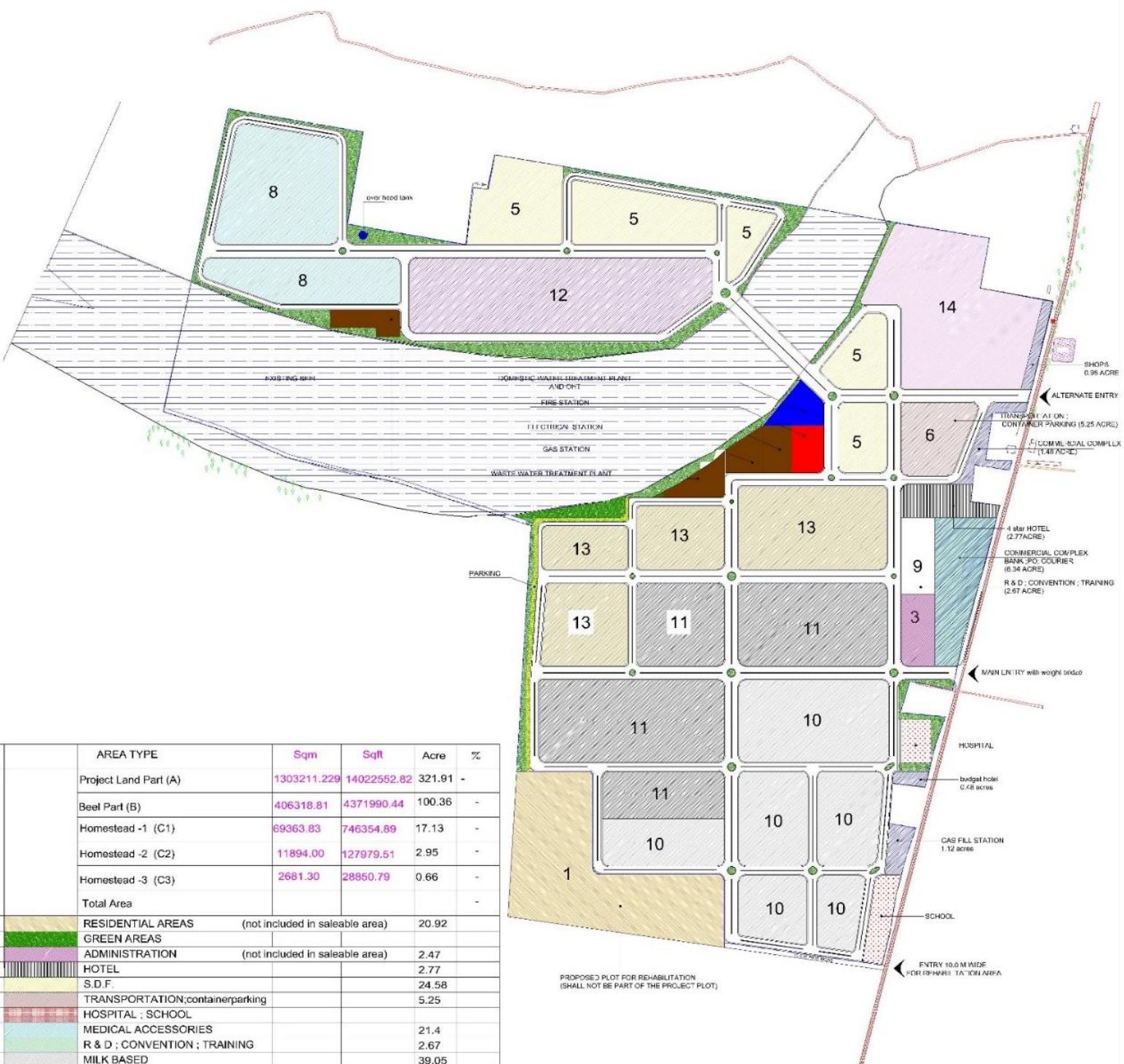
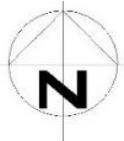


Draft Detailed Feasibility Study report for Jamalpur Economic Zone

Draft Report
January 2017



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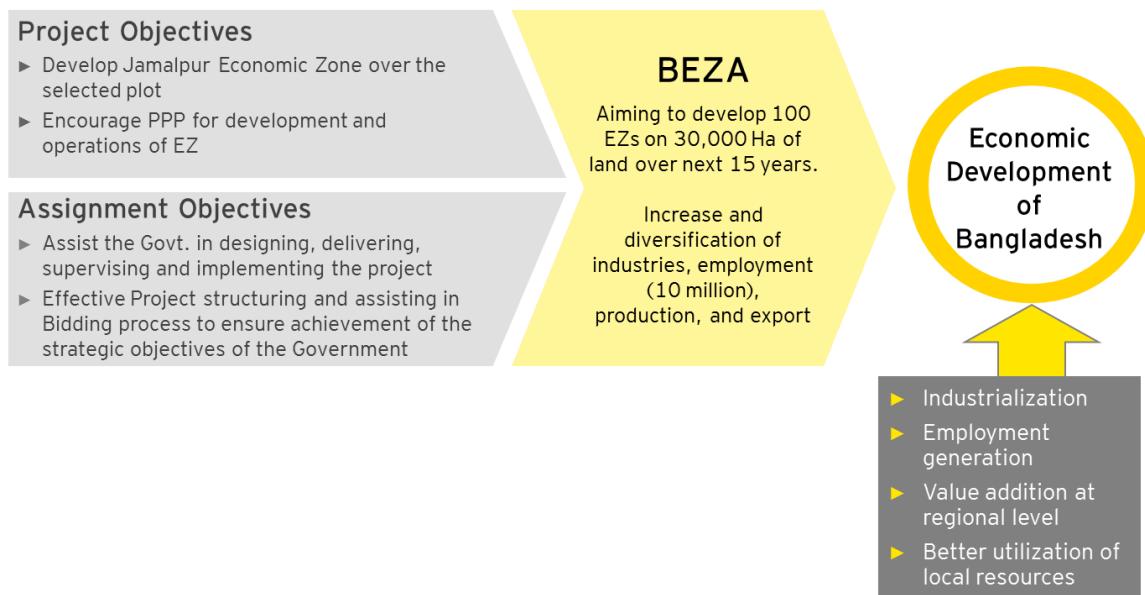
1. Introduction

1. Introduction

1.1 Executive Summary setting out the overall findings and key issues of the Project

Industrial Development would require common infrastructure facilities such as power supply, industrial Gas supply, water supply, Water Treatment plant for treatment up to water quality suitable for industrial purpose, drainage system network, waste water treatment facility, solid waste management system, public transport to provide adequate connectivity to Jamalpur Sadar and other neighboring residential and commercial area, adequate road network connectivity to major commercial markets, sea-ports and airports of the country. In addition to the scale of supply of utilities such as electricity, gas and water, their consistency will also play a critical role in sustainability of the industries that would develop in the Economic Zone.

Apart from these utility and infrastructure related service gaps, to ensure environmental sustainability of the proposed development, it will be highly important to set up an organized structure for environmental compliance of the envisaged developments within and around the proposed project. Chapter 2 of this report present the need analysis of the proposed development.



A holistic development process for establishing an Economic Zone will not be satisfied if only the internal infrastructure are in place. It also requires an adequate infrastructure to link with the rest of the economy. Thus the link project assessment exercise has been carried out.

Based on the assessment of these primary and secondary survey outcomes, following key linked projects and Government Authorities responsible for their implementation have been identified which would contribute to seamless operation of the proposed Economic zone development and the envisaged developments of support industries in and around the Economic Zone.

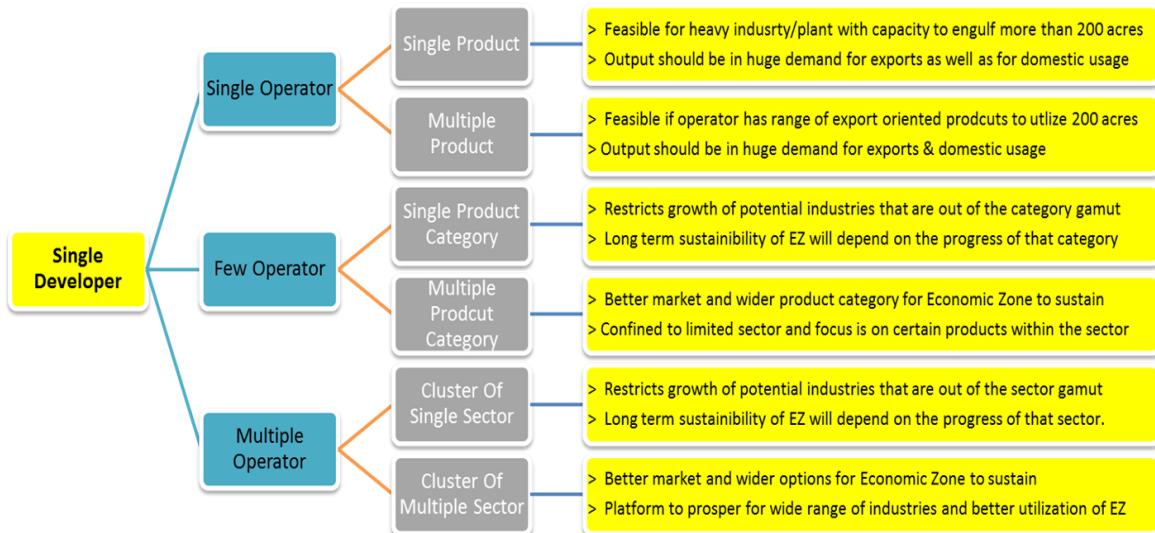
Key Linked Projects	Implementing Agency
▶ Land Acquisition	▶ Deputy Commissioner's office, Jamalpur
▶ Upgradation of the Road network	▶ Roads & Highways Department, Jamalpur

▶ Development of Electrical Grid line for power supply to the Economic Zone and an Electrical sub-station within the Economic Zone	▶ Jamalpur Palli Bidyut Samity
▶ Development of Industrial Gas pipeline network for supply to the Economic Zone and a Gas Substation within the Economic Zone	▶ Titas Gas Transmission and Distribution Company
▶ Domestic Water Treatment Plant and water pumping station	▶ Department of Public Health Engineering, Jamalpur
▶ Drainage network for disposal of the treated waste water	▶ Department of Public Health Engineering, Jamalpur
▶ Solid Waste Management system	▶ Department of Public Health Engineering, Jamalpur
▶ City Development planning	▶ Jamalpur Municipality
▶ Fire station establishment	▶ Jamalpur Fire Service

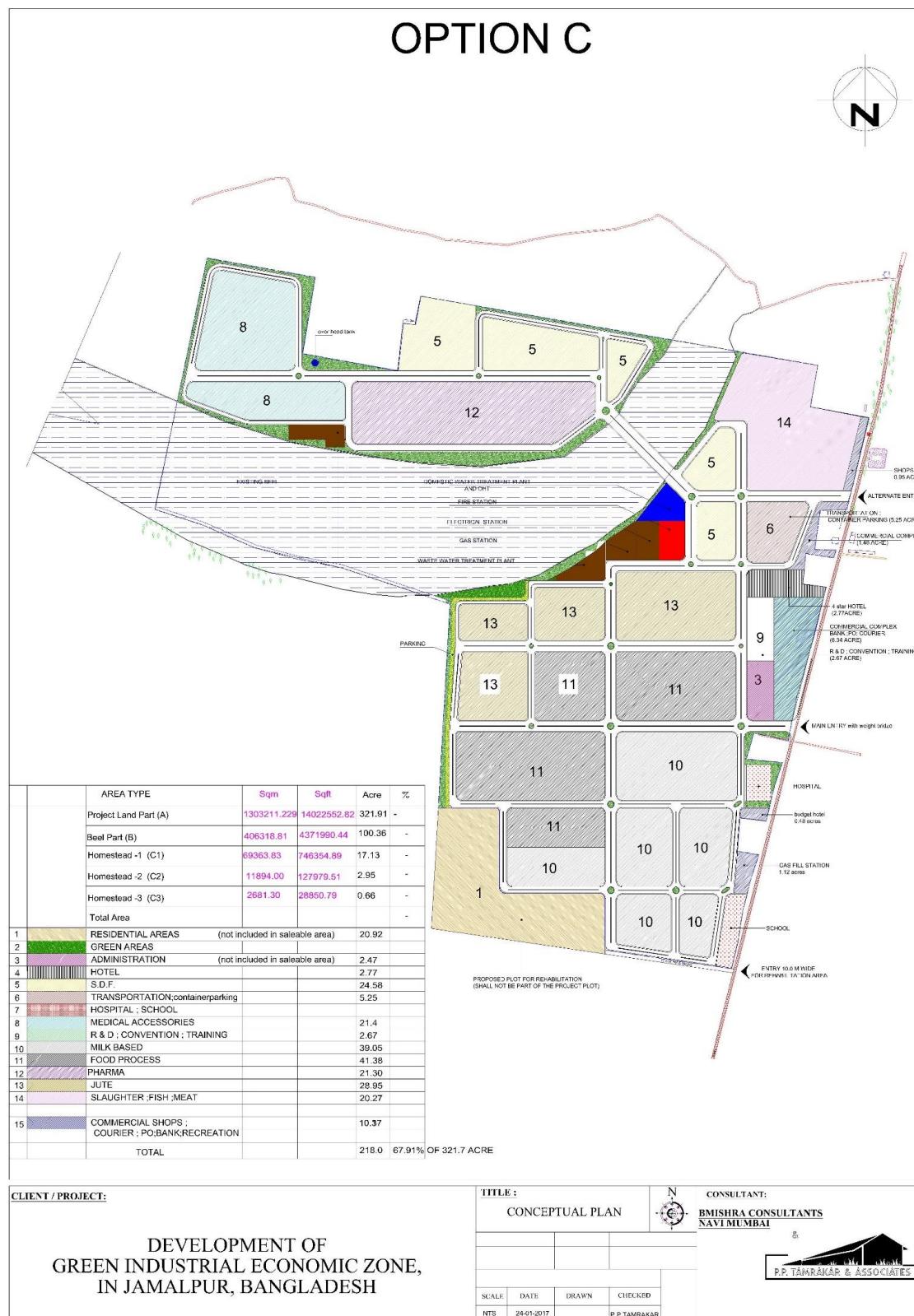
The details status of the link projects are presented in Chapter 3.

The technical suitability of the project has been assessed through required engineering surveys and investigations. The Topographic survey and soil investigations ensures the suitability of the proposed site to be developed as an Economic zone. The survey results are presented in the Chapter 4.

The development modality of the EZ provides enough rooms to accommodate all possible scenarios to avoid the risks of attractiveness to the investors.



In this process three options of indicative master plans are developed. The logical deduction shows one of them as preferred option (Option C as presented in Chapter 4)



The estimated project cost of the project BDT 304 cr. excluding LA and R&R costs. However, the estimated capital cost for the private partner is in the tune of BDT 210 cr.

S.NO	PARTICULARS OF ITEM	MILLION BT
	Responsibilities of the Private Partner	
1	Road and internal network	563.28
2	Drainage piping and waste water treatment plants	276.79
3	Domestic water piping and tanks for storage	103.19
4	Storm water drainage	71.08
5	Administrative building and associated construction work	90.00
6	Bridge	550.00
7	Green area with plantation	10.00
8	Site boundary: 2 m above the fill level	144.00
9	Fire fighting	70.00
10	Electrification - street lighting and power distribution	75.00
11	Gas distribution network	37.98
	Total direct project cost to developer in bt million (a)	1,991.32
	Contingencies @ 5%	99.57
	Total cost including contingencies	2,090.88
	Responsibility of government	
1	Rehabilitation - houses only	200.00
2	Land filling area	456.21
5	Retaining wall with water body protection	135.00
9	Site boundary (only as required for land filling as retaining wall)	259.20
	Total project cost in bt million (b)	1,050.41
	Total project cost (a+b)	3,041.72

The total project cost that includes IDC and financial overheads for the private partner stood as BDT 290 cr.

The modalities of the operation and maintenance are presented in Chapter 4, Chapter 5 and Chapter 8.

The basic operating model of the Economic Zone is either of the two as listed below:

1. The developer will realize the entire development cost through upfront sales proceeds and the operation and maintenance will be carried out with basic minimum profit (say about 15%)
2. Owing to market sensitivity towards upfront payments, the developer may choose to realize lower amount of sales proceeds and may charge higher level of lease premium subsequently throughout the entire lease period.

In the first model, the developer quickly realizes his investment along with profit but the attractiveness of the plots to the individual manufacturers reduces. In contrast, the second model portrays a lower level of upfront with same service provisioning and thereby increases the attractiveness but the revenue gap is recovered through lease rentals. In this model, the project viability depends on long term realization of lease rental.

Item	Flow of cost	Cost	Remarks
Lease Rental	Developer to Contracting Authority	BDT 0.1 per sq. ft. To be increased annually at 5%	
Lease Rental	Individual lease holder to developer	BDT 2 per sq. ft. To be increased annually at 7.7%	
Maintenance cost	Developer spends through maintenance expenses	BDT 2.96 per sq. ft. Considered an escalation of 5% per annum (period maintenance cost has been annualized)	Applicable on the entire park area (425.88 acres)
Maintenance cost	Individual Lease holder pays to the developer towards meeting the maintenance expenses of the developer	BDT 6.67 per sq. ft. Considered an escalation of 5% per annum	Applicable only on the industrial use (195 acres)
Charges for services (like gas, electricity, water)	The Contracting Authority will collect the charges and pay to the suppliers	To be decided at a later date depending on the charges of the basic supply cost	The charge that Contracting Authority will collect will be higher than the supply cost owing to meeting the administrative expenses, unforeseen contingencies and a normal profit. The case of partial cost recovery may be decided at later stage

Chapter 6 presents the preliminary Social and Environmental Impact Assessment.

Environmental Impact

- The Initial Environmental Examination (IEE) is completed and Authority has received the Site Clearance Certificate (SCC).
- The proposed site of the Jamalpur EZ does not fall in the Ecologically Critical Area (ECA) in Bangladesh.
- The proposed site for the Jamalpur EZ do not fall under the jurisdiction of any of the protected or ecologically sensitive areas in the Bangladesh.
- The TOR for EIA has already been approved by the Department of Environment (DoE).

- Since Site Clearance Certificate (SCC) has already been procured, the construction / development work can be started.

Social Impact

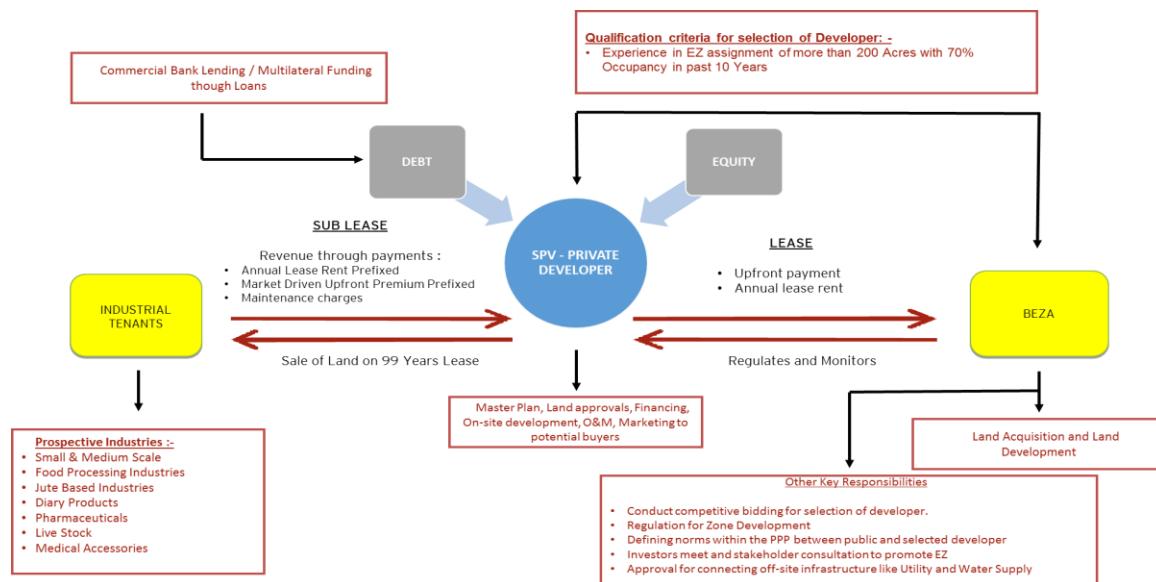
- Direct impact on Homestead lands due to the project is limited only on 10 Households.
- As per Government record, impacted homestead land is 2.41 acres, which is less than 1% of the total project area.
- The size of the village that is going to be indirectly impacted is 17.13 acres as per the topographic survey and there are about 75 households in this land parcel.
- As per social survey, all the impacted households prefer 'land for land' for their loss of homestead lands.
- For the loss of structures, the affected people prefer 'structure for structure' as compensation.
- The project affected people prefer job opportunity during the construction / development phase of project as well as vocational training for skill enhancement and better employability for restoration of their livelihood.
- Since the compensation structure as envisaged by the DC office is one time settlement, no entitlement matrix has been developed.
- A 100% social survey may be conducted for the village outside the project area as indicated above as indirect project affected area.
- From the sample survey and consultation, it is observed that majority of the households are ready to relocate if 'land for land' is provided. This process requires further stakeholder consultation.
- In case the alternative of implementation option where the existing indirectly impacted village to be relocated at a suitable place, an alternative model of land pooling can be adopted to reduce the time for land acquisition. In this model, the affected people voluntarily transfer their land to government and in lieu the government transfer the land earmarked for relocation to the land givers.

A detailed discussion on market demand has been presented in Chapter 7. Post secondary data analysis and stakeholder consultation following industries come out to be potential industries for the Jamalpur Economic Zone.

Agro Based	SMES	Health Care	Cattle Based	Logistics
Jute	Soft Drinks	Medical Equipment	Leather	Cold Storages
Maize	Handicraft	Medical Accessories	Meat	Warehouses
Spices	Fertilizers	Pharmaceutical	Milk	Packaging
Fruits & Pulp	Ceramics			
Mustard Oil	Garments			
Rice				

Chapter 8 presents the detailed financial modeling. The structure of the entire development, operation and maintenance is expressed through the following flow diagram.

Draft Detailed Feasibility Study for Jamalpur Economic Zone



The project is found commercially viable.

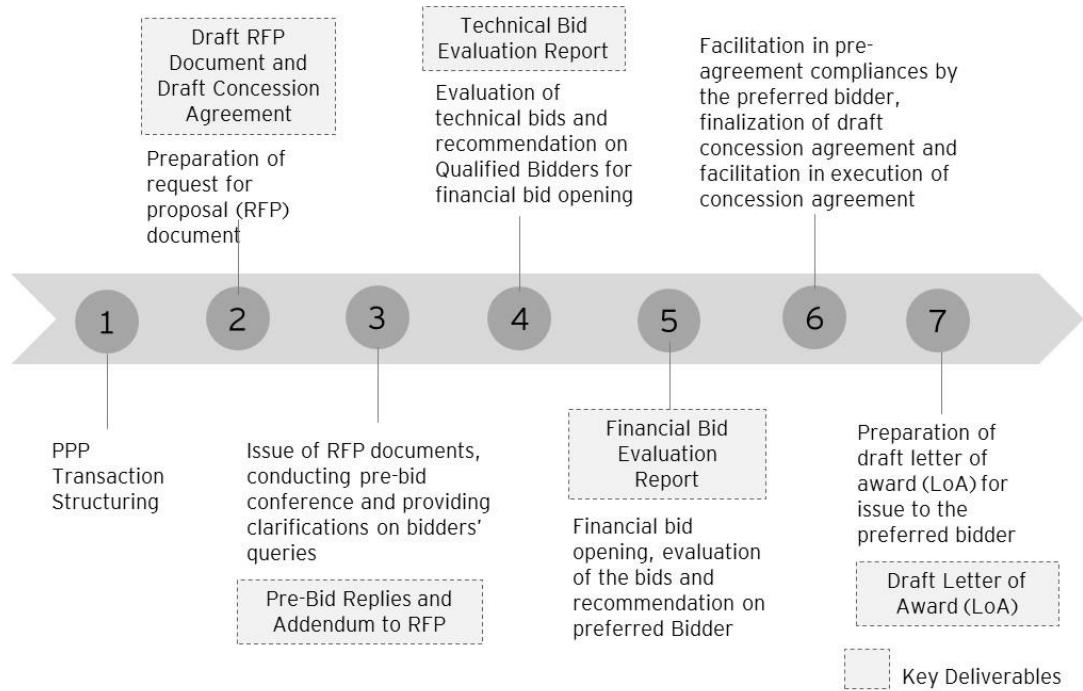
		Equity	Project		
Period	Development Cost	IRR	NPV in Cr	IRR	NPV in Cr
100 Years	100%	20.48%	BDT 2.97	11.92%	BDT 20.71
60 Years		20.43%	BDT 2.77	11.63%	BDT 13.34
30 Years		18.88%	BDT 1.28	10.50%	BDT 0.49

In the following risk matrix, potential project development and implementation risks have been identified along with their scale. The identified risks have also been allocated to suitable stakeholders and appropriate mitigation measures have been proposed to address these project related risks. Details are presented in Chapter 9.

Type of Risk	Assessment of risk
Conceptualization of EZ	Very low
Marketability of the EZ plots	Very low
Project development risk	Low
Environmental & Social risk	Nil/ Low
Non-performance of the developer	Low
Commercial operations risk	Low
Operations & maintenance risk	Low

Chapter 10 through Chapter 11 presents the outline of the second stage of the project development i.e. transaction structuring and procurement plan. The flow of the second stage is present below.

Draft Detailed Feasibility Study for Jamalpur Economic Zone



1.2 Introduction to the Project

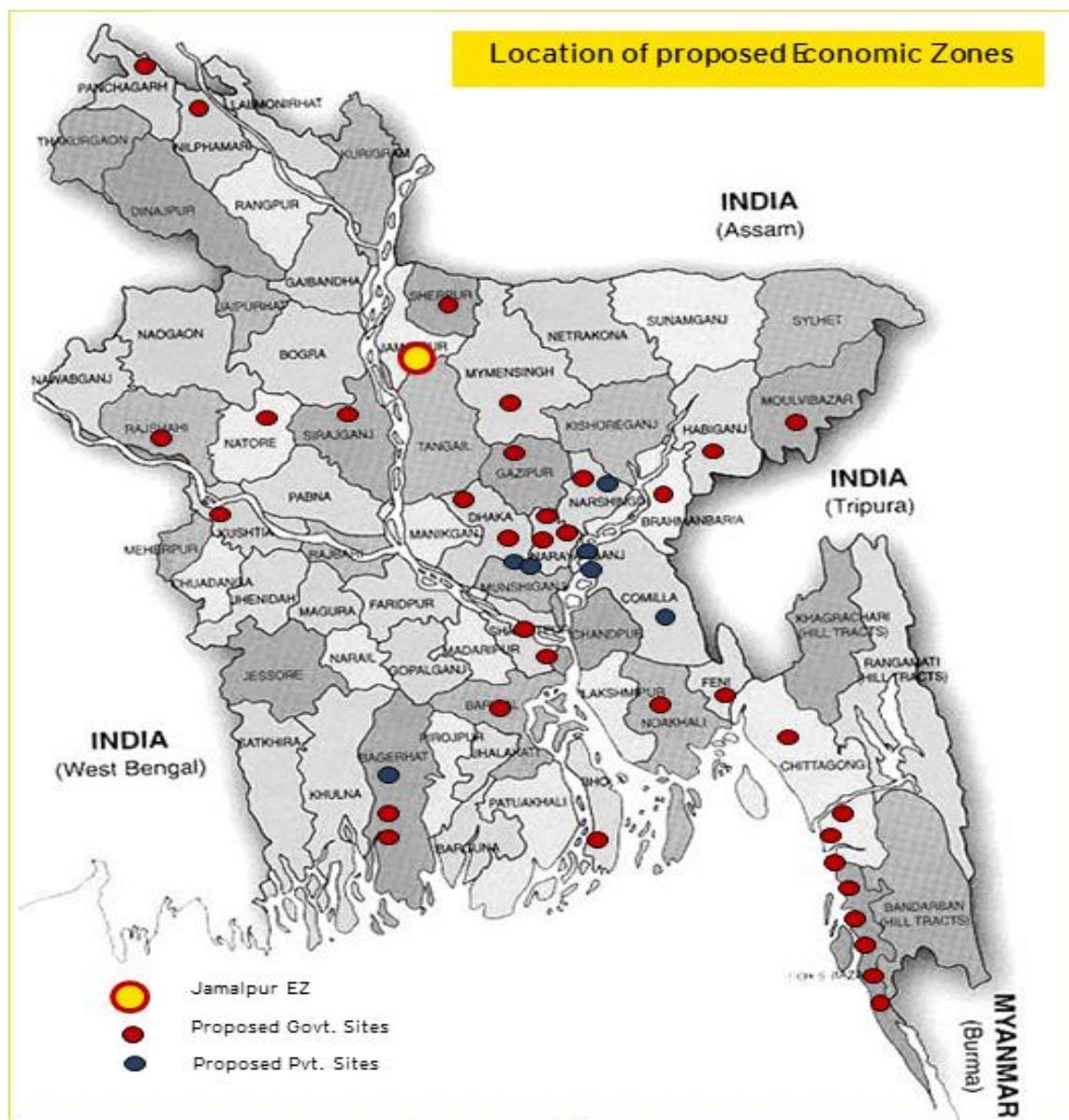
Government of Bangladesh has taken up the initiative of developing Economic Zones across the country through Bangladesh Economic Zone Authority (BEZA) to encourage rapid economic development in the country. Jamalpur district has comparative advantage in terms of abundant Agriculture and Livestock resources along with extensive presence of low cost manpower. The Government has strategically proposed an Economic Zone in Jamalpur in order to utilize this resource potential of Jamalpur and other neighboring districts to boost the economic development in this region.

Project location:

The land identified for the proposed development is located in Jamalpur Sadar of Jamalpur district.

- ▶ Land area identified is approximately 443 acres
 - ▶ Located adjacent to national highway N4, which is approximately 15 kms from Jamalpur town

Figure 1-1 : Proposed economic zones



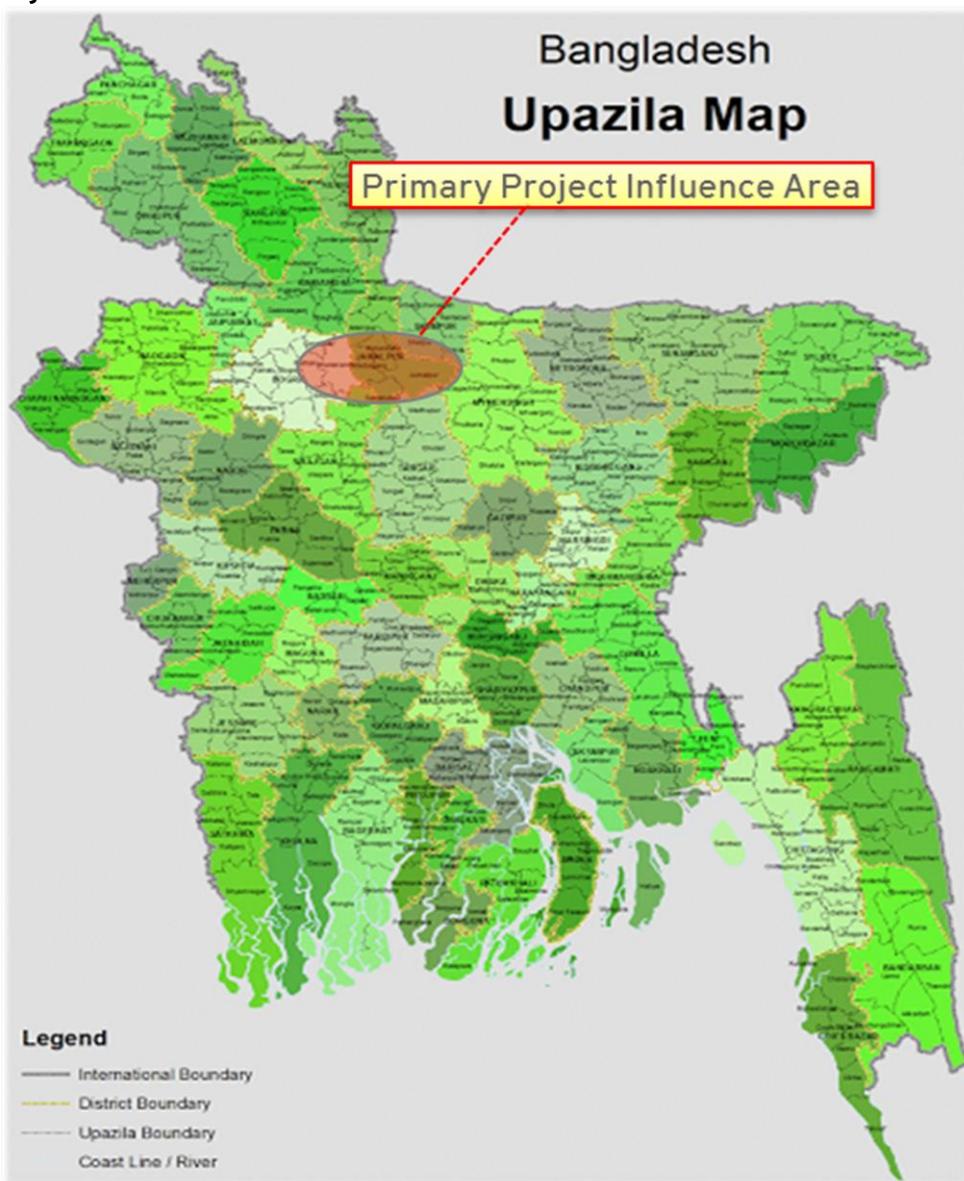
Source: BEZA

1.3 Background of the Project

Socio-Economic Exposition of Project Catchment Area:

The immediate catchment area is shown in the following map,

Figure 1-2 : Immediate catchment area



Source: Google maps and EY Analysis

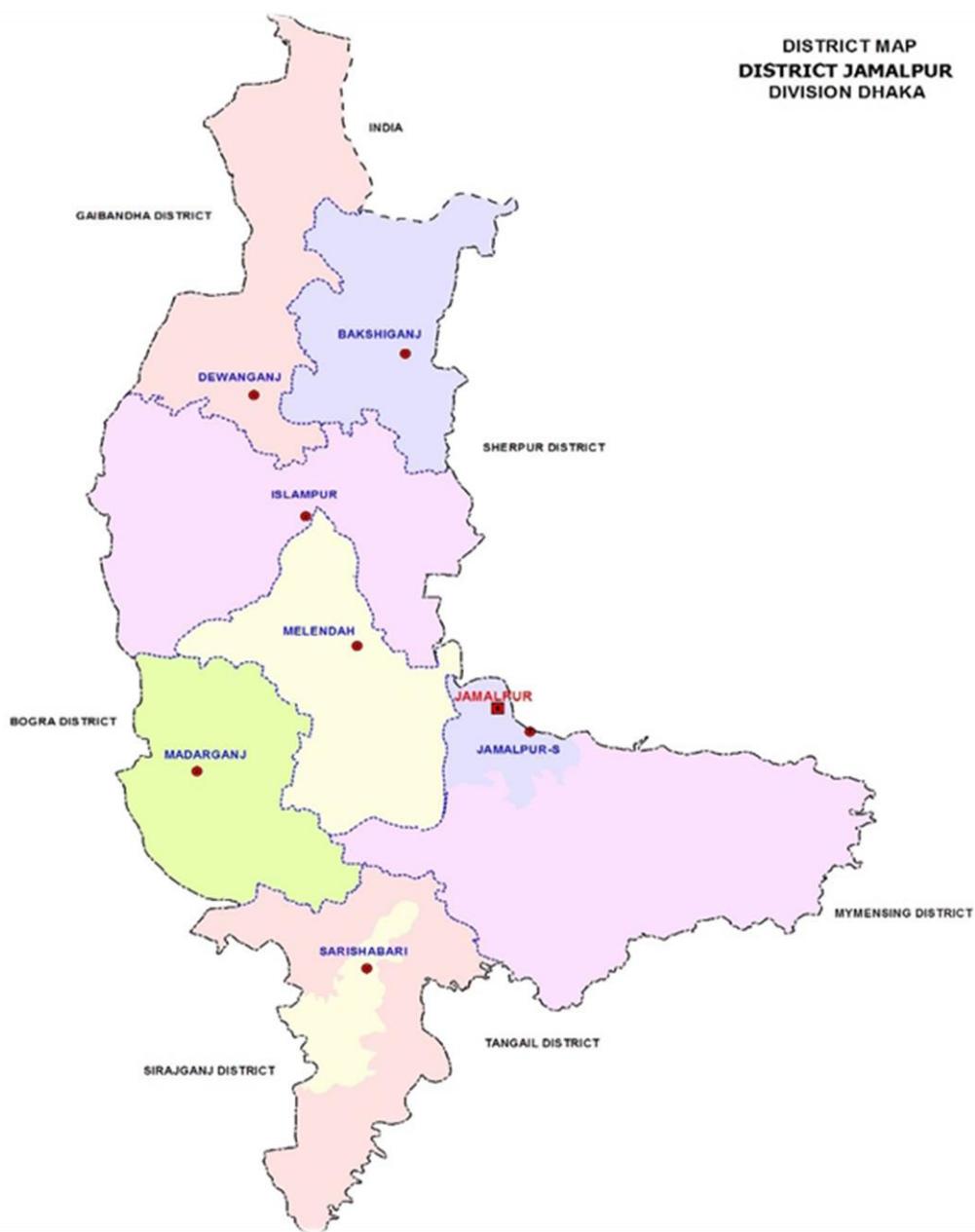
The primary influencing regions of the proposed Jamalpur economic zone are shaded in the red zone. The key primary regions are following Upzilas of Jamalpur District:

- ▶ Jamalpur Sadar
- ▶ Sarishabari
- ▶ Madarganj
- ▶ Melandaha
- ▶ Dhanbari of Tangail District

The constructive impacts on primary region will be injunction of direct employment, boosting of Infrastructure developments, new investment opportunities, betterment in quality of life and balanced overall growth.

The salient features of Jamalpur district:

Figure 1-3 : Map of Jamalpur district



Source: Google maps

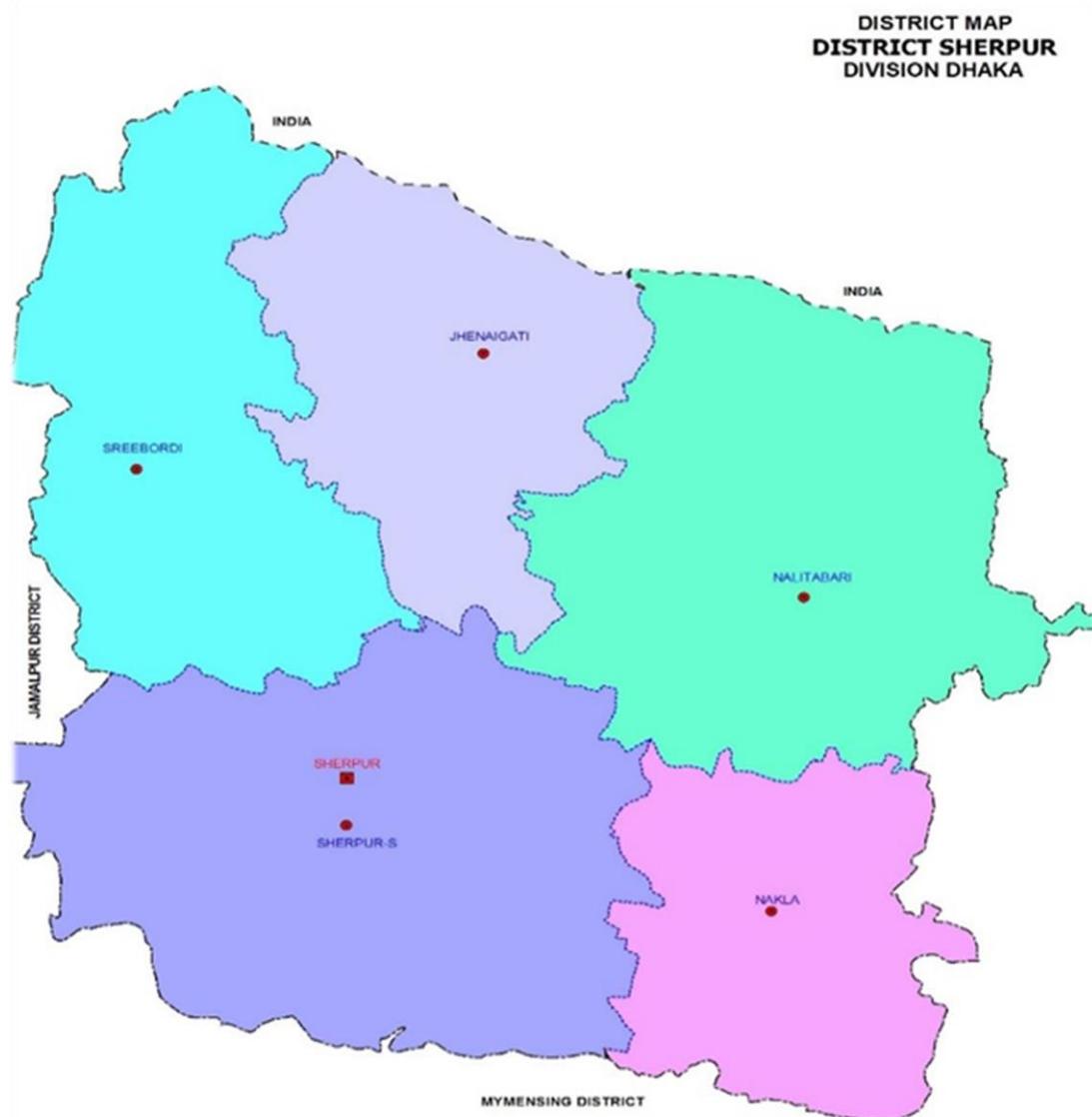
The economy of Jamalpur district is largely agricultural. As per the Jamalpur District Statistics 2011, out of total 5,46,075 holdings of the district, 3,36,784 (61.67%) holdings are farms and remaining 38.33% are non-farm holdings. These non-farm holdings are mostly dependent on non-agricultural activities. However, the primary growth is due to agricultural activities, the non-farm holdings play an important role in the economy of this district.

Jamalpur district will be directly influenced from the proposed Jamalpur Economic Zone development project. It forms primary influence region of the proposed Jamalpur Economic Zone development project with being the foremost supplier of raw materials for industries to be located in the economic zone.

Jamalpur is a paramount market centre for the rice, sugarcane, jute, tobacco, and mustard engendered in the region. The city is well connected by road, rail, and river with Dhaka and the rest of the country. It has a railway station and three dakbungalows. The town's main exports are jute, tobacco, mustard seed, peanut, leather, egg, pulse, betel leaf and handicrafts.

The salient features of Sherpur district:

Figure 1-4 : Map of Sherpur district



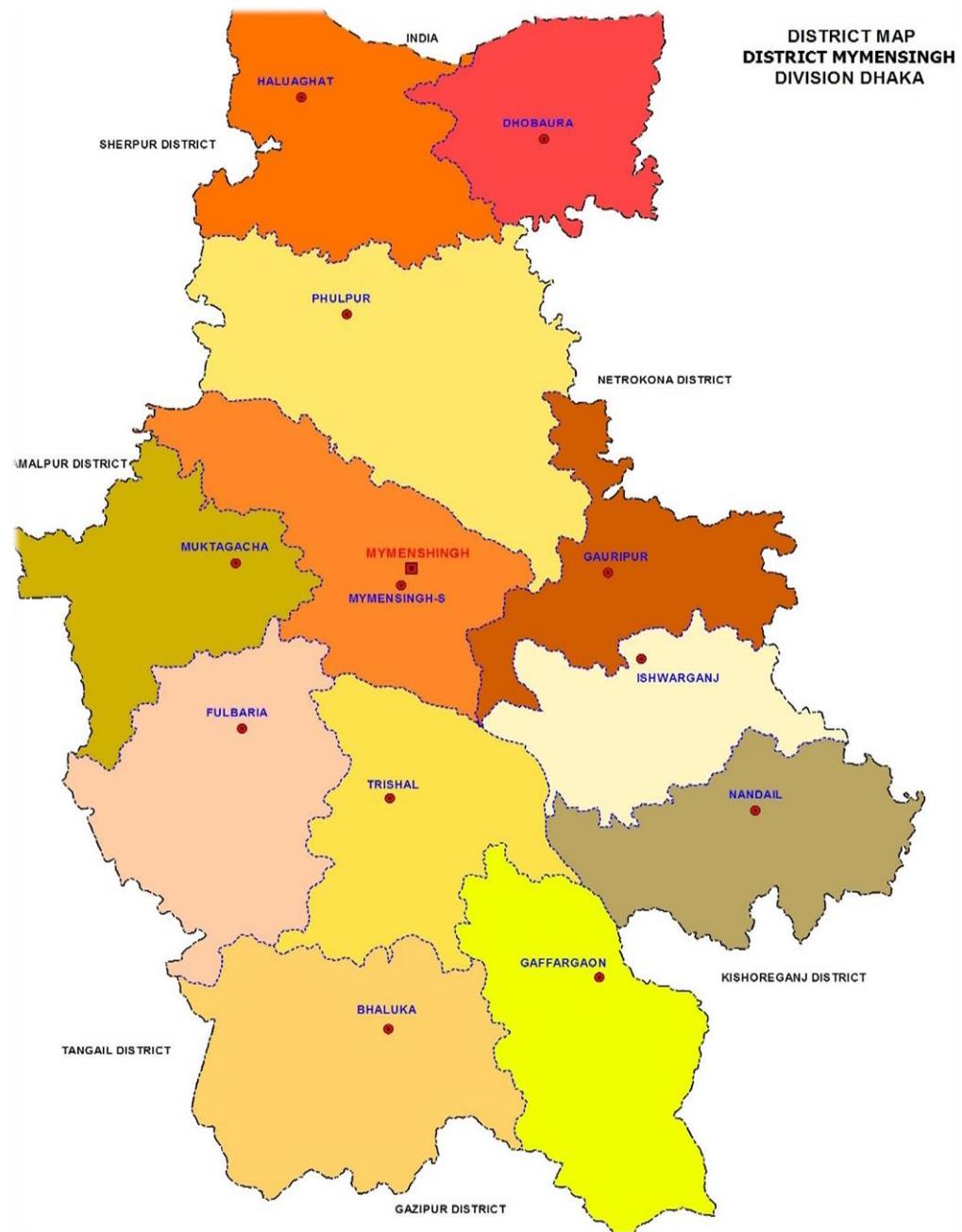
Source: Google maps

The economy of Sherpur is mainly agro based, although non-farm economic activities performing a significant share in the development oriented program of the district. As per the Sherpur District Statistics 2011, out of total 3,35,460 holdings of the district, 60.12% holdings are farms and the remaining 39.88% holdings form the part of non-farm holdings which also contribute good to the economy for this district.

Sherpur district forms a part of secondary influence region of the proposed Jamalpur Economic Zone, say around 15 to 25 kilometer radius from the district boundary in the south west, owing to the fact that other regions will be catered from the neighboring economic zones in the vicinity. This district is rich for producing the Paddy, wheat, jute, maize, mustard, kalai, betel leaf, potato, onion, vegetables and banana engendered in the region. The town's main exports are Paddy, wheat, maize, betel leaf, banana, and vegetables. The industrial profile of Sherpur generally consists of rice mills and match factories and few aluminium industries.

The salient features of Mymensingh district:

Figure 1-5 : Map of Mymensingh district



Source: Google maps

The economy of Mymensingh is principally agricultural. As per the Mymensingh District Statistics 2011, out of total 11,03,260 holdings of the district, 59.15% holdings are farms. Mymensingh district will be partially influenced from the proposed Jamalpur Economic Zone development project, say around 15 to 25 kilometer radius from the boundary of the district in west whereas the other regions will be catered by the economic zones in the vicinity of Dhaka. Thus, Mymensingh district forms a part of secondary influence region of the proposed Jamalpur Economic Zone.

Mymensingh is a principal market centre for the local and High Yielding Variety (HYV) paddy, sugarcane, wheat, vegetables, spices, jute, pulses, and other minor cereals and also various fruits like mango, banana, jackfruit, guava, coconut etc., which are engendered in the region. The main exports are garments clothes, jute, paddy, oil seed, egg, banana, leather, milk products, jackfruit, chicken and chilli.

The salient features of Tangail district:

Figure 1-6 : Map of Tangail district



Source: Google maps

The economy of Tangail district is predominantly agricultural. As per the Tangail District Statistics 2011, out of total 8,01,637 holdings of the district, 62.50% holdings are farms and remaining 37.50% are non-farm holdings which also contribute to the greater extent to the economy of this district.

Tangail district will be partially influenced from the proposed Jamalpur Economic Zone development project, say around 20 to 40 kilometer radius from the boundary of the district in north whereas the other regions will be catered by the economic zones in the vicinity of Dhaka. Thus, Tangail district forms a part of secondary influence region of the proposed Jamalpur Economic Zone development project.

Tangail is a paramount market centre for the paddy, potato, jute, sugarcane, sesame, linseed, wheat, mustard seed and pulse engendered in the region. The main exports are jute, pineapple, silk, cotton, sari, banana, sugarcane jackfruit and honey.

Socio-Demographic features of Jamalpur and surrounding districts:

The table below shows the relative assessment of the neighboring districts along with the country with respect to socio-demographic intricacies,

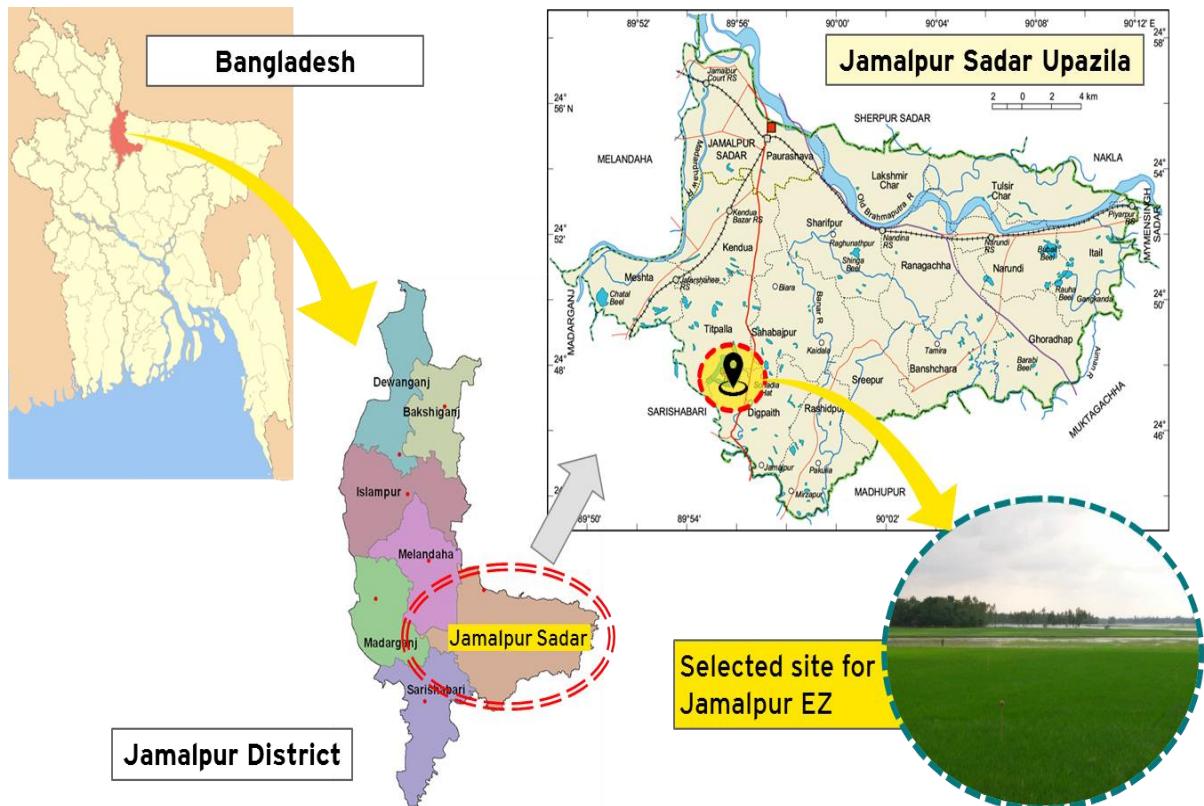
Table 1-1 : Socio-Demographic profile

Particulars	Jamalpur District	Sherpur District	Mymensingh District	Tangail District	Bangladesh
Population ("000")	2,292.7	1,358.3	5,110.3	3,605.1	1,44,043.7
Share of National Population	1.6%	0.9%	3.5%	2.5%	100%
Area	2,115.2 Sq.km.	1,364 Sq.km.	4,363.5 Sq.km.	3,414.4 Sq.km.	1,47,570 Sq.km
Share of Area	1.4%	0.9%	3.0%	2.3%	100%
Population Density	1,084/Sq.km	995/Sq.km	1,163/Sq.km	1,056/Sq.km	976/Sq.km
Male	11,28,724	6,76,388	25,39,124	17,51,370	7,21,09,796
Female	11,63,950	6,81,937	25,71,148	18,47,713	7,19,33,901
Sex Ratio	970	990	990	950	1,000
Annual Growth Rate	0.8%	0.6%	1.3%	0.9%	1.5%
Urbanization Rate	16.9%	13.9%	15.6%	15.1%	23.3%
Literacy Rate	38.4%	37.9%	43.5%	46.8%	51.8%
Male Literacy Rate	41.1%	40.2%	44.9%	50.0%	54.1%
Female Literacy Rate	35.9%	35.7%	42.2%	43.8%	49.4%
School attendance rate for 5 to 24 years age group	54.7%	53.2%	53.1%	54.9%	52.7%
Number of Upzila	7	5	12	12	545
Number of Union	68	52	146	67	4,543
Number of Pourashava	7	3	10	8	310
Number of Mauzas	718	434	2137	564	56,349
Number of Villages	1,361	695	2,692	919	87,223

Source: *Bangladesh Population and Housing Census 2011*

Location of proposed Jamalpur economic zone,

Figure 1-7 : Location of proposed Jamalpur EZ project



Source: EY

The plot selected for the proposed EZ project is situated in South-West zone of Jamalpur Sadar Upazilla in the Jamalpur District. It is adjacent to national highway N4 - Jamalpur Joydebpur National Highway 4, and the site is located approximately 15 kms from Jamalpur town and approximately 150 kms from the national capital city Dhaka.

The proposed project footprint comprises of following Six villages:

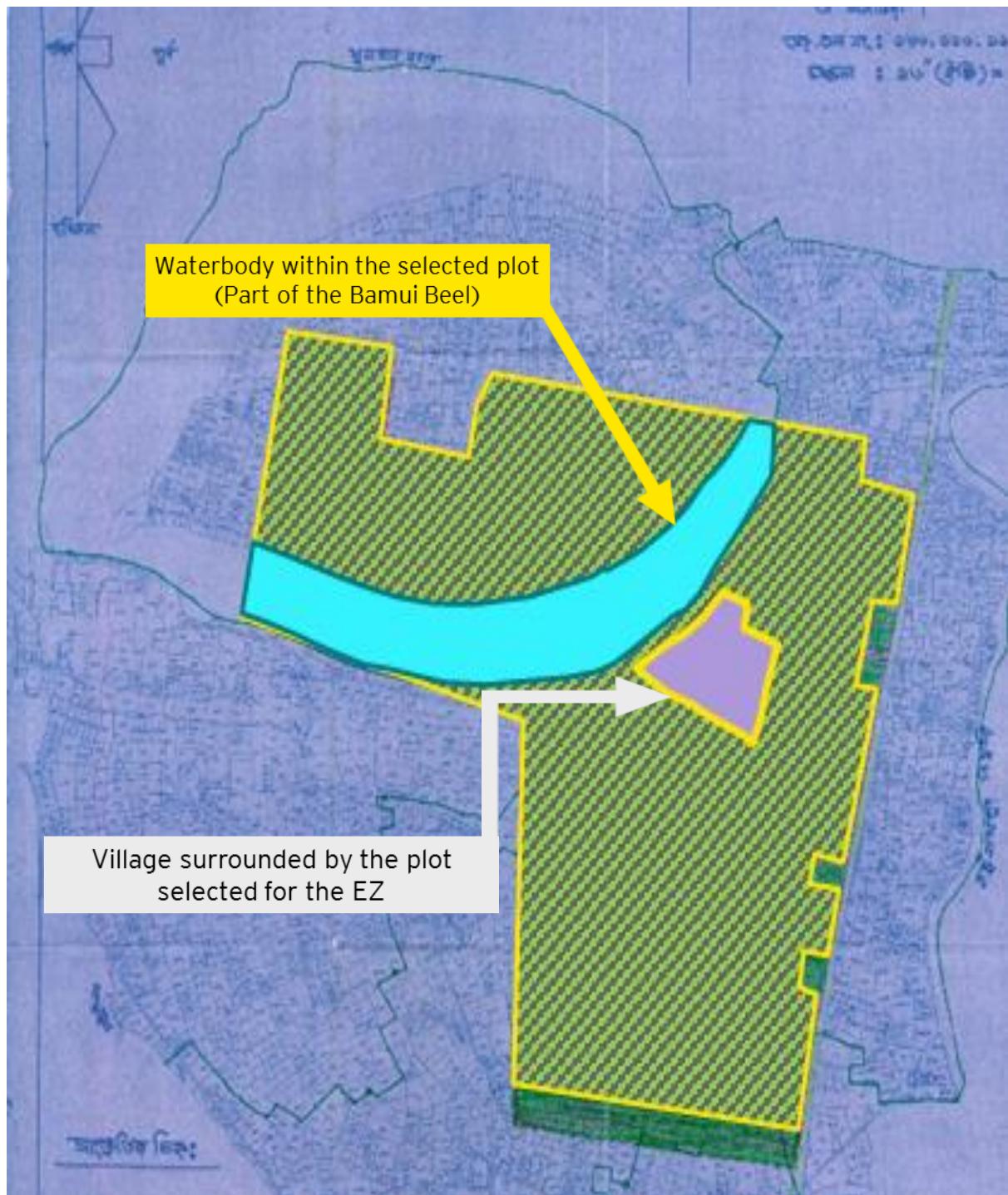
- ▶ Raghunathpur Dighuli
- ▶ Haridrahata
- ▶ Gandail
- ▶ Joanerpara
- ▶ Sontia
- ▶ Sultan Nagar

The proposed plot partially includes a water body named 'Bamui Beel'. Total area of the waterbody within the project site is around 100.36 acres. The waterbody is 4 to 6 feet deep, within the project location. Most of the plot is flooded with water up to around 1 to 2 feet deep during the monsoon season. Hence, appropriate soil filling is required to be done in order to avoid such flooding in future which could have a negative impact on the functioning of the industries.

The existing land use pattern followed for the selected plot consists of mostly agricultural land with almost flat terrain and residential land use for an area around 3.61 acres (for two homesteads) included in the selected plot, however a part of homestead of around 17.13 acres is excluded from the total land area of the plot. These three homesteads are the part of Raghunathpur Diguli village of the selected plot area for Jamalpur EZ.

Salient features of the proposed Jamalpur Economic Zone are discussed here,

Figure 1-8 : Salient features of proposed Jamalpur EZ



Source: BEZA and EY Analysis

The site is surrounded by the Paboi market around 3 kms in the north, Digpaith market around 3.4 kms in the south, Bangshi river and Joydevpur-Tangail-Jamalpur national highway N4 adjoining in the east and Gabtoli bazar around 4.8 kms in the west. The proposed Jamalpur economic zone will be spread on 443.01 acres of land which is including homestead of around 17.13 acres of land as shown in the above layout (Village surrounded by the plot selected for the EZ). The actual land area excluding homestead (not accounted for development area) comes out to be 425.88 acres of land area including part of bamui beel area (100.36 acres).

Table 1-2 : Overview of the Identified Project Site Assessment

Location Assessment	
Location	Adjacent to N4 Joydevpur-Tangail-Jamalpur National Highway and near Bamui Beel
Total Site area	Approx. 443 acres (Approx. 3 acres to be acquired and approx. 100 acres of waterbody)
Location Characteristics	
Location Boundary	Location boundaries shall be finalized post completion of Land acquisition process
Encroachments	None
Shape	L-shaped land with a waterbody within site
Ownership	Individual ownership of 343 Acres; Land ownership shall be transferred by the Government to BEZA post Land Acquisition process
Physical Conditions	
Land Type and profile	<ul style="list-style-type: none"> ▶ Agricultural land with a waterbody (Bamui Beel) of approx. 23% of the total plot area ▶ Depth of the waterbody: vary in range of approximately 6 to 10 feet (according to depth profile as per the final results of the Topography Survey) ▶ Flat Terrain ▶ Elevation: the plot is below the adjacent Road Level by 7 to 12 feet (according to detailed elevation profile as reported in the Topography survey report)
Current Usage of the selected plot	
Usage	Currently used as agricultural land and fishing ponds
Existing Structures within proposed plot	There is no residential or commercial structure within the plot selected for the EZ. Some portion of Raghunathpur Dighuly Mouza within is inhabited which is not within the selected plot
Location Catchment	
Location Neighborhood	<ul style="list-style-type: none"> ▶ Neighbouring Markets: <ul style="list-style-type: none"> ▶ Digpaith Market - 6 kms ▶ Jamalpur Sadar - 15 kms ▶ Bausi Bazar - 11 kms ▶ Dhanbari Bazar - 15 kms ▶ Bausi Bazar railway station: 11kms ▶ Jamalpur Sadar railway station: 15.7 kms ▶ Administrative offices of Jamalpur Sadar - 17 kms ▶ There is a small water channel (Bangshi River) running in neighbourhood of the selected plot that connects to the waterbody existing in the plot from the outside end of the waterbody

Source: EY Analysis

Preliminary Assessment of the Proposed Project site: SWOT analysis

Strengths:

- ▶ The location terrain is suitable for development
- ▶ The location is free from any encroachments
- ▶ Smooth Land Acquisition process: The land owners of the proposed plot are willing to hand over their land for the EZ development.
- ▶ Good direct connectivity with National Highway network which in turn would connect the EZ to local markets, Sea Ports, Airports and In-land ports

Weaknesses:

- ▶ The area is a low lying terrain and faces water logging during the rainy season; would require significant investment to improve the level of the plot
- ▶ Nearest railway line connectivity is more than 10 kms away from proposed site
- ▶ Existing local investments are predominantly small size

Opportunities:

- ▶ At present, there are no similar large scale industrial set up in this region of the North-West region of Bangladesh
- ▶ Abundant availability of low cost labour
- ▶ Significantly large Agriculture and Livestock resource base available in primary and secondary catchment region which is being exported as raw material with no or minimal value addition at local level.

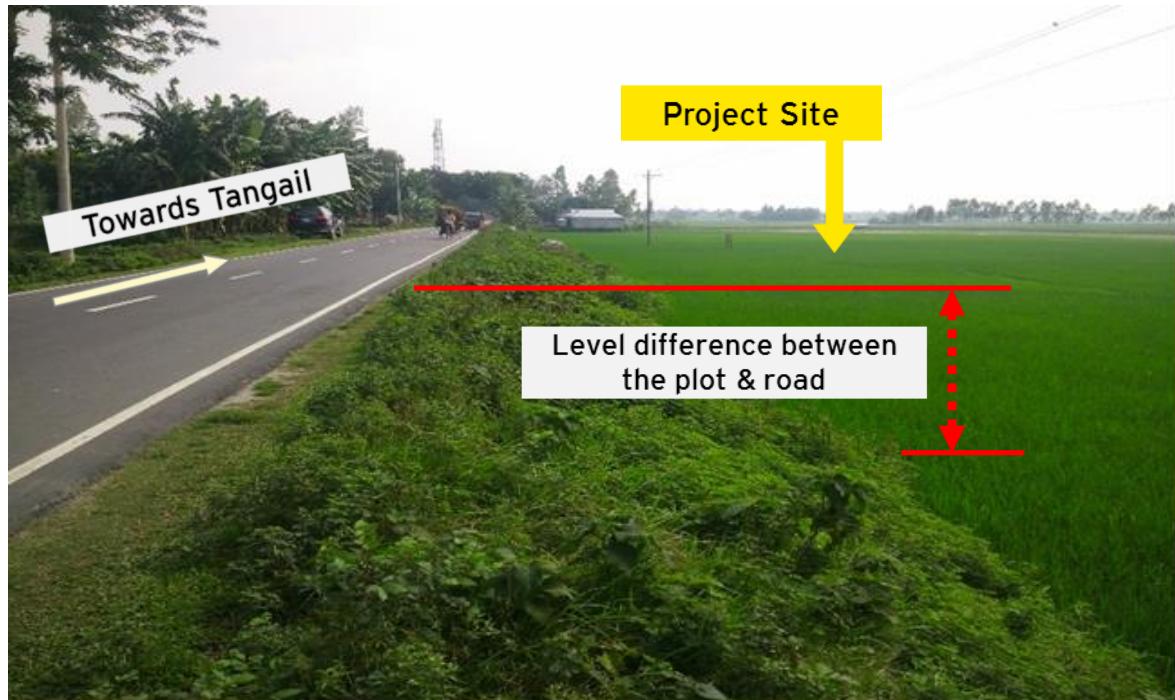
Threats:

- ▶ The proposed project plot surrounds a habitation from all sides with some of the occupants depending on fishing in the adjacent waterbody for livelihood. Development activities such as site level uplifting and access control to the waterbody may get opposed by the local villagers if such social risks are not mitigated properly.
- ▶ Environmental impact due to this development needs to be assessed considering presence of the waterbody within development area as well as in immediate vicinity.

Accessibility of the project site:

Road connectivity of the selected plot,

Figure 1-9 : Road connectivity of the proposed Jamalpur EZ



Source: EY

The selected plot is well connected to the road network of the country through the National Highway N4 (Joydevpur-Tangail-Jamalpur National Highway N4) abutting the site. The site is connected to Jamalpur town around 15 kms in the north side and Tangail around 75 kms on the south side through the national highway N4.

Most part of the plot is at approximateky 7 to 12 feet lower elevation with respect to the adjacent Joydevpur-Tangail-Jamalpur national highway N4 Road.

Road, Rail, Inland waterways, Sea route and Air network of the country,

Figure 1-10 : Transportation network of the country



Source: Google maps

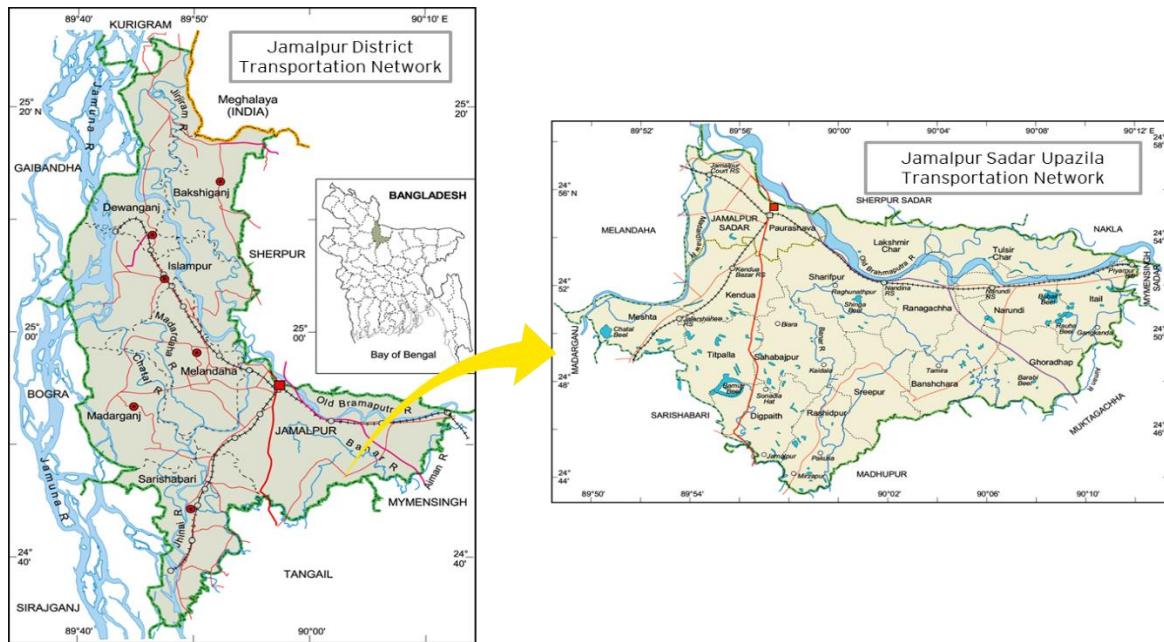
Bangladesh has four ministries responsible for the transportation within the country:

- ▶ Road transport - Ministry of Road Transport and Bridges
- ▶ Civil aviation - Ministry of Civil Aviation and Tourism
- ▶ Maritime Transport - Ministry of Shipping
- ▶ Rail transport - Ministry of Railways

Transportation network in Bangladesh consists of Road network of around 21000 kilometers, Rail network of around 2855 route kilometers, 10 operational airports along with 5 short take-off landing ports, and 5 sea ports along with 22 river ports & 448 secondary riverine ports.

Road, Rail and Inland waterways network of Jamalpur District and Jamalpur Sadar upzila,

Figure 1-11 : Transportation network of Jamalpur district and Jamalpur Sadar Upzilla



Source: Google maps

Transportation infrastructure of Jamalpur District:

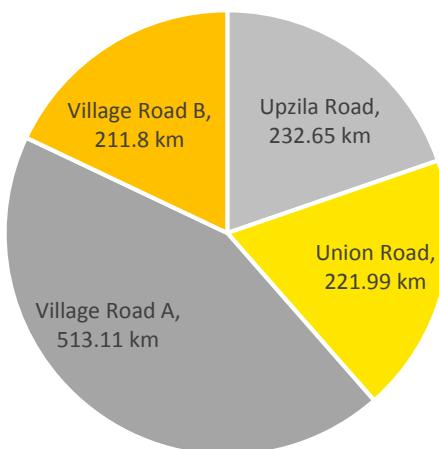
The road network of Jamalpur district comprises of following,

- ▶ Pucca roads network of around 772 kms (18%)
- ▶ Semi Pucca roads of around 120 kms (3%)
- ▶ Kutcha roads of around 3,374 kms (79%)

The railway line network of Jamalpur district consists of a round 108 kms and Inland waterways network of 68 nautical-miles (which is approximately 126 kms) according to BIWTA.

The road network for jamalpur Sadar upzila comprises of following,

Figure 1-12 : Road network of Jamalpur Sadar Upzilla



Source: Local Government Engineering Department (LGED) and EY Analysis
Connectivity of the site with Airport network of Bangladesh,

Figure 1-13 : Airport network of the country



Source: Google maps and EY

There are two types of airports operational in Bangladesh, which are indicated as follows:

- International Airports
- Domestic Airports

There are total 10 airports operational in Bangladesh amongst which 3 are International airports and rest are Domestic airports. In addition to the above mentioned airports, there are 5 short take-off landing (STOL) ports also operational in Bangladesh.

Table 1-3 : Airport connectivity analysis for the proposed site

Sr. No.	Airport Name	Airport Division	Airport Type	Location Served	Distance from proposed project location (Approx. in Km.)	Indicative time required to cover the distance by goods vehicle (in hr and min)
1	Shah Amanat International Airport	Chittagong	International	Chittagong	425	12hr and 42 mins
2	Hazrat Shahjalal International Airport	Dhaka		Dhaka	144	5hr and 22 mins
3	Osmani International Airport	Sylhet		Sylhet	369	10hr and 30 mins
4	Barisal Airport	Barisal	Domestic	Barisal	289	11hr and 2 mins
5	Cox's Bazar Airport	Chittagong		Cox's Bazar	592	15hr and 59 mins
6	Ishwardi Airport	Rajshahi		Ishwardi (Ishurdi)	184	5hr and 2 mins
7	Jessore Airport	Khulna		Jessore	308	8hr and 20 mins
8	Shah Makhdum Airport	Rajshahi		Rajshahi	221	5hr and 44 mins
9	Saidpur Airport	Rangpur		Saidpur	293	8hr and 18 mins
10	Tejgaon Airport	Dhaka		Tejgaon	156	5hr and 44 mins

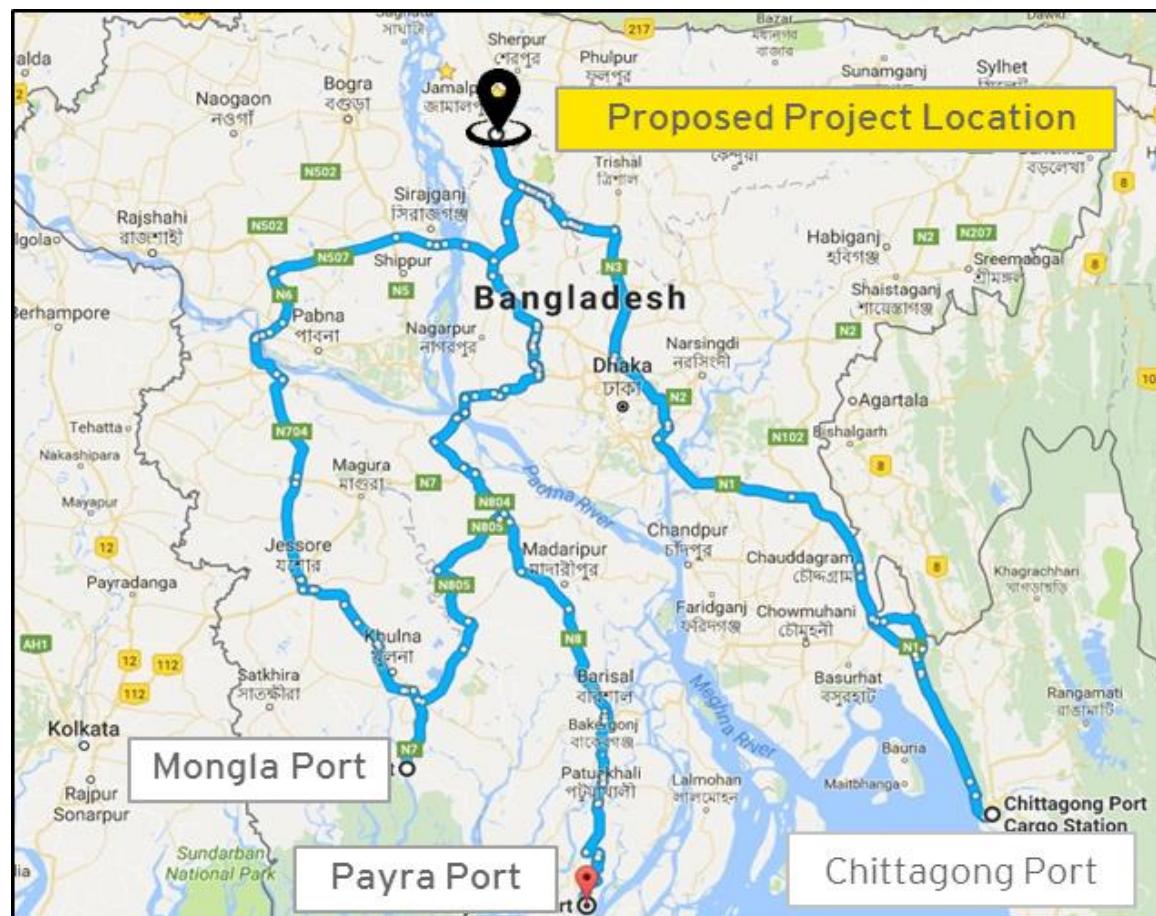
Source: EY Analysis

Hazrat Shahjalal International Airport at Dhaka is the nearest airport to the proposed project location which is at a distance of around 144 kilometers.

The indicative travel time required for a goods vehicle to transit from the project site to Hazrat Shahjalal International Airport and vice versa is approximately 5 hours and 22 minutes, whereas the indicative travel time required for a goods vehicle to transit from the project site to the nearest domestic airport - Ishwardi Airport and vice versa is approximately 5 hours and 2 minutes.

Road connectivity of the project site with major Seaports of Bangladesh,

Figure 1-14 : Road network showing port connectivity



Source: Google maps and EY Analysis

Table 1-4 : Port connectivity analysis for the proposed site

Sr. No.	Port Name	Cargo Capacity (in MT) 2014-15	Container Capacity (in TEUs) 2014-15	Maximum Draft	Distance from proposed project location	Indicative time required to cover the distance by goods vehicle
1	Chittagong Port	43 million	1.5 million	8.99 m	401 km	11 hr and 18 mins
2	Mongla Port	6.5 million	50,000	8.24 m	346 km	11 hr and 52 mins
3	Payra Sea Port	Port not yet fully Operational			400 km	14 hr and 59 mins

Source: EY Analysis, Chittagong Port Authority (CPA) and Mongla Port Authority (MPA)

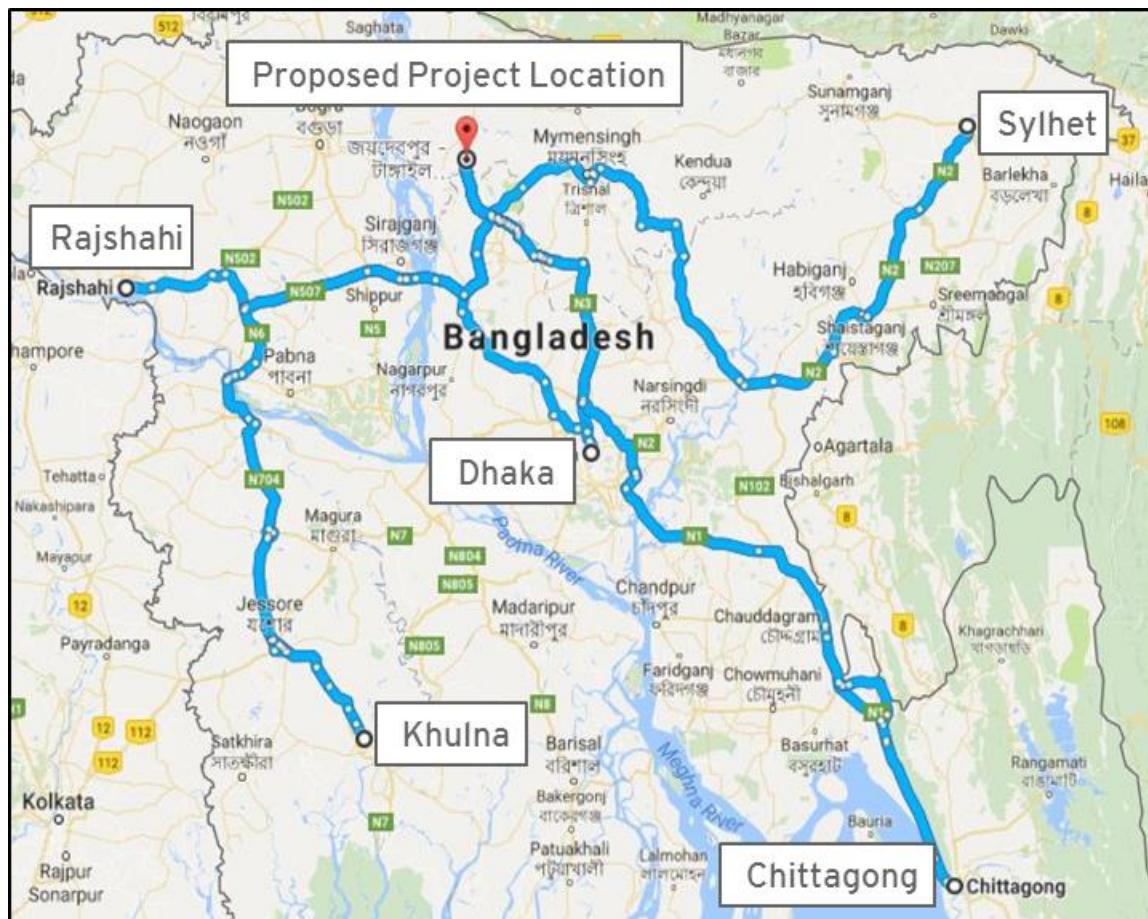
Mongla Port at Bagerhat District is the nearest port from the proposed project location which is around 346 kilometers from the proposed EZ location; Mongla Port has max. draft of 8.24 meters.

