraction of making investments (abundant population, low cost labor, long term population bonus, improvement of business environment)
   d. Geopolitical position of Bangladesh, linchpin connecting South Asia and ASEAN
   e. Partnership between Japan and Bangladesh
   f. Function and role of BEZA
   g. Presentation of 2 potential sites to be developed with support from Japan – Araihazar and Nayanpur
   h. Incentive package applicable to EZ
   i. Address by BEZA Chairman

(3) Deliverable
   DVD English version 1, DVD Japanese version 1 (full color)

6.4.3 Supporting BEZA's activities for FDI promotion to developers of EZs and investors in the EZ site

In April of 2016, the Chairman and Secretary of BEZA were invited to Japan by JICA and the JICA survey team. When BEZA visited the Japanese developers, JICA survey team members were accompanied by BEZA, providing information about a basic plan for short-term EZ development, as well as a supplementary survey and other relevant information, thereby supporting BEZA's activities.
In November of 2016, the Chairman of BEZA and 8 officers from BEZA and other government organizations were invited to Japan to discuss a Medium term EZ development Master Plan with JICA and the survey team. On this occasion, JICA survey team members visited the Japanese developer with BEZA. The survey team also supported BEZA with marketing opportunities, such as meeting with potential investors (from the shipbuilding, auto parts and steel industries), JETRO and major members of the Japan Bangladesh Association. The JICA survey team also organized a visit to the Kashima Seaboard Industrial Complex where they met Ibaragi prefecture officers, and visited the port management office, water supply office and effluent treatment facility office. They could understand the industrial zones for heavy and petrochemical industries with the assistance of the JICA survey team.



6.4.4 Organizing Investment Promotion Seminars

The Investment Promotion Seminar provides an opportunity to present information regarding the site of EZ development to enterprises in the private sector, and therefore drawing more of investors' attention to Bangladesh. Initially, 2 seminars were intended to be held in Bangladesh and one in Japan, but these plans were changed due to various unforeseen reasons. Finally, the seminar was held in Japan during a single session.

Initial Plan		Alteration
1st seminar in Bangladesh was scheduled for early June 2015.	After completion of the EZ development basic plan in Polash, the seminar for introducing EZ development plan was scheduled.	JICA's support for formulating the EZ development plan at Polash was halted. The seminar to introduce the case for EZ at Polash was cancelled accordingly.
2nd seminar in Bangladesh was scheduled for December 2015.	The seminar was intended to introduce the short term basic plan and medium term masterplan for all candidate sites.	As the selection of candidate sites for medium term EZ development was delayed due to the situation within the GoB etc., formulating a master plan for medium term EZ development was delayed. Then, the seminar was postponed to around September 2016. However, an IS terror attack occurred in Dhaka on July 1st, and the decision was made by JICA to suspend the survey in Bangladesh. Ultimately, the seminar was not held in Bangladesh.
Seminar in Japan was scheduled in May	The seminar was intended to introduce the short term basic plan and medium term masterplan for all candidate sites.	The 2nd Japan-Bangladesh Public and Private joint economic dialogue (Japan-Bangladesh Committee for Commercial and Economic Co-operation) was held and Bangladeshi government representatives and business circle delegation came to Japan. At that time, a Bangladeshi investment seminar was held jointly by BOI, JICA and JETRO on April 15th , 2016, where the original JICA investment seminar was merged with this seminar. The BEZA chairman was invited* to make a presentation on EZ development during the seminar.

(1) Investment Promotion Seminar in Japan

The Investment Promotion Seminar was held in Tokyo and Osaka, in Japan.

1) Seminar in Tokyo

a. <u>Outline of seminar</u>

- Date and time: Friday, April 15th 2016 14:00-18:00
- Venue: JETRO Headquarters (Tokyo), 5th floor Exhibition Hall
- Organized by: BOI, JICA, JETRO
- In association with: Bangladesh Embassy in Tokyo, Federation of Bangladesh Chambers of Commerce and Industry, Japan Chamber of Commerce and Industry, Tokyo Chamber of Commerce and Industry, Mitsubishi Tokyo UFJ Bank
- Number of participants: 211 persons, 158 enterprises / organizations

- Program: see below.

