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Draft Feasibility Report

Construction & Operation of Inland Container Terminal (ICT) at Khanpur, Bangladesh

Submitted to

PPO Office, Bangladesh

September, 2015

PPO Office, Bangladesh

pwc

To,

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September 17, 2015

Subject: Submission of "Preliminary Findings Report for Phase I" for the engagement captioned "Transaction Advisory Services for Construction & Operation of Inland Container Terminal (ICT) at Khanpur"

Dear Sir,

This has reference to the agreement signed between PricewaterhouseCoopers Private Limited and Public Private Partnership Office on 30th March, 2015 for "*Transaction Advisory Services for construction & operation of Inland Container Terminal (ICT) at Khanpur*".

We are pleased to submit to you the deliverable, "Draft Feasibility Report" for Phase 1 of this engagement. Kindly let us know should you require any clarification or should your team have further suggestions.

Yours sincerely,

Nripesh Kumar

Director

PricewaterhouseCoopers Private Limited

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List of Abbreviations

Abbreviations	
ADB	Asian Development Bank
APTA	Asia-Pacific Trade Agreement
ARAP	Abbreviated Resettlement Action Plan
ASEAN	Association of Southeast Asian Nations
BCIC	Bangladesh Chemical Industries Corporation
BDT	Bangladesh Taka
BEPZA	Bangladesh Export Processing Zone Authority
BEZA	Bangladesh Export Zone Authority
BIM	Bangladesh Institute of Management
BIWTA	Bangladesh Inland Waterway Authority
BOI	Board of Investment
BSCIC	Bangladesh Small and Cottage Industries Corporation
BSEC	Bangladesh Steel and Engineering Corporation
BSFIC	Bangladesh Sugar and Food Industries Corporation
BT	Bangladesh Taka
CAGR	Compound Average Growth Rate
CAPEX	Capital Expenditure
CFADS	Cash Flow Available for Debt Servicing
DCR	Dhaka Capital Region
DTA	Domestic Tariff Area
EA	Environmental Assessment
EBITDA	Earnings before Interest, Tax, Depreciation and Amortization
EHS	Environment, Health and Safety
EIA	Environment Impact Assessment
EIR	Economic Incentive and Institutional Regime
EIRR	Economic Internal Rate of Return
EMP	Environment Management Plan
EPZ	Export Processing Zone
EU	European Union
EZ	Economic Zone
FCL	Full Container Load
FDI	Foreign Direct Investment
FEU	Forty feet Equivalent Unit
FOP	Factors of Production
FY	Financial Year
FYP	Five Year Plan

GDP	Gross Domestic Product
GOB	Government of Bangladesh
GSP	Generalized Scheme of Preferences
GVA	Gross Value Added
ICT	Information and Communications Technology
IEE	Initial Environmental Examination
IRR	Internal Rate of Returns
KEI	the Knowledge Economy Index
KLD	Kilo Litres per Day
LCL	Less than Container Load
LDC	Least Developed Country
LPG	Liquefied Petroleum Gas
M & A	Mergers and Acquisitions
MSME	Micro, Small and Medium Enterprises
NIBT	Net Income Before Tax
NITTRED	National Institute of Textile Training, Research and Design
NPO	National Productivity Organization
O&M	Operations and Maintenance
ODOP	One District One Product
OECD	Organization for Economic Co-operation and Development
OPEX	Operating Expenditure
PAP	Project Affected Persons
POL	Petroleum Oil Lubricants
PPP	Public Private Partnership
RMG	Readymade Garment
RTA	Regional Trade Agreements
SAFTA	South Asian Free Trade Area
SCITI	Small and Cottage Industries Training Institute
SIA	Social Impact Assessment
SMEs	Small and Medium Enterprises
SMI	Survey of Manufacturing Industries
SYFP	Sixth Five Year Plan
TEU	Twenty feet Equivalent Unit
Tk.	Bangladeshi Taka
TPE	Total Persons Engaged
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
UP	Union Parishad

USA	United States of America
USD	United States Dollar
WB	World Bank
WTO	World Trade Organization

Executive Summary

Project Overview

With 720-km long coast line along with 700 natural rivers and tributaries crisscrossing the country, Bangladesh has one of the largest Inland waterway networks in the world. In order to utilize the complete potential of country's Inland water network, especially for container trade, GOB is increasingly promoting the usage of Inland Water Transportation (IWT). Increase in the share of IWT is expected to result in reduction in logistics cost and de-congest the existing road network. To encourage transportation of containers using IWT, GOB intends to develop a network of river ports with modern container handling infrastructure. The proposed Inland Container Terminal at Khanpur is one such project identified by the Government.

To facilitate the transportation of containers using Inland Water Transportation (IWT), an existing jetty has been identified at Khanpur for development of a full-fledged Inland Container Terminal (ICT). This jetty is adjacent to Narayanganj port and has direct access to Shitalakhya River. IWT connectivity to the proposed ICT at Khanpur falls under Class I category with depth ranging between 12 to 13 feet (3.5 meters).

The Public Private Partnership (PPP) Office under the Prime Minister's Office has awarded the Transaction Advisory Services contract of the above mentioned project to PricewaterhouseCoopers Private Limited as the Transaction Advisors ("TA") on March 30, 2015. The inception report detailing approach and methodology to be adopted, work plan and staffing schedule to be followed for phase 1 was submitted on May 03, 2015. Further, Preliminary Findings Report (PFR) highlighting technical issues related to the proposed ICT at Khanpur was submitted on July 14, 2015. A presentation on the PFR was made to the officials from BIWTA and PPP Office on August 06, 2015 and preliminary findings were discussed. At this stage, the TA is submitting its draft report detailing its technical assessment including Infrastructure, EIA and SIA, financial feasibility, risk assessment and PPP Structuring, identification of regulatory requirements, heads of terms of Concession Agreement, Procurement Plan, and recommendations.

Salient Features of the Project

TABLE: SALIENT FEATURES OF PROPOSED PROJECT

Project Feature	Description
Viable Business Model	Simple Option – 30 years Concession-Base case Traffic with Bulk Operations
Project Implementation Model	Based on Market Sounding and Financial Feasibility analysis (Equity IRR 18.94%), project is suitable to be implemented under PPP mode
Key Success Factors	• Operator should be allowed to handle bulk traffic along with containers • Time to market should as early as possible • BIWTA to ensure land to be free from all encumbrances
Way Forward	• Timely approval of the Draft report • Preparation of PIM and commencement of Marketing activities • Preparation and finalisation of Transaction strategy and related documents
Government Support	• BIWTA to ensure land to be free from all encumbrances • Expansion of access road considering future requirement • Permission to the operator to invest in Inland Container Vessels

Project Feature	Description
	• BIWTA to ensure round the clock availability of river police for secure and safe transit of cargo • Fast track implementation of project including transaction and development phase • Similar to other infrastructure projects, VAT exemption on tariff for complete concession period

Preliminary Project Assessment

Project Influence Area: The Project Influence Area (PIA) is the zone of influence where the project can offer maximum benefits to its stakeholders. With proximity to Dhaka Capital Region (DCR and industries located in the immediate vicinity (50 Km), the PIA for the proposed ICT at Khanpur would include industrial establishments in and around Dhaka metropolitan area, Narsingdi, Gazipur, and Narayanganj. DCR is the largest and most developed industrial region in Bangladesh with 16.6% of total industrial establishments in the country[1]. Out of these, nearly half of the industries are located in the Dhaka metropolitan area.

Key Commodities: Based on in-depth analysis of various clusters in PIA of the proposed project, major commodities identified with potential for export and import include

TABLE: POTENTIAL IMPORT & EXPORT COMMODITIES

Import Commodities	Export Commodities
Textile Raw Material	Ready Made Garments (RMG)
Raw Cotton	Jute and Jute Products
Plastics & Rubber Articles	Frozen Goods
Chemical & Pharmaceutical Products	Leather and Leather Products

Existing Connectivity: The existing facility is connected to the national highway network using the Demra-Narayanganj road. The road directly leading to the ICT Khanpur premises is a two lane road framed by concrete walls on both sides and this road is used for mixed traffic including passenger and cargo. In case of a probable future line-up of trucks during peak situation the traffic situation could become quite constricted and will probably lead to road blocks.

Based on the road connectivity assessment, it can be concluded that Demra-Narayanganj road is critical for the proposed ICT at Khanpur. Existing freight traffic on this road is estimated at around 80 to 100 trucks per day. With development of ICT Khanpur, the freight traffic on this road is expected to reach 180 to 200 trucks per day by 2025 (800 PCU). Considering 2000 PCU/h as the capacity of a two lane road with mixed traffic conditions, the existing road is sufficient to handle 300 trucks per day. However, to ensure smooth evacuation of containers/cargo and to provision for peaking in the absence of buffer yard (parking area), additional road capacity is desirable

The proposed ICT Khanpur location at the Shitalakshya River is a part of the waterway network notified under Indo-Bangladesh Protocol on Inland Water Transit & Trade. For inter-country trade, five ports of call designated in Bangladesh include Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj. The existing jetty at Khanpur falls under the supervisory control of Narayanganj port. Depth across the river channel from Chittagong to Khanpur ranges between 3.5 m to 6.5 m (also classified as Class 1 waterway). This indicates a sufficient draft for berthing as well as for smooth navigation. However, there is one critical section near Char Gazaria where the river depth is likely to be below 3.5 m. Vessels accessing the waterway connecting Chittagong

[1] Bangladesh Bureau of Statistics

and the proposed ICT at Khanpur have to cross Bay of Bengal and therefore, vessels have to have the ability to cross the Bay of Bengal and not designed as pure inland ships.

Demand Assessment

To arrive at the potential demand for transportation of container using IWT, two approaches (i) Top-Down Analysis and (ii) Bottom-Up Analysis were followed. To formulate strategies addressing the most adverse impact, lower traffic of the two approach (traffic projections) was considered for further assessment.

- In *Bottom-Up Approach*, potential commodities were identified based on the PIA profile. Traffic volumes of these identified commodities were projected taking into account with past trends and drivers for future growth. The information/data required was obtained based on secondary research as well as interactions with stakeholders including cargo owners, freight forwarders, transporters, vessel manufacturers, shipping lines, off-Dock Facility Operators, Chittagong port etc.
- On the other hand, for the *Top-Down Approach,* the projections are based on:
    - a thorough quantitative and qualitative analysis of past trends regarding economic development, foreign trade, and port handling capacities in Bangladesh;
    - identification of the crucial parameters that determine demand as well as supply of port services;
    - projection of these parameters based on a mix of quantitative and qualitative information;
    - the forecast allocates market shares to Chittagong based on existing as well as likely future competition;
    - Sensitivity analysis for the estimates of container traffic (*Top-Down Approach*) projections for the potential demand was carried out considering base, low and high scenarios. Traffic projection under base scenario is prepared considering the assumptions based on historic trend analysis. Whereas, projections for potential container demand for low and high case scenarios are prepared by adjusting these assumptions.

The national traffic volumes for loaded and empty containers based on the "*Top-Down*" approach are expected to grow from 2.28 million TEU in FY 2017 to 10.8 million TEU in FY 2040 at CAGR of 7.34%. Whereas, national traffic volumes for loaded containers based on "*Bottom-Up*" approach are expected to grow from 2.28 million TEU in FY 2017 to 12.7 million TEU in FY 2040 at CAGR of 8.15%. Comparison of the traffic projections under both approaches is presented in the table below:

TABLE: NATIONAL TRAFFIC ESTIMATION SUMMARY

Head	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
"Top Down"(in '000 TEU's)	2280	4027	5988	8251	10221	10832	**7.34%**
"Bottom Up" (in '000 TEU's)	2280	3802	6072	8909	11541	12766	**8.15%**

As can be seen from the table above, overall growth of national container traffic based on "bottom up" approach is higher as compared to the projection based on "top down" approach. To remain conservative in our estimates, projections for national container traffic based on "top down" approach have been considered for arriving at the potential traffic for the proposed ICT at Khanpur.

Competitive Assessment

The proposed ICT at Khanpur will have to compete with 5-6 other river based inland container terminals and two Inland Container Depots including Kamlapur (existing) and Dhirasram (proposed). These river based container terminals are in various stages of development. Based on the detailed SWOT analysis of competing players, the proposed facility can suitably address competitive issues (upcoming/existing) on the basis of the following parameters:

- Strategic location including Narayanganj industrial area, especially the Adamjee EPZ with an estimated sized of around 76,000 TEU per annum.
- Existing ecosystem including availability of transport operators, handling agents, labour and Customs.
- Low Capital Cost as compared to other Greenfield ICTs.
- Early mover advantage and
- Support from the government in terms of Public Private Partnership

Logistics Cost Assessment

Logistics cost for the competing facilities was assessed considering freight cost based on river distance from the Chittagong port and road distance to key hinterland clusters. For the logistics cost assessment, it was assumed that cargo handling charges will be determined by market forces and in the competitive market environment, these charges will be similar for all the competing facilities. Based on the assessment of river distance to Chittagong Port, various competing facilities are almost comparable (only exception is the A K Khan Terminal which is approx. 50 Km far away compared to others). Further, based on road distance to key hinterland clusters and planned/existing competing facilities, the most competitive facilities identified based on the shortest distance are:

- For Dhaka City – Pangaon ICT & ICD Kamlapur;
- For Narayanganj – ICT Khanpur & ICT Kumudini (under Planning stage);
- For Gazipur – AK Khan Terminal and ICD Dhirasram.

SWOT Analysis of ICT Khanpur

The proposed ICT at Khanpur holds several strengths and weaknesses and faces opportunities as well as threats. The following figure shows the major aspects concerning a SWOT analysis.

Strength

- Direct access to industrial area Narayanganj (incl. Adamjee EPZ).
- **One of the first terminals (if implemented in a short time frame).**
- Dhaka city lies within 35 km radius of the proposed facility.

Weaknesses

- Narrow access road condition.
- Limited land for future expansion.
- Additional cost for relocation of current warehouse.
- Congested river route

Opportunities

- BIWTA studies are promoting the ICT development and do create an awareness for IWT.
- Increase of road congestion can be suitably addressed using IWT
- Increase of fuel/energy prices can using IWT
- Intensified use of Protocol routes agreed on political level.

Threats

- Future highway enhancement projects supporting road transport.
- **Earlier completion of competing ICT projects.**
- Low market acceptability of Pangaon terminal due to inefficient process and issues around last mile transportation might adversely impact the attractiveness of proposed facility.

With strategic location in Narayanganj, distances to plants and business located in and around Narayanganj including Adamjee EPZ is shortest from the proposed ICT at Khanpur. Short distance to units/business in the hinterland will ensure in-times deliveries of cargo from Khanpur and the probability of interruptions during

transfer from terminal to the importer is quite low. By this the duration of transfer as well as the time of arrival at the near-by location is very reliable.

At present, the existing terminal at Pangaon and the upcoming Summit Terminal (expected to be operational by December 2015) are the two direct competitors for the proposed ICT at Khanpur. While the market acceptability of Pangaon is low due to inefficient process and issues around last mile transportation, Summit terminal is expected to be developed as an anchor facility for Maersk Line which may lead to discrimination in services for other MLOs and therefore, may not be attractive enough for other MLOs. If ICT Khanpur could manage an early implementation, it could be the first private container terminal offering non-discriminatory services to all its customers.

Potential Demand for ICT Khanpur

As inland waterway transport for container is a new concept in Bangladesh, reservations from market towards shifting to inland shipping is expected in short to medium term. Accordingly, the potential share of containers to be transported by inland shipping is expected to be lower at the beginning and will primarily be dominated by import containers. It is expected that with short distances to catchment clusters and provision of reliable services (especially vessel schedule linking major ports), the proposed ICT can maximize its cargo share. Potential traffic (in 1000 TEU) for the proposed ICT at Khanpur under each scenario is summarized in the table below:

TABLE: POTENTIAL DEMAND FOR ICT KHANPUR

Expected volume (Thousand TEU's)	2016	2017	2018	2019	2020	2025	2030	2035	2040
High Case		12.8	18.3	22.0	25.6	58.6	91.7	128.8	139.9
Base Case		5.5	11.0	14.6	18.3	46.7	75.0	105.5	115.3
Low Case		1.8	3.7	5.5	7.3	32.9	58.5	85.5	97.9

In addition to the container traffic, there is some existing bulk traffic of approximately 0.8 - 1 Million tonnes per annum comprising of building material, fertilizer and other dry bulk cargoes.

It is important to understand that the actual realization of potential demand of proposed container terminal will further be governed by factors like – Shipping dynamics, competition, hinterland connectivity, transportation dynamics, industry dynamics, social & political environment and regulatory environment. However any significant unexpected change in the above mentioned factors can impact the traffic dynamics- positively or negatively.

Project Scoping

Service Portfolio & Facility Requirement

The service portfolio for ICT Khanpur shall include (but not be limited to):

- Market compliant vessel schedule,
- Individual Custody provision,
- CFS/Warehouse facility,
- staff provision,
- empty container depot,
- bonded area,
- Hassle free custom clearance process,

- Reefer storage service.

Providing these services would require proper coordination and integration of the key stakeholders within the system which would include shipping lines, freight forwarders, customs, importers/exporters, vessel operators & trucking companies. Along with the above mentioned service portfolios, some general expectations shall also be fulfilled, which majorly includes – service reliability, theft protection, damage protection and 24/7 Operations.

To provide the above mentioned services, infrastructure facilities at the proposed ICT at Khanpur would include – CFS facility, open area for handling specialized import cargo such as waste paper and steel scrap. The proposed CFS facility will have the provision of two dedicated ramps for shifting the cargo to warehouse and another for stuffing of containers. Suitable equipment will be deployed for stuffing/stripping of containers. For storage of reefer containers, standard electric plug points are proposed along the periphery of the premise. In order to enhance security of the proposed facility, the entire area shall be protected with wall and barbed wire fencing, along with gated entry (Check-in/check-out system).

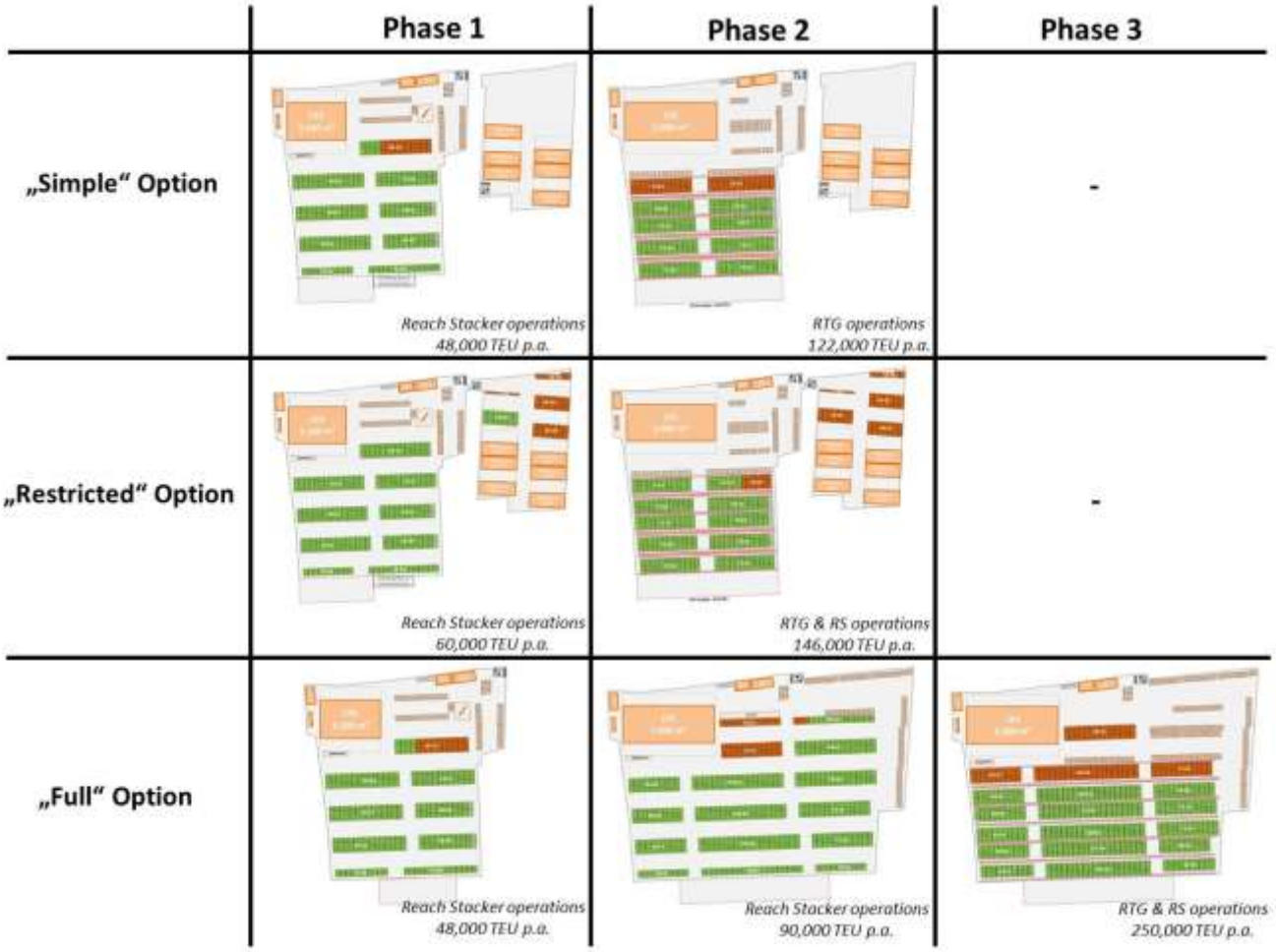
Infrastructure Assessment

Infrastructure assessment was carried out based on the traffic projections for three scenarios - base, high and low scenarios. The assessment includes project development elements such as berth & yard requirement, equipment and capital expenditure.

Three different options have been proposed for the purpose of facility development encompassing different land availability and terminal capacity:

S.No	Option	Land Requirement	Description
1	Simple	**Existing land only**	Warehouses to be relocated to the playground area. Development will take place in two phases. Terminal capacity with annual turnover of 48,000 TEU will be achieved after first phase of development which will subsequently increase to 122,000 TEU after second phase of development by gradually shifting from RS operations to RTG operations
2	Restricted	**Existing land + Expansion land**	Warehouses to be relocated to the playground area and rest of the playground area will be utilised for storage of containers. Development will take place in two phases. Terminal capacity with annual turnover of 60,000 TEU will be achieved after first phase of development which will subsequently increase to 146,000 TEU after second phase of development by gradually shifting from RS operations to RTG operations.
3	Full Area	**Existing land + Expansion land + Land for shifting the Dredger Base**	Under this option, all areas adjacent to the facility will be merged to one large terminal facility. Warehouses will not be relocated to the playground area but outside the facility. Dredger base as well as the passenger facility will be shifted to another location which is not defined at this moment. Development will take place in three phases. Terminal capacity with annual turnover of 48,000 TEU can be provided after the first phase of development. In the second phase of development, remaining unused land will be prepared/paved gradually for RS storage yard which will lead to an annual capacity of 90,000 TEU after the end of second phase of development. In the final phase i.e. after third phase of development, annual capacity of 250,000 TEU can be provided by shifting from RS operations to RTG operations in the storage area.

Layouts of all the options for the proposed ICT at Khanpur are presented in the figure below:



As understood based on discussions with BIWTA, extension area required for implementing the Restricted option and the Full area option will not be available due the proposed capacity expansion of the existing dredger base. BIWTA is in the process of procuring 20 dredgers and majority of the extension area (required to implement the Restricted option as well Full area option) will be used for developing workshops, office space and warehouses for spare parts. However, there will be some space in the extension area to accommodate the relocation of existing warehouses which are presently used for storing spare parts for dredgers. Accordingly, the Restricted option and the Full area option were excluded from the detailed financial analysis.

In accordance with the above fact, we propose Simple option to be used for further analysis, as only this option is feasible from technical implementation point of view.

Considering the traffic projections, development of the terminal area under Simple Option has been planned in two phases:

- ***First Phase*** (Design capacity of 48,000 TEU/Annum) includes the utilization of existing Khanpur Terminal premises**.**
- ***Second Phase*** (Design capacity of 122,000 TEU/Annum) considers utilization of the same area with a gradual adjustment of the terminal layout by changing the storage yard operations from reach stacker operations to RTG operations.

TABLE: CAPITAL EXPENDITURE SUMMARY – SIMPLE OPTION

Costs are in Million BDT	2016 - 2020	2021 - 2025	2026 - 2030	2031 - 2035	2036 - 2040	2041 - 2045	Total
Equipment Costs	505	68	771	953	492	-	2,789
Civil Works Costs	770	152	108	464	-	-	1,494
Financing Costs	45	-	-	38	-	-	83
DSRA Pre-funding	53	-	-	46	-	-	99
Total Investment (Million BDT)	**1,374**	**220**	**879**	**1,501**	**492**	**-**	**4,466**
Total Investment (Million USD)	**18**	**3**	**11**	**19**	**6**	**-**	**57**

As per the estimates of capital expenditure present in the above table, Total capital expenditure (EPC Cost) considering global standards for similar work and the industry benchmarks for Greenfield projects is estimated at BDT 4,282 million (USD 54.86 million) over a period of 30 years. Combining EPC costs with soft costs like financing costs and cash reserves prefunding, total capital expenditure amounts to BDT 4,466 million (USD 57.2 million) over a period of 30 years. Based on the infrastructure assessment, the initial stage of capital expenditures will occur in 2016 to make the terminal operational in 2017.

Environmental & Social Impact Assessment

Environmental impacts during construction phase:

- Air quality will be impacted by dust and particulates emitted from cut and fill operation, demolition/construction activities (roads, bank protection, etc.), site clearing, and emissions from vehicles transporting men and materials to and from construction sites, and handling of fine particulate materials.
- Vehicular movement will increase the noise pollution in the project area
- Construction of berths inside the river may create suspended solids in water and spread these to downstream areas
- The soil quality in the area will also be impacted if the cut soil (excavated soil from the construction site) is deposited on the banks along the river or on low-lying areas. If there is difference in soil quality (including textural class) between the excavated site and dumping site, there may be impacts on soil at dumping site
- Felling of trees will impact the existing flora and fauna of the region and it is necessary that the developer create an alternative afforestation area

Environmental impacts during operations phase:

- The air quality surrounding the proposed terminal is likely to be affected by:
  - gaseous emissions from the movement of mechanised ships
  - loading and unloading equipment using liquid fuel
  - emissions from vehicular movement in the terminal and on access roads
  - secondary development such as urbanisation and the consequent increase in vehicular traffic
- Shitalakhya River has been declared as Ecologically Critical Area in 2009. Thus, polluting activities are prohibited on this river. Discharge of any quantity of wastewater or solid waste into the river should be collected in the terminal and treated.

Socio-Economic impacts:

- New job opportunities will open up for the local population. The proposed development will create direct employment at various levels including the jobs at terminal including environmental management cell.
- Development of waterway is expected to catalyse industrial growth in the region since a cost-effective alternative for the transport of raw materials and products will be available. This industrial growth will create further employment opportunities for the local population.

- Secondary growth such as new industries, business centres, and urbanisation will improve the income level of the local population, the purchasing power, and the economic status. There will be a positive impact on the economy of the region.
- Quality of life will also improve due to the improvement in the air quality expected due to the shifting of cargo transport from road to water. Road transport typically produces much more air pollution than water transport.
- Water transport through Shitalakhya River from Chittagong to Narayanganj is an alternative to highway transport between Dhaka and Chittagong, which is already busy and congested. Thus the waterway might lead to decongesting of the highway.
- It is proposed that the project will utilize a portion of the existing playground in the vicinity. Though the playground is located on the land parcel under the legal ownership of BIWTA, it is envisaged that utilization of the playground will leave the local neighbourhood children and adolescents without an adequate playing and recreational field area.

However, another similarly sized playing field exists within a 10 km radius of the current playground, which can be evaluated as an alternative.

Financial Assessment

As understood based on preliminary market sounding, there are general reservations from market towards cost and efficiency of IWT system for containers. To enhance market attractiveness of the project as well as IWT system, tariffs for the proposed ICT at Khanpur are benchmarked below the existing rates charged by other competing facilities such as ICT Pangaon and ICD Kamlapur.

Base case means - Simple option with base case traffic and 30 years concession duration without bulk traffic

Financial assessment of the project was carried out by estimating the operating revenues and operating costs in three steps:

a) Base case for different concession periods
b) Base case with high traffic for different concession periods
c) Base case with bulk traffic for initial 10 years for different concession periods

Financial Assessment of Base case

Based on services envisaged, revenue can be broadly categorized into accruals from vessel related charges, cargo handling charges at berth & yard, container storage charges, reefer plug in charges and bulk handling charges. Summary of operating revenue is present in the table below:

TABLE: OPERATING REVENUE SUMMARY – BASE CASE

Operating revenue profile	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Traffic (TEU)	5,491	10,948	14,643	18,304	21,965	30,202	57,922	88,100	111,518	116,379	117,981
Container Terminal Revenue (BDT Million)	16	75	114	147	183	261	587	1,031	1,487	1,751	1,905
Operating Revenue /	2,914	6,851	7,785	8,031	8,332	8,642	10,134	11,703	13,334	15,046	16,147

Operating revenue profile	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
TEU (BDT)											

Operating expenditure likely to be incurred at proposed Inland Container Terminal facility at Khanpur, has been segregated into the following six heads:

- Personnel costs
- Equipment Costs
- Labour cost (Stuffing/de-stuffing cost)
- Infrastructure maintenance cost
- Utility Costs
- Miscellaneous Costs

Combined together, these cost heads will cover all the fixed and variable operating expenses of the proposed ICT Khanpur facility. Summary of operating revenue is present in the table below:

TABLE: OPERATING COSTS SUMMARY – BASE CASE

Operating costs profile	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Traffic (TEU)	5,491	10,948	14,643	18,304	21,965	30,202	57,922	88,100	111,518	116,379	117,981
Container Terminal Costs (BDT Million)	37	71	83	96	113	145	272	441	619	736	815
Operating Costs / TEU (BDT)	6,685	6,475	5,702	5,221	5,146	4,814	4,695	5,006	5,554	6,323	6,910

Summary of Key financial indicators under multiple scenarios are present in the table below:

TABLE: SUMMARY OF ALTERNATE SCENARIOS BASE CASE

Scenario Name	Description	Equity IRR	Post-tax Project IRR	Pre-tax Project NPV	Post-tax Project NPV	Average DSCR	Financial Viability
Scenario 1	Without Bulk Traffic - 40 year concession	11.10%	11.20%	576.67	282.54	2.7342	FAIL
Scenario 2	Without Bulk Traffic - 35 year concession	10.76%	11.04%	499.47	229.80	2.7435	FAIL
Scenario 3	Without Bulk Traffic - 30 year concession	9.90%	10.67%	362.48	134.29	2.7892	FAIL

As per the results of the above table, financial feasibility was tested on the base case scenario for different concession period durations i.e. 30 years, 35 years and 40 years and it was analysed that base case is not viable under different concession duration scenarios.

Financial Assessment of Base case with High Traffic

In order to analyse the financial feasibility of the proposed project, base case with high traffic profile was analysed.

Summary of operating revenue and operating cost with high case traffic is added as Annexures to this report.

Summary of Key financial indicators under multiple scenarios are present in the table below:

TABLE: SUMMARY OF ALTERNATE SCENARIOS – BASE CASE WITH HIGH TRAFFIC

Scenario Name	Description	Equity IRR	Post-tax Project IRR	Pre-tax Project NPV	Post-tax Project NPV	Average DSCR	Financial Viability
Scenario 1	Without Bulk Traffic - High Case - 40 year concession	14.03%	12.89%	1139.32	695.85	3.9839	FAIL
Scenario 2	Without Bulk Traffic - High Case - 35 year concession	13.91%	12.81%	1061.65	642.74	3.9969	FAIL
Scenario 3	Without Bulk Traffic - High Case - 30 year concession	13.40%	12.48%	876.77	512.50	4.0161	FAIL

As per the results of the above table, financial feasibility was tested on the base case scenario with high traffic profile for different concession period durations i.e. 30 years, 35 years and 40 years and it was analysed that base case with high traffic profile is not viable under different concession duration scenarios.

Financial Assessment of Base case with Bulk Traffic for Initial 10 years

In order to achieve the financial feasibility and increase the market attractiveness of the proposed project, bulk traffic was added to the container traffic under base case scenario for initial 10 years.

Summary of operating revenue including bulk handling operations is present in the table below:

TABLE: OPERATING REVENUE SUMMARY – COMBINED TERMINAL

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Terminal Revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	1,905
Bulk Handling Revenue	109	225	234	243	252	261	152	-	-	-	-
Combined terminal revenues	125	300	347	391	435	521	739	1,031	1,487	1,751	1,905

Summary of operating costs including bulk handling operations is present in the table below:

TABLE: OPERATING COST SUMMARY – COMBINED TERMINAL

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container	39	75	88	100	117	150	275	441	619	736	815

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Terminal Operating Costs											
Bulk Handling Costs	38	79	82	85	88	91	53	-	-	-	-
Combined Terminal Operating Costs	**77**	**154**	**169**	**185**	**206**	**241**	**328**	**441**	**619**	**736**	**815**

Summary of Key financial indicators under multiple scenarios are present in the table below:

TABLE: SUMMARY OF ALTERNATE SCENARIOS COMBINED OPERATIONS

Scenario Name	Description	Equity IRR	Post-tax Project IRR	Pre-tax Project NPV	Post-tax Project NPV	Average DSCR	Financial Viability
Scenario 1	With Bulk Traffic - 40 year concession	**19.04%**	**15.60%**	**1426.37**	**1005**	**3.0962**	**PASS**
Scenario 2	With Bulk Traffic- 35 year concession	**19.04%**	**15.57%**	**1349.17**	**952.62**	**3.1064**	**PASS**
Scenario 3	With Bulk Traffic - 30 year concession	**18.94%**	**15.54%**	**1212.17**	**857.61**	**3.1531**	**PASS**

As per the results of the above table, financial feasibility was tested for different concession period durations i.e. 30 years, 35 years and 40 years and it was analysed that base case with bulk traffic is viable under all the scenarios.

Based on the results achieved for scenarios under Container terminal operations and Combined terminal operations as shown above, it can be recommended that the **proposed project can be financially viable by combining container operations with the bulk operation for initial 10 years or till the time container traffic volume reaches 55000 TEU annually.**

Considering the results of all the scenarios, "**Simple option – 30 years Concession, Base case Traffic with Bulk handling operations**" is the preferred option as this scenario achieves financial viability with minimum concession duration of 30 years. Key financial indicators for this scenario are presented in the table below:

Description	Financial Indicator Value
Business Model	Simple Option - Container operations combined with Bulk operations for initial 10 years, 30 years Concession and Base case Traffic profile
Equity IRR	18.94%
Post-tax Project IRR	15.44%
Post-tax Project NPV	857.61 Million BDT
Minimum DSCR	1.5081
Average DSCR	3.1531

With equity IRR of **18.94%** and considering nascent stage of Inland Water Transportation of containers in Bangladesh, Equity return of more than 18% is desirable.

In addition, with economic IRR of 23.12%, the proposed project is economically viable.

Sensitivity Analysis of Preferred Option

Sensitivity analysis of the proposed preferred option was performed based on following parameters:

- Capital expenditure
- Traffic
- Operating costs
- Senior Debt Interest rate

Sensitivity on Base Case Model	Equity IRR	Minimum DSCR
Upside Sensitivities		
Capital Expenditure reduced by 20%	25.03%	1.9269
Capital Expenditure reduced by 10%	21.67%	1.6944
Traffic increased by 20%	28.64%	2.1010
Traffic increased by 10%	23.91%	1.8048
Operating Costs reduced by 20%	23.61%	1.7982
Operating Costs reduced by 10%	21.31%	1.6532
Interest Rate reduced by 2%	21.31%	1.8286
Interest Rate reduced by 1%	20.10%	1.6538
Downside Sensitivities		
Capital Expenditure increased by 10%	16.67%	1.3555
Capital Expenditure increased by 20%	14.67%	1.2282
Traffic decreased by 10%	13.55%	1.2109
Traffic decreased by 20%	7.65%	0.9133
Operating Costs increased by 10%	16.55%	1.3628
Operating Costs increased by 20%	14.06%	1.2174
Interest Rate increased by 1%	17.82%	1.3849
Interest Rate increased by 2%	16.79%	1.2793

Graphical representation of the impact of each sensitivity factor on Equity IRR of the project is illustrated with the Tornado Diagram shown below:

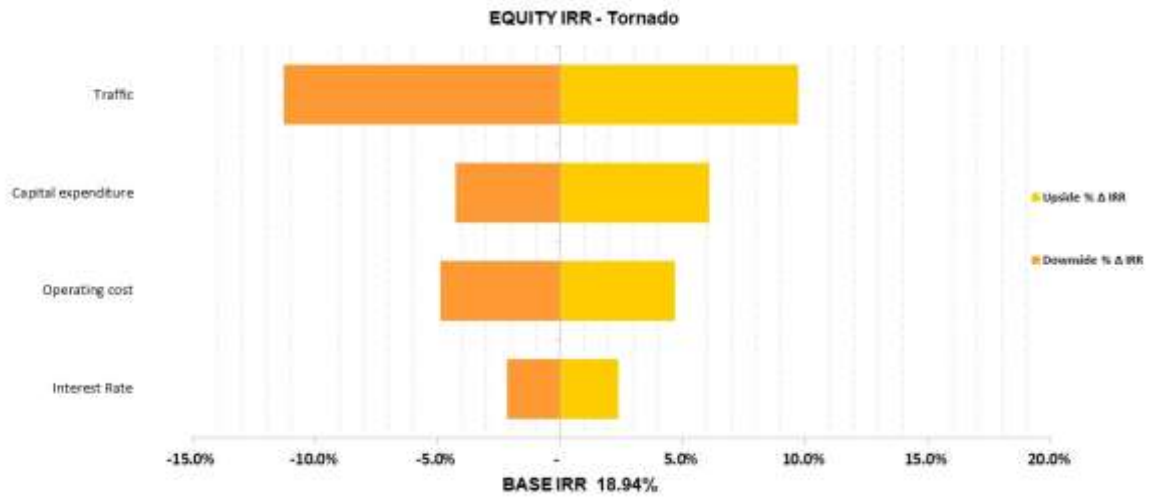


FIGURE: EQUITY IRR – TORNADO DIAGRAM

Notes for tornado:

1. The X axis shows % change from the base IRR of 18.94%
2. The Y axis show the driver and their base values
3. Red bars are for downside scenarios
4. Orange bars are for upside scenarios
5. Beside the bar absolute value for drivers are mentioned

Above analysis shows that, Traffic has the most impact on Equity IRR as compared to other sensitivity factors.