Both Chittagong and Mongla ports have Container handling capacity and are well connected to the proposed project location through National Highways.

Since, operators in the proposed EZ may require cold chain operation of goods transport, this container transportation infrastructure is ensured in the proposed site.

Connectivity with major Domestic markets of Bangladesh,

Figure 1-15 : Road network showing major domestic market connectivity



Source: Google maps and EY Analysis

Table 1-5 : Domestic market connectivity analysis for the proposed site

Sr. No.	Domestic Market	Distance from proposed site location (Approx. in Km.)	Indicative time required to cover the distance by goods vehicle (in hr and min)
1	Dhaka	146	5 hr and 26 mins
2	Chittagong	396	11 hr and 13 mins
3	Khulna	354	11 hr and 28 mins
4	Rajshahi	213	5 hr and 28 mins

Source: EY Analysis

The proposed project location is directly connected to major domestic markets of Bangladesh, such as, Dhaka, Chittagong, Khulna, Rajshahi and Sylhet, via National Highway network. These major markets form the potential contributors of trade from the proposed Economic Zone in terms of domestic exports. Dhaka Domestic market is the nearest domestic market from the proposed project location, for which the goods vehicle takes around 5 hours and 26 minutes via roadway transit, which is almost very similar to the transit towards Rajshahi domestic market, for which the goods vehicle takes around 5 hours and 28 minutes via roadway transit.

1.4 Approach and Methodology to the Feasibility Study including data collection

The approach to the feasibility study is based on the ground reality of the national economy, market dynamics, and exposition of the manufacturing set up of the country, local conditions and a robust financial modeling. Additionally, project structuring along with transaction plan is developed taking in to consideration similar experience in the country and benchmarking with the best international practices. With this approach the methodology of the feasibility study has been distinctly divided into several sub-tasks.

Methodology of the different sub-tasks are presented subsequently.

1.4.1 Linked project assessment

Linked project assessment has been carried out after detailed reconnaissance survey of the proposed site in terms of physical infrastructure. The aspects those are covered in detail are accessibility, utility services including power supply, gas connection, water supply, and other civic infrastructure.

In this connection EY experts visited relevant departments to understand the ongoing development activities as well as overall development plans in the coming future.

The details of stakeholders consulted and the assessment results are presented in Chapter 3 subsequently.

1.4.2 Market demand assessment

Market demand assessment has been conducted based on the following two interlinked activities,

- ▶ Identification of sector or product category that may be feasible for development of Jamalpur Economic Zone project.
- ▶ Market response to the induced development initiative of Bangladesh Government.

Sector or product category has been identified based on the research with secondary data on the manufacturing sector of the economy, external trade and its dynamics.

Market responses has been tested through market research results on the individual procedures.

The outcome of the study is presented in Chapter 7 of the report.

1.4.3 Environmental and social assessment

The Initial Environmental Examination (IEE) of the proposed site has been completed and clearance has been obtained along with the approved ToR. The assessment thus focuses on methodology to proceed to the next stage of the study which is preparation of Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP).

The social assessment has been carried out for the initial social screening. Since the land acquisition is in the advance stage, the study focuses on the both direct and indirect impact of the project. The study has been carried out based on the field surveys.

The outcomes are presented in Chapter 6 of the report.

1.4.4 Technical surveys

Technical surveys conducted during the feasibility study are,

- ▶ Topographic survey
- ▶ Social investigation

Both the surveys are conducted with the standard procedure in concurrence with the employing authority.

The results of the technical surveys are presented in Chapter 5 of the report.

1.4.5 Indicative master plan

It is indeed clear that the concessionaire will develop all the required infrastructure as per his own understanding and strategy towards the market vis-à-vis perceived market responses. However, an indicative master plan has been developed to estimate the availability of the net area for the industrial use, block cost estimate towards development of infrastructure and possible zoning.

The indicative master plan is presented in the Chapter 5 of the report.

1.4.6 Financial analysis

The financial analysis has been carried out based on a set of assumption whose rational is adopted from the entire feasibility study. The spread sheet model estimates the commercial viability of the project from the perspective of the developer. The outcome of the analysis is presented in terms of IRR and NPV.

The financial analysis also gives indication on the possible sale price of the industrial plots. The exercise further extended to the sensitivity analysis due to the risks out of increase in capital costs and lower response from the industrialists.

The outcome of the financial analysis is presented in the Chapter 8 of the report.

1.4.7 Project structuring and Transaction plan

The project has been structured based on the outcome of the financial analysis. Transaction plan has been devised based on the standard national practice and international experiences on similar projects with the focus on optimum risk sharing model and to close a successful transaction.

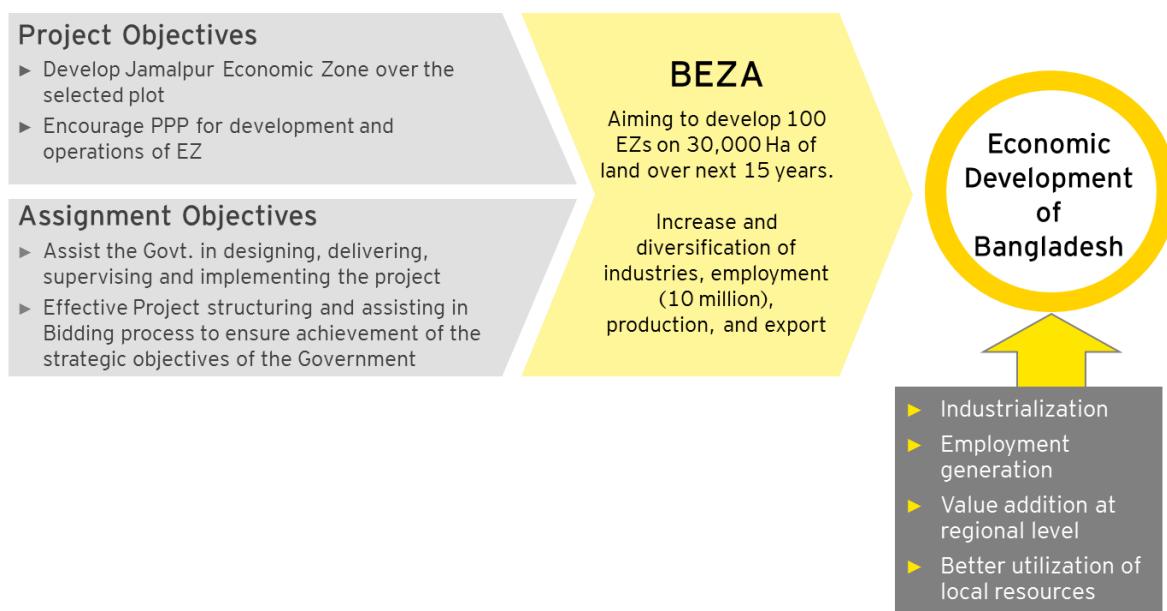
The details of the project structuring and transaction plan are presented in the Chapter 8 of the report.

2. Needs Analysis

2. Needs Analysis

2.1 The strategic objectives of the PMO and the BEZA

BEZA aspires to become a sustainable development driving force and a world class investment promoter and service provider to ensure quality of life of the people. BEZA intends to establish 100 Economic Zones on 30,000 hectares of land in the next 15 years with an employment generation for 10 million people. BEZA aims to establish these economic zones in all potential areas in Bangladesh including backward and underdeveloped regions with a view to encouraging rapid economic development through increase and diversification of industries, employment, production and export which would in turn lead towards overall economic development of Bangladesh. The Authority is also actively encouraging private sector participation through PPP model for development Economic Zones in the country. The proposed development of Jamalpur Economic Zone would contribute as a step forward towards achieving these objectives.



Jamalpur District and the surrounding region has comparative advantage in terms of abundant Agriculture and Livestock resources along with extensive presence of low cost manpower. Development of the Economic Zone at Jamalpur would help in creating a planned industrial set up to capitalize on this resource potential of the region, generate employment and to improve the returns gained by regional communities against the raw resources produced through value addition at regional level instead of export of the raw material to other industrial set up within the country as well as abroad. This would lead to overall improvement in economy of the region.

In order to achieve this, the PPP Authority has engaged EY to assist the Government for Feasibility studies of the proposed project, selection of private partner for development of the EZ and implementation of the project under PPP mode.

2.2 Assessment of the need for provision of service

Industries in Jamalpur District have grown mostly in unorganized pattern through individual industrial developments and most of these are small scale industries. An organized industrial infrastructure would encourage large scale industries to develop in the region through provision of ready-to-use enabling infrastructure set up. Development of such Economic Zone and establishment of large scale industries will also lead to an induced industrial development in the region by creating scope for supporting industries of multi-fold scale. At present, there are no

large scale organized industrial set up in Jamalpur District of scale similar to the proposed Economic Zone.

In order to incentivize growth of industries at larger scale in this region, development of such Economic Zone would act as a commercial catalyst through provision of the various economic incentives proposed by the Bangladesh Government for the industries operating within Economic Zones.

The local Agriculture and Livestock resources of Jamalpur District and surrounding regions are currently not being utilized for value addition at local level. Development of such large scale organized industrial set up would help in consumption of these resources at local level for further value addition and product development instead of the raw material being exported to industries in other regions of the country and abroad.

Development of this Economic Zone will offer an organized and superior infrastructure for the industries to operate within, compared to the unorganized clusters of the individually growing industries. Adaptation of such superior infrastructure of global standards in the production process would help the industries in achieving economies of scale, efficiency and global competitiveness.

2.3 Existing or envisioned service gaps

Industrial Development of the proposed scale would require common infrastructure facilities such as power supply, industrial Gas supply, water supply, Water Treatment plant for treatment up to water quality suitable for industrial purpose, drainage system network, waste water treatment facility, solid waste management system, public transport to provide adequate connectivity to Jamalpur Sadar and other neighboring residential and commercial area, adequate road network connectivity to major commercial markets, sea-ports and airports of the country. In addition to the scale of supply of utilities such as electricity, gas and water, their consistency will also play a critical role in sustainability of the industries that would develop in the Economic Zone.

Apart from these utility and infrastructure related service gaps, to ensure environmental sustainability of the proposed development, it will be highly important to set up an organized structure for environmental compliance of the envisaged developments within and around the proposed project.

2.4 Key stakeholders and requirements identified for seamless implementation of the project

It is very important to ensure a holistic development of the Economic Zone and all supporting functions required for the seamless operations of the system as a whole including the Economic Zone and its support activities. In order to ensure this, we have identified various key stakeholders which will play important role in development and successful operation of the proposed Economic Zone. We have reached out to these key stakeholders to understand the current scenario and proposed future developments. The data gathered through these key stakeholders has been analyzed keeping the international industry practices and standards in consideration to identify key requirements for seamless implementation and operations of the proposed industrial development.

Deputy Commissioner's office:

Deputy Commissioner's office is facilitating BEZA for the Land Acquisition process. Acquisition of total 343.97 acres land has been approved by the Government and as per the estimate provided by Land Acquisition team of the DC office, total compensation required for acquisition of this 343.97 acres land is BDT 123.96 crores. In order to smoothly execute the land acquisition process, timely disbursement of the approved compensation amount would be very important.

Considering the development of the Economic Zone and other induced developments which would lead to significant expansion is expected in the population and commercial activities of the Jamalpur Sadar Upzilla including high inflow of manpower through migration. The DC office and police department may require upscaling in sync with the social and commercial expansion of Jamalpur Sadar, in order to ensure law and order within the society post expansion.

Local Industries:

Most of the small scale industries currently operating in Jamalpur Sadar region are small scale individual business operations. Through our multiple interactions with these industry players, it has been noted that these industries have potential to further expand their operation which is also evident from a survey conducted by BSCIC Jamalpur among the business community of the city. These small scale industries would require standard plots of smaller size within the proposed Economic Zone for expansion of their operations.

Apart from the already existing potential for expansion of these small scale industries, the induced requirement of the supporting industries due to operations of the major industries upcoming within the Economic Zone would also add to the need of a cluster of smaller plots within the Economic Zone.

Handicrafts industry:

Handicrafts is one of the traditional occupation of Jamalpur and Jute is one of the major produce in the district. Along with development of Jute based industry, handicrafts related industries can also be promoted for development within this Economic Zone. In order to upscale this industry, it would be important to provide global market access to this Handicrafts industry.

Local community:

Local community of Jamalpur can provide extensive supply of low cost manpower, however, in order to enable the local community to work for the industries that would be operating within the Economic Zone, it is necessary to create sufficient academic facilities and vocational training infrastructure in the region for skills development. Such training centers are required for providing skills development trainings that are relevant to the skilled manpower requirement of the operating industries to create good skilled employment opportunities for the members of local community.

These training programs may be run in partnership with some of the major industries existing within the EZ to provide customized training to suite specific skills requirement or they can be operated independently by the Government.

The economic development of the region would create multifold job opportunities in turn through multiplier effect of employment generation from development of major industries, several supporting industries for these major industries and the service provider local business operations providing various services to the manpower employed by the major and supporting industries. And, the academic institutions and vocational training centers would play a very important role in enabling the local community to be part of this process of multiplier effect of employment generation.

Specifically, the project affected persons / communities should be given the skills development training and employment opportunities on priority basis.

Municipality:

The direct effect of rapid industrialization in the economic zone will lead to further developments and increase in number of habitants in the influence region. Currently, there is existence of ribbon development along the N4 Jamalpur - Tangail road and the Jamalpur city. Due to such industrial activities the migrant habitants and other squatters will start residing along the road side adding to the ribbon developments which may be uncontrolled and haphazard. In order to ensure that this development expansion of the city region is executed in efficient and organized manner, it is necessary to create a long term City Development Plan taking all these envisaged developments into consideration.

The Municipality has already submitted a proposal for preparation of CDP for development of Jamalpur. To prevent the unorganized growth of the city by maneuvering all the upcoming

developments towards a planned city development approach, the City Development Planning should be approved on priority basis and master planning of the development region should start immediately. In accordance with the City Development Plan, it is envisaged that a Development Authority may be required to develop and provide all the required infrastructure and to control the growth in and around Jamalpur city as well as the proposed Jamalpur Economic Zone.

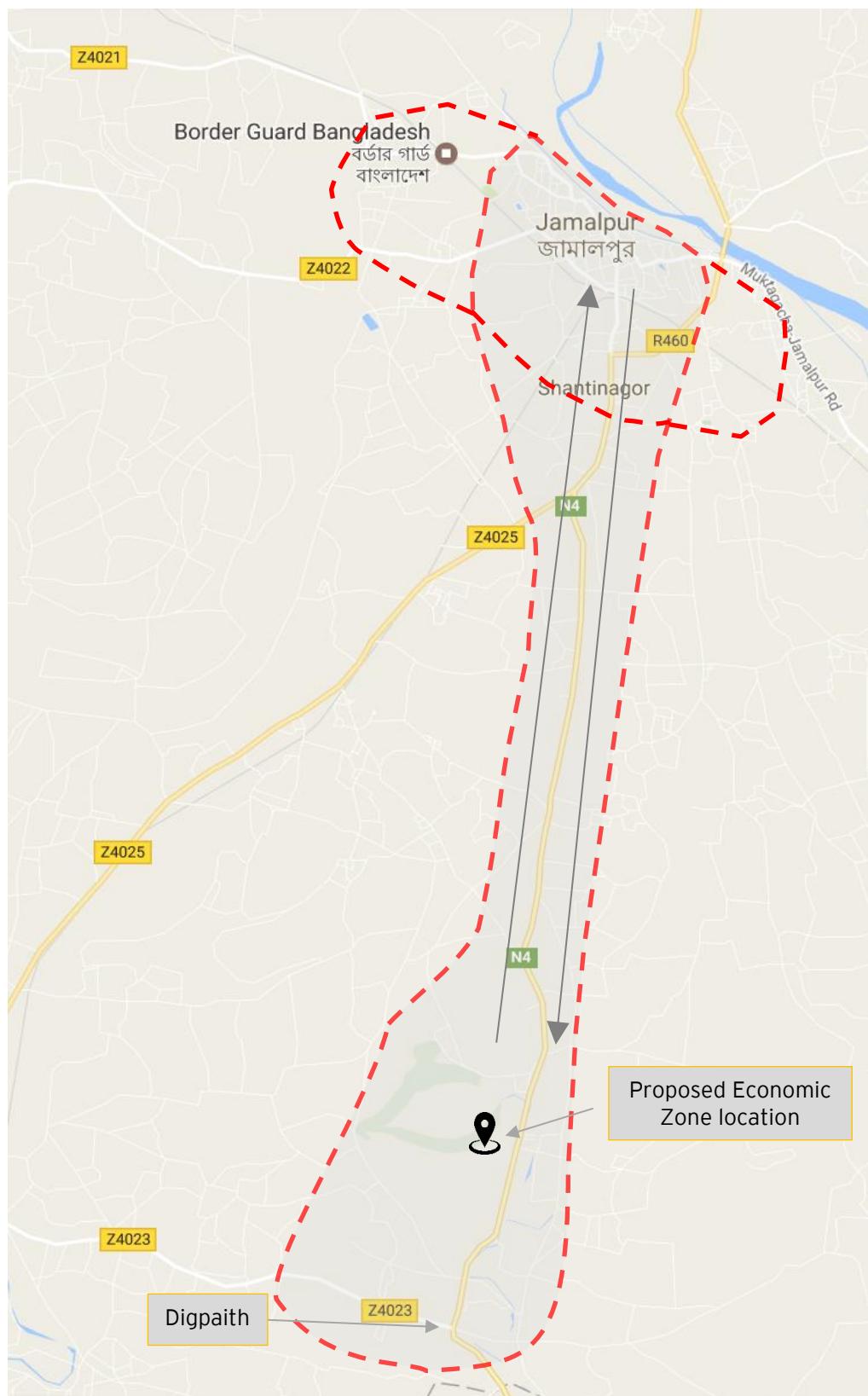
The additional population migrated to the city due to the envisaged induced economic development would add burden to the already loaded traffic system within the city. To ensure smooth traffic movement within the city area of Jamalpur as well as on the stretch connecting the city center to the proposed EZ, this master planning exercise would also be required to prepare a plan for traffic control and public transportation.

The development plan should also take into consideration the housing facility requirement for the increase in number of habitants in the region owing to the employment generation through the multiplier effect. The Authority should plan for development of two separate categories of housing facility, MIG (Middle Income Group) and LIG (Low Income Group), to meet major of the housing requirement. This organized housing development is required to prevent unorganized housing developments in the region in ad-hoc manner and to create better living standard in affordable housing range compared to unorganized developments.

Apart from this, the Development Plan would also be required to plan for all other social infrastructure developments, such as, schools, hospital / health centers, utilities, academic institutions, Government Administrative set up, etc. of adequate scale to meet the envisaged increase in demand due to migration for employment.

It is envisaged the development of the influence region will take place in the following indicative manner which is highlighted on the subsequent map.

Figure 2-1 : Envisaged City development Region



Source: EY

3. Linked Project Assessment

3. Linked Project Assessment

3.1 Identification of key linked projects

The following stakeholders were consulted to understand the existing and proposed infrastructure developments for identification and assessment of the Linked Projects for the proposed development of Jamalpur Economic Zone. The primary and secondary survey outcomes have been assessed for the existing infrastructure and upcoming developments in relation with the requirements of the proposed Economic Zone.

Key Stakeholders consulted:

- ▶ Deputy Commissioner's office
- ▶ Jamalpur Municipality
- ▶ Roads & Highways Department
- ▶ Jamalpur Palli Bidyut Samity
- ▶ Titas Gas Transmission and Distribution Company
- ▶ Department of Public Health Engineering, Jamalpur
- ▶ BSCIC Jamalpur
- ▶ District Livestock office
- ▶ District Agriculture office
- ▶ Local business community of Jamalpur
- ▶ Local inhabitants

Based on the assessment of these primary and secondary survey outcomes, following key linked projects and Government Authorities responsible for their implementation have been identified which would contribute to seamless operation of the proposed Economic zone development and the envisaged developments of support industries in and around the Economic Zone.

Key Linked Projects	Implementing Agency
▶ Land Acquisition	▶ Deputy Commissioner's office, Jamalpur
▶ Upgradation of the Road network	▶ Roads & Highways Department, Jamalpur
▶ Development of Electrical Grid line for power supply to the Economic Zone and an Electrical sub-station within the Economic Zone	▶ Jamalpur Palli Bidyut Samity
▶ Development of Industrial Gas pipeline network for supply to the Economic Zone and a Gas Substation within the Economic Zone	▶ Titas Gas Transmission and Distribution Company
▶ Domestic Water Treatment Plant and water pumping station	▶ Department of Public Health Engineering, Jamalpur
▶ Drainage network for disposal of the treated waste water	▶ Department of Public Health Engineering, Jamalpur
▶ Solid Waste Management system	▶ Department of Public Health Engineering, Jamalpur
▶ City Development planning	▶ Jamalpur Municipality
▶ Fire station establishment	▶ Jamalpur Fire Service

3.2 Requirements for the linked projects and critical issues in implementation

3.2.1 Land Acquisition

Deputy Commissioner's office is taking charge of implementation of the Land Acquisition work. The Ministry of Land has approved Land Acquisition of 343 acres land and the Land acquisition team of the DC office, Jamalpur has submitted the estimated total compensation required for the land acquisition. Appropriate compensation for acquisition of the selected land for the EZ development needs to be finalized by the Government and accordingly, the approval and disbursement of funds should be processed, in order to initiate implementation of the Land Acquisition process. The Earthwork for development of the selected plot for Economic Zone can be started at site only after completion of Land Acquisition process which would require these approvals and disbursement of the funds for acquisition.

3.2.2 Road network

Various road development projects are currently under implementation or in proposal stage for upgradation of the road network of Jamalpur district. Roads & Highways Department, Jamalpur is responsible for all such road development projects. Good connectivity with major domestic markets and export centers of Bangladesh would play a very important role in supporting the industries through smooth logistics for procurement of raw materials as well as domestic sales and export of the produced goods. As per the Statement of Road Location prepared in 2014, Jamalpur district had Highway road network of 296 kms in total out of which, a total road length of 129 kms were of 5.5 m width while the remaining 167 kms road length was of 3.7 m width.

Following are some of the major ongoing and proposed Road development projects to upgrade the Road network of Jamalpur District. Please also refer the Figure 3-1 for layout demarcation of these proposed developments.

Table 3-1 : Upgradation plans for the Rid network of Jamalpur district

Sl.No.	Road	Up gradation plan
1	Jamalpur - Elenga (N4) (providing connection to Dhaka via Tangail)	<ul style="list-style-type: none"> ▶ This stretch is a part of Joydebpur - Tangail - Jamalpur Highway (N4). The proposed Economic Zone project site is immediately adjacent to this Highway and it connects Jamalpur as well as the project site to Dhaka via Tangail. This road also provides connectivity to the western part of the country through the Bangabandhu bridge. ▶ The Jamalpur - Elenga stretch (77.6 kms) has been proposed to be upgraded to 7.3m wide 2 lane road. The proposal has been submitted to ECNEC for approval. ▶ The remaining Elenga - Joydebpur stretch of the N4 highway has been approved for upgradation to 4 lanning and is currently under construction. Hence, if the Jamalpur - Elenga stretch

		is approved for upgradation to Four lane highway, it would provide and continuous Four lane highway connecting the proposed site to Dhaka.
2	Jamalpur - Chechua - Muktagacha (Z4101) (providing connection to Dhaka via Mymensingh)	<ul style="list-style-type: none"> ▶ This stretch connects Jamalpur to Mymensingh and Dhaka. This can be another alternative to the highway N4 for connecting the project site to Dhaka. ▶ This 40 kms stretch has been proposed to be upgraded to 4 lane road and the proposal for this road expansion has been submitted to ECNEC for approval.
3	Jamalpur - Bakshiganj - Kamalpur (Z4606) (provide connection for export to Meghalaya via 3 Land Custom stations)	<ul style="list-style-type: none"> ▶ This 40 kms stretch connects Jamalpur to Kamalpur which can be used for trade with Meghalaya through Land Customs station. This stretch has been proposed to be upgraded to 7.3 m two-lane road. Further connection from Kamalpur to Nakugaon and Rowmari Land Customs stations are proposed to be upgraded to 5.5 m two-lane roads. Proposal for this road expansion has been submitted to ECNEC for approval. ▶ Once developed, this stretch would provide the industries in the proposed Economic Zone direct road connectivity for import-export trade with Meghalaya and other markets of North-Eastern Region of India.
4	Dewanganj - Bahadurabad Ferry Ghat (for connection to Gaibandha Division)	<ul style="list-style-type: none"> ▶ Jamalpur is already connected to Dewanganj by a 5.5 m wide two-lane road (Z4021). ▶ Further, it is proposed to provide road connection from Dewanganj to Bahadurabad by a 4.3 kms stretch which has been proposed to be developed at cost BDT 60 crore. ▶ This stretch would provide connection to the Bahadurabad Ferry Ghat which can be used for trade with the Gaibandha Division on the other side of Brahmaputra river. Proposal for this road expansion has been submitted to ECNEC for approval. ▶ A proposal to connect the Bahadurabad Ferry Ghat near Dewanganj to

		Gaibandha Division through a Tunnel or Ferry Setup has also been submitted and is being considered by the Ministry.
5	Jamalpur - Madarganj (Z4022)	<ul style="list-style-type: none"> ▶ Upgradation of this 29 kms stretch to 7.3 m wide two-lane road is already ongoing. ▶ Further, from Madarganj to Ghat, which would be a 6km stretch, is also being developed by local govt.
6	Bypass around Jamalpur City connecting entry points of N4 and Dewanganj Road	<ul style="list-style-type: none"> ▶ This 6.45 kms Bypass is being upgraded to 7.3 m two-lane road so that the Madarganj, Melandaha and Dewanganj bound traffic wouldn't have to trespass through Jamalpur city.

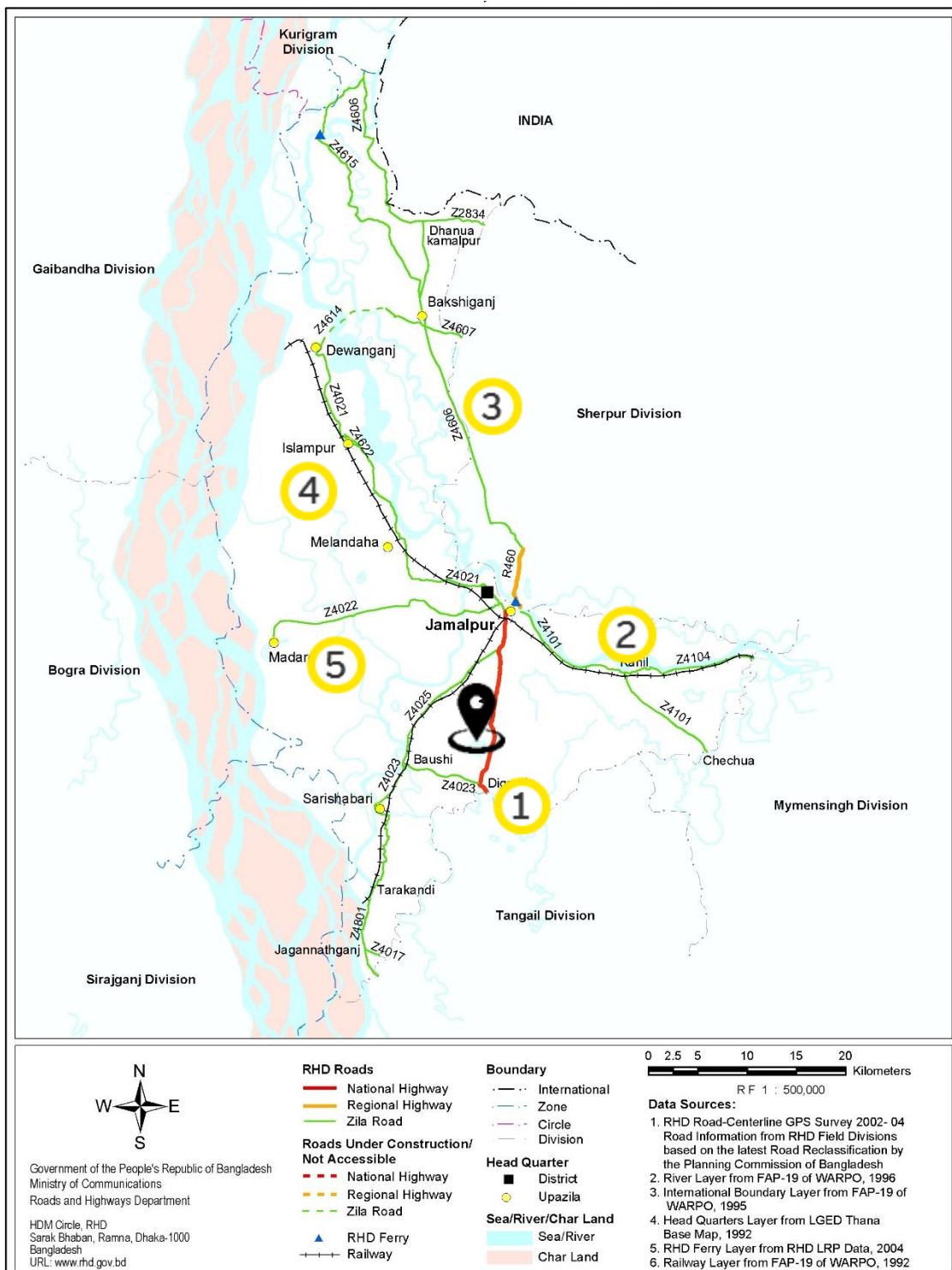
Source: Roads & Highways, Jamalpur district

Out of this Road network of Jamalpur District, the following two highways are very crucial for the proposed Economic Zone project.

- ▶ Jamalpur - Elenga - Joydebpur (N4)
- ▶ Jamalpur - Chechua - Muktagacha (Z4101)

Both of these routes are 5.5 m wide two-lane roads. These routes provide connectivity to major domestic market Dhaka, export hub Chittagong. The Jamalpur - Elenga stretch also connects the proposed project plot to the Bangabandhu bridge which is a road linkage across the Jamuna river and further connects to the commercial centers on the western side of the river, such as, Khulna, Mongla Port and Rajshahi.

Figure 3-1 : RHD Road Network, Jamalpur Division



Source: Roads & Highways, Jamalpur district

In addition to the already proposed road network upgradation initiatives, it is recommended that the following two upgradations are also taken into consideration.

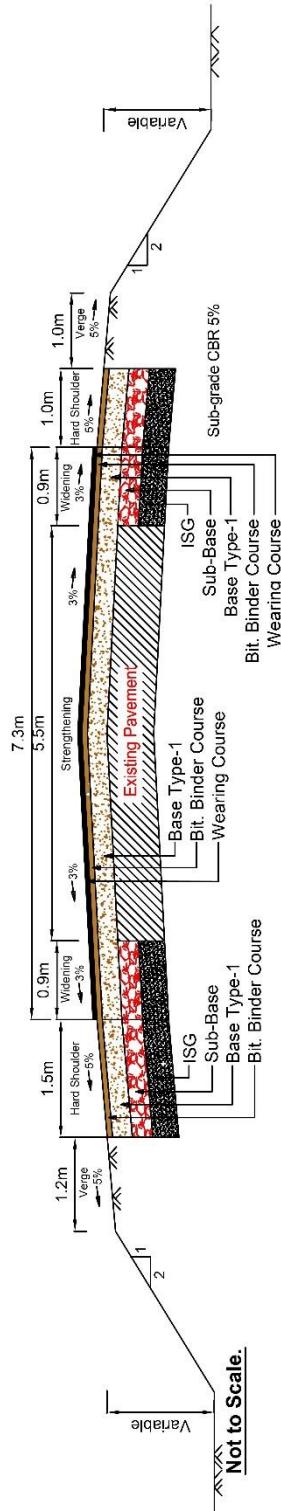
- 1) Consideration for Jamalpur Sadar to Elenga stretch of the N4 highway to be widened to 4 lane instead of 2 lane:
 - ▶ Since the N4 Highway connecting Jamalpur Sadar to Elenga will be a common route for connecting the proposed Economic Zone to Sea ports, Dhaka Airport and also some of the major domestic markets, it is expected to receive higher traffic of heavy vehicles.
 - ▶ Further, the Elenga to Joydevpur stretch of the N4 highway is already being upgraded to 4 lane. It should also be noted that the Government is also targeting to upgrade all National Highways to 4 lane in next 5 years.
 - ▶ Hence, expansion of the Jamalpur Sadar to Elenga stretch of the N4 highway to 4 lane road instead of 7.3 m wide 2 lane road should be considered and assessed.
- 2) Consideration for profile correction of the Jamalpur Sadar to Elenga stretch of the N4 highway:
 - ▶ The added traffic induced by the EZ once it gets operational shall comprise of significant volume of Heavy vehicle traffic. However, the existing profile of the N4 Highway is designed for regular vehicular load.
 - ▶ Hence, the Authority should also consider profile correction of this stretch to accommodate load of heavy vehicle traffic.
 - ▶ Revision of proposal to ECNEC for Road Project approval may take approximately 15 days.

Typical road profile that is being executed for most of the projects of road widening to 7.3 m wide two-lane road in Jamalpur District:

Figure 3-2 : Widening and Strengthening Design of Existing Pavement

Widening and Strengthening Design of Existing Pavement.

Name of Division : Road Division, Jamalpur
 Name of Road : Jamalpur-Chechua-Muktgaracha Road.
 Chainage and Length : Ch. 0+000 to Ch. 38+000 = 38.00Km.



Thickness Chart for Widening

Layers	Wearing Course	Bit. Binder Course	Agg. Base Type-1	Sub-Base	ISG	Total Thickness
Thickness (mm)	50	70	200	250	300	870mm
Minimum CBR(%)	-	-	80	25	8	-

Thickness Chart for Strengthening over Existing Carrigeway

Layers	Wearing Course	Bit. Binder Course	Agg. Base Type-1	Sub-Base	ISG	Total Thickness
Thickness (mm)	50	70	200	200	-	320mm
Minimum CBR(%)	-	-	80	-	-	-

Thickness Chart for Hard Shoulder

Layers	Bit. Binder Course	Agg. Base Type-1	Sub-Base	ISG	Total Thickness
Thickness (mm)	70	200	250	300	820mm
Minimum CBR(%)	-	80	25	8	-

Source: Roads & Highways, Jamalpur district

Considerations and assumptions for the typical road design that is being implemented for most of the Road widening projects:

- ▶ The Design is prepared following GDS Manual (Revised) 2005.
- ▶ AADT provided by Jamalpur Road Division vide memo no-965; dated 08/08/2016.
- ▶ In this Design RHD Pavement Design Guide April/2005 & AASHTO/1993 Design Specification has been followed.
- ▶ Design Sub-Grade minimum CBR is 5%.
- ▶ Traffic Growth Rate per year = 7%.
- ▶ Cumulative ESAL = 10.66 million for 10 years Design life and Cumulative ESAL = 31.63 million for 20 years Design life. After 10 years 50 mm overlay is to be provided or treatment should be taken on the basis of need assessment report prepared by HDM Circle
- ▶ $SN_R = 4.57$ for first 10 years and $SN_R = 5.30$ for 20 years.
- ▶ For Old Section existing surface should be scarified and re-compacted.
- ▶ Free Board = 1.00 meter
- ▶ Design Life = 20 years
- ▶ Detail Geometric Design is to be made by the respective field office
- ▶ Work should be done as per proper specification

This road design may not be suitable for the Jamalpur Sadar to Elenga stretch of the N4 highway which is expected to receive increased heavy vehicular traffic once the Economic Zone gets operational. Hence, the Jamalpur Sadar to Elenga stretch of the N4 highway and other such identified road stretches may need profile correction as well along with the road widening work to sustain the heavy vehicular traffic.

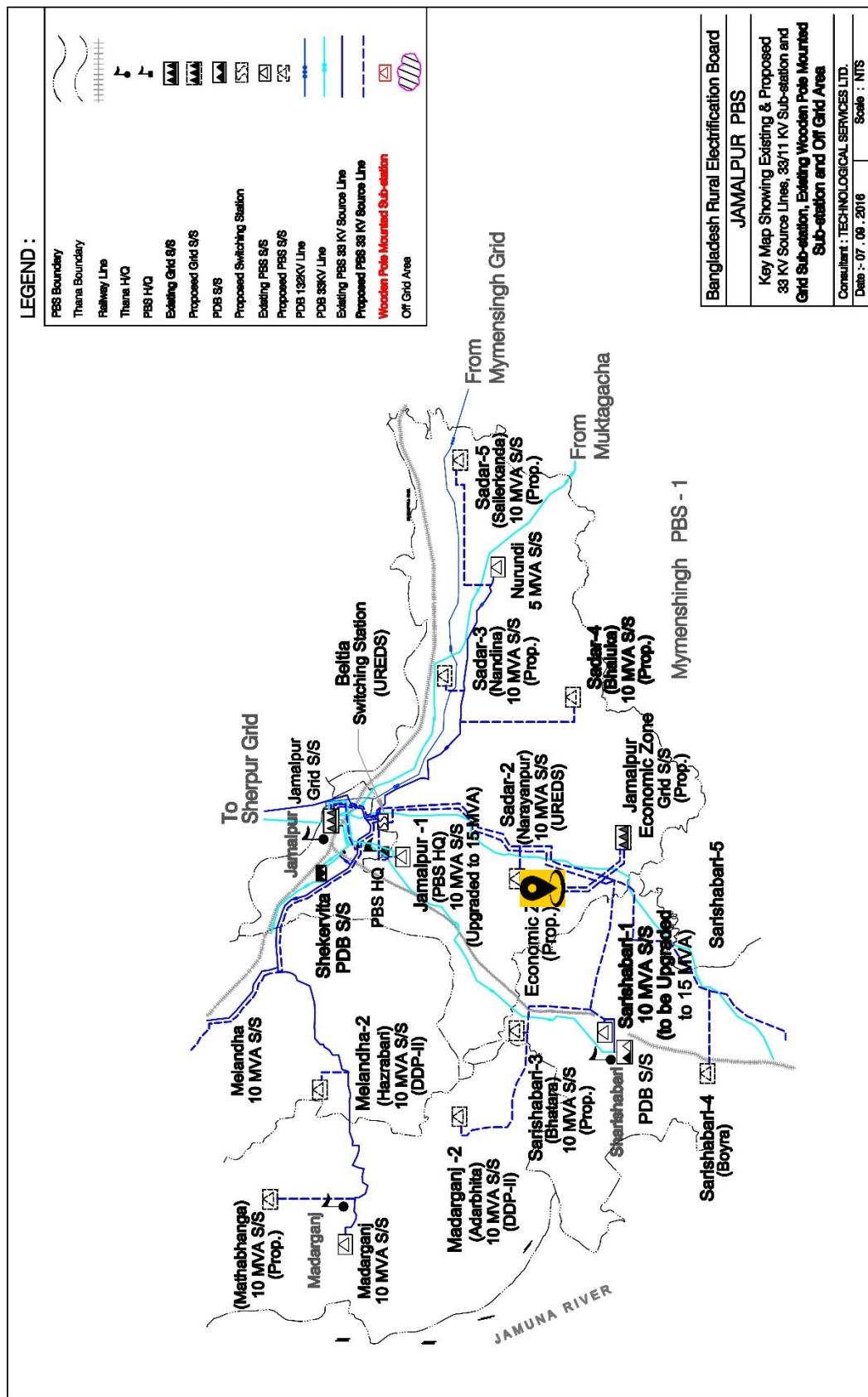
3.2.3 Power Supply

Jamalpur Palli Bidyut Samity shall be responsible for providing power supply for the proposed Economic Zone. The development of Electrical Grid line for power supply of required scale to the proposed Economic Zone and an Electrical sub-station within the Economic Zone shall be developed by Jamalpur Palli Bidyut Samity.

The requirement of power supply for this project has been assessed in two stages. Initial requirement of power supply to the project during execution of construction and other development works is expected to be of scale lesser than 1 MW. To meet this requirement, a power supply line of up to 1 MW can be provided from the existing distribution network which is running close to the proposed site. Necessary development work and arrangements can be done within 3 months once the power requirement is approved and requisition is communicated to the Authority. The tentative budget for creating this supply line is expected to be approximately BDT 1 crore.

Further power supply requirement for the proposed Economic Zone shall arise once the project gets into operational phase. Electricity requirement during the operational phase of the project can be taken care of in stage-wise manner as per the requirement of the Economic Zone. The Authority shall be able to develop a power supply line of 15 MW for supply to the Economic Zone within 6 months from one of the double circuit feeder which is currently under construction to connect Sarishabari sub-station. The tentative budget for this would be in range of BDT 15 crores. Apart from this, a power supply line of 6 MW can be developed from the existing power supply network at cost of approximately BDT 6 crores within 1 year. If the operations at the Economic Zone requires further upgradation of the electricity supply, a dedicated line of 30 MW can be constructed within 2 years connecting from the Switching station in Beltia, at cost of approximately BDT 35 crores.

Figure 3-3 : Existing / Proposed Grid, Switch Station, and PBS S/S



Source: Jamalpur PBS

Table 3-2 : Readiness for power supply

Sl No.	Description of use	Supply size	Timeline for connecting the supply to the EZ	Tentative Cost of connection	Remarks
1	Construction Power	1 MW	3 months	BDT 1 crore	The supply can be connected within 3 months from the date of requisition from existing distribution network which is running close to the proposed site
2	Power for operation of the EZ	6 MW	1 year	BDT 6 crores	
3	Power for operation of the EZ	15 MW	6 months	BDT 15 crores	One of the double circuit feeder which is under construction to connect Sarishabari sub-station can be used to supply this power to the EZ
4	Power for operation of the EZ	30 MW	2 Years	BDT 35 crores	The cost is inclusive of the line construction from Switching station in Beltia to the EZ (BDT 5 crores). This dedicated power supply will be ensured if there is a demand placed from the EZ

Source: EY Analysis

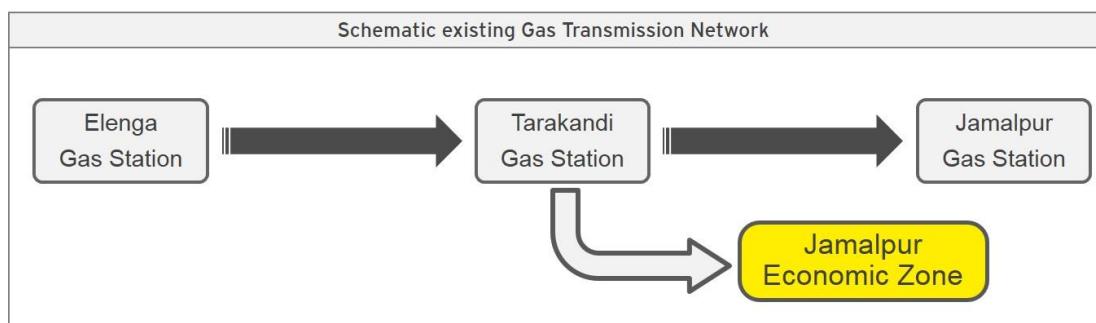
3.2.4 Supply of Industrial Gas

Some industries require Industrial Gas for carrying out some of their processes, such as, ceramic products manufacturing, food processing, etc. Hence, providing Industrial Gas supply to the proposed Economic Zone should be planned in order to enable such industries to operate in the Economic Zone. 'Titas Gas Transmission and Distribution Company', which is a Government undertaking firm, will be in charge for providing Gas connection to the Economic Zone plot.

At present, there are only Domestic and Commercial connections available in Jamalpur Sadar area, and it would be required to create a dedicated connection of Gas supply as an Industrial Gas line to the Economic Zone. For providing this Industrial Gas line to the EZ, there are two alternatives available at present in the site vicinity:

- ▶ Jamalpur Sadar Gas Substation
- ▶ Faizal More Gas Substation

Elenga Gas Substation is an immediate upstream Gas substation which provides gas supply to the Jamalpur Sadar and Faizal More Gas Substations. Considering the distance from these three neighboring substations and Faizal More substation being upstream w.r.t Jamalpur substation, tapping a dedicated Industrial Gas line from Faizal More would be a preferred alternative for Gas supply to the proposed Economic Zone.

Figure 3-4 : Proposed Gas transmission Network

Source: EY

Table 3-3 : General modalities & typical timeline for development of Gas supply line

Stage	Typical Timeline
Planning, Design & Approval process by Pipeline Nirman Department	1 month
Tendering process by Titas Gas, Dhaka	3 month
Execution: selected contractor	1 month

Source: Stakeholder consultation

3.2.5 Water Treatment Plan and Pumping Station

The industries operating in the Economic Zone would also require treated water for industrial use. The Department of Public Health Engineering, Jamalpur division shall be responsible for developing a Water Treatment Plant and a Pumping Station for pumping out the Ground water and also for pumping the treated water to an overhead tank. However, the Overhead tank and the water distribution network for the distribution of in the Economic Zone shall be developed by the selected Developer.

Various aspects of creating water supply facility for the project are being considered by the Public Health Engineering Department, such as, possible alternatives for source of water in vicinity of the site, typical quality of water and measures to be taken to assess usability of the water, cost of creating water supply facility, space required for such facility, modalities and typical timeline of implementation of such projects.

The nearest location viable for tapping water from river for such industrial purpose shall be at least 35 to 40 kms from site. And, transporting this river water through pipeline to the proposed Economic Zone would require creating pumping stations at intervals of around 8-10 kms and providing settling tanks to remove silt, which would not be a viable option considering cost of creating and maintaining such facility for such distance. Hence, the viable alternative is consumption of ground water. However, the ground water from low depth is expected to have iron content in this area, which would not allow use of the low depth water for the purpose of industrial processes in specific production lines. Hence, it would be required to find out appropriate depth of ground water with quality acceptable for industrial use through test borings at various levels.

The ground water would also have to be treated before industrial use. Tentative timeline for creating bore well facility:

- ▶ Bore well development: typically 6 months

- ▶ Treatment plant construction: typically 18 months
- ▶ One treatment plan with 350 cum/hr discharge generally costs BDT 10 to 12 crores.

3.2.6 Drainage network and Solid Waste Management system

At present, there is no drainage network for disposal of the treated waste water in vicinity of the selected project plot. Hence, it would be necessary to create a drainage network outside the project plot for suitable disposal of the treated waste water. Similarly, in order to avoid any environmental concerns, for the purpose of appropriate disposal of the Solid Waste generated from the industries operating within the Economic Zone, a suitable Solid Waste Management system would have to be developed outside the Economic Zone. The Economic Zone would have a set up for solid waste collection and management and the collected waste by this system shall be transported to the external Solid Waste Management system. The Department of Public Health Engineering, Jamalpur division shall be responsible authority for developing both these facilities Drainage network as well as Solid Waste Management system. As a part of this exercise, the authority would also have to identify appropriate location for the disposal of the solid waste as well as the treated waste water.

3.2.7 City Development planning

As discussed in section 2.4 of this report, in order to ensure that the envisaged development expansion of the city region, under influence of the Jamalpur Economic Zone development, is executed in efficient and organized manner, to prepare traffic control and public transportation plan, to plan for organized housing development and for the additional requirement of social infrastructure development, it is necessary to create a long term City Development Plan taking all the envisaged developments into consideration. Jamalpur Municipality shall be the responsible authority for this City Development planning and the Municipality has already submitted a proposal for preparation of CDP for development of Jamalpur.

3.2.8 Fire station establishment

The proposed Economic Zone would also require a Fire Station within the premises of the project plot. The Jamalpur Fire Service Department shall be responsible for establishing an operational Fire Station within the Economic Zone. However, the developer shall be responsible for developing the building and all necessary infrastructure for setting up a Fire station and as per the requirements stipulated by the Authority.

4. Technical Assessment and Survey Analysis

4. Technical Assessment and Survey Analysis

4.1 Topographical Survey

As a part of feasibility study, IRG Development Services Limited (IRGDLS), a local consulting firm has been appointed to carry out the topographic survey of the project area. Topographic survey of the project land area of approximately 443 acres was carried out from 5th October, 2016 to 15th October, 2016.

The scope of works of the topographic survey included following activities:

- ▶ Collection of necessary data from filed survey and secondary sources.
- ▶ Preparation of topographic map
- ▶ Preparation of topographic report.
- ▶ Preparation of Superimposed Mouza Map on Topographic Map
- ▶ Preparation of Cross sectional Drawings

The methodology adopted for performing the topographical survey included working grids of the squares of 25mX25m by fixing Northing and easting at 25m center to center, using instruments like Total Station Kolida & Level Instrument Pentex, leveling procedure to be followed with desired standards highlighting benchmarks including FBM & TBM and the visual observations i.e. any depression, undulation, ground elevation, ditches etc. and also the existing physical features like homestead areas, trees, electricity line, underground pipe line, roads etc.

The key observations of the topographical survey consisted of the following:

Whole of the project area was found to be nearly flat. No major differences were found in the levels found in the project land part. No major ditches, depression or heaps are observed except the Beel named Bamui.

Some kinds of trees are present in the Project area. Some homestead areas were observed within and outside of the project boundary area & other topographical elements are located at different locations. The existing flexible pavement is at the eastern side of Project Boundary which is known as Dhaka - Jamalpur Highway.

Total project area is calculated as 17,92,797.86 square meter which can be segregated as project land area, Beel area and the homestead areas. Segregation of the total project area has been provided in table 1 below,

Table 1: Segregation of the total project area

Area Type	Sq. m	Sq. ft.	Decimal	Katha	Bigha	Acre
Project Land part (A)	1303211.2	14022552.8	32191.35	19475.76	973.79	321.91
Beel Part	406318	4371990.44	10036.71	6072.20	303.60	100.36
Homestead (C 1)	69363.83	7463.54.89	1713.39	1036.60	51.83	17.13
Homestead (C 2)	11894.00	127979.51	293.80	177.74	8.89	2.95
Homestead (C 3)	2681.30	28850.79	66.23	40.07	2.00	0.66
Total	1793468.33	18551373.54	44301.48	26802.37	1340.11	443.01

Source: Topography survey

The detailed Topographical Report has been presented as Annexure to this Feasibility Study Report.

4.2 Soil Inspection survey

This report contains the results of field investigation and laboratory tests which were carried out on the subsurface soils of the Jamalpur Economic Zone development site.

A total of 07 (Seven) boreholes were sunk at the site to the depth of about 24.0 m from the existing ground level as detailed in the borehole logs subsequently. The soil is a highly complex material, which differs from other conventional structural materials. The primary objectives of this study were to gather information on sub-surface conditions at the site and develop criteria to aid in the design and construction of the proposed structure.

The scope of work included for the soil investigation involved reconnaissance survey of the soil for fixing borehole, drilling of boreholes, locating the ground water level, performing SPT & collection of soil samples and laboratory testing of soil samples.

The field investigation included primary activities like boring & recording of sub-soil stratification, execution of Standard Penetration Test (SPT), extraction of Disturbed Soil Sample and recording of Ground Water Level. The laboratory testing for the soil samples included following major tests:

- ▶ Grain size analysis (Sieve & Hydrometer)
- ▶ Moisture content Test
- ▶ Specific Gravity Test
- ▶ Dry Unit Weight
- ▶ Wet Unit Weight
- ▶ Atterberg's Limit Test (Liquid & Plastic Limit)
- ▶ Chemical Test
- ▶ Direct Shear Test

The bearing capacity of shallow and deep foundation and other foundation parameters were evaluated using field and laboratory tests. For cohesion less soil and for instances where UD samples could not be collected, the field SPT values after necessary correction were used to obtain soil constants like cohesion(σ_c), angle of internal friction(phi) and unit weight(y).

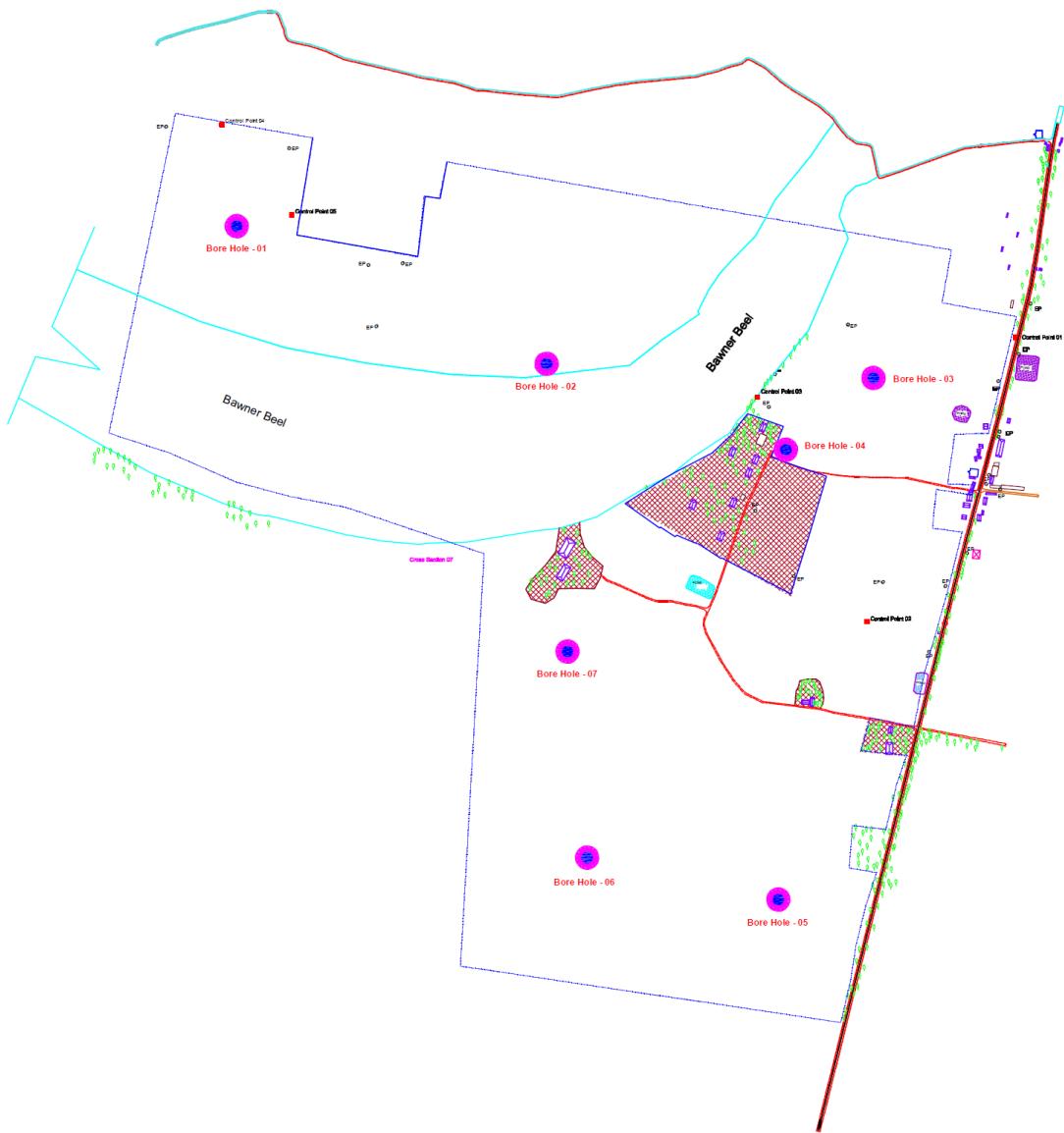
For silty fine sand, where SPT is more than 15, the correction of SPT values had been done using equation $N = 15 + 0.5(N-15)$

Bangladesh has been divided into three Seismic Zones namely Zone-1, Zone-2 and Zone-3, with values of Seismic Zoning coefficient, z of 0.075, 0.15 and 0.25 respectively. According to this Zoning Map the Project site falls in the Zone-3.

The sub-soil formation encountered at the proposed site is homogeneous. The sequence of lithological composition as well as consistency of the soil at different depths has been depicted in the respective bore logs as shown subsequently. However the allowable bearing capacity of soil for footing and pile is shown in the annexure considering the magnitude of the structure, by which the structural designer may put his justice to select the suitable type and depth of foundation.

The Soil investigation report consisted of various relevant data, drawings, bore logs, curves etc. for entire satisfaction of the design Engineer. However, design engineer will be able to select the suitable type of foundation.

The detailed Soil Investigation Report has been presented as Annexure to this Feasibility Study Report.



BORE HOLE LOCATION MAP

4.3 Broad/indicative master plan

Site Master Plan Preparation

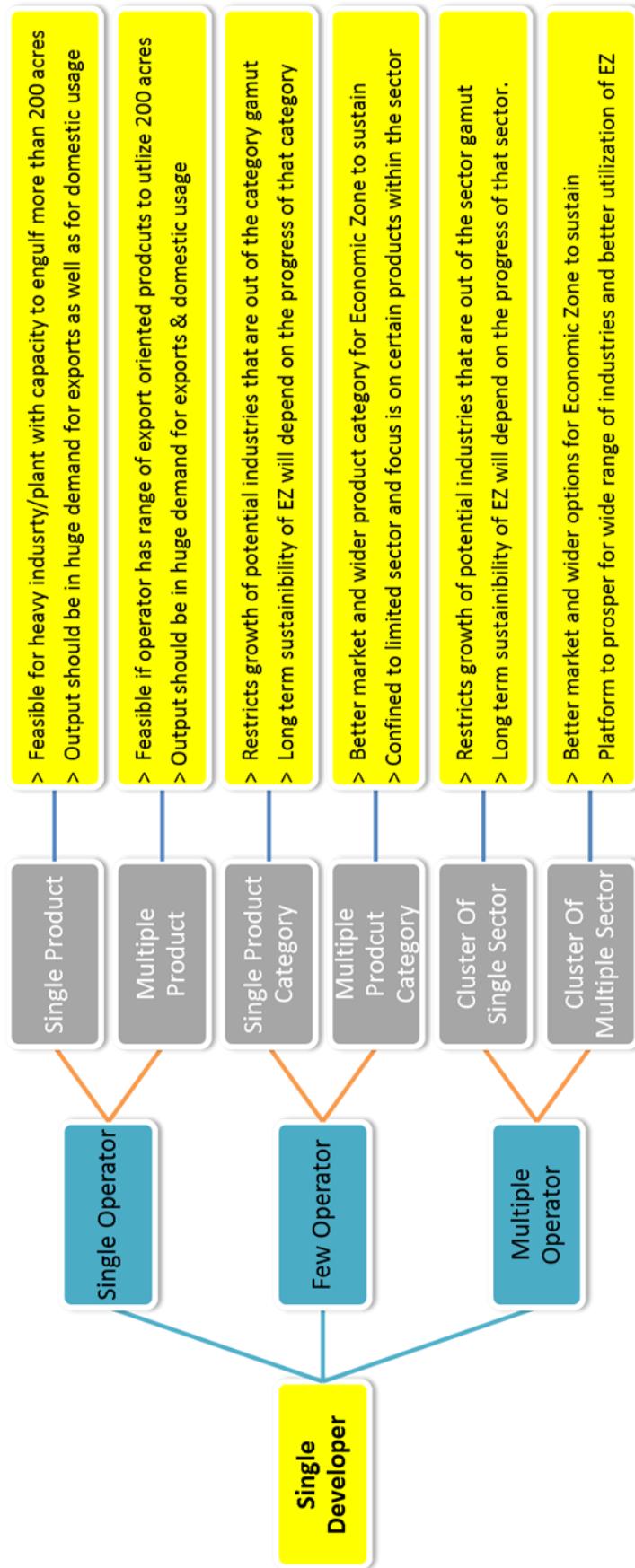
The site master plan for the Economic Zone provides guidance for the development of the industrial park. It should be environment-friendly and supportive to the multi-disciplinary industry operations. The guiding criteria on Technical Quality, Economic Quality, Environmental Quality, Social & Functional Quality and Administration & Management Quality should be integrated into the Site Master Plan of an Industrial Park.

Planning Strategy for Jamalpur EZ - A Green Industrial Park

Keeping clear and focused vision of development of Jamalpur Economic zone development a green approach is taken where short, medium and long-term planning goals and objectives for the zone is developed. The overall, broad Planning Strategy indicates that the following should be done:

- Develop an EZ that will promote the industries like food processing units, milk based industries, Jute Manufacturing, Pharmaceutical industries, medical accessories etc. and ancillary activities for the domestic and export markets.
- Be competitive with other regional and international EZs.
- Promote strong physical and economic linkages to strengthen the capacity of the EZ.
- Attract new investors and new types of value added production to Bangladesh.
- Create employment opportunities for the local population.
- Encourage the development and use of environmentally friendly and green technology throughout the EZ to minimize impacts on the environment.

Possible Development Structures of EZ:



Multiple operator with multiple sector is the most viable option. This will allow Jamalpur agro based industries to grow under the umbrella of Economic Zone as well as allow other industries at the country level and outside to invest and expand with exim benefits of EZ. Employment generation will not be confined to certain domestic segments but will enable it reach to wide range of industrial sector that will be willing to show their interest for development in EZ.

Models of Master Planning

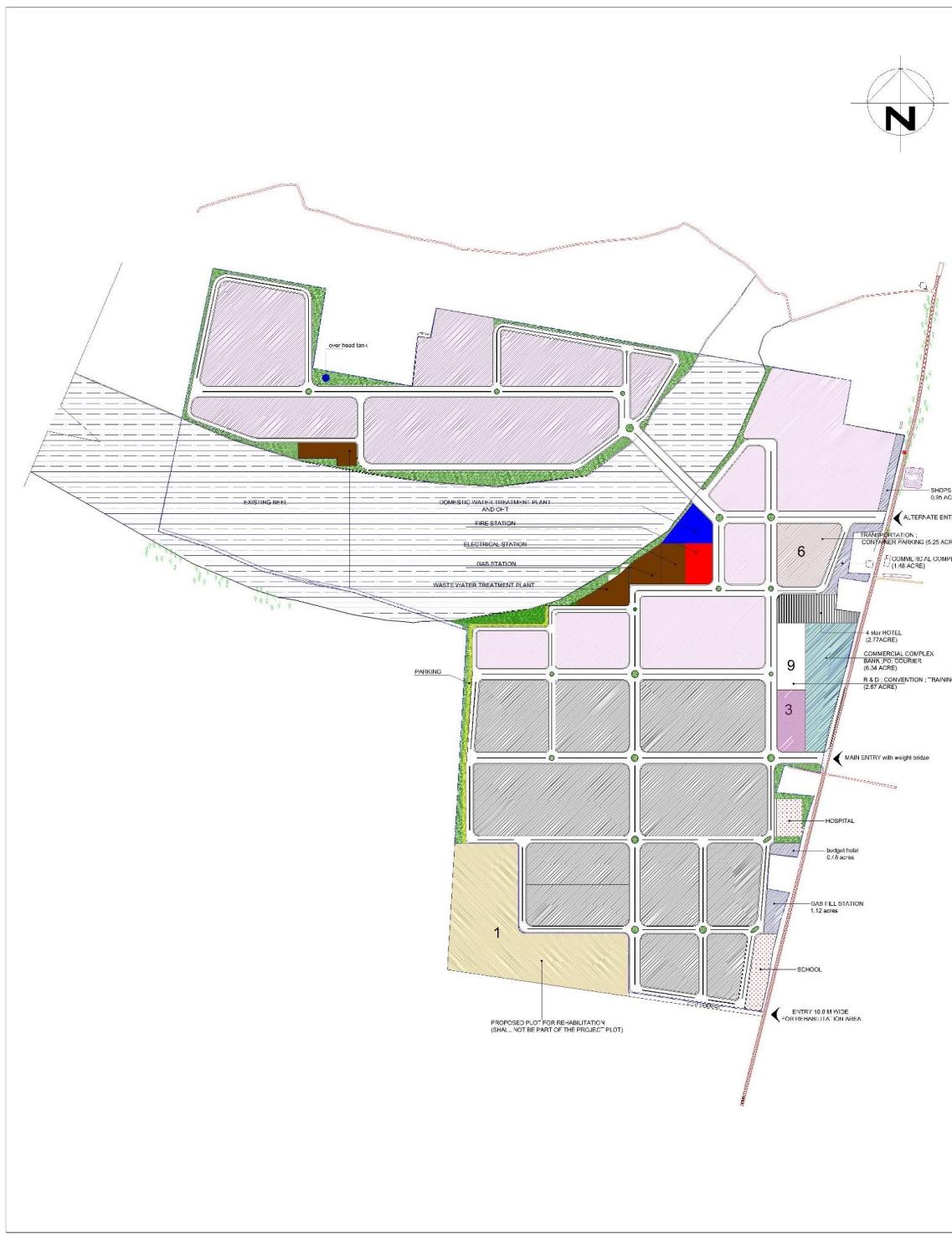
While developing the master plan for Jamalpur EZ a Single owner multi operator model with multiple product category has been adopted, however flexibility is given so that scope for other model like single owner single operator, single owner with limited operators are wide open in the later stages of development.

1. Single owner single operator: where there is single owner of the project and site shall be operated completely by a single company/operator.



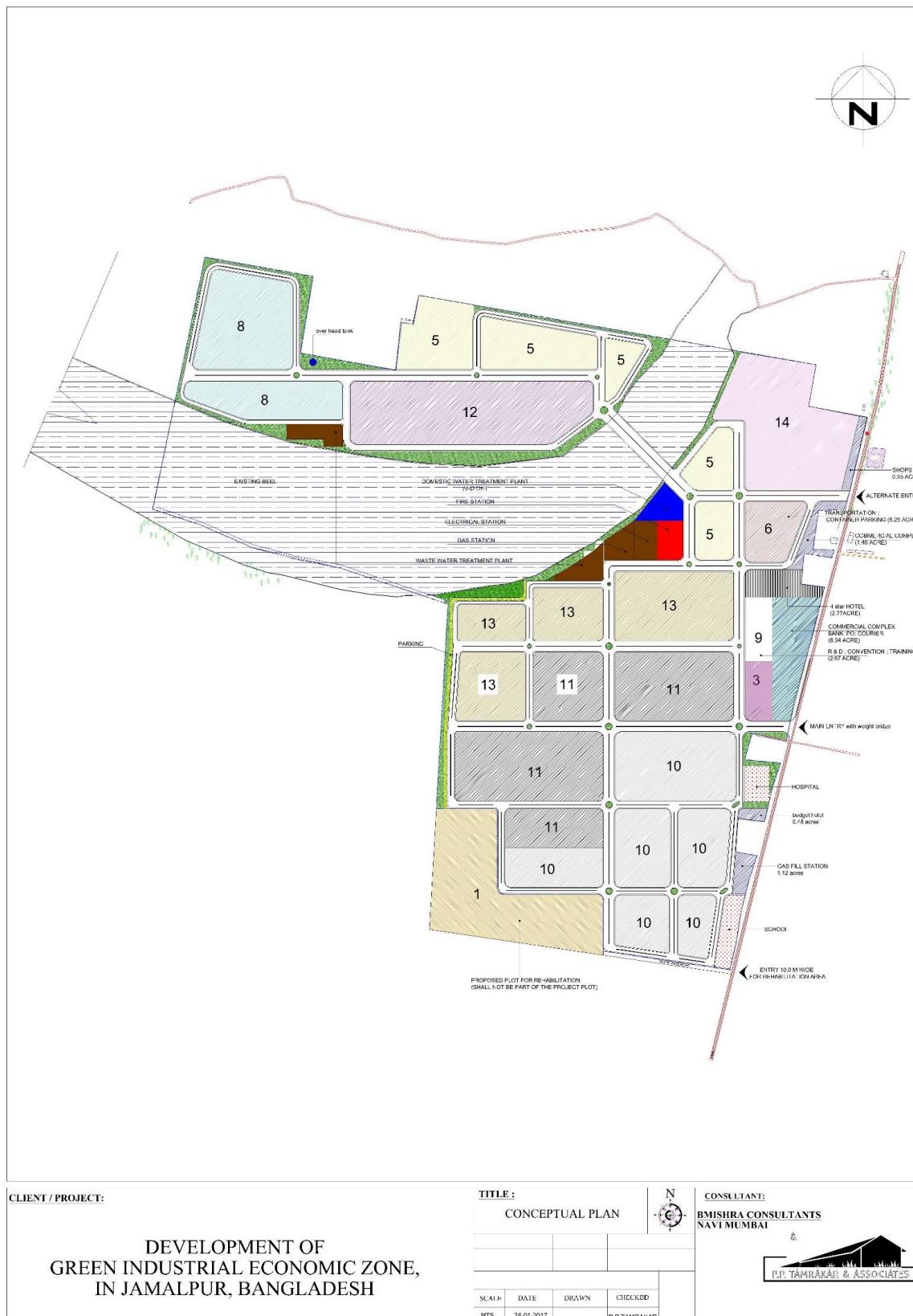
CLIENT / PROJECT:		TITLE :				CONSULTANT:	
		CONCEPTUAL PLAN				RMISHRA CONSULTANTS NAVI MUMBAI	
						P.P. TAMRAKAR & ASSOCIATES	
SCALE	DATE	DRAWN	CHECKED				
NTS	24-01-2017			P.P. TAMRAKAR			

2. Single Owner Few Operators: where there is single owner of the project and site shall be operated by limited (maximum 3-5) companies/operators.



CLIENT / PROJECT:		TITLE : CONCEPTUAL PLAN				CONSULTANT:	
DEVELOPMENT OF GREEN INDUSTRIAL ECONOMIC ZONE, IN JAMALPUR, BANGLADESH						RMISHRA CONSULTANTS NAVI MUMBAI	
SCALE	DATE	DRAWN	CHECKED				
NTS	24-01-2017		P.P.TAMRAKAR				P.P. TAMRAKAR & ASSOCIATES

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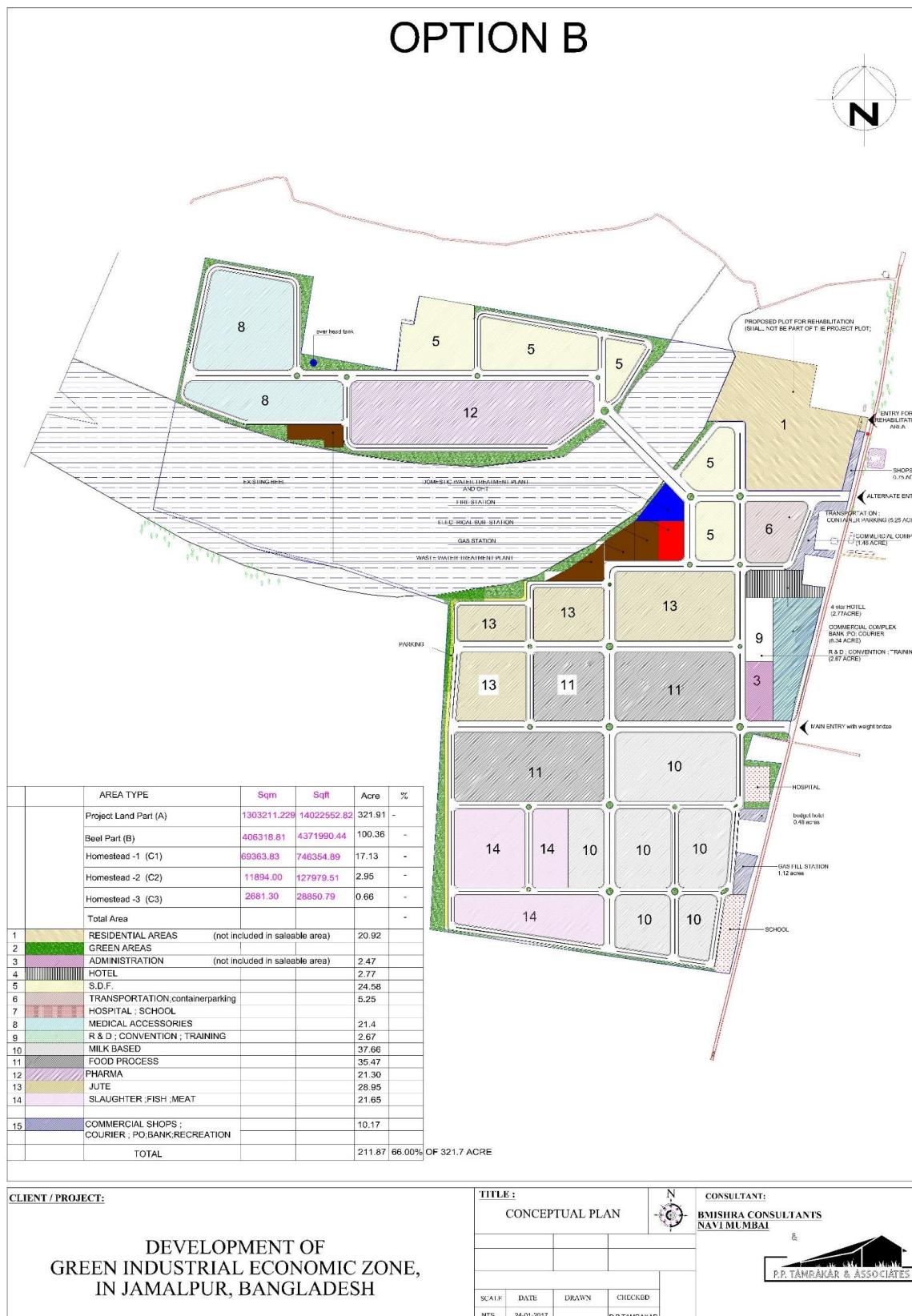
Depending on the rehabilitation location of the existing village, slight variation in the master plan is anticipated. Below shown are the three different options of village rehabilitation:

Description	Option A	Option B	Option C
Village	Village surrounded by the proposed EZ plot (not part of the project plot)	Proposed plot for Rehabilitation (shall not be part of the project plot)	Proposed plot for Rehabilitation (shall not be part of the project plot)
Village location	Same as current location	North-East end of the plot, next to the main highway	South-West end of the plot, internal end, away from main highway
Village shape	Same as original, not to be disturbed	As shown	As shown
Access road & village	To be isolated from the EZ project plot by a wall - · Between the EZ plot and the village access road · Between the Bamui beel and the village access road · Between the EZ plot and the village boundary on all sides · However, in option B & C, the outer sides of village and access road, which are not next to the EZ plot boundary, can be left open without wall. (please call me if clarification required on this)		
Village area	Not saleable; not part of the project plot		

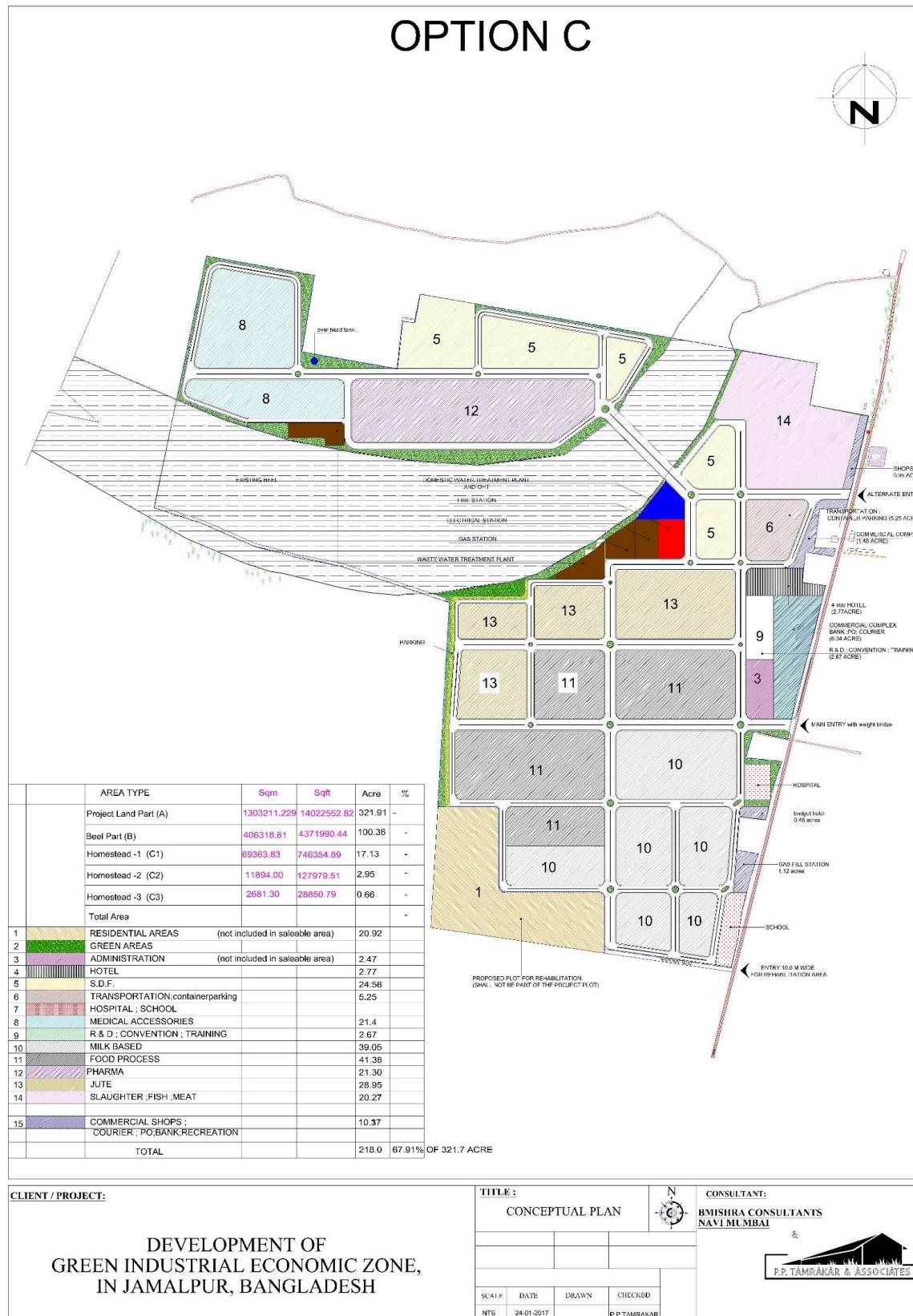
Option A: Village surrounded by the proposed EZ plot (not part of the project plot)



Option B: Proposed plot for Rehabilitation (shall not be part of the project plot)



Option C: Proposed plot for Rehabilitation (shall not be part of the project plot)



Planning Principle for Jamalpur EZ - A Green Industrial Park

The 'general process of planning' and 'plan formation process' are suggested as these plans are to be integrated with urban/regional plans and ensure continuity with infrastructure and services provisioned in these plans. These site master plans should be reviewed as and when necessary, and statutory approvals obtained.