The seminar was held following “The 2nd Japan Bangladesh public-private joint economic dialogue” in which senior officials from the Bangladeshi government and top management from Bangladeshi enterprises participated as members of the mission. Eighteen (18) people made speeches and presentations. Speeches were made by the Ambassador of Bangladesh in Japan, the Principal Secretary from the Prime Minister’s Office, the Executive Chairman of the Bangladesh Economic Zone Authority, the President of FBCCI and so on, who represented Bangladesh. JETRO, JICA and other investors made speeches on behalf of Japan. Following each speech or presentation, the Q & A session encompassed a wide range of themes, including the Bangladeshi economy, infrastructure, economic zones, policy, investment promotion, business climates and industries etc.

After the conclusion of the seminar, business card exchange party, business matching, networking and other exchanges of information were made among the participants in the seminar.

Tokyo Seminar Program

Bangladesh Investment Seminar

Time & Date	14:00–18:00, Friday, April 15th 2016 (registration starts at 13:30)
Venue	Exhibition Hall, JETRO Headquarters
Organizer	Board of Investment(BOI) Japan International Cooperation Agency(JICA) Japan External Trade Organization (JETRO)
Supporter	Embassy of the People's Republic of Bangladesh in Japan, The Federation of Bangladesh Chamber of Commerce and Industry (FBCCI), The Japan Chamber of Commerce and Industry, The Tokyo Chamber of Commerce and Industry, Bank of Tokyo Mitsubishi UFJ
Program	**14:00 Opening Remarks** Mr. Satoshi Shimomura, Executive Vice President, JETRO Mr. Toru Arai, General Director, South Asia Department, JICA **14:06 Welcome Address** H.E. Ms. Rabab Fatima, Ambassador, People's Republic of Bangladesh to Japan **14:10 Speech 1 「Investment Opportunity in Bangladesh 」** Mr. Abul Kalam Azad, Principal Secretary of Prime Minister's Office Mr Hedayetullah Al Mamoon, Senior Secretary, Ministry of Commerce **14:20 Speech 2 「Economic Zone Development of Bangladesh 」** Mr. Paban Chowdhury, Executive Chairman of BEZA **14:27 Speech 3 「High Tech Park Development of Bangladesh」** Ms. Hosne Ara Begum, Managing Director, Bangladesh High-Tech Park Authority **14:32 Speech 4 「Investment Opportunity in PPP」** Mr. Syed Afsor H. Uddin, CEO, Public Private Partnership Authority **14:37 Speech 5 「JICA's Assistance for the Improvement of Investment Climate in Bangladesh」** Mr. Takuro Takeuchi, Director, JICA Mr. Naoyuki Maekawa, Senior Advisor, JICA **15:07 Remarks** Dr. Towfiq-e-Elahi Chowdhury, Advisor to Hon'ble Prime Minister, Power, Energy and Mineral Resources **15:12 Remarks** Dr. Syed Abdus Samad, Executive Chairman of BOI **15:17 Tea Break** **15:30 Address** Mr. Abdul Matlub Ahmed, President of FBCCI **15:35 Presentation – Investment Opportunity in Power Sector** Mr. Md. Nurul Akter, Director, Energyoac Power Generation Co. Ltd. **15:50 Presentation – Latest Business Environment** Mr. Tomoya Sano, Marubeni **16:05 Presentation – Advantages of Light Engineering Sector** Prof. Kamal Uddin, Professor of BUET **16:20 Presentation – Growing RMG Sector** Mr. Masanori Kojima, Chairman of Kojima Iryo **16:35 Presentation – Competitive Pharmaceutical Sector** Mr. Syed Kaiser Kabir, MD & CEO of Reneta Limited **16:50 Presentation – TBD** Mr. Koichi Honda, Vice President, YKK Corporation **17:05 Announcement by JETRO** Mr. Naoyuki Maekawa, Senior Advisor, JICA **17:00 Vote of Thanks by BOI** TBD, BOI

b. Aggregate analysis of the outcome of the survey of participants in seminar

Number of participants	211
Questionnaire sheets collected	81
Ratio of collection	38.4%

[Questionnaire 1] Was the seminar helpful (useful) for you?