Project Implementation Structure

Given the objectives that the proposed ICT at Khanpur wishes to achieve and pros & cons associated with each PPP arrangement (presented in Section 14.1), PPP arrangement based on Concession Contracting options appears to be suitable for the proposed project. Qualitative assessment comparing project objectives with modalities under each of the PPP model is presented in the table below

Project Objectives	Management Contract	Turnkey Contracts	Lease Contracts	Joint Venture Contract	Concession Contract (incl. BOT)
Infrastructure Development by Private Sector?	-	+	-	+	++
Best practices in Operations & Maintenance?	+	-	+	++	++
Capital Investment by Private Sector?	-	-	-	+	+++
Strong Marketing Capabilities?	+	-	++	++	+++

Project Objectives	Management Contract	Turnkey Contracts	Lease Contracts	Joint Venture Contract	Concession Contract (incl. BOT)
High level of efficiency & innovations?	+	-	+	++	+++
Upside for the government?	-	-	-	++	++
Commercial and Financing Risk for Government?	-	-	++	+	+++
Involvement of MLO by leveraging global network?	-	-	+	+	+
Regulatory control with the Government?	+	+	+	+	+
Government to monitor performance?	+	+	-	++	++
Private Sector to handle majority of risks?	-	-	++	+	++

- Poor + Fair ++ Good +++ Very Good

As can be seen from the table above, majority of the project objectives can be satisfied by delivering the proposed ICT at Khanpur under both the PPP options including Joint Venture Contract and Concession Contract. In Joint Venture Contracting option, government will have to contribute for the capital investment and it is also envisaged that the government will share some of the risks such as commercial, financing etc. associated with the project. Whereas, in Concession Contract option, private sector is responsible for managing all investment requirements as well as risks associated with the project. Given the objectives that the proposed ICT at Khanpur wishes to achieve, PPP arrangement based on Concession Contracting options appears to be suitable for the project.

Risk Assessment & Risk Management

Analysis of the detailed risk profile identifies the traffic risk, competition risk and land acquisition risk as the major risks.

- Traffic risk can be mitigated by allowing the operator to handle existing bulk traffic during the initial years of operations. To encourage the usage of IWT for transportation of containers, GoB should consider VAT exemption on tariffs for entire concession period.
- Risk from competition can be mitigated by ensuring early "time to market". Given the requirement of early time to market, GOB should implement the procurement process based on "Single Stage Bidding" which is less time consuming
- This land acquisition risk associated with the parcel of land which is currently being used by the amusement park and this area falls under the ambit of land being considered for development and operations under the preferred option. In case this land is not made available to the developer for the development of ICT Khanpur facility, this will decrease the returns of the developer from the project and might become less attractive from investment point of view. In order to mitigate this risk, BIWTA must ensure land availability free from all encumbrances.

Conclusion

- Dhaka Capital Region is the largest and most developed industrial city in Bangladesh and is in the close vicinity (within 50 Km radius) of the proposed facility. In addition, strategic location of the proposed ICT at Khanpur can suitably serve the container traffic originating/destined from/to Adamjee EPZ located at distance of about 6 Km from the proposed project.

- Based on the road connectivity assessment, it can be concluded that Demra-Narayanganj road is critical for the proposed ICT at Khanpur. Existing freight traffic on this road is estimated at around 80 to 100 trucks per day. With development of ICT Khanpur, the freight traffic on this road is expected to reach 180 to 200 trucks per day by 2025 (800 PCU). Considering 2000 PCU/h as the capacity of a two lane road with mixed traffic conditions, the existing road is sufficient to handle 300 trucks per day. However, to ensure smooth evacuation of containers/cargo and to provision for peaking in the absence of buffer yard (parking area), additional road capacity is desirable

- Based on the detailed SWOT analysis of the competing players, the proposed facility can suitably address competitive issues (upcoming/existing) with its strategic location, existing ecosystem, early mover advantage and support from the government.
- Potential demand for the proposed ICT at Khanpur is estimated at 5,500 TEU for the first year of operations and is expected to cross 100,000 TEU mark in the 18 year of operations, by providing suitable & market compliant services.
- Service portfolio of the proposed ICT Khanpur will be governed by the market requirements and the strengths of the operator considering backward and forward linkages with industry and vessel operators.
- By involving key stakeholders during facility planning will create awareness about the pros and cons of facility under consideration and also streamline critical issues related to successful project implementation.
- It is recommended that an institutional framework should be put in place for implementing the EMP and Grievance Redress Mechanism.
- Given the land availability and considering operational issues, simple is the most preferred options for implementing the proposed ICT at Khanpur.

- Standalone container operations will not be sufficient to achieve financial viability for the proposed ICT at Khanpur. It is recommended that container operations should be combined with the bulk operation for initial 10 years or till the time container traffic volume reaches 55000 TEU annually.

- With equity IRR of 18.94%, Simple option with base case traffic for 30 years duration along with bulk handling operations is proposed as preferred option. Preferred option is also viable from economic perspective.
- Based on sensitivity analysis of the preferred option, equity returns are most sensitive to traffic volumes estimation for the project.
- To mitigate the major risks including traffic, competition and land availability, it is recommended that:
    - Operator should be allowed to handle bulk traffic along with containers
    - VAT exemption for entire concessions period is required from the government
    - Time to market should as early as possible
    - BIWTA to ensure land to be free from all encumbrances

1. Introduction

1.1. Background

Bangladesh is witnessing sustained annual GDP growth of over 6% (Y-o-Y) since FY 2010. Growth was underpinned by stable macroeconomic and prudent monetary policies, rising industry and services output and continued high levels of remittances. Going forward, Government of Bangladesh's (GOB) objective is to develop a growth trajectory that can ensure an annual increase of 8% in real GDP growth and reduce poverty from 40% to 15% by 2021.

Bangladesh lies at apex of the Bay of Bengal and has rivers that come down from the surrounding countries and flow through it. Majority of the area of this country consists of low and plain lands. According to Banglapedia, nearly 7% surface area of the country is covered by dense 24,000-km long network of inland waterways and three major river systems including their confluence form the world's largest delta. Bangladesh has about 9,000 sq. km of territorial waters and 20,000 sq. km of Economic Resources Zone (ERZ). With 720-km long coast line along with 700 natural rivers and tributaries crisscrossing the country, Bangladesh has one of the largest Inland waterway networks in the world.

With reduced transportation cost resulting from economies of scale, majority of bulk cargo including liquid and solid bulk (coal, clinker, sand etc.) is primarily transported using inland waterway network of the country. In order to utilize the complete potential of country's Inland water network, especially for container trade, GOB is increasingly promoting the usage of Inland Water Transportation (IWT). Increase in the share of IWT is expected to result in reduction in logistics cost and de-congest the existing road network.

To encourage transportation of containers using IWT, GOB intends to develop a network of river ports with modern container handling infrastructure.

The proposed Inland Container Terminal at Khanpur is one such project identified by the Government. The project would be executed by Bangladesh Inland Water Transport Authority (BIWTA) – a government agency responsible for development, maintenance, operations and control of IWT system in the country. The implementation of this project will be supported by PPP Office, Bangladesh.

1.2. Project

To facilitate the transportation of containers using IWT, an existing jetty at Khanpur has been identified for development of a full-fledged Inland Container Terminal. The existing facility is located adjacent to Narayanganj port and has direct access to the Shitalakhya River. IWT connectivity to the facility falls under Class I category with depth ranging between 12 to 13 feet (3.5 meters). The existing facility is connected to the national highway network ("N1" Dhaka-Chittagong Highway) using the Demra-Narayanganj road. This is a two lane road and is used for mixed traffic including passenger and freight.

With the jetty length of about 77 meters (252 feet), the existing facility is used for handling small bulk vessel carrying building material, fertilizer and other dry bulk cargoes. The utilized terminal area has a size of 9.36 acres and primarily contains six warehouses, a shed for cranes, an overhead water tank, a pump station, and a small office. Internal roads including truck lanes and warehouse access roads are not paved.

There is some extension area on north of the existing terminal. A part of this area is currently used as a playground and some parts are covered with building constructions. This extension area is separated from the currently used terminal by a public road providing access to a small passenger terminal. In addition, BIWTA has a dredger base which can be used for extension of the terminal if required.

The primary objective of this project includes development and operations of an inland container terminal at Khanpur to enhance the share of IWT for transportation of container, especially from the port of Chittagong to Dhaka region. The implementing agency proposes development of full-fledged container terminal including, berths, container yard, warehouses, customs examination area, parking and other allied infrastructure.

1.3. Objectives of this Report

The Public Private Partnership (PPP) Office under the Prime Minister's Office has awarded the Transaction Advisory Services contract of the above mentioned project to PricewaterhouseCoopers Private Limited as the Transaction Advisors ("TA") on March 30, 2015. TA will be supported by UNICONSULT Universal Transport Consulting GmbH as sub consultants. The project kick-off meeting between the Transaction Advisors ("TA") and the concerned stakeholders was held on April 23, 2015 ("Commencement Date"). The TA would assess the technical, commercial, financial, environmental and social viability of the project as part of Phase I.

Subsequent to the kick-off meeting, the inception report detailing approach and methodology to be adopted, work plan and staffing schedule to be followed for phase 1 was submitted on May 03, 2015. Further, Preliminary Findings Report (PFR) highlighting technical issues related to the proposed ICT at Khanpur was submitted on July 14, 2015. A presentation on the PFR was made to the officials from BIWTA and PPP Office on August 06, 2015 and preliminary findings were discussed. At this stage, the TA is submitting its draft feasibility report detailing its technical assessment including Infrastructure, EIA and SIA, financial feasibility, risk assessment and PPP Structuring, identification of regulatory requirements, heads of terms of Concession Agreement, Procurement Plan, and recommendations.

Key objectives of this study are -

- Conduct technical assessment including assessment of infrastructure based on the available land, conduct Environmental Impact Assessment (EIA) and Social Impact Assessment (SIA), in case required, modification in facility design based on the outcomes of EIA and SIA
- Assessment of financial feasibility of the project
- Identification of various risks associated with the project and formulation of mitigation measures. Identification of suitable PPP structure for implementing the project
- Identification of regulatory requirements including approval/clearances required from the government to implement the project
- Defining head of terms of a concession agreement and mapping of the procurement plan
- Summarising the recommendations

2. Need Analysis

The Inland Waterway Transport (IWT) for container is a new concept in Bangladesh. As understood based on the interaction with stakeholder, IWT has the potential to dominate the transportation of containers in Bangladesh. Accordingly, this chapter aims at identifying the need for developing IWT as an alternative mode of transportation.

Need analysis was carried out considering economic development, maritime trade and logistics performance of Bangladesh. Information/data required was collected using various secondary sources including reports from the World Bank Group, Asian Development Bank etc. The information so obtained was triangulated based on the primary interactions with stakeholders including BIWTA, D G Shipping, Vessel Owners Association, Chittagong Port Authority and other stakeholders.

Accordingly this chapter is organized in the following sections:

- Economic Development in Bangladesh
- Overview of Maritime Trade of Bangladesh
- Logistics Performance of Bangladesh

2.1. Economic Development in Bangladesh

Bangladesh was ranked as the 37th largest economy in the world by IMF in 2013[2]. Growth potential of the economy has resulted in the inclusion of Bangladesh in the 'Next 11'of Goldman Sachs and is now recognized as the next Asian Tiger Economy.

Bangladesh is a densely populated country with a population of around 155 million living on land area of 147,570 square kilometres (56,977 square miles). More than half of the country's GDP accrues from the service sector even though half of population continues to be employed in agriculture. With availability of large labour force and the need for employment expansion and productivity enhancement, Bangladesh's manufacturing sector is experiencing a strong push by policy makers. As a result of structural reforms in the policies, Readymade Garment (RMG) industry in Bangladesh has emerged as the leading foreign exchange earner. Continuous reforms and policy efforts have led to significant growth in the industrial base of the country, bolstered with increasing realization of domestic and foreign investments in the country. Trends in growth of country's GDP are presented in the figure below:

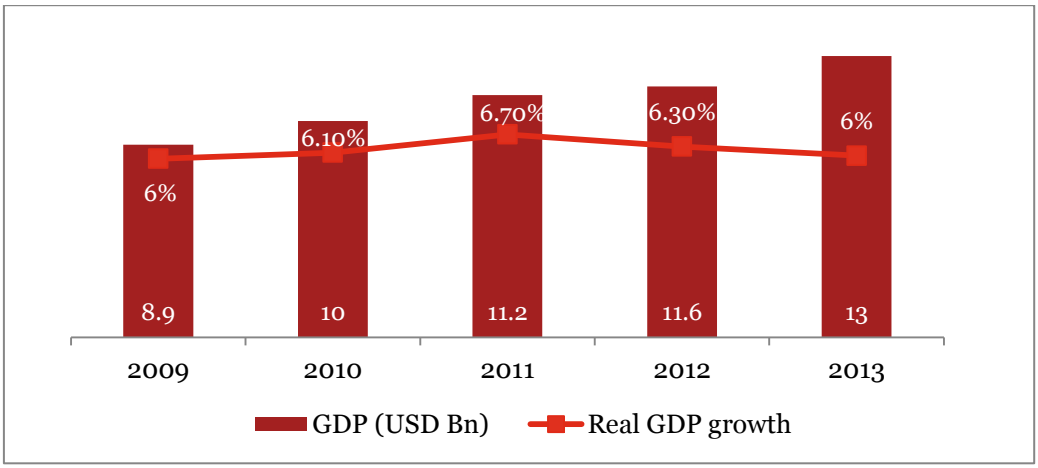


FIGURE 1: BANGLADESH GDP GROWTH TREND

[2] Purchasing Power Parity Terms

Source: World Bank

The GDP of Bangladesh has grown from USD 8.9 Bn in 2009 to USD 13 Bn in 2014 at CAGR above 6%. The average GDP growth rate in Bangladesh has remained at 5.62% from 1994 until 2013 and reached all-time high of 6.71% in 2011. This robust GDP growth was largely propelled by the industrial sector which has exhibited an average growth rate in excess of GDP growth over the same period. The GDP per capita has also gradually increased from USD 598 to USD 829 in 2013[3].

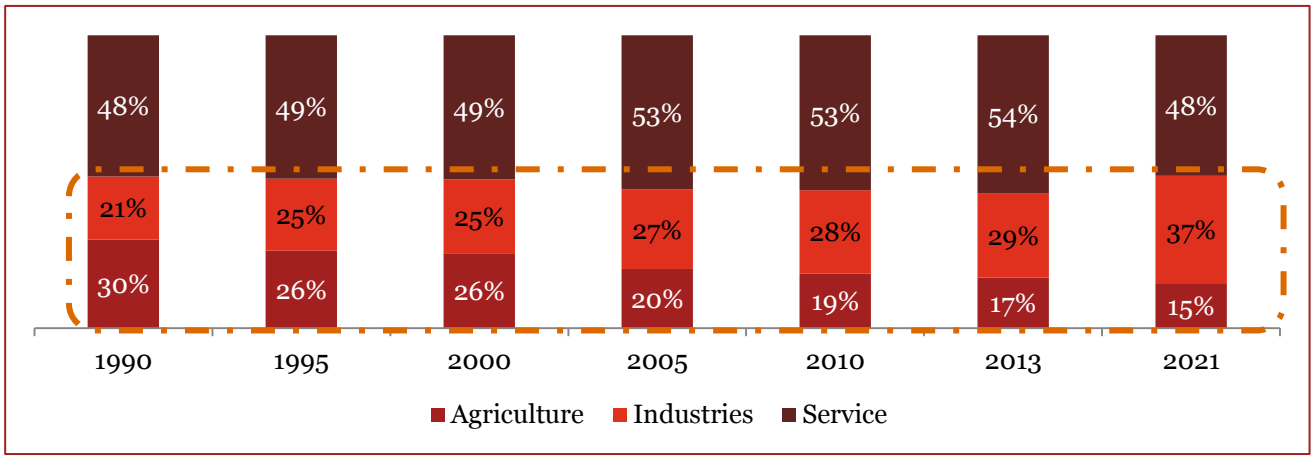


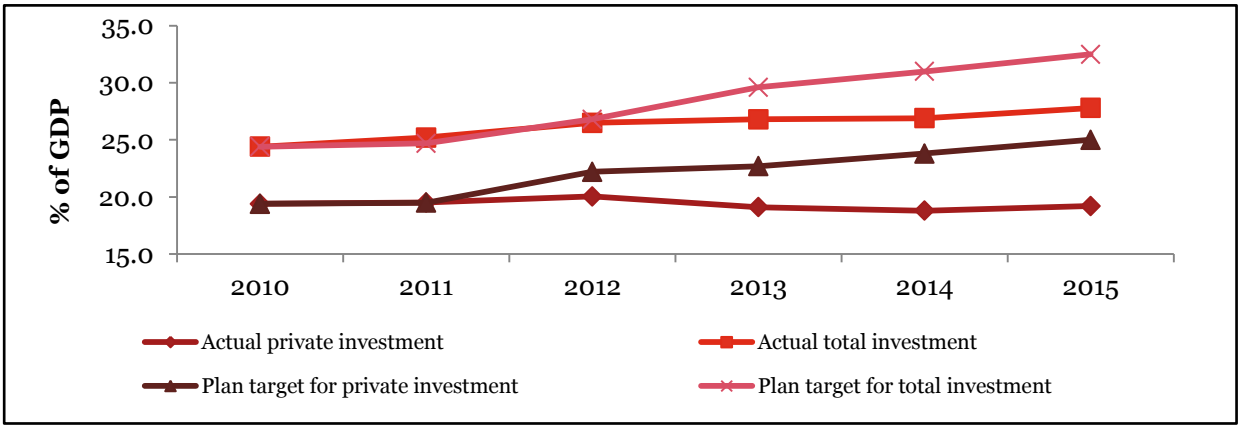
FIGURE 2: SPLIT OF GDP- BANGLADESH

Source: World Bank

A brief look at the GDP split of Bangladesh for 2013, GDP contribution of service sector, industry sector and agriculture sectors is nearly 54%, 29% and 17% respectively. While the contribution to GDP from industrial sector has grown from 25% in 2000 to 29% in 2013, GDP contribution of agriculture sector has declined from 26% in 2000 to 17% in 2013. Going forward, the contribution of industries in the overall economy is expected to reach 37% bye 2021 and over the same period, the respective contribution from services and agriculture sector are expected to decline.

Within industries, on account of trade liberalization, investment de-regulations and improved financial performance, the country's Industry sector has shown a positive growth from 1990 onwards mainly led by emergence of RMG sector.

On the other hand, trends indicate that investments have remained virtually stagnant at around 25%–26% of GDP over the past several years and to meet the targets of the Sixth FYP itself (FY11-15), the rate needs to be raised to the 32%–33%.



[3] World Bank indicators (GDP per capita-current USD)

FIGURE 3: ACTUAL INVESTMENT V/S 6TH FYP TARGETS

Source: ADB Country Outlook 2014 (Bangladesh)

In continuation of this growth story, Bangladesh's Perspective Plan targets transformation of Bangladesh into a middle-income economy by 2021. Accordingly, the Perspective Vision Plan 2021 sets ambitious targets of over 8% GDP growth rate for 2015 to 2020 and over 10% from 2021 onwards. The Plan sets its basis on substantial increase in investment rate in economy, most of which is likely to come from national savings and FDI.

For achieving the high growth agenda set by the Perspective Plan, it is imperative to involve and attract private sector participation to enhance mobilization of funds. The proposed growth is likely to be driven by industries sector resulting in employment generation and human resource development in the country.

2.1.1. *Trade*

Foreign trade of Bangladesh has grown from US$ 14.5 billion in 2001-02 to USD$ 57.6 billion in 2012-13. With imports at USD 34,084 Million and exports at USD 23,562 Million[4] for 2012-13, foreign trade of Bangladesh is skewed toward imports resulting in negative balance of trade for the economy.

The import basket of Bangladesh consists of imports of Textile raw material, Food grains, Spices, Edible oil, POL and Crude petroleum, Chemicals & Pharmaceuticals and Fertilizers. Imports of textile raw material are major inputs for the dominating RMG industry and constitute ~1/5th of the import basket. Textile raw material as a commodity group primarily includes Yarn, Fabric, raw cotton, accessories etc. This highlights the absence of downward linkages for the flourishing garment industry and also a major opportunity for taking the manufacturing sector further. With limited (sufficient for 8-10%[5] of the total demand) production of high quality textile raw material, domestic RMG industry is largely imports dependent.

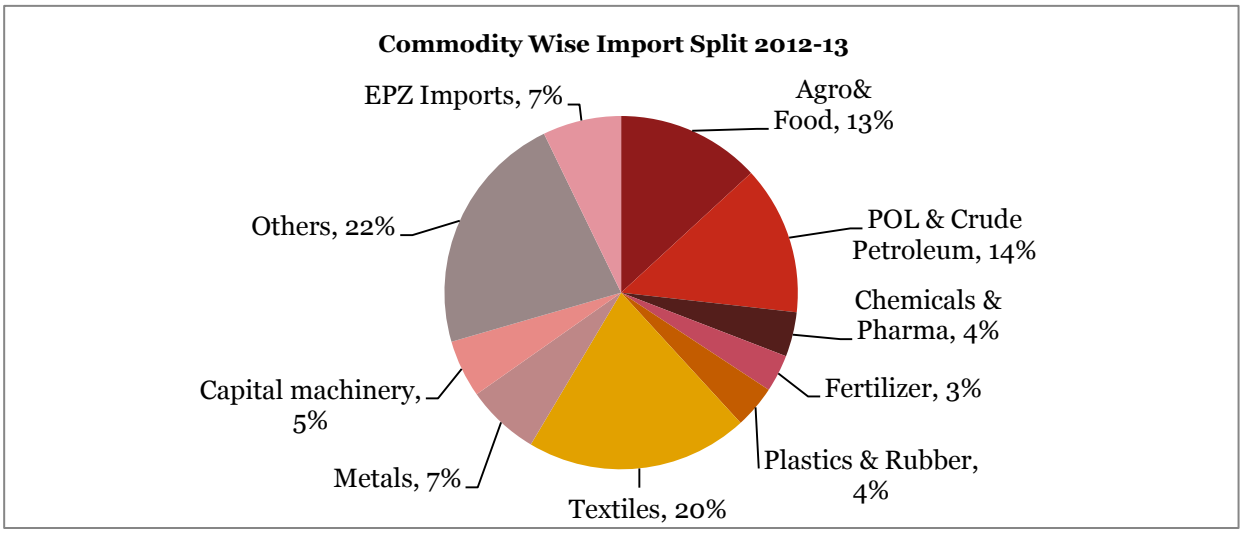


FIGURE 4: MAJOR IMPORT COMMODITIES IN BANGLADESH

Source: Review of the imports data of Bangladesh

Amongst the total exports, Ready-made Garments is the major commodity which accounts for nearly 68% (in value terms) of the total exports. Besides RMG, around 11% of the total exports include Jute & Jute products, Leather & Leather products and Frozen food. Exports contribution of Export Processing Zones (EPZ) developed by the Government is around 16% of the total exports.

[4] Bangladesh Bank

[5] SYFP

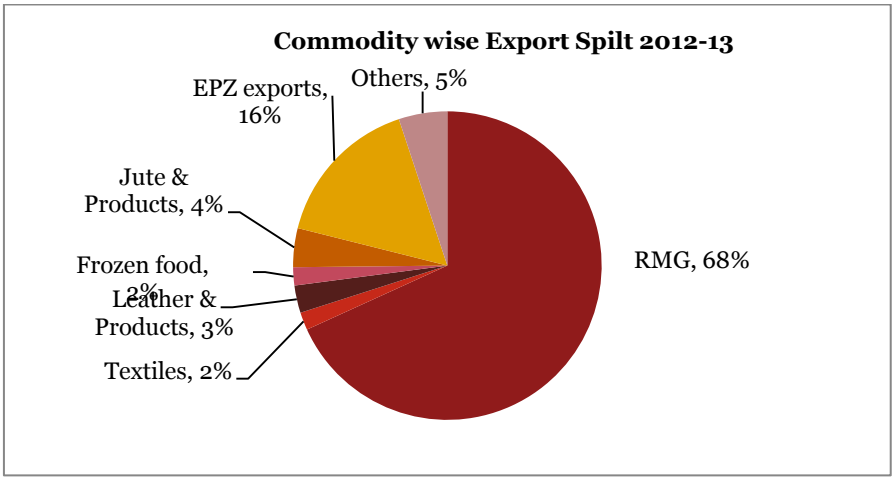


FIGURE 5: MAJOR EXPORT COMMODITIES IN BANGLADESH

Source: Review of the exports data of Bangladesh (Consultant's Analysis)

While the RMG domination in exports is indeed a reflection of country's position as world's second-largest garment manufacturer, it also possibly suggests relatively low emphasis and export competitiveness of the country's other items which need urgent focus. Similarly, the country needs to focus on substituting imports of capital goods and other items of domestic consumption through adequate investment in industrial infrastructure that can enable domestic manufacturing.

Asian economies including China, India, Japan, Malaysia, and South Korea together account for nearly 50% of the country's total imports. Whereas, European Union, USA, UK, and Germany are the major export markets and together accounts for nearly 70% of the country's total exports.

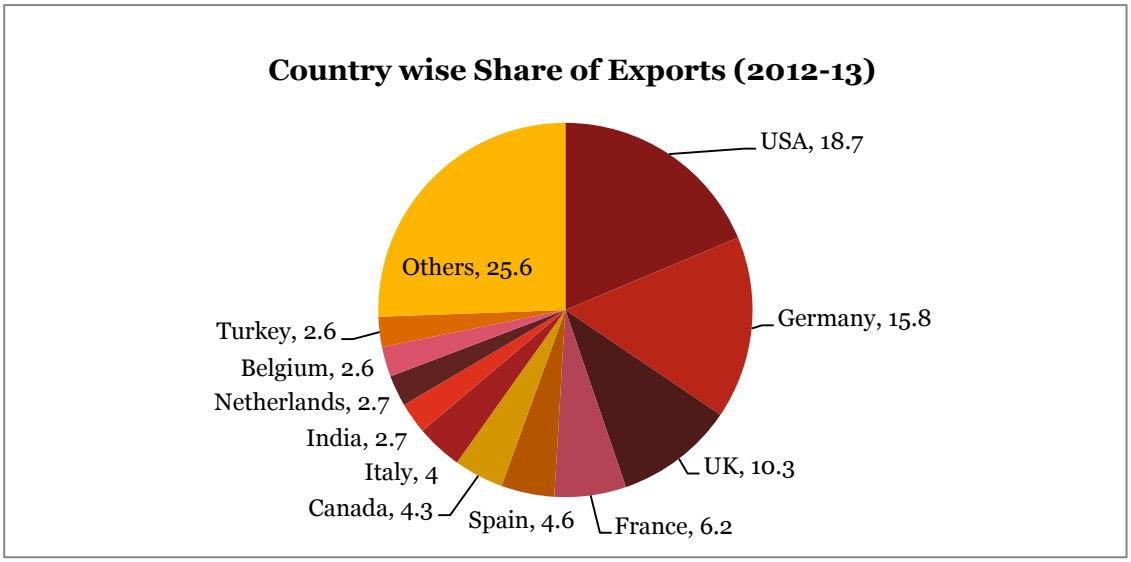


FIGURE 6: KEY EXPORT MARKETS FOR BANGLADESH

Source: Bangladesh Bank

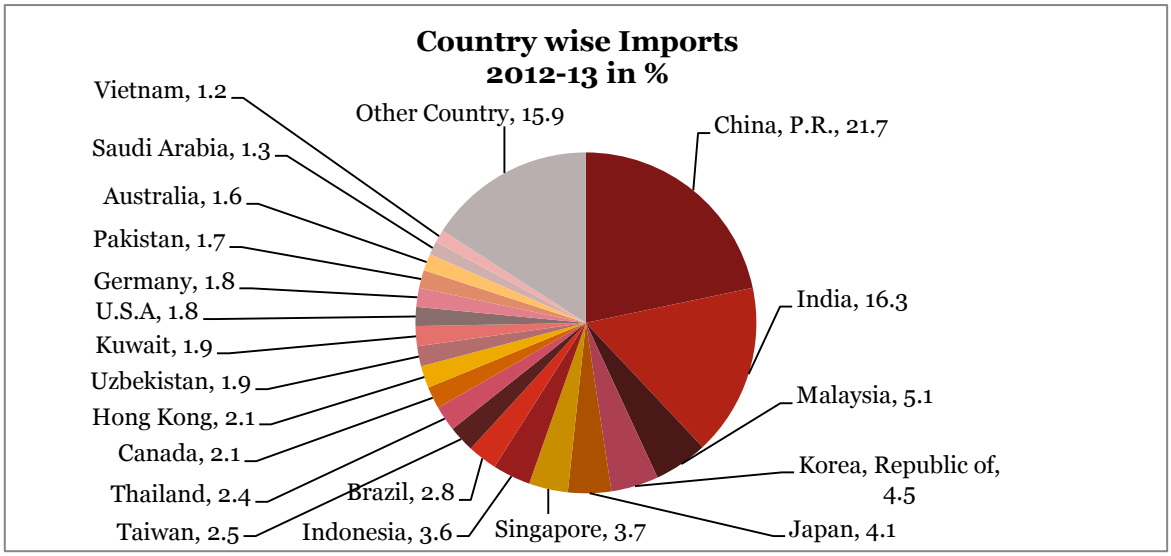


FIGURE 7: KEY SOURCE MARKETS FOR BANGLADESH

Source: Bangladesh Bank

2.1.2. *FDI trends*

As per Bangladesh Bank, FDI inflow in Bangladesh was around USD 12,632 Million from 1977 to 2013. The inflow of FDI in Bangladesh in past 5 years has shown a mixed trend with a sharp dip in FY2011 due to global financial crisis combined with political unrest in the country followed by a significant revival in FY2012 and FY2013 because of promotional incentives in the sectors including banking, telecommunications, energy, and garment industries.

As can be seen from the below figure, manufacturing sector has been the highest grossing sector with an average share of above 33% of the total FDI in past 5 years.

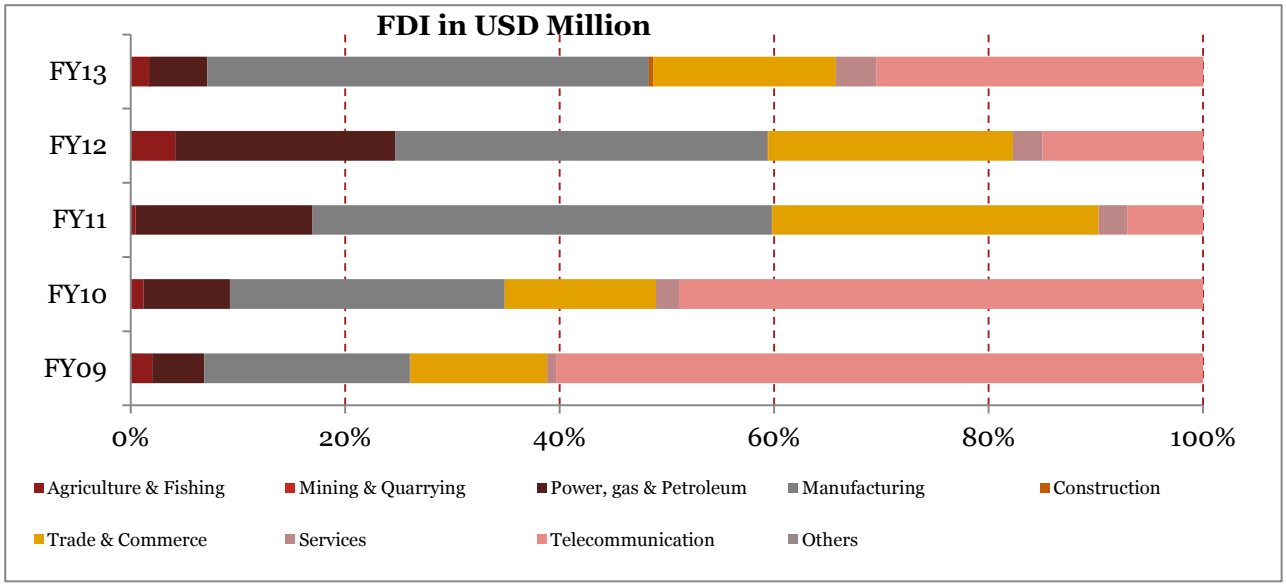


FIGURE 8: SECTOR WISE FDI (USD MILLION) IN BANGLADESH

Source: Bangladesh Bank & Consultant's Analysis

Recently, Malaysia, UK, Singapore, South Korea and Egypt have emerged as the top countries who have invested in Bangladesh.

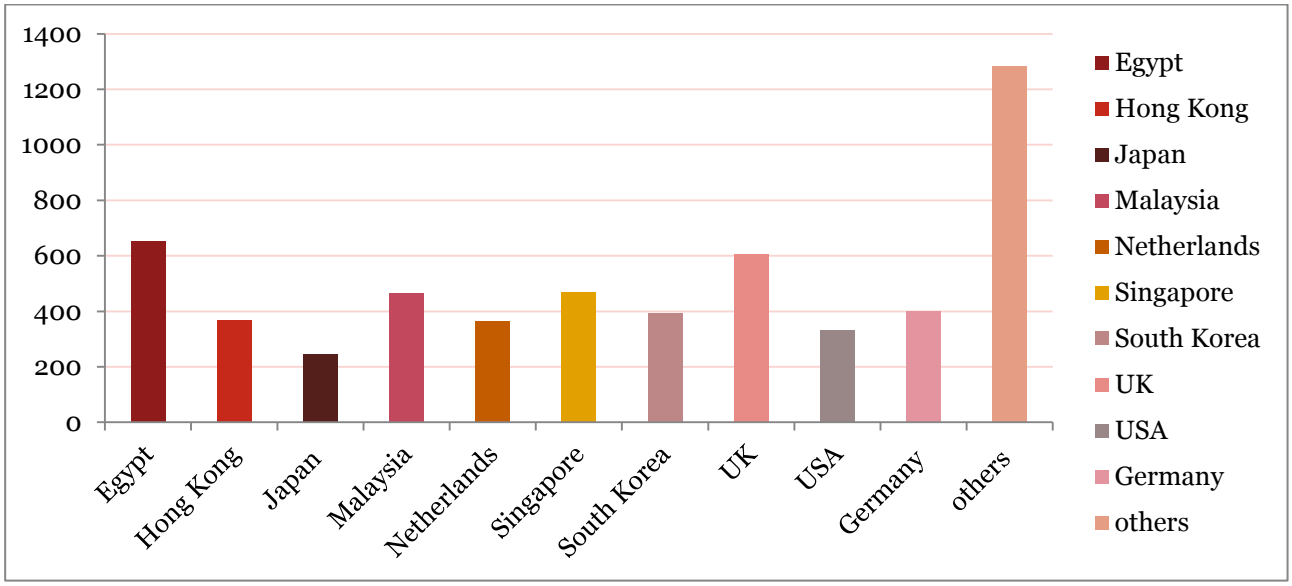


FIGURE 9: COUNTRY WISE FDI (USD MILLION) IN BANGLADESH FOR (FY 09 – FY 13)

Source: Bangladesh Bank & Consultant's Analysis

This increase in investments can be attributed to the liberalization of industrial and investment policies in the inception of Sixth Five year plan, reduction in bureaucratic control over private investment and opening up of new industrial avenues. Some of the major incentives provided by the Government include tax exemptions for power generation, import duty exemptions for export processing industries, tax holidays for different industries, double taxation avoidance treaty on the basis of bilateral agreements and facilities for the full repatriation of invested capital, profit and dividend.