The key contents of a Site Master Plan report of Jamalpur EZ are:

- Overview of the Economic Zone- location, total area of the site, expected number of industries, expected number of service related industries supporting the main industry, project cost, expected employment generation, targeted investments etc.
- Land use break-up of the site.
- Designation of zones/sites for industries according to types, including service industries, general industries, obnoxious and hazardous industries, etc. Elaboration of permissible industries and restricted industries.
- Basic infrastructure (road network, electricity, water supply, gas, eco-friendly transportation, security, fencing, fire and disaster management etc.).
- Technical infrastructure (green factory buildings, renewable energy/energy efficiency provisions, business center, warehouses, training & convention center, design center, incubators etc.).
- Environmental infrastructure (storm water drainage, sewerage/wastewater conveyance, wastewater treatment and disposal facilities, solid waste management facilities, green/open spaces/ landscapes, environmental monitoring etc.).
- Social infrastructure (food and beverages facilities, training/entrepreneurship development facilities, recreational facilities, gender specific infrastructure - provisions for women employees, barrier free infrastructure to enable people with disabilities, hotels/guest house, public toilets, hospital, school etc.).
- General development control regulation for controlling and regulating the use and development of land within the industrial park, including imposition of conditions and restrictions in regard to the open space to be maintained for buildings, the percentage of building area for a plot, the locations, number, size, height, number of stories and character of buildings and density of built up area allowed in specified area etc.

The Master Plan for the Jamalpur EZ

The Master Plan for the Jamalpur EZ follows best International practice of planning for EZs and utilizes international development standards integrated with the local requirements of Bangladesh. The plan is based on the market assessment and demand forecast in this feasibility study. The prominent features of the Jamalpur EZ Master Plan are:

- A fully fenced and secured facility with CSS monitoring and LED lighting.
- More than 65% of the site is leasable.
- An EZ Administration building, a Customs building, a cargo/container parking area, a fire and police station, waste collection center, domestic water and waste water treatment plants and small-scale convenience retail at the entrance of the site to assist investors and support tenants of the zone.
- Landscaped open spaces within the zone for the use of the tenants.
- A flexible plot design, which allows a variety of building types (i.e. factories, warehouses, or processing plants etc.).
- A road network with a 25-meter wide main arterial for easy on- and off-site access, and secondary roads throughout, to properly manage traffic and limit congestion. Landscaped sidewalks line the road network within the EZ.
- The site will have a full range of quality utilities available to investors (24/7) including consistent and stable electricity, water, drainage, wastewater and water supply treatment plants, a water retention pond, and telecom. The site will also utilize an energy conserving systems via a water retention pond for recycling water.
- The plan includes housing for the resettled households within the EZ.

Land Use Break-up

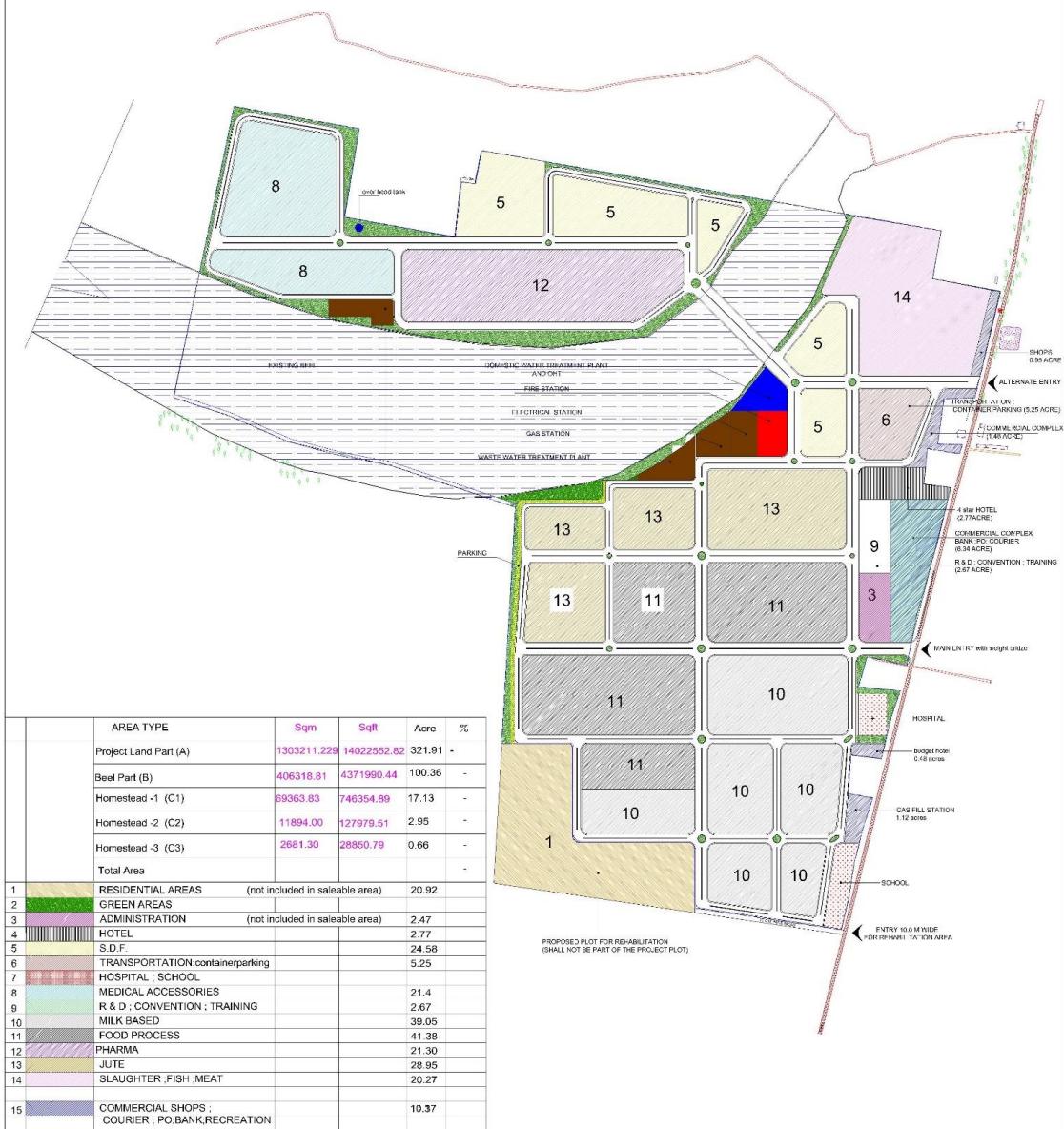
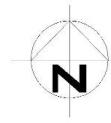
The suggested distribution of the land use within the Green Industrial Park is:

- Industrial (plots): 65%
- Residential: 0 %
- Parks and open spaces: 5%
- Common infrastructure zones: 15%
- Roads and circulation: 15%
- Total site area: 100%

The industrial plots include the areas that can be allotted to industries for the purpose of industrial or commercial activity. The common infrastructure zones include areas for basic infrastructure (excluding roads, transportation), environmental infrastructure, social infrastructure and relevant technical infrastructure. The roads and transportation areas include roads, railway, parking areas, pedestrian pathways, bicycle tracks, petrol pumps, weighbridge, service stations, etc.

Option C of the above discussed master plan models is adopted where single developer will be controlling multiple operators with multi products category environment:

OPTION C



CLIENT / PROJECT:		TITLE : CONCEPTUAL PLAN		CONSULTANT: BMISHRA CONSULTANTS NAVI MUMBAI	
DEVELOPMENT OF GREEN INDUSTRIAL ECONOMIC ZONE, IN JAMALPUR, BANGLADESH					
SCALE	DATE	DRAWN	CHECKED		
NTS	26-01-2017		P.P.TAMRAKAR		

Industrial Zones/Plots

The industrial zones should be earmarked based on homogeneity of function of the industrial activity and their inter-relationship to get the best use of land. The examples of such zones are:

- Milk Based products industries
- Food Processing Industry
- Jute based industry
- Meat based industry
- Pharmaceutical Industry
- Medical Accessories Manufacturing Industry
- Standard design factories for Micro, Medium, and Small Enterprises (MSME)
- Utility zone housing all basic infrastructure like water treatment plans (both domestic and waste water), power substation, fire station, gas station etc.
- Commercial Zone including shops, banks, post office, Fuel Filling station etc.
- Hotels; 4star and budget
- Hospital facility
- School

Each zone should be divided into blocks of appropriate size, which can be subdivided into plots. Depending on demand for size of the plot, smaller plots could be clubbed together. Also, in the future, without changing infrastructure, the plots could be combined or sub-divided as per demands persisting then.

The minimum plot size for layout & sub division of land for industrial uses shall be minimum 5000 sq. m. except for the standard design factories. These layout shall be developed based on the local market study. Plots shall be aligned to orient buildings for maximum ventilation and natural light.

Key Assumptions

- Based on the market survey above mentioned industries have been considered however there can be variation in plot distribution at the time of detailed design because of actual sale of plots to the operators.
- Village has to be relocated to the southern corner of the plot which saves cost and gives better utilization of plot.
- As per CSR rules a hospital and school development plots have been identified.
- All basic infrastructure like commercial complex, bank and post offices are considered.
- Possible green area has been identified without affecting the saleable area.
- Water treatment plant, substation, fire station, gas plant, earth filling, retaining wall structures etc. has been kept under the scope of government to develop. Spaces have been identified for the same.
- Earth filling shall be done by dredging as notified by the authorities and the cost has been considered for the same.
- All costing are based on SOR 2014 with 7% inflation per year.
- Wherever cost was not available in the SOR, suitable assumptions have been made.

Provisioning of Basic Infrastructure

Road network:

The road network includes hierarchies of roads as per site size and requirements. The suggestive road hierarchies are:

- **Hierarchy of Roads:**

Arterial Roads / main Distributor/Collector Roads ROW of 25 m	These are connector roads which distribute the traffic from access streets to arterial and sub arterial roads. They cater to a speed of 30km/h. These roads have free frontage access but no parked vehicles and have heavy cross traffic and minimum roadway inter-section spacing of 150 m.
Access Streets ROW of 15 m	These are used for access functions to adjoining properties and areas. They carry relatively lower volumes of traffic at low speeds.
Local Street ROW of 7.5 m	Street for access to residence, business or other abutting property, having necessary parking and pedestrian movement.

It is necessary to accommodate utility services along and across the roads. The design of utilities has to be done to ease maintenance and operations but keep in mind that it will affect the traffic flow and conflict with other services. Location should be taken up so that minor or no adjustments are required with road works taken up later. These utility services include the following:

- Sewers
- Storm water drains, drainage
- Water supply lines
- Electricity cables
- Telecommunication cables
- Gas pipelines
- Cross conduit ducts

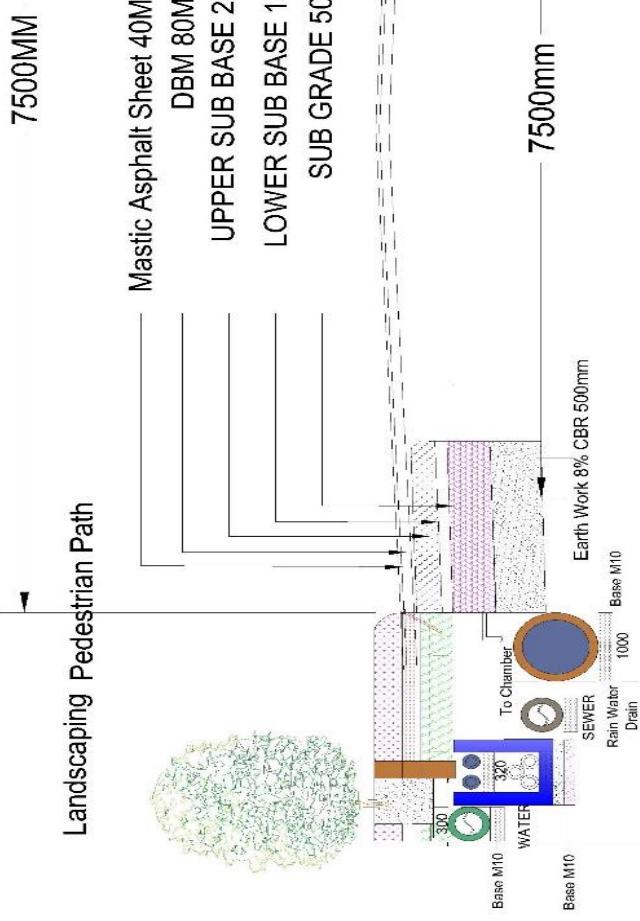
The road cross sections shall also provide for:

- Green belts - Tree belt should have a minimum width of 0.7m and a desirable width of 1.5m or more.
- Traffic control devices
- Public toilets integrated suitably
- Shaded pedestrian pathways - The minimum width should be 1.2m in order to accommodate wheelchair users. Comfortable minimum width is 1.8m.
- Spaces of benches, street light poles, service providers (e.g. kiosks)

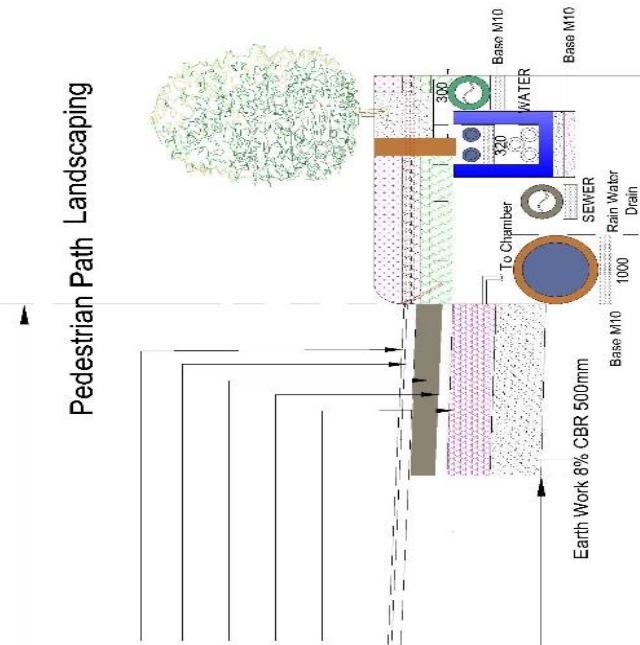
Below are the typical section for different width of roads as mentioned above:

Section: 7.5m wide road

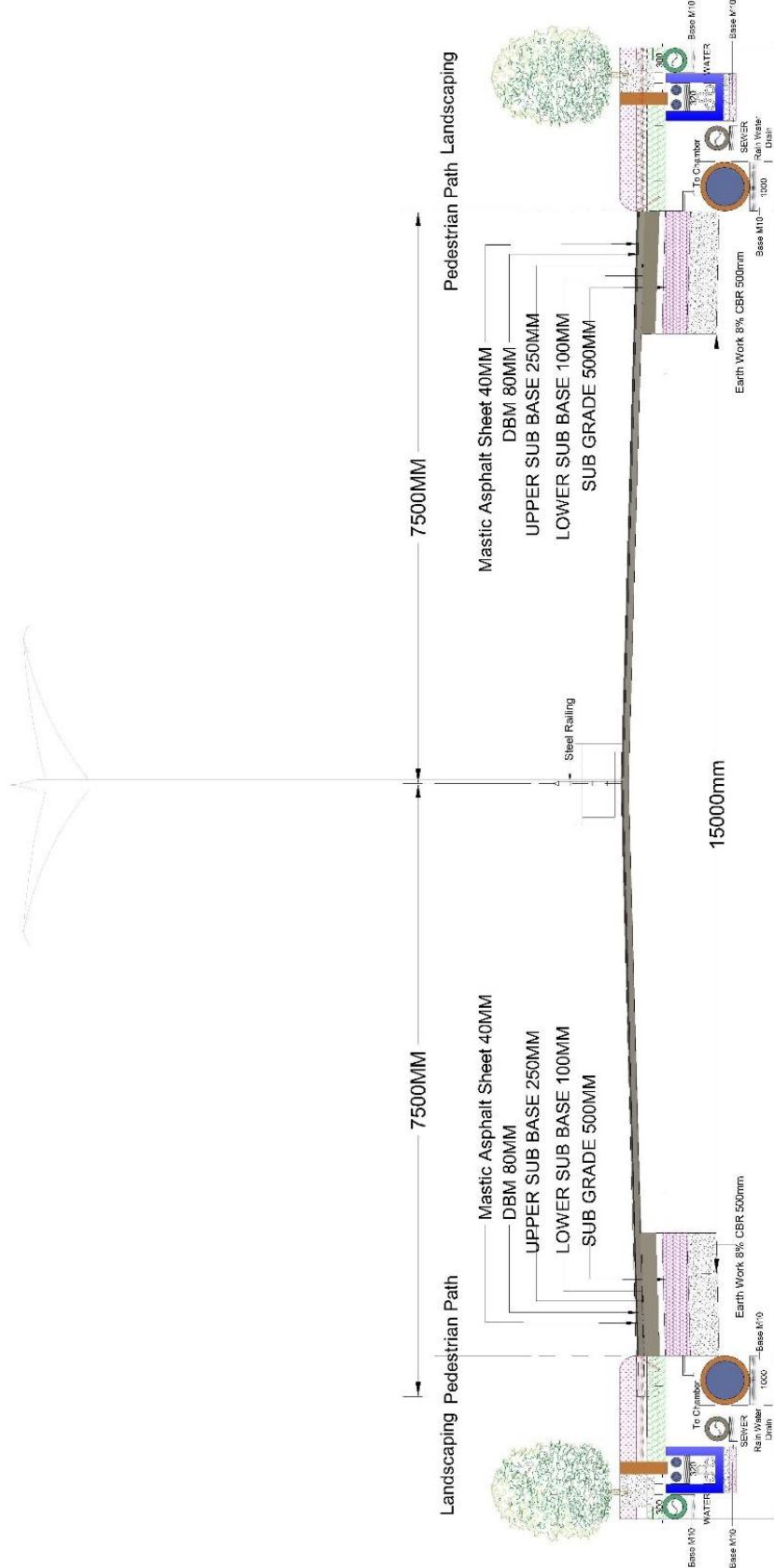
Landscaping Pedestrian Path



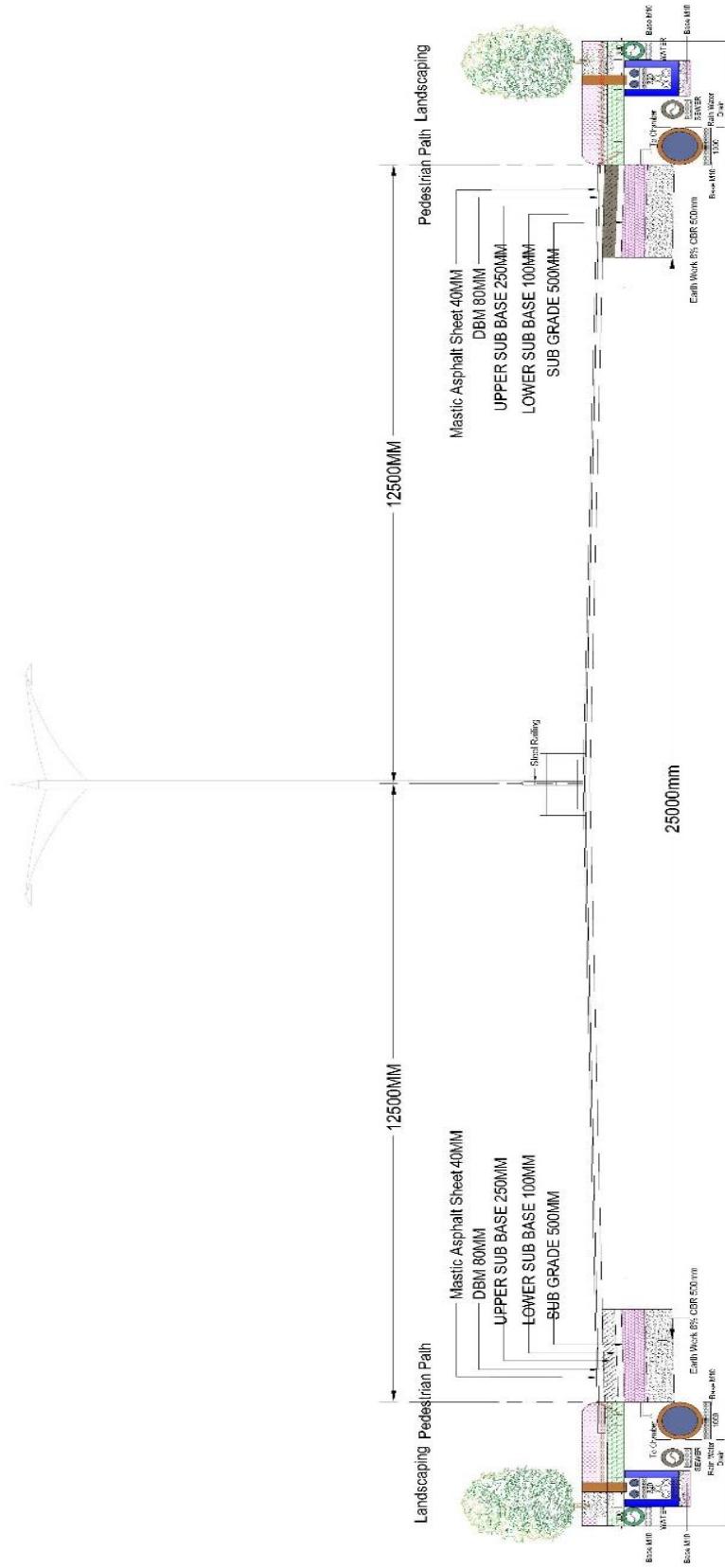
Pedestrian Path Landscaping



Section: 15m wide road



Section: 25m wide road



Entry/exit provisions:

The entry/exit gates could have signature architecture to reflect the unique identity of the Industrial Park as well as integrate local architectural elements. The infrastructure to be provided with entry/exit includes:

- Security cabin.
- Information center.
- Weigh bridge
- Map of the Industrial Park.
- Parking facility - to provide for adequate parking/standing to avoid queuing at the entry/exit; to
- Provide for parking for those who want to use bicycles or battery operated vehicles.
- Bus parking for external transport.
- Bus parking for internal transport.
- Adequate front space (in front of gate) for landscaping and aesthetic treatment.
- Public toilets.
- Drinking water facility.

Mobility: eco efficient transportation

- External road linkages to nearby settlements or housing areas where from the workers/employees will travel to the Industrial Park and to the railway station, bus station etc. in a time bound manner.
- Bus stops and pedestrian access points near the entrance gates.
- Eco-friendly public transportation such as battery operated vehicles, CNG buses to operate from the Industrial Park to the nearby settlement, housing areas, railway station, bus station etc.
- Bicycle and pedestrian network from surrounding settlements to the Industrial Park.

Signage: appropriate signage should be provided as per standards. Signage includes the following:

- Directional signage along major roads, pedestrian ways and bicycle ways.
- Signage on landmarks, central facilities, zonal facilities etc.
- Signage pertaining to names of industries should be uniform.
- Information signage.
- Advertisement boards/hoardings.

Safety & Security

To provide for security measures, fencing, and for fire & other disaster. These include:

- Centralized security office at the main entrance. In addition, security cabins at the exit and other strategic points.
- Close circuit (CCTV) cameras placed at all strategic locations in the industrial park.
- Fencing all around the industrial park made of environment-friendly materials.
- Provision for a fire station.
- Provision for a police post.

Utilities -

The site requires different utilities for smooth operation such as water treatment plant, tanks and distribution line, waste water pipes and its treatment facility, a power substation with distribution network, a gas station with distribution network, firefighting station with the fire water network, telecommunications and fiber optics network.

Water treatment storage and distribution:

Raw water shall be collected at a low level storage tanks from the municipal and other water sources like ground water and Beel water. The tanks shall be able to store water for minimum 7

days of requirement. A reverse osmosis and micron filtration system shall be installed before sending this water to the elevated tanks at two zones as shown in drawing. From these elevated water tanks the water shall be provided to each plots through water distribution network.

Waste water treatment

Sewage treatment is the process of removing contaminants from wastewater, domestic sewage and primary treated effluent. It includes physical, chemical and biological processes to remove various contaminants. Reliability, Capital cost and Operation & maintenance cost are the key factors considered for selection of appropriate treatment system. Sequential batch reactors (SBR) treatment system has been considered for waste water treatment which is a type of activated sludge process for the treatment of wastewater. SBR reactors treat wastewater such as sewage or output from anaerobic digesters or mechanical biological treatment facilities in batches. This system has been widely used for municipal and industrial wastewater treatment applications to meet specific discharge requirements. 2 numbers of sewage treatment plant of capacity 2MLD are proposed.

Power substation with distribution network

An electrical power substation shall be built inside the economic zone which suitable redundancy with the generator to provide uninterrupted power supply to the industries. The 11kv substation shall be installed by the government and only power and lighting distribution is in the scope of developer which is spread across the development plots.

Gas station with distribution network

A gas station shall be built inside the economic zone which shall provide uninterrupted gas supply to the industries as per requirement. The gas station shall be installed by the government and only gas distribution network is in the scope of developer which is spread across the development plots.

Fire station along with site firefighting network

A plot for fire station is considered for the fire officers and their equipment's. Fire tanks with a total storage capacity of 200cu.m. Shall be provided to the fire station along with fire pumps and distribution network.

Other utilities

Other utilities like telecommunication network, fire optics network etc. shall be provided as per the requirements by the operator of these services.

Bulk Costing of Development

The costs of development could be calculated based on essential infrastructure to be developed at the site by the economic zone developer, including roads, lighting, drainage, sewerage, greenery, entry/exit gates, buffer zones, waste management etc. The cost of development will depend on the infrastructure and services provided in the industrial park. A bulk cost estimate for the investment required to develop the site is followed through next section of the report.

Development Guidelines

Development guidelines have been prepared to help maintain the integrity of the EZ and give guidance to investors when they are formulating plot and factory/building designs.

Architectural Plans

The following is required:

- Any investor constructing a building within the EZ must submit the site plans/architectural plans for the proposed building and/or all ancillary structures to BEZA for approvals via their one-stop shop.
- Plot plans must provide plot dimensions and indicate the location and dimensions of the setbacks, building(s), internal roads, parking area(s), landscaped areas, walkways, loading bays, and vehicular and pedestrian access points.
- All connections to utilities within the plot must be identified and properly detailed.
- Cross-sections and roof drawings should be included in the set of drawings.

Setbacks and Site Coverage

Setbacks are required within the EZ. The minimum setbacks for plots are:

- Front Setbacks from Main Roads: 65.57 ft. (20m)
- Front Setbacks from Secondary Roads: 49.2 ft. (15m)
- Sideyard Setbacks on both sides: 26.2 ft. (8m)
- Backyard Setbacks: 32.8 ft. (10m)

Site coverage for each plot of land is set at a maximum of 0.6 times. In addition:

- Nothing can be constructed within the side yard setbacks, as this area must be open for fire access. Low level landscaping however, is permitted in this area.
- 30% of the backyard setback can be used for services (generators, garbage bins and storage)
- 35% of the front setback must be landscaped with trees.
- Sufficient parking shall be provided.
- All landscape designs must be approved by BEZA via their one-stop shop.

Plot Access

The following is required on each industrial plot within the EZ:

- All vehicular access onto/off a plot must occur from secondary roads. Access from the main artery is prohibited.
- All plots are permitted one access point.
- All access points must be a minimum of 65.6 ft. (20m) from any intersection.

Fencing

All industrial plots within the EZ must be fenced. In addition:

- The maximum height of fences within the EZ must be 7.2 ft. (2.2m) from grade.
- Fences should have a solid base with galvanized bars above. All fences must be painted black.
- No fence shall be concealed by landscaping.
- Fences between two adjoining plots must be built 3.28 ft. (1m) from the property line to ensure space for maintaining the fence.

Parking

All parking must be contained (at-grade) within the plot area. No street parking is permitted within the EZ. In addition:

- All plots must have a minimum of 1 parking space for a standard sized automobile (2.5mx4.6m) per 200 m² of floor space.
- Bicycle parking is permitted at 1 space per 500 m² floor space.
- Parking dimensions and turning radius within the EZ are as follows:

- Cars: Parking widths 8.2 ft. (2.5m)/Parking lengths 15.1 ft. (4.6m).
- Trucks: Parking widths 11.8 ft. (3.6m)/Parking lengths 32.8 ft. (10.0m)/Internal turning radius 28.5 ft. (8.7m)/Exterior turning radius 42 ft. (12.8m).
- Trailers: Parking widths 11.8 ft. (3.6m)/Parking lengths 59 ft. (18.0m)/Internal turning radius 22.6 ft. (6.9m)/Exterior turning radius 45.3 ft. (13.8m).

Landscaped Areas

The following is required for all landscaped areas within the EZ:

- All plant materials must be indigenous to the Jamalpur region.
- All plant materials must be watered using an automatic irrigation system.
- Sprinkler systems must be designed to not spray adjacent sidewalks, neighboring properties, and buildings.
- All grass areas should be mulched to a depth of 2 inches.
- Plant materials must be placed in a manner that will not obstruct roads or pedestrian pathways.

Signage

All signs must be pre-approved by BEZA via their one-stop shop. The following is required for all signage within the EZ:

1. Entrance of the EZ
 - A single sign is permitted at the entry of the EZ.
 - This monument sign must be a maximum of 20 ft. (6.1m) in height (measured from the grade of the highway's centerline). Such sign is intended to identify the EZ.
2. For Industrial Plots within the EZ
 - A single sign is permitted for all industrial plots within the EZ.
 - This monument sign must be a maximum of 8 ft. (2.4m) tall and 40 ft. (12.2m) wide.
 - The sign can be free standing or mounted on the side of the main building within the plot.
 - If the sign is illuminated, the light should not affect adjacent properties.
3. Free Standing Signs
 - The base and sides of the sign must be constructed from a masonry product (excluding smooth or textured concrete blocks).
 - The top of the sign must have an architectural feature representing the concept of the EZ.
 - Free standing, plexi-glass signs are not permitted within the zone.
4. Building Mounted Signs
 - Any illuminated sign and/or associated lighting must not affect adjacent plots.
5. Commercial Areas- Market Places

- 1 free standing sign located adjacent the public street is permitted at the main entrance of a market place.
- The free standing sign must include only the name of the market place and the major anchor tenants.
- The maximum size of the sign shall be 200 square ft. in area.
- The maximum height of the sign shall be proportional to the road frontage where the sign is located, but may not exceed 20 ft. (6.1m) in height.

6. Individual Commercial Tenant Signage

- Anchor tenants of commercial properties over 40,000 square ft. in area shall be permitted one building mounted sign on each facade that faces a public street or main driveway.
- No more than two building mounted signs shall be permitted.
- The permitted size of the building mounted signs must not exceed 2 square ft. for each lineal foot of tenant space on which the sign is mounted, but shall not exceed 250 square ft.
- Individual tenants of commercial properties fewer than 40,000 square ft. in area are permitted one building mounted sign.
- The permitted size of the building mounted sign must be a maximum of 2 square ft. per each lineal foot of tenant space on which the sign is mounted but shall not exceed 100 square ft.in area.
- Corner tenants are permitted to break their allotted square footage up and display it on the front and side facades, if the side façade of the property is visible from a public street or main driveway. In this instance, the permitted signage can be broken into one sign area on the front façade and one sign area on the side façade.

7. Free Standing Commercial Plots

- 1 building mounted sign shall be permitted on each façade that faces a public street or main driveway.
- No more than two signs shall be permitted.
- The permitted size of the building mounted signs shall be a maximum of 2 square ft. per each lineal foot of building or tenant space on which the sign is mounted, but shall not exceed 200 square ft.in area.
- 1 monument sign shall also be permitted at a maximum of 8 ft. (2.4m) tall and 24 square feet in area.

Utility Connections

The tenant shall apply to BEZA via the one-stop shop using the prescribed forms, at least 30 days before the actually designated service connection is required. Approvals must be obtained before any connections can be made within the EZ. The following documents shall be submitted in triplicate with the application:

1. Electricity

The following is required for all electrical connections:

- A site map drawn to a suitable scale, showing the location of the tenant's sub-station

within the premises and the location of the EZ's 11KV line and incoming cable to be the consumers sub-station.

- Details of the required connection.
- Copies of the manufacturer's test certificate and manual of the transformer as per BSS or IEC standards.
- Copy of the oil test report for the transformer (the oil test report is to be prepared after the transformer is brought to the site). Such tests may be conducted by Bangladesh Power Development Board or any expert recognized by the Chief Electrical Inspector of the EZ.

2. Wastewater

The following is required for all wastewater connections:

- A site map drawn to a suitable scale, showing the location of the tenant's wastewater connection.
- Details of the required connection.
- The wastewater, drainage and rainwater drainage systems must be designed separately.
- Pre-treatment for toxic and chemical constituent elimination from each factory is required prior to discharging to the wastewater system. Details of this system are required.

3. Water Supply

The following is required for all water supply connections:

- A site map drawn to a suitable scale, showing the location of the tenant's water supply connection.
- Details of the required connection.
- Plans for the tenants to construct their own over-head reservoir, pump and float valve, at their own cost before applying for a construction permit.
- Water meter at the cost of the tenant and to be approved by BEZA via their one-stop shop; to be kept sealed and made available to BEZA and the EZ operator at all times.
- If an unauthorized water connection is detected, BEZA or the EZ operator may cut off the said connection without notice.

4.4 Estimation of capital and operating costs

The development modalities of the project has two distinct components.

- Development responsibilities of the private developer-cum-operator
- Development responsibilities of the Government

Thus the capital cost of the project has two distinct brackets. The following table on cost of development of the project has specified the development cost both for the private developer-cum-operator and the Government. The estimated block cost is based on the prevailing rates in the country and occasionally refers to the PWD Schedule of Rates 2014 (inflation adjusted).

The development cost has been assessed for the most preferred option that is option C. Since the estimated cost is based on block cost estimate, the cost estimates for the other two options that is, Option A and Option B, has a different capital cost to the private operator and the Government, due to the difference in the cost of the bridge and development of the land due to rehabilitation.

The civil development cost to the private operator is BDT 219 crores and civil development cost to the government is BDT 105 crores.

DEVELOPMENT COST			
S.NO	PARTICULARS OF ITEM	MILLION BT	% SHARE
1	ROAD AND INTERNAL NETWORK		
	A. 7.50m wide internal roads	29.53	1.48
	B. 15.00m Sub Arteriary Roads	202.50	10.17
	C. 25.00m wide Arteriary Road	331.25	16.63
2	DRAINAGE PIPING AND WASTE WATER TREATMENT PLANTS	276.79	13.90
	2 NUMBERS OF SEWAGE TREATMENT PLANT WITH PUMPING FACILITY 2 MLD		
	Supplying, fitting and fixing laying Pipes up to depth of invert dia R.C.C pipe having 1.83 meter in length made of stone chips with 40 mm cement joint including all fittings and specials like plain bend, Tees, reducing sockets, junctions, door bends cowls, anti-siphon, gasket and cement joints, making holes in walls and mending good the damages etc. all complete approved and accepted by the Engineer.		
	R.C.C pipe of 375 mm dia with thickness 50mm		
	R.C.C pipe of 300 mm dia with thickness 50mm		
	R.C.C pipe of 225 mm dia with thickness 40mm		
	R.C.C pipe of 150 mm dia with thickness 40mm		
	100mm dia uPVC Pressure waste pipe for final disposal		
	inspection pits and covers		
3	DOMESTIC WATER PIPING AND TANKS FOR STORAGE	103.19	5.18

	2 NUMBER OF ELEVATED STORAGE TANKS WITH 500CU.M.		
	WATER PIPPING:Supplying, fitting and fixing GJ. pipe conforming to the standard BS-1387 & BDS-1031, having chemical composition (in%) Carbon0.17-0.25, Manganese 0.95-1.20, Sulphur 0.060 max, Phosphorous 0.060 max, Tensile properties : mimimum Yield Strength 188 MPa, minimum Tensile Strength 313 MPa and for A) Manufacturer b) Material c) Wall thickness d) Nominal outside dia e) Intended use etc, on the body of the pipe with all fittings, such as bends, elbows, sockets, reducing sockets, tee, unions, jam-nuts etc. including cutting trenches where necessary and fitting the same with earth duly rammed and fixing in walls with holder bats and making hole in floors, walls and consequeni mending good the damages etc. all complete in all respects approved and accepted by the Engineer.		
	100 mm dia G.I. Pipe with wall thickness 3.65 mm, outside diameter min 113 mm, weight 10.42 kg/m, can withstand min 50 kg/cm ² hydraulic pressure.		
	75-80 mm dia G.I. Pipe with wall thickness 3.25 mm, outside diameter min 87 .9 mm, weight 7.22 kg/m, can withstand min 50 kg/cm ² hydraulic pressure .		
	62-65 mm dia G.I. Pipe with wall thickness 3.25 mm, outside diameter min 75.2 mm, weight 6.15 kg/m, can withstand min 50 kg/cm ² hydraulic pressure.		
	50 mm dia G.I. Pipe with wall thickness 3.65 mm, outside diameter min 59.7 mm, weight 5.38 kg/m, can withstand min 50 kg/cm ² hydraulic pressure.		
4	Storm water draianage: R.C.C pipe of 375 mm dia with thickness 50mm	71.08	3.57
5	Administrative buliding and associted construction work	90.00	4.52
6	Bridge: 225m long and 35m wide, construction shall be based on the battery of box culverts methodology to save cost	550.00	27.62
7	Green area with plantation	10.00	0.50
8	Site boundary: 2 m above the fill level	144.00	7.23
9	FIRE FIGHTING		
	Fire station (fire water tank, pump room and related services)	20.00	1.00

	Fire Hydrent & Fire fighting equipment: Fire Pump Set, Horizontal split case type UL/FM approved, meeting all NFPA requirements, complete with all pipework, valves, flow sensors/switch, alarm valves, Control panel with starters, ATS, all controls and relays, fully integrated with Firealarm system, Building Management System, Factory cabling & wiring from Control panel to motors & controls, complete set mounted on structural steel frame with necessary vibration isolators ready to connect to field pipework. Internal and external Hydrants with hose reels and cabinets	50.00	2.51
11	ELCTRIFICATION - STREET LIGHTING AND POWER DISTRIBUTION	75.00	3.77
12	GAS DISTRIBUTION NETWORK	37.98	1.91
	Installation of 50 5L, Grade-8, ERW Natural pipe line for supplying Titas Gas including, supplying, fitting, fixing and laying different sizes M.S. pipes with necessary tape and primer including. cutting trenches (450 x 910 mm) in all kinds of soil, cleaning, cutting, applying coal-tar, wrapping the pipes and back filling the trenches, excavating earth including. leveling, dressing and removing excess earth in all respects as per specification of Titas Gas T and D Co. Ltd. and accepted by the Engineer.		
	75 mm N.D (88.90 mm O.D) M.S pipe, weight min 8.3 kg/m, standard test pressure 176 kg/ m ² , wall thickness min 11.29 mm		
	50 mm N.D. (60.30 mm O.D) M.S pipe, weight min 5.44 kg/m, standard test pressure 176 kg/ m ² , wall thickness min 3.91 mm		
	25 mm N.D. (33.40 mm O.D) M.S pipe weight min 2.50 kg/m, standard test pressure 50 kg/ m ² , wall thickness min 3.38 mm welding		
	TOTAL DIRECT PROJECT COST TO DEVELOPER IN BT MILLION (A)	1,991.32	100.00
	Contingencies @ 5%	99.57	
	Total cost including contingencies	2,090.88	
	Responsibility of Government		
1	REHABILITATION - HOUSES ONLY	200.00	
2	LAND FILLING AREA	456.21	
5	RETAINING WALL WITH WATER BODY PROTECTION: 3m high and 500mm thick	135.00	
9	Site boundary with 2m retaining wall for the fill	259.20	
	TOTAL PROJECT COST IN BT MILLION (B)	1,050.41	
	TOTAL PROJECT COST (A+B) in BT Million	3,141.29	

The operating and maintenance cost as assumed in the financial model, are reproduced as below. Detailed considerations for the operating cost of the project have been presented in the chapter on Financial Analysis.

Item	Flow of cost	Cost	Remarks
Lease Rental	Developer to Contracting Authority	BDT 0.1 per sq. ft. To be increased annually at 5%	
Lease Rental	Individual lease holder to developer	BDT 2 per sq. ft. To be increased annually at 7.7%	
Maintenance cost	Developer spends through maintenance expenses	BDT 2.96 per sq. ft. Considered an escalation of 5% per annum (period maintenance cost has been annualized)	Applicable on the entire park area (425.88 acres)
Maintenance cost	Individual Lease holder pays to the developer towards meeting the maintenance expenses of the developer	BDT 6.67 per sq. ft. Considered an escalation of 5% per annum	Applicable only on the industrial use (195 acres)
Charges for services (like gas, electricity, water)	The Contracting Authority will collect the charges and pay to the suppliers	To be decided at a later date depending on the charges of the basic supply cost	The charge that Contracting Authority will collect will be higher than the supply cost owing to meeting the administrative expenses, unforeseen contingencies and a normal profit. The case of partial cost recovery may be decided at later stage

5. Project Scope

5. Project Scope

5.1 Formulating development concepts of the modality

The key objective of the proposed development is induced industrialization. The process needs to take into consideration, national and international experience of such initiatives. A PPP model is best suited for this sort of development concept as experienced elsewhere internationally. However, it is important to make the project attractive and investment friendly with an optimum scale of operation so that manufacturers find it feasible to operate within the park. In this context, EY has developed the development modalities and the interaction among the players to make such a concept successful. The development concept is presented in chapter 8 where a detailed discussion on structuring option is presented.

Based on the development modalities as discussed in chapter 8, the services to be delivered by the private partner and the Contracting Authority is presented in the preceding section of the chapter.

5.2 Descriptions of services to be delivered by the private partner / contracting authority

The consideration of the scope bifurcation for the Private Partner and the Contracting Authority vis-à-vis the other stakeholders are as follows:

- The Contracting Authority will hand over the plot to the private partner with basic land development through land filling.
- The Contracting Authority will specify the boundary of the Park.
- The land will be handed over free of all encroachments.
- The Contracting Authority shall take the Initial Environmental clearances so that the plot can be leased out to private partner.
- The Contracting Authority ensure the services up to the park gate.
- All internal infrastructure to be developed for the smooth operation of the park by the Private Partner.
- Specific infrastructure within the individual industrial plots shall be developed by the individual manufacturer.
- The Private Partner's responsibility is to provide all the basis services and facilities up to the individual operator's plot.
- There will be many non-revenue earning services those are confined to the manufacturer and their employees, shall be the responsibility of the private partner. On the other hand, the development of the services for the manufacturer and their employees as well as a larger section of the society shall be the responsibility of other stakeholders through the Contracting Authority.
- The specific facilities, which are required for operation of a particular manufacturing unit which are not required for other manufacturers, shall be developed by the particular manufacturer requiring such facilities.
- Revenue generating other ancillary facilities like hotels, shopping mall, internal transport services, etc. can be leased out by the developer to other operators or the Private Partner operate themselves if it is attractive to him/her.
- Certain operations by default are responsibility of the Government Agencies only, for example, Fire Services, Solid Waste Management, etc. Hence, the developed plots to create such facilities will be handed over to the respective public agencies.

Sl. No.	Description	Saleable (Y/N)	Remarks
	Processing area		
1	Industrial plots	Y	Only plot development; no structures to be built
2	specialized infrastructure		
2a	Warehouse	Y	Only plot development; no structures to be built
2b	Truck lay bay / Parking area	N	Entire setup to be developed by the developer
2c	Container yard	Y	Only plot development; no structures to be built
2d	Q.A & Q.C lab	Y	Only plot development; no structures to be built
2e	R&D facility	Y	Only plot development; no structures to be built
2f	Training center	N	Entire setup to be developed by the developer
3	Roads & Culverts	N	To be developed by the developer
4	Bridge	N	To be developed by the developer
5	Utilities		
5a	Gas Substation & administration office of supplying agency	N	Only plot development; Substation to be developed by Govt. Authority
5b	Water pump station	N	Only plot & Overhead Tank development; Treatment plant to be built by Govt. Authority
5c	Power Substation	N	Only plot development; Substation to be developed by Govt. Authority
5d	Construction of utility duct along the roads / utility corridors	N	entire set up to be developed by the developer
5e	Gas Pipeline network installation	N	No separate ROW; to be within utility duct; Gas pipelines network to be developed by the developer
5f	Water distribution network installation within EZ	N	No separate ROW; to be within utility duct; pipelines network to be developed by developer
5g	Power distribution network installation within EZ	N	Power distribution network to be developed by developer

Sl. No.	Description	Saleable (Y/N)	Remarks
5h	Fibre optic cable network installation	Y	No separate ROW; to be within utility duct; developer will sell the installation rights to a data service provider for all installations and operations
5i	STP	N	STP set up to be developed by the developer
5j	WWTP	N	WWTP set up to be developed by the developer
5k	Solid Waste Management	N	Set up for Solid Waste Management to be developed by the Developer
5l	Fire station	N	Plot and the fire station structure to be developed by the developer
5m	Fire Protection System including dedicated water storage tanks, piping network and other necessary compliances as per international standards	N	To be developed by the developer; cost to include cost of entire FPS set up; obtaining Fire NOC shall be developer's responsibility
5n	Common Industrial Effluent Treatment Plant (Not to be installed)	N	Not to be provided; Individual industrial operators shall be responsible to develop Effluent treatment plant for themselves if treatment is required prior to releasing the effluent to WWTP
6	Public amenities including Street Lighting, Road side water sheds, rest rooms and other necessary amenities within site	N	Cost to the developer to include the cost of entire set up
7	Green & open space	N	To be developed by the developer including the landscaping work as well
8	Rain Water Harvesting system	N	Cost to the developer to include the network of storm water drainage across the EZ; RWH pits for individual plots to be constructed by each operator individually
9	Shuttle services inside the EZ including depot for the shuttles	N	Cost to the developer to include the cost of entire set up including the depot set up, intermediate bus stop shelters, battery operated shuttles, etc.

Sl. No.	Description	Saleable (Y/N)	Remarks
10	Small kiosks / coffee shops within the EZ area	Y	To be developed by the developer
	Non processing area		
1	Entrance plaza - at each entry point	N	To be developed by the developer
2	Admin block	N	To be developed by the developer
3	Security surveillance set up	N	To be developed by the developer
3	Investors club	N	To be developed by the developer
4	Crèche	N	Entire set up to be developed by the developer with plot provision for future expansion if needed. And to be handed over to the contracting authority. It may be run and maintained by EZ park labor welfare society.
5	School	N	Only plot to be developed by the developer; no structures to be built. Developed plots to be handed over to BEZA for further development; BEZA may handover the plot to Education Department
6	Hospital / Health Care	N	Only plot to be developed by the developer; no structures to be built. Developed plots to be handed over to BEZA for further development; BEZA may handover the plot to Health Department
7	Hotels	Y	Only plot development; no structures to be built
8	Retail	Y	Only plot development; no structures to be built
9	Convention Center	Y	Only plot development; no structures to be built
10	Recreation	Y	Only plot development; no structures to be built

Sl. No.	Description	Saleable (Y/N)	Remarks
11	Gas filling station	Y	Only plot development; no structures to be built; plot may be sold to some Gas station agency
12	Compound wall	N	Superstructure of the compound wall to be developed by the developer; retaining wall below the plot level to be developed by the Authority

5.3 The broad output specification and the key performance indicators (KPIs)

The key quality parameters of Industrial Park/Estate are related to:

- Economic quality
- Technical quality
- Environmental quality
- Socio-functional quality
- Administrative & management quality

Details of these parameters are given below.

Economic quality		
1.	Land value development	Development cost per unit area i.e. saleable cost of the economic zone.
2.	Efficient land use	<ul style="list-style-type: none"> • Land use break-up in accordance with applicable laws/rules/norms. • Site master plan and different thematic layers to be prepared in appropriate scales: <ul style="list-style-type: none"> Site master plan. Land use plan. Transportation plan (e.g., roads, parking, service station, petrol pump, mobility plan, pedestrian pathways, bicycle tracks/stations etc.).
Technical Quality Parameters		
3.	Renewable energy and energy efficiency	<ul style="list-style-type: none"> • Total primary energy demand; solar and other renewable energy provisions; energy efficiency measures; provisions for heating and cooling; energy efficiency measures. <ul style="list-style-type: none"> Solar street lamps and external lighting fixtures Solar panels (PVs) on roof tops of factory buildings Green Factory Buildings Insulated rooftops Solar energy generation in public/common areas Renewable energy/energy efficiency fixtures

4.	Quality of transport Infrastructure	<ul style="list-style-type: none"> • Presence of an overall transport system; quality of the traffic model and modal split; innovative and eco-efficient mobility offerings; quality of internal and external connectivity and their accessibility; public transport infrastructure; parking spaces; supporting infrastructure (Service stations, weigh bridges; fuel stations etc.) Hierarchy of roads and road cross sections as per standards. Integration of utility services [Sewers, storm water drains, drainage, water supply lines, electricity cables, lighting, telecommunication cables, optical fibre cables, gas pipelines, green belts, traffic control devices, public toilets - integrated suitably, spaces for benches, street light poles, service providers (e.g., kiosks) etc.]. Entry and exit gates with access control provisions at the entry/exit gates (security cabin, Information center, map of the Industrial park, parking facility, public toilets, drinking water facility etc.). Internal and external public transportation systems [internal transport from entry gates to discourage private vehicular movement, eco-friendly internal transport - battery operated vehicles, external transport - CNG buses, automobile service stations, signage etc.] Adequate parking facilities at entry/exist. Centralized parking, zone level parking, plot level parking. Weigh bridges at every entry and exit gates.
5.	Quality of pedestrian infrastructure	<ul style="list-style-type: none"> • Provisions for pedestrians; safety and comfort; street crossing aids; way finding systems. Pedestrian pathways along roads
6.	Quality of overall logistics concept	<ul style="list-style-type: none"> • Logistic support provisions for factories and employees. Business center, One-stop-services, Administrative building, club house of investors. Information center Warehouses/raw material depots Training center Incubation center Design center, product/material testing facility Commercial zone
7.	Resource-efficient infrastructure	<ul style="list-style-type: none"> • Resource efficient infrastructure, viz. sustainable building materials, earthworks management; recycle and reuse of treated wastewater and rain water; recycle and reuse of wastes; recycle and reuse of chemicals and materials; reduced demands of fresh water use etc. Green Factory Buildings and Green Buildings. Usage of eco-friendly building materials for roads, fencing, buildings etc.

		<p>Renewable energy, energy efficiency and resource efficiency fixtures/installations</p> <p>Recycles/reuse of wastes, wastewater, rainwater and materials</p>
8.	Safety & security provisions	<ul style="list-style-type: none"> Provisions for safety and security of the industrial park and the employees. Centralized security office at the main entrance. In addition, security cabins at the exit and other strategic points. Close circuit (CCTV) cameras placed at all strategic locations in the industrial park. Fencing all around the industrial park made of environment friendly materials. Provision for a fire station. Provision for a police post. Disaster management center.
9.	Utilities	<ul style="list-style-type: none"> Provisions for the required utilities the industrial park. Power transmission lines Power sub-station Water conveyance, treatment, adequate storage and distribution network Telecommunications network

Environmental Quality Parameters		
10.	Waste management	<p>Adequacy of provisions for waste management, including compostable organic wastes, hazardous wastes, plastic wastes, paper and other recyclable wastes, used containers and packaging materials etc.</p> <p>Provisions for collection and transportation of wastes.</p> <p>Recycling center for e-waste</p> <p>Recycling center for recycling of wastes</p> <p>Hazardous wastes collection and temporary storage facility.</p>
11.	Rain water management	<ul style="list-style-type: none"> Adequacy of provisions for rain water management, including storm water drainage, recycle/reuse for industrial production or cooling or for fire protection or irrigation of green spaces etc. <p>Storm water drainage network.</p> <p>Mandatory rainwater harvesting facilities shall be developed at each plot.</p>
12.	Climate Change adaptation	<ul style="list-style-type: none"> Provisions for climate change adaptation due to increasing temperatures, increased flood, reduced water reserves etc. <p>Assessment of flooding areas and provisions of appropriate land use and drainage;</p> <p>Landscaping and greenery provisions;</p> <p>Appropriate internal and external transportation provisions;</p>

13.	Biodiversity, greenery	<ul style="list-style-type: none"> Preservation and additional provisions for retaining and promoting biodiversity in the industrial park. Local habitat to be encouraged. <p>Preparation of habitat objectives, mapping of habitat functions and implementation of measures.</p> <p>Conservation of existing plantation, water bodies and other natural features on site.</p> <p>Provisions for greenery and buffer zones. Hierarchical greens - central greens, green belts at the periphery, vertical and horizontal stretches of greens across the industrial park, avenue plantation, plantation at plot level.</p>
14.	Emissions and air pollution control	<ul style="list-style-type: none"> Provisions for control of atmospheric emissions and air pollution. <p>Restrictions on unsuitable air polluting industries.</p> <p>Measures for reduction of emissions, viz. eco-efficient mobility with battery operated vehicles, CNG buses for internal/external transport, bicycling tracks, pedestrian pathways that do not cause pollution, usage of clean fuels, common steam and power plants.</p> <p>Online air quality monitoring station and display boards.</p>
15.	Waste water pollution control	<ul style="list-style-type: none"> Provisions for waste water pollution control. <p>Provisions for wastewater conveyance system in accordance with slopes and zoning of industries.</p> <p>Provisions for common effluent treatment plants, sewage treatment plants.</p> <p>Provisions for storage of treated waste water (guard pond)</p> <p>Provisions for recycle/reuse.</p>
		Online monitoring systems to check water quality compliance with standards.

Socio-functional Quality Parameters

16.	Social quality and infrastructure	<ul style="list-style-type: none"> Provisioning of social infrastructure. <p>Training center to cater to vocational training, education facility</p> <p>Incubator for entrepreneurship promotion</p> <p>Hospital/health care facilities</p> <p>Public toilets, drinking water facilities in commercial complex area</p> <p>ATM, post office/courier service, bank</p> <p>Information center for customer services</p> <p>Hotels and Guest house, dormitories for employees /workers /visitors</p> <p>Recreational facilities</p> <p>Residential township in the vicinity</p> <p>Special arrangements for truck drivers</p> <p>Transportation/mobility arrangements</p> <p>Safety & security</p>
17.	Gender considerations	<ul style="list-style-type: none"> Special provisions for women employees. <p>Play schools and crèche for infant children of workers, ladies room and accommodation for late</p>

		<p>working/shift operating employees Safety and security, internal and external transportation Health center, canteens/ food outlets, kiosks, toilets, internal shuttle service (battery operated)</p>
18.	Health, comfort and user satisfaction	<ul style="list-style-type: none"> Provisions for health, comfort and user satisfaction in the industrial park. Health center. Recreational areas, including sports fields, greenery, parks etc. Safety provisions, including security at entry/exits, access control, fencing, CC cameras across the site, police post. Landmark area at the center with extensive landscaped area, amphitheater etc. that provide ample opportunities for social interaction. Elegantly designed green factory buildings and landscaped areas that provide visual identity and impact.
19.	Functional and design quality	<ul style="list-style-type: none"> High functional and design quality of the industrial park. Signature architecture identity and visual impact Mobility integrated with existing transport/mobility network Master Plan aligned with slopes/contours Art in the design - traffic islands, landscaped areas at the entry/exist gates etc.
Administrative & Management Quality Parameters		
20.	Administrative & management infrastructure	<ul style="list-style-type: none"> Provisioning of infrastructure for administration and management of the industrial park. Administrative building with club house facility for investors One stop service center Product display/exhibition and marketing center IT based industrial park information system

5.4 Allocation of costs

As per the consideration regarding bifurcation of the responsibilities described in section 5.2, out of the total development cost of the project which is envisaged to be BDT 304 crores excluding land acquisition cost, the allocation of cost to the private partner is in the tune of BDT 219 crores and the remaining BDT 105 crores is from Government exchequer. In addition to this, a contingency of 5% has been considered in financial modeling.

6. Preliminary Environment and Social Impact Assessment

6. Preliminary Environment and Social Impact Assessment

Background of the Project

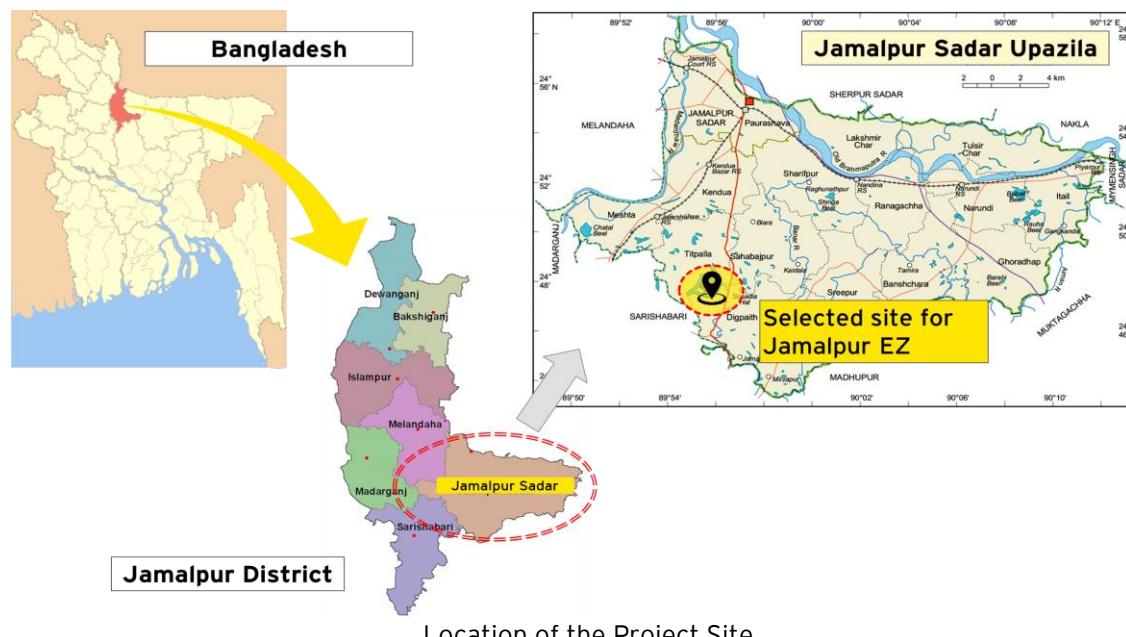
Government of Bangladesh has taken up the initiative of developing Economic Zones across the country through Bangladesh Economic Zone Authority (BEZA) to encourage rapid economic development in the country. The proposed project is located in Jamalpur Sadar upzilla of Jamalpur district, which has comparative advantage in terms of abundant Agriculture and Livestock resources along with extensive presence of low cost manpower.

The Government has strategically proposed an Economic Zone in Jamalpur in order to utilize this resource potential of Jamalpur and other neighboring districts to boost the economic development in this region. Development of the Economic Zone at Jamalpur would help in creating a planned industrial set up to capitalize on the resource potential of the region, generate employment and to improve the returns gained by regional communities against the raw resources produced which would lead to overall improvement in economy of the region.

The plot selected for the proposed EZ project is situated in South-West zone of Jamalpur Sadar Upazilla in Jamalpur District. It is adjacent to national highway N4, approx. 15 kms from Jamalpur town and approx. 150 kms from Dhaka. The Project has primarily been planned to be developed in around 444 acres of land and the project footprint comprises of six villages of Jamalpur Sadar Upazilla: Raghunathpur Dighuly, Haridrahata, Gandail, Joanerapara, Sontia and Sultan Nagar. The proposed plot partially includes a water body named 'Bamui Beel'. Total area of the waterbody within the project site is approx. 100 acres.

Location Map:

The figures provided below, illustrate the Project Site location.



- i) Total area = approximately 444.33 acres
- ii) Total Beel area within the project plot = approximately 100.36 acres

6.1 Preliminary Assessment of Environmental Impact in relation to the Project

A brief literature survey on the available reports on Environmental Impact of Export Processing Zones in Bangladesh are summarized as follows:

Environmental Issues in Export Processing Zones

The environmental impacts of EPZs proposed to be set up in PSDSP broadly depend on the nature and type EPZs and local environmental conditions of the area they are located. These impacts may be categorized as below.

- ▶ Impacts on water resources due to disposal of untreated industrial effluents;
- ▶ Health impacts due to air emissions from stack & other industrial operations;
- ▶ Impacts due to disposal of solid & hazardous wastes, including waste sludge;
- ▶ Hazards due to storage, handling and use of chemicals/hazardous materials;
- ▶ Impacts due to ground / surface water extraction;
- ▶ Impacts due to disposal of untreated domestic wastewater;
- ▶ Indirect impacts due to land use change, increased traffic & other developments

The initial assessment of potential sub-projects of PSDSP (Kaliakoir Hi-Tech Park and Expansion of Comilla EPZ), indicate that the EPZ's could also have the following site specific impacts.

- ▶ Interference to natural drainage paths due to the siting of EPZs;
- ▶ Pollution of surface and ground water sources;
- ▶ Impacts on environment during construction
- ▶ Potential environmental liabilities of non-compliant industries

Environmental Policies, rules and regulation in Bangladesh

The environmental legislations in Bangladesh is based on a set of policies.

- ▶ National Environmental Policy, 1992
- ▶ National Environmental Management Action Plan, 1995
- ▶ National Conservation Strategy, 1992
- ▶ National Water Policy, 2000
- ▶ National Water Management Plan, 2001

National Environmental Policy, 1992

Bangladesh National Environmental Policy is the basic framework for environmental action. Comprises the key policy elements.

- ▶ Maintenance of the ecological balance and protection as well as improvement of the environment;
- ▶ Safe guard against natural disasters; sustainable utilization of all natural resources;
- ▶ Regulation of all activities which pollute and degrade environment;

National Environmental Management Action Plan (NEMAP), 1995

NEMAP addresses the issues and management requirements with the following broad objectives:

- ▶ Identification of national key environmental issues;
- ▶ Action required to stop environment degradation; to improve of the natural environment and improvement of the quality of life of the people through sustainable development;
- ▶ Conservation of habitats and bio-diversity;

National Conservation Strategy, 1992

The National conservation strategy focuses to development in the industrial sector. The recommendations are as follows:

- ▶ Enforcement of pollution prevention/control technologies.
- ▶ Import ban on Hazardous or toxic materials/wastes.
- ▶ Reducing dependence on imported technology and machinery and development of sustainable local skills and resources.

National Water Policy, 2000

Development and management of the nation's water resources has been covered in the national water policy. The policy encompasses protection, restoration and preservation of the environment and biodiversity of the

- ▶ Wetlands;
- ▶ Mangrove and other natural forests;
- ▶ Endangered species;
- ▶ Water quality;
- ▶ Agencies and departments entrusted with water management to regulate, plan, construct, operate, protect and maintenance to protect surface and ground water around various industrial centres.

The focuses of the policy are as follows:

- ▶ Zoning regulations for safe water availability and suitable effluent discharge possibilities and monitoring by relevant government agencies;
- ▶ Standards of effluent disposal into common watercourses
- ▶ Payment by industrial polluters for remedial cleanup of water bodies polluted by them.

National Water Management Plan, 2001

The National Water Management Plan emphasized on

- ▶ Water quality;
- ▶ Measures to clean up industrial pollution;
- ▶ Effluent discharge monitoring;
- ▶ Zoning regulations for new industries.

Among the long list of relevant laws and regulations Environmental Conservation Act, 1995 (ECA 1995) and the Environmental Conservation Rules (under the ECA, 1995, ECR 1997) are the most important.

Table 6-1 : Environment Related Laws and Regulations

	Laws/ Regulations	Enforcing Agencies - Ministry/ Authorities
1.	The Environment Conservation Act, 1995 and subsequent amendments in 2000 and 2002	Department of Environment, Ministry of Environment and Forest
2.	Environment Conservation Rules, 1997 and subsequent amendments in 2002 and 2003	Department of Environment, Ministry of Environment and Forest
3.	Environment Court Act, 2000 and subsequent amendments in 2002	Judiciary and Ministry of Environment & Forest
4.	The Vehicle Act, 1927 The Motor Vehicles Ordinance, 1983 The Bengal Motor Vehicle Rules, 1940	Bangladesh Road Transport Authority (BRTA)
5.	The Brick Burning (Control) Act, 1989 The Brick Burning (Control) Amendment Act, 1992	Ministry of Environment & Forest
6.	The Removal of Wrecks and Obstructions in inland Navigable Water Ways Rules 1973	Bangladesh Inland Water Transport Authority
7.	Water Supply and Sanitation Act, 1996	Ministry of Local Government, Rural Development and Cooperatives
8.	The Ground Water Management Ordinance 1985	Upazila Parishad
9.	The Forest Act, 1927 and subsequent amendments in 1982 and 1989	Ministry of Environment and Forest
10.	The Private Forests Ordinance Act, 1959	Regional Forest Officer, Forest Department
11.	Bangladesh Wild Life (Preservation) Act, 1974	Ministry of Environment and Forest Bangladesh Wild Life Advisory Board
12.	The Protection and Conservation of Fish Act 1950 subsequent amendments in 1982	Ministry of Fishery
13.	Natural Water Bodies Protection Act 2000	RAJUK/Town Development Authority/Municipalities
14.	The Embankment and Drainage Act 1952	Ministry of Water Resources and FCD
15.	Antiquities Act 1968	Ministry of cultural Affairs
16.	The Building Construction Act 1952 (with amendments)	Ministry of Works
17.	The Land Acquisition Act, 1894 and The Acquisition and Requisition of Immovable Property Ordinance 1982 and subsequent amendments in 1994, 1995, 2004	Revenue Department
18.	The Factories Act, 1965 Bangladesh Labour Law, 2006	Ministry of labour

Environmental Guidelines for projects in Bangladesh

The Department of Environment classifies all the projects in four categories depending on the extent of impact on the environment. These are:

- i) Green;
- ii) Orange- A;
- iii) Orange- B; and
- iv) Red

Green Category

Projects/industries which do not have any negative impact on the environment. No Initial Environmental Examination (IEE) or Environmental Impact Assessment (EIA) is required. Obtain Site Clearance Certificate and Environmental Clearance Certificate through an application in a prescribed format to DOE.

Orange A and B Category

Orange category includes those projects that produce such wastes that can produce moderate or significant impacts on environment but the impacts could be mitigated easily if proper action is undertaken. Depending on the nature and extent of impacts the projects under Orange category has been sub-divided into two sub-Categories- Orange A and Orange B.

- ▶ The projects/industries likely to produce some wastes but are not believed to be significantly harmful to the surrounding environment and can be managed easily are categorized under "Orange A".
- ▶ The "Orange B" category projects/industries are those likely to produce some adverse environmental impacts but not considered to be overly significant and that the impacts can be mitigated with no residual adverse impacts.

Red Category

This category includes projects/ industries that may have a significant impact on the surrounding environment and that these adverse impacts must be properly managed or controlled. These project/industries must first require an IEE for the purpose of obtaining site clearance, and then EIA, for obtaining environmental clearance. If the site clearance is granted the project proponent can go ahead with implementation of the project subject to the conditions as may be stipulated while granting the site clearance.

These steps are detailed further in the table below.

Table 6-2 : Environmental Management Process in the Project Development Cycle

A	Project Identification & Pre-Feasibility Studies (Pre-Construction) Phase
	1. Environmental Screening : Categorization of the project (as identified in section 4.3) and establishment of the need for conducting EA
B	Project Design Phase
	2. Initial Environmental Examination (IEE): Assess environmental impacts, determine scope of EA and key issues to be considered in project design. 3. Scoping: identify significant potential impacts and project alternatives, and propose terms of reference for the EIA. 4. Secure Site Clearance Certificate from DoE and Commence EA 5. Baseline Data Collection: identify current environmental conditions without the project and anticipate future impacts due to project interventions. 6. Public consultation with all stakeholders at various stages in the assessment process to ensure quality, comprehensiveness and effectiveness, and that stakeholder views are adequately addressed.

	<p>7. Prepare EIA Report: summarize all information obtained, analyzed and interpreted in a report form; should contain a non-technical summary including methods used, results, interpretations and conclusions. The report should also include recommendations for mitigation of negative impacts, enhanced opportunities and relevant policy and regulatory actions. The report should be shared with stakeholders participating in the consultation process and affected by the recommendations and time for feedback should be allowed.</p> <p>8. Prepare Environmental Management Plans of the project to determine specific actions to be implemented during the designing of the project that includes plans for engineering design and construction stages to minimize or mitigate adverse environmental impacts.</p> <p>9. Design mitigation measures: to avoid, reduce and minimize adverse environmental impacts and enhance beneficial impacts.</p>
C	Project Appraisal/ Approval (Financing) Phase
	<p>10. Review and Approval of EIA Report: review report to assess if all issues have been adequately addressed and to facilitate the decision-making process; decide if project should proceed (ECC from DoE and review of report by The World Bank), or if further alternatives must be examined.</p>
D	Construction Phase
	<p>11. Implementation of Environmental Management Plan (EMP) to address adverse environmental impacts.</p> <p>12. Environmental Monitoring to determine compliance with EMP.</p> <p>13. Mid-term independent evaluation to assess the continued relevance of the mitigation plans and need for any alterations based on actual developments during the construction phase.</p>
E	Post-Construction Phase
	<p>14. Environmental Audit: As per the recommendations of EIA study.</p> <p>15. Regular monitoring arrangements to record and evaluate progress against initial plans and potential new challenges and opportunities.</p>

Proposed Site of the project: Screening under Ecologically Critical Area (ECA) in Bangladesh

An ecologically critical area is an environmental protection zone which take care of saving the limited engendered species of creatures as well as other living things and natural beauty of the earth. The most prevailing environmental acts in Bangladesh are The Environment Conservation Act, 1995 and the Environment Conservation Rules, 1997, which refer to Ecologically Critical Areas. According to this legislation, environmental protection is deemed particularly relevant in Ecologically Critical Areas, which are defined by the Government as areas where degradation of the environment has reached or threatens to reach a 'critical' state. Specifically, under the Environment Conservation Act and Rules, the Government will take into special consideration areas such as

- ▶ Human settlements;
- ▶ Ancient monuments;
- ▶ Archaeological sites;
- ▶ Forest sanctuaries;
- ▶ National parks;
- ▶ Game reserves;
- ▶ Wildlife habitats;
- ▶ Wetlands, mangroves, forested areas;
- ▶ Biodiversity areas; and other similar areas.

Department of Environment of Bangladesh has declared 12 areas, generally wetlands, as ECA, which includes islands and rivers such as,

- ▶ Hakaluki Haor;
- ▶ Sonadia Island;
- ▶ St Martin's Island;
- ▶ Teknaf Peninsula (including Cox's Bazar Sea Beach, but not their buffer zones);
- ▶ Tanguar Haor;
- ▶ Marjat baor (oxbow lake) and 10 km peripheral distance from the identified Sundarbans Reserved Forest, and entire four rivers (Buriganga River, Shitalakshya River, Turag River and Balu River) flowing within and surrounding Dhaka city.

The proposed site of the Jamalpur EZ does not fall in the Ecologically Critical Area (ECA) in Bangladesh.

Proposed Site of the project: Screening for Protected Areas

1. As per the Article 23 of the Wildlife Order of GoB, it has provisions for declaration of Protected Areas and also has guidelines barring activities in the Protected Areas. These protected Areas include
 - ▶ Wildlife Sanctuary;
 - ▶ National Park; and
 - ▶ Game Reserve.
whose definitions are provided in the Bangladesh Wildlife (Preservation) Order, 1973 (henceforth Wildlife Order) which states as follows:
2. "Wildlife Sanctuary means an area closed to hunting, shooting or trapping of wild animals and declared as such under Article 23 by the government as undisturbed breeding ground primarily for the protection of wildlife inclusive of all natural resources such as vegetation soil and water" (paragraph (p) of Article 2).
3. "Game Reserve means areas declared by the government as such for the protection of wildlife and increase in the population of important species wherein capturing of wild animals shall be unlawful (paragraph (c) of Article 2)".
4. Overall, the 'Protected Area' of Bangladesh covers an area of around 43,435 hectare which accounts for around 16% of the total area managed by the Forest Department and almost 2% of total area of Bangladesh. It includes
 - ▶ 8 National Parks;
 - ▶ 7 Wildlife Sanctuaries;
 - ▶ 1 Game Reserve; and
 - ▶ 5 other conservation sites which are National Botanical Garden, Dhaka, Baldha Garden, Dhaka, Madhabkunda Eco-Park, Moulavibazar, Sitakunda Botanical Garden and Eco-Park, Chittagong and Dulahazara Safari Parks & Cox's Bazar.

The proposed site for the Jamalpur EZ do not fall under the jurisdiction of any of the protected or ecologically sensitive areas in the Bangladesh.

DOE Clearance Procedures

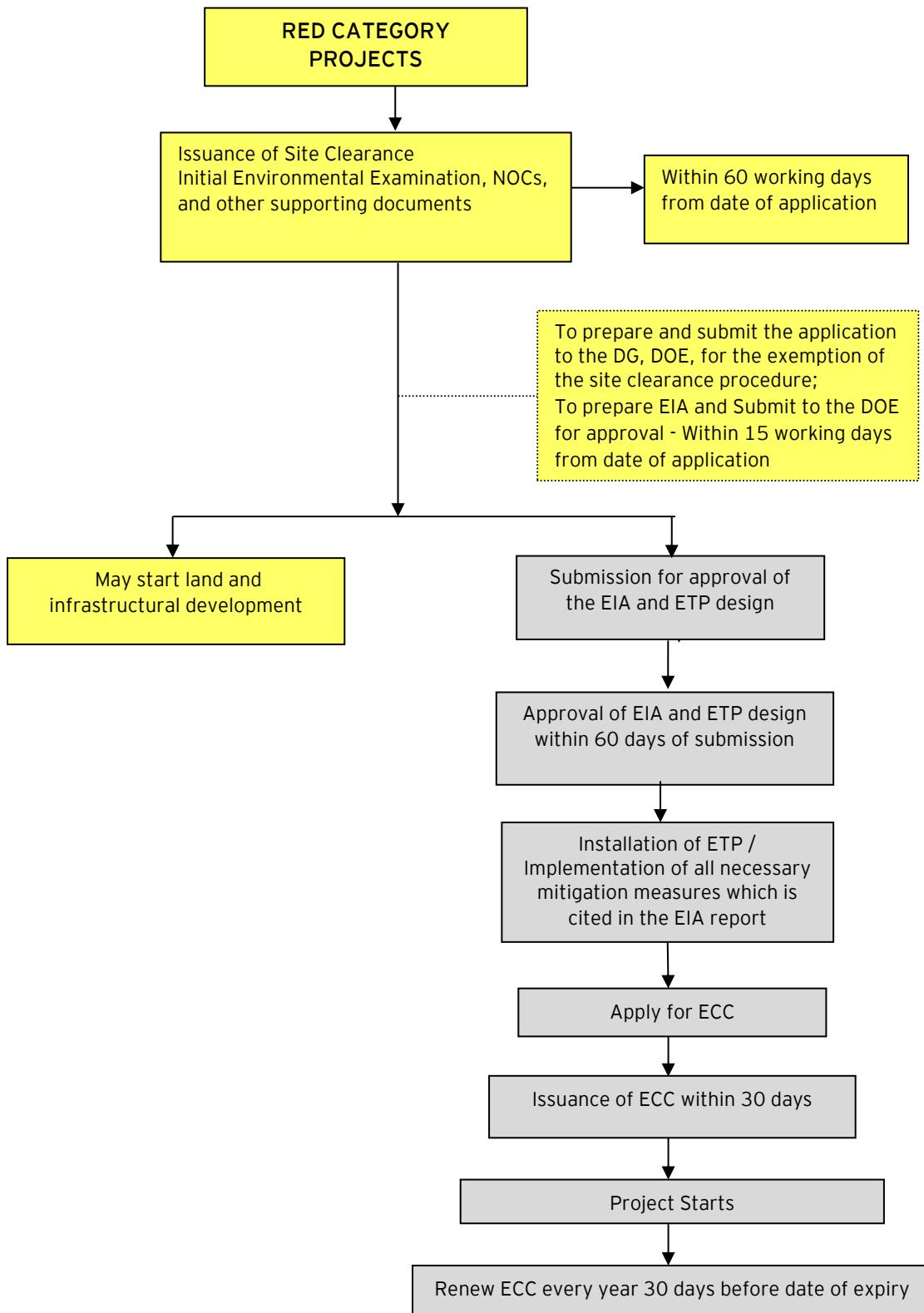
The EZ/EPZs proposed to be developed under PSDSP as per ECR are considered a red category project/facility, and will have to secure ECC. The enterprises operating within the zone will be classified according to the nature of its operations/industry and shall comply with appropriate DOE regulations.

The DoE, clearance procedure is a two stage process.

- a) Initial Stage: Site Clearance Certificate (SCC)
- b) Advanced Stage: Environmental Clearance Certificate (ECC)

The Clearance procedure is presented through the following flow diagram:

Figure 3: Various steps of Environmental Clearance Process of DOE



c) **Validity Period of Environmental Clearance Certificate**

Categories of Project	Validity	Renewal Period
Green	3 year	30 days before expiry of the validity period
Orange A & B	1 year	
Red	1 year	

In the present case of Jamalpur EZ development, the development process follows the distinctive two stages.

Stage-1: The Site development of construction of required infrastructure as required for the zone to be operational.

Stage-2: Individual operators to obtain ECC before their operation.