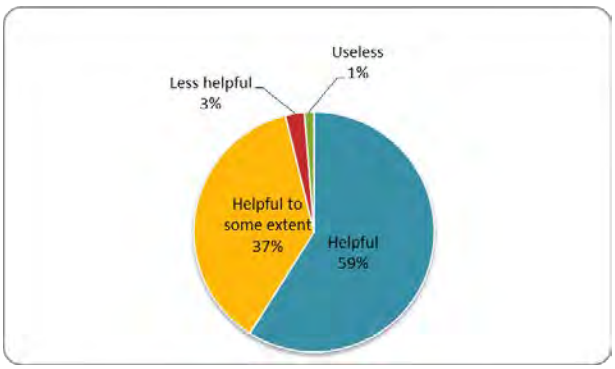
92 % of respondents replied “helpful” or “helpful to some extent”
The reasons are cited as follows:

- The program of the seminar was prepared on the initiative of the Bangladeshi government. Both senior officials from each government organization and top management from the private sector participated in the seminar, where various presentations and discussions were held with respect to broad themes. The positive attitude of public and private sector members of the Bangladeshi mission made an impression on the participants in the seminar.
- The participants could also see that the Japanese government is making efforts to improve infrastructure and streamline the business environment in Bangladesh, which will also provide the necessary information and insight to Japanese investors interested in future investment in Bangladesh.

After the seminar was over, business matching and business card exchanges were made among the participants, which was useful for networking.
On the other hand, since there were so many presenters in such a short space of time, it is likely that issues important to various sectors were only touched upon briefly and not discussed in great detail.

<Breakout>

Helpful	46	59.0%
Helpful to some extent	29	37.2%
Less helpful	2	2.6%
Useless	1	1.3%
No reply	3	←This is not included in population paramet
Total	81	

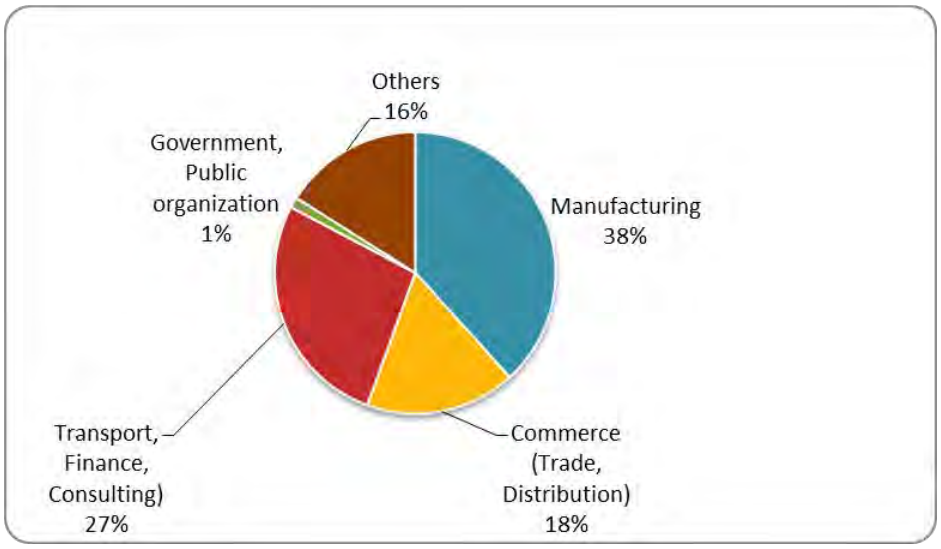


The reasons for a reply of “Useful” (Summary)
● Participants could listen directly to the ideas of representatives of the Bangladeshi government and private sectors. ● As they listened to various presentations from various Bangladeshi participants, the overall situation could be understood. ● It was realized that Bangladeshi participants attempted the investment promotion with concerted efforts beyond the bounds of each government organization. ● The informational materials were detailed. The speeches were passionate and intelligently presented. ● ODA aid projects could be understood clearly. The future potential could be recognized. ● Business cards were exchanged and networks were expanded.