The following figure highlights the Government's strategy for giving impetus to the FDI inflow and to instill confidence among foreign investors (Source: Perspective Plan 2021)

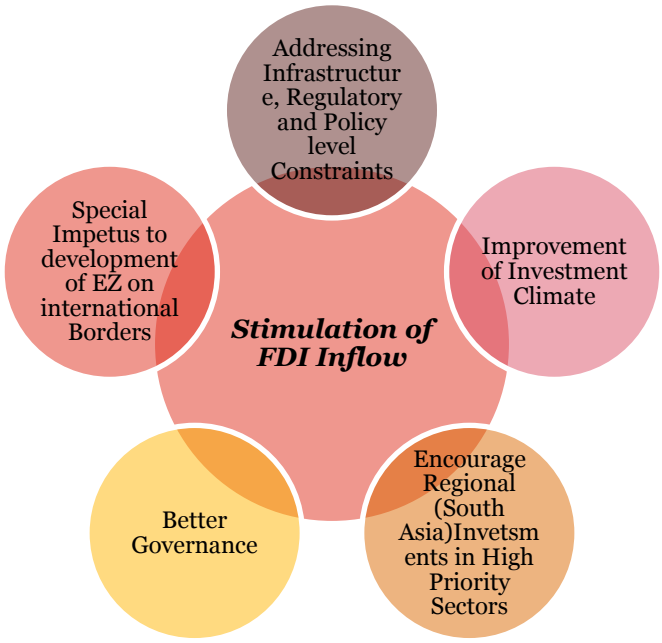


FIGURE 10: IMPETUS FOR FDI, BANGLADESH PERSPECTIVE PLAN 2021

Source: Perspective Plan 2021

2.1.2.1. *Factors Driving Industry (esp. manufacturing industry) Growth*

Domestic Consumption Pattern

With the growth in population and increase in disposable income resulting from economic growth, domestic consumption in Bangladesh has steadily increased over the last decade. Final Consumption expenditure (the sum of household final consumption expenditure and government consumption expenditure as a % of GDP) has been in the range of 82%-84% during the period 2008-2012[6]. Trend in the final consumption expenditure in Bangladesh is presented in the table below:

TABLE 1: FINAL CONSUMPTION EXPENDITURE AS % OF GDP

Year	% of GDP
2008	84.2
2009	82.75
2010	82.2
2011	83.56
2012	82.41

Source: World Bank

Going forwards, domestic consumption expenditure of Bangladesh is expected to increase with the implementation of the Prospective Plan

Growing Foreign Trade

Foreign trade of Bangladesh has registered sustainable growth since FY 2008- 09 due to initiation of economic reforms and adoption of liberal foreign trade policy. This growth in foreign trade can be attributed to the growing international demand for ready-made garments produced in Bangladesh. Government is consistently pursuing an export led economic development strategy to stimulate export earnings. Promotional campaign and industry assistance are being provided under Export Diversification Program. Three more EPZs were established in Dhaka, Comilla and Chittagong. Trends in foreign trade of Bangladesh are presented in the figure below:

TABLE 2: FOREIGN TRADE INFORMATION

Year	Import (US$ billion)	Export (US$ billion)	Total Trade (US$ billion)
2001-02	8.54	5.99	14.53
2002-03	9.66	6.55	16.21
2003-04	10.90	7.60	18.5
2004-05	13.15	8.65	21.8
2005-06	14.75	10.53	25.28
2006-07	17.16	12.18	29.34
2007-08	20.37	14.11	34.48
2008-09	22.51	15.57	38.08
2009-10	23.74	16.20	39.94
2010-11	33.66	22.92	56.58
2011-12	35.52	24.30	59.82

[6] This was last measured in 2012 as per World Bank Report

2012-13	33.97	27.03	61
2013-14	36.99	30.18	67.17
12 Year CAGR	13%	14%	14%

Source: Foreign Exchange Policy Department, Bangladesh Bank, CCI&E and EPB

As can be seen from the table above, the foreign trade has attained a CAGR of 14% over the last 12 years. This trend is expected to continue with the implementation of the Prospective Plan.

Further, as per the HSBC trade forecast report, the destination of exports from Bangladesh is likely to witness a shift from developed economies like France and Canada to rapidly growing third world economies like Turkey and India. However, traditional destinations like USA, UK and Germany are likely to retaining top spots for exports from Bangladesh. Existing and likely future markets for exports from Bangladesh are presented in the table below:

TABLE 3: TRADE FORECAST: TOP EXPORT DESTINATION FOR BANGLADESH (2012, 2030)

Rank	Y 2012	Y 2030
1	USA	USA
2	Germany	Germany
3	UK	UK
4	France	India
5	Canada	Turkey

Source: HSBC Trade Forecast Report

Thrust on industrialization and increased responsiveness of institutional framework

The Ministry of Industries (MoI) is the focal point for promotion of industrial activity in Bangladesh. Ministry of Industries is primarily responsible for developing new policies and strategies for promotion, expansion and sustainable development of Industrial sector of the country. Four corporations under the MoI are tasked with implementing industrial development in key sectors of the country, viz.

Bangladesh Chemical Industries Corporation (BCIC),

Bangladesh Sugar and Food Industries Corporation (BSFIC),

Bangladesh Steel and Engineering Corporation (BSEC) and Bangladesh Small and Cottage Industries Corporation (BSCIC),

The Government has also identified the Small and Medium Enterprises (SMEs) as a priority sector and as the driving force for industrialization. A national taskforce led by the Principal Secretary of the Prime Minister's Office has been formed so that proper policies and planning are followed in establishing SMEs. The SME Foundation (SMEF) provides assistance to SMEs in the country.

Further, in order to provide administrative, institutional and infrastructure facilities in the country's industrialization, there are organizations such as the Bangladesh Standard and Testing Institution (BSTI), Bangladesh Industrial Technical Assistance Centre (BITAC), Bangladesh Institute of Management (BIM), National Productivity Organization (NPO) and Small and Cottage Industries Training Institute (SCITI) under the Ministry of Industries, and the National Institute of Textile Training, Research and Design (NITTRED), Textile Vocational Institutes, Textile Diploma Institute and Bangladesh Silk Research and Training Institutes under the Ministry of Textiles and Jute. For the leather industry, the Bangladesh college of Leather Technology and different district level polytechnic institutes provide technical education. These institutes also provide assistance for industrialization by providing training on management and quality control of goods, safeguarding consumers' interests, producing and repairing import-substitute spare-parts used in industries, manufacturing

new tools necessary for the production of industrial goods that are in demand, and by improving efficiency and overall productivity.

To drive private sector investment, the Board of Investment (BOI) has been established as the primary agency to assist and develop private sector industrial investment in the country, by identifying the hindrances to investment and to provide necessary facilities and assistance in the establishment of industries.

2.1.3. *Overall Business climate in Bangladesh*

The table below captures the key aspects of the overall business climate in Bangladesh.

TABLE 4: BUSINESS CLIMATE IN BANGLADESH

Parameter	Description
Business Environment	• Bangladesh offers the most liberal investment climate and FDI regime in South Asia, with no prior approval requirements or limits on equity participation and repatriation of capital, dividends, profit and income for foreign investors. • The Foreign Private Investment (Promotion and Protection) Act, 1980, which deals with promotion and protection of investment in Bangladesh, ensures equal treatment for local and foreign investors. • Bangladesh offers a competitive location for doing business in terms of costs, inputs, human resources, market access, facilitation etc. • Investing in the appropriate sector in Bangladesh can yield higher returns than most other competing locations, with lesser risks. • Bangladesh continues to make all possible efforts to reduce the costs of doing business and minimize risks and uncertainties. • Bangladeshi products enjoy duty free and quota free access to almost all the developed countries.
Infrastructure Readiness	• Labour Force : 53.7 million • International Airport: Total 3 • Domestic Airport: Total 7 • Seaport: Total 2 • Inland River Ports : More than 10 • EPZ : Total 8 • Installed Power Generation Capacity:10445 MW • Financial Market: 56 banks, 29 Financial Institutions, 2 Stock Exchanges, 62 Insurance Companies • Road Transport :More than 20,000 km roads carry about total 70% of country's total passenger and cargo • Rail Transport: Total 2,745 km cover 32% total area of Bangladesh • Waterways: 5200-8372 km

Parameter	Description
The Economy (Year 2014)	• National Budget FY 2014-2015 : Tk.2505.06 billion • GDP : US$ 129.86 billion • Per Capita Income : US$ 1190 • GDP Growth : 6.01% • Inflation Rate : 7.44% • Investment Rate : 24.4% of GDP • Public Spending : 18.3% of GDP • Foreign Exchange Reserve: US$ 21467.1 million

Source: Bangladesh Bank, BBS, Consultant's Analysis

It may thus be inferred from the above the nation is taking conscious efforts in improving the business environment in the country. The organized industrial development is expected to result in sustainable source of income and job opportunities for all strata of society.

2.1.4. Economic Development & Major Industrial Clusters - Bangladesh

Bangladesh is one of the most densely populated and less urbanized countries in Asia: only 27% of its people live in cities and towns (CIA 2009). Estimates indicate that urban areas account for 60% of national GDP[7]. Urbanization is proceeding fastest in the capital city, Dhaka, but other large urban centres are also growing rapidly. More than half of the country's urban population lives in the four largest cities—Chittagong, Dhaka, Khulna, and Rajshahi. With population of nearly 14 million, Dhaka accounts for more than a third of the country's urban population.

Urbanization in recent years has been marked by intensified urban pull exerted by the growth of industries (particularly export-oriented industries in the large cities), construction, and foreign remittances. In the mid-1970s, like many other developing countries, Bangladesh began to modernize its industrial production system, first through joint ventures with the Republic of Korea and Singapore, and then by itself, with Bangladeshi entrepreneurs.

The location of cities with respect to transport, government services, and natural resources appears to be important in relation to competitiveness – centrally located cities with good connectivity are more competitive than those located close to the country's borders. Chittagong and Dhaka, because of their location advantages are today acting as the major economic hubs in the country, have had higher concentrations and specializations of employment and economic activities, and have benefited greatly from access to migrant labour, public services, and markets associated with agglomeration.

The Greater Dhaka District is the most urbanized and has the highest per capita GDP, followed by Chittagong. Economic corridor of Comilla which runs between Dhaka and Chittagong has a much lower per capita GDP, possibly because of its poor infrastructure and poor governance. The third spatial concentration of economic development is the Jessore–Khulna–Mongla corridor.

Industrial development in Bangladesh is concentrated mainly in and around Dhaka and Chittagong. Location of key industrial clusters in Bangladesh and their indicative profile is presented in figure below:

[7] Source: Competitive Cities in the 21st Century – ADB Report

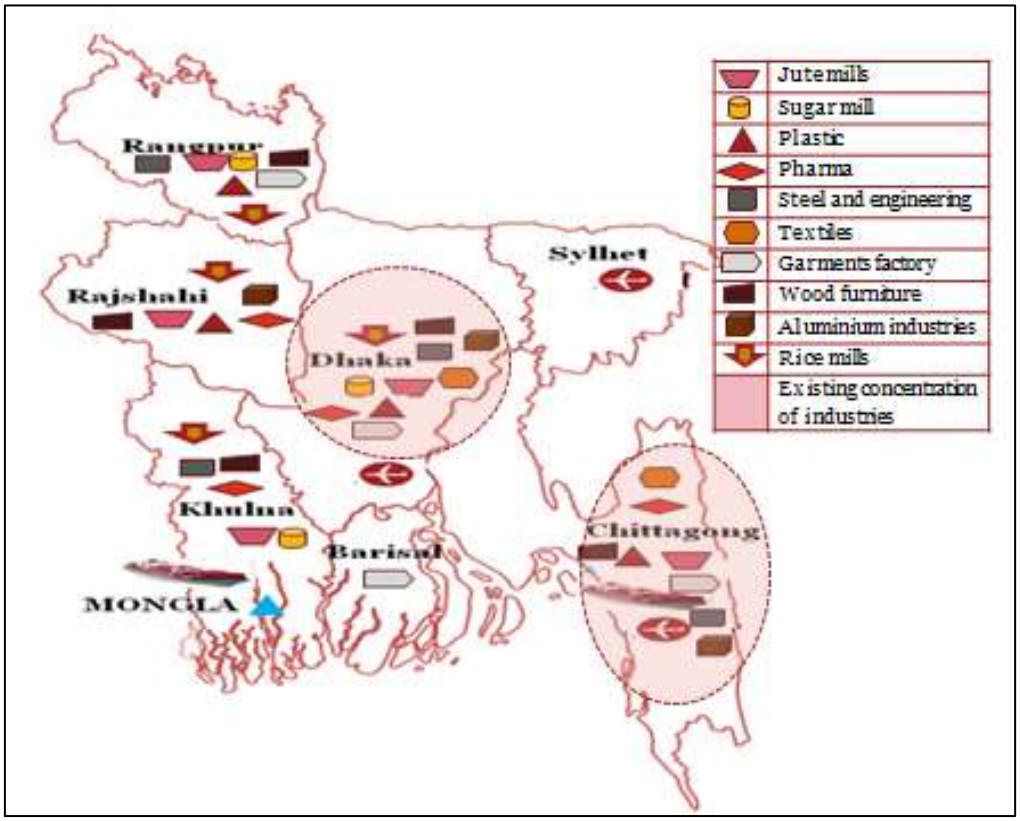


FIGURE 11: INDUSTRIAL LANDSCAPE OF BANGLADESH

Source: Bangladesh Bank, BBS, Consultant's Analysis

As per the comparative economic assessment of different divisions within Bangladesh (presented as annexure to this report), nearly half of the county's manufacturing establishments are concentrated in Dhaka and Chittagong.

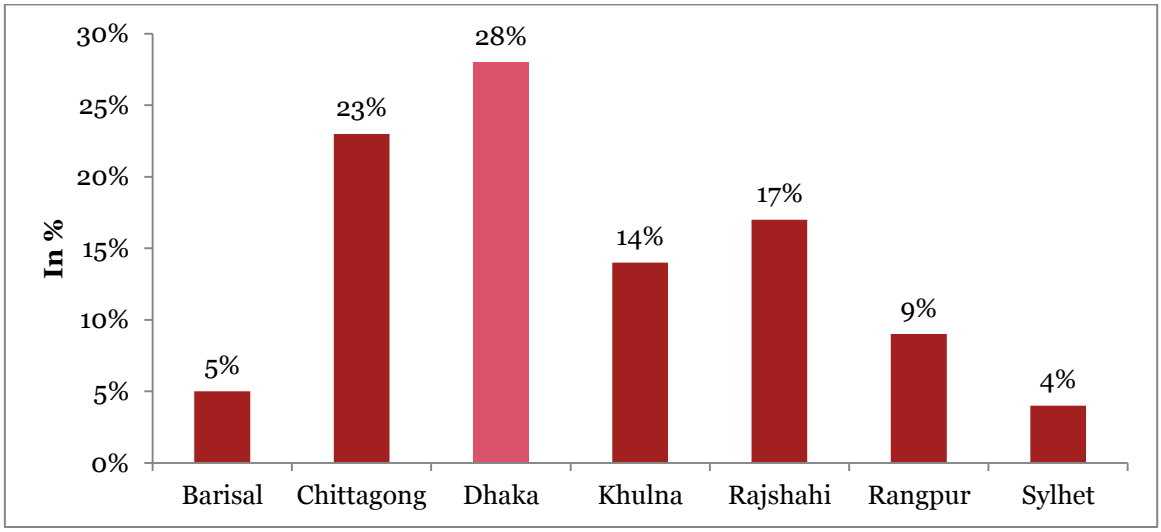


FIGURE 12: MANUFACTURING UNITS DIVISION WISE SHARE IN BANGLADESH

Source: Bangladesh Bank, BBS, Consultant's Analysis

The Dhaka Capital Region (DCR) is the largest and most developed industrial city in Bangladesh. It is also the administrative, commercial, and cultural centre of the country. GDP per capita is low by international standards, but GDP per hectare is high because of the intensity of urban development and business activities. In

2005, the DCR had more than 74,000 industry units, half of which were in the Dhaka metropolitan area. The next-largest concentration of manufacturing units in the DCR can be observed in Narayanganj, Narsingdi, and Gazipur.

Within Dhaka metropolitan area, majority of the industries are concentrated in the central city area and most of these are textile manufacturing units, located primarily in Mirpur and Savar, and along the Airport Road. Micro industries cluster in DCR include Keranigonj Thana and south of the Buriganga River and most industry units in these areas function as tier -2 for large-scale industries. In addition, there are two export processing zones in Savar, northwest of Dhaka city are primarily dominated by textile manufacturing units.

Outside Dhaka metropolitan area, Narayanganj is one of the largest industrial clusters with more than 8,000 textile and garment factories engaged in hosiery production.

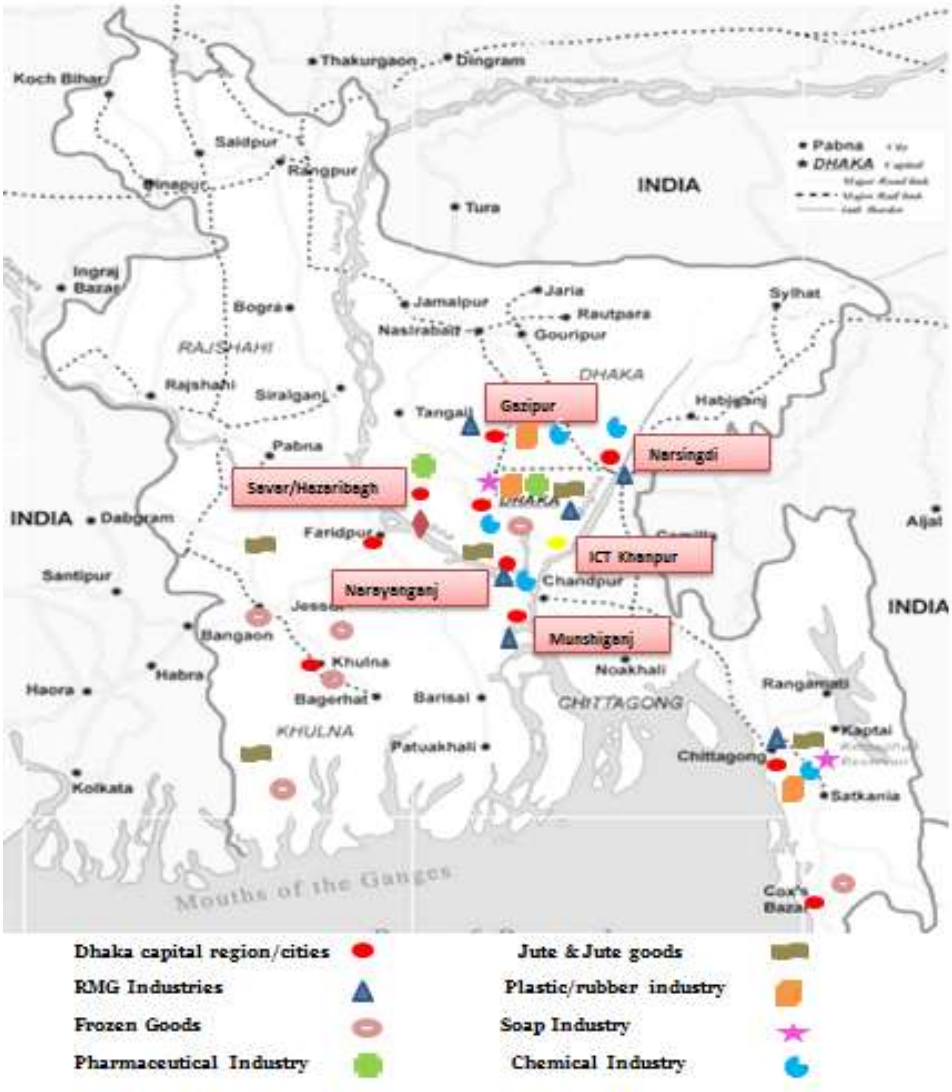


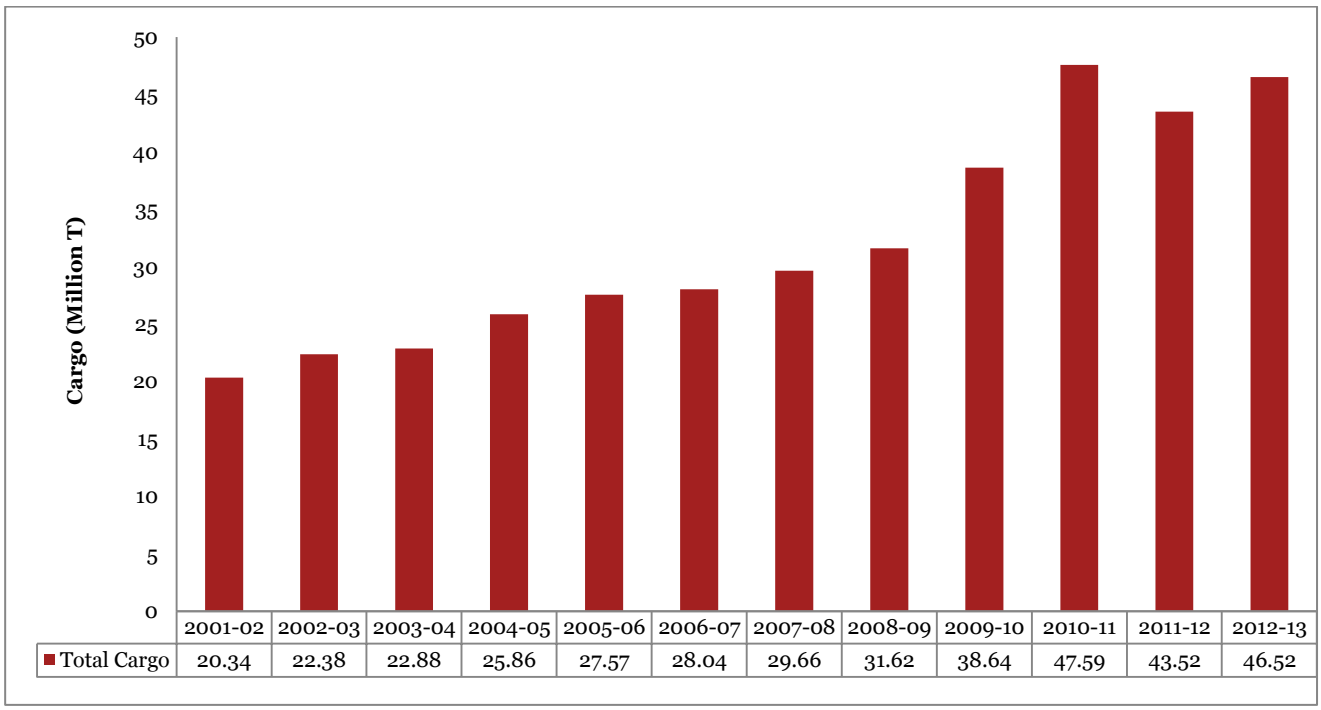
FIGURE 13: CONCENTRATION OF MANUFACTURING INDUSTRIES IN DCR

Source: Bangladesh Bank, BBS, Consultant's Analysis

From the above assessment, it can be concluded that Bangladesh is witnessing sustained annual GDP growth of over 6% (Y-o-Y) since FY 2010. In continuation of this growth story, Bangladesh's Perspective Plan targets transformation of Bangladesh into a middle-income economy by 2021. Accordingly, the Perspective Vision Plan 2021 sets ambitious targets for the future with over 8% growth rate being targeted after 2015, augmenting to 10% year on year growth by 2021.

2.2. *Overview of Maritime Trade*

About 80% volume of nation's foreign trade is handled by Bangladeshi ports. Maritime trade of Bangladesh has grown from about 20.34 million tonnes in 2001-02 to about 46.5 million tonnes in 2012-13 at 7.8% CAGR.



	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Total Cargo	20.34	22.38	22.88	25.86	27.57	28.04	29.66	31.62	38.64	47.59	43.52	46.52

FIGURE 14: MARITIME TRADE OF BANGLADESH – TOTAL CARGO (2001-02 TILL 2012-13)

Source: General Shipping Statistics of Bangladesh

Containers and solid bulk together accounts for nearly 60%[8] of the total maritime trade of the country. Commodity wise distribution of the maritime trade of Bangladesh for 2013 is presented in the figure below:

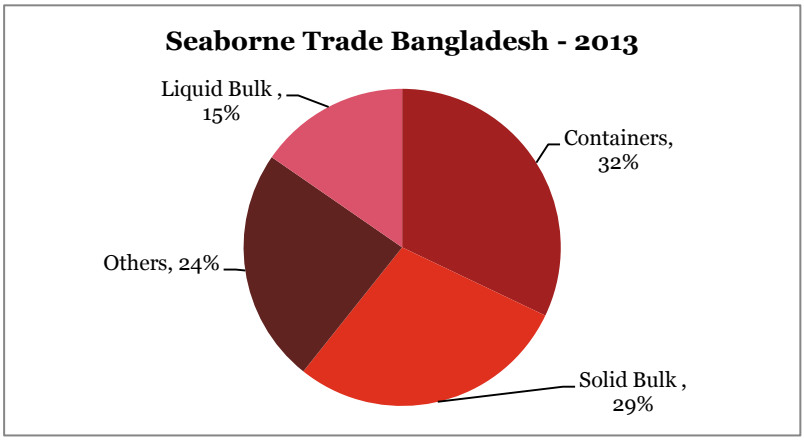


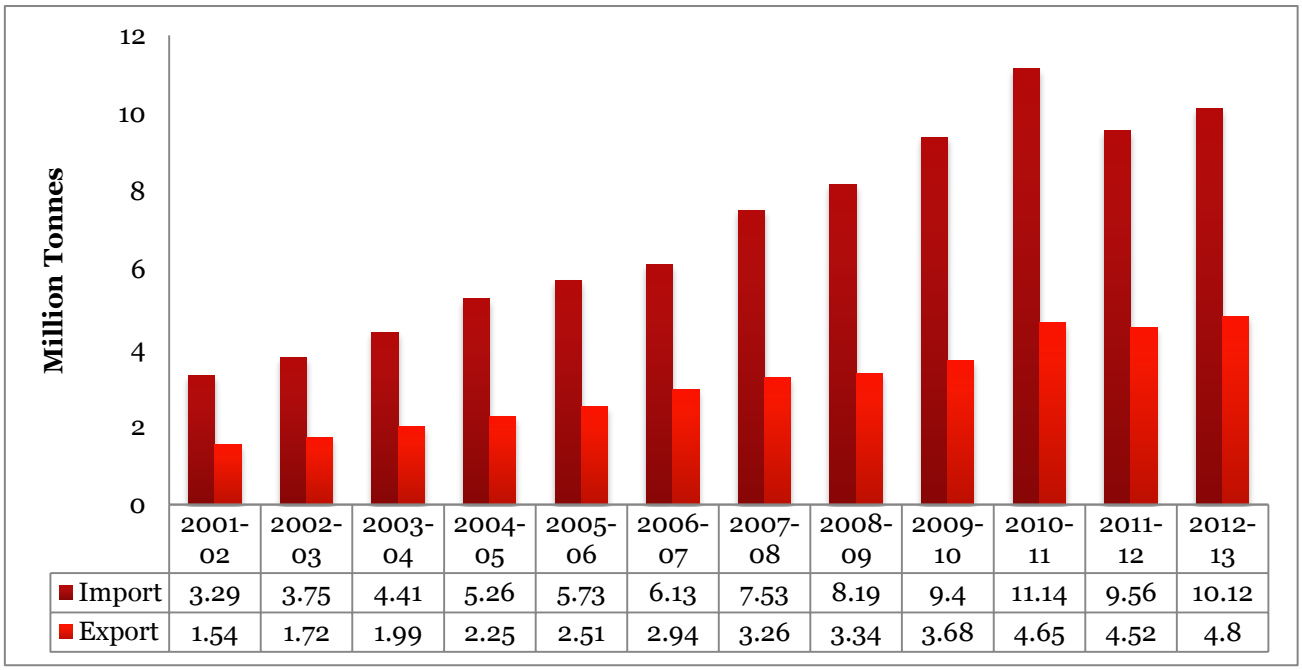
FIGURE 15: SEABORNE TRADE BANGLADESH (2013)

Source: Bangladesh Bank, BBS, Consultant's Analysis

[8] Chittagong Port Authority & Mongla Port Authority

Major bulk commodities are clinker, food grain and fertilizers. Container cargo is primarily dominated by textile products including RMG, jute and consumer goods.

Container trade of Bangladesh has grown from about 4.8 million tonnes in 2001-02 to about 14.9 million tonnes in 2012-13 at 11% CAGR (more than the growth of overall maritime trade), indicating increase of containerization. Trends in Import and Export of container tonnage are presented in the figure below:



	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Import	3.29	3.75	4.41	5.26	5.73	6.13	7.53	8.19	9.4	11.14	9.56	10.12
Export	1.54	1.72	1.99	2.25	2.51	2.94	3.26	3.34	3.68	4.65	4.52	4.8

FIGURE 16: MARITIME TRADE IN FORM OF CONTAINERIZED TONNAGE (2001-02 TILL 2012-13)

Source: Bangladesh Bank, BBS, Consultant's Analysis

As can be seen from the above figure, container trade of Bangladesh is dominated by imports tonnage which accounted for nearly 68% of the total container tonnage handled at Bangladeshi ports in 2012-13. As presented in the figure below, container trade in terms of container boxes (TEU) is fairly balanced. However, a close comparison of container tonnage and container TEU signifies that nearly 50% of the containerized export includes empty boxes (empty TEU). Further, based on the assessment of data obtained from CPA for 2013-14, share of empty containers is about 40% of the total containers exported from CPA in 2013-14 and the similar trend is expected at Mongla port as well.

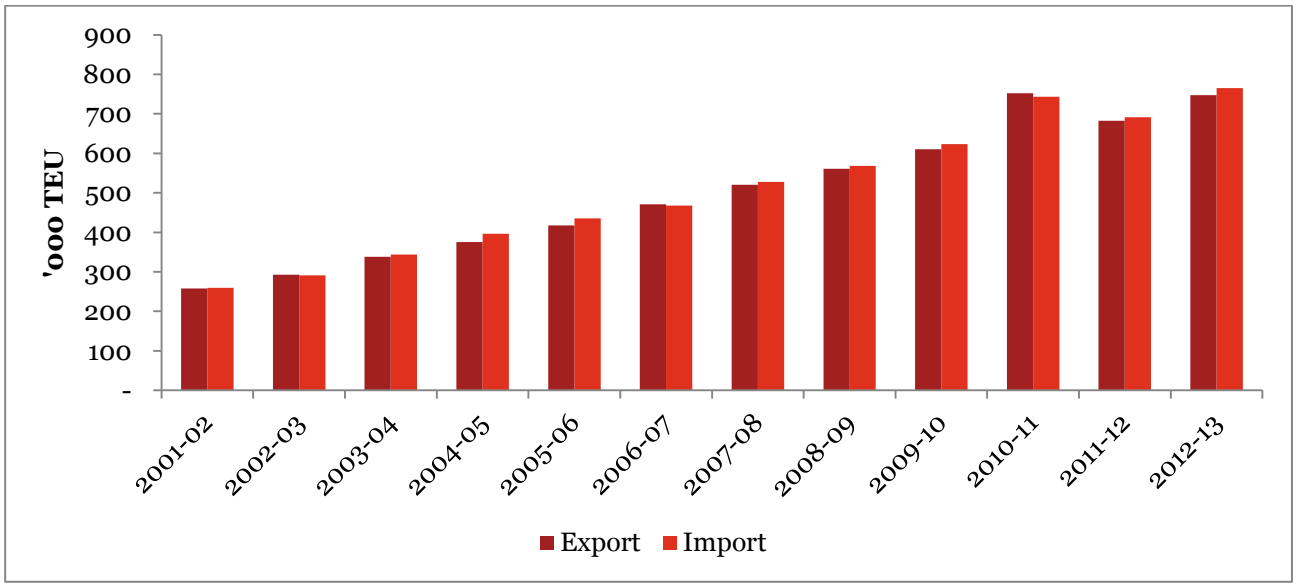


FIGURE 17: MARITIME TRADE IN FORM OF CONTAINERS TEU (2001-02 TILL 2012-13)

Source: Bangladesh Bank, BBS, Consultant's Analysis

Maritime trade of the country is primarily handled at two ports including Chittagong and Mongla. Of these ports, Chittagong handles 93%[9] of country's maritime trade and generates nearly 30% of Bangladeshi GDP.

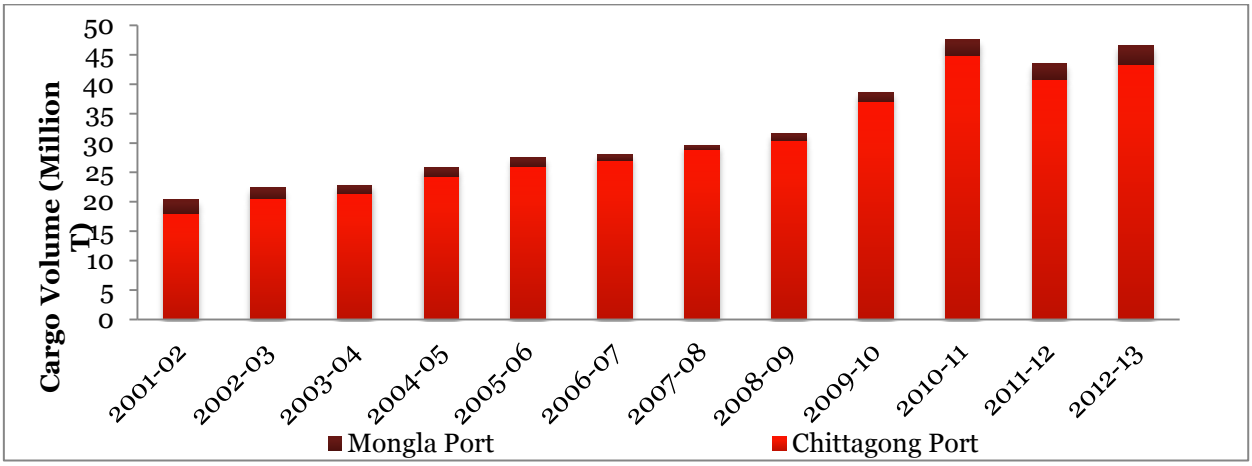


FIGURE 18: MARITIME TRADE THROUGH MONGLA & CHITTAGONG PORT

Source: Bangladesh Bank, BBS, Consultant's Analysis

2.2.1. *Chittagong Port*

Export-Import (EXIM) traffic at Chittagong port has grown from 18 million tonnes in 2001-02 (FY 02) to 43 million tonnes in 2012-13 (FY 13) at about 8.3% CAGR.

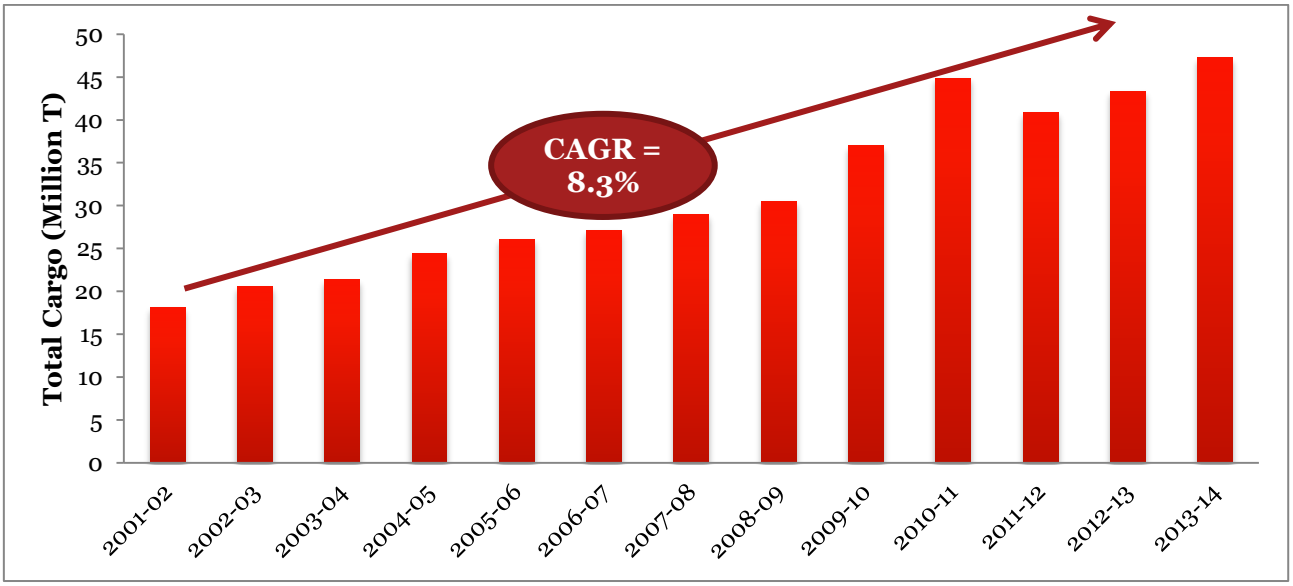


FIGURE 19: CARGO HANDLED AT CHITTAGONG PORT

Source: Bangladesh Bank, BBS, Consultant's Analysis

[9] As per 2012-13 figures mentioned in General Shipping Statistics of Bangladesh

With major commodities including garments, jute and consumer goods, containers accounted for nearly one third of the total EXIM tonnage handled at Chittagong port in 2013.