The SCC has already been procured for the proposed site with approved TOR for conducting EIA. The approved TOR for the EIA as applicable for the EIA is presented below. *[Original approved letter along with the approved TOR has been attached to this report as Annexure.....]*

TOR for EIA

- I. The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) study considering the overall activity of the said project in accordance with this ToR and following additional suggestions.
- II. The EJA report should be prepared in accordance with following indicative outlines:
 - 1. Executive summary
 - 2. Introduction:(Background, brief description, rationale of the project, scope of study, methodology, limitation, EIA team, references)
 - 3. Legislative, regulation and policy consideration (covering the potential I legal, administrative, planning and policy framework within which the EIA will be prepared)
 - 4. Project Description
 - i. Introduction
 - ii. Project Objective
 - iii. Project Options
 - iv. Interventions under Selected Options
 - v. Project activities: A list of the main project activities to be undertaken during site clearing, construction as well as operation
 - vi. Project schedule: The phase and timing for development of the project
 - vii. Resources and utilities demand: Resources required to develop the project, such as soil and construction material and demand for utilities (water, electricity, sewerage, waste disposal and others), as well as infrastructure (road, drains, and others) to support the project
 - viii. Map and survey information Location map, cadastral map showing land plots (project and adjacent area), geological map showing geological units, fault zone, and other natural features.
 - ix. Project Plan, Design, Standard, Specification, Quantification, etc.
 - 5. Environmental and Social Baseline
 - 5.1. Meteorology
 - 5.1.1. Temperature
 - 5.1.2. Humidity
 - 5.1.3. Rainfall
 - 5.1.4. Evaporation
 - 5.1.5. Wind Speed

- 5.1.6. Sun Shine Hours
- 5.2. Water Resources
 - 5.2.1. Surface Water System
 - 5.2.2. Tropical Cyclones and Tidal Flooding
 - 5.2.3. Salinity
 - 5.2.4. Drainage Congestion and Water Logging
 - 5.2.5. Erosion and Sedimentation
 - 5.2.6. River Morphology
 - 5.2.7. Navigation
 - 5.2.8. Ground Water System
- 5.3. Land Resources
 - 5.3.1. Agro ecological Regions
 - 5.3.2. Land Types
 - 5.3.3. Soil Texture
 - 5.3.4. Land Use
- 5.4. Agriculture Resources
 - 5.4.1. Fanning Practice
 - 5.4.2. Cropping Pattern and intensity
 - 5.4.3. Cropped Area
 - 5.4.4. Crop Production
 - 5.4.5. Crop Damage
 - 5.4.6. Main Constraints of Crop Production
- 5.5. Livestock and Poultry
 - 5.5.1. Feed and Fodder Shortage
 - 5.5.2. Livestock/Poultry Diseases
- 5.6. Fisheries
 - 5.6.1. Introduction
 - 5.6.2. Problem and Issues
 - 5.6.3. Habitat Description
 - 5.6.4. Fish Production and Effort
 - 5.6.5. Fish Migration
 - 5.6.6. Fish Biodiversity
 - 5.6.7. Fisheries Management
- 5.7. Ecological Resources
 - 5.7.1. Bio-ecological Zone
 - 5.7.2. Common Flora and Fauna
 - 5.7.3. Ecosystem Services and Function
- 5.8. Socio Economic Condition
 - 5.8.1. Socio Economic Condition
 - 5.8.2. Quality of Life Indicators
 - 5.8.3. Income and Poverty
 - 5.8.4. Gender and Women
 - 5.8.5. Common Property Resources
 - 5.8.6. Conflict of Interest and Law and Order Situation
 - 5.8.7. Historical, Cultural and Archaeological Sites
- 5.9. Ecological Resources
 - 5.9.1. Bio-ecological Zone
 - 5.9.2. Common Flora and Fauna
 - 5.9.3. Ecosystem Services and Function
- 6. Identification and Analysis of Key Environmental Issues (Analysis shall be presented with Scenarios, Maps, Graphics, etc. for the Case of Anticipated Impacts on Baseline)
 - 6.1. Environmental Sensitivity Investigation
 - 6.2. Environmental Asset
 - 6.3. Environmental Hot Spots

- 6.4. Likely Beneficial Impacts
 - 6.5. Community Recommendations
 - 6.6. Alternate Analysis
 - 7. Environmental and Social Impacts
 - 7.1. Introduction
 - 7.2. Impact on Water Resources
 - 7.2.1. Pre-Construction Phase
 - 7.2.2. Construction Phase
 - 7.2.3. Post-Construction Phase
 - 7.3. Impact on Land Resources
 - 7.3.1. Pre-Construction Phase
 - 7.3.2. Construction Phase
 - 7.3.3. Post-Construction Phase
 - 7.4. Impact on Agriculture Resources
 - 7.4.1. Pre-Construction Phase
 - 7.4.2. Construction Phase
 - 7.4.3. Post-Construction Phase
 - 7.5. Impact on Fisheries
 - 7.5.1. Pre-Construction Phase
 - 7.5.2. Construction Phase
 - 7.5.3. Post-Construction Phase
 - 7.6. Impact on Eco System
 - 7.6.1. Pre-Construction Phase
 - 7.6.2. Construction Phase
 - 7.6.3. Post-Construction Phase
 - 7.7. Socio Economic impact
 - 7.7.1. Pre-Construction Phase
 - 7.7.2. Construction Phase
 - 7.7.3. Post-Construction Phase
 - 8. Public Consultation and Disclosure
 - 8.1. Introduction
 - 8.2. Objectives of Public Consultation and Disclosure Meeting
 - 8.3. Approach and Methodology of Public Consultation and Disclosure Meeting
 - 8.4. Public Consultation Meetings (PCMs)
 - 8.5. Public Disclosure Meetings (PDMs)
 - 9. Environmental Management Plan and Monitoring Indicators
 - 9.1. Introduction
 - 9.2. Mitigation Plan
 - 9.3. Enhancement Plan
 - 9.4. Contingency Plan
 - 9.5. Compensation Plan
 - 9.6. Monitoring Plan
 - 9.7. Monitoring Indicators
 - 10. Cost Estimation for Environmental / Mitigation Measures and Monitoring
 - 11. Conclusions and Recommendations
- III. Without obtaining approval of EIA report by the Department of Environment, the project authority shall not be allowed to conduct earth filling or any kind of physical intervention in the proposed project site and also not be able to start the physical activity of the project.
- IV. This approval of the Terms of Reference (TOR) would not mean any acceptance or site clearance of the project.
- V. The proposed EIA study would not establish any claim, right in favor of the proponent for getting site clearance or environmental clearance.
- VI. Without EIA approval, the project authority shall not be able to start the operation of the project.

VII. The project authority shall submit the EIA report along with the Feasibility Study Report, the applicable fee in a treasury challan, No Objection Certificate (NOC) from Local Authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public), NOC from concerned authority for cutting/razing/dressing of hill or hilly land (if it is required) and NOC from other relevant agencies for operational activity etc. to the Tangail District Office of DOE in Tangail with a copy to the Head Office of DOE in Dhaka.

Additionally following the World Bank safeguard tasks policies, the following needs to be ensured at different stages:

1. Detailed screening criteria for sensitivity and to gauge the nature and magnitude of potential impact.
2. Develop an environment management plan.
3. Public consultation at all stages of preparation of EA, appraisal, design, implementation and monitoring.
4. Disclosure of information at comparison on summary of project description an potential adverse impact, summary of EA report and EA report.

Environment Management Requirements for Individual Enterprises in EPZs

1. Good environmental management practices by the individual EZ/EPZ enterprises/tenants are very important to avoid impacts during operational phase of project. To ensure this, PSDSP mandates all tenants to connect to the following common facilities and comply with maintenance requirements (pre-treatment, maintenance charges, etc.).
 - i) Common Effluent Treatment Plants, with tertiary treatment for reuse/recycling
 - ii) Common Hazardous Waste Disposal Facilities
 - iii) Common Solid Waste Disposal Facilities
 - iv) Common Wastewater Treatment Plant with reuse /recycling facilities
 - v) Integrated rainwater harvesting and water supply facilities
 - vi) Adequate plantation (both in the EPZ and individual plot) to minimize air and noise impacts
2. In addition to the above, all the tenants shall fully comply with the GoB regulatory requirements such as the following.
 - i) Conducting IEE and securing SCC prior to allotment of the plot in the EPZ
 - ii) Conducting EIA and securing ECC (as applicable) prior to the commencement of construction
 - iii) Implementation of EMP and ECC conditions during and operation phase
 - iv) Ensuring compliance to environmental regulation of GoB during operation
 - v) In addition to the above, the environmental management and monitoring tools developed by BEPZA, through the Bangladesh Investment Climate Fund (BICF) project, shall be adopted (as applicable) to improve environmental performance of the enterprises. These tools include Environmental Monitoring & Enforcement Plan Guidelines, Environmental Best Management Practice Manual, Environmental Audit of Enterprises, Environmental Enforcement Strategy, Environmental Inspection Forms & Modules, Evaluation & Rating Criteria for Enterprises

3. All these aspects will be incorporated in the tenant lease agreement of the EPZ and shall be monitored for its implementation by Environmental Cell of EPZ operator. A sample set of environmental specifications for Bid documents and tenant lease conditions of BEPZA on environmental requirements are provided in Annex 16 and 17 respectively. The same shall be appropriately modified and incorporated in the respective sub-projects documents.

As summarized above on regulatory review, any new zone development would be required to perform an EIA and obtain and ECC from the GoB. Similarly, all 'Category A and B' projects would need to perform an EA to comply with the safeguard policies of The World Bank.

4. In line with both these requirements, all 'Category A' and 'B' sub-projects (identified as per the criteria established in section 4.3) will be subjected to an environmental assessment process, and will ensure that all key environmental issues are addressed in the project. This shall comprise the following steps.

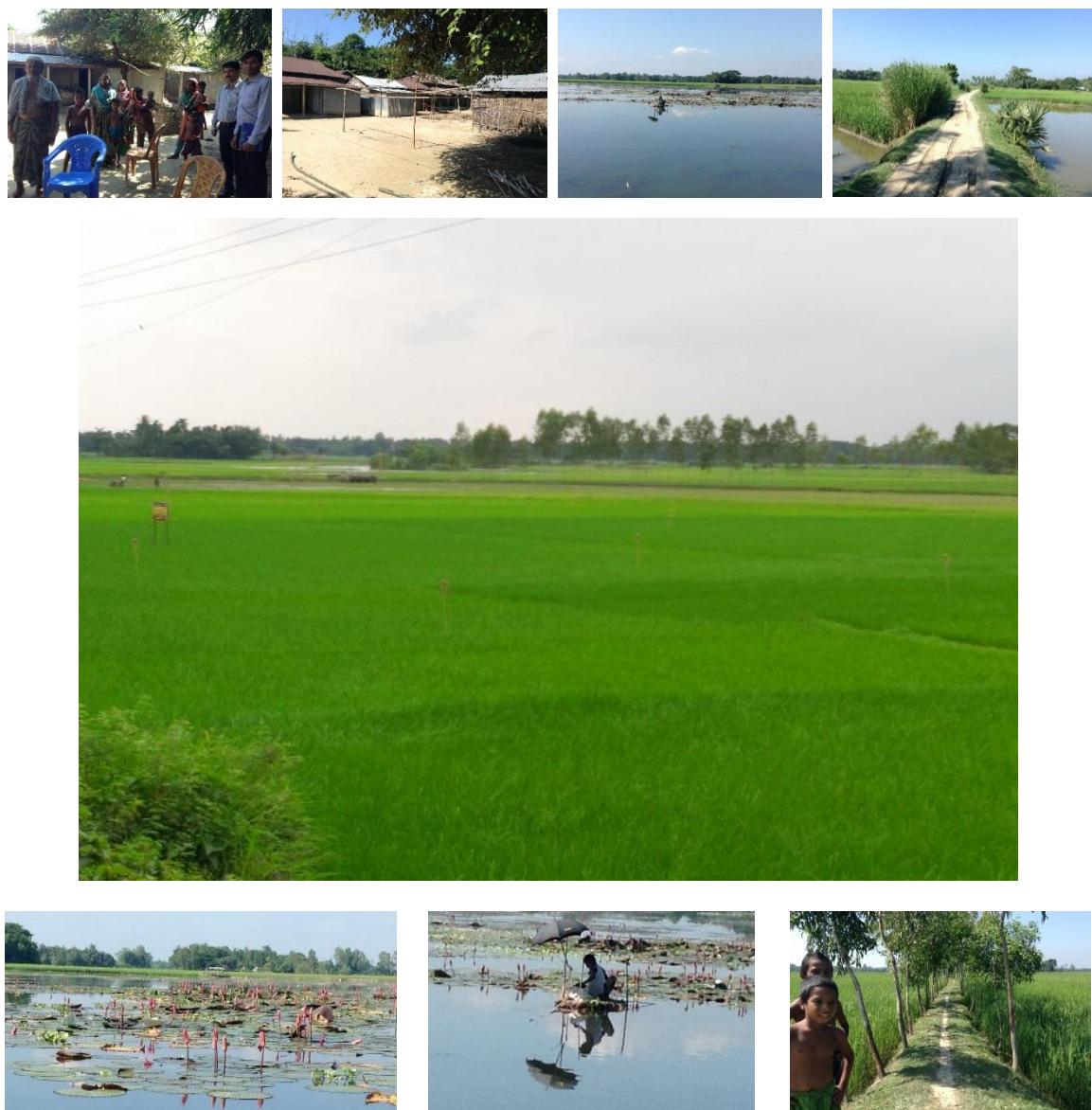
- i) A screening exercise that identifies the project category and establishes the need for conducting an EA;
- ii) An IEE that defines the scope of EA (for category A and B Projects) and generic EMP for Category C projects;
- iii) Securing site clearance certificate and commencement of EA;
- iv) Prepare EA and EMP and secure clearances (DoE and Bank);
- v) Implement EMP and monitor its effectiveness.

6.2 Preliminary Assessment of Social Impact in relation to the Project

The preliminary Social Impact Assessment has been carried out during the period October 2016 to January 2017. The project area is consisting of farming land and two hamlets of few inhabitants. However, there is one village contiguous to the proposed site which has indirect impact due to the proposed development. The general features of the proposed site are as follows:

- The project site consists of Agricultural land and waterbody.
- The entire system is in a low lying set up.
- There are villages adjacent to the proposed site.
- Livelihood is dependent on Agriculture and Fishing
- Agricultural activities are seasonal and there is disguised unemployment
- Besides Agriculture, there are unskilled job engagement
- The access to the village, which is surrounded by the project site, is through fair weathered road. There is no another route to access the village. There is no education or health facility within this village.
- Since there are limited alternative sources of income, people are worried about their livelihood after the land acquisition.
- People are participative to the development process

Figure 6-1 : Site photos



Source: EY

Direct impact

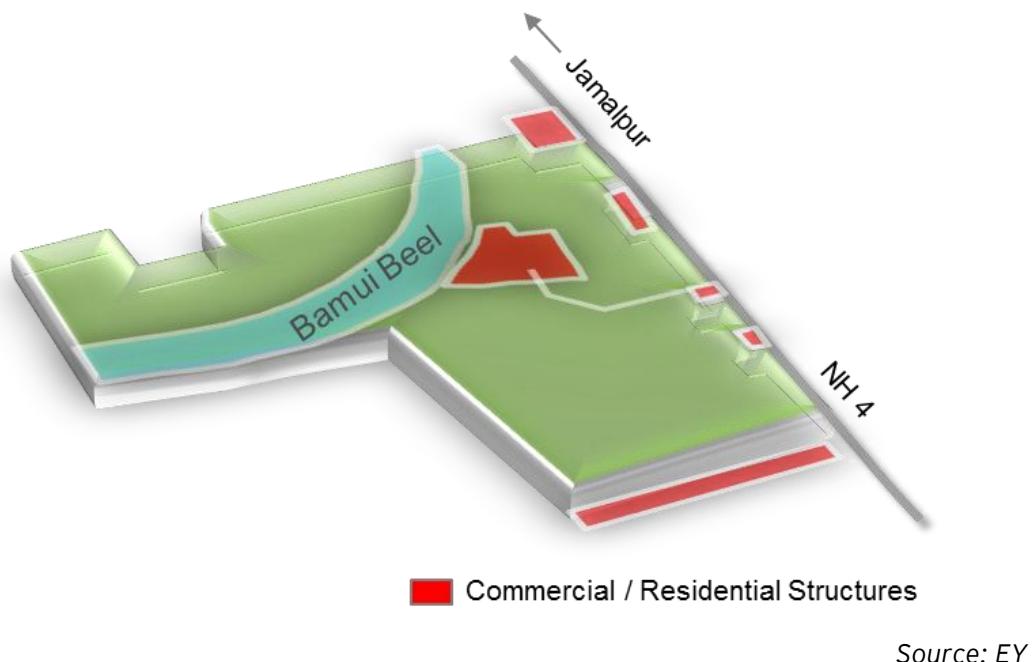
The direct impact of the project is of two folds.

1. Loss of farming land
2. Loss of homestead lands - 6 households are impacted

Indirect impact

Since the proposed site is in low lying setup, it requires land filling of around 8 to 10 feet. This will create a hazard for the villages, particularly the village that is surrounded by the project site. If these villagers are also not raised to the same level, it will be a disaster during the rain and the entire village area will be water logged, even after creating drainage system. Though there is no structure affected directly by the proposed development, there are indirect impacts on the villagers. Culturally, people are integrated with the Bamui Beel and local people want to restore it in its present form. People expressed their willingness to have some preferential job opportunity during the construction and operation phase of the Economic Zone.

Figure 6-2 : Indirect impact to the habitation



Source: EY

The challenges of indirect impact of the project are as follows:

- ▶ To relocate the village surrounded by the site is preferred.
- ▶ If relocation is not an executable option, then overall development of the village is required to remove the ground level difference and that will finally require to demolish the structures and to reconstruct all the houses.
- ▶ Project affected persons need to provide some skill development program so that they should get the employment opportunity.
- ▶ Female unemployment rate is extremely high and proper care should be taken during skill enhancement and job absorption to keep the gender parity.
- ▶ Students from the village access to the school through internal roads, which will be blocked after the EZ development. Proper care should be taken to give access to schools or to create similar facilities within the village.

Methodology of impact assessment

The social assessment has been carried out for the initial social screening. Since the land acquisition is in the advance stage, the study focuses on the both direct and indirect impact of the project. The study has been carried out based on the field surveys. The social survey has been carried out for all the 13 (thirteen) impacted households and 20% (15 out of 75 households) of the households who are going to be indirectly impacted due to the proposed development. The survey instrument used as per standard guidelines of the funding agencies. The questionnaire used for the social survey is presented in annexure to this report.

Outcome of the social screening survey

The following section of the report presents the outcome of the social screening survey. The results are based on all the thirteen households, those who are losing their homestead land and 25 households who are going to be indirectly impacted.

1. Type of Ownership

The entire village is under private ownership and there is no government owned land. There is a mosque and a graveyard inside the village.

Table 1: Ownership of Land

Type of Ownership	Share of Type of Ownership(%)
Private	93
Government	0
Religious	1
Community	6
Other	0

2. Type of Land

Since the total land is being used for residential purposes, it is under non-irrigated type. There are almost 140 residential structures in this village.

Table 2: Type of land

Type of Land	Share of type of Land(%)
Irrigated	0
Non-Irrigated	100
Barren	0
Forest	0
Other	0

3. Use of land

The only use of the entire land in this village is for residential purposes. There is no commercial structure inside this village.

Table 3: Use of land

Use of land	Share of Use of land(%)
Cultivation	0
Orchard	0
Residential	100
Commercial	0
Forestation	0
No Use/Barren	0
Other(specify)	0

Status of Ownership

The status of all the ownerships in this village are titleholder. No other status of ownership is found.

Table 4: Status of Ownership

Status of Ownership	Share of Status of Ownership(%)
Titleholder	100
Customary Right	0
License from Local Authority	0
Encroacher	0
Squatter	0
Other(specify)	0

Type of private Ownership

In this village, most of the households are under joint ownership. Single ownership households are limited to 15% only.

Table 5: Type of Private Ownership

Type of private Ownership	Share of type of private Ownership(%)
Individual/Single	15
Joint/Share Holders	85
Others(Specify)	0

People associated with the land

There are no agricultural labourer associated with the land, neither tenant/Lessee nor sharecropper.

Table 6: Agriculture Labour Associated with the Land

Agriculture Labour Associated with the Land	Share of agriculture Labour Associated with the Land(%)
Yes	0
No	100

Table 7: Tenant or Lessee Associated with the Land

Tenant or Lessee Associated with the Land	Share of tenant or Lessee Associated with the Land(%)
Yes	0
No	100

Table 8: Sharecropper Associated with the Land

Sharecropper Associated with the Land	Share of sharecropper Associated with the Land(%)
Yes	0
No	100

Having Boundary Wall

There is no structure in this area having any boundary wall. However, some of the houses have temporary fencing.

Table 9: Structure Area of the Affected is having Boundary Wall

Having Boundary Wall	Share of having Boundary Wall(%)
Yes	0
No	100

Table 10: Area of the boundary wall only (in Meter)

Area of the boundary wall (meter)	Share of area of the boundary wall(%)
Length	NA
Height	NA

Scale of Impact on structure

There will be 100% impact in case of all the structures.

Table 12: Scale of Impact on structure

Scale of Impact on structure	Share of scale of Impact on structure(%)
25%	0
50%	0
75%	0
100%	100

Type of Construction of the structure

All the structures in the village are under the category defined as temporary and made of mud/brick/wood made walls, thatched/tin roof.

Table 13: Type of Construction of the structure

Type of Construction of the structure	Share of type of Construction of the structure
Temporary (buildings with mud/brick/wood made walls, thatched/tin roof)	100
Semi-Permanent(buildings, with tiled roof and normal cement roof)	0
Permanent (with RCC, single/ double store building	0

Use of Structure

In the entire village, the structures are being used as residence. there is no commercial structure found in the village. Thus the villagers are dependent on the outside markets.

Table 14: Use of the Structure (select appropriate code from below)

Use of Structure under Residential Category	Share of use (%)
House	0

Hut	100
Other(specify)	0

Use of Structure under Commercial Category	Share of use (%)
Shops	0
Hotel	0
Small Eatery	0
Kiosk	0
Farm house	0
Petrol pump	0
Clinic	0
STD Booth	0
Work shop	0
Vendors	0
Com, Complex	0
Industry	0
Other(specify)	0

Use of Structure under Mixed Category	Share of use (%)
Residential-cum-Commercial Structure	0

Use of Structure under Community Type	Share of use (%)
Community center	0
Club	0
Trust	0
Memorials	0
Other(specify)	0

Use of structure under Religious Structure	Share of use (%)
Temple	0
Church	0
Mosque	100
Gurudwara	0
Shrines	0
Sacred Grove	0
Other(specify)	0

Use of Government Structure	Share of use (%)
Government office	0
Hospital	0
Collage	0
Bus stop	0

Use of Other Structure	Share of use (%)
Boundary wall	0
Foundation	0
Cattle Shed	0

Other(specify)	0
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Status of the Structure

The status of the structure is legal title holder.

Table 15: Status of the Structure

Status of the Structure	Share (%)
Legal Title holder	100
Customary Right	0
License from Local Authority	0
Encroacher	0
Squatter	0

People associated with the Structure

There are no Tenant associated with the structures, neither employee/wage earner in commercial structure nor employee/wage earner in the residential structure.

Table 16: Any of the following people associated with the Structure?

Tenant in the structure	Share (%)
Yes	0
No	100

Employee/ wage earner in commercial structure	Share (%)
Yes	0
No	100

Employee /wage earner in residential structure	Share (%)
Yes	0
No	100

Type of trees

Trees in the village are categorized under Fruit bearing and non-fruit bearing.

Table 17: Share of trees within the affected area

Type of trees	Share of trees (%)
Fruit Bearing	40
Non- fruit Bearing	60

Religious Category

The entire population of the surveyed households follows Muslim religion.

Table 19: Religious Category

Religious Category	Share (%)
Muslim	100
Hindu	0
Christian	0
Buddhist	0
Other(specify)	0

If displaced, do they have additional land to relocate

The surveyed households do not have alternative plots to relocate.

Table 21: If displaced, do you have additional land to relocate

If displaced, do you have additional land to relocate	Share (%)
Yes	0
No	100

Resettlement / Relocation Option

People of this village prefer to get project assisted relocation; No Self-Relocation.

Table 22: Resettlement / Relocation Option

Resettlement / Relocation Option	Share (%)
Self-Relocation	0
Project Assisted Relocation	100

Compensation Option for Land loser

The compensation option preferred by the villagers against the loss of homestead land is ‘Land for land loss’.

Table 23: Compensation Option for Land loser

Compensation Option for Land loser	Share (%)
Land for land loss	100
Cash for land loss	0

Compensation Option for Structure loser

Villagers prefer ‘structure for structure loss’ as compensation option.

Table 24: Compensation Option for Structure loser

Compensation Option for Structure loser	Share (%)
Structure for structure loss	100
Cash for structure loss	0

Table 25: Income Restoration Assistance (fill codes in preferred order)

Type to Income Restoration Assistance	Priority order
Employment Opportunities in Construction work	1
Assistance / loan from other ongoing development scheme	3
Vocational Training	2
Others (specify.....)	

Age in years

Table 26: Gender classification of the population

Years	Share of Male (%)	Share of Female (%)
0-5	30	70
6-10	53	47
11-20	56	44
21-40	46	54
41-60	61	39
61 and above	33	67

Education

Very high level of illiteracy prevails in the surveyed population. Only around 8% of the population of more than 5 years age, is having education up to matriculation and above.

Table 27: Education

SL. No	Description	Education(%)
1	Illiterate	45
2	Literate	16
3	Up to middle	27
4	Below metric	4
5	Metric	7
6	Graduate	1
7	Above	0

Occupation

The employment rate including organized, unorganized and farming sector is 45%. Among which, 34% is labour in general, 37% in farming activity, 16% in service and 13% is in business and trading activities.

Table 28: Occupation

SL. No	Description	Occupation(%)
1	Service	5
2	Business	4
3	Agriculture	12
4	Study	29
5	Housewife	35

6	Labour	11
7	Unemployed	4
8	Professional	0

Annual Income

The range of annual household income of the surveyed households is between BDT 80,000 to BDT 5,00,000. The average household income and per capita income is presented in the following table.

Table 29: Annual Income

Classification	Annual income (in BDT)
Per capita income	25,722
Average Household Income	1,85,200



Consultation with project affected persons - indirectly affected village



Household interviewed with identification board - directly impacted household



Consultation with project affected persons - indirectly affected village



Household interviewed with identification board - indirectly impacted household



Household interviewed with identification board - indirectly impacted household



Social survey team at work

Affected Area

The Deputy Commissioner's office has estimated the affected area as follows:

Name of the Area		Description of the land (Class)	Measurement of the Land (Acre)	Compensation structure (BDT per Acre)
01	Rugunathpur Diguli	Nama (Low Land) Kanda (Farming Land) Bari/Viti(Home / Residential Plot)	30.4600 132.7400 2.1300 <hr/> 165.3300	22,01,000 22,01,000 33,01,500
02	Sultan Nagar	Nama (Low Land) Kanda (Farming Land) Bari/Viti(Home / Residential Plot)	84.4600 18.2150 0.2000 <hr/> 102.8750	15,38,900 19,64,800 48,57,700
03	Joyannerpara	Nama (Low Land) Bari/Viti(Home / Residential Plot)	50.6700 0.0800 <hr/> 50.7500	28,57,100 42,85,650
04	Horidrohata	Kanda (Farming Land)	16.2250	44,06,800
05	Sontia	Nama (Low Land) Kanda (Farming Land)	0.3500 3.7700 <hr/> 4.1200	29,65,100 20,08,500
06	Gandail	Nama (Low Land) Kanda (Farming Land)	1.0250 3.6450 <hr/> 4.6700	20,32,600 21,20,000
Total		Nama (Low Land) Kanda (Farming Land) Bari/Viti(Home / Residential Plot)	166.965 174.595 2.410 <hr/> 343.970	

The total compensation estimated as follows:

Classification of compensation	Compensation Value (in BDT crores)
Land	76.81
Structure	1.80
Trees	0.85
Total (Land + Structure + Trees)	79.47
50% solatium	39.74
Compensation for loss of crop	2.33
Total compensation	121.53

Adequacy of compensation

The consultant has conducted first hand field survey on market rates of the lands within 3 km periphery of the project site. It is found that the compensation along with solatium is in line with the market price.

Since the compensation structure as envisaged by the DC office is one time settlement, no entitlement matrix has been developed. However, stakeholders analysis indicates that additional compensation may be provided through exploring other sources like funds from international funding agencies.

6.3 Conclusions

Environmental Impact

- The Initial Environmental Examination (IEE) is completed and Authority has received the Site Clearance Certificate (SCC).
- The proposed site of the Jamalpur EZ does not fall in the Ecologically Critical Area (ECA) in Bangladesh.
- The proposed site for the Jamalpur EZ do not fall under the jurisdiction of any of the protected or ecologically sensitive areas in the Bangladesh.
- The TOR for EIA has already been approved by the Department of Environment (DoE).
- Since Site Clearance Certificate (SCC) has already been procured, the construction / development work can be started.

Social Impact

- Direct impact on Homestead lands due to the project is limited only on 10 Households.
- As per Government record, impacted homestead land is 2.41 acres, which is less than 1% of the total project area.
- The size of the village that is going to be indirectly impacted is 17.13 acres as per the topographic survey and there are about 75 households in this land parcel.
- As per social survey, all the impacted households prefer 'land for land' for their loss of homestead lands.
- For the loss of structures, the affected people prefer 'structure for structure' as compensation.
- The project affected people prefer job opportunity during the construction / development phase of project as well as vocational training for skill enhancement and better employability for restoration of their livelihood.
- Since the compensation structure as envisaged by the DC office is one time settlement, no entitlement matrix has been developed.
- A 100% social survey may be conducted for the village outside the project area as indicated above as indirect project affected area.
- From the sample survey and consultation, it is observed that majority of the households are ready to relocate if 'land for land' is provided. This process requires further stakeholder consultation.
- In case the alternative of implementation option where the existing indirectly impacted village to be relocated at a suitable place, an alternative model of land pooling can be adopted to reduce the time for land acquisition. In this model, the affected people voluntarily transfer their land to government and in lieu the government transfer the land earmarked for relocation to the land givers.

7. Demand Assessment and Market Study

7. Demand Assessment and Market Study

7.1 Market analysis

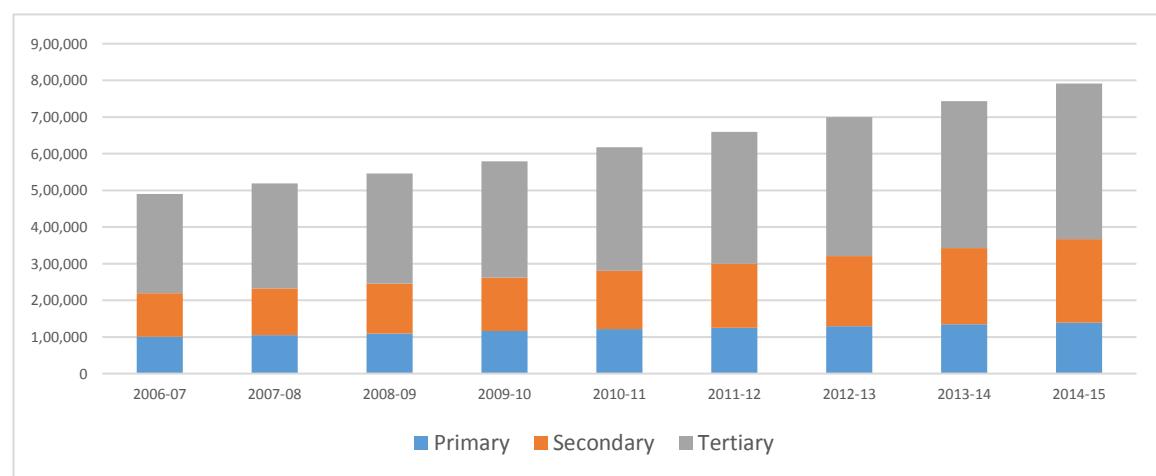
Bangladesh is a developing economy with a vast population of around 144 million as per census 2011. The market driven economy is growing substantially wherein readymade garment trade along with knitwear trade is the backbone of the economy. Bangladesh is in the course of action of an evolution from a primarily agricultural economy to an industrial and service economy. The private sector is playing a progressively agile role in the economic life of the country, while the public sector focusses more on the physical and social infrastructure. The state-owned enterprises have been experiencing rapid privatization.

In the present context, the demand assessment and market analysis is to put forward the analytical results that justify the investment initiative as well as the presenting an overall scenario that enable to identify the potential industries that the developer may target to rope in the park. This chapter analyzes the structure of the economy, its manufacturing environment, trading landscape and overall policy regime for both, domestic and foreign investor, manufacturer and trader. This is further substantiated with data collected through primary research.

7.1.1 Structure of the economy:

Economy of Bangladesh of progressing through a steady growth rate of more than 6% over the last decade. Though marginal, the rate of growth is increasing. Among the three broad category of the sectors, the secondary sector is growing at the highest rate, close to 10% per annum during the period 2006-07 to 2014-15. This is followed by the tertiary sector, around 6% and primary sector around 4%.

Figure 7-1 : GDP at constant 2005 prices (Tk Cr)



During the said period, GDP of Bangladesh at constant prices grew from TK 516 thousand crore to TK 825 thousand crore.

The sub-sectoral composition of the GDP along with the growth rates are presented in the following Table 7.1. Among the subsectors, contribution of the highest growth rate is observed for the financial intermediaries and followed by the manufacturing sector. In case of both the sectors, the growth rate over the last five years is close to 10%. The agriculture sector recorded the lowest growth rate around 3%.

Figure 7-2 : Trend of major sectors - GDP at Constant Prices in crore Tk.

Sr. No.	Gross Domestic Product at Constant Prices (Base Year: 2005-06) in crore Tk.										CAGR 8 years	CAGR 5 years
	Sector	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15		
A	PRIMARY SECTOR											
1	AGRICULTURE AND FORESTRY	74,410	77,292	79,682	84,904	88,206	90,332	91,656	95,151	97,116	3.38%	2.72%
2	FISHING	18,397	19,685	20,657	21,607	23,051	24,279	25,780	27,419	29,176	5.93%	6.19%
3	MINING AND QUARRYING	7,433	8,003	8,841	9,561	9,907	10,593	11,584	12,127	13,033	7.27%	6.39%
	TOTAL PRIMARY SECTOR	1,00,240	1,04,980	1,09,180	1,16,072	1,21,164	1,25,204	1,29,020	1,34,697	1,39,325	4.20%	3.72%
B	SECONDARY SECTOR											
4	MANUFACTURING	81,613	87,596	93,459	99,671	1,09,651	1,20,567	1,32,994	1,44,653	1,59,583	8.74%	9.87%
5	ELECTRICITY, GAS AND WATER SUPPLY	5,832	6,284	6,740	7,412	8,402	9,291	10,126	10,585	11,327	8.65%	8.85%
6	CONSTRUCTION	31,836	33,742	35,962	38,554	41,235	44,709	48,305	52,209	56,716	7.49%	8.03%
	TOTAL SECONDARY SECTOR	1,19,281	1,27,622	1,36,161	1,45,637	1,59,288	1,74,567	1,91,425	2,07,447	2,27,626	8.41%	9.34%
C	TERTIARY SECTOR											
7	WHOLESALE AND RETAIL TRADE	67,571	72,481	76,728	81,219	86,650	92,457	98,173	1,04,776	1,11,681	6.48%	6.58%
8	HOTEL AND RESTAURANTS	3,658	3,866	4,093	4,339	4,608	4,902	5,220	5,570	5,952	6.27%	6.53%
9	TRANSPORT, STORAGE & COMMUNICATION	50,878	55,079	59,513	64,006	69,409	75,761	80,514	85,382	90,499	7.46%	7.17%
10	FINANCIAL INTERMEDIATIONS	15,139	15,733	15,728	16,711	18,456	21,180	23,110	24,790	26,978	7.49%	10.05%
11	REAL ESTATE, RENTING & BUSINESS ACTIVITIES	39,382	40,876	42,442	44,078	45,790	47,586	49,509	51,615	54,018	4.03%	4.15%
12	PUBLIC ADMINISTRATION AND DEFENCE	15,293	16,289	17,447	18,882	20,552	22,099	23,542	25,165	27,047	7.39%	7.45%
13	EDUCATION	10,835	11,609	12,293	12,931	13,659	14,717	15,645	16,781	18,059	6.59%	6.91%
14	HEALTH AND SOCIAL WORKS	9,749	10,321	10,634	11,360	12,080	12,540	13,137	13,802	14,587	5.17%	5.13%
15	COMMUNITY, SOCIAL AND PERSONAL SERVICES	58,399	60,262	62,192	64,191	66,265	68,416	70,643	72,955	75,404	3.25%	3.27%
	TOTAL TERTIARY SECTOR	2,70,904	2,86,516	3,01,070	3,17,717	3,37,469	3,59,658	3,79,493	4,00,836	4,24,225	5.77%	5.95%
16	TAX LESS SUBSIDY	25,958	28,319	28,645	27,672	28,422	29,062	29,960	31,156	33,357	3.18%	3.81%
	GDP at constant market price	5,16,383	5,47,437	5,75,056	6,07,097	6,46,342	6,88,493	7,29,896	7,74,136	8,24,532	6.02%	6.31%
	Growth rate	7.06%	6.01%	5.05%	5.57%	6.46%	6.52%	6.01%	6.06%	6.51%		

Source: Bangladesh Bureau of Statistics and EY Analysis

The structure of the economy shows that tertiary sector the largest and followed by the secondary and primary sector. Tertiary sector contribute more than half of the GDP in the economy.

Due to the differential growth rates among the sub-sectors of the economy, the structure of the economy is changing. During the analysis period of 2006-07 to 2014-15 the contribution of the primary sector decreased from 20.5% to 17.6%. Same decreasing trend is observed in case of tertiary sector also where the contribution dropped by 1.6% percentage points.

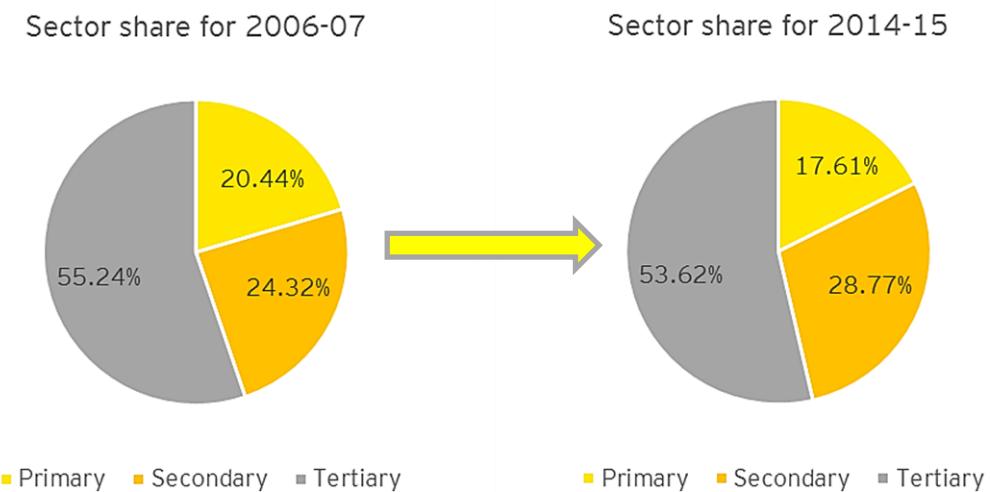
The Table 7.2 and Figure 7.2 shows the comparative sectoral share of the economy. Table 7.3 presents the changing sub-sectoral structure of the economy and it is found the manufacturing sector is becoming stronger whereas agriculture sub-sector becoming weaker.

Table 7-1 : Comparative assessment - Sectoral share of GDP at Constant Prices in %

Sr. No.	Sector	2006-07	Share (%)	2014-15	Share (%)
1	Primary	1,00,240	20.44%	1,39,325	17.61%
2	Secondary	1,19,281	24.32%	2,27,626	28.77%
3	Tertiary	2,70,904	55.24%	4,24,225	53.62%
Total		4,90,425	100.00%	7,91,176	100.00%

Source: Bangladesh Bureau of Statistics and EY Analysis

Figure 7-3 : Comparative assessment - Sectoral Share



Source: Bangladesh Bureau of Statistics and EY Analysis

Table 7-2 : Trend of major sectors - Sectoral share of GDP at Constant Prices in %

Sr. No.	Sector	Sectoral Share of GDP (%) at Constant Prices (Base Year: 2005-06)										CAGR 8 years	CAGR 5 years
		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15			
A PRIMARY SECTOR													
1	AGRICULTURE AND FORESTRY	15.17	14.89	14.58	14.65	14.27	13.7	13.09	12.81	12.27	-2.62%	-3.48%	
2	FISHING	3.75	3.79	3.78	3.73	3.73	3.68	3.68	3.69	3.69	-0.20%	-0.22%	
3	MINING AND QUARRYING	1.52	1.54	1.62	1.65	1.6	1.61	1.65	1.63	1.65	1.03%	0.00%	
	TOTAL PRIMARY SECTOR	20.44	20.22	19.98	20.03	19.6	18.99	18.42	18.13	17.61	-1.85%	-2.54%	
B SECONDARY SECTOR													
4	MANUFACTURING	16.64	16.87	17.1	17.2	17.75	18.28	19	19.47	20.17	2.43%	3.24%	
5	ELECTRICITY, GAS AND	1.19	1.21	1.23	1.28	1.36	1.41	1.45	1.42	1.43	2.32%	2.24%	
6	CONSTRUCTION	6.49	6.5	6.58	6.65	6.67	6.78	6.9	7.03	7.17	1.25%	1.52%	
	TOTAL SECONDARY SECTOR	24.32	24.58	24.91	25.13	25.78	26.47	27.35	27.92	28.77	2.12%	2.74%	
C TERTIARY SECTOR													
7	WHOLESALE AND RETAIL	13.78	13.96	14.04	14.02	14.02	14.02	14.03	14.1	14.12	0.31%	0.14%	
8	HOTEL AND RESTAURANTS	0.75	0.74	0.75	0.75	0.75	0.74	0.75	0.75	0.75	0.00%	0.00%	
9	TRANSPORT, STORAGE &	10.37	10.61	10.89	11.05	11.23	11.49	11.5	11.49	11.44	1.24%	0.70%	
10	FINANCIAL	3.09	3.03	2.88	2.88	2.99	3.21	3.3	3.34	3.41	1.24%	3.44%	
11	REAL ESTATE, RENTING &	8.03	7.87	7.77	7.61	7.41	7.22	7.07	6.95	6.83	-2.00%	-2.14%	
12	PUBLIC ADMINISTRATION	3.12	3.14	3.19	3.26	3.33	3.35	3.36	3.39	3.42	1.15%	0.96%	
13	EDUCATION	2.21	2.24	2.25	2.23	2.21	2.23	2.24	2.26	2.28	0.39%	0.44%	
14	HEALTH AND SOCIAL WORKS	1.99	1.99	1.95	1.96	1.95	1.9	1.88	1.86	1.84	-0.97%	-1.26%	
15	COMMUNITY, SOCIAL AND	11.91	11.61	11.38	11.08	10.72	10.38	10.09	9.82	9.53	-2.75%	-2.97%	
	TOTAL TERTIARY SECTOR	55.25	55.19	55.1	54.84	54.61	54.54	54.22	53.96	53.62	-0.37%	-0.45%	
	GDP	100	100	100	100	100	100	100	100	100			

Source: Bangladesh Bureau of Statistics and EY Analysis

From the above analysis, we found the following salient features of the Bangladesh Economy:

- ▶ The economy is growing at a steady growth rate around 6%
- ▶ Tertiary sector is the major contributor of the economy
- ▶ Structural change is observed in the economy where contribution of the secondary sector is increasing
- ▶ Financial intermediaries and the manufacturing sector is growing at the fastest rate of around 10%
- ▶ Agriculture sector is worst performing and the growth rate is close to 3%.

7.1.2 Overview of manufacturing sector:

This section of the chapter is presenting an overview of the manufacturing sector in Bangladesh taking in account number of establishments, gross output, value addition and level of utilization of the installed capacity. Subsequently, trend of some of the important manufacturing sub-sectors are also presented.

There are around 43 thousands registered manufacturing establishments in the country with a gross output of TK 54 thousand crore. Total value added estimated as TK 16 thousand crores. Average gross output per establishment stood as around Tk 13 cr which implies majority of the establishments are in the tiny and small in nature. Highest average gross output is registered in manufacturing sub-sector termed as basic metal.

In the context of country manufacturing sector the top ten subsectors in terms of number of establishments, gross output, gross value addition and capacity utilization is presented in the following matrix. These top ten sectors contributes 91% of the gross output of the manufacturing sector.

Interestingly textile and allied manufacturing sector occupies around 42% of the establishments produce 47% of the gross output. Textile subsector is a natural selection in the country with high level of manufacturing efficiency and comparative advantages in the low cost skilled labor force.

Apart from textile and allied products the manufacturing sector of Bangladesh further comprises of major manufacturing industry groups of food products, beverages, tobacco products, leather & related products, chemicals & chemical products, pharmaceuticals, medicinal chemical & botanical products, rubber & plastic products, non-metallic mineral products, basic metals; electrical equipment; and others.

Few sub-sectors are showing high level of overutilization of install capacities. Repair and installation of equipment (79%), manufacturing of machinery and equipment (22%), manufacturing of electrical equipment (18%), pharmaceutical products (19%), Chemical and products (12%) and fabricated metals (17%) are on the top of the list of overutilization.

Details of the performance of manufacturing sector in Bangladesh is presented in the following Table 7.3 below,

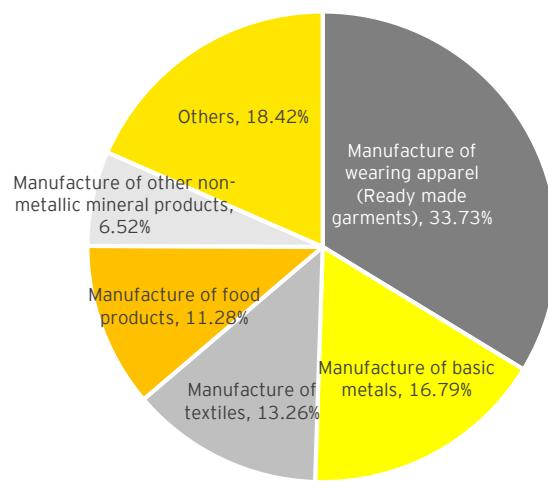
Table 7-3 : Top Ten Manufacturing Sub-sectors in Bangladesh, 2012

Rank	Sub Sector	Share of total manufacturing Output	Share of total manufacturing Establishments (%)	Average Gross Output (TK million)	Average Gross value addition- (TK million)	Average gross value addition as % of average gross output	Share of establishments utilizing capacity more than 100%
1	Wearing apparel (Readymade garments)	33.7	16.3	261	79.6	30.5	2
2	Basic Metals	16.8	2.8	752	180.1	24.0	4
3	Textile	13.6	25.7	65	20.0	30.8	3
4	Food products	11.3	19.7	72	20.6	28.6	6
5	Non-metallic mineral products	6.5	10.9	76	23.8	31.4	3
6	Chemicals and products	2.6	1.3	249	66.2	26.6	12
7	Pharmaceuticals	2.1	1.2	229	68.6	30.0	19
8	Tobacco products	1.6	1.1	179	49.5	27.6	1

9	Leather & products	1.4	2.2	82	23.8	29.1	6
10	Fabricated metal products except machineries	1.3	3.4	49	15.3	31.4	17

Source: EY analysis

Figure 7-4 : Top performing industries in terms of gross output



Source: Survey of manufacturing industries, 2012 and EY Analysis

Figure 7-5 : Comparative assessment of major manufacturing industries

Type of manufacturing industry	No. of establishments	Share	Gross output (in million taka)	Share	Average Gross output per establishment (in million taka)	Gross Value Added (in million taka)	Capacity Utilization rate (% of total establishments)			
							25-50%	50-75%	75-100%	100-150%
Total	42,792	100.00%	53,94,902	100.00%	126	15,62,944	4%	33%	59%	5%
Manufacture of food products	8,441	19.73%	6,08,777	11.28%	72	1,73,959	3%	31%	60%	6%
Manufacture of beverages	367	0.86%	52,826	0.98%	144	13,564	5%	37%	48%	9%
Manufacture of tobacco products	487	1.14%	87,197	1.62%	179	24,103	13%	45%	41%	1%
Manufacture of textiles	10,983	25.67%	7,15,247	13.26%	65	2,19,728	3%	21%	73%	3%
Manufacture of wearing apparel (Ready made garments)	6,984	16.32%	18,19,482	33.73%	261	5,55,979	5%	33%	61%	2%
Manufacture of leather and related products	930	2.17%	76,174	1.41%	82	22,180	18%	17%	59%	6%
Manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	302	0.71%	6,912	0.13%	23	2,306	2%	46%	48%	4%
Manufacture of paper and paper products	902	2.11%	57,187	1.06%	63	15,691	2%	47%	47%	4%
Printing and reproduction of recorded media	904	2.11%	10,821	0.20%	12	4,863	3%	9%	88%	1%
Manufacture of coke and refined petroleum products	19	0.04%	3,684	0.07%	194	1,309	0%	38%	62%	0%
Manufacture of chemicals and chemical products	563	1.32%	1,40,184	2.60%	249	37,248	9%	41%	38%	12%
Manufacture of pharmaceuticals, medicinal chemical and botanical products	494	1.15%	1,13,070	2.10%	229	33,881	11%	52%	18%	19%
Manufacture of rubber and plastics products	1,036	2.42%	51,143	0.95%	49	16,903	4%	38%	54%	4%
Manufacture of other non-metallic mineral products	4,654	10.88%	3,51,779	6.52%	76	1,10,552	2%	54%	41%	3%

Type of manufacturing industry	No. of establishments	Share	Gross output (in million taka)	Share	Average Gross output per establishment (in million taka)	Gross Value Added (in million taka)	Capacity Utilization rate (% of total establishments)			
							25-50%	50-75%	75-100%	100-150%
Manufacture of basic metals	1,205	2.82%	9,05,850	16.79%	752	2,16,992	2%	31%	64%	4%
Manufacture of fabricated metal products, except machinery and equipment	1,449	3.39%	71,357	1.32%	49	22,259	3%	45%	35%	17%
Manufacture of computer, electronic and optical products	149	0.35%	39,623	0.73%	266	10,777	41%	26%	34%	0%
Manufacture of electrical equipment	884	2.07%	1,45,166	2.69%	164	41,146	2%	29%	51%	18%
Manufacture of machinery and equipment n.e.c.	195	0.46%	13,141	0.24%	67	3,912	0%	25%	52%	22%
Manufacture of motor vehicles, trailers and semi-trailers	137	0.32%	36,780	0.68%	268	9,970	7%	58%	28%	6%
Manufacture of other transport equipment	276	0.64%	36,291	0.67%	131	10,291	0%	32%	65%	3%
Manufacture of furniture	1,055	2.47%	39,685	0.74%	38	11,322	3%	52%	43%	3%
Other manufacturing	235	0.55%	11,263	0.21%	48	3,498	10%	50%	40%	0%
Repair and installation of machinery and equipment	120	0.28%	1,134	0.02%	9	459	6%	10%	4%	79%
Recycling	21	0.05%	129	0.002%	6	52	0%	19%	75%	6%

Source: Survey of manufacturing industries, 2012

Nationally manufacturing establishments are classified based on number of persons engaged and are classified into four categories; tiny, small, medium and large. Tiny and small establishments together contributed 3.7% in the GDP while medium and large scale manufacturing units contributed 16.5% as on 2014-15.

Manufacturing sector in Bangladesh is employing a substantial portion of the labor force in the country. According to report on labor force survey, Bangladesh 2013, agriculture, services and industry sectors is employing 45.1%, 34.1% and 20.8% respectively of the total employed population aged 15 and above in Bangladesh.

The characteristics of the manufacturing sector in Bangladesh is presented in the following Table 7.6 and Table 7.7. Tiny and small establishments are 76% of the total number of establishments. However they contribute 27% of the gross output through engaging around 22% of the labour force. Average employment in the manufacturing sector is 117 while large units employ more than 800 labour force on an average.

Table 7-4 : Number of manufacturing establishments by size, TPE, Gross output and GVA

Size class	No. of establishments	Total Persons Engaged (TPE)	Gross Output		Gross Value Added	
			Number	Both sex	Million Taka	Share %
Total	42,792	50,15,936	53,94,905	100.00	15,62,947	100.00
Micro (10<= TPE>=24)	17,384	2,71,644	2,75,818	5.11	92,092	5.89
Small (25<=TPE >=99)	15,666	7,38,801	12,03,267	22.30	3,69,974	23.67
Medium (100<= TPE >250)	6,103	10,41,220	14,08,342	26.11	3,63,646	23.27
Large (TPE >=250 persons)	3,639	29,64,272	25,07,478	46.48	7,37,235	47.17

Source: Survey of manufacturing industries, 2012

Table 7-5 : Characteristics of the Manufacturing Sector

Size class	No. of establishments	Share of Total Persons Engaged (TPE) - (%)	Share of Gross Output (%)	Average number of Employment
Micro (10<= TPE>=24)	40.6	5.4	5.11	16
Small (25<=TPE >=99)	36.6	14.7	22.3	47
Medium (100<= TPE >250)	14.3	20.8	26.11	171
Large (TPE >=250 persons)	8.5	59.1	46.48	815

Source: Survey of manufacturing industries, 2012

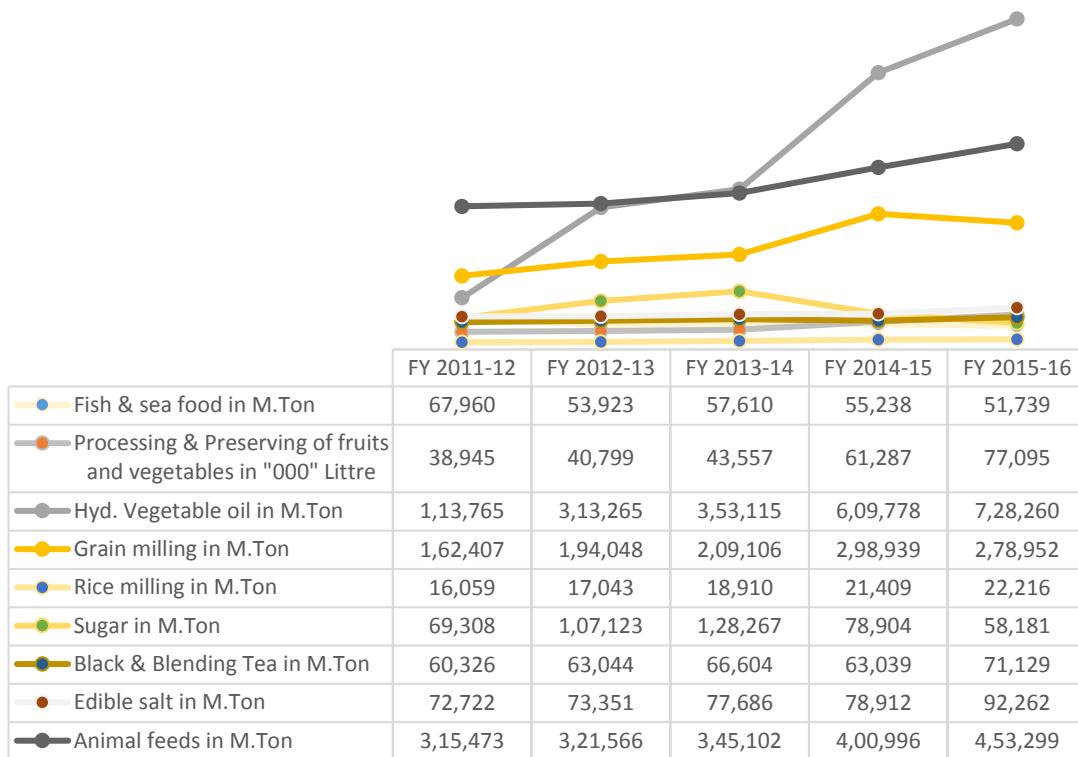
Some of the major industry groups are dealt in detail in the following sub sections,

7.1.3 Manufacturing of food products

This industry is a rapidly growing sector in Bangladesh, which has several small scale factories and domestic units involved in food processing business. Some of the major sub sectors of this manufacturing of food products industry include fish & sea food sector, processing & preserving of fruits & vegetables sector, hyd. vegetable oil sector, grain milling sector, rice milling sector, sugar sector, black & blending tea sector, edible salt sector and animal feeds sector.

According to SMI 2012, manufacturing of food products sector had 8,441 number of establishments which is around 19.73% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 6,08,777 million taka. Thus, the average gross output per establishment comes out to be around 72 million taka.

Key players performing in this sub sector of food processing are Akij Food & Beverage Ltd., Ahmed Food Products (Pvt.) Ltd., Al-Amin Food & Fruits Industries (Pvt.) Ltd., AP Enterprise, Jobeda Food Industries Ltd., Rupali Seafoods Ltd., Sunlay Food Industries Ltd. and Taseem Food Ind. Ltd.

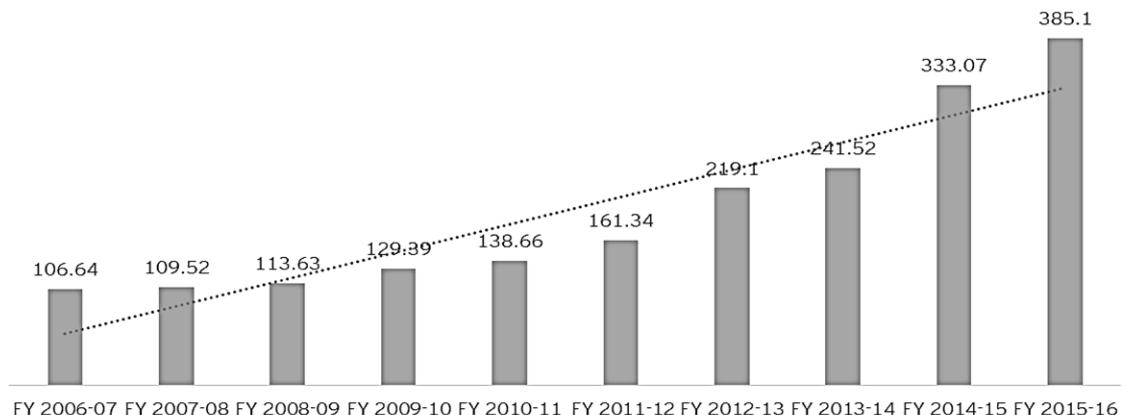
Figure 7-6 : Trend of major sub sectors of manufacturing of food products industry

Source: *Bangladesh Bureau of Statistics*

The trend charted by the various sub sectors of the manufacturing of food products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Fish and sea food sector has declined at a CAGR of 6.59%;
- ▶ Processing and preserving of fruits and vegetables sector have grown at a CAGR of 18.62%, which is showing a twofold increase with respect to FY 2011-12;
- ▶ HYyd. vegetable oil sector has shown significant growth at a CAGR of 59.06%, which is maximum amongst the basket of manufacturing industry and registering around six and a half fold increase with respect to FY 2011-12;
- ▶ Grain milling sector has grown at a CAGR of 14.48%;
- ▶ Rice milling sector has grown at a CAGR of 8.45%;
- ▶ Sugar sector has declined at a CAGR of 4.28%;
- ▶ Black and blending tea sector has grown at a CAGR of 4.20%;
- ▶ Edible salt sector has grown at a CAGR of 6.13%; and
- ▶ Animal feeds sector has grown at a CAGR of 9.49%.

Figure 7-7 : Trend of Quantum Index of Industrial Production for manufacturing of food products industry



Source: *Bangladesh Bureau of Statistics*

As per BBS, the Quantum Index of Industrial Production for manufacturing of food products industry shows a good progressive trend. The production of food products has been growing at a healthy CAGR of 15.34% for the last 9 years from 2006-07 to 2015-16 and at a CAGR of 22.67% for the last 5 years from 2010-11 to 2015-16, which is second highest growth witnessed amongst the basket of manufacturing industry.

Some of the key challenges faced by the Bangladeshi food processing industry are acute problems of low capacity utilization, marketing underperformances and technological obsolescence. Quality of the finished product is generally very impecunious due to the high fluctuations in raw material quality and lack of efficient technologies and trained manpower. In the current state of development, the majority of the Bangladesh food processing industry is inept to meet the food standards and safety requirements of the international market, but the only exception is shrimp sector, due to interventions from EU and United States Food and Drug Administration (U.S FDA).

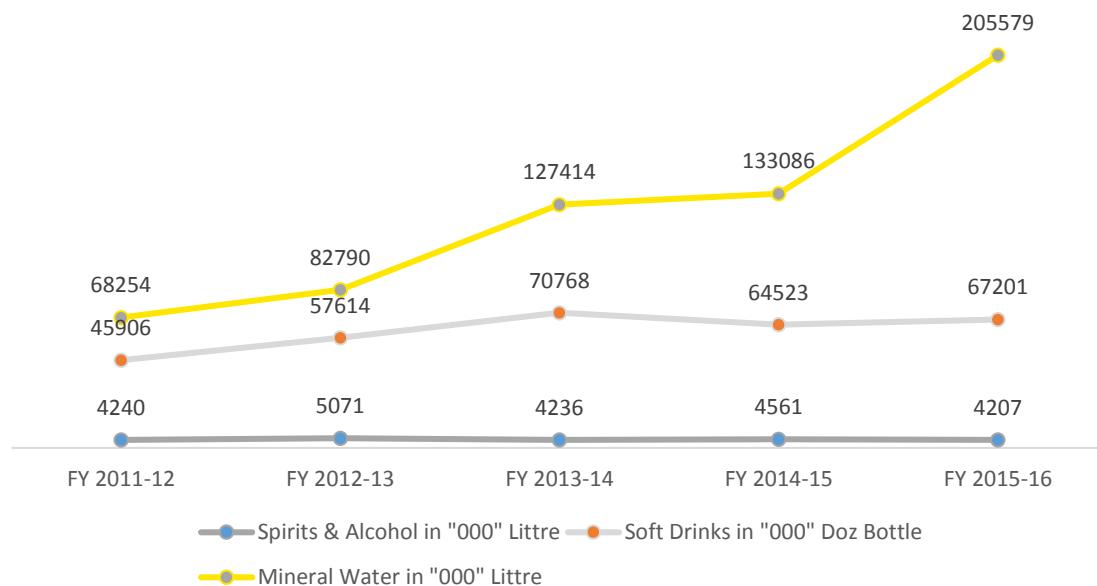
7.1.4 Manufacturing of beverages

This industry is a rapidly growing sector in Bangladesh, which has several small scale factories and domestic units involved in manufacturing of beverages business. Some of the major sub sectors of this manufacturing of beverages industry include spirits & alcohol sector, soft drinks sector and mineral water sector.

According to SMI 2012, manufacturing of beverages sector had 367 number of establishments which is around 0.86% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 52,826 million taka. Thus, the average gross output per establishment comes out to be around 144 million taka.

Key players of this sub sector of manufacturing of beverages are Akij Food & Beverage Ltd., D-Watertech Ltd., Power Trade Group, Transom Beverage Limited, Sun Crest Beverage Industries Limited, Eastern Beverage Limited, Sanowara Drinks and Beverage, Desh Beverage Limited, National Beverage Industries Limited, Dhaka Beverage Ltd., Bangladesh Beverage Industries Ltd. and HR Trading Corporation.

Figure 7-8 : Trend of major sub sectors of manufacturing of beverages industry

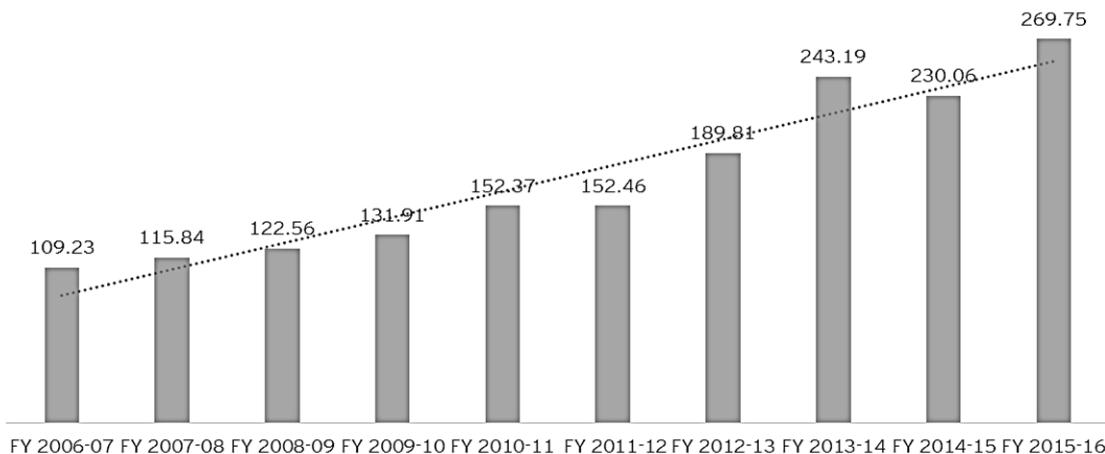


Source: *Bangladesh Bureau of Statistics*

The trend charted by the various sub sectors of the manufacturing of beverages industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Spirits and alcohol sector has remained pretty stagnant but declined at a CAGR of 6.59%;
- ▶ Soft drinks sector have grown at a CAGR of 10.00%; and
- ▶ Mineral water sector has shown significant growth at a CAGR of 31.74% which demonstrates a threefold increase in the volumes of production for mineral water sector.

Figure 7-9 : Trend of Quantum Index of Industrial Production for manufacturing of beverages industry



Source: *Bangladesh Bureau of Statistics*

The Quantum Index of Industrial Production for manufacturing of beverages industry shows a progressive trend. The production of beverages has been growing at a healthy CAGR of 10.57% for the last 9 years from 2006-07 to 2015-16 and at a CAGR of 12.10% for the last 5 years from 2010-11 to 2015-16.

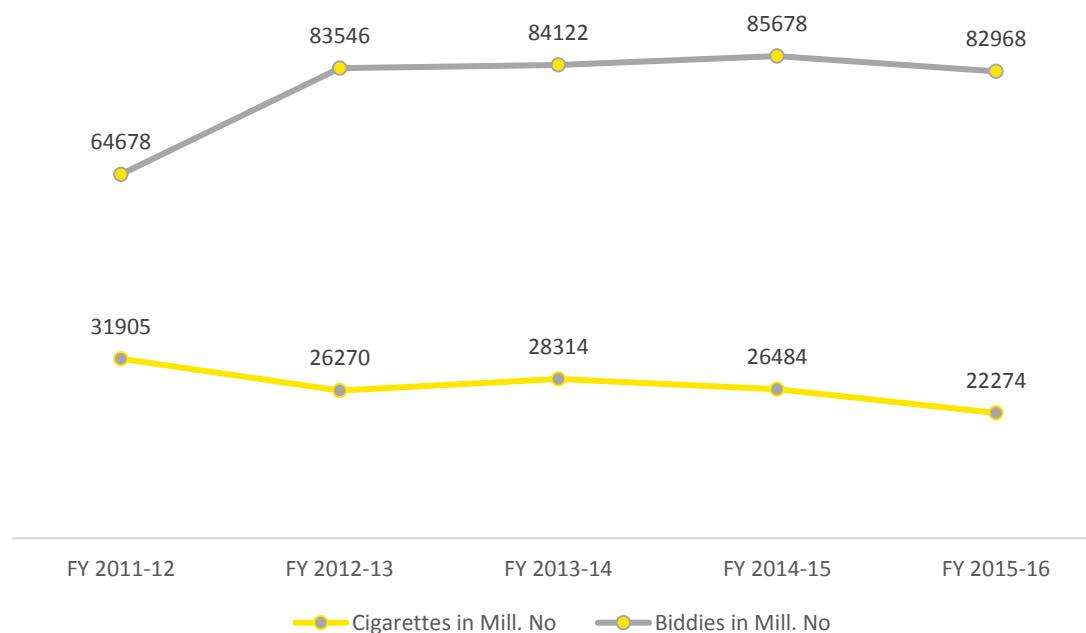
7.1.5 Manufacturing of tobacco products

Bangladesh is one of the largest tobacco consuming countries in the world. Some of the major sub sectors of this manufacturing of tobacco products industry include cigarettes sector and biddies sector. Both the sectors, cigarettes sector and biddies sector are rising in Bangladesh. In fact the biddies consumption has outpaced the population growth. Cigarette manufacturing is highly concentrated, while bidi manufacturing is much more fragmented. The major tobacco products export partners are Netherlands, USA, Belgium, Rep. of Korea and Germany whereas the major import partners are India, USA, Brazil, Zimbabwe and Portugal. The contribution of tobacco manufacturing sector is around 1% of GDP, whereas this industry contributes around 9% of the total tax revenue of the country and employment in the tobacco manufacturing industry is meagerly around 0.5% of the total labor force employed.

Key players of this sub sector of manufacturing of tobacco products are Dhaka Tobacco Industries, British American Tobacco Bangladesh, Akij Group of Industries, Husna Tobacco Pvt. Ltd., Sonali Tobacco Products and Abul Khair & Tobacco Company.

According to SMI 2012, manufacturing of tobacco products sector had 487 number of establishments which is around 1.14% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 87,197 million taka. Thus, the average gross output per establishment comes out to be around 179 million taka.

Figure 7-10 : Trend of major sub sectors of manufacturing of tobacco products industry



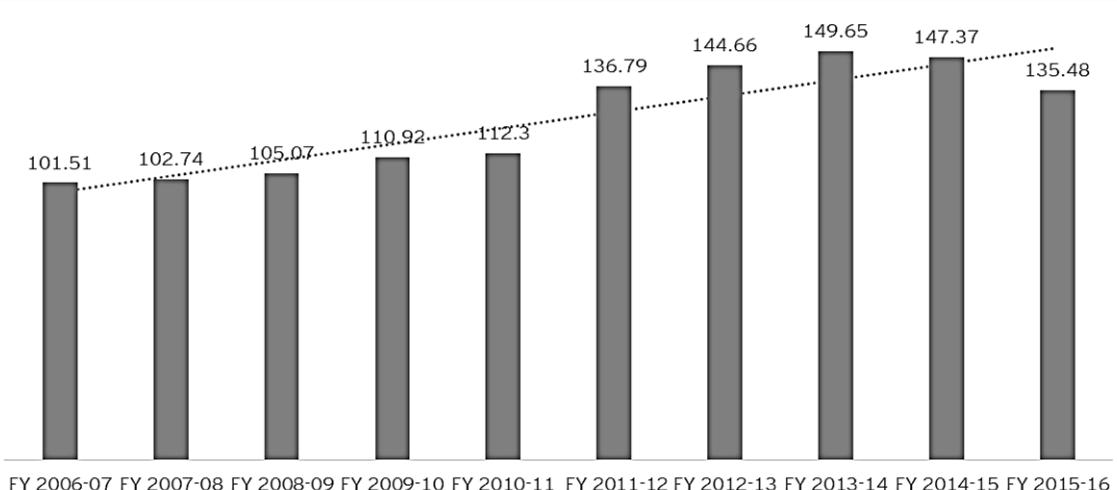
Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of tobacco products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Cigarettes sector has declined at a CAGR of 8.59% which is around 1.5 times decrease in the production of volumes for the cigarettes sector;
- ▶ Whereas for biddies sector has grown at a CAGR of 6.42%.

This resultant decline in the production of cigarettes is the efforts taken by Bangladeshi government by implementing stringent acts like WHO Framework Convention on Tobacco Control (FCTC), Smoking and Tobacco Product Usage (control) Act and Bangladesh Tobacco Control Act (BTCA).

Figure 7-11 : Trend of Quantum Index of Industrial Production for manufacturing of tobacco products industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of tobacco products industry shows a steady progressive trend, but the index are fluctuating in nature. The production of

tobacco products has been growing at a CAGR of 3.26% for the last 9 years from 2006-07 to 2015-16 and at a CAGR of 3.82% for the last 5 years from 2010-11 to 2015-16.

7.1.6 Manufacturing of textile

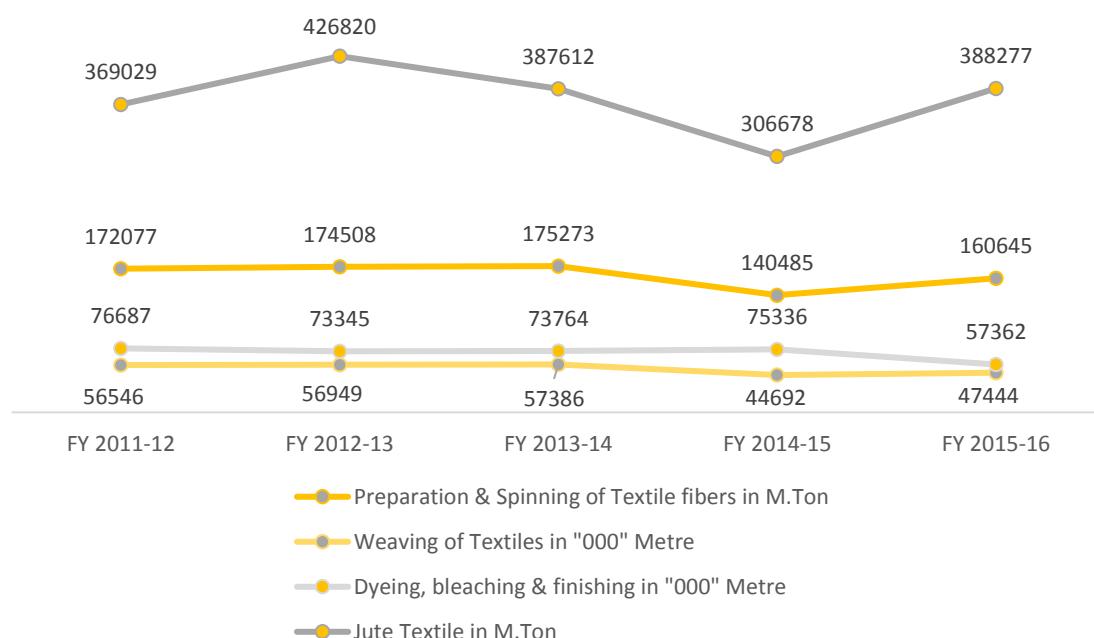
The textile industries form up the primary source of growth in Bangladesh's swiftly developing economy. The exports of the textiles are one of the major source of earning foreign exchange for the country. This industry has a sound potential to provide direct employment and also provides the direct employment to around 4 million people, which accounts for around 45% of all industrial employment in the country.

Bangladesh is next only to China, the world's second-largest apparel exporter of western brands. About sixty percent of the export contracts of western brands are with European buyers and about forty percent with American buyers. There is also provision of dedicated service for educating the masses in terms of textile sector expertise by the provision of Bangladesh University of Textiles (BUTex), which is the only public university specializing in textile engineering. Some of the major sub sectors of this manufacturing of textile industry include preparation & spinning of textile fibers sector, weaving of textile sector, dyeing, bleaching & finishing sector and jute textile sector.

Key players of this sub sector of manufacturing of textile industry are ABS International, Anaa Textiles Ltd., Tanz Apparels, East Bengal International, Symbol Fashion Ltd., Hasan Industrial Company, One Tex BD Ltd., Tahsin Trade International, Omea textiles manufacturing & Exporter Ltd. and Ritz Textiles company Ltd.

According to SMI 2012, manufacturing of textiles sector had 10,983 number of establishments which is around 25.67% of the total establishments, which is the highest sector in terms of establishments in this manufacturing industry basket. The gross output from this sub sector was 7,15,247 million taka, which is the third largest sector in this manufacturing industry basket in terms of gross output addition. Thus, the average gross output per establishment comes out to be around 65 million taka.

Figure 7-12 : Trend of major sub sectors of manufacturing of textiles industry

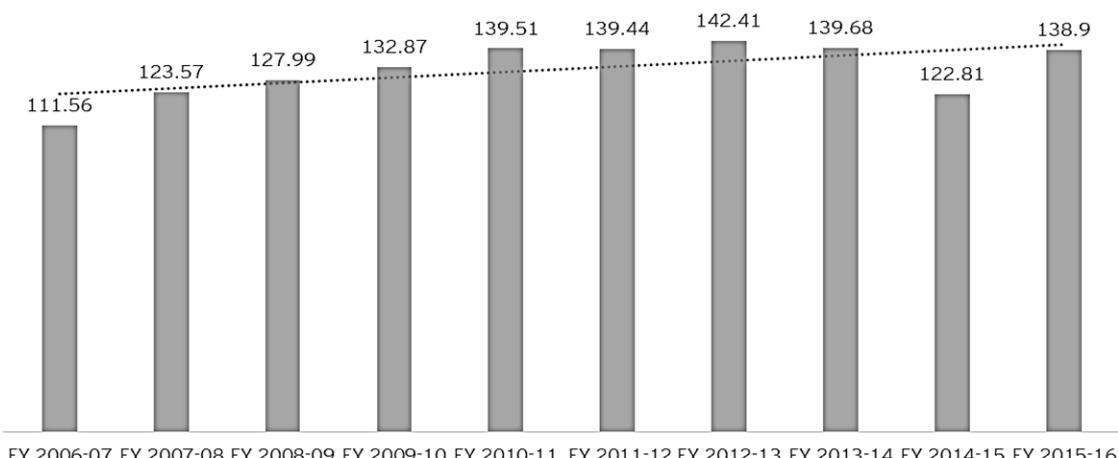


Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of textiles industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Preparation & spinning of textile fibers sector has remained pretty stagnant but declined at a CAGR of 1.70%;
- ▶ Weaving of textiles sector has declined at a CAGR of 4.29%;
- ▶ Dyeing, bleaching & finishing sector has declined to a greater extent at a CAGR of 7.00%; and
- ▶ Jute textiles sector has grown at a CAGR of 1.28%.

Figure 7-13 : Trend of Quantum Index of Industrial Production for manufacturing of textiles industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of textile industry shows a steady progressive trend, but the index are fluctuating in nature. The production of textiles has been growing at a CAGR of 2.47% for the period of last 9 years from 2006-07 to 2015-16, but this trend has declined at a CAGR of 0.09% for the period of last 5 years from 2010-11 to 2015-16.

7.1.7 Manufacturing of wearing apparel

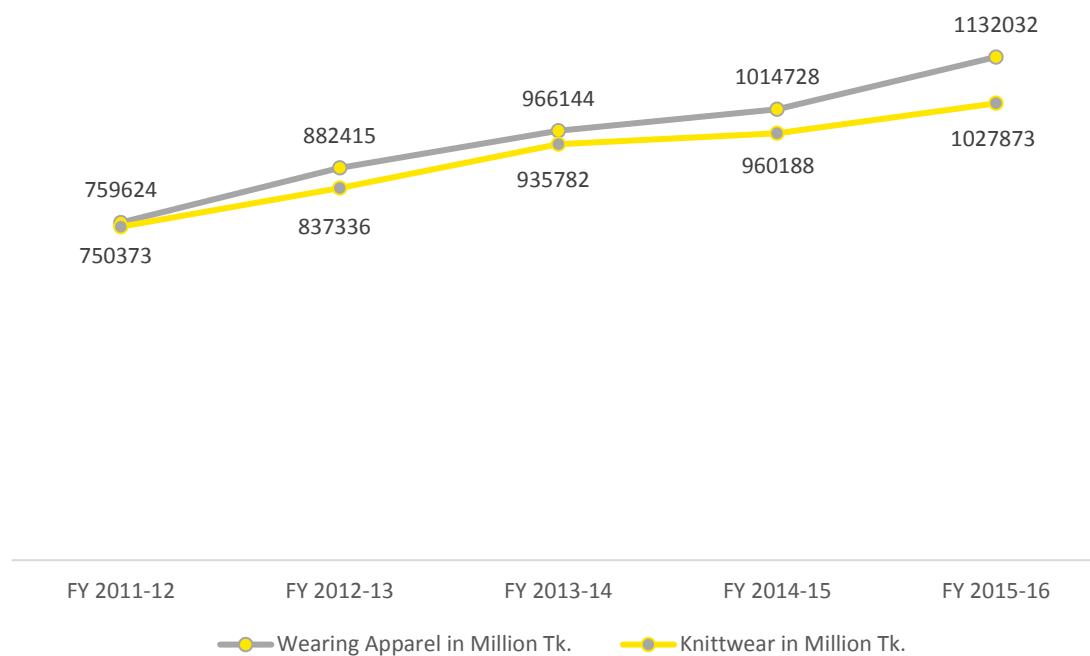
The manufacturing of wearing apparel industry also known as ready-made garment industry is the dominant sector in Bangladesh in terms of value addition to GDP and employing a massive labor force in the basket of manufacturing industry. A key driver of the country's notable economic growth is its vivacious ready-made garment (RMG) sector, earning a status as an international leader in low-cost and high-quality manufacturing. This industry was valued at \$25.5 billion in 2014-15; wherein RMG exports accounted for around 83 percent of total exports during the October-December 2015 period, assigning Bangladesh as the second-largest exporter of RMG after China. This sector employs over 4 million people, of which around 80 percent women from rural communities and low income groups. Due to high labor cost and capacity constraints facing the major competitors like China, Vietnam, Cambodia, Myanmar and various other countries; Bangladesh's RMG sector is well established to attain the \$50 billion mark by 2021. These industries are mainly located in Dhaka and Chittagong.

Key players of this sub sector of manufacturing of wearing apparel industry are Alutex industries, Apex spinning & knitting mills, Argon denims Ltd., Desh garments Ltd., Familytex BD Ltd., Generation next fashions Ltd., Hamid fabrics Ltd., Saiham cotton mills Ltd., Simtex industries Ltd. Stylecraft Ltd., Tosrifa industries Ltd. and Zahintex industries Ltd.

According to SMI 2012, manufacturing of wearing apparel sector had 6,984 number of establishments which is around 16.32% of the total establishments, which is the third highest sector in terms of establishments in this manufacturing industry basket. The gross output from this sub sector was 18,19,482 million taka, which is the largest sector in this manufacturing

industry basket in terms of gross output addition. Thus, the average gross output per establishment comes out to be around 261 million taka which is fourth largest amongst the manufacturing industry basket.

Figure 7-14 : Trend of major sub sectors of manufacturing of wearing apparel industry

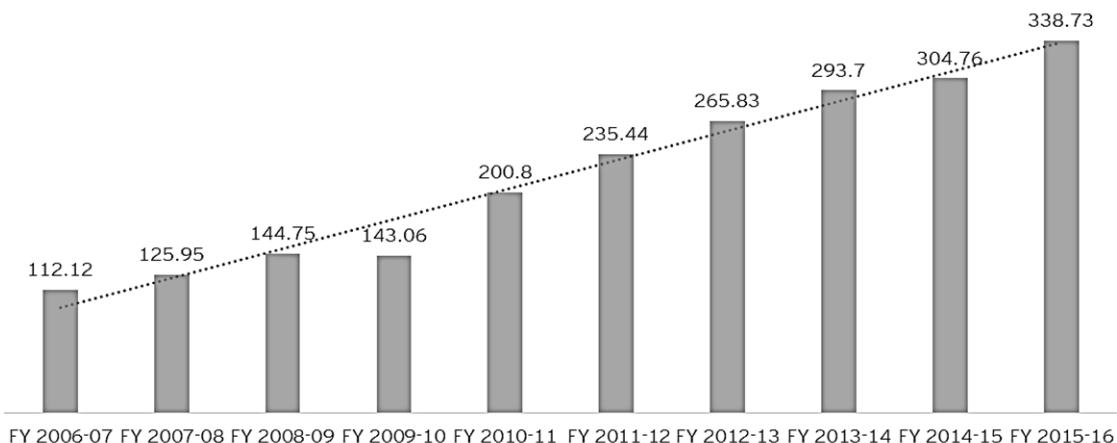


Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of wearing apparel industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Wearing apparel sector has shown progressive growth and has grown at a CAGR of 10.49% recording around 1.5 times growth from the FY 2011-12; and
- ▶ Knittwear sector has also shown progressive growth and grown at a CAGR of 8.18% which is around 1.38 times growth from the FY 2011-12.

Figure 7-15 : Trend of Quantum Index of Industrial Production for manufacturing of wearing apparel industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of textile industry shows a steady progressive trend, but the index are fluctuating in nature. The production of textiles has been growing at a CAGR of 13.07% for the period of last 9 years from 2006-07 to 2015-16 which is threefold increase over the 2006-07; and grown at a CAGR of 11.02% for the period of last 5 years from 2010-11 to 2015-16 which is around 1.7 times increase from the year 2006-07. The primary reason for decline of index in the year 2009-10 was due to global economic slowdown; however, the industry stood resistant as compared to index of preceding year.

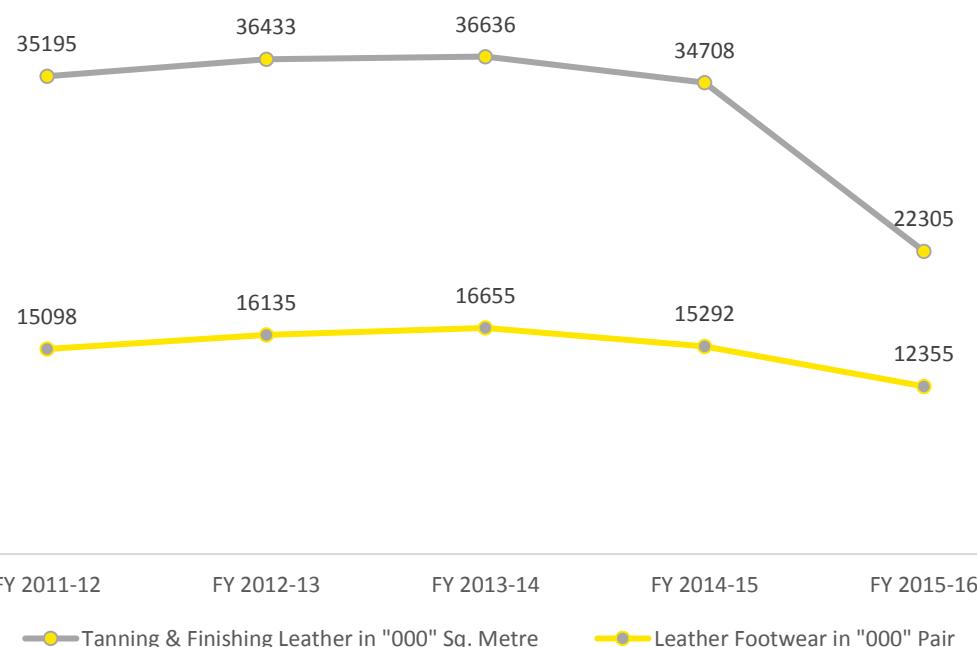
7.1.8 Manufacturing of leather and related products

The Government of Bangladesh has recognized the leather sector as one with significant growth and investment imminent, and this sector is ranked second in the exports earning sector in Bangladesh. Currently Bangladesh produces and exports good quality bovine and ovine, caprine (buffalo and cow; sheep and goat) leathers that have a good transnational repute for fine textured skins. However, the entire leather sector meets only around 0.5% of the world's leather trade worth US\$75 billion. Bangladesh has about 113 tanneries that produce around 180 million square feet of hides and skins per year. In addition to this, there are about 30 modern shoe manufacturing plants involved in the production of high-quality footwear, along with around 2500 smaller footwear manufacturers and around 100 small-to-medium leather goods manufacturers, and a small number of vocational larger manufacturers. The sector directly employs around 5,58,000 people. Most of the tanneries do not have proper effluent plants and engender around 20,000 cubic metre tannery effluent and around 232 tonnes solid waste per day.

Key players of this sub sector of manufacturing of leather and related products industry are HBM leather crafts, Capital tannery, RMM leather industries Ltd., Samata leather complex Ltd., Legacy footwear Ltd., Fortune shoes Ltd., Apex tannery Ltd., Bata shoe company Ltd. and Apexadelchi footwear Ltd.

According to SMI 2012, manufacturing of leather and related products sector had 930 number of establishments which is around 2.17% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 76,174 million taka. Thus, the average gross output per establishment comes out to be around 82 million taka.

Figure 7-16 : Trend of major sub sectors of manufacturing of leather and related products industry



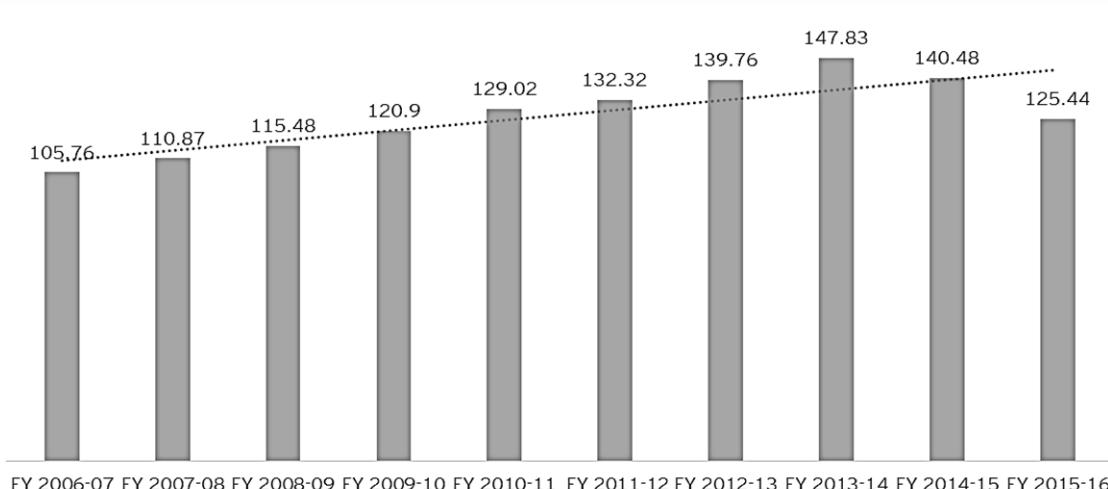
Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of leather and related products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Tanning & finishing leather sector has declined at a CAGR of 10.78%; and
- ▶ Leather footwear sector has declined at a CAGR of 4.89%.

The primary reason for the downfall of this sector is due to demand in major transnational markets has been reducing amidst serious concerns over the environmental hazard created by the country's leather industry. Another reason is due to China's leather market not performing well in recent times, which is the major buyers of rawhide & skins from Bangladesh.

Figure 7-17 : Trend of Quantum Index of Industrial Production for manufacturing of leather and related products industry



Source: *Bangladesh Bureau of Statistics*

The QIIP for manufacturing of leather and related products industry shows a steady progressive trend, but the index are fluctuating in nature. The production of leather and related products has been growing at a CAGR of 1.91% for the period of last 9 years from 2006-07 to 2015-16; and has declined at a CAGR of 0.56% for the period of last 5 years from 2010-11 to 2015-16. The primary reason for recent decline of index is due to plummeting global demands.

7.1.9 Manufacturing of basic metals

Bangladesh has more than 400 steel, re-rolling and auto-re-rolling mills with a collective annual production capacity of around 80 lakh tonnes, compared to the total demand of around 40 lakh tonnes (which is the market value of BDT 200 billion). The government projects account for around 40% of total steel consumption.

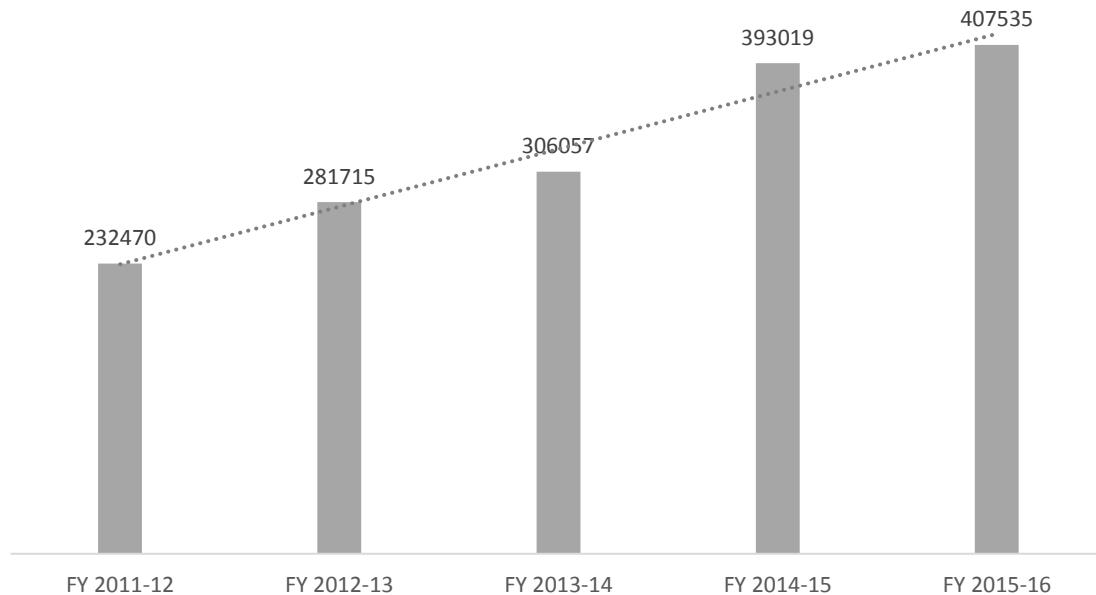
Bangladesh is one of the lowest consumers of steel products in the world. Per capita steel consumption in Bangladesh now stands at only 25 kilograms, while it is 55 Kilograms in India and 324 kilograms in various other developed nations. Although a number of companies of this sector are producing basic metals/steel, however around 15 lakh tonnes are still imported every year. Currently, three big steelmakers explicitly, BSRM, Abul Khair Steel and KSRM are supplying more than 50 percent of the country's annual need for around 35 to 40 lakh tonnes of steel.

Key players of this sub sector of manufacturing of basic metals industry are Arteco metallic, Asif steels Ltd., Baizid steel industries Ltd., Bangladesh Steel Re-rolling Mills Ltd., Golden re-rolling mills industries Ltd., Hazi Islam Uddin Steel & Re-rolling Mills Ltd., K S M Steel Re- Rolling Mills Ltd. and Rahim Steel Re-Rolling Mills Ltd.

Subsequently steel demand is derived from the demand of other sectors like construction of buildings, roads, consumer durables and infrastructure, its fortune is dependent on the growth of these sectors as well.

According to SMI 2012, manufacturing of basic metals sector had 1,205 number of establishments which is around 2.82% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 9,05,850 million taka which is the second largest in this manufacturing industry basket. Thus, the average gross output per establishment comes out to be around 752 million taka which is the highest amidst manufacturing industry basket.

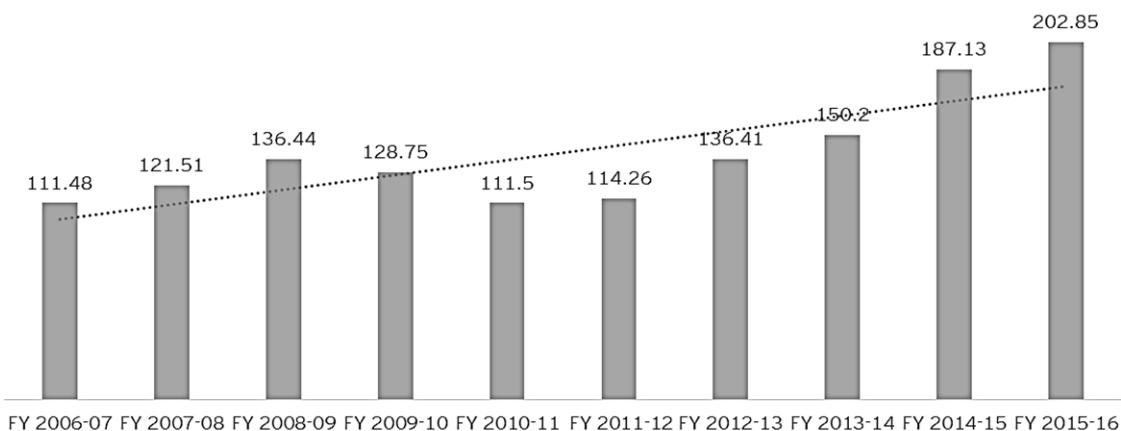
Figure 7-18 : Trend of manufacturing of basic metals industry



Source: Bangladesh Bureau of Statistics

The trend charted by the manufacturing of basic metals industry for the last 4 years from FY 2011-12 to FY 2015-16 is, for re-rolling sector has shown a significant growth and has grown at a CAGR of 15.07% which depicts a growth of around 1.8 times over the FY 2011-12.

Figure 7-19 : Trend of Quantum Index of Industrial Production for manufacturing of basic metals industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of basic metals industry shows a healthy progressive trend, but the index are fluctuating in nature. The production of basic metals has been growing at a CAGR of 6.88% for the period of last 9 years from 2006-07 to 2015-16; and has grown at a CAGR of 12.71% for the period of last 5 years from 2010-11 to 2015-16 which depicts around 1.8 times growth over the FY 2010-11.

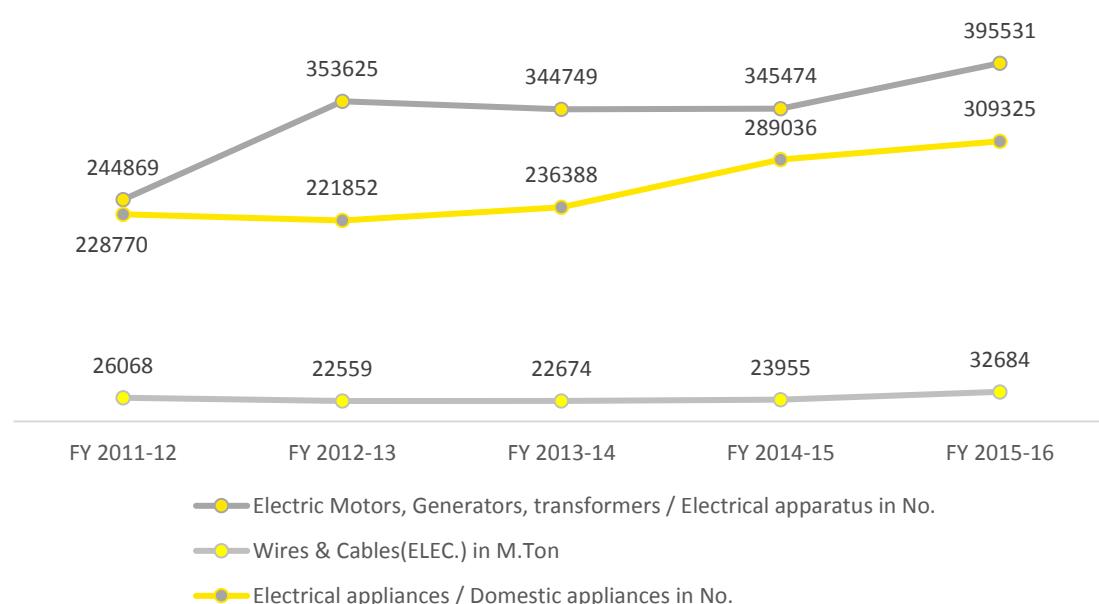
7.1.10 Manufacturing of electrical equipment

The electrical equipment manufacturing industry produces equipment that generates, transports, and/or uses electricity. Some of the major sub sectors of this manufacturing of electrical equipment industry include electric motors, generators, transformers/electrical apparatus sector; electric wires & cables sector; and electrical appliances / domestic appliances sector. This industry has a very potential export market throughout the world. There are two types of electrical industrial clusters in Bangladesh. These are natural industrial clusters and manmade industrial cluster. Around 80% of natural electrical industrial clusters are situated in Nawabpur, Sutrapur, Jatrabari, Shempur, and Keranigong area of Dhaka city. Remaining of the electrical industries are situated in Gazipur, Narayon Gong, Chittogong, Barisha and Kustia district of Bangladesh. Only manmade electrical industrial park of Bangladesh is established in Shempur-Kadamtali area near Dhaka city.

Key players of this sub sector of manufacturing of electrical equipment industry are A. H. Electric Co., Bengal Power conversion, Billal enterprise, Clipsal house, Desh engineers & Mfg. Co. Ltd., Eastern electric company, Electric world Ltd., fare trade centre, J.B.L Electric, Jubair trading, Melody radio house, Shaheen electric company, Siemens Bangladesh Ltd., Singer Bangladesh Ltd., Toshiba and Techno Index Ltd.

According to SMI 2012, manufacturing of electrical equipment sector had 884 number of establishments which is around 2.07% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 1,45,166 million taka. Thus, the average gross output per establishment comes out to be around 164 million taka.

Figure 7-20 : Trend of major sub sectors of manufacturing of electrical equipment industry

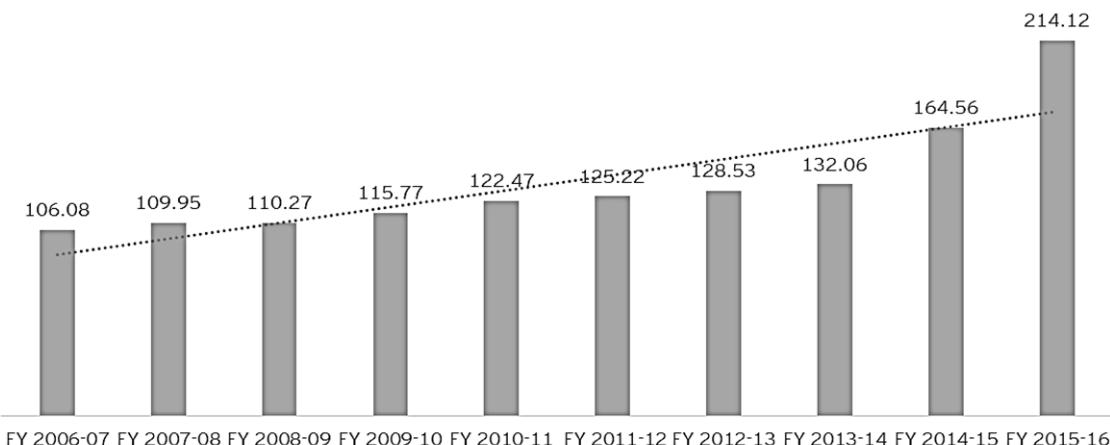


Source: *Bangladesh Bureau of Statistics*

The trend charted by the various sub sectors of the manufacturing of electrical equipment industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Electric motors, generators, transformers / electrical apparatus sector has shown a healthy progressive trend and has grown at a CAGR of 12.74% registering a growth of around 1.6 times over the FY 2011-12;
- ▶ Wires & cables (ELEC.) sector has grown at a CAGR of 5.82%; and
- ▶ Electrical appliances / domestic appliances sector has grown at a CAGR of 7.83% witnessing around 1.4 times growth over the FY 2011-12.

Figure 7-21 : Trend of Quantum Index of Industrial Production for manufacturing of electrical equipment industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of electrical equipment industry shows a healthy progressive trend. The production of electrical equipment has been growing at a CAGR of 8.12% for the period of last 9 years from 2006-07 to 2015-16; and has grown at a CAGR of 11.82% for the period of last 5 years from 2010-11 to 2015-16.

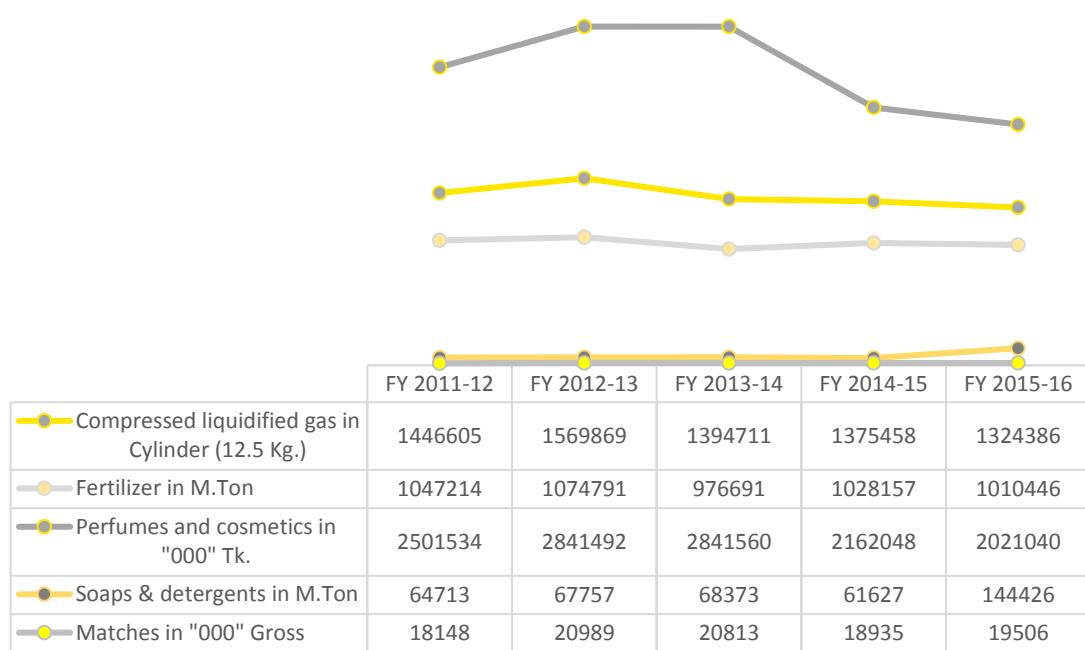
7.1.11 Manufacturing of Chemicals and chemical products

The manufacturing of chemicals and chemical products industry is one of the flourishing industries of Bangladesh. The key concern of this industry is the derived demand of chemicals for industries such as textiles, pharmaceuticals, construction and allied sectors. Some of the major sub sectors of this manufacturing of chemicals and chemicals products are compressed liquefied gas sector, fertilizers sector, perfumes and cosmetics sector, soaps & detergents sector and matches sector. Bangladesh has a dedicated authority to govern chemicals sector, which is known as Bangladesh Chemical Industries Corporation (BCIC).

According to SMI 2012, manufacturing of chemicals and chemical products sector had 563 number of establishments which is around 1.32% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 1,40,184 million taka. Thus, the average gross output per establishment comes out to be around 249 million taka.

Key players of this sub sector of manufacturing of chemicals and chemical products industry are Ashugonj Fertilizer & Chemical Company Ltd., DAP Fertilizer Company Ltd., Modern chemical, Bangla chemical, Bangladesh Soap factory MEB Group, Elite chemical industries Ltd., Maks chemical Ltd., Ideal chemical industry Ltd., Natural Gas Fertilizer Factory Ltd., Jamuna Fertilizer Company Ltd., Polash Urea Fertilizer Factory, Rhymer Chemical Industries Ltd., Sunshine corporation Ltd., TSP Complex Ltd., Urea Fertilizer Factory Ltd., Zon Ron Ltd. and Zenia trading house.

Figure 7-22 : Trend of major sub sectors of manufacturing of chemicals and chemical products industry

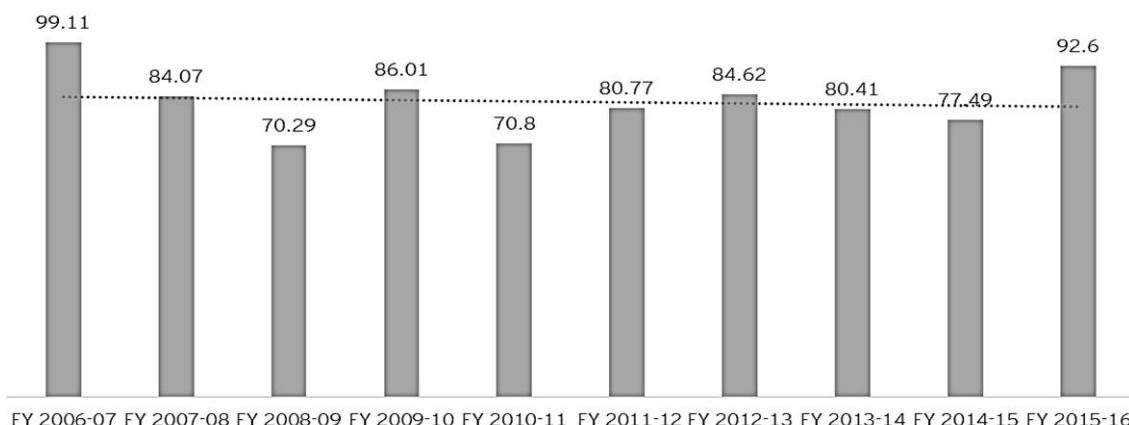


Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of chemicals and chemical products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Compressed liquefied gas sector has declined at a CAGR of 2.18%;
- ▶ Fertilizers sector has declined at a CAGR of 0.89%;
- ▶ Perfumes & cosmetics sector has declined at a CAGR of 5.19%;
- ▶ Soaps & detergents sector has shown a health progressive trend and has grown at a CAGR of 22.23% witnessing around 2.3 times growth over the FY 2011-12;
- ▶ Whereas matches sector has grown at a CAGR of 1.82%.

Figure 7-23 : Trend of Quantum Index of Industrial Production for manufacturing of chemicals and chemical products industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of chemicals and chemical products industry shows a declining trend, with fluctuating indexes. The production of chemicals

and chemical products has been declining at a CAGR of 0.75% for the period of last 9 years from 2006-07 to 2015-16; but has shown a good ramping up growth and has grown at a CAGR of 5.52% for the period of last 5 years from 2010-11 to 2015-16 and exhibits the status quo as a potential industry to grow in future.

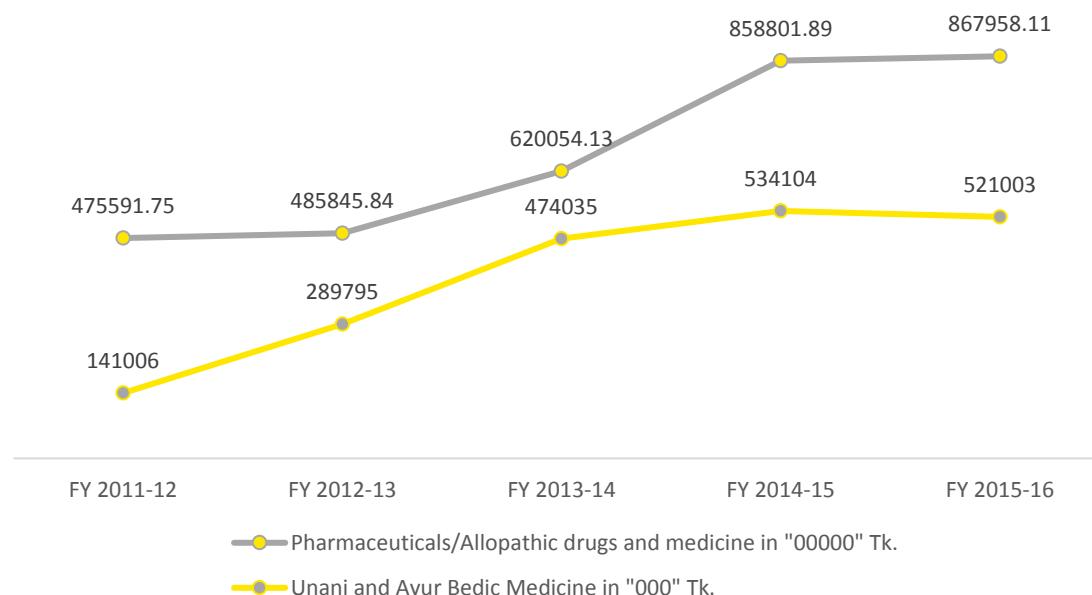
7.1.12 Manufacturing of Pharmaceuticals, Medicinal Chemicals and Botanical products

The pharmaceutical industry is one of the most developed sectors in Bangladesh. This industry focuses primarily on branded generic final formulations using imported Active Pharmaceutical Ingredients (APIs), wherein only 3% of APIs are locally produced. The sector provides 97% of the total medicine requirement of the local market and export to around 90 countries in the world. In addition to modern medicines Ayurvedic, Unani, Biochemic, Homeopathic and Herbal drugs are officially recognized. The sector employs around 1,15,000 workers and the growth stood around 11.37% in FY 2013-14. According to IMS Health, annual pharmaceutical sales in the local market may reach BDT 160 billion within 2018. The key destinations for Bangladeshi medicines are Myanmar, Sri Lanka and Kenya, while nearly 50 countries import Bangladeshi medicines regularly. The growth in exports has been more or less over 10% from 2010 to 2014. In 2015, the exports was over \$ 41.17 million. Pharmaceutical companies are trying to export to regulated, unregulated and moderately regulated markets. In 2000 there were 173 active and licensed allopathic drug-manufacturing units in the country, while the figure stands at 300 in 2014.

Key players of this sub sector of manufacturing pharmaceuticals, medicinal chemicals and botanical products are Square Pharmaceuticals Ltd., Incepta Pharmaceuticals Ltd., Beximco Pharmaceuticals Ltd., Opsonin Pharmaceuticals Ltd., Renata Pharmaceuticals Ltd., Eskayef Pharmaceuticals Ltd., Aristopharma Ltd., A.C.I Ltd., Acme pharmaceuticals Ltd. and Healthcare pharmaceuticals Ltd.

According to SMI 2012, manufacturing of pharmaceuticals, medical chemicals and botanical products sector had 494 number of establishments which is around 1.15% of the total establishments in this manufacturing industry basket. The gross output from this sub sector was 1,13,070 million taka. Thus, the average gross output per establishment comes out to be around 229 million taka.

Figure 7-24 : Trend of major sub sectors of pharmaceuticals, medical chemicals and botanical products industry

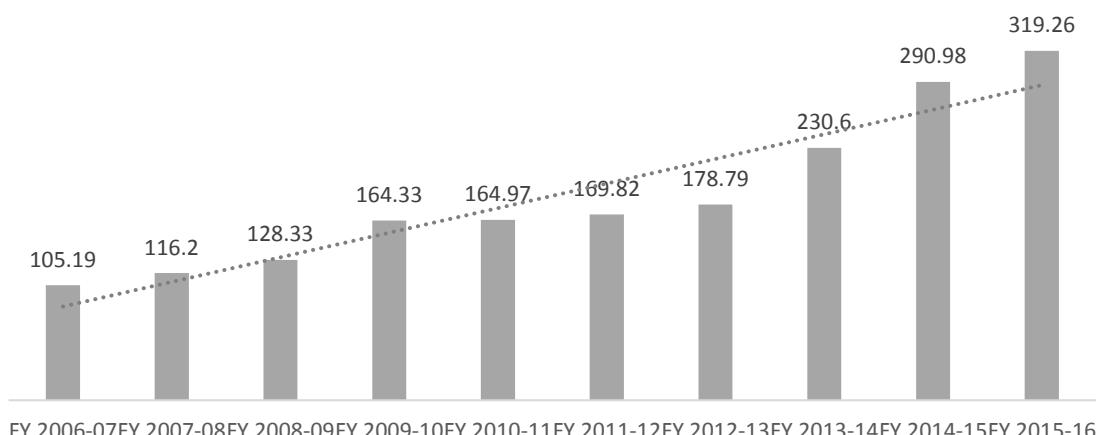


Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of chemicals and chemical products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Pharmaceuticals/allopathic drugs and medicine sector has grown at a CAGR of 16.23% recording a growth of around 1.9 times over the FY 2011-12;
- ▶ Whereas the Unani and Ayurvedic medicines sector has shown a significant growth at a CAGR of 38.64% recording a flourishing growth of around 3.7 times over the FY 2011-12.

Figure 7-25 : Trend of Quantum Index of Industrial Production for manufacturing of pharmaceuticals, medicinal chemicals and botanical products industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of pharmaceuticals, medicinal chemicals and botanical products industry shows a vigorous progressive trend. The production of pharmaceuticals, medicinal chemicals and botanical products has been growing at a CAGR of 13.13% for the period of last 9 years from 2006-07 to 2015-16; and has grown at a CAGR of 14.12% for the period of last 5 years from 2010-11 to 2015-16 registering a around 2 times increase over the FY 2010-11.

7.1.13 Manufacturing of Rubber and Plastic Products

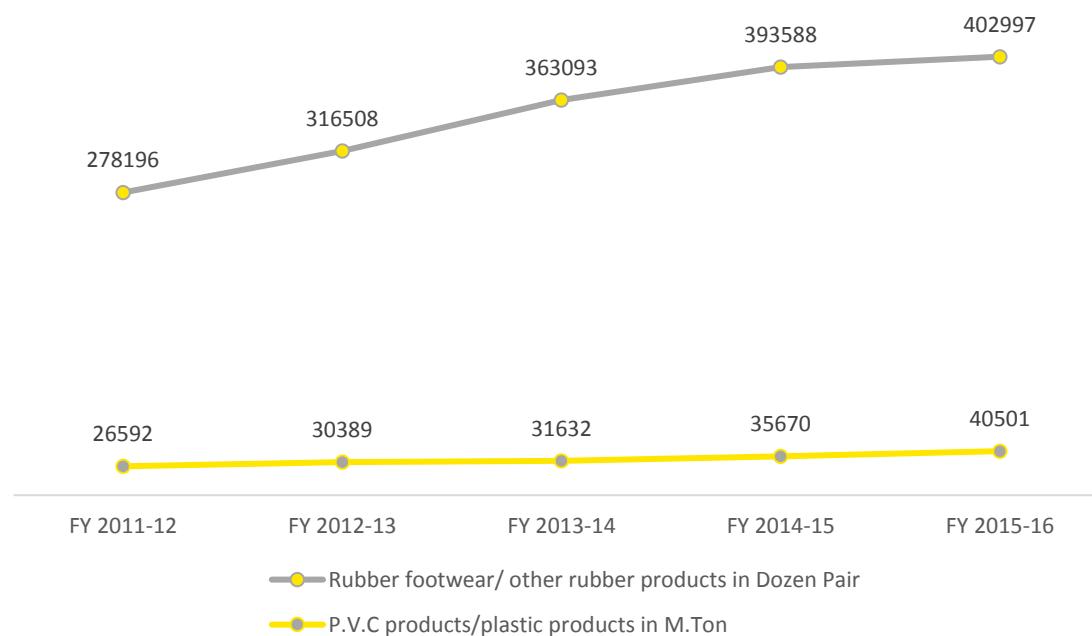
Rapid industrial growth and multiple uses of rubber products in the industries have enhanced the rubber production in Bangladesh. The government has set a target of producing 1,00,000 tonnes of rubber in the year 2020 and 200,000 tonnes by the year 2050. Bangladesh produced 24,000 tonnes of rubber in 2012, out of which around 60% is consumed domestically and around 40% is exported.

The plastic industry has emerged as an important industrial sector in Bangladesh during the last two decades. There are around 3000 plastic manufacturing units, around 98% of which belong to small - medium enterprise (SMEs). The availability of cheap labor, vast population and speedy development of plastic wastes recycling industries have given Bangladesh a vast impending advantages to compete in the international market.

Key players of this sub sector of manufacturing of rubber and plastic products industry are Desh Bangla Rubber & Plastic, Platypus International, Sinobangla Industries Ltd., ABC plastic, Deshbandhu Group of Industries, Deshbandhu polymer Ltd., Factory-National Polymer Industry Pvt. Ltd., National Polymer Industries Pvt. Ltd. and Maghna Group of Industries.

According to SMI 2012, manufacturing of rubber and plastic products sector had 1,036 number of establishments which is around 2.42% of the total establishments in this manufacturing industry basket. The gross output from this sub sector of manufacturing of rubber and plastic products was 51,143 million taka. Thus, the average gross output per establishment comes out to be around 49 million taka per establishment.

Figure 7-26 : Trend of major sub sectors of rubber and plastic products industry

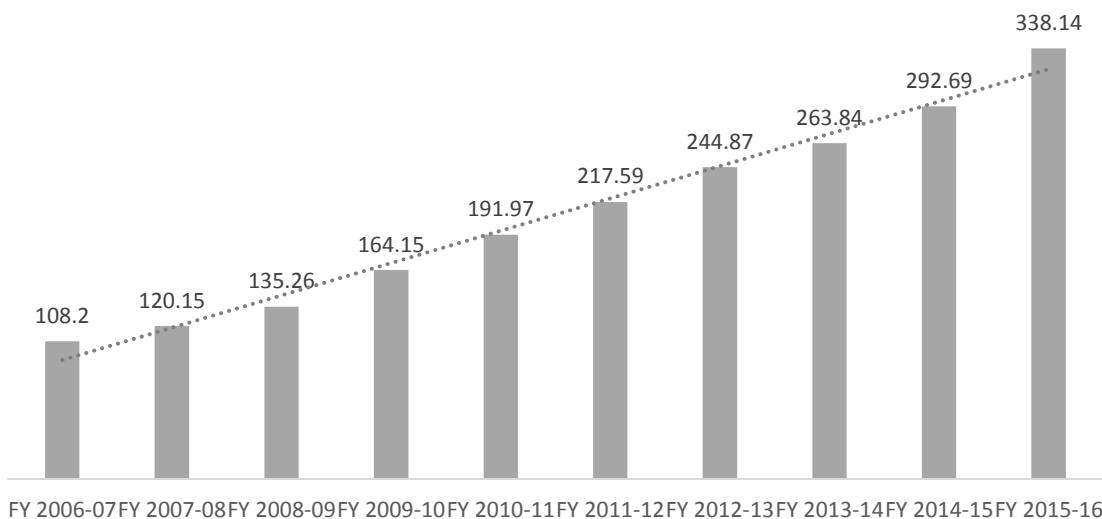


Source: *Bangladesh Bureau of Statistics*

The trend charted by the various sub sectors of the manufacturing of rubber and plastic products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Rubber footwear / other rubber products sector has grown at a CAGR of 9.71% recording a growth of around 1.5 times over the FY 2011-12;
- ▶ Whereas the P.V.C products / plastic products sector has witnessed a vigorous growth at a CAGR of 11.09% recording a growth of around 1.5 times over the FY 2011-12.

Figure 7-27 : Trend of Quantum Index of Industrial Production for manufacturing of rubber and plastic products industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of rubber and plastic products industry shows a vigorous progressive trend. The production of rubber and plastic products has been growing at a CAGR of 13.50% for the period of last 9 years from 2006-07 to 2015-16; and has grown at a CAGR of 11.99% for the period of last 5 years from 2010-11 to 2015-16.

7.1.14 Manufacturing of Non - Metallic Mineral Products

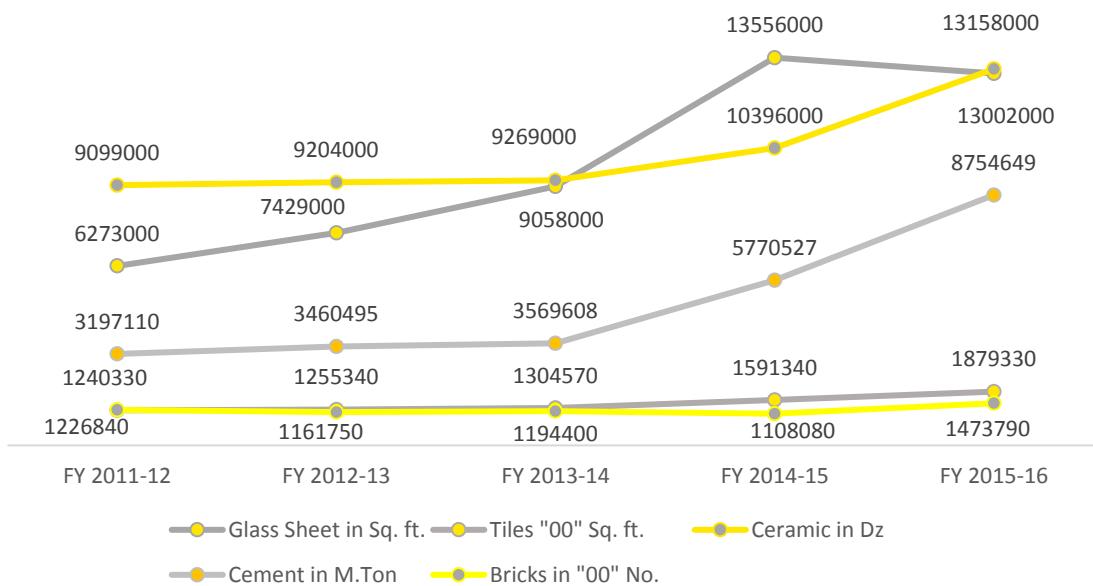
Some of the major sub sectors of this manufacturing of non - metallic mineral products are glass sheet sector, tiles sector, ceramic sector, cement sector and bricks sector.

Glass sheets, titles, ceramic and bricks are manufactured by many small - medium enterprises (SMEs).

According to SMI 2012, manufacturing of non-metallic mineral sector had 4,654 number of establishments which is around 10.88% of the total establishments in this manufacturing industry basket. The gross output from this sub sector of manufacturing of non-metallic mineral products was 3,51,779 million taka. Thus, the average gross output per establishment comes out to be around 76 million taka per establishment.

Key players in cement industry are Alhaj Mostafa-Hakim Cement Industries Limited, CEMEX Cement Bangladesh Ltd., Shah Cement Industries Ltd., Meghana Cement Mills Ltd., Mir Cement Ltd., Diamond Cement Ltd. and Crown Cement Ltd. Key glass manufacturers are Nasir Glass Inds. Ltd., the Bengal Glass Works Ltd., M/s. Famous Glass Works and Victoria Glass House. Key players of ceramics and tiles industry are MIR CERAMIC LTD., RAK Ceramics (BD) Ltd., Star Ceramics and Akij Ceramics. Key players in brick manufacturing sector are Abdul Monem Auto Bricks Limited, Sara Bricks Ltd., M/s. Zakira Brick Manufacturing Co., M/s. Akata Brick Manufacturer, M/s. Sharika Bricks & Co., Gazi Auto Bricks, First Auto Bricks Ltd., and Rashid Auto bricks Ltd.

Figure 7-28 : Trend of major nonmetallic mineral products industry

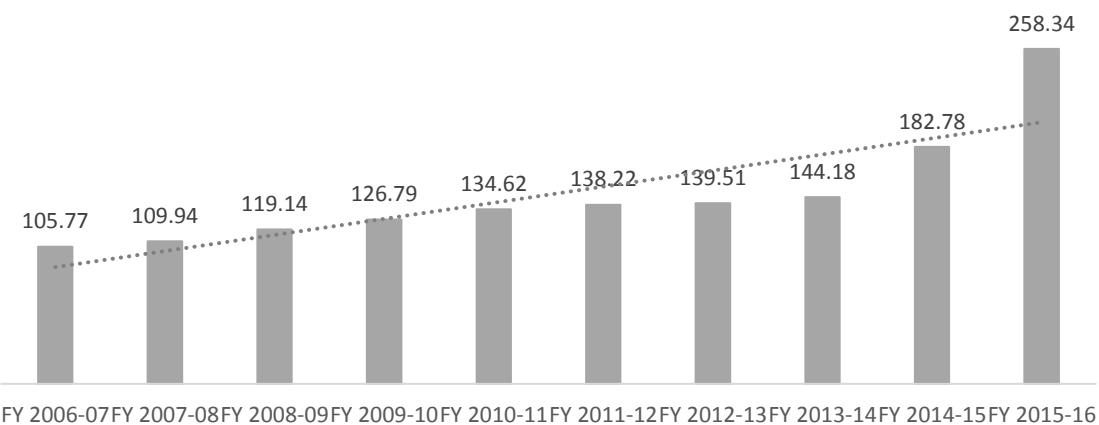


Source: Bangladesh Bureau of Statistics

The trend charted by the various sub sectors of the manufacturing of non-metallic mineral products industry for the last 4 years from FY 2011-12 to FY 2015-16 is as follows:

- ▶ Glass sheet sector has grown at a CAGR of 19.99% recording a growth of around 2.1 times over the FY 2011-12;
- ▶ The tiles sector has witnessed a growth at a CAGR of 11.25% recording a growth of around 1.5 times over the FY 2011-12;
- ▶ Ceramic sector has grown at a CAGR of 9.66%;
- ▶ Cement sector has shown a vigorous growth and grown at a CAGR if 26.64% registering around 2.8 times increase over the FY 2011-12; and
- ▶ Bricks sector has grown at a CAGR of 4.41%.

Figure 7-29 : Trend of Quantum Index of Industrial Production for manufacturing of nonmetallic mineral products industry



Source: Bangladesh Bureau of Statistics

The Quantum Index of Industrial Production for manufacturing of non-metallic mineral products industry shows a strong progressive trend. The production of non-metallic mineral products has been growing at a CAGR of 10.43% for the period of last 9 years from 2006-07 to 2015-16; and has grown at a CAGR of 13.92% for the period of last 5 years from 2010-11 to 2015-16.

For this industry the recent index for FY 2015-16 has grown at around 42% over the previous FY 2014-15 recording a sound potential for future business expansion.

7.2 Local Resource Base

Resource base in Jamalpur district is discoursed in detail in the following section,

The distribution of farming areas in hectares (Ha.) for various crops cultivated in Bangladesh is shown below,

Table 7-6 : Trend of Agricultural planting area

Crops	Planting (Ha.)					CAGR 4 years
	2011-12	2012-13	2013-14	2014-15	2015-16	
Rice (spring)	1,29,900	1,26,372	1,27,943	1,28,990	1,28,725	-0.23%
Paddy (summer)	1,13,236	82,865	1,11,801	1,03,049	10,258	-45.14%
Jute	46,100	42,510	42,620	46,095	47,325	0.66%
Mustard	19,050	19,050	20,265	20,500	20,130	1.39%
Wheat	4,048	7,575	8,215	8,495	8,890	21.73%
Maize	2,440	4,235	4,734	6,234	7,380	31.88%
Potato	4,466	4,176	4,583	4,283	4,550	0.47%
Chinese Almond	610	432	529	512	486	-5.52%
Sweet potato	1,043	1,027	746	783	625	-12.02%
Vegetables	17,250	16,250	16,590	16,630	15,465	-2.69%
Brinjal	3,280	3,353	3,980	3,655	3,546	1.97%
Tomato	1,330	1,350	1,900	1,458	1,695	6.25%
Green Chilly	11,878	10,165	10,035	7,872	7,585	-10.61%
Onion	3,059	2,835	2,716	2,575	2,130	-8.65%
Garlic	860	690	721	655	545	-10.78%
Banana*	-	-	-	1,154	880	-23.74%*
Pineapple*	-	-	-	150	155	3.33%*

Source: Bangladesh Bureau of Statistics (BBS) Statistics and Informatics Division (SID) - Statistics 2011 and EY Analysis

Note: 2015-16 are EY Estimates based on historic data and growth pattern

* - Growth year on year

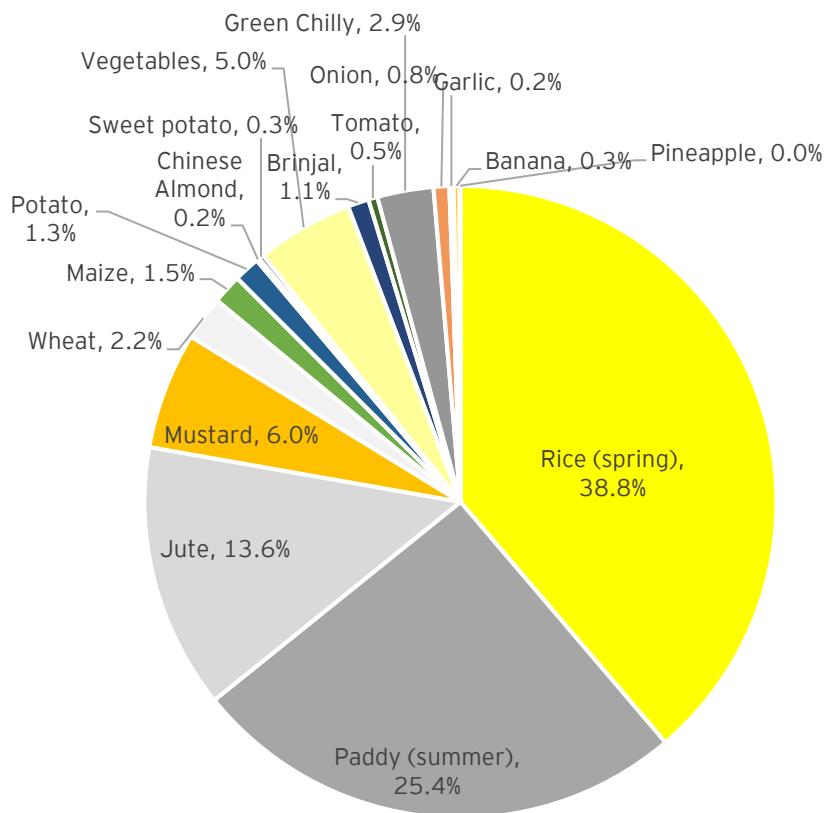
In Jamalpur District, Rice and Jute are the major crops in terms of planting area of farming as well as revenue from crops. The proposed Economic Zone may attract industries based on these raw materials.

During consultation with stakeholders, it has also been noted that there is a general tendency of shifting towards short term yielding crops like vegetables, pulses etc. instead of long term duration yielding crops like sugarcane and cotton due to longer waiting times to recoup the costs and gain returns.

The planting area for farming for Maize has displayed the highest CAGR growth of around 32% over the last 4 years followed by wheat, tomato and others subsequently.

The average area for plantation in hectares share for the various crops is shown below,

Figure 7-30 : Composition of average area for plantation



Source: Agriculture Department, Jamalpur District and EY Analysis

It is important to note that, the average share of the planted area in hectares for Rice (Spring) is maximum followed by paddy (Summer), Jute and Mustard which together constitute to around 84% of the total average plantation in hectares whereas the others are constituting to around 16% only amidst the listed basket of crops.

The quantum of the various crop production in metric ton (MT) is shown below,

Table 7-7 : Trend of Agricultural production

Crops	Production (MT)					CAGR 4 years
	2011-12	2012-13	2013-14	2014-15	2015-16	
Rice (spring)	5,30,778	5,02,464	5,21,957	5,18,765	5,10,608	-0.96%
Paddy (summer)	2,80,244	2,13,673	2,76,100	2,48,835	2,61,519	-1.71%
Jute*	5,35,755	4,16,598	4,06,724	4,65,072	4,45,024	-4.53%
Mustard	20,193	20,193	22,291	22,550	22,546	2.79%
Wheat	10,712	23,881	25,877	27,656	27,559	26.65%
Maize	16,061	28,094	42,094	58,173	72,545	45.78%
Potato	68,022	73,994	87,665	90,011	95,550	8.87%
Chinese Almond	897	783	915	1,003	923	0.72%
Sweet potato	14,654	20,026	13,356	13,611	10,937	-7.05%
Vegetables	3,59,590	3,07,954	3,42,476	3,24,285	3,02,341	-4.24%
Brinjal	67,240	70,413	85,920	86,067	88,650	7.16%
Tomato	39,235	40,500	72,515	46,373	53,392	8.01%
Green Chilly	17,038	12,993	12,734	10,602	10,619	-11.15%
Onion	26,093	23,262	21,721	21,681	20,235	-6.16%
Garlic	6,043	4,770	4,633	4,258	3,597	-12.16%
Banana*	-	-	-	14,530	12,480	-14.11%*
Pineapple*	-	-	-	1,800	1,860	3.33%*

Source: Bangladesh Bureau of Statistics (BBS) Statistics and Informatics Division (SID) - Statistics 2011 and EY Analysis

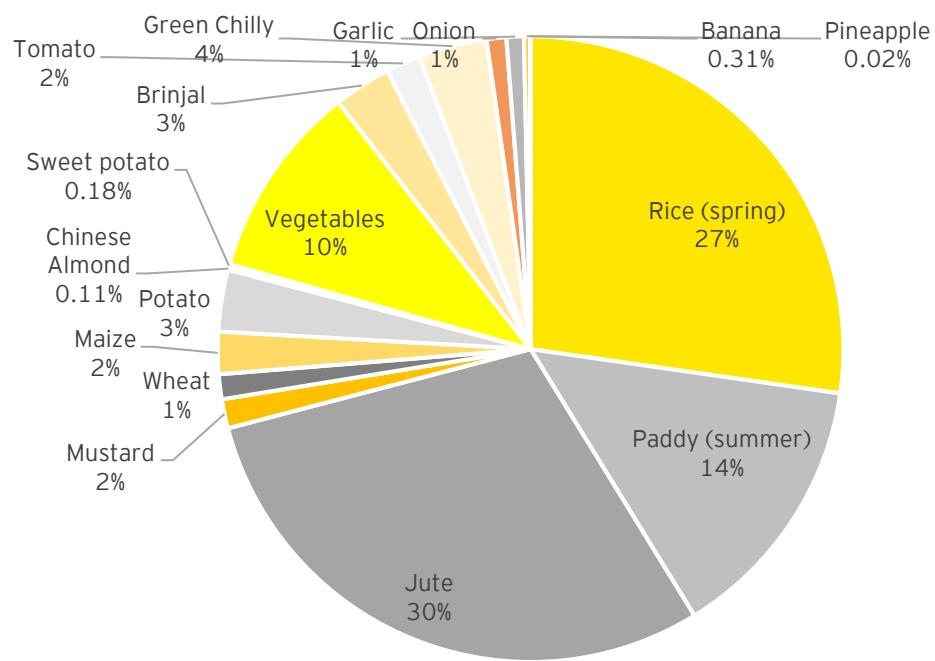
Note: 2015-16 are EY Estimates based on historic data and growth pattern

* - Growth year on year

It is seen that CAGR witnessed by Maize production is highest amidst the crop basket followed by wheat, potato and tomato subsequently. This was not so surprising owing to the fact that the plantation for these crops particularly maize, wheat and tomato has also increased at a good CAGR as illustrated above.

The share of approximate yield from the various crops is shown below,

Figure 7-31 : Composition of approximate yield from crops



Source: Agriculture Department, Jamalpur District and EY Analysis

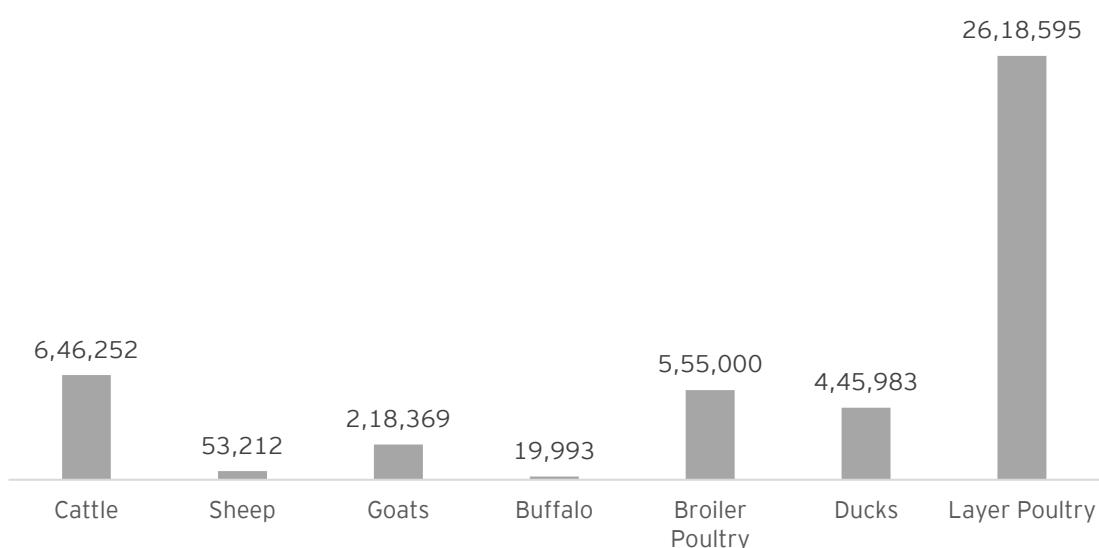
It is important to note that jute production is yielding highest share amongst the crop basket followed by Rice (Spring), Paddy (Summer) and Vegetables subsequently which together constitute around 81% of the total approximate yield from the crop basket, whereas the remaining crops constitute to only around 19% of the total approximate yield.

The total value of the approximate yield from crops (including major crops) during the last year (FY 2015-16) is approximately BDT 6,000 Crores.

Livestock population in Jamalpur district:

The total number of animals present in Jamalpur district is shown below,

Figure 7-32 : Presence of livestock in Jamalpur district



Source: Department of Livestock Services, Bangladesh

The population pf layer poultry is maximum amidst livestock basket of Jamalpour reflecting around 58% of the total population followed by cattle (around 14%) and broiler poultry (around 12%) subsequently, whereas the remaining livestock account for around 16% of the total livestock only. The total population of livestock in Jamalpur is approximately 4.6 million.

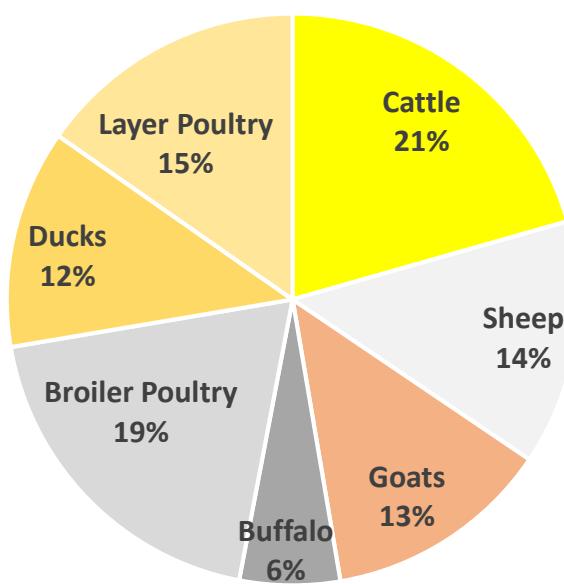
In the last year (FY 2015-16), from the current Livestock basket a total output production for Milk, Eggs and Wool is obtained as follows:

- ▶ The approximate yield from Milk was 1.5 Lakh Metric Tons;
- ▶ The approximate yield from Eggs was 21Crores in Numbers; and
- ▶ The approximate yield from Wool was 53 Metric Tons

The total value of yield for the above production is approximately BDT 1,300 Crores.

The total number of livestock farms present in Jamalpur district is shown,

Figure 7-33 : Total number of livestock farms in Jamalpur district

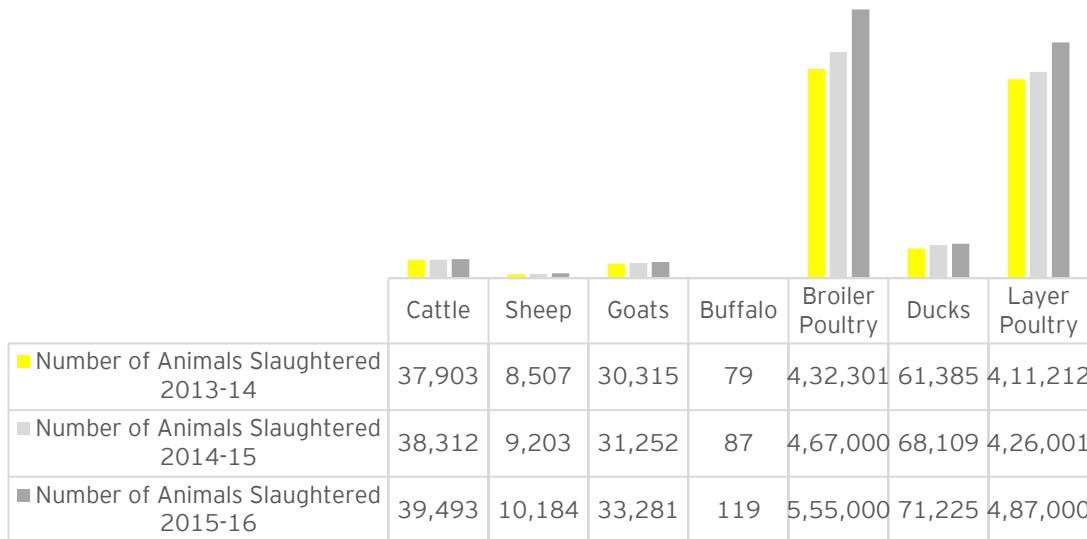


Source: Department of Livestock Services, Bangladesh

Currently, a total of 2870 livestock farms exist in Jamalpur district, wherein the cattle farms are highest followed by broiler poultry farms and layer poultry farms subsequently which together constitute to around 55% and the remainig farms constitute to around 45% of the total livestock farms.

The trend for livestock slaughtered in jamalpur district is shown below,

Figure 7-34 : Trend of livestock slaughtered



Source: Department of Livestock Services, Bangladesh

The total number of livestock slaughtered in jamalpur district in 2013-14, 2014-15 and 2015-16 are around 0.98 million, 1.04 million and 1.20 million respectively registering Y-o-Y growth of 5.93% and 15.03% over the two years. The highest CAGR in slaughtering of livestock is witnessed for Buffaloes which is 22.73% over the last two years immediately followed by broiler poultry (13.31%) and Sheep (9.41%) subsequently.

From the current Livestock (for the last one year 2015-16) a total output production for Meat and Skin is obtained as follows:

- ▶ Meat - Approx. 0.9303 Lakh Metric Tons
- ▶ Skin of Cattle - 39,493 Pieces; Skin of Sheep - 10,184 Pieces;
- ▶ Skin of Goat - 33,281 Pieces; Skin of Buffalo - 119 Pieces

The total value of yield for the above production is approximately BDT 10 Crores.

The mineral map of bangladesh is presented below,

Figure 7-35 : Mineral map of Bangladesh



Source: Google maps

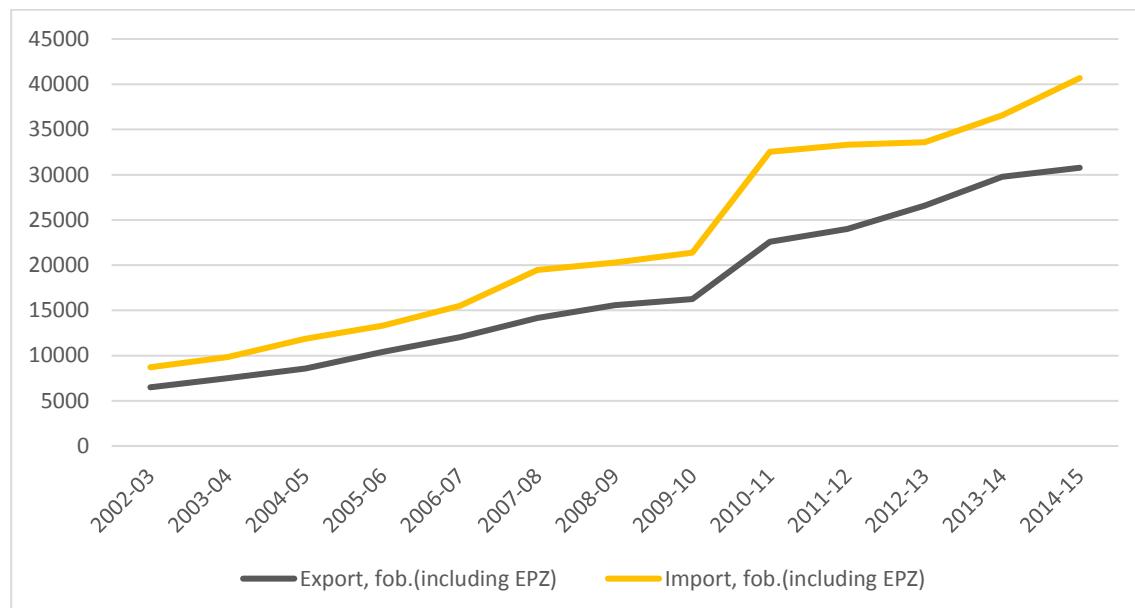
Important mineral deposits of Bangladesh include natural gas, coal, limestone, hardrock, gravel, boulder, glass sand, construction sand, white clay, brick clay, peat, and beach sand heavy minerals. Around Jamalpur vicinity, white clay, silica sand and ordinary stone are available.

Manufacturing units that uses china clay as input is a natural selection for Jamalpur considering availability of white clay along with oil and gas.

7.3 Review of local and international market capability

Growth rate foreign trade of Bangladesh is impressive. Both export and import is growing at the same pace of around 14%. Thus the trade balance deficit is also rising at a rate about 13.5% during the period 2002-03 to 2014-15.

Figure 7-36 : Export and import of Bangladesh in USD Mn



The overview of international market of Bangladesh has shown below,

Table 7-8: Trend of Balance of payments

Year	Balance of payments in million USD			Annual Change
	Export, fob.(including EPZ)	Import, fob.(including EPZ)	Trade Balance	
2002-03	6492	8707	-2215	-
2003-04	7521	9840	-2319	4.70%
2004-05	8573	11870	-3297	42.17%
2005-06	10412	13301	-2889	-12.37%
2006-07	12053	15511	-3458	19.70%
2007-08	14151	19481	-5330	54.14%
2008-09	15581	20291	-4710	-11.63%
2009-10	16236	21388	-5152	9.38%
2010-11	22592	32527	-9935	92.84%
2011-12	23989	33309	-9320	-6.19%
2012-13	26567	33576	-7009	-24.80%
2013-14	29777	36571	-6794	-3.07%
2014-15	30768	40685	-9917	45.97%

Source: *Bangladesh Bank*

The study of Bangladesh export and import trade data depicts the declining trend of trade balance with the import trade being higher than the export trade. The export trade f.o.b including EPZ trade for 2014-15 was at 30,768 million USD whereas the import trade f.o.b including EPZ trade (using customs record) was 40,685 million USD, as per the Bangladesh

Bank data, which depicts a negative trade balance of 9,917 million USD. The export trade basket comprises of readymade garments & knitwear sectors which together constitute 81.68%, jute goods, frozen food and other goods. The export processing zones exports constituted to around 15.89% of the total export basket.

The import and export trade of Bangladesh by value in million USD is shown below,

Figure 7-37 : Import trade of Bangladesh by value in million USD

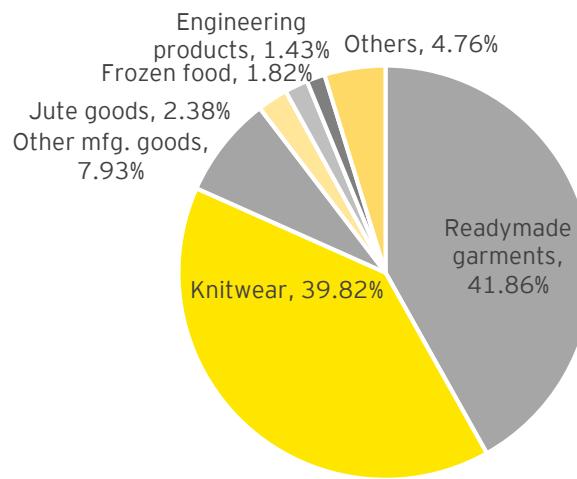
Sr. No.	Commodity	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR 8 years	CAGR 5 years
A Major primary goods												
1	Rice	180	874	239	75	830	288	30	348	504	13.74%	46.38%
2	Wheat	401	537	643	761	1081	613	696	1126	983	11.86%	5.25%
3	Oilseeds	106	136	159	130	103	177	242	524	374	17.07%	23.53%
4	Crude petroleum	524	695	584	535	923	987	1102	929	320	-5.98%	-9.77%
5	Raw cotton	858	1213	1291	1439	2689	2083	2005	2422	2296	13.09%	9.79%
Total major primary goods		2069	3455	2916	2940	5626	4148	4075	5349	4477	10.13%	8.77%
B Major intermediate goods												
6	Edible oil	583	1006	865	1050	1067	1644	1402	1766	2744	21.36%	21.18%
7	Petroleum products	1709	2058	1997	2021	3186	3922	3642	4070	4743	13.61%	18.60%
8	Fertilizer	357	632	955	717	1241	1381	1188	1026	1339	17.97%	13.31%
9	Clinker	240	347	314	333	446	504	487	615	638	13.00%	13.89%
10	Staple fibre	97	110	112	118	180	428	454	492	1078	35.12%	55.65%
11	Yarn	582	691	792	718	1391	1384	1356	1506	1851	15.56%	20.85%
Total major intermediate goods		3568	4844	5035	4957	7511	9263	8529	9475	12393	16.84%	20.11%
C	Capital Machinery	1929	1664	1420	1595	2325	2005	1835	2288	3321	7.03%	15.80%
D	Other goods	9590	11666	13136	14246	18196	20099	19645	23563	24999	12.72%	11.90%
Total imports		17156	21629	22507	23738	33658	35515	34084	40675	45190	12.87%	13.74%
Annual Change		16.40%	26.07%	4.06%	5.47%	41.79%	5.52%	-4.03%	19.34%	11.10%		

Source: Export promotion bureau, Bangladesh Bank and EY Analysis

Figure 7-38 : Export trade of Bangladesh by value in million USD

Sr. No.	Commodity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	CAGR 9 years	CAGR 5 years
A Primary commodities													
1	Raw Jute	148	147	165	148	196	357	266	230	126	112	-3.05%	-10.59%
2	Tea	12	7	15	12	6	3	3	2	4	3	-14.28%	-12.94%
3	Frozen food	459	515	534	455	445	625	598	544	638	568	2.40%	5.00%
4	Agricultural products	105	88	120	147	184	262	304	351	402	339	13.91%	13.00%
5	Other primary commodities	49	75	154	108	53	69	96	183	209	244	19.53%	35.71%
Total primary commodities		773	832	988	870	884	1316	1267	1310	1379	1266	5.63%	7.45%
B Manufacture goods													
6	Jute goods	361	321	318	269	540	758	701	801	699	743	8.35%	6.59%
7	Leather	257	266	284	177	226	298	330	400	506	398	4.98%	11.98%
8	Naphtha, furnace oil and bitumen	88	84	185	142	301	261	275	314	162	78	-1.33%	-23.67%
9	Readymade garments	4084	4658	5167	5919	6013	8432	9603	11040	12442	13065	13.79%	16.79%
10	Knitwear	3817	4554	5533	6429	6483	9482	9486	10476	12050	12427	14.01%	13.90%
11	Chemical products	206	215	216	280	103	105	103	93	93	112	-6.55%	1.69%
12	Shoe	95	136	170	187	204	298	336	419	172	189	7.94%	-1.52%
13	Handicrafts	4	8	5	6	4	4	5	6	8	9	9.43%	17.61%
14	Engineering products	111	237	220	189	311	310	376	368	367	447	16.74%	7.52%
15	Other mfg. products	730	867	1025	1096	1135	1664	1820	1800	2309	2475	14.53%	16.87%
Total manufactured goods		9753	11346	13123	14694	15320	21612	23035	25717	28808	29943	13.27%	14.34%
Grand Total		10526	12178	14111	15564	16204	22928	24302	27027	30187	31209	12.84%	14.01%
Annual Change		21.63%	15.69%	15.87%	10.30%	4.11%	41.50%	5.99%	11.21%	11.69%	3.39%		

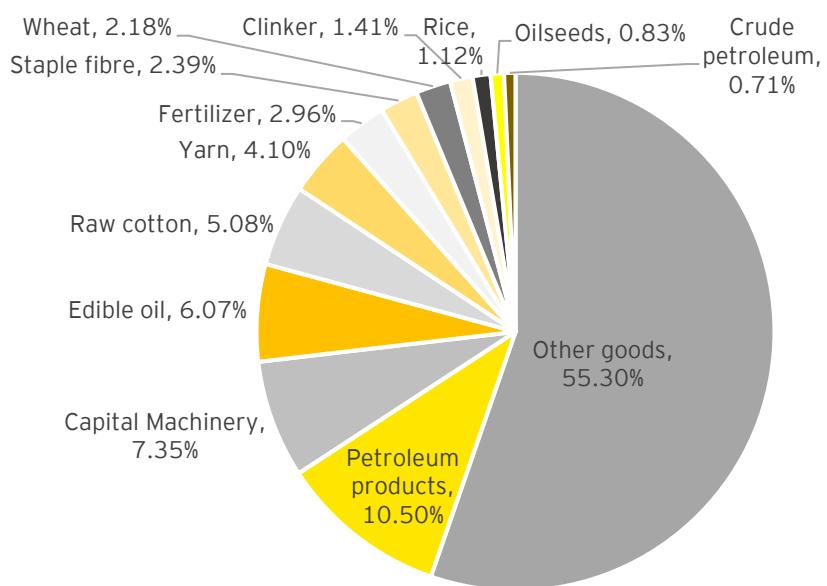
Source: Bangladesh Bank and EY Analysis

Figure 7-39 : Commodity wise Export trade for 2014-15

Source: Export promotion bureau, Bangladesh Bank and EY Analysis

It is not surprising to see the export basket is governed by RMG and Knitwear sector together constituting around 82% whereas rest of the other commodities constitute to around 18% of the total export basket. The import trade basket on the other hand comprises of petroleum products, capital machinery, edible oil, raw cotton, yarn, fertilizer, staple fiber, wheat, clinker, rice, oilseeds, crude petroleum and other goods. The export processing zones import trade constituted to around 6.94% of the total import basket.

Over 68% of Bangladesh's exports have been in the readymade garments sector. This is not surprising since this sector has garnered the bulk of FDI investment and is also the fastest growing sector in manufacturing. This also showcases Bangladesh's comparative advantage in labor intensive manufacturing, however its reach should spread its reach to other labor oriented sector as well. Notably, during the period FY 2005-06 to FY 2014-15, proportion of other items in Bangladesh's export basket has decreased. This calls for diversification of the export basket and comparatively lesser reliance on the readymade garment segment, in future.

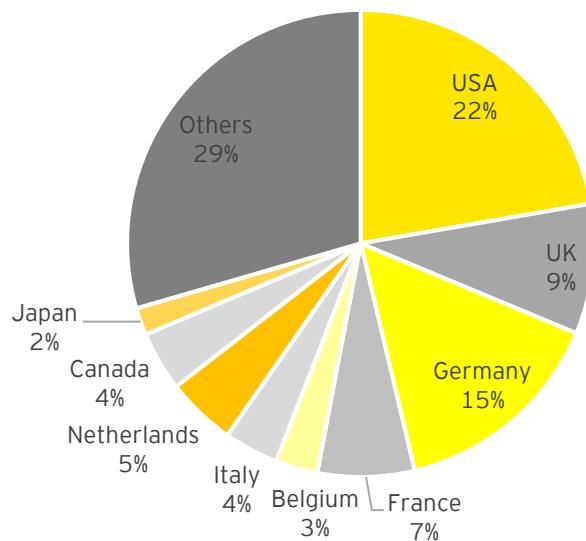
Figure 7-40 : Commodity wise Import trade for 2014-15

Source: Bangladesh Bank and EY Analysis

Currently, petroleum products imports are dominating in the import basket followed by capital machinery imports, edible oil imports and other imports subsequently.

The detailed study pertaining to identification of major markets brings in to focus the major export and import partners of Bangladesh.

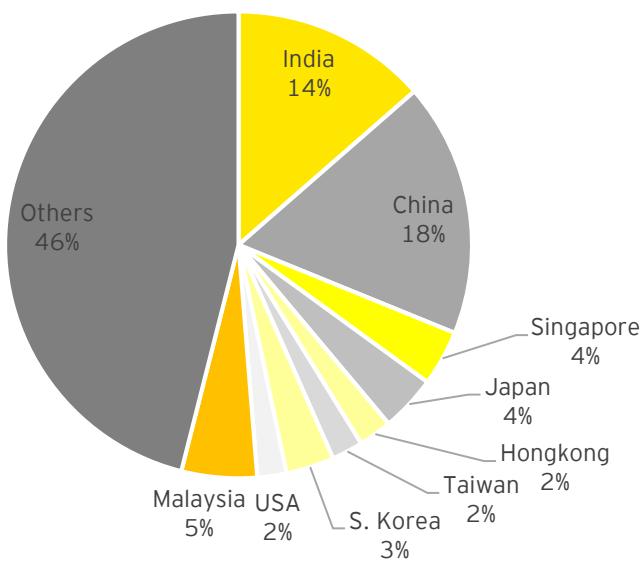
Figure 7-41 : Country wise share of Export trade partners for 2014-15



Source: Export promotion bureau and EY Analysis

Currently, USA is dominating in the Bangladeshi exports followed by Germany, UK and others subsequently.

Figure 7-42 : Country wise share of Import trade partners for 2014-15

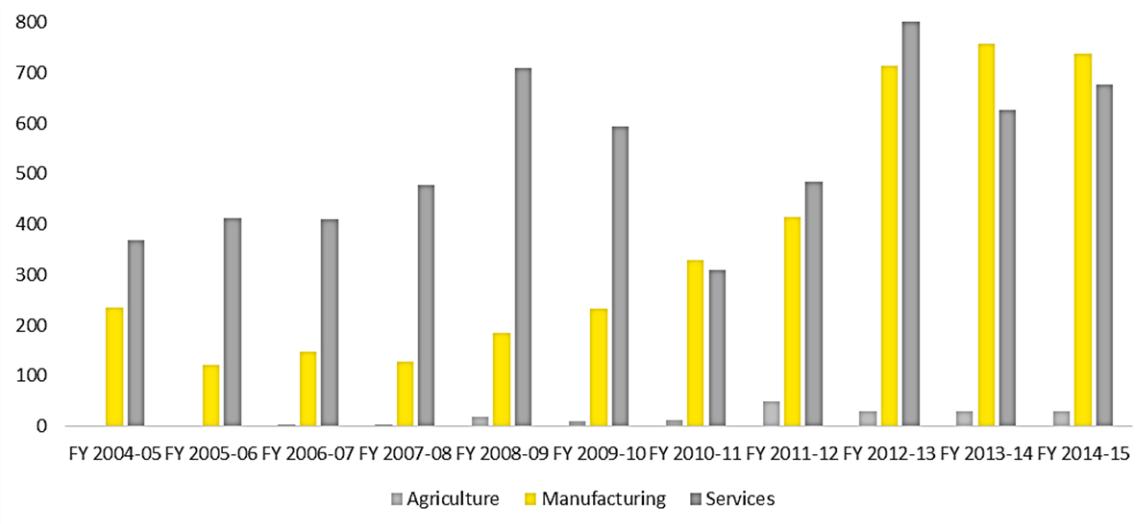


Source: Bangladesh Bank and EY Analysis

Currently, China is dominating in the Bangladeshi imports followed by India, Malaysia and others subsequently.

The FDI inflow in Bangladesh has been growing progressively showing an immense potential for foreign proficiency in terms of skillsets and efficiency in order to transform Bangladeshi infrastructure and manufacturing industries at a faster pace to modern levels. The trend charted for the key sectors of agriculture sector, industry sector and services sector receiving FDI inflow in million USD is shown below,

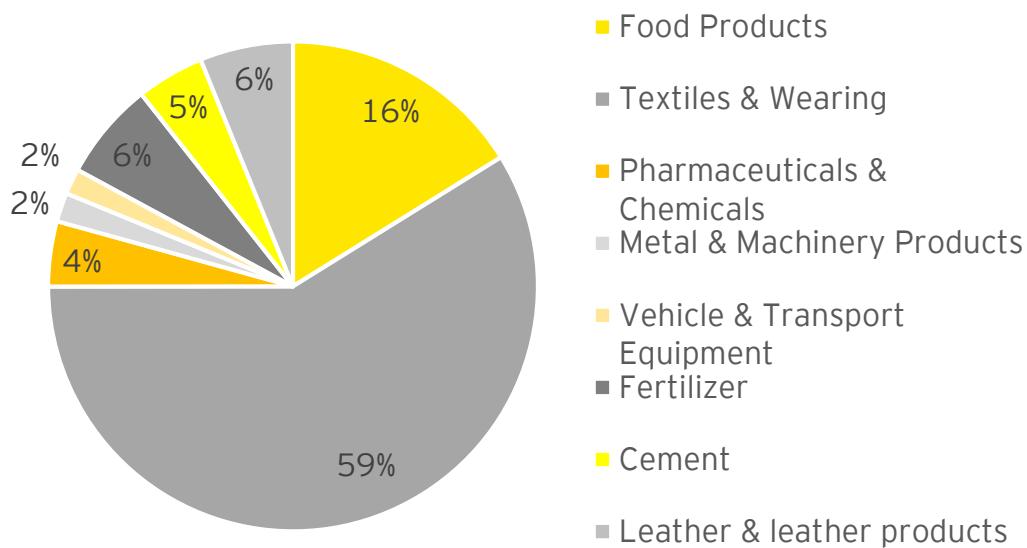
Figure 7-43 : Trend for FDI inflow in Bangladesh



Source: *Bangladesh Bank*

Out of the three sectors namely agriculture, manufacturing and services, agriculture sector has witnessed the highest CAGR of net FDI inflow. However, this is the case only because of a very negligible base. Net FDI inflow into manufacturing sector has grown at a robust CAGR of 13.5%, followed by services which has witnessed a CAGR of 7%. Notably, Hong Kong accounted for the highest share in net FDI inflow in FY 2014-15, followed by India and China.

Figure 7-44 : Segment-wise FDI inflow into manufacturing sector



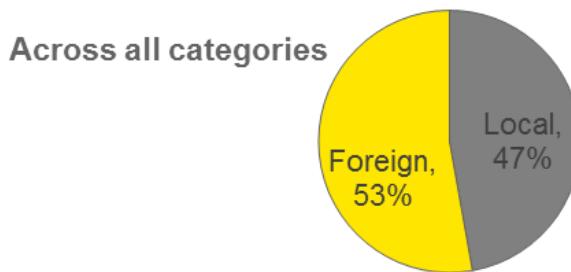
Source: *Bangladesh Bank*

FDI inflow has predominantly gone into the textiles and wearing apparels sub-sector within manufacturing industry. This is not surprising as the textiles sub-sector has also witnessed the

highest Quantum Index of Industrial Production growth rate. Food products sector stands at second place in terms of net FDI inflow consumption, followed by fertilizer sector, leather sector, cement sector and pharmaceuticals sector.

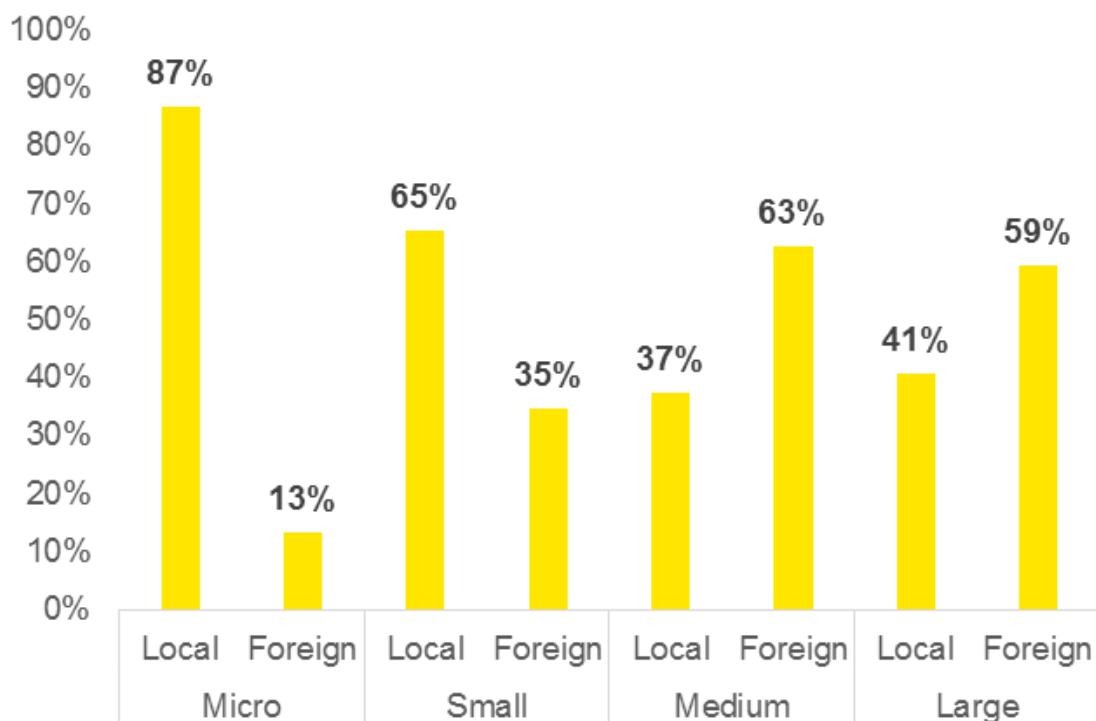
Raw material usage by scale of industry:

Figure 7-45 : Usage of local/foreign raw materials



Source: SMI and EY Analysis

Figure 7-46 : Usage of local/foreign raw materials as per stratification based on size



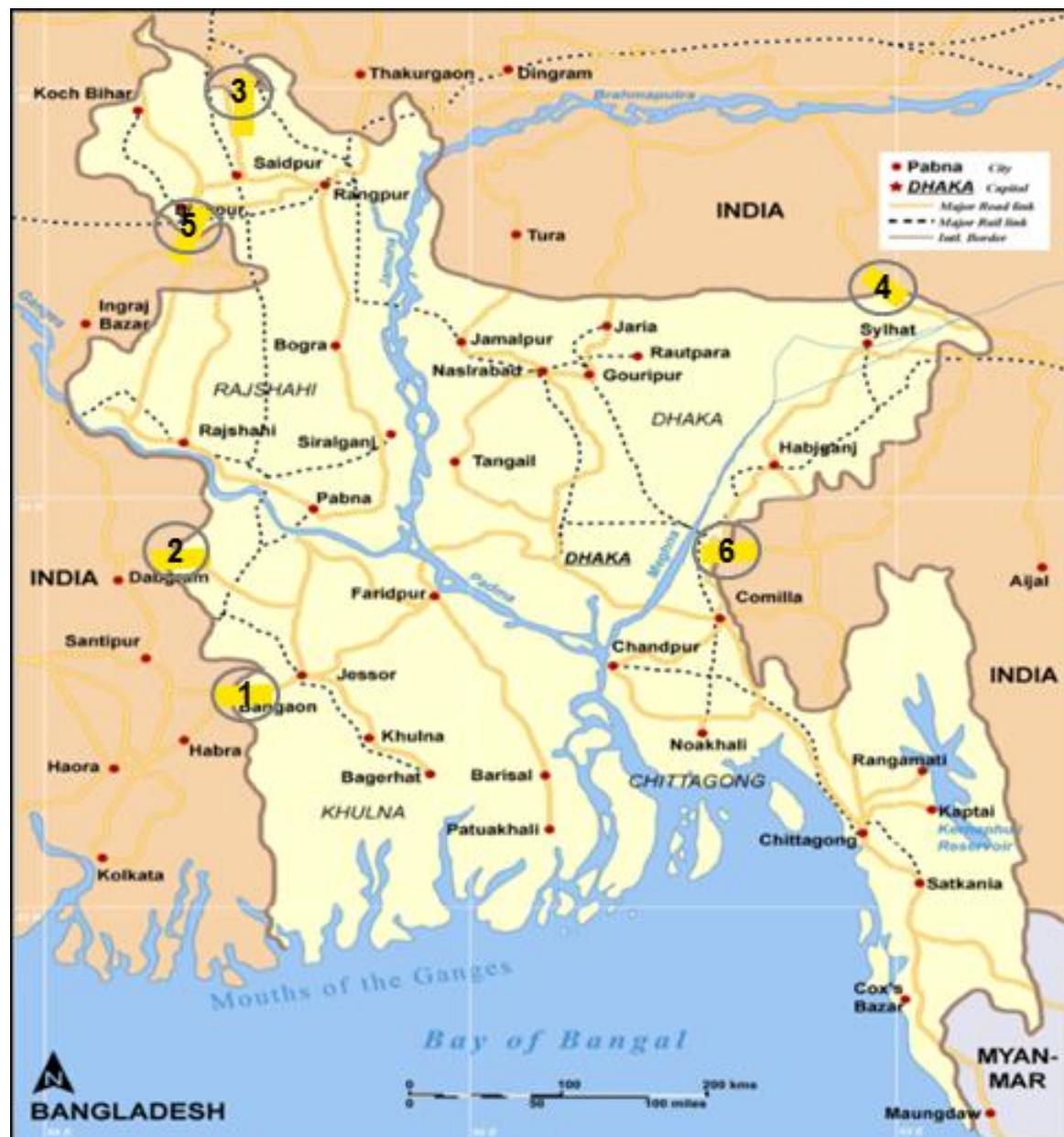
Source: Survey of Manufacturing Industries, 2012

Note: All figures are for 2010-11

Medium and Large scale industry are relying on Foreign inputs considerably. There is a huge potential to tap these segments. If it is made feasible to utilize domestic resources for such industries, it will enable Bangladesh to reduce its dependence on imports. Key initiative like EPZs and EZs sets out the right platform for such developments.

Bangladesh's modes of trade:

Figure 7-47 : Trade through road



Source: Google maps and EY Analysis

Table 7-9 : Trade points through road between Bangladesh and India

Sr. No.	Bangladesh	India
1	Benapole	Petrapole
2	Banglabandha	Fulbari
3	Burimari	Changrabnahrda
4	Tamabil	Dawki
5	Dinajpur	Hilli
6	Akhaura	Agartala

Source: EY Analysis

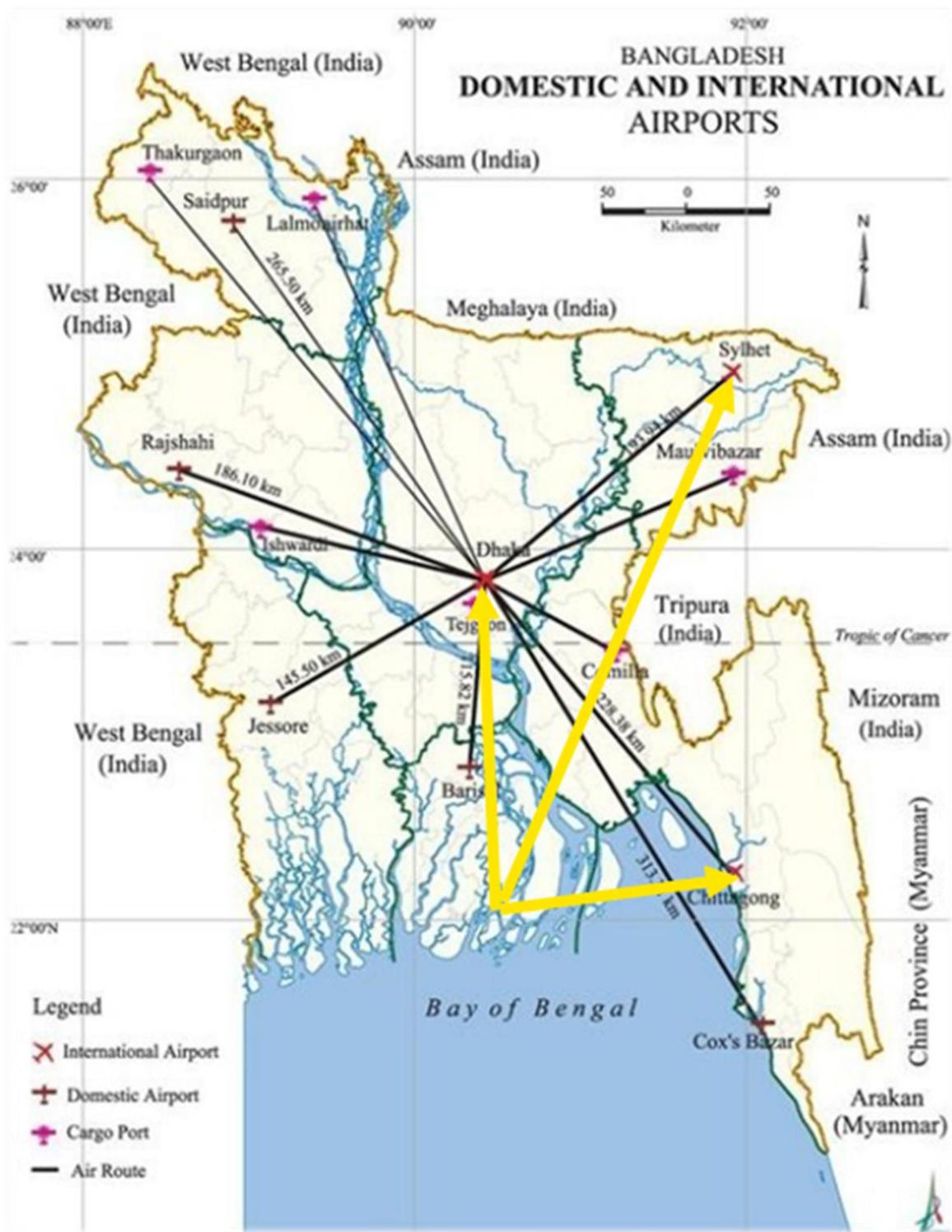
Figure 7-48 : Trade through rail



Source: Google maps

Trade via road and rail is challenging owing primarily to the following reasons:

- ▶ Lack of adequate infrastructure facility
- ▶ Long-drawn regulatory process for export/import of goods
- ▶ Lack of warehouses and storage facilities at land ports

Figure 7-49 : Trade through air

Source: Google maps and EY Analysis

The air freight mainly includes, textiles (readymade garments and knitwear) exported to United States and European Union nations; in 2015, 18,852 tons were exported to United States and 64,223 tons were exported to European Union nations.

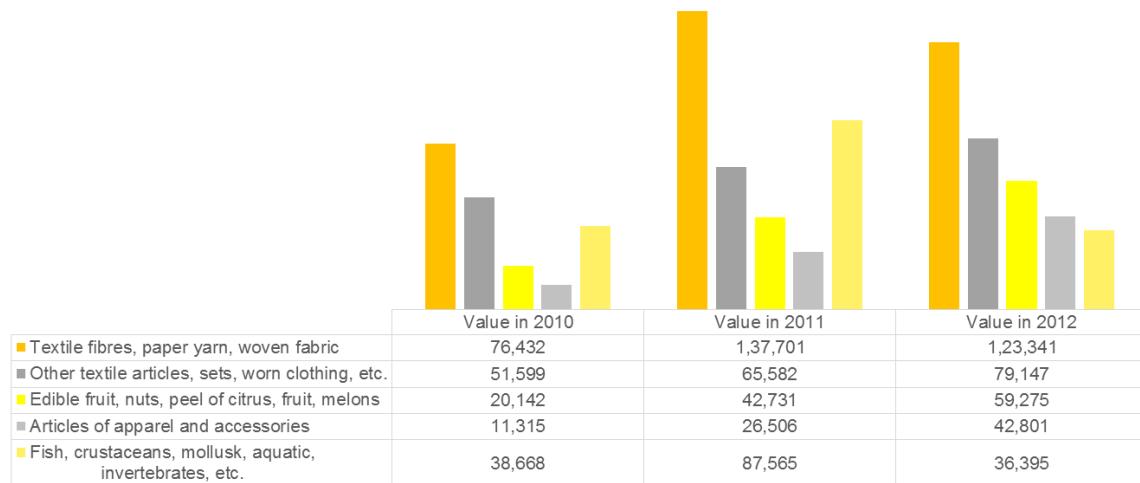
Figure 7-50 : Trade through sea

Source: Google maps and EY Analysis

Chittagong and Mongla ports account for around 87% of Bangladesh's foreign trade. Inland Water Transportation system serves as feeder ports to these 2 ports. Major items traded at Chittagong Port include food grain (e.g., wheat), cement, fertilizer, coal, salt, sugar, and edible oils. Chittagong Port accounts for 79% of trade of agricultural commodities.

Trend and pattern of cross-border trade with India:

Figure 7-51 : Top exports of Bangladesh to India (in US\$ '000s)

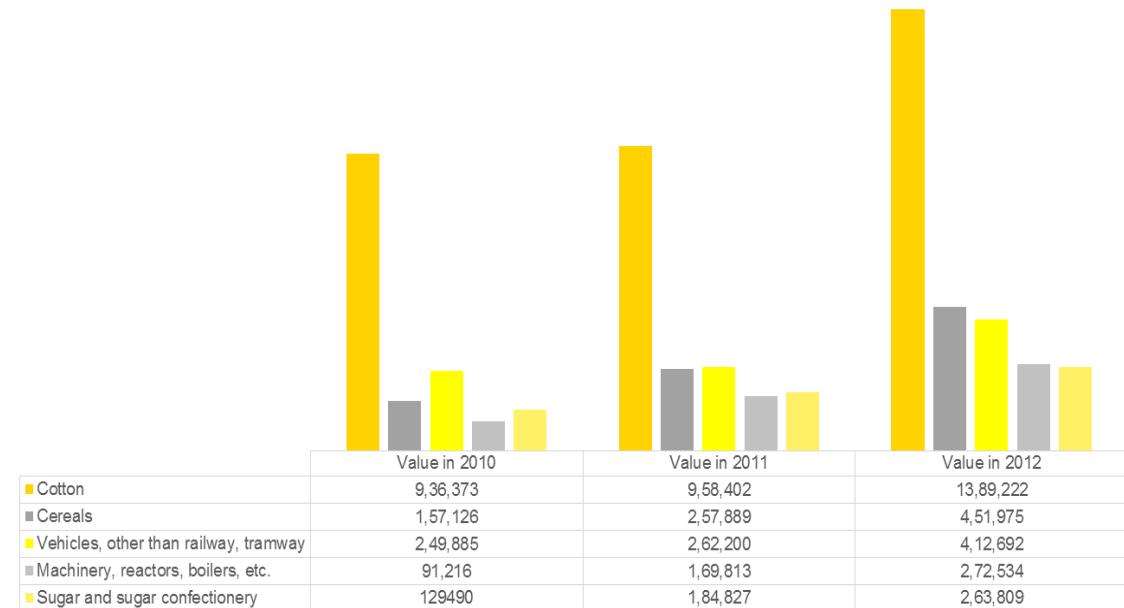


Source: ITC Trade map

Exports to India is currently confined to agro industry and products from small scale enterprises.

EPZ will enable promote this further and also allow to enhance the possibility of medium and large scale industry outputs to be exported

Figure 7-52 : Top exports of Bangladesh to India (in US\$ '000s)



Source: ITC Trade map

Imports from India ranges from SME's to heavy engineering and technology driven products. EPZ can lay the platform to reduce dependency on imports and build infrastructure for indigenous manufacturing. Technology collaboration with external nations too can promote this objective to a greater extent in coming future.

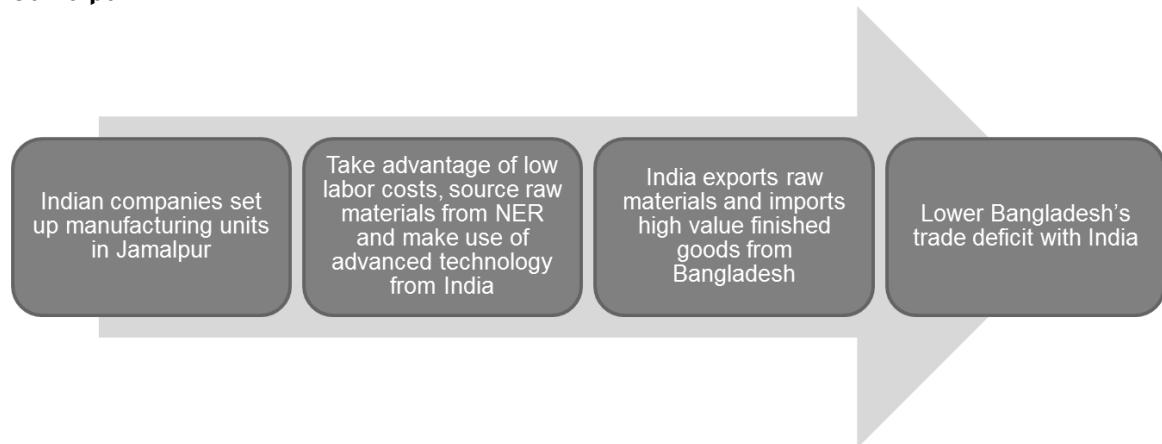
Table 7-10 : NER's trade with Bangladesh in FY 2010-11

State	Name of LCS	Value of Import (Rs Lakhs)	Top products imported
Assam	Sutarkandi	3073	Cement, misc food items and plastic items
Assam	Karimganj	67	Knitted & crocheted synthetic fabric
Assam	Mankachar	253	Cement, vest, cloak & religious book
Meghalaya	Dawki	0.1	Food items, fire clay & bricks
Meghalaya	Dalu	296	Cement. Syn, fabrics
Meghalaya	Mahendraganj	449	Cotton waste, synthetic fabric, food product
Tripura	Agartala	20352	Stone, cement, fish, PVC pipes & furniture
Assam	Srimantapur	2488	Stone, cement, plastic sheet of polymers
Tripura	Khowaighat	306	Stone & cement
Tripura	Manu	459	Broken stone, bricks & cement
Tripura	Muhurighat	1838	Stone, bricks & cement
Meghalaya	Old Raghnabazar	68	Textile items, cotton vest and others

Source: Ministry of Development of North East Region, Government of India based on Indian Customs

North-Eastern Region (NER) states of India share almost 1,880 km with Bangladesh. Of this, 1,434 km is a land border and 446 km is a riverine tract. Four NER states, namely, Assam, Meghalaya, Tripura and Mizoram, have international borders with Bangladesh. To facilitate the border trade, the Government of India has set up 26 Land Customs Stations (LCS) along the NER-Bangladesh border. Trade is primarily concentrated in agricultural commodities, processed foods, minerals and garments. The NER-Bangladesh trade mainly flows through Assam, Meghalaya and Tripura, among which Meghalaya has the highest share.

Figure 7-53 : Potential avenues for co-operation between North-East states of India and Jamalpur



Source: EY Analysis

Facilitation of trade through development of 'Border Haats':

Border Haats are allowed to sell local agricultural and horticultural products, small agriculture and household goods. Regulatory incentives include no imposition of local tax on trading services. Both Indian as well as Bangladeshi currencies are accepted, hence removing forex costs. Currently, four Border Haats are operational in Bangladesh which are,

- ▶ Kalaichar (Meghalaya-Bangladesh border)
- ▶ Balat (Meghalaya-Bangladesh border)
- ▶ Kamlasagar (Tripura-Bangladesh border)
- ▶ Srinagar (Tripura-Bangladesh border)

7.4 Potential Industries - Jamalpur Economic Zone

Post secondary data analysis and stakeholder consultation following industries come out to be potential industries for the Jamalpur Economic Zone.

Figure 7-54 : Potential Industries

Agro Based	SMES	Health Care	Cattle Based	Logistics
Jute	Soft Drinks	Medical Equipment	Leather	Cold Storages
Maize	Handicraft	Medical Accessories	Meat	Warehouses
Spices	Fertilizers	Pharmaceutical	Milk	Packaging
Fruits & Pulp	Ceramics			
Mustard Oil	Garments			
Rice				

Source: Stakeholder consultation and EY Analysis

7.4.1 Agro based industries

Bangladesh is an agrarian economy and it relishes reasonable benefits compared with many other nations with respect to producing and exporting a wide range of fruits and vegetables to the world's markets where there is an enormous demand. The possibility for achieving such standards are due to the very fertile soil, favourable weather conditions and availability of low cost labour force giving the local producers a big advantage in producing the fruits and vegetables for export markets across the globe. Not only fruits and vegetables are the notable achievements but also it includes jute, maize, spices, mustard oil and rice including paddy.

7.4.2 SMEs in Jamalpur district

There is a local manufacturing base in Jamalpur. BSCIC also runs an organized industrial park in Jamalpur, which is fully operational. Majority of the units are small and tiny scale.

- ▶ Bangladesh Small and Cottage Industries Corporation (BSCIC) is the prime mover organization in Bangladesh to support industrialization process through creation of an entrepreneurial society.
- ▶ BSCIC was established by an Act of the Parliament in 1957. Vision of this corporation is to accelerate the industrial growth through promotion and extension of small and cottage industries.
- ▶ Its development activities are motioned, catalysed and supported by promotion and extension services to the small and cottage industries (SCI). SCI's contribution to GDP (2012-2013) is about 5.27 percent which is 19.54 percent of the industries (manufacturing) sector's contribution.

A snapshot of the manufacturing units in Jamalpur is presented as follows:

Table 7-11 : Existing number of SCIs in Jamalpur district

Existing Industries in Jamalpur	
Number of Small scale industry	472
Number of cottage Industry	9,910
Total Employment	1,22,700

Source: *BSCIC*

Significant particulars of Bangladesh Small and Cottage Industries Corporation (BSCIC):

- ▶ The total industrial estate area is around 26.3 acres;
- ▶ The total number of plots within the site are around 197 plots
- ▶ The total number of plots leased out till now are 193 plots and the remaining 4 plots are left out to be leased out; and
- ▶ The total number of industries which have leased these 193 plots are 60 industries, out of which,
 - ▶ 44 industries are operational at present;
 - ▶ 10 industrial set ups are under construction; and
 - ▶ 6 Industries have leased the plots but are not operational, which could be known as the sick industries.

Primary Survey Results on Local Demand

Primary survey were conducted among the potential investors those are searching for developed space inside an organized industrial park. It is found that all the potential

manufacturing setup is in the category tiny and small scale and to cater mostly to the local needs.

Keeping in mind the local demand for organized set up, later in this report, the concept of Standard Design Factory has been introduced and incorporated in the master plan suitably as option.

The nature of the local demand as come out from the primary survey is presented in the following Table 7-10,

Table 7-12 : Probable industries in coming future

Expected Industry in Future	Investment in Lakhs	Area in Sq. Ft.
Agri Machineries	150	4,500
Aluminium Utensils	80	6,000
Chemical	460	51,000
Cloths	150	22,500
Cold Storage	50	9,000
Cotton Mills	50	4,500
Eclectic Bulbs	50	9,000
Electric Accessories	50	9,000
Engineering	540	90,000
Fertilizer	100	15,000
Fishery feeds	150	9,000
Food Processing	1,980	2,46,000
Furniture	90	15,000
GI ware	150	4,500
Herbal medicine	50	9,000
Jute Products	50	9,000
Jute and Derivatives	315	45,000
Medicine	100	18,000
Melamine Furniture	150	27,000
Milk Processing	100	15,000
Mineral water	150	4,500
Plastic goods	230	18,000
Poultry Feed	130	12,000
Steel Furniture	410	42,500
Textile	100	6,000
Thread Manufacturing	50	4,500
Tobacco Processing	250	31,500
Upholstery	50	6,000
Veterinary Medicine	50	9,000
Wooden Furniture	20	6,000

Source: BSCIC primary survey

7.4.3 Medical accessories and equipment sector and pharmaceutical sector

Medical accessories and equipment sector:

The Bangladeshi medical device market is expected to achieve one of the fastest growth rates in the world, at around 14.5% annually by 2019 as per business wire analysis. With lesser native manufacturing, the demand for imported goods continues to determine the growth, and positive trade indicators authorize the assessment. This under-developed market has huge potential, but prospects will fulcrum upon sustaining political stability and economic growth.

Pharmaceutical Sector:

This sector is one of the fastest growing sector in Bangladesh with around 231 companies in the market. The market size is around \$380 million per year, out of which around 95% of the demand is met by the indigenous companies, whereas around 5% of the total demand is being imported (mainly cancer drugs, vaccines for viral diseases, and hormones).

7.4.4 Cattle based

There is a good supply of raw materials with respect to livestock in Jamalpur district as discussed in detail in the section 7.5 of this report, which could be useful for the industrial set ups in the economic zone. The primary industrial set ups would be comprising of milk processing, meat processing and mechanical slaughterhouse.

7.4.5 Logistics

This sector is the need of the hour in order to boost the Fast Moving Consumer Goods (FMCG) and perishable products trade. The provision of cold storage facilities and warehouses will boost the trade for product sectors like frozen foods, milk, fruits and vegetables, etc. thus enabling an elongated period of usage more than their useful life and maintaining the desired quality of the product sectors.

7.5 Recommendations in relation to potential market interest

Potential investment sectors besides Readymade Garment sector are highlighted here,

7.5.1 Fruits and vegetable products sector

Due to the Underutilisation of the country's agricultural capacity, this scenario presents many opportunities for investors seeking to export agricultural products. Cold storages facilities serving the supply chain, especially fresh produce for export have good scope. Particularly for this sector there is a special provision of no royalty charges applicable by the airlines transiting these products to the multiple destinations as per the new Bangladesh export policy 2015-18.

7.5.2 Ceramics sector

The global ceramics industry is worth in excess of \$10 bn. Bangladesh, being a gas-rich and low-labour-cost economy, is perfectly positioned to be a strategic partner in production and supply of ceramic products across the globe.

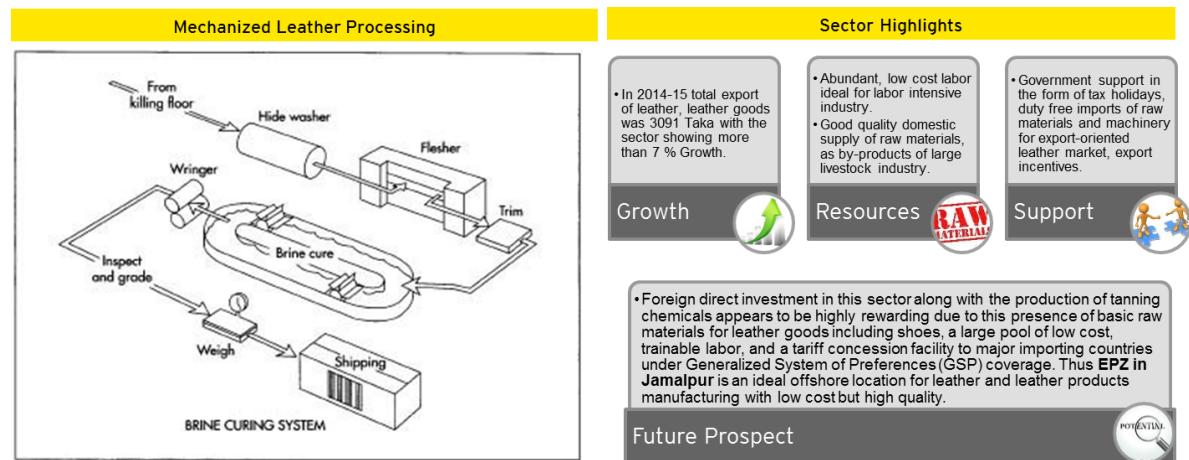
7.5.3 Electronics and light engineering sector

The high skill, low cost labour of the electronics & light engineering sector in Bangladesh offers companies great returns on investment. Entrepreneurs from China, & Japan have taken advantage of this facilities to manufacture products for the export market.

7.5.4 Leather sector

Bangladesh produces around 2-3% of the world's leather from an organized supply of raw materials. The leather industry is ideally suited to Bangladesh with its abundance of labour availability and natural resources at internationally competitive rates.

Figure 7-55 : Value chain analysis for leather processing



Source: EY Analysis

Bangladesh has a long established tanning industry which produces around 2-3% of the world's leather from a ready supply of raw materials. The country is therefore an established and attractive location to source and outsource the manufacture of finished leather products. The leather industry is ideally suited to Bangladesh with its abundance of labour and natural resources at internationally competitive rates.

Livestock trade and mechanical slaughterhouse : - At present, there are no mechanical slaughterhouse in the catchment region and trade of livestock occurs through open markets in the region, in live form for the purpose of local consumption of meat. Major such open markets of livestock in Jamalpur Sadar Upzila are Sakal Bazaar, Station Bazaar, Beltia Bazar and Nandina Markets. The nearest mechanical slaughterhouse available in vicinity of the project location is in Gazipur, which is more than 100 kms from the site. Hence, the project location has significant potential for Mechanical slaughterhouse and further meat and leather value chain related industries.

7.5.5 Aquaculture products sector

Frozen foods is the second largest export sector of the Bangladesh economy. This is promising sector for investors looking to supply in international & domestic markets. Building infrastructure for storage and transport can be promoted through the proposed Economic Zone.

7.5.6 IT/ITES sector

During the last five years the average yearly growth rate of software & IT Enabled Services industry has been over 40% registering a great potential for future expansion and anticipation for adding more to the services sector of the economy. Currently there are over five hundred (500+) registered software and ITES companies in the country, out of which 40% are export oriented in nature, thus adding substantially to the GDP of the country.

7.5.7 Pharmaceutical sector

Expansive international companies have established operations in the country as they seek to grow, promote exports, drive down manufacturing costs, and undertake research and development into reverse engineering of patented medicines.

Figure 7-56 : Value chain analysis for pharmaceutical sector



Source: EY

The **Pharmaceutical** in Bangladesh has developed fast. Originally set up to cater for local needs as a manufacturer of patent medicines, the industry now exports drugs to highly regulated markets. Expansive international companies have established operations in the country as they seek to grow, promote exports, drive down manufacturing costs, and undertake research and development into reverse engineering of patented medicines. Flourishing opportunities in this sector are pharmaceuticals, patented medicines manufacture, active pharmaceutical ingredients production, and generic pharmaceuticals

Medical Accessories and Equipment's:

The light engineering industry in Bangladesh continues to grow each year. This labour-intensive sector produces a diverse range of items, including import substitute machinery spares, plant machineries, small tools, toys, consumer items and paper products for the domestic market. Entrepreneurs from China, Japan and Korea have taken advantage of this situation to manufacture products for the export market. Such set up can boost manufacturing of medical equipment's in EPZs and accessories which is currently imported in the country.

Significant imports of basic medical accessories along with the trading country partner are listed below,

- ▶ Dearon Surgical Blades (China)
- ▶ Foley Balloon Catheter (China)
- ▶ Medi tape (Japan)
- ▶ Surgical Gloves (Malaysia)
- ▶ Surgical Suture - Ethicon (India)
- ▶ Uro line (India)
- ▶ Wound Drainage Tube (India)
- ▶ Syringes

The sector potential is highlighted here,

- ▶ Highly skilled work force and internationally competitive cost base, with high quality management resources fluent in English.
- ▶ Ideal regulatory and tariff environment.
- ▶ Excellent geographical location close to emergent economic giants of China and India.
- ▶ Significant potential for research and development, contract research outsourcing and clinical trials development.
- ▶ Quality tertiary education producing a plentiful supply of top flight scientific talent

7.6 Identification of potential competing alternatives

As such there are no potential competing alternatives found in the near vicinity of the proposed Jamalpur economic zone development project.

8. PPP Transaction Structure

8. PPP Transaction Structure

8.1 BEZA Act 2010

The Government of Bangladesh passed the Bangladesh Economic Zones Act in 2010 and this was led by formation of Bangladesh Economic Zone Authority (BEZA).

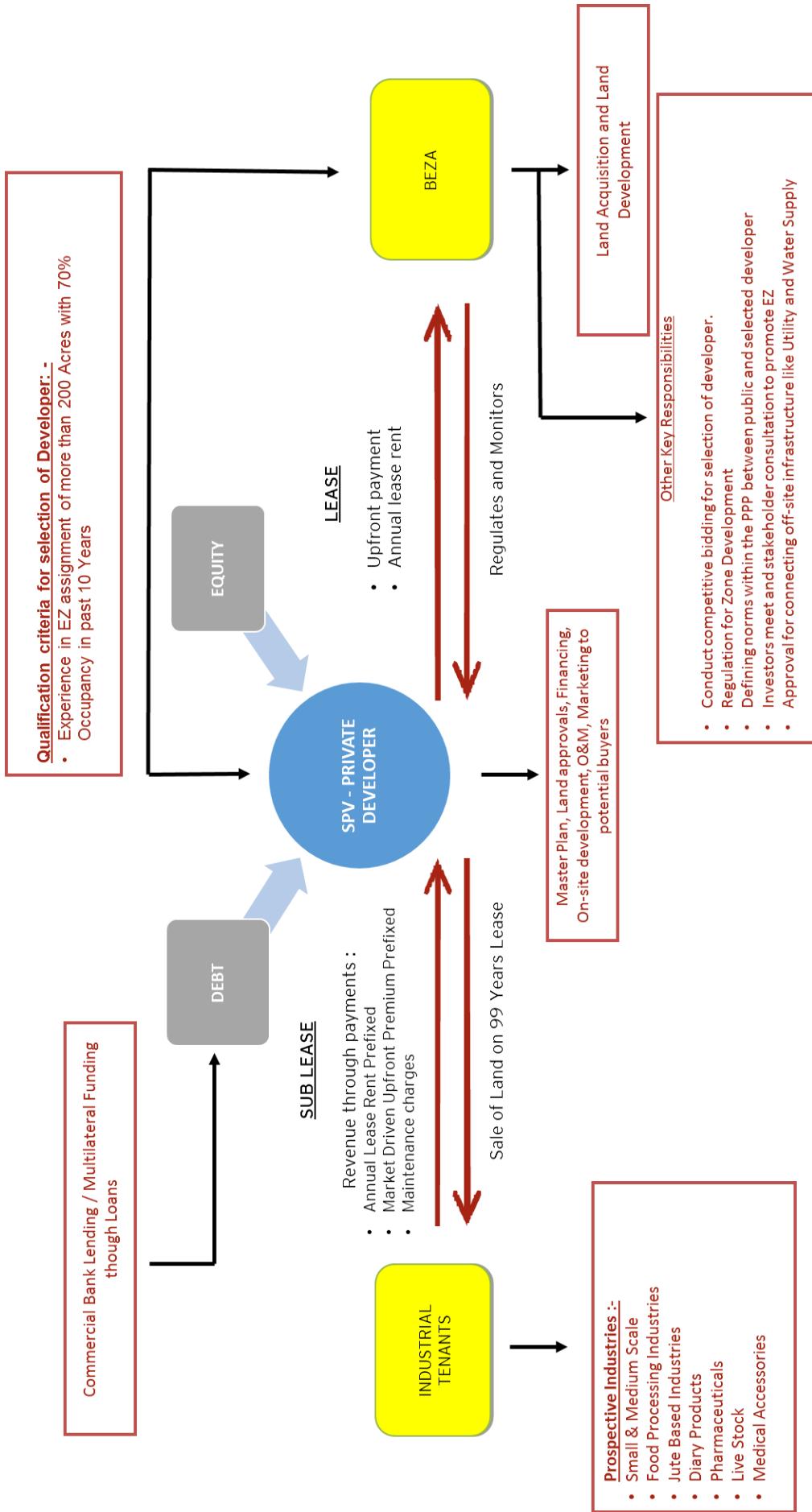
This law is passed for establishing, development and management of new economic zones in underdeveloped areas for rapid economic development, employment, production and increasing export and matters related therewith. The act also promotes Public Private Partnership mode for implementation of EZ across the country and allots provision of required technical assistance, Viability Gap Financing (VGF) and infrastructure investment funds are allotted for developing the EZ. Currently there are several EZ in pipeline and many upcoming to promote industrial growth.

8.2 Options assessment

Options	Option 1	Option 2	Option 3	Option 4
Tasks	Government-Led Model	Operating and Managing Outsourcing	Concession PPP Model	Private Owned PPP Model
Land Acquisition	Government	Government	Government	Government
Financing	Government	Government	Land is acquired by the government and leased to a private developer who pays for the land upfront along with a fixed annual lease	Private operator
Land development	Government	Government	Private operator / Government	Private operator
O & M	Government	Private operator	Private operator	Private operator
Regulation	Government	Government	Government	Government

8.3 Recommendations on the proposed structuring option

Public Private Participation can be executed under different structures and heads and hence selecting the most suitable option is critical for successful implementation of the EZ. Land acquisition, funding mechanism, technical assistance and revenue streams are some crucial parameters to be taken into account before designing the PPP structure. After evaluating the weightage of key factors, a concession PPP model with following structures is most feasible option for the development of Economic Zone:



8.4 Incentives & benefits for EZ developers offered by BEZA

INCENTIVES	BENEFITS
TAX HOLIDAY	Income tax exemption on income derived from the business development of EZ in a block of 10 years in 15 years. After expiry of 10th year tax exemption will be 70% in 11th year and 30% in 12th year. But the tax exemption will not be appreciable from 13th year.
VAT ON ELECTRICITY	Exemption of VAT on electricity or taxes on sale, of self-generated or purchased electric power for use of processing area of EZ (for 10 years).
VAT ON LOCAL PURCHASE	All purchase excluding petroleum product from Domestic Tariff Area (OTA) shall be exempted from VAT, sales tax etc.
SUBSIDY	One time capital subsidy up to 50% of cost incurred for setting up Central Effluent Treatment Plant (CETP).
CUSTOM DUTY	Exemption from custom/excise duties for development of EZs.
STAMP DUTY	<ul style="list-style-type: none"> • Exemption of stamp duty and registration fees for registration of EZ land but limited to first transaction only. • Exemption of stamp duty for registration of loan/credit document.
INCOME TAX & OTHERS	<ul style="list-style-type: none"> • Exemption from dividend tax. • Exemption of income tax on service charges

8.5 Financial Appraisal

The Economic Zone Act 2010 provides the legal coverage for attracting and leveraging private investment towards development of zones as zone developers and operators, along with the provision for tailored infrastructure services; such as private provision for power, effluent treatment, etc. on a Public-Private Partnership (PPP) basis.

This chapter presents a financial analysis of the proposed investment to ascertain its attractiveness to the developers or operators. Throughout the subsequent sections, various assumptions and considerations are presented. The outcome of the financial analysis is presented through IRR and NPV throughout the concession period. The financial model is further subject to risk analysis which has been carried out with increase in development cost and various concession periods. There is also market risk owing to salability of the developed plots to individual developers which has been treated later in this chapter. There are also several other multidimensional risks owing to social and environmental issues which has been handled through subjective analysis and presented in the next chapter.

The basics of business model for the developer

The basic operating model of the Economic Zone is either of the two as listed below:

3. The developer will realize the entire development cost through upfront sales proceeds and the operation and maintenance will be carried out with basic minimum profit (say about 15%)
4. Owing to market sensitivity towards upfront payments, the developer may choose to realize lower amount of sales proceeds and may charge higher level of lease premium subsequently throughout the entire lease period.

In the first model, the developer quickly realizes his investment along with profit but the attractiveness of the plots to the individual manufacturers reduces. In contrast, the second model portrays a lower level of upfront with same service provisioning and thereby increases the attractiveness but the revenue gap is recovered through lease rentals. In this model, the project viability depends on long term realization of lease rental.

8.6 Project Cost

The estimated project cost of the project BDT 304 cr. excluding LA and R&R costs. However, the estimated capital cost for the private partner is in the tune of BDT 210 cr.

S.NO	PARTICULARS OF ITEM	MILLION BT
	Responsibilities of the Private Partner	
1	Road and internal network	563.28
2	Drainage piping and waste water treatment plants	276.79
3	Domestic water piping and tanks for storage	103.19
4	Storm water drainage	71.08
5	Administrative building and associated construction work	90.00
6	Bridge	550.00
7	Green area with plantation	10.00
8	Site boundary: 2 m above the fill level	144.00
9	Fire fighting	70.00
10	Electrification - street lighting and power distribution	75.00
11	Gas distribution network	37.98
	Total direct project cost to developer in bt million (a)	1,991.32
	Contingencies @ 5%	99.57
	Total cost including contingencies	2,090.88
	Responsibility of government	
1	Rehabilitation - houses only	200.00
2	Land filling area	456.21
5	Retaining wall with water body protection	135.00
9	Site boundary (only as required for land filling as retaining wall)	259.20
	Total project cost in bt million (b)	1,050.41
	Total project cost (a+b)	3,041.72

The total project cost that includes IDC and financial overheads for the private partner stood as BDT 290 cr. TPC and its phasing is presented as follows:

CGT	Y-1	Y-2	Y-3
% capex phasing	25%	45%	30%

Total development cost	210	52.50	94.50	63.00
Escalation	22.2	3	10	10
Preliminary expenses	3.5	1	2	1
Contingencies	-	-	-	-
Financing fees	3.5	1	2	1
Total project cost (excl IDC)	239.2	57	107	75
Upfront payment	30	10	10	10
IDC	20.38	0.96	6.18	13.25
Total project cost (incl IDC)	289.6	68	123	98

8.7 Assumptions for the financial analysis

- Construction / development Period - 3 years
- Capex Phasing for project development

Year 1	Year 2	Year 3
25%	45%	30%

- Upfront Land Premium to be paid by the developer to the contracting Authority - BDT 30.00 Crores to be paid in three equal annual instalments
- Start of Construction and Concession period - 1st April 2017
- Start of Revenue from the Industrial operators - 1st Apr 2020
- Debt being raised for project development - 70%
- Equity investment for project development - 30%
- Interest rate - 12%
- Period for repayment of debt - 7 years
- Moratorium period - 3 years (start of debt repayment - 1st Apr 2020)
- Discount Rate for Project NPV - 10.44%
- Discount Rate For Equity NPV - 16%

The following table is reproduced from section 4.4 of the report for ready reference of readers. For further details, please refer section 4.4.

Item	Flow of cost	Cost
Lease Rental	Developer to Contracting Authority	BDT 0.1 per sq. ft. To be increased annually at 5%
Lease Rental	Individual lease holder to developer	BDT 2 per sq. ft. To be increased annually at 7.7%
Maintenance cost	Developer spends through maintenance expenses	BDT 2.96 per sq. ft. Considered an escalation of 5% per annum
Maintenance cost	Individual Lease holder pays to the developer	BDT 6.67 per sq. ft. Considered an escalation of 5% per annum

8.8 Detailing the revenue stream

As per the financial analysis, revenue for the first five years and every _____ year is as mentioned in the following table.

Year	1	2	3	4	5	15	25	35	45	55
escalation rate	8%	8%	8%	8%	8%	8%	8%	8%	8%	8%
escalation factor (%)	7.7	15.9	24.9	34.5	44.9	204.2	538.8	1241.3	2716.4	5813.7
Industrial				1.9	2.4	5.1	10.8	22.8	47.9	100.6
Maintenance Charges	0.0	0.0	0.0	6.8	7.2	11.7	19.2	31.2	50.9	83.0
Upfront Premium	11.4	11.4	15.2	177.7	38.0	0.0	0.0	0.0	0.0	0.0
Total Revenue	11.4	11.4	15.2	186.5	47.7	16.9	30.0	54.1	98.8	183.6

The revenue stream for different concession period on current prices is presented as follows:

Revenue counter (BDT crores)	Concession period of 100 years	Concession period of 60 years	Concession period of 30 years
Lease rental	39610	2009	190
Maintenance Charges	15523	2086	376
Upfront Premium	253	253	253
Total Revenue	55387	4350	821

The upfront lease rate for the developed plots has been considered as BDT 1.3 crores per acre.

8.9 Commercial viability

The commercial viability of the project is presented as follows:

Period	Development Cost	Equity		Project	
		IRR	NPV in Cr	IRR	NPV in Cr
100 Years		20.48%	BDT 2.97	11.92%	BDT 20.71
60 Years	100%	20.43%	BDT 2.77	11.63%	BDT 13.34
30 Years		18.88%	BDT 1.28	10.50%	BDT 0.49

The commercial viability of the project has been further tested with 10% overrun in cost. And the results are as follows:

Period	Development Cost	Equity		Project	
		IRR	NPV in Cr	IRR	NPV in Cr
100 Years	110%	12.28%	- BDT 9.51	10.72%	- BDT 4.95
60 Years		11.80%	- BDT 9.70	10.25%	- BDT 2.50
30 Years		9.14%	- BDT 11.24	8.71%	- BDT 15.65

9. Project Risk Assessment

9. Project Risk Assessment

In the following risk matrix, potential project development and implementation risks have been identified along with their scale. The identified risks have also been allocated to suitable stakeholders and appropriate mitigation measures have been proposed to address these project related risks.

Type of Risk	Description	Assessment of risk	Risk mitigation measures and Allocation of risk
Conceptualization of EZ	During conception, the flexibility on category of product, scale size of manufacturers, clustering approach and single large scale manufacturer	Very low	Since the conceptualization is not restricted on any product category, size scale of manufacturer and specific cluster, this risk is low. Moreover, in the masterplan, provisions are kept for large scale operator as well as micro manufacturers through Standard Design Factories (SDF)
Marketability of the EZ plots	Attractiveness of the EZ plots with necessary infrastructure and price for the plots	Very low	All necessary infrastructure will be created and provided by the developer. Actual price of the plot based on land price, development cost and facility cost is very high. The pricing of the plots has been kept low as follows: 1. A substantial portion of price reduction will be there as government will not recover the full land acquisition price as well as land development cost 2. The developer will not recover the full development cost through upfront payments. Instead, a differed payment mechanism will be adopted through payment of lease rental Thus, the risk is shared by both the private developer and the Contracting Authority.
Project development risk	Selection of incompetent developer	Low	Transaction structure will be developed in such a way that an experienced and competent developer will be selected
Environmental & Social risk	Review of potential environmental risk	Nil	Initial Environmental Examination (IEE) is carried out and Site Clearance Certificate

			(SCC) has been issued with TOR for detailed EIA.
	Review of potential social risk	Low	Only 10 households are getting affected with share of homestead land being less than 1% of the project area. The compensation structure is such that it is one time settlement which is similar to market valuation. Since the compensation is one time settlement, there is no risk of future disputes and non-payments.
	Social assessment risk	Low	The social assessment risk is covered for both direct and indirect impacts. In case of indirect impacts, people will be given choices to relocate. If not acceptable to them, the project will be implemented excluding the village settlement land.
	Environmental assessment risk	Nil	The project site verification covered all seasons in a year and no potential environmental risk is observed.
	Applicable Environmental Standards	Nil	The applicable laws and regulations of the country will be followed. The TOR for EIA has already been approved. For individual manufacturers, Environmental clearances will be procured in consideration with the categorization of the industry as per prevailing laws.
	Applicable Social Standards	Nil	Only few households will be affected and there will be one time settlement. The land acquisition authority is providing 50% solatium on the ready reckoner rates to maintain its adequacy of compensation. In case of indirectly impacted rehabilitation, the proposal should be 'land for land' and 'structure for structure' to avoid any social risk.
	Environmental and Social Management System	Low	Once EIA study will be completed, a suitable EMP will be adopted to safeguard the environmental and social risk.
	Stakeholder Engagement	Nil	During all initial environmental and social screening, stakeholders consultation has

			been carried out. During all future actions, stakeholders engagement will be ensured through proper monitoring framework.
	Grievance Mechanism	Nil	The respective public agency shall establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance
Non-performance of the developer	Unsatisfactory performance of the developer	Low	This risk will be covered under concession agreement through imposition of penalty and if required, revocation of the concession agreement.
Commercial operations risk	Non-utilization of the plots by individual tenants	Low	Under the supervision of the contracting authority, it should be legal binding for the developer to revoke the non-utilized lands with specific terms and conditions, which may be a part of concession agreement. For individual manufacturers, the timeline to start the commercial operation will be discussed and incorporated in the lease agreement.
Operations & maintenance risk	Adequate maintenance of the common infrastructure of the EZ	Low	Transaction structure will be developed in such a way that an experienced and competent developer will be selected

10. Heads of Terms for Concession Agreement

10. Heads of Terms for Concession Agreement

10.1 Key commercial terms and contractual conditions

The following heads of commercial terms that will be decided by the contracting authority during the final feasibility stage and will be incorporated suitably in the draft concession agreement.

Sl. No.	Description of terms / conditions	Comments
1.	Responsibility of the government	Covered in chapter of project scoping (chapter 5)
2.	Responsibility of the private partner	Covered in chapter of project scoping (chapter 5)
3.	Floor rate of the upfront premium that the developer will pay to the Contracting Authority	As per the financial analysis, the minimum guaranteed upfront premium has been estimated to be BDT 30 crores. This will be further discussed and finalized.
4.	Types of utility & service charges that will be collected by the contracting authority	<p>The list of probable services is as follows:</p> <ul style="list-style-type: none"> ▶ Power ▶ Water ▶ Gas ▶ Solid waste management <p>The final list will be decided at later stage and shall be incorporated in the concession agreement suitably.</p>
5.	Payment mechanism and timeline of the upfront premium to be paid by the successful bidder to the Contracting Authority	<p>In the financial analysis, it is considered that the upfront premium shall be paid by the developer in three equal annual instalments starting from the signing of concession agreement.</p> <p>The differed payment shall be secured through Bank Guarantee.</p>
6.	Payment mechanism and timeline of the lease rentals to be paid by the successful bidder to the Contracting Authority	<p>In the financial analysis, it is considered that the first instalment of the lease rental to be paid by the developer to the contracting authority shall be BDT 0.1 per sq. ft., amounting to BDT 0.14 crores per annum.</p> <p>The lease rental shall be increased annually at 5%.</p>

10.2 Key performance indicators and service credits

The key performance indicators and service credits are listed below:

- ▶ Completion and approval of master plan
- ▶ All statutory approvals required for the development
- ▶ Development of common infrastructure within the EZ
- ▶ Leasing of the developed plots to individual manufacturers
- ▶ Commencement of operations by the individual manufacturers
- ▶ Handing over developed plots for public utilization

Minimum obligation of the successful bidder on each of the above indicator will be finalized based on consultation with the contracting authority and the same shall be incorporated in the concession agreement with for the successful bidder.

The conceptualization of the Economic Zone is open to various options, such as, single operator, multiple clusters and multiple operators. Thus, apart from the above listed key indicators, the performance indicators specific to the model of development of the successful bidder, will be adopted through a joint meeting between the contracting authority and the private partner before signing the concession agreement. The mutually agreed performance indicators will be made part of the concession agreement.

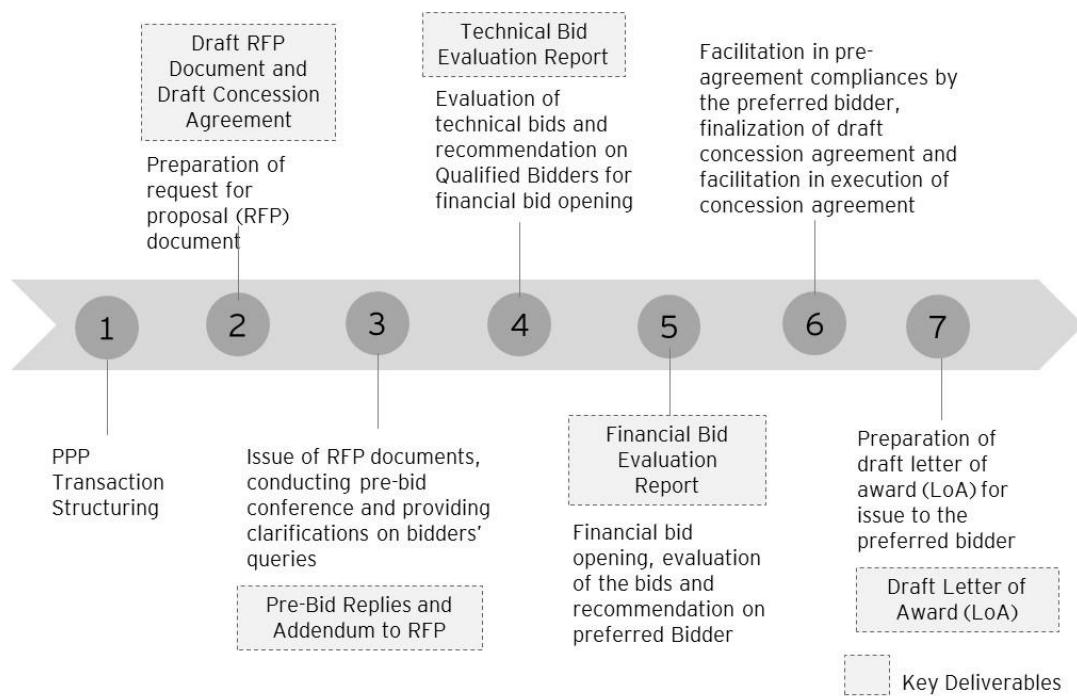
11. Procurement Plan

11. Procurement Plan

11.1 Plan for developing and executing procurement process

Upon successful completion of the activities envisaged in Phase-I of the assignment and post confirmation on the commercial viability of the project on the preferred PPP structure, work on Phase II will commence. We shall prepare an inception report to summarize the findings of Phase I and to re-establish the approach & methodology to be adopted for the proposed tasks in Phase II.

Our experience in similar assignments including successful development of International facilities, suggest that a typical PPP procurement process Development and Implementation involves following keys tasks and deliverables.



11.2 Expected Project team structure



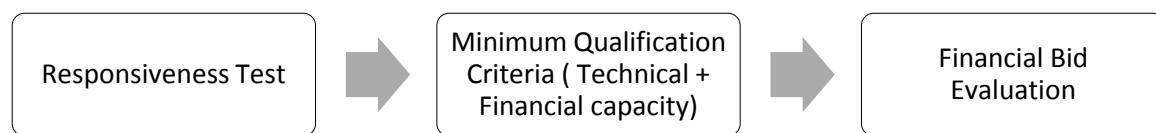
11.3 Outline structure for the RFP document

The transaction for selection of developer for the proposed project is envisaged to be undertaken in single stage bidding format. Hence, the RFP document shall cover eligibility criteria as well as the evaluation process for selection of successful bidder including both the technical and financial parameters.

Following are the key heads that shall be covered under the RFP document for the single stage bidding process:

- Background and details of the project
- Bidding process overview
- Tentative timeline for the bidding process
- Details related to Bid security and other financial covenants
- Terms related to allowance to participate as a consortium
- Clarifications related to conflict of interest
- Details related to the bid preparation and submission
- Description on the bid opening and evaluation procedure
- Eligibility criteria - for Technical and Financial eligibility of the bidders
- Evaluation parameters and marking system for technical and financial bids
- Templates for all necessary forms to be submitted as a part of the bid
- Draft concession agreement

The bids for this single stage bidding process shall be invited in two separate envelops: Technical Bid and Financial Bid. Following three step evaluation process shall be followed for the evaluation of the received bids.



In order to ensure selection of a competent private partner for effective implementation of the project, we have evaluated various key parameters related to the project and have outlined the recommended qualification criteria for the bidders to be eligible for financial bid opening.

Proposed minimum eligibility criteria: Technical Capacity

For demonstrating Technical Capacity and experience, the Bidder shall, over the past 5 (five) years preceding the Due Date, have:

- A. Paid for development of Eligible Project(s) in Category 1 and/or Category 2 as specified below; and/or
- B. Paid for or received payments for construction work of Eligible Project(s) in Category 3 and/or Category 4 as specified below.

Category 1 Eligible Projects: Project(s) undertaken as a PPP project for development of Economic Zone / Special Economic Zone / Industrial park / Industrial estate / Export Processing Zone / logistic park / Technology park or similar organized Industrial development, where the entity claiming experience shall have paid for development of the project.

Category 2 Eligible Projects: Project(s) undertaken as a PPP project in core sector, where the entity claiming experience shall have paid for development of the project.

Category 3 Eligible Projects: Construction Project(s) for development of Economic Zone / Special Economic Zone / Industrial park / Industrial estate / Export Processing Zone / logistic park / Technology park or similar organized Industrial development, where the entity claiming experience shall have paid for execution of its construction works or received payments from its client(s) for construction work executed, fully or partially, during the past 5 (five) years preceding the Due Date.

Category 4 Eligible Projects: Construction Project(s) in core sector, where the entity claiming experience shall have paid for execution of its construction works or received payments from its client(s) for construction work executed, fully or partially, during the past 5 (five) years preceding the Due Date.

The Core sector would be deemed to include highways, power, telecom, airports, railways, metro rail, pipelines, irrigation, water supply, sewerage and mixed use real estate development projects.

Minimum experience required for Eligibility:

- (a) The sum total of capital cost of all the Eligible Projects must be more than BDT 200,00,00,000 (BDT Two Hundred crores); and
- (b) The capital cost of at least one eligible project must be more than BDT 100,00,00,000 (BDT One Hundred crores); and
- (c) The capital cost of each project must be more than BDT 20,00,00,000 (BDT Twenty crores) for the project to be an Eligible Project.

Where, the capital cost of a project shall be computed as specified below for the purpose of Eligibility assessment and Technical Experience Score evaluation:

- The cost of land for purchase or leasing shall not be included in the capital cost of the project.
- Only the payments actually made or received, as the case may be, during the past 5 (five) years preceding the Due Date shall qualify for the purpose of computing project capital cost for assessment of Eligibility and for the purpose of evaluating Technical Experience Score. Any payments made or received prior to this specified period shall not be considered as part of project capital cost.
- Construction works shall not include supply of goods or equipment except when such goods or equipment form part of a turnkey construction contract/ EPC contract for the project.
- As per the above mentioned terms, if the computed payments/receipts for a specific project are less than BDT 20,00,00,000 (BDT Twenty crores), the project shall not be reckoned as an Eligible Projects for the purpose of Eligibility assessment and Technical Experience Score evaluation.

The Bidder is a Consortium, the experience of the Lead Member and other Consortium Member(s) shall be counted as experience towards meeting Technical Capacity of the Bidder.

Proposed minimum eligibility criteria: Financial Capacity

- Minimum Net Worth: The Bidder must have a minimum average Net Worth of at least BDT 100,00,00,000 (BDT One Hundred Crore) across last three completed financial years preceding the Due Date.
- Free Cash Flow towards Equity ("FCFE"): The Bidder must demonstrate that it has average FCFE of at least BDT 25,00,00,000 (BDT Twenty Five Crore) over the last 3 (three) completed financial years preceding the Due Date.

Proposed minimum eligibility criteria: Operation & Maintenance Experience

The Applicant shall, in the case of a Consortium, include a Member who shall subscribe and continue to hold at least 10% (ten per cent) of the subscribed and paid up equity of the SPV for a period of 3 (three) years from the date of commercial operation of the Project, and has either by itself or through its Associate, experience of 3 (three) years or more in operation and maintenance (O&M) of eligible projects as specified below:

- Project(s) undertaken as a PPP project for development of Economic Zone / Special Economic Zone / Industrial park / Industrial estate / Export Processing Zone / logistic park / Technology park or similar organized Industrial development; and,
- The capital cost of each project must be more than BDT 20,00,00,000 (BDT Twenty crores) excluding cost of land for purchase or leasing, for the project to be an Eligible Project; and,
- The project should have been operated and maintained by the member for a period of minimum 3 (three) years within the past 5 (five) years preceding the Due Date, for the project to be an Eligible Project; and,
- The sum total of capital cost of all the eligible Projects, as specified above, must be more than BDT 100,00,00,000 (BDT One Hundred crores) excluding cost of land for purchase or leasing.

In case the Applicant is not a Consortium, it shall be eligible only if it has equivalent experience of its own or through its Associates.

Evaluation and Scoring pattern for the Technical parameters:

In order to take the development and/or construction experience of the bidders into account for Technical Evaluation, Experience Score for each Eligible Project shall be computed as mentioned below.

$$\text{Experience Score of an Eligible Project} = \frac{\text{Capital cost (Eligible payments / receipts) of the project (in BDT) as specified in the section 8.2.1 a)} \times (\text{Category Factor})}{1 \text{ Crore}}$$

Categories	Category Factor
Category 1	1.25
Category 2	1.00
Category 3	0.75
Category 4	0.50

Aggregate Experience Score of a Bidder shall be sum total of experience score of each Eligible Project of the contractor computed as per the above formula.

The proposed marking system for the Development / Construction Experience:

Sl. No.	Criteria	Maximum Marks
1	Development / Construction Experience	
	Aggregate Experience Score up to and including 200	16
	Aggregate Experience Score over 200 up to and including 250	19
	Aggregate Experience Score over 250 up to and including 300	22
	Aggregate Experience Score over 300	25
2	Net Worth: Marks will be allotted based on average net-worth of the Bidder across last three 3 completed financial years	
	Equal to or over BDT 100,00,00,000 (BDT One Hundred Crore) up to and including BDT 125,00,00,000 (BDT One Hundred and Twenty Five Crore)	9
	Over BDT 125,00,00,000 (BDT One Hundred and Twenty Five Crore) up to and including BDT 150,00,00,000 (BDT One Hundred and Fifty Crore)	11
	Over BDT 150,00,00,000 (BDT One Hundred and Fifty Crore) up to and including BDT 175,00,00,000 (BDT One Hundred and Seventy Five Crore)	13
	Over BDT 175,00,00,000 (BDT One Hundred and Seventy Five Crore)	15
3	Free Cash Flow towards Equity (FCFE) Marks will be allotted based on average FCFE of the Bidder across last three 3 completed financial years	
	Equal to or over BDT 25,00,00,000 (BDT Twenty Five Crore) up to and including BDT 30,00,00,000 (BDT Thirty Crore)	7
	Over BDT 30,00,00,000 (BDT Thirty Crore) up to and including BDT 40,00,00,000 (BDT Forty Crore)	8
	Over BDT 40,00,00,000 (BDT Forty Crore) up to and including BDT 50,00,00,000 (BDT Fifty Crore)	9
	Over BDT 50,00,00,000 (BDT Fifty Crore)	10

Evaluation of Financial Bid:

The Bidders whose Technical Bids pass the test of responsiveness and satisfy the Minimum Eligibility Criteria, will have their Financial Bids opened and evaluated. The Bid Variable, for financial evaluation under this IFB, shall be the Total Upfront Premium quoted by the Bidder. The Bidder with the highest Total Upfront Premium will be given a financial score (S_F) of 50, and the financial score (S_F) of other Financial Bids will be computed as follows:

$$S_F = 50 \times F / F_M$$

Where,

- F = The Total Upfront Premium in the Financial Bid of the Bidder being evaluated
- F_M = Highest Total Upfront Premium among the Financial Bids of the technically-qualified Bidders

Combined Evaluation including Technical and Financial score:

The total score of the bidders (S) shall be sum of their combined technical scores (S_T) and financial scores (S_F) : $S = S_T + S_F$

The Bidder scoring the highest combined total score (S) shall be selected as the Preferred Bidder for the Project.

12. Annexures

12. Annexures

- 12.1 Annexure 1: Topographic Report**
- 12.2 Annexure 2: Soil Investigation Report**
- 12.3 Annexure 3: Terms of Reference for EIA**
- 12.4 Annexure 4: Social Survey Questionnaire**
- 12.5 Annexure 5: Social Survey datasheet**

12.1 Annexure 1: Topographic Report

Table of Content

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4	Methodology	02
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	5.1 Findings of the Visual Observations	03
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Annexure

SL No	Topic
Annexure - A	Detail Topographic Map
Annexure - B	Mouza Map Superimposed on Topographic Map
Annexure - C	Cross sectional Map of North to South Direction
Annexure - D	Cross sectional Map of East to West Direction

1. Introduction

Bangladesh Economic Zones Authority (BEZA) aims to establish economic zones in all potential areas in Bangladesh including backward and underdeveloped regions with a view to encouraging rapid economic development through increase and diversification of industry, employment, production and export.

As a part of the vision BEZA wants to develop a economic zone at Jamalpur Sadar Upazila in district. Ernst & Young LLP (India) has been appointed by Bangladesh Economic Zones Authority (BEZA) for conducting feasibility study of the Jamalpur Economic Zone development project. Topographic survey of the project land area of approximately 443 acres was carried out from 5 october 2016 to 15 october 2016.

As a part of feasibility study, IRG Development Services Limited (IRGDSL), a local consulting firm has been appointed by Ernst & Young LLP (India) to carry out the topographic survey of the project area.

2. Scope of Works

The scope of works of the topographic survey is as follows:

1. Collection of necessary data from filed survey and secondary sources.
2. Preparation of topographic map
3. Preparation of topographic report.
4. Preparation of Superimposed Mouza Map on Topographic Map
5. Preparation of Cross sectional Drawings

3. Project Location

The project is located at Jamalpur Sadar Upazila in Jamalpur District (24.789555 N, 89.927695 E). Location Map of the project shown in figure 1 below:

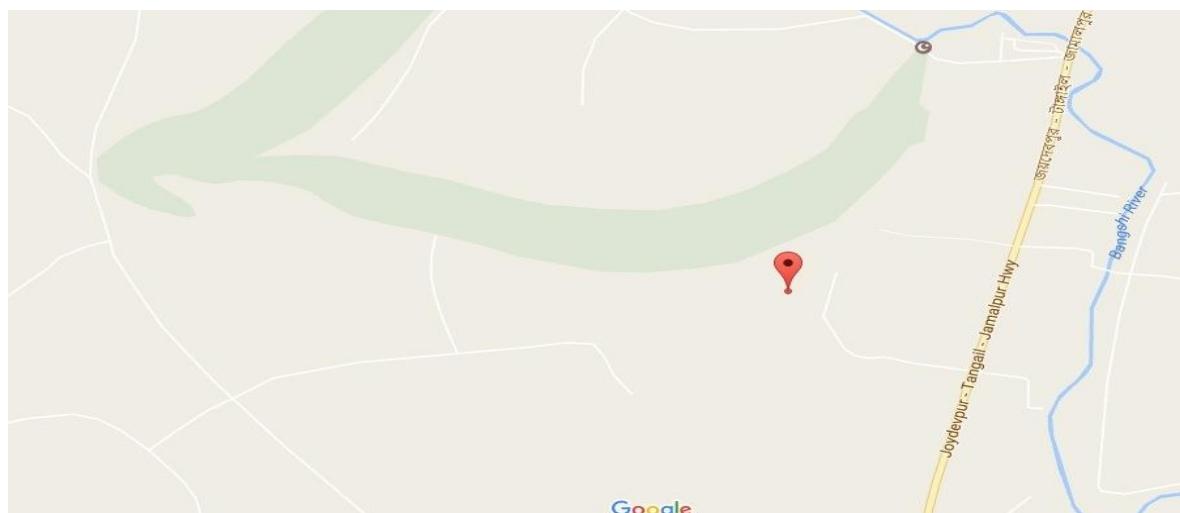


Fig. 01: Location Map of Jamalpur Economic Zone

4. Methodology

The topographical survey was carried out keeping necessary TBM, FBM or Control Points and following the methodology and controls described as below:

4.1 Working Grids

To execute the field survey the project area was divided into the squares of 25m X 25m by fixing Northing and easting at 25m center to center.

All the data taken is based on the N E Z as

- N - Northing
- E – Easting
- Z - Leveling / Elevation

4.2 Instrument Used

The entire topographic survey was carried out with the help of latest survey instrument.

- i. The site survey was carried out with the instrument Total Station Kolida which gives high accuracy.
- ii. Leveling was carried out with the instrument Level Instrument Pentex which produces high accuracy.

4.3 Leveling

To find out the nearest to picture of the levels of the exiting ground the working has done the Grid interval of 100 meters. Using level instrument (**Pentex**) the contour readings are made and then shifted to the drawing. Some of the important digital Control points found / fixed are as follows.

4.4 BENCH MARK

A benchmark is a point of reference by which something can be measured. In surveying, a "bench mark" (two words) is a post or other permanent mark established at a known elevation that is used as the basis for measuring the elevation of other topographical points. Simply, It is the reference level fixed to define the relative heights and depressions at various locations of the area under study.

a) Locations of FBM & TBM

The FBM & TBM (Fundamental bench mark & temporary bench mark) are carried from SOB (Survey of Bangladesh) bench mark; it is almost 500m away from the project site and is located at Near Agrani Bank, Jamtali Bazar, Jamalpur.

b) Fixing of FBM & TBM in project area

- After the observation of North Star and level readings of FBM & TBM as by Survey of Bangladesh, the coordinates have been shifted to the project area by the GPS.
- In the project site Five Control Points are established.
- Then the leveling is done by using the leveling instrument.

Note: All leveling work has been based on **Mean Sea Level** extracted from BM established by Survey of Bangladesh (SOB).

4.5 Visual Observations

As part of the topographic survey visual observations of the proposed project land area i.e; any depression, undulation, ground elevation, ditches etc and also the existing physical features i.e; homestead areas, trees, electricity line, underground pipe line, roads etc was made.

5. Findings of the Topographic Survey

5.1 Findings of the visual observations

Whole of the project area was found to be nearly flat. No major differences were found in the levels found in the project land part. No major ditches, depression or heaps are observed except the Beel named Bamui.

Some kinds of trees are present in the Project area. Some homestead areas were observed within and outside of the project boundary area & other topographical elements are located at different locations. The existing flexible pavement is at the eastern side of Project Boundary which is Called (Dhaka - Jamalpur Highway).

5.2 Features in the Project Area

Area:

Total project area is calculated as 17,92,797.86 square meter which can be segregated as project land area, Beel area and the homestead areas. Segregation of the total project area has been provided in table 1. Below;

Table 1: Segregation of the total project area

Area Type	Sq. m	Sq. ft	Decimal	Katha	Bigha	Acre
Project Land part (A)	1303211.229	14022552.82	32191.35	19475.76	973.79	321.91
Beel Part	406318	4371990.44	10036.71	6072.20	303.60	100.36
Homestead (C 1)	69363.83	7463.54.89	1713.39	1036.60	51.83	17.13
Homestead (C 2)	11894.00	127979.51	293.80	177.74	8.89	2.95
Homestead (C 3)	2681.30	28850.79	66.23	40.07	2.00	0.66
Total					1340.11	443.01

Existing Structures in the Project Area:

There are some structures in the three homestead areas as indicated in the topographic map which is attached in **Annex A**.

Plants / Trees:

There are some trees most of them are located in the homestead areas as shown in the topographic map. Plants and trees are of mango, jackfruit and many wooden trees.

Special Features in the project area:

The Bamui Beel of 100.36 acre area is the major special feature within the project boundary. Other features like Electric poles; roads, etc are located along the boundary line with the main highway.

5.3 Features Surroundings of the Project Location Area

Location:

The project area is located at 18km North side near Jamalpur Sadar.

North / East Features:

The project area is mainly surrounded by paddy lands. The features of the around the projects as below:

North Side - Homestead area

South Side - Paddy land

East Side - Homestead area and Dhaka to Jamalpur Highway Road

West Side - Paddy Land

6. Explanations of the Topographic Map

- a) *The drawings are self explanatory:* yet following details may help to understand the drawings more easily.
- b) *Software used:* MS CAD & Auto CAD 2010 have been used for the preparation of topographic survey drawings.
- c) *Contours:* Nil
- d) *Legend:* The legend containing all relevant symbols is attached.
- e) *Coordinates:* Each northing and easting are setup in different place of Project area as shown in the drawing
- f) *Scale Factor:* Scale factor used is 1:1000 & 1:500

12.2 Annexure 2: Soil Investigation Report

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ANNEXURES

- Annex -1 Bore hole location map
- Annex -2 Bore logs
- Annex-3 Grain Size Distribution
- Annex-4 Direct Shear Test
- Annex-5 Abstract & Laboratory Test (Soil Characteristics)
- Annex-6 Seismic Zoning Map

1. Introduction:

This report contains the results of field investigation and laboratory tests which were carried out on the subsurface soils of the site Bangladesh Economic Zone Authority (BEZA) under Proposed Development Economic Zone in Jamalpur.

Particulars of the borehole number and drilling of the boreholes at the site are summarized below:

Table 01: Particulars of the borehole number and drilling of the boreholes at the site

Bore Hole No	Boring Depth (m)	No. of DS Collection
BH-1	24	16
BH-2	24	16
BH-3	24	16
BH-4	24	16
BH-5	24	16
BH-6	24	16
BH-7	24	16

A total of 07 (Seven) boreholes were sunk at the site to the depth of about 24.0 m from the existing ground level as detailed in the borehole logs of Fig. 2.

This report consists of various relevant data, drawings, bore logs, curves etc. for entire satisfaction of the design Engineer. Discussion and recommendation of probable type of foundations have also been included; however, design engineer will select the suitable type of foundation. Subsequent sections of this report contain descriptions of the field exploration and laboratory testing results and general sub-surface conditions.

2. Objectives of Investigation:

The soil is a highly complex material. It differs from other conventional structural materials. The primary objectives of this study were to gather information on sub-surface conditions at the site and develop criteria to aid in the design and construction of the proposed structure. The principal objectives were accomplished by;

- 1) Drilling test borings to determine soil stratigraphy and to obtain samples for laboratory testing.
- 2) Performing laboratory tests to determine physical characteristics of the soil.
- 3) Performing engineering analysis to developed design guide line for recommendation.
- 4) Establishment of ground water level.

3. Scope of Works:

This report covers the technical requirement for the sub-soil investigation in the proposed site. The scope of work consists of the following field and laboratory works;

- a) Reconnaissance survey of the soil to fix up the actual point of borehole.

- b) Drilling of 07 (Seven) nos. boreholes up to the maximum depth 24.0 m by Hand drilling of wash boring method.
- c) Findings the ground water level.
- d) Execution of standard penetration test (SPT) and collection of disturbed and undisturbed soil samples.
- e) Execution of laboratory test on selected soil samples.

4. Field Investigations:

a) Boring & Recording of Sub-Soil Stratification:

Sub-surface condition were determined by of 07 (Seven) nos. boreholes up to the maximum depth 24.0 m soil borings drilled by wash boring method. Boring was executed with 1.5 m long steel casing. In this method drilling bit used for cutting soil is connected to 50 mm outer diameter and 35 mm inner dia drill rod through which drilling mud is pumped. The mud slurry flows out at high pressure from the base of the drilling bit and carries cuttings of the soil to the surface.

b) Execution of Standard Penetration Test (SPT):

Standard penetration tests (SPT) were performed at the interval of 1.5 m for the whole depth of boring in all the bore holes. Tests were executed by using a split-spoon sampler of 35 mm internal diameter and a 63.5 kg hammer falling freely from a constant height of 76cm on the drill rod. Numbers of blows produce the penetration are recorded in three different 15cm intervals.

The 'N' values were counted as the summation of the number of blows required in the 2nd and 3rd 15cm of penetration against the respective interval of depth.

c) Extraction of Disturbed Soil Sample:

Disturbed soil samples were collected at every 1.50 meter interval. Cohesion less soils were sampled with the split spoon sampler in accordance with ASTM D1586 standard procedure. Each sample was removed from the sampler in the field, carefully examined and then classified by **Al- Mayeda Survey Consultants** Geo-technical technician. These soil samples were duly classified in situ in order to construct a depth wise stratification's chart of borehole and to evaluate the overall sub-soil picture of the investigated site.

d) Recording of Ground Water Level:

Ground water levels along the project alignment were measured during drilling operation and 24 hours afterward. Specific ground water readings are indicated on the boring logs. It is noted, however, that ground water levels may fluctuate seasonally, climatically and due to other factors not evident at the time of field exploration.

5. Laboratory Testing:

Selected soil samples were tested in the laboratory to determined applicable physical and engineering properties. The laboratory program included;

- 1) Grain size analysis (Sieve & Hydrometer)
- 2) Moisture content Test

- 3) Specific Gravity Test
- 4) Dry Unit Weight
- 5) Wet Unit Weight
- 6) Atterberg's Limit Test (Liquid & Plastic Limit)
- 7) Chemical Test
- 8) Direct Shear Test

Grain size analysis, Atterberg's limits tests were carried out to ascertain the detail composition of the soil. These tests also help in classifying the soil properly for geological and geo-technical interpretation. The Unconfined Compression test and direct shear tests were performed to evaluate the shear characteristics and friction values of the sub-soil formation.

6. Description of Soil Composition:

- a) The following terms are used in this report for description of soil composition;

Trace - 1 % to 10 %

Little - 10 % to 20 %

Some - 20 % to 35 %

- b) On the basis of N-Values the relative density/consistency of soil formation may be said to very, as very loose, loose, medium, dense and very dense for non-cohesive soil and very soft, medium, stiff, very stiff and hard for cohesive soil according to the following correlation table.

- c) Based on N-values other very useful soil parameters may be obtained from the correlation chart given by different research works. Two such useful correlation for cohesive and non-cohesive soil after prof. K.Terzaghi are given in table-1 & table-2

7. Calculation of Soil Mechanics Parameters:

The bearing capacity of shallow and deep foundation and other foundation parameters were evaluated using field and laboratory tests. For cohesion less soil and for instances where UD samples could not be collected, the field SPT values after necessary correction were used to obtain soil constants like cohesion(C_c), angle of internal friction(phi) and unit weight(y).

For silty fine sand, where SPT is more than 15, the correction of SPT values had been done using following equation;

$$N = 15 + 0.5(N-15)$$

The empirical correlations of soil properties with SPT are given below:

For Cohesion less Soil

SPT N Value	Approx phi	Density Index	Description	Density T/cu/Cu m
0 - 4	25 - 30	0	Very loose	1.12-1.60
4	27 - 32	15	Loose	1.44-1.84
10	30 - 35	35	Medium	1.76-2.08
30	35 - 40	65	Dense	1.76-2.24
50	38 - 43	85	Dense	2.08-2.40

For Cohesive Soil

SPT N Value	Qu t/sq.m	Density T/cu. m	Description
0	0	-	Very soft
2	2.5	1.60 - 1.92	Soft
4	5.0	1.76 - 2.08	Medium
8	10.0	1.76 - 2.08	Stiff
16	20.0	1.92 - 2.24	Very Stiff
32	40.0	1.92 - 2.24	Hard

8. Determination of Bearing Capacity of Soil for Footing:

The SPT is widely used to obtain the allowable bearing capacity values in the following general equation for sandy soil (for 25 mm settlement)

$$Q_a = N/F_1 K_d \quad B < F_4$$

$$Q_a = N/F_2 (B + F_3/B)^2 K_d \quad B > F_4$$

Where,

- q_a = allowable bearing capacity, psf
- N = SPT Value
- B = width of footing
- D = depth of footing
- $KD = 1 + 0.33 D/B < 1.33$
- $F_1 = 2.5$ (F factors)
- $F_2 = 4$
- $F_3 = 1$
- $F_4 = 4$

Terzaghi has expressed the bearing capacity values in the following general equation (Terzaghi, 1942; Meyerhof, 1951)

$$q_{ult} = 1.3 c N_c + \gamma D N_q + 0.6 \gamma B N_y$$

Where,

- q_{ult} = ultimate bearing capacity, psf
- c = cohesion of soil, psf
- γ = moist unit weight of soil pcf
- D = depth of foundation
- B = width of footing
- N_c, N_q, N_y = bearing capacity factors

9. Earthquake & Seismicity:

Bangladesh has been divided into three Seismic Zones namely Zone-1, Zone-2 and Zone-3, with values of Seismic Zoning coefficient, z of 0.075, 0.15 and 0.25 respectively. According to this Zoning Map the Project site falls in the Zone-3.

10. Determination of Settlement of Soil:

The magnitude and rate of settlement due to consolidation of normally Consolidated soils can be calculated by the following equations (Terzaghi, 1943)

$$S = C_c H / (1 + e_0) \log_{10} (P_0 + \Delta P) / P_0$$

Where,

S = settlement due to consolidation.

C_c = compression index to be determined from the results of consolidation tests.

H = thickness of the layer. If the soil is drained on top and bottom as in the consolidation test, half-thickness should be used.

e_0 = natural void ratio of the soil in place.

P_o = weight of soil above mid-height of the consolidating layer.

ΔP = consolidation pressure = net additional pressure

11. Determination of Pile Capacity (a single pile):

The load applied to a single pile is carried jointly by the soil beneath the tip of the pile and by soil around the shaft, and the maximum load that the pile can support the pile capacity is

$$Q = AP^*E_b + (f_s \pi D^* L)$$

Where

Q = pile capacity

E_b = end bearing capacity

f_s = shaft resistance (skin friction)

A_p = area of pile point

D = diameter of pile

L = length of pile

End bearing:

$$\begin{aligned} E_b &= 0.6 \times N \text{ tsf} < 45.0 \text{ tsf (for granular soil)} * \\ &= A_p \times 9 c \text{ (for cohesive soil)} \end{aligned}$$

Where

c = cohesion of soil beneath pile point (or s_u)

N = standard penetration test value

Skin friction:

$$\begin{aligned} Q_s &= \alpha c \text{ (for cohesive soil)} \\ &= N/6 \text{ in ton/m}^2 \text{ (for granular soil)} \end{aligned}$$

Where

α = adhesion factor

c = shearing strength

* (Ref. Drilled Shafts, Manual, Student Workbook, Volume-1, National highway Institute,

12. Conclusion & Recommendation:

From the field and confirmatory laboratory test results, it can be concluded as follows;

The sub-soil formation encountered at the proposed site is homogeneous. The sequence of lithological composition as well as consistency of the soil at different depths has been depicted in the respective bore logs in Fig.2.

However; we enclosed the allowable bearing capacity of soil for footing and pile with this report in Table - 3 & Table - 4.1 to 4.7 & 5.1 to 5.7 considering the magnitude of the structure, the structural designer may put his justice to select the suitable type and depth of foundation.

This report consists of various relevant data, drawings, bore logs, curves etc. for entire satisfaction of the design Engineer. However, design engineer will select the suitable type of foundation. Subsequent sections of this report contain descriptions of the field exploration and laboratory testing results and general sub-surface conditions.

Engr. Md. Jahirul Islam
B.Sc.Engg. (Civil)
Geotechnical Engineer
Al- Mayeda Survey Consultants

Engr. Mir.Zakir Hossain
M.Sc.Engg.(Civil)
M-12116, IEB

TABLE-1

**Correlation between standard penetration resistance and
different soil parameters for cohesionless soil**

Compactness	very loose	loose	medium	dense	very dense
Relative density	0% to 15 %	15% to 35 %	35% to 65 %	65% to 85 %	85% to 100 %
SPT 'N'	0 to 4	4 to 10	10 to 30	30 to 50	>50
Angle of internal friction ϕ	28	28 to 30	30 to 36	36 to 41	
Unit weight. (moist) pcf	<100+	95 to 125	110 to 130	110 to 140	>130
Submerged unit weight pcf.	< 60	55 to 65	60 to 70	65 to 85	> 75

TABLE-2

**Correlation between standard penetration resistance and
different soil parameters for cohesive soil**

Consistency	very soft	soft	medium	stiff	very stiff
Unconfined comp. Test in tsf	0 - 0.25	0.25 - 0.50	0.50 - 1.00	1.00 - 2.00	2.00 - 4.00
SPT 'N'	0 to 2	2 to 4	4 to 8	8 to 16	16 to 32
Unit weight (Saturated) in pcf	100	100 - 120	110 - 130	120 - 140	130 +

(Ref. FOUNDATION DESIGN. Wayne C. Teng. Page 12 & 15)

TABLE-3

ALLOWABLE BERAING CAPACITY (Q_a) OF SOIL FOR FOOTING IN TSF

Client : BEZA
Project : Proposed Development Economic Zone in Jamalpur

Depth in (m)	Boring-1				Boring-2				Boring-3				Boring-4			
	ALLOWABLE BEARING CAPACITY IN TSF															
	C	Nc	Y'	Q _a	C	Nc	Y'	Q _a	C	Nc	Y'	Q _a	C/N	Nc	Y'	Q _a
1.50	0.3125	5.7	0.0288	0.8199	0.1875	5.7	0.0263	0.5070	0.1875	5.7	0.0263	0.5070	0.3750	5.7	0.0313	0.9784
3.00	0.4375	5.7	0.0313	1.1850	0.3125	5.7	0.0288	0.8679	0.3125	5.7	0.0288	0.7815	0.4375	5.7	0.0350	1.1973
4.50	0.5000	5.7	0.0328	1.3990	0.3750	5.7	0.0303	1.0778	0.2500	5.7	0.0278	0.7565	1.1250	5.7	0.0350	0.2367
	FACTOR OF SAFETY = 3.0															

Average Bearing Capacity

at depth 1.50m = 0.70305 tsf
 at depth 3.00m = 1.0079 tsf
 at depth 4.50m = 0.86749 tsf

Ref. Foundation Design - Wayne C. Teng page-58

Ref. Foundation Analysis & Design - Joseph E. Bowls Fifth Edition page-263, 2

TABLE-3

ALLOWABLE BERAING CAPACITY (Q_a) OF SOIL FOR FOOTING IN TSF

Client : BEZA
Project : Proposed Development Economic Zone in Jamalpur

Depth in (m)	Boring-5				Boring-6				Boring-7							
	ALLOWABLE BEARING CAPACITY IN TSF															
	C	Nc	Y'	Q _a	C	Nc	Y'	Q _a	C	Nc	Y'	Q _a				
1.50	0.2500	5.7	0.0278	0.6638	0.1250	5.7	0.0253	0.3509	0.1875	5.7	0.0263	0.5070				
3.00	0.3750	5.7	0.0303	1.0273	0.2500	5.7	0.0278	0.7102	0.3125	5.7	0.0288	0.7815				
4.50	0.5000	5.7	0.0328	1.3990	0.3750	5.7	0.0303	1.0778	0.4375	5.7	0.0313	1.2371				
	FACTOR OF SAFETY = 3.0															

Average Bearing Capacity

at depth 1.50m = 1.18374 tsf
 at depth 3.00m = 1.99791 tsf
 at depth 4.50m = 2.88913 tsf

Ref. Foundation Design - Wayne C. Teng page-58

Ref. Foundation Analysis & Design - Joseph E. Bowls Fifth Edition page-263, 2

Table-4.1

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-1

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	5	s			0.0774	3.0
3.0	7	s			0.1084	4.2
4.5	8	s			0.1239	4.8
6.0	10	s			0.1549	6.0
7.5	10	s			0.1549	6.0
9.0	11	s			0.1704	6.6
10.5	15	s			0.2323	9.0
12.0	26	s			0.4027	15.6
13.5	36	s			0.5576	21.6
15.0	42	s			0.6506	25.2
16.5	50	s			0.7745	30.0
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.2

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-2

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	3	c	0.1875	1.00	0.1875	1.7
3.0	5	c	0.3125	0.94	0.2930	2.8
4.5	6	c	0.3750	0.90	0.3375	3.4
6.0	13	s			0.2014	7.8
7.5	12	s			0.1859	7.2
9.0	19	s			0.2943	11.4
10.5	21	s			0.3253	12.6
12.0	30	s			0.4647	18.0
13.5	38	s			0.5886	22.8
15.0	50	s			0.7745	30.0
16.5	50	s			0.7745	30.0
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.3

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-3

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	3	c	0.1875	1.00	0.1875	1.7
3.0	5	c	0.3125	0.94	0.2930	2.8
4.5	4	s			0.0620	2.4
6.0	12	s			0.1859	7.2
7.5	15	s			0.2323	9.0
9.0	30	s			0.4647	18.0
10.5	34	s			0.5266	20.4
12.0	38	s			0.5886	22.8
13.5	45	s			0.6970	27.0
15.0	50	s			0.7745	30.0
16.5	50	s			0.7745	30.0
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.4

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-4

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	6	s			0.0929	3.6
3.0	7	s			0.1084	4.2
4.5	18	s			0.2788	10.8
6.0	21	s			0.3253	12.6
7.5	22	s			0.3408	13.2
9.0	12	s			0.1859	7.2
10.5	14	s			0.2169	8.4
12.0	36	s			0.5576	21.6
13.5	38	s			0.5886	22.8
15.0	45	s			0.6970	27.0
16.5	50	s			0.7745	30.0
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.5

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-5

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	4	s			0.0620	2.4
3.0	6	s			0.0929	3.6
4.5	8	s			0.1239	4.8
6.0	9	s			0.1394	5.4
7.5	11	s			0.1704	6.6
9.0	12	s			0.1859	7.2
10.5	13	s			0.2014	7.8
12.0	27	s			0.4182	16.2
13.5	30	s			0.4647	18.0
15.0	50	s			0.7745	30.0
16.5	50	s			0.7745	30.0
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.6

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-6

Depth in m	Avg. SPT Value	Sample type	Shearing strength in tsf	Alpha factor	Ultimate skin friction in tsf	Ultimate End Bearing (E_b) in tsf
0.0						
1.5	2	s			0.0310	1.2
3.0	4	s			0.0620	2.4
4.5	6	s			0.0929	3.6
6.0	9	s			0.1394	5.4
7.5	12	s			0.1859	7.2
9.0	13	s			0.2014	7.8
10.5	18	s			0.2788	10.8
12.0	26	s			0.4027	15.6
13.5	29	s			0.4492	17.4
15.0	36	s			0.5576	21.6
16.5	38	s			0.5886	22.8
18.0	50	s			0.7745	30.0
19.5	50	s			0.7745	30.0
21.0	50	s			0.7745	30.0
22.5	50	s			0.7745	30.0
24.0	50	s			0.7745	30.0

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-4.7

CHART FOR ULTIMATE SKIN FRICTION & END BEARING CAPACITY OF PILE IN TSF

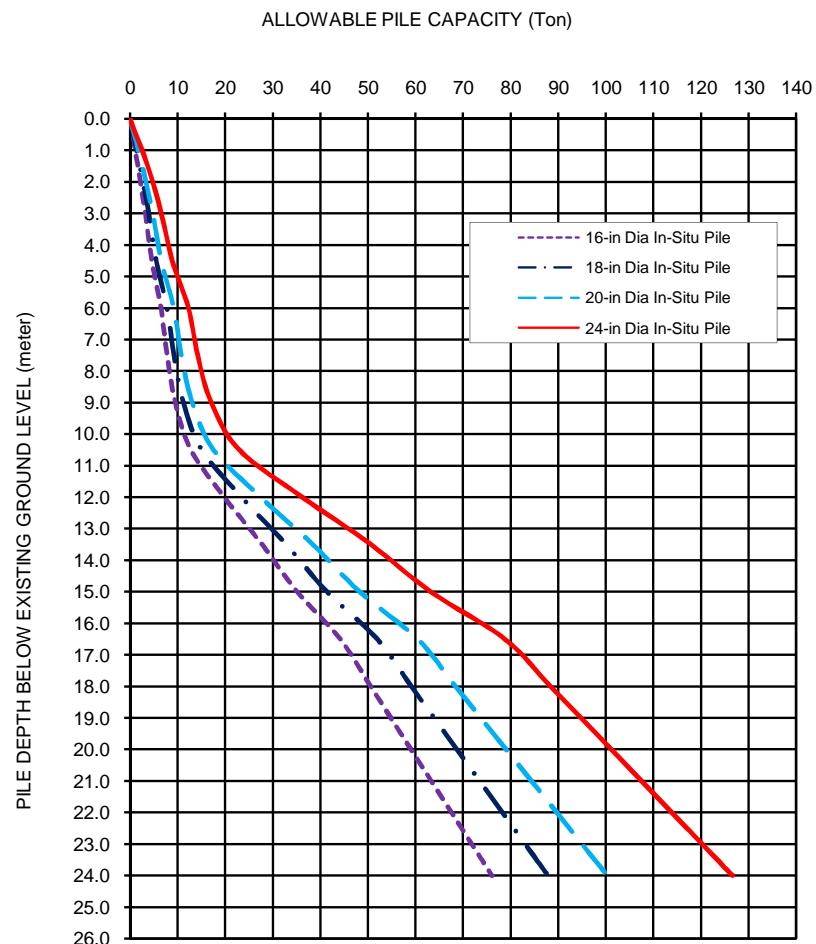
Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-7

Note :
Sample type (C) --- Clayey silt/Silty clay
Sample type (S) --- Silty sand/ Sandy silt
Sample type (O) --- Organic soil

Table-5.1
PILE DESIGN CHART
Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-1

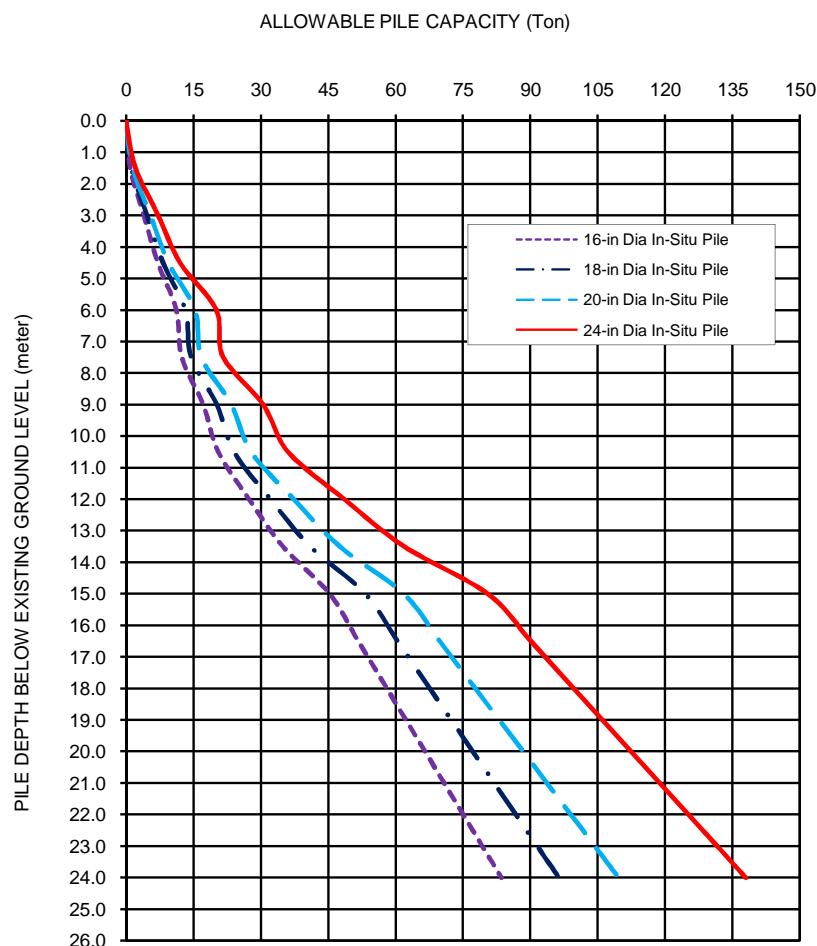


NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.2
PILE DESIGN CHART
Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-2

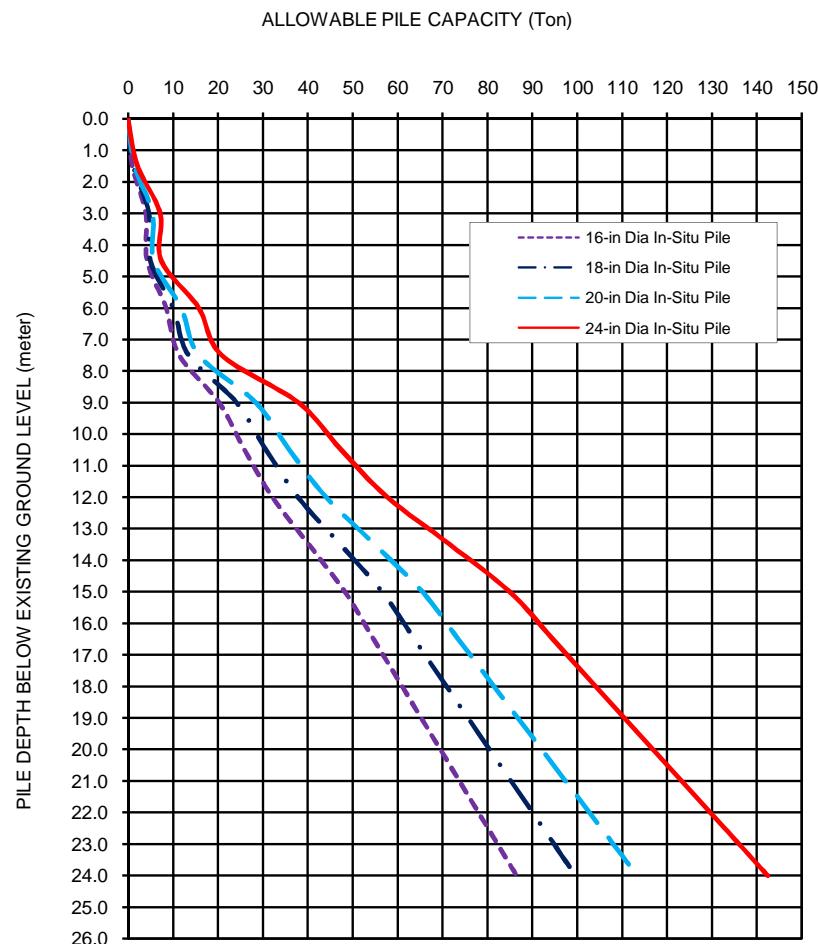


NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.3
PILE DESIGN CHART
Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-3



NOTES:

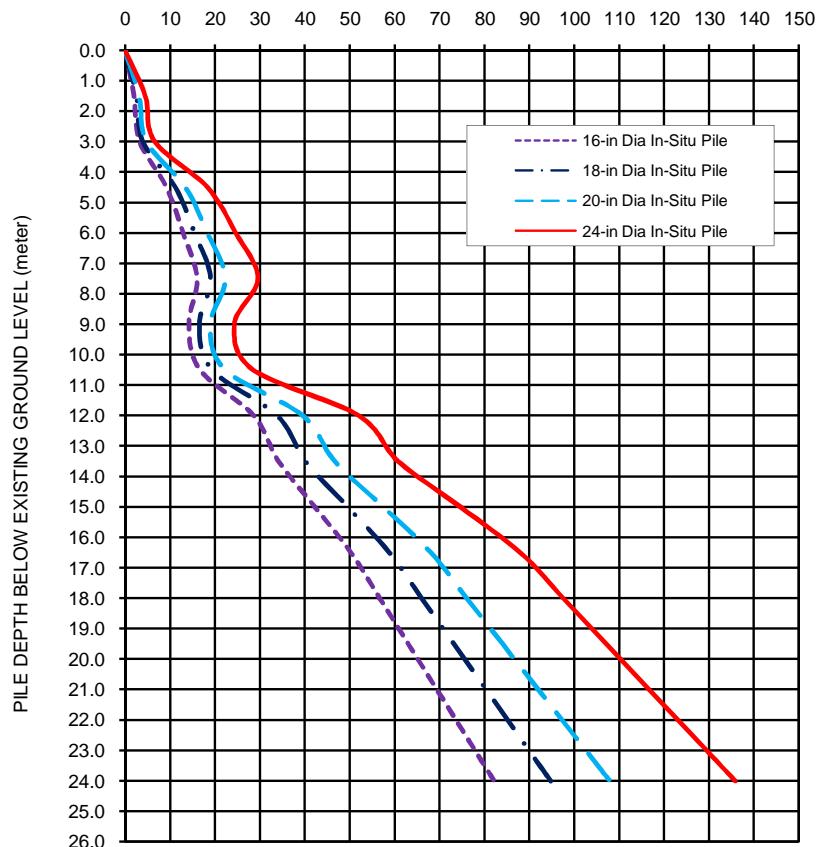
- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.4
PILE DESIGN CHART

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-4

AUTHORISED PILE CAPACITY (Ton)



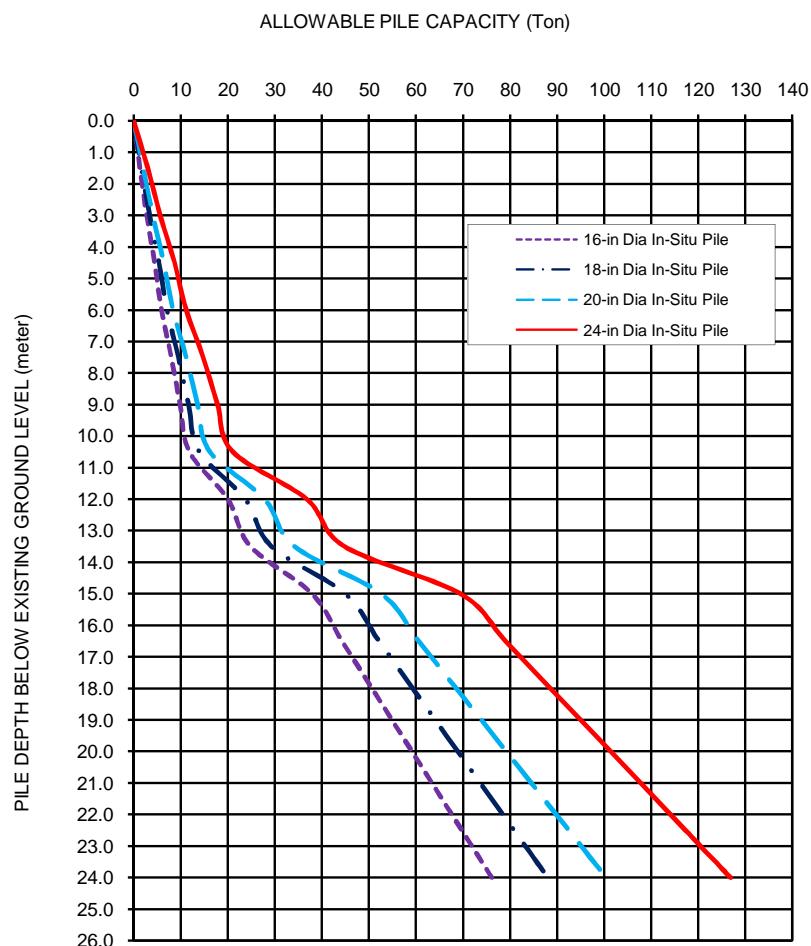
NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.5
PILE DESIGN CHART

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-5

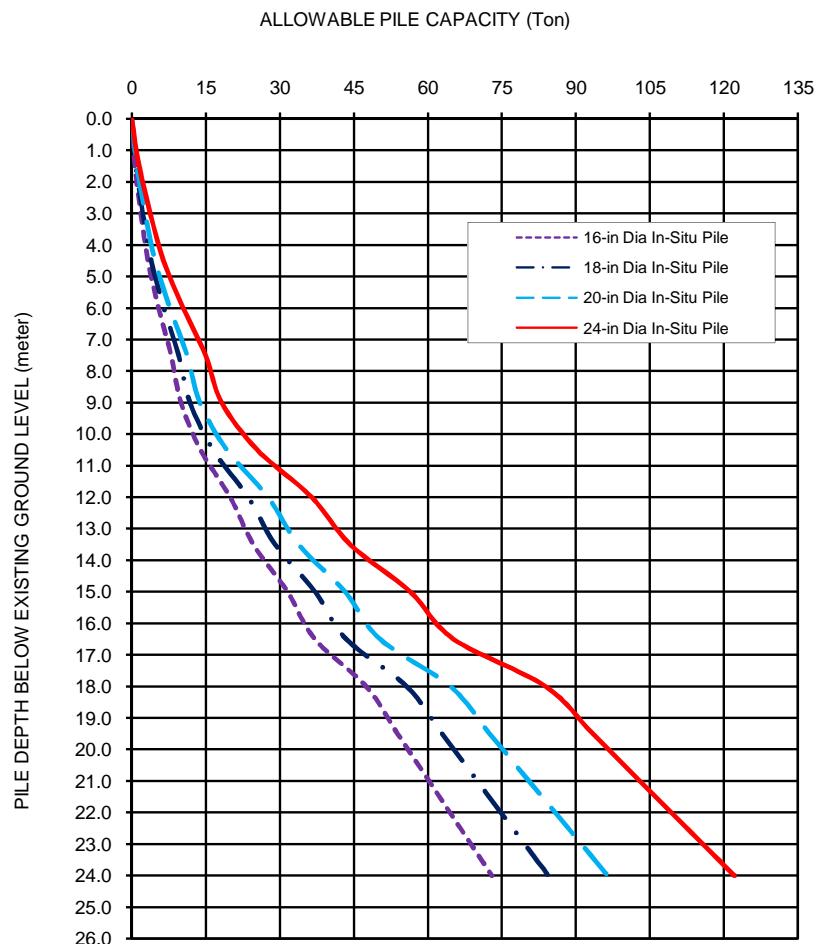


NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.6
PILE DESIGN CHART
Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

BH-6



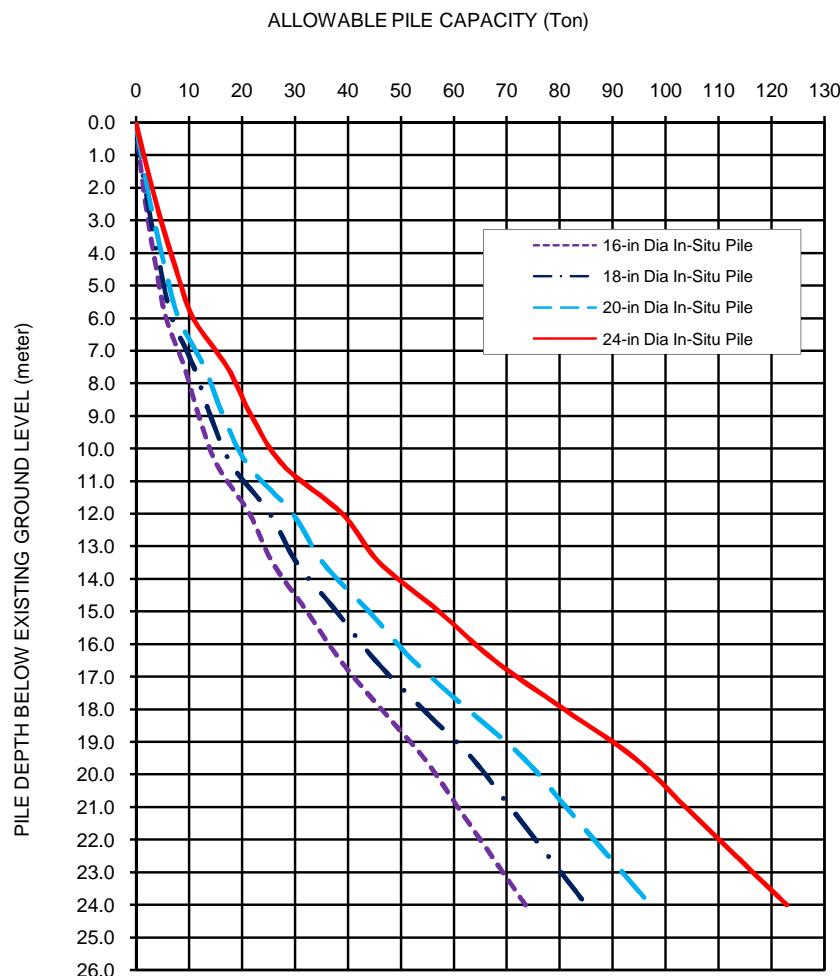
NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

Table-5.7
PILE DESIGN CHART

Client : BEZA
Project: Proposed Development Economic Zone in Jamalpur.

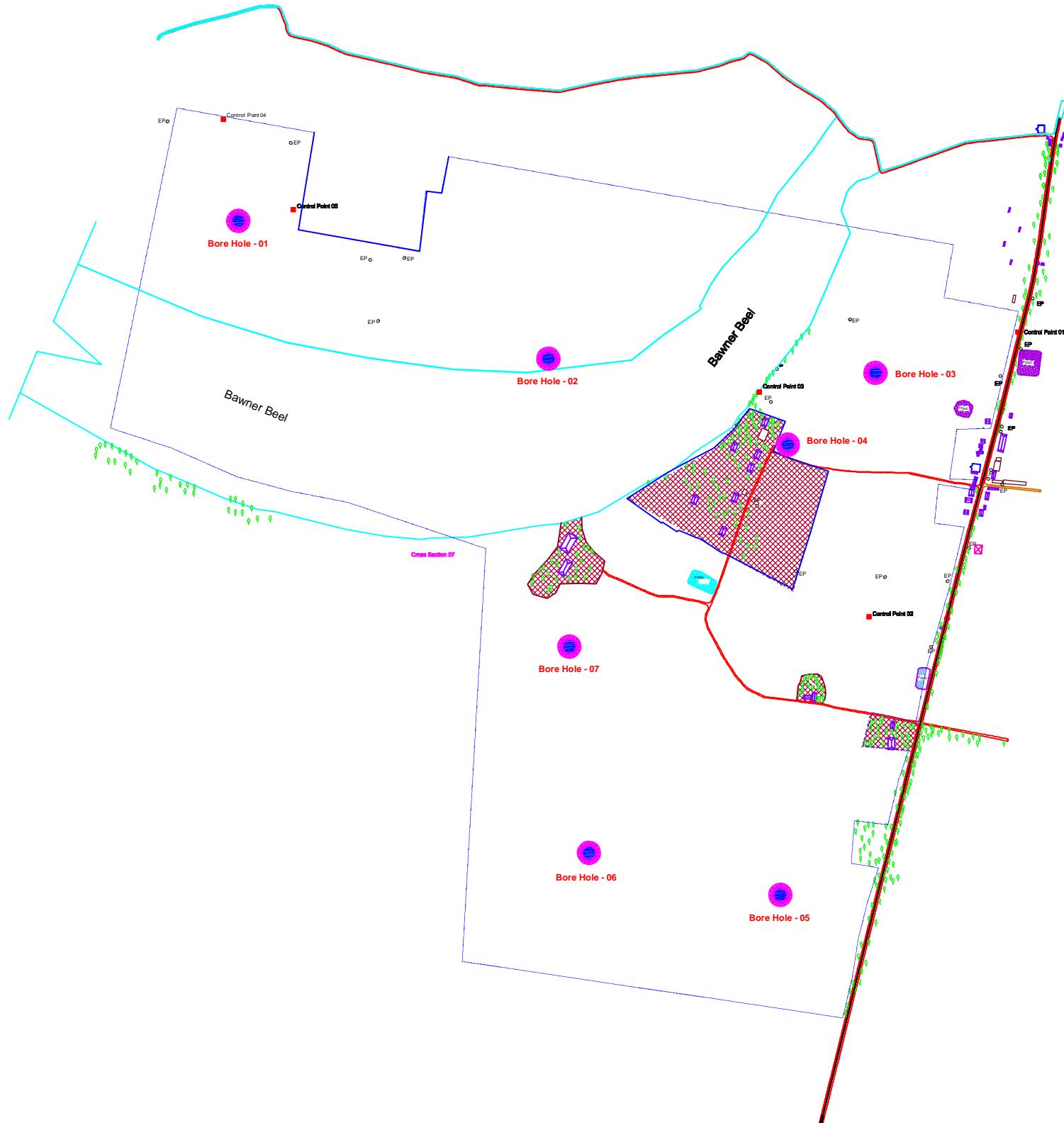
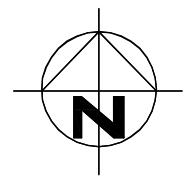
BH-7



NOTES:

- 1.0 The allowable axial compression loads shown in this figure include a minimum factor of safety (F.S) of 2.5 for both skin friction and end bearing.
- 2.0 The center to center spacings/distances for the piles should be equal to or greater than 2.5 times the pile diameter.
- 3.0 The pile caps should be extended beyond the outside face of exterior piles at least 6 inches, preferably 10 inches

ANNEX - 1: BORE HOLE LOCATION MAP



BORE HOLE LOCATION MAP

ANNEX - 2: BORE LOGS

RECORD OF BORING AND TESTING (BORE LOG)

Project : Proposed Development Economic Zone in Jamalpur.					Client : BEZA		
					Soil Strata Legend:		
Bore Hole No : BH 01		Ground Water Level (GWL) : 1.828m.Below			Sand	Peat / Organic	
Method of Boring : WASH		Date of Starting : 02/01/2017			Silt	Mica	
Boring Depth : 24.0m		Date of Completion : 02/01/2017			Clay	Disturb Sample (D)	
Location of Boring : Bot Tala, Jamalpur.					Grit/ Stone	Undisturb Sample (UD)	
Sample No.	Type of Sample	Stratification		Standard Penetration Test (SPT)			
		Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata			
D1		1	7.5m	Light Gray Medium Fine Silty Sand.			
UD1		2					
D2		3					
D3		4					
D4		5					
D5		6					
D6		7					
D7		8					
D8		9					
D9		10					
D10		11					
D11		12					
D12		13					
D13		14					
D14		15					
D15		16					
D16		17					
		18					
		19					
		20					
		21					
		22					
		23					
		24					
		25					
		Soil Strata Legend		SPT Intervals (meter)		N-Value	
						Graphical representation of N values	
						00 10 20 30 40 50 60	

RECORD OF BORING AND TESTING (BORE LOG)

RECORD OF BORING AND TESTING (BORE LOG)

Project : Proposed Development Economic Zone in Jamalpur.					Client : BEZA		
Bore Hole No : BH 03 Ground Water Level (GWL) : 2.26m.Below					Soil Strata Legend:		
Method of Boring : WASH Date of Starting : 03/01/2017					Sand	Peat / Organic	
Boring Depth : 24.0m Date of Completion : 03/01/2017					Silt	Mica	
Location of Boring : Bot Tala, Jamalpur.					Clay	Disturb Sample (D)	
					Grit/ Stone	Undisturb Sample (UD)	
Sample No.	Type of Sample	Stratification			Standard Penetration Test (SPT)		
		Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	SPT Intervals (meter)	N-Value
D1		1				1.5	
UD1		2				3	
D2		3		Gray Medium Clay Silt.		5	
D3		4				4	
D4		5				12	
D5		6		Gray Medium to Dense Fine Silty Sand.		15	
D6		7				30	
D7		8				34	
D8		9				38	
D9		10				45	
D10		11				50	
D11		12				50	
D12		13		Gray Dense Fine Silty Sand.		50	
D13		14				50	
D14		15				50	
D15		16				50	
D16		17				50	
		18				50	
		19				50	
		20				50	
		21				50	
		22				50	
		23				50	
		24				50	
		25					

RECORD OF BORING AND TESTING (BORE LOG)

Project : Proposed Development Economic Zone in Jamalpur.					Client : BEZA		
Bore Hole No : BH 04 Ground Water Level (GWL) : 2.13m.Below					Soil Strata Legend:		
Method of Boring : WASH Date of Starting : 03/01/2017					Sand	Peat / Organic	
Boring Depth : 24.0m Date of Completion : 03/01/2017					Silt	Mica	
Location of Boring : Bot Tala, Jamalpur.					Clay	Disturb Sample (D)	
					Grit/ Stone	Undisturb Sample (UD)	
Sample No.	Type of Sample	Stratification			Standard Penetration Test (SPT)		
		Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	SPT Intervals (meter)	N-Value
D1		1		Gray Medium Fine Silty Sand.		1.5	
UD1		2				6	
D2		3				7	
D3		4				18	
D4		5				21	
D5		6				22	
D6		7		Gray Medium to Dense Fine Silty Sand.		12.0	
D7		8				14	
D8		9				36	
D9		10				38	
D10		11				45	
D11		12				50	
D12		13		Gray Dense Fine Silty Sand.		50	
D13		14				50	
D14		15				50	
D15		16				50	
D16		17				50	
		18				50	
		19				50	
		20				50	
		21				50	
		22				50	
		23				50	
		24				50	
		25					

RECORD OF BORING AND TESTING (BORE LOG)

Project : Proposed Development Economic Zone in Jamalpur.					Client : BEZA		
Bore Hole No : BH 05 Ground Water Level (GWL) : 2.21m.Below					Soil Strata Legend:		
Method of Boring : WASH Date of Starting : 04/01/2017					Sand	Peat / Organic	
Boring Depth : 24.0m Date of Completion : 04/01/2017					Silt	Mica	
Location of Boring : Bot Tala, Jamalpur.					Clay	Disturb Sample (D)	
					Grit/ Stone	Undisturb Sample (UD)	
Sample No.	Type of Sample	Stratification			Standard Penetration Test (SPT)		
		Depth below E.G.L (m)	Thickness (m)	Description of Soil Strata	Soil Strata Legend	SPT Intervals (meter)	N - Value
D1		1				1.5	
UD1		2				4	
D2		3		Gray Medium Clay Silt.		6	
D3		4				8	
D4		5				9	
D5		6				11	
D6		7		Gray Medium to Dense Fine Silty Sand.		12	
D7		8				13	
D8		9				27	
D9		10				30	
D10		11				50	
D11		12				50	
D12		13		Gray Dense Fine Silty Sand.		50	
D13		14				50	
D14		15				50	
D15		16				50	
D16		17				50	
		18				50	
		19				50	
		20				50	
		21				50	
		22				50	
		23				50	
		24				50	
		25					

RECORD OF BORING AND TESTING (BORE LOG)

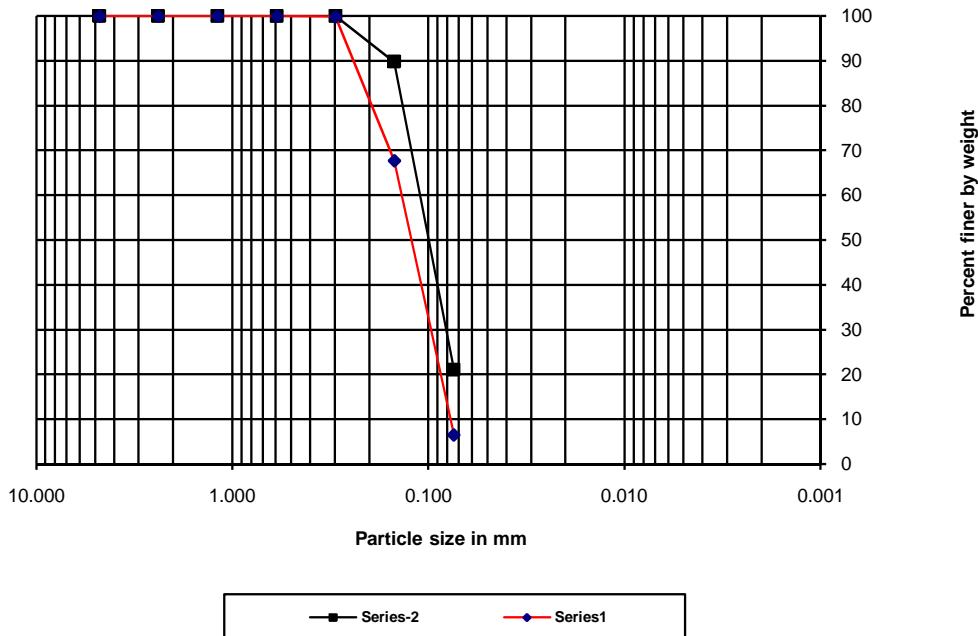
RECORD OF BORING AND TESTING (BORE LOG)

ANNEX - 3: GRAIN SIZE DISTRIBUTION

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-1

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS DEPTH-1.50m	C _U = D ₆₀ /D ₁₀ = 1.90 C _C = (D ₃₀) ² /(D ₆₀ xD ₁₀) = 0.844	
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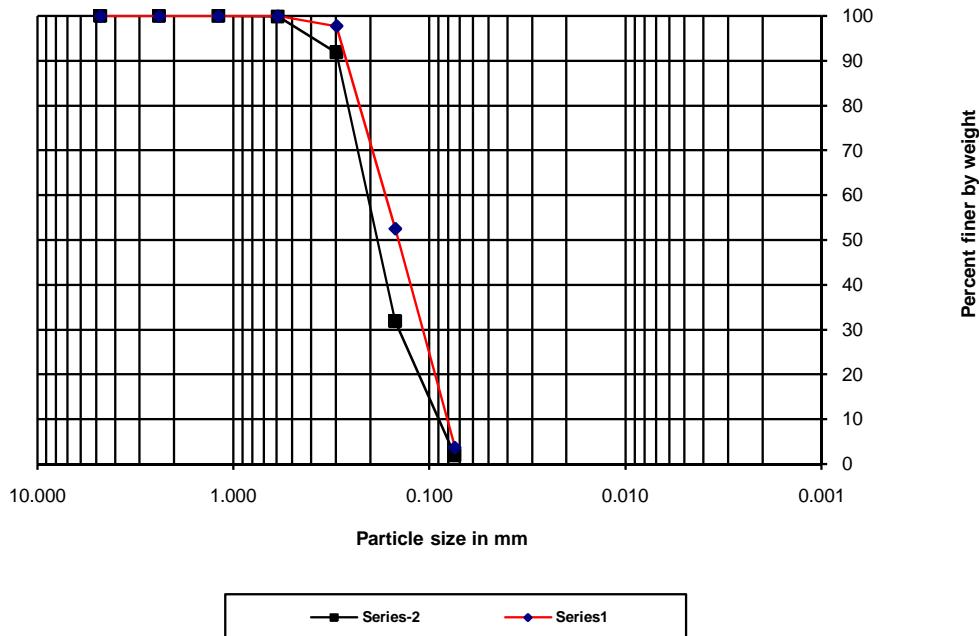
Series-2

DS DEPTH-6.00m	C _U = D ₆₀ /D ₁₀ = 1.714 C _C = (D ₃₀) ² /(D ₆₀ xD ₁₀) = 0.762	
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AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-1

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS	$D_{10} = 0.080$	$C_U = D_{60}/D_{10} = 2.13$
DEPTH-10.50m	$D_{30} = 0.110$	
	$D_{60} = 0.170$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.89$

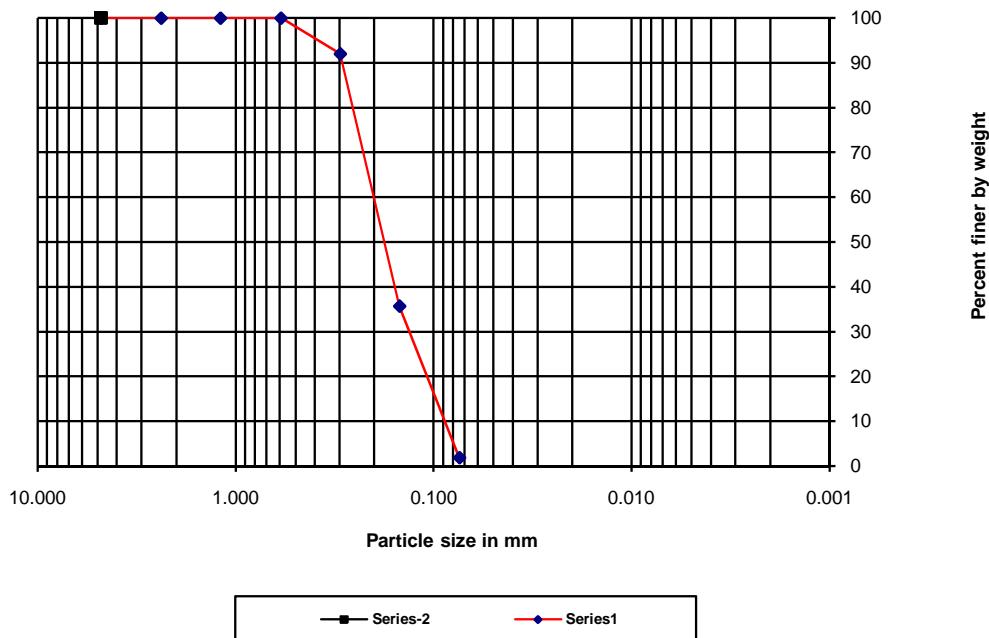
Series-2

DS	$D_{10} = 0.09$	$C_U = D_{60}/D_{10} = 2.222$
DEPTH-16.50m	$D_{30} = 0.150$	
	$D_{60} = 0.2$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.25$

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-1

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

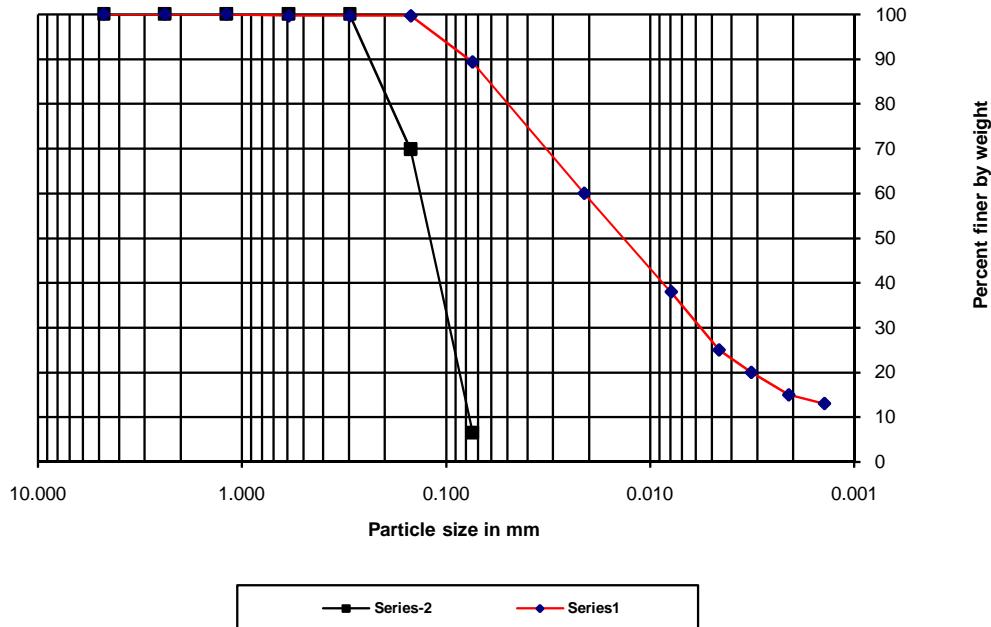


Series-1			
DS	$D_{10} = 0.080$	$C_U = D_{60}/D_{10}$	= 2.50
DEPTH-21.0m	$D_{30} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 1.225
	$D_{60} = 0.200$		

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-2

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



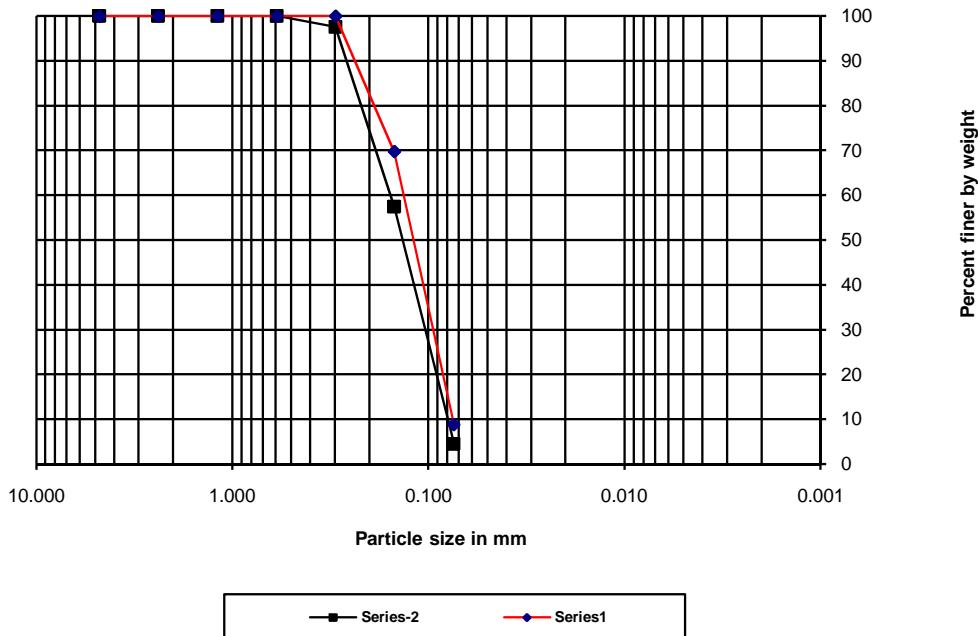
Series-1			
DS	$D_{10} = 0.001$	$C_U = D_{60}/D_{10} = 20.00$	
DEPTH-1.50m	$D_{30} = 0.005$		
	$D_{60} = 0.020$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.152$	

Series-2			
DS	$D_{10} = 0.079$	$C_U = D_{60}/D_{10} = 1.772$	
DEPTH-7.50m	$D_{30} = 0.10$		
	$D_{60} = 0.14$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.868$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-2

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS	$D_{10} = 0.075$	$C_U = D_{60}/D_{10} = 1.87$
DEPTH-9.00m	$D_{30} = 0.095$	
	$D_{60} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.86$

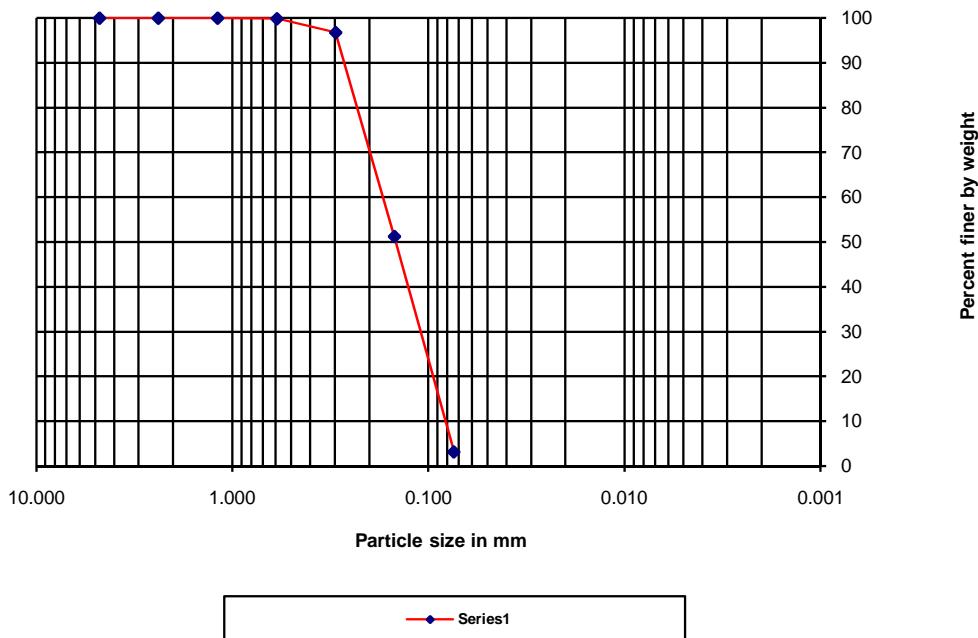
Series-2

DS	$D_{10} = 0.08$	$C_U = D_{60}/D_{10} = 2.125$
DEPTH-16.50m	$D_{30} = 0.11$	
	$D_{60} = 0.17$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.89$

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-2

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

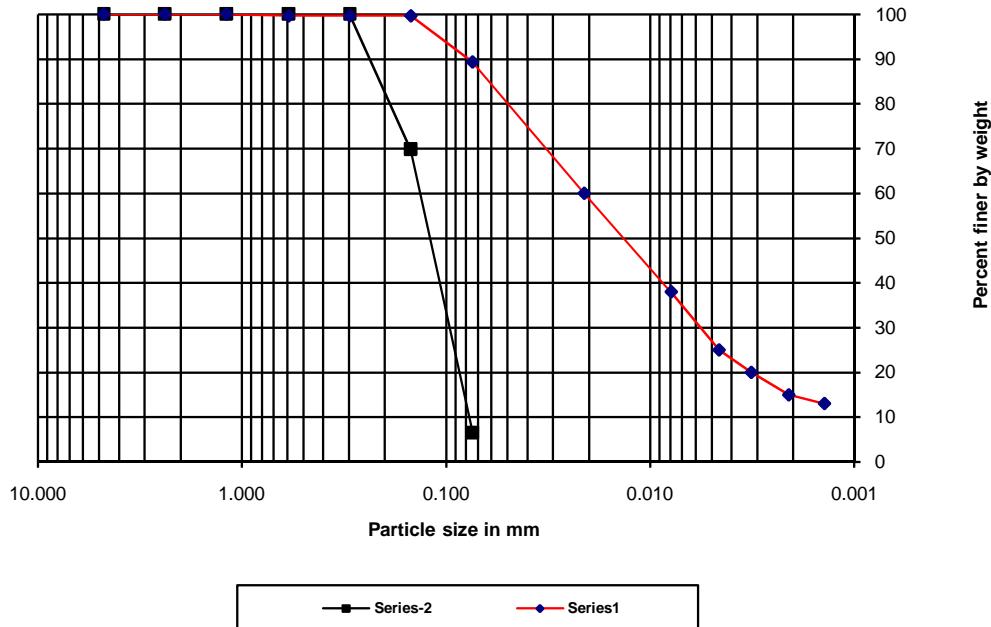


Series-1			
DS DEPTH-21.0m	D ₁₀ = 0.080 D ₃₀ = 0.110 D ₆₀ = 0.170	C _U = D ₆₀ /D ₁₀ = 2.13 C _C = (D ₃₀) ² /(D ₆₀ ×D ₁₀) = 0.89	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-3

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



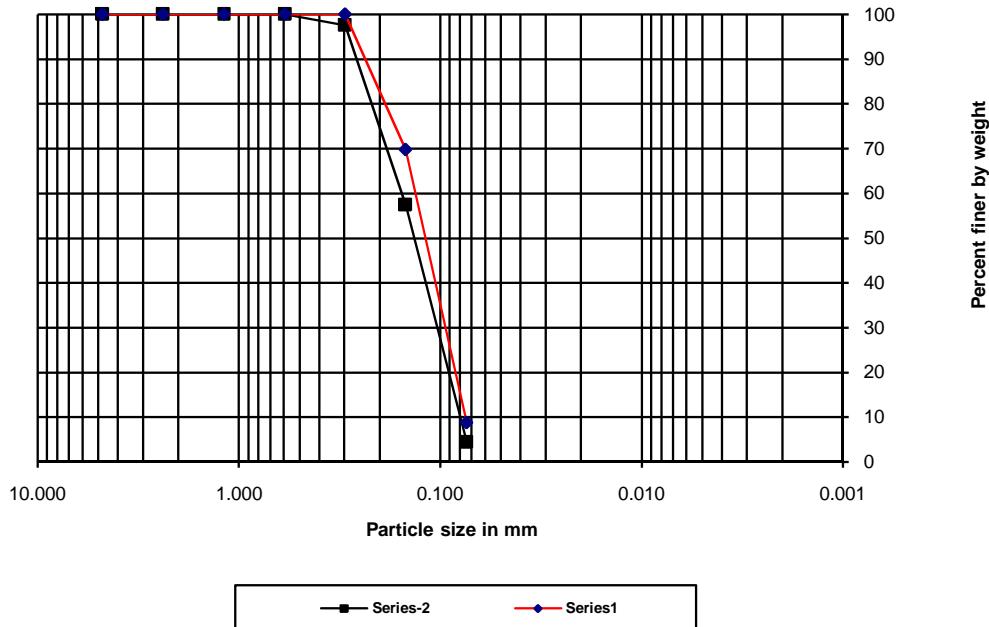
Series-1			
DS	$D_{10} = 0.001$	$C_U = D_{60}/D_{10} = 19.00$	
DEPTH-1.50m	$D_{30} = 0.005$		
	$D_{60} = 0.019$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.316$	

Series-2			
DS	$D_{10} = 0.078$	$C_U = D_{60}/D_{10} = 1.795$	
DEPTH-6.00m	$D_{30} = 0.10$		
	$D_{60} = 0.14$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.879$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-3

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS	$D_{10} = 0.076$	$C_U = D_{60}/D_{10} = 1.84$
DEPTH-9.00m	$D_{30} = 0.094$	
	$D_{60} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.83$

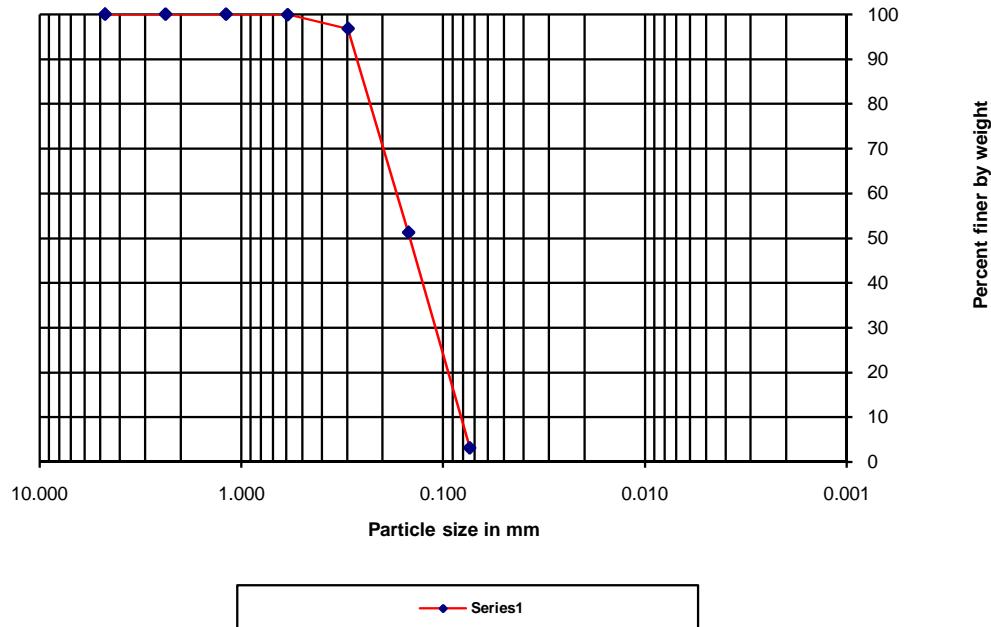
Series-2

DS	$D_{10} = 0.07$	$C_U = D_{60}/D_{10} = 2.571$
DEPTH-15.00m	$D_{30} = 0.11$	
	$D_{60} = 0.18$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.96$

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-3

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

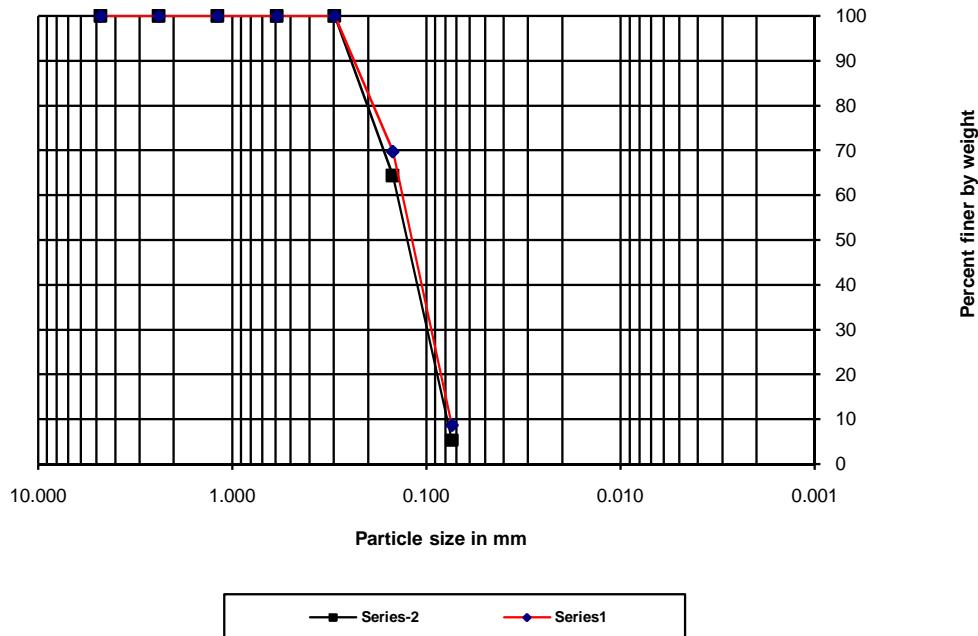


Series-1			
DS	$D_{10} = 0.079$	$C_u = D_{60}/D_{10}$	= 2.15
DEPTH-21.0m	$D_{30} = 0.112$	$C_c = (D_{30})^2/(D_{60} \times D_{10})$	= 0.934
	$D_{60} = 0.170$		

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-4

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS	$D_{10} = 0.074$	$C_U = D_{60}/D_{10} = 1.89$
DEPTH-1.50m	$D_{30} = 0.096$	
	$D_{60} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.89$

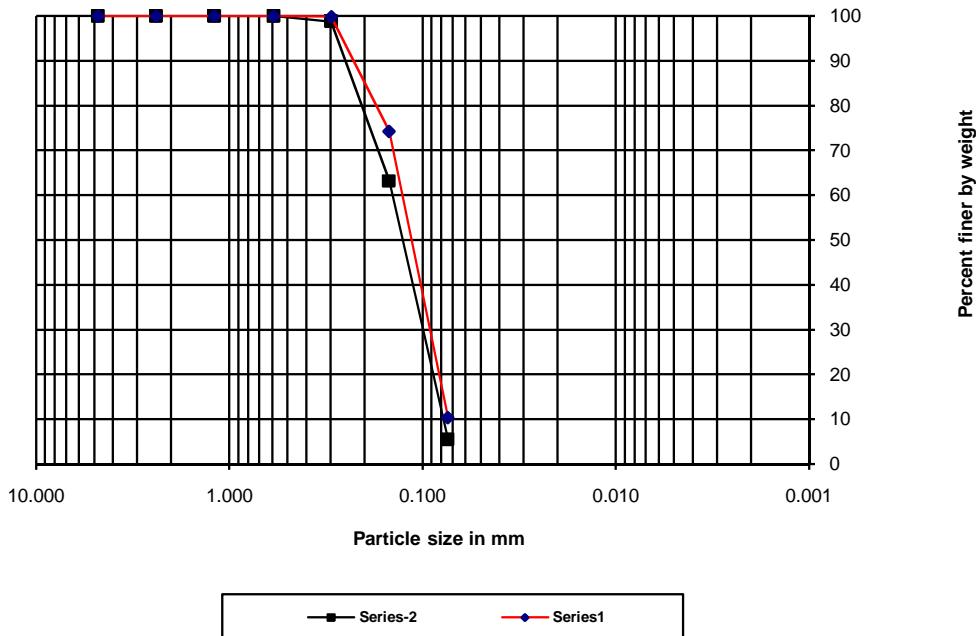
Series-2

DS	$D_{10} = 0.08$	$C_U = D_{60}/D_{10} = 1.75$
DEPTH-4.50m	$D_{30} = 0.100$	
	$D_{60} = 0.14$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.893$

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-4

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



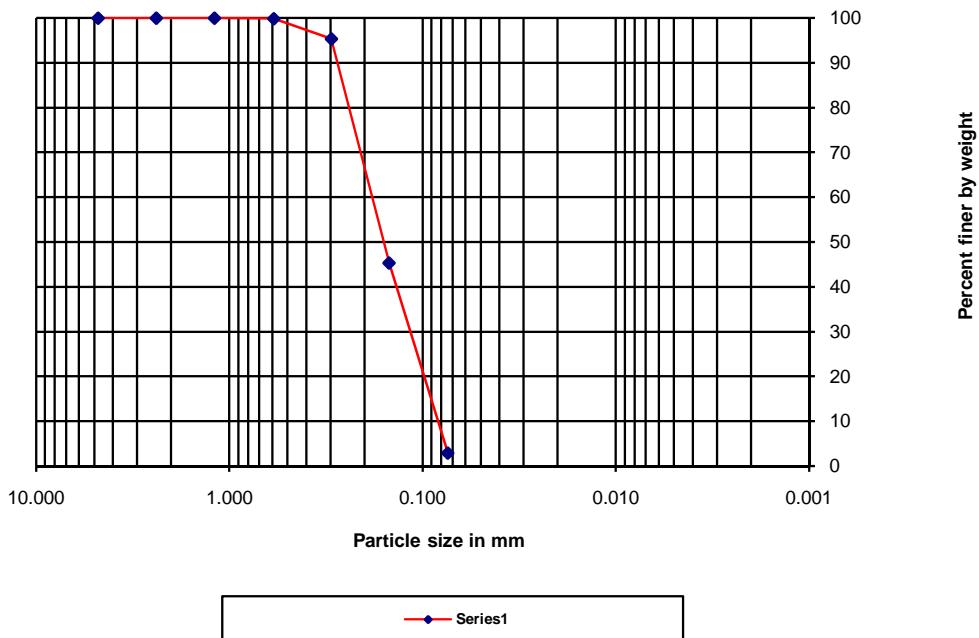
Series-1			
DS	$D_{10} = 0.076$	$C_U = D_{60}/D_{10} = 1.84$	
DEPTH-7.50m	$D_{30} = 0.090$		
	$D_{60} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.761$	

Series-2			
DS	$D_{10} = 0.08$	$C_U = D_{60}/D_{10} = 2$	
DEPTH-16.50m	$D_{30} = 0.10$		
	$D_{60} = 0.16$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.781$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-4

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

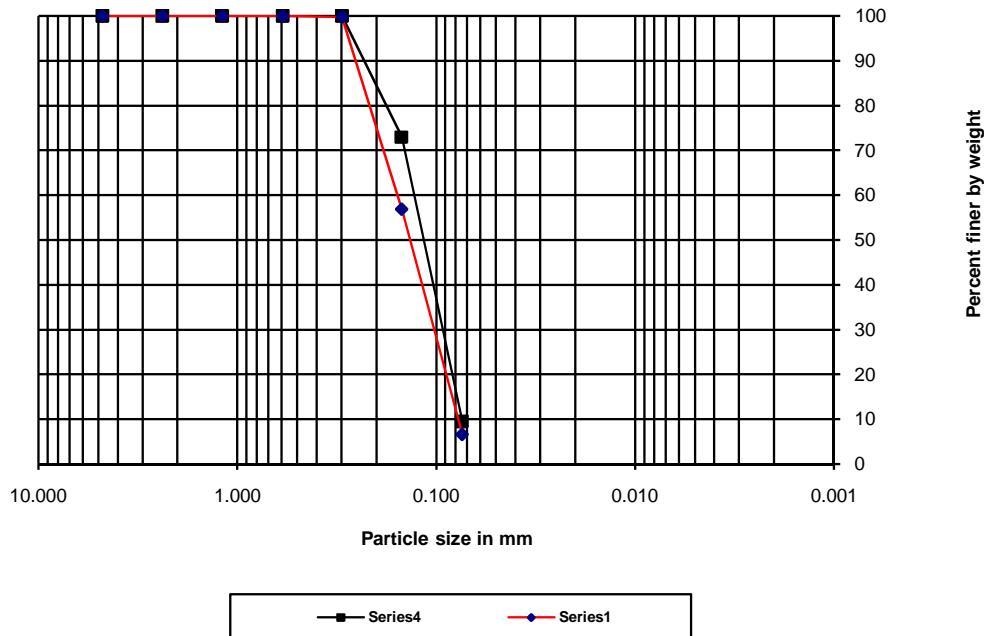


Series-1			
DS	$D_{10} = 0.081$	$C_U = D_{60}/D_{10}$	= 2.33
DEPTH-22.50m	$D_{30} = 0.120$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 0.941
	$D_{60} = 0.189$		

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-5

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



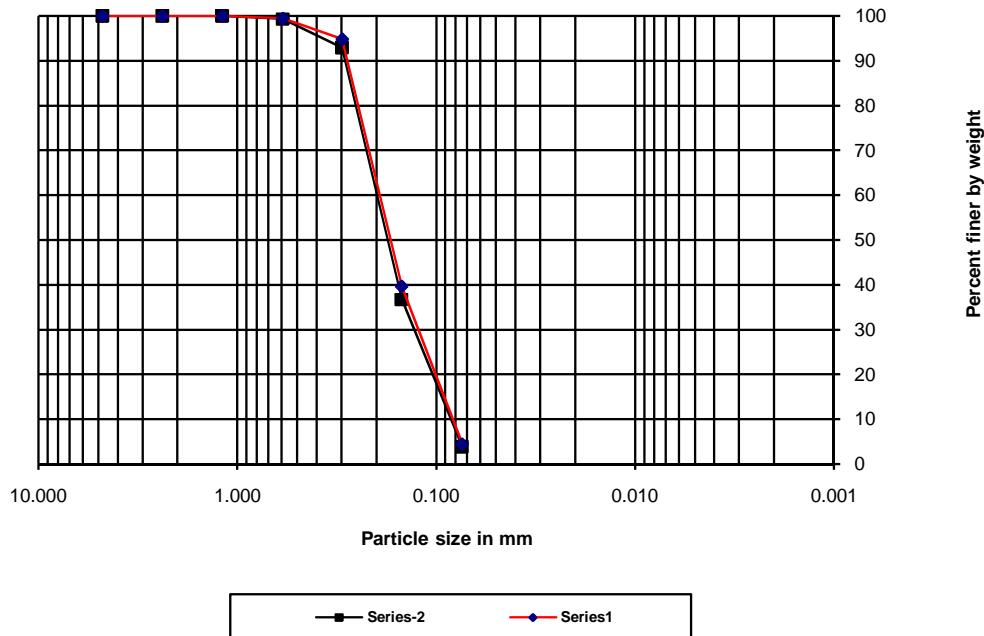
Series-1			
DS	$D_{10} = 0.078$	$C_U = D_{60}/D_{10}$	= 2.05
DEPTH-1.50m	$D_{30} = 0.100$		
	$D_{60} = 0.160$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 0.801

Series-2			
DS	$D_{10} = 0.075$	$C_U = D_{60}/D_{10}$	= 1.733
DEPTH-7.50m	$D_{30} = 0.090$		
	$D_{60} = 0.13$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 0.831

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-5

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



Series-1

DS	$D_{10} = 0.081$	$C_U = D_{60}/D_{10} = 2.47$
DEPTH-12.00m	$D_{30} = 0.130$	
	$D_{60} = 0.200$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.043$

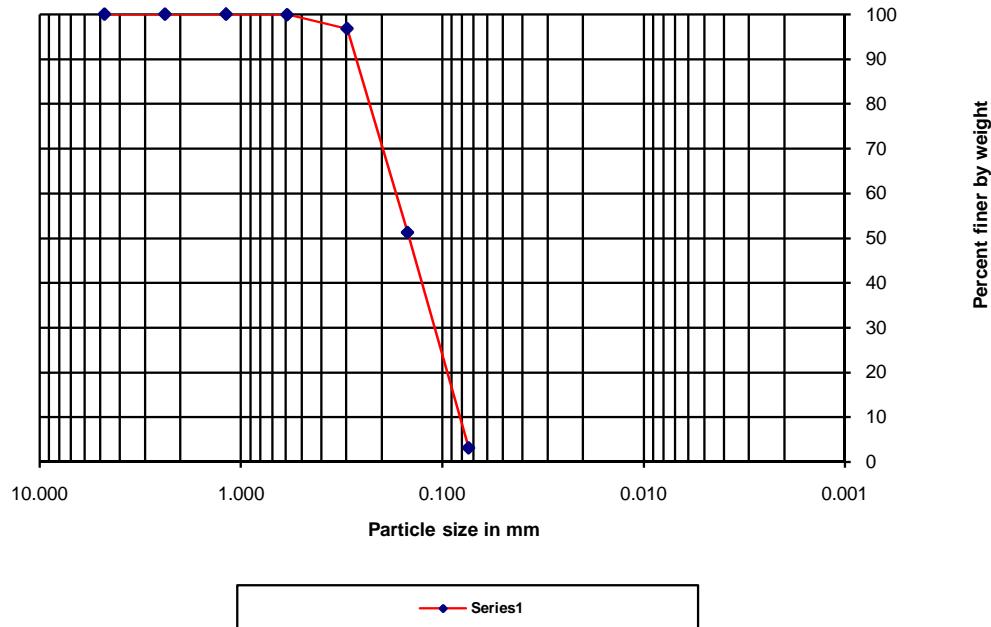
Series-2

DS	$D_{10} = 0.082$	$C_U = D_{60}/D_{10} = 2.561$
DEPTH-16.50m	$D_{30} = 0.14$	
	$D_{60} = 0.21$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.138$

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-5

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

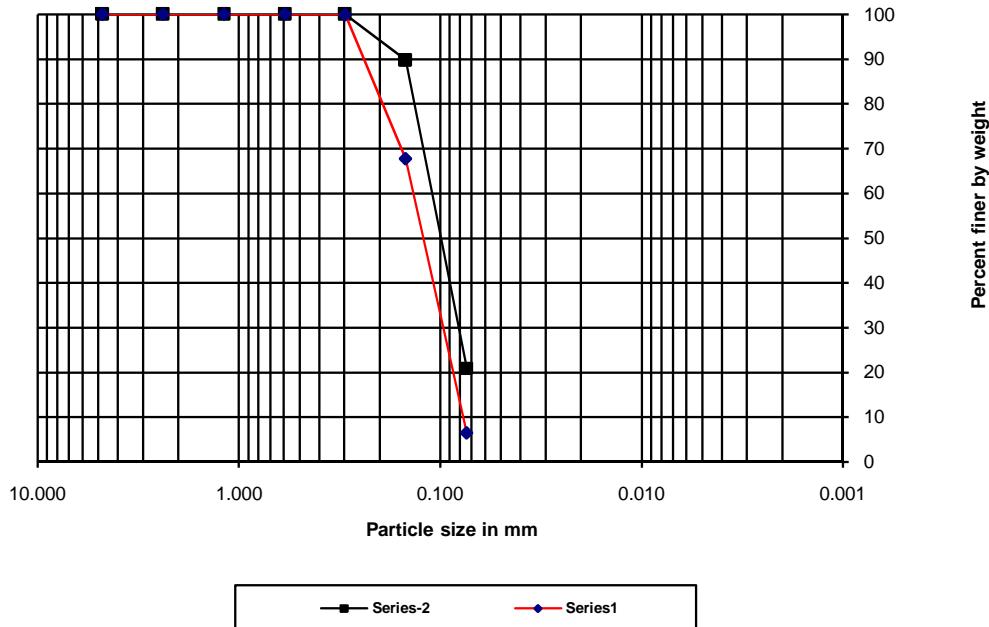


Series-1			
DS	$D_{10} = 0.082$	$C_u = D_{60}/D_{10}$	= 2.07
DEPTH-19.50m	$D_{30} = 0.110$	$C_c = (D_{30})^2/(D_{60} \times D_{10})$	= 0.868
	$D_{60} = 0.170$		

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-6

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



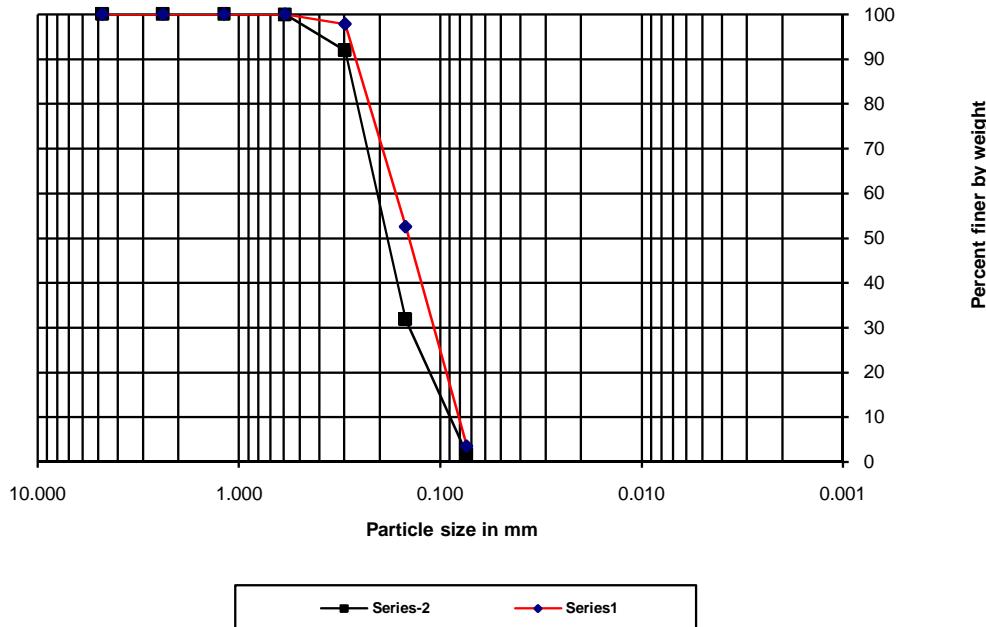
Series-1			
DS	$D_{10} = 0.08$	$C_U = D_{60}/D_{10}$	= 1.88
DEPTH-1.50m	$D_{30} = 0.100$		
	$D_{60} = 0.15$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 0.833

Series-2			
DS	$D_{10} = 0.07$	$C_U = D_{60}/D_{10}$	= 1.714
DEPTH-7.50m	$D_{30} = 0.079$		
	$D_{60} = 0.12$	$C_C = (D_{30})^2/(D_{60} \times D_{10})$	= 0.743

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-6

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



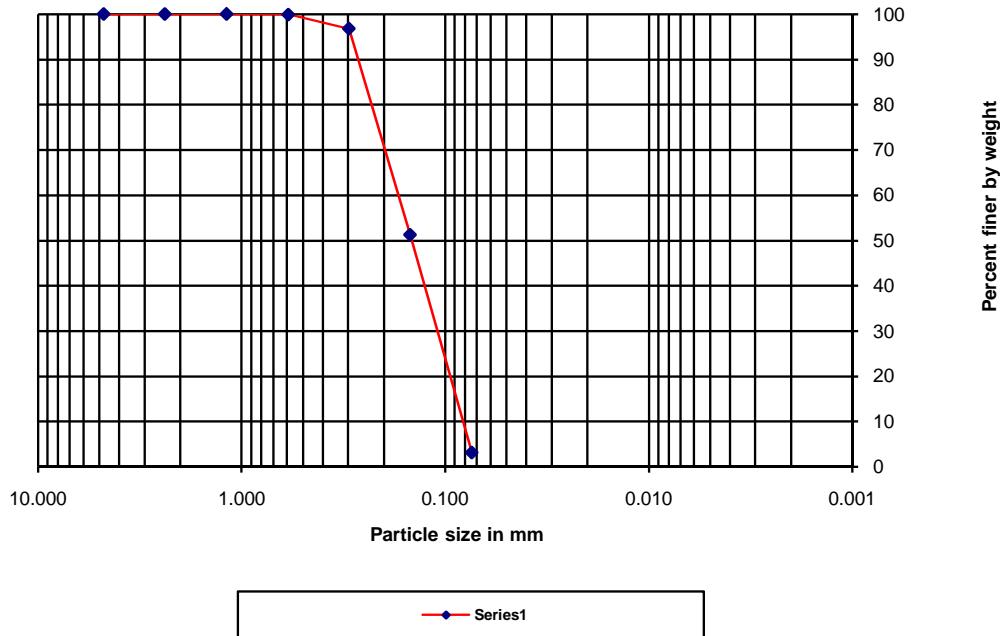
Series-1			
DS	$D_{10} = 0.080$	$C_u = D_{60}/D_{10} = 2.13$	
DEPTH-10.50m	$D_{30} = 0.110$		
	$D_{60} = 0.170$	$C_c = (D_{30})^2/(D_{60} \times D_{10}) = 0.89$	

Series-2			
DS	$D_{10} = 0.08$	$C_u = D_{60}/D_{10} = 2.5$	
DEPTH-18.00m	$D_{30} = 0.151$		
	$D_{60} = 0.2$	$C_c = (D_{30})^2/(D_{60} \times D_{10}) = 1.425$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-6

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS

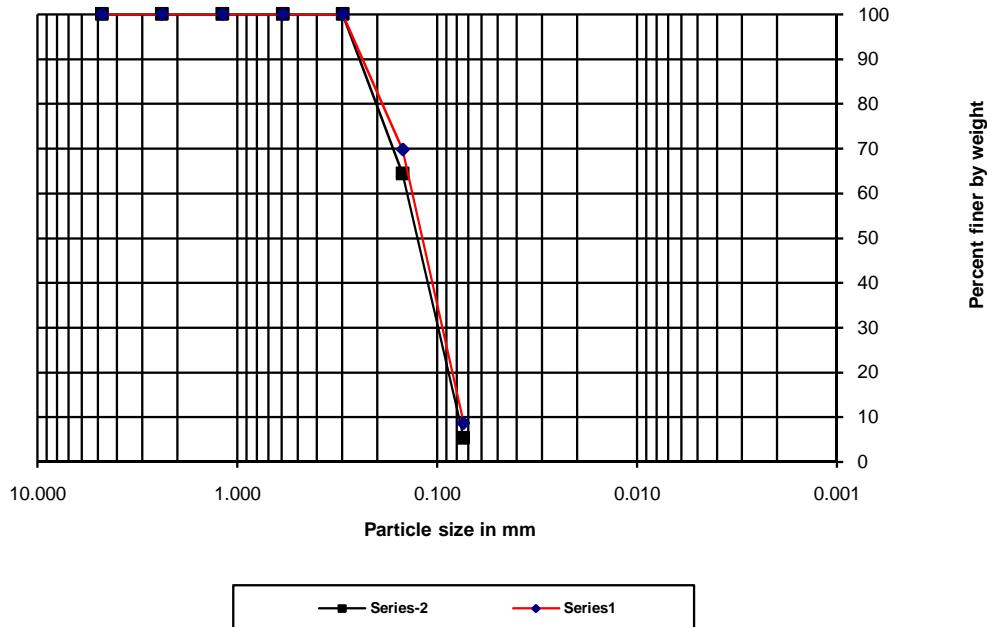


Series-1			
DS DEPTH-21.0m	D ₁₀ = 0.079 D ₃₀ = 0.110 D ₆₀ = 0.171	C _u = D ₆₀ /D ₁₀ = 2.16 C _c = (D ₃₀) ² /(D ₆₀ xD ₁₀) = 0.896	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-7

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



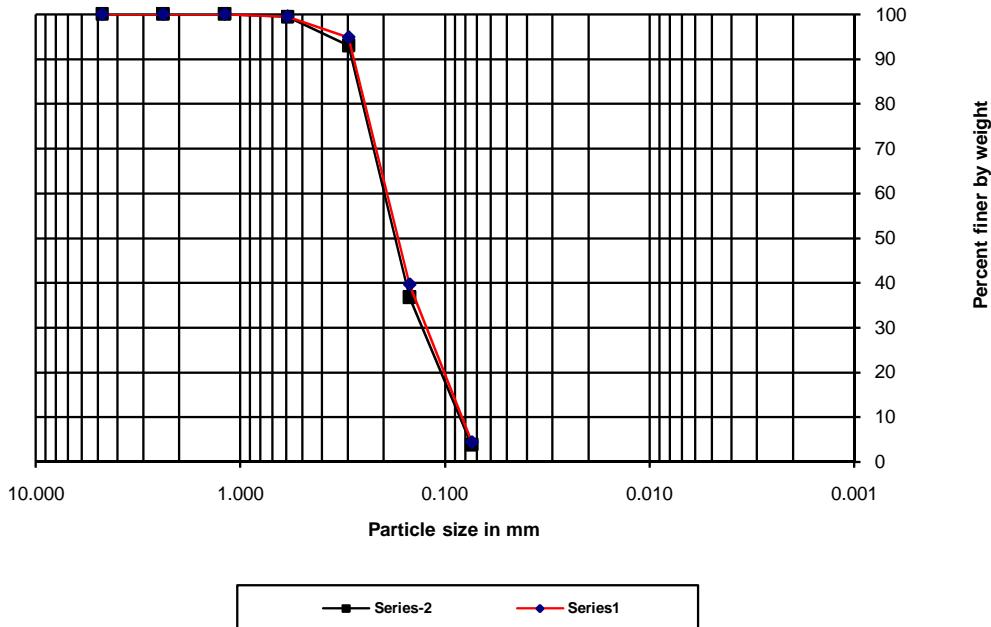
Series-1			
DS	$D_{10} = 0.075$	$C_U = D_{60}/D_{10} = 1.87$	
DEPTH-1.50m	$D_{30} = 0.095$		
	$D_{60} = 0.140$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.86$	

Series-2			
DS	$D_{10} = 0.08$	$C_U = D_{60}/D_{10} = 1.875$	
DEPTH-7.50m	$D_{30} = 0.100$		
	$D_{60} = 0.15$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 0.833$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-7

GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



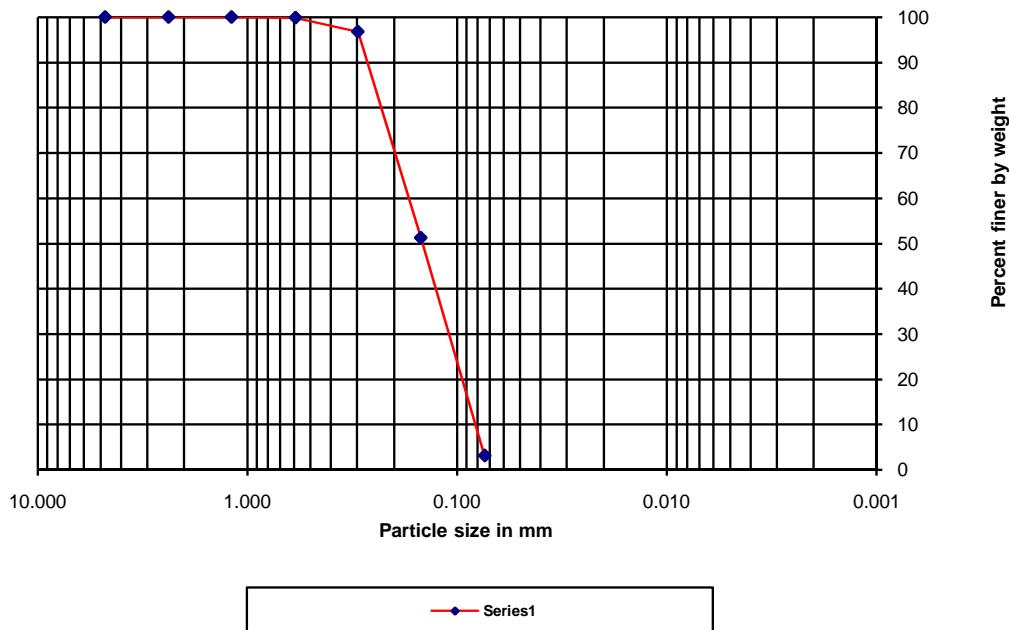
Series-1			
DS	$D_{10} = 0.082$	$C_U = D_{60}/D_{10} = 2.44$	
DEPTH-12.00m	$D_{30} = 0.130$		
	$D_{60} = 0.200$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.03$	

Series-2			
DS	$D_{10} = 0.082$	$C_U = D_{60}/D_{10} = 2.561$	
DEPTH-19.50m	$D_{30} = 0.15$		
	$D_{60} = 0.21$	$C_C = (D_{30})^2/(D_{60} \times D_{10}) = 1.307$	

AMSC

Client : BEZA
Project :Proposed Development Economic Zone in Jamalpur
Location :BH-7

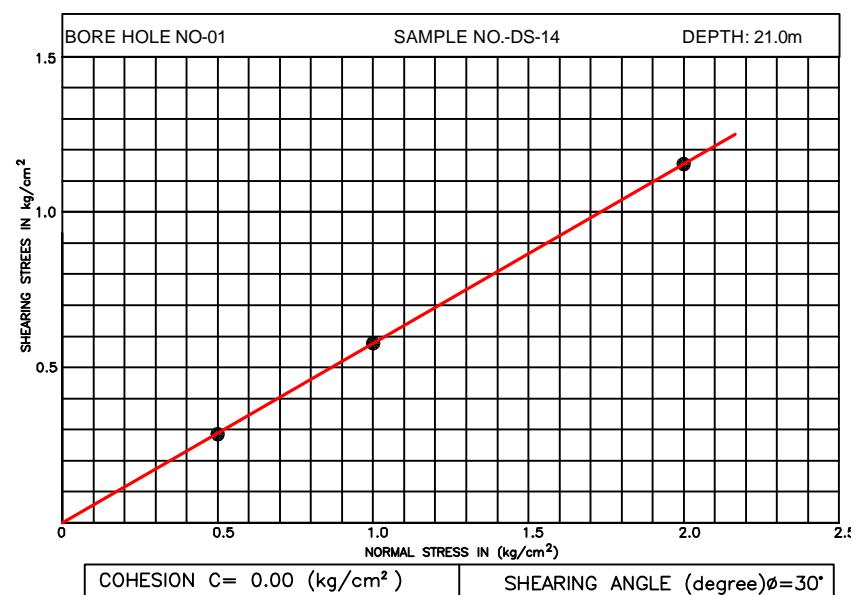
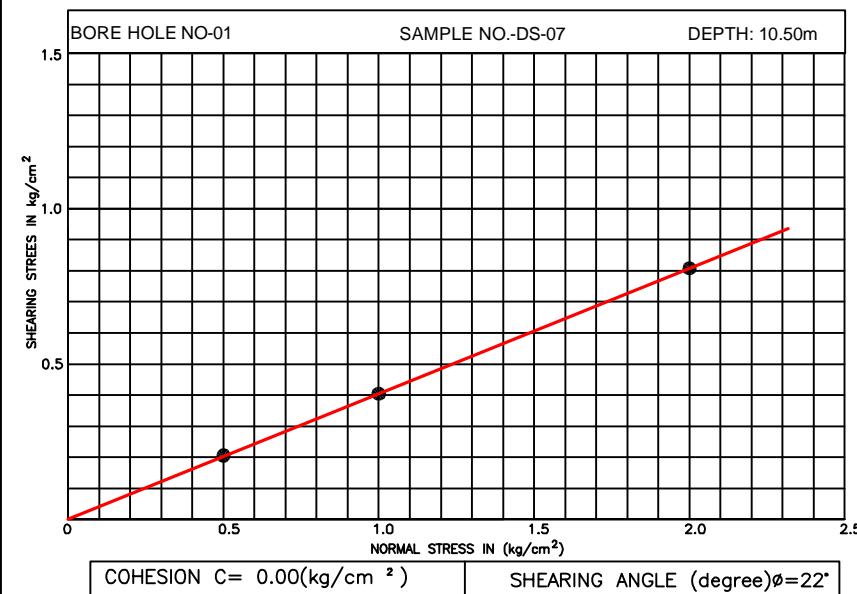
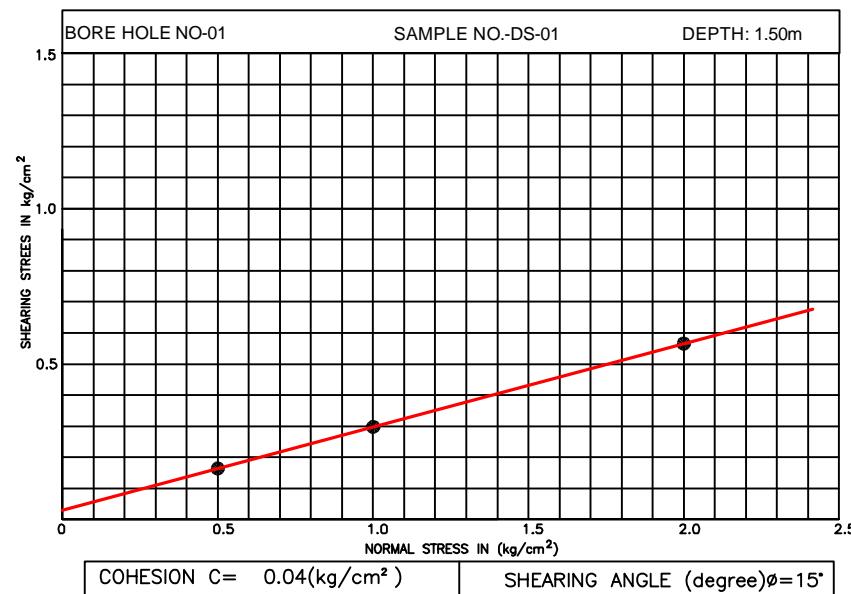
GRAIN SIZE DISTRIBUTION, HYDROMETER ANALYSIS



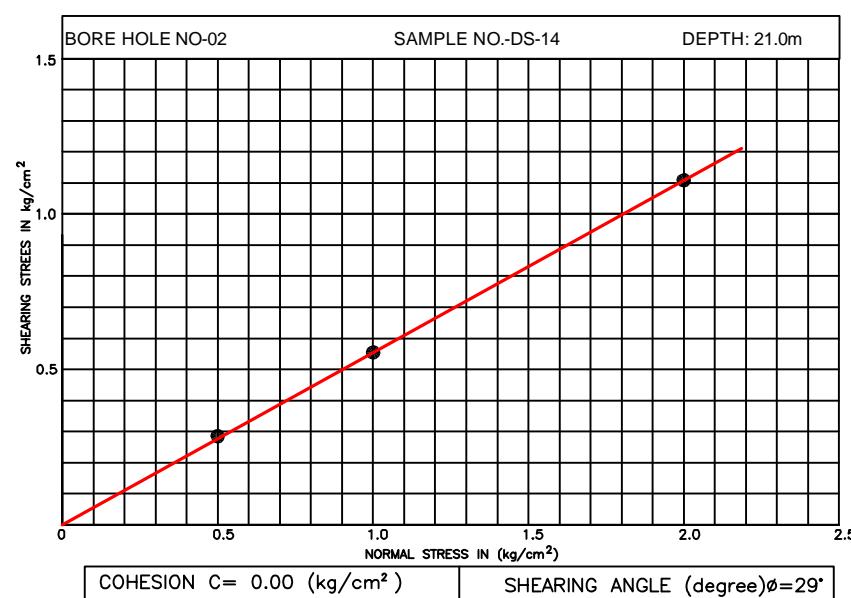
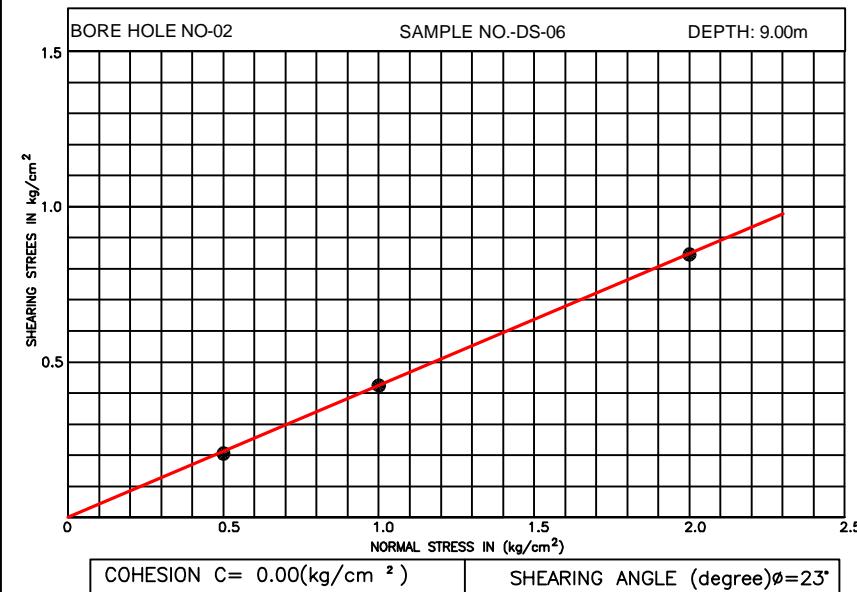
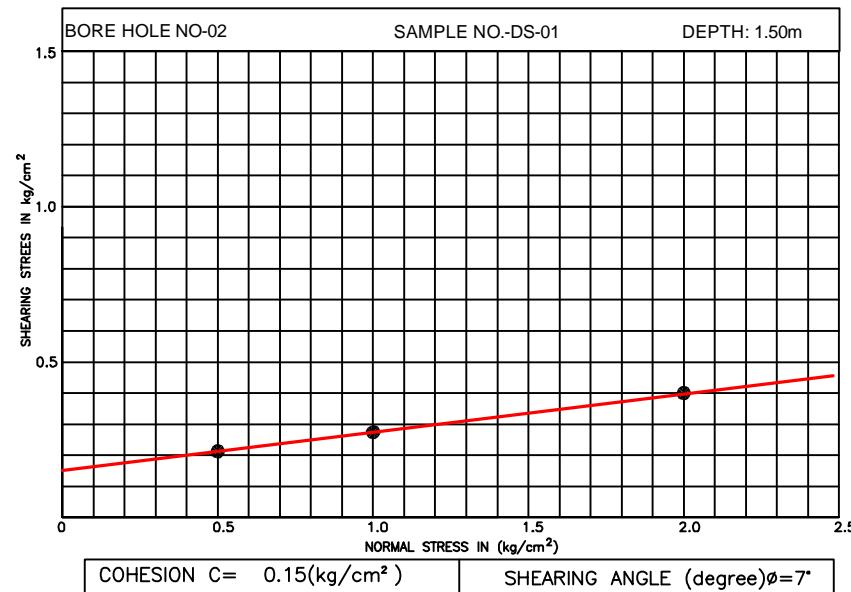
Series-1			
DS DEPTH-22.50m	D ₁₀ = 0.080 D ₃₀ = 0.113 D ₆₀ = 0.170	C _u = D ₆₀ /D ₁₀ = 2.13 C _c = (D ₃₀) ² /(D ₆₀ xD ₁₀) = 0.939	

ANNEX – 4: DIRECT SHEAR TEST

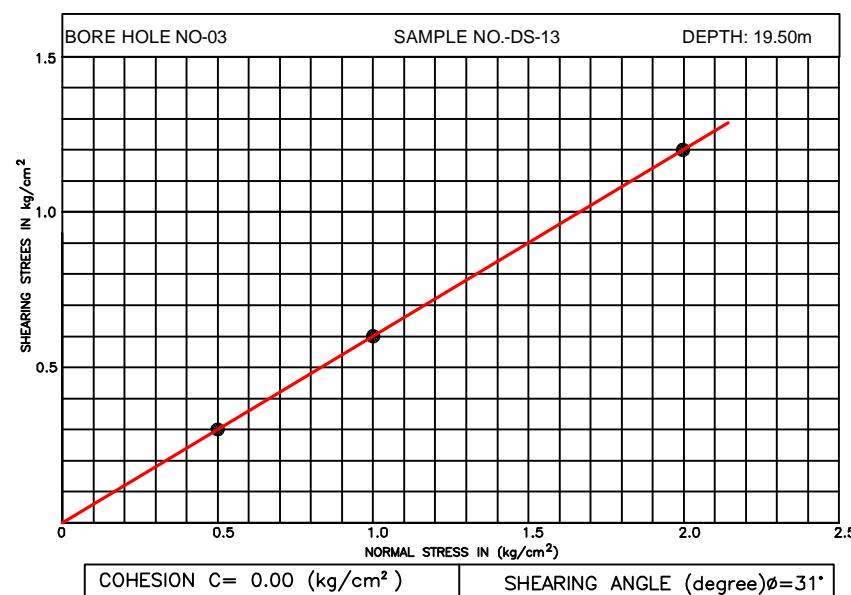
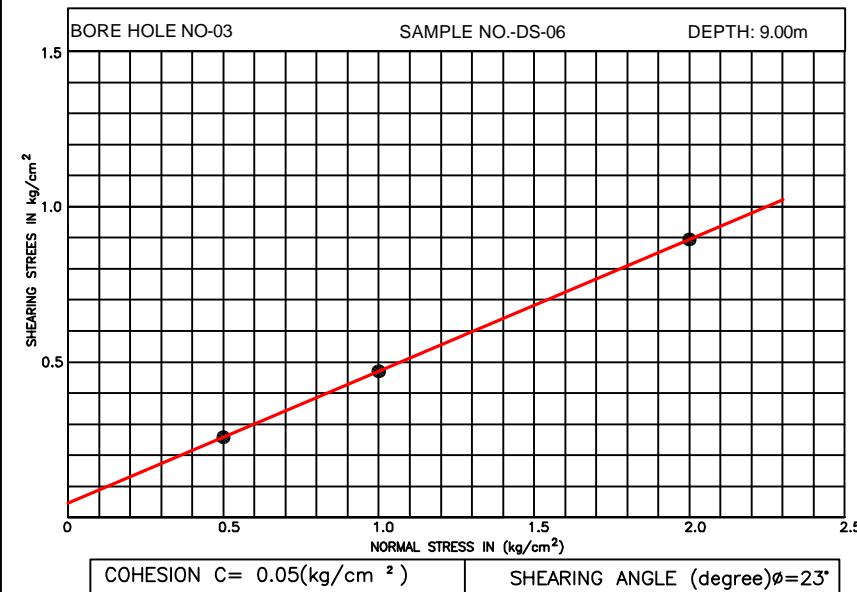
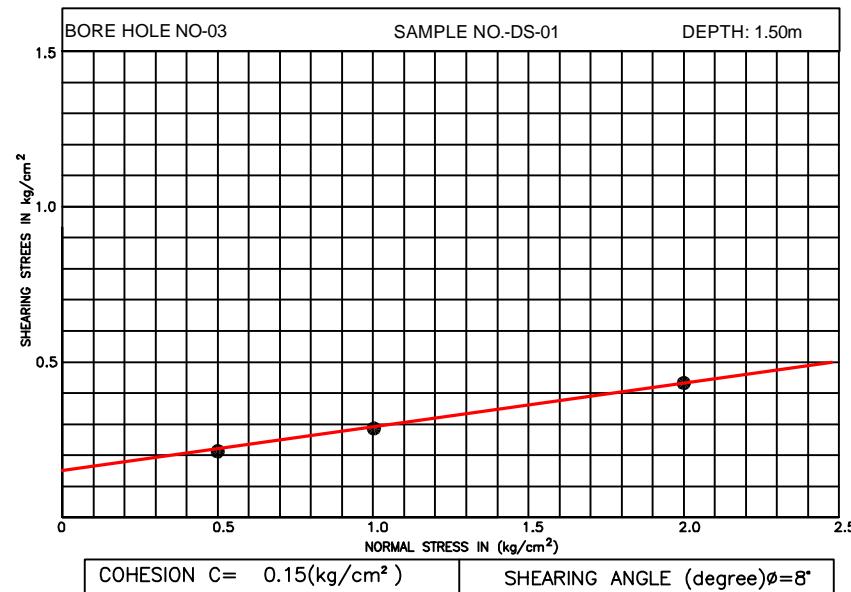
DIRECT SHEAR TEST



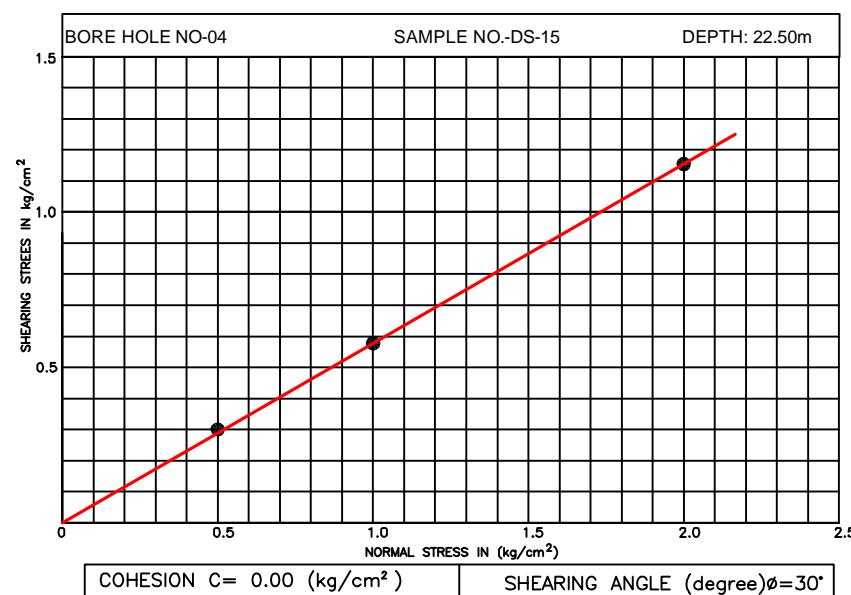
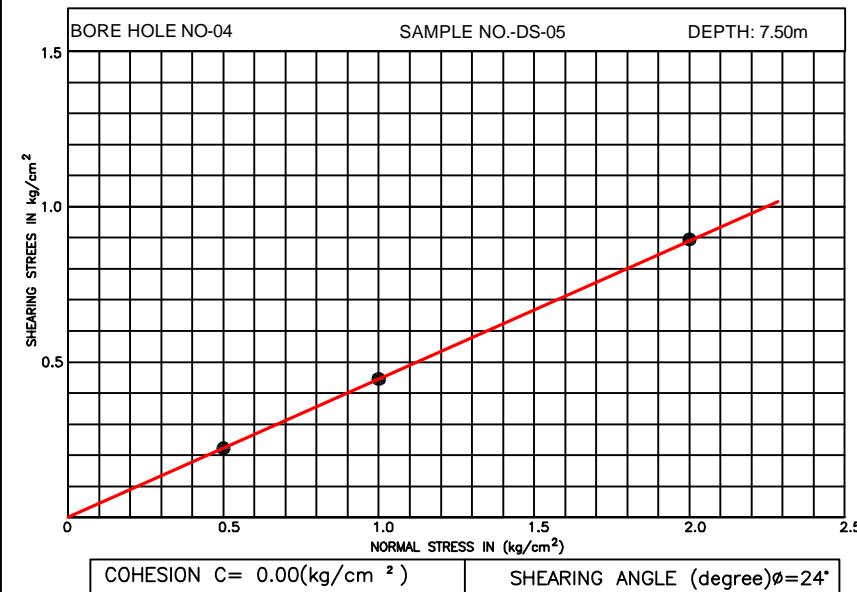
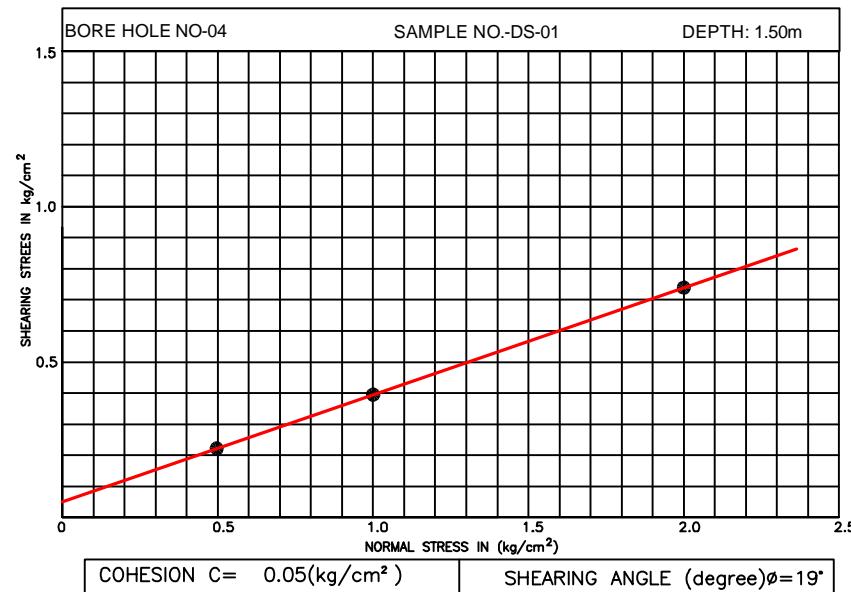
DIRECT SHEAR TEST



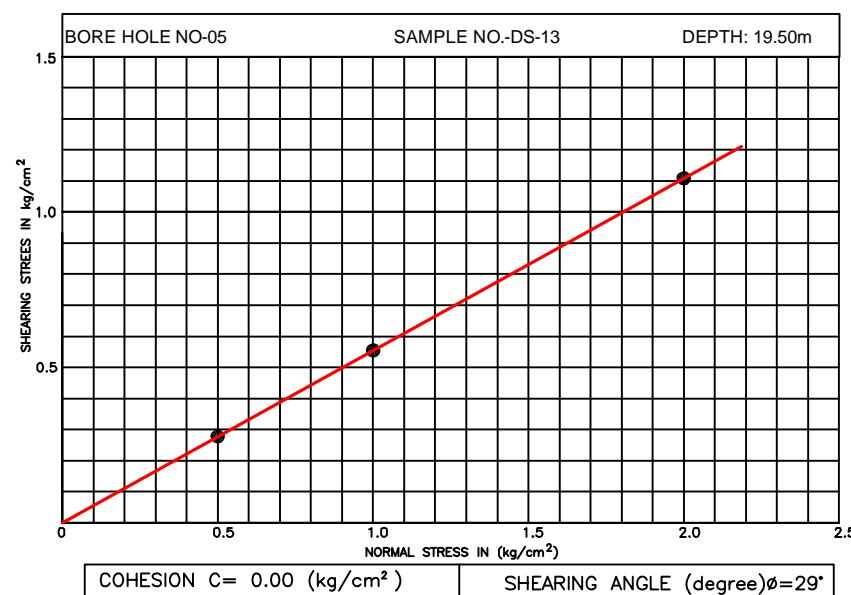
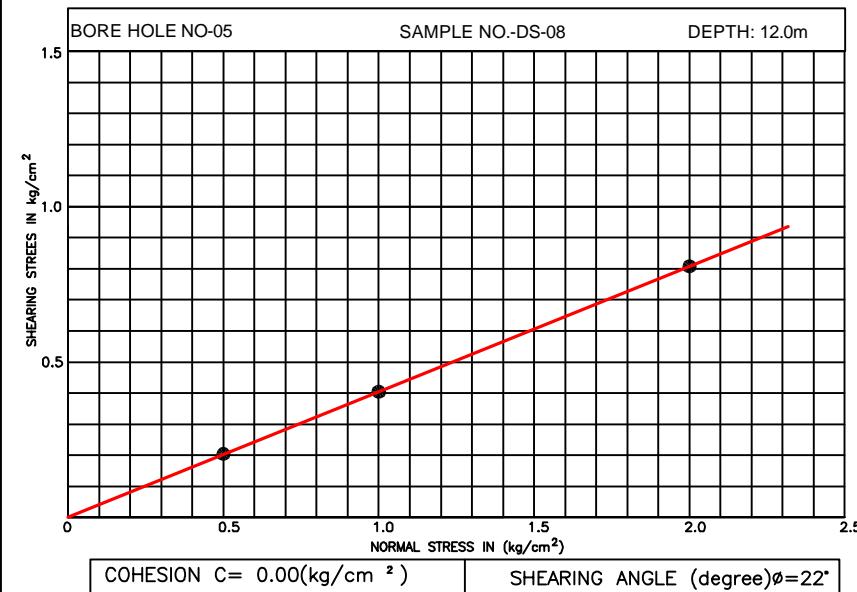
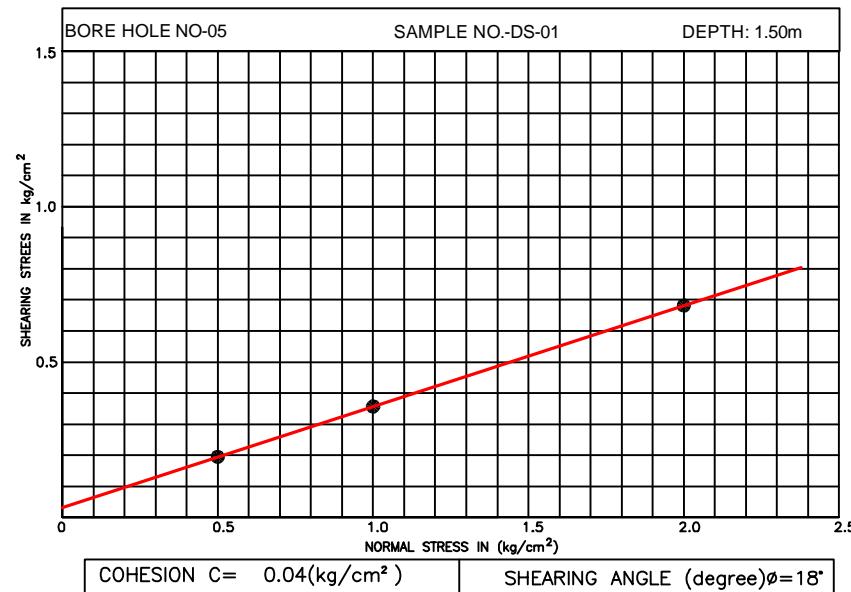
DIRECT SHEAR TEST



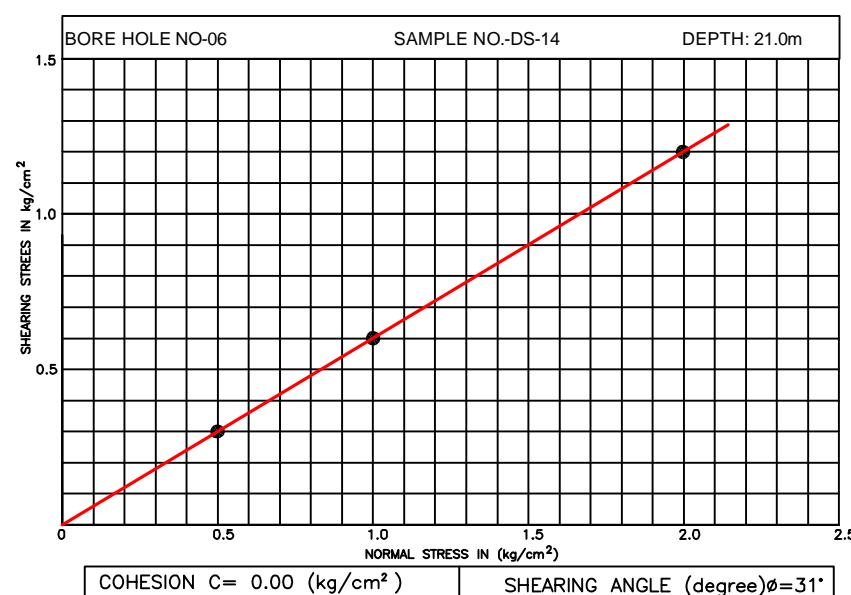
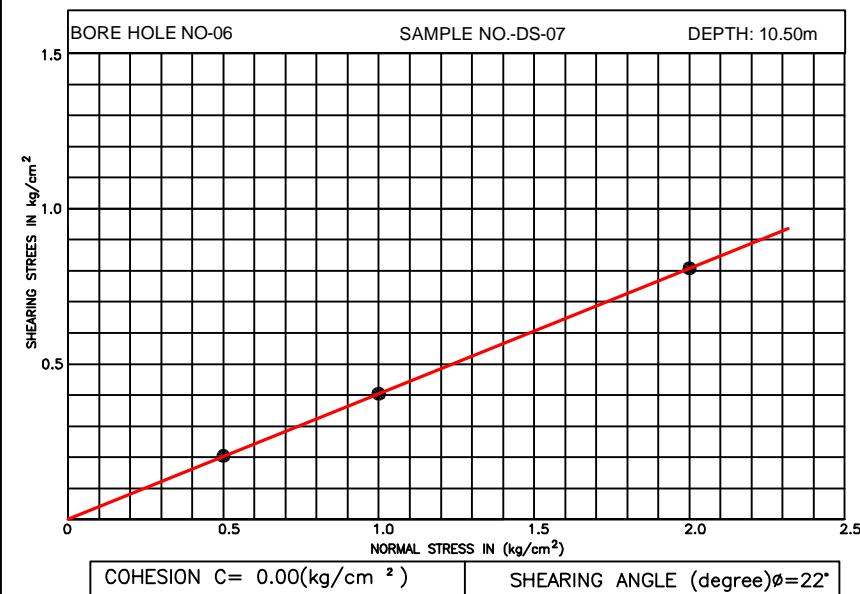
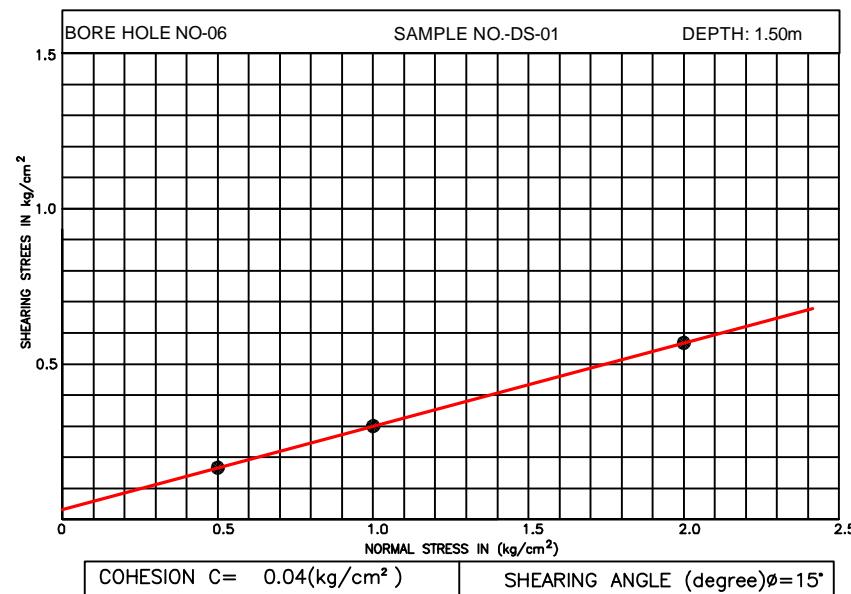
DIRECT SHEAR TEST



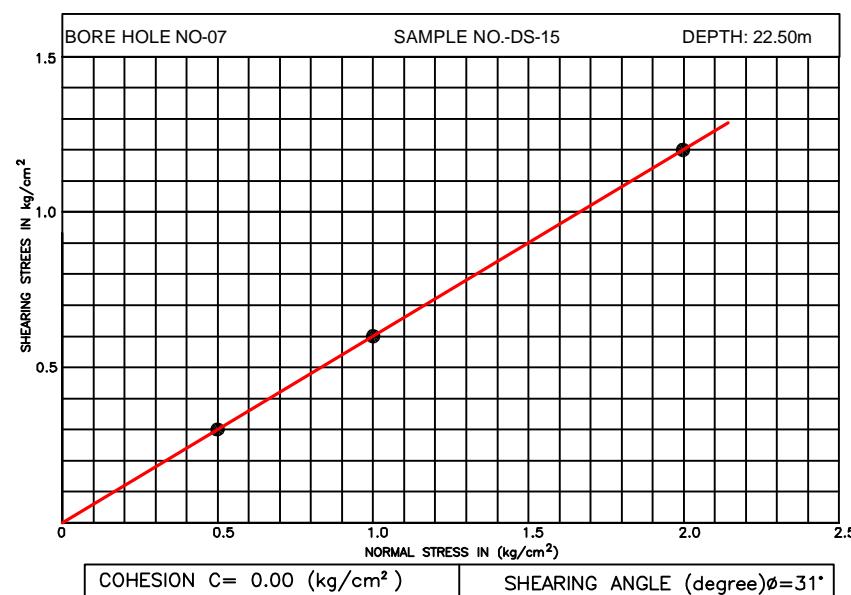
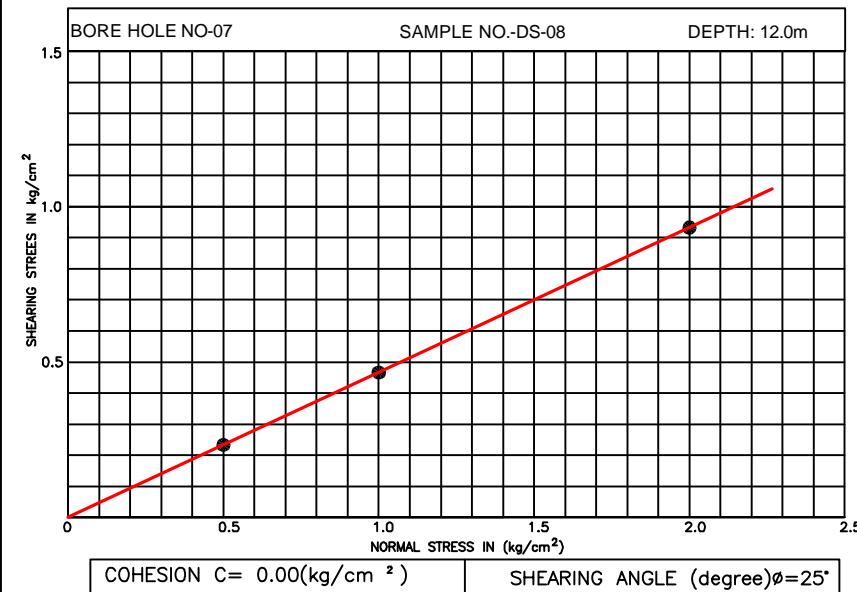
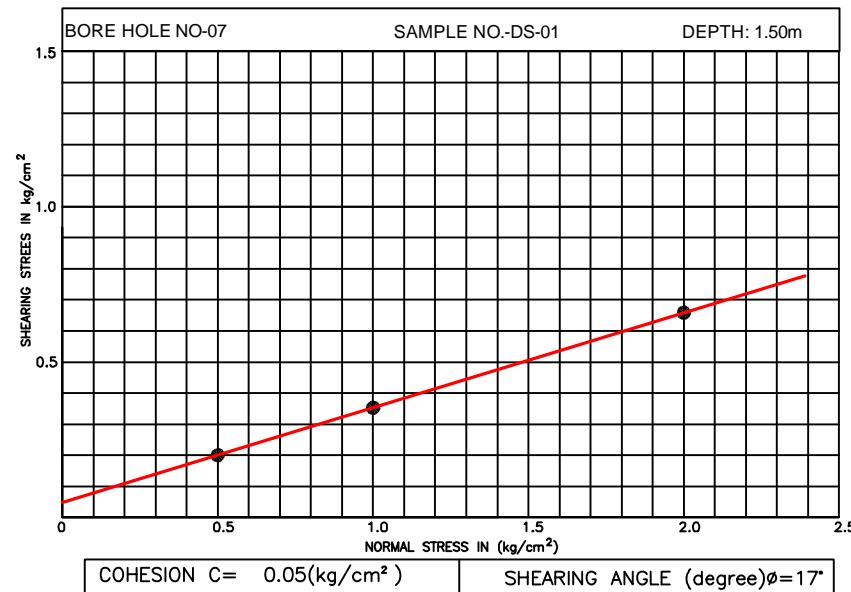
DIRECT SHEAR TEST



DIRECT SHEAR TEST



DIRECT SHEAR TEST



ANNEX – 5: ABSTRACT AND LABORATORY TEST (SOIL CHARACTERISTICS)

ANNEX – 6: SEISMIC ZONING MAP

89°

90°

91°

92°

26°

26°



INDIA

25°

25°



INDIA

24°

24°

ZONE 2
(Z=0.15)ZONE 1
(Z=0.075)

INDIA

23°

23°

BAY OF BENGAL

LEGEND

- International Boundary
- River & Lake
- Seismic Zones
- Location of City/Town

20 0 20 40 60 80 100 km

SCALE

22°

22°

MYANMAR

21°

21°

12.3 Annexure 3: Terms of Reference for EIA

Government of the People's Republic of Bangladesh
Department of Environment
Head Office, E-16 Agargaon
Dhaka-1207
www.doe.gov.bd

Memo No: DoE/Ta:Dist:/Jamalpur/30.39.36.4.1078.160915/ ৫৩৪

Date: ১২/১০/২০১৫

Subject: **Approval of Terms of Reference (ToR) for EIA of Jamalpur Economic Zone at Jamalpur Sadar Upazila under Jamalpur District.**

Ref: Your Application dated 29/09/2015 and 15/10/2015 .

With reference to your application dated 29.09.2015 and 15.10.2015 for the subject mentioned above, the Department of Environment hereby gives approval of the Terms of Reference (ToR) for Environmental Impact Assessment (EIA) Study of the proposed Jamalpur Economic Zone at Jamalpur Sadar Upazila under Jamalpur District subject to fulfilling the following terms and conditions :

- I. The project authority shall conduct a comprehensive Environmental Impact Assessment (EIA) study considering the overall activity of the said project in accordance with this ToR and following additional suggestions.
- II. The EIA report should be prepared in accordance with following indicative outlines :
 1. Executive summary
 2. Introduction: (Background, brief description, rationale of the project, scope of study, methodology, limitation, EIA team, references)
 3. Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)
 4. Project Description
 - i. Introduction
 - ii. Project Objective
 - iii. Project Options
 - iv. Interventions under Selected Options
 - v. Project activities: A list of the main project activities to be undertaken during site clearing, construction as well as operation
 - vi. Project schedule: The phase and timing for development of the project
 - vii. Resources and utilities demand: Resources required to develop the project, such as soil and construction material and demand for utilities (water, electricity, sewerage, waste disposal and others), as well as infrastructure (road, drains, and others) to support the project
 - viii. Map and survey information
Location map, cadastral map showing land plots (project and adjacent area), geological map showing geological units, fault zone, and other natural features.
 - ix. Project Plan, Design, Standard, Specification, Quantification, etc.
 5. Environmental and Social Baseline
 - 5.1 Meteorology
 - 5.1.1 Temperature
 - 5.1.2 Humidity

- 5.1.3 Rainfall
- 5.1.4 Evaporation
- 5.1.5 Wind Speed
- 5.1.6 Sun Shine Hours

5.2 Water Resources

- 5.2.1 Surface Water System
- 5.2.2 Tropical Cyclones and Tidal Flooding
- 5.2.3 Salinity
- 5.2.4 Drainage Congestion and Water Logging
- 5.2.5 Erosion and Sedimentation
- 5.2.6 River Morphology
- 5.2.7 Navigation
- 5.2.8 Ground Water System

5.3 Land Resources

- 5.3.1 Agroecological Regions
- 5.3.2 Land Types
- 5.3.3 Soil Texture
- 5.3.4 Land Use

5.4 Agriculture Resources

- 5.4.1 Farming Practice
- 5.4.2 Cropping Pattern and Intensity
- 5.4.3 Cropped Area
- 5.4.4 Crop Production
- 5.4.5 Crop Damage
- 5.4.6 Main Constraints of Crop Production

5.5 Livestock and Poultry

- 5.5.1 Feed and Fodder Shortage
- 5.5.2 Livestock/Poultry Diseases

5.6 Fisheries

- 5.6.1 Introduction
- 5.6.2 Problem and Issues
- 5.6.3 Habitat Description
- 5.6.4 Fish Production and Effort
- 5.6.5 Fish Migration
- 5.6.6 Fish Biodiversity
- 5.6.7 Fisheries Management

5.7 Ecological Resources

- 5.7.1 Bio-ecological Zone
- 5.7.2 Common Flora and Fauna
- 5.7.3 Ecosystem Services and Function

5.8 Socio Economic Condition

- 5.8.1 Socio Economic Condition
- 5.8.2 Quality of Life Indicators
- 5.8.3 Income and Poverty
- 5.8.4 Gender and Women
- 5.8.5 Common Property Resources
- 5.8.6 Conflict of Interest and Law and Order Situation
- 5.8.7 Historical, Cultural and Archaeological Sites

5.9 Ecological Resources

- 5.9.1 Bio-ecological Zone
- 5.9.2 Common Flora and Fauna
- 5.9.3 Ecosystem Services and Function

6. Identification and Analysis of Key Environmental Issues (Analysis shall be presented with Scenarios, Maps, Graphics, etc. for the Case of Anticipated Impacts on Baseline)
 - 6.1 Environmental Sensitivity Investigation

- 6.2 Environmental Asset
- 6.3 Environmental Hot Spots
- 6.4 Likely Beneficial Impacts
- 6.5 Community Recommendations
- 6.6 Alternate Analysis
- 7. Environmental and Social Impacts
 - 7.1 Introduction
 - 7.2 Impact on Water Resources
 - 7.2.1 Pre-Construction Phase
 - 7.2.2 Construction Phase
 - 7.2.3 Post-Construction Phase
 - 7.3 Impact on Land Resources
 - 7.3.1 Pre-Construction Phase
 - 7.3.2 Construction Phase
 - 7.3.3 Post-Construction Phase
 - 7.4 Impact on Agriculture Resources
 - 7.4.1 Pre-Construction Phase
 - 7.4.2 Construction Phase
 - 7.4.3 Post-Construction Phase
 - 7.5 Impact on Fisheries
 - 7.5.1 Pre-Construction Phase
 - 7.5.2 Construction Phase
 - 7.5.3 Post-Construction Phase
 - 7.6 Impact on Eco System
 - 7.6.1 Pre-Construction Phase
 - 7.6.2 Construction Phase
 - 7.6.3 Post-Construction Phase
 - 7.7 Socio Economic Impact
 - 7.7.1 Pre-Construction Phase
 - 7.7.2 Construction Phase
 - 7.7.3 Post-Construction Phase
- 8. Public Consultation and Disclosure
 - 8.1 Introduction
 - 8.2 Objectives of Public Consultation and Disclosure Meeting
 - 8.3 Approach and Methodology of Public Consultation and Disclosure Meeting
 - 8.4 Public Consultation Meetings (PCMs)
 - 8.5 Public Disclosure Meetings (PDMs)
- 9. Environmental Management Plan and Monitoring Indicators
 - 9.1 Introduction
 - 9.2 Mitigation Plan
 - 9.3 Enhancement Plan
 - 9.4 Contingency Plan
 - 9.5 Compensation Plan
 - 9.6 Monitoring Plan
 - 9.7 Monitoring Indicators
- 10. Cost Estimation for Environmental Mitigation Measures and Monitoring
- 11. Conclusions and Recommendations

- III. Without obtaining approval of EIA report by the Department of Environment, the project authority shall not be allowed to conduct earth filling or any kind of physical intervention in the proposed project site and also not be able to start the physical activity of the project.
- IV. This approval of the Terms of Reference (TOR) would not mean any acceptance or site clearance of the project.

- V. The proposed EIA study would not establish any claim, right in favour of the proponent for getting site clearance or environmental clearance.
- VI. Without EIA approval, the project authority shall not be able to start the operation of the project.
- VII. The project authority shall submit the EIA report along with the Feasibility Study Report, the applicable fee in a treasury chalan, No Objection Certificate (NOC) from Local Authority, NOC from Forest Department (if it is required in case of cutting any forested plant, private or public), NOC from concerned authority for cutting/razing/dressing of hill or hilly land (if it is required) and NOC from other relevant agencies for operational activity etc. to the Tangail District Office of DOE in Tangail with a copy to the Head Office of DOE in Dhaka.



19.10.2015

(Syed Nazmul Ahsan)
Director (Environment Clearance, c.c)
Phone # 02-8181778

Project Director

Jamalpur Economic Zone

Support to Capacity Building of Bangladesh Economic Zones Authority Project

Bangladesh Economic Zones Authority (BEZA)

BDBL Bhaban, Level # 15

12, Kawran Bazar, Dhaka-1215.

Copy Forwarded to:

- 1) PS to Secretary, Ministry of Environment and Forests, Bangladesh Secretariat, Dhaka.
- 2) Director, Department of Environment, Dhaka Regional Office, Dhaka.
- 3) Deputy Director/Office in-charge, Tangail District Office, Tangail.
- 4) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

12.4 Annexure 4: Social Survey Questionnaire

Census Survey Questionnaire
Jamalpur Economic Zone Project

Project Name: **Jamalpur Economic Zone** Questionnaire No:

Name of the Village: Name of the Mouza.....

District:-Jamalpur, Sub-district:-Jamalpur Sadar Plot No.

.....

1. Ownership of the Land

1. Private	2. Government	3. Religious	4. Community	5. Others	<input type="checkbox"/>
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2. Type of Land

1. Irrigated	2. Non-Irrigated	3. Barren	4. Forest	5. Other.....	<input type="checkbox"/>
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3. Use of Land

1.Cultivation	2. Orchard	3. Residential	4. Commercial	<input type="checkbox"/>
5. Forestation	6. No Use/ Barren	7. Other (specify)		
4. Affected area of the Land/Plot (in Acre):
5. Total Area of the affected Land/Plot (in Acre):
6. Total Land Holding of the Affected Person (in Acre)

1. Irrigated:	2. Non-irrigated:
3. Other:	4. Total:
7. Status of Ownership

1. Titleholder	2. Customary Right	3. License from Local Authority	<input type="checkbox"/>
4. Encroacher	5. Squatter	6. Other (specify):	
8. Type of Private Ownership

1. Individual/Single	2. Joint/Shareholders	<input type="checkbox"/>
	3. Other (specify):	
9. Name of the Owner/Occupier (s):
10. Father's Name:
11. Rate of the Land (Per Acre)

1. Market Rate:	2. Revenue Rate:
-----------------------	------------------------
12. Any of the following people associated with the Land

A. Agricultural Laborer	1. Yes	2. No	<input type="checkbox"/>
Name (i).....	(ii)		
B. Tenant/Lessee	1. Yes	2. No	<input type="checkbox"/>
Name (i).....	(ii)		
C. Sharecropper	1. Yes	2. No	<input type="checkbox"/>
Name (i).....	(ii)		
13. Any structure in the Affected Land 1. Yes..... 2. No.....
14. Area of the affected structure excluding boundary wall (in Square Meter)

a) Length	b) Width	c) Height
-----------------	----------------	-----------------

15. Area of the boundary wall only (in Meter): a) Length b) Height

16. Area of the total structure excluding boundary wall (in Square Meter)

a) Length b) Width c) Height

17. Scale of Impact on structure

a) 25% b) 50% c) 75% d) 100%

18. Type of Construction of the Structure

1. Temporary (buildings with mud/brick/wood made walls, thatched/tin roof)

2. Semi-Permanent (buildings, with tiled roof and normal cement floor)

3. Permanent (with RCC, Single/ Double storey building)

19. Type of Construction of the Boundary Wall (use code from Question: 20)

20. Age of the Structure (in years):

23. Market Value of the Structure (in Rs.):

24. Use of the Structure (select appropriate code from below)

A. Residential Category

1. House 2. Hut 3. Other(specify).....

B. Commercial Category

4. Shops 5. Hotel 6. Small Eatery 7. Kiosk 8. Farm House

9. Petrol Pump 10. Clinic 11. STD Booth

12. Workshop 13. Vendors 14. Com. Complex

15. Industry 16. Other(specify).....

C. Mixed Category

18. Residential-cum-Commercial Structure

D. Community Type

19. Comm. Center 20. Club 21. Trust 22.

Memorials 23 Other(specify).....

E. Religious Structure

24. Temple 25. Church 26. Mosque 27. Gurudwara 28. Shrines

29. Sacred Grove 30. Other(specify).....

F. Government Structure

31. Government Office 32. Hospital 33. School 34. College

35. Bus Stop 36. Other(specify).....

G. Other Structure

37. Boundary Wall 38. Foundation 39.

Cattle Shed 40. Other

(specify).....

25. Type of Business/Profession by Head of Household:

26. Status of the Structure

1. Legal Titleholder 2. Customary Right 3. License from Local Authority

4. Encroacher 5. Squatter

27. Any of the following people associated with the Structure?

A. Tenant in the structure

1. Yes

2. No

Name (i) (ii)

(iii) (iv)

B. Employee/ wage earner in commercial structure

1. Yes

2. No

Name (i) (ii)

.....

(iii) (iv)

C. Employee/ wage earner in residential structure

1. Yes

2. No

Name (i) (ii)

.....

(iii) (iv)

28. Number of trees within the affected area

1. Fruit Bearing.....2. Non-fruit Bearing.....3. Total.....

29. Vulnerability: (tick, multiple responses possible)

1...BPL__2.Disabled member/head__3. Indigenous People____3. Other (specify)_____

30. Religious Category

1. Muslim 2. Hindu 3. Christian 4. Buddhist

6. Other (specify).....

31. Number of family members Male..... Female..... Total.....

32. Number of family members with following criteria

1. Unmarried Son > 30 years.....2. Unmarried Daughter/Sister > 30 years.....

3. Divorcee/Widow.....4. Physically/Mentally Challenged Person

5. Minor Orphan.....

33. Vulnerability Status of the Household:

A. Is it a woman headed household? 1. Yes 2. No

B. Is it headed by physically/mentally challenged person? 1. Yes 2. No

C. Is it a household Below Poverty Line (BPL) 1. Yes 2. No

34. Annual income of the family Rs.....

35. If displaced, do you have additional land to shift? 1. Yes 2. No

36. Resettlement/ Relocation Option

1. Self Relocation 2. Project Assisted Relocation

37. Compensation Option for Land loser

1. Land for land loss 2. Cash for Land loss

38. Compensation Options for Structure loser

1. Structure for structure loss 2. Cash for Structure loss

39. Income Restoration Assistance (fill codes in preferred order)

1. Employment Opportunities in Construction work

 || || ||

2. Assistance/ Loan from other ongoing development scheme

3. Vocational Training

4. Others (specify)

40. Details of Family Members: (fill appropriate code)

Sl. No	Name of the Family Member	Age	Sex	Marital Status	Education	Occupation
		(in years)	1. Male 2. Female	1. Married 2. Unmarried 3. Widow 4. Widower 5. Others	1. Illiterate 2. Literate 3. Up to middle 4. Below metric 5. Metric 6. Graduate 7. Above	1. Service 2. Business 3. Agriculture 4. Study 5. Housewife 6. Labor 7. Unemployed 8. Professional
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

(Signature of the Supervisor) Date:

(Signature of the investigator)

12.5 Annexure 5: Social Survey datasheet

SL. No	Questions	Responses	
1	Name of PAP	Md. Aminur Islam	
2	Father's Name	Md. Ibrahim Islam	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	9 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	6 months	
12	Market value of the Structure (in Rs)	5,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 4 Female: 3 Total: 7	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	500000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)		



Sl. No	Questions	Responses	
1	Name of PAP	Md. Motiur Rahman	
2	Father's Name	Abdul Kuddus	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	15 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	20 Years	
12	Market value of the Structure (in Rs)	2,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 1 Female: 3 Total: 4	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	500000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work; Vocational Training	



SL. No	Questions	Responses	
1	Name of PAP	Most. Meheron Begum	
2	Father's Name	Md. Dudu	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	15 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	20 Years	
12	Market value of the Structure (in Rs)	2,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 2 Female: 2 Total: 4	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	200000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work; Vocational Training	



Sl. No	Questions	Responses	
1	Name of PAP	Hashina Bauaa	
2	Father's Name	Late Hazrat Ali Mandal	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	72 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 Years	
12	Market value of the Structure (in Rs)	20,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 12 Female: 10 Total: 22	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	108000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Vocational Training	



SL. No	Questions	Responses	
1	Name of PAP	Md. Mozammel	
2	Father's Name	Late Md. Hossain	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	11 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 Years	
12	Market value of the Structure (in Rs)	3,50,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	BPL	
16	Religious Category	Muslim	
17	Number of family members-	Male: 3 Female: 3 Total: 6	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	80000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Cash for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work; Assistance/Loan from other ongoing development scheme	



SL. No	Questions	Responses	
1	Name of PAP	Md. Mojibur	
2	Father's Name	Late Kudduj	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	12 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	15 Years	
12	Market value of the Structure (in Rs)	10,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	BPL	
16	Religious Category	Muslim	
17	Number of family members-	Male: 6 Female: 6 Total: 12	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	500000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work; Assistance/Loan from other ongoing development scheme	



Sl. No	Questions	Responses
1	Name of PAP	Md. Omar Ali
2	Father's Name	Late Azgar Mandal
3	Ownership of the land	Private
4	Type of Land	Non-irrigated
5	Use of Land	Residential
6	Affected area of the Land /Plot (in Acre)	11 Satak
7	Status of Ownership	Title Holder
8	Type of Private Ownership	Individual/Single
9	Scale of Impact On Structure	100%
10	Type of Construction of Structure	Temporary
11	Age of the Structure (in year)	10 Years
12	Market value of the Structure (in Rs)	3,00,000 BDT
13	Use of the Structure	Hut
14	Status of the Structure	Legal Titleholder
15	Vulnerability	
16	Religious Category	Muslim
17	Number of family members-	Male: 4 Female: 4 Total: 8
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No
19	Annual income of the family	100000 BDT
20	If displaced, do you have additional land to shift?	No
21	Resettlement/Relocation option	Project assisted relocation
22	Compensation option for land loser	Land for land loss
23	Compensation option for	Structure for structure loss
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work;



SL. No	Questions	Responses	
1	Name of PAP	Md. Shahid Ali	
2	Father's Name	Md. Azgar Mandal	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	11 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	11 Years	
12	Market value of the Structure (in Rs)	3,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 3 Female: 3 Total: 6	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	100000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work;	



SL. No	Questions	Responses	
1	Name of PAP	Late Ahammed Ali	
2	Father's Name	Late Hazrat Ali	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	10 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	12 years	
12	Market value of the Structure (in Rs)	3,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 1 Female: 4 Total: 5	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	1,20,000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	

SL. No	Questions	Responses	
1	Name of PAP	Md. Nazmul Haq	
2	Father's Name	Late Abdul Azmul Aziz	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	20 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	9 years	
12	Market value of the Structure (in Rs)	2,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 2 Female: 3 Total: 5	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	1,20,000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)		



SL. No	Questions	Responses	
1	Name of PAP	Soyom Ali and Jamal Uddin	
2	Father's Name	Late Asor Munshi	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	50 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	12 years	
12	Market value of the Structure (in Rs)	3,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 1 Female: 6 Total: 7	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	1,20,000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Md. Montu Mia & Rahima Begum	
2	Father's Name	Late Giash Uddin	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	17 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	12 years	
12	Market value of the Structure (in Rs)	6,00,000 BDT	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability		
16	Religious Category	Muslim	
17	Number of family members-	Male: 3 Female: 2 Total: 5	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	2,40,000 BDT	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Late. Lokman Hazi	
2	Father's Name	Late. Nazir Mondol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	200 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary, Semi Permanent	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	7 Lakh	
13	Use of the Structure	House	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	1	
16	Religious Category	Muslim	
17	Number of family members-	Male:8 Female:8 Total:16	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	3 Lakh	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for Structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work Vocational Training	



Sl. No	Questions	Responses	
1	Name of PAP	Late. Mohir Ali	
2	Father's Name	Late . Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	100 shotok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:2 Female:4 Total:6	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	80,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Md. Shahin	
2	Father's Name	Late. Hormuj	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	90 Shotok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	2 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:3 Female:3 Total:6	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	84,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	

SL. No	Questions	Responses	
1	Name of PAP	Md. Rofikul	
2	Father's Name	Late . Hormuj	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	120 Shotok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	2 lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:2 Female:2 Total:4	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	84,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in Construction work	

SL. No	Questions	Responses
1	Name of PAP	Md. Numman Ali Fokir
2	Father's Name	Md. Jamid Ali Fokir
3	Ownership of the land	Private
4	Type of Land	Non-irrigated
5	Use of Land	Residential
6	Affected area of the Land /Plot (in Acre)	32 Shotok
7	Status of Ownership	Title Holder
8	Type of Private Ownership	Joint /Share holders
9	Scale of Impact On Structure	100%
10	Type of Construction of Structure	Temporary
11	Age of the Structure (in year)	1 year
12	Market value of the Structure (in Rs)	3 Lakh
13	Use of the Structure	Hut
14	Status of the Structure	Legal Titleholder
15	Vulnerability	No
16	Religious Category	Muslim
17	Number of family members-	Male:2 Female:4 Total:6
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No
19	Annual income of the family	2 Lakh
20	If displaced, do you have additional land to shift?	No
21	Resettlement/Relocation option	Project assisted relocation
22	Compensation option for land loser	Land for land loss
23	Compensation option for	Cash for structure loss
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work Vocational Training



SL. No	Questions	Responses	
1	Name of PAP	Md. Sujuj Ali	
2	Father's Name	Late. Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	6 Shotok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint /Share holders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10year	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:1 Female:1 Total:2	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	72,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Cash for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Md. Numur Ali Nummar Ali Fokir	
2	Father's Name	Md. Jamid Ali Fokir	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	9 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint / shareholders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	1 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:2 Female:2 Total:4	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	2 Lakh	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in Construction work Vocational Training	



SL. No	Questions	Responses	
1	Name of PAP	Lebu Mia	
2	Father's Name	Md. Suruj Ali	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	6 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint / shareholders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	7 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:1 Female:1 Total:2	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family		
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in Construction work	

SL. No	Questions	Responses	
1	Name of PAP	Ali Afjal	
2	Father's Name	Md. Dela Alam	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	32 Satak	
7	Status of Ownership	Joint/ Shareholder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	1 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:4 Female:2 Total:6	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	-----	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Sanoyar Ali	
2	Father's Name	Late. Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	6 Satak	
7	Status of Ownership	Joint/ Shareholder	
8	Type of Private Ownership	Individual/Single	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	7 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:1 Female:1 Total:2	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	-----	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	

SL. No	Questions	Responses	
1	Name of PAP	Sadek Ali	
2	Father's Name	Late. Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	170 Shotok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint/ shareholders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:2 Female:3 Total:5	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	72,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction	



SL. No	Questions	Responses	
1	Name of PAP	Md. Majed Ali	
2	Father's Name	Late. Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	6 Satak	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint / shareholders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	10 years	
12	Market value of the Structure (in Rs)	3 Lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Relligious Category	Muslim	
17	Number of family members-	Male:1 Female:2 Total:3	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	72,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	Employment opportunities in construction work	



SL. No	Questions	Responses	
1	Name of PAP	Md. Asket Ali	
2	Father's Name	Late. Gandol	
3	Ownership of the land	Private	
4	Type of Land	Non-irrigated	
5	Use of Land	Residential	
6	Affected area of the Land /Plot (in Acre)	5 shatok	
7	Status of Ownership	Title Holder	
8	Type of Private Ownership	Joint / shareholders	
9	Scale of Impact On Structure	100%	
10	Type of Construction of Structure	Temporary	
11	Age of the Structure (in year)	5 years	
12	Market value of the Structure (in Rs)	3 lakh	
13	Use of the Structure	Hut	
14	Status of the Structure	Legal Titleholder	
15	Vulnerability	No	
16	Religious Category	Muslim	
17	Number of family members-	Male:1 Female:0 Total:1	
18	Vulnerability status of the household- (A) Is it a woman head household? (B) Is it headed by physically/mentally challenged person? (C) Is it a household Below Poverty Line(BPL)?	(A) No (B) No (C) No	
19	Annual income of the family	96,000	
20	If displaced, do you have additional land to shift?	No	
21	Resettlement/Relocation option	Project assisted relocation	
22	Compensation option for land loser	Land for land loss	
23	Compensation option for	Structure for structure loss	
24	Income structure loser restoration assistance (preferred order)	-----	

Our Offices

Ahmedabad

2nd floor, Shivalik Ishaan
Near. C.N Vidhyalaya
Ambawadi,
Ahmedabad - 380 015
Tel: + 91 79 6608 3800
Fax: + 91 79 6608 3900

Bengaluru

12th & 13th floor
"U B City" Canberra Block
No.24, Vittal Mallya Road
Bengaluru - 560 001
Tel: + 91 80 4027 5000
+ 91 80 6727 5000
Fax: + 91 80 2210 6000 (12th floor)
Fax: + 91 80 2224 0695 (13th floor)

1st Floor, Prestige Emerald
No.4, Madras Bank Road
Lavelle Road Junction
Bengaluru-560 001 India
Tel: +91 80 6727 5000
Fax: +91 80 2222 4112

6th floor
"U B City" Canberra Block
No.24, Vittal Mallya Road
Bangaluru-560 001
Tel: + 91 80 4027 5000
Tel: + 91 80 6727 5000
Fax: + 91 80 2210 6000
+ 91 80 2224 0695

Chandigarh

1st Floor
SCO: 166-167
Sector 9-C, Madhya Marg
Chandigarh - 160 009
Tel: + 91 172 671 7800
Fax: + 91 172 671 7888

Chennai

Tidel Park,
6th & 7th Floor
A Block (Module 601,701-702)
No.4, Rajiv Gandhi Salai
Taramani
Chennai - 600 113
Tel: + 91 44 6654 8100
Fax: + 91 44 2254 0120

Hyderabad

Oval Office
18, iLabs Centre,
Hitech City, Madhapur,
Hyderabad - 500 081
Tel: + 91 40 6736 2000
Fax: + 91 40 6736 2200

Kolkata

22, Camac Street
3rd Floor, Block C"
Kolkata - 700 016
Tel: + 91 33 6615 3400
Fax: + 91 33 2281 7750

Mumbai

14th Floor, The Ruby
29 Senapati Bapat Marg
Dadar (west)
Mumbai - 400 028
Tel + 91 22 6192 0000
Fax + 91 22 6192 1000

5th Floor Block B-2,

Nirlon Knowledge Park
Off. Western Express Highway
Goregaon (E)
Mumbai - 400 063
Tel: + 91 22 6192 0000
Fax: + 91 22 6192 3000

NCR

Golf View Corporate
Tower - B
Near DLF Golf Course,
Sector 42
Gurgaon - 122 002
Tel: + 91 124 464 4000
Fax: + 91 124 464 4050

6th floor, HT House

18-20 Kasturba Gandhi Marg
New Delhi - 110 001
Tel: + 91 11 4363 3000
Fax: + 91 11 4363 3200

4th & 5th Floor, Plot No 2B,

Tower 2, Sector 126,
Noida - 201 304
Gautam Budh Nagar, U.P. India
Tel: + 91 120 671 7000
Fax: + 91 120 671 7171

Pune

C-401, 4th floor
Panchshil Tech Park
Yerwada (Near Don Bosco School)
Pune - 411 006
Tel: + 91 20 6603 6000
Fax: + 91 20 6601 5900

Kochi

9th Floor "ABAD Nucleus"
NH-49, Maradu PO,
Kochi - 682 304
Tel: + 91 484 304 4000
Fax: + 91 484 270 5393

Draft Detailed Feasibility Study for Jamalpur Economic Zone

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