[Questionnaire 2] Please select the name of sector to which your company belongs.

The manufacturing sector accounts for 38% of participants, commerce 14%, service 27%, and others 16%. The rest belong to housing, building, engineering and ICT/communication, most of which are infrastructure businesses.

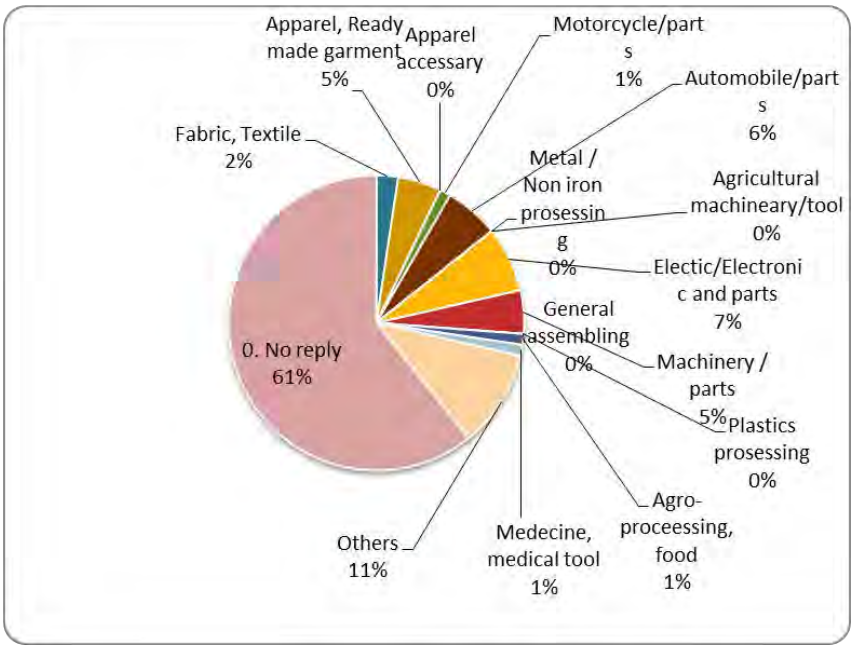
Item	Reply	Reply ratio
Manufacturing	31	38%
Commerce (Trade, Distribution)	14	17%
Transport, Finance, Consulting)	22	27%
Government, Public organization	1	1%
Others	13	16%
Total	81	



[Questionnaire 3] Please select the industry sector to which your company belongs.

Major sectors are fabric/textile/apparel/RMG 10%, automobile/parts 8%, motorcycle/parts 2%, electric/electronic parts 10%, and machinery 7%. Others are agro-processing, medicine/medical tools, printing, card manufacturing, paper & pulp, home appliances, jewelry, steel, daily products, ICT, chemicals, CETV lens, camera lenses, and photo accessories (each 2%). Japanese direct investment to Bangladesh is minimal in the sectors of automobile parts, electric/electronics and machinery, but it is estimated that businesses belonging those sectors might be somewhat interested in investment to Bangladesh. (Please note that 51 respondents out of a total of 60 did not reply to this questionnaire, which accounts for 85% of respondents)

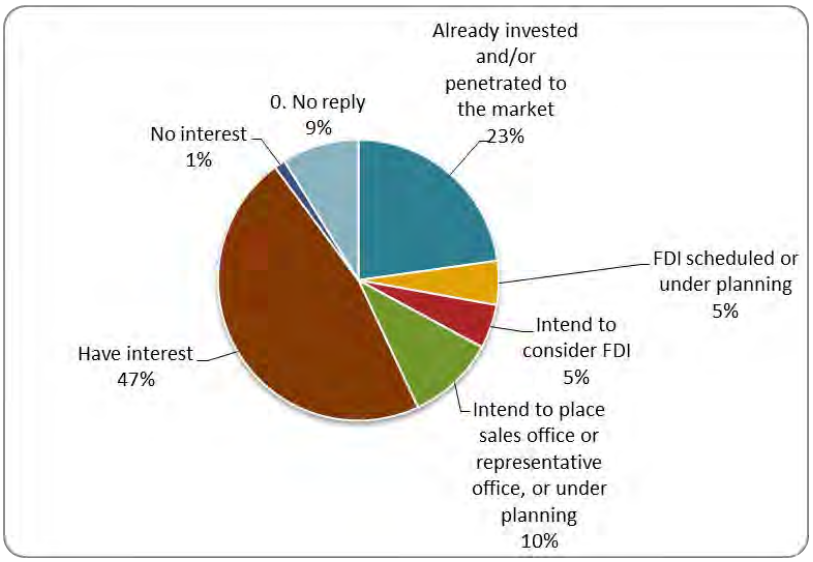
Item	Reply	Reply ratio
Fabric, Textile	2	3%
Apparel, Ready made garment	4	7%
Apparel accessary	0	0%
Motorcycle/parts	1	2%
Automobile/parts	5	8%
Agricultural machineary/tool	0	0%
Metal / Non iron prosessing	0	0%
Electic/Electronic and parts	6	10%
Machinery / parts	4	7%
General assembling	0	0%
Plastics prosessing	0	0%
Agro-proceessing, food	1	2%
Medecine, medical tool	1	2%
Others	9	15%
0. No reply	51	85%
Total	60	



[Questionnaire 4] Are you interested in investment / penetration to Bangladesh?

Out of 53 respondents, 18 enterprises indicated “Already invested and/or penetrated to the market”. Four (4) enterprises indicated “FDI scheduled or under planning”, and 4 enterprises indicated “Intend to consider FDI”. Eight (8) enterprises indicated “Intend to place sales office or representative office, or under planning”, while 37 enterprises are generally interested in Bangladesh. Seven (7) enterprises gave no reply.

Item	Reply	Reply ratio
Already invested and/or penetrated to the market	18	34%
FDI scheduled or under planning	4	8%
Intend to consider FDI	4	8%
Intend to place sales office or representative office, or under planning	8	15%
Have interest	37	70%
No interest	1	2%
0. No reply	7	13%
Total	53	



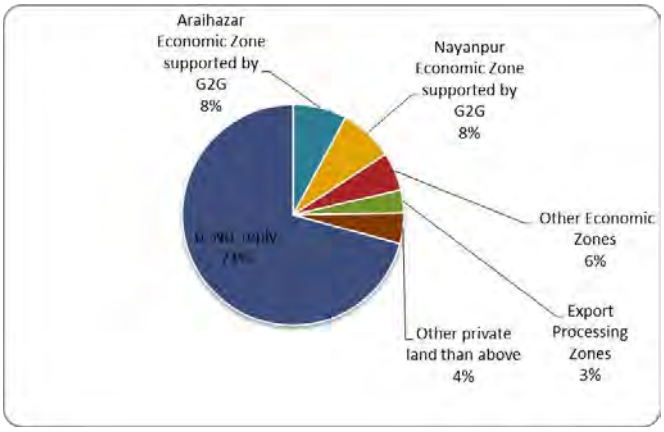
[Questionnaire 5] In which places are you interested in the case of direct investment?

The options were: Araihazar Economic Zone supported by G2G, Nayanpur Economic Zone supported by G2G, Other Economic Zones, Export Processing Zones, or Other private land than above.

Seven (7) respondents (8%) are interested in the Arihazar EZ and Nayanpur EZ respectively. Five (5) respondents (7%) are interested in Other Economic Zones.

As there was insufficient information with respect to other economic zone sites, it seems difficult to select economic zone site.

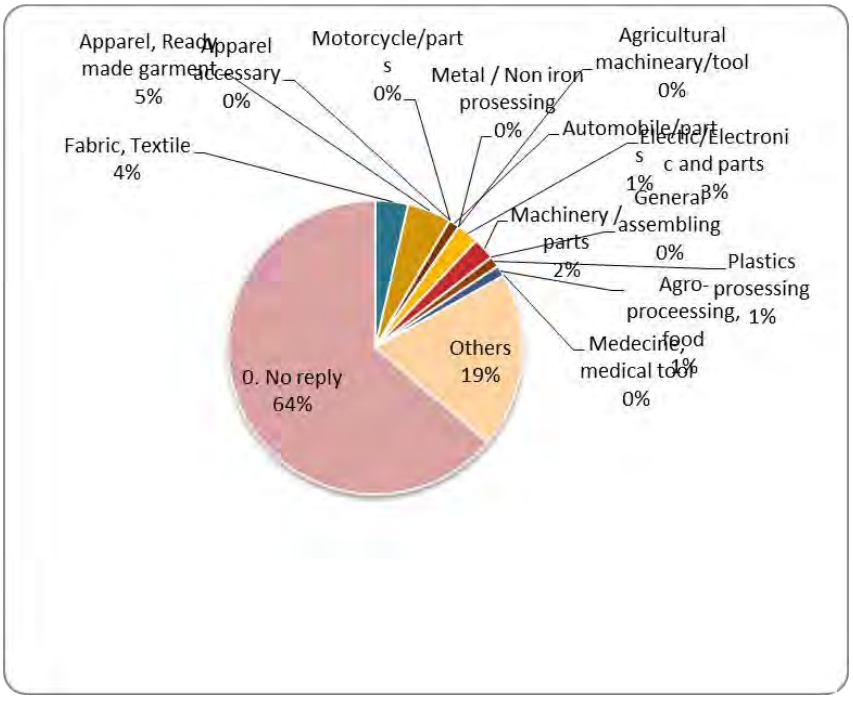
Item	Reply	Reply ratio
Araihazar Economic Zone supported by G2G	7	8%
Nayanpur Economic Zone supported by G2G	7	8%
Other Economic Zones	5	6%
Export Processing Zones	3	3%
Other private land than above	4	4%
0. No reply	63	71%
Total	89	



[Questionnaire 6] In which sector will you invest directly?

Seven (7) respondents indicated interest in investing in the following sectors: fabric, textiles, apparel, and ready-made garments. Two (2) respondents indicated electric/electronics and parts, 2 respondents indicated machinery/parts. One (1) respondent each indicated automobile/parts, plastics processing, agro-processing & food.

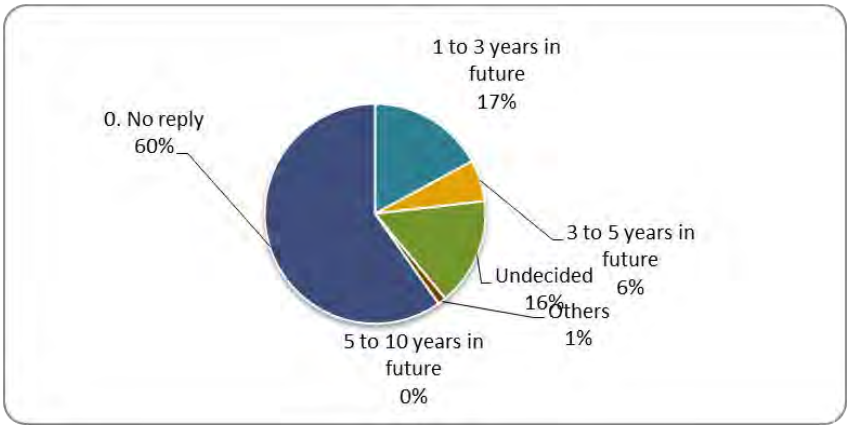
Item	Reply	Reply ratio
Fabric, Textile	3	4%
Apparel, Ready made garment	4	6%
Apparel accessary	0	0%
Motorcycle/parts	0	0%
Automobile/parts	1	1%
Agricultural machineary/tool	0	0%
Metal / Non iron prosessing	0	0%
Electic/Electronic and parts	2	3%
Machinery / parts	2	3%
General assembling	0	0%
Plastics prosessing	1	1%
Agro-proceessing, food	1	1%
Medecine, medical tool	0	0%
Others	16	23%
0. No reply	53	75%
Total	71	



[Questionnaire 7] When will you commence investment?

Fourteen (14) respondents indicated that investment will commence within 1-3 years, which was the most common reply.
Beyond this, there is a shortage of suitable land for investing in manufacturing factories.

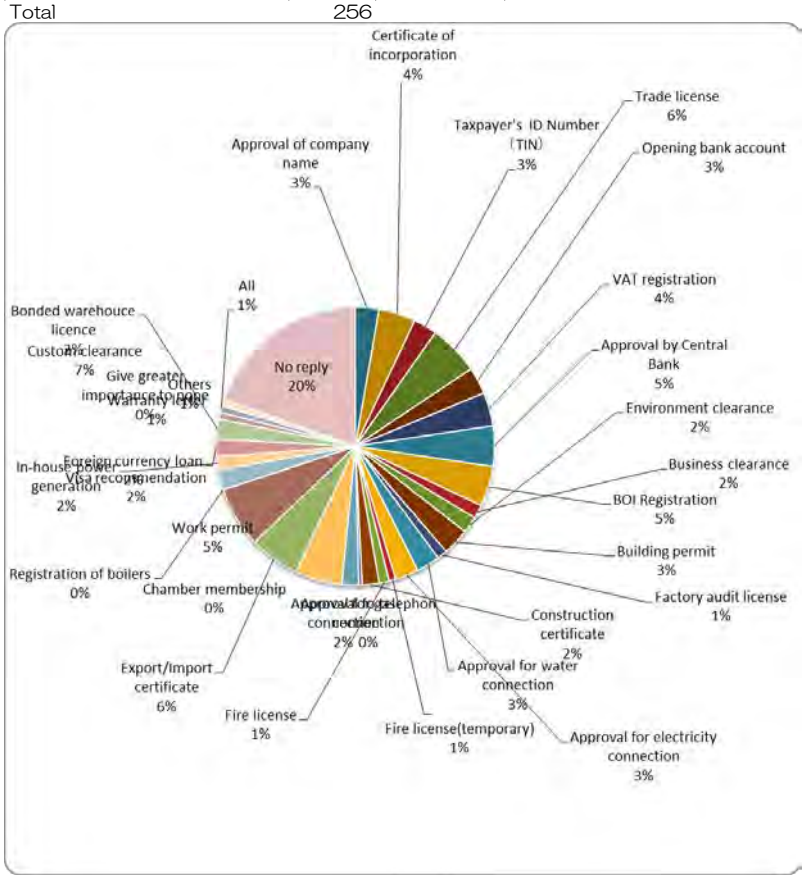
Item	Reply	Reply ratio
1 to 3 years in future	14	17%
3 to 5 years in future	5	6%
5 to 10 years in future	0	0%
Undecided	13	16%
Others	1	1%
0. No reply	49	60%
Total	82	



[Questionnaire 8] Please select the item of One-Stop Service which you may think is very important.

Items that the participants believe to be of great importance are as follows: Approval of company name, Certificate of incorporation, Trade license, VAT registration, Work permit, Export/Import certificate and Customs clearance.

Item	Reply	Reply ratio
Approval of company name	7	3%
Certificate of incorporation	11	4%
Taxpayer's ID Number（TIN）	7	3%
Trade license	15	6%
Opening bank account	8	3%
VAT registration	10	4%
Approval by Central Bank	12	5%
BOI Registration	12	5%
Business clearance	4	2%
Environment clearance	5	2%
Building permit	8	3%
Factory audit license	3	1%
Approval for water connection	7	3%
Approval for electricity connection	7	3%
Fire license(temporary)	2	1%
Fire license	3	1%
Construction certificate	5	2%
Approval fo telephon connection	1	0%
Approval for gas connection	5	2%
Work permit	14	5%
Chamber membership	0	0%
Export/Import certificate	15	6%
Custom clearance	18	7%
Registration of boilers	0	0%
Visa recommendation	6	2%
In-house power generation	4	2%
Foreign currency loan	5	2%
Bonded warehouce licence	6	2%
Warranty letter	2	1%
All	2	1%
Give greater importance to none	0	0%
Others	2	1%
No reply	50	20%
Total	256	



[Questionnaire 9] Please remark any opinion on Economic Zone incentive packages freely.

- Incentive is important for FDI. But in Bangladesh, corporate taxes are imposed on deemed income, which is seems very illogical for developed countries like Japan.
- Unless such a situation is improved, it would be difficult to increase investment in the future.
- We desire that Bangladesh should prepare more attractive incentives compared with its neighboring countries. We believe that Bangladesh should clarify that the incentives for investing in Bangladesh bring more advantages and benefits than investing in neighboring countries.
- Please clarify the difference between EZ and EPZ.

[Reference]

Among the 211 industrial sector participants, there were 62 persons (29.4%) from manufacturing, and 36 persons (17.1%) that were “others (media and unknown)”.

(Based on number of registration on seminar)

Industrial sector	Present	Ratio
1. Manufacturing	62	29.4%
2. Commerce(Trade, Distribution)	22	10.4%
3. Service （Transport, Finance, Consulting)	70	33.2%
4. Government, Public Organization	8	3.8%
5. Construction, Real Estate, Developer, Infrastructure	13	6.2%
6. Other (Media, Unknown)	36	17.1%
Total	211	100.0%

2) Outline of Seminar at Osaka

- Date and time: Wednesday, April 13th 2016 14:00-18:00
- Venue: Osaka Chamber of Commerce and Industry
- Organized by: BOI, JICA, JETRO
- In association with: Bangladesh Embassy in Tokyo, Federation of Bangladesh Chambers of Commerce and Industry, Japan Chamber of Commerce and Industry, Osaka Chamber of Commerce and Industry, Mitsubishi Tokyo UFJ Bank
- Number of participants: 122 persons

At Osaka seminar, Dr. S.A. Samad, Executive Chairman of Board of Investment made the opening remarks. Dr. Tawfiq-e-Elahi Chowdhury, BB Power, Energy and Mineral Resources Affairs Advisor to Prime Minister, Mr. Abudl Matlub Ahmad, President of The Federation of Bangladesh Chambers of Commerce and Industry made speech. The Managing Director of the High Tech Park Authority, the Chairman of Bangladesh Export Processing Zones Authority, the CEO of Public Private Partnership Authority and many other senior officials participated in seminar. Mr. Ahmad, President of FBCCI and Mr. Salahuddin Kasem Khan, representatives from the Japan-Bangladesh Chamber of Commerce and Industry led the representatives of large enterprises of Bangladesh, who were participating the seminar. The event was broadcasted live on television by Ekattor TV of Bangladesh from the Osaka seminar venue.

Representing Japan, JETRO and JICA made presentations. Many investors who were interested in investment in Bangladesh joined the seminar, and the venue was filled to capacity. The participants showed interest in receiving updated information which was provided, and exchanged opinions with participants from public and private sectors of Bangladesh. One Bangladeshi presenter emphasized the incentives and investment opportunities, and the potential in the emerging country's economy, thereby indicating to Japanese investors that Bangladesh is now prepared to successfully handle further economic development.