Container traffic at Chittagong port has grown from 0.5 million TEU in 2001-02 to 1.6 million TEU in 2013-14 at 10.39% CAGR[10]. Further, it is expected that container traffic at the port is likely to be doubled[11] by 2020.

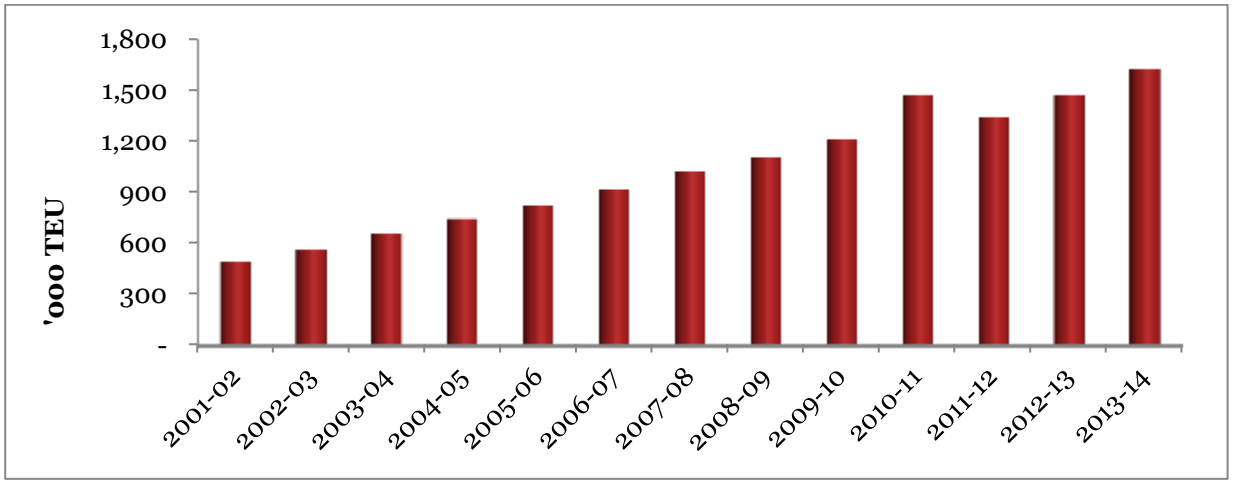


FIGURE 20: GROWTH IN CONTAINER TRAFFIC CHITTAGONG PORT

Source: Bangladesh Bank, BBS, Consultant's Analysis

To match the pace of growing traffic, Chittagong port is planning to increase its capacity. Some of the initiatives include Chittagong Port Trade Facilitation Project, installation of Vessel Traffic Management Information System (VTMIS), and Construction of a Container Terminal (NCT) at New-Mooring area of Chittagong Port.

2.2.2. *Mongla Port*

Export-Import (EXIM) traffic at Mongla port has grown from 2.26 million tonnes in 2001-02 (FY 02) to 3.15 million tonnes in 2012-13 (FY 13) at about 3.07% CAGR (slower growth rate observed due to major infrastructure gap, in terms of connectivity with hinterland areas).

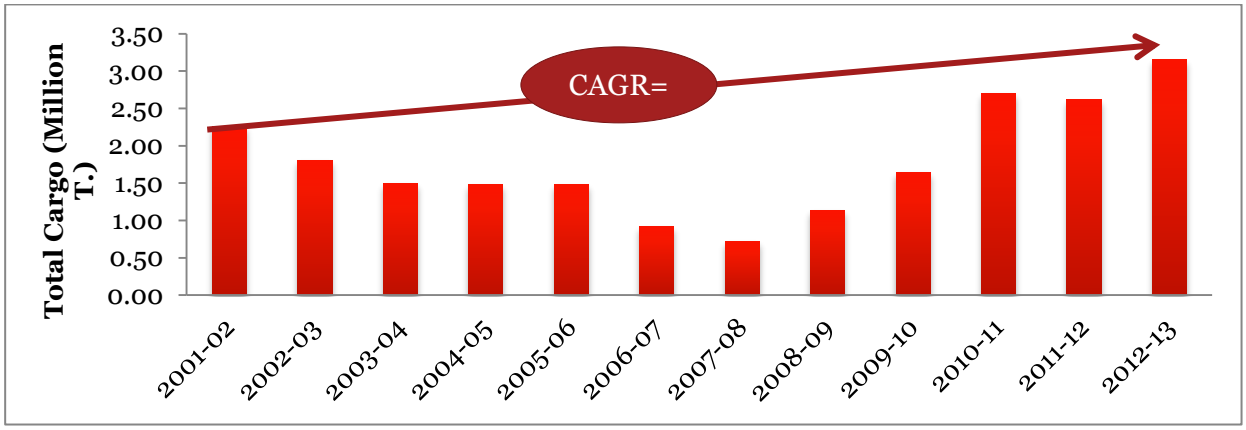


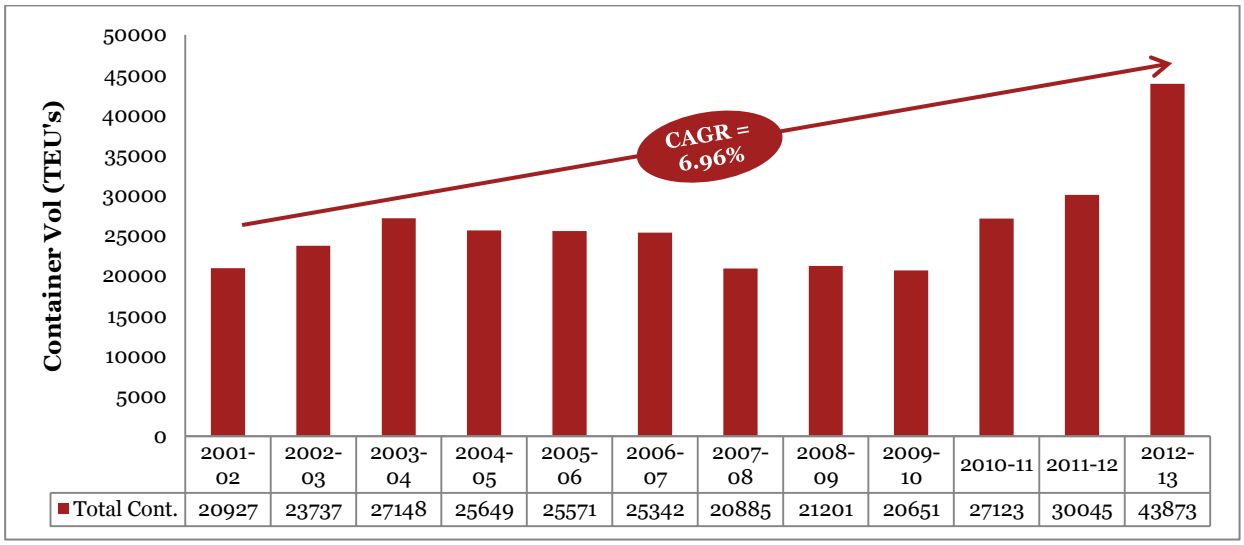
FIGURE 21: CARGO VOLUME HANDLED AT MONGLA PORT

Source: Bangladesh Bank, BBS, Consultant's Analysis

[10] Source: Chittagong Port Authority and Shipping Statistics – DG Shipping

[11] Source: ADB Completion Report on Chittagong Port Trade Facilitation Project.

Container traffic at Mongla port has grown from 20,927 TEU in 2001 to 43,873 TEU in 2013 at 6.96% CAGR. Further growth in import & export cargo was observed constant at 6.96% CAGR, same as that of overall growth rate, representing a trade balance. Growth in container traffic at Mongla port is presented in the figure below:



	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Total Cont.	20927	23737	27148	25649	25571	25342	20885	21201	20651	27123	30045	43873

FIGURE 22: GROWTH IN CONTAINER TRAFFIC – TOTAL CARGO, MONGLA PORT

Source: Bangladesh Bank, BBS, Consultant's Analysis

Based on the above assessment it can be concluded that the maritime trade of Bangladesh has doubled in last 10 years. This growth in maritime trade can be attributed to growing containerized cargo. Given the RMG export target of USD 50 Billion by 2020 and with implementation of the proposed infrastructure projects, the same trend is expected continue. With the well-established ecosystem, majority of the container traffic is handled at Chittagong port, and considering the positive trend in containerization, this traffic is expected to double by 2020.

2.3. Logistics Performance of Bangladesh

Besides distance and connectivity, the nation's logistics performance plays a significant role in boosting trade. As per the World Bank Logistics Performance Index, 2014, supply chain bottlenecks are the primary cause of friction in trade (trade cost) and reducing them by half would raise the trade by 15% & production by 5% globally[12].

The World Bank Logistics Performance Index (LPI) 2014 shows Bangladesh's overall score of 2.56 deteriorating compared to its 2010 score of 2.74, although it remains within the category of "partial performance of logistics providers[13]." Only the "logistics competence" indicator registered a modest improvement in 2014, which indicates that competence and quality of logistics services (e.g., transport operators, customs brokers) has improved and is key to future growth of LPI.

[12] World Bank LPI, Transport Business Summit 2014, Brussels

[13] The distribution of LPI scores is broken down into four categories: (i) logistics unfriendly (if score < 2.35), (ii) partial performers (if 2.35 < score < 2.85), (iii) consistent performers (if 2.85 < score < 3.35), and (iv) logistics friendly (if score > 3.35). data.worldbank.org/indicator/LP.LPI.OVRL.XQ

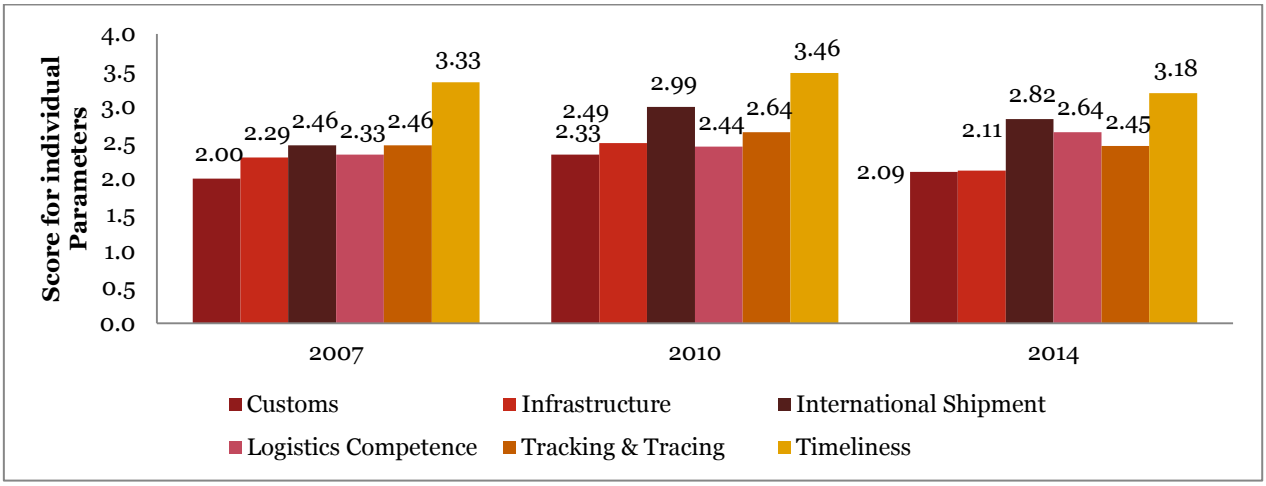
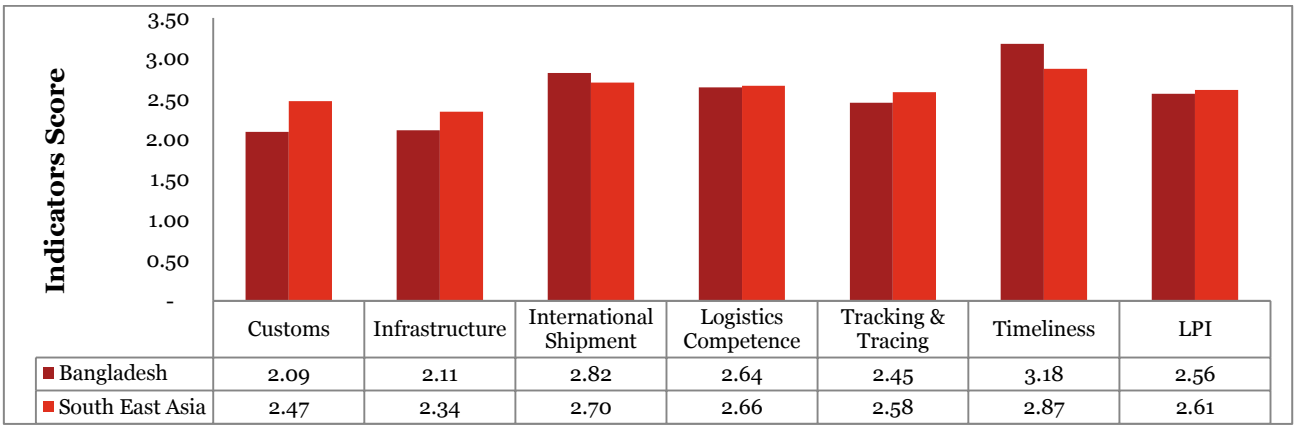


FIGURE 23: BANGLADESH LOGISTICS PERFORMANCE INDEX 2007, 2010, 2014

Source: World Bank

When compared to LPI index of other South Asian countries, Bangladesh scores high on international shipments and timeliness. However, the country scores low on the parameters including performance of customs, availability of infrastructure, logistics competence and performance of track & trace services.



	Customs	Infrastructure	International Shipment	Logistics Competence	Tracking & Tracing	Timeliness	LPI
Bangladesh	2.09	2.11	2.82	2.64	2.45	3.18	2.56
South East Asia	2.47	2.34	2.70	2.66	2.58	2.87	2.61

FIGURE 24: LOGISTICS PERFORMANCE INDEX, 2014 (BANGLADESH VS SOUTH EAST ASIA)

Source: World Bank

High cost of trade resulting from the inadequacies of logistics system is one of the major impediments in developing economies like Bangladesh affecting the competitiveness of indigenous products in the global market. An efficient logistics system is a pre-requisite to suitably handle the increasing foreign trade. In Bangladesh, two third of the land is vulnerable to flooding and most of the areas remain under water for two to five months of a year. Thus this has a significant impact on the development & maintenance of the Road and Rail network.

FIGURE 25: BANGLADESH WATERWAY MAP

Source: Consultant's Analysis

In such case Inland water Transport system comes as a cheaper and natural alternative means of transport (only mode of transport in some areas) which shall be promoted and used significantly to boost country's GDP & Foreign Trade. Khanpur ICT is one of those strategic initiatives towards strengthening country's logistics system by encouraging the usage of waterway for facilitating international & domestic trade. In addition, growing demand for environment friendly logistics service in advanced economies will further strengthen the existence of this initiative.

According to ADB: Bangladesh can raise its GDP by 1% and foreign trade by 20% if the inland water transport logistic systems are made efficient

3. Preliminary Project Assessment

The Project Influence Area (PIA) can be defined as the zone of influence where the project can offer maximum benefits to its stakeholders. With the proximity to Dhaka metropolitan area and industries located in the immediate vicinity (50 Km), the PIA for the proposed ICT at Khanpur would include industrial establishments in Dhaka Capital Region (DCR) including Narsingdi, Gazipur, Dhaka and Narayanganj Accordingly, this chapter aims at identifying potential industries / cluster for the project, by developing an understanding of the Project Influence Area (PIA).

The PIA profile, detailing beneficiary industries, key clusters and connectivity of the proposed ICT at Khanpur with the identified clusters/industries was prepared using following sources of data and information:

- Site visits and interactions with stakeholders / project beneficiaries including industries located in SEZs, Chittagong Port Authority, BGMEA, BIWTA, D G Shipping, Vessel Owners and other service providers like Clearing & Forwarding Agents, Cargo handling and transport agents.
- Data from various sources including Chittagong Port Authority, D G Shipping, Annual Report of beneficiary industries etc.

Accordingly, this chapter is organized in the following sections:

- Project Influence Area
- Connectivity

3.1. Project Influence Area

The proposed project envisages redevelopment of an existing jetty at Khanpur in Narayanganj area. Narayanganj district (subset of Dhaka division) is located on bank of the river Shitalakhya and spreads over 684 Sq. km in area[14]. District is surrounded by Gazipur and Narsingdi districts in north, Munshiganj district in south, Brahmanbaria and Comilla district on the east and Dhaka in west. Physically the "zila" is characterized by alluvial formations caused by several rivers such as, Shitalakhya, Meghan, old Brahmaputra, Buriganga, Balu and Dhaleshwari. Districts on east i.e. Comilla and Brahmanbaria are situated on the east coast of river Meghna.

Narayanganj district is home for merchandising and manufacturing of jute, yarn, dying items and weaving industry. Majority of the population in this district is engaged in international trading, import and export business, garments industries, knitwear garments, shipyard, brickfield etc. The major income generating activities of the people in this district is business and working in the textile mill and factories.

Narayanganj has the oldest and most prominent river port handling passenger as well as freight traffic. In 2013-14, Narayanganj port handled about 45 million passengers and nearly 4[15] million tonnes of freight traffic.

The proposed Inland Container Terminal project is situated in Khanpur area of the Dhaka Capital Region (DRC). With proximity (50 km radius) to key industrial clusters, Project Influence Area for the proposed project includes industrial clusters in Narayanganj, Dhaka city, Narsingdi, and Gazipur. Map of Narayanganj district along with indicative locations of adjoining districts is presented in the figure below:

[14] District Statistics published by Bangladesh Bureau of Statistics (BBS) in Dec 2013

[15] Department of Ports, BIWTA

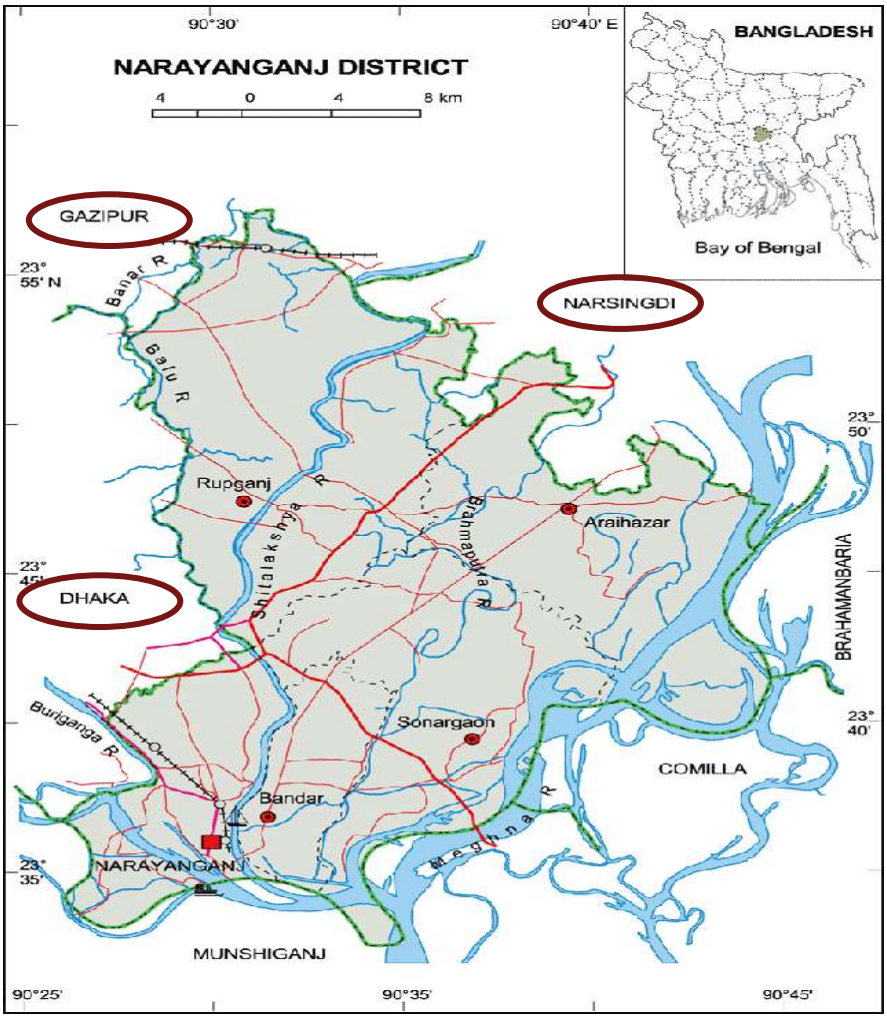


FIGURE 26: NARAYANGANJ & SURROUNDING DISTRICTS MAP

Source: Consultant's Analysis

As per Bangladesh Bureau of Statistics, nearly 17% of the total manufacturing industry establishments in Bangladesh are concentrated in DRC and half of these industries are located in Dhaka metropolitan area. The main business districts of the city include Motijheel, Panthapath and Gulshan. Bashundhara City is a recently developed economic area that houses many high-tech industries and corporations. In addition, there are Export Processing Zones (EPZ) to encourage the export of garments, textiles and other goods. Export processing zone, are located at Dhaka and Tejgaon Industrial Area.

Narayanganj district is pioneer in merchandising and manufacturing of jute, yarn and dying items. Cottage industry like weaving abounds in this district. International trading, import and export business, garments industries, knitwear garments, shipyard, brickfield etc., create employment opportunities. Adamjee Export Processing Zone, Kamal Industrial area, BSCIC Industrial area are the major industrial hub in this region.

Industrial profile of Gazipur district includes Garments industry, Aluminum factory, Textile mill, Pharmaceutical industry, Cosmetics industry, Machine tools factory, Diesel plant, Security printing press, Ordnance factory, Ceramics factory, Packaging industry, Brick field etc.

The economy of Narsingdi is mixed type with agriculture and non-agriculture and most of the vegetables sold in Dhaka city are produced in Narsingdi cluster. In addition to several jute mills, textile craft industry form one of the major industrial establishments in district.

To develop an understanding of the business environment in the PIA and to identify potential commodities along with key industry player and competitive environment, in depth analysis of each cluster in PIA of the proposed ICT at Khanpur was undertaken and the same is presented as annexure to this report. Based on the

in-depth analysis of various clusters in the PIA of the proposed project, commodities with potential for export and import using the proposed container terminal are presented in the table below:

TABLE 5 : POTENTIAL COMMODITIES FOR EXPORT AND IMPORT

Cluster	Import Commodities	Export Commodities
Dhaka City	Machinery and Equipment, Chemicals, Iron and Steel, Textiles, Foodstuffs, Petroleum products, Cement, Chemicals, Precious Stones & Jewellery, Plastic Granules and raw material for rubber	Garments, Fish, Jute goods, Leather products, Frozen Goods
Narayanganj	Textile yarns, Textile fabric, Chemicals, Plastic & Rubber Granules	Readymade Garments (Knitwear), Jute goods,
Gazipur	Chemicals, Plastic & Rubber Granules, Raw Cotton, Textile Yarn and fabrics	Readymade garments,
Narsingdi	Raw Cotton, Leather Hides, Textile Yarn & Textile Fabrics, Chemicals	Textile and Textile articles

Source: Consultant's Analysis

In addition to the potential export import commodities, existing and future likely competition in the PIA is presented in the table below:

TABLE 6 : EXISTING AND FUTURE LIKELY COMPETITION IN PIA

Cluster	Existing/Proposed Container Terminals	Brief Profile
Dhaka City	Pangaon River Terminal (Existing)	Operational since 2014, is a container river terminal at Pangaon along the Buriganga River (South Keraniganj, Dhaka). It is the first Bangladeshi inland container terminal. The container river terminal at Pangaon connects Dhaka with the ports of Chittagong and Mongla. In total the terminal has a storage capacity of 3,500 TEU of containers and can handle 116,000 TEUs containers annually.
	ICD Kamlapur (Existing)	Located in the heart of Dhaka city and is operational since 1987, with an annual handling capacity of this facility is around 90,000 TEU. Train services between Chittagong port and Kamlapur ICD are provided by Bangladesh Railways (BR)
Narayanganj	Ananda Container Terminal (Proposed)	Planned the bank of Meghan River, being developed by Ananda group. The proposed site is located 30 km east of Dhaka city and north east of Narayanganj city
	Rupayan Port & Logistic ICT (Under Construction)	Planned on the eastern river bank of the Shitalakshya River in Dhamgarh. It is approx. 6 km up the river from the Khanpur Terminal location and commencement of phase 1 commercial operations is expected in 2016
	Kumudini Container Terminal (Proposed)	Planned in direct vicinity towards south of the Khanpur Terminal, at about 500 m down the Shitalakshya River

Cluster	Existing/Proposed Container Terminals	Brief Profile
Gazipur	ICD Dhirasram	To cater the limited capacity of ICD Kamlapur Bangladesh Railway (BR) is planning to develop a full-fledged ICD near Dhirasram railway station with capacity of around 3, 54,000 TEU. The facility is proposed in Gazipur district and is in the close proximity to the garment cluster including Mirpur, Tejgaon, and Demra.
Narsingdi	A K Khan Container Terminal (Under Construction)	Located in the northeast of Dhaka in Polash area of Narsingdi district, on the bank of river Shitalakshya, developed and financed by AK Khan Group. Proposed location is connected to the national road network using road R 30 Located in the northeast of Dhaka in Polash area of Narsingdi district, on the bank of river Shitalakshya, developed and financed by AK Khan Group. Proposed location is connected to the national road network using road R 302 2

Source: Consultant's Analysis

Based on the PIA assessment, major commodities/industries with potential for exports and imports are:

- Textile and Textile Products including RMG
- Machinery and Equipment,
- Chemicals,
- Foodstuffs,
- Plastic & Rubber

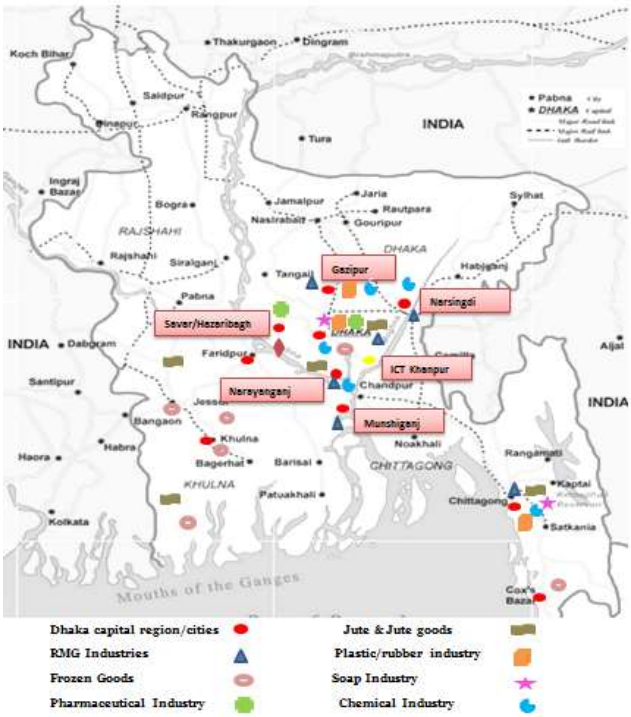


FIGURE 27: DHAKA CAPITAL REGION – INDICATIVE PRIMARY HINTERLAND OF PROPOSED FACILITY

Source: Consultant's Analysis

3.2. Hinterland Connectivity

3.2.1. Road Connectivity with Narsingdi, Gazipur, Dhaka City, Adamjee EPZ, Savar EPZ etc.

The existing facility is connected to the national highway network using the Demra-Narayanganj road. The road directly leading to the ICT Khanpur premises is a two lane road framed by concrete walls on both sides and this road is used for mixed traffic including passenger and cargo. In case of a probable future line-up of trucks during peak situation the traffic situation could become quite constricted and will probably lead to road blocks.

Figure 28: Current Road Access Situation

Source: PwC/UNIconsult

The Dhaka-Chittagong-Highway is a two lane express road (one lane per direction) and part of the national highway no 1 leading from Dhaka to Teknaf Upazila. This highway is heavily congested and truck travel times increased distinctly. The Dhaka–Chittagong stretch of this highway is one of the busiest road stretches in the country. At present, only 20' containers are allowed to be transported on Bangladeshi roads and 40' container are stripped within the port area due to narrow curves and/or limited space for turning.

The Roads and Highways Department (RHD) is expanding the Dhaka–Chittagong stretch to four lanes which will provide additional road capacity to the market. Experiences with infrastructure extension programs have shown, that additional infrastructure will not lead to decongestion as then more infrastructure (for the same number of truck travels per day) is available but will generate more traffic which again leads to congestion as the additional capacity is quite fast utilized by this.

Adamjee EPZ, one of the key cargo generating centre is located at distance of around 7 km from Khanpur. Existing facility is connected to Adamjee EPZ using Demra-Narayanganj Road. This is a two lane road, presently used for mixed traffic condition. Another cargo generating centre in the PIA of the proposed ICT at Kanpur is Dhaka EPZ. This EPZ is situated at distance of around 50 km from Khanpur and its connectivity with the existing facility consists of Narayanganj Highway, Dhaka - Narayanganj road, Ahsanullah Road, Saradghat – Gabtoli Road, National Highway N5 (Dhaka – Aricha Highway).

Narsingdi district is situated at a distance of around 50 km from Khanpur. Connectivity of the existing facility with Narsingdi district consists of Demra-Narayanganj Road, National Highway N1, National Highway N5 (Bostail – Madanpur Highway), R114 i.e. Araihazar – Narsingdi Highway and Narsingdi – Raipur Highway. Gazipur districted is situated at distance of around 60 km from Khanpur and its connectivity with the existing facility include Demra-Narayanganj Road, National Highway N105 (Dhaka City Bypaas Road), National Highway N3 (Dhaka – Mymensingh Highway) and R312 i.e. Rajendrapur - Kapasia - Toke Road.

FIGURE 29: CURRENT IMPRESSION OF DHAKA-CHITTAGONG-HIGHWAY

Source: Roads and Highways Department – Bangladesh

Based on the road connectivity assessment, it can be concluded that Demra-Narayanganj road is critical for the proposed ICT at Khanpur. Existing freight traffic on this road is estimated at around 80 to 100 trucks per day. With development of ICT Khanpur, the freight traffic on this road is expected to reach 180 to 200 trucks per day by 2025 (800 PCU).

Considering 2000 PCU/h as the capacity of a two lane road with mixed traffic conditions, the existing road is sufficient to handle 300 trucks per day. However, to ensure smooth evacuation of containers/cargo and to provision for peaking in the absence of buffer yard (parking area), additional road capacity is desirable.

3.2.2. Waterway Connectivity

The ICT Khanpur location at the Shitalakhya River is connected to the waterway notified under Indo-Bangladesh Protocol on Inland Water Transit & Trade, under which inland vessels of one country can transit through the specified routes of the other country. For inter-country trade, five ports of call have been designated in each country. These are Haldia (West Bengal), Kolkata (West Bengal), Pandu (Assam), Karimganj (Assam) and Silghat (Assam) in India and Narayanganj, Khulna, Mongla, Sirajganj and Ashuganj in Bangladesh. The Narayanganj terminal is located 1.5 km downstream from the Khanpur site.

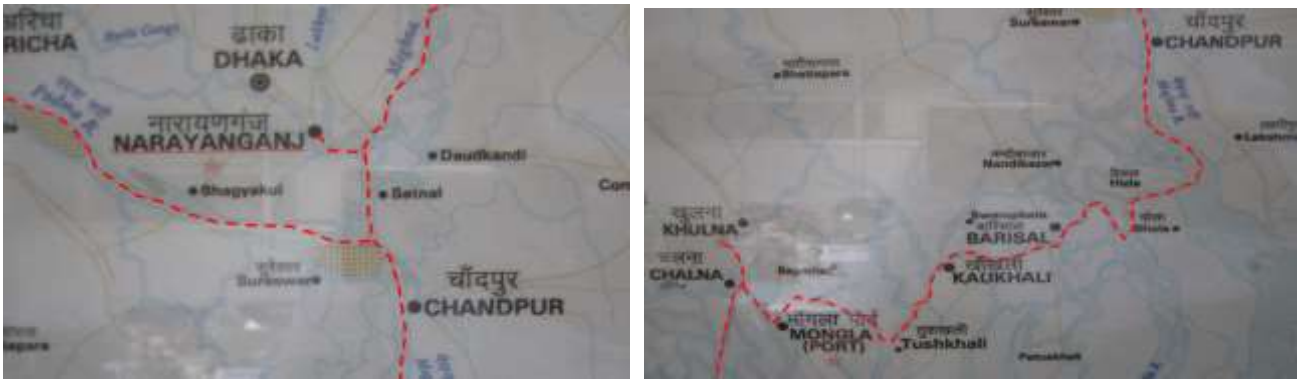


FIGURE 30: MAP SHOWING CUT OUT OF THE PROTOCOL ROUTS AND PORTS

Source: Consultant's Analysis

The figure above (right) presents an inland waterway connection between Mongla and the Meghna River which again is connected to the Shitalakhya River. Currently dredging measures are executed between Mongla and Barisal to eliminate shallow section in order to provide a class 1 inland waterway.

The IWT corridor between Dhaka-Narayanganj and the Chittagong port is of prime national importance—it is Class-I waterway with a guaranteed LAD of 3.6 m. This waterway has adequate navigational draft for most of its length during the low water period, except for spots where silt deposition takes place. One such chronic problem spot lies near Hizla in the lower Meghna River. These spots are located mostly in the southern part of the country and are dominantly tidal in character. The River Karnaphuli connecting the Port of Chittagong with the Bay of Bengal is one such tidal river.

On the Class-I inland waterway from Chittagong to Khanpur (and vice versa) the inland vessel is supported by three different pilots. Pilotage is mandatory on Bangladeshi inland waterways. On the whole way seven power lines cross the waterway. All of them are above the Shitalakhya River where six of them are close to Madanganj and one close to Gope Char. They provide sufficient air draft for inland vessels. There are no bridges over the waterway between Khanpur and Chittagong. With modernized navigation aid system in place, 24/7 navigation is possible.

Inland waterway transport between Port of Chittagong and Dhaka is mainly used for bulk cargo. Inland waterway vessels have to use the River Karnaphuli and cross the Bay of Bengal Bay in order to enter the Meghna on route to the main destinations around Dhaka. Thus, the vessels have to be designed not as pure inland ships but also have to have the ability to cross the Bay of Bengal. This fact could increase the transport costs per unit.

As understood based on interactions with stakeholders including handling agent at Khanpur jetty and based on initial analysis of hydrographical maps available with BIWTA, the water depth directly at the existing jetty is around 2.0 m. This lower draft is presented in the figure below:

FIGURE 31: MAPS SHOWING WATER DEPTH AT BERTH

Source: Consultant's Analysis

The provided data varies from stating a depth of 3.5 m up to a depth of 6.5 m). Maps highlighting water depth and locations of some Power Lines crossing the river is presented in the figure below:

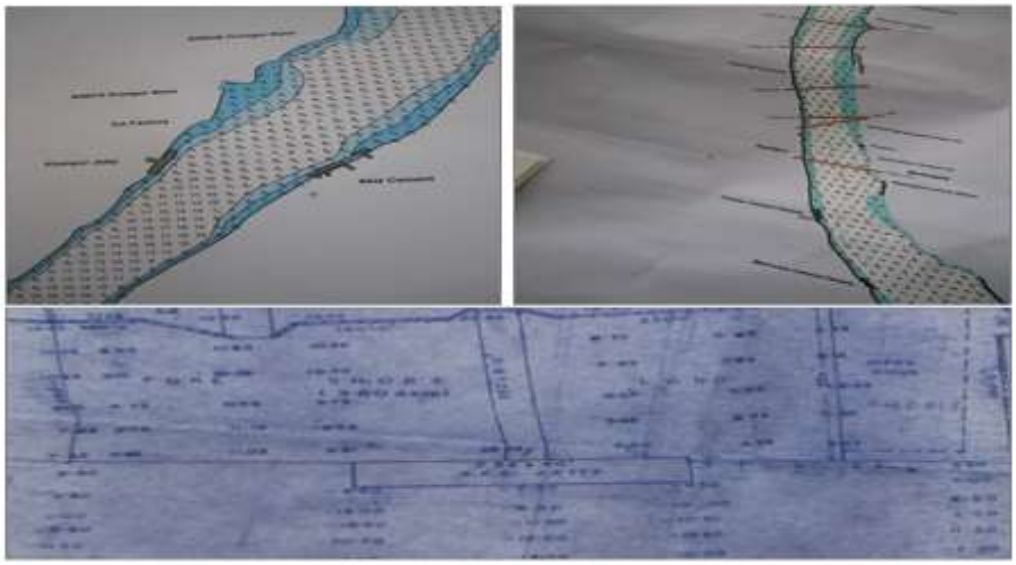


FIGURE 32: MAPS SHOWING WATER DEPTH IN CHANNEL AND CROSSING POWER LINES

Source: BIWTA

The waterway connectivity between Chittagong and the proposed ICT at Khanpur include the Shitalakhya River, the Shahbazhpur River as well as the coastal areas on Bay of Bengal. As it is classified as a class I waterway a water depth of 3.5 m is ensured even during low water at all locations. By a first rough observation of the hydrographical maps followed by discussions with the Dredging department, it appears that most of the waterway sections are distinctly deeper than 3.5 m. There is only one section near Char Gazaria, where river´s depth is likely to be below 3.5 m.

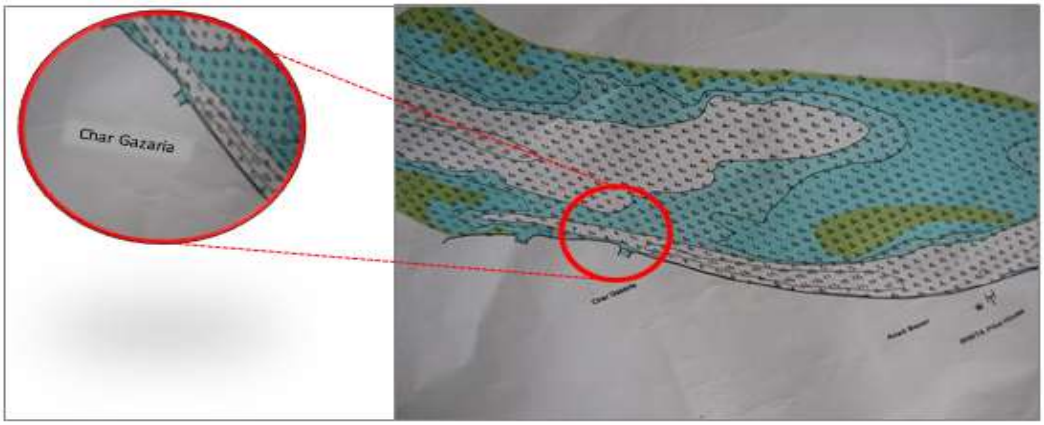


FIGURE 33: MAP SHOWING SHALLOW LOCATION AT CHAR GAZARIA

Source: BIWTA; processed by PwC/UNIconsult

Based on the river connectivity assessment, it can be concluded that:

- Draft for berthing and navigation is sufficient with depth across the river channel from Chittagong to Khanpur ranges between 3.5 m to 6.5 m. However, there is one critical section near Char Gazaria where the river depth is likely to be below 3.5 m and vessels have to wait for tidal window to cross this section.
- Issues around turning of vessels can be suitably address using upstream area for turning.
- Better management of existing traffic including safety and security of cargo is required to attract main line shipping operators for operating the Inland container vessels.

Vessels accessing the waterway connecting Chittagong and the proposed ICT at Khanpur have to cross Bay of Bengal and therefore, vessels have to be designed not as pure inland ships but also have to have the ability to cross the Bay of Bengal.

4. Demand Assessment

The proposed Inland Container Terminal (ICT) at Khanpur will serve the Dhaka Capital Region area and the industries located in the immediate vicinity (50 Km) of this project. Accordingly, this chapter aims at identifying potential traffic for the proposed ICT project considering the key commodities and competitive environment in the PIA.

To arrive at the potential demand for transportation of container using IWT, two different approaches including (i) Top Down Analysis and (ii) Bottom Up Analysis were followed. To remain conservative in our estimates, lowest of the two results (traffic projections) was considered for the further assessment.

For the Bottom Up approach, potential commodities were identified based on the PIA profile. Traffic volume of these identified commodities was projected taking into account the past trends and drivers for future growth, which were determined based on the information obtained through our discussions with stakeholders and through various other secondary sources. Whereas for Top Down approach, historic container trade trends were analysed to arrive at the potential demand for IWT.

Likely market share of the proposed ICT project was arrived based on competitive assessment and logistics cost assessment using the following sources of data and information:

- Interactions with stakeholders / project beneficiaries including industries located in SEZs, Chittagong Port Authority, D G Shipping, Vessel Owners and other service providers like Clearing & Forwarding Agents, Cargo handling and transport agents.
- Site visits to Chittagong Port, Off Dock facilities in Chittagong, Pangaon Container Terminal, ICD Kamlapur, Summit Alliance Terminal and Khanpur Jetty
- Data from various secondary sources including reports published by ADB and the World Bank.

Accordingly this chapter has been organized in the following sections:

- Traffic Projection using “bottom up” approach
- Traffic Projection using “top down” approach
- Logistics cost assessment
- Assessment of Competitive Landscape
- Potential demand for ICT Khanpur

4.1. Traffic projections: Bottom-Up Approach

Review of the exports and imports data of Bangladesh reveals a negative trade balance with imports currently being higher than exports. The imports for 2012-13 stood at USD 34,084 Million and exports at USD 23,562 Million[16]. Bangladesh has been recording sustained trade deficits since 1976 mainly due to a high value of imports.

Growth in value of exports was observed at 19%[17] CAGR and the growth in value of import was observed at CAGR 17% from 2001 to 2012. Further, growth in terms of export and import containers was observed at nearly 11% CAGR and nearly 10% CAGR respectively. Higher growth in the value as well as container volume of exports when compared to imports indicates enhancement of manufacturing capabilities which will eventually fill the existing gap in Balance of Trade.

[16] Bangladesh Bank

[17] Bangladesh Bank & Consultant’s Analysis

Based on the PIA assessment, key export and import commodities are presented in the table below:

TABLE 7 : KEY EXPORT AND IMPORT COMMODITIES IN PIA

Import Commodities	Export Commodities
Textile Raw Material	Ready Made Garments (RMG)
Raw Cotton	Jute and Jute Products
Plastics & Rubber Articles	Frozen Goods
Chemical & Pharmaceutical Products	Leather and Leather Products

Source: Consultant's Analysis

Import-Export trends and drivers for each of the identified commodities are discussed in the subsequent sections.

4.1.1. Import

The import basket consists of raw cotton, textile yarn, textile fabric & articles thereof, Plastic & rubber articles, chemical & pharmaceutical and others, which mostly includes consumable items including milk & cream, mechanical & electrical appliances, leather products, precious jewelleries etc. As majority share of the import commodity (close to 40% in terms of TEU's) is of raw cotton, textile yarn, textile fabric & textile articles which serves as an input to the dominating RMG industry. Following figure shows the respective share of key import commodities for 2011-12.

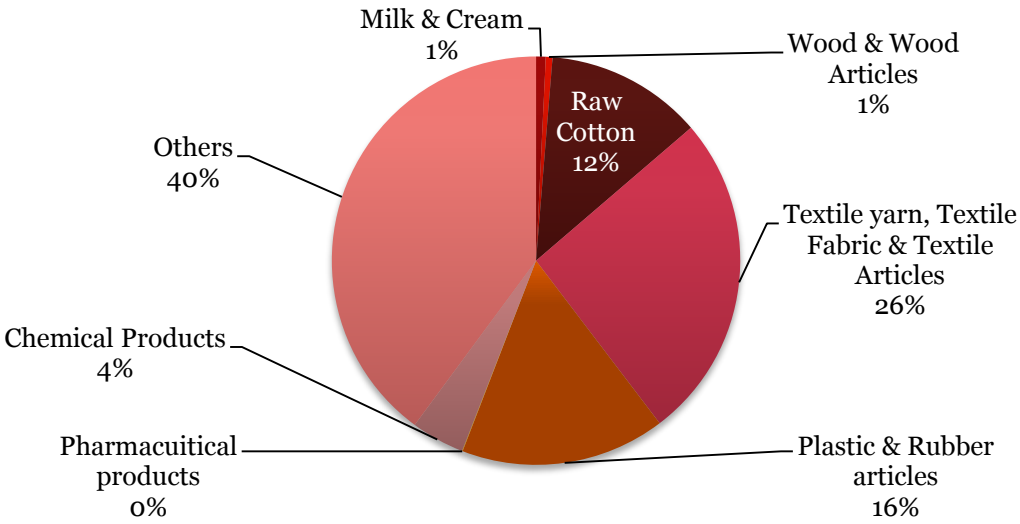


FIGURE 34: SHARE OF KEY IMPORT COMMODITIES (2011-12)

Source: Consultant's Analysis

As understood based on the interactions with stakeholders, the import (containerized cargo) is primarily dominated by 4 key commodities which comprise of 60% of import volume and include – Textile yarn, Textile fabric & Textile Articles, Raw Cotton, Plastic and rubber articles, chemical & pharmaceutical products. In the following sections a detailed past trend and major clusters & key players of each of these commodities has been presented in order to assess the future potential.

4.1.1.1. Textile Raw Material

Textile raw material as a commodity group includes Yarn, Fabric and textile article and are major inputs for the dominating RMG industry. This highlights the limited downward linkages for the flourishing Garment industry

and also a major opportunity for taking the manufacturing sector further. Following figure shows the historic growth trend:

TABLE 8 : IMPORT TREND – TEXTILE & TEXTILE ARTICLES

Description	2009-10	2010-11	2011-12
Import (Million, Taka)	318633	495783	510448
Import (000' Tons)	1489	2384	1524
Import (TEUs)	175169	280420	179262

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

Import in terms of value is showing a growth rate of 26%, whereas the effective growth in overall container volume observed is 1% due to overall increase in unit price (BT/MT) of the commodity. As understood based on the interactions with stakeholders, this commodity is voluminous in nature and majority of it is transported using FEU boxes. Average tonnes per TEU for this commodity group are around 8.5T/TEU.

Production & Consumption Clusters and Key Players

Textile yarns, textile fabrics & textile articles act as an input to the dominating RMG/Textile industry. Majority of this industry is concentrated in two clusters including Chittagong & Dhaka capital region (which also includes Narayanganj, Dhaka, Narsingdi, and Gazipur).

With more than 8,000 factories and SMEs of varying sizes are involved in the production of textiles and ready-made garments, Dhaka Capital Region has the largest share of Textile/RMG industries. Nearly 60% of these industrial units are situated in the Dhaka metropolitan area, 8% in Narayanganj and 17% in Gazipur (Figure below)[18].

[18] ADB Report – Cluster based economic development

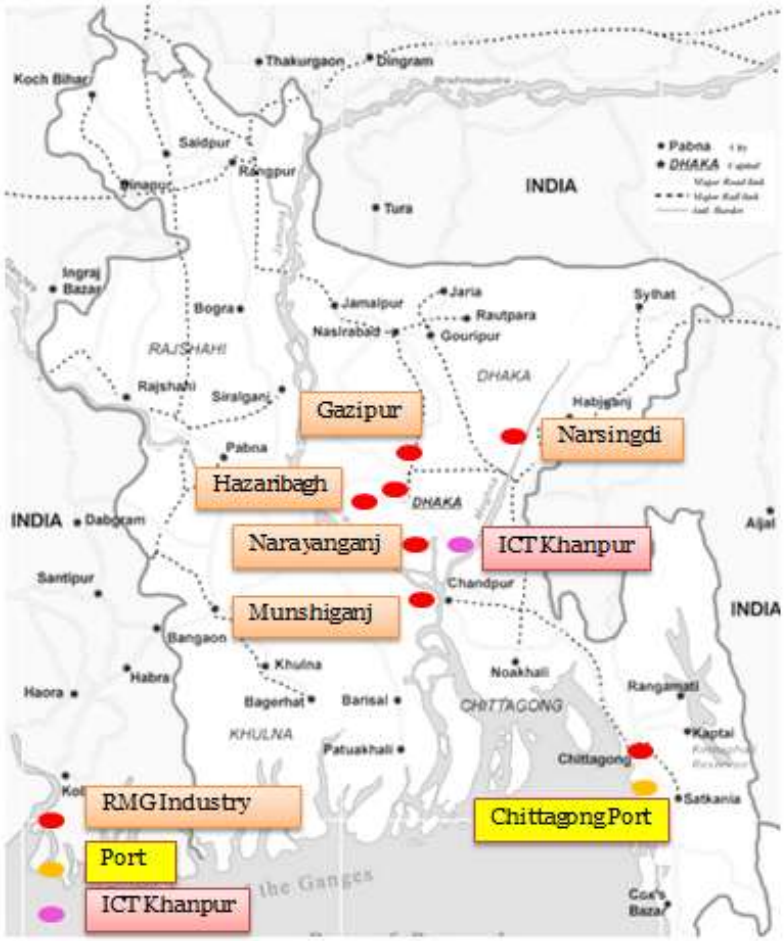


FIGURE 35: KEY CLUSTER OF DISTRICTS FOR TEXTILE YARN, FABRIC AND ARTICLES IN BANGLADESH

Source: Consultant's Analysis

Key Players in the RMG industry are Greenland Garment, Hameem Group, Biswas Group, Bextex Limited, Silver Line Group, Benetex Industries LTD, Antim Knitting Dyeing & Finishing Ltd and Antim Knit Composite Ltd, Abed Textile processing mills Ltd etc. Profile of key players in the PIA is presented as annexure to this report.

4.1.1.2. Raw Cotton

Import of Raw cotton constitutes ~12%[19] of the import basket and is major raw material for the dominating RMG/Textile industry. Annual requirement of raw cotton for textile industry of Bangladesh is estimated around 2.5 million bales. Local production is only about 0.1 million bales. Around 4-5% of the national requirement is fulfilled through the local production; remaining 95-96% is fulfilled by importing raw cotton from USA (40%), CIS (35%), Australia, Pakistan, South Africa and other country producing countries (25%) (BTMA, March, 2002). This indicates a huge gap in demand and supply and thus a strong prospect for promoting cultivation of cotton within country.

Some of the major challenges associated with cotton production in Bangladesh are – Low yield long duration crop, high input cost, competition from other crops, unregulated market. Following figure shows the historic growth trend:

[19] Consultant's Analysis & BBS data

TABLE 9 : IMPORT TREND – RAW COTTON

Description	2009-10	2010-11	2011-12
Import (Million, Taka)	98185	193966	154685
Import (000' Tons)	866	934	730
Import (TEUs)	101872	109847	85863

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

While the Y-o-Y growth in terms of value of imports was observed at above 20% for 2009-10 and 2010-11, the effective Y-o-Y growth in overall container volume has remained at 8% during the same period. There was a decline in the total import volumes in 2011-12 as compared to 2010-11 and this can be attributed to decline in demand from spinning subsector due to increase in price for imports. However, considering the growth in Textile/Garment industry and in absence of any major initiative from the government to promote cotton production within country, the imports of raw cotton is expected to grow at same rate as before. As understood based on the interactions with stakeholders, this commodity is voluminous in nature and majority of it is transported using FEU boxes. An average tonnes per TEU for this commodity is around 8.5 T/TEU.

Production & Consumption Clusters and Key Players

Raw cotton acts as a major raw material to the dominating RMG/Textile industry and majority of the raw cotton consumption industry is located in the close vicinity of RMG/Textile industry. Raw cotton is also used as a raw material for Cotton seed industry (for cotton crude oil, which is used by soap industry & edible oil industry), Fibre Industry (for yarn production).

As mentioned earlier, majority of the RMG/Textile industry is concentrated in two clusters including Chittagong and Dhaka capital region (which also include Narayanganj, Dhaka, Narsingdi, and Gazipur). Most of the soap & edible oil industries are situated in the Dhaka city and few of them are located in Gazipur area. Indicative location of these clusters from the proposed ICT at Khanpur is presented in the figure below:

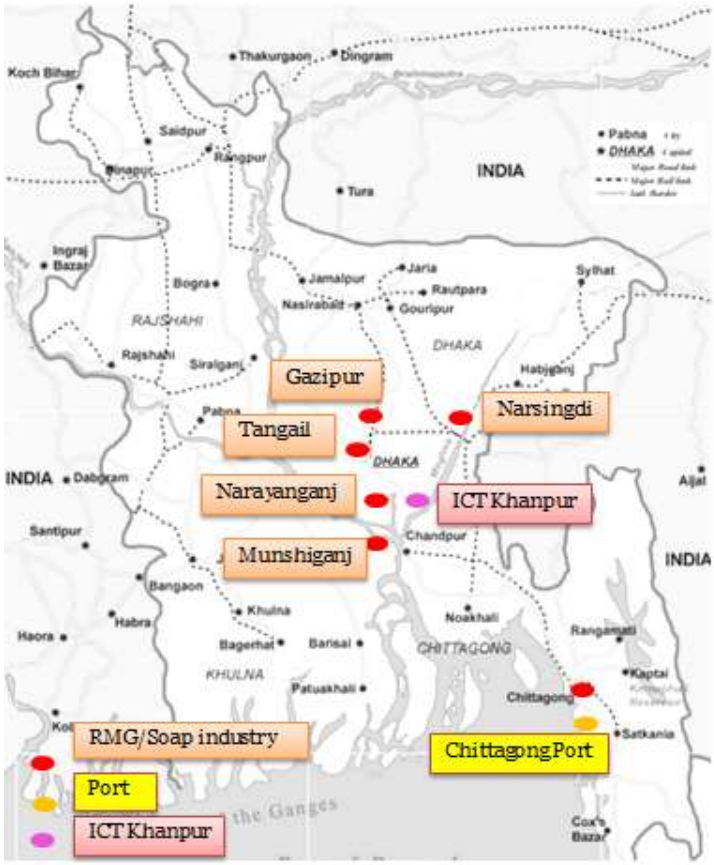


FIGURE 36: KEY CLUSTER FOR RAW COTTON IN DCR

Source: Consultant's Analysis

4.1.1.3. Plastic & Rubber Articles

Import of Plastic & Rubber articles constitutes ~16% [20] of the country's import basket. The imported plastic/rubber polymer granules act as major raw material for the rubber/plastic industry. Plastic industry sector boasts around 3000 manufacturing units employing a total of more than 2 million people either directly or indirectly. According to the UN report, scrap plastic articles acts as major raw material for Plastics industry operating in and around the capital city of Dhaka. Around 300 small facilities are recycling some 138 tonnes of plastic wastes each day; availability of river water and low transportation costs have made these units economically attractive.

Rubber based industries produce glue, tyre, tube, and other rubber components for various lines of industries. Tyre is major component of any automobile segment and there is a lot of scope being seen in the bicycle industry.

Plastic raw material is one of the petroleum by-product and with the limited refining capacity, majority of the plastic industry in Bangladesh uses imported polymer granules. During the period 1989 to 2007, the import of polymers has increased from 10,000 tonnes to 289,000 tonnes per year. Commodity wise, polymers of polyethylene, propylene and polycetal are the three largest imported resins. At present total consumption of polymers including imported polymers and recycled plastic wastes is 750,000 tonnes in FY 2010- 2011[21]. Demand for import of plastics raw materials is increasing to complement the growth of associated industry segments including packaging, Healthcare/Pharmaceutical, Construction, Consumer products and Agriculture. Following figure shows the historic growth trend for the imports of rubber and plastic articles:

[20] Consultant's Analysis & BBS data

[21] Journal of Chemical Engineering IEB

TABLE 10 : IMPORT TREND – RUBBER & PLASTIC ARTICLES

Description	2009-10	2010-11	2011-12
Import (Million, Taka)	71742	99160	118020
Import (000' Tons)	995	1346	1569
Import (TEUs)	71050	96148	112040

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

The growth in terms of value of imports was observed at CAGR 28% for period of three years from 2009-10 to 2011-12 and the effective growth in overall container volume was observed at 25.6% during the same period. This high growth in container volumes can be attributed to the increasing demand for plastics and rubber products in the country. In addition, with limited indigenous polymer production capacity, import of polymer is expected to remain same for quite some time till Govt. takes some initiatives towards capacity building for production of Plastic polymers. As understood based on the interactions with stakeholders, average tonnes per TEU for this commodity is around 14 T/TEU.

Production & Consumption Clusters and Key Players

Imported plastic polymer granules (as polymers are not produced in Bangladesh) act as raw material to rapidly growing plastic industry. Most of the rubber and plastic industries are situated in and around capital city of Dhaka. At present there are 2,997 plastic enterprises in Bangladesh and among them, nearly 1,965 companies are small, 980 are medium companies and around 52 companies are big that deals internationally. About 65% of industries in Dhaka and 20% of companies are located in the port city Chittagong (EPB)[22]

[22] Research work by Japan Bangla Business Centre

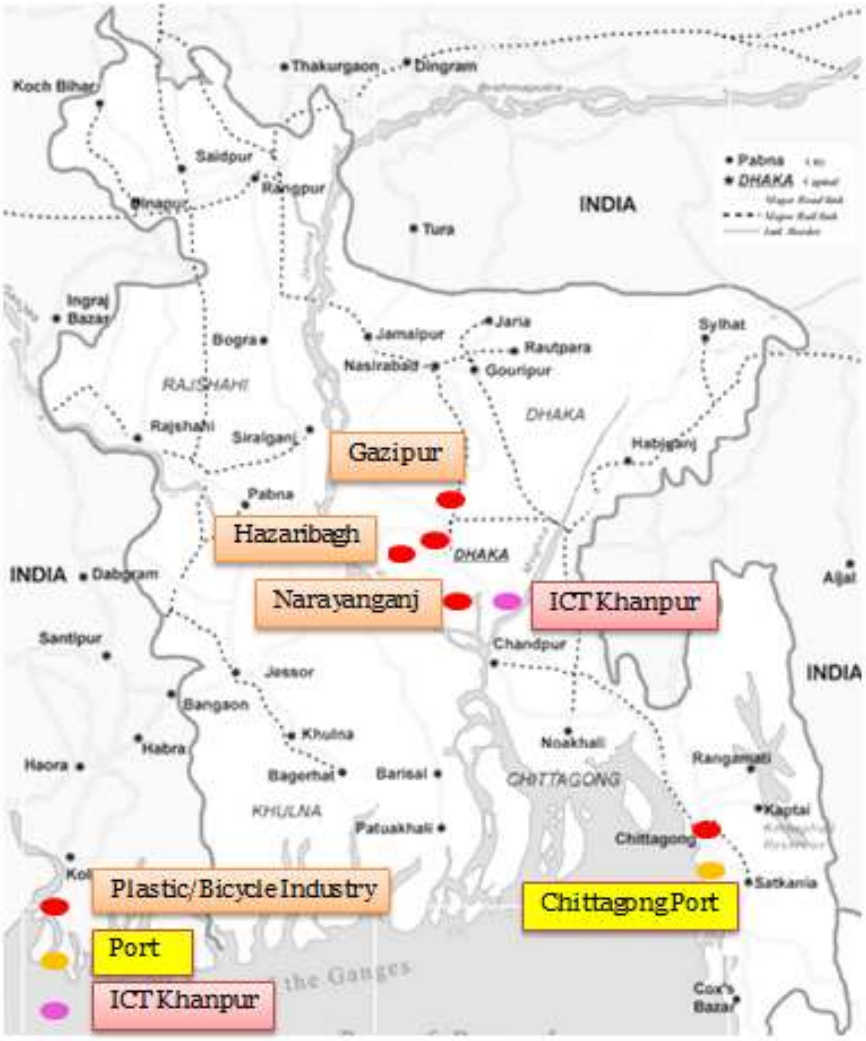


FIGURE 37: KEY CLUSTER FOR PLASTIC & RUBBER ARTICLES

Source: Consultant's Analysis

4.1.1.4. Chemical & Pharmaceutical Products

Import of Chemical & Pharmaceutical Products constitute ~27%[23] of the country's import basket. Chemical sector of Bangladesh is predominantly imports dependent and import market is dominated by traders. These imported chemicals are used by pharmaceutical industry, textile industry, dying industry, leather industry, edible oil industry, and waste water treatment. Chemical & pharmaceutical products as the commodity group include caustic soda, hydrogen peroxide, Hydrochloric acid, stable bleaching powder, chlorinated paraffin wax, produce of chloro alkali , anti-cancer drugs, antibiotics, Active Pharmaceutical Ingredients etc.,

Due to lack of research and development activities, Bangladesh chemical industry lacks technical know-how and there are only very few Local Players in this field who are capable of meeting domestic demand. For the chemical including caustic soda, hydrogen peroxide, Hydrochloric acid, stable bleaching powder, chlorinated paraffin wax, produce of chloro alkali etc., Bangladesh is totally dependent on foreign chemical companies.

The Pharmaceutical industry is one of the potential sectors for industrial diversification in Bangladesh. The domestic market is mainly involved in production of vitamins, enzymes and cough syrups. The imports of chemical for pharmaceutical industry primarily include essential drugs like anti-cancer drugs, antibiotics etc., which cannot be produced in Bangladesh due to lesser orientation towards research activities. With limited

[23] Consultant's Analysis & BBS data

production capacity of APIs (Active Pharmaceutical Ingredients – required for producing various drugs), nearly 80% of the country's API demand is imports dependent. Following figure shows the historic growth trend the imports of chemical and pharmaceutical:

TABLE 11 : IMPORT TREND – CHEMICAL & PHARMACEUTICAL PRODUCTS

Description	2009-10	2010-11	2011-12
Import (Million, Taka)	156268	240790	254868
Import (000' Tons)	167	255	295
Import (TEUs)	16700	25500	29500

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

While the growth in terms of value of imports was observed at 28% CAGR for 2009-10 to 2011-12, the effective growth in overall container volume was observed at around 33% CAGR for the same period. This increasing in demand can be attributed to growing demand from dependent industries including Garments industry, dying industry, pharmaceutical industry, leather industry. In addition, a declining trend in the average cost per tonnes of imports over the three year period from 2009-10 to 2011-12 indicates a shift from import of high value finished product to import of low value raw material. This can attributed to the growing production capacity of the domestic industry resulting in higher demand for chemical and pharmaceutical raw material. Given the governments initiatives, growing healthcare awareness and increasing demand from dependent industry segments, the import for this commodity group is expected to remain same for quite some time.

As understood based on the interactions with stakeholders, average tonnes per TEU for this commodity is around 24T/TEU.

Production & Consumption Clusters and Key Players

Imported chemicals act as raw material for rapidly growing textile industry, Pharmaceutical industry, dying industry, leather industry, edible oil industry, and waste water treatment plastic industry. Most of these industries are located in Dhaka Capital Region & Chittagong. Major consumption centre for chemical and pharmaceutical compounds are Dhaka Capital region including areas like Dhaka, Narayanganj, Gazipur, Narsingdi. About 65% of industries in are located in Dhaka region and 20% of companies are located in the port city Chittagong (EPB).

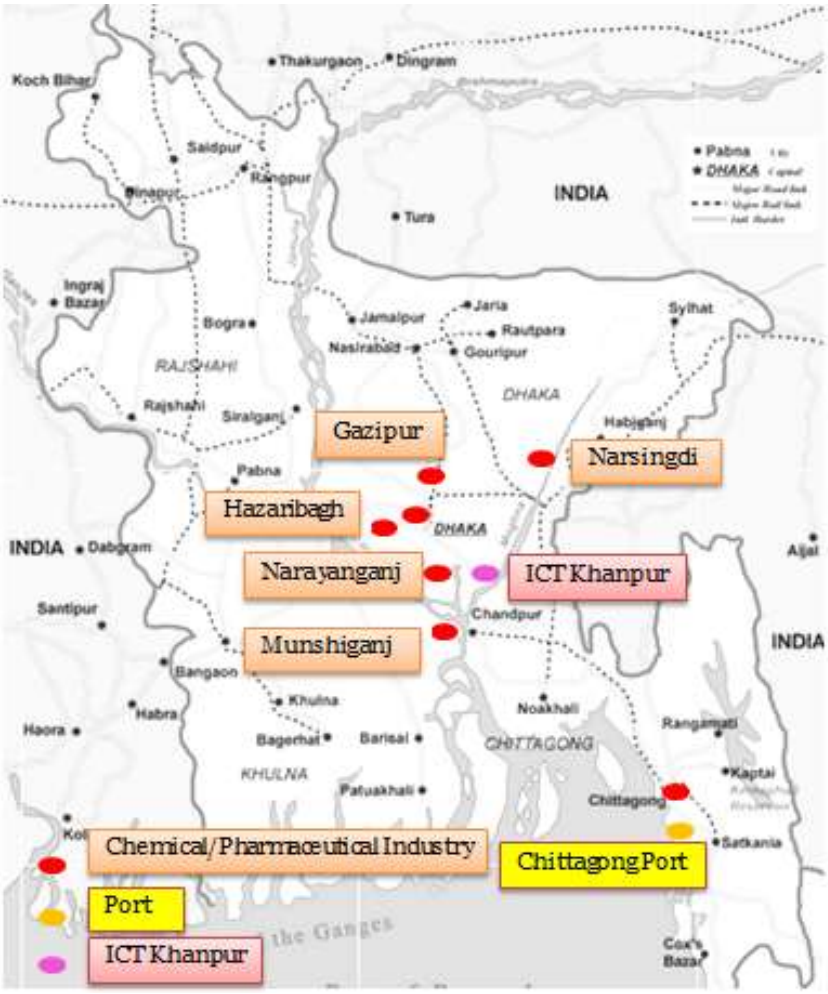


FIGURE 38: KEY CLUSTER FOR CHEMICAL & PHARMACEUTICAL INDUSTRIES

Source: Consultant's Analysis

Key industry players are Drugs International Limited, Opsonin Pharmaceuticals Limited, Incepta Pharmaceuticals etc. and these are located in Dhaka Capital Region. Brief profile of key players in the PIA is presented as annexure to this report.

Key assumptions based on the detailed analysis of trends (import value as well as import volume), drivers, production & consumption cluster, key players is presented in the table below:

TABLE 12 : ASSUMPTION– KEY IMPORT COMMODITIES

S. No.	Commodities	Market Input
1	Textile yarn, fabric & articles	With lower past growth trend and considering significant efforts from the government to increase domestic availability, future demand for the imports of textile yarn, fabric & articles is expected to remain at 1% till 2039-2040
2	Raw Cotton	Given the limited availability of domestic produce, it was assumed that the growth trend will follow past growth and will remain constant for initial 10 years starting from 2012-13 till 2022-23 at 8%. Further considering govt. initiatives towards capacity building of research facilities in Bangladesh will lead to an enhanced cotton yield & farming techniques. This will further boost domestic production and eventually reduced import dependency. Thus for our future demand projection we have gradually reduced the import share to 7 % by 2027-28 & to 6% by 2037-38

3	Plastic & rubber articles	Considering Govt. initiatives towards capacity building of research facilities in Bangladesh will lead to development of production techniques and skilled manpower for production of Plastic & rubber granules. This will strengthen the domestic production and eventually reduced import dependency. Thus for our future demand projection we have gradually reduced the import share every 5 years from 17 % by 2012-13 to 5% by 2039-40
4	Chemical & pharmaceutical products	Increased awareness of healthcare and the governments increased expenditure in this sector is causing the demand to increase in this sector exponentially. Thus for our future demand projection we have initially increased the growth rate to 20% in 2017-18 (from 16% in 2012-13) and then gradually reduced the import share every 5 years from 20 % in 2017-18 to 7% by 2039-40
5	Others	This include consumables such as electrical appliances, paper, paper board & articles, prepared food stuff, beverages, spirits, tobacco, leather products, precious, semi-precious stones, medical/surgical instruments. The growth rate of these consumption driven commodities is expected to hover close to that of GDP growth rate. The same has been applied in order to establish growth in demand of Other commodities.

Source: Consultant's Analysis

Based on the above assumptions, commodity wise import volumes were projected and detail estimates of import traffic are presented as annexure to this report. Summary of commodity wise import volume projections is presented in the table below:

TABLE 13 : FUTURE CARGO PROJECTION (IMPORT) COMMODITY-WISE (IN TEU)

Import Commodity	2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
Textile Yarn, Fabric & Articles	181054	190290	199997	210199	220921	232190	236857	1%
Plastic & Rubber Articles	131087	275327	485221	817625	1201360	1607691	1772479	10%
Raw Cotton	92732	136254	200202	280794	393829	527031	592173	7%
Chemical & Pharmaceutical Products	14258	35479	74519	143479	241771	355241	406715	13%
Others	319907	428108	572905	766676	1025985	1372999	1542702	6%
Total (Loaded Containers)	739,039	1,065,459	1,532,843	2,218,773	3,083,865	4,095,152	4,550,926	6.96%

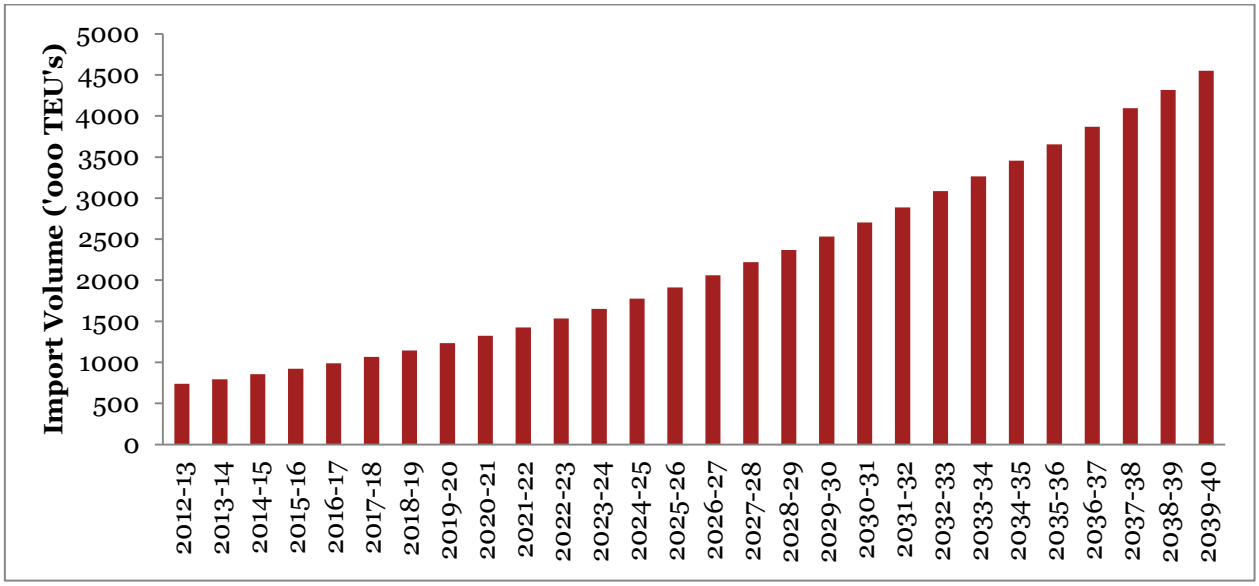


FIGURE 39: FUTURE CARGO PROJECTION (IMPORT IN '000 TEU)

Source: Consultant's Analysis

4.1.2. *Export*

The export basket of Bangladesh consists of readymade garments, jute & jute goods, leather, frozen goods, tea and others, which mostly includes consumable items, precious jewelleries etc. Following figure shows the respective share of key export commodities for 2011-12.

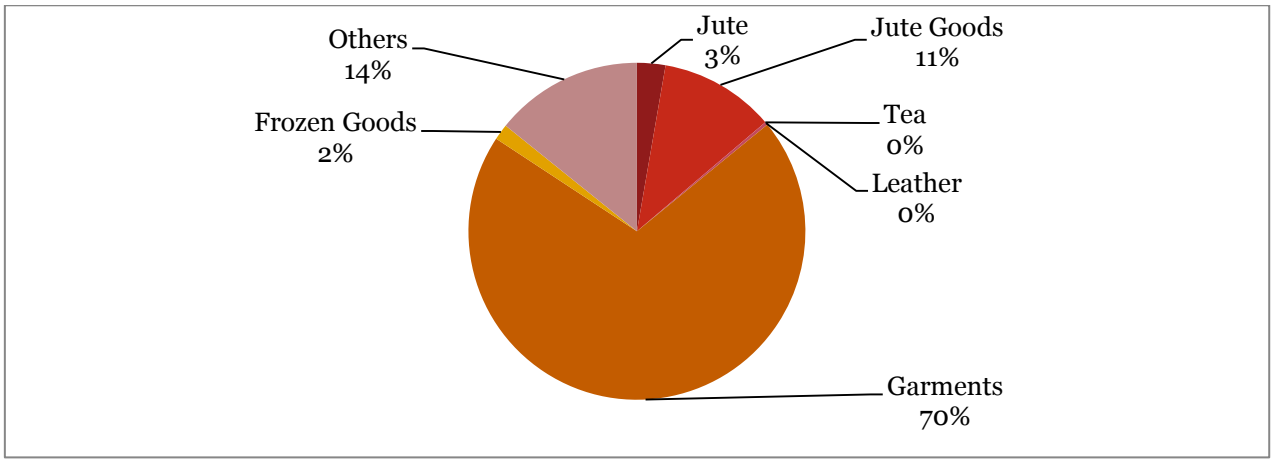


FIGURE 40: SHARE OF KEY COMMODITIES (2011-12)

Source: Consultant's Analysis

As understood based on the interactions with stakeholders, the export (containerized cargo) is primarily dominated by 4 key commodities which comprise of ~85% of export volume and include – Garments, Jute & Jute Goods, Leather and Frozen Goods. In the following sections a detailed past trend and major clusters & key players of each of these commodities has been presented in order to assess the future potential.

4.1.2.1. *Garments*

The textile and Readymade Garments (RMG) industry has been the country's export leader for the last 10 years. The industry generates an estimated 1.2 billion jobs in the DCR and exported more than $3.6 billion worth of textiles and garments in 2009. This sector has gained comparative advantage because of (i) its large pool of low-cost labour; and (ii) policy support from the government, including the establishment of economic enterprise

zones and other taxation, foreign ownership, and infrastructure inducements for exporters and investors. The sector was named one of the "thrust sectors" by the government in its 2006–2009 industrial and export development policies.

The five core industries in the RMG segment are cotton textiles, knitwear, woollen textiles, jute textiles, and hand looms. The backward and forward linkages supporting the industry segment include government support (in policy and strategy matters), utility services, industry associations and interest groups, educational establishments, labour unions, national and international markets, and R&D and design support services. Many functions of the segment are poorly developed, inefficient, or missing. As a result, the segment is not functioning efficiently, undermining its competitiveness against other Asian textile and RMG industries. Following figure shows the historic growth trend for this commodity:

TABLE 14 : EXPORT TREND – GARMENTS

Description	2009-10	2010-11	2011-12
Export (Million, Taka)	967110	1227010	1282850
Export (000' Tons)	2134.7	2063.5	2364.6
Export (TEUs)	284628	275135	315277

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

While the Y-o-Y growth in terms of value of imports was observed at 5% for 2010-11 and 2011-12, the effective Y-o-Y growth in overall container volume was observed at 15% during the same period. Given the government incentives for this industry segment, growing international demand for textile products manufactured in Bangladesh and considering RMG export target of USD 50 Billion by 2020, this growth trend is expected to continue.

As understood based on the interactions with stakeholders, this commodity is voluminous in nature and primarily includes export of finished products using corroborated box packaging. Given the voluminous nature, majority of this is transported using FEU boxes. Average tonnes per TEU for this commodity are around 7.5T/TEU.

Production & Consumption Clusters and Key Players

RMG/Textile industry has a strong presence in two clusters including Chittagong & Dhaka capital region (which also includes Narayanganj, Dhaka, Narsingdi, and Gazipur). Of the two clusters, Dhaka Capital Region (DCR) has the largest share of Textile/RMG industries. Textile and RMG industrial establishment in DCR include nearly 8000 factories and SMEs of varying sizes. As per ADB report on Cluster based Economic Development, nearly 60% of these industrial establishments are situated in the Dhaka metropolitan area, 8% in Narayanganj and 17% in Gazipur.

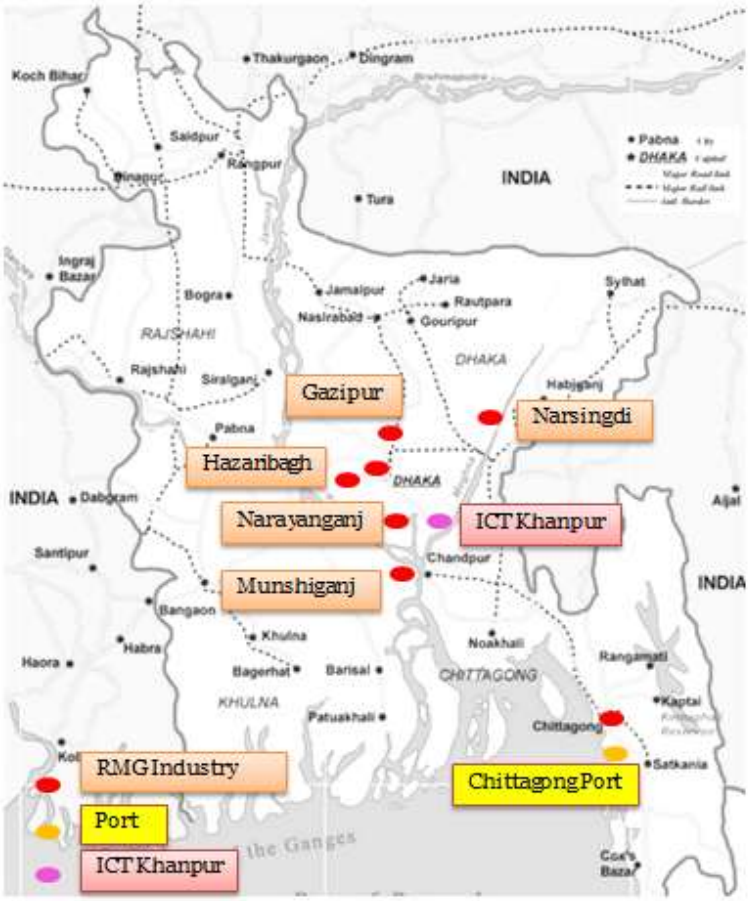


FIGURE 41: KEY CLUSTER FOR TEXTILE YARN & ARTICLES IN DCR[24]

A linear pattern of textile and RMG factories is also developing along the major roads and highways leading out of Dhaka.

Key Players in the RMG industry are Greenland Garment, Hameem Group, Biswas Group, Bextex Limited, Silver Line Group, Benetex Industries LTD, Antim Knitting Dyeing & Finishing Ltd and Antim Knit Composite Ltd, Abed Textile processing mills Ltd etc. Profile of key players in the PIA is presented as annexure to this report.

4.1.2.2. Jute & Jute Goods

With favourable agro-climatic environment, Bangladesh is a natural home for producing the best quality jute in the world. Jute was one of the important export items of Bangladesh till the end of 1980s. However, due to ascendancy of export-oriented readymade garments (RMG), and later on of shrimp, jute lost its pre-eminent position. Jute sector in Bangladesh started to decline with the introduction of synthetic substitutes and technological developments leading to progressive replacement of natural raw materials. Further, with ban on plastic bags implemented in many countries, demand for natural fibre products across the world is expect to grow.

Key items for jute export include raw jute, jute yarn and twine jute carpet, jute ropes, and other jute items. With combined share of 60% of the total jute exports from Bangladesh, China and Pakistan are the major markets for the export of raw jute. For jute yarn, major markets are Turkey, Belgium and India.

[24] ADB Report – Cluster based economic development

Major markets for export of jute woven fabric from Bangladesh include India, New Zealand and Korea. Other significant market for export of Jute & Jute products are Indonesia, Middle East, North Africa, East Africa, USA, Australia and Russia.

With growing environmental awareness and increase trends around green businesses[25], production of diversified jute goods in Bangladesh is getting a momentum.

Following figure shows the historic growth trend for the export of this commodity

TABLE 15 : EXPORT TREND – JUTE & JUTE GOODS

Description	2009-10	2010-11	2011-12
Export (Million, Taka)	66380	70660	76880
Export (000' Tons)	943.7	1064	1140.4
Export (TEUs)	51174	57627	61994

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

The Y-o-Y growth in terms of value of export was observed at 9% during 2010-11 to 2011-12 and the Y-o-Y growth in overall container volume was observed at around 7% over the same period. Given the growing demand for jute products, this growth trend is expected to continue. As understood based on the interactions with stakeholders, average tonnes per TEU for this commodity is around 24 T/TEU.

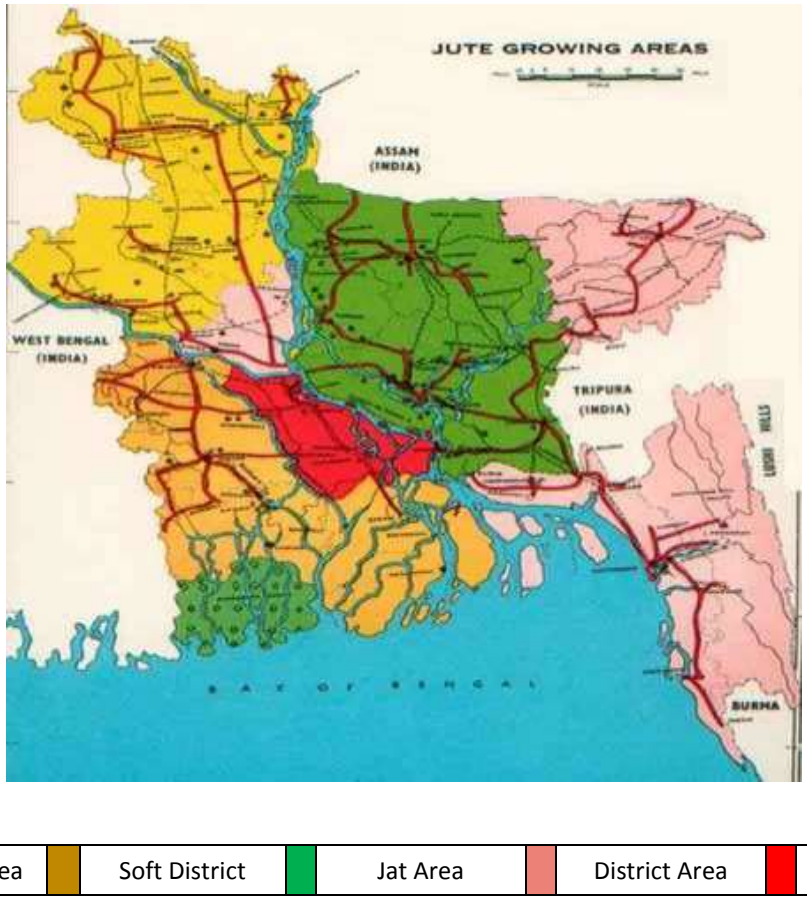
Production & Consumption Clusters & Key Players

In general, jute growing areas of Bangladesh can be divided into five regions. These regions produce both varieties including White and Tossa, of varying degree of quality/grade. These five regions are[26] :

1. Jat area (Jute Cultivation): Include mainly Munshiganj, Narayanganj, Manikganj, Gazipur, Tangail, Kishoreganj, Mymensing and Jamalpur shown in green in the map.
2. Hard districts: Include mainly Faridpur, Shariatpur, Madaripur and Gopalganj shown in red in the map.
3. Soft districts: Kushtia, Chuadanga, Jessore, Narail, Meherpur, Magura are the prominent growing areas in this category shown in orange in the map.
4. District area: Chandpur, Chittagong, Chapainawabganj, Rajshahi, Pabna, Bogra, and Sylhet are shown in pink in the map.
5. Northern area: Consists mainly of Rangpur, Kurigram, Nilphamari, Gaibandha, Thakurgaon and Dinajpur shown in yellow in the map.

[25] Potential for Bangladeshi Jute Products – Rahiman Akhter ,Export promotion Bureau, Bangladesh

[26] Cash Crop wing – Department of Agriculture, Ministry of Agriculture, Govt. of Bangladesh



	Northern Area		Soft District		Jat Area		District Area		Hard District

FIGURE 42: KEY CLUSTER FOR JUTE & JUTE GOODS

At present, there are 141 jute mills operating in Bangladesh. Of these, 117 are in private sector and 24 are government-controlled. Among them, 83 are composite jute mills (producing yarn and jute goods) of which 59 are private and 24 are government. Also, there are 58 spinning mills producing yarn. The mills are prominently located in Dhaka, Narayanganj, Chittagong, Faridpur and Khulna.

Key Players in this industry segment are Asia Jute, Cotheeka Jute industry, Jute World Exports etc. Brief profile of key players in the PIA is presented as annexure to this report.

4.1.2.3. Frozen Goods

Frozen food export is another key commodity exported from Bangladesh and accounts for about 3% of total export and contributes 3.78% to the national GDP. Export of frozen food products as a commodity group include frozen shrimp and prawn, frozen fish, fresh and chilled fish, shark fins & fish maws and live crabs. Shrimp is the major sub commodity and accounts for more than 80% of total frozen food items exported from the country. Bangladesh accounts for nearly 2.5 % of world shrimp market. With nearly 148 (88 are registered by GOB) sea food processing plant in the country, total sea food processing capacity of Bangladesh is estimated at around 3,00,000 metric tonnes per year. Due to inefficient value chain, capacity utilisation of these processing plants is only 14%-16% of their total capacity.

Following figure shows the historic growth trend in in exports of frozen food:

TABLE 16 : EXPORT TREND – FROZEN GOODS

Description	2009-10	2010-11	2011-12
Export (Million, Taka)	41490	47580	33990
Export (000' Tons)	139.7	115.2	123.3

Description	2009-10	2010-11	2011-12
Export (TEUs)	7760	6398	6849

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

While the Y-o-Y growth of export in terms of value was observed at -28.6% for 2010-11 and 2011-12, the effective Y-o-Y growth in overall container volume was observed at 7% for the same period. This de-growth in value of exports over the period from 2010-11 to 2011-12 can be attributed to declining demand from EU markets, particularly after the economic meltdown. As understood based on the interactions with stakeholders, this commodity is exported using 40 feet reefer containers and average tonnes per TEU for this commodity is around 18 tonnes.

Production & Consumption Clusters

At present, nearly 145 shore based frozen food processing units are functional in Bangladesh. These units are concentrated around those cities which have direct access to river or sea shore such as DCR, Chittagong, Khulna, Jessore, Satkhira, Bagerhat, Cox's Bazar, Chandpur, Kishoregonj, Gopalganj, Syihet and Patuakhali. These units produce a wide variety of frozen food products such as Fresh Water shell On (FWSO), Ser Water shell On (SWSO), Peeled and Deveined (P&D), Peeled and Undeveined (PUD).

FIGURE 43: KEY CLUSTER FOR FROZEN GOODS

Source: Google Maps and Consultant's Analysis

Key Players in this industry segment include the following:

- Khulna Frozen Food Exports Ltd. (Based in Khulna)

- Export frozen shrimps and white fishes from Bangladesh.
- Amam Sea Food Industries Ltd. (Based in Khulna)
- It markets seafood products including shrimps, prawns and fish.
- Aqua Resources Ltd. (Based in Dhaka).
- Asian Sea food Ltd. (Based in Chittagong).
- It is in the field of processing of a variety of shrimp and fishery products for export markets for the last 16 years.
- Rupali Seafoods Ltd. (Based in Khulna).
- ARK Seafoods Ltd. (Based in Chittagong)
- They are the exporters of frozen shrimps and white fishes.

4.1.2.4. Leather

Leather industry is one of the traditional industry segments of Bangladesh and globally recognized for the production of finest goatskin leather products. As per industry estimates, leather exports from Bangladesh accounts for nearly 0.5% of the global leather and leather products market which is valued at USD 215 billion. As per Exports Promotion Bureau, exports of leather including leather products has grown from about USD 0.5 billion in 2009-10 to USD 0.9 billion in 2012-13 at 28.8% CAGR.

Major destination for exports of leather from Bangladesh include Italy, New Zealand, Poland, UK, Belgium, France, Germany, US, Canada and Spain. In addition, countries like Japan, India, Nepal and Australia are some of the emerging destinations for exports of leather goods from Bangladesh.

Leather sector in the country is facing challenges around the environment and labour health issues associated with processing of leather. To address these challenges, The Asia Foundation is working closely with leather associations in Bangladesh and the Ministry of Industries to develop an ecosystem which is compliant to international health and environment standards. Under this initiative, nearly 155 tanneries located in and around Dhaka will be relocated to new industrial estate in Savar which has waste-treatment facility. Relocation of the industrial units is in process and the new facility is expected to be inaugurated in December 2015. With this initiative, leather industry in Bangladesh has started to attract foreign investors and nearly 51 players have expressed their interest in setting up footwear units in Bangladesh.

Following figure shows the historic growth trend for exports of this commodity:

TABLE 17 : EXPORT TREND – LEATHER

Description	2009-10	2010-11	2011-12
Export (Million, Taka)	33650	41150	47780
Export (000' Tons)	22.7	20.6	23.8
Export (TEUs)	1260	1143	1321

Source: Bangladesh Bureau of Statistics & Consultant's Analysis

Export in terms of value as well as overall container volume have grown at Y-o-Y 16% during 2010-11 and 2011-12. This high growth rate is mainly because of the reason that the industry has diversified its products by combining the latest advances in leather technology with an increasing supply of fine-quality local hides and skins. As understood based on the interactions with stakeholders, average tonnes per TEU for this commodity is around 13 T/TEU.

Production & Consumption Clusters

The leather goods industry is concentrated in and around Dhaka. According to the Bangladesh Bureau of Statistics (BBS) economic census data for 2003, the DCR accounted for nearly 72% of all leather industry establishments in the country (3,520 out of 4,914). There are more than 200 tanneries in Bangladesh, 90% of

these in the Hazaribagh area of Dhaka. The rest are moderately concentrated in Gazipur, and a few are in Narsingdi and Manikganj.

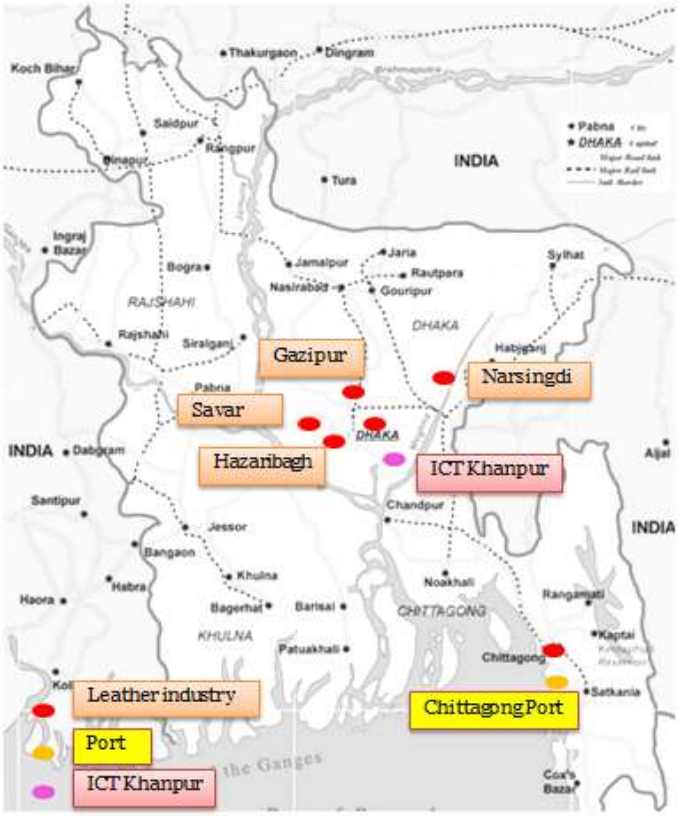


FIGURE 44: KEY CLUSTER FOR LEATHER ARTICLES[27]

Source: Consultant's Analysis

Key Players in this industry segment include the following:

- RMM Leather Industries Limited. Factory location: Hazaribagh (Unit 1), Factory location: Khulna (Unit 2)
- Apexadelchi Footwear Limited: It is a leading manufacturer and exporter of leather footwear from Bangladesh to major shoe retailers in Western Europe, North America and Japan. Capacity – 20,000 pairs of complete shoes per day
- Capital Tannery: It is one of the prominent manufacturers within Bangladesh engaged in exporting all kinds of leather articles. Factory location: Hazaribagh

Key assumptions based on the detailed analysis of export trends and drivers are presented in the table below:

TABLE 18 : ASSUMPTIONS– KEY EXPORT COMMODITIES

S. No.	Commodities	Growth Assumptions
1	Ready-made Garments	Exports from Bangladesh are dominated by textile and textile products and container volumes are growing at 15% Y-o-Y. To remain conservative and

[27] ADB Report – Cluster Based Economic Development

S. No.	Commodities	Growth Assumptions
		considering maturity of this industry resulting in stabilization of growth in later years. It is assumed that the growth in exports will gradually reduce from 15 % in 2012-13 to 5% by 2039-40.
2	Jute & Jute Goods	Given the tough competition from plastic products, it is assumed that future demand will remain constant at 7% for initial 5 years (since 2012-13 till 2017-18), then gradually reduce to 6% by 2022-23 (& will remain constant till 2027-28), 5% (till 2032-33) and 4% till (2039-40).
3	Frozen Goods	Frozen food export is also one of the key export commodities of Bangladesh, and contributing 3.78% the country's GDP. Growth in export container volumes is observed at 7% YoY. The growth in demand for this commodity is likely to remain constant at 7% for initial 10 years (since 2012-13 till 2022-23) then gradually reduced to 6% (till 2027-28), 5% (till 2032-33) and 4% till (2037-38).
4	Leather products	Given the initiative by government, it is assumed that growth in future demand is likely to remain at 16% for initial 5 years (since 2012-13 till 2017-18) then gradually reduce to 8% by 2039-40.
5	Others	Other in export primarily include commodities such as home textile, light engineering (majorly dominated by Bicycle industry), other general cargo etc. The growth rate of these commodities is expected to hover close to that of GDP growth rate. The same has been applied in order to establish growth in demand of Other commodities.

Based on the above assumptions, commodity wise export volumes were projected and detail estimates of export traffic are presented as annexure to this report. Summary of commodity wise export volume projections is presented in the table below:

TABLE 19 : SUMMARY OF EXPORT TRAFFIC

Export Commodity	2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
Garments	315277	634134	1275470	2247815	3458542	4414073	4866516	11%
Jute & Jute Goods	47516	66643	89184	119348	152322	185322	200445	5%
Frozen Goods	6849	9606	13472	18029	23010	27996	30280	6%
Leather	1829	3842	7397	13035	20993	30846	35979	12%
Others	71864	95266	127487	170607	228310	305531	343295	6%
Total (Loaded Containers)	443334	809491	1513011	2568834	3883177	4963768	5476514	9.76%

Source: Consultant's Analysis

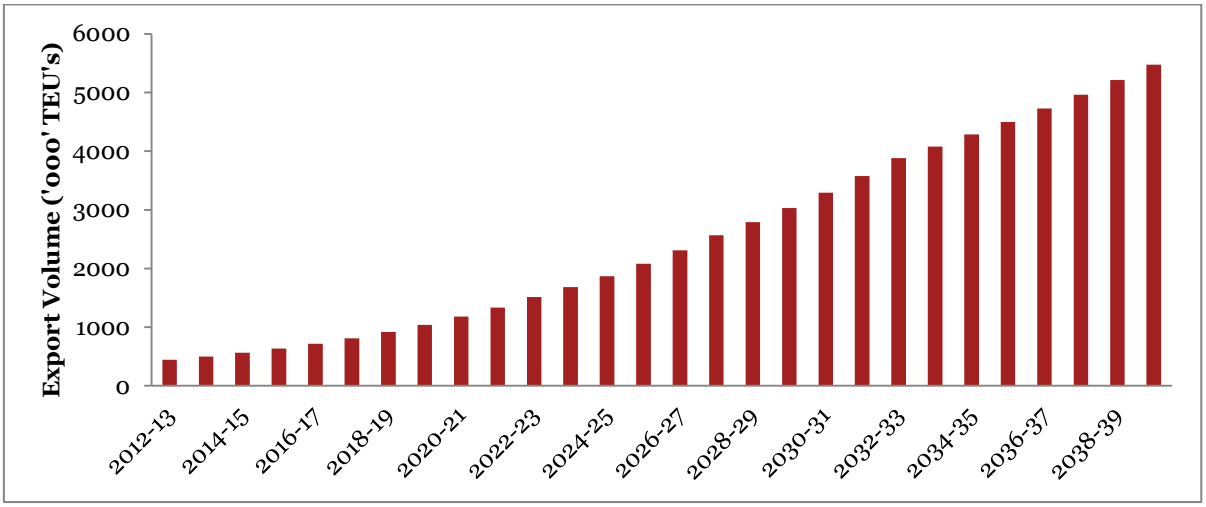


FIGURE 61: FUTURE CARGO PROJECTION (EXPORT) COMMODITY-WISE (2011-12)

Source: Consultant's Analysis

4.1.3. *Summary of Bottom-up Approach*

Summary of import and export container traffic projections for Bangladesh based on Bottom-up approach are presented in the table below:

TABLE 20 : BOTTOM UP APPROACH BASED SUMMARY OF EXPORT TRAFFIC

Head	2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
Import	739,039	1,065,459	1,532,843	2,218,773	3,083,865	4,095,152	4,550,926	6.96%
Export	443334	809491	1513011	2568834	3883177	4963768	5476514	9.76%
Total (TEU)	**1,182,373**	**1,874,949**	**3,045,854**	**4,787,607**	**6,967,043**	**9,058,920**	**10,027,439**	**8.24%**

Source: Consultant's Analysis

4.2. *Traffic projections: Top-Down Approach*

The port of Chittagong has a monopolistic position in Bangladesh and handles more than 90% of the country's foreign trade and nearly 93% of the total container trade of Bangladesh. Competition from seaports in other countries, such as Kolkata/Haldia in India, is limited due to the geographical location of Bangladesh. In addition, the cargo handled at Chittagong is national cargo, not transit or transhipment volumes for other countries. To complement the growing container trade of Bangladesh, two new port projects including Para and Somalia are planned and may affect the volumes handled at Chittagong in the medium to long term. Thus, the calculations for potential container traffic that the proposed ICT at Khanpur can attract are based on the expected growth of national container volumes, independent of existing as well as upcoming the port capacities and utilisation. However, it is expected that majority of the national demand of container traffic will be served by Chittagong port due to availability of ecosystem along with the capacity expansion measures under implementation. In addition, it is also expected that at least one additional sea port will be developed to cater to the spill over demand from the port of Chittagong.

In general, port handling demand is a combination of both origin/destination traffic (imports/exports, including domestic and transit traffic), as well as transhipment traffic. Import/export traffic is directly related to the demand for/supply of cargo in the domestic or transit country, which, among other factors, is usually dependent on economic conditions such as GDP growth, population, consumption and production patterns. Hinterland distribution of cargo is based on different transport modes including road, rail and inland waterways.

The projections for potential container traffic for Bangladesh looks at a period until 2040 and differentiates between three scenarios, the Base, the High and the Low Case. These projections are based on:

- a thorough quantitative and qualitative analysis of past trends regarding economic development, foreign trade, and port handling capacities in Bangladesh;
- identification of the crucial parameters that determine demand as well as supply of port services;
- projection of these parameters based on a mix of quantitative and qualitative information;
- the forecast allocates market shares to Chittagong and an expected additional port and shows handling potentials, differentiating between imports and exports;

Likely future cargo volumes that can be handled at Bangladesh ports are projected based on the methodology of elasticity techniques, using development pattern as well as relationship between the economy and container trade. However, due to complexity of the analysed cargo developments, opinion and judgment of experts was incorporated where appropriate past data was not available.

The economic concept of elasticity (multiplier) is a tool for measuring the responsiveness of a function to changes in parameters in a unit-less way. To determine the elasticity of two parameters x and y, the following equation can be applied:

$$Elasticity = \%\ change\ in\ parameter'x' \div \%\ change\ in\ parameter\ 'y'$$

Following this equation, the elasticity is a ratio of percentage change in one variable to the percentage change in another variable. For the interpretation, if the elasticity is larger than 1, the relationship between two parameters is considered to be elastic (a parameter responds largely to small changes in other parameters). If it is less than 1, the relationship is said to be inelastic (it does not change much in response to changes in other parameters).

Historic data for real GDP growth rates for Bangladesh was obtained from the International Monetary Fund (IMF). Based on extensive qualitative and quantitative information provided by external sources (EIU, IMF, World Bank), growth rates for the Bangladesh GDP were estimated. For historic trends in container trade of Bangladesh, container traffic handled at Chittagong port which represents more than 90% of the national container trade was used.

The long-term development of containerized imports is directly related to the economic development of a country or region. An expanding economy usually leads to more trade in order to meet the growing demand of industry and consumers. Equally, the increasing trade is considered to be the engine of growth for a country's wealth. This is frequently reflected in a correlation between the growth of the real GDP and the container throughput. The relationship between GDP growth and container throughput is generally regarded as the best available tool for preparing macro level projecting of future container throughput. Typically, the elasticity factor of container growth and GDP growth varies with the per capita income of a country. Whereas the multiplier is generally high in emerging countries and it is considerably lower in high income countries. Therefore, the multiplier used in for projecting the traffic will decrease gradually from 1.7 (based on the past relation between GDP and container trade in Bangladesh) to even below 1.0 towards end of the forecast period in order to reflect long-term reducing growth rates to provide a realistic development pattern.

In order to induce sensitivity in our estimates, projections for the potential demand of national container traffic are prepared considering three different scenarios including base, low and high case. Traffic projection under base case scenario is prepared considering the assumptions based on historic trend analysis. Whereas, projections for potential container demand for low and high case scenarios are prepared by adjusting these assumptions. Accordingly, base case scenario is preferred over low and high case scenario and projections under low and high case scenarios are presented as annexure to this report.

4.2.1. Base Case Scenario

The annual growth rate from 2015 to 2040 is influenced by the GDP growth rate (constant price) as it is projected by the IMF. The maximum capacity of Mongla Port has been assumed at around 74,000 TEU annually. To provide the basis for the potential container traffic at ICT Khanpur, it is assumed that majority of the container traffic will be bounded to/from Chittagong and there will be a new container port at the Bay of Bengal to take over the spill over traffic from Chittagong and Mongla port. The new port will increase its annual

throughput gradually. The “step-wise” development of new port is assumed considering the time required for economic development of the catchment area and shifting of shipping line services shifted from an existing terminal to the new one. The projection of national container demand under base case is shown in the following table:

TABLE 21 : NATIONAL CONTAINER DEMAND PROJECTIONS

National Container Traffic Forecast - Base Case		2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030	2035	2040
Traffic Potential Bangladesh														
Container Handling	1,000 TEU	1,373	1,513	1,672	1,848	2,052	2,281	2,529	2,798	3,077	4,757	6,893	9,101	10,832
Growth	%	-9.08	10.13	10.57	10.52	11.02	11.15	10.88	10.62	9.97	8.54	7.15	4.80	2.75
GDP Growth	%	6.26	6.07	6.11	6.31	6.76	7.00	7.00	7.00	6.74	6.62	6.50	6.00	5.50
Multiplier				1.71	1.67	1.63	1.59	1.55	1.52	1.48	1.29	1.10	0.80	0.50
Traffic Potential Mongla														
Container Handling	1,000 TEU	30.05	43.87	46.98	50.41	54.36	58.77	63.54	68.70	74.07	74.07	74.07	74.07	74.07
Share in Total		0.022	0.029	0.028	0.027	0.026	0.026	0.025	0.025	0.024	0.016	0.011	0.008	0.007
Traffic Potential Port Projects Somalia OR Para														
Container Handling	1,000 TEU	0	0	0	0	0	100	200	400	600	1,387	2,489	3,918	5,416
Share in Total		0.000	0.000	0.000	0.000	0.000	0.044	0.079	0.143	0.195	0.292	0.361	0.431	0.500
Traffic Potential Chittagong														
Container Handling	1,000 TEU	1,343	1,469	1,626	1,798	1,998	2,122	2,266	2,329	2,403	3,295	4,330	5,108	5,342
Share in Total		0.979	0.971	0.972	0.973	0.974	0.930	0.896	0.832	0.781	0.693	0.628	0.561	0.493

Source: Consultant's Analysis

As can be seen from the above table, national traffic volumes for loaded and empty containers based on "top down" approach is expected to grow from 1.5 million TEU in FY 2013 to 10.8 million TEU in FY 2040 at CAGR of 7.6%. Whereas, national traffic volumes for loaded containers based on "bottom up" approach is expected to grow from 1.2 million TEU in FY 2013 to 10 million TEU in FY 2040 at CAGR of 8.2%. Considering the additional share of empty containers at around 50%, traffic projection based on "bottom up" approach appears to be on the higher side. This high share of empty containers in overall trade can be attributed to limited domestic production resulting in higher dependency on imports of raw material as well as finished goods. Further, considering the aggressive plans, especially for RMG export target of USD 50 Billion by 2020 and limited capacity of domestic textile industry producing essential raw material, the share of empty containers in overall container trade is expected to increase further from the current level. Therefore, traffic projections based on "bottom up" approach are expected to remain higher than the traffic projections prepared using "top down" approach. Comparison of traffic projections under both the approaches is presented in the table below:

TABLE 22 : COMPARISON OF NATIONAL TRAFFIC PROJECTIONS

Head	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
"Top Down"(in '000 TEU's)	2280	4027	5988	8251	10221	10832	**7.34%**
"Bottom Up" (in '1000 TEU's)	2280	3802	6072	8909	11541	12766	**8.15%**

Source: Consultant's Analysis

As can be seen from the table above, overall growth of national container traffic based on "bottom up" approach is higher as compared to the projection based on "top down" approach. To remain conservative in our estimates, projections for national container traffic based on "top down" approach have been considered for arriving at the potential traffic for the proposed ICT at Khanpur.

The share of Dhaka bounded cargo from/to the considered sea ports has been assumed keeping constant at 80%. This is the current share as Dhaka is the major economic area in Bangladesh. It is expected that Dhaka will continue to play this role in the far future.

4.3. Competitive Landscape

The proposed ICT at Khanpur will have to compete with other 5-6 river based inland container terminals and two Inland Container Depots (ICD) including Kamlapur (existing) and Dhirasram (proposed). These river based container terminals are in various stages of development. Various competing facilities (including existing and upcoming) along with their indicative locations are presented in the figure below:

FIGURE 45: INDICATIVE LOCATION OF COMPETING FACILITIES

Source: Consultant's Analysis

4.3.1. *Pangaon ICT (or Dhaka ICT)*

Pangaon Terminal is located on the southern river bank of the Buriganga River. This terminal was jointly developed by CPA and BIWTA, and is being operated by CPA. The stated capacity of this terminal is around 116,000 TEU for the starting phase and is proposed to be extended to 160,000 TEU annually. This facility already offers its services to the market since 2014 and handled nearly 1,000 – 2,000 TEU in 2104.

FIGURE 46: PANGAON ICT

Source: Consultant's Analysis

The logistic industry mainly criticizes the facility for:

- High terminal handling costs which would lead to higher value chain costs,
- Absence of an integrated CFS and bonded storage facility on terminal premises,
- Inadequate security measures, and
- Not satisfying customs processes.
- Higher first and last mile transportation cost

The terminal provides two straddle carriers for the horizontal transport as well as one harbour mobile crane (HMC). The berth facility has a length of 590 ft. . SWOT Analysis of the terminal is shown in the table below

Strength	Weaknesses
• Ready for operations. • Operator also active at CPA. • Land extension is available. • Close to Dhaka city.	• Not sufficient CFS capacity. • No swift established customs processes • Tedious processes for adjustment of framework (e.g. rates)
Opportunities	**Threats**
• BITWA studies are promoting the ICT development and creating an awareness. • Vessel capacity availability	• Connected to Dhaka by congested two lane roads. • Restriction on road transport during day time in Dhaka. • No rail connectivity

FIGURE 47: SWOT ANALYSIS PANGAON ICT

Source: Consultant's Analysis

4.3.2. *Summit Alliance Terminal*

Summit Terminal is located in the Munshiganj District on the northern river bank of the Dhaleshwari River and is close to the Maktarpur Bridge and the Gope Char. It is owned by Summit Alliance Group. Stated capacity of this terminal is around 60,000 TEU for the starting phase and is proposed to be extended to 120,000 TEU. It is expected that phase-I will be operational in 2015. The terminal has a size of 15.2 acres and will provide 80 meter berth during phase 1. Among other, it is proposed that terminal will have two fixed column cranes (FCC) provided by crane manufacturer Liebherr and a three level warehouse with 1,350 m² per level are available. In addition, developer is also planning to charter three vessels to facilitate movement of containers from Chittagong port.

FIGURE 48: SUMMIT ALLIANCE ICT

Source: Consultant's Analysis

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• First terminal to be reached when approaching Dhaka by IWT. • Ready for operations.	• 20 Km far from highway N8. • Limited expansion area available.
Opportunities	**Threats**
• Three vessel capacity availability. • Operator is logistics provider of MCC/Maersk (Iglobal leading shipping line)	• Connected to Dhaka by congested two lane road. • Restriction on road transport during day time in Dhaka. • No rail connectivity

FIGURE 49: SWOT ANALYSIS SUMMIT ALLIANCE ICT

Source: Consultant's Analysis

4.3.3. *Rupayan Port & Logistic Services Ltd*

Rupayan Terminal is located on the eastern river bank of the Shitalakhya River in Dhamgarh. It is approx. 6 km up the river from the Khanpur Terminal location. The Dhaka region can be reached by the Kanchpur Bridge. The terminal is developed and owned by Rupayan Port & Logistics Services Ltd as part of the Rupayan Group (a Bangladesh real estate group). The size of the terminal is reported to be 30 acre in phase 1. A berth facility of 90 m will be provided during the starting phase and commencement of phase 1 commercial operations is expected in 2016. The information about the expected annual capacity of the terminal is stated being 375,000 TEU per annum. The project is quite delayed as the initial date of starting the operations lies in 2014.

FIGURE 50: RUPAYAN PORT & LOGISTIC SERVICES LTD.

Source: Consultant's Analysis

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• 3 Km distance from highway N1 and N105. • Integration of customs and health inspection during planning.	• The operator is not experienced in operating a terminal and providing logistics/port services.
Opportunities	**Threats**
• CFS facility can be operated through road transport in the starting phase due to good road connectivity.	• Connected to Dhaka by congested two lane road. • Delay in project (Initially planned for 2014). • No rail connectivity.

FIGURE 51: SWOT ANALYSIS RUPAYAN PORT & LOGISTIC SERVICES LTD.

Source: Consultant's Analysis

4.3.4. *Kumudini Container Terminal*

The proposed site for Kumudini Container Terminal is located in direct vicinity of Khanpur Terminal at a distance of about 500 m downstream on the Shitalakhya River. The area is supposed to be around 30-40 acre with annual capacity of around 150,000 TEU. The distance to Narayanganj rail station is about 500 meters from the identified land. Currently no construction activities could be observed at the proposed premises. A feasibility study has already been elaborated and the land is owned by the Kumudini Welfare Trust of Bengal. As understood based on the interactions with stakeholders, proposal for this facility was approved by the PMO in 2012 and this facility is likely to be developed by a Joint Venture including Kumudini Trust and a logistics company, probably from India. Further, it was learnt that a feasibility study has already been elaborated and submitted to the ministry of External Affairs, India for their approval

FIGURE 52: KUMUDINI CONTAINER TERMINAL

Source: Consultant's Analysis

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• Located directly within the Narayanganj area which is one of the largest business areas.	• Operator not experienced in operating a terminal and providing logistics/port services.
Opportunities	**Threats**
• Located directly at Narayanganj port which is included in the Indo-Bangladesh protocol routes	• Project at a very early stage. • Projects reputation is quite bad due to non-involvement of local entrepreneurs.

FIGURE 53: SWOT ANALYSIS KUMUDINI CONTAINER TERMINAL

Source: Consultant's Analysis

4.3.5. *Ananda Container Port*

Ananda Container Port is located in the Narayanganj District on the river bank of the Meghan River. It is being developed by Ananda Group. The proposed site is located 30 km east of Dhaka city and north east of Narayanganj city. The reported future capacity varies from 400,000 to 900,000 TEU annually which seems to be quite ambitious. As understood based on interactions with stakeholders, the project is expected to be delayed due to financial constraints. The government has granted approval to Ananda Group to establish a container port November 2013. After approval the start-up capacity has been reported being 250,000 TEU annually by 2016. Future plan includes enhancement of the handling capacity to 600,000 TEU's per year by the end of 2021.

The Ananda Group has to carry out necessary dredging at its own cost to ensure adequate navigability in the channel for smooth plying of container-laden vessels. Ananda Shipyard and Slipways Limited (ASSL) initially known as Ananda Builders Limited (ABL), had been instituted as an engineering company in 1983 on the bank of river Buriganga on the periphery of Dhaka. In the year 1986 the shipyard had acquired the present location on the line of Meghna.

FIGURE 54: ANANDA CONTAINER PORT

Source: Consultant's Analysis

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• Direct access to the highway N1. • A comparative large area of around 400,000 m2. • Land belongs to investor	• Located at the very outer periphery of the Narayanganj district and not close to Gazipur area. • Investor is not experienced in terminal and logistics services.
Opportunities	**Threats**
• Investor is well experienced in shipbuilding which could support the development of sophisticated ICV.	• Project at a very early stage. • Delay in project • No rail connectivity.

FIGURE 55: SWOT ANALYSIS ANANDA CONTAINER PORT

Source: Consultant's Analysis

4.3.6. *A K Khan Container Terminal*

Site for the proposed AK Khan Terminal project is located in the northeast of Dhaka in Polash area of Narsingdi district, on the bank of river Shitalakhya. AK Khan Terminal Project will be developed and financed by AK Khan Group of Chittagong. Connection to national railway network could be provided by a linking to a rail track passing the premises at a distance of approx. 1.2 km. Proposed location is connected to the national road network using road R 302. Total area of the facility is around 30 acres. With planned berth length of 180 m, first construction phase is likely to generate handling capacity for 140,000 TEU. The start of partial operations is expected during third quarter 2016. As understood based on interactions with stakeholders, the approval has been granted and the terminal design has already been completed. Available information about the expected final annual capacity varies between 250,000 TEU and 336,000 TEU. The investor A. K. Khan & Co Ltd is a business conglomerates in Bangladesh, operating since 1945. The Group engages in textiles, telecom, water supply, deep sea fishing and agricultural industries. The group is also planning to expand its business in hotels and real estate.

Given the location, AK Khan Terminal is not in direct competitor to the Khanpur ICT as this terminal is supposed to focus mainly on the demand originating from the Gazipur area.

FIGURE 56: A K KHAN CONTAINER TERMINAL

Source: Consultant's Analysis

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• Nearest to Gazipur district as compared with other ICT's. • Extension area available. • Operator is experienced in providing logistics services.	• Longest transit time on inland waterway from Chittagong port.
Opportunities	**Threats**
• The Dhaka – Chittagong rail line is less than 2 Km away.	• Project at nascent stage. • Delay in project

FIGURE 57: SWOT ANALYSIS A K KHAN CONTAINER TERMINAL

Source: Consultant's Analysis

4.3.7. ICD Kamlapur

ICD Kamlapur is located in the heart of Dhaka city and is operational since 1987. With stack area suitable for staking of 4000 TEU (3 High), annual handling capacity of this facility is around 90,000 TEU. Train services between Chittagong port and Kamlapur ICD are provided by Bangladesh Railways (BR). Entire facility is surrounded by various commercial as well as residential establishments including Kamlapur Passenger Rail Terminal which further limits the scope for expansion. In addition, day time access of commercial vehicles to the facility is restricted due the congested city area. This has resulted in the declining container volumes.

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• The location is close to the consumers/producers. • The counterpart terminal at Chittagong is also operated by CPA. • No competition in rail transport.	• No extension area.
Opportunities	**Threats**
• The improvement of the Dhaka-Chittagong rail line to increase its capacity.	• Restriction on road transport during day time in Dhaka.

FIGURE 58: SWOT ANALYSIS ICD KAMLAPUR

Source: Consultant's Analysis

4.3.8. ICD Dhirasram

With growing container volumes and limited capacity at ICD Kamlapur, Bangladesh Railway (BR) is planning to develop a full-fledged ICD near Dhirasram railway station with capacity of around 3,54,000 TEU in Gazipur district. The proposed ICD is in the close proximity to the garment cluster including Mirpur, Tejgaon, and Demra. As per the preliminary estimates by BR, total land requirement for this facility would be around 80 Ha for construction including ICD facility and take-off line from nearest railway station (Pubail). As understood based on interactions with stakeholders, project is in planning stage and land acquisition has not been initiated.

SWOT Analysis of the terminal is shown in the table below:

Strength	Weaknesses
• Location is close to Gazipur district. • New green field ICD project providing the chance to implement operational improvement.	• No river access to the new facility.
Opportunities	**Threats**
• Planned establishment of Export Processing Zones in the catchment area of this terminal.	• Limited rail infrastructure with two ICD's operating in parallel. • Direct competitor AK Khan Container terminal. • Early project stage. • There can be delays due to non-availability of land.

FIGURE 59: SWOT ANALYSIS ICD DHIRASRAM

Source: Consultant's Analysis

4.3.9. *Summary*

TABLE 23 : SUMMARY OF COMPETITION MAPPING

Facility	Distance To Market	Available Area Acres	Supposed Capacity At Final stage TEU p.a.	Expansion Area	Road	Connectivity Rail	River	Project Status	Investor Experienced In Port &Logistics Services
Pangaon ICT / Dhaka ICT	Close To Eastern Dhaka Market	32	160,000	Yes	Dependence On Bridge Connection To Reach Dhaka	No	Yes	Established/Ready For Operations	Yes – CPA
Summit Alliance Terminal	Located Close To Southern Edge Of Narayanganj District	15	120,000	Limited	Narrow, Congested Two Lane Road	No	Yes	Established/Almost ready For Operations	Yes
Rupayan Port	Close To Two EPZ	30	390,000	No	Dependence On Bridge Connection To Reach Dhaka	No	Yes	Civil works in progress	No
Kumudini ICT	Directly In Narayanganj District	30-40	150,000	No	Narrow, Congested Two Lane Road	Likely	Yes	Early Stage	No
Ananda Container Port	Located At The Periphery Of Narayanganj District	100	600,000	No	Direct Access To Highway No 1	No	Yes	Land Preparation Executed	No
AK Kahn CT	Close To Gazipur District	30	250,000 - 336,000	Yes	Access To Highway Network	Very Likely	Yes	Civil Works In Progress	Yes

Facility	Distance To Market	Available Area Acres	Supposed Capacity At Final stage TEU p.a.	Expansion Area	Road	Connectivity Rail	River	Project Status	Investor Experienced In Port &Logistics Services
ICD Kamlapur	City Centre Of Dhaka	33	90,000	No	Congested city Area	Yes	No	Established/Working	Yes – CPA
ICD Dhirasram	Close Togazipur District	Not Available	354,000	Not Available	Direct Access To Highway No 105	Yes	No	Early Stage	N.A.
ICT Khanpur	Directly In Narayanganj District	20	200,000	No	Narrow, Congested Two Lane Road	No	Yes	Early Stage	N.A.

Source: Consultant's Analysis

The proposed ICT at Khanpur will have to compete with other 5-6 river based inland container terminals and two ICDs including Kamlapur (existing) and Dhirasram (proposed). These river based container terminals are in various stages of development. Based on the detailed SWOT analysis of competing players, the proposed facility can suitably address competitive issues (upcoming/existing) on the basis of the following parameters:

- Strategic location including Narayanganj industrial area, especially the Adamjee EPZ with an estimated sized of around 76,000 TEU per annum.
- Existing ecosystem including availability of transport operators, handling agents, labour and Customs.
- Low Capital Cost as compared to other Greenfield ICTs.
- Shortest road distance resulting in reduced last & first mile cost for the industries located in western parts of Dhaka Capital Region including Narayanganj industrial area
- Early mover advantage and
- Support from the government in terms of Public Private Partnership.

4.4. Logistics Cost Assessment Considering the Competing Facilities

Logistics cost for the competing facilities was assessed considering freight cost based on river distance from the Chittagong port and road distance to key hinterland clusters. For the logistics cost assessment, it was assumed that cargo handling charges will be determined by market forces and for the competitive market environment, these charges will be similar for all the competing facilities.

One of the main challenges for the ICT concept in general is the additional handling process leading to additional handling costs in comparison to road transport. Rail transportation has a similar additional handling cost structure. Maximum capacity of a train is 60 TEU and current vessel design provides ICV with a capacity of 176 TEU which almost three-times a train capacity. The key activity based value chain of the three transport modes are shown in the following figure.

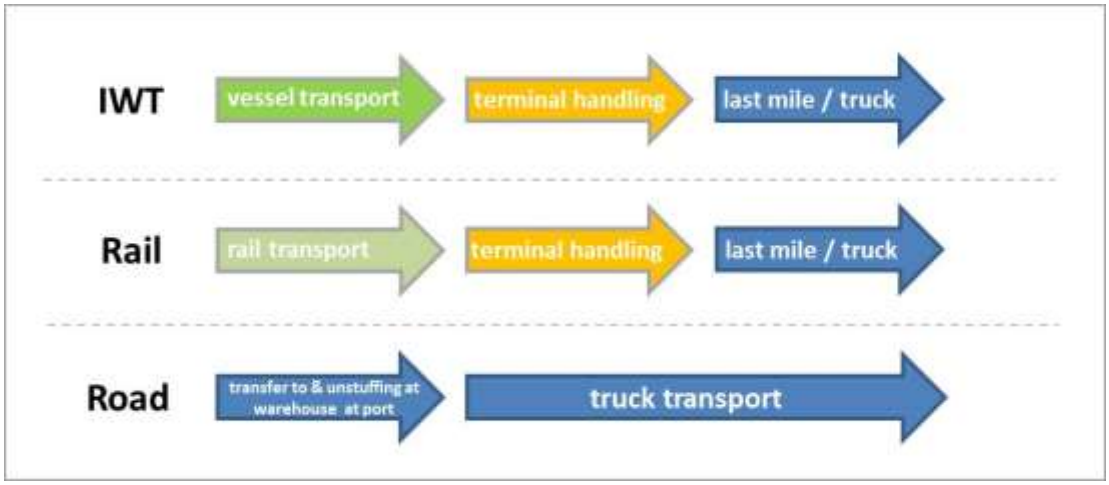


FIGURE 60: TRANSPORT CHAIN SECTIONS

Source: Consultant's Analysis

Handling at sea port is not mentioned in the above diagram as it is common for all transport modes. This is also valid for the handling at destination of the cargo/container.

TABLE 24 : COMPARISONS OF TRANSPORT DISTANCES OF ICT/ICD PROJECTS AROUND DHAKA

Terminal	River distance to CPA km	Last & First Mile Road Distance		
		Narayanganj	Gazipur	Dhaka
Pangaon ICT /Dhaka ICT	306	20	65	25
Summit Alliance Terminal	295	10	80	35
Rupayan Port	307	20	60	30
Kumudini CT	299	1	70	30
Ananda Container Port	293	30	75	50
A K Kahn CT	348	50	40	40
ICD Kamlapur	n.a.	20	45	1
ICD Dhirasram	n.a.	55	10	35
ICT Khanpur	300	1	70	30

As can be seen from the table above, distance between the Port of Chittagong and different terminal locations is almost comparable and it is expected that the vessel transport section will not lead to any substantial difference

in transport cost. Probable exception is the AK Khan terminal, as its distance to Chittagong Port is almost 50 km greater than the other terminal locations. This additional distance leading to increase in cost will be compensated by its vicinity to the Gazipur cluster. AK Khan Terminal will be quite competitive for the containers originating/destined from/to Gazipur region and the proposed ICD at Dhirasram will be in direct competition to the AK Khan terminal.

Further, based on road distance to key hinterland clusters and planned/existing competing facilities, the most competitive facilities identified based on the shortest distance are:

- For Dhaka City – Pangaon ICT & ICD Kamlapur;
- For Narayanganj – ICT Khanpur & ICT Kumudini (under Planning stage);
- For Gazipur – AK Khan Terminal and ICD Dhirasram.

Round-trip transport rate for one TEU on rail has been investigated to be BDT 21,000 and TEU handling rate at ICD Kamlapur is around BDT 4,450. In comparison to this a round-trip transport rate for one TEU via road is around BDT 50,000. Market expectations towards probable vessel transportation cost and terminal handling rates are below the current rail transportation rates. As the ICT concept is representing a new transport alternative which has not proven its capability, a market-compliant transport rate is essential for attracting container volumes to attract cargo from road transportation to inland vessels transportation.

4.5. SWOT Analysis of ICT Khanpur

The proposed ICT at Khanpur holds several strengths and weaknesses and faces opportunities as well as threats. The following figure shows the major aspects concerning a SWOT analysis.

Strength

- Direct access to industrial area Narayanganj (incl. Adamjee EPZ).
- **One of the first terminals (if implemented in a short time frame).**
- Dhaka city lies within 35 km radius of the proposed facility.

Weaknesses

- Narrow access road condition.
- Limited land for future expansion.
- Additional cost for relocation of current warehouse.
- Congested river route

Opportunities

- BIWTA studies are promoting the ICT development and do create an awareness for IWT.
- Increase of road congestion can be suitably addressed using IWT
- Increase of fuel/energy prices can using IWT
- Intensified use of Protocol routes agreed on political level.

Threats

- Future highway enhancement projects supporting road transport.
- **Earlier completion of competing ICT projects.**
- Low market acceptability of Pangaon terminal due to inefficient process and issues around last mile transportation might adversely impact the attractiveness of proposed facility.

FIGURE 61: SWOT ANALYSIS FOR ICT KHANPUR

Source: Consultant's Analysis

With strategic location in Narayanganj, distances to plants and business located in and around Narayanganj including Adamjee EPZ is shortest from the proposed ICT at Khanpur. Short distance to units/business in the hinterland will ensure in-times deliveries of cargo from Khanpur and the probability of interruptions during transfer from terminal to the importer is quite low. By this the duration of transfer as well as the time of arrival at the near-by location is very reliable.

At present, the existing terminal at Pangaon and the upcoming Summit Terminal (expected to be operational by December 2015) are the two direct competitors for the proposed ICT at Khanpur. While the market acceptability of Pangaon is low due to inefficient process and issues around last mile transportation, Summit terminal is expected to be developed as an anchor facility for Maersk Line which may lead to discrimination in services for other MLOs and therefore, may not be attractive enough for other MLOs. If ICT Khanpur could manage an early implementation, it could be the first private container terminal offering non-discriminatory services to all its customers.

The existing facility at Khanpur is connected to the national highway network using the Demra-Narayanganj road. This is a two lane road and is used for mixed traffic including passenger and freight. Existing freight traffic on this road is estimated at around 80 to 100 trucks per day. With development of ICT Khanpur, the freight traffic on this road is expected to reach 180 to 200 trucks per day by 2025 (800 PCU). However, considering 2000 PCU/h as the capacity of a two lane road with mixed traffic conditions, the existing road is sufficient to handle 300 trucks per day. However, to ensure smooth evacuation of containers/cargo and to provision for peaking in the absence of buffer yard (parking area), additional road capacity is desirable.

There is some space owned by the BIWTA and almost directly connected to the current Khanpur terminal area which could be used as extension area in the future. The utilization of this land will generate a kind of contorted terminal area which will probably influence terminal's productivity. The additional land needed to create one contiguous (almost right-angled) terminal area is currently utilized by third parties or squatters.

There are currently six warehouses located on the existing Khanpur terminal. These warehouse capacities have to be moved to another location in order to create a suitable layout for efficient container handling. The relocation does generate costs that are on top of the actual investments.

4.6. Potential demand for ICT Khanpur

As the inland waterway transport for container is a new concept in Bangladesh, some general reservations of the market towards inland shipping has been experienced during the stakeholder interactions. It is expected that the potential share of containers likely to be transported by inland shipping will be low at the beginning. The share at the beginning of operations has been assumed as 2% in 2017, turning into 10% until 2025 and to 20% until 2040. The 20% [28] share has been considered as a realistic dimension in comparison to other countries/regions in world having a share of inland water transport between 7% and 35%.

It is expected, with the provision of a reliable service and short distances to consuming and producing areas, the proposed ICT at Khanpur will contribute to the development of inland waterway transport for containers.

Given the general reservations around IWT system, it is assumed that there will be only one weekly vessel call during the first full year of operations and average utilization of this one call is expected to be low at around 30%. A second vessel departure can be established in the second year by keeping the average utilization constant at 30%. While the vessel calls are assumed to be constant at two per week till 2021, the vessel utilization is expected to increase every year. A third vessel call will be established in 2022 and the average vessel utilization will increase up to 85% by 2025.

[28] Based on primary interactions with stakeholders including cargo owners and C&F agents, with market compliant vessel schedule and services, IWT can attract 20-30% of the cargo from road.

It is expected that during the first year of operations no export cargo could be attracted by the ICT Khanpur. But by earning trust within the market during the starting phase of operations at least a minor share of export cargo can be attracted in the second year of operations (2018). As understood based on primary interactions with stakeholders associated with Dhaka EPZ and Adamjee EPZ (including C & F agents, Customs and industry players), total contribution of these EPZs is estimated at around 176,000 TEU. It was also indicated that with the strategic locations in Narayanganj, the proposed ICT at Khanpur can suitably serve the container traffic originating/destined from/to these EPZ, especially Adamjee EPZ. Detailed assessment of the potential traffic from these EPZ is presented as annexure to this report.

Considering the above assumptions, potential traffic for ICT Khanpur under each scenario considered for national traffic projections is presented in the subsequent sections.

4.6.1. *Base Case Scenario*

The split of empty and full containers for import and export for the period 2019-2040 is based on the average share of each type of container handled at Chittagong port.

TABLE 25 : KHANPUR EXPECTED VOLUME – BASE CASE

Base Case		2016	2017	2018	2019	2020	2025	2030	2035	2040	2045
National container volume (w/o Mongla)	1,000 TEU	1,998	2,222	2,466	2,729	3,003	4,683	6,819	9,027	10,758	11,005
Share of Dhaka-bounded traffic	%		80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Thereof inland waterway	%		2.0	3.0	4.0	5.0	10.0	13.8	17.5	20.0	20.0
Total inland waterway potential	1,000 TEU		35.6	59.2	87.3	120.1	374.6	750.1	1,263.7	1,721.2	1760.9
Thereof attracted by ICT Khanpur	%		15.4	18.6	16.8	15.2	12.5	10.0	8.4	6.7	6.7
Expected volume for ICT Khanpur	**1,000 TEU**		**5.5**	**11.0**	**14.6**	**18.3**	**46.7**	**75.0**	**105.5**	**115.3**	**117.9**
Import Full			2.7	5.5	6.9	8.6	22.0	35.4	49.8	54.5	55.7
Export Full			0.0	1.7	4.5	5.6	14.2	22.9	32.2	35.2	36
Import Empty			0.0	0.0	0.5	0.6	1.4	2.3	3.3	3.6	3.6
Export Empty			2.7	3.8	2.8	3.5	8.9	14.4	20.2	22.1	22.6
Reefer			*0.0*	*0.1*	*0.3*	*0.4*	*1.1*	*1.7*	*2.5*	*2.7*	*2.8*
Expected vessel traffic	*calls p.a.*		*52*	*104*	*104*	*104*	*156*	*254*	*357*	*390*	*398*
Average vessel utilization	*%*		30	30	40	50	85	85	85	85	85

Source: Consultant's Analysis

The reefer container volume equals 0% of loaded container handled at ICT Khanpur in 2017 but increasing to 1.5% in 2018 and keeping constant by 3.0% from 2019 until 2040.

4.6.2. *Low Case Scenario*

The low case development of the ICT Khanpur is based on a (low case) national container traffic demand. The projected demand for containers that can be attracted at the proposed ICT at Khanpur is shown in the following table:

TABLE 26 : KHANPUR EXPECTED VOLUME – LOW CASE

Low Case		2016	2017	2018	2019	2020	2025	2030	2035	2040	2045
National container volume (w/o Mongla)	1,000 TEU	1,938	2,125	2,324	2,537	2,754	4,102	5,910	7,728	8,997	9,742
Share of Dhaka-bounded traffic	%		80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0	80.0
Thereof inland waterway	%		2.0	3.0	4.0	5.0	10.0	13.8	17.5	20.0	20.0
Total inland waterway potential	1,000 TEU		34.0	55.8	81.2	110.2	328.2	650.1	1,081.9	1,439.5	1,558.7
Thereof attracted by ICT Khanpur	%		5.4	6.6	6.8	6.6	10.0	9.0	7.9	6.8	6.8
Expected volume for ICT Khanpur	**1,000 TEU**		**1.8**	**3.7**	**5.5**	**7.3**	**32.9**	**58.5**	**85.5**	**97.9**	**106.0**
Import Full			0.9	1.8	2.6	3.5	15.6	27.6	40.4	46.2	50.1
Export Full			0.0	0.3	1.7	2.2	10.1	17.9	26.1	29.9	32.3
Import Empty			0.0	0.0	0.2	0.2	1.0	1.8	2.6	3.0	3.3
Export Empty			0.9	1.5	1.1	1.4	6.3	11.2	16.4	18.8	20.3
Reefer			0.0	0.0	0.1	0.2	0.8	1.4	2.0	2.3	*2.5*
Expected vessel traffic	calls p.a.		52	52	52	104	156	198	289	331	358
Average vessel utilization	%		10	20	30	20	60	85	85	85	85

Source: Consultant's Analysis

The reefer container volume equals 0% of total loaded container handled at ICT Khanpur in 2017 but increasing to 1.5% in 2018 and keeping constant by 3.0% from 2019 until 2040.

4.6.3. *High Case Scenario*

Potential traffic for ICT Khanpur under high case scenario is prepared considering the following assumptions:

- National IWT will reach 20% in 2040
- Two vessel calls per week could be established
- Fast increase of vessel utilization from 35% in 2017 to 70% in 2020

TABLE 27 : KHANPUR EXPECTED VOLUME – HIGH CASE

High Case		2016	2017	2018	2019	2020	2025	2030	2035	2040	2045
National container volume (w/o Mongla)	1,000 TEU	2,028	2,272	2,539	2,829	3,136	5,000	7,320	9,749	11,755	11,874
Share of Dhaka-bounded traffic	%		80.0	80.2	80.4	80.7	81.7	82.8	83.9	85.0	85.0
Thereof inland waterway	%		2.0	3.0	4.0	5.0	10.0	13.8	17.5	20.0	20.0
Total inland waterway potential	1,000 TEU		36.3	61.1	91.0	126.5	408.7	833.6	1,431.6	1,998.3	2,018.6
Thereof attracted by ICT Khanpur	%		35.2	30.0	24.1	20.3	14.3	11.0	9.0	7.0	7.0
Expected volume for ICT Khanpur	**1,000 TEU**		**12.8**	**18.3**	**22.0**	**25.6**	**58.6**	**91.7**	**128.8**	**139.9**	**141.3**
Import Full			6.4	9.2	10.4	12.1	27.7	43.3	60.8	66.1	66.7
Export Full			0.0	1.4	6.7	7.8	17.9	28.0	39.3	42.7	43.1
Import Empty			0.0	0.0	0.7	0.8	1.8	2.8	4.0	4.3	4.4
Export Empty			6.4	7.7	4.2	4.9	11.2	17.6	24.7	26.8	27.1
Reefer			*0.0*	*0.2*	*0.5*	*0.6*	*1.4*	*2.1*	*3.0*	*3.3*	*3.3*
Expected vessel traffic	*calls p.a.*		104	104	104	104	208	316	427	447	451
Average vessel utilization	*%*		35	50	60	70	80	83	87	90	90

Source: Consultant's Analysis

The reefer container volume equals 0% of total loaded container handled at ICT Khanpur in 2017 but increasing to 1.5% in 2018 and keeping constant by 3.0% from 2019 until 2040.

4.6.4. *Traffic Summary*

Potential traffic (in 1000 TEU) for the proposed ICT at Khanpur under each scenario is summarized in the table below:

TABLE 28 : ICT KHANPUR – POTENTIAL TRAFFIC SUMMARY

Expected volume ('000 TEU)	2016	2017	2018	2019	2020	2025	2030	2035	2040
High Case		12.8	18.3	22.0	25.6	58.6	91.7	128.8	139.9
Base Case		5.5	11.0	14.6	18.3	46.7	75.0	105.5	115.3
Low Case		1.8	3.7	5.5	7.3	32.9	58.5	85.5	97.9

Source: Consultant's Analysis

It is important to mention that realization of potential demand for the proposed Inland Container Terminal at Khanpur will be governed by various other factors. Some of the major ones are mentioned below:

- Shipping dynamics such as vessel availability, active participation of Main Line Container Operators (MLCOs) etc.
- Competitive environment like development/expansion of terminals like Pangaon, Summit Alliance, Kumudini etc.
- Hinterland connectivity
- Transportation dynamics like increase in the rail or road freight.
- Industry dynamics:
    - Change in the demand for imports,
    - Change technology
    - Delay in planned expansion etc.
- Social & political environment in the region.
- Regulatory environment:
    - Availability of Customs
    - SEZ Policy
    - India Bangladesh Trade Protocol
    - Cabotage law for coastal shipping

Based on our assessment it appears highly likely that our assessment and future projections are reasonable. However any significant unexpected change in the above mentioned factors can impact the traffic dynamics- positively or negatively.

5. Project Scoping

To attract the projected traffic volumes, the proposed ICT at Khanpur will have to provide market compliant services along with suitable infrastructure facilities where different logistics functions can be performed in an integrated manner. Accordingly, the present chapter aims at identifying services that the proposed ICT will offer to maximize its market share and infrastructure facilities that will enable these services.

For identifying the market compliant services, interactions with stakeholders / project beneficiaries including industries located in SEZs, BGMEA, D G Shipping, Vessel Owners and other service providers like Clearing & Forwarding Agents, Cargo handling and transport agents were undertaken. In order to ascertain the infrastructure required, existing infrastructure at similar facilities in India and Europe was assessed and compared with similar facilities in Bangladesh including Chittagong Port, ICT Pangaon, ICD Kamlapur, Summit Alliance terminal.

Scale of infrastructure required and size of different facilities along with the necessary phasing was ascertained considering potential demand for the proposed ICT at Khanpur and industry benchmarks for design and operational efficiency.

Accordingly this chapter has been organized in the following sections:

- Service Portfolio
- Facility Requirement
- Infrastructure Assessment

5.1. Service Portfolio

A facility like the ICT Khanpur has to compete with other 5-6 river based inland container terminals and two ICDs including Kamlapur (existing) and Dhirasram (proposed). To maximize the market share and to suitably address the competition, ICT Khanpur has to develop a suitable service portfolio which can define a very clear picture of the unique selling prepositions within the market. Various stakeholder interactions undertaken by the project team to elaborate the service portfolio provides a good understanding of the market demand. The Pangaon Project shows what could happen, if services and other parameters do not match with market´s expectations, requests and needs.

As the ICT Khanpur facility is competing with well-established road transport system, the terminal operations have to be reliable and as swift as possible. The disadvantage of current truck transport is the occurrence of unpredictable delays due to road congestion. The disadvantage of the rail transport between Chittagong and Dhaka is high dwell time of around 12 days for import container at the Chittagong Port before it is transferred to Dhaka Kamlapur. This temporal delay occurs due to limited capacity (in terms of track infrastructure, low average speed for meter gauge operation and rolling stock availability) of the existing rail system. These delays are an opportunity for the new ICT to convince the customer by providing reliable vessel departures (fixed schedule and market-compliant number of vessel calls per week).

Beside the quality of services also the security aspect has to be highlighted. The importing and exporting companies have to trust the terminal operations for the ability to protect the cargo against theft and damage. This can be ensured by the provision of security staff and suitable systems. The mitigation of losses due to damages can be achieved by appropriate training of operational staff and strict prosecution. One of the main requirements of the import and export industry is the availability of storage and weather sheltered area for handling export cargo as well as space for de-stuffing/stripping of import container. Given the operations cycle for container trade, import containers will arrive at the terminal by inland container vessel and the export cargo (to be stuffed in one container) will arrive gradually by truck at the terminal. Due to this import and export cargo have different requirements towards handling facilities. The equipment (especially utility forklifts with a capacity of 3-7 t) for stuffing stripping of the containers as well as the trained staff to operate them have to be provided by the terminal.

One of the main challenges for container based logistics value chain is to facilitate the availability of empty containers at the requested time, at the requested place in the requested quality. In addition, availability of empty containers is critical for a container terminal to attract exports cargo. To ensure optimum inventory levels of empty containers, various empty container facilities are established in and around sea ports and close to economic/industrial areas. However, empty container is just a cost centre without any contribution to

revenues. Thus, shipping lines (owner of the containers) are quite reluctant to pay for storage of the empty container. Low cost solution for storing empty container can be offered by optimizing the storage area based on high density stacking operated by empty container handlers (ECH). To enhance the attractiveness for shipping line and to encourage them for storage of empty containers, the proposed ICT at Khanpur could offer value added services such as container cleaning and repair (workshop incl. welding facility),

The following figure shows the stakeholder and their required services towards ICT Khanpur. The requirements outside the circles represents general conditions that are expected to be provided.

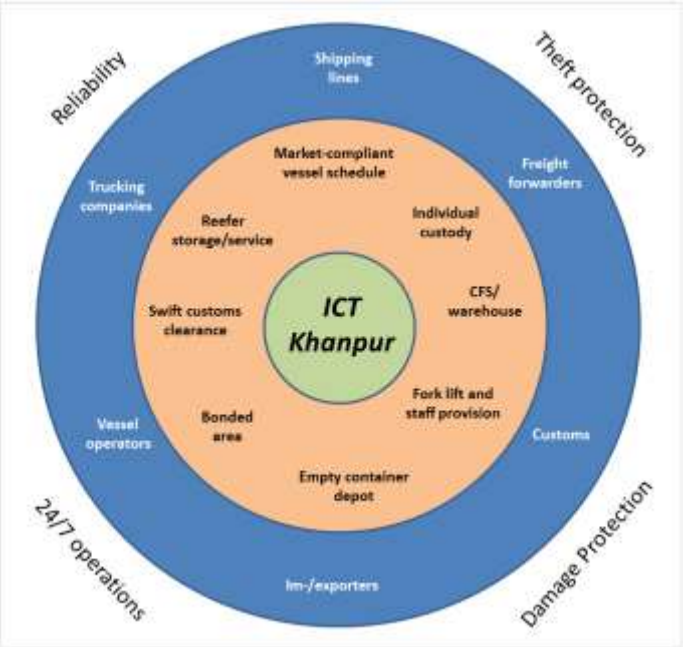


FIGURE 62: SERVICE PORTFOLIO – ICT KHANPUR

Source: Consultant's Analysis

The market requires swift processing of documents and permissions, especially the customs clearances which requires physical presence of Customs Officers have to be integrated in the terminal process. As the Khanpur location processes the customs clearance for bulk vessels, the establishment of container-related customs clearance at Khanpur is assumed to be manageable.

Further, provision for handling of special containers like reefer and flats or flat racks with OOG (out of gauge) cargo should be provided. For the storage of reefer containers, electricity plugs have to be provided to supply electricity to the integrated cooling/freezing generators of the reefer container.

5.2. Facility Requirement

The provision of some services mentioned in the previous section requires certain facilities which would include a combination of hard and soft infrastructure. Hard infrastructure facilities would include physical assets such as berth, CFS, container yard for loaded & empty containers, examination area, transit warehouses, equipment for handling and movement of cargo etc. Soft infrastructure refers to services like customs clearance, stuffing/stripping, IT System, maintenance, operations and value added services. Hard and soft infrastructure envisaged at the proposed ICT at Khanpur is presented in the figure below:

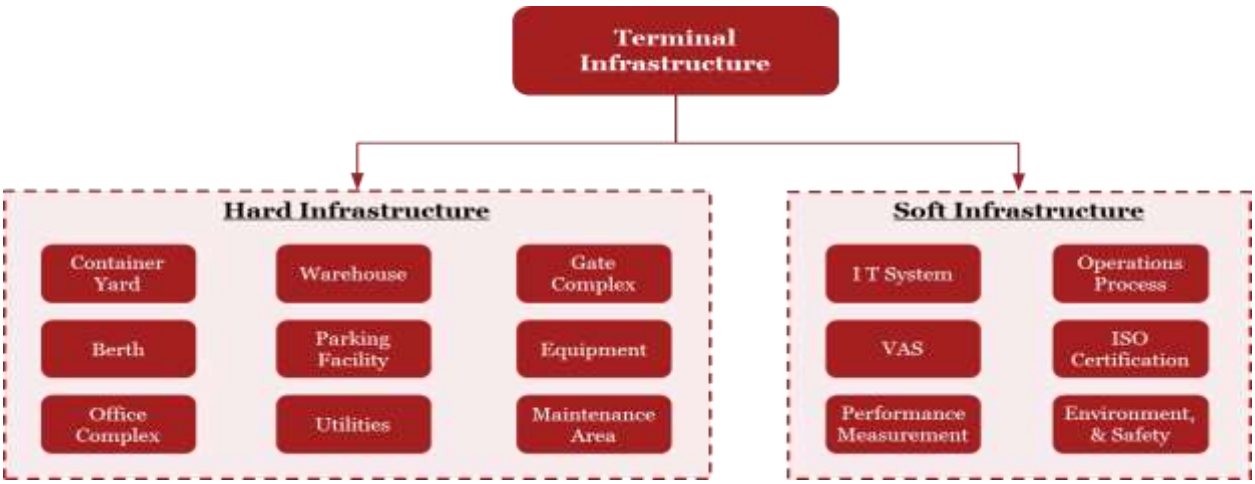


FIGURE 63: TERMINAL INFRASTRUCTURE – ICT KHANPUR

Source: Consultant's Analysis

Hard infrastructure required at the proposed ICT at Khanpur would include:

- Berth for loading/unloading of containers from the vessel
- Container Freight Station
- Container stack area for loaded and empty containers
- Gate complex.
- Office/Commercial space for various stakeholders
- Handling equipment.
- Parking facilities.
- Equipment repair workshop.
- Public utilities/conveniences.
- Ancillary infrastructure such as boundary, utilities etc.

The terminal layout contains a CFS facility which is expected to be used mainly for export cargo. The import cargo will be handled on the open area which could eventually in the later development of the premises be equipped simple open shed constructions. The provision of cargo handling equipment for stuffing and stripping of container has been considered in the operational planning described in subsequent sections. It is important to provide small forklifts that could operate inside a container.

For the reefer storage, certain area with electricity plugs has to be established. This is recommended at the periphery of the premises to keep the possibilities of adjustment of storage pattern for standard container on the centre space of the terminal as flexible as possible.

For the provision of a bonded area certain approvals have to be obtained. It has to ensure that the premises are well protected against theft. This is in general guaranteed by sufficient number of security staff and the establishment of a (concrete) wall or fence facility around the entire terminal area. In addition, a gate complex along with procedures for the check-in and –out of external trucks have to be provided in accordance to the bonded area regulations.

An empty container stock or storage area will be provided within the regular container storage area. The empty container can be stored up to six high (max) within blocks.

Individual custody of container does need container slots that could be quite easy inspected during the whole day. It is recommended to choose container slots for this kind of services within sight of the administration building or the gate facility.

5.3. Critical Linked Projects – Affecting the Cargo Demand at Proposed Facility

The cargo demand at ICT Khanpur depends of course on the national economic development. Besides this general definition, the development of the terminal is depending on the ability (of the sales team) to establish a market-compliant vessel schedule. This is one of the important factors determining the share of cargo that can be shifted from road to inland waterway transportation. Considering the general market opinion of "one vessel call per week is no vessel call", efforts are required to establish more than one call per week.

The existence of well-established administrative processes concerning customs clearance is prerequisite for a logistics facility dealing with foreign trade. Therefore, Customs processes have to be integrated in the daily terminal procedures.

Following are some of the critically linked projects to which will impact the cargo demand:

- **New industrial park in Munshiganj, Bangladesh**: The industrial park is within proximity of 55 Km from ICT Khanpur. It will be hub for 200-300 garment factories. This will enforce the ecosystem of backward linkage industries to the Apparel industry. As many of the backward linkage industries to garment industry are located in and around Narayanganj area thus the overall trade volume will be enhanced. Some part of this increased cargo traffic (due to enhanced trade potential of the area) will also get shifted to IWT.
- **Ashuganj Port** – It will help create an ecosystem for the use of inland water terminal for the trade through water ways. It is likely that once the movement of cargo starts over this belt, it is going to generate more and more demand for these vessels which would help develop the current trade scenario, thus opening more transportation options for many districts in the north which will divert the container cargo movements shift from road and rails to water ways. This will create the availability of vessels over the Meghna river belt. Since, inland water terminal is a new concept; Ashuganj Port would definitely help in highlighting the benefits of using water ways as a potential mode of Transportation.
- **Kunming-Dhaka-Kolkata railway project** - China has already proposed to build the high-speed 3,000-kilometre railway between Kolkata and Kunming. This project would facilitate the inter country trade through railway (due to enhanced connectivity) which might impact the share of container traffic via ICT Khanpur because of the possibility of container cargo that might be transported via rail, thus increasing the competition for ICT Khanpur.
- **Dhaka-Chittagong 4lane project**: It will take about four and half-an-hour to five hours to go to Chittagong from Dhaka. There are 14 bypasses on the four-lane Dhaka-Chittagong Highway. This will help reduce the congestion on road over this path, which in turn will benefit cargo supplies being transported via road to achieve less ETA (estimated time of arrival). This might impact the share of container cargo that will be transported by water ways thus increasing the competition for ICT Khanpur.
- **Mongla Port**: There is plan to rebuild two jetties and turn them into high multi-purpose jetties to reduce the pressure of imported goods. At least 1000 ships could be berthed at Mongla port by 2030. Further Padma Bridge (with the provision for vehicles running above and trains running below) is also being constructed which will enhance connectivity Dhaka and Mongla and will reduce the distance between Mongla and Dhaka. It will also connect 19 south Bangladesh districts with Dhaka. The 6.15km-long two-tier Padma Bridge attract some share of the Dhaka bound cargo which is currently being handled at Chittagong port.
- **Construction of a bypass**: The government plans to build a new road, bypassing Dhaka, connecting Mawa Ghat with Jamuna multi-purpose bridge. This will allow vehicles not to enter into Dhaka Capital region and bypass it. It will reduce the congestion on the road thus reducing the time of travel for the cargo container movement, creating a competition for ICT Khanpur. This further may hit the cargo share of ICT.

TABLE 29 : CRITICAL LINKED PROJECTS & THEIR IMPACT

Project	Impact on National Cargo Traffic/Trade	Impact on Dhaka Capital Region	Impact on Khanpur ICT
New industrial park, Munshiganj	Overall trade will increase (due to capacity expansion) increasing Cargo traffic	Boost the ecosystem of backward linkage industry enhancing the trade potential of Narayanganj area	Share of increased trade volume will also get shifted to IWT and eventually to ICT Khanpur
Ashuganj Port	Cargo traffic will increase which will facilitate northern districts of Bangladesh	Develop ecosystem for IWT through enhanced awareness regarding benefits of using water ways for transport.	Availability of more vessels on the river belt.
Kunming-Dhaka-Kolkata railway project	Cargo traffic will increase via rail due to enhanced inter-country trade (due to enhanced connectivity)	DCR will get exposed to international market through this new Rail connectivity, which will enhance trade prospects.	Might impact the share of cargo traffic from the IWT due to development of competing facility & thus impacting ICT Khanpur.
Dhaka-Chittagong 4lane project	The congestion on road will reduce which will also enhance the speed of cargo delivery.	It will facilitate Dhaka and nearby districts in the overall development of cargo shipping by improving the road connectivity and reducing the congestion.	It will increase the competition and impact the share of cargo traffic via ICT Khanpur by strengthening the competing facility (Road)
Mongla port	Enhance trade potential by increasing cargo traffic movement from Mongla port due to its upgraded connectivity with other part of Bangladesh & exposure to sea port	This will facilitate the trade between southern districts of Bangladesh with Dhaka Capital region.	It may impact the share of cargo traffic via ICT Khanpur, by developing a competing facility (Mongla port) through its enhanced connectivity with rest of Bangladesh.
Construction of a bypass	Enhanced connectivity will work as trade facilitator & eventually may help in enhancing national cargo traffic	Regional diversification in terms of new establishment coming up in other parts of Bangladesh (due to enhanced connectivity) will eat up the share of manufacturing establishments of Dhaka Region, eventually impacting cargo traffic.	Bypassing the Dhaka Capital region will allow the cargo traffic movement being diverted straight from north to Mongla port (south) and vice versa, thus not attracting any traffic from Dhaka Capital region. This might have an impact on ICT Khanpur cargo traffic.

Source: Consultant's Analysis

6. Preliminary Technical Assessment

This chapter aims at covering the site assessment of the existing facility and infrastructure assessment covering the development of the proposed facility under various development scenarios.

6.1. Site Assessment

The existing facility including jetty at Khanpur is located adjacent to Narayanganj port. Its location coordinates are 23°37'36.59"N; 90°30'42.40"E. It has direct access to the Shitalakhya River and is approx. 10 km north of the river bifurcation at Gobe Char - the southern peak of Dhaka region. River access of the facility falls under Class I5 category with depth more than 3.5 meters (12 to 13 feet). The location has a road connection to the R 111 and R 110 that are both connected to the N1 Dhaka-Chittagong Highway.

The jetty is backed up by 9.36 acre of developed land, which has been graded but largely unpaved except for network of internal roadways(at some places), which again needs maintenance work. This backup land was formed by filling with dredged material from the river around 1980. The filling has been done some 35 years ago indicates that the ground is stable and will provide a satisfactory base for the type of paving system required for container handling(due to self-compaction & consolidation). However it should be noted that no subsurface investigation has been performed to ensure the bearing capacity and is suggested to perform subsurface investigations which include but not limited to performing geotechnical investigations viz. CBR test (to ensure the mechanical strength of subgrade), liquid limit & Plastic limit tests etc. in order to facilitate pavement design. The land in this area is reasonably flat & level still some amount of grading will be required.

Also the subsurface elevation needs to be verified with respect to the high flood level (HFL) of past 40-50 years by conducting field surveys. It shall be ensured that subsurface elevation shall be kept at considerably higher elevation in order to mitigate the risk of flooding of terminal area (to safeguard container cargos)

FIGURE 64: TERRAIN OF EXISTING FACILITY

Source: Consultant's Analysis

The 9.36 acres large terminal area contains 6 godowns which are used by different departments of BIWTA, particularly by dredging department for storage of equipment and spare parts. In addition, there are 3 storage buildings which are centrally located and to enhance the circulation and storage space within terminal premise, these 3 storage building need to be shifted along the periphery of the terminal area. The basic structure is framed structure (reinforced concrete) with filled in brick masonry work and steel roof truss covered with CGI sheets. The area which is not utilized by buildings is partly covered by larger trees, which might be required to be removed or relocated to other area with in the terminal to increase storage and circulation space.

The existing BIWTA vacant land of 3.37 acres is presently being used as playground for recreation of the local community. The vacant land is also being used as football coaching centre for the children of local community. The proposed project envisages utilizing the vacant land partially to relocate the existing warehouses.

FIGURE 65: TERRAIN OF PLAYGROUND AREA

Source: Consultant's Analysis

A proposed amusement park is being constructed in an area of approximately 0.5 acres in the land adjacent to existing jetty. The amusement park will house water sports and act as recreational facility to the local community.

FIGURE 66: TERRAIN OF AMUSEMENT PARK AREA

Source: Consultant's Analysis

There is also a city corporation road of 300 feet in width which connects the main road to the ferry ghat. The city corporation road separates the existing BIWTA vacant area (presently being used as playground facility) and the godown area. There are close to 40 temporary establishments on both sides of the road and these establishments offer sale of food items. The most common size of such an individual establishment is around 6 ft *8 ft and few (5-6) establishments are of the size 8ft*16 ft. There is also a spindle manufacturing unit and an automobile workshop in an area of close to 1 acer.

FIGURE 67: ROAD CONNECTING MAIN ROAD TO FERRY GHAT

Source: Consultant's Analysis

The existing berth is 40m wide and is made up of reinforced concrete piled structures constructed around 40 years ago. A 262 ft. long trestle connects the berth with the terminal premises. In some instances, the apron is also used for temporary storage of bulk cargo after unloading it from the vessel. Area on the right and left side of 31 ft. wide trestle is currently unused fore shore land. On the site visit dated 21st May 2015, it has been observed that this land is used for (private) farming as well as storage of metal tubes used for dredging measures. Current situation of the fore shore land & Jetty is presented in the figure below:

FIGURE 68: PHYSICAL INFRASTRUCTURE STATUS OF EXISTING FACILITY

Source: Consultant's Analysis

As understood based up on the reconnaissance survey, piled jetty with its berth facilities, apron and trestle is more than 30 years old. This jetty is partly damaged and is not suitable for handling higher loads. The concrete structure has damaged at many locations including piers & beams supporting the deck slab and approach slab (connecting the apron & trestle) of trestle & apron, exposing the reinforcement steel which eventually has corroded reducing the load carrying capacity of the overall structure. However it should be noted that no structural field tests has been performed to ensure the safe load carrying capacity and workability of the existing structure. It would be advisable to perform structural tests viz. Non Destructive Tests (Structural Integrity Test) to ensure structural safety and determine extent of repair & maintenance required to revamp the existing facility & make it usable.

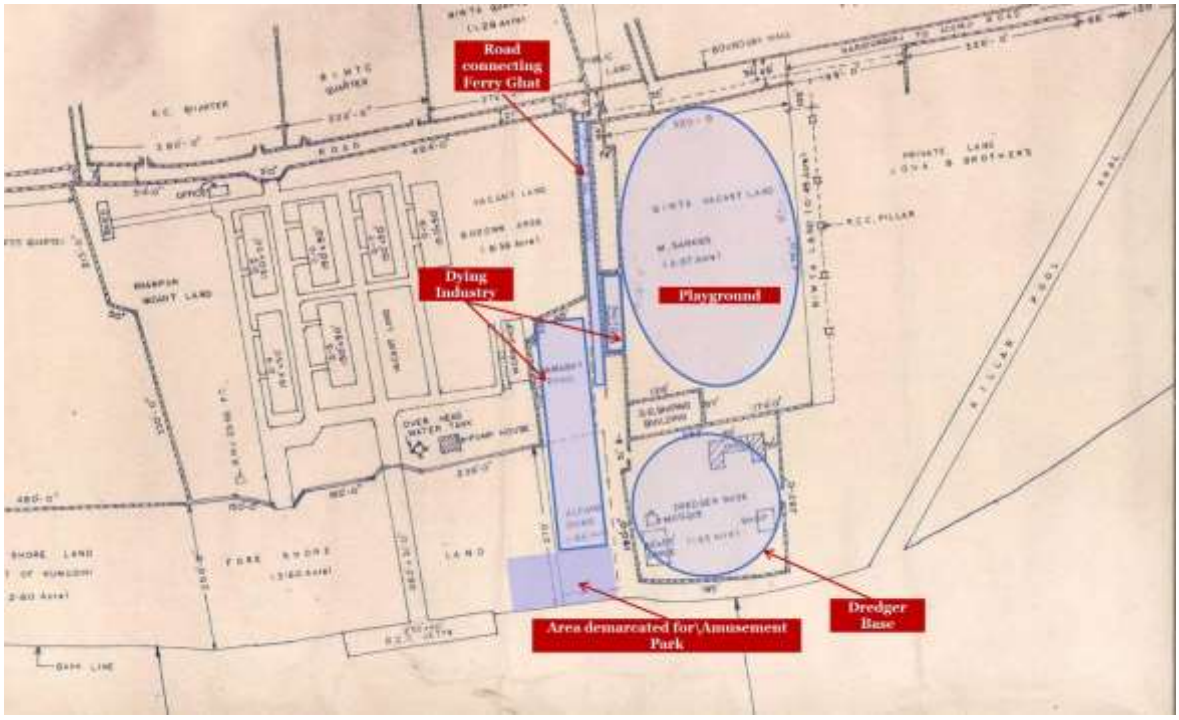
The current situation could be observed by the following choice of pictures taken during the site visit on May 21st 2015.

FIGURE 69: PHYSICAL INFRASTRUCTURE STATUS CONCRETE STRUCTURE

Source: Consultant's Analysis

Present structure of the terminal is not suitable to be served as a container terminal facility. Major civil construction works have to be executed. One of the first measures that have to be started is the relocation of existing warehouses. These warehouses are located in centre of the facility and are required to be moved to a periphery location. This could be at the southern part of the Khanpur Terminal or on the extension site. Total covered warehousing space at the terminal is around 45,700 ft². Also, there are several small existing sheds on the premises that have to be removed. This would be based on the required future capacity (shed, workshop, equipment garage). Following figure shows as a rough sketch of the site location and the adjacent area to the facility.

FIGURE 71: LAYOUT OF EXISTING FACILITY AND ADJACENT AREA



Source: Consultant's Analysis

6.2. *Infrastructure Assessment*

The infrastructure assessment covers three different options to develop the existing area around the existing area of the proposed Inland Container Terminal at Khanpur. These options and their individual development phases are shown in the following figure. All options consider the relocation of the six existing warehouses on the Khanpur premises.

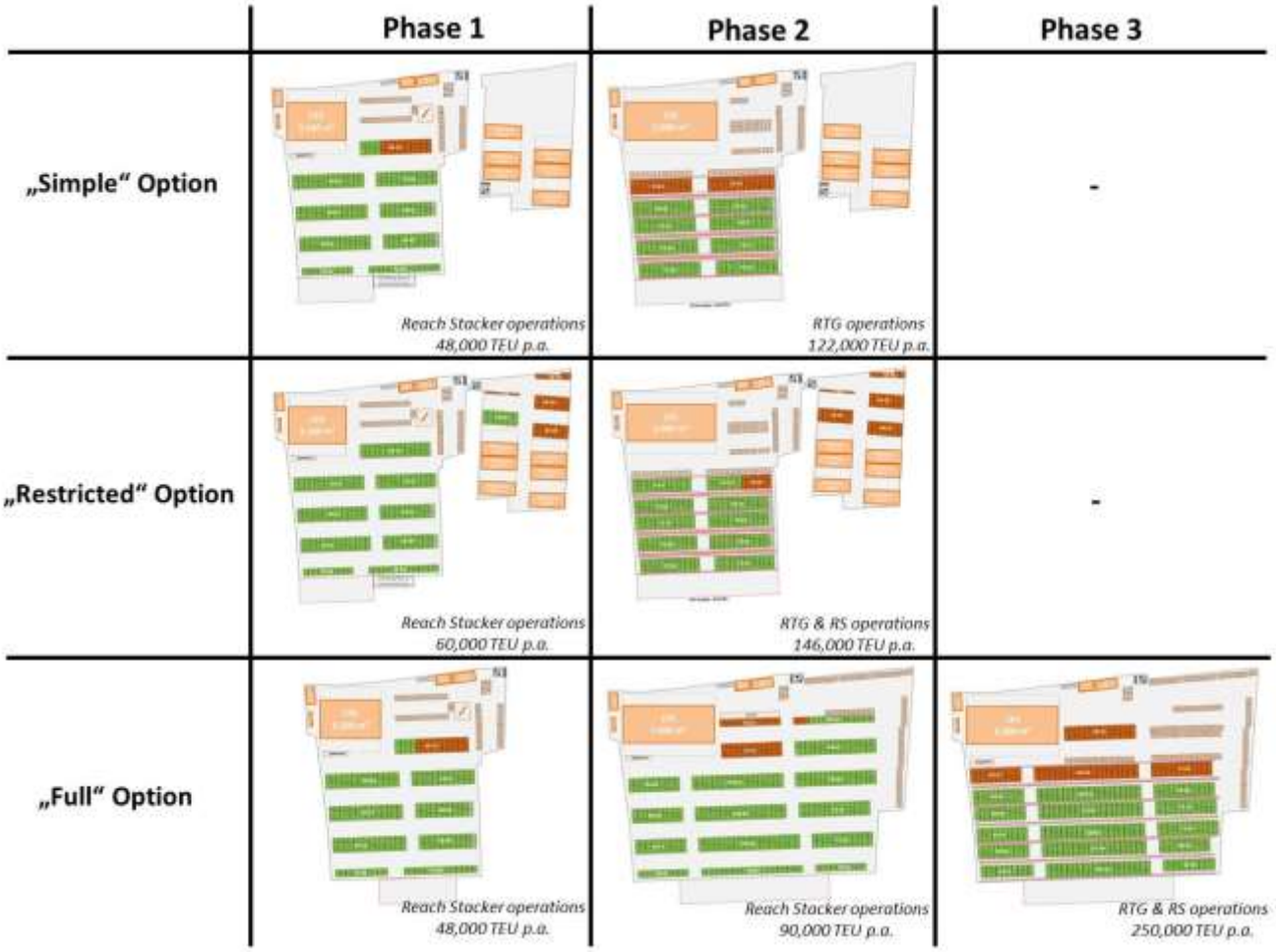


FIGURE 72: OVERVIEW DEVELOPMENT OPTIONS

Source: Consultant's Analysis

Simple Option mainly focuses on the utilization of the existing area of Khanpur terminal as well as the prepared foreshore land to be used as container terminal area in the future. The six warehouses are relocated on the playground area adjacent the Khanpur terminal. The playground area adjacent to the terminal is not connected to the Khanpur terminal in this option as the warehouse utilization and operations are assumed being independently from container terminal operations. Annual capacity of 48,000 TEU throughput can be provided after the first phase of development and annual capacity of 122,000 TEU can be provided at the end of second phase of development by shifting from Reach Stacker operations to RTG operations in the storage area.

Restricted Option is structured like Simple Option mentioned above, in addition to the Simple Option it includes the utilization of the remainder space on the playground area for the expansion of container storage capacity of the terminal. Annual capacity of 60,000 TEU throughput could be provided. By shifting from RS operations to RTG operations in the storage area a capacity of 146,000 TEU can be provided after the second phase of development. Empty containers handling on playground area will mainly be performed by ECH. A small share of empty container will be stored in RTG blocks. The operation of a RTG on the playground area is not recommended as the RTG working in that area could not be shifted to the other RTG blocks. Other reason for not implementing RTG in playground area is due to high investment requirement for RTG pavement as compared to ECH.

Full Option considers the availability of all land sections adjacent to the Khanpur terminal. Under this option, all areas will be merged to one large terminal facility. Warehouses will not be relocated to the playground area but outside the facility. Dredger base as well as the passenger facility will be shifted to another location which is not defined at this moment. Annual capacity of 48,000 TEU throughput can be provided after the first phase of development. First phase of development under this option is comparable to the Simple Option as they both have the same Phase 1 layout. In the second phase of development, RS operations will be continued and the remaining unused land will be prepared/paved gradually for RS storage yard which will lead to an annual capacity of 90,000 TEU after the end of second phase of development. In the final phase i.e. after third phase of development, annual capacity of 250,000 TEU can be provided by shifting from RS operations to RTG operations in the storage area. One empty container block for ECH operations will continue to operate.

This infrastructure assessment is based on the "Base Case Scenario" for expected traffic development at the ICT Khanpur. In order to increase the utilization of available terminal space, storage pattern will be changed gradually from Reach Stacker (RS) to Rubber-Tyred-Gantry crane (RTG) operations. The layouts shown above define the final stage of each phase. The transition from one phase to another will happen gradually.

Following sections describe the different options from the operational point of view. Procurement of equipment as well as construction of paved terminal area and buildings is driven by the realisation of the projected demand.

6.2.1. *Simple Option (Base Case)*

6.2.1.1. *Berth and Yard Requirements*

The requested container handling capacity is based on the traffic forecast. This section focusses on the handling capacities of the major terminal infrastructure and major container handling equipment. For defining the future container handling requirement at the terminal, use of a mobile harbour crane is suggested.

Berth requirement is derived from container throughput versus vessel call projections. Berth Occupancy Rate (BOR) is a percentage ratio between actual times of berth occupancy versus total available berthing time per year. Maximum berth occupancy for a single berth is considered to be 50% of the total available time as per the conservative international standard for berth occupancy of inland water facilities. In case of a facility providing 2 berths, maximum BOR is limited to 65% and maximum BOR of 75% can be considered for a facility providing 3 or more berths. The purpose of determining these BOR limits is to ensure that vessels do not encounter waiting times for berths. Average operational idle time per vessel call is 22.4% of the total time on berth which consists of non-operational time before the start of cargo operations plus non-operational time after the completion of operations.

TABLE 30: SIMPLE OPTION (BASE CASE): CONTAINER BERTH ESTIMATION

Year	2017	2018	2019	2020	2025	2030	2034	2035	2040
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	68,590	72,274	78,989
Vessel Calls	52	104	104	104	156	254	339	357	390
Average Container per Call (Boxes)	72	72	96	121	205	203	203	203	203
Duration per Call (Hours)	4	4	5	7	11	11	11	11	11
Berthing Idle Time (Hours)	2	2	2	2	2	2	2	2	2
Total Berthing Time (Hours)	313	625	765	904	2,088	3,361	4,488	4,729	5,168
No. of Berths required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
Berth Occupancy	**4%**	**7%**	**9%**	**10%**	**24%**	**38%**	**26%**	**27%**	**29%**

Source: Consultant's Analysis

Above table shows the development of the BOR of the berth infrastructure at ICT Khanpur. The BOR of 50% will be reached in 2034 with a forecasted throughput 68,590 boxes i.e. 100,141 TEU converted using a TEU factor 1.46 per box. Thus, it is recommended to start the construction of the second berth at least in 2032. The table above shows the BOR after the implementation of a second berth facility.

For the purpose of determining the capacity of the yard, storage requirements are subdivided into reach stacker yard for full containers and a specific empty container yard. The traffic forecast indicates that reefer containers are handled at the facility and reefer operations are expected to start in 2018 with a share of 1.5% of the volume of full containers handled at the facility (discharging and loading). Share of reefer container volume increases to 3% from year 2019 onwards keeping into consideration the existence of reefer container during infrastructure planning. Using these projections of reefer container volume, requirement of number of reefer plugs and reefer racks is determined.

Most influential factor for determining the yard capacity is the dwell time of the containers, which reflects the average time a container spends in the storage yard. The dwell time counts from the moment when a container is stacked-in until the moment it is stacked-out from the yard.

TABLE 31: SIMPLE OPTION (BASE CASE) ESTIMATES FOR CONTAINER YARD AREA

Year	2017	2018	2019	2020	2025	2030	2035	2040
Full Container Yard - RS/RTG								
Containers in Yard (TEU)	2,746	7,167	11,384	14,230	36,286	58,313	82,034	89,655
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	194	308	385	982	1,579	2,221	2,427
Static Slots (TEU)	**81**	**212**	**336**	**420**	**1,072**	**1,722**	**2,423**	**2,648**
Number of Ground Slots (TEU)	***41***	***106***	***169***	***211***	***536***	***552***	***485***	***530***
Empty Container Yard - ECH/RTG								
Containers in Yard (TEU)	2,746	3,781	3,259	4,074	10,389	16,695	23,487	25,669
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	102	88	110	281	452	636	695
Static Slots (TEU)	**81**	**111**	**96**	**120**	**306**	**491**	**691**	**755**
Number of Ground Slots (TEU)	***16***	***22***	***19***	***24***	***61***	***98***	***138***	***151***
Reefer Container Storage & Plugs								
Containers in Yard (TEU)	-	108	342	427	1,089	1,749	2,461	2,690
Dwell Time (TEU)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	-	3	9	12	29	47	67	73
Static Slots (TEU)	**-**	**3**	**10**	**13**	**32**	**52**	**73**	**79**
Number of Ground Slots (TEU)	***-***	***2***	***5***	***6***	***16***	***26***	***36***	***40***
Reefer TEU Factor	2	2	2	2	2	2	2	2
Number of Reefer Containers (Boxes)	-	67	213	267	680	1,093	1,538	1,681
Dwell Time (Days)	7	7	7	7	7	7	7	7
Reefer Plugs Required	**-**	**2**	**5**	**6**	**14**	**21**	**30**	**33**
Number of Reefer Racks	***-***	***1***	***1***	***1***	***1***	***1***	***1***	***1***

Source: Consultant's Analysis

The table above shows the development of required ground slots. A Ground slot is the space required to store one 20' container (TEU). Besides the dwell time, stacking height is also a determining factor in estimating the capacity of a yard. For the container yard area completely operated by reach stackers, an average stacking height of two (ground level plus one additional layer above the ground level) is considered.

The storage pattern in the figure below show how full containers are supposed to be stacked in order to provide the most flexible possible option for the availability of container by reducing the number of potential re-stow or shifter movements. Shifter is a container that has to be moved in advance to get access to the originally needed container, higher the containers are stored, higher are the number of potential shifter movements. These shifter movements cannot be invoiced to the client as these are due to the capacity constraints of the facility thus, these have to be reduced to a minimum.

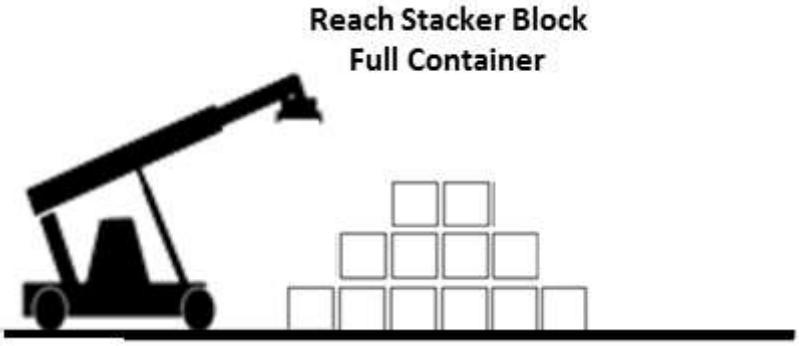


FIGURE 73: STACKING PATTERN - FULL CONTAINER

Source: Consultant's Analysis

Empty containers are stored in a different way as compared to loaded containers. Demand for these containers is not for a particular container by stating the container number but for a specific type of container. Considering the demand process, storage procedures could mainly follow the last-in-first-out principle. The storage of empty container could be structured and much less space intensive as compared to the space required for full container storage, as shown in the following figure:

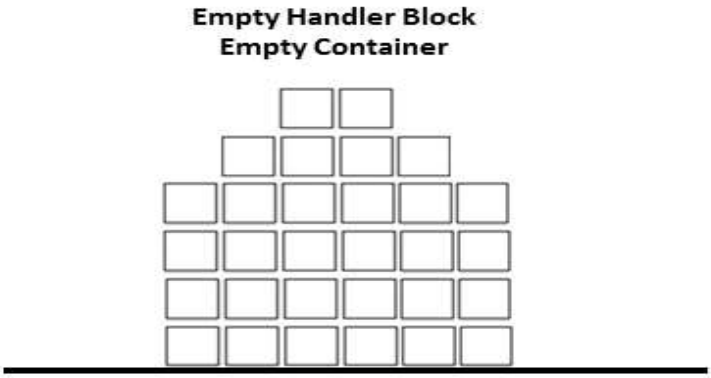


FIGURE 74: STACKING PATTERN - EMPTY CONTAINER

Source: Consultant's Analysis

In order to achieve less storage space intensive pattern for storing the loaded containers as achieved for storing the empty containers, different storage equipment is required. One type of suitable equipment is the rubber-tyred gantry crane which is a portal crane that spans over six container rows and one additional truck lane. Stacking height reaches 1 over 5 meaning that one container could be lifted over a container stored in the fifth layer. This type of crane is recommended for the ICT Khanpur project as its operations are more flexible. Due to the rubber tires each crane can change from on storage block to another. Wheel section of this crane can be turned by 90° and by this the crane can use the 15 m traffic lane between the blocks to shift from to another.

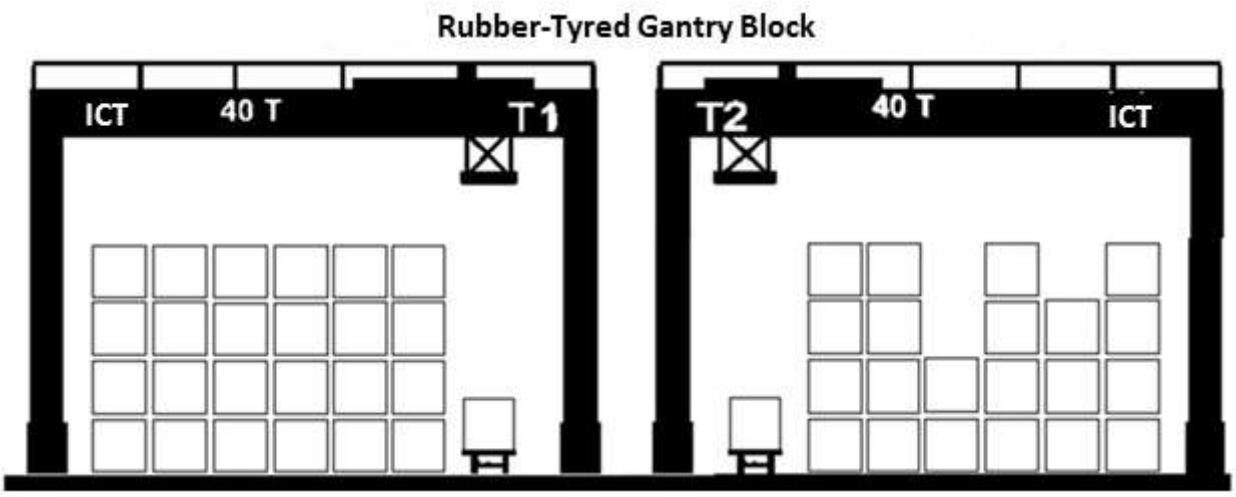


FIGURE 75: GANTRY BLOCK

Source: Consultant's Analysis

6.2.1.2. *Equipment Requirements*

In line with the proposed operational concept, the equipment requirements are calculated for mobile harbour crane, reach stackers, rubber-tyred gantry, terminal tractor-trailer units, utility forklifts, terminal vehicles and a terminal operating IT-system (TOS). The traffic forecast for the base scenario defines a throughput larger than 48,000 TEU from 2026 on. Thus, the start of procurement of RTG is foreseen from that year on.

For the purpose of determining the equipment requirement, general calculation assumptions are mentioned in the table below:

TABLE 32 : GENERAL ASSUMPTIONS- EQUIPMENT REQUIREMENT CALCULATION

General Assumptions	Assumption	Unit
Effective operating hours per shift	6	Hours
Equipment operating days in a year	360	Days
Container TEU factor	1.46	Factor
Maximum equipment shifts per day	2	

TABLE 33 : MHC REQUIREMENT CALCULATION ASSUMPTIONS

MHC requirement	Assumption	Unit
Number of moves by MHC per hour	18	Per hour
MHC operating efficiency	85	%
Restows movements % of total traffic	5	%
Asset life	30	Years

TABLE 34: SIMPLE OPTION (BASE CASE) ESTIMATES FOR MHC

Year	2017	2018	2019	2020	2025	2030	2035	2040
Mobile Harbour Crane Requirements								
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	72,274	78,989
Restows, hatch covers etc. (Boxes)	188	375	501	627	1,598	2,569	3,614	3,949
Total Annual Moves	3,949	7,874	10,531	13,164	33,568	53,944	75,888	82,938
Maximum Annual Moves per MHC	77,760	77,760	77,760	77,760	77,760	77,760	77,760	77,760
Annual Operational Moves per MHC	66,096	66,096	66,096	66,096	66,096	66,096	66,096	66,096
Number of MHCs Required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

Source: Consultant's Analysis

In 2033 the number of expected container moves will be higher than 66,096 moves per year which leads to a requirement of second mobile harbour crane. The number of expected container moves corresponds to the number of forecasted container throughput expressed in boxes (not TEU). Each box needs one move. Additional moves estimated at 5% of the total traffic volume due to restows on the vessel are also taken into account.

TABLE 35 : REACH STACKER REQUIREMENT CALCULATION ASSUMPTIONS

Reach stacker requirement	Assumption	Unit
Number of moves by Reach stacker per hour	20	Per hour
Reach stacker operating efficiency	85	%
Reach stacker moves required per container	3.5	Moves / container
Minimum number of Reach stacker to be equipped	2	units
Asset life	10	Years

TABLE 36: SIMPLE OPTION (BASE CASE) ESTIMATES FOR REACH STACKERS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Reach Stacker Requirements								
Container Throughput Yard for RS (Boxes)	1,881	4,909	7,797	9,747	24,854	9,941	-	-
Annual RS Moves	6,582	17,181	27,290	34,113	86,988	34,795	-	-
Maximum Annual Moves per RS	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Annual Operational Moves per RS	73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440
Number of Reach Stackers Required	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**

Source: Consultant's Analysis

The procurement of reach stackers and empty handler is assumed from the calculations of the operations model. But in the very beginning of the operations of the terminal, it could be decided to buy two reach stacker instead of buying one reach stacker and one empty handler. In general the attitude of "one stacker is no stacker" occurs when it comes to the involvement of operations manager. This is a decision to be agreed on by the future terminal management. Capacity-wise one reach stacker is sufficient within the first few years. Assumption used in the financial model is to retain 2 reach stackers until the end of operations period.

TABLE 37 : ECH REQUIREMENT CALCULATION ASSUMPTIONS

ECH requirement	Assumption	Unit
Number of moves by ECH per hour	15	Per hour
ECH operating efficiency	85	%
ECH moves required per container	2.5	Moves
Asset life	10	Years

TABLE 38: SIMPLE OPTION (BASE CASE) ESTIMATES FOR ECH

Year	2017	2018	2019	2020	2025	2030	2035	2040
Empty Container Handler Requirements								
MTY Container Throughput for ECH Ops (Boxes)	1,881	2,590	2,232	2,790	7,116	11,435	-	-
Annual ECH Moves	4,701	6,474	5,581	6,976	17,789	28,588	-	-
Maximum Annual Moves per ECH	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800
Annual Operational Moves per ECH	55,080	55,080	55,080	55,080	55,080	55,080	55,080	55,080
Number of ECHs Required	**1**	**1**	**1**	**1**	**1**	**1**	**-**	**-**

Source: Consultant's Analysis

TABLE 39 : TERMINAL TRACTOR & TRAILER REQUIREMENT CALCULATION ASSUMPTIONS

Terminal tractor & trailer requirement	Assumption	Unit
Terminal tractors required for first MHC	5	Units
Terminal tractors required for an additional MHC	4	Units
Terminal tractors required for each Reach stacker	3	Units
Terminal tractors required for each ECH	3	Units
Terminal tractors required for each RTG	3	Units
Asset life	10	Years

TABLE 40: SIMPLE OPTION (BASE CASE) ESTIMATES OF TERMINAL TRACTORS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Terminal Tractor-Trailer Units Requirements								
Number of MHC Working	1	1	1	1	1	1	2	2
Number of RS Working	2	2	2	2	2	2	2	2
Number of ECH Working	0	0	0	0	1	0	0	0
Number of RTG Working	0	0	0	0	0	2	3	3
Number of Terminal Tractors Required	**11**	**11**	**11**	**11**	**14**	**17**	**24**	**24**
Number of Terminal Trailers Required	**11**	**11**	**11**	**11**	**14**	**17**	**24**	**24**

Source: Consultant's Analysis

TABLE 41 : FORKLIFT REQUIREMENT CALCULATION ASSUMPTIONS

Forklift requirement	Assumption	Unit
Number of moves by Forklift per hour	12	Per hour
Forklift operating efficiency	85	%
Forklifts moves required per container	6	Moves
Asset life	10	Years

TABLE 42: SIMPLE OPTION (BASE CASE) ESTIMATES OF UTILITY FORKLIFTS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Utility Forklift (3 - 7 Tons) Requirements								
Container Throughput for UF (3-7 T) Ops (Boxes)	1,787	4,434	6,795	8,494	21,660	34,807	48,967	53,516
Annual UF (3 - 7 T) Moves	10,719	26,604	40,771	50,964	129,958	208,845	293,799	321,095
Maximum Annual Moves per UF (3 - 7T)	51,840	51,840	51,840	51,840	51,840	51,840	51,840	51,840
Annual Operational Moves per UF	44,064	44,064	44,064	44,064	44,064	44,064	44,064	44,064
Number of Utility Forklifts (3 - 7 Tons) Required	**1**	**1**	**1**	**2**	**3**	**5**	**7**	**8**

Source: Consultant's Analysis

TABLE 43 : AUXILIARY EQUIPMENT REQUIREMENT CALCULATION ASSUMPTIONS

Auxiliary Equipment Requirement	Assumption	Unit
Terminal vehicle required	2	Units
Asset life	10	Years
TOS required	1	Units
TOS asset life	20	Years
Reefer racks required	1	Units
Reefer racks asset life	15	Years

TABLE 44: SIMPLE OPTION (BASE CASE) ESTIMATES OF AUXILIARY EQUIPMENT

Year	2017	2018	2019	2020	2025	2030	2035	2040
Auxiliary Equipment Requirements								
Terminal Vehicle	2	2	2	2	2	2	2	2
Reefer Racks	-	1	1	1	1	1	1	1
TOS	1	1	1	1	1	1	1	1

Source: Consultant's Analysis

TABLE 45 : RTG REQUIREