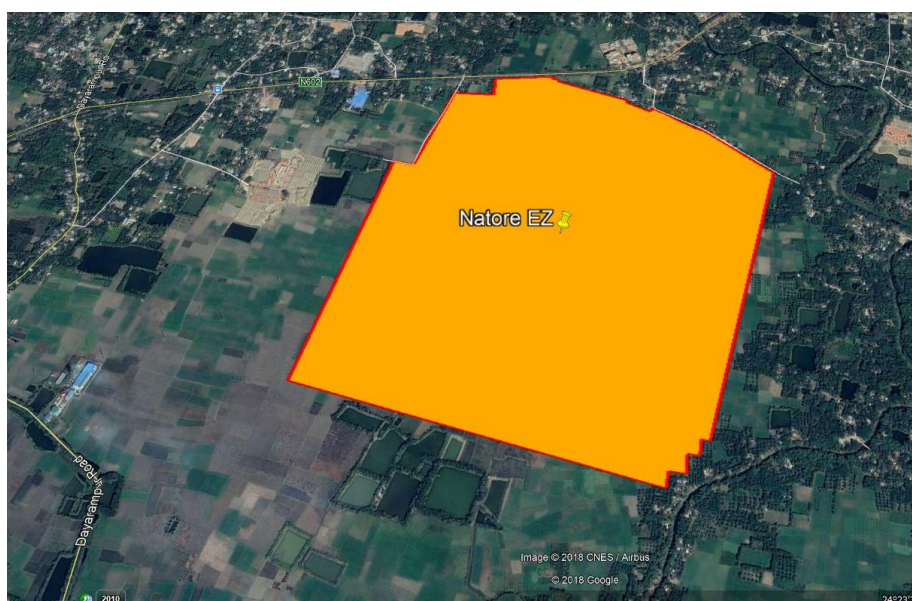




## Bangladesh Economic Zones Authority

### *Pre-feasibility Study Report*

### Natore Economic Zone



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***Pre-feasibility Study Report***  
***Natore Economic Zone***

24 December 2018

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## **References**

## **Abbreviations**

|       |   |   |
|-------|---|---|
| API   | : | Active Pharmaceutical Ingredients                             |
| BASIS | : | Bangladesh Association of Software and Information Services   |
| BBS   | : | Bangladesh Bureau of Statistics                               |
| BCTMA | : | Bangladesh Cosmetics and Toiletries Manufacturers Association |
| BEIOA | : | Bangladesh Engineering Industry Owners Association            |
| BEMMA | : | Bangladesh Electrical Merchandise Manufacturers Association   |
| BEPZA | : | Bangladesh Export Processing Zones Authority                  |
| BEZA  | : | Bangladesh Economic Zones Authority                           |
| BGMEA | : | Bangladesh Garment Manufacturers and Exporters Association    |
| bn    | : | billion   |
| BSCIC | : | Bangladesh Small and Cottage Industries Corporation           |
| BDT   | : | Bangladesh BDT  |
| CAGR  | : | Compound Annual Growth Rate                                   |
| EPB   | : | Export Promotion Bureau                                       |
| EPZ   | : | Export Processing Zone  |
| ETP   | : | Effluent Treatment Plant                                      |
| EZ    | : | Economic Zone   |
| GDP   | : | Gross Domestic Product  |
| GoB   | : | Government of Bangladesh                                      |
| ICT   | : | Information and Communication Technology                      |
| IRR   | : | Internal Rate of Return                                       |
| LNG   | : | Liquefied Natural Gas   |
| mn    | : | million   |
| NEZ   | : | Natore Economic Zone  |
| PMO   | : | Prime Minister's Office                                       |
| PPP   | : | Public-Private Partnership                                    |
| RMG   | : | Ready Made Garments   |
| SEZ   | : | Special Economic Zone   |
| SFB   | : | Standard Factory Buildings                                    |
| TPE   | : | Total Number of Persons Employed                              |
| USD   | : | US Dollar   |

## Executive Summary

### Pre-feasibility Study Report Natore Economic Zone

*Bangladesh Economy.* Growth in Bangladesh has been underpinned by a stable and prudent macro-economic policy, rising industry and service outputs and a continued high level of remittances. Going forward, the objective of Government of Bangladesh (GoB) is to develop a growth trajectory that will support an overall increase in real GDP growth of 8% per annum and reduce poverty from 40% to 15% by 2021.

Bangladesh achieved more than 6% economic growth on average in the last five years. In spite of prolonged global economic downturn, the economy of Bangladesh has been maintaining high and sustainable growth rates. GDP growth of 7.28% during 2016-2017 was based on 10.2% growth in industry sector followed by 6.7% growth in service sector and 3% growth in agriculture sector. The growth of industries in 2017 was largely driven by higher manufacturing activities and growth in export earnings<sup>1</sup>. The growth of the industrial sector is dominated by exports earning in RMG, which has been growing at an average of 20%<sup>2</sup> over the last five years. In reorganization of the long-term development challenges, the government has adopted Bangladesh Vision 2021. Bangladesh plans to achieve lower-middle income status by 2021, which requires the economy to grow by 8 to 10%<sup>3</sup> per annum. Share of manufacturing is expected to grow from 17% in 2009 to 28% in 2021. Decline in share of agriculture is projected to be compensated by increased share of industry and manufacturing while share of services would remain steady.

Manufacturing is the predominant and leading sector within broad industry accounting for 77%<sup>4</sup> of all industrial units located across the country followed by construction (15%) . Out of total 9,49,590, 27.6%<sup>5</sup> manufacturing units are located in Dhaka division, 22.6% in Chittagong division and 14.2%<sup>6</sup> in Khulna division. The sector recorded average 9.38% annual growth rate during 2006-2017. In 2008-09, it grew by 6.6% fuelled by 8.1% growth in small and cottage industry and 6.2% growth in medium and large industry. The growth increased to 10.3% in 2015-16.

As per Bangladesh Economic Review 2017, the contribution of manufacturing industries to national GDP was 21.7% in 2016-17, of which medium and large-scale industries contributed 18% to GDP and small-scale industries contributed only 3.7% to GDP. Foreign trade of Bangladesh has registered sustainable growth since 2008-09 due to initiation of economic reforms and adoption of an export-biased liberal foreign trade policy. In 2015-16, the earning from international trade was USD 79 bn (Imports USD 41.2 bn and exports USD 37.81 bn resulting in a negative trade balance of USD 3.39 bn) . Government has been pursuing an export led economic development strategy to stimulate export earnings. Promotional campaign and industry assistance are being given under export diversification program.

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<sup>1</sup>Bangladesh Economic Review, 2017 and Bangladesh Bank annual report, 2016-17

<sup>2</sup>Bangladesh Bank

<sup>3</sup>Perspective Plan 2010-2021

<sup>4</sup>Preliminary Report on Economic Census 2013

<sup>5</sup> Same as above

<sup>6</sup> Same as above

GoB has successfully provided serviced land, infrastructure, and a good business environment via the Export Processing Zones (EPZs) Program. Since 1993, EPZs have triggered impressive growth in exports, mainly in the RMG sector, at an average annual rate of 23%. Bangladesh Economic Zones Act, 2010 was passed in Parliament in August 2010, providing the overall framework for establishing economic zones throughout Bangladesh. To support commitment to economic zones, BEZA intended in undertaking pre-feasibility study of Natore Economic Zone (NEZ). In this regard, BEZA has engaged Infrastructure Investment Facilitation Company (IIFC) for conducting this pre-feasibility study.

*Approach and Methodology.* A series of initial meetings were carried out with BEZA, local authorities, and key industry stakeholders and visits to investigate and make assessment on the site, connectivity, availability of labor, existing industrial base, social infrastructure especially level of education, industrial policy and business environment, fiscal levies and taxation policies, financial markets, trends of investments and exports and so on. The past trend of investment in the relevant sectors in Bogura, Natore, Dhaka, Pabna, Chapainawabgonj was also analysed and tried to assess the potential investment in the future that was required in estimating the *demand for the land* for an industry.

A long list of industrial sectors that existed 'manufacturing' under Bangladesh government economic sector classification, was extracted and then short-listed the sectors based on the labor availability; presence of raw materials/ backward linkage industries; presence of forward linkage industries as well; growth prospect/export competitiveness; and suitability with respect to existing local demand for the products. A scoring exercise of the short-listed sectors was carried out to prioritise the space allocation for each sector in the EZ based on suitability of the sector for the EZ. A separate demand projection was prepared for the site for each shortlisted sector.

*Natore.* Natore is a northern district of the Bangladesh with an area of 1,896.05 km<sup>2</sup> where many small and mid-sized units of industries are sited. Natore sub-division was established in 1845. The land use pattern of the proposed EZ area falls under agriculture zone and aquaculture zone. The project site is situated adjacent to the Natore-Rajshahi Highway. Existing road may be improved and used as an access road to the project site. Natore Railway Station is located at a distance of 5 km (approximate) from proposed EZ. The site is located at Natore Sadar upazila of Natore District. Out of total 71,975 acres of land, 3.8% is low land, 65.7% medium and 30.5% is high. The site is currently arable low flat land.

*Competitiveness of Natore.* The economy of Natore<sup>7</sup> is predominantly agricultural. Agriculture and food processing sectors play a vital role in the economy of this district. Out of total 369,000 households of the district, 65.4% holdings are farms producing variety of crops namely local and HYV rice, jute, wheat, potato, vegetables, spices, pulses, oil seeds, sugarcane and other minor crops, etc. Various fruits like mangos, jackfruits, litchis, jam (black berries), palms, bananas, guavas, water melons etc. are the main fruits of the district.

Examining the data by economic activities, it is observed that the wholesale and retail trade, repair of motor vehicles and motorcycles have appeared as the two largest sectors while manufacturing holds the third position with number of establishments at 11,500 and TPE 73,500. Out of the total manufacturing establishments, a significant 92.88% sell their products entirely at

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<sup>7</sup> IIFC analysis till 2017 based on Economic Census, 2013, BBS (District Report Natore) and District Statistics, 2011, Statistical Pocket Book 2016, BBS



local market while 0.21% do exclusively export and the lowest portion 0.02% sell both at local and foreign markets.

It is apparent that economic activities in Natore have experienced a significant downfall in recent period. This is due to less focus on the district and therefore, reduced enthusiasm of local entrepreneurs. Most of the industries in Natore are cottage based, which implies that the raw material and experienced labor is available in the district, however, due to entrepreneurship being on a downward trend, the raw materials and labor available is not being utilized in medium and large scale industries. In other words, despite potentials, the district is passing a slump in economic activities, which deserves an enhanced attention from the government.

*Natore BSCIC Estate.* For promotion and extension of small and cottage industries in the private sector, Natore BSCIC Estate industrial complex was established in 1987 on 15 acres of land. This industrial estate complex consists of various industries. The industry mix represents an ideal combination to be assumed for future planning of EZs in Natore and shows the prospect of different industries. It means that food processing, pharmaceuticals and plastic, ceramics etc. are the most prospective sectors for Natore.

*Potential Industry Sectors for the Site.* The site specific exercise was carried out to identify the potential industry sectors and it was decided to carry out the survey among industries located at Natore and its surrounding areas. It was also decided to survey manufacturing industries located in Dhaka to assess their willingness to expand or relocate their businesses to proposed EZ at Natore. In this regard, the list of industries from Natore Chamber of Commerce, Natore BSCIC Estate and trade associations was collected.

The existing industries in the area/region of NEZ were examined. Industry trend in this area has also examined in identifying the potential industry sectors which may be attracted for NEZ. Based on the examination the following types of industries located in Natore, Bogura, Dhaka, Pabna and Chapainawabganj, were identified for conducting the investor survey. The businesses are categorized into the following types: light engineering, textile and RMG, food processing, jute, furniture, pharmaceutical and leather.

*Food Processing.* Food processing sector is one of the growing sectors in Bangladesh in terms of production, growth, consumption, and export. Comprised of 200 companies, the processed food industry provides most of the requirements of the local market. The total turnover of the industry is estimated to be USD 2.5 bn.

*Light Engineering.* Growth prospect and import substitution prospect is high in the light engineering industry. This sector contributes to growth in various related sectors and a wide range of economic activities.

*There are strong backward and forward linkages between the light engineering industries and other sector such as agriculture, automobile, and transportation in Bangladesh. The Sector is experiencing positive export performance in recent time, and achieved 14.1% export growth in 2015. Export earnings from the light engineering sector stood at USD 510 mn in 2016.*

The sector produces mainly spare parts of machineries of transport, agriculture, power, automobiles and pharmaceutical sector, and electrical switches and accessories. Most of light engineering industries are located at Dhaka, Chittagong, Narayanganj, Bogura, Gazipur, Kishorganj. Number of export quality light engineering products is going to foreign market on

direct and subcontracting means. The bicycle and bicycle parts export industry has emerged relatively recently in the industrial landscape of Bangladesh. Foreign direct investment was critical to the emergence of the bicycle export sector. A domestic trading group, Meghna, was the next firm to enter the bicycle export manufacturing industry. Bicycle exports are the single largest product export within Bangladesh's light engineering sector, contributing to about 7.5% of engineering exports.

*Furniture Industry.* It is estimated that, by 2018 Bangladesh will earn export potential of crafts furniture accessories worth of USD 20 mn along with furniture worth USD 60 mn. Furniture sector was included in the Export Policy, 2009-2012 as a Special Development Sector and in Export Policy, 2012- 2015, it has been upgraded as a Highest Priority Sector due to extreme export potentials. The total export growth target for 2013- 14 was nearly 13% from USD 28 bn last fiscal. According to Export Promotion Bureau data, in 2009-10, the furniture export volume was USD 19 mn, while it amounted to USD 21 mn in 2010-11 and USD 27 mn in 2011-12. In 2016-17, the total export volume was USD 53 mn.

*Pharmaceuticals.* With 194 operating companies, the pharmaceutical industry provides 97% of the total medicinal requirement of the local market. The industry also exports medicines to global markets, including Europe. Nearly 80% cumulative growth in the last three years means that the Bangladesh pharmaceutical market has doubled. The domestic retail market is growing at 25% per year. Bangladesh is also going to establish an API park where 40 API industries are expected to operate. Current market size is approximately BDT 76,500 mn per year. The industry contributes 1% of the GDP. At present, there are 15 companies in Bangladesh manufacturing 40 APIs. The industry imports APIs mostly through sea and air.

*Plastics Industry.* Plastic products industry initiated as a backward linkage industry for RMG sector, today plastic and plastic based products manufacturing is profoundly contributing to the economy. The development of plastics industry in local SME sector has flourished by low-end domestic plastic products. According to BPGMEA, plastic product industry contributes 1.2% of the country's GDP with a total investment of BDT 185.5 bn.

*Jute Industry.* Jute manufacturing sector is one of the oldest traditional manufacturing sectors of Bangladesh. Jute sector of Bangladesh has made and continues to make significant contributions to the overall economy of the country. The importance of this sector to the Bangladesh economy could not be overstated. Jute cultivation area is about 6% of the total land area of the country and about 10% of the total agricultural land area. But jute production is about 26% of all agricultural crops production in Bangladesh.

*Demand for Industrial Land.* Much of the demand for space in the proposed EZ will likely be from companies that will relocate operations from Dhaka and Chittagong. Consultants looked at multiple indicators, published information about growth trends, and estimated number of business enterprises in operation in Bangladesh.

The number of new business enterprises created each year ranges between 5 to 8%, based on published data. Industrial lands are unavailable here, and all business enterprises, from leather workshops to garments industries, are scattered throughout residential areas without proper planning. There are governmental pressures to move business enterprises away from Dhaka.

The demand has been forecasted based on the following scenario assumptions.

| Years Needed for Full uptake | Base case | Aggressive Case | Conservative Case |
|------------------------------|-----------|-----------------|-------------------|
| Food Processing              | 6         | 4               | 8                 |
| Light Engineering            | 6         | 4               | 8                 |
| Plastic / Ceramic and Misc.  | 7         | 5               | 9                 |
| Furniture                    | 7         | 5               | 9                 |
| Jute                         | 8         | 6               | 10                |
| Pharmaceutical               | 10        | 8               | 12                |

**Master Planning Considerations.** BEZA’s vision is to make master plan and accordingly develop industries for every EZ. In the NEZ area master plan layout make various types of industries on about 300 acres of land. The broad category of land use for *i.e.* food processing, light engineering, plastic / ceramic and miscellaneous, furniture, jute, pharmaceutical, commercial area, Fire Services, CETP, CSTP, water treatment plants, power plant etc in the proposed EZ along with excellent state of the infrastructure facilities and professional management to attract and support investments in the industrial sectors. It focuses on development of medium and small-scale industries as well as trading and Services. The processing activities are prime activities and the efficiency of production is enhanced by a number of other activity zones. These include post-harvest activities, linking infrastructures, marketing infrastructure, R&D services, community facilities and green spaces.

**Environmental and Social Review:** The environmental and social baseline is the existing status of environment and society around the proposed project site. It has been analyzed through assessment of environmental components like air, water, land, noise, soil, etc. The baseline provides the basis for assessment of impact (potential changes in the baseline conditions) due to the development of proposed NEZ.

**Air Quality:** The air quality of the proposed site is within the limit of Bangladesh Standard (ECR, 1997) . The sources of small amount of air pollutants are emissions from vehicles.

**Noise Level:** There are no major sources of noise in the project area. The baseline noise environment in the project area is within the range of Bangladesh Environmental Quality Standard (Noise Pollution (Control) Rules, 2006) . The main sources of the noise are the construction equipment, traffic movement and the neighbor residential areas.

**Water Quality:** There are no major surface water sources in the project area. It is proposed to utilize ground water for domestic, office consumption and different processes of NEZ’s industries. Ground water samples were analysed for parameters covering physical, chemical and bacteriological characteristics. All the test results are found within the limit.

**Land Type and Cropping Pattern:** In Natore Sadar upazila out of total 71,975 acres of land, 3.8% is low land, 65.7% medium and 30.5% is high. Five crop combination has been practiced in the project area *i.e.*, aman-boro-aus-wheat-sugarcane. Sugarcane is the eighth important crop of the country which grows best in Natore.

**Socio-economic Conditions:** Most of the people in the project area depends on agriculture. Literacy rate in Natore Sadar upazila is around 55.6%. Road transport and railway communication are available in the project area. It is expected that development work will create employment opportunities for local people as well as raise health and education status.

**Financial Analysis:** The financial analysis demonstrates financial results considering two choices of investment; government/BEZA led model and PPP model under three different demand options namely base case, aggressive case and conservative case. Considering the different choices and options the financial analysis has been made. The project IRR was derived from the projected cash flow to the project and equity IRR from the projected cash flow to equity as follows:

| Output                        |      |
|-------------------------------|------|
| Equity IRR (after tax)        | 9.3% |
| Project IRR (after tax)       | 9.5% |
| DSCR                          |      |
| Average                       | 1.0  |
| Maximum                       | 2.20 |
| Minimum                       | 0.12 |
| Equity Payback Period (year)  | 15   |
| Project Payback Period (year) | 11   |

**Scenario Analysis.** Scenario analysis of different options demonstrates that the difference in financial indicators in the base case, aggressive case and conservative. Financial results for different investment models are given below.

|                                      |                          | Government led Model | PPP Model |
|--------------------------------------|--------------------------|----------------------|-----------|
| <b>Equity IRR</b>                    | <i>Base Case</i>         | 9.3%                 | 14.0%     |
|                                      | <i>Aggressive Case</i>   | 11.1%                | 17.1%     |
|                                      | <i>Conservative Case</i> | 7.7%                 | 11.6%     |
| <b>Project IRR</b>                   | <i>Base Case</i>         | 9.5%                 | 13.1%     |
|                                      | <i>Aggressive Case</i>   | 10.7%                | 15.1%     |
|                                      | <i>Conservative Case</i> | 8.3%                 | 11.4%     |
| <b>Average DSCR</b>                  | <i>Base Case</i>         | 1.0                  | 1.3       |
|                                      | <i>Aggressive Case</i>   | 1.1                  | 1.5       |
|                                      | <i>Conservative Case</i> | 0.8                  | 1.0       |
| <b>Equity Payback Period, years</b>  | <i>Base Case</i>         | 15                   | 12        |
|                                      | <i>Aggressive Case</i>   | 13                   | 11        |
|                                      | <i>Conservative Case</i> | 16                   | 14        |
| <b>Project Payback Period, years</b> | <i>Base Case</i>         | 11                   | 11        |
|                                      | <i>Aggressive Case</i>   | 10                   | 9         |
|                                      | <i>Conservative Case</i> | 12                   | 12        |

**Sensitivity.** Various factors affect the equity IRR of the EZ project. In order to understand the importance of project parameters in determining the viability of the project, it is important to carry out a sensitivity analysis. The following factors have significant effect on the equity IRR:

- i) Capital Cost
- ii) O&M Expense
- iii) Lease Rate

Each of the above factors was varied by 10% in both directions and the effects on the equity IRR were observed.

#### **Sensitivity of Equity IRR**

Capital Cost, O&M Expense, Lease rate have been analyzed for examining their impact on IRR. They were varied by 10% in both directions and the effects on the equity IRR were observed.

#### *Government led Model*

|              | -20%  | -10%  | 0%   | 10%   | 20%   |
|--------------|-------|-------|------|-------|-------|
| Capital Cost | 11.6% | 10.4% | 9.3% | 8.3%  | 7.5%  |
| O&M Expense  | 9.6%  | 9.5%  | 9.3% | 9.2%  | 9.0%  |
| Lease Rate   | 3.5%  | 6.5%  | 9.3% | 11.8% | 14.1% |

#### *PPP Model*

|              | -20%  | -10%  | 0%    | 10%   | 20%   |
|--------------|-------|-------|-------|-------|-------|
| Capital Cost | 17.1% | 15.5% | 14.0% | 12.8% | 11.7% |
| O&M Expense  | 14.4% | 14.2% | 14.0% | 13.9% | 13.7% |
| Lease Rate   | 6.8%  | 10.6% | 14.0% | 17.2% | 20.0% |

*Based on reasonable assumptions, after tax equity IRRs 9.3% and 14.0% have been derived for Government led Model and PPP Model respectively. The equity IRR varies significantly with changing the key factors, capital cost and lease rate, whereas O&M expense variation has insignificant effect on equity IRR.*

**Net Present Value (NPV):** NPV has been calculated using the cost of capital/hardle rate of 9%. The computation shows the NPV in Government led model and PPP model are Tk. million 305 PPP Tk. million 2,656 which are positive and indicates the project is viable in both cases.

**Economic Analysis:** The economic IRR is 12.37% with a Benefit to Cost ratio of 1.15 considering a discount rate of 10% during base case. The Economic IRR of 12.37% shows that the project is economically viable throughout its life. It is going to create a positive impact on the economy of the nation as a whole.

**Overall Findings with respect to suitability of site.** Availability of labor, manufacturing of quality products, low price of land, availability of raw materials, available transportation, business-oriented people are the strengths of NEZ, while Insufficient gas and water and need of a domestic airport may act as obstacles to rapid growth. The opportunities may be in the forms of expansion of business, employment creation, and use of domestic products (raw materials) ; while risks are associated with higher interest rate of bank loan for investors, weak and inadequate power and infrastructure facilities.



# Pre-feasibility Study Report Natore Economic Zone

## 1 Introduction

*Growth in Bangladesh has been underpinned by a stable and prudent macro-economic policy, rising industry and service outputs and a continued high level of remittances. Going forward, the objective of Government of Bangladesh (GoB) is to develop a growth trajectory that will support an overall increase in real GDP growth of 8% per annum and reduce poverty from 40% to 15% by 2021.*

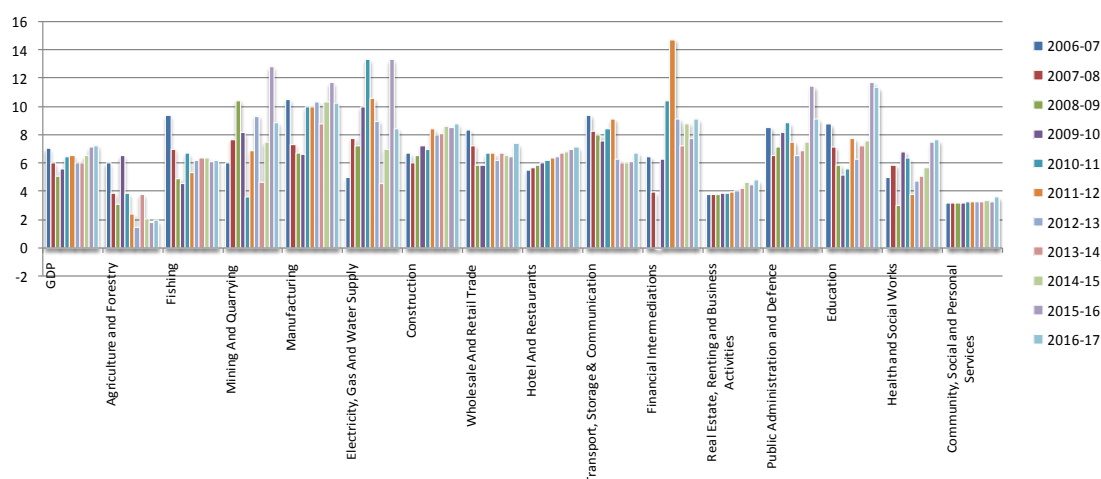
Bangladesh sustained an annual GDP growth of approximately 6.3% during the period of 2005-09, despite the global financial crisis and global food price shock. Growth in Bangladesh has been underpinned by a stable and prudent macroeconomic monetary policy, rising industry and service outputs and a continued high level of remittances. Going forward, the Government of Bangladesh's (GoB) objective is to develop a growth trajectory that will support an overall increase in real GDP growth of 8% per annum and reduce poverty from 40% to 15% by 2021.

### 1.1 Bangladesh Economy

As already mentioned, the Bangladesh economy has been experiencing steady growth over the last decade and prospects are looking better for the coming years, with a booming industrial sector, flourishing remittance flow, record high foreign currency reserve and growing interest of international investors' in Bangladesh.

Bangladesh achieved more than 6%<sup>8</sup> economic growth on average in the last five years. Most of the global economies including the Asian economies were severely affected by the global economic crisis and their growth rates experienced significant decline since 2009. Even after the five years of financial crisis, the global economics are still struggling to revive their economies. In spite of global economic downturn, the economy of Bangladesh has been maintaining high and sustainable growth rates.

**Figure 1.1: Sector-wise Growth Rate<sup>9</sup>**



<sup>8</sup> Ministry of Finance

<sup>9</sup> (At constant price) Annual Report, Bangladesh Bank, 2017

GDP growth 7.28% during 2016-2017 was based on 10.2% growth in industry followed by 6.7% growth in service sector and 3% growth in agriculture. The growth of industries in 2017 was largely driven by higher manufacturing activities and growth in export earnings<sup>10</sup>. The growth of the industrial sector is dominated by exports earning in RMG, which has been growing at an average of 20%<sup>11</sup> over the last 5 years.

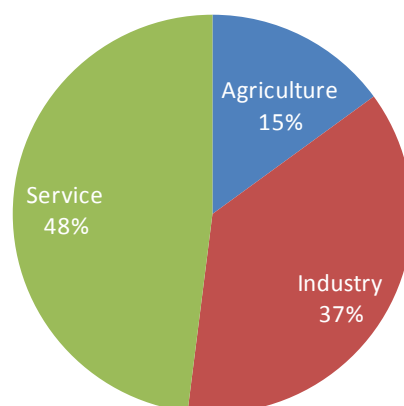
The growth that had occurred in the service sector of the economy was fueled by growing importance of education, health and social activities. Income growth had been dominated by wages and salaries in incorporated firms. The life span of the population continued to increase with more urbanization and more apt to live in a modern life. The later trend is particularly helping to reduce poverty level.

In the past decade, the economy has apparently become more stable. Living standards, as measured by per capita GDP, had improved at a higher rate. Internal and external balances were in good shape. Unemployment rate remained at a reasonable level. The economic stability and business prospects that prevailed in this particular period have generated significant confidence that may be a cause for good economic development in the near future.

## 1.2 Vision 2021

In reorganization of the long-term development challenges, the government adopted Bangladesh Vision 2021. The vision and the associated Perspective Plan 2011-21 have set solid development targets for Bangladesh by the end of 2021. Bangladesh plans to achieve lower-middle income status by 2021, which requires the economy to grow by 8% to 10% per annum. Bangladesh economy has sustained modestly high growth in the last 10 years. Achieving the targeted robust growth will require a major spur in the rate of investment.

**Figure 1.2: Target Share of GDP by 2021<sup>12</sup>**



Promotion of structural transformation in the economy has been cited as one of the important strategic goals of the Perspective Plan. In the structural transformation process, within the time of Perspective Plan 2011-21, agriculture's share will decline from 16% (2004-09 average) to 12% by the end of Seventh Five Year Plan and share of manufacturing will grow from 15% (2004-09 average) to 22% in 2021.

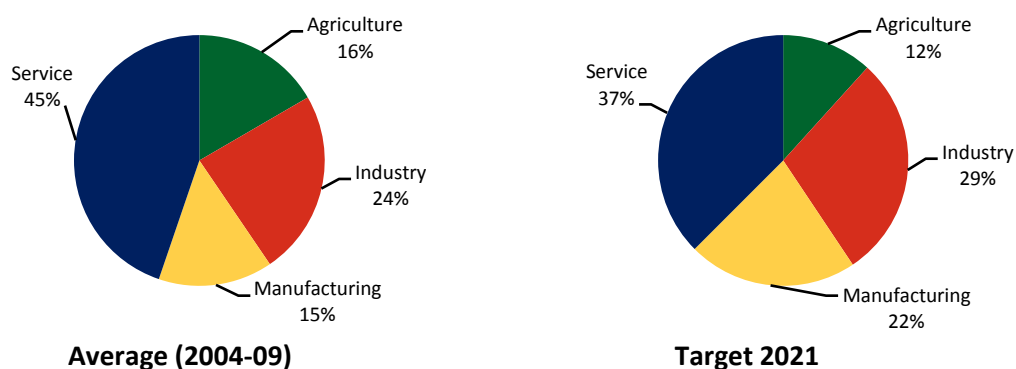
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<sup>10</sup>Bangladesh Economic Review, 2017 and Bangladesh Bank annual report, 2016-17

<sup>11</sup>Bangladesh Bank

<sup>12</sup>Perspective Plan of Bangladesh 2010-2021

**Figure 1.3: Strategic Structural Change: Share of GDP (percent)**



As a strategic option, Seventh Five Year Plan explicitly has chosen the path of boosting manufacturing for creating productive high-income jobs and development. It is found that decline in share of agriculture is projected to be compensated by increased share of industry and manufacturing while share of services remains steady.

### 1.3 Labor Force

The sustained growth in Bangladesh's labor force (nearly 2 mn a year) is an asset that nevertheless increases the country's vulnerability. Creating productive employment will largely depend on creating an environment conducive to private sector investment, particularly within the labor-intensive manufacturing and service sectors.

### 1.4 Industrial Zone Regime

GoB has successfully provided serviced land, infrastructure, and a good business environment via the Export Processing Zone (EPZ) Program. EPZs have been used as a "strategic instrument" for attracting FDI and dealing with the shortcomings in the overall investment climate, business registration, and licensing, etc. environment. Bangladesh Export Processing Zone Authority (BEPZA) was established in 1980, with the first EPZ built in Chittagong in 1983. The EPZ program was the first systematic initiative to provide fully serviced land and a better business environment for investors, targeting large scale, export-oriented manufacturing. Since 1993, EPZs have triggered impressive growth in exports, mainly in the RMG sector, at an average annual rate of 23%, reaching nearly USD 2.9 bn by 2010, and employing almost 28,000 people.

Bangladesh's current EPZ model, however, has had its limits, both in terms of cumulative impacts and spillovers into the domestic economy. As an exporting enclave, EPZs have provided little in the way of linkages with the domestic economy, up-stream or down-stream, resulting in low technology and efficiency spillovers, which normally accompany foreign investment. Investments in other sectors beyond the low capital investment of the RMG segment have also not materialized.

The GoB's objective is therefore to maximize the potential direct and indirect impacts through a more modern regime of Economic Zones (EZs). As such, the government has launched an effort to develop a new EZ paradigm in Bangladesh drawing from numerous successful examples from around the world, as well as Bangladesh's own positive experience with the EPZ model. In addition, the GoB is expecting additional spillover effects to local firms stemming from new foreign direct investment and from more investment within value chains. This will in turn



stimulate the procurement of more local products and produce better linkages between firms and educational institutions. A faster adaption to international environmental and social practices would also be encouraged through this new EZ policy regime.

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

Bangladesh Economic Zones Act, 2010 was passed in Parliament in August 2010, providing the overall framework for establishing EZs throughout Bangladesh. Under this Act, the Bangladesh Economic Zones Authority (BEZA) was established under the Prime Minister's Office (PMO) and governed by a Board chaired by the Prime Minister. The law provides the legal coverage for attracting and leveraging private investment in the development of zones as zone developers or operators, and in the provision of providing infrastructure services, such as power, effluent treatment, wastewater treatment etc. The law also allows for development of EZs and support infrastructure through a Public-Private Partnership (PPP) mechanism.



## 2 Approach and Methodology

### 2.1 The Assignment

To support their commitment to economic zones, BEZA intended in undertaking pre-feasibility study of NEZ. In this regard, BEZA engaged IIFC for conducting this pre-feasibility study. The time-frame for the assignment was 6 months. The approach undertaken to comply with the ToR is described in the following section.

### 2.2 Approach

The methodology reflected the specific requirements of the project's scope and terms of reference as set out in the agreement. Efforts were given to satisfy these requirements and achieve project objectives. Our approach has been based on the following elements:

- an approach and work plan based on careful allocation and scheduling of tasks to ensure an efficient and seamless delivery of outputs in the desired timeframe; and
- a focus on producing practical and useable deliverables, rather than a more traditional focus on production of substantial reports on theory and recommendations. Whilst reports will be provided at key milestones, the emphasis of the project will be very much on practical approaches, workshops and inter-working between the consultants and the counterpart team

To accommodate within the timeframe of engagement, a prioritization was needed. A zone could not be a stand-alone initiative; rather it has to be integrated with other developments in the region. Especially it has to take care of the existing power operations and connectivity with the existing network of roads, power, telecommunication and ICT networks. In addition, the area development plan of local authorities and national authorities were also looked at, so that the EZ project can be harmonized with the development plan of the government.

### 2.3 Component 1: Competitive and Comparative Advantage

#### 2.3.1 Task 1: Due Diligence

##### *Stakeholder Meetings*

Key BEZA staff and local trade associations and industries of Natore (Natore Chamber of Commerce and industry and BSCIC Natore) were consulted to discuss the project and to understand their concerns and interests. The stakeholders are aware of the project and eager to find the direct and indirect employment opportunities in the project.

##### *Collection of Background Documents/Data on the Project/Site*

All available background information/data, relevant laws, policies, maps, existing studies and reports previously undertaken were reviewed to understand the key development issues for the proposed EZ site.

##### *Inception*

The following activities were carried out as part of inception.

### *Kick-off meeting with BEZA*

At the kick-off meeting, the following issues were covered:

- discussed the project approach and update the deliverables and timeframes. The purpose of this step was to discuss BEZA's priorities and to ensure that the deliverables of this project meet BEZA's objectives;
- established the day-to-day working processes between IIFC and the BEZA counterpart team, including communication, consultation, reporting and obtaining of documents and data needed for the project;
- discussed and obtained direction from BEZA on the Government's policy objectives for the sector; and
- obtained input from BEZA on key issues impacting the project objectives, tasks and deliverables.

### *Initial meetings*

A series of initial meetings with BEZA, local authorities, and key industry stakeholders were carried out. As the project team already had an understanding of the EZs and key problems and constraints, through team members' previous involvement with BEZA, it has benefitted to revisit the issues raised and obtain first hand input and feedback from the industry players.

## 2.3.2 Task 2: Benchmarking the Economic Zone

### *Competitiveness Analysis*

The site's potential competitiveness in different industrial sub-sectors was benchmarked vis-à-vis in other countries of the region such as India, China and other similar countries on the following key issues:

- *Infrastructure and utilities – availability, reliability and cost*
- *Availability of labor, existing industrial base, social infrastructure – especially education*
- *Industrial policy and business environment in state/country, fiscal levies and taxation*
- *Financial markets, trends of investments and exports*

## 2.3.3 Task 3: Industry Assessment

### *Identification of Potential Industry Sectors*

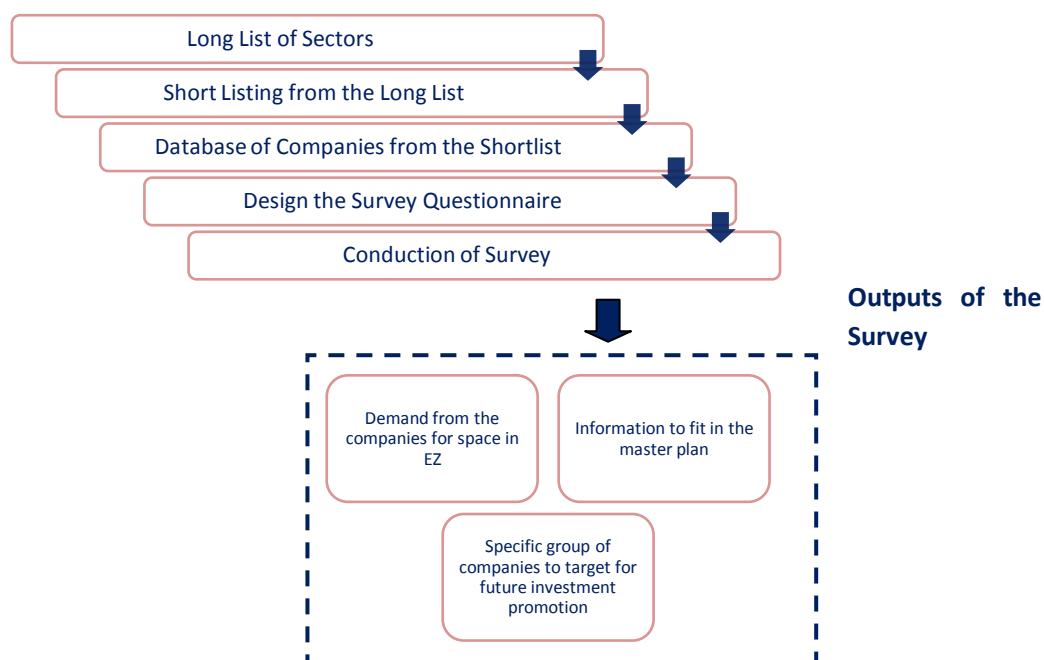
To identify the potential industry sectors, manufacturing sectors were identified and then short-listing the sectors by parametric analysis. The etam subsequently prepared a database of companies to be surveyed and a questionnaire was administered to receive the data from the relevant companies to determine if there was sufficient demand from the companies for space in the EZ and also to gather information to fit in the master plan and the pre-feasibility study; e.g.:

- projected size of plots;
- requirements for electric power, waste water treatment, potable water, and other infrastructure and services' and
- desired incentives including duty-free and other typical incentives, etc.

And to identify among the companies surveyed, a specific group of companies to target for future investment promotion purposes.

The following figure illustrates the overall methodology:

**Figure 2.1: Overall Methodology of Industry Survey**



The following paragraphs discuss the above process step-by-step.

### Short listing of suitable sectors

A long list of industrial sectors, which exists as 'manufacturing' under Bangladesh government economic sector classification, was extracted. These are:

#### Long list of sectors:

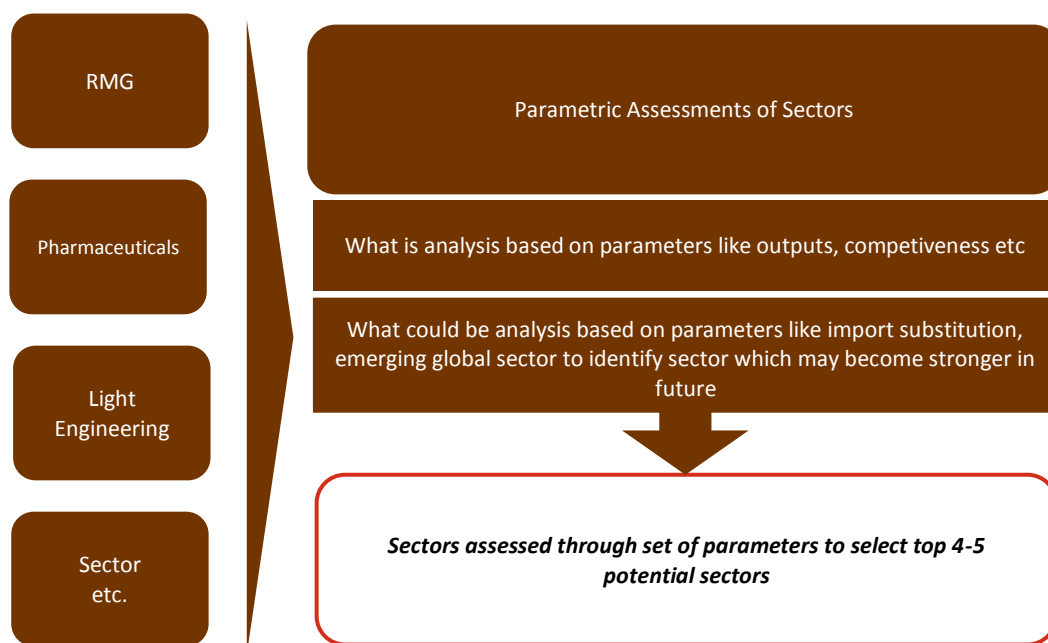
1. Textile and RMG Industry
2. Pharmaceutical
3. Leather Footwear
4. Shipbuilding and Repair
5. ICT Industry (computer, electronic and optical products and software)
6. Light Engineering
7. Frozen Fish
8. Food Processing
9. Cement
10. Wood and products of wood and cork
11. Paper and paper products
12. Printing and reproduction of recorded media
13. Refined petroleum products
14. Chemicals and chemical products
15. Rubber and plastics products
16. Non-metallic mineral products
17. Basic metals
18. Fabricated metal products
19. Electrical equipment
20. Machinery and equipment
21. Motor vehicles, trailers and semitrailers
22. Furniture
23. Ceramics products

From the above long list, shortlisted them on a priority based on the following parameters:

1. suitability with respect to land per unit of value addition;
2. suitability for proximity to port facility;
3. environmental suitability;
4. labor availability in the region;
5. presence of raw materials/ backward linkage industries in the region;
6. presence of forward linkage industries as well;

7. growth prospect/export competitiveness;
8. import substitution prospect; and
9. suitability with respect to existing local demand for the products.

**Figure 2.2: Broad Framework for Short-listing of Suitable Sectors**



**Short list of sectors:**

- Natore EZ**

  - Food Processing
  - Light Engineering
  - Plastic
  - Furniture
  - Leather Industry
  - Automobile
  - June Industry
  - Pharmaceuticals

A scoring exercise of the short-listed sectors was carried out to prioritise the space allocation for each sector in the EZ based on suitability of the sector for the EZ. The scoring system with respective weights for different parameters was as follows:

**Table 2.1: Scoring Table of Each Sector**

|    | Parameter   | Weightage | Suitability<br>(High/Low/<br>Medium) | Score | Weighted<br>Score |
|----|---|-----------|--------------------------------------|-------|-------------------|
| 1. | Suitability with respect to Land per unit of Value Addition               | 25%       |                                      |       |                   |
| 2. | Suitability for proximity to Port Facility or Sea                         | 15%       |                                      |       |                   |
| 3. | Environmental Suitability   | 15%       |                                      |       |                   |
| 4. | Labor availability in Dhaka region  | 10%       |                                      |       |                   |
| 5. | Presence of Raw materials/<br>Backward Linkage Industries in Dhaka Region | 10%       |                                      |       |                   |
| 6. | Growth Prospect/Export Competitiveness                                    | 10%       |                                      |       |                   |
| 7. | Import substitution Prospect  | 10%       |                                      |       |                   |
| 8. | Suitability with respect to existing Local Demand of the Products         | 5%        |                                      |       |                   |
|    | <b>Total Score</b>  |           |                                      |       |                   |

Scores: High 10, Low 0, Medium 5

The above box has been filled up for each sector to find the total score and then they were ranked by total scores. Space allocated on the basis of total scores so that the viable sectors receive highest consideration for potential investment.

### *Investor Survey*

Apart from the above theoretical exercise, a survey was conducted to ascertain the demand for industrial spaces/plots in the EZ. More specifically the purpose of the demand survey was to:

- (a) Determine if there exists satisfactory demand for space in the zone;
- (b) Determine the sectors for which there is demand in the site;
- (c) gather information to feed directly into the master plan and pre-feasibility study (*e.g.*, projected size of plots, requirements for electric power, waste water treatment, potable water, and other infrastructure and services, desired incentives including duty-free and other typical incentives) ; and

A database of 200 companies in the priority sectors, was created with the following characteristics:

- Target companies that are potential zone end-users.
- Relatively even distribution by industry
- Full information on the name and nature of the company; identify the focal persons with their full contact details, base country and structure of capital (by country) , website, etc.

The survey questionnaire was drafted to bring together the following information;

- Name and contact details of the respondent
- Size and annual revenue of the company
- Exact products or services, sales value, sales destinations (in-country sales vs. exports and which exact country destinations)
- Expansion plans, potential interest in investing in Bangladesh (for foreign companies) , and at which site (both foreign and local companies) , and which of Bangladesh sites would be the preferred choice (ranked) , given the current location, available infrastructure, and conditions of investment; destination markets for the expansion.
- Requirements for additional conditions
- Reasons for expansion, criteria for choosing a site etc.
- Projected timeframes for the expansion, and projected needed size and configuration of land, electric power, and water including wastewater treatment, solid waste removal, telecommunications, and any other physical and infrastructure needs.
- Projected needs for personnel, sub-categories of personnel, infrastructure and service needs, and requirements for labor pool size, proximity to urban area, universities, etc,
- Preferences for purchasing land, renting land and constructing their own building, or renting space in a standard factory building (ranked)

One-on-one investor/demand surveys were conducted in the physical presence of the company representatives.

#### *Synthesize the Findings from the Investor Survey*

The findings from the demand survey have been provided in the industry assessment chapter. The analysis of the data from the demand survey pulled information with regard to:

- The sectors and sub-sectors that have the greatest demand, and therefore should be targeted
- Which sectors and sub-sectors demonstrate little demand and should be eliminated or receive low priority
- Whether the respondents to the survey from the priority sectors have expressed a preference for locating in the zone and are willing to pay additional charges/fees, if the zone is "special"
- In the zone, which incentives and services are most important (ranked)
- The site is coming out the strongest for which sectors
- Some basic recommendations on specific facilities for development (such as, projections on plot requirement amount, plot/factory sizes, industry-wise yearly water consumption, electricity requirements, training facilities, and working strength, etc. for each industry/sector over a 20 year period)

### *Determine the Target Industries*

Data acquired from survey were analysed to identify industry sector requirements, barriers to investment and potential interest in the EZ. The data were also qualified against the information received from face to face to interview to maintain the accuracy of the analysis.

### *Industry profile for Each Identified Sector*

A profile for each short listed sector was prepared and provided in Section 5.5.

## 2.3.4 Task 4: Demand Forecast

### *Twenty-Year Demand Forecast*

*Demand Analysis.* The study of the macroeconomic scenario in Bangladesh with *special focus on potential industry sectors* constituted an important part in our approach. The demand assessment was conducted through the following two methods viz. top-down approach and the bottom-up approach to validate the top-down approach. This was followed by sector specific studies. An important part of this activity was to identify the *chief sources of raw materials/other key inputs* for the industry and assess the existing and proposed linkages. The past trend of investment in the relevant sectors in Natore, Natore, Dhaka, Pabna, Chapainawabgonj, was also analysed and tried to assess the potential investment in the future that was required in estimating the *demand for the land*.

The analysis proceeded to the next step by preparing a 20 year demand forecast for the site (s) selected. The demand projections were developed in three scenarios: (i) a conservative case, (ii) a base case, and (iii) an aggressive case. A separate demand projection was prepared for each site. The findings of the demand forecasts highlighted, in each year interval, the amount of land required by sector.

## 2.4 Component 2: Master Planning

### 2.4.1 Task 5: Transport and Off-site Infrastructure Assessment

#### *Transport and Offsite Infrastructure Assessment of EZ Site and Influence Area*

Under this activity, a comprehensive transport and offsite infrastructure assessment was carried out for EZ site and its area of influence. The proposed assessment was include:

- (i) a review of the national transport modes (airports, roads, railway, seaports) , current and proposed modal split, and offsite infrastructure networks that currently support the proposed EZ development;
- (ii) a detailed assessment of existing offsite transport infrastructure and its conditions to identify opportunities, constraints or critical problems;
- (iii) a list of offsite transport and offsite infrastructure network improvements/ upgrades required to make the EZ a viable transport/ logistics platform.

The transport and infrastructure improvements/ upgrades were taken into account the industry sector infrastructure requirements to be proposed for the EZ site.



Based on the GIS data, transport pattern was studied to assess proximity to national highway, major and minor roads traversing the proposed economic zone area. This Information on existing railway lines, airport, major settlements, and infrastructure linkages were considered. Further the data was utilized as a guiding tool for proposing the transportation network to support the proposed development.

The study also looked into if there is any feeder power line available nearby the proposed site, in near future if PGCB will provide 132 KV transmission line. Internal networking is considered within the EZ to provide electricity to the customers. Each economic zone will have its own power plant to address shortage of power from national grid.

#### *Site Assessment*

A physical inspection of the proposed site was conducted, which included the boundary demarcation, type of land, pattern of land use, water bodies, trees and other natural resources.

#### *Connectivity Assessment*

The transportation and communication system to the NEZ site, was examined, which is very crucial in the development of an industry. The transportation network required to bring raw material, machinery, workers and other logistic units to the area and send finished products to the customers were also examined. It may be mentioned that communication system is essential for the networking with the customers and the other stakeholders.

#### *Develop an Action/Implementation Plan for Upgrading Transport and Off-site Infrastructure Networks*

Support to the new EZ is require upgrading of offsite infrastructure and improvement of potentially important transport assets.

### **2.4.2 Task 6: Planning Regime for the Proposed Economic Zone**

#### *Best Practice Master Plan*

The best practice master plan has been developed for the zone based on the outcomes of industry assessment, sector profiles, and the demand forecast in Component 1, and the results of the transport and offsite infrastructure assessment in Component 2 .

It was done at a broad level and following aspects were looked into:

- Boundary shape
- Physical site features
- Area availability
- Environmental considerations
- Social issues
- Micro climatic conditions
- Compatibility issues
- Surrounding areas
- Buffer requirements
- Accessibility
- Security
- Logistic requirements

- Transportation issues
- Functional requirements
- Visibility

#### *Land Use Plan*

The land use pattern of the economic zones has been determined considering the land requirement for various processing units, logistics requirements, research, capacity development, skill development, residential facilities, schools and various social amenities etc. Apart from general infrastructure, varieties of small and large plots have been considered in the master plan to meet the varied needs of the industrialists.

A concrete surface road has been proposed in the master plan for the internal road in the zone in terms of resistance against heavy rain and heavy truckload that is very common in economic zones. The main road has been planned from the entrance crossing through factory plots in the industrial zone. Water distribution network inside the zone has been considered to deliver water to each factory along the roads, coming through the tower and tank at several places built inside the zone. A gravity feed system will be used to supply water to the water supply pipeline located along the footpath of the road inside the EZ project areas.

#### *Zoning Plan*

A zoning plan has been prepared as an integral part of the master plan which would logically delineate specific zone as commercial area, processing area and non-processing area. The zoning plan is envisaged to attract foreign investors due to modern infrastructure such as an efficient drainage system, a reliable power supply plant, a water supply treatment plant replenished by river water and rainwater as source, a CETP and communication systems equipped to international standards. These strategically designed infrastructure elements will be equally accessible to the local as well as foreign investors.

#### *Phasing Plan*

Phasing plan is include in the master plan to rationalize the sequencing of of the development and construction of the zone. The EZ phasing plan will also correspond with the 20 year demand forecast. In the plan, the consultant identified the land requirement for each phase.

### **2.4.3 Task 7: On-site Infrastructure Concept Plans and Cost Estimates**

#### *On-site Infrastructure Concept Plans*

The infrastructure concept plans has been prepared including the following on-site networks, among others: i) roads, ii) water, iii) power (electricity and gas) , iv) drainage/storm water, v) sewerage/wastewater, vi) wastewater/ effluent treatment plant, street lighting and fencing, and viii) telecommunication. All infrastructure plans has been prepared in CAD format at a scale.

#### *Develop Cost Estimates for Infrastructure, Utilities and Buildings*

Cost estimates are based on the premise that land development, land filling, external/ off-site infrastructure, which include connectivity infrastructure like road, gas or power outside the zone premises are borne by the government. The social infrastructure ensures proper living conditions

of the people inside the zone, which includes administrative buildings, a mosque, a vocational training center and commercial facilities. The cost estimates also include the commercial facilities like shops, restaurants, banks, etc. are essential for day-to-day life of the tenants inside the Zone. Cost has been estimated both at the base year (2018) and subsequently at the point when they will be incurred with escalation during time elapsed.

#### 2.4.4 Task 8: Environmental and Social Review of EZ and Area of Influence

##### *Environmental Review*

The environmental baseline is the existing status of environment around the proposed project site. It has been analyzed through assessment of environmental components like air, water, land, noise, soil, etc. and environmental characteristics like physical, biological and socio-economic status of the study area, within the 10 km radial zone of the project site. Physical environment includes topography, land, soil, meteorology, air, water, noise, etc. and the biological environment includes flora and fauna.

##### *Social Review*

The social baseline is the existing status of society around the proposed project site. Socio-economic environment of the study area includes demography, ethnicity, religion, education and employment opportunity, occupation, income, poverty, social relations, etc. Baseline environmental conditions are based on the data collected from various related agencies and the secondary documents from published sources and websites. The baseline provides the basis for assessment of impact (potential changes in the baseline conditions) due to the development of proposed NEZ.

### 2.5 Component 3: Financial and Economic Modeling

The project was analyzed from both *economic and financial point of view* as well as funding requirements with sources:

- **Financial Analysis** – estimate financial costs and benefits and evaluate financial viability using net present value and internal rates of return in constant prices with sensitivity analysis for at various key variables.
- **Economic analysis** – estimate economic costs and benefits for the project in terms of rates of return on investment and net present value, with sensitivity analysis for various key variables.

##### *Financial Model*

The key objectives of preparing a financial model for financial analysis was:

- to demonstrate the financial viability of development of the zone based upon demand forecast, expected lease rates, cost estimates, planning parameters and other information.
- to illustrate the sensitivity of the financial and commercial viability to key



parameters and to identify the areas which could be adjusted (lease rates or other parameters) to influence the profitability of the project.

- to determine the requirement of initial support and later on to implement project on a commercial footing.

The main approach was to determine the financial viability of the project on the basis of an assessment of demand forecast for industrial plots, revenue collection from commercial areas, capital cost estimate for the project, revenue projection and financing structure.

Financial analysis of the project took into consideration, such factors as:

- Short and long-term financial obligations;
- projected revenue stream, projected costs (fixed and variable) , depreciation schedule and asset construction schedule;
- Demand forecast for leasable area of the zone;
- Lease rate structure and the impact of amendments in that structure;
- Sources and cost of capital

The financial model covered the following:

- a) Determination of the revenue projection, projection income statements and cash flow statements over the life of the project.
- b) Calculate various matrices such as IRR, payback periods and debt-service coverage ratio for assessment of project viability.
- c) Sensitivity analysis on the major parameters including capital cost, O&M expense, lease rate etc. in order to explore its sustainability under different changing situations.

Financial analysis on options for cost recovery of capital investments and recurrent costs under different demand forecast scenarios.

### *Economic Model*

The purpose of the economic analysis was to quantify the economic and social benefits of the project with its costs of implementation and operations. In conducting the economic impact analysis of the zone, an economic model was built to identify and quantify costs and benefits associated with the Zone Development business. The outputs of the model are the Economic Rate of Return (ERR) , Benefit Cost ratio (BCR) and Net Present Value (NPV) of the project. The unquantifiable benefits linked with the project were also identified to evaluate the overall economic and social impact of the project.

| Level 1- Project  | Level 3- Macro Level   |
|---|--|
| EIRR based on economic costs and benefits   | Overall economic benefits of the project<br>- Impact on state economy<br>- Economic benefits in terms of jobs created (direct employment, induced and indirect employment due to other investments in the economy) |
| Level 2- Immediate External Impact  |  |
| Off-site infrastructure impact Economic benefits emanating due to these investments |  |

The approach and methodology of the economic analysis of the zone is shown below:

- a) *Comparison between scenarios where project is implemented and where project is not implemented:* To identify the benefits and costs of the zone, a matrix was designed to

portray the economic and social impacts of implementing the project. The matrix helped to identify the service and facilities gap as well as to assess the needs of the project.

- b) *Compare Benefits with Costs:* Project investment decisions involve large up-front costs, with benefits that are achieved over time. The costs and benefits of the proposed EZ was identified and the relevant benefits and costs were classified into two subcategories: (a) quantifiable and (b) not quantifiable. Then a framework was developed to define the value and to measure the quantifiable benefits and costs associated with the economic zone. It is envisaged that the industries which will be set up in the zone will be able to achieve higher efficiencies and hence better productivity.
- c) *Prepare Economic Model incorporating Results of Financial Model:* The financial profit/ (loss) (considering capital expenditure, operational expenditure, revenue) was converted into economic equivalent terms in designing the economic model. Economic benefits of the zone were estimated and added to the financial profit. Costs, including economic costs and taxes, were subtracted to attain the net economic benefit of the project.
- d) *Discounting Benefits and Costs to Present Values:* The economic model was designed to calculate the Economic Rate of Return (ERR) and Cost Benefit ratio. In this context, the corresponding costs and benefits which would be generated during the development of the zone were quantified. Thereafter, all pertaining quantifiable future costs and benefits were converted into present value terms by applying Net Present Value (NPV) principle.



## 3 About Project Location

### 3.1 Natore District

Natore, is a northern district of the country with an area of 1,896.05 km<sup>2</sup>. Natore sub-division was established in 1845. It was declared as a district in 1984. It has a long history and diversified cultural heritage.

Figure 3.1: Natore District



*Profile.* Natore district is a part of the Rajshahi division. It is bounded by Pabna, Bogura, Naogaon and Rajshahi and Kushtia districts. Consists of 6 upazilas: Natore Sadar, Bagatipara, Singra, Boraigram, Gurudaspur, Lalpur, 8 municipalities (Pourashava), 52 union parishads and 1,434 villages.

Natore town has good road communication system. It is considered as the 'gate-way' for having communication with divisional HQ Rajshahi with the capital city Dhaka. It is also the gateway for inter-connection with the Rangpur and Khulna divisions.

*Area.* 1896.05 km<sup>2</sup> *Population.* 1.84 mn<sup>13</sup>

*Geographical Location.* The district is bounded on the north by Bogura and Noagaon districts, on the east by Sirajganj and Pabna districts, on the south by Pabna and Kushtia districts and on the west by Rajshahi district. The road distance from Natore to Dhaka is 220 km. Lalpur is the lowest average annual rainfall area of Bangladesh. It lies between 24°25' and 24°58' north latitudes and between 88°01' and 88°30' east longitudes. The Annual Average Temperature is maximum 37.8°C, minimum 11.2°C; annual rainfall 1862 mm<sup>14</sup>.

*Economy.* Economy of Natore is based on agriculture. Amongst industrial activities, there are two sugar mills in the district owned by Bangladesh Sugar and Food Industries Corporation (BSFIC). Pran Agro Ltd. is a private food manufacturing plant of Pran-RFL Group. More industries will be set up if gas is supplied through pipeline in Natore.

*Municipalities.* Natore Sadar, Bagatipara, Singra, Boraigram, Gurudaspur, Gopalpur, Bonpara Pourashava Naldanga

*Thanas.* Natore city has seven thanas in the district. They are Gurudaspur, Natore Sadar, Baraigram, Bagatipara, Lalpur, Singraand, Naldanga

*Rivers.* Ten (10) most noted of which are Atrai, Baral, Narod and Nandakunja. Chalan Beel is notable.

*Climate.* The climate here is tropical. When compared with winter, the summers have much more rainfall. This location is classified as AW by Koppen and Geiger. In Natore, the average annual temperature is 25.8 °C. The average annual rainfall is 1556 mm.

### 3.2 Natore Sadar

Natore Sadar upazila has an area of 401.29 km<sup>2</sup>, located in between 24°19' and 24°35' north latitudes and in between 88°51' and 89°07' east longitudes. It is bounded by Atrai and Baghmara upazilas on the north, Bagatipara and Baraigram upazilas on the south, Singra and Gurudaspur upazilas on the east, Puthia and Baghmara upazilas on the west.

*Administration.* Natore thana was formed in 1793 and it was turned into an upazila in 1984. 'Natore Municipality was formed in 1869. Natore Sadar has 15 unions/wards, 275 mauzas/mahallas, and 310 villages.

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<sup>13</sup> Data updated by IIFC based on Population and Housing Census 2011

<sup>14</sup> <https://www.thebangladesh.net/natore-details>

Figure 3.2: Natore Sadar



**Literacy and Education.** Literacy rate and educational institutions Average literacy: 45.44%; male 49.91%, female 40.64%. Educational institutions: college 17, PTI 1, technical educational institution 10, secondary school 55, primary school 162, NGO operated school 209, deaf and dumb educational institution 1, madrasa 22. Noted educational institutions: Nawab Siraj-Ud-Daulah Government College (1965) , Natore Government Boys' High School (1944) , Naba Bidhan Girls' High School (1967) , Dighapatia PN High School (1852) , Natore Maharaja Gagadindra Nath High School (1884) , Madhnagar SI High School (1930) .

**Communication Facilities.** Communication facilities Pucca road 199.19 km, semi-pucca road 44.21 km, mud road 448.79 km; railway 25.25 km.

**Health Centers.** Hospital 2, upazila health complex 1, union health centre 12, satellite clinic 4, mother and child welfare centre 1, family welfare centre 8, chest diseases hospital 1, clinic 37

**Land use.** The proposed EZ area currently falls under agriculture zone and aquaculture zone. It was observed during site visits that two crops are cultivated in a year at the land parcel.



### 3.3 Project Site

The proposed site for the development of Natore EZ is located at Natore Sadar upazila of Natore district. The site is adjacent to the Natore-Rajshahi highway in five mouzas namely Ragoigachi, Rajapur, Bihar, Narayankandi, Khamardiar.

The mouza map of proposed EZ provided by BEZA is shown in the figure below superimposed on google map is presented following figures. Reconfirmation of the site details are shown further in the table below.

**Table 3.1: Reconfirmation of the Site Details**

| Parameters             | Details  |                            |
|------------------------|--|----------------------------|
| Site Co-ordinates      | 24 <sup>0</sup> 24'7.72"N                            | 88 <sup>0</sup> 59'56.08"E |
| Site Boundaries        |  |                            |
| East                   | Agricultural land                                    |                            |
| West                   | Agricultural land                                    |                            |
| North                  | Natore – Rajshahi Highway                            |                            |
| South                  | Agricultural land                                    |                            |
| Total area of the site | 300 acres  |                            |
| Mouza Details          | Ragoigachi, Rajapur, Bihar, Narayankandi, Khamardiar |                            |
| Current Land Ownership | Private land   |                            |
| Existing Land Use      | Agriculture  |                            |

#### *Type of land*

The land is uniform within the study area. Out of total 71,975 acres, 3.8% is low, 65.7% medium and 30.5% high.

Figure 3.3: Mouza Map

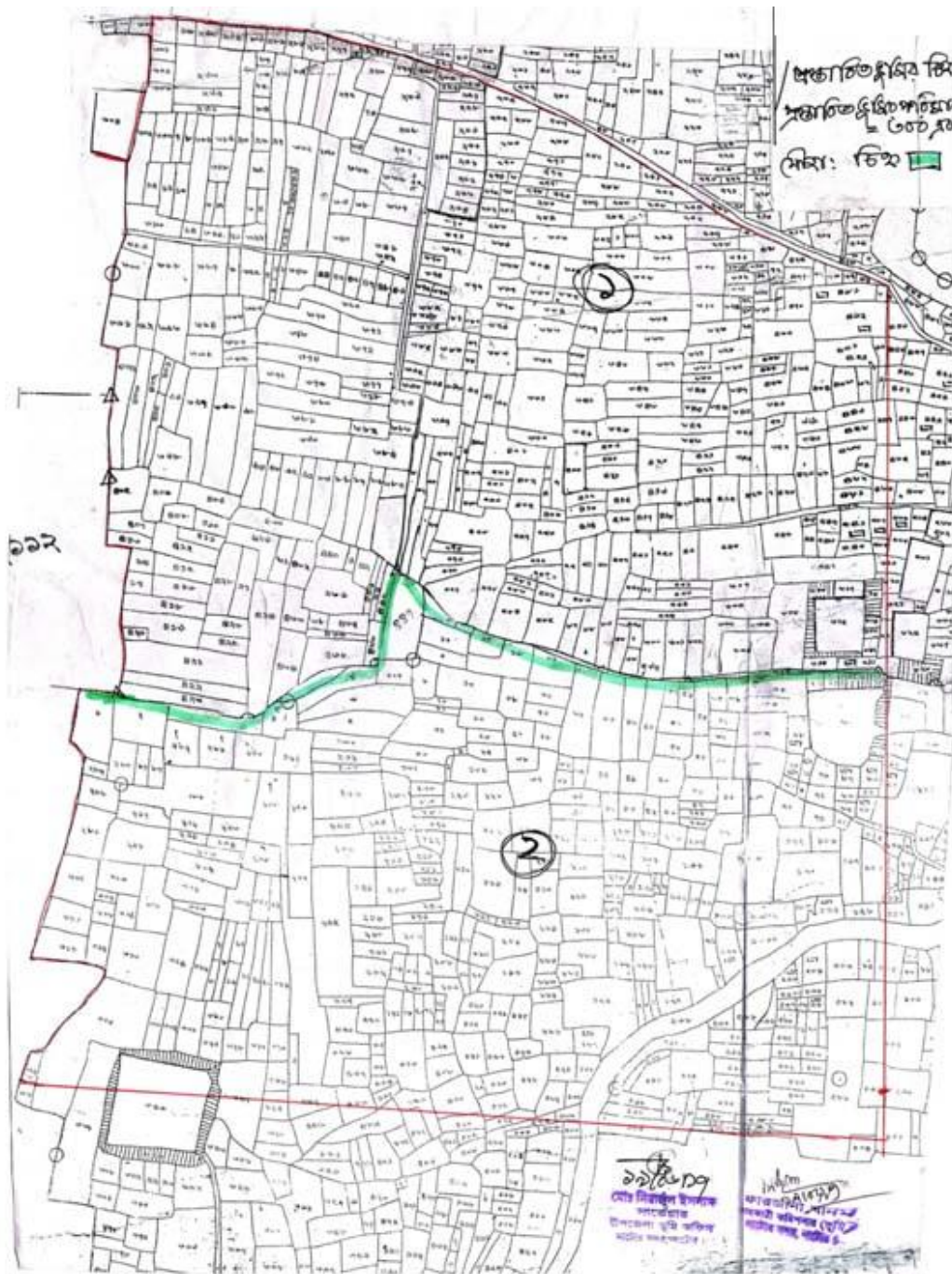


Figure 3.4: Area Fill Image of Natore EZ



Figure 3.5: Mouza Map Superimposed on Google map

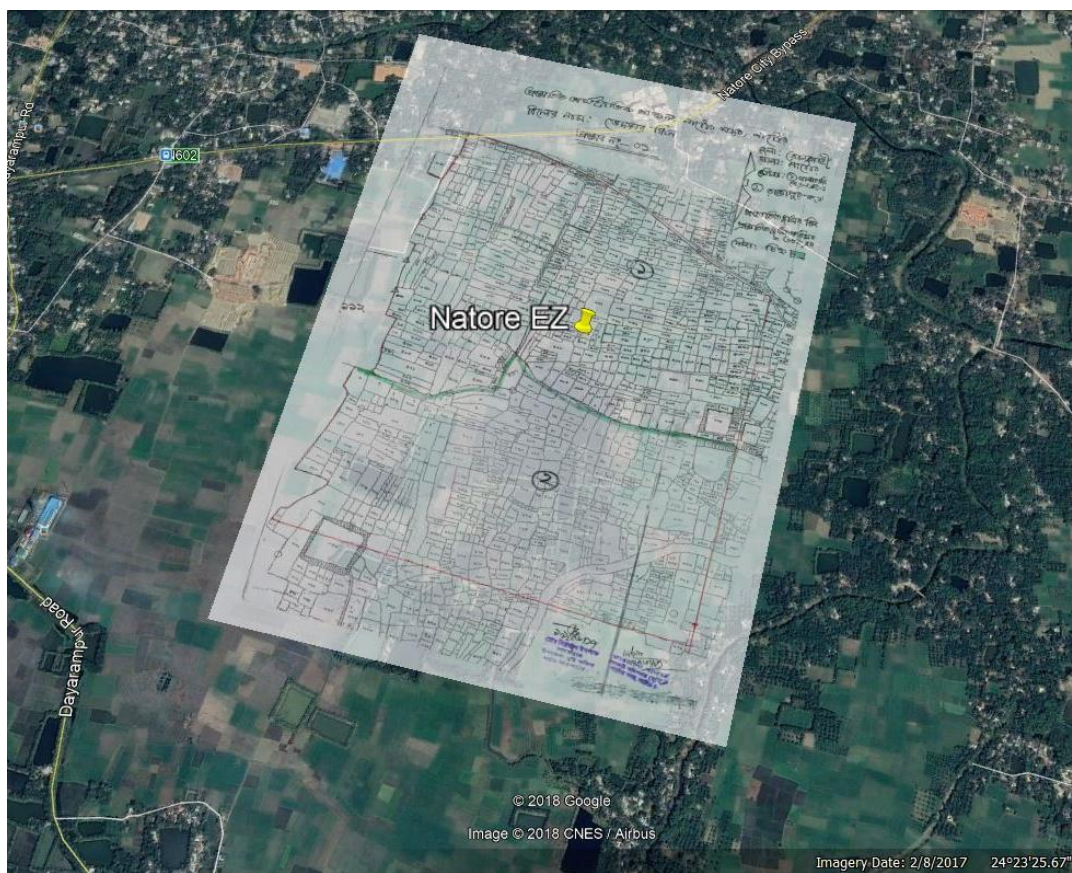


Figure 3.6: Mouza Map Superimposed on Google map

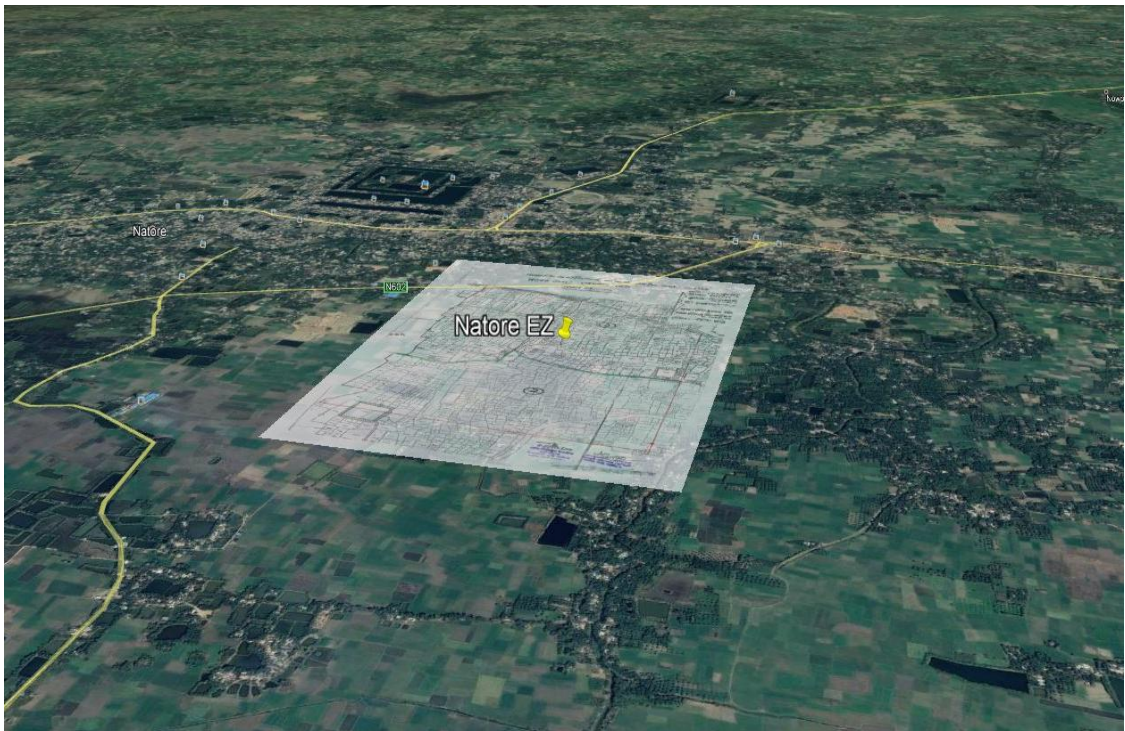


Figure 3.7: Current Site Condition of Proposed Natore EZ



Current condition inside proposed site



Current condition inside proposed site



High-voltage power line inside proposed site

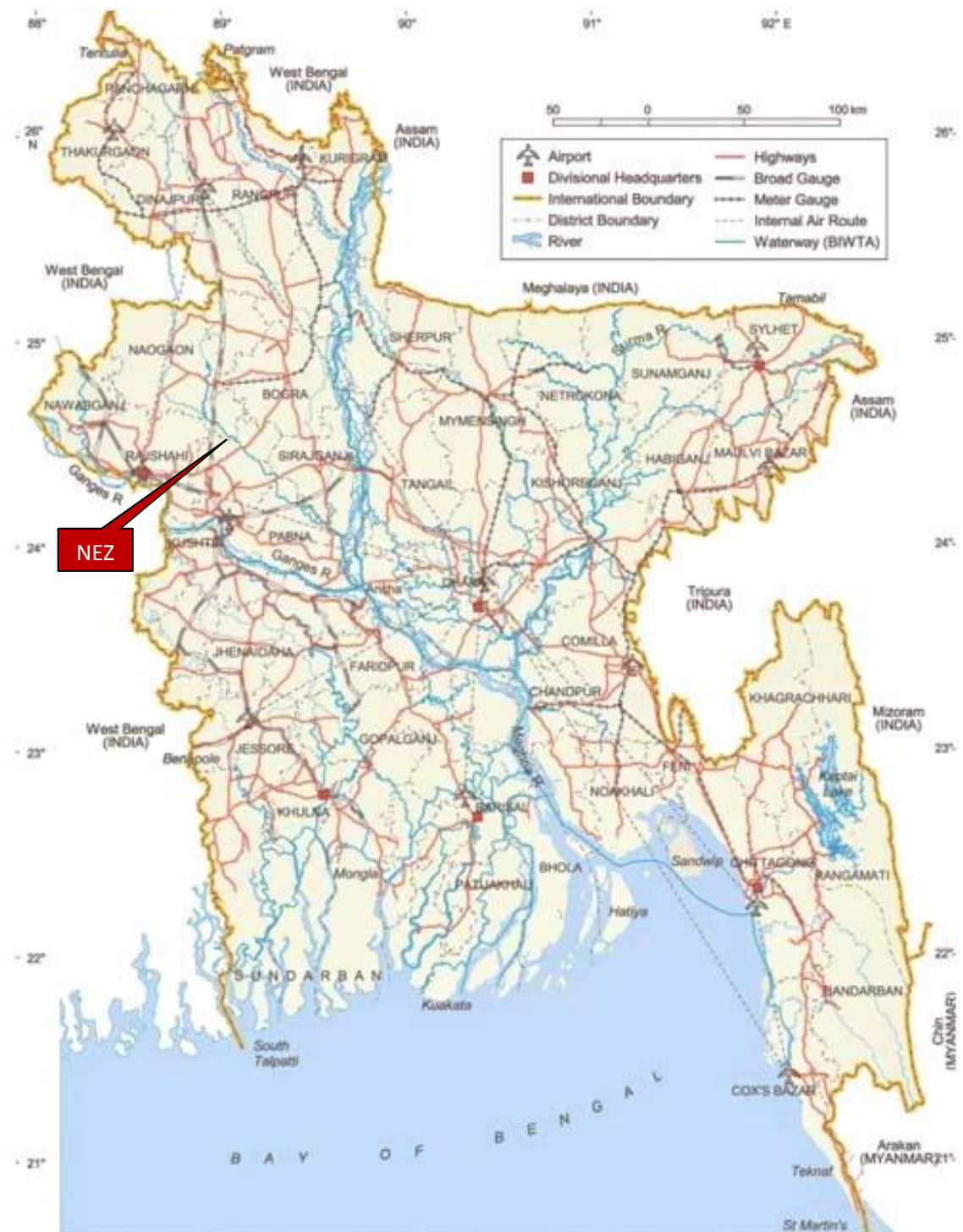


Current condition inside proposed site

### 3.4 Existing Off-site Infrastructure: Road and Rail Network

The site is situated adjacent to Natore-Rajshahi highway. Existing road may be improved and used as access road to the project site. This however will need widening. The site is about 800 m away from Natore Baro Harishpur bypass, 2 km from Madrasha Morh (zero point) , 3 km away from Natore DC office, 5 km away from Natore railway station, 0.5 km away from the central bus terminal.

Figure 3.8: Road and Rail Connectivity





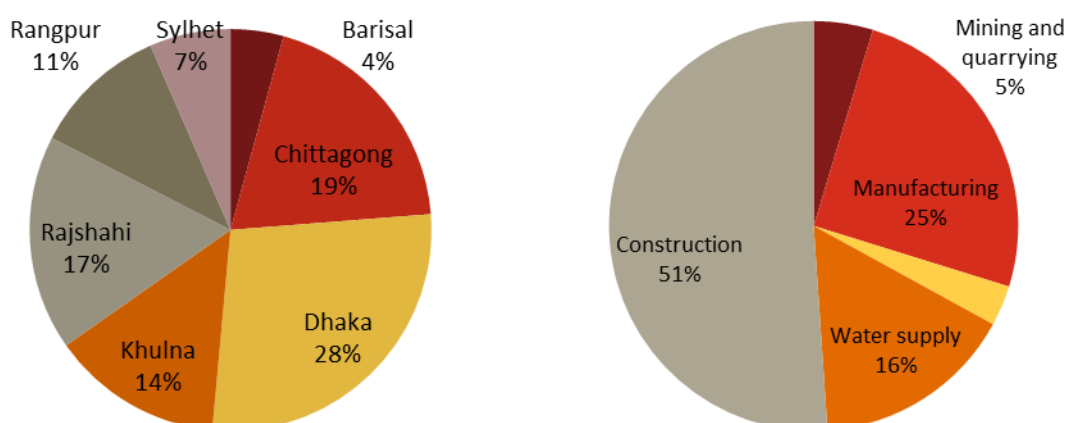
## 4 Competitiveness Assessment

### 4.1 Bangladesh Economy

Vision 2021 of the GoB stipulates that Bangladesh will attain middle-income status by 2021. In order to achieve this goal, the government has set its economic growth target at 10% in 2021<sup>15</sup>. To fulfill this vision it is envisaged that the manufacturing sector will play a central role. The strategy of the government has been to facilitate a dynamic, vibrant, pro-export and competitive manufacturing sector that would eventually contribute 30% to national income and be able to absorb 20% of the work force. Since 1990s, government has been pursuing a market-oriented industrial strategy. The policy regime for manufacturing improved significantly in the 1990s, based on investment deregulation, trade liberalization, better exchange rate management and improved financial sector performance. The result is evident from the higher share of industry in GDP as agriculture continues to decline.

The geographical distribution of economic units by division and economic sector is shown in the following figure:

**Figure 4.1: Distribution of Economic Units by Broad Industrial Classification and Division<sup>16</sup>**



**Intensity of Economic Activity by Divisions**

**Intensity of Economic Activity by Sectors**

As depicted, manufacturing is a leading sector after construction within broad industry accounting for 25% of all economic units. Around 28% manufacturing units located in Dhaka division, 19% in Chittagong division and 14% in Khulna division.

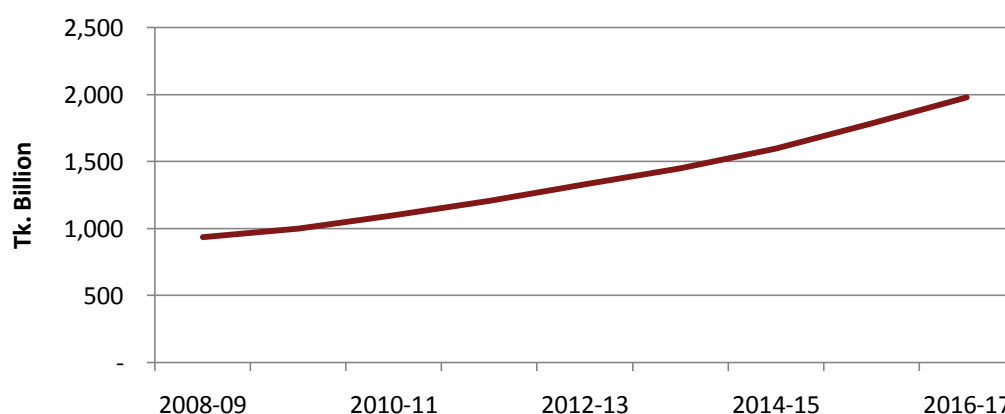
#### 4.1.1 Manufacturing Sector

Manufacturing has been a major driver of industrial growth in Bangladesh. However, it is narrow-based to only few industries: RMG and textiles, fish and seafood, leather, fertilizer and pharmaceuticals.

<sup>15</sup> Seventh Five Year Perspective Plan

<sup>16</sup> Economic Census, Bangladesh Bureau of Statistics

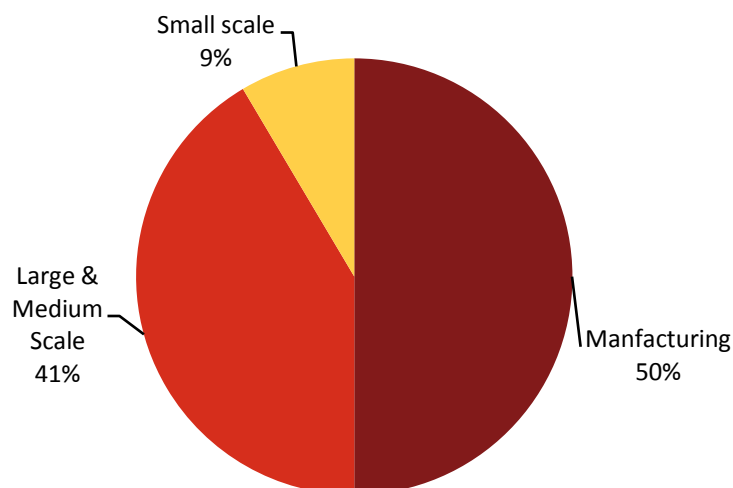
**Figure 4.2: Volume of Manufacturing Sector<sup>17</sup>**



In 2015-16, the sector grew overall 12% fueled by 12% growth in medium and large industry and 9% growth in small and cottage industry. Rapid growth in medium and large-scale industry units mainly propelled by RMG and knitwear uplift. However, in 2016-17 the sector grew by 11%.

As per Bangladesh Economic Review 2017, the contribution of manufacturing industries to national GDP was 21.7% in 2016-17, of which medium and large-scale industries contributed 18% to GDP and small-scale industries contributed only 3.7% to GDP. The share of manufactured goods to GDP has been increasing over the years.

**Figure 4.3: Share of Manufacturing in GDP<sup>18</sup> in 2016-17**



<sup>17</sup>Bangladesh Economic Review 2017 (At constant prices of 2005-06)

<sup>18</sup>Bangladesh Economic Review 2017

#### 4.1.2 Raw Materials of Manufacturing Industries

The following table illustrates the sources of raw materials of the industries:

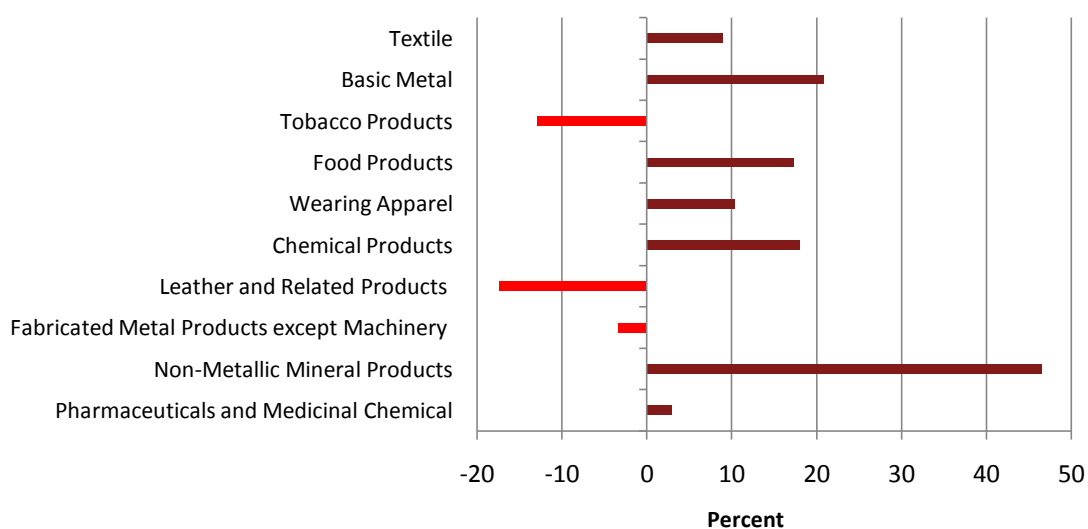
**Table 4.1: Sources of Raw Materials<sup>19</sup>**

| Sectors/Industries | Raw Materials  |
|--------------------|--|
| Light Engineering  | <ul style="list-style-type: none"> <li>Ship scraps as raw materials are used for this sector without testing its composition, at the same time competing finished products are also imported.</li> </ul>   |
| Food Industry      | <ul style="list-style-type: none"> <li>The industry is local raw material dependent</li> </ul>   |
| Furniture          | <ul style="list-style-type: none"> <li>The main varieties of furniture are produced from wood, processed wood, melamine board, Medium Density Fiber Board (MDF) , particleboard, steel etc. On average 60% of raw materials of furniture sector are imported from different countries.</li> </ul>                |
| Textile and RMG    | <ul style="list-style-type: none"> <li>The backward-linkage industry supplies around 90% raw materials to the knitwear subsector and 40% to the woven sub-sector.</li> <li>60% woven raw fabrics are imported, mainly from China and India to meet the demand of woven sub sector.</li> </ul>                    |
| Plastic Industry   | <ul style="list-style-type: none"> <li>Polymers use as main raw material. Industry uses imported raw materials of polymer granules</li> </ul>  |
| Pharmaceutical     | <ul style="list-style-type: none"> <li>Bangladesh pharmaceutical production is very import-intensive as raw materials like API, packaging, and materials are imported from abroad. Around 50% of the total pharmaceutical import comes from China, 30% from India, and the rest from other countries.</li> </ul> |

#### 4.1.3 Medium and Large Manufacturing Industries

The medium and large scale industries comprises a wide range of sectors such as textile and apparel industry, pharmaceutical industry, food products, chemical products, leather industry, tobacco industry etc. Indices that recorded increase and decrease in 2015-16 compared to the same period of the preceding year are as follows:

**Figure 4.4: Growth of Industrial Production<sup>20</sup>**



<sup>19</sup> Ministry of Industries, 2015

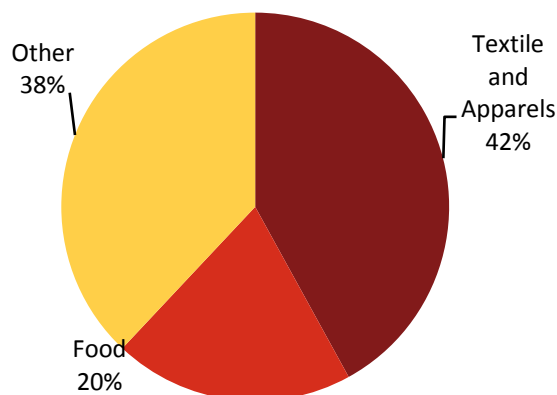
<sup>20</sup> Bangladesh Bureau of Statistics, July 2016



#### 4.1.4 Geographical Concentration

In Bangladesh, there are around 50,000 units of major industries mainly located at Dhaka, Chittagong and different industrial zones. Out of the total industrial units, 98.68% units are under private sector and 1.32% of them are run by the government.

**Figure 4.5: Key Industrial Units Distribution**



Textile and apparels units account for 42%<sup>21</sup> and food sector accounts for 19.81%<sup>22</sup> of manufacturing units of the country.

**Table 4.2: Data on Major Industrial Units<sup>23</sup>**

| Number of Total Key Industries             | 42,592 |
|--|--------|
| Textile and apparels                       | 17,967 |
| Food                                       | 8,441  |
| Private Ownership                          | 98.68% |
| Government Ownership                       | 1.32%  |
| Number of Fully Government Owned Companies | 103    |
| Foreign Ownership                          | 263    |
| Joint Venture (Local and Foreign)          | 263    |
| Government and Private Ownership           | 35     |

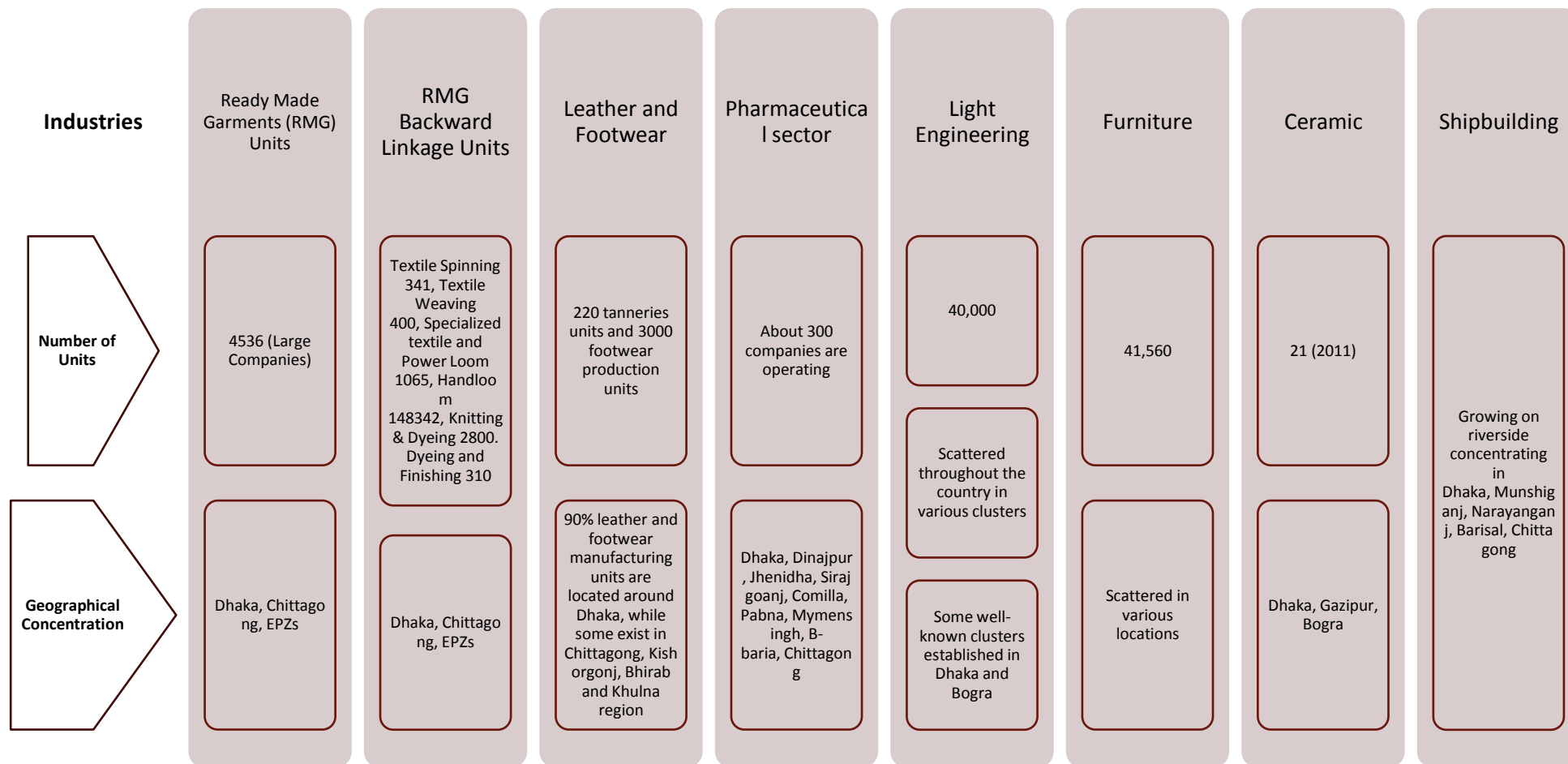
The following figure depicts the geographical concentration of major medium and large industries in Bangladesh:

<sup>21</sup> Economic Census 2013, Bangladesh Bureau of Statistics

<sup>22</sup> Same as above

<sup>23</sup> Same as above

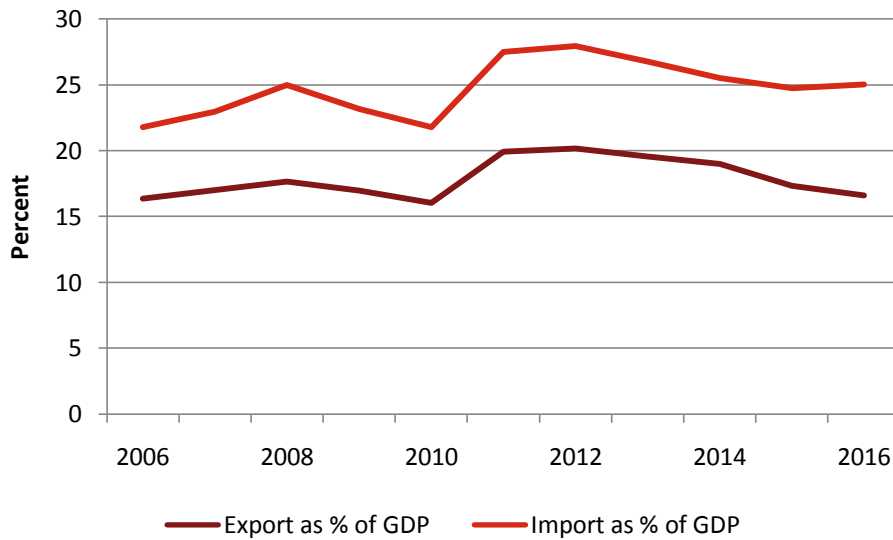
Figure 4.6: Geographical Concentration of Major Small, Medium and Large Industries



#### 4.1.5 Foreign Trade

In 2006, export accounted for only 16% of GDP where as its share steadily increased to 17%<sup>24</sup> of country's GDP by 2016. On the other hand the contribution of Import to GDP is higher than export that revealed that Bangladesh experienced trade deficit, imports exceeded exports. However, the trade deficit, as a share of GDP gradually decreased due to strong surge in export volume of the country.

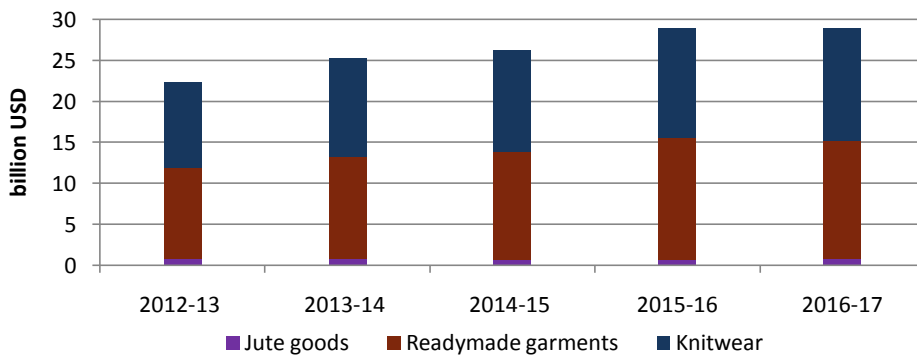
**Figure 4.7: Share of Foreign Trade to GDP<sup>25</sup>**



#### 4.1.6 Export Trend

Export from Bangladesh has been experiencing a shift from the agricultural products to manufactured goods. The main export items are RMG and knitwear, leather and leather products, paper, furnace oil, urea, ceramic products, raw jute and jute products. In 1983-84, manufactured goods accounted for 65.2% of total export volume of the country. Manufacturing dominated over 92% of total export of the country since 2003-04 till now<sup>26</sup>.

**Figure 4.8: Export of Major Commodities<sup>27</sup>**



<sup>24</sup>Bangladesh Economic Review, 2017

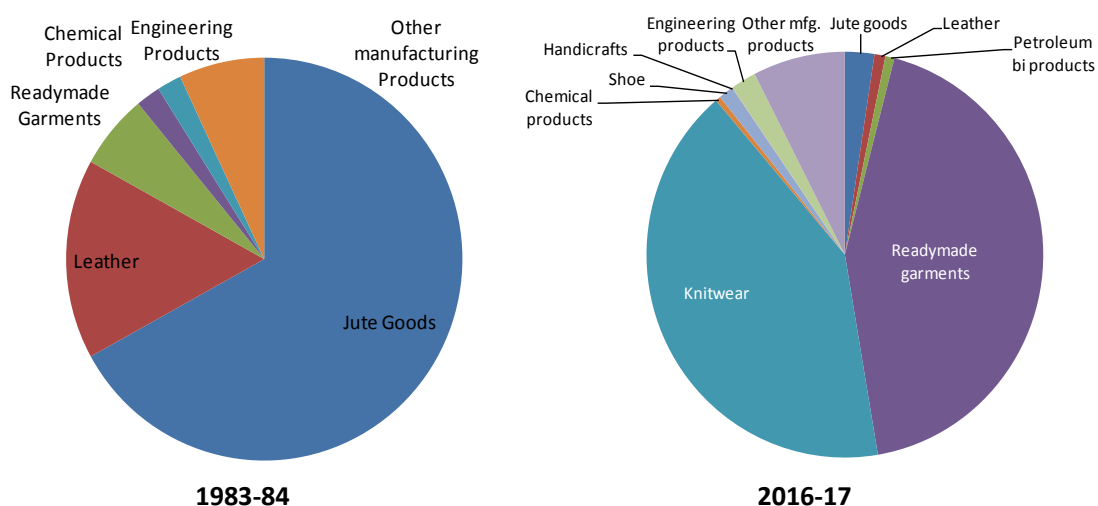
<sup>25</sup>The World Bank, <http://data.worldbank.org/indicator>

<sup>26</sup>Same as above

<sup>27</sup>Export Promotion Bureau

In 1983-84, export of manufactured commodities was dominated by jute goods that was accounted for 67.48% and in 2015-16, its share declined to only 2.48%<sup>28</sup>.

**Figure 4.9: Share of Manufacturing to Export<sup>29</sup>**

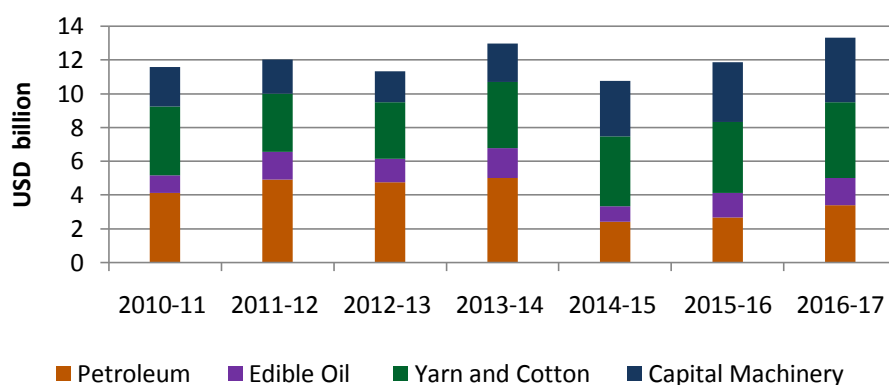


On the other hand, share of textile and apparel items in export continued to rise. Over the periods, Bangladesh has achieved robust growth in this sector. It contributed more than 83%<sup>30</sup> of the total export earnings. To reduce the excessive dependence of single-basket export, government has taken initiative to diversify the export focusing on leather and footwear, engineering products, shipbuilding and pharmaceutical products.

#### 4.1.7 Import Trend

Economy of Bangladesh depends on the import of both consumer items and industrial raw materials. Major import products are raw cotton, crude petroleum, wheat, oil, seeds, edible oil, petroleum products, fertilizer, yarn, capital goods, staple fibres, iron and steel. The following figure provides the imports by major commodities. It implies maximum import of yarn and cotton, capital machinery and petroleum products.

**Figure 4.10: Import by Major Commodities<sup>31</sup>**



<sup>28</sup> Bangladesh Economic Review, 2016

<sup>29</sup> EPB; Bangladesh Economic Review 2016

<sup>30</sup> Bangladesh Garment Manufacturers and Export Association (BGMEA)

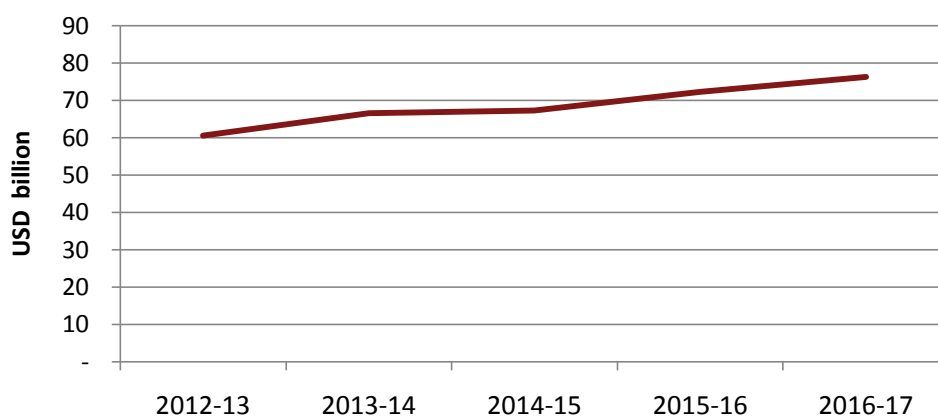
<sup>31</sup> Bangladesh Economic Review 2016

#### 4.1.8 Increase in Foreign Trade

Foreign trade of Bangladesh has registered sustainable growth since 2008-09 due to initiation of economic reforms and adoption of an export-biased liberal foreign trade policy. Bangladesh’s economy has benefited from its growing share of the global RMG market. Government has been pursuing an export led economic development strategy to stimulate export earnings. Promotional campaign and industry assistance are being given under export diversification programme.

In 2012-13, the total export was around USD 26 bn. By 2016-17, the earning from international trade increased to USD 34bn. Imports in 2012-13 was USD 42.3 bn and in 2016-17 it was USD 37.81 bn resulting in a total foreign trade of 76 bn. The following figure shows the volume of foreign trade (*i.e.* import plus export) over years. In 2016-17, the foreign trade grew by 6% while average growth of last five years was also 6%.

**Figure 4.11: Volume of Foreign Trade<sup>32</sup>**



#### 4.2 Competitiveness of Natore

The economy of Natore is predominantly agricultural. Out of total 369 thousand households of the district 65.4% holdings are farms which produce varieties of crops namely local and HYV rice, jute, wheat, potato, vegetables, spices, pulses, oil seeds, sugarcane and other minor crops etc. Various fruits like mangoes, jackfruits, litchis, palms, bananas, guavas, watermelons etc. are the main fruits grown in the district. Besides crops and fruits, livestock and poultry are the subsidiary source of household income of the district. *All these indicate a large potential of agro and fisheries based industries in Natore.*

The following figure shows type and numbers of establishments together with persons engaged in those establishments are shown below:<sup>33</sup>

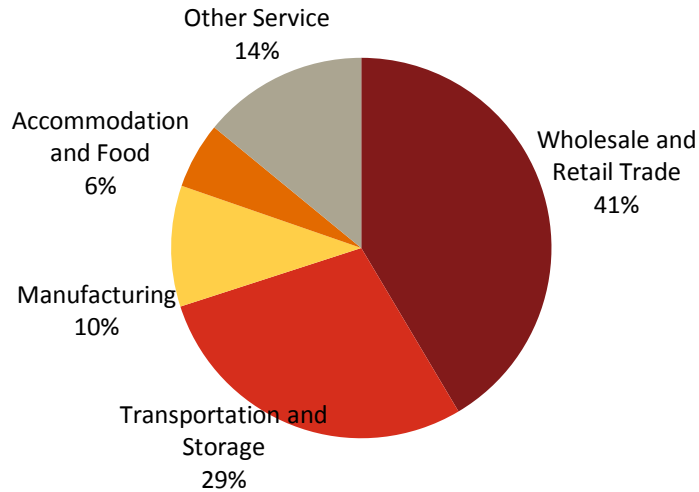


<sup>32</sup> Monthly Economic Trends, Bangladesh Bank (Table IIIA) Summation of import and export

<sup>33</sup> IIFC analysis till 2017 based on Economic Census 2013

Examining the data by economic activity, the wholesale and retail trade, repair of motor vehicles and motorcycles activity has appeared as the unbeatably largest sector and manufacturing holds the third position with establishments 11,500 and TPE 73,500.

**Figure 4.12: Share by Economic Activities in Natore**

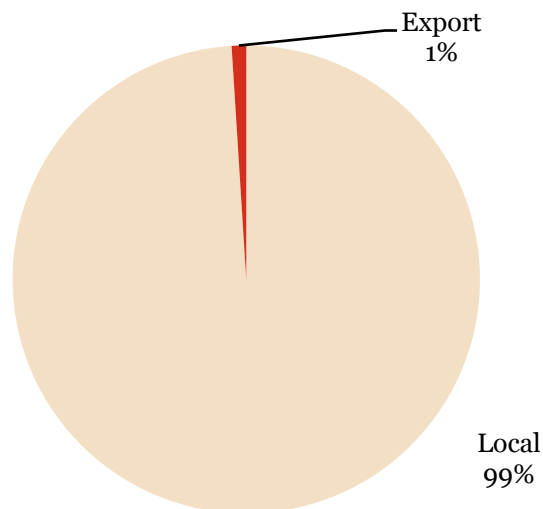


#### 4.2.1 Manufacturing Establishments

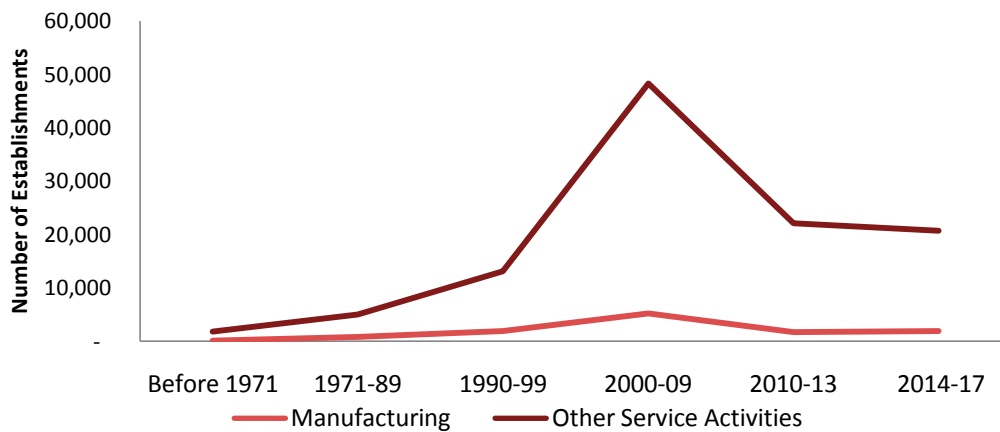
In Natore, of the total manufacturing establishments, a significant 92.88% sell their products entirely at local market while 0.21% exclusively at export market and 0.02% sell their goods both at local and foreign markets.

The following figure provides the data on number of manufacturing establishments by market.

**Figure 4.13: Market Share of Manufacturing Establishments**



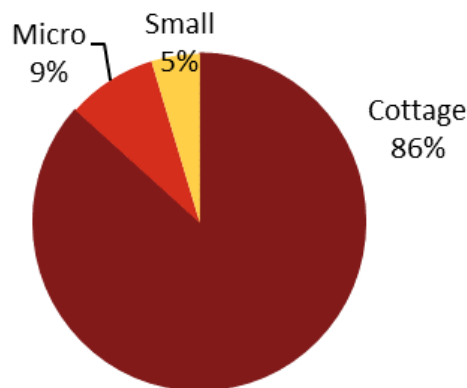
**Figure 4.14: Growth and fall of Economic Activity in Natore<sup>34</sup>**



It is apparent that economic activities in Natore have experienced a downfall in recent period. This is due to declining trend of business entrepreneurship in the district. In other words, it shows that a diversity of economic activities is needed to tap potential for growth in Natore especially in agro-based industries.

The establishments by categories, economic activities and locations are presented in this chapter. It is note-worthy that establishments have been categorized into five such as Cottage, Micro, Small, Medium and Large strictly following the categories described in the National Industrial Policy 2010.

**Figure 4.15: Number of Manufacturing Establishments by Category**



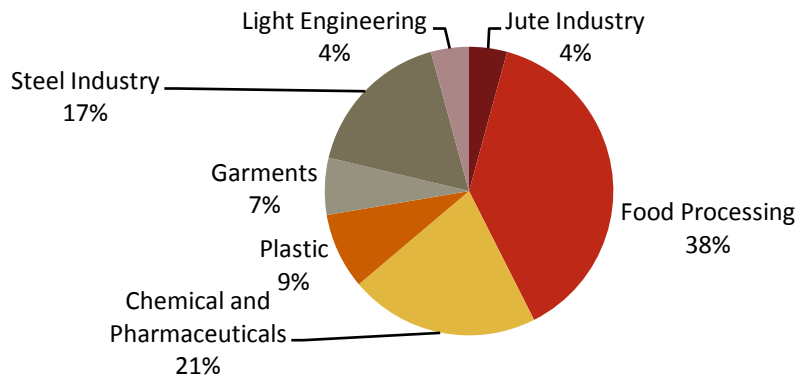
The above figure shows that most of the industries in Natore are cottage based, which implies that the raw material and experienced labor is available in the district, however, due to entrepreneurship being on a down trend, the raw materials and labor is not being utilized in medium and large scale industries. In other words, despite potentials the district is passing a slump in economic activities, which deserves an enhanced attention from the government.

#### 4.2.2 Natore BSCIC Estate

Natore BSCIC estate complex was established in 1987 on 15 acres of land. It is located 3 Km from proposed EZ in Natore Sadar upazila. In the industrial complex there are 47 factories. Around 1,700 (male 1100 and women 600) labours are employed in the same.

<sup>34</sup> IIFC analysis till 2017 based on Economic Census IIFC 2013, District Report: Natore

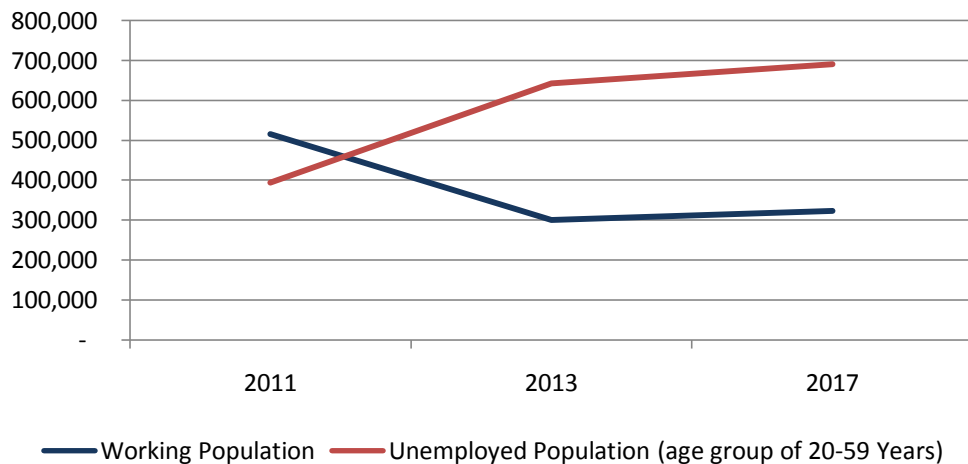
**Figure 4.16: Industry Mix in Natore BSCIC Estate**



### 4.2.3 Employment Prospect in Natore

In a district where once there was a culture of entrepreneurship, and currently there is a declining manufacturing trend, an ideal situation exists where skilled and semiskilled labor is readily available. In fact, the whole set of labor who was laid off due to closure of industries during 2010-13, are expectedly looking for jobs for a more comfortable livelihood.

**Figure 4.17: Unemployment in Natore<sup>35</sup>**



The total unemployed population in Natore district is estimated at around 1 mn which is around 68% of eligible working population. As laid out earlier, the labors who were working in industries which were laid off during the last 10 years, have joined the unemployed population. It indicates a large prospect of availability of labor in Natore.

## 4.3 Competitive and Comparative Advantage of the Site

### 4.3.1 Benchmarking the Zone

A comparative assessment was carried out, which assembled a large number of quantitative investment or locational factors, and a scheme has been developed for aggregation across such variables. The objective of the benchmarking exercise is to identify the proposed EZ's main

<sup>35</sup>2011 data (Population and Housing Census 2011), 2013 data (Economic Census 2013) and 2017 data (IIFC's updated Estimate)



competitors and make comparison against each other. The following six EZs/Industrial Parks selected for the assessment:

|    | Name of the EZ/Industrial Park | Country    |
|----|--------------------------------|------------|
| 1. | Ishwardi EPZ                   | Bangladesh |
| 2. | Phnom Penh SEZ                 | Cambodia   |
| 3. | Tien Son Industrial Zone       | Vietnam    |
| 4. | Bitung                         | Indonesia  |
| 5. | Mingaladon Economic Zone       | Myanmar    |

### Ishwardi EPZ

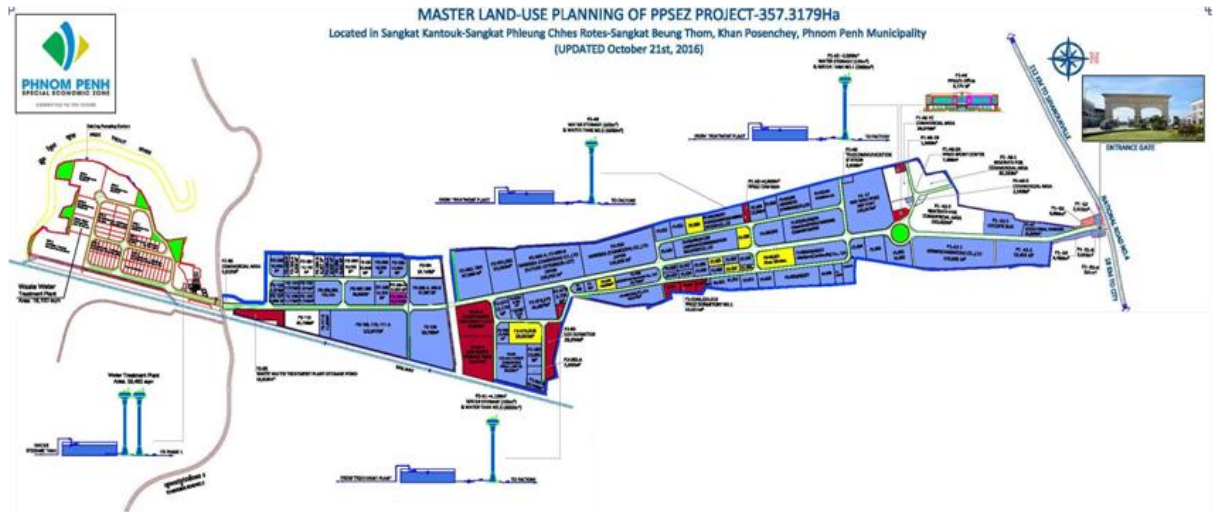
Ishwardi EPZ is situated 10.60 kms from Ishwardi Airport, 130 kms from Bangabandhu (Jamuna) Bridge, 220 kms from Dhaka, 280 kms from Mongla port, 110 kms from Rajshahi Airport and 484 kms from Chittagong port. The EZ has 309 acres of land accommodating around 9,500 workers. The EPZ



has total 158 plots with an average plot size of 2000 sqm. The EPZ has also Space of Standard Factory Building of 20420 sqm. These plots has been allocated to various industries including integrated textile, light engineering (Part) , electronics and electrical goods, chemical and fertilizer, tent, RMG and plastic factory. There. The EPZ has its own water supply and also a Sub-station of 11 kv, 3 phase, 50 cycles / sec.

### Phnom Penh Special Economic Zone

Phnom Penh is the capital city of Cambodia and the most populated city as well. Phnom Penh SEZ was established in 2006 on the outskirts of the capital Phnom Penh. There are around 100 companies located in Phnom Penh SEZ (10/2016) within a land area of about 357 hectares (approximately 890 acre) , accommodating around 21,000 workers.

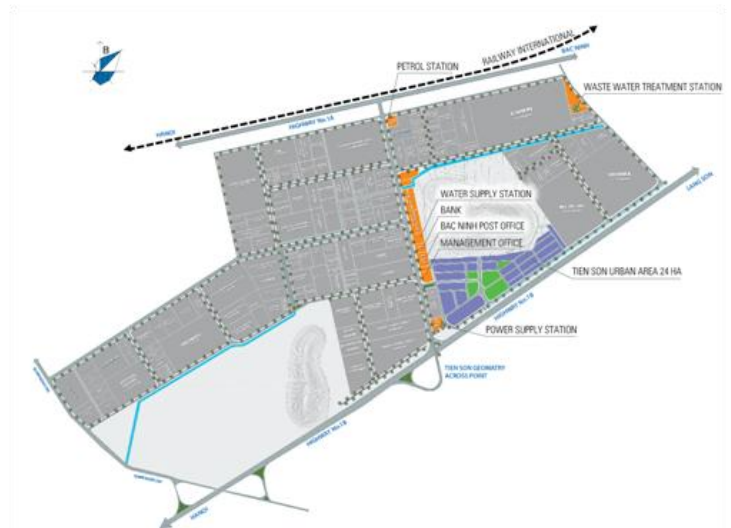


It operates under the authority of the Cambodia SEZ Board under the umbrella of the Council for the Development of Cambodia (CDC) . It was converted into a Public Limited Company (PLC) on July 7th, 2015. Key manufacturers and investors in Phnom Penh SEZ include Betagro, Coca Cola, Denso, Laurelton Diamonds, Minebea and Toyota amongst many others. Key Infrastructures includes flood-safe dyke and drainage system, electricity and telecommunication network, dry port, power station, independent water supplies etc.<sup>36</sup>

*Tien Son Industrial Zone:*

Tien Son Industrial Park is located in the area of Bac Ninh Province, Vietnam with the total area of 350 ha (865 acre) . This is the first industrial park project in Bac Ninh Province. It is about 22 km away from Hanoi capital.

With facilitated investment conditions and attractive preference policies, Bac Ninh has recently ranked the second in the North in terms of provincial competitiveness index, and reached top 10 in FDI attraction nationwide for years.



The zone has adequate infrastructure support including power supply, water supply and drainage system, waste and waste water treatment etc. It was developed in two phases starting from 1999, first phase 134.76 ha (333 acre) , second phase 214.24 ha (530 acre) . Primary sectors in this IP include electrical and electronic, steel, consumer goods and garment production, agricultural processing and foodstuff etc.<sup>37</sup>

<sup>36</sup> (Phnom Penh SEZ Website)

<sup>37</sup> (Viglacera Website)

### Bitung Special Economic Zone

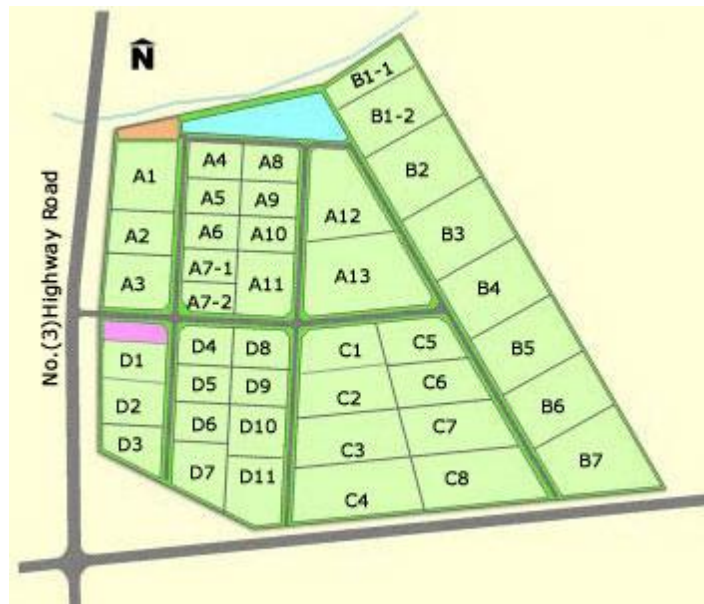
Bitung SEZ is newly launched by the Government of Indonesia in 2014. Bitung SEZ is managed by the provincial government of North Sulawesi and is designated by the Government as the centre of fishery, distribution, and logistic in Sulawesi Economic Corridor.

It has an area of 534 hectare (1320 acre) at Tanjung Merah Bitung Village, North Sulawesi Province. Priority sectors in the area are logistics, herbal pharmacy, fish processing and coconut processing, creating more than 30,000 jobs in the area. It is governed by the The National Council for SEZ of Indonesia<sup>38</sup>.



### Mingaladon Industrial Park

Mingaladon Industrial Park (MIP) , an ideal location for an industrial zone in the northern part of Yangon City, Union of Myanmar, had jointly been developed as the first international standard industrial park where as comprising 222 Acres of total land area in Phase I, by Mitsui & Co., Ltd. of Japan and the Department of Urban and Housing Development (DUHD, the previously DHSHD) Ministry of Construction of the Union of Myanmar.



Mingaladon Industrial Park is situated 7 km from Yangon International Airport, 23 km from the centre of Yangon City, 24 km from the Port of Yangon and 50 km from Thilawa Container Terminal.

The above sites will be assessed based on following criteria against the proposed zone.

#### 4.3.2 Benchmarking Criteria

A total of twenty one criteria were chosen as being particularly relevant for this assignment at this prefeasibility stage<sup>39</sup>. The criteria are outlined below. Each criterion was given a mark

<sup>38</sup> KEK Website

ranging from 1-4 with four being least cost/best advantage and one being greatest cost/most disadvantageous. The marks allocated to each criterion for each of the sites is shown below. The overall score from the comparative analysis are then detailed. The sites with the highest overall marks were then ranked.

**Figure 4.18: Benchmarking Criteria**

|                               |                      |            |                      |                                     |                                |
|-------------------------------|----------------------|------------|----------------------|-------------------------------------|--------------------------------|
| Size                          | No. of Plots         | Employment | Employment/acre      | Distance from commercial metropolis | Distance from nearest sea-port |
| Distance from nearest airport | Lease Tenure         | Lease rate | Maintenance Charge   | Minimum Wage                        | Skilled Wage Rate              |
| Semi Skilled Wage Rate        | Management Wage Rate | OSS        | Water Treatment Unit | Waste Water TP                      | Corporate tax rate             |
|                               |                      | VAT        | Tax holiday          |                                     |                                |

**Table 4.3: Benchmarking Criteria – Allocated Marks**

| 1. Size (Acre)                          |   | 11. Min. wage                              |   |
|---|---|--|---|
| Adequate with Expansion                 | 4 | Cheapest                                   | 4 |
| Adequate no Expansion                   | 3 | Normal                                     | 3 |
| Less than 500 Acre - possible expansion | 2 | Expensive                                  | 2 |
| Less than 500 Acre no expansion         | 1 | Most expensive                             | 1 |
| 2. No. of plots                         |   | 12. Skilled wage rate                      |   |
| > 300                                   | 4 | Cheapest                                   | 4 |
| 200 > 299                               | 3 | Normal                                     | 3 |
| 100 > 199                               | 2 | Expensive                                  | 2 |
| > 100                                   | 1 | Most expensive                             | 1 |
| 3. Employment                           |   | 13. Semi-Skilled wage rate                 |   |
| > 50,000                                | 4 | Cheapest                                   | 4 |
| 35,000 - 50,000                         | 3 | Normal                                     | 3 |
| 20,000 - 35,000                         | 2 | Expensive                                  | 2 |
| < 20,000                                | 1 | Most expensive                             | 1 |
| 4. Employment/Acre                      |   | 14. Management wage rate                   |   |
| > 75                                    | 4 | Cheapest                                   | 4 |
| 25-75                                   | 3 | Normal                                     | 3 |
| 15-25                                   | 2 | Expensive                                  | 2 |
| < 15                                    | 1 | Most expensive                             | 1 |
| 5. Distance from commercial metropolis  |   | 15. OSS                                    |   |
| 10 km or less                           | 4 | Available                                  | 4 |
| 10 – 30 km                              | 3 | Not Available                              | 1 |
| 30 - 70 km                              | 2 |  |   |
| > 70 km                                 | 1 |  |   |
| 6. Distance from nearest sea-port       |   | 16. Water treatment unit (m <sup>3</sup> ) |   |
| 25 km or less                           | 4 | < 5000                                     | 4 |
| 25 – 50 km                              | 3 | 5000 – 10000                               | 3 |
| 50 – 75 km                              | 2 | 10000 – 20000                              | 2 |

<sup>39</sup> Feasibility Study Reports of Mirsarai 2, Sherpur EZ and Dhaka SEZ

|   |   |  |   |
|---|---|--|---|
| > 75 km   | 1 | > 20000                                  | 1 |
| <b>7. Distance from nearest air-port</b>          |   | <b>17. Wastewater TP (m<sup>3</sup>)</b> |   |
| 10 km or less                                     | 4 | > 20000                                  | 4 |
| 10 – 30 km  | 3 | 15000 – 20000                            | 3 |
| 30 - 60 km  | 2 | 10000 – 15000                            | 2 |
| > 60 km   | 1 | < 10000                                  | 1 |
| <b>8. Lease tenure (yrs)</b>                      |   | <b>18. Corporate tax rate ( percent)</b> |   |
| > 60  | 4 | < 20 percent                             | 4 |
| 41 – 60   | 3 | 20 percent - 25 percent                  | 3 |
| 26 – 40   | 2 | 26 percent - 30 percent                  | 2 |
| < 25  | 1 | > 30 percent                             | 1 |
| <b>9. Lease rate</b>                              |   | <b>19. VAT ( percent)</b>                |   |
| Cheapest  | 4 | < 10 percent                             | 4 |
| Normal  | 3 | 10 percent - 15 percent                  | 3 |
| Expensive   | 2 | 16 percent - 20 percent                  | 2 |
| Most expensive                                    | 1 | > 20 percent                             | 1 |
| <b>10. Maintenance charge/m<sup>2</sup>/month</b> |   | <b>20. Tax holiday (yrs)</b>             |   |
| Cheapest  | 4 | > 15                                     | 4 |
| Normal  | 3 | 10 – 15                                  | 3 |
| Expensive   | 2 | 5 – 9                                    | 2 |
| Most expensive                                    | 1 | < 5                                      | 1 |

The above competitive indicators come in two categories. There are the charges that need to be paid, like the land lease charges. The lower they are, the more attractive is the zone in question. In contrast, there are indicators, such as tax holiday, lease tenure. The higher they are, the more attractive is the zone in question.

### Data

Efforts were given to collect information from the following sources:

- i) web-sites, including those hosted by the authorities that run these comparator industrial parks or SEZs;
- ii) research papers brought out by bilateral and multilateral agencies as JETRO, JICA, UNESCAP etc;

### Weighting

As part of the benchmarking assessment a weighting, or rating, were applied to each criteria. This would enable those criteria considered more important to have a greater effect on the overall score. For instance, size of the zone and lease tenure is highly attributed as these are considered for growth of industries at the zones. Consequently criteria 1, “Size” and criteria 4 “Leased Tenure”, were given a higher weighting than the others. The weighting was then adjusted to a percentage of 100 percent and this percentage was multiplied by the mark previously given.

One of the key advantages of the method adopted is that different weightings can be applied to each of the criteria and the matrix marks and ranking updated automatically using a spreadsheet. It makes easier to assess and review the results of the evaluation process, as there is a greater difference between the marks applied to each site.

The data collected for each site is provided in following. The markings applied to each criterion, weighting and overall marks for each site are included in the overall results of the benchmarking process.

*Limitations of the Assessment*

The assessment has following limitations:

- The assessment is based on numerical data from available sources. It does not take into account the micro and macro factors related with the success or failure of an EZ.
- The operational efficiencies of the EZs have not been taken into account. If the industries are using automation then the employment generation will be less than the labour sensitive industries.
- The assessment is based on attributes of site, not the performance of the zone.

**Table 4.4: Benchmarking Assessment – Collected Data<sup>40</sup>**

|                 | Items Compared                           | Natore EZ  | Ishwardi EPZ | Phnom Penh | Tien Son | Bitung    | Mingaladon |
|-----------------|--|------------|--------------|------------|----------|-----------|------------|
|                 | Economic Attributes                      | Bangladesh | Bangladesh   | Cambodia   | Vietnam  | Indonesia | Myanmar    |
| <b>General</b>  |  |            |              |            |          |           |            |
| 1               | Size (Acre)                              | 300        | 309          | 890        | 865      | 1320      | 222        |
| 2               | No. of plots                             | 226        | 158          | 103        | 90       | 48        | 41         |
| 3               | Employment                               | 4,000      | 9500         | 21,000     | 26,000   | 35,000    | NA         |
| 4               | Employment /Acre                         | 13         | 31           | 24         | 30       | 27        | NA         |
| <b>Location</b> |  |            |              |            |          |           |            |
| 5               | Distance from commercial metropolis (km) | 43         | 29           | 18         | 22       | 43        | 23         |
| 6               | Distance from nearest sea-port (km)      | 456        | 280          | 209        | 100      | 6         | 24         |
| 7               | Distance from nearest air-port (km)      | 50         | 110          | 8          | 35       | 37        | 7          |
| <b>Cost</b>     |  |            |              |            |          |           |            |
| 8               | Leased-tenure (yrs)                      | 20         | 30           | 50         | 50       | 30        | 30         |
| 9               | Lease rate (m2/year)                     | 1.25       | 1.25         | 55         | 60       | 175       | 0.3        |
| 10              | Maintenance charge (m2/month)            | 0.15       | 0            | 0.06       | 0.5      | 0.06      | NA         |
| 11              | Min. wage (US\$/month)                   | 70         | 70           | 30         | 130      | 177       | 68         |
| 12              | Skilled wage rate (USD/month)            | 87         | 87           | 180        | 325      | 414       | 145        |
| 13              | Semi-Skilled wage rate (USD/month)       | 72         | 72           | 120        | 215      | 209       | 92         |

<sup>40</sup> Reference of figures of different foreign EZs

Mingaladon, Myanmar

[http://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06\\_chapter5.pdf](http://www.ide.go.jp/library/English/Publish/Download/Brc/pdf/06_chapter5.pdf)

Lease Term

[http://www.mingaladon.com/land\\_use\\_plan\\_lease\\_terms.htm](http://www.mingaladon.com/land_use_plan_lease_terms.htm)

Infrastructures

[http://www.mingaladon.com/infrastructure\\_services.htm](http://www.mingaladon.com/infrastructure_services.htm)

Incentive

[http://www.mingaladon.com/investment\\_incentives.htm](http://www.mingaladon.com/investment_incentives.htm)

<http://www.ide.go.jp/library/English/Publish/>

Download/Brc/pdf/06\_chapter5.pdf

Phnom Penh, Cambodia

Government Policy

[http://www.business-in-asia.com/cambodia/economic\\_zones.html](http://www.business-in-asia.com/cambodia/economic_zones.html)

Tien Son, Vietnam

[http://ipc.vn/setting-up/locations/d\\_23/129/tien-son-industrial-zone.html](http://ipc.vn/setting-up/locations/d_23/129/tien-son-industrial-zone.html)

<http://en.viglaceraip.com/investment-incentive-of-tien-son-ip>

Salary, Tax, Incentives

<http://en.viglaceraip.com/wp-content/uploads/Tien-Son-IP-English.pdf>

Power, Waste and waste water treatment

<http://en.viglaceraip.com/technical-infrastructure-of-tien-son-ip>

VAT

<https://www.healyconsultants.com/vietnam-company-registration/free-zones/>

Ishwardi EPZ

<http://www.bepza.gov.bd/pages/epzdetails/ishwardi-export-processing-zone>

<http://www.bepza.gov.bd/pages/epzdetails/ishwardi-export-processing-zone/utility-services-3>

<http://www.bepza.gov.bd/pages/epzdetails/ishwardi-export-processing-zone/location-4>

Bitung, Indonesia

<https://kppip.go.id/en/bitung-industrial-special-economic-zone-national-tourism-strategic-locationkspn-north-sulawesi/>

|                          | Items Compared<br>Economic Attributes      | Natore EZ  | Ishwardi EPZ | Phnom Penh | Tien Son | Bitung    | Mingaladon |
|--------------------------|--|------------|--------------|------------|----------|-----------|------------|
|                          |  | Bangladesh | Bangladesh   | Cambodia   | Vietnam  | Indonesia | Myanmar    |
| 14                       | Management wage rate (USD/month)           | 301        | 301          | 700        | 700      | 995       | 600        |
| <b>Facility Services</b> |  |            |              |            |          |           |            |
| 15                       | OSS  | 1          | 1            | 1          | 0        | 1         | 1          |
| 16                       | Water treatment unit (m <sup>3</sup> /day) | 9,500      | NA           | 5,300      | 7,000    | 72,000    | 5,000      |
| 17                       | Wastewater TP (m <sup>3</sup> /day)        | 9,600      | NA           | 4,500      | 4,000    | 64,800    | NA         |
| <b>Government Policy</b> |  |            |              |            |          |           |            |
| 18                       | Corporate tax rate (%)                     | 35         | 35           | 20         | 22       | 25        | 30         |
| 19                       | VAT (%)                                    | 15         | 15           | 10         | 0        | 10        | 0          |
| 20                       | Tax h <sup>o</sup> day(yrs)                | 10         | 10           | 9          | 2        | 15        | 5          |

**Table 4.5: Benchmarking Assessment – Comparative Analysis**

| Items Compared                             | Natore EZ  | Ishwardi   | Phnom Penh | Tien Son | Bitung    | Mingaladon | Max Marks | Weighting | Percentage |
|--|------------|------------|------------|----------|-----------|------------|-----------|-----------|------------|
|  | Bangladesh | Bangladesh | Cambodia   | Vietnam  | Indonesia | Myanmar    |           |           |            |
| Size (Acre)                                | 1          | 1          | 3          | 3        | 3         | 1          | 4         | 15        | 9          |
| No. of plots                               | 3          | 2          | 2          | 1        | 1         | 1          | 4         | 10        | 6          |
| Employment                                 | 1          | 1          | 2          | 2        | 2         | 0          | 4         | 10        | 6          |
| Employment /Acre                           | 1          | 3          | 2          | 3        | 3         | 0          | 4         | 10        | 6          |
| Distance from commercial metropolis (km)   | 2          | 3          | 3          | 3        | 2         | 3          | 4         | 10        | 6          |
| Distance from nearest sea-port (km)        | 1          | 1          | 1          | 1        | 4         | 4          | 4         | 10        | 6          |
| Distance from nearest air-port (km)        | 2          | 1          | 4          | 2        | 2         | 4          | 4         | 10        | 6          |
| Leased-tenure (yrs)                        | 1          | 2          | 3          | 3        | 2         | 2          | 4         | 10        | 6          |
| Lease rate (m <sup>2</sup> /year)          | 3          | 3          | 2          | 2        | 1         | 4          | 4         | 10        | 6          |
| Maintenance charge (m <sup>2</sup> /month) | 3          | 0          | 4          | 1        | 4         | 0          | 4         | 5         | 3          |
| Min. wage (US\$/month)                     | 3          | 3          | 4          | 2        | 1         | 3          | 4         | 10        | 6          |
| Skilled wage rate (USD/month)              | 4          | 4          | 2          | 1        | 1         | 3          | 4         | 5         | 3          |
| Semi-Skilled wage rate (USD/month)         | 4          | 4          | 2          | 1        | 2         | 3          | 4         | 5         | 3          |
| Management wage rate (USD/month)           | 4          | 4          | 2          | 2        | 1         | 3          | 4         | 5         | 3          |
| OSS  | 4          | 4          | 4          | 1        | 4         | 4          | 4         | 10        | 6          |
| Water treatment unit (m <sup>3</sup> /day) | 3          | 0          | 3          | 3        | 1         | 3          | 4         | 5         | 3          |
| Wastewater TP (m <sup>3</sup> /day)        | 1          | 0          | 1          | 1        | 4         | 0          | 4         | 5         | 3          |
| Corporate tax rate (%)                     | 1          | 1          | 3          | 3        | 3         | 2          | 4         | 5         | 3          |



| Items Compared    | Natore EZ  | Ishwardi   | Phnom Penh | Tien Son  | Bitung    | Mingaladon | Max Marks | Weighting  | Percentage |
|-------------------|------------|------------|------------|-----------|-----------|------------|-----------|------------|------------|
|                   | Bangladesh | Bangladesh | Cambodia   | Vietnam   | Indonesia | Myanmar    |           |            |            |
| VAT (%)           | 3          | 3          | 3          | 4         | 3         | 4          | 4         | 5          | 3          |
| Tax holiday (yrs) | 3          | 3          | 2          | 1         | 3         | 2          | 4         | 10         | 6          |
|                   | <b>48</b>  | <b>43</b>  | <b>52</b>  | <b>40</b> | <b>47</b> | <b>46</b>  | <b>80</b> | <b>165</b> | <b>100</b> |

**Table 4.6: Benchmarking Assessment – Overall Score**

| Items Compared                             | Natore EZ  | Ishwardi   | Phnom Penh | Tien Son   | Bitung     | Mingaladon |
|--|------------|------------|------------|------------|------------|------------|
|  | Bangladesh | Bangladesh | Cambodia   | Vietnam    | Indonesia  | Myanmar    |
| Size (Acre)                                | 9          | 9          | 27         | 27         | 27         | 9          |
| No. of plots                               | 18         | 12         | 12         | 6          | 6          | 6          |
| Employment                                 | 6          | 6          | 12         | 12         | 12         | 0          |
| Employment /Acre                           | 6          | 18         | 12         | 18         | 18         | 0          |
| Distance from commercial metropolis (km)   | 12         | 18         | 18         | 18         | 12         | 18         |
| Distance from nearest sea-port (km)        | 6          | 6          | 6          | 6          | 24         | 24         |
| Distance from nearest air-port (km)        | 12         | 6          | 24         | 12         | 12         | 24         |
| Leased-tenure (yrs)                        | 6          | 12         | 18         | 18         | 12         | 12         |
| Lease rate (m2/year)                       | 18         | 18         | 12         | 12         | 6          | 24         |
| Maintenance charge (m2/month)              | 9          | 0          | 12         | 3          | 12         | 0          |
| Min. wage (US\$/month)                     | 18         | 18         | 24         | 12         | 6          | 18         |
| Skilled wage rate (USD/month)              | 12         | 12         | 6          | 3          | 3          | 9          |
| Semi-Skilled wage rate (USD/month)         | 12         | 12         | 6          | 3          | 6          | 9          |
| Management wage rate (USD/month)           | 12         | 12         | 6          | 6          | 3          | 9          |
| OSS  | 24         | 24         | 24         | 6          | 24         | 24         |
| Water treatment unit (m <sup>3</sup> /day) | 9          | 0          | 9          | 9          | 3          | 9          |
| Wastewater TP (m <sup>3</sup> /day)        | 3          | 0          | 3          | 3          | 12         | 0          |
| Corporate tax rate (%)                     | 3          | 3          | 9          | 9          | 9          | 6          |
| VAT  | 9          | 9          | 9          | 12         | 9          | 12         |
| Tax h'day(yrs)                             | 9          | 9          | 9          | 12         | 18         | 12         |
| <b>Total Score</b>                         | <b>215</b> | <b>206</b> | <b>261</b> | <b>209</b> | <b>236</b> | <b>227</b> |

**Table 4.7: Competitive Advantages of the Sites**

| Name of EZ     | Competitive Advantage   |
|----------------|---|
| Natore EZ      | <ul style="list-style-type: none"> <li>• Arable flat land</li> <li>• Very Well connected with the nearby airport, rail station and commercial hub</li> <li>• Lowest labour rate in the region</li> <li>• Ease of establishing industries</li> <li>• Investor friendly rules and regulations</li> </ul>  |
| Ishwardi EPZ   | <ul style="list-style-type: none"> <li>• Very Well connected with the nearby airport, rail station and commercial hub</li> <li>• Attractive incentive package</li> <li>• One stop service</li> <li>• Investor friendly rules and regulations</li> </ul>   |
| Phnom Penh SEZ | <ul style="list-style-type: none"> <li>• Located centrally in the heart of the region's east-west corridor</li> <li>• Comprehensive and high-standard infrastructure</li> <li>• One-stop services in partnership with relevant government authorities</li> <li>• Competitive investment incentives</li> <li>• Investment protection agreements with key markets</li> <li>• Efficient infrastructure and strategic location</li> <li>• A young and motivated workforce</li> </ul>                                |
| Tien Son IZ    | <ul style="list-style-type: none"> <li>• Synchronized infrastructure construction</li> <li>• Large investments for manufacturing in the electronics sector</li> <li>• Entrepreneurial dynamism allow several small and medium sized enterprises to flourish</li> <li>• Proximity to highly developed Infrastructure</li> <li>• Attractive business environment</li> </ul>   |
| Bitung SEZ     | <ul style="list-style-type: none"> <li>• Strategic location as the centre of fishery, distribution, and logistic in Sulawesi Economic Corridor</li> <li>• Attractive fiscal exemptions and incentives</li> <li>• Top priority program in the national development planning</li> <li>• Connected with all major regional infrastructures</li> <li>• One Stop Service System (OSS) to accelerate permit process for businesses</li> <li>• Streamlined and hassle free procedure of setting up business</li> </ul> |
| Mingaladon     | <ul style="list-style-type: none"> <li>• An ideal location for an industrial zone in the northern part of Yangon City</li> <li>• Planned future expansion</li> <li>• Streamlined one stop service</li> <li>• Very close to Yangon International Airport (7 km)</li> <li>• Only 24 km from the Port of Yangon</li> <li>• Vicinity to the labor population</li> </ul>   |

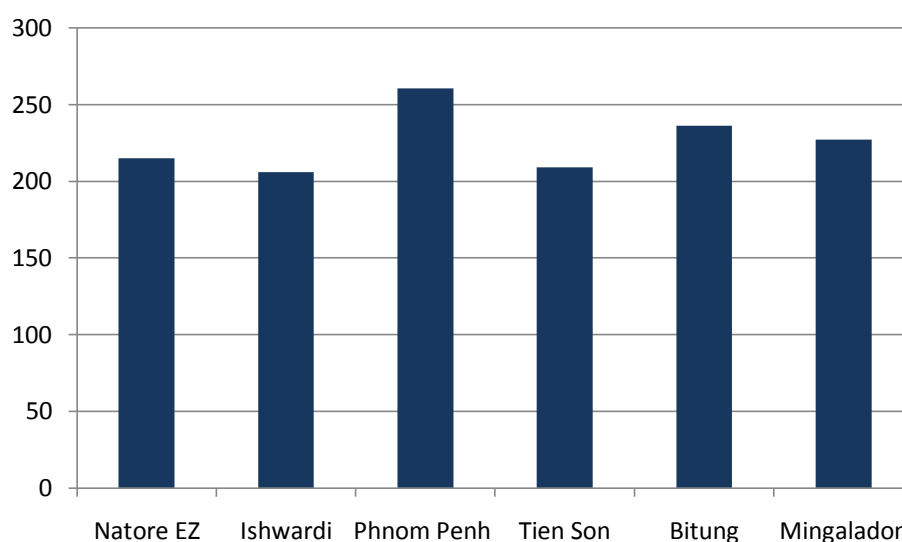
### 4.3.3 Results of Benchmarking Assessment

After applying the benchmarking evaluation criteria, the sites were ranked in the following order.

**Table 4.8: Results of Benchmarking Assessment**

| Name of Ezs | Country          | Overall Score |
|-------------|------------------|---------------|
| Natore EZ   | Bangladesh       | 215           |
| Ishwardi    | Bangladesh       | 206           |
| Phnom Penh  | Cambodia         | 261           |
| Tien Son    | Vietnam          | 209           |
| Bitung      | <b>Indonesia</b> | 236           |
| Mingaladon  | Myanmar          | 227           |

**Figure 4.19: Results of Benchmarking Assessment in Graphical Form**





## 5 Industry Assessment

### 5.1 Potential Industry Sectors for the Site

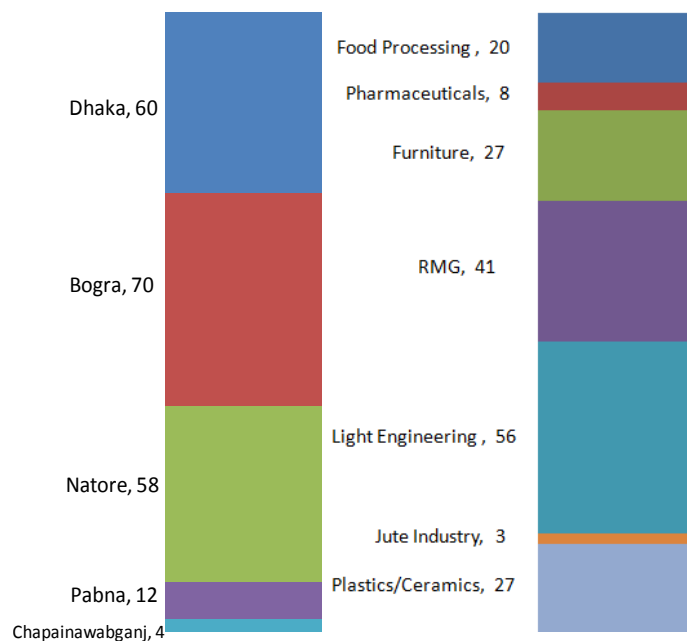
Since the EZ is located at Natore, the site specific exercise was carried out to identify the potential industry sectors and it was decided to carry out the survey among industries located at Natore and surrounding areas. It was also decided to survey manufacturing industries at Dhaka to assess their willingness to expand their business to proposed EZ at Natore. In this regard, the team collected the list of industries from Natore Chamber of Commerce, Natore BSCIC Estate and trade associations at Dhaka.

The existing industries in the immediate area/region of NEZ, were surveyed. The sample size was 200. Industry trend in this area was also examined in identifying the potential industry sectors which might be attracted for NEZ. Based on the examination, the following types of industries located in Bogura, Natore, Dhaka, Pabna and Chapainawabganj were identified for conducting the investor survey.

1. Light Engineering
2. Food Processing
3. Jute Industry
4. Furniture
5. Plastic
6. Pharmaceutical
7. Automobile
8. Leather
9. RMG

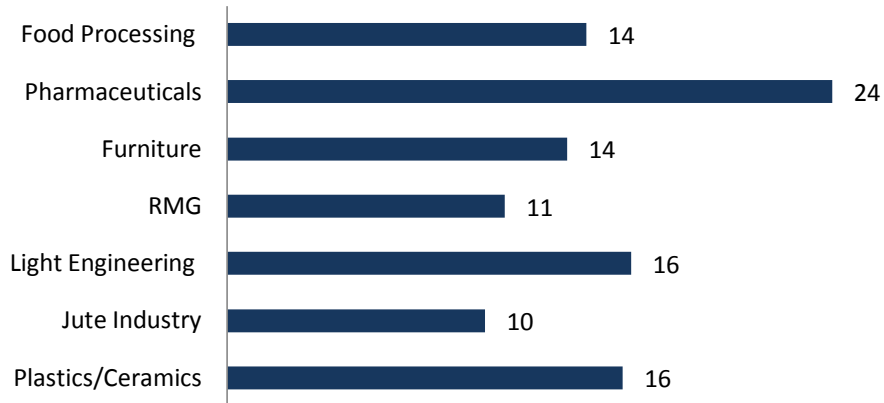
### 5.2 Sample Characteristics of Industry Survey

Industry survey was carried out based on the above categories and locations. Number of industries was surveyed according to location and sector is presented in the following figure.



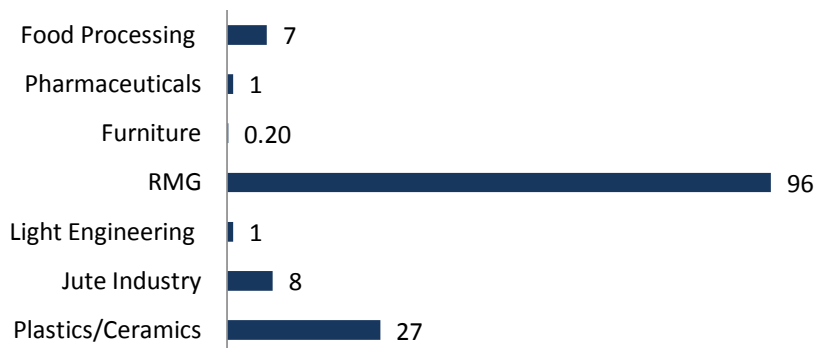
The following figure represents the number of years in operation of the surveyed industries. It appears from the figure below that the designated Industries are in operation ranges from 10 to 24 years.

**Figure 1: Number of Years in Operation**



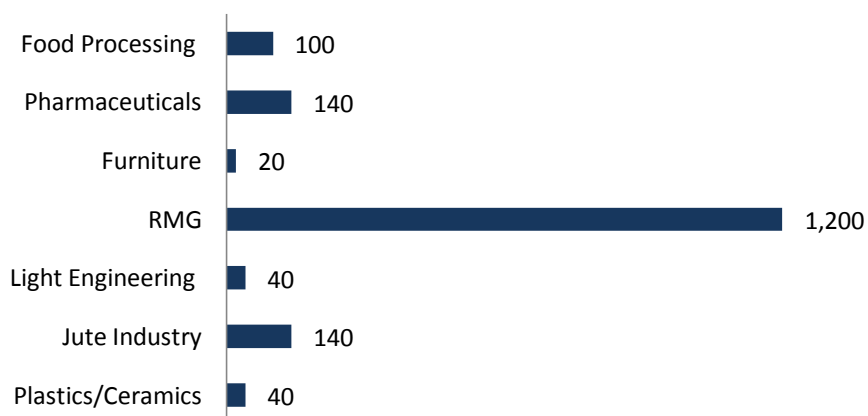
The following figure illustrates the capital strength of surveyed industries by sectors. RMG sector dominates in investment.

**Figure 2: Capital Base of Industries Surveyed**



The following figure shows the data on number of employees of the surveyed industries by sectors. RMG industries surveyed have maximum number of employment as it is labor intensive.

**Figure 1: Number of Employees of the Industries Surveyed by Sector**



### 5.3 Investor Survey

The investor survey was carried out with industries in the designated sectors based in Bogura, Natore, Dhaka, Pabna and Chapainawabganj through individual, in-person interviews. The survey was conducted to identify industry/sector requirements, barriers to investment and potential interest in the EZ.

A questionnaire was filled up by the consulted individuals. The purpose of the consultation was threefold:

- To understand motivations for desiring a new operating location;
- Gauge interest in existing business enterprises to move to a new location.
- Collect data on the operating parameters—current and desired—of business enterprises, including land, buildings, utilities, and workforce.

**Table 5.1: Suitability of Industries**

|  | Parameter   | Weightage | Suitability | Score | Weighted Score |
|--|---|-----------|-------------|-------|----------------|
| <b>1) Food Processing</b>              |   |           |             |       |                |
| 1                                      | Suitability with respect to Land per unit of Value Addition             | 25%       | High        | 10    | 2.50           |
| 2                                      | Suitability for proximity to Natore and Rajshahi                        | 15%       | Medium      | 10    | 1.50           |
| 3                                      | Environmental Suitability   | 15%       | Medium      | 5     | 0.75           |
| 4                                      | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                                      | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | Medium      | 10    | 1.00           |
| 6                                      | Growth Prospect/Export Competitiveness                                  | 10%       | Low         | 10    | 1.00           |
| 7                                      | Import substitution Prospect  | 10%       | Low         | 10    | 1.00           |
| 8                                      | Suitability with respect to existing Local Demand of the Products       | 5%        | Medium      | 10    | 0.50           |
|  | <b>Total</b>  |           |             |       | <b>9.25</b>    |
| <b>2) Light Engineering</b>            |   |           |             |       |                |
| 1                                      | Suitability with respect to Land per unit of Value Addition             | 25%       | Medium      | 5     | 1.25           |
| 2                                      | Suitability for proximity to Natore and Rajshahi                        | 15%       | Low         | 0     | -              |
| 3                                      | Environmental Suitability   | 15%       | Medium      | 5     | 0.75           |
| 4                                      | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                                      | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6                                      | Growth Prospect/Export Competitiveness                                  | 10%       | Medium      | 5     | 0.50           |
| 7                                      | Import substitution Prospect  | 10%       | Medium      | 5     | 0.50           |
| 8                                      | Suitability with respect to existing Local Demand of the Products       | 5%        | Low         | 0     | -              |
|  | <b>Total</b>  |           |             |       | <b>5.00</b>    |
| <b>3) Plastic / Ceramics and misc.</b> |   |           |             |       |                |
| 1                                      | Suitability with respect to Land per unit of Value Addition             | 25%       | High        | 10    | 2.50           |
| 2                                      | Suitability for proximity to Natore and Rajshahi                        | 15%       | Medium      | 5     | 0.75           |
| 3                                      | Environmental Suitability   | 15%       | Medium      | 5     | 0.75           |

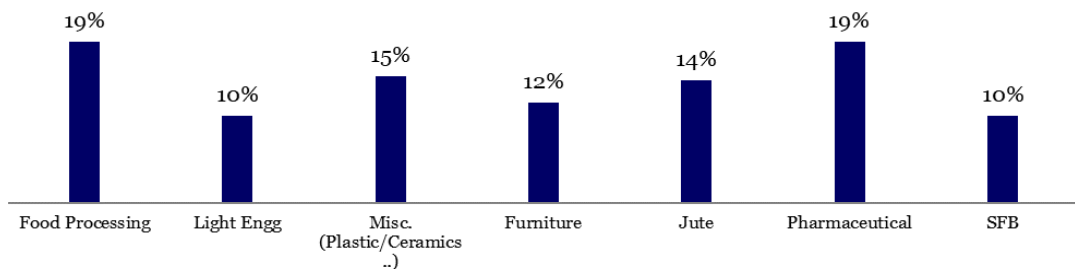
|                          | Parameter   | Weightage | Suitability | Score | Weighted Score |
|--------------------------|---|-----------|-------------|-------|----------------|
| 4                        | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                        | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6                        | Growth Prospect/Export Competitiveness                                  | 10%       | Low         | 0     | -              |
| 7                        | Import substitution Prospect  | 10%       | High        | 10    | 1.00           |
| 8                        | Suitability with respect to existing Local Demand of the Products       | 5%        | Medium      | 5     | 0.25           |
|                          | <b>Total</b>  |           |             |       | <b>7.25</b>    |
| <b>4) Furniture</b>      |   |           |             |       |                |
| 1                        | Suitability with respect to Land per unit of Value Addition             | 25%       | Medium      | 5     | 1.25           |
| 2                        | Suitability for proximity to Natore and Rajshahi                        | 15%       | Medium      | 5     | 0.75           |
| 3                        | Environmental Suitability   | 15%       | Medium      | 5     | 0.75           |
| 4                        | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                        | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6                        | Growth Prospect/Export Competitiveness                                  | 10%       | Medium      | 5     | 0.50           |
| 7                        | Import substitution Prospect  | 10%       | Medium      | 5     | 0.50           |
| 8                        | Suitability with respect to existing Local Demand of the Products       | 5%        | Low         | 0     | -              |
|                          | <b>Total</b>  |           |             |       | <b>5.75</b>    |
| <b>5) Jute Industry</b>  |   |           |             |       |                |
| 1                        | Suitability with respect to Land per unit of Value Addition             | 25%       | High        | 10    | 2.50           |
| 2                        | Suitability for proximity to Natore and Rajshahi                        | 15%       | Medium      | 5     | 0.75           |
| 3                        | Environmental Suitability   | 15%       | Medium      | 5     | 0.75           |
| 4                        | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                        | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6                        | Growth Prospect/Export Competitiveness                                  | 10%       | Medium      | 5     | 0.50           |
| 7                        | Import substitution Prospect  | 10%       | Medium      | 5     | 0.50           |
| 8                        | Suitability with respect to existing Local Demand of the Products       | 5%        | low         | 0     | -              |
|                          | <b>Total</b>  |           |             |       | <b>7.00</b>    |
| <b>6) Pharmaceutical</b> |   |           |             |       |                |
| 1                        | Suitability with respect to Land per unit of Value Addition             | 25%       | High        | 10    | 2.50           |
| 2                        | Suitability for proximity to Natore and Rajshahi                        | 15%       | medium      | 5     | 0.75           |
| 3                        | Environmental Suitability   | 15%       | High        | 10    | 1.50           |
| 4                        | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5                        | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6                        | Growth Prospect/Export Competitiveness                                  | 10%       | High        | 10    | 1.00           |
| 7                        | Import substitution Prospect  | 10%       | High        | 10    | 1.00           |
| 8                        | Suitability with respect to existing Local Demand of the Products       | 5%        | High        | 10    | 0.50           |
|                          | <b>Total</b>  |           |             |       | <b>9.25</b>    |

|   | Parameter   | Weightage | Suitability | Score | Weighted Score |
|---|---|-----------|-------------|-------|----------------|
| <b>7) Standard Factory Building (SFB)</b> |   |           |             |       |                |
| 1   | Suitability with respect to Land per unit of Value Addition             | 25%       | Medium      | 5     | 1.25           |
| 2   | Suitability for proximity to Natore and Rajshahi                        | 15%       | Low         | 0     | -              |
| 3   | Environmental Suitability   | 15%       | Low         | 0     | -              |
| 4   | Labour availability in the Natore region                                | 10%       | High        | 10    | 1.00           |
| 5   | Presence of Raw materials/ Backward Linkage Industries in Natore Region | 10%       | High        | 10    | 1.00           |
| 6   | Growth Prospect/Export Competitiveness                                  | 10%       | High        | 10    | 1.00           |
| 7   | Import substitution Prospect  | 10%       | Medium      | 5     | 0.50           |
| 8   | Suitability with respect to existing Local Demand of the Products       | 5%        | Medium      | 5     | 0.25           |
|   | <b>Total</b>  |           |             |       | <b>5.00</b>    |

#### 5.4 Nature of the Zone with Respect to Suitability of Industries

Based on the above industry analysis, a suitability assessment of different industries for the zone was carried out. The industries have been scored in the table depending upon suitability for the zone. The scores are presented in the following figure.

**Figure 5.2: Suitability Mix of Industries**



The above figure shows that there is a reasonable level of suitability for establishing food processing, light engineering, plastic/ceramics and misc., furniture, jute industry and pharmaceutical. Multi product economic zone will provide more opportunity for the potential sectors to set up industries in the best possible way to ensure 100% land take up of the zone. Food processing industry can be accommodated considering demand and availability labor.

Plastic/ceramics and misc., jute industry, furniture and SFB also fit well in this mix because of the availability of backward and forward linkages. Further analysis in the financial and economic analysis chapter indicates that a multi-product economic zone at the site can be financially and economically viable as well.

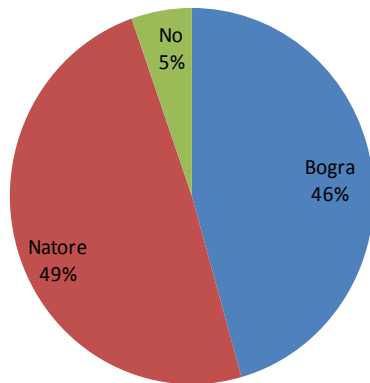
#### 5.5 Findings from the Investor Survey

The consultants have analysed data acquired from survey and have also qualified the acquired data against the secondary data available in various national and international sources to maintain the realism of the analysis. The raw data was compiled for each of the industries surveyed, as appropriate. The findings of the survey are presented below.

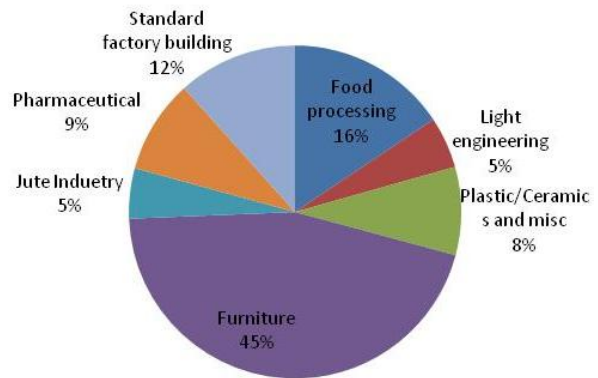


Out of 204 respondents, 49% have shown their interest of setting up industries in NEZ. The total land requested for NEZ is 220 acres out of 300 acres. Floor spaces requested in standard factory buildings are 168,060 sft.

**Figure 5.3: Percentage of Interest to set up industries in NEZ**

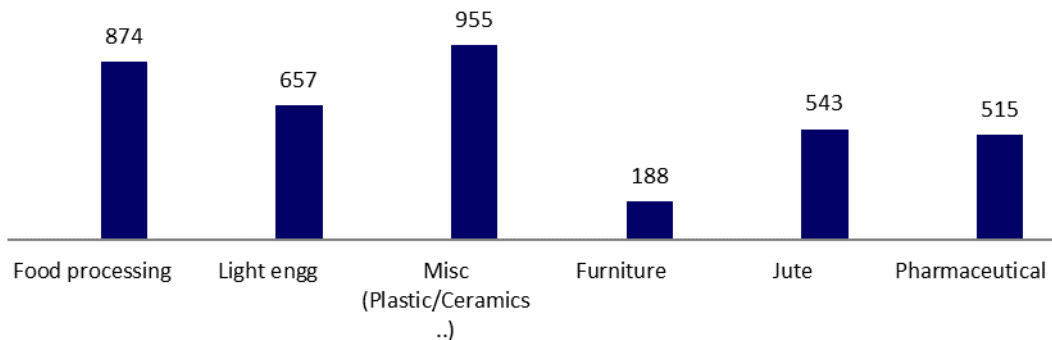


**Figure 5.4: Percentage of Responses by Industry (Land Requirement)**



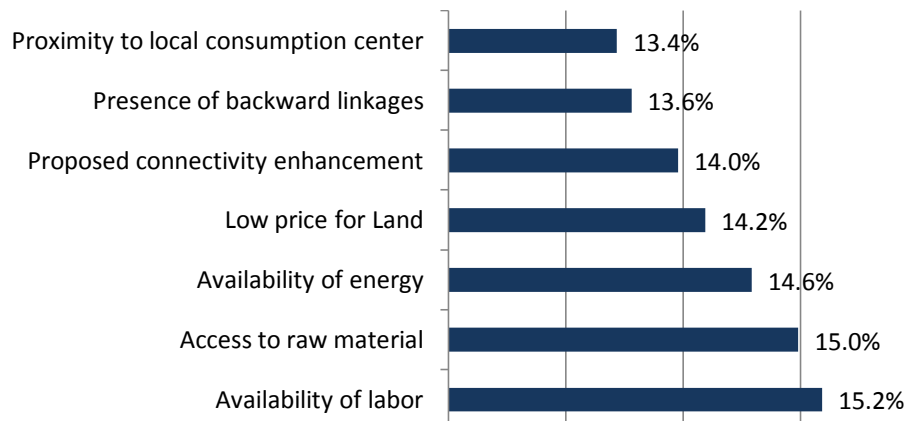
Furniture industries expressed interest to take up 45% and food processing industries 16% of the total required land derived from survey. It has been observed that the requirements are close to the size of NEZ from those industries which are mostly interested to set up business in this EZ.

**Figure 5.5: Employment Generation Potential**



The above graph shows that the employment generation potential of plastic/ceramics and food processing industries are comparatively much higher than the other sectors. Food processing is expected to create employment of around 1800 people which is highest compared to all other industries in NEZ. The whole EZ is expected to create employment of around 4,000.

**Figure 5.6: Rationale for Interest**



Availability of labour, access to raw materials, availability of energy and the low price of land are the main reasons for the interest of industries in NEZ.

## 5.6 Target Industries and Industry Profile

The target industries for each sector was determined based on the analysis carried out of the investor survey and review of secondary data. A profile for each short-listed sector was prepared and given in this report, which includes typical land, power and water requirements and typical employment requirements which have provided in prescribed format. The target industries for NEZ are:

- 1) Food Processing
- 2) Light Engineering
- 3) Plastic/Ceramics and misc
- 4) Furniture
- 5) Jute Industry
- 6) Pharmaceuticals

The following chapters present a brief analysis of different industries and their suitability for the zone.

### ***Food Processing***

Food processing sector is one of the growing sectors in Bangladesh in terms of production, growth, consumption, and export. The demand for processed foods is picking up because of rising income and busy lifestyle of domestic population. Increasing disposable income<sup>41</sup> and growing urban middle class are contributing to the growth of this industry. The growing number of restaurants, hotels and supermarkets are also driving the demand for processed foods.

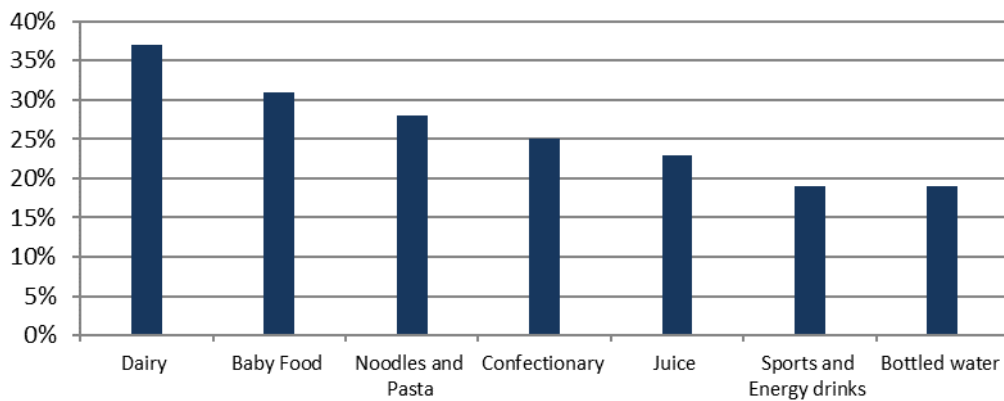
The processed food industry provides most of the requirements of the local market. The total turnover of the industry is estimated to be USD 2.5 bn. Products are being exported to 130 countries, including Australia and US. The industry has been expanding and is also expected to continue.



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<sup>41</sup>Mr. Kamruzzaman Kalam, the marketing director of PRAN-RFL group

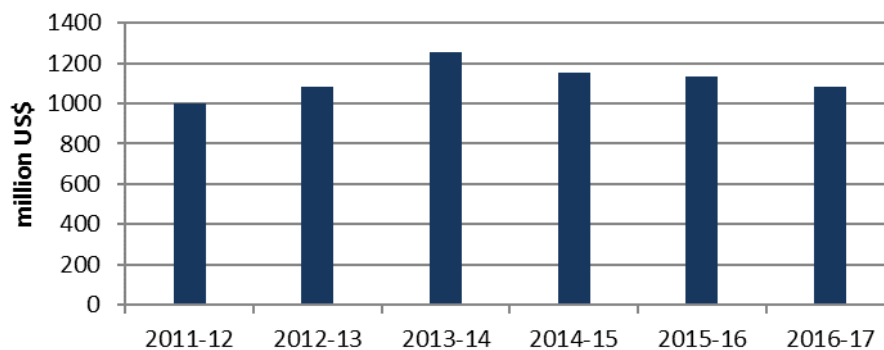
**Figure 5.7: Compounded Annual Processed Food Growth Rate**



Overall sales of processed foods are anticipated to grow at 17% per year over 2013-2018, reaching a value of USD 21.2 bn in 2018.<sup>42</sup>

In 2011-12, food processing companies shipped USD 1532.68 mn worth of processed food. The amount escalated to USD 1,794.05 mn in 2014-15, then went downward at USD 1,631.04 mn and USD 1,079 mn in 2015-16 and 2016-17 respectively, according to the data compiled by Bangladesh Export Promotion Bureau. Frozen food, shrimps and fish contributed a major portion of the export in all these years.

**Figure 5.8: Food Export Performance**



The increase in number of processed food companies, cash incentives provided by the government, better pricing and the quality of the locally made foods facilitated the growth. Major exporters of food products- Pran, Sajeeb, ACI, Alin Foods, Partex, Globe Soft Drinks, Bombay Sweets, Starline Food, Akij Foods. Those firms earned nearly BDT 20 bn from export in 2015-2016. The major export destinations of those products are African countries, Middle East, France, Italy, Germany and England. Among those companies, Pran exports products to 130 countries including 40 African nations and earned around BDT 14 bn from exports in 2015-16.<sup>43</sup>

<sup>42</sup>The Daily Star, 18 September 2015, Euromonitor International

<sup>43</sup>The daily star, November, 2016



### Light Engineering

In light engineering industry, prospect of growth and import substitution is significantly high. This sector contributes to growth in various related sectors and a wide range of economic activities .

- It is estimated that there are more than 40,000 units of light engineering industries producing 10,000 different items, and employing 7 mn persons<sup>44</sup>.
- The sector is currently

contributing 2% to the GDP<sup>45</sup>

- There are strong backward and forward linkages between the light engineering industries and other sector such as agriculture, automobile, and transportation in Bangladesh.
- The Sector is experiencing positive export performance in recent time, and achieved 14.1% export growth in 2015. Export earnings from light engineering stood at USD 510 mn in 2016<sup>46</sup>.
- In the 7th Five Year Plan, GoB has given emphasis to attract FDI in the light engineering sector, for greater and easier market access, and for easier transfer of technology<sup>47</sup>.
- To facilitate FDI in the sector, the government is planning to set up several SEZs and hand over these SEZs to investors from Japan, China, India and other countries

The sector produces mainly spare parts of machineries of transport, agriculture, power, automobiles and pharmaceutical sector, and electrical switches and accessories. The sector is attributed to manufacturing spare parts “from aircraft to bicycles.”

Most of light engineering industries are located at Dhaka, Chittagong, Narayangong, Bogura, Gazipur, Kishorganj. Number of export quality light engineering products are going to foreign market on direct and subcontracting means. These are spare parts of paper and cement mills, bicycle, fancy light fitting, construction equipment, battery, voltage stabilizer, iron chain, cast iron article, carbon rod, automobile spares, electronics items, and stainless steel wares.

### Prospect of Natore for Light Engineering

There are currently large number of light engineering industries in Natore who are producing spare parts for automobiles, mills, factories and maintenance work foundry, agro-machinery, factory spares, LPC, cylinders and maintenance work. They can be the potential clients for LE Industry in the proposed EZ. Large amount of metals are used by the light engineering clusters as raw materials. Most of the raw materials are basic metals and are using old machineries imported from India. Hence Maldah, west Bangal in India and Sonamasjid Land port, Chapai Nawabganj in Bangladesh can be the potential route for importing raw materials for LE.

<sup>44</sup>[http://www.bpc.org.bd/lepbbc\\_current\\_sector\\_profile.php](http://www.bpc.org.bd/lepbbc_current_sector_profile.php)

<sup>45</sup>As above

<sup>46</sup>[http://www.lged.gov.bd/UploadedDocument/UnitPublication/1/322/11. percent207th percent20Five percent20Year percent20Plan \(Final percent20Draft\) .pdf](http://www.lged.gov.bd/UploadedDocument/UnitPublication/1/322/11. percent207th percent20Five percent20Year percent20Plan (Final percent20Draft) .pdf)

<sup>47</sup>As above

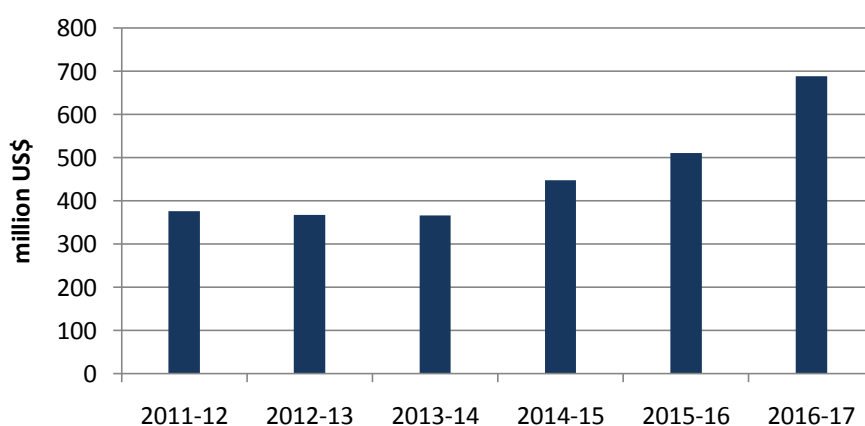
The bicycle and bicycle parts export industry has emerged relatively recently in the industrial landscape of Bangladesh. Foreign direct investment was critical to the emergence of the bicycle export sector. Malaysian investors were the first to seize the EU market opportunity by establishing the first bicycle-exporting firm in Bangladesh in 1995. A domestic trading group, Meghna, was the next firm to enter the bicycle export manufacturing industry. Bicycle exports are the single largest product export within Bangladesh’s light engineering sector, contributing to about 7.5%<sup>48</sup> of engineering exports.

Meghna Group is the largest bicycle manufacturer and exporter (90%) . It has nine factories, including two for handling exports, two for meeting local demand and five to produce bicycle components. They currently produce six types of bicycles. Alita Bangladesh, a Taiwan based company, is one of largest bicycle exporters. Pran-RFL Group is the latest entrant with a manufacturing capacity of 500,000 bicycles annually. Side by side with the export-oriented bicycle industry, Bangladesh also has a cottage industry of small-scale bicycle assemblers, parts manufacturers and retailers, which had its beginning during the 1970s.<sup>49</sup> The Bongshal market of Dhaka is the hub of this bicycle cottage industry in the country, employing about 2,000 people in businesses related to bicycle assembling, component manufacturing and retailing.

Bangladesh exported bicycles worth USD 689 mn during 2016-17 and USD 510 mn during 2015-16, thereby earning for itself the tenth position in the global ranking of bicycle exporters.

Major export destinations of the light engineering products include European Union, Japan, India, Australia, Africa etc.

**Figure 5.9: Volume of Light Engineering Export from Bangladesh<sup>50</sup>**



### Plastics Industry

Plastic products industry initiated as a backward linkage industry for RMG sector, today plastic and plastic based products manufacturing is profoundly contributing to the economy. The development of plastics



<sup>48</sup>The World Bank

<sup>49</sup>do

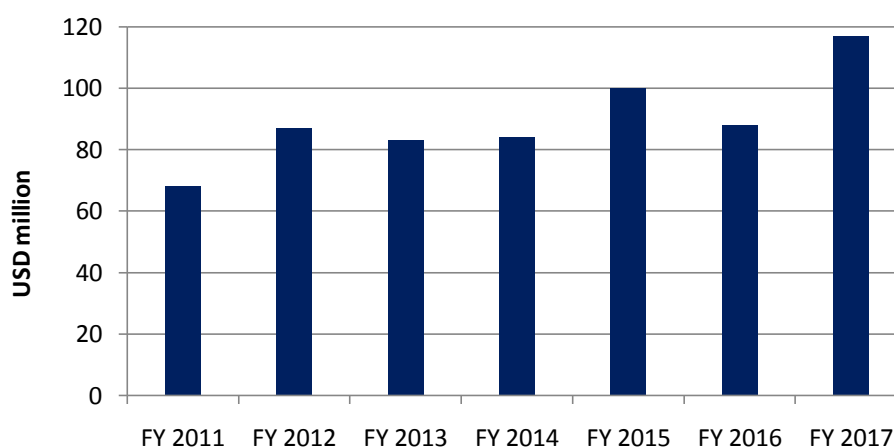
<sup>50</sup> Calculation from EPB data

industry in local SME sector has flourished by low-end domestic plastic products. The plastic sector contributed more than 1% to GDP of the country with nearly USD 117 mn worth of direct export in 2016-17<sup>51</sup>.

Bangladesh exports a number of items like shopping bags, garbage bags, butcher bags, oven sacks, industrial films, PVC pipes and bags, polythene sheet, plastic hangers, hand gloves, ropes, plastic waste, V belt, toys, electric switches, polyester thread, computer accessories, melamine table ware, toothbrush, ball pen, artificial flower and wall clock. According to BPGMEA data, currently more than 300 manufacturers export plastic goods worth nearly BDT 30 bn annually. Despite having a very good potential, Bangladesh holds a market share of only 0.01% against the global demands of USD 590 bn with the ranking of 89 in world exports. Per capita use of plastic goods in Bangladesh is very low (only 5 kg) comparing to the world average of 80 kg.<sup>52</sup>

Bangladesh exports a number of items like shopping bags, garbage bags, butcher bags, oven sacks, industrial films, PVC pipes and bags, polythene sheet, plastic hangers, hand gloves, ropes, plastic waste, V belt, toys, electric switches, polyester thread, computer accessories, video/audio cassettes, melamine table ware, toothbrush, ball pen, artificial flower and wall clock. *At present plastic is exported to almost 77 countries of Asia, Europe, Africa, America and Oceania (Afrin and Lima, 2015). Top five major plastic goods export destinations are China, USA, India, Germany and Belgium representing around 73% of total Bangladesh plastic exports.*<sup>53</sup>

**Figure 5.10: Export of Plastics Products**



According to the latest data of Export Promotion Bureau, during 2017, the plastic export was USD 117 mn.

**Table 5.2: Plastic Factories Based on Target Market<sup>54</sup>**

| Categories  | No. of Factories | %  | Current Market Size |
|---|------------------|----|---------------------|
| Factories engaged in the production for domestic market | 4,150            | 83 | BDT 200 bn (Local)  |
| Factories engaged in indirect export (customs bonded)   | 500              | 10 | BDT 40 bn (Export)  |
| Direct exporter (Customs Bonded)                        | 300              | 6  |                     |
| Indirect and direct exporter                            | 50               | 1  |                     |

<sup>51</sup><https://thefinancialexpress.com.bd/views/views/increasing-export-competitiveness-of-plastic-industry-1528040722>

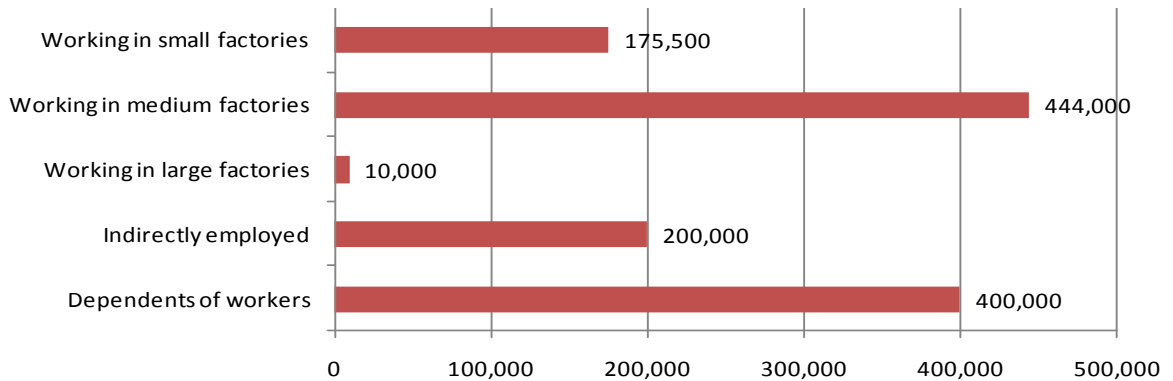
<sup>52</sup> Moazzem and Sehrin, 2016

<sup>53</sup> BPGMEA, Hasan, 2015

<sup>54</sup>Source: EPB and BPGMEA

At present, there are about 5,000 plastic industries in the country of which 3,500 are small and 1,480 are medium and 20 are large sized that employ *around 1.2 mn people*. Around 65% of these factories are situated in Dhaka, followed by 20% in Chittagong, 10% in Narayanganj and remaining 5% in other areas in the country. Out of the available units, almost 98% falls under SME<sup>55</sup>.

**Figure 5.11: Total Employment in Plastics Sector<sup>56</sup>**



In Bangladesh, plastic goods production has an average growth rate of more than 15% per year. The value addition in manufacturing plastic products lies between 51% and 70%, which is also estimably high. The concentration of plastic manufacturing industries in and around Natore makes this industry more suitable for the EZ.

Lack of gas and electricity, manpower shortage are the major hindrance for the industry not being able to run at its full capacity. Infrastructure facilities such as electricity, gas, transportation, and telecommunication facility marks Natore an ideal

Plastic pots and bottles are now increasingly becoming popular as it lowers production and distribution cost for packaging and storage of fruits, dried products and some other kinds of products. The existing and potential food processing industries can be the potential client for NEZ. Therefore Setting up a plastic industry in NEZ will meet the customer demands not only in Natore and its adjacent districts.

location for plastic industry where the industry can reach to its full potential. NEZ will be able to provide the uninterrupted utility services to help flourish the growth. Also, higher probability of establishing forward and backward linkages inside the zone, as well as concentrated and planned setup of the industries will attract industrialists to set up units inside the zone.



### **Furniture Industry**

The furniture industry in Bangladesh has been experiencing healthy growth over the last 6 years. The domestic market is exhibiting an upward trend and is currently worth BDT 67 bn.<sup>57</sup> In the last fiscal, Bangladesh earned USD 7

<sup>55</sup> Pintu, 2016; Islam, 2011

<sup>56</sup> Source: BPGMEA

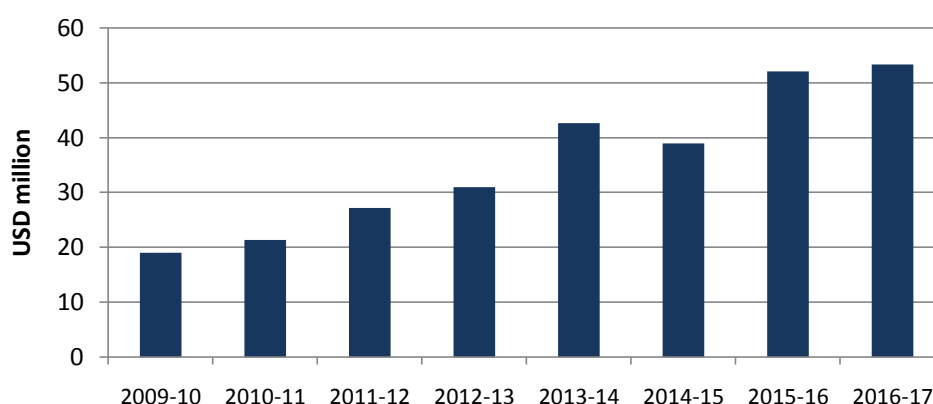
<sup>57</sup> EU Technical Report, 2012

mn from the furniture export to the US market and then USD 5 mn from the Swedish market. Meanwhile, the Ministry of Commerce has set a furniture export target of about USD 38 mn with 20% growth for the current financial year. In wood furniture manufacturing, labour accounts for up to 40% of the total costs. In Bangladesh, labour costs account for 20% of the production.

At present, Bangladesh is producing a wide variety of international standard quality furniture. The furniture industry is no more confined within only timber products; in fact businesses are now accommodating modern machineries, innovative designs and use of per materials. Despite a large quantity is imported every year mainly from China, proliferation of the furniture industry is a call of time for this large import substitute and also to capture the lucrative global furniture market.<sup>58</sup>

There is good potential for the export of furniture based on the export trend.<sup>59</sup> It is estimated that, by 2018 Bangladesh will earn export potential of crafts furniture accessories worth of USD 20 mn along with furniture worth USD 60 mn. Furniture sector was included in the Export Policy 2009-2012 as a special development sector and in Export Policy 2012-2015, it was upgraded to a highest priority sector due to export potentials.<sup>60</sup>

**Figure 5.12: Export of Furniture from Bangladesh**



The figure shows that in 2009-10, the furniture export volume was USD 19 mn, while it increased to USD 21 mn in 2010-11 and USD 27 mn in 2011-12. In 2016-17, the total export was USD 53 mn.<sup>61</sup>

**Table 5.3: Overview of the Furniture Industry**

| Firm Size                                  | Micro and Small | Medium | Total  |
|--|-----------------|--------|--------|
| Number of Enterprises                      | 70,953          | 81     | 71,034 |
| Local Market Share at Sales Price (BDT bn) | 42.2            | 24.45  | 66.65  |
| Manpower involved (mn)                     | 1.77            | 0.03   | 1.8    |

There are around 70,000 enterprises engaged in this industry which created around 2.5 mn employment and exported products to USA, Canada, Australia, UK, Middle East, Gulf countries,

<sup>58</sup> Export diversification and the furniture industry, Textile Today.

<sup>59</sup> Selim H. Rahman, Chairman and Managing Director of Hatil. Furniture industry can emerge as the country's second largest employment generating sector after RMG, if right government policies are implemented on the market., IDLC Monthly Business Review, August, 2017.

<sup>60</sup> IDLC Monthly Business Review, August, 2017.

<sup>61</sup> Same as above



and other south Asian and east Asian countries. Also, the local customer demand is rising from the corporate offices and apartments.<sup>62</sup>

On average 60% of raw materials of furniture sector are imported from different countries. Of those, timber, wood coating materials, hardware and accessories, world class fabrics etc. are major importable items. Bangladesh ranks 3 in Asia's least tree filled countries. As a result, most of the wood will have to import from other countries. For furniture industry Natore can be an extra advantage since Meghalaya, a state of India is neighbouring and there are enough trees and forest in that region. To import raw materials from this state will require less distance and time with less procedure. Furniture industry of Bangladesh is also shifting its focus from dependency on raw timber to processed wood and other contemporary furniture materials to capture new export markets rapidly.



### **Jute Industry**

Jute manufacturing sector is one of the oldest traditional manufacturing sectors of Bangladesh. Jute sector of Bangladesh has made and continues to make significant contributions to the overall economy of the country. The importance of this sector to the Bangladesh economy could not be overstated. Jute cultivation area is about 6% of the total land area of the country and about 10% of the total

agricultural land area. But jute production is about 26% of all agricultural crops production in Bangladesh.

Though the prestigious heritage of jute seems to be losing its place, jute yet a major commodity of export earnings. Income from the Bangladesh export of jute and jute items has broken all previous records to hit the billiondollar mark for the first time. On an average, 90% of all jute production is exported currently, in which around 40% in the form of raw jute and 60% in the form of jute products.

The jute sector has provided employment opportunity to a large number of people in different regions of the country. Jute manufacturing is a very labour-intensive activity compared to other manufacturing activities and thus it assumes a special importance in terms of employment creation. Employment is created in the manufacturing of major jute products such as sacking, hessian and Carpet Backing Cloth (CBC) and also other products such as carpets and rugs and in jute pressing and baling activities.

Total number of workers employed in public and private sector jute mills are estimated to be around 166,000, of which about 61% workers employed in the private sector. In addition, around 50,000 workers/artisans are employed in the diversified jute product (DJP) sector which is fully operated by the private sector in Bangladesh.

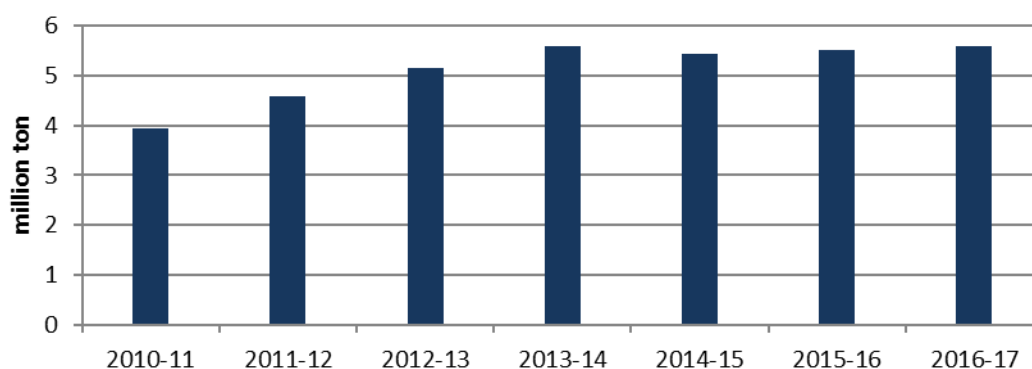
Over the last two decades, the private sector plays a dominant role in jute manufacturing, marketing and trading compared to the public sector. Average share of traditional jute products

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<sup>62</sup>according to AHM Shahedin, a senior officer of Partex Particle, The daily star, April 5, 2015

produced by the private sector is about 77% of the total production in Bangladesh. Although jute's contribution to export has declined as percentage of total export of the country, its contribution to agriculture and employment remains significant. Jute as a very important agro-product of Bangladesh is eco-friendly and it takes only four years for getting substantial return in jute industry.

**Figure 6.13: Export of Jute Products from Bangladesh**



*Jute Export from Bangladesh.* Bangladesh is the second highest exporter of jute products after China. It accounts for about 35% of the total world production and 90% of exports and 60% of product varieties. The above figure shows the export of jute products from Bangladesh. It reflects that the volume of jute products export increased during 2010-11 to 2013-14 and remained stable up to 2016-17. The country earned USD 563.9 mn by exporting jute and jute goods during the period in 2016-17<sup>63</sup>.



#### **Pharmaceuticals**

*With 194 operating companies, the pharmaceutical industry provides 97% of the total medicinal requirement of the local market. The industry also exports medicines to global markets, including Europe.*

The industry started flourishing with the promulgation of Drug Control Ordinance (1982). Nearly 80% cumulative growth in the last three years means that the Bangladesh pharmaceutical market has doubled<sup>64</sup>. About 5,600 brands of medicines are manufactured in different dosage forms in Bangladesh. The domestic retail market is growing at 25% per year<sup>65</sup>. Bangladesh is also going to establish an API park where 40 API industries are expected to operate<sup>66</sup>. Current market size is approximately BDT 76,500mn<sup>67</sup> per year. The industry contributes 1%<sup>68</sup> of the GDP.

<sup>63</sup><https://www.dhakatribune.com/business/2018/03/04/export-jute-jute-goods-maintain-steady-growth/>

<sup>64</sup>BIDA, 2015

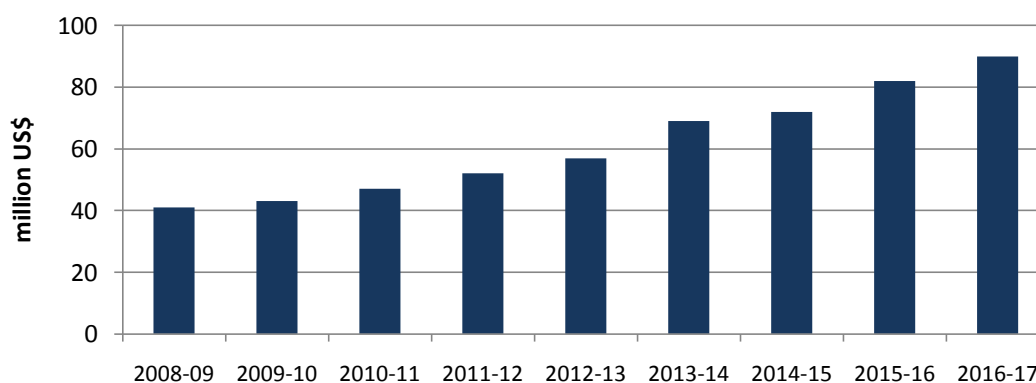
<sup>65</sup>Same as above

<sup>66</sup>Same as above

<sup>67</sup>Eskayef Bangladesh Ltd

<sup>68</sup>Growth of Pharmaceutical Sector of Bangladesh: [www.bangladesh-corporate-world.blogspot.com](http://www.bangladesh-corporate-world.blogspot.com)

**Figure 5.13: Export of Medicine from Bangladesh (USD mn)**



In 2016-2017 Bangladesh exported pharmaceutical products worth USD 89.82 mn against USD 82.11 mn in 2015<sup>69</sup>. According to the EPB, Bangladesh currently exports pharmaceutical products to 107 countries, of which Myanmar imports the highest quantity of medicines worth USD 11.5 mn followed by Sri Lanka with USD 8.3 mn, the Philippines with USD 6.4 mn, Vietnam USD 5.3 mn, Kenya USD 3.7 mn, Afghanistan USD 3.3 mn, Slovenia USD 3.4 mn and Nepal USD 1.3mn<sup>70</sup>.

The pharmaceutical industry also set a target of exploring 30 new destinations for their products during the current financial year. BEXIMCO Pharmaceuticals has become the first Bangladeshi pharmaceutical company to be approved by the US Food and Drug Administration (US FDA) following the successful inspection of its oral solid dosage facility at Tongi, during 19-22 January 2015. The Company received the establishment inspection report (EIR) from the US FDA on 22 June, 2015 stating the audit was formally concluded<sup>71</sup>.

APIs consist a significant part of the manufacturing cost of a drug. Approximately 80%<sup>72</sup> of the APIs are imported and 75–80%<sup>73</sup> of the imported APIs are generic. At present, there are 15 companies in Bangladesh manufacturing 40 APIs<sup>74</sup>. Companies are still dependent on import from India and China. The government has taken initiative to set-up a park for Active Pharmaceutical Ingredients (API) with a focus on developing synthetic chemistry skills.

The industry imports APIs mostly through sea and air. Therefore, proximity to sea and airport is a significant factor, for consideration of setting up pharmaceutical industries in Bangladesh. It also depends upon consumer concentration in the proximity. All these have resulted that the majority of the pharmaceutical industries are located in Dhaka region. *Dhaka accommodates the highest concentration of medicine users and it has an international airport, which is emerging as a busy international airport. This indicates a high degree of suitability of the pharmaceutical industries for setting up in the zone.*

<sup>69</sup>[http://www.eblsecurities.com/AM\\_Resources/AM\\_ResearchReports/SectorReport/Pharmaceuticals percent20Industry percent20of percent20Bangladesh.pdf](http://www.eblsecurities.com/AM_Resources/AM_ResearchReports/SectorReport/Pharmaceuticals%20percent20Industry%20of%20percent20Bangladesh.pdf)

<sup>70</sup>Same as above

<sup>71</sup><http://www.biospace.com/News/beximco-pharmaceuticals-receives-u-s-fda-approval/382497>

<sup>72</sup>The World Bank, 2012

<sup>73</sup>Same as above

<sup>74</sup><http://www.pharmajogot.com/api-in-open-market-behind-drug-manufacturers/>



## 6 Demand Forecast

The demand forecast is the most important element of the feasibility study, and draws upon findings from the industry analysis, stakeholder consultation, and open source data and published studies. The demand forecast identifies:

- a) the type of industries most likely to be located in the zone,
- b) the number of tenants proposed, and
- c) the land and infrastructure requirements of units over a 20 year period.

Assumptions were made according to three demand scenarios—Base Case, Aggressive Case and Conservative Case. The result is three demand estimates, one conforming to each of the three sets of assumptions. This will provide public officials, physical planners, and investors with realistic views of interest of the business enterprises in the zone, infrastructure requirements, suggested timeframe of the project, and marketing and promotional recommendations to meet anticipated demand.

### 6.1 Purpose of Demand Forecast

The demand forecast has broad and important applications throughout the feasibility study:

- *Forecast Revenue.* Estimate the number of plots that will be taken up in the zone over a period of 20 years and subsequent revenue of the zone from the users.
- *Financial Analysis.* Estimate the costs and revenues associated with developing and operating the zone, and project the internal rate of return (IRR) of developing and operating the project.
- *Economic Analysis.* Suggest effects the zone will have on society, and estimate the economic rate of return (ERR) to the government based on its financial and in-kind contributions to zone development and operation.

### 6.2 Sources of Data

The demand forecast draws upon numerous sources of data and information—both quantitative and qualitative in nature. Specifically, these include:

- *Stakeholder Consultation.* The stakeholder consultation was conducted. The consultation provides information on the interest of firms in relocating to or establishing new industries in the zone, the operating costs and parameters of these companies, the growth potential of business enterprises, and other data pertinent to the demand forecast.
- *Business Enterprise Association Consultations.* Consultations with business enterprise industry associations were held.<sup>75</sup> The information provided by the associations include testimonials on actual and perceived demand for space in the zone, as well as information on operating conditions faced by association members that may influence their proclivity to relocate.

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<sup>75</sup>These associations include: Bangladesh Engineering Industry Owner Association (BEIOA) , Bangladesh Electrical Merchandise Manufacturers Association (BEMMA) , Bangladesh Plastic Goods Manufacturers and Exporter Association (BPGMEA) , and the Small and Medium Enterprise Foundation (SMEF) . Notes taken during consultations with these organizations are included in Appendix G of this report.

- *Open Source Data and Analysis.* The demand forecast employed data from the Bangladesh Bureau of Statistics (BBS) with respect to the number of firms in each sector, and also drew upon open source analysis from the World Bank, IFC, and previous analysis of industries.<sup>76</sup>

### 6.3 Demand Forecast Methodology

Demand estimations for EZs provide calculations of the likely intent on new and existing companies to locate—or relocate—operations in a particularly defined zone. The forecast represents an approximation based upon several “pillars” that provide evidence to substantiate the demand estimation. This section defines those pillars that constitute the methodology behind the demand forecast, and discusses the evidence each of them provides in detail.

- *Assumptions.* Demand for space in the zone is contingent upon policies and conditions that were assumed at the outset of the study.
- *Investment Trends.* The demand forecast considers new company formation trends and viability of existing business enterprises as a way to establish a baseline upon which the demand estimations are based.
- *Relocation Trends.* The EZ will be heavily marketed to attract companies wishing to relocate from Dhaka and Chittagong. As such, consultants explored these firms’ stated willingness—and actual proclivity—to locate or relocate, external pressures to move, and analyzed the types of firms that would actually move.
- *Uptake Rates in Bangladesh.* The demand forecast reviewed actual land uptake rates of other EZs in Bangladesh in support of high demand for serviced industrial space.

Utilizing the above facts, data were gathered and trends, economic pressures and policies were analysed to determine the likely number of companies that would be located in the zone.

### 6.4 General Assumptions

The following broad assumptions define the parameters against which the demand forecast was made. A change in any of these assumptions could affect the demand estimations in a positive or negative manner.

- Business enterprises in the designated sectors will be the target groups to locate in the zone, regardless of their export status. The zone will be open to any in these sectors that desires land and/or building space in the sizes offered. The business enterprises in the zone will be allowed to have sales to the Bangladeshi domestic market as well as export.
- The zone will offer a streamlined approval process for establishing business enterprise units at a one-stop office within the zone. This will include services such as business registration, licensing, permitting, environmental clearances, work permits, and others.
- Law and order within the EZ will be maintained at the desired level to maintain a peaceful business environment.
- A power plant will be constructed in the zone. This will provide a dedicated power supply for tenants in the zone.
- Additional utilities such as LNG, water, waste treatment, and telecommunications will be available to zone tenants at market-rate tariffs.
- Business enterprises will have the option to lease serviced land, or rent pre-constructed SFBs or the warehouses.

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<sup>76</sup> General analysis of SME industry sectors is included in Section 4 of this report.

## 6.5 Investment Trends

Much of the demand for space in the proposed EZ will likely be from companies that will relocate operations from Dhaka and Chittagong. However, it is also necessary to examine the formation of new business enterprises to understand growth and, hence, potential demand from new firms. Consultants looked at multiple indicators, published information about growth trends, and estimated number of business enterprises in operation in Bangladesh.

## 6.6 Growth Trends

The number of new business enterprises created each year ranges between 5 to 8 percent, based on published data<sup>77</sup>. The growth rate of business enterprises changes quite often depending on government policies, particularly with respect to taxation. Overall the consultation found that there was a great potential for growth. The single factor most likely to hamper growth, according to firm, is the shortage of gas and electrical power. An indirect effect has arisen from the lack of gas supply at the national level. These industries form a major customer base for the zone. Therefore, the gas shortage has negative impact on the growth of industries.

## 6.7 Rationale for Relocating from Dhaka City

*Congestion.* Business enterprises currently operating in Dhaka are under pressure to relocate away from the congested city. Industrial lands are unavailable here, and all business enterprises, from leather workshops to garments industries, are scattered throughout residential areas without proper planning. Consolidation could save time and technical pressures, and lower the average cost of doing business as well as the per-unit cost of business enterprise products.

*Safety and environmental hazard:* A fire at a garment factory in a Dhaka suburb killed 112 workers in 2012<sup>78</sup>. In 2013, a commercial complex near Dhaka, housing five garment factories, collapsed, with 1,135 deaths suffered<sup>79</sup>. In September 2016, a boiler exploded and triggered fire at a packaging factory near Dhaka, when at least 30 workers died and dozens injured<sup>80</sup>. The relocation process of tanneries in Hazaribagh is ongoing to protect from the environmental hazards<sup>81</sup>.

*Governmental mandate and social pressure.* There are governmental pressures to move businesses away from Dhaka. The recent incidents mentioned above created a backlash against industrialists that operate in the congested old parts of the town, often without proper permits or sanitation.

## 6.8 Reasons Business Enterprises Remain in Dhaka City

Despite the pressures to relocate away from Dhaka, there are also valid reasons that keep business enterprises in their current place of business. These are discussed below:

*Forward and Backward Linkages.* Dhaka is attractive because customer base is large, in both retail outlets and wholesale markets. Businesses have access to raw material supplies. This

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<sup>77</sup> International Journal of SME Development, Small and Medium Enterprise Foundation, April 2014

<sup>78</sup> <http://www.independent.co.uk/news/world/asia/bangladesh-factory-fire-at-least-23-killed-and-dozens-injured-after-blaze-in-tongi-a7236476.html>

<sup>79</sup> Same as above

<sup>80</sup> Same as above

<sup>81</sup> <http://www.theindependentbd.com/printversion/details/50368>

naturally developed value chain cannot be easily replicated elsewhere. The connectivity inside Dhaka is still better compared to the other areas, even if it takes longer time moving from one place to another inside the city.

*Worker Availability.* Dhaka being the capital city attracts labour force of all levels from the surrounding areas. However, as the project site is only 25 km away from Dhaka, and it is expected that accommodations for workers will be developed in the zone and surrounding areas, access to workforce will be less of a problem.

## 6.9 Willingness to Locate to the Proposed Economic Zone

This interest is in response to cramped conditions in Dhaka and Chittagong and governmental pressures to move industrial business activities elsewhere. Light engineering industries and garments industries, for instance have a strong demand to move to an EZ, as they want to simultaneously upgrade technology, and require the space to do so. They are now finding it difficult to secure financing for capital improvements because of the sub-standard conditions of their current factories. Interviews with industry associations confirm the strong interest in the zone elucidated in the stakeholder consultation.

## 6.10 Past Uptake Rates of other Industrial Parks

The industrial estates provided by BSCIC in Natore, Dhaka and Chittagong demonstrate a near 100 percent occupancy level. Older sites in the environs of Dhaka and Chittagong demonstrate a 100 percent occupancy rate. While developing the demand forecast the fact was recognised. It was also recognized that rental and utility services, good governance like one-stop service and other facilities that would be provided in the zone, would trigger more demand.

## 6.11 Demand Forecast Scenarios

This section of the pre-feasibility study presents the demand forecast calculations under three distinct growth scenarios—base case, conservative, and aggressive. In addition to calculating the number of tenants likely to locate in the zone, extrapolations and interpolations of the utility and land requirements, as well as employment generation was carried out.

### *Base Case*

The base case scenario makes the following assumptions with regard to firms actually locating in the proposed EZ.

- Interest from business enterprises remains strong, being actually interested and capable of relocating to the zone.
- Pressure from international buyer of RMG to establish compliance factory remains strong.
- The government of Bangladesh takes action or incentives to encourage industrial enterprises to establish new industries in the zone and relocate/expand away from city. BEZA promises to provide facilitation services such as training, one-stop bureaucratic services, and other amenities inside the zone.
- The zone contains a dedicated source of power generation, water, effluent treatment, and solid waste disposal.
- New EZs may be built or expanded during the next 20 years.

### *Aggressive Case*

The aggressive scenario assumes more positive assumptions about economic and political conditions in the country and streamlined approval process under the new EZ regime. It differs from the base case scenario with respect to the following aspects:

- The proposed zone will contain more newly formed firms than in the base case scenario. This will arise due to the greater ease to start and operate a company.
- All regulatory approvals, especially those for establishing the business enterprises in the zone, will be provided and regulated within the zone itself. This differs from the Base Case, whereby all consents must be obtained from the central authorities.
- The political conditions will remain peaceful, for at least first five years of operation.
- The linked projects for offsite infrastructure needed for the zone, will be completed on a fast track basis by the government, while the Base Case assumes that the operation of the zone will continue in parallel with the period while the entire required off-site infrastructure may not be complete. The zone can start operation, with a slim access road first, then widening works may go on while the operation of the EZ is continued. However, it assumes that the power plant will be built on an urgent basis.
- The proposed zone will be aggressive in marketing and promotion of the zone to business enterprises.
- Raw material and services suppliers will be allowed to locate inside the zone on a first-come, first serve basis.

### *Conservative Case*

The conservative scenario differs from the other two scenarios in the following manner.

- There are delays in preparing necessary offsite infrastructure for the zone.
- Business enterprises remain in city as pressures to relocate lessen.
- Business enterprise, industry associations are not able to effect enmasse relocation, and are not able to arrange for the necessary financing options for business enterprises.



**Table 6.1: Twenty-Year Demand Forecast for the Zone (plot take up over the years)**

*Base Case*

| Years             | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Food Processing   | 20% | 22% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Light Engineering | 20% | 22% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Plastic           | 10% | 12% | 15% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Furniture         | 5%  | 10% | 15% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Jute Industry     | 10% | 12% | 15% | 25% | 50% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Pharmaceutical    | 5%  | 5%  | 10% | 15% | 25% | 50% | 60% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| SFB               | 15% | 20% | 25% | 50% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |

*Aggressive Case*

| Years             | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|-------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Food Processing   | 20% | 25% | 50% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Light Engineering | 15% | 25% | 50% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Plastic           | 20% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Furniture         | 20% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Jute Industry     | 5%  | 25% | 50% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Pharmaceutical    | 5%  | 15% | 25% | 50% | 60% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| SFB               | 25% | 50% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |

*Conservative Case*

| Years             | 1  | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  |
|-------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Food Processing   | 0% | 5%  | 10% | 15% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Light Engineering | 5% | 10% | 15% | 25% | 50% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Plastic           | 0% | 5%  | 5%  | 15% | 25% | 50% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Furniture         | 0% | 0%  | 5%  | 15% | 25% | 50% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Jute Industry     | 0% | 0%  | 5%  | 15% | 25% | 50% | 60% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| Pharmaceutical    | 0% | 0%  | 0%  | 0%  | 5%  | 15% | 25% | 50% | 60% | 75% | 90% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |
| SFB               | 5% | 10% | 15% | 25% | 50% | 75% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% | 95% |

## 7 Master Plan

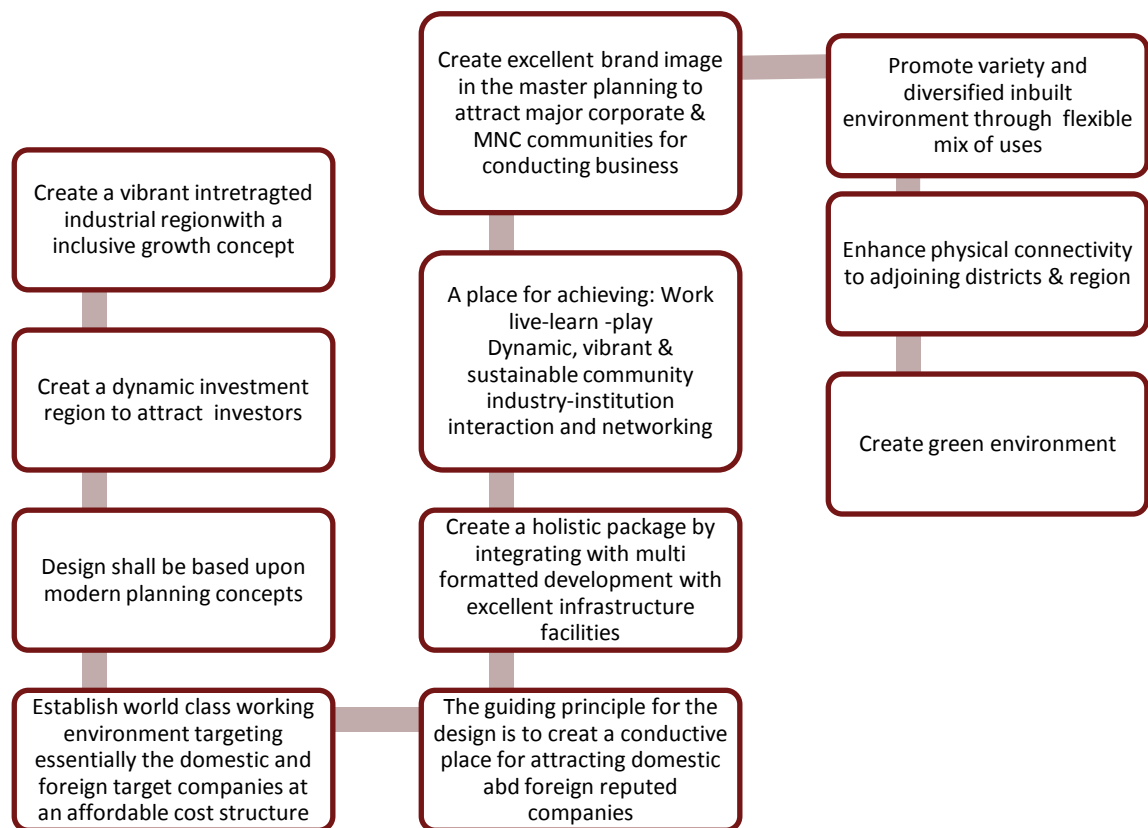


### 7.1 Master Planning Considerations

The planning for the proposed NEZ is based on the broad objective of establishing a world-class business environment targeted essentially at high growth manufacturing and processing industrial and related infrastructure sectors.

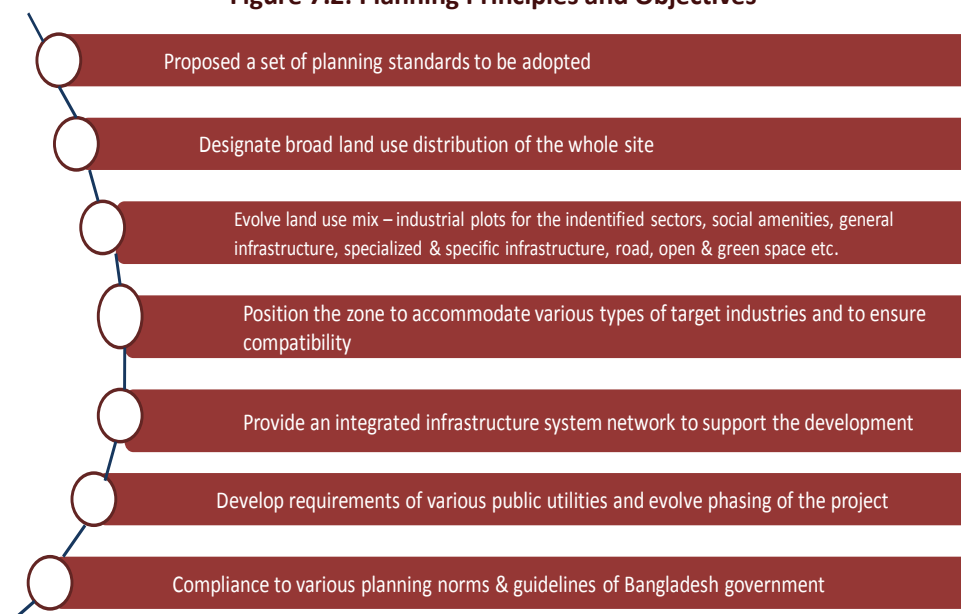
The EZ shall be self-contained region with a “Sustainable–Holistic–Smart intelligent–eco-comic Zone” having required services and facilities. An integrated planning exercise has been done to position the project taking into account the geographic, demographic, availability of raw materials, industrial, economic and social characteristics of the region and it is in this context master planning of the project was carried out.

**Figure 7.1: Economic Zone Planning Concepts**



The master plan has been developed on about 300 acres of land. The proposal is to create a thriving place where industrialists in the targeted sectors, entrepreneurs, venture capitalists, Bank investments can work. It is important that the master plan accommodates both the user industries and requirements of various supporting infrastructure.

**Figure 7.2: Planning Principles and Objectives**



From the planning point of view, the EZ is a package of number of land uses. The whole area is divided into various zones. Each zone within the NEZ is dedicated to specific sub-sectors and would be self-sufficient units in terms of facilities, ability to attract investors and revenue generation. Social and commercial amenities are also planned to provide convenience to visitors as well as to the working people within the EZ.

**Figure 7.3: Broad Zone Demarcations**

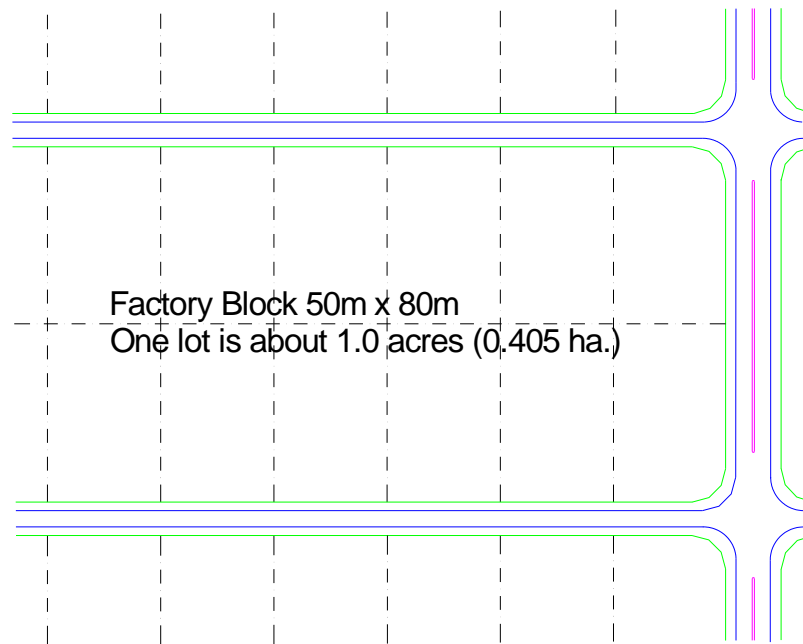


### 7.1.1 Plots inside the Zone

The standard size of industrial plots is proposed to be 1 acre (0.405 ha) each. The factory dimension excluding the front setback (main road: 25m, minor road: 15m) becomes approximately square which forms a desired factory wall-line. The road network is planned in order to divide the factory lot block by approximately 50m x 80m, on average, for optimizing the traffic flow inside the economic zone.

In addition, the plot size may be adjusted. Large tenants will be able to take lease of by adding a multiple standard plots and small tenants may take a fraction of a plot by dividing the standard plot into smaller pieces.

**Figure 7.4: Standard Factory Block and Road Network**



Minimum setback from plot boundary is as follows:

- Frontage: 20m for the main road, 15m for the minor road
- Side Yard: 8m (on both sides)
- Back Yard: 10 m

The followings are regulations on the ground coverage:

- Nothing can be constructed on the set back area on the side of the building for the fire fighting. It should be properly landscaped with small sized trees.
- 30% of the setback area on the backyard can be used for services (generator room, prayer room, etc.)
- 65% of the frontage can be used for parking, loading unloading, security booth, walk/driveway etc.
- 35% of the setback at the frontage should be landscaped with trees and properly grassed space.

Figure 7.5: Setbacks for Tenant Buildings on Major Roads

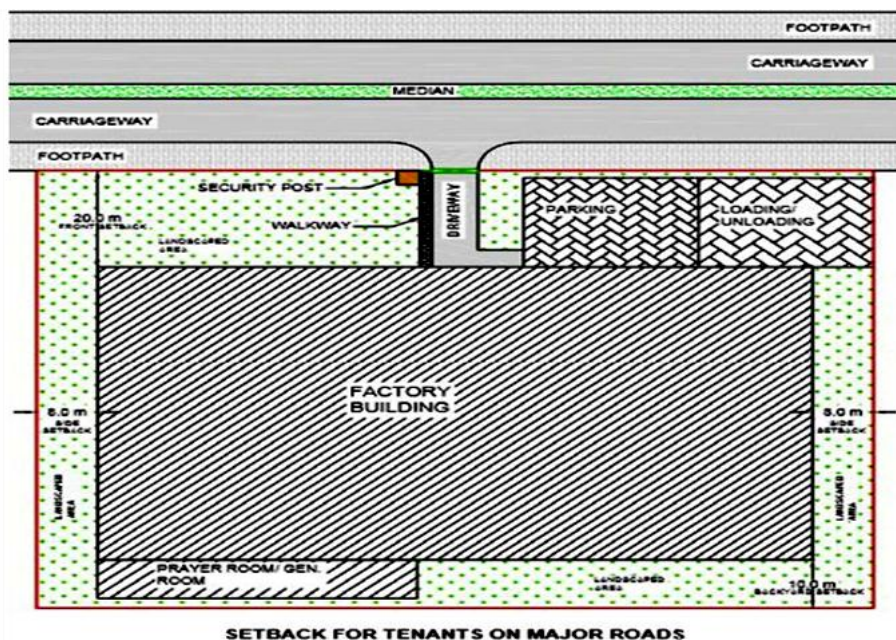
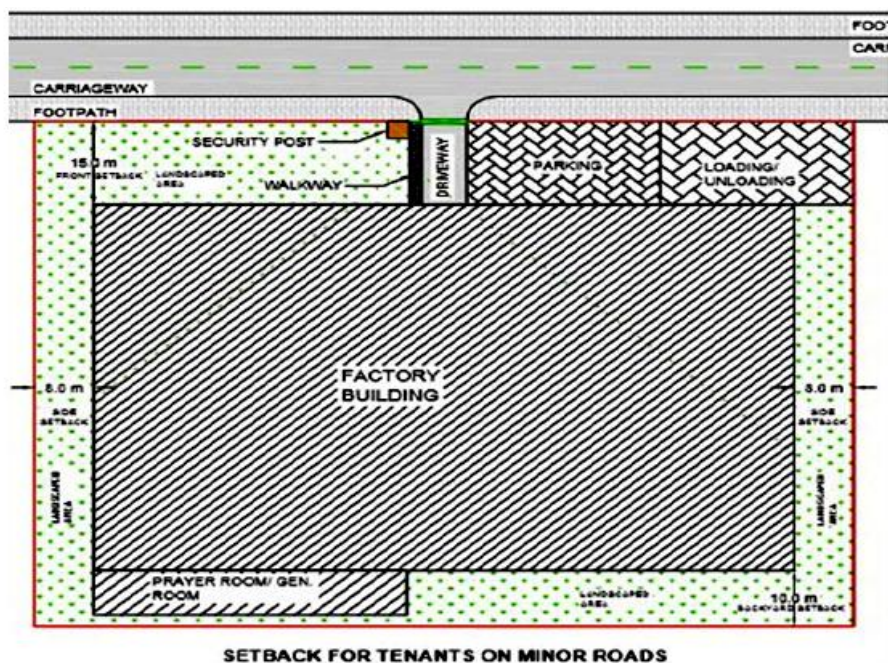


Figure 7.6: Setbacks for Tenant Buildings on Minor Roads



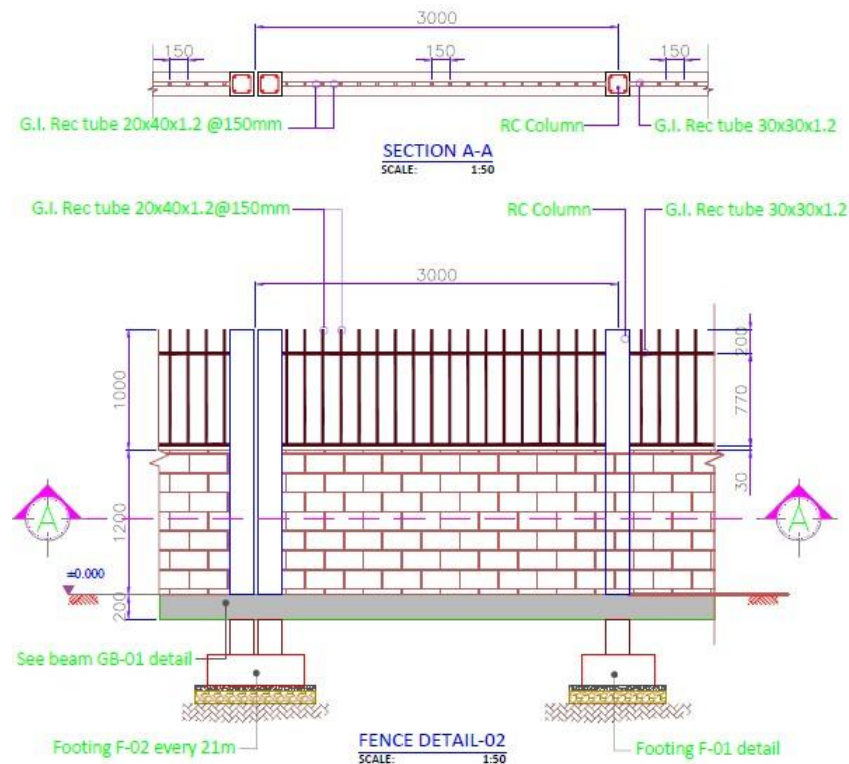
### 7.1.2 Fences

Each tenant will build fence surrounding own leased land. The maximum height of fence shall be 2.2 m from the ground level. For the front side, the upper half should be open type and the lower half should be closed. The following points discuss broad specification of fences:

- 1) The fences facing the front road shall be open-type fences made of iron bars or galvanized chain-link fencing material framed with galvanized pipes and other similar types of fences. Details of colour and material should be discussed with the economic zone administration.
- 2) No concealing fences shall be erected facing the roads. On the other hand, the structure of the side and back fence should be closed type for security purposes.

- 3) The fence between two adjoining plots could be built rightly on the plot division line with agreement of both tenants of plot and the cost of the fencing could be shared by the two tenants.
- 4) The setback of 3.281 feet (1m) is required between the u-channel and the fence. This is for necessary maintenance of the fence foundation in the future. The setback should be grassed for the landscape purpose.

**Figure 7.7: Standard Front Fence**



### 7.1.3 Parking

- Parking for industries and other facilities is to be developed within the plot. Noon-street parking will be allowed within the Zone (EZ) .
- 30 percent of the set back area on the front can be used as open parking.
- 30 percent of the setback area on the front can be used for loading and unloading.
- All plots will have a minimum parking space allocation of 1 standard sized automobile (2.5mx4.6m) per 200 m<sup>2</sup> of floor space.
- An extra 5 percent of ground coverage is permissible for construction of automated multi- level/multi-level parking with ramp parking structures for additional needs.
- In the case of basement parking, it cannot exceed the set back line and maximum 20 percent of the ground coverage. It should be kept as service area (prayer room, generator room etc.) .
- Space Standard for parking:

**Table 7.1: Equivalent Car Space (ECS) in Different Type of Parking**

| Parking Type          | Area in m <sup>2</sup> Per ECS |
|-----------------------|--------------------------------|
| Open shed             | 23                             |
| Basement              | 32                             |
| Multi-level with ramp | 30                             |
| Automated multi-level | 16                             |

- For bicycle parking, one space per 500 sqm floor space is to be provided.
- The dimension of parking area and turning radius will be fixed in accord with the following table below:

**Table 7.2: Recommended Dimensions for Parking Area Design**

| Type of vehicle | Parking width (m) | Parking length (m) | Internal turning radius (m) | External Turning radius (m) |
|-----------------|-------------------|--------------------|-----------------------------|-----------------------------|
| Car             | 2.5               | 4.6                | -                           | -                           |
| Truck           | 3.6               | 10                 | 8.7                         | 12.8                        |
| Trailer         | 3.6               | 18                 | 6.9                         | 13.8                        |

#### 7.1.4 Gate System

1. Gate 1 (main gate) located at entry point
2. Gate 2 (main gate) located between processing zone and non processing zone

#### 7.1.5 Land Use Pattern within the Zone

The land use pattern of the zone was designed considering the requirement for various processing units and support facilities like logistics, research, capacity development, skill development, residential facilities, schools and other various social amenities.

**Figure 7.8: Broad Zone Demarcations**



Figure 7.9: Land Use Map

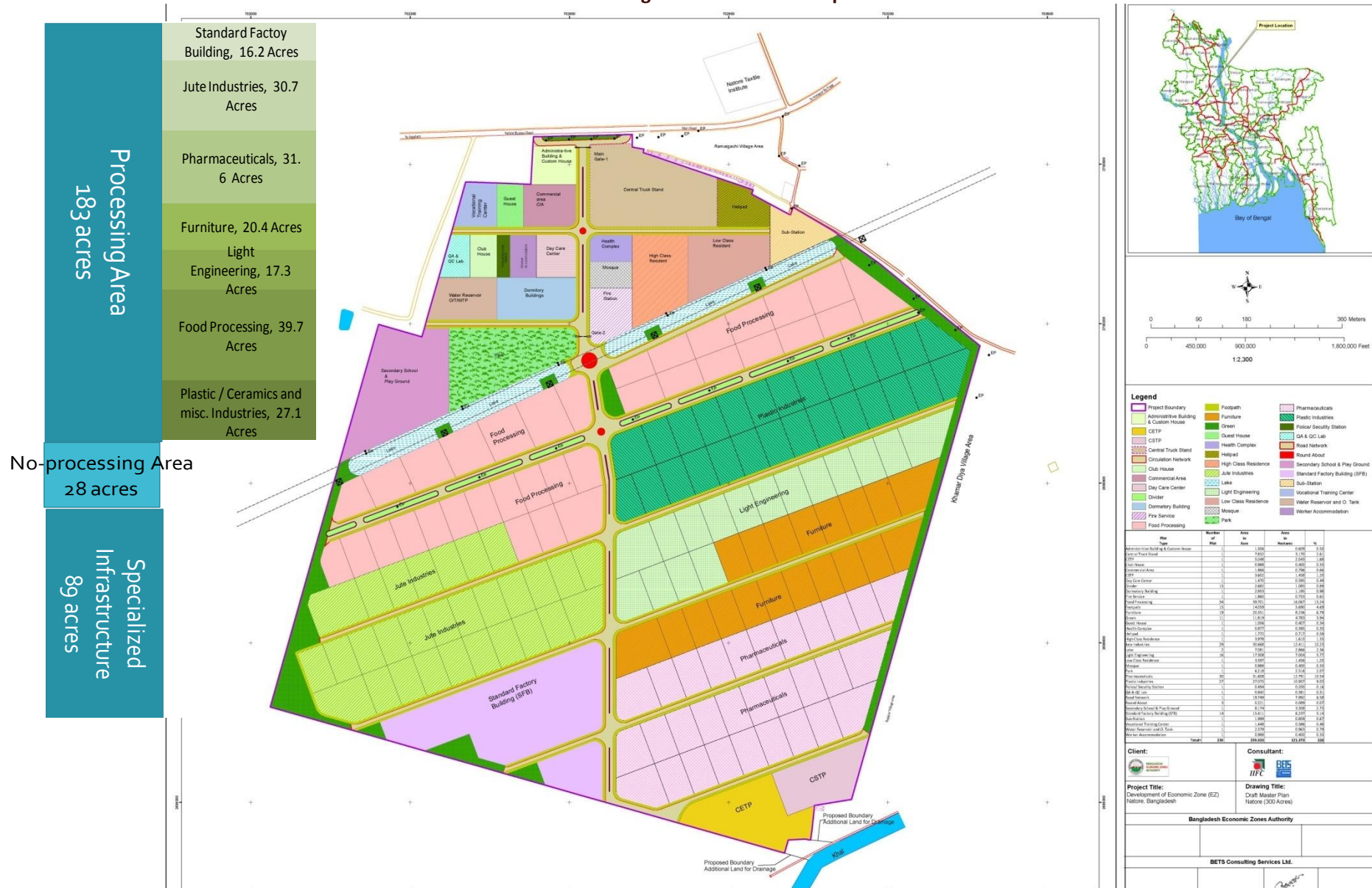
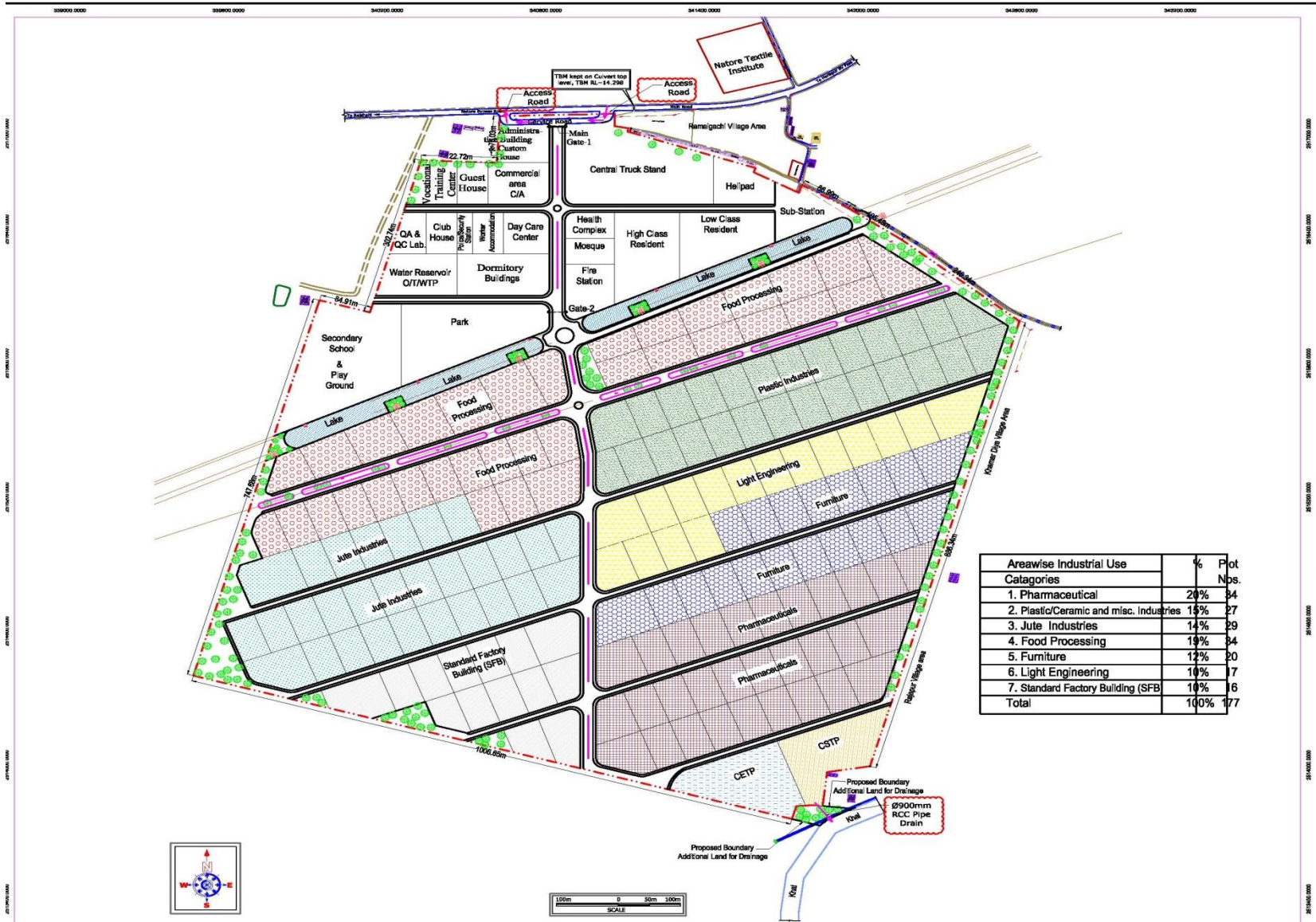




Figure 7.10: On-site and Off-site Infrastructure



**Table 7.3: Land Use Pattern of NEZ**

| Land use Category                    | Plot Type                     | No of Plots                              | Area in Acre | Area in Hectares | %             |              |
|--------------------------------------|-------------------------------|--|--------------|------------------|---------------|--------------|
| <b>a) Processing Area</b>            | Food Processing               | 34                                       | 39.70        | 16.07            | 13.16         |              |
|                                      | Furniture                     | 19                                       | 20.35        | 8.24             | 6.74          |              |
|                                      | Jute Industries               | 29                                       | 30.67        | 12.41            | 10.16         |              |
|                                      | Light Engineering             | 16                                       | 17.31        | 7.00             | 5.74          |              |
|                                      | Pharmaceuticals               | 30                                       | 31.61        | 12.79            | 10.48         |              |
|                                      | Plastic Industries            | 27                                       | 27.08        | 10.96            | 8.97          |              |
|                                      | SFB                           | 15                                       | 16.23        | 6.57             | 5.38          |              |
|                                      | <b>Sub Total</b>              |  | <b>170</b>   | <b>182.94</b>    | <b>74.04</b>  | <b>60.63</b> |
| <b>b) Specialized infrastructure</b> | Central Truck Stand           | 1  | 7.83         | 3.17             | 2.60          |              |
|                                      | CETP                          | 1  | 5.05         | 2.04             | 1.67          |              |
|                                      | Commercial Area               | 1  | 1.97         | 0.80             | 0.65          |              |
|                                      | CSTP                          | 1  | 3.60         | 1.46             | 1.19          |              |
|                                      | Day Care Center               | 1  | 1.47         | 0.60             | 0.49          |              |
|                                      | Dormatory Building            | 1  | 2.95         | 1.20             | 0.98          |              |
|                                      | Footpath                      | 15                                       | 14.06        | 5.69             | 4.66          |              |
|                                      | Green                         | 11                                       | 10.08        | 4.79             | 3.92          |              |
|                                      | Lake                          | 2  | 7.08         | 2.87             | 2.35          |              |
|                                      | Mosque                        | 1  | 0.99         | 0.40             | 0.33          |              |
|                                      | Park                          | 1  | 6.22         | 2.52             | 2.06          |              |
|                                      | QA and QC Lab                 | 1  | 0.94         | 0.38             | 0.31          |              |
|                                      | Road Network                  | 1  | 22.43        | 9.08             | 7.43          |              |
|                                      | Round About                   | 3  | 0.22         | 0.09             | 0.07          |              |
|                                      | Vocational Training Center    | 1  | 1.45         | 0.59             | 0.48          |              |
|                                      | Water Reservoir and O. Tank   | 1  | 2.38         | 0.96             | 0.79          |              |
|                                      | <b>Sub Total</b>              |  | <b>43</b>    | <b>88.72</b>     | <b>36.61</b>  | <b>29.98</b> |
|                                      | <b>c) Non Processing Area</b> | Administrative Building and Custom house | 1            | 1.51             | 0.61          | 0.50         |
|                                      |                               | Club House                               | 1            | 0.99             | 0.40          | 0.33         |
|                                      |                               | Fire Service                             | 1            | 1.86             | 0.75          | 0.62         |
| Guest House                          |                               | 1  | 1.01         | 0.41             | 0.33          |              |
| Health Complex                       |                               | 1  | 0.98         | 0.40             | 0.32          |              |
| Helipad                              |                               | 1  | 1.77         | 0.72             | 0.59          |              |
| High Class Residence                 |                               | 1  | 3.98         | 1.61             | 1.32          |              |
| Low Class Residence                  |                               | 1  | 3.60         | 1.46             | 1.19          |              |
| Police/ Security Station             |                               | 1  | 0.49         | 0.20             | 0.16          |              |
| Secondary School and Play Ground     |                               | 1  | 8.17         | 3.31             | 2.71          |              |
| Sub-Station                          |                               | 1  | 2.00         | 0.81             | 0.66          |              |
| Worker Accommodation                 |                               | 2  | 1.98         | 0.80             | 0.66          |              |
| <b>Sub Total</b>                     |                               |  | <b>13</b>    | <b>28.33</b>     | <b>11.46</b>  | <b>9.39</b>  |
| <b>Grand Total (a+b+c)</b>           |                               | <b>226</b>                               | <b>300.0</b> | <b>122.11</b>    | <b>100.00</b> |              |

From the proposed land use, it can be seen that industrial usage is predominant. Besides offering a pleasant environment for people to work, the zone authority will offer a variety of ready-to-use

land plots complete with infrastructure for clients to construct their own factory buildings. The percolation of plots is done depending upon the types of industries to be accommodated. Prominent sites that normally command a slightly higher land premium are reserved for industrial brand names and multinational companies (MNCs) who desire these prime locations for enhancement of their corporate image and are ready to pay a premium price for the same.

## 7.2 Onsite Infrastructure

The infrastructure is the key requirement for sustainable operation of the EZ. Infrastructure requirements are categorized as follows:

- 1) Infrastructure within EZ
- 2) Specialized infrastructure
- 3) External connectivity and offsite infrastructure for EZ.



### 7.2.1 Road Network Inside the Zone

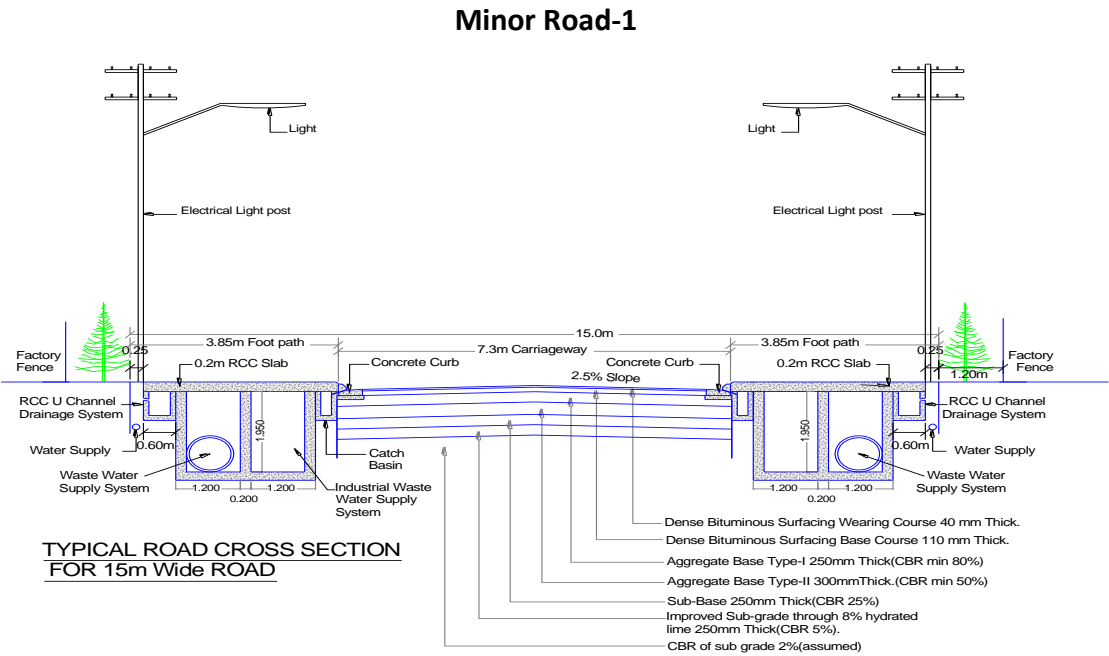
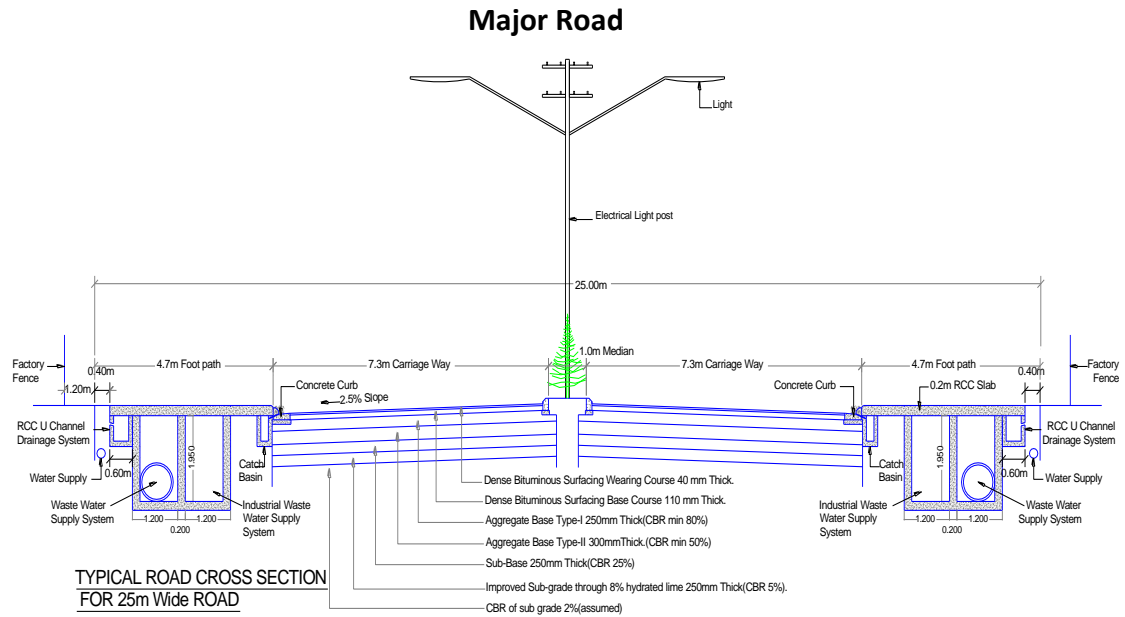
A flexible pavement/road is selected for the internal road in the economic zone. Two types are selected for the road network design; main road (width: 25m) and minor road (width: 15m) . The main road is divided by the central median. The carriageway of each direction of traffic is 7.3 m. A 4.7 m sidewalk is also provided on both sides of the road. Plants are provided on the median and street lightings are provided on the median of the main road.

The minor road is supposed to be an undivided 2 lane type which carriageway is 7.3 m. A 3.85 m sidewalk is to be also provided on both sides of the road. Street lightings are to be provided on both sides of the sidewalk.

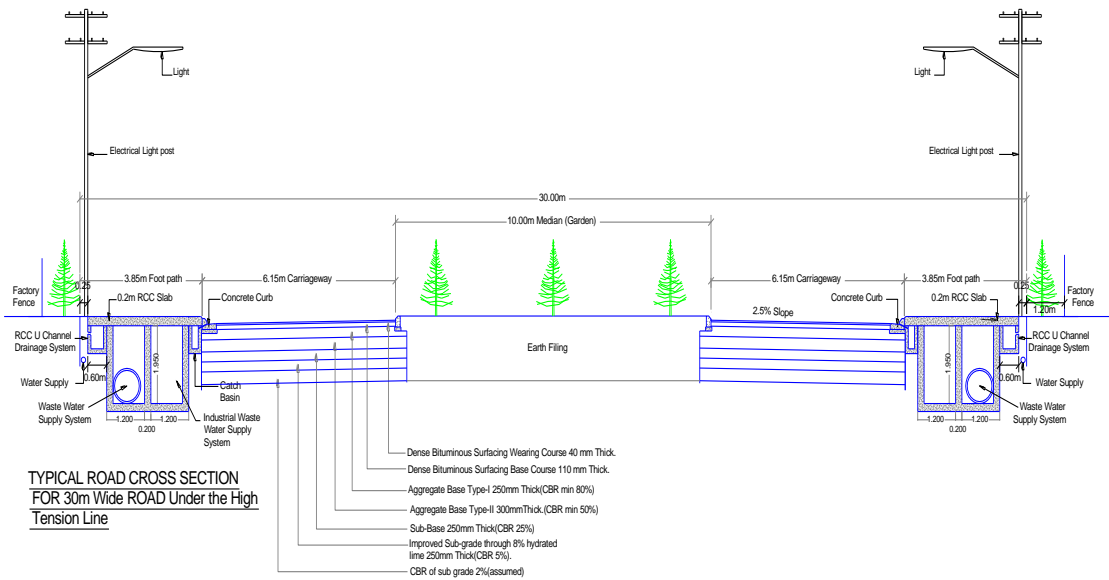
The cross section of the roads is shown in the following figures. The main road is planned from the entrance crossing into factory plots in the industrial zone. The road network is designed surrounding the factory lot block to optimize the traffic flow.

Two Access Road has been considered for entry and exit of the traffic from Natore Bypass road. The access roads have been connected to a one-way service road in order to smooth operating of the traffics.

**Figure 7.11: Typical Cross Sections of Major and Minor Roads**



### Minor Road-2



### 7.2.2 Power Supply System

In order to determine the Electrical power system requirements for economic zone in Natore with easy access of power both from Power Grid Company of Bangladesh (PGCB) and REB controlled power authority Palli Bidyut Samity-Natore PBS-1. Proposed Natore EZ is about 5 km distant from Natore Sadar Substation at Fulbari. PGCB sub-station is also located at Harishpur bypass, it is almost 1 km away from proposed EZ.

In the first option, the industrial set-ups may be provided power by the prospective REB sub-stations planned to be set up inside the EZ zone which is only 1 km away from the existing REB sub-station. In the second option a new power station (HFO fuelled) is to be constructed with 24 MW capacity based on HFO for stable power supply.

The EZ will have to construct one 2x10/14 MVA, 33kV/11KV sub-stations with 11KV distribution lines, 11/0.4KV substations and 0.4/0.23KV lines according to the load requirement, covering the whole area of the respective zone with the required capacity to meet the load demand.

**Table 7.4: Load Estimate for NEZ**

| Sl. No. | Plot Type                 | Number of Plots | Area in Acre | Area in Hectares | Total Power consumption, MW | Net Power consumption, MW |
|---------|---------------------------|-----------------|--------------|------------------|-----------------------------|---------------------------|
| 01      | Processing Area (PA)      |                 |              |                  |                             |                           |
|         | CETP                      |                 | 5.01         | 2.03             | 0.17                        | 0.34                      |
|         | CSTP                      |                 | 3.60         | 1.46             | 0.21                        | 0.31                      |
|         | Light Engineering         | 17              | 17.29        | 7.00             | 0.42                        | 2.94                      |
|         | Pharmaceutical            | 34              | 31.57        | 12.79            | 0.23                        | 2.94                      |
|         | Food Processing           | 34              | 39.65        | 16.06            | 0.04                        | 0.64                      |
|         | Standard Factory Building | 16              | 15.40        | 6.24             | 0.23                        | 1.43                      |
|         | Jute Industry             | 29              | 30.63        | 12.41            | 0.35                        | 4.34                      |
|         | Plastic Industries        | 27              | 27.04        | 10.95            | 0.21                        | 2.30                      |
|         | Furniture                 | 20              | 20.33        | 8.23             | 0.14                        | 1.15                      |
|         | O.W.T and Water Treatment |                 | 2.38         | 0.96             | 1.5                         | 1.44                      |

| Sl. No. | Plot Type   | Number of Plots | Area in Acre | Area in Hectares | Total Power consumption, MW | Net Power consumption, MW |
|---------|---|-----------------|--------------|------------------|-----------------------------|---------------------------|
|         | Plant   |                 |              |                  |                             |                           |
|         | Power Plant/ Sub-Station  |                 | 1.99         | 0.81             | 0.12                        | 0.10                      |
| 02      | Commercial Area (Bank, Insurance, Restaurant, Health services etc.) |                 | 1.95         | 0.79             | 0.6                         | 0.47                      |
| 03      | Non Processing Area (NPA)   |                 |              |                  |                             |                           |
|         | Administrative Building and Custom House                            |                 | 1.51         | 0.61             | 0.6                         | 0.37                      |
|         | Dormitory   |                 | 2.95         | 1.19             | 0.15                        | 0.18                      |
|         | Fire Services   |                 | 1.47         | 0.59             | 0.6                         | 0.36                      |
|         | Guest House   |                 | 0.99         | 0.40             | 0.4                         | 0.16                      |
|         | Green   |                 | 10.09        | 4.09             | 0.005                       | 0.02                      |
|         | Helipad   |                 | 1.77         | 0.72             | 0.25                        | 0.18                      |
|         | High Class Residence  |                 | 3.97         | 1.61             | 0.22                        | 0.35                      |
|         | Mosque  |                 | 0.99         | 0.40             | 0.12                        | 0.05                      |
|         | Health Complex  |                 | 0.97         | 0.39             | 0.12                        | 0.05                      |
|         | Low class residence   |                 | 3.59         | 1.46             | 0.16                        | 0.23                      |
|         | Lake  |                 | 4.28         | 1.73             | 0.002                       | 0.00                      |
|         | Park  |                 | 6.21         | 2.51             | 0.03                        | 0.08                      |
|         | Secondary School and Play Ground                                    |                 | 8.17         | 3.31             | 0.11                        | 0.36                      |
|         | QA / QC Lab   |                 | 0.94         | 0.38             | 1                           | 0.38                      |
|         | Road  |                 | 32.04        | 12.97            | 0.03                        | 0.39                      |
|         | Round About   |                 | 1.03         | 0.42             | 0.05                        | 0.02                      |
|         | Day Care Center   |                 | 1.86         | 0.75             | 0.6                         | 0.45                      |
|         | Central Truck Stand   |                 | 7.82         | 3.17             | 0.03                        | 0.09                      |
|         | Vocational Training Center  |                 | 1.45         | 0.59             | 0.4                         | 0.24                      |
|         | Club House  |                 | 0.99         | 0.40             | 0.12                        | 0.05                      |
|         | Water Reservoir and O/Tank/WTP                                      |                 | 2.38         | 0.96             | 0.06                        | 0.06                      |
|         | Worker Accommodation  |                 | 1.48         | 0.60             | 0.04                        | 0.02                      |
|         | Health Complex  |                 | 0.97         | 0.39             | 0.12                        | 0.05                      |
|         | Low class residence   |                 | 3.59         | 1.46             | 0.16                        | 0.23                      |
|         | <b>Total</b>  |                 |              |                  |                             | <b>22.51</b>              |

### 7.2.3 Existing Utility Condition

Existing REB 33/11 kV Fulbari substation is located 5 km (approximately) from the proposed EZ. This substation can be utilized for the initial phase of small load requirements by mutual discussion with REB authority. At present, electricity is supplied to the area by the Rural Electrification Board (REB) by 11 KV lines.

### 7.2.4 HFO based Power Plant inside the EZ

Basic information about the proposed HFO based power plant project is as follows.

- The proposed capacity of the plant: 20 MW±10%
- Mode of operation: Base load, Fuel: HFO (Furnace Oil)

*Properties of HFO System:* HFO, also known as “heavy fuel oil”, is based on the high viscosity, tar-like mass. As a residual product, HFO is a relatively inexpensive fuel – it typically costs 30% less than distillate fuels (MDO/MGO) (Verlinkung) . It thus became the standard fuel for large marine diesel engines during the oil crisis in the 1970s and 1980s, and it required extensive adaptation of the injection system and other components of low and medium speed engines – which are still the only reciprocating engines capable of running on HFO.

*Reciprocating Engine Generator:* The Facility will include the complete (HFO) based reciprocating engine generator units, constructed with new and unused materials and equipment, having a total net power generation capacity of 24 MW to 27 MW at the Reference Site Conditions, to operate as a fully despatchable plant. It is required that the net capacity of each engine generator will be not less than 5 MW.

Facility will be operated using HFO (furnace oil) as fuel. The project Sponsor will arrange the supply and delivery to the site of required quantities HFO for Bangladesh Petroleum Corporation or any other Fuel Supplier for use as fuel to the power generation facility. The fuel supply arrangements will be required to ensure an adequate and reliable supply of fuel and shall, along with the Fuel Supply Agreement. Fuel storage facility for operating the Facility for at least 15 days continuously at 80% plant factor shall be constructed by the Company at its own cost before Commercial Operations Date and the Company shall maintain this stock of fuel for all time.

Each reciprocating engine shall be of heavy duty, industrial type, of proven design, directly coupled to a 50 Hz generator. Each reciprocating engine generator shall be installed within an acoustic, ventilated enclosure incorporating fire detection and protection facilities. Each reciprocating engine shall be provided with all associated ancillary and auxiliary equipment and systems for the safe, efficient and reliable operation.

*Generators:* Generators shall have a minimum short circuit ratio of not less than 0.5. Each generator shall comply with IEC 34 and BPDB requirements and shall be rated to match the engine output over the full range of ambient temperatures specified. Generator and exciter windings shall possess insulation that is non-hydroscopic and of Class F type complying with IEC 85, but having a temperature rise not exceeding that of Class B under any operating condition within the specified output.

Quality of the management of the generator and accessories shall be in accordance with the requirements of ISO 9001, EN 29001 or BS 5750 Part 1 and other similar equivalent International quality standards. Anti-condensation heaters shall be provided for the air circuits, generator windings, excitation system and control cubicles. Heaters shall be capable of maintaining the air temperature above that of dew point to prevent condensation. These heaters shall automatically switch on when the generator is taken out of service.

The generators shall be capable of supplying their rated power within 48.5 Hz and 51.5 Hz and  $\pm 10\%$  of nominal rated voltage within the power factor range 0.85 lagging and 0.95 leading at the Delivery Point.

*Cooling System:* Method of cooling is to be designed based on the availability of water and other site conditions.

*Liquid Fuel System:* It will be needed to arrange a liquid fuel supply to the Facility. Required necessary arrangement for operation of the Facility with HFO including fuel transportation, receiving and handling, construction of jetty, pipe line up to the Facility storage, fuel measuring system, internal fuel supply system, fuel heating and purification/treatment system as per requirement of the offered plant shall be responsibility of the Company at its own cost.

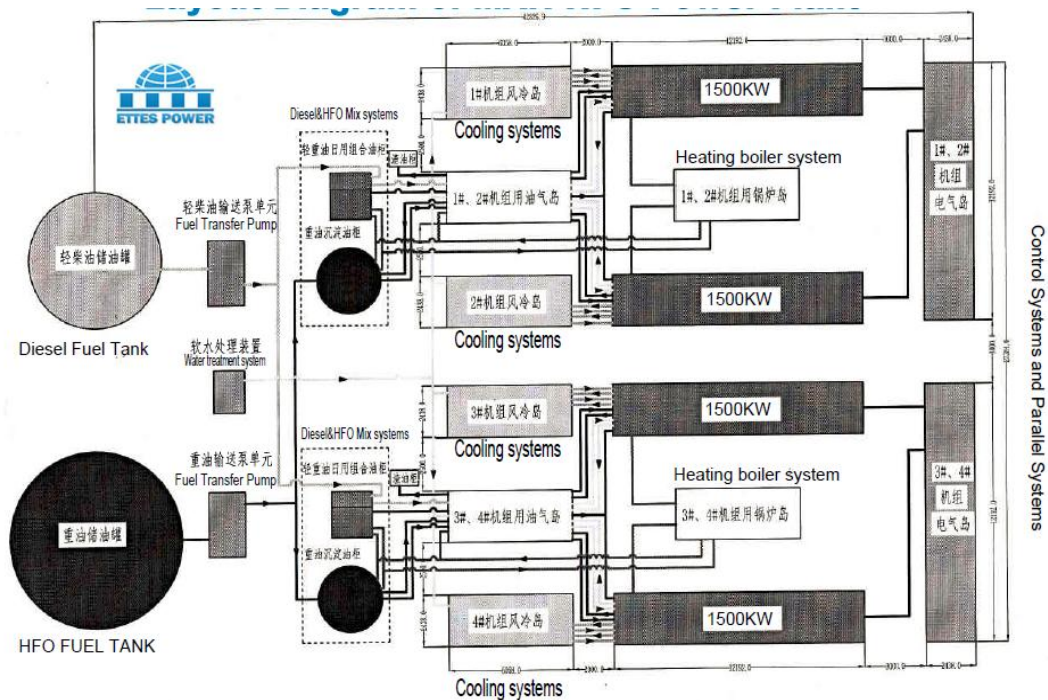
Fuel storage facility for operating the plant for at least 15 days continuously at 80% plant factor shall be constructed by the Company at its own cost before COD and Company shall maintain this stock of fuel for all time thorough out the Term.

**Environmental Requirements:** The facility will be designed to be capable of complying with the laws of Bangladesh and the Environmental guidelines as applicable such as World Bank Group and Asian Development Bank environmental and social guidelines or any internationally accepted Environmental Guideline.

Oily water and chemical drains shall be treated to an approved quality before discharge. All drains and other liquids, if discharged from the Facility shall at all times comply with appropriate environmental regulations and meet the quality standards specified in GOB Environment Conservation Rule (1997) .

**Air Quality:** The required air quality should be maintained by controlling emission limits and selecting appropriate stack height.

**Figure 7.12: Layout Diagram of MAN HFO Power Plant**



### 7.2.5 Cost Estimate for Power Systems

**Option-1:** If power supply option is considered from REB, then inside power Infrastructures will be as follows while outside power Infrastructures cost will be borne by EZ authority due to their own benefit of prospective revenue

| Item No      | Description                      | Quantity | Unit Price BDT (million) | Total BDT (million) | Remarks          |
|--------------|----------------------------------|----------|--------------------------|---------------------|------------------|
| 1.           | 33/11 kV substation, 2x10/14 MVA | 1        | 126.50                   | 126.50              | Indicative price |
| 2.           | 11 kV line, single circuit       | 10 km    | 1.13                     | 11.34               |                  |
| 3.           | 0.4/0.23 kV line                 | 9.5 km   | 0.81                     | 7.70                |                  |
| 4.           | Distribution transformers        | 15       | 0.60                     | 9.00                |                  |
| <b>Total</b> |                                  |          |                          | <b>154.54</b>       |                  |



*Option-2:* If power supply option is considered from Economic Zone owned Power plant to be constructed in future, then only inside power Infrastructures will be needed and its cost will be as follows:

Inside Power Infrastructures to be constructed by SEZ authority in case of SEZ owned Power Plant

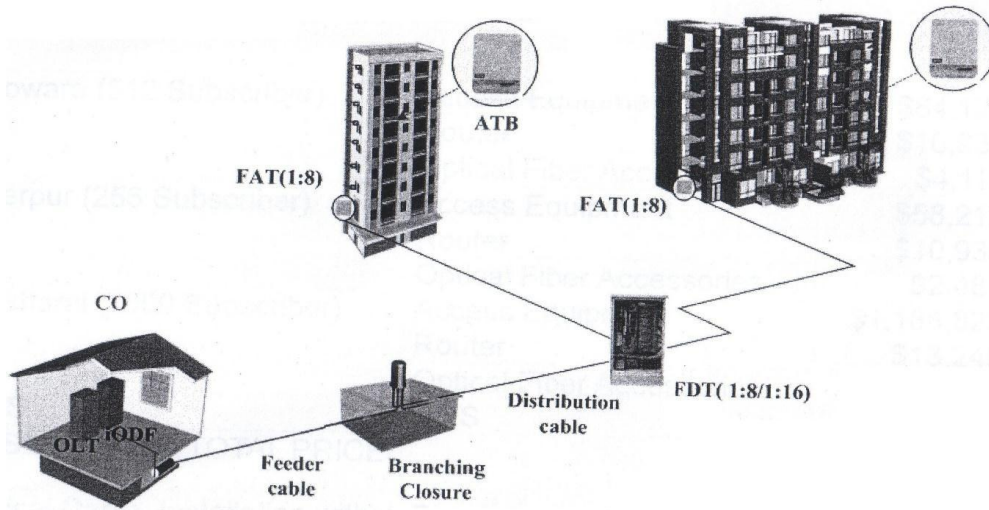
| Item No      | Description                      | Quantity | Unit Price BDT | Total BDT     | Remarks          |
|--------------|----------------------------------|----------|----------------|---------------|------------------|
| 1.           | 24 MW HFO fired                  | 1        | 1,320          | 1,320         | Indicative price |
| 2.           | Power Plant                      | 1        | 127            | 127           |                  |
| 3.           | 33/11 kV substation, 2x10/14 MVA | 10 km    | 1              | 11            |                  |
| 4.           | 11 kV line, single circuit       | 9.5 km   | 1              | 8             |                  |
| 5.           | 0.4/0.23 kV line                 | 15       | 1              | 9             |                  |
| <b>Total</b> |                                  |          |                | <b>14,746</b> |                  |

### 7.3 Telecommunication System

#### 7.3.1 Connection (On-site)

The numbers of industries have been estimated is 136 according to the number of plots in the master plan. Considering 6 telephone lines per industry and other connections, such as, connections in the BEZA (Bangladesh Economic Zone Authority) administrative office, customs office, proposed power plant, and power supply office and some residential connections, the total numbers of telephone connections is estimated to be 700 LU and the number of distribution points is considered to be 300. The capacity of the telephone exchange, considering future expansion in the surroundings, is assessed to be 7,000 LU and effective number of connections in the 1st Phase will be 2,500LU, proportional internet connections. The number of industries may be more or less than the number of plots. Some of the big industries may sometimes need more than one plot. On the other hand, more than one small industry may sometimes share one plot.

**Figure 7.13: Connection Diagram (On-site)**



*Transmission System in Bangladesh:* Bangladesh is a reverie country, as the country's long distance transmission systems are mainly composed of microwave, UHF and VHF radio links. The Optical Fiber is also used in city and some district headquarter areas for interconnecting local exchange and Remote Switching Units (RSU) in multi exchange networks and also for interconnections between switching exchanges and microwave station. As in all EPZs in Bangladesh, BTCL have their PSTN network, it is recommended that Telecom development works in EZs shall be offered to BTCL. BTCL has two modes of financial systems, a) a Contributory work, and b) a Self financed work.

- a) *Contributory work:* When a corporate body asks BTCL to establish a telephone network, BTCL submits estimates for the contribution of funds. After placing of a fund by a corporate body, BTCL expands the network as required.
- b) *Self financed work:* when BTCL finds that an area is under development, BTCL includes expansion work in ongoing or in future sand expands their net work for expansion of own business from their own fund.
- c) Due to an abrupt fall of revenue rate of BTCL service, BTCL has become reluctant to do any self- financed work. One BTCL spokesman remarked that, if the government is interested in these works and place the required budget, BTCL can do them with their own finance.

Finally, it is proposed that, BEZA should write to BTCL through the Ministry of Telecommunications, informing them that offices of Natore EZ is going to be built, hence the Ministry should be requested to instruct BTCL to include the Natore proposed EZ in their future expansion project.

Information can also be given to the approved private PSTN Operators, Mobile Phone Operators and ISPs that they can expand their network for their own business expansion. It is recommended that Grameen Phone and other operators should be offered to the opportunity to establish their network without any conditions.

### 7.3.2 Telecommunications (Off-site)

If Bangladesh Telecommunication Company Limited (BTCL) fixed phone network is to be installed in Natore EZ site, a Fiber Optic Cable (FOC) connection will be established between Natore EZ site and Natore main Exchange at upazila. Also Telephone Exchange/exchanges of BTCL shall be installed at EZ site and the local network will be expanded according to need. Local network by copper cable will not be difficult with single Exchange. To cover the network by copper cable, one BTCL Exchange needs to be installed. Because by copper cable, subscribers can be connected up to a maximum distance of 4 Km. The cost of a telecommunications system is calculated most modern soft switching (SS) technology, as in near future technologies are being changed very rapidly. Since power transmission lines in the EZ site will be overhead, the FOC line can be hung overhead to reduce the local network expansion cost.

### 7.3.3 Data Communications Network

In Bangladesh there are two Types of National Network; Radio Link Network and OFC Link Network BTCL has both the types.

The Power Grid Company Bangladesh also has an OFC overhead Network throughout Bangladesh along the high tension power transmission Towers.

Band Connection/Leased Line connection: BTCL have copper, optical fiber and microwave networks almost all over the country. BTCL introduced Digital Data Network (DDN) service in the year 2000 to allow point to point domestic data connectivity and International Private Leased Circuit (IPLC) termination inside Bangladesh. 64Kbps to 2Mbps data circuits are available through DDN nodes. Subscriber is connected through telephone cable (copper local loop DSL) . Transmission backbone among exchanges consists of optical and microwave network. DDN service is available in 41 district headquarters through 71 nodes. Present capacity is more than 1000 high speed point to point leased line internet and corporate connectivity, 60% of which is in use.

Natore EZ may be brought under the DDN service since it will fulfil the eligible criteria of the DDN connectivity- Producers of same types of goods and services.

## **7.4 Water Supply System**

In Natore, the water consumption demand will be about 9,500 m<sup>3</sup> per day. Per day volume of water requirement is given bellow for Natore EZ:

*Water Requirement:* 9,500 m<sup>3</sup>/Day

*Ground Water:* There is no surface water source for water supply of Natore EZ. Water is to be drawn by installing production tube wells in the project area to meet the water demand. Each tube well can supply 500 m<sup>3</sup> of water per day. Around 19 tube wells are recommended to be set in Natore EZ. The BWDB report has not considered sea water as a source.

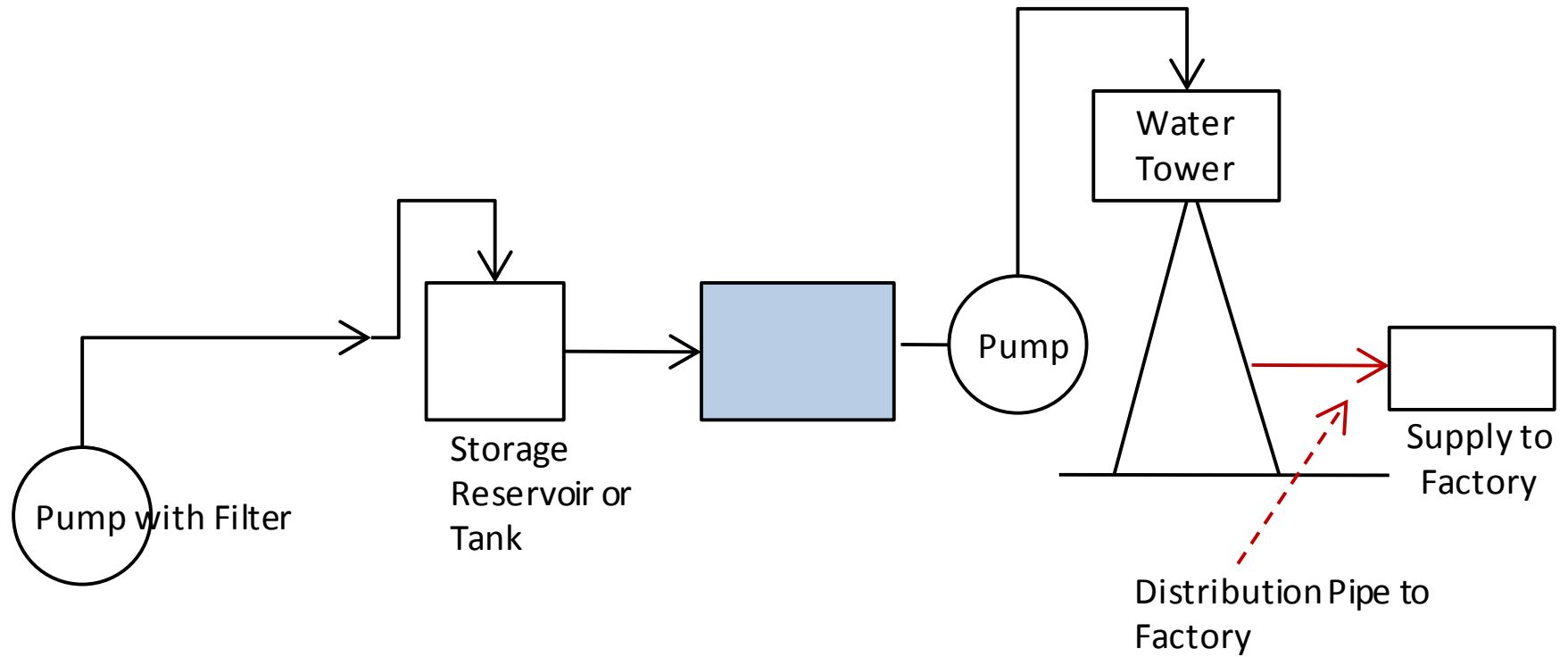
*Water Distribution Network:* Water Distribution Networks deliver water to each factory along the roads, coming through the tower and tank at several places built inside the zone. The treatment system is composed of the following:

- ground water intake
- Reservoir
- Treatment Plant
- Tank and Tower
- Distribution Pipe Network

A gravity feed system will be used to supply water to the water supply pipe line located along the footpath of the road inside the project. The size of main water supply pipe will be from 150 mm. –350 mm. and water supply pressure is in the range of 1 – 3 bars. Main water supply pipe will be of high density polyethylene (HDPE) if available, to avoid corrosion as well as breaking in the future. The supply system of the pipe network is shown in the Figure 7.15.

*Basic Concept Drawing of Water Supply System:* The basic water supply system is shown in the following figures.

Figure 7.14: Water Supply Distribution Network



## 7.5 Drainage

The rain discharging flow has been designed using the engineering analysis. As a first step, rain fallen on the ground and factory roofs are expected to flow into the u- channel along the road. Next, the rainwater flows into the ditch/khal south-east side of the EZ. Finally, the rainwater will flow out to the Naord river by existing channel. The flow system of the u-channel drain is shown in the Figure 7.16.

## 7.6 Fire Protection System

For the fire protection system, besides a fire station and a fire truck, a water body has been considered to collect water for fire service according to the local standard to supply water in case of fire protection need.

## 7.7 Data Connectivity

A robust infrastructure for high-speed internet connectivity is essential for ensuring the sustainable operation of the Economic Zone. On top of that, it is imperative to have connectivity from multiple operators to maintain high uptime and seamless service levels to the tenants. An operator with sufficient capability may provide network connectivity inside the Economic Zone and maintain clientele among tenants independently.

## 7.8 Industrial Effluent Treatment System

The industrial effluents will be collected from the industries through an effluent pipe network and will be treated in the CETP. Total volume of industrial effluent 9,600 m<sup>3</sup>/Day. The industries will be responsible to do preliminary treatment for their industrial effluent. Maximum value for some critical wastewater parameters that can be discharged to the central effluent treatment plant will be set up to prevent overloading of the treatment operation. Industrial effluent will be collected and transported via a network of drains to the effluent treatment plant. Effluent treatment involves following stages. The Industrial Waste water collection pipe network for Industry is shown in the following Figure 7.18.

### 7.8.1 Pre-treatment

Pre-treatment stage is the first stage of effluent treatment process of CETP, where materials that can be easily collected from the raw wastewater before they damage or clog the machineries will be removed.

**Screening:** In screening, large objects or floating solids will be removed from the influent water. This will be done with a bar screen which are cleaned manually. The solids will be collected and later disposed in a landfill or incinerated.

**Grit removal:** In grit removal, pre treatment may include a sand or grit channel or chamber where the velocity of the incoming wastewater will be carefully controlled to allow sand, grit and stones to settle.

### 7.8.2 Primary Treatment

In this stage, the effluent will be converted to a homogeneous liquid capable of being treated biologically. The effluent will be taken to equalization tank through a lift pump for chemical

dosing. The chemical dosing is usually done by using alum, ferric chloride, calcium hydroxide or sodium hydroxide. Then the effluent is taken to mixing tank. The pH of the effluent will be corrected here.

### 7.8.3 Secondary Treatment

The secondary treatment will be done to degrade the biological contents of the effluent. Through aeration secondary treatment will be done. The purpose of secondary treatment is to reduce the organic compounds of the effluent through bacteria formation and help in coagulation of the compounds to create removable solids.

Activated Sludge: This process will be used for aeration. Activated sludge plants encompass a variety of mechanisms and processes that use dissolved oxygen to promote the growth of biological floc that substantially removes organic material.

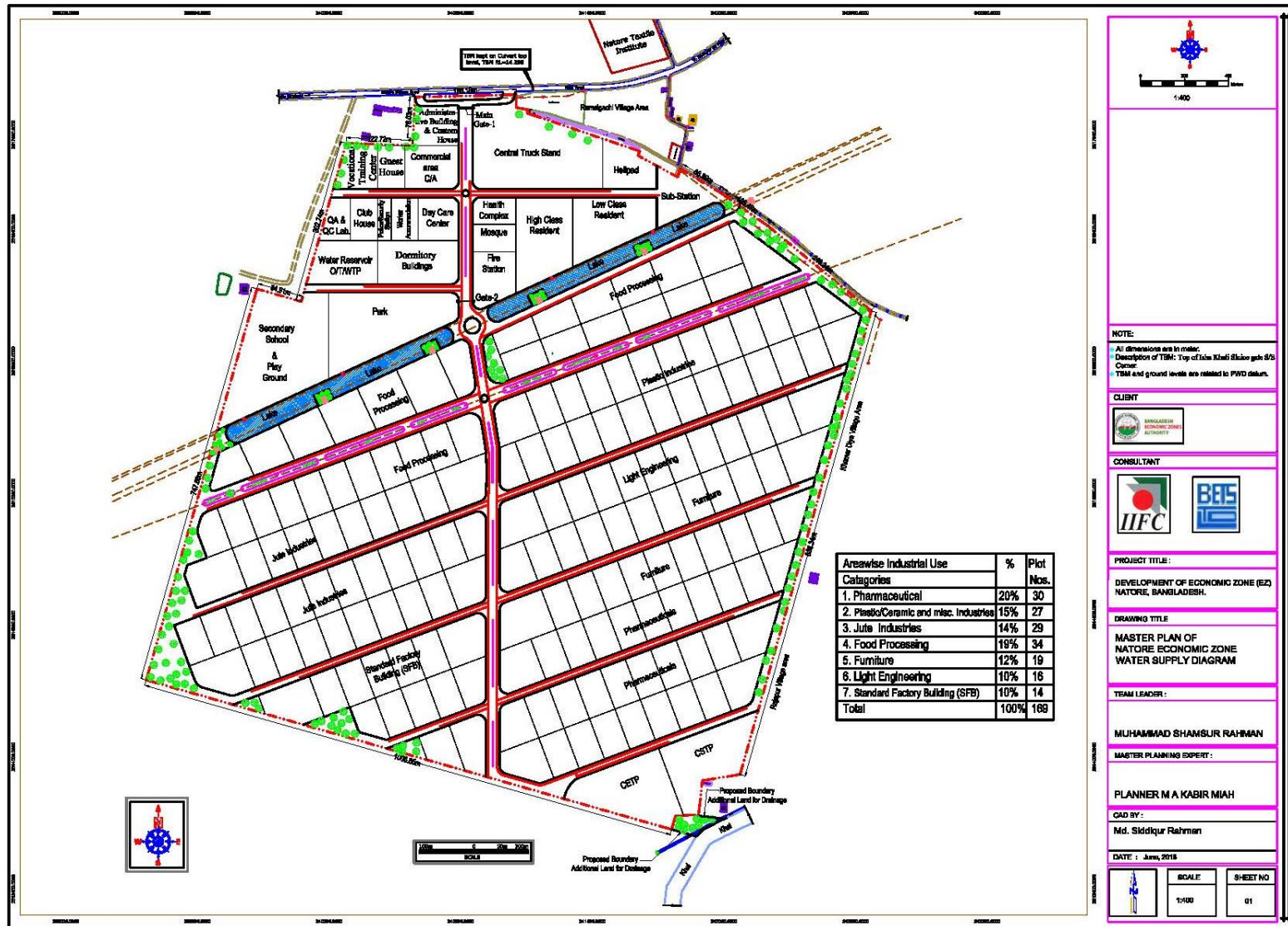
The final step in the secondary treatment stage is to remove the biological flocs or filter material and produce effluent containing very low levels of organic material. In this purpose, the effluent will be passed to clarifier through lift pump. Later on, it will be passed through bio-filter.

Bio-filter: Bio-filter includes a reactor filled with a filter media. The media either is in suspension or supported by a gravel layer at the foot of the filter. The dual purpose of this media is to support highly active biomass that is attached to it and to filter suspended solids. Then the final treated effluent will be passed through final outlet.

### 7.8.4 Sludge disposal

When a liquid sludge is produced, further treatment may be required to make it suitable for final disposal. Typically, sludge is thickened (dewatered) to reduce the volumes for disposal. Near the settling tank, there is a sludge drying bed. By dewatering the sludge, sludge cake will be produced. The sludge cake will be used to make clay bricks..

Figure 7.15: Water Supply Distribution Network



**NOTE:**  
 All dimensions are in meter.  
 Description of TBM: Top of the Khafi Shikho gate B/S Corner.  
 TBM and ground levels are related to PWD datum.

**CLIENT:**

**CONSULTANT:**

**PROJECT TITLE:**  
 DEVELOPMENT OF ECONOMIC ZONE (EZ)  
 NATORE, BANGLADESH.

**DRAWING TITLE:**  
 MASTER PLAN OF  
 NATORE ECONOMIC ZONE  
 WATER SUPPLY DIAGRAM

**TEAM LEADER:**  
 MUHAMMAD SHAMSUR RAHMAN  
 MASTER PLANNING EXPERT:

**PLANNER M A KABIR MIAH**

**CAD BY:**  
 Md. Siddiqur Rahman

**DATE:** June, 2018

|                        |                        |
|------------------------|------------------------|
| <b>SCALE:</b><br>1:400 | <b>SHEET NO:</b><br>01 |
|------------------------|------------------------|

Figure 7.16: Flow System of the u-Channel Drain

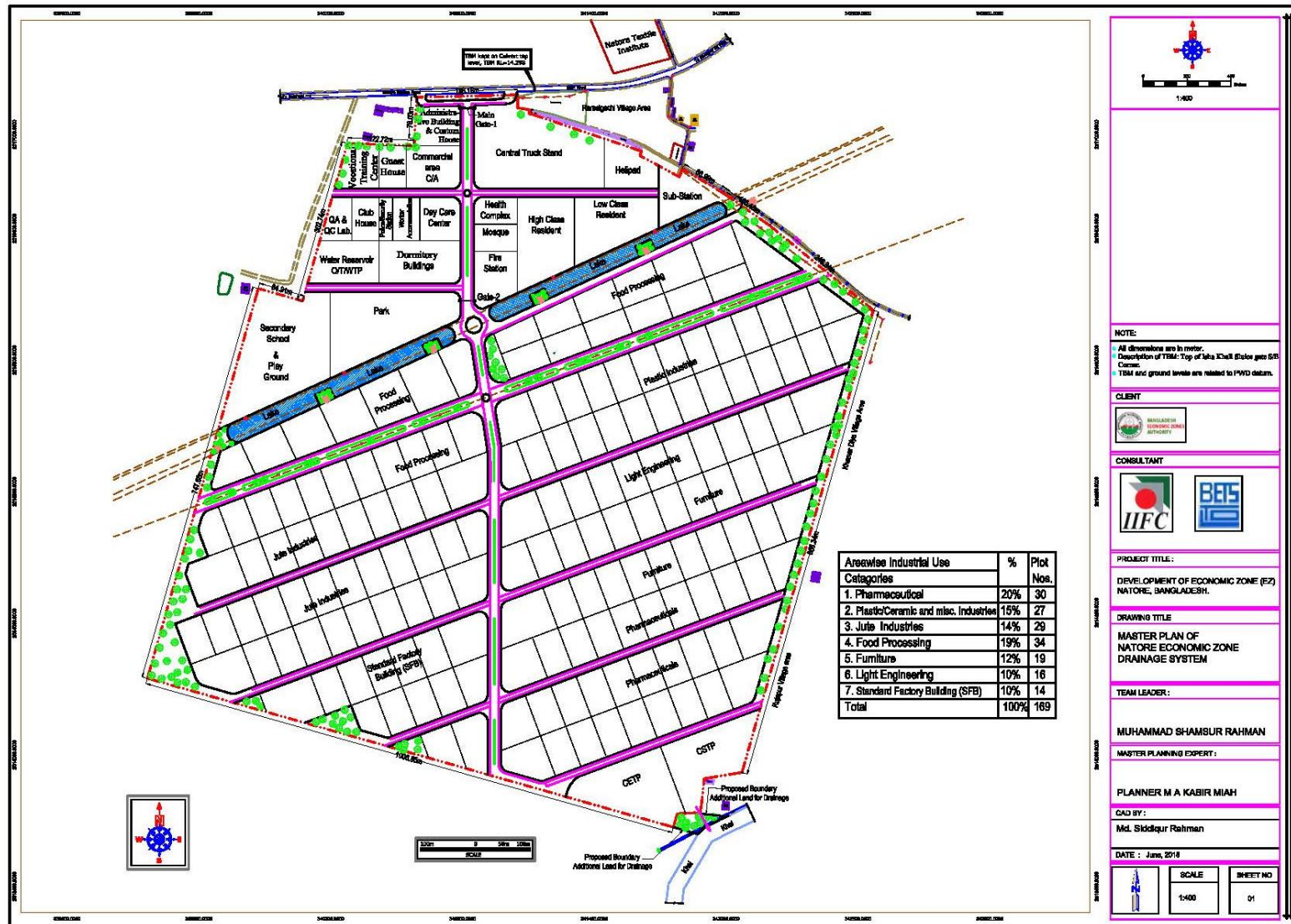
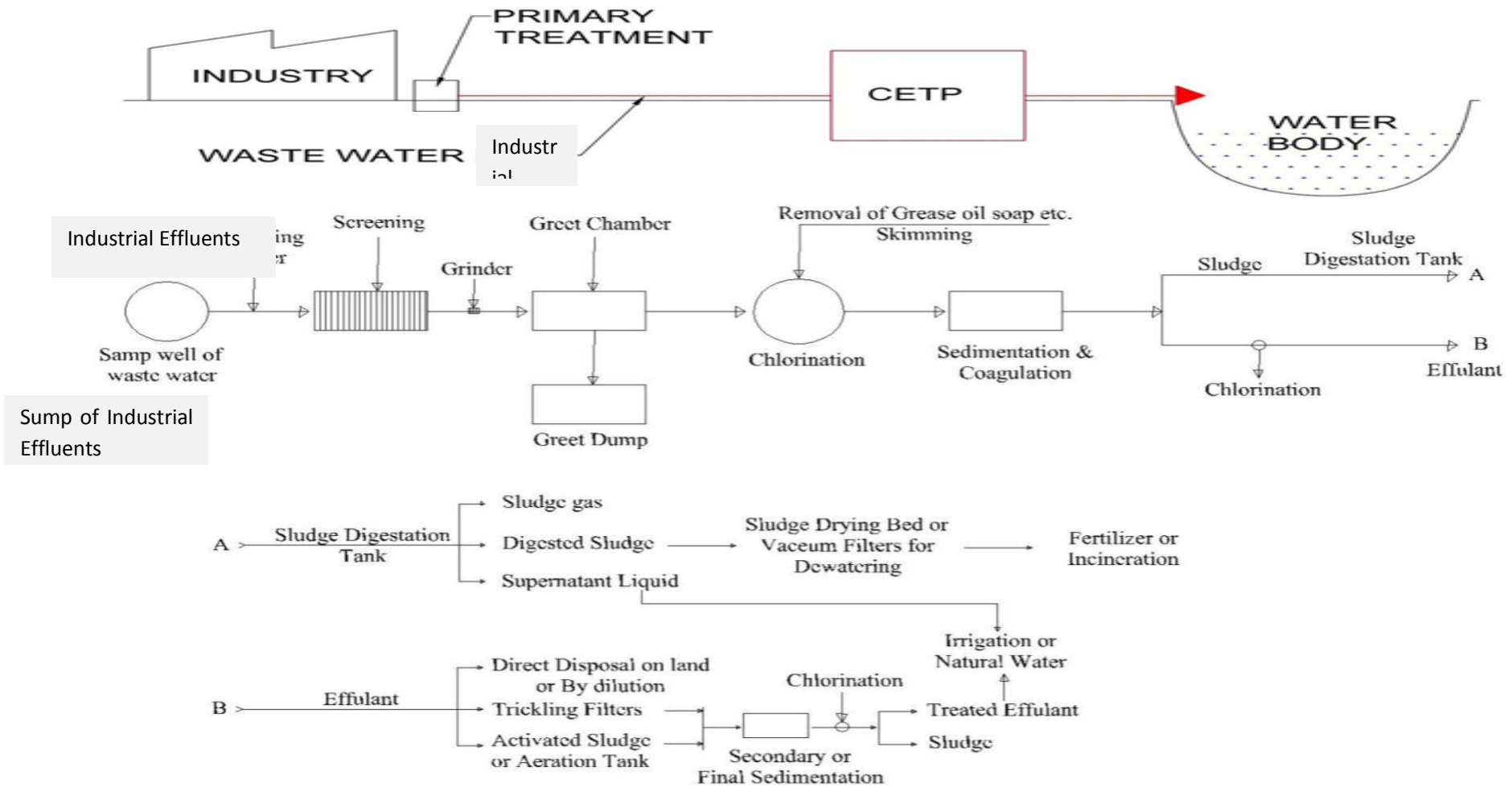




Figure 7.17: Effluent Treatment System



**Table 7.5: Recommended First and Second Level Standard for the Zone**

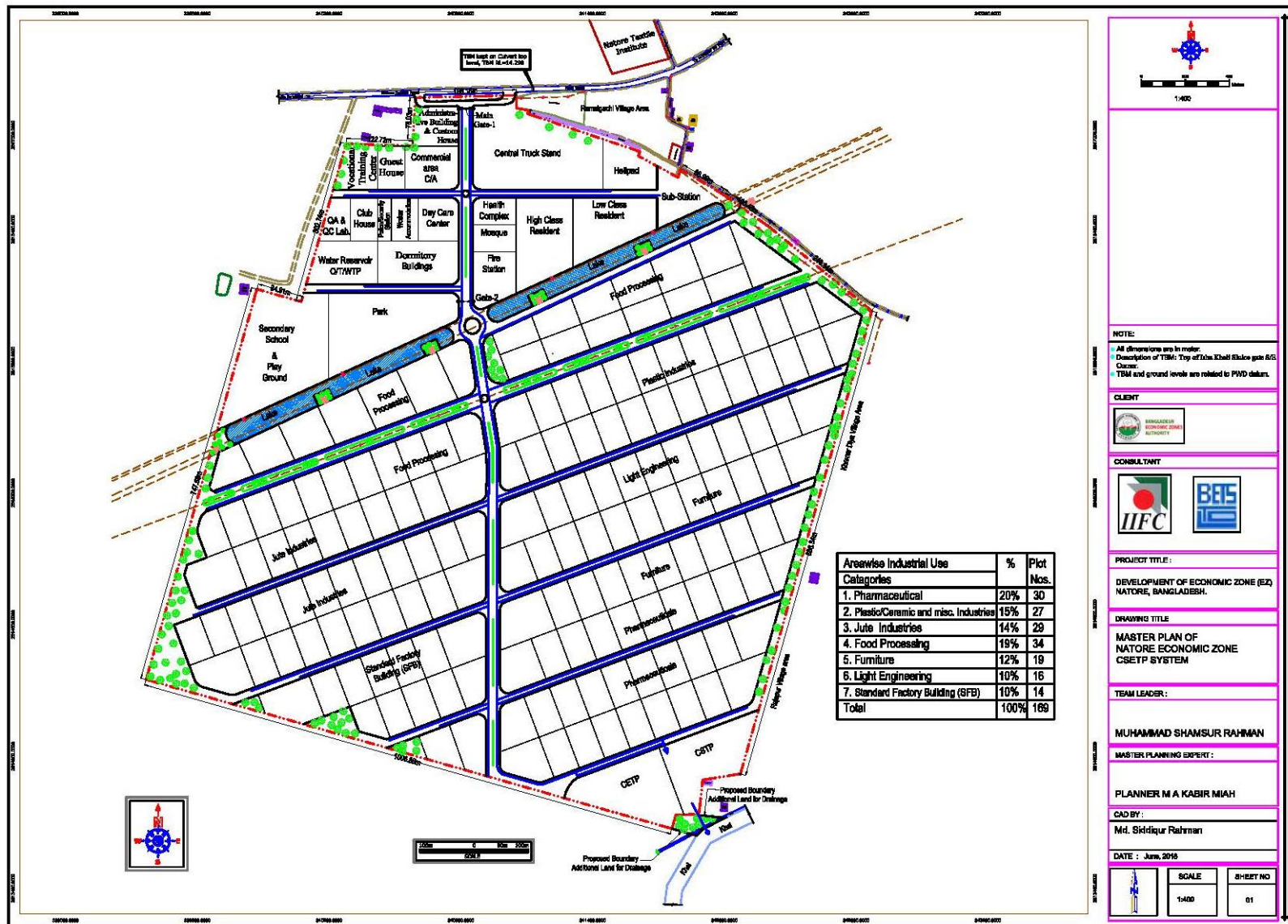
| Sl. No. | Parameters             | Unit | First Level Standards for the Industries | Standards for CETP |
|---------|------------------------|------|--|--------------------|
| 1       | Temperature            | 0C   | <45                                      | 40                 |
| 2       | pH                     |      | 10                                       | 8-Jun              |
| 3       | BOD5 (5 days at 20 °C) | mg/l | <50                                      | <30                |
| 4       | COD                    | mg/l | <50                                      | <30                |
| 5       | Total Suspended Solids | mg/l | <50                                      | <30                |
| 6       | Total Dissolved Solids | mg/l | <1,200                                   | <1,000             |
| 7       | Grease and Oil         | mg/l | <10                                      | <5                 |
| 10      | Nitrate (NO3)          | mg/l | <15                                      | <10                |
| 12      | Chloride (ion)         | mg/l | <600                                     | <500               |
| 13      | Sulphate (as SO4)      | mg/l | <400                                     | <400               |
| 14      | Sulphide (as Sulphur)  | mg/l | <1                                       | <0.75              |
| 15      | Phosphate (PO4)        | mg/l | <5                                       | <3                 |
| 16      | Cyanide (CN)           | mg/l | <1                                       | <0.75              |
| 18      | Arsenic (As)           | mg/l | <0.10                                    | <0.03              |
| 20      | Iron (Fe)              | mg/l | <3                                       | <1.5               |
| 21      | Boron (B)              | mg/l | <2                                       | <1                 |
| 22      | Manganese (Mn)         | mg/l | <5                                       | <3                 |
| 23      | Cadmium (Cd)           | mg/l | <0.1                                     | <0.05              |
| 24      | Chromium (Cr) +3       | mg/l | <1                                       | <0.5               |
| 25      | Chromium (Cr) +6       | mg/l | <1                                       | <0.5               |
| 26      | Copper (Cu)            | mg/l | <2                                       | <1.5               |
| 27      | Lead (Pb)              | mg/l | <1                                       | <0.3               |
| 28      | Mercury (Hg)           | mg/l | <0.005                                   | <0.002             |
| 29      | Nickel (Ni)            | mg/l | <2                                       | <0.5               |
| 30      | Selenium (Se)          | mg/l | <0.1                                     | <0.05              |
| 32      | Zinc (Zn)              | mg/l | <15                                      | <10                |
| 34      | Ammonia (NH3)          | mg/l | <8                                       | <5                 |
| 35      | DO                     | mg/l | >2                                       | >7                 |

## 7.9 Domestic Waste Treatment

The individual industrial units will carry out their own domestic waste treatment through small treatment facilities on their own..

*Basic Diagram of Wastewater Collection System:* The basic process of waste water treatment was explained in the previous section (Sewerage System) . Solid Waste should be treated at a primary treatment facility equipped by the tenants and the Solid Waste flows into the underground pipes along the road. The lifting stations are necessary to lift the Solid Waste to arrive at the central treatment plant. Eventually the dimension of the collection pipes is increased. The Waste water collection pipe network is shown in the following figure.

Figure 7.18: Waste Water Collection Network



## 7.10 Solid Waste Treatment and Management

The management of waste is a key component in a business' ability to maintaining ISO14001 accreditation. Companies are encouraged to improve environmental efficiencies each year by eliminating waste. The following solid waste management plan for the proposed industries like light engineering, RMG, furniture, pharmaceutical and food processing in BEZ need to be addressed.

### 7.10.1 Inventory of Hazardous Waste Generation

Since industries change their products, processes and capacity of production, and new industries get established periodic, updating of inventories is required. It should be made mandatory on the part of industries to report changes/additions in hazardous waste generation and steps taken to reduce generation of waste per unit of production. Industries will be required to store hazardous waste for a period not exceeding 90 days and shall maintain a record of sale, transfer, storage, recycling and reprocessing of such wastes like food wastes, leaves, peels, pomace, skins, rinds, cores, pits, pulp, stems, seeds, twigs, and spoiled fruits and vegetables, Iron chips, waste iron, plastics, wood, Jute fiber, unused drugs, pressurized containers, air pollution control equipment, packaging wastes and laboratory wastes unless agreed by DoE and BEZA. The waste could either be recycled /reused or disposed of in captive or common Treatment, Storage and Disposed Facilities (TSD) available in the country, or be incinerated. Inventories of 'end of life' consumer products such as e-waste are also required to be made.

### 7.10.2 Waste Avoidance and Waste Minimization at Source

In the hierarchy of waste management, waste avoidance and waste minimization have to be attempted first, for which dissemination of information on technological options should be a continuing exercise. Promote implementation of recovery of resources such as solvents, other reagents and by-products as well as re-generation of spent catalysts in a time frame manner.

### 7.10.3 Reuse, Recovery and Recycling of Hazardous Waste

Industrial associations/industries should explore options/ opportunities of reusing, recovery and recycling of hazardous waste in an environmentally sound manner. Establishment of 'Waste Exchange Banks/ Centers' should be encouraged to provide information on wastes and promote reuse, recovery and recycling technologies which upscale the quality of resource recovery. Introduce payback scheme as part of extended corporate responsibility in case of lead-acid batteries. Develop a system for channel sing of wastes containing toxic metals for recovery, such as mercury from thermometers and fluorescent tube lights, cadmium from batteries etc.

### 7.10.4 Encourage Cleaner Production and eco-design Practice

Encourage cleaner production and eco-design practice within each manufacturing sector:

This is a process which minimizes environmental impact across the product life cycle, whilst producing a high quality, cost-effective product.

#### 7.10.5 Encourage the use of Environmental Product Labeling

Encourage the use of Environmental Product Labeling on products to enable consumers to make informed choices about the products they buy.

#### 7.10.6 Encourage the implementation of Environmental Management Systems (EMS)

Encourage the implementation of Environmental Management Systems (EMS), which can result in better resource efficiency and increased awareness of waste prevention and recycling practices throughout staff, the DoE and BEZA, will promote the implementation of EMS through the provision of guidance, advice and leading by example.

#### 7.10.7 Safe Disposal of Hazardous Waste

For the waste which cannot be recycled/ reused, safe and environmentally sound disposal should be adopted depending upon waste category. Design and operation norms of disposal facilities should be strictly adhered to as per the guidelines to be framed by DoE. Supervision of such facilities by DoE and BEZA during construction stage is required to ensure quality of construction as per guidelines, including post closure monitoring.

#### 7.10.8 Setting up of Common Treatment, Storage and Disposal Facilities (TSDFs)

Setting-up of TSDFs should be considered within industrial estates/ EPZs. The Government may consider providing financial support for establishing such treatment facilities. The TSDFs shall cater to meticulously delineated hazardous waste catchments areas taking into consideration their distance from the generators and availability of wastes. DoE and BEZA shall ensure that in a given hazardous waste catchments area, there are no multiple operating TSDFs. Unit Investor will be encouraged to establish TSDFs.

#### 7.10.9 Transportation of Hazardous Waste

BEZA will develop on-line tracking system for movement of hazardous waste from generation to the disposal/ recovery/ recycle stage. Industries have to pay for collection and transportation of waste for treatment and disposal outside the industries own premises.

#### 7.10.10 Use of Cement Kilns for Hazardous Waste Incineration

Use of hazardous wastes (such as ETP sludge from dyes & dye intermediates, tyre chips, paint sludge, Toluene-Di-Isocyanate tar residue and refinery sludge) as supplementary fuels in cement kilns need to be promoted.

#### 7.10.11 Illegal Dump Sites and Remediation

To take care of illegal dumping, surveillance both by enforcement agencies and industry associations needs to be stepped up. The approach for site remediation of dump sites would vary from site to site depending on nature of pollutants, future damage potential

and remedial cost. The remediation strategy should focus on the 'Polluter Pays Principle' which needs to be strictly enforced. In such a case, the polluter has to reinstate or restore the damaged or destroyed elements of the environment at his cost. To take care of cases of remediation wherein polluters are not traceable, a dedicated fund needs to be created by MoEFCC.

#### 7.10.12 Strengthening the Infrastructure of Regulatory Bodies

For effective enforcement of regulations, DoE has to be strengthened in terms of manpower, equipment, instruments and other infrastructure facilities. The Government may support DoE by adequate funding, training and awareness programmes, periodically. BEZA, in this case, would co-operate the DoE.

#### 7.10.13 Disposal of Date Expired Drugs and Pesticides

In order to deal with such hazardous wastes, as well as disposal in a facility as per following options should be permitted:

- To have these processed wherever possible by the industry.
- To appropriately incinerate either through dedicated incinerators of individual industry or through incinerators available with common facilities.

### 7.11 Administration/One-stop Service Building and Other Supporting Buildings

The administrative/One-Stop Service Building shall be built at the left side of the entrance with four storied building having 10,969 m<sup>2</sup> (2,742 m<sup>2</sup> on each floor) . The following functions shall be included:

- One-Stop Service Division (about 10 staffs)
- Economic Zone Administration Division (about 30 staffs)
- Security Office (10 staffs: 24 hours)
- Presentation/Seminar Room (50 people can be accommodated)
- Meeting Rooms (3 Rooms)
- Custom House

The commercial building shall be built at the right side of the entrance with five storied building having 15,912 m<sup>2</sup> (3,182 m<sup>2</sup> on each floor) . The following functions shall be included:

- Banks
- Insurance companies
- Shopping mall/market
- Restaurants
- Residential hotel

### 7.12 Standard Factory Building

The Standard Factory Buildings shall be built at the west side of EZ with four storied building of different sizes for commercial use.

### 7.13 Supporting Buildings

*Fire station:* The fire service building shall be three storied building with gas metering station having 2,484 m<sup>2</sup> (828 m<sup>2</sup> on each floor) . All the function shall be included as per fire service requirements or demand.

*Police/security station:* The police/security building shall be two storied building having 1,200 m<sup>2</sup> (600 m<sup>2</sup> on each floor) . All the function shall be included as per security requirements or demand.

*Training Center:* The training center building shall be three storied building having 2,110 m<sup>2</sup> (703 m<sup>2</sup> on each floor) . All the function shall be included as per vocational training requirements or demand.

*Secondary School:* The school building shall be four storied building having 3,840 m<sup>2</sup> (960 m<sup>2</sup> on each floor) . All the function shall be included as per education requirements or demand.

*Health and Day care Center:* The Health and Day care building shall be four storied building having 23,768 m<sup>2</sup> (5,942 m<sup>2</sup> on each floor) . All the function shall be included as per health requirements or demand.

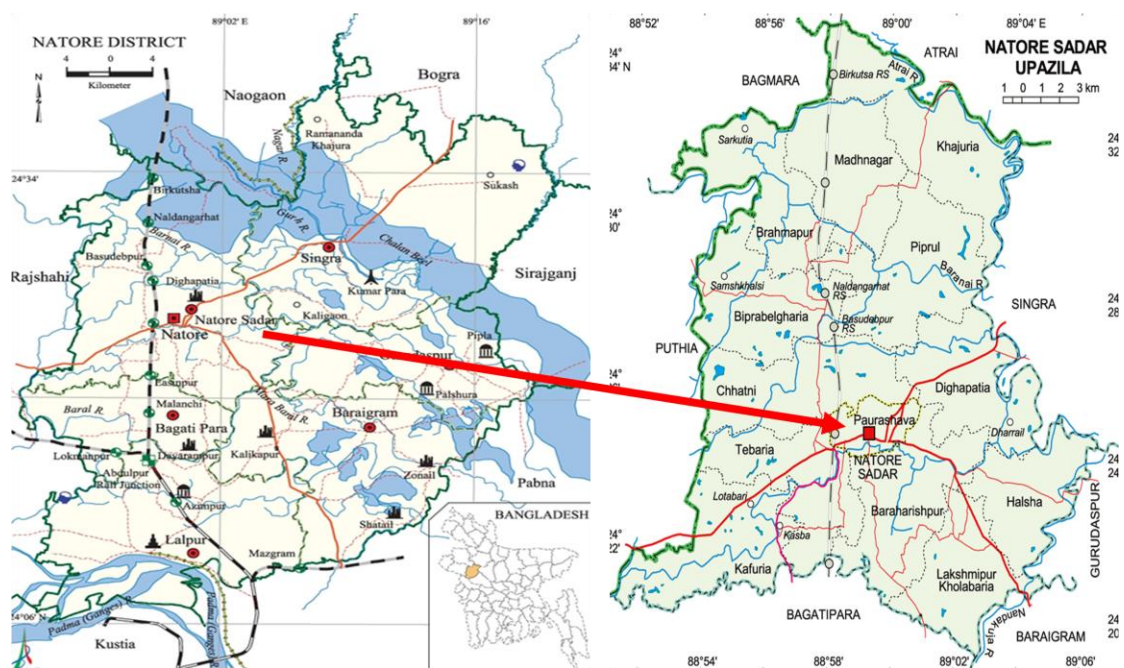


## 8 Environmental Review

The baseline provides the basis for assessment of impact (potential changes in the baseline conditions) due to the development of proposed NEZ. It has been established through assessment of environmental components like air, water, land, noise, soil, etc. and environmental characteristics like physical, biological and socio-economic status of the study area, within the 10 km radial zone of the project site.

Physical environment includes topography, land, soil, meteorology, air, water, noise, etc. and the biological environment includes flora and fauna while socio-economic environment includes demography, ethnicity, religion, education and employment opportunity, occupation, income, poverty, social relations, etc.

**Figure 8.1: Location Map of the Project Site<sup>82</sup>**

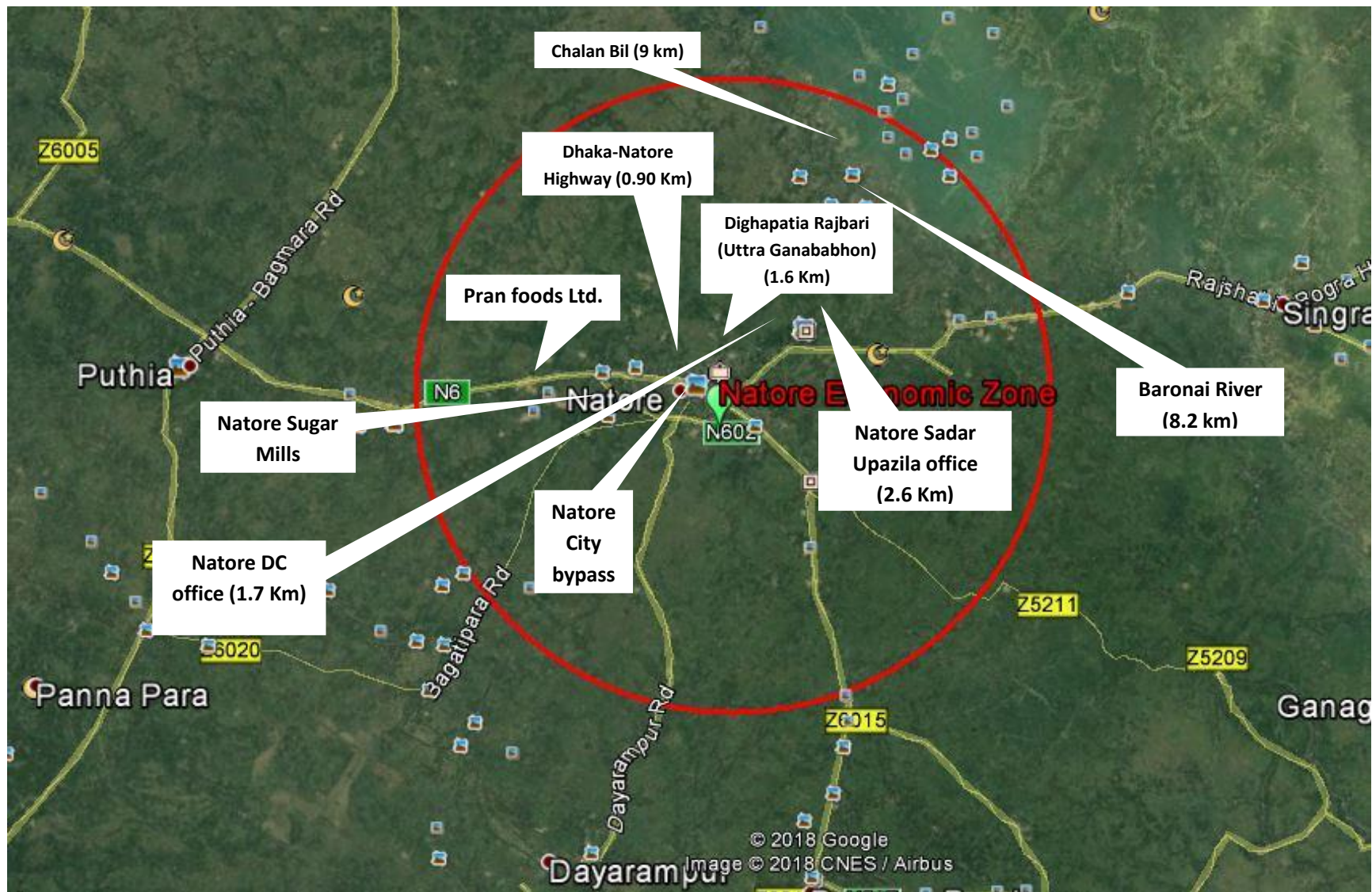


The above figure and the following tables illustrate the proposed project location and summary of various environmental settings considering 10 km radius zone.

<sup>82</sup>[http://en.banglapedia.org/index.php?title=Natore\\_Sadar\\_Upazila](http://en.banglapedia.org/index.php?title=Natore_Sadar_Upazila)



Figure 8.2: Objects within 10 km Radius of NEZ



**Table 8.1: Important Features of the NEZ at A Glance<sup>83</sup>**

|     | Parameters                               | Description  |
|-----|--|--|
| 1.  | Ecologically Critical Area               | No ecologically critical areas were found within the study area.   |
| 2.  | Reserve/Protected Forests                | No reserve or protected forests area was found within the study area.  |
| 3.  | Predominant Geological Formations        | Natore district lies in the Rajshahi division of Bangladesh which falls under a stable Precambrian Platform and is characterized by limited to moderate thickness of sedimentary rocks. The major geological formation of Natore district are alluvium, stream deposits, delta plain deposit and flood plain deposits. |
| 4.  | Topography                               | The topography of the project area is predominantly flat terrain.  |
| 5.  | Major Physiographic Units                | The proposed NEZ is located mostly in Ganges River floodplain.   |
| 6.  | Major Soil Type                          | General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low.                               |
| 7.  | Major crops                              | Like other areas of Bangladesh, agriculture is important part of the project area. The major crops in the project area are Paddy, wheat, sugarcane, jute, ginger, turmeric, vegetables etc.  |
| 8.  | Flooding                                 | The proposed project area gets inundated with flood water during rainy season.   |
| 9.  | Seismicity                               | The project area falls in the earthquake Zone-II of the seismic map of Bangladesh. This zone refers comparatively medium intensity of seismic effects.   |
| 10. | Environment and Social Hotspots          | River, Canals, Homestead forests and vegetation, School, College, Madrasha, Masjid, Mandir, Math etc.  |
| 11. | Major Settlement                         | Residential area, Commercial area, Industrial Area, Bus terminals, Institutional structures, etc.  |
| 12. | Major Industries/ Business Entrepreneurs | Rice mill, Jute mill, Loom, textile industry, Small scale cottage industry, Bamboo and cane industry, Wooden furniture, Saw mill, Aluminium industry, Oil mill, Printing press, cold storage etc.  |

**Table 8.2: Existing Environmental Settings of NEZ<sup>84</sup>**

| Particulars             | Details   |
|-------------------------|---|
| Location                | Natore Sadar upazila, Natore district.  |
| Total Area              | 300 acres.  |
| Site Elevation          | Average 14 m from ASL.  |
| Land Type               | Low Land  |
| Nearest Airport         | Ishwardi Airport (Approx. 41.9 km away from the project site) , Shah Makhdum Airport ( Approx. 48.3 km away from the project site) .  |
| Nearest Railway Station | Abdulpur railway station (22.8 km away from the project site) .   |
| Nearest Port            | Hili land port (146 km from the project site) , Sonamasjid Land Port (131km from the project site) .  |
| Climatic conditions     | <b>Temperature:</b> The annual average temperature varies maximum 34.2 <sup>0</sup> C to minimum 8.4 <sup>0</sup> C.<br><b>Humidity:</b> Average humidity is 76.8%.<br><b>Rainfall:</b> The average annual rainfall is 1736 mm. |

<sup>83</sup> BBS District Statistics of Natore, 2011; Banglapedia, 2018 and Field Visit

<sup>84</sup> Google Earth, BBS District Statistics of Natore, 2011&Field Visits

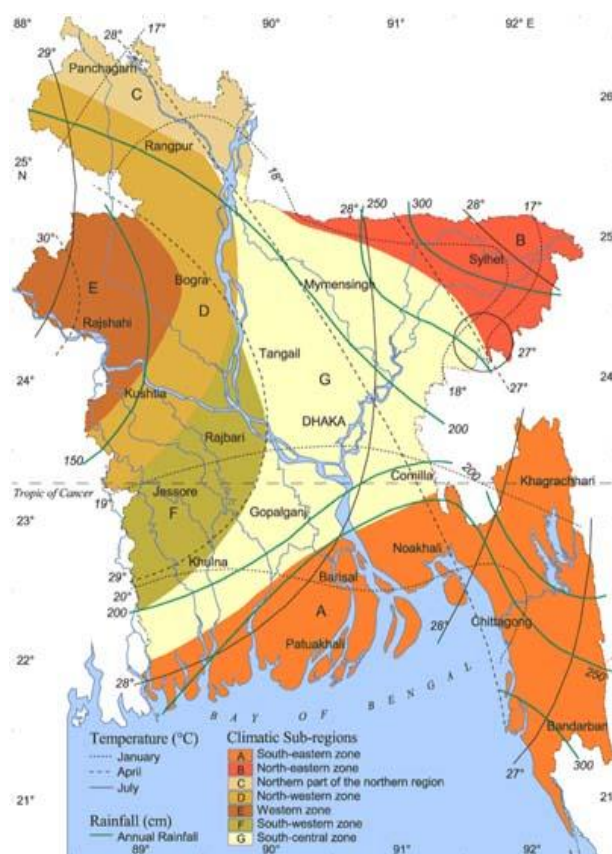
| Particulars                | Details  |
|----------------------------|--|
| Seismic Zone               | Zone II (Seismic coefficient is 0.05 g) .  |
| Forests / National Parks   | None within 10 km.   |
| Archaeological Site        | Natore Rajbari and Dighapatia Rajbari (Uttara Ganabhaban) (1.6 km) , Madanmohan Rath made of copper (Madhabnagar) , Vishnu statue of gorur (prince of birds) . |
| Nearest major Water Bodies | Barnai, Nandakuja.   |

### 8.1 Meteorology

Bangladesh is located in the tropical monsoon region and its climate is characterized by high temperature, heavy rainfall, often excessive humidity and fairly marked seasonal variations. From the climatic point of view, three distinct seasons can be recognised in Bangladesh- the cool dry season from November to February, the pre-monsoon hot season from March to May and the rainy monsoon season which lasts from June to September.<sup>85</sup>

Most rain occurs during the monsoon (June-September) and little in winter (November-February) . Moderate rains are also reported in Months of March, April and October. The climatic sub-regions of Bangladesh are presented in the following figure and as per that, the Natore district falls in climatic sub-regions of Western Zones.

Figure 8.3: Climatic Sub-regions of Bangladesh Indicating the NEZ site



Climatic conditions of the study area were collected from the Bangladesh Meteorological Department at Rajshahi station. Rainfall, temperature, relative humidity and wind speed are described in the following sections.

**Temperature:** The period from February to May is marked by continuous increase in the temperatures. The monthly minimum average temperature varies from 8.5 to 26.80C during the period of 2008 to 2017. The monthly maximum average temperature varies from 11.2 to 37.70C over the period of 2008-2017. The monthly maximum and minimum average temperatures over the period of 2008 to 2017 at Rajshahi station has been given in the following tables.

<sup>85</sup> Banglapedia, 2018

**Table 8.3: Monthly Minimum Average Temperature at Natore Station<sup>86</sup>**

| Year | Monthly Maximum Average Temperature in Degree Celsius |      |      |      |      |      |      |      |      |      |      |      |
|------|---|------|------|------|------|------|------|------|------|------|------|------|
|      | Jan   | Feb  | Mar  | Apr  | May  | June | July | Aug  | Sep  | Oct  | Nov  | Dec  |
| 2008 | 24.5  | 29.5 | 33.4 | 37.4 | 34.9 | 36.7 | 33.4 | 32.9 | 33.6 | 31.9 | 29.7 | 25.4 |
| 2009 | 11.2  | 15.0 | 19.7 | 23.5 | 24.3 | 26.1 | 26.0 | 26.7 | 26.0 | 23.1 | 16.5 | 12.9 |
| 2010 | 22.3  | 28.7 | 35.8 | 38.3 | 35.9 | 35.0 | 34.0 | 34.0 | 33.2 | 31.9 | 29.8 | 25.1 |
| 2011 | 22.6  | 28.2 | 33.6 | 34.7 | 34.5 | 34.1 | 33.5 | 32.2 | 32.8 | 32.8 | 29.1 | 24.2 |
| 2012 | 23.4  | 28.4 | 33.9 | 35.4 | 38.3 | 36.2 | 33.3 | 34.2 | 33.5 | 32.3 | 28.1 | 23.0 |
| 2013 | 23.3  | 27.8 | 33.9 | 36.4 | 33.8 | 35.1 | 34.3 | 33.4 | 34.3 | 31.3 | 29.5 | 25.5 |
| 2014 | 22.9  | 25.9 | 32.5 | 37.9 | 37.1 | 34.8 | 33.9 | 33.8 | 34.0 | 32.5 | 30.1 | 24.5 |
| 2015 | 23.7  | 28.5 | 33.0 | 33.8 | 36.0 | 34.5 | 33.4 | 33.8 | 34.3 | 32.9 | 30.5 | 25.3 |
| 2016 | 24.1  | 29.4 | 32.1 | 37.7 | 34.7 | 35.3 | 32.8 | 34.0 | 34.0 | 33.0 | 30.0 | 26.1 |
| 2017 | 26.4  | 29.6 | 30.5 | 32.8 | 34.5 | 33.0 | 32.5 | 32.8 | 34.1 | 32.1 | 29.4 | 26.2 |

**Table 8.4: Monthly Maximum Average Temperature at Natore Station<sup>87</sup>**

| Year | Monthly minimum average Temperature in Degree Celsius |      |      |      |      |      |      |      |      |      |      |      |
|------|---|------|------|------|------|------|------|------|------|------|------|------|
|      | Jan   | Feb  | Mar  | Apr  | May  | June | July | Aug  | Sep  | Oct  | Nov  | Dec  |
| 2008 | 11.1  | 12.0 | 20.1 | 23.1 | 24.2 | 25.7 | 26.0 | 26.4 | 25.8 | 22.6 | 16.5 | 15.0 |
| 2009 | 12.3  | 12.6 | 18.0 | 23.9 | 24.4 | 26.6 | 26.6 | 26.4 | 25.9 | 22.1 | 17.8 | 11.6 |
| 2010 | 9.3   | 13.1 | 19.8 | 25.6 | 25.4 | 26.0 | 26.6 | 26.6 |      |      |      |      |
| 2011 | 8.5   | 12.5 | 18.7 | 22.1 | 23.9 | 26.2 | 25.8 | 26.4 | 25.9 | 23.2 | 16.9 | 12.5 |
| 2012 | 11.5  | 12.2 | 17.4 | 22.8 | 25.8 | 26.8 | 26.3 | 26.6 | 26.1 | 21.8 | 16.3 | 11.7 |
| 2013 | 9.2   | 13.5 | 18.2 | 22.6 | 24.7 | 26.5 | 26.6 | 26.2 | 26.3 | 23.4 | 26.1 | 12.6 |
| 2014 | 11.0  | 12.7 | 17.3 | 22.9 | 25.3 | 26.3 | 26.8 | 26.3 | 25.9 | 22.4 | 15.7 | 12.0 |
| 2015 | 11.6  | 14.3 | 17.9 | 22.0 | 24.7 | 26.2 | 26.1 | 26.7 | 25.9 | 23.0 | 18.0 | 13.6 |
| 2016 | 10.8  | 15.6 | 19.9 | 24.9 | 24.0 | 26.2 | 26.6 | 26.7 | 26.4 | 24.0 | 17.5 | 13.6 |
| 2017 | 14.9  | 17.6 | 20.4 | 23.9 | 25.9 | 26.5 | 26.3 | 26.9 | 26.7 | 24.3 | 7.4  | 17.4 |

**Humidity:** Due to heavy rainfall and proximity to Bay of Bengal, the humidity levels in Bangladesh remains high. Relative humidity in the project area is generally above 80% during June to December. The month of March is the driest with relative humidity 58%. Relative humidity normally varies in the range of 58-89% throughout the year. The monthly variation of humidity patterns in the project area has been given in the following figure.

**Table 8.5: Monthly Average Humidity at the Project Site<sup>88</sup>**

| Year | Monthly average relative humidity at Rajshahi Station (In Percentage) |     |     |     |     |      |      |     |     |     |     |     |
|------|---|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|
|      | Jan   | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
| 2015 | 82  | 77  | 66  | 77  | 77  | 82   | 86   | 86  | 84  | 82  | 81  | 82  |
| 2014 | 82  | 76  | 65  | 63  | 70  | 84   | 86   | 86  | 84  | 82  | 77  | 83  |
| 2013 | 79  | 74  | 64  | 62  | 80  | 83   | 83   | 86  | 84  | 86  | 76  | 80  |
| 2012 | 79  | 66  | 58  | 69  | 67  | 80   | 86   | 85  | 86  | 80  | 78  | 85  |
| 2011 | 70  | 73  | 64  | 72  | 81  | 84   | 85   | 88  | 86  | 82  | 80  | 83  |
| 2010 | 80  | 69  | 61  | 67  | 74  | 82   | 83   | 83  | 85  | 85  | 80  | 79  |
| 2009 | 83  | 68  | 63  | 61  | 76  | 76   | 85   | 87  | 85  | 81  | 77  | 80  |
| 2008 | 79  | 73  | 69  | 67  | 75  | 86   | 89   | 86  | 86  | 84  | 79  | 86  |

**Rainfall:** About 80% of the precipitation occurs during five monsoon months (May to September) Minimum precipitations are recorded during the month of November to February whereas

<sup>86</sup> BBS Yearbook of Agricultural Statistics (2012-17) and Statistical Bulletin (April 2015-December 2017)

<sup>87</sup> Same as above

<sup>88</sup> BBS Yearbook of Agricultural Statistics (2012-17) and Statistical Bulletin (April 2015-December 2017)

average showering does occur in March, April and October. The monthly average normal rainfall variation based on the climatology data and number of normal rainy days in each month in the project have been given in the following figure.

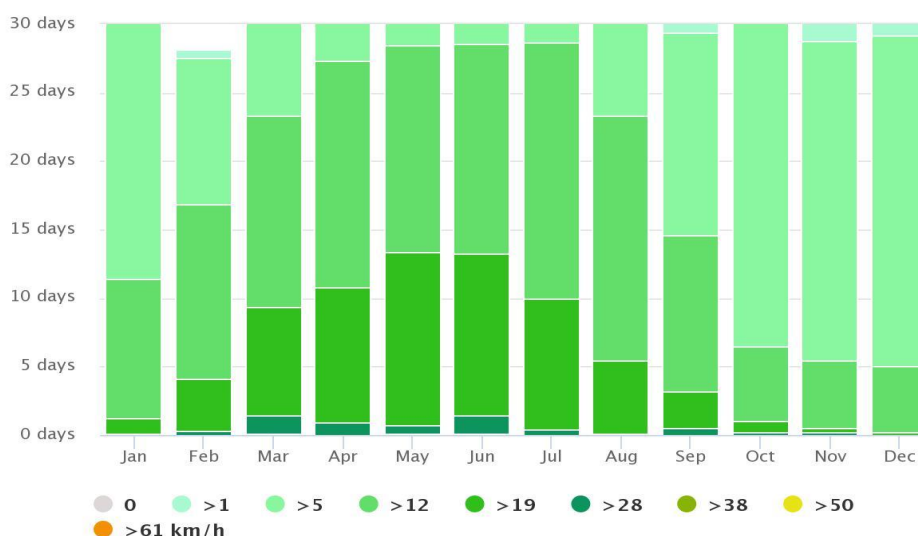
**Table 8.6: Monthly Rainfall at Rajshahi Station<sup>89</sup>**

| Year | Monthly rainfall at Rajshahi Station (In Millimeter) |     |     |     |     |      |      |     |     |     |     |     | Total annual rainfall |
|------|--|-----|-----|-----|-----|------|------|-----|-----|-----|-----|-----|-----------------------|
|      | Jan  | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |                       |
| 2016 | 42   | 3   | 54  | 146 | 217 | 106  | 379  | 167 | 170 | 95  | 0   | 1   | 1,380                 |
| 2015 | 14   | 14  | 39  | 144 | 177 | 285  | 353  | 127 | 254 | 7   | 6   | 1   | 1,421                 |
| 2014 | -  | 27  | 12  | 51  | 151 | 188  | 242  | 359 | 153 | 5   | -   | -   | 1,188                 |
| 2013 | 6  | -   | 6   | 123 | 17  | 137  | 314  | 179 | 178 | 102 | 101 | 1   | 1,164                 |
| 2012 | 6  | -   | 6   | 123 | 17  | 137  | 314  | 179 | 178 | 102 | 101 | 1   | 1,164                 |
| 2011 | 6  | -   | 10  | 94  | 187 | 341  | 144  | 554 | 203 | 35  | 1   | -   | 1,575                 |
| 2010 | 1  | 2   | 2   | 37  | 75  | 211  | 94   | 101 | 101 | 127 | 3   | 39  | 793                   |
| 2009 | 1  | 7   | 28  | 0   | 131 | 126  | 183  | 240 | 282 | 45  | 0   | 0   | 1,043                 |
| 2008 | 26   | 0   | 0   | 30  | 144 | 247  | 373  | 245 | 129 | 121 | 0   | 0   | 1,315                 |

**Evaporation:** Maximum evaporation in Bangladesh occurs during the summer months (March-May), the highest evaporation generally occurs during April. The mean monthly evaporation varies from the minimum of 51 mm in winter to a maximum of 183 mm in summer. The rate of evaporation in the eastern part is generally lower than in the western and northern-western parts of Bangladesh.

**Wind Speed and Direction:** Wind directions at the project site are mostly from the North-West or West towards South-East or East during November to February. The wind directions are east to the west during March to October. Monthly average wind speed of the project area is presented in the following figure. This shows how many days within one month can be expected to reach certain wind speeds. Wind Rose diagram in the project area from January to December are given in the following figure..

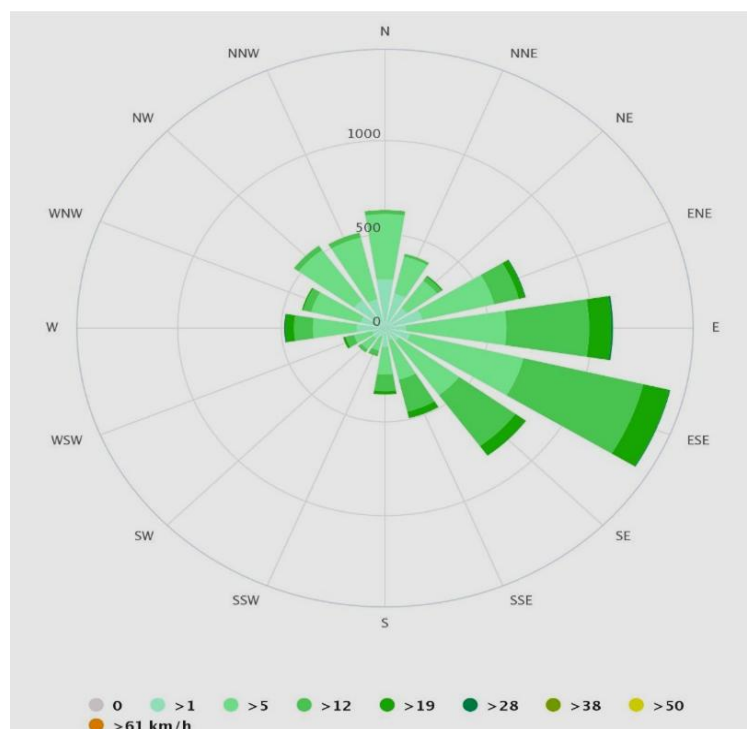
**Figure 8.4: Monthly Average Wind Speed in the Project Site<sup>90</sup>**



<sup>89</sup>BBS Yearbook of Agricultural Statistics (2012-17) and Statistical Bulletin (April 2015-February 2017)

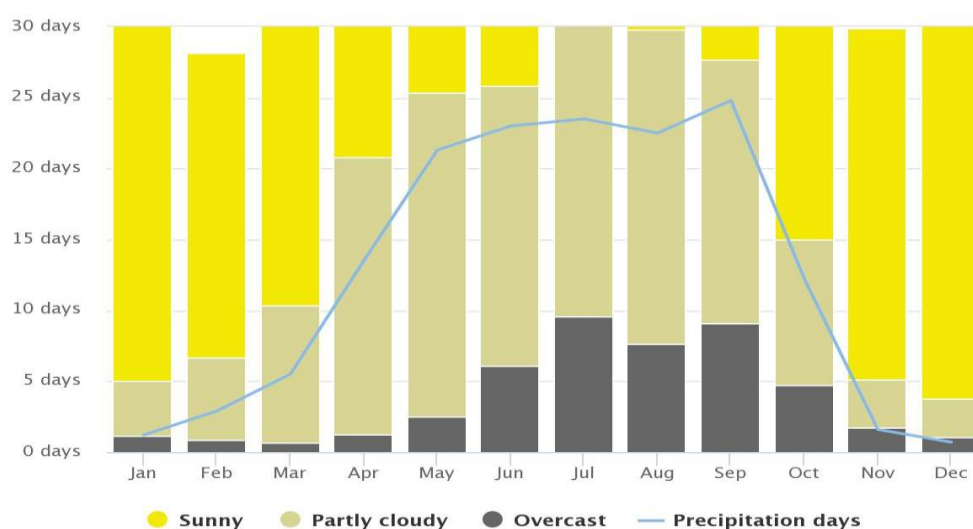
<sup>90</sup>[https://www.meteoblue.com/en/weather/forecast/modelclimate/natore\\_bangladesh\\_7483813](https://www.meteoblue.com/en/weather/forecast/modelclimate/natore_bangladesh_7483813)

Figure 8.5: Wind Rose Diagram for the Project Site<sup>91</sup>



**Sun Shine Hours:** Sunshine duration or sunshine hours is a climatological indicator which is measuring duration of sunshine in a given period (usually, a day or a year) for a given location on Earth, typically expressed as an average value over several years. It is a general indicator of cloudiness of a location, and thus differs from insolation, which measures the total energy delivered by sunlight over a given period. Sunshine duration is usually expressed in hours per year, or in (average) hours per day. In the project area, December is the sunniest, followed by January and November. July and August has the lowest amount of sunshine. The average monthly sunshine hours at the project has been given in the following figure.

Figure 8.6: Average Monthly Sunshine Hours in the Project Area<sup>92</sup>



<sup>91</sup> [https://www.meteoblue.com/en/weather/forecast/modelclimate/natore\\_bangladesh\\_7483813](https://www.meteoblue.com/en/weather/forecast/modelclimate/natore_bangladesh_7483813)

<sup>92</sup> [https://www.meteoblue.com/en/weather/forecast/modelclimate/Natore\\_bangladesh\\_1337233](https://www.meteoblue.com/en/weather/forecast/modelclimate/Natore_bangladesh_1337233)

## 8.2 Air Quality and Noise

### 8.2.1 Ambient Air Quality

The present ambient air of the concerned area is not much contaminated. To assess the present air quality of the area, one Ambient Air Quality Monitoring (AAQM) Station was setup. The locations were selected on the basis of meteorological data, topography, sensitive locations etc. Monitoring was conducted in respect of the following parameters:

- a. Total Suspended Particulate Matter (SPM)
- b. Sulphur Dioxide (SO<sub>2</sub>)
- c. Nitrogen Oxides (NO<sub>2</sub>)

All the above mentioned pollutants were monitored at the station. The equipment were placed at a height of 3 to 7 meters above ground level at the monitoring stations, thus negating the effects of windblown ground dust and free from vertical obstructions within a cone of 120° from the actual position of the sampler, to avoid any impedance to the pollutants. The equipment was always placed at open space free from trees and vegetation which otherwise act as a sink of pollutants resulting in lower levels in monitoring results. The results were compared with respect to Standard of ECR, 1997 for industrial and mixed area. Summary of the monitored air quality results are given below in the following table. All the air quality parameters were within the acceptable range prescribed by Environmental Conservation Rules (ECR), 1997.

**Table 8.7: Determination of Air Quality of the Project Area<sup>93</sup>**

| Air quality parameters     | SPM (µg/m <sup>3</sup> ) | SO <sub>x</sub> (µg/m <sup>3</sup> ) | NO <sub>x</sub> (µg/m <sup>3</sup> ) |
|----------------------------|--------------------------|--------------------------------------|--------------------------------------|
| Average concentration      | 5                        | 4                                    | 8                                    |
| Standard Limit (ECR, 1997) | Below 200                | Below 120                            | Below 100                            |

### 8.2.2 Ambient Noise Level

Data indicates that the existing noise levels in proposed area are within the range of Bangladesh Environmental Quality Standard as well as WB General EHS Guidelines, 2007 for residential zone. This report uses the primary data as baseline data of noise environment.

**Table 8.8: Noise Level in the Project Area<sup>94</sup>**

| Location          | Noise level dB (A) | BD Standard dB (A) (Noise Pollution (Control) Rules, 2006) |
|-------------------|--------------------|--|
|                   | Day                |  |
| South-West Corner | 15                 | 75   |
| North-West Corner | 35                 |  |
| South-East Corner | 15                 |  |
| North-East Corner | 32                 |  |

The baseline noise environment in the project area was within the range accepted by Bangladesh Environmental Quality Standard (Noise Pollution (Control) Rules, 2006) .

<sup>93</sup> Bangladesh Environmental Engineering Training and Lab. Services Ltd.

<sup>94</sup> Same as above

### 8.2.3 Air Pollution and Noise Sources from Existing and Known Sources

**Existing and Known Sources of Noise:** Noise attenuation is typically described as a set reduction in decibel level per doubling of distance from the source. Depending on the nature of the noise source, sound propagates at different rates. Measures of sound level from a source should specify the distance from the source. The standard reference distance for sound levels at the source is 50 feet. Natural factors such as topography, vegetation, and temperature can further reduce noise over distance. The two most common types of noise are point source and line source. Point source noise is associated with noise that remains in one place for extended periods of time, such as with construction activities. Line source noise is generated by moving objects along a linear corridor. Highway traffic is the best example of line source noise. The standard reduction for point source noise is 6 dB per doubling of distance from the source while for a line source it is 3 dB per doubling of distance from the source.

**Construction Noise:** One of the easiest things to identify and one of the hardest things to quantify is noise associated with the actual construction of the project. How much noise construction activities will generate, how often will it occur, and how long will it last are all questions that should be answered in the assessment. Construction is usually performed in a series of steps or phases, and noise associated with different phases can vary greatly. However, similarities in noise sources allow typical construction equipment to be placed into one of three categories: heavy equipment, stationary equipment, or impact equipment.

**Heavy equipment:** Heavy equipment can be defined as earth-moving equipment, such as excavating machinery like excavators, backhoes, and front loaders, as well as handling equipment like graders, pavers, rollers, and dump trucks. Noise levels at 50 feet from heavy equipment range from about 72 to 97 dB. During the phase of construction using heavy equipment, noise is generated more or less at a constant level. Therefore, noise levels can be equated to an average hourly level.

**Stationary Equipment:** Stationary equipment such as pumps, power generators, and air compressors, Effluent treatment plant (ETP) etc., generally run continuously at relatively constant power and speed. Noise levels at 50 feet from stationary equipment can range from 68 to 88 dB, with pumps typically in the quieter range. An averaged noise level may be assumed for stationary equipment because of its fixed location and constant noise pattern.

**Existing and Known Sources of Air pollutants:** There are several sources of air pollutants like stake emissions, emissions from different processing units, emissions from vehicles, emissions from landfill discharge, emissions from natural gas use, emissions from electricity consumption etc.

## 8.3 Water Resources

**Surface Water System:** There are no major surface water sources in the project area. People used ground water for all types of work.

**Ground Water System:** It is proposed to utilize ground water for domestic, office consumption and different processes of NEZ's industries. The deep tube well based sub-surface stratigraphy of the area is consists of clay and silty clay with fine-grained sand, which is considered as natural levee and floodplain deposits.



Water sampling and analysis were undertaken to understand the overall baseline water quality characteristics of groundwater in the project area. Ground water sampling locations were selected to obtain representative water samples from various zones within the project area. The samples were collected from existing tube well. A total of five ground water samples were collected from the studied area. The samples were analysed for parameters covering physical, chemical and bacteriological characteristics as mentioned in the scope of works. Water samples were collected randomly in pre-washed sterile glass bottles. The water quality was compared with the Bangladesh ECR standard for best practise classification criteria and has been given in the following table.

**Table 8.9: Ground water Quality Data<sup>95</sup>**

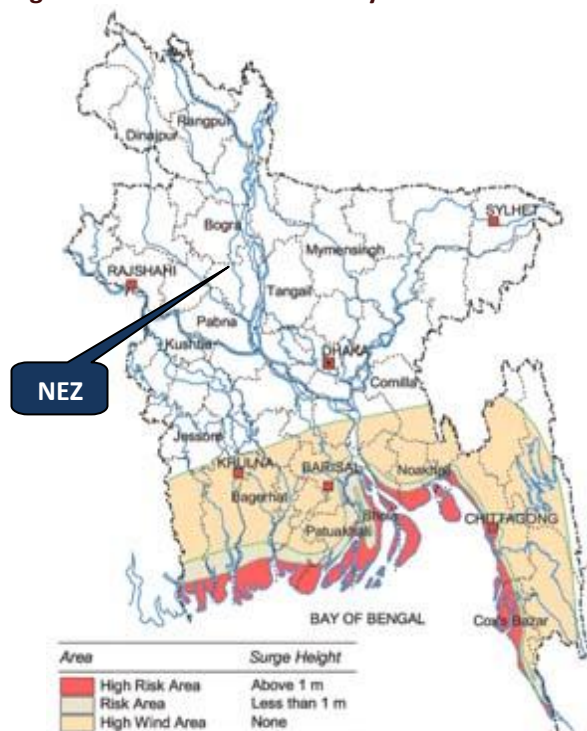
|    | Parameter           | Unit      | Concentration present | Bangladesh Standard for Drinking water (ECR, 1997) | Analysis Method        |
|----|---------------------|-----------|-----------------------|--|------------------------|
| 1. | Temperature         | °C        | 25                    | -  | Digital thermometer    |
| 2. | pH                  |           | 6.80                  | 6.5-8.5  | pH meter               |
| 3. | TDS                 | mg/L      | 255                   | 1000   | Conductivity meter     |
| 4. | Turbidity           | mg/L      | 5.7                   | 10   | Turbidity meter        |
| 5. | EC                  | µc/cm     | 527.6                 | -  | Conductivity meter     |
| 6. | Phosphate           | mg/L      | 0.21                  | 6  | APHA, 1998             |
| 7. | DO                  | mg/L      | 1.45                  | 0.3-1  | DO meter               |
| 8. | Alkalinity          | mg/L      | 258                   | -  | APHA, 1998             |
| 9. | Total coliform (TC) | CFU/100ml | Nil                   | Nil  | Membrane Filter method |
| 10 | Fecal Coliform      | CFU/100ml | Nil                   | Nil  | Membrane Filter method |
| 11 | Arsenic             | mg/L      | 0.01                  | 0.05   | AAS                    |
| 12 | Chromium            | mg/L      | <0.01                 | 0.05   | AAS                    |
| 13 | Lead                | Mg/L      | BDL                   | 0.05   | AAS                    |

\*CFU= Colony Forming Unit; \*BDL= Below Detection limit

**Tropical Cyclones and Tidal Flooding:** Natural hazards can be categorized into three broad categories: exogenic hazards caused by the earth surface processes (flood, riverbank erosion, coastal erosion, landslide, soil erosion and groundwater contamination) ; endogenic hazards caused by internal earth processes (earthquake and volcanic eruption) and atmospheric hazards caused by atmospheric processes (storm, cyclone, northwester, tornado, hurricane, drought, etc.) . On many occasions there are overlaps between these different events. Natural hazards can be profiled against seven basic criteria such as event magnitude, frequency of occurring, duration and areal extent, speed of onset, spatial dispersion and temporal spacing.

<sup>95</sup> Bangladesh Environmental Engineering Training and Lab Services Ltd

Figure 8.7: Position of NEZ at Cyclone Affected Areas<sup>96</sup>



The cyclone risk map shows the location of NEZ is in a very safe zone. Due to a cyclone, rising of water level and tidal flooding from Rivers was not experienced before in the project area. The flood prone map of Bangladesh shows that proposed NEZ falls in monsoon flood area. So, the project area is affected, though infrequently, by internal and external flood. External floods are caused in the low area by over flow of sorrowing river and khal, while internal floods are caused by storm water due to rainfall and insufficient drainage facilities.

Figure 8.8: Position of NEZ at Flood Prone Areas<sup>97</sup>



<sup>96</sup> <https://www.thebangladesh.net/cyclone-maps-of-bangladesh.html#map-1>

<sup>97</sup> <http://en.banglapedia.org/index.php?title=Flood>

**Salinity:** Salinity problems are mainly associated with coastal regions in Bangladesh. The Figure given below shows the saline zones of Bangladesh which clearly indicates that the proposed NEZ site is in salinity free zone. The surface water of rivers are non-saline. The project will use ground water through deep tube-well and will harvest rain water during rainy season..

**Figure 8.9: Salinity Zones of Bangladesh<sup>98</sup>**



**Drainage Congestion and Water Logging:** Droughts most commonly affect the northwestern region, which generally has lower rainfall than the rest of the country. The proposed project area occupies the Ganges River Flood Plain. The average elevation in the proposed location is around 14m from MSL. Nearest water body of the project site are Chalanbeel and Barnai River. The floodwater does not stand resulting no water logging. The topography does not inhibit drainage in the project site. The drainage pattern of the project area follows the land gradient, sloping etc. with water body. It will be developed proper drainage system for the site and preserved the natural water bodies within the project site.

**Erosion and Sedimentation:** millions of people of the country are affected by riverbank erosion every year that damages standing crops, farmland and homestead land. The project area is in Ganges River Flood Plain and it is estimated that about 5% of the total floodplain of Bangladesh is directly affected by riverbank erosion. Riverbank erosion is problematic in about 94 upazila out of 496 of the country. During monsoon, extensive overbank spills, bank erosion and bank-line shifts have become typical. The unpredictable shifting behaviour of the rivers and their encroachments not only affect the rural floodplain population but also the urban growth centres and infrastructures.

<sup>98</sup>[http://en.banglapedia.org/index.php?title=Saline\\_Soil](http://en.banglapedia.org/index.php?title=Saline_Soil)

**Table 8.10: Occurrence of River Erosion in Various Upazilas of Natore District (2008-2011)<sup>99</sup>**

| Upazila     | 2008 | 2009 | 2010 | 2011 |
|-------------|------|------|------|------|
| Bagatipara  | No   | No   | No   | No   |
| Baraigram   | No   | No   | No   | No   |
| Gurudaspur  | No   | No   | No   | No   |
| Lalpur      | No   | No   | No   | No   |
| NatoreSadar | No   | No   | No   | No   |
| Singra      | No   | No   | No   | No   |

From the above table it is evident that generally river erosion doesn't occurs in the project area.

**Navigation:** The project area lacks steamer/launch stations. Major communication facilities are roads and railways.

## 8.4 Land Resources

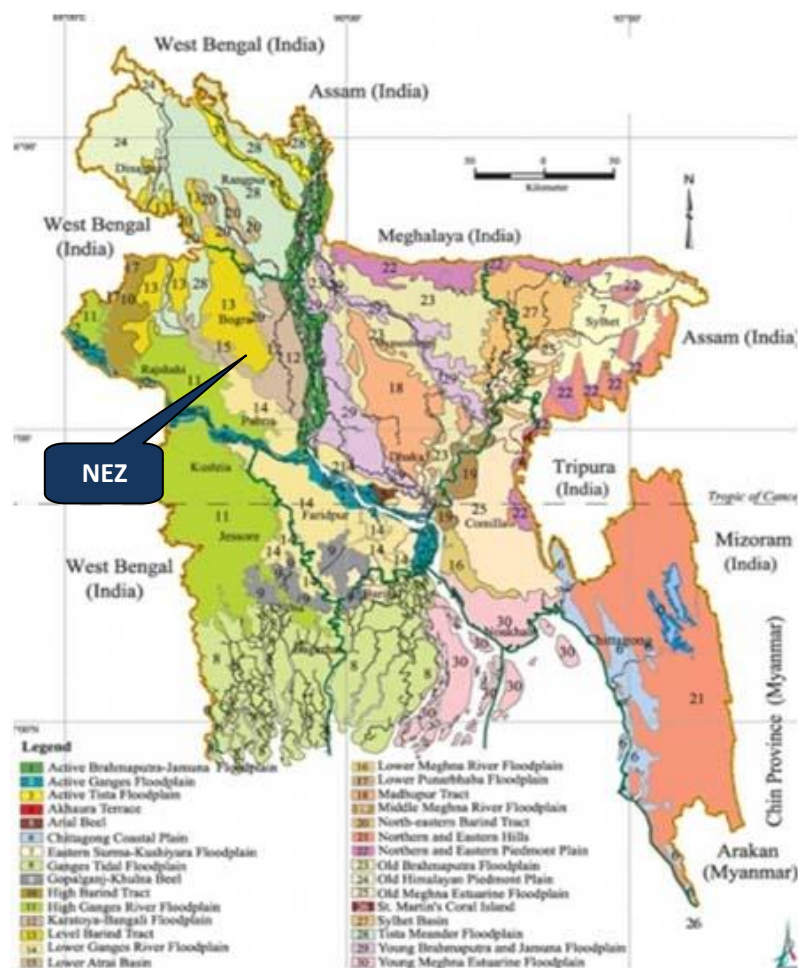
**Agro-ecological regions:** Agro-ecological Zones are land areas categorized on the basis of four elements such as physiography, soils, land levels in relation to flooding and agro-climatology. Physiography forms the primary element in defining and delineating the agro ecological regions in Bangladesh. Soils form the second element in defining and differentiating agro ecological zones as soil conditions determine important properties for plant growth, moisture supply, root aeration and nutrient supply. The third factor is land level in relation to flooding. The last one is related to different agricultural products for different climatic conditions of the regions.<sup>100</sup> It is considered in identifying agro ecological zones in Bangladesh comprises the four climatic zones of the country. Agro-ecological zone indicates an area characterized by homogeneous agricultural and ecological characteristics. This homogeneity is more prominent in the sub-region and unit levels.

The agro-ecological zones of Bangladesh have been divided in 30 regions. The proposed NEZ falls under the High Ganges River Flood plain. This region includes the western part of the Ganges river floodplain which is predominantly highland and medium highland. Most areas have a complex relief of broad and narrow ridges and inter-ridge depressions. The upper parts of high ridges stand above normal flood level. Lower parts of ridges and basin margins are seasonally shallowly flooded. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low.

<sup>99</sup> BBS, 2011

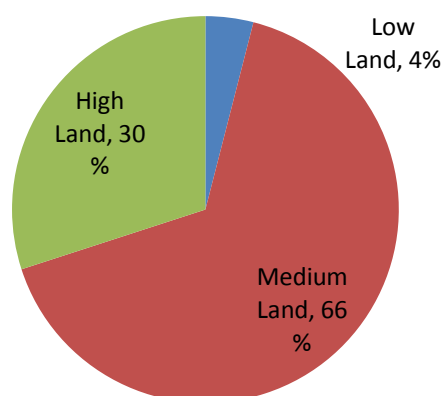
<sup>100</sup> Banglapedia, 2018

Figure 8.10: Agro-Ecological Regions of Bangladesh<sup>101</sup>



**Land Types:** The land type characteristics are uniform within the study area, although the land types of Natore district are not uniform. Out of total 71,975 acres of land, 3.8% (2,730 acres) low land, 65.7% (47,327 acres) medium and 30.5% 21918 acres are high land.<sup>102</sup> The following figures show the land types of Natore Sadar upazila.

Figure 8.11: Land Types of the Project Area



**Soil Texture:** Soil texture is known as a qualitative classification instrument used both in the field and laboratory for agricultural soils to determine classes based on their physical texture. While

<sup>101</sup> [http://en.banglapedia.org/index.php?title=Agroecological\\_Zone](http://en.banglapedia.org/index.php?title=Agroecological_Zone)

<sup>102</sup> BBS Natore District Statistics, 2011

classes are distinguished in the field and the class is then used to determine crop suitability and to approximate the soils responses to environmental and management conditions such as drought or calcium (lime) requirements.

As a qualitative rather than a quantitative tool it is a fast, simple and effective means to assess a soil's physical characteristics. The proposed NEZ is located in Ganges River flood plain. General soil types predominantly include calcareous dark grey floodplain soils and calcareous brown floodplain soils. Organic matter content in the brown ridge soils is low but higher in the dark grey soils. Soils are slightly alkaline in reaction. General fertility level is low.<sup>103</sup> The soil classification map of Bangladesh shows that the soil texture of the project area is combination of Entisols and Inceptisols.

Figure 8.12: Soil Classification Map of Bangladesh<sup>104</sup>

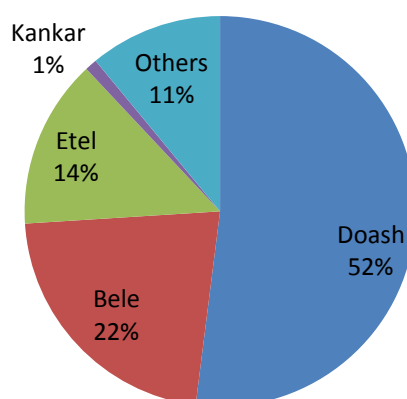


The following figure represents the broad soil classification of the project area. The soil of the project area is the combination of Doash, Bele, Etel, Kankar and others.

<sup>103</sup> Banglapedia, 2018

<sup>104</sup> [http://en.banglapedia.org/index.php?title=Bangladesh\\_Soil](http://en.banglapedia.org/index.php?title=Bangladesh_Soil)

**Figure 8.13: Broad Soil Classification of Rajshahi district<sup>105</sup>**



#### 8.4.1 Agricultural Resources

**Farming Practice:** Total area of Natore Sadar upazila is 401.29 sq km.<sup>106</sup> there is no reserve forest within the project area. The Bangladesh Bureau of Statistics, 2011, provided the land area based on utilization of Natore Sadar upazila.

Farmers cultivate their crops using their perception and indigenous knowledge about the environment, especially the duration and magnitude of flood. The project area has a diversified farming practice like rice, jute, wheat, potato, vegetables, spices, pulses, oil seeds, sugarcane and other minor crops etc. Based on the ownership of agricultural land, Landowner is 51.20% and landless is 48.8 % in Natore Sadar upazila.<sup>107</sup> The following table shows the land area based on utilization of the project area.

**Table 8.11: Land Area Based on Utilization of the Project Area<sup>108</sup>**

| Name of the Crops | Area (Acres) | Production (Metric ton) |
|-------------------|--------------|-------------------------|
| Wheat             | 12,200       | 17,192                  |
| Jute              | 10,650       | 11,751                  |
| Sugarcane         | 7,595        | 143,467                 |
| Lentil (Masur)    | 4,595        | 7,571                   |
| Mug               | 2,600        | 5,070                   |
| Maize             | 810          | 4,757                   |
| Gram              | 6            | 8                       |
| Motor             | 290          | 435                     |
| Kheshari          | 350          | 437                     |
| Mash-Kalai        | 215          | 215                     |
| Potato            | 735          | 15,840                  |
| Rape and mustard  | 4,810        | 7,923                   |
| Ground nut        | 650          | 1,294                   |
| Til               | 590          | 804                     |
| Pepper            | 245          | 367                     |
| Onion             | 4,400        | 50,875                  |
| Garlic            | 1,375        | 11,000                  |
| Turmeric          | 750          | 16,419                  |

<sup>105</sup> BBS Natore District Statistics, 2011

<sup>106</sup> Banglapedia, 2018

<sup>107</sup> Same as above

<sup>108</sup> BBS Natore District Statistics, 2011

| Name of the Crops         | Area (Acres) | Production (Metric ton) |
|---------------------------|--------------|-------------------------|
| Ginger                    | -            | -                       |
| Tomato                    | 115          | 2,875                   |
| Radish                    | 160          | 2,800                   |
| Bean                      | 360          | 5,940                   |
| Pumpkin                   | 95           | 1,425                   |
| Parble (Potol)            | 221          | 3,262                   |
| Cabbage                   | 95           | 2,090                   |
| Brinjal                   | 465          | 7,672                   |
| Lady's finger             | 50           | 712                     |
| Arum                      | 85           | 1,062                   |
| Cauliflower               | 105          | 1,837                   |
| Cucumber                  | 25           | 600                     |
| Papaya                    | 75           | 1,500                   |
| Guava                     | 110          | 1,320                   |
| Lime and Lemon            | 65           | 305                     |
| Jackfruit                 | 136          | 1,904                   |
| Banana                    | 510          | 2,550                   |
| Pineapple                 | -            | -                       |
| Mango                     | 860          | 8,950                   |
| Litchi                    | 136          | 816                     |
| Blackberry                | 80           | 320                     |
| Water melon/Melon (Bangi) | 45           | 1,440                   |

#### 8.4.2 Land Use and Cropping Pattern

Five crop combination has been practiced in the project area *i.e.* aman-boro-aus-wheat-sugarcane. Sugarcane is the eighth important crop the country which grows best in Natore.<sup>109</sup> The cropping intensity of Natore district is 160 % while the national cropping intensity is about 173 % in 2015-16.<sup>110</sup> Out of 74100 acre of temporary cropped area, 168 acre, 50,418 acre, 20,881 acre, and 2,801 acre are current fallow, single, double and triple cropped area, respectively.<sup>111</sup> The following figure shows the agricultural land use map of Bangladesh.

<sup>109</sup> Banglapedia

<sup>110</sup> Yearbook of Agricultural Statistics, 2016

<sup>111</sup> BBS, 2011



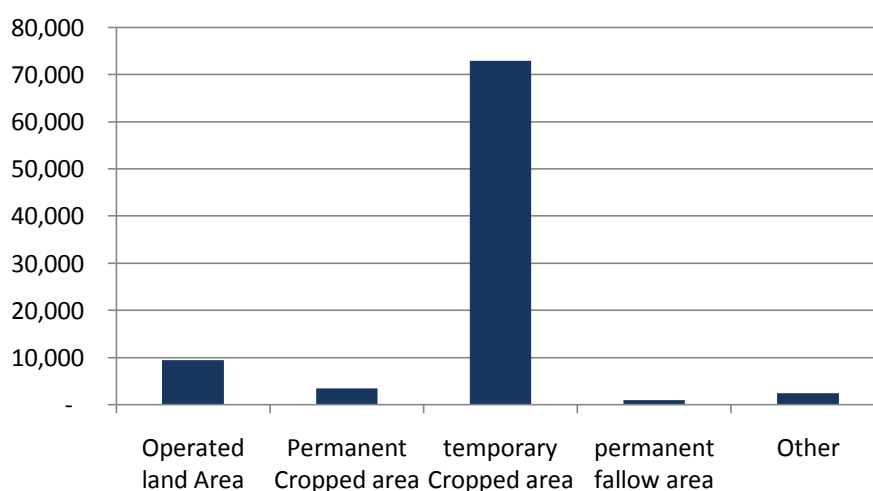
Figure 8.14: Agricultural land use Map of Bangladesh<sup>112</sup>



**Cropped Area:** The total operated land area is 9,166 acres, permanent cropped area is 2,812 acres, temporary cropped area is 74,100 acres, permanent fallow area is 144 acres and other is 785 acres in Natore Sadar upazila under Natore district. The following figure shows the cropped area of the project site.

<sup>112</sup> <https://www.thebangladesh.net/agricultural-landuse-of-bangladesh.html>

Figure 8.15: Cropped Area in the Project Site<sup>113</sup>



There is no cropped area found within the project site. The project will not hamper the agricultural practices and development; rather the farmers could be benefited indirectly by promotion of economic growth of the area by the project.

**Crop Production:** The major crops in the project area are paddy (Boro) , wheat, sugarcane and betel leaf. The following table shows the rice production in the project area.

Table 8.12: Production of Rice in the Project Area during the Period of 2009-2011<sup>114</sup>

| Year      | Types of rice |                         |             |                         |             |                         |
|-----------|---------------|-------------------------|-------------|-------------------------|-------------|-------------------------|
|           | Aus           |                         | Aman        |                         | Boro        |                         |
|           | Area (Acre)   | Production (Metric ton) | Area (Acre) | Production (Metric ton) | Area (Acre) | Production (Metric ton) |
| 2009-2010 | 605           | 430                     | 33,750      | 28,287                  | 34,930      | 26,179                  |
| 2010-2011 | 1,902         | 3,234                   | 21,464      | 40,781                  | 31,504      | 155,944                 |

**Crop Damage:** Crop productions are damaged by different climatic threats like flood, rainstorm, heavy rainfall, untimely rainfall, river bank erosion etc. Among the threats, floods and river bank erosions are very common in this area. Flooding is beneficial only within certain limits of timing, duration and magnitude. The aman rice crop suffers damage due to sudden rain and riverine flood with strong wind in summer in the project area. The project will not be a reason for crop damage.<sup>115</sup>

**Main Constraints of Crop Damage:** Economic, environmental and other factors can constrain crop production in different ways. Economic demotivation and financial problem can cause initial pessimism in production decision. Environmental hostile factors like disasters and unwanted conditions can cause harms in latter stage of production. Main constraints of crop production in the project area are-

- Irregular irrigation facilities during winter season
- Flood water submerged the land during rainy season

<sup>113</sup> BBS Natore District Statistics, 2011

<sup>114</sup> Same as above

<sup>115</sup> Ahmed, 2011

- Lack of training for suitable cultivation and overcoming the loss of crop to the farmers
- Non-introducing the new high yielding varieties and new technologies;
- Low fertility of land
- Lack of open market sell of seeds and fertilizer, quality seed and other inputs as demanded by farmers
- Unavailability of credits
- Lack of agricultural loans of flood-affected farmers

## 8.5 Livestock and Poultry

Livestock and poultry has been playing significant role in the economy of the study area, as in the agricultural share of economy of Bangladesh. Along with agriculture, it is an essential part of integrated farming system. Livestock provides supports for cultivation like threshing and crushing of oil seeds; cow dung as a source of manure and fuel; a ready source of funds; and meat, milk and eggs for household consumption. Agricultural by-products can be used as fodder and feed of Livestock and poultry. There are 67833 Cow and buffalo, 50340 goat and 4695 sheep in the project area. Moreover, there are also 394,010 hens and cock, 102,890 duck in the project site.<sup>116</sup>

**Table 8.13: Status of Livestock and Poultry at the Project Area<sup>117</sup>**

| Particulars     | Number  |
|-----------------|---------|
| Cow and buffalo | 67,833  |
| Goat            | 50,340  |
| Sheep           | 4,695   |
| Hen and Cock    | 394,010 |
| Duck            | 102,890 |
| Others          | 7,840   |

Most of the households in the project area have poultry and livestock, a practice that helps to reduce poverty through generating alternative income and employment. The common livestock and Poultry found in the project area is Cow/bullock, Buffalo, Goat, Sheep, Duck, Chicken etc

**Feed and Fodder Shortage:** Fodders and feed is the most important input of livestock rearing. Crop residues and naturally grown grasses alongside roads, river bank, char lands, etc. are the main feed for the cattle in Bangladesh. Shortage of fodder and high price of feed ingredients are affecting the small holders significantly. Dairy units are running off due to shortage of fodder or grazing land/ high price of feed ingredients. The pasture land has reduced significantly all over the country due to cultivation of High Yielding Varieties (HYV) of rice to meet the demand of growing population. Climate change is causing unusual behaviour in temperature, rainfall, flooding pattern etc., and affecting either in natural growth or damaging the pasture grasses. Besides, adulteration of commercial feed by the miller; Inadequate or no quality control system of commercial feed is traceable.

A potential threat to natural growth of grasses in the char lands for grazing of animals. Fodder cultivation is not generally practiced by the smallholders, because of land constraints belonging to them. However, Private dairy farmers grow the fodder for their cows either in their own land or leased out lands from others. Most of the poor families do not have their adequate land to

<sup>116</sup> BBS Natore District Statistics, 2011

<sup>117</sup> Same as above

grow fodders. They are to depend on naturally grown grasses in alongside roads, embankments and polders, and also on aquatic plants. The smallholders suffer from shortage of fodder during cropping seasons. Seasonal variation is experienced by the farmers in availability of forages. Crop residues and a very little amount of green forages are given to their animals throughout the year. The dairy farmers cultivate maize as fodders and fodders of exotic and high yielding varieties for their animals. Some of these are perennial type, such as: Napier, Para, German, Sudan grass, Jumbo, etc. However, fodder cultivation in cultivable land depends on opportunity costs with other crop.<sup>118</sup>

Constraints of feeds and fodder availability in the project site for cattle can be summarized as follows:

1. Scarcity of grazing land
2. Scarcity of land for fodder cultivation
3. Low quality and adulterated feed in the market
4. Use of crop residues as household cooking fuel and other purposes.
5. Change in cropping pattern
6. Lack of standards and quality control system
7. Lack of knowledge of feeding system
8. Lack of coordinated effort

***Livestock/Poultry Diseases:*** Parasites and diseases cause serious losses in the livestock and poultry production. Compounding factors make the control of health problems difficult and they include:

1. General low level of nutrition
2. Large livestock population
3. Warm humid climate
4. Congestion of animals during annual flooding
5. Difficult communications impede implementing control programs

The government has estimated that losses due to internal parasites are far greater than losses caused by diseases but both are serious. Mainly, adequate levels of nutrition would significantly reduce production losses caused by parasites. The most frequently reported diseases among cattle and buffaloes are anthrax, black quarter and foot and mouth disease. Newcastle disease, fowl pox, fowl cholera and duck plague are common among poultry.<sup>119</sup>

The most crucial period is between July and October (rainy season) for outbreak of livestock and poultry diseases. The duck plague generally occurs in summer. However, some diseases prevail throughout the year. During monsoon season, the wet condition of the animal shelter promotes various kinds of diseases to the bullocks and cows. The unhygienic condition of the courtyards during this season may also spread the diseases to the poultry birds.

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<sup>118</sup>Bangladesh Delta Plan, 2010

<sup>119</sup>BARC, 1985

## 8.6 Fisheries

The demand for fish being considerable, various modes of catching fish is practice. Many varieties of fresh water fishes are available in the district. Most of the supply comes from Rivers, ponds, canals and low lying areas inundated by rain water.<sup>120</sup> The information regarding fisheries in Natore Sadar upazilla is given in the following table.

**Table 8.14: Fish Production in Natore Sadar Upazila<sup>121</sup>**

|                     | Natore Sadar Upazilla |
|---------------------|-----------------------|
| Number of pond      | 8,400                 |
| Number of Dighee    | 8                     |
| Number of fisherman | 2,499                 |
| Production of fish  | 10,554                |

**Problems and Issues:** Fish biodiversity is affected by morphological changes of River, disruption of ecology, intensive agriculture, indiscriminate fishing, and loss of River-khal connectivity for filling wetlands and water regulatory structures on khals on the project area. The key fisheries problems and issues identified during baseline survey are as follows:

- Unplanned and indiscriminate fishing using monofilament gill net, and overexploitation of fishes by using large number of narrow meshed estuarine set bag nets for fishing;
- Interrupting fish migration and movement due to improper management and mal-functioning of the water regulatory structures along with encroachment and barriers;
- Siltation of internal khals, causing loss to the year round river-khal connectivity;
- Lack of quality fish seed and feed for the improved aquaculture practices;
- Insufficient loan facilities for aquaculture practices;
- Lacking of extension services and updated information;
- Poor market facility;
- Prevalence of fish diseases;
- Lack of technical knowledge on pond management; and
- Insufficiently trained farmers in the project area

**Habitat Description:** On the basis of habitat of fisheries of the study area are classified under two broad categories: capture fisheries and culture fisheries. Rivers and Internal khals are considered under capture fish habitat; whereas the ponds: homestead ponds and commercial ponds are classified under culture fisheries. Fish habitat in Rivers and internal khals is generally the open source of fisheries for local people like non-commercial professional and household level fishermen. It also enriches the inland closed water commercial and private culture of fisheries like ponds, leased beels, etc. especially during rainy season.

**Fish Production and Effort:** The annual fish production of Natore district in the year of 2013-14 and 2014-15 were 13107 and 13531 metric ton, respectively (Agricultural yearbook, 2016) .Different types of fishing method used from prehistoric times and now fishing methods had

<sup>120</sup> BBS Natore District Statistics, 2011

<sup>121</sup> Same as above

been modified. Generally gears are those equipment that are used to catch the fishes. The fishermen selected their fishing gears depending on types of water body, different operation area, depth of water and availability of target species to be caught. Major categories of gears include nets, traps and hooks. For fishing purpose, a wide variety of nets such as gill nets, seine nets, lift nets, push nets and cast nets were usually used. The fishing traps were Polo, Hancha, kholsun, Chunga, etc. For line fishing chip barshi (hook), wheelbarshi, Jianibarshi, Tagi and Daun (longline) were used. All types of gears were broadly classified into four major categories. These groups were nets, traps, hook and lines and spears.

**Fish Migration:** Many types of fish migrate on a regular basis, on time scales ranging from daily to annually or longer, and over distances ranging from a few metres to thousands of kilometres. Fish usually migrate to feed or to reproduce, but in other cases the reasons are unclear. Migrations involve the fish moving from one part of a water body to another on a regular basis.

The open water fish species migrate for spawning and feeding to open and regulated khals as they use these khals for feeding and shelter ground. Most of the open water fishes choose still water during that time and the migration is very crucial for reproduction of fishes. Some fish species migrate horizontally to these water bodies as part of their life cycle. Due to sedimentation channel bed and water control structures hamper the migration of fish and other aquatic biota. Fish species such as Tengra, Phaisa, Gulsha, Khorsula, etc. migrate horizontally to these water bodies as part of their life cycle. A difference can be made between main channel migratory species, such as the major carps and the floodplain resident species that are often small and have accessory respiratory systems and prolific reproduction.

**Fish Biodiversity:** The project area is rich in fish biodiversity. The fisheries resources in the Baral River and surrounding water bodies were investigated in field survey as well from secondary sources. In this area, several carp, catfish, perch species were found. A list of fisheries species in the proposed project site is given in the following table.

**Table 8.15: List of Fish Species found in Project Area<sup>122</sup>**

|    | Local (Bangladeshi) Name | English Name            | Scientific Name          |
|----|--------------------------|-------------------------|--------------------------|
| 1  | Rui                      | Rohu                    | <i>Labeorohita</i>       |
| 2  | Katla                    | Catla                   | <i>Catla Cattla</i>      |
| 3  | Mrigal                   | Migal                   | <i>Cirrhinus mrigala</i> |
| 4  | Kalibaush (kalbasu)      | Orange-fin labeo        | <i>Labeocalbasu</i>      |
| 5  | Air/Aor                  | Long Whiskered cat fish | <i>Spertaaor</i>         |
| 6  | Tit puti                 | Ticto barb              | <i>Puntius ticto</i>     |
| 7  | Nama chanda              | Elongate glass-perchlet | <i>Chanda nama</i>       |
| 8  | Ranga Chanda             | Indian glassy fish      | <i>Chanda ranga</i>      |
| 9  | Meni/bheda               | Gangetic leaf fish      | <i>Nandus nandus</i>     |
| 10 | Ghaira                   | Waking snakehead        | <i>Channa orientalis</i> |
| 11 | Baghair                  | Goonch                  | <i>Bagarius bagarius</i> |
| 12 | Bata                     | Bata                    | <i>Labeobata</i>         |
| 13 | Ritha                    | Rita                    | <i>Rita rita</i>         |
| 14 | Vadiouti                 | Pool barb               | <i>Puntius sophore</i>   |
| 15 | Punti                    | Swamp barb              | <i>Puntius chola</i>     |

<sup>122</sup> BBS Natore District Statistics, 2011

|    | Local (Bangladeshi) Name | English Name             | Scientific Name                |
|----|--------------------------|--------------------------|--------------------------------|
| 16 | Shol                     | snake head murrel        | <i>Channa striata</i>          |
| 17 | Gojar/ Gojal             | Giant snake head         | <i>Channamarulius</i>          |
| 18 | Pungash (river)          | Yellowtail catfish       | <i>Pangasius pagasius</i>      |
| 19 | Bacha                    | Batchwa Bacha            | <i>Eutropicchthys hvacha</i>   |
| 20 | Teri punti               | Onespot barb             | <i>Puntius terio</i>           |
| 21 | Gong tengra              | Gagatacenia              | <i>Gagatacenia</i>             |
| 22 | Darkina                  | Slender rasbora          | <i>Rasboradaniconius</i>       |
| 23 | Bhagna                   | Reba Carp                | <i>Cirrhinus reba</i>          |
| 24 | Golsa/ GolsaTengra       | Gangetic Mistus          | <i>Mystus cavasius</i>         |
| 25 | Mourala                  | Indian Carplet           | <i>Amblypharyngodon mola</i>   |
| 26 | Pabda                    | Pabo Cat fish            | <i>Ompakpabo</i>               |
| 27 | Ghora chela              | Ghora chela              | <i>Securiculagora</i>          |
| 28 | Boumach                  | Bengal loach             | <i>Boti adario</i>             |
| 29 | Muribacha                | Garua Bachcha            | <i>Clupisomagarua</i>          |
| 30 | Kajuli                   | Gangetic ailia           | <i>Ailia coila</i>             |
| 31 | Kajuli                   | Jamuna ailia             | <i>Ailichthys punctata</i>     |
| 32 | Khailsha                 | Banded gourami           | <i>Colisa fasciata</i>         |
| 33 | Chitol                   | Humped Featherback       | <i>Nototerusechitala</i>       |
| 34 | Foli                     | Grey Featherback         | <i>Notopterus notopterus</i>   |
| 35 | Tatkini/Bata/Bangla      | Reba carp                | <i>Cirrhinus reba</i>          |
| 36 | Shingi                   | Stinging catfish         | <i>Heteropneustes fossilis</i> |
| 37 | Mahur                    | Walking Catfish          | <i>Clarias batrachus</i>       |
| 38 | Dhela/ Dipali/ ketti     | Cotio                    | <i>Osteobramacotio</i>         |
| 39 | Sarputi / Swarnaputi     | Olive barb               | <i>Puntias sarana</i>          |
| 40 | KabashiTengra            | Gangetic mystus          | <i>Mystus cavasius</i>         |
| 41 | Poa                      | Otolithoides pama        | <i>Otolithoides pama</i>       |
| 42 | Phasa                    | Gangetic hairfin anchovy | <i>Setipinnaphasa</i>          |
| 43 | Khorsula                 | Corsula                  | <i>Rhinomugil corsula</i>      |
| 44 | Kakila                   | Freshwater garfish       | <i>Xenentodon cancila</i>      |
| 45 | Tepa                     | Ocellated pufferfish     | <i>Tetraodon cutcutia</i>      |

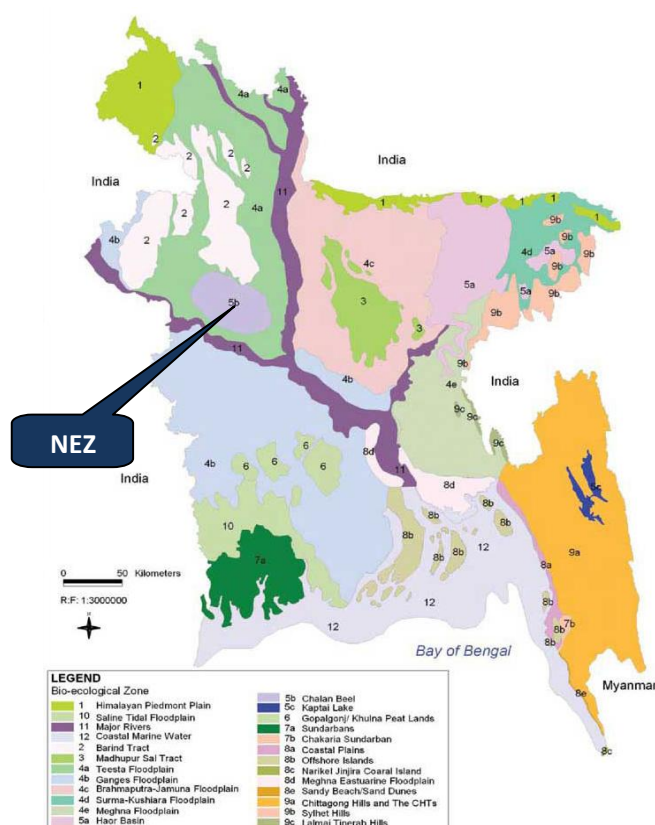
**Fisheries Management:** There is no fishery based community association found in the study area. Fishing right on existing fish habitats is limited. Enforcement of fisheries regulation is also weak. No fish sanctuary is found in the study area.

## 8.7 Ecological Resources

**Bio-ecological Zones:** In the context of physiographic and biological diversity IUCN, The World Conservation Union, has divided Bangladesh into 25 Bio-ecological Zones.<sup>123</sup> The study area has fallen under bio-ecological zones of Chalanbeel (5b) . Major physiographic units of this area are Ganges River floodplain. Average rainfall of this zone ranged from 1270-1780 mm. Calcareous dark grey and calcareous brown floodplain soils are found in this zone. The following figure shows the Bio-ecological zones of Bangladesh including the project area.

<sup>123</sup> Nishat et al., 2002

Figure 8.16: Bio-Ecological Zones of Bangladesh<sup>124</sup>



### 8.7.1 Common Flora and Fauna

**Floral diversity of the project area:** In general terms an ecological system can be defined as an assemblage of organisms (plant, animal and other living organisms - also referred to as a biotic community) living together with their environment (or biotope) , functioning as a loose unit. That is, a dynamic and complex whole, interacting as an "ecological unit". Ecosystems are functional units of interacting abiotic, biotic, and cultural (anthropogenic) components. All natural ecosystems are open systems where energy and matter are transferred in and out through the complex interactions of energy, water, carbon, oxygen, nitrogen, phosphorus, sulfur and other cycles. Appropriate mitigation program should be undertaken to protect the existing ecosystem from gaseous emissions and water discharge from the proposed NEZ.

**Terrestrial Flora:** : Terrestrial plants found during survey in and around the project area, on homesteads, roadside and agricultural lands have been listed. The project area provides the following major species of natural plants including herbs, shrubs, grasses and plants which are important both economically as well as for environmental sustainability of the area.

Table 8.16: List of Terrestrial Flora around the Project Site<sup>125</sup>

|    | Local Name | English Name | Scientific Name                             |
|----|------------|--------------|---|
| 1. | Am         | Mango        | <i>Mangifera indica L. (Anacard)</i>        |
| 2. | Jam        | Black bary   | <i>Syzygium cumini L. (Myrtaceae)</i>       |
| 3. | Zhau       | Zhau         | <i>Casuarina littorea</i>                   |
| 4. | Kathal     | Jackfruit    | <i>Artocarpus heterophyllus Lamk</i>        |
| 5. | Narikel    | Coconut      | <i>Cocos nucifera L. (Palmae)</i>           |
| 6. | Peyara     | Guava        | <i>Psidium Guajava (L) Bat. (Myrtaceae)</i> |

<sup>124</sup> Bio ecological zones of Bangladesh, IUCN

<sup>125</sup> BBS Natore District Statistics, 2011, Field visit



|     | Local Name | English Name         | Scientific Name                         |
|-----|------------|----------------------|---|
| 7.  | Kola       | Banana               | <i>Musa Paradisica</i>                  |
| 8.  | Khejur     | Date Palm            | <i>Phoenicis sylvestris</i>             |
| 9.  | Supari     | Betel nut            | <i>Areca catechu</i>                    |
| 10. | Shimul     | Silk cotton tree     | <i>Bombax ceiba L. (Bombacaceae)</i>    |
| 11. | Pitraj     | Pitraj               | <i>Aphanamixis polystachia</i>          |
| 12. | Babla      | Indian gumtree       | <i>Acacia nilotica</i>                  |
| 13. | Mandar     | Coral tree           | <i>Erythrina ovalifolia</i>             |
| 14. | Barak bans | Clumping bamboo      | <i>Bambusa balcooa</i>                  |
| 15. | Beora bans | Indian thorny bamboo | <i>Bambusa bambos</i>                   |
| 16. | Kamranga   | Carambola            | <i>Averrhoa carambola</i>               |
| 17. | Kadbel     | Wood Apple           | <i>Feronia limonia (L.)</i>             |
| 18. | Bel        | Indian Apple         | <i>Aegle marmelos (L.)</i>              |
| 19. | Tal        | Palm tree            | <i>Borassus flabellifer L. (Palmae)</i> |
| 20. | Jambura    | Citron               | <i>Citrus grandis</i>                   |
| 21. | Bash       | Bamboo               | <i>Podocarpus neriifolia</i>            |
| 22. | Dumur      | Fig tree             | <i>Ficus hispida</i>                    |
| 23. | Lebu       | Lemon                | <i>Citrus aurantifolia</i>              |
| 24. | Neem       | Margosa              | <i>Melia Azadirachta indica</i>         |
| 25. | Mehedi     | Henna                | <i>Lawsonia inermis</i>                 |
| 26. | Jamrul     | Wax Apple            | <i>Syzygium samarangense</i>            |
| 27. | Pepe       | Papaya               | <i>Carica papaya L (caricaceae)</i>     |
| 28. | Shajina    | Drumstick            | <i>Moringa oleifera</i>                 |

**Terrestrial Faun:** The terrestrial fauna including mammals, birds and amphibians around the project site area presented in the following table.

**Table 8.17: List of Terrestrial Fauna around the Project Site**<sup>126</sup>

|                | Local Name  | English Name     | Scientific Name                 |
|----------------|-------------|------------------|---------------------------------|
| <b>Mammals</b> |             |                  |                                 |
| 1.             | Chita       | Leopards         | <i>Panthera pardus</i>          |
| 2.             | Bonnoshukor | Wild boars       | <i>Sus scrofa</i>               |
| 3.             | Shial       | Jackals          | <i>Canis aureus</i>             |
| 4.             | Bon biral   | Jungle cat       | <i>Felis chaus</i>              |
| 5.             | Shial       | Fox              | <i>Vulpes bengalensis</i>       |
| 6.             | Khorgosh    | Hares            | <i>Orvctolagus cuniculus</i>    |
| 7.             | Kath biral  | Squirrels        | <i>Callosciurus pygerythrus</i> |
| 8.             | Goru        | Cow              | <i>Bos taurus</i>               |
| 9.             | Mohesh      | Buffalo          | <i>Bubalus bubalis</i>          |
| 10.            | Biral       | Cat              | <i>Felis : Catus</i>            |
| <b>Birds</b>   |             |                  |                                 |
| 1.             | Pati Hans   | Spot-billed Duck | <i>Anas poecilorhyncha</i>      |
| 2.             | Rajhans     | Bar-headed Goose | <i>Anser indicus</i>            |
| 3.             | Bok         | Heron            | <i>Mycteria</i>                 |
| 4.             | Sharos      | Stork            | <i>Ephippiarhynchus</i>         |
| 5.             | Machhranga  | Kingfisher       | <i>Alcedo atthis</i>            |
| 6.             | Payra       | Pigeon           | <i>Columba livia</i>            |
| 7.             | Chil        | Kite             | <i>Milvus migrans</i>           |
| 8.             | Shagoon     | Vulture          | <i>Gyps bengalensis</i>         |

<sup>126</sup> Same as above

|                   | Local Name  | English Name      | Scientific Name                                    |
|-------------------|-------------|-------------------|--|
| 9.                | Eagal       | Eagle             | <i>Accipiter badius</i>                            |
| 10.               | Ghughu      | Dove              | <i>Streptopelia tranquebarica</i>                  |
| 11.               | Kokil       | Cuckoo            | <i>Cuculus micropterus</i>                         |
| 12.               | Myna        | Common myna       | <i>Gracula religiosa autra</i>                     |
| 13.               | Kokil/Kuli  | Asian Koel        | <i>Eudynamis scolopaceus</i>                       |
| 14.               | Pencha      | Owl               | <i>Nocturnalus : Strigiformes</i>                  |
| 15.               | Dhushor Bok | Grey Heron        | <i>Ardeacinerea joui clark</i>                     |
| 16.               | Bulbuli     | Red vented Bulbul | <i>Microscelis amaurotis/<br/>Pycnonotus cafer</i> |
| 17.               | Shalik      | Indian mynah      | <i>Acridothera tristis</i>                         |
| 18.               | Chorai      | Sparrow           | <i>Passer domesticus</i>                           |
| 19.               | Doyel       | Magpie Robin      | <i>Copsychus saularis</i>                          |
| 20.               | Paira       | Pigeon            | <i>Columba livia domestica</i>                     |
| <b>Amphibians</b> |             |                   |  |
| 1.                | Beng        | Frog              | <i>Rana limnocharis</i>                            |

### 8.7.2 Ecosystem Services and Function

The Millennium Ecosystem Assessment (MA) defined ecosystem services as "the benefits people obtain from ecosystems." The MA also delineated the four categories of ecosystem services—supporting, provisioning, regulating and cultural. The national economy and the people of Bangladesh are inseparably linked to the productivity and sustainability of Bangladesh's ecosystem, including vast and differentiated terrestrial ecosystem that are seasonally variable in their characteristics as well. The population of the project area usually gets all types of ecosystem services as discussed below.

**Supporting services:** Ecosystem services "that are necessary for the production of all other ecosystem services". These include services such as nutrient recycling, primary production and soil formation. These services make it possible for the ecosystems to provide services such as food supply, flood regulation, and water purification.

#### **Products obtained from ecosystems**

- Food (including sea food and game) , crops, wild foods, and spices
- Raw materials (including lumber, skins, fuel wood, organic matter, fodder, and fertilizer)
- Genetic resources (including crop improvement genes, and health care)
- Water
- Biogenic minerals
- Medicinal resources (including pharmaceuticals, chemical models, and test and assay organisms)
- Energy (hydropower, biomass fuels)
- Ornamental resources (including fashion, handicraft, jewellery, pets, worship, decoration and souvenirs like furs, feathers, ivory, orchids, butterflies, aquarium fish, shells, etc.)

#### **Regulating services**

"Benefits obtained from the regulation of ecosystem processes"

- Carbon sequestration and climate regulation
- Waste decomposition and detoxification

- Purification of water and air
- Pest and disease control

#### Cultural services

"Nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences"

- Cultural (including use of nature as motif in books, film, painting, folklore, national symbols, architect, advertising, etc.)
- Spiritual and historical (including use of nature for religious or heritage value or natural)
- Recreational experiences (including ecotourism, outdoor sports, and recreation)
- Science and education (including use of natural systems for school excursions, and scientific discovery)
- Therapeutic (including eco therapy, social forestry and animal assisted therapy)

## 8.8 Potential Environmental Impacts and Mitigation Measures

| Item                | Expected Impacts   | Mitigation Measures and Environmental Management   |
|---------------------|--|--|
| Air Quality         | – Impact of air pollution, dust/emission gases by construction work              | – Sprinkle water around the Project site and roads<br>– Avoidance of intensive operation of construction machineries   |
| Water Quality       | – Discharging muddy water from bare land<br>– Wastewater from construction camps | – Installation of setting ponds or simple turbid water treatment<br>– Installation of septic tank<br>– Preparation of the discharge water treatment plan   |
| Waste               | – Construction waste by cut earthwork  | – Reuse the residual soil generated in cutting work for filling work in the site<br>– Preparation and implementation of the waste management program   |
| Noise and Vibration | – Impacts of noise and vibration by construction machineries and vehicles        | – Installation of sound-proofing sheet<br>– Avoidance of construction at night time<br>– Advanced notice for construction work time near the residential area<br>– Avoidance of intensive operation of construction machineries<br>– Speed limit for drivers |
| Hydrology           | – Impact on hydrology due to water consumption used in the construction work     | – Limited and short term usage of groundwater<br>– Preparation of tentative retention pond<br>– Suggest less water consumption industry  |
| Earthquake          | – Increasing of the damage of the earthquake in and around the Projects site     | – Compliance with the National Standard Operational Procedure for building construction  |



## 9 Social Review

### 9.1 Socio-economic Condition

Natore Sadar Upazila is the largest Upazila of Natore District in respect to population came into existence as an Upazila in 1793 and was upgraded into 1984. There are two views about the origin of the Upazila name. The first view is that, previously the present place of the Upazila headquarters was neither a high land nor a low lying area.

**Table 9.1: Demographic Conditions of the Project Area<sup>127</sup>**

| Key Indicators                        | District  |           | Upazila  |          |
|---------------------------------------|-----------|-----------|----------|----------|
|                                       | 2011      | 2001      | 2011     | 2001     |
| Population (Enumerated)               |           |           |          |          |
| Both Sex                              | 17,06,673 | 15,21,336 | 4,42,422 | 4,00,030 |
| Male                                  | 8,54,183  | 7,84,200  | 2,21,820 | 2,07,466 |
| Female                                | 8,52,490  | 7,37,136  | 2,20,602 | 1,92,564 |
| Urban                                 | 2,28,008  | 1,42,460  | 91,469   | 70,835   |
| Other Urban                           | -         | 49,366    | -        | 16,293   |
| Rural                                 | 14,78,665 | 13,29,510 | 3,50,953 | 3,12,902 |
| Annual growth rate (%)                | 1.14      | 9.23      | 1.00     | 0.81     |
| Sex Ratio                             |           |           |          |          |
| Total                                 | 100       | 106       | 101      | 108      |
| Urban                                 | 101       | 109       | 103      | 109      |
| Other Urban                           | -         | 106       | -        | 106      |
| Rural                                 | 100       | 106       | 100      | 107      |
| Household                             |           |           |          |          |
| Total                                 | 4,23,875  | 3,37,311  | 1,10,203 | 88,131   |
| Urban                                 | 55,663    | 30,718    | 21,489   | 15,151   |
| Other Urban                           | -         | 10,833    | -        | 3,576    |
| Rural                                 | 3,68,212  | 2,95,760  | 88,714   | 69,404   |
| Household Size (General)              |           |           |          |          |
| Total                                 | 4.01      | 4.50      | 3.98     | 4.52     |
| Urban                                 | 4.02      | 4.62      | 4.13     | 4.66     |
| Other Urban                           | -         | 4.52      | -        | 4.54     |
| Rural                                 | 4.00      | 4.49      | 3.94     | 4.49     |
| Area sq. km.                          | 1900.19   | 1896.06   | 401.12   | 401.28   |
| Area sq. mile                         | 733.66    | 732.07    | 154.87   | 154.93   |
| Density per sq. km.                   | 898       | 802       | 1103     | 997      |
| Density per sq. mile                  | 2326      | 2078      | 2857     | 2582     |
| Urbanization (%)                      | 13.36     | 12.61     | 20.67    | 21.78    |
| Literacy (7 years and above) (%)      |           |           |          |          |
| Both Sex                              | 49.6      | 41.5      | 55.6     | 45.4     |
| Male                                  | 51.9      | 45.4      | 58.4     | 49.9     |
| Female                                | 47.3      | 37.4      | 52.9     | 40.6     |
| School Attendance (5 to 24 years) (%) |           |           |          |          |
| Both Sex                              | 55.3      | 41.7      | 57.8     | 43.4     |
| Male                                  | 58.4      | 44.4      | 60.9     | 46.4     |
| Female                                | 52.3      | 38.9      | 54.7     | 40.3     |

<sup>127</sup> BBS Natore District Statistics, 2011

| Key Indicators                 | District  |           | Upazila  |          |
|--------------------------------|-----------|-----------|----------|----------|
|                                | 2011      | 2001      | 2011     | 2001     |
| Population (Adjusted)          |           |           |          |          |
| Both Sex                       | 17,74,832 | 15,91,813 | 4,60,563 | 4 18,959 |
| Male                           | 8,88,305  | 8,20,538  | 2,30,923 | 2,17,287 |
| Female                         | 8,86,527  | 7,71,275  | 2,29,640 | 2,01,672 |
| Administrative/Geographic Unit |           |           |          |          |
| Upazila                        | 6         | 6         | 1        | 1        |
| Union                          | 52        | 52        | 12       | 12       |
| Mauza                          | 1,174     | 1,272     | 255      | 263      |
| Village                        | 1,351     | 1,384     | 297      | 302      |
| Paurashava                     | 8         | 4         | 2        | 1        |
| Ward                           | 75        | 36        | 18       | 9        |
| Mahalla                        | 166       | 93        | 49       | 33       |

**Area and Location:** The Upazila occupies an area of 401.29 sq. km. It is located between 24°19' and 24°35' north latitudes and between 88°51' and 89°07' east longitudes. The Upazila is bounded on the north by Atrai Upazila of Naogaon District and Bagmara Upazila of Rajshahi District, east by Singra Upazila and Gurudaspur Upazila, south by Baraigram Upazila and Bagatipara Upazila and east by Puthia Upazila and Bagmara Upazila of Rajshahi District.

**Administrative/Geographic Unit:** The Upazila consists of 2 Paurashavas, 18 Paura Wards, 9 Mahallas, 12 Unions, 255 Populated Mauzas and 297 Villages. The average size of population of each paura ward and mahalla are 5082 and 1867 respectively. On the other hand, the average size of population of each union, mauza and village are 29246, 1376 and 1182 respectively.

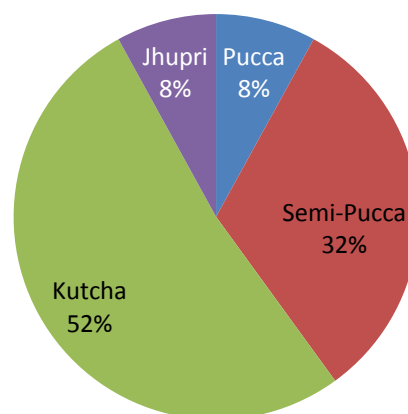
## 9.2 Status of Life Indicators

**Housing and Household Characteristics:** In the Upazila, there are 110,203 households. Distribution of household by type shows that there are 99.60% general unit, 0.07% institutional and 0.33% other unit.

**Household Size:** The average household size (General) for the Upazila is 4.0 persons, for rural area the size is slightly lower i.e., 3.9 and for urban area the size is slightly higher i.e. 4.1 (BBS, 2011). According to HIES (2016), the average household size for Rajshahi Division is 3.76, whereas it is 4.06 for national average.

**Type of Housing Structure:** In the Upazila, 7.8% general household live in Pucca house, 32.2% in semi-pucca house, 52.4% in kutch house and the remaining 7.6% live in Jhupri which is shown in a Pie-chart below:

**Figure 9.1: Housing Structure by Type at Natore Sadar Upazila<sup>128</sup>**



**Source of Drinking Water:** In Natore Upazila, 91.8% general households get the facility of drinking water from tube-well, 4.4% from tap and the remaining 3.8% household get water from other sources.

**Sanitation:** In the Upazila, 78.8% general households use sanitary latrine, 16.5% non-sanitary latrine and the remaining 4.7% have no toilet facility.

**Table 9.2: Water and sanitation status of the project area<sup>129</sup>**

| Water and Sanitation Indicators |                      | Natore Sadar Upazilla |
|---------------------------------|----------------------|-----------------------|
| Source of Water                 | Tube well            | 91.8%                 |
|                                 | Tap                  | 4.4%                  |
|                                 | Others               | 3.8%                  |
| Sanitation                      | Sanitary latrine     | 78.8%                 |
|                                 | Non-sanitary latrine | 16.5%                 |
|                                 | No latrine           | 4.7%                  |

It is observed that about 12.01% households use supply water in 2016 as against 10.62% in 2010. The highest proportion of 85.18% has reported to use tube well water. Its proportion was also the highest in 2010 as 85.37%. Sources of drinking water from various other sources contribute only 2.82% at the national level<sup>130</sup>.

**Access to Electricity:** All the 12 unions of the Upazila have brought under the Rural Electrification Program. However, a total of 55.8% general households reported to have electricity connection in the entire Upazila in 2011 as against 31.2% in 2001<sup>131</sup>.

According to HIES (2016), households with access to electricity show an increase to 75.92% in 2016 from 55.26% in 2010. In rural areas, it increased from 42.49% in 2010 to 68.85% in 2016, whereas in urban areas it has increase d to 94.01% in 2016 from 90.10% in 2010.

<sup>128</sup> BBS (Bangladesh Bureau of Statistics), 2011. Bangladesh Population and Housing Census. Community Report-Natore. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

<sup>129</sup> Same as footnote 47

<sup>130</sup> BBS (Bangladesh Bureau of Statistics), 2016. Preliminary Report on Household Income and Expenditure Survey (HEIS). Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

<sup>131</sup> BBS (Bangladesh Bureau of Statistics), 2011. Bangladesh Population and Housing Census. Community Report-Natore. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

**Population Characteristics:** According to Population and Housing Census 2011, the total population of the Upazila is 442,422 of which 221,820 are males and 220,602 are females. The sex ratio of the Upazila is 101 which have decreased in 2011 as against 108 in 2001<sup>132</sup>.

**Growth Rate:** The decadal population growth rate for the Upazila is 10.60% and the annual compound growth rate is 1.00%. The decadal growth rates over the last half-century are shown in table below.

**Table 9.3: Decadal Growth Rate of Population, 1951-2011**

| Decades   | Growth Rate (%) |
|-----------|-----------------|
| 1951-1961 | 8.4             |
| 1961-1974 | 35.3            |
| 1974-1981 | 28.2            |
| 1981-1991 | 56.6            |
| 1991-2001 | 51.3            |
| 2001-2011 | 10.6            |

**Literacy and Education:** Information on literacy and education is furnished below:

**Literacy:** In Natore Upazila, it is found that 55.6% population aged 7 years and over is literate. Literacy rates by sex of three consecutive censuses are presented in table below.

**Table 9.4: Literacy Rate by Sex, 1991-2011<sup>133</sup>**

| Item     | 1991 | 2001 | 2011 |
|----------|------|------|------|
| Both Sex | 31.2 | 45.4 | 55.6 |
| Male     | 37.5 | 49.9 | 58.4 |
| Female   | 24.4 | 40.6 | 52.9 |

The above table shows that the literacy rate of the Upazila in 2011 is 55.6% for both sex, 58.4 for male and 52.9% for female. It shows an increase of 10.2, 8.5 and 12.3 percent point in 2011 over 2001 for both sex, male and female respectively. In the Upazila, the literacy is the highest i.e., 82.5% in Ward No. 06 of Natore Paurashava and the lowest i.e., 46.1% in Halsa Union.

**Education:** School attendance of boys and girls between ages 3-29 years is presented below:

**Table 9.5: School Attendance Rate by sex<sup>134</sup>**

| Item     | 3-5 Years | 6-10 Years | 11-14 Years | 15-19 Years | 20-24 Years | 25-29 Years |
|----------|-----------|------------|-------------|-------------|-------------|-------------|
| Both Sex | 11.39     | 83.65      | 87.81       | 52.49       | 14.13       | 2.63        |
| Male     | 11.08     | 83.16      | 84.67       | 55.84       | 21.08       | 4.01        |
| Female   | 11.72     | 84.16      | 91.14       | 48.90       | 8.83        | 1.42        |

There exist sex differences in school attendance rates in different age groups which can be observed from the above table. The female attendance rate in the age groups 3-5, 6-10 and 11-14 years is higher than their male counterparts. On the other hand, male attendance rate in the age groups 15-19, 20-24 and 25-29 years is higher than female. The highest school attendance rate is 91.14% which is found for female in the age group 11-14 years.

<sup>132</sup> Same as footnote 50

<sup>133</sup> Same as footnote 50

<sup>134</sup> BBS (Bangladesh Bureau of Statistics), 2011. Bangladesh Population and Housing Census. Community Report-Natore. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

**Table 9.6: Number and Types of Different Educational institutions in the Project Area<sup>135</sup>**

| Name of the educational institutions                | Number of educational institutions |
|---|------------------------------------|
| Government primary school (class I-V)               | 94                                 |
| Registered primary school (class I-V)               | 76                                 |
| Private (non-registered) primary school (class I-V) | 4                                  |
| Kindergarten school (pre schooling)                 | 42                                 |
| NGO school  | 8                                  |
| Government secondary school                         | 2                                  |
| Non-government secondary school                     | 60                                 |
| School & college (operating jointly),               | 0                                  |
| Government college                                  | 2                                  |
| Non-government college                              | 4                                  |
| Madrasah  | 7                                  |
| Kawmi madrasah                                      | 10                                 |
| Ebtedayee madrasah                                  | 13                                 |
| Technical and vocational institution                | 4                                  |
| Medical college                                     | 0                                  |
| Agricultural and veterinary college                 | 0                                  |
| Number of (public or private) university            | 1                                  |

Noted Educational institutions of the project area are NawabSiraj-Ud-Daulah Government College (1965), Natore Government Boys' High School (1944), NabaBidhan Girls' High School (1967), Dighapatia PN High School (1852), Natore Maharaja GagadindraNath High School (1884), and 'Madhnagar SI High School (1930)<sup>136</sup>.

In HIES 2016 literacy rate stands at 65.6% at the national level where 67.8% for the male and 63.4% for the female population. In rural areas, literacy rates of population of both sexes, male and female are 63.3%, 65.5% and 61.2% respectively. In urban areas, literacy rates of population of both sexes, male and female are 71.6%, 74.0% and 69.3% respectively. In 2010, literacy rate was 57.9% at the national level for both sexes with 53.4% in rural areas and 70.4% in urban areas. Literacy rate of male was 61.1% and that of female population was 54.8%. In rural areas male literacy rate was 56.7% compared to 73.1% in urban areas. Similarly, female literacy rate was 50.2% in rural areas as compared to 67.7% in urban areas.

**Health:**The health profile for Natore Sadar Upazilla indicates that the most prevalent diseases within the project area are tuberculosis, pneumonia and diarrhea, etc. Besides, there observed other seasonal diseases in the project area like cold, seasonal viral fever etc. The condition of health services related institutions of the project are given in table below.

**Table 9.7: Health Related Facilities in the Project Area<sup>137</sup>**

| Health related facilities                        | Number of health related facilities |
|--|-------------------------------------|
| 1. Government health complex                     | 1                                   |
| 2. Private hospital/clinic                       | 4                                   |
| 3. Diagnostic center                             | 32                                  |
| 4. Missionary hospital and charitable dispensary | 1                                   |

<sup>135</sup> Same as footnote 53

<sup>136</sup> Banglapedia, (2018). NatoreSadarUpazila. Retrieved from [http://en.banglapedia.org/index.php?title=Natore\\_Sadar\\_Upazila](http://en.banglapedia.org/index.php?title=Natore_Sadar_Upazila)

<sup>137</sup> BBS (Bangladesh Bureau of Statistics), 2011. Bangladesh Population and Housing Census. Community Report-Natore. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.



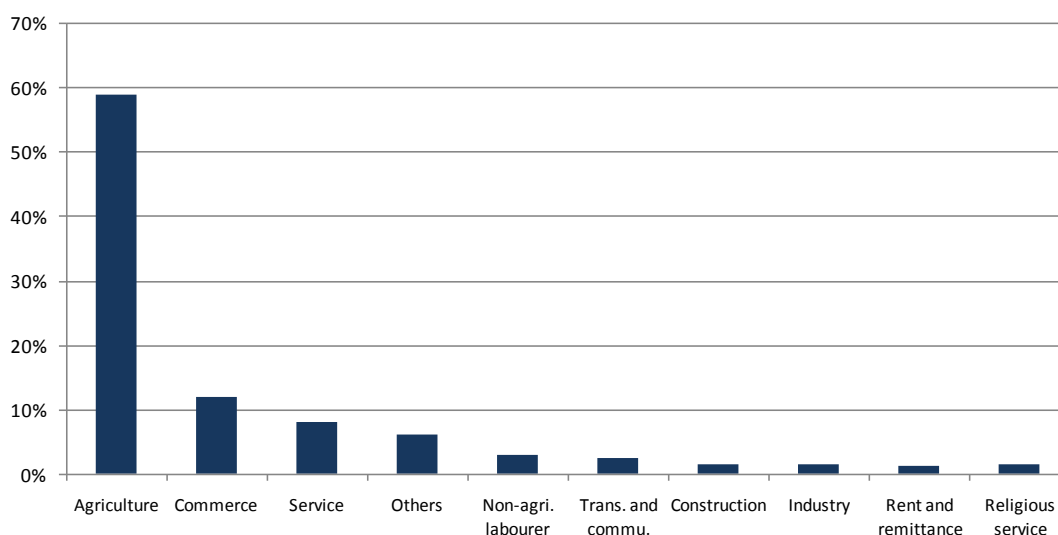
| Health related facilities  | Number of health related facilities |
|--|-------------------------------------|
| 5. Physician/Practitioner  | 116                                 |
| 6. Number of health center providing health and family planning services | 12                                  |
| 7. Number of existing family planning personnel                          | 112                                 |
| 8. Number of Community clinic  | 32                                  |

**Transportation and culture:** Road transport and railway communications are available in the project area. Dhaka–Natore national highway is adjacent to the project site. In Natore Sadar Upazila, there are 396km metalled road, 30km semi metalled road, 578km un-metalled road, 4.3 km waterways during monsoon season and 34km railways<sup>138</sup>. The culture of the area is manifested in various cultural forms, including music, dance and drama, art and craft, folklore and folktales, literature, philosophy and religion, festivals, etc.

### 9.3 Status of Economic Activity

There are various kinds of livelihood are existed in the project area. However, most of the population of the project area are agriculture dependent. The order of occupations of Natore Sadar Upazilla is agriculture 58.68%> commerce 15%> service 7.99%> others 6.53%> non-agricultural labourer 4.33%> transport and communication 4.06%> construction 1.22%> industry 1.02%> rent and remittance 0.99%> religious service 0.18%. The livelihood status of the population of the project area is given in figure below.

**Figure 9.2: Livelihood Patterns of the Project Area<sup>139</sup>**



The following table highlighted the figures of the establishments and the Total Persons Engaged (TPE) by different non-farm economic activities.

**Table 9.8: Number of Establishments and TPE and Average Size by Economic Activity<sup>140</sup>**

|    | Economic Activities  | Establishments | Total Persons Engaged (TPE) |        |        | Average Size of Establishments |
|----|----------------------|----------------|-----------------------------|--------|--------|--------------------------------|
|    |                      |                | Total                       | Male   | Female |                                |
| 1. | Mining and Quarrying | 25             | 67                          | 58     | 9      | 2.68                           |
| 2. | Manufacturing        | 9,705          | 62,121                      | 47,318 | 14,803 | 6.4                            |

<sup>138</sup> Same as footnote 56

<sup>139</sup> Banglapedia, (2018). NatoreSadarUpazila. Retrieved from [http://en.banglapedia.org/index.php?title=Natore\\_Sadar\\_Upazila](http://en.banglapedia.org/index.php?title=Natore_Sadar_Upazila)

<sup>140</sup> BBS (Bangladesh Bureau of Statistics), 2013. Economic Census of Natore District. Statistics and Informatics Division. Ministry of Planning, Government of the People’s Republic of Bangladesh, Dhaka.

|     | Economic Activities  | Establishments | Total Persons Engaged (TPE) |                |               | Average Size of Establishments |
|-----|--|----------------|-----------------------------|----------------|---------------|--------------------------------|
|     |  |                | Total                       | Male           | Female        |                                |
| 3.  | Electricity, Gas, Steam and Air Conditioning Supply                  | 45             | 789                         | 663            | 126           | 17.53                          |
| 4.  | Water Supply, Sewerage, Waste Management and Remediation Activities  | 8              | 14                          | 14             | 0             | 1.75                           |
| 5.  | Construction   | 176            | 732                         | 690            | 42            | 4.16                           |
| 6.  | Wholesale and Retail Trade, Repair of Motor Vehicles and Motorcycles | 39,100         | 11,5211                     | 11,1897        | 3,314         | 2.95                           |
| 7.  | Transportation and Storage   | 26,939         | 34,636                      | 32,642         | 1,994         | 1.29                           |
| 8.  | Accommodation and Food Service Activities (Hotel and Restaurants)    | 5311           | 11,460                      | 11,216         | 244           | 2.16                           |
| 9.  | Information and Communication  | 123            | 694                         | 647            | 47            | 5.64                           |
| 10. | Financial and Insurance Activities                                   | 509            | 4,790                       | 3,994          | 796           | 9.41                           |
| 11. | Real Estate Activities   | 3              | 17                          | 17             | 0             | 5.67                           |
| 12. | Professional, Scientific and Technical Activities                    | 451            | 1,455                       | 1,445          | 10            | 3.23                           |
| 13. | Administrative and Support Service Activities                        | 588            | 1,962                       | 1,948          | 14            | 3.34                           |
| 14. | Public Administration and Defense, Compulsory Social Security        | 329            | 6,153                       | 5,512          | 641           | 18.7                           |
| 15. | Education  | 2,164          | 17,811                      | 13,315         | 4,496         | 8.23                           |
| 16. | Human Health and Social Work Activities                              | 1,079          | 4,933                       | 3,878          | 1,055         | 4.57                           |
| 17. | Art, Entertainment and Recreation                                    | 113            | 321                         | 318            | 3             | 2.84                           |
| 18. | Other Service Activities   | 13,264         | 3,7933                      | 33,794         | 4,139         | 2.86                           |
|     | <b>Total</b>   | <b>99,932</b>  | <b>30,1099</b>              | <b>269,366</b> | <b>31,733</b> | <b>3.01</b>                    |

Source: Economic Census (BBS), 2013

The above table shows that the total number of 3, 01,099 persons are engaged in the total of 99,932 establishments in Natore, of whom 2, 69,366 (89.46%) are male and only 31,733 (10.54%) female. These figures imply that the male has the strong dominance in the job market, while the female is still insignificant. Moreover, analyzing the same figures of the female of the two censuses, it is found that female participation in the labor market has been significantly increased from 8.34% in 2001 & 03 to 10.54% in 2013.

**Table 9.9: Establishments and TPE by Sex and Average Size of Establishments by Upazila<sup>141</sup>**

| Upazila        | 2001 & 03      |  |        |        |                       | 2013           |                             |        |        |                       |
|----------------|----------------|--|--------|--------|-----------------------|----------------|-----------------------------|--------|--------|-----------------------|
|                | Establishments | Total Persons Engaged (TPE)<br>Average Size of Estd. |        |        | Average Size of Estd. | Establishments | Total Persons Engaged (TPE) |        |        | Average Size of Estd. |
|                |                | Total  | Male   | Female |                       |                | Total                       | Male   | Female |                       |
| Bagatipara     | 3,808          | 8,599  | 7,782  | 817    | 2.30                  | 6,233          | 17,193                      | 15,754 | 1,439  | 2.76                  |
| Baraigram      | 6,290          | 18,994   | 17,259 | 1,735  | 3.00                  | 15,295         | 50,522                      | 45,867 | 4,655  | 3.30                  |
| Gurudaspu<br>r | 3,960          | 12,793   | 11,687 | 1,106  | 3.20                  | 11,226         | 33,930                      | 30,743 | 3,187  | 3.02                  |
| Lalpur         | 6,177          | 13,466   | 12,325 | 1,141  | 2.20                  | 19,626         | 53,617                      | 46,570 | 7,047  | 2.73                  |

<sup>141</sup> Same as footnote 59

| Upazila       | 2001 & 03      |  |                |              |                       | 2013           |                             |                |               |                       |
|---------------|----------------|--|----------------|--------------|-----------------------|----------------|-----------------------------|----------------|---------------|-----------------------|
|               | Establishments | Total Persons Engaged (TPE)<br>Average Size of Estd. |                |              | Average Size of Estd. | Establishments | Total Persons Engaged (TPE) |                |               | Average Size of Estd. |
|               |                | Total  | Male           | Female       |                       |                | Total                       | Male           | Female        |                       |
| Natore Sadar  | 13,346         | 38,436   | 35,033         | 3,403        | 2.90                  | 28,350         | 97,862                      | 85,768         | 12,094        | 3.45                  |
| Singra        | 7,191          | 20,378   | 19,181         | 1,197        | 2.70                  | 19,202         | 47,975                      | 44,664         | 3,311         | 2.50                  |
| <b>Natore</b> | <b>40,772</b>  | <b>112,666</b>                                       | <b>103,267</b> | <b>9,399</b> | <b>2.80</b>           | <b>99,932</b>  | <b>301,099</b>              | <b>269,366</b> | <b>31,733</b> | <b>3.01</b>           |

The above table provides information on total establishments; total persons engaged (TPE) and average size of establishments by Upazila. The table discloses that in 2013, out of 6 Upazilas, Natore Sadar contains 28,350 establishments which is the highest in Natore District. It is followed by Lalpur with 19,626, Singra with 19,202, Baraigram with 15,295 establishments and so on.

Above data explain that TPE have been increased considerably over the two census periods. According to Census 2013, Natore Sadar upazila has got the highest average size of establishments with 3.45 followed by Baraigram with 3.30, Gurudaspur with 3.02, Bagatipara with 2.76, Lalpur with 2.73 and Singra with 2.50.

**Table 9.10: Number of Establishments by Size of Investment Invested by NRB by Upazila<sup>142</sup>**

| Upazila       | Establishments | Investment (in '000' Taka) |           |           |            |
|---------------|----------------|----------------------------|-----------|-----------|------------|
|               |                | Up to 50                   | 51-100    | 101-500   | Above 500  |
| 1             | 2              | 3                          | 4         | 5         | 6          |
| Bagatipara    | 15             | 2                          | 0         | 6         | 7          |
| Baraigram     | 98             | 15                         | 14        | 22        | 47         |
| Gurudaspur    | 51             | 2                          | 0         | 3         | 46         |
| Lalpur        | 31             | 5                          | 1         | 9         | 16         |
| Natore Sadar  | 198            | 14                         | 20        | 39        | 125        |
| Singra        | 61             | 5                          | 2         | 8         | 46         |
| <b>Natore</b> | <b>454</b>     | <b>43</b>                  | <b>37</b> | <b>87</b> | <b>287</b> |

The above table provides information on number of establishments by size of investment made by the Non-resident Bangladeshis (NRB). Out of 99,932 establishments, Non-Resident Bangladeshis have invested only in 454 establishments which is 0.45% of the total.

It is evident from the table that the largest size (Above Tk.500 thousand) holds the highest number 287 (63.22%) of establishments followed by Tk.101-500 thousand with 87 (19.16%), Tk. Up to 50 thousand with 43 (9.47%) and Tk. 51-100 thousand with 37 (8.15%) establishments.

Among the Upazilas, Natore Sadar ranks the top with 198 and Bagatipara, the bottom with 15 establishments having NRB investment.

## 9.4 Income and poverty

According to World Bank (2016), the poverty headcount ratio for Natore Sadar Upazila is 32% whereas it is 35% for Natore District<sup>143</sup>. Natore Sadar Upazila has 18.8% extreme poor with lower poverty line and 31.8% poor with upper poverty line observed by World Bank, BBS and WFP in 2010.

<sup>142</sup> BBS (Bangladesh Bureau of Statistics), 2013. Economic Census of Natore District. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

<sup>143</sup> <http://www.worldbank.org/en/data/interactive/2016/11/10/bangladesh-poverty-maps>

According to HIES (2016)<sup>144</sup>, poverty rates for 2000 to 2016 have been presented in the following table. It is observed from the table that poverty reduced more than one half during 2000 to 2016. During this period poverty has been reduced by 24.3%. This reduction is commendable; the rate of annual reduction is estimated at 1.5% per annum. Using lower poverty line the poverty incidence reduced from 34.3% to 12.9% during the period, a reduction of 21.4% during the period.

**Table 9.11: Poverty Head Count Rate (HCR) 2000-2016**

| Poverty Line       | 2016 | 2010 | 2005 | 2000 |
|--------------------|------|------|------|------|
| Upper Poverty Line | 24.3 | 31.5 | 40.0 | 48.9 |
| Lower Poverty Line | 12.9 | 17.6 | 25.1 | 34.3 |

The Head Count Rates of incidence of poverty in Rajshahi Division in 2010 was 16.8% using lower poverty line, whereas it 14.2% in 2016. For upper poverty line, 29.8% were in upper poverty line in Rajshahi Division, where 28.9% is found in 2016. The poverty gap for lower poverty line is still 2.3% for Rajshahi Division and it was 5.6% for upper poverty line (HIES, 2016).

The HIES 2016 findings show that average monthly household income is TK. 15,945 at national level, TK. 13,353 in rural area and TK. 22,565 in urban area. It has increased in 38.90% at national level in 2016 compared to 2010. The factors that contributed prominently for such increase of monthly household income are remittances, wide spread Social Safety Net Programmes, increase job opportunities and increase wage rates, etc. The rate of increased in estimated at 172.94% at the national level as compared to 2000.

## 9.5 Gender and women

The gender sex ratio for Natore Sadar Upazila was found 101 in 2011, whereas it was 108 in 2001. The literacy rate (7 years and above) for female in study area was 52.9% in 2011, and 40.6% in 2001, whereas it was about 58.4% for male in 2011 and about 50% in 2001 (BBS, 2011). In HIES 2016 literacy rate stands at 65.6% at the national level where 67.8% for the male and 63.4% for the female population. In rural areas, literacy rates of population of both sexes, male and female are 63.3%, 65.5% and 61.2% respectively. In urban areas, literacy rates of population of both sexes, male and female are 71.6%, 74.0% and 69.3% respectively. In 2010, literacy rate was 57.9% at the national level for both sexes with 53.4% in rural areas and 70.4% in urban areas. Literacy rate of male was 61.1% and that of female population was 54.8%. In rural areas male literacy rate was 56.7% compared to 73.1% in urban areas. Similarly, female literacy rate was 50.2% in rural areas as compared to 67.7% in urban areas.

In addition, women comprise almost 50% of the total population, which indicates a healthy sex ratio. This indicates a lower disparity for the girl child. However, women in Natore District may still be classified as vulnerable due to the fact that a large fraction of the same are not allowed to work or earn a living or pursue higher level education due to cultural and religious belief. They are mostly relegated to household chores, raising families and domestic works like raising cattle and crop harvest. They are also occasionally attributed to social evils like child marriage, polygamy and domestic violence.

<sup>144</sup> BBS (Bangladesh Bureau of Statistics), 2016. Preliminary Report on Household Income and Expenditure Survey (HIES). Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

## 9.6 Common property resources

Throughout the world there are assets that are neither private nor state property, but common property. The term denotes a class of institutions that govern the ownership and rights-of-access to assets. Common property assets are to be distinguished from "public goods," in that, unlike the latter, use by someone of a unit of a common property asset typically reduces the amount available to others by one unit (in economic terminology, such an asset is rivalrous in use). The institution of common property creates and harbors reciprocal externalities. As some of the most interesting examples of common property assets are natural resources, this entry is restricted to them. Social institutions, canals, playgrounds can be referred as common property resources. Hats, bazars and fairs are social institution or at least the mechanism of not only trade but also social interaction. The common property resources of the project are presented in table below.

**Table 9.12: Common Property Resources of the Project Area<sup>145</sup>**

| Common property resources | Number of common property resources |
|---------------------------|-------------------------------------|
| Daily Bazar               | 48                                  |
| Weekly hat                | 22                                  |
| Public library            | 2                                   |
| Cinema hall               | 1                                   |
| Registered club           | 53                                  |
| Orphanage                 | 3                                   |
| Auditorium                | 1                                   |
| Mosque                    | 2590                                |
| Eid-Gah                   | 265                                 |
| Temple                    | 90                                  |
| Church                    | 3                                   |
| Pagoda                    | 1                                   |
| Cyclone shelter           | 0                                   |
| Flood camp shelter        | 0                                   |
| Stadium/ Playground       | 2                                   |
| Park/ Amusement Park      | 2                                   |
| Bridge                    | 78                                  |
| Baily Bridge              | 1                                   |
| Culvert                   | 321                                 |

## 9.7 Conflict of Interest and Law and Order Situation

Natore District is situated on the north-west side of Bangladesh in Rajshahi Division. The total area of this District is 1900.19 sq km. The office of Superintendent of Police is situated at Hazra of Natore Sadar Thana. There are seven police stations namely Natore Sadar, Singra, Baghatipara, Noldangha, Boraigram, Gurudaspur and Lalpur under two Circles-Natore and Boraigram. There are two investigation centers and two police outposts in this district.

<sup>145</sup> BBS (Bangladesh Bureau of Statistics), 2011. Bangladesh Population and Housing Census. Community Report-Natore. Statistics and Informatics Division. Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.

## 9.8 Historical, cultural and archaeological sites

The proposed project area has cultural heritage and resource of national and regional value. Historical sites of Natore Sadar are Natore Rajbari and Dighapatia Rajbari (Uttara Ganabhaban), Madanmohan Rath made of copper (Madhabnagar), Vishnu statue of gorur (prince of birds) as his mounts (Kuriapara). The cultural sites in the project area are mosques and graveyards which are located mostly in respective areas. The project footprint is devoid of any cultural sites or heritage sites. If evidence of any other ancient heritage or any archaeological symbol is found during execution of the project, actions will be taken in accordance with relevant acts and rules.

## 9.9 Potential Social Impacts and Mitigation Measures

| Potential Negative Impacts   | Potential Positive Impacts  | Mitigation Measures  |
|--|---|--|
| <ul style="list-style-type: none"> <li>• Agriculture land would be converted into industrial area affects socio-economic conditions of marginal &amp; tenant farmers;</li> <li>• Long term use of ground water may affects irrigation for the cultivation of agriculture;</li> <li>• Conflict may arise during land acquisition process;</li> <li>• The unskilled local community may feel unhappy if preferential treatment is given to the people outside Natore Sadar Upazila for skilled jobs.</li> <li>• There will be an increase in the demand for temporary accommodation, housing and basic services including sanitation, health and emergency services in Natore Sadar Upazila areas.</li> <li>• The rate of poverty and illiteracy in the area may lead to the child labor deployment.</li> <li>• The absence of gender inclusive policies and procedures may lead the women to take up unskilled and low skilled jobs.</li> </ul> | <ul style="list-style-type: none"> <li>• The commissioning of NEZ will directly improve the local economy of the area which in turn will increase the purchasing power of the local population.</li> <li>• The employable population in Natore Sadar Upazila will have access to better employment opportunities during the construction and commissioning phases of NEZ.</li> <li>• Enhanced employability for the women in the area.</li> </ul> | <ul style="list-style-type: none"> <li>• Industry with less water consumption can be given priority for its sustainability and agriculture irrigation;</li> <li>• Need to develop a long term development plan for the area to improve the quality of basic amenities for the increasing population in the coming years.</li> <li>• Equal employment opportunities should be given to women, especially those who are now unemployed or are working in the service sector as daily wage workers.</li> <li>• Measures should be taken to prohibit child labor in the EZ as per the National Child Labor Elimination Policy 2010 of Ministry of Labor and Employment.</li> <li>• Land acquisition process should follow the guidelines of WB, GoB, etc.</li> </ul> |

## 9.10 Recommendations

- a) Environmental Management and Monitoring Plan should be developed and followed strictly for both during construction and operation phases of the Project;
- b) Zero Discharge Plan (ZDP) should be developed and maintained during operation phase of the project
- c) National 3R Strategy for Waste Management (Reduce, Reuse, Recycle) should be followed for Liquid and Solid Waste Management;
- d) IFC PS-3 (Resource Efficiency and Pollution Prevention) should be followed for Occupational Health and Safety (OHS) Management during construction and operation phases of the Project;
- e) Roof top all infrastructures should be managed for the purpose of harvesting rain water, photovoltaic solar energy and gardening;
- f) All infrastructures should be built based on the seismic design consideration to avoid potential hazard risk;
- g) To avoid hazard due to any disaster, warning system, emergency evacuation system, construction of ground flood at an elevated level, provision of emergency equipment should be considered;
- h) Proper training regarding EHS should be provided to Project Management Unit as well as work forces during construction and operation phases;
- i) Development of a green belt surrounding the area should be considered with due importance;
- j) A social census can be carried out on land owner before land acquisition so as to determine their actual loss, and prepare right compensation plan by BEZA;
- k) Eligible local people should be considered on priority basis that will be helpful for minimizing the socio-economic disruption.



## 10 Financial and Economic Analysis

### 10.1 Financial Analysis

This section presents the assumptions and results of the financial analysis of the Economic zone. The purpose of the financial analysis is to determine the financial viability of the project. The financial analysis conducted is based upon BEZA/Government led model and PPP model for the zone.

The key objectives of preparing a financial model for financial analysis were:

- to demonstrate the financial viability of development of the Economic Zone based upon demand forecast, expected lease rates, cost estimates, planning parameters and other information;
- to illustrate the sensitivity of the financial and commercial viability to key parameters and to identify the areas which could be adjusted (lease rates or other parameters) to influence the profitability of the project;
- to determine the requirement of initial support and later on to implement project on a commercial footing.

The main approach was to determine the financial viability of the project on the basis of an assessment of demand forecast for industrial plots, revenue collection from commercial areas, capital cost estimate for the project, revenue projection and financing structure.



Financial analysis of the project has taken into consideration, such factors as:

- short and long-term financial obligations;
- projected revenue stream, projected costs (fixed and variable) , depreciation schedule and asset construction schedule;
- demand forecast for leasable area of the Economic Zone;
- lease rate structure and the impact of amendments in that structure;
- financial structure of the project.

The financial model has covered the following:

- a) determination of the revenue projection, projection income statements and cash flow statements over the life of the project;
- b) calculate various financial outputs such as IRR, payback periods and debt-service coverage ratio for assessment of project viability;
- c) sensitivity analysis on the major parameters including capital cost, O&M expense and lease rate. in order to explore its sustainability under different changing situations;



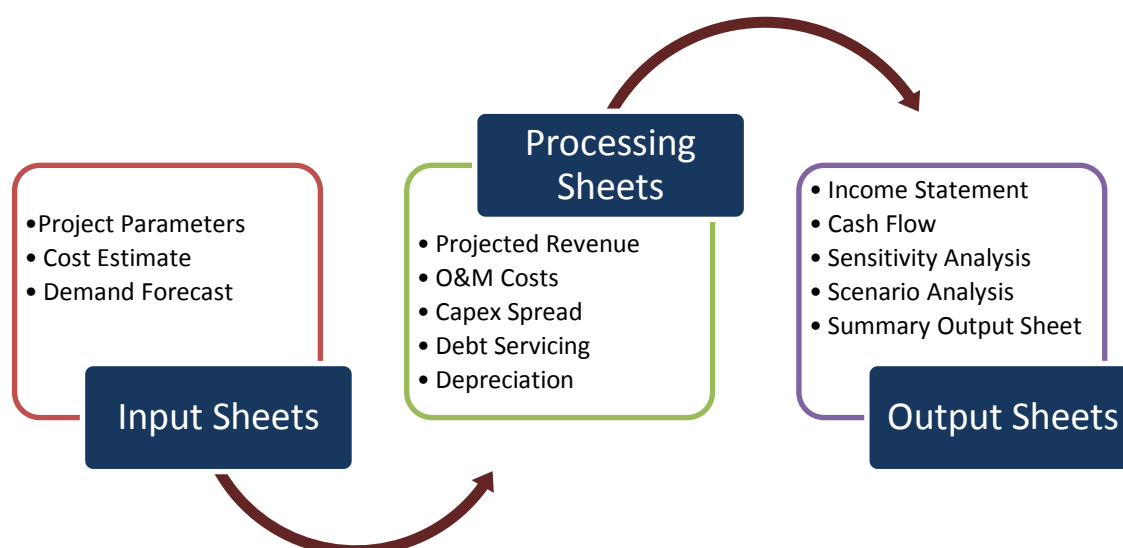
- d) financial analysis on options for cost recovery of capital investments and recurrent costs under different demand forecast scenarios.

### 10.1.1 Structure of the Financial Model

The financial analysis for the project was conducted using a spread sheet based model:

- 1) a projection of each component of cost and expenses on the basis of a consistent set of background financial/economic assumptions; and
- 2) the revenue generated by a given structure of revenue sources. The results of combining cost and revenue projection are presented as output indicators as shown in the following figure.

**Figure 10.1: Flow Chart of the Financial Model**



The model contains interlinked sheets keeping in view of the available data and information. The sheets of the model are as follows:

|                          |  |
|--------------------------|--|
| <b>Input Sheets</b>      |  |
|                          | Project Parameters<br>Cost Estimate<br>Demand Forecast   |
| <b>Processing Sheets</b> |  |
|                          | Debt Servicing<br>Projected Revenue<br>Depreciation<br>Projected O&M expenses                                |
| <b>Result Sheets</b>     |  |
|                          | Income Statement<br>Cash Flow Statement<br>Sensitivity Analysis<br>Scenario Analysis<br>Summary Output Sheet |

The input and input support sheets accommodate all the basic inputs of the project required for the financial model. These inputs have connection with other sheets (processing/intermediate calculation) where specific calculations are made. Then the outcomes of the individual sheets

were connected to the result sheets to obtain the final results. Sensitivity analysis is also included in the model to test its sensitiveness on change of different important parameters.

The interlinked sheets as used in the financial model are briefly described as follows.

### Input and Input Support Sheets:

The input sheets include (1) Capex Assumption sheet (2) capital cost summary sheet, and (3) demand forecast sheet.

*Capex and Opex Assumption Sheet:* These two sheets contain all the major parameters of the project which will act as inputs to the model. The parameters include: (1) leasable commercial area, and (2) cost escalation factors, etc.

*Capital Cost Summary Sheet:* Capital cost summary includes land development, off-site infrastructure, on-site infrastructure, project management costs.

This worksheet provides a summary of the project costs for the development of the economic zone. This worksheet has an onward relationship with depreciation, capex year and cash flow sheet.

*Demand Forecast:* The sheet provides different demand projections based on different space take up scenarios. The projected demand was used for determining the projected revenue and projected variable costs for the project. This sheet has an onward relationship with the revenue and O&M.

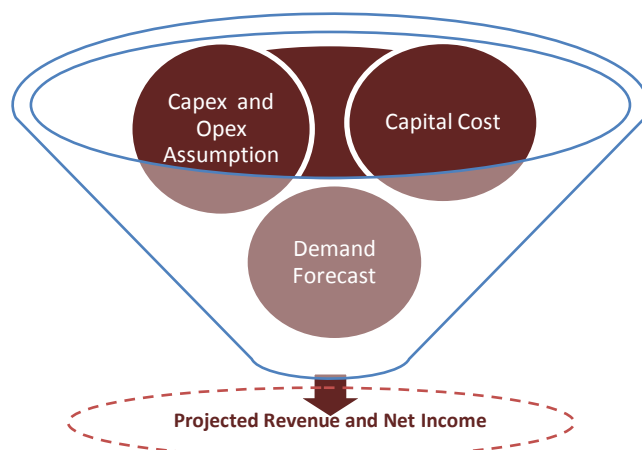
*Processing Sheets:* The processing sheets compute and process data as provided in the capex assumption and capital cost sheets. The processing sheets are (1) sources of finance (2) revenue, (3) depreciation, (5) O&M expenses and (6) Capex year.

*Sources of Finance:* This worksheet sets out a consolidated summary of finance stating separately the yearly amount of equity in Bangladeshi BDT. The computation of yearly equity is derived from capital cost, and debt equity ratio. This sheet has link to the cash flow sheet.

*Revenue:* This worksheet calculates the projected revenue of the Economic Zone from sources such as:

- a) Rent from Land Lease
- b) Rent from Training Centre Space
- c) Rent from Commercial Facilities Space
- d) Rent from SFB
- e) W&S service charge from tenants
- f) Power service charge from tenants
- g) CETP service charge from tenants

Figure 10.2: Input Sheets in the Model



Revenue was calculated based on the demand forecast and the lease rates. The output of the revenue sheet is processed in the income statement sheet to calculate the projected net income of the operator.

**Depreciation:** Depreciation sheet calculates the depreciated value of the assets annually. It takes data from capex assumption sheet and after computation, the depreciation expense from this sheet goes to the income statement.

**O&M Expenses:** It receives data from the input sheet and input support sheets regarding operation cost, maintenance cost and fixed costs of the project. The output of the O&M expenses sheet is used in the income statement sheet to calculate the projected net profit of the business.

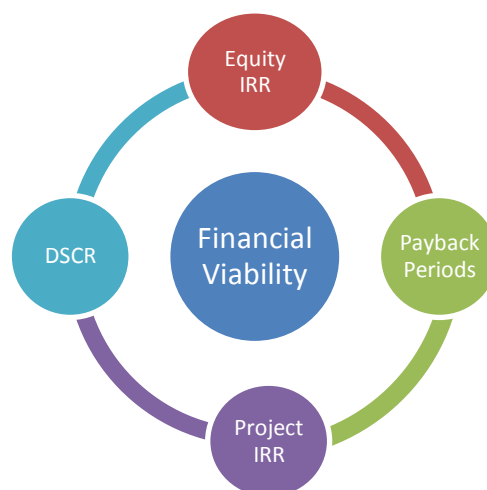
**Capex Year Sheet:** The capex year is used for incorporating capital cost phasing of the project year by year. Phasing of construction cost during construction is also projected in this sheet.

**Financial Statements:** Results of operating performance and financial position at periodic intervals are the essence of financial statements. The financial model provides projected financial statements such as, income statements and cash flow statements depicting profitability, liquidity and overall financial health of the entity. The result sheets include (1) Income Statement and (2) Cash Flow Analysis.

**Income Statement:** The financial model provides income statements for each year for 20 years. The revenue stream over the years is shown in the income statement. The statement also shows the O&M expenses (fixed and variable) , financing expenses and depreciation expenses as deductions from the revenues to obtain net income before tax. After deducting applicable tax, the net income for the equity holder is derived.

**Cash Flow Analysis:** Cash flow statement is an important financial output in the model, especially to work out the appropriate cash requirements of the project. The financial model incorporates the cash flow analysis for the project and determines the project and Equity IRR.

Figure 10.3: Key Financial Indicators



### Result (Financial Indicator) Sheets

**Summary Output Sheet:** The key requirement for financial viability is that the business is able to earn profit and keep up cash flow sufficient to finance all necessary future investments. This sheet gives the results of the model run in summarized form. The key results indicators are:

- Internal Rate of Return (IRR) on capital employed in the total project and on equity. This is the ultimate parameter to determine the viability of the project.
- Total Capital Payback Period
- Equity Payback Period

**Sensitivity Analysis Sheet:** Sensitivity analysis is used to test the robustness of the results to variation in key inputs and project parameters. Cash flow as well as financial indicators depend

on the interplay of several factors including capital cost, O&M expense and revenue and charges it earns from different category of services. It was used to identify the values, if any, at which, preference for one option is switched to preference for another. Considering these variations of parameters, change of output /results was found through this analysis.

*Scenario Analysis Sheet:* The model incorporates different demand forecast scenarios. This sheet analyses the results of these scenarios in different combinations.

### 10.1.2 Natore Economic Zone Businesses

The Economic Zone Act 2010 provides the legal coverage for attracting and leveraging private investment towards development of zones as zone developers and operators. As such, the financial model of the economic zone incorporates two types of investment choices, government/BEZA led model and PPP model. In both choices/ options of investment the financial model considers broadly two types of sub-businesses.

- 1) Core/Main Business (designated as M1, M2 and M3)
- 2) Component Businesses (designated as C1, C2, C3, C4 and C5)

The core business is leasing out land to different industries and rents collected from the floor space and other facilities of training center and commercial amenities.

The component businesses are premised on different sub-components of the project that have individual cost recoveries, such as power supply, gas supply etc. The capital, O&M expenses and revenues for the component business have been matched exactly so that the resulting tariffs do not have any element of cross subsidization.



### 10.1.3 Land Lease

The EZ will lease out land to different industries and receive revenue. Assumptions and estimates have been made on the following major items for the economic zone with respect to land lease and operation and maintenance:

- 1) Land Lease Tariff to be charged from the industrial units. The lease tariff covers the conservancy tax for cleaning, security, street lighting etc.
- 2) Total leasable area
- 3) Total Capital Cost for construction of Boundary Wall, Admin Building, land filling etc.
- 4) O&M Expense
  - Maintenance
  - Salary and Allowances

It has been assumed that 95% of the leasable space will be taken up at full capacity. 5% of the leasable area is estimated to be transitional, *i.e.* in-between lease and unoccupied. The capital cost covers the cost for boundary wall, internal road, common zone facilities, etc.

### 10.1.4 Vocational Training Centre

One of the core businesses of the EZs is to provide training center facilities, lease out spaces of training center and receive revenue. Assumptions and estimates have been made on the following major items for the EZ with respect to operation and maintenance of training center:

- 5) Rental Tariff to be charged from the training center lessees
- 6) Total Floor Space of training center
- 7) Total Capital Cost for construction of the training center
- 8) O&M expense for operating the training center
  - Maintenance
  - Salary and Allowance
  - Land Rent
  - Utilities

It has been assumed that 95% of the leasable space will be taken up at full capacity. 5% of the leasable area is estimated to be vacant for transition.

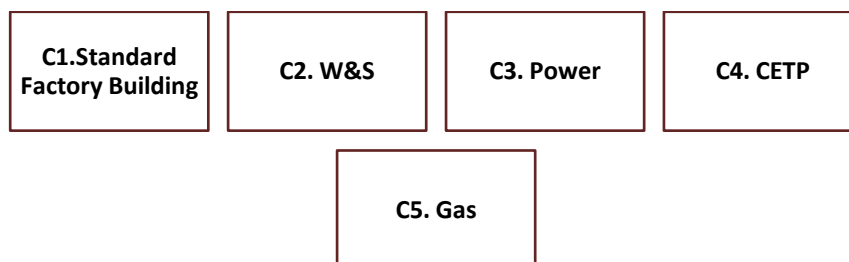
### 10.1.5 Commercial Facilities

One of the main services of an economic zone is to lease out commercial facilities/spaces and possessions to the different vendors, shop owners, banks etc. Major assumptions and estimates made with respect to commercial facilities are as follows:

- 1) Rent Tariff
- 2) Total Floor Space
- 3) Total Capital Cost for constructing the commercial facilities
- 4) O&M expense for maintaining the Commercial Facilities
  - Maintenance
  - Salary and Allowance
  - Land Lease Rent
  - Utilities

It has been assumed that 95% of the leasable space will be taken up at full capacity. 5% of the leasable area is estimated to be transitional, *i.e.* in-between lease or unoccupied.

The Economic Zone will earn substantial revenue from different facilities and services (component businesses) offered in the forms of charges for the use of water supply, power, CETP and others. The Ishwardi and Uttara EPZ tariff rates have been applied in the component businesses for determining the overall tariff of the Economic Zone.



### 10.1.6 Standard Factory Building

Standard factory building is a significant part of the business of an economic zone. It helps the entrepreneurs to start businesses on a first track basis with readily available factory space. The financial model presents the assumptions and estimates made on the following items:

- 1) Rent Tariff for space in SFB
- 2) Total Floor Space in SFB
- 3) Total Capital Cost of constructing SFB
- 4) O&M expense for operation and maintenance of SFB
  - Maintenance
  - Salary and Allowance
  - Land Lease Rent
  - Utilities

Rent for spaces of SFB is based on the rates of Standard Factory Building of Ishwardi and Uttara EPZ in the country. It has been assumed that 95% of the leasable space will be taken up at full capacity. 5% of the leasable area is estimated to be transitional.

### 10.1.7 Water and Sewerage System

Water and sewerage services may be treated as a component business to determine the tariff rate for water and sewerage services to be charged to the industries. The EZ will have deep tube wells, water treatment plant for providing these services. The EZ will also lay water and sewerage pipes and pumps, and also be responsible for operation and maintenance of the water and sewerage system. The EZ will charge tariff to different industries for these services. The tariff will be charged based on the amount of water supplied (BDT/m<sup>3</sup>) to the industries. Major assumptions are as follows:

- 1) W&S Charge (tariff to be charged from tenants)
- 2) Capacity of the system
- 3) Total Capital Cost for constructing the system
- 4) O&M expense for running the system
  - Maintenance
  - Salary and Allowance
  - Land Lease Rent
  - Utilities

The tariff of water and sewerage system is based on the rates of Ishwardi and Uttara EPZ in the country. The above facilities will use ground water for water requirement of the zone.

### 10.1.8 Power

The Economic Zone is responsible for providing power connections to industrial enterprises to be located within the zone. Therefore, the EZ has to either build its own power generation plant, or enter into an agreement with a third party to construct a power plant and supply power to the zone inside tenants/industries. Tariff (Tk/kWh) will be charged to the industries for the electricity supplied.

Major assumptions and estimates have been made for power supply on the following items:

- 1) Power Tariff
- 2) Capacity of the Power Plant
- 3) Total Capital Cost for constructing the power plant
- 4) O&M expense for running the power plant
  - Maintenance
  - Salary and Allowance
  - Land Lease Rent
  - Fuel and Utilities

The tariff of power is based on the rates of Ishwardi and Uttara EPZ in the country. The plants are not always operated at 100% load factor. The Plant Load Factor (PLF) has been considered as 70%.

### 10.1.9 CETP

Central Effluent Treatment may be treated as a component project to determine the tariff rate to be charged to the industries for providing effluent treatment services. The tariff will be charged based on the amount of effluent treatment (BDT/m<sup>3</sup>) to the industries. The financial model contains major assumptions and estimates that have been made with respect to CETP for the following items:

- 1) Charge (tariff) for effluent treatment
- 2) Capacity of the CETP
- 3) Total Capital Cost for constructing the CETP
- 4) Operation and Maintenance Expense of CETP
  - Maintenance
  - Salary and Allowance
  - Land Rent
  - Utilities

The tariff of CETP system is based on the rates of CETP at CEPZ.

## 10.2 Term/Business Period

The business period over which the EZ would receive a profitable return on his investment is very important. However, this would depend on the following factors:

- sources of capital and its repayment terms;
- economic life of major depreciable assets;
- revenue earnings;
- capability of the tenants/ buyers to pay the cost; and
- Phasing of the Zone's infrastructure.

The financial model is prepared considering a period of 20 years, although law permits for 50 years lease period. From financial point of view, longer project period will not carry any significant impact on the results of the financial model. Moreover 50 years, a very long investment recovery period will eventually discourage the investment.

### 10.3 Capital Cost

Capital costs have been estimated both at the base year (2018) and subsequently at the point when they will be incurred with escalation during time elapsed. It comprises cost of land development, land filling, external/ off-site infrastructure, which include connectivity infrastructure like road, gas or power. The social infrastructure ensures proper living conditions of the people inside the zone, which includes administrative buildings, a mosque, a vocational training center and commercial facilities. These are the part of capital cost but some of the social infrastructure like the mosque, etc. will not generate direct revenue. The capital cost also include the commercial facilities like shops, restaurants, banks, etc. are essential for day-to-day life of the tenants inside the Zone.

The table on the following page shows BEZA has to bear the whole investment cost in BEZA/government led model whereas the PPP operator has to bear only the on-site infrastructure cost. In PPP model BEZA has also obligation to bear cost other than onsite and offsite infrastructure cost. In case of PPP option offsite infrastructure will be borne by other relevant agencies. Though the land cost will be incurred by BEZA in PPP model, the PPP operator will have to pay some upfront fee and annual lease rent.

### 10.4 Cost Escalation and Contingency

It is assumed that all costs are escalated from the time of their estimation to the time the cost is actually incurred at the rates shown in the following table:

**Table 10.1: Cost Escalation Rates**

|    | Cost Item                                   | Escalation Rate (per year) | Comments   |
|----|---|----------------------------|--|
| 1) | Land Filling Cost Escalation                | 5%                         | Percentage adapted as per industry norms.  |
| 2) | Cost Escalation for Off-site infrastructure | 15%                        | Average of Construction Material Price Indices and recent trend, Bangladesh Bureau of Statistics |
| 3) | Cost Escalation for On-site infrastructure  | 15%                        | As above   |



**Table 10.2: Capital Cost**

|   | Rate        |                                 |       | Cost<br>Tk m | Cost Split   |                  |              |                  |
|---|-------------|---------------------------------|-------|--------------|--------------|------------------|--------------|------------------|
|   | Tk per unit | Amount                          | Units |              | BEZA Model   |                  | PPP Model    |                  |
|   |             |                                 |       |              | BEZA         | Private Operator | BEZA         | Private Operator |
| <b>1. Land Development and Boundary Wall</b>        |             |                                 |       | <b>1,635</b> | <b>1,635</b> | <b>0</b>         | <b>1,635</b> | <b>0</b>         |
| 1.1 Land Filling                                    | 408         | 3,898,513 cum                   |       | 1,591        | 1,591        | 0                | 1,591        | 0                |
| 1.2 Boundary Wall                                   | 8,000       | 5,472 m                         |       | 44           | 44           | 0                | 44           | 0                |
| <b>2. Land Cost</b>                                 |             |                                 |       | <b>1,620</b> | <b>1,620</b> | <b>0</b>         | <b>1,620</b> | <b>0</b>         |
| 2.1 Land Price                                      | 5,400,000   | 300 Acre                        |       | 1,620        | 1,620        | 0                | 1,620        | 0                |
| <b>3. Off-site Infrastructure</b>                   |             |                                 |       | <b>31</b>    | <b>31</b>    | <b>0</b>         | <b>31</b>    | <b>0</b>         |
| Access Road & Water                                 |             |                                 |       |              |              |                  |              |                  |
| 3.1 Disposal Line                                   | 8,500       | 900 sqm                         |       | 10           | 10           | 0                | 10           | 0                |
| 3.2 Optical Fiber Cable                             |             | LS                              |       | 21           | 21           | 0                | 21           | 0                |
| <b>4. On-site Infrastructure</b>                    |             |                                 |       | <b>4,684</b> | <b>4,684</b> | <b>0</b>         | <b>0</b>     | <b>4,684</b>     |
| 4.1 Common Facilities and Businesses                |             |                                 |       |              |              |                  |              |                  |
| 4.1.1 Internal Roads                                | 8,500       | 79,923 sqm                      |       | 1,071        | 1,071        | 0                | 0            | 1,071            |
| 4.1.2 Other Common Zone Facilities                  |             | Details in the assumption sheet |       | 726          | 726          | 0                | 0            | 726              |
| 4.1.3 Social Facilities                             | 25,000      | 23,768 sqm                      |       | 594          | 594          | 0                | 0            | 594              |
| 4.1.4 Training Center                               | 25,000      | 2,110 sqm                       |       | 53           | 53           | 0                | 0            | 53               |
| 4.1.5 Commercial Facilities                         |             |                                 |       | 840          | 840          | 0                | 0            | 840              |
| 4.2 Component Businesses                            |             |                                 |       |              |              |                  |              |                  |
| 4.2.1: C1. SFB                                      | 2,500       | 184,000 sqm                     |       | 460          | 460          | 0                | 0            | 460              |
| 4.2.2: C2. Water Supply and Sewerage System         |             | Details in the assumption sheet |       | 376          | 376          | 0                | 0            | 376              |
| 4.2.3: C3. Power Supply System                      |             | Details in the assumption sheet |       | 155          | 155          | 0                | 0            | 155              |
| 4.2.4: C5. Gas Supply System                        |             | Details in the assumption sheet |       | 42           | 42           | 0                | 0            | 42               |
| 4.2.5: C4. CETP                                     |             | LS cum                          |       | 367          | 367          | 0                | 0            | 367              |
| <b>5. Project Preparatory Costs of the Sponsors</b> |             |                                 |       | <b>62</b>    | <b>62</b>    | <b>0</b>         | <b>62</b>    | <b>0</b>         |
| 5.1 Consultancy Fees for Feasibility Study          |             | LS                              |       | 6            | 6            | 0                | 6            | 0                |
| 5.2 Legal Support                                   |             | LS                              |       | 6            | 6            | 0                | 6            | 0                |
| 5.3 Administrative & Marketing Promotions           |             | LS                              |       | 5            | 5            | 0                | 5            | 0                |
| 5.4 Vehicle   |             | LS                              |       | 45           | 45           | 0                | 45           | 0                |
| Total (before cost escalation, IDC and upfront fee) |             |                                 |       |              | 8,032        | 0                | 3,348        | 4,684            |
| 6.0 Upfront Fee                                     | 10%         | of Land Price                   |       |              | 0            | 0                | 0            | 162              |
| Total (before cost escalation and IDC)              |             |                                 |       |              | 8,032        | 0                | 3,348        | 4,846            |
| 7.0 Cost Escalation                                 |             |                                 |       |              | 780          |                  | 0            | 881              |
| 8.0 Interest During Construction Period             |             |                                 |       |              | 752          |                  |              | 494              |
| <b>Total Capital Cost</b>                           |             |                                 |       |              | <b>9,563</b> | <b>0</b>         | <b>3,348</b> | <b>6,220</b>     |
|   |             |                                 |       |              |              | 9,563            |              | 9,568            |

## 10.5 Demand Forecast

The model has been used to assess the viability of developing the economic zone using three different demand forecast scenarios. The three different scenarios analyzed are as follows:

**Table 10.3: Time Required for Land Take-up**

| Years Needed for Full uptake | Food Processing and Light Engineering | Plastic and Furniture | Jute Industry | Pharmaceutical |
|------------------------------|---------------------------------------|-----------------------|---------------|----------------|
| Base case                    | 6                                     | 7                     | 8             | 10             |
| Aggressive Case              | 4                                     | 5                     | 6             | 8              |
| Conservative Case            | 8                                     | 9                     | 10            | 12             |

The above land take up rates have been taken in consideration of the following:

*Investment Trends:* The demand forecast considers new company formation trends and viability of existing business enterprises as a way to establish a baseline upon which the demand estimations are based.

*Relocation Trends:* The zone will be heavily marketed to attract companies wishing to relocate from city. As such, consultants explored these firms' stated willingness—and actual proclivity—to locate or relocate, external pressures to move, and analyzed the types of firms that would actually move.

*Uptake Rates in Bangladesh:* The demand forecast reviewed actual land uptake rates of other economic zones in Bangladesh in support of high demand for serviced industrial space.

For each scenario, the financial analysis indicates the internal rate of return (IRR) of the project and allows for sensitivity analysis on costs and other factors to see their effect on the IRR.

## 10.6 Identification of Revenues and Expenses

### 10.6.1 Revenues

The Economic Zone is expected to earn revenue from a number of sources. The financial model considered the following sources.

CRS activities were considered in the financial model, such as day care center, secondary school etc. Assumptions were made in the financial model that the revenue sources will be from land lease, training center, commercial facilities, SFB rent, water supply charge, power supply charge, CETP and gas supply.

### 10.6.2 Depreciation

Depreciation is a non-cash expense. Though it does not directly influence cash flow, it influences tax obligations from income of the business, by offering tax savings adding to depreciation. Depreciation like interest is a tax deductible item considered by the tax authorities.

*Basis of Depreciation:* The Income Tax Ordinance, 1984 allows deduction of depreciation of assets from the income of the particular year to determine the taxable income for that period. Section 29 (1) (VII) and (IX) of the Income Tax Ordinance provides provisions for the following methods of depreciation:

- Normal Depreciation
- Accelerated Depreciation

The ordinance also provides prescribed rates of depreciation irrespective of actual life of the assets. Normal Depreciation method is used in the model. It is briefly described in the following section. The Income Tax Ordinance prescribes the depreciation schedule.

The “Normal Depreciation Method” is considered as base case for the financial model. The following table provides the prescribed rates for normal depreciation.

**Table 10.4: Schedule for Normal Depreciation**

|    | Types of Assets                    | Depreciable amount <sup>146</sup> |
|----|------------------------------------|-----------------------------------|
| 1) | Building (general)                 | 10%                               |
| 2) | Factory building                   | 20%                               |
| 3) | Furniture and fixture              | 10%                               |
| 4) | Machinery and plant (general rate) | 20%                               |

Each year, depreciation has been charged by the above prescribed percentage on the written down value *i.e.* the value of asset less accumulated depreciation in the previous years. In accounting concept, it is referred to as declining balance method. Depreciation each year will be reduced as the same percentage as applied on a declining balance. This method of depreciation has been used in the financial model as the base case, as the depreciation is mainly calculated for determining taxable income and thereby tax to be paid.

According to S.R.O No. 227 and S.R.O No. 229 of Finance Act 2015, Developers of Economic Zone in Bangladesh will enjoy the following Income Tax Exemption:

| Duration of Tax Exemption | Rate of Tax Exemption |
|---------------------------|-----------------------|
| Year 1-10                 | 100%                  |
| Year 11                   | 70%                   |
| Year 12                   | 30%                   |

As tax exemptions are already provided in the front-end of the years of operation, accelerated depreciation will not be beneficial as such, as that would not result any tax saving. Rather normal depreciation may result some tax saving for the developer at the back-end as this method will result some level of depreciation over the whole period of operation.

### 10.6.3 O&M expenses

Each of the facilities developed and constructed by the Economic zone has operational costs, which include salary and allowances of employees, maintenance costs, and utilities costs. In addition, the cost of fuel used in the power plant is also an operational cost. Maintenance costs associated with training center and commercial facilities are based on the amount of revenue generated from each items. The O&M expense will be higher if the buildings are in full capacity and lower if not all leasable spaces are taken up.

<sup>146</sup> As Percentage of written down value

Economic zone will also operate and maintain 20 MW power generation unit. Fuel costs associated with running the power plant, operation and maintenance costs and salary of staff of the power plant has been estimated and incorporated in the model.

O&M expense of W&S, and CETP has also been considered. Maintenance of roads, sewerage system all have yearly operations and maintenance costs associated with them. Estimates on the amount of O&M expense has been made on the basis of investment. In addition to the internal infrastructure, there are also costs associated with the operations of the Zone such as security, etc. All such costs have been incorporated in the model.

For O&M expense calculation of both main and component business, the salary and allowance is based on the latest rate (pay scale 2015) declared by the pay commission of Bangladesh. The allowance including medical, festival and New Year bonuses, house rent, conveyance, education for children etc.

**Table 10.5: O&M Expense Escalation Estimates**

|                                       |      |        |
|---------------------------------------|------|--------|
| Salary and Allowances Escalation Rate | 5%   | per yr |
| Other O&M Expenses Escalation Rate    | 2.5% | per yr |

## 10.7 Return from the Project

The internal rate of return (IRR) on a project is the annualized effective compounded return rate or discount rate that makes the net present value of all cash flows from the project equal to zero. Internal rates of return give an indication on the desirability of investments or projects. The higher a project's IRR, the more desirable it is to undertake the project. Amongst other factors, returns depend upon tariff rates. The following tariff rates have been assumed:

**Table 10.6: Assumed Tariff Rates**

|    |                               | Unit               | Base Tariff (2018) | Beginning Margin over Base Tariff | Beginning Tariff (Natore EZ) 2021 | Comparison                     |       | Unit         |
|----|-------------------------------|--------------------|--------------------|-----------------------------------|-----------------------------------|--------------------------------|-------|--------------|
| 1. | Land Lease Charge             | USD/sqm/yr         | 1.25               | 10%                               | 1.38                              | Ishwardi and Uttara EPZ Charge | 1.25  | USD/sqm /yr  |
| 2. | Power                         | Tk/kWh             | 8.97               | 10%                               | 9.87                              | ""                             | 8.97  | Tk/kWh       |
| 3. | Water and Sewerage            | Tk/m3              | 24.74              | 10%                               | 27.21                             | ""                             | 24.74 | Tk/m3        |
| 4. | C1. SFB                       | USD/sqm/yr         | 1.60               | 10%                               | 1.76                              | ""                             | 1.60  | USD/sqm /yr  |
| 5. | CETP                          | Tariff (year-wise) | 47.88              | 15%                               | 55.06                             | DEPZ Charge                    | 2.75  | USD/sqm /mon |
| 6. | Rent of Training Center       | Tk/sqm/yr          | 5,000              | 25%                               | 6,250                             | ""                             | 47.88 | Tk/m3        |
| 7. | Rent of Commercial Facilities | Tk/sqm/yr          | 5,000              | 25%                               | 6,250                             |                                |       |              |
| 8. | Gas Supply                    | Tk/m3              | 7.76               | 10%                               | 8.54                              | Titas Indust. Rate (1 Jun 17)  | 7.76  | Tk/m3        |
| 9. | O&M Charge                    | of Utility Charge  | 15%                |                                   | 15%                               |                                |       |              |

**Table 10.7: Financial Return From the Project**

| Output                        |      |
|-------------------------------|------|
| Equity IRR (after tax)        | 9.3% |
| Project IRR (after tax)       | 9.5% |
| DSCR                          |      |
| Average                       | 1.0  |
| Maximum                       | 2.20 |
| Minimum                       | 0.12 |
| Equity Payback Period (year)  | 15   |
| Project Payback Period (year) | 11   |

The equity IRR of the project has been calculated from the projected cash flow to equity where as project IRR has been calculated the cash flow with respect to the project. However the project and equity return as well as DSCR and payback period are moderately satisfactory.

**Project IRR Computation using Discount Rate:** Project IRR computation is shown in the following table.

**Table 10.8: Project IRR Computation (using discount rate)**

|                            | Government Led Model |      | PPP Led Model |      |
|----------------------------|----------------------|------|---------------|------|
| Net Present Value (NPV) at |                      |      |               |      |
|                            | 9.0%                 | 442  | 12.5%         | 315  |
|                            | 10.0%                | -446 | 13.5%         | -156 |
|                            | 9.48%                | 0    | 13.15%        | 0    |

The above table shows the present value of net cash flow is zero at discount rate 9.48% in government led model and 13.15% in PPP model which represent the project IRR.

**Net Present Value (NPV):** NPV has been calculated using the cost of capital/hardle rate of 9%. The computation shows the NPV in Government led model and PPP model are Tk. million 305 PPP Tk. million 2,656 which are positive and indicates the project is viable in both cases.

## 10.8 Scenario Analysis

Scenario analysis of different options demonstrates is in the table below.

**Table 10.9: Scenario Analysis**

|                     |                          | Government led Model | PPP Model |
|---------------------|--------------------------|----------------------|-----------|
| <b>Equity IRR</b>   | <i>Base Case</i>         | 9.3%                 | 14.0%     |
|                     | <i>Aggressive Case</i>   | 11.1%                | 17.1%     |
|                     | <i>Conservative Case</i> | 7.7%                 | 11.6%     |
| <b>Project IRR</b>  | <i>Base Case</i>         | 9.5%                 | 13.1%     |
|                     | <i>Aggressive Case</i>   | 10.7%                | 15.1%     |
|                     | <i>Conservative Case</i> | 8.3%                 | 11.4%     |
| <b>Average DSCR</b> | <i>Base Case</i>         | 1.0                  | 1.3       |
|                     | <i>Aggressive Case</i>   | 1.1                  | 1.5       |
|                     | <i>Conservative Case</i> | 0.8                  | 1.0       |

|                                      |                          | Government led Model | PPP Model |
|--------------------------------------|--------------------------|----------------------|-----------|
| <b>Equity Payback Period, years</b>  | <i>Base Case</i>         | 15                   | 12        |
|                                      | <i>Aggressive Case</i>   | 13                   | 11        |
|                                      | <i>Conservative Case</i> | 16                   | 14        |
| <b>Project Payback Period, years</b> | <i>Base Case</i>         | 11                   | 11        |
|                                      | <i>Aggressive Case</i>   | 10                   | 9         |
|                                      | <i>Conservative Case</i> | 12                   | 12        |

Difference of results obtained from base case and aggressive case is substantial which indicates IRR depends on the early land take-up. Average DSCRs in all cases are more than 1 which is satisfactory. Equity and project payback period in government led model shows the project need more than half of the project tenure to recover the capital. PPP model is attractive in comparison with government led model.

## 10.9 Sensitivity Analysis

Various factors affect the equity IRR of the project. In order to understand the importance of each factor in determining the viability of the project, it is important to carry out a sensitivity analysis. The following factors have been analyzed for examining their impact on the internal rate of return:

- Capital Cost;
- O&M Expense;
- Lease rate

The above factors were varied by 10% in both directions and the effects on the equity IRR were observed.

**Table 10.10: Sensitivity to Equity IRR**

### *Government led Model*

|              | -20%  | -10%  | 0%   | 10%   | 20%   |
|--------------|-------|-------|------|-------|-------|
| Capital Cost | 11.6% | 10.4% | 9.3% | 8.3%  | 7.5%  |
| O&M Expense  | 9.6%  | 9.5%  | 9.3% | 9.2%  | 9.0%  |
| Lease Rate   | 3.5%  | 6.5%  | 9.3% | 11.8% | 14.1% |

### *PPP Model*

|              | -20%  | -10%  | 0%    | 10%   | 20%   |
|--------------|-------|-------|-------|-------|-------|
| Capital Cost | 17.1% | 15.5% | 14.0% | 12.8% | 11.7% |
| O&M Expense  | 14.4% | 14.2% | 14.0% | 13.9% | 13.7% |
| Lease Rate   | 6.8%  | 10.6% | 14.0% | 17.2% | 20.0% |

Based on reasonable assumptions, after tax equity IRRs 9.3% and 14.0% have been derived for Government led Model and PPP Model respectively. The equity IRR varies significantly with changing the key factors, capital cost and lease rate, whereas O&M expense variation has insignificant effect on equity IRR.

## 10.10 Economic Analysis

Infrastructure investment is considered as capital investment and it has a ripple effect throughout the economy that continues to provide favorable outcome for a long time. Although the infrastructure does not directly contribute to the production process but it is a prime requirement for the development and operation of any production facility. The primary challenge that the developing countries such as Bangladesh face in establishing and operating production based industries are the lack of different infrastructural support. The government in most cases does not have the capacity to develop the required infrastructure. To solve the issue the Government of Bangladesh has taken the initiative to involve the private sector in developing the infrastructure support through systematic investment in the economic zones. The government itself is also developing some economic zones, in areas that are important for the overall growth of the economy of the country. When an entity invests significant amount in the development of infrastructure facilities, the primary motive usually is to get financial return by using that infrastructure. The return in this case would be the direct return to the developers. But a large scale infrastructure development always has greater impact on the economy as a whole. The following chapter aims at to quantify the economic impact of Natore Economic Zone (NEZ) on the economy as a whole.

### 10.10.1 Economic Impact

**Rational of the project:** Economic zones are basically infrastructure development projects that would provide support to other industrial projects. They would provide land, road access, utility services and other facilities to potential industries that would be setup inside the zone. They would be the provider of resources to the investors for uninterrupted operation of their business. Developing infrastructure is costly. Economic zones would receive economies of scale in terms of operation regarding the infrastructures developed, since there would be many industries inside a zone and all of them would be sharing the cost. Therefore for individual investors the cost of setting up a new industry would be lower compared to the industries setup outside a zone. The industries that are being setup in isolation would therefore make underinvestment in infrastructures, leading to lower operational efficiency and lower competitiveness. The economic zone would be an organized initiative to develop sophisticated technology based industrial operation. It would be important not only to strengthen infrastructure access but also to improve other capabilities (technical, managerial, operational) of the unit investors.

**Methodology of Economic Analysis:** In order to conduct economic analysis, it is first required to quantify the costs and benefits in to economic equivalent terms. It is required to identify and evaluate the inputs and outputs at their true economic cost. All the revenues and costs used for the economic analysis has been obtained from the financial modeling in the previous chapter. Some important considerations for the economic analysis are:

- a) Economic analysis is considered at constant prices in local currency terms. Thus, in case of accounting for economic costs and benefits, all costs and benefits must be measured in 'real' terms. In such analysis, all the costs and benefits are considered at the commencement year i.e. 2018 and an escalation factor has been applied on the costs and the associated benefits. To undertake the economic analysis, financial costs were converted to their economic cost equivalents. Financial components include Capital

Costs (land acquisition, development and construction cost, etc.), and Operating Expenses.

- b) Items such as taxes and duties, included in financial costs are excluded as these are market distortions.
- c) Debt service costs are not included as costs in an economic analysis as the interest payments do not entail the use of a resource. The economic analysis for the proposed Economic zone is undertaken at three levels:
  - Level 1: Estimation of ERR by considering the economic equivalents of direct costs and benefits of the project. Benefits in terms of employment generation are also estimated.
  - Level 2: Estimation of cost of off-site infrastructure and its impact on the economy. While data on the cost of off-site infrastructure is available, data on commensurate economic benefits that will accrue due to the provision of off-site infrastructure is not readily available. Hence, a description of economic benefits stemming from the project has been provided.
  - Level 3: The income and employment multiplier effect has been discussed in this level.

**Assumptions:** The economic analysis has been conducted based on a time period of 20 Years. The model is based on the similar assumptions that was drawn on for the financial model and has been discussed in the financial model chapter. The assumptions that differ has been discussed here:

Capital Expenditure (CAPEX): The CAPEX incurred on various components has been provided in the financial model. This CAPEX is segregated into three components:

- a) Material: 50% of the total CAPEX,
- b) Equipment: 40% of the total CAPEX,
- c) Labor: 10% of the total CAPEX

The effect of inflation has already been considered in the financial model in determining all the costs and revenues. So, it can fairly be assumed that the figures in the financial model are economic/ market cost and revenue.

Operation and Management (O&M) Expenditure (OPEX): The OPEX incurred on various components as provided in the financial model is also segregated into three components, in the following proportion:

- a) Material: 10% of the total OPEX,
- b) Equipment: 20% of the total OPEX,
- c) Labor: 70% of the total OPEX.

Standard Exchange Rate (SERF)<sup>147</sup> of 1.03 and Shadow Wage Rate Factor (SWRF)<sup>148</sup> of 0.944 have been considered based on Bangladesh Planning Commission information and previous ADB

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<sup>147</sup> Shadow Exchange Rate (SER): The economic price of foreign currency used in the economic valuation of goods and services. Shadow Exchange Rate Factor (SERF): The ratio of economic price of foreign currency to its market price. Alternatively, the ratio of the shadow to the official exchange rate. For economic analysis using the domestic price numeraire, the SERF is applied to all outputs and inputs, including labor and land that have been valued at border price equivalent values, with project effects measured at domestic market price values left unadjusted.



economic analysis reports for Bangladesh. These have been applied to tradable inputs and labor component to get domestic equivalents.

*Equipment:* It has been considered that around 75% of the equipment and machinery used for the project would be imported.

*Treatment of Tax* Since tax, subsidies and incentives are distortionary in nature; their impact is required to be zeroed out by making necessary adjustments. On the 75% of the equipment that is imported, Shadow Exchange Rate Factor (SERF) has been applied that is the rate after adjusting for all distortions including trade restrictions, duty etc. Therefore, on this component after adjusting by SER, the import duty need not be reduced as it has already been taken into account while arriving at SER. On the domestic component (25%) of the equipment, VAT or other applicable rates are reduced to convert to economic cost. VAT rate has been considered as 15% as per prevailing rate in Bangladesh.

*Calculation:* The total economic cost has been arrived at by adding the following components of the project:

- a) Material (CAPEX)
- b) Equipment (CAPEX)
- c) Labor (CAPEX)
- d) Land Cost
- e) Material (OPEX)
- f) Labor (OPEX)
- g) Equipment (OPEX)

Total economic benefit has been arrived at by adding the following components:

- a) All lease revenues (industrial plot, commercial area, residential area)
- b) All utilities revenue (Electricity, Water, GAS, CETP)
- c) Service Charge

|                            |                      |                    |                        |
|----------------------------|----------------------|--------------------|------------------------|
| <i>Economic IRR</i>        | <i>12.37%</i>        |                    |                        |
| <i>Discount rate</i>       | <i>10%</i>           | <i>12%</i>         | <i>14%</i>             |
| <i>NPV of Net Benefits</i> | <i>2,255,665,082</i> | <i>294,666,306</i> | <i>(1,084,326,694)</i> |
| <i>Benefit Cost Ratio</i>  | <i>1.15</i>          | <i>1.02</i>        | <i>0.91</i>            |

The Economic IRR derived from above methodology is 12.37% with a Benefit to Cost ratio of 1.15 considering a discount rate of 10% during base case. The Economic IRR of 12.37% shows that the project is economically viable throughout its life. It is going to create a positive impact on the economy of the nation as a whole.

<sup>148</sup>Shadow Wage Rate Factor (SWRF): The ratio of the shadow wage rate of a unit of a certain type of labor, measured in the appropriate numeraire, and the project wage for the same category of labor. Alternatively, the ratio of the economic and the SWRF can be used to convert the financial cost of labor into its economic cost. It is assumed that 75% of the labor in the project would be skilled and the SWRF for them would be 1.00. The same would be 0.75 of unskilled labors and they would compose 25% of the labor force.

In addition, the economic analysis also assumes the loss of yield by the cultivation of triple season's agriculture crops in Natore District. The total production of paddy in Natore District for the year of 2016-2017 is presented in table below.

**Table 10.11: Production of paddy Natore District<sup>149</sup>**

| Type of Paddy | Year 2016-2017  |                    |
|---------------|-----------------|--------------------|
|               | Area (in Acres) | Production (in MT) |
| Aus           | 12,254          | 10,885             |
| Aman          | 194,805         | 200,021            |
| Boro          | 130,013         | 242,318            |
| Total         | 337,072         | 453,224            |

It is found that a total of 453,224 MT paddy has been produced during 2016 to 2017 in Natore District within 337,072 acres of agriculture land. The proposed NEZ would be established on 300 acres of agriculture land with triple cropping pattern. So for 300 acres of land, a total of 403 MT yield would be lost according to assumption based on agriculture statistics of year 2016-2017.

It is calculated that the loss is 0.08% of total yield in Natore District. Expert thinks that this loss has no significant impact on the local economy of Natore, as planned economic infrastructure development (i.e. NEZ) would play vital and sustainable roles to the livelihoods of affected farmers and tenants. Moreover, local crop productions would be backward support of raw materials for agro-based industries that has been proposed in upcoming NEZ.

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<sup>149</sup> BBS (Bangladesh Bureau of Statistics), 2017. Yearbook of Agricultural Statistics. Ministry of Planning, Government of the People's Republic of Bangladesh.



## 11 Conclusion

Trade associations of Natore are very much enthusiastic to relocate or set up new industries in the EZ for creating employment opportunity for the youth and economic development of the area. In addition, the existing industries which are advancing fast will get a boost once if the EZ is built in Natore.

The local trade association expects a positive impact on the socio-economic development in the area as a result of the development of the project. They also expect that the EZ would improve communication and transportation facilities in the locality and overall socio-economic conditions of the local communities. It was perceived that the project would adequately contribute to the increase in employment and income opportunities of the people by various means, thereby alleviating poverty in this region. New livelihood opportunities will be available to the people during the construction and commissioning phases of the zone. Direct employment opportunities for the local people (especially construction workers and unskilled labourers) are expected to increase.

The consultation with the trade associations reflected that rice mills, pulses mills, jute mills, tannery industry, food Industries, steel industries, furniture industries (steel, wooden, aluminium) , sugar mills, auto-rice mills have been established in last ten years in this area. To establish industries in Natore EZ the following points were mentioned by the trade association:

**Strong Points:** Availability of labor, low price of land, availability of raw materials, available transportation

**Weak Points:** Insufficient connectivity of power, gas and water, inadequate rail connectivity from Natore to Dhaka, insufficient of road infrastructure, unskilled manpower;

**Opportunities:** Expansion of business, employment creation, use of domestic products;

**Risks:** Higher interest rate of bank loan, insufficient road Infrastructure, Inadequate of trained labor

It has been suggested that the following facilities can be taken for attracting investors in the identified areas.

- Connection of gas and power needs to be simplified;
- Development of transportation network (road, rail and air) ;
- Low price of land/plot;
- Land/space allocation needs to be simplified;
- Necessary support for getting long-term loan.

It is important to note that this report has covered the benchmarking of the economic zone, industry assessment and demand forecast to comply with the ToR. Concept of master planning, social and environmental review has also been covered.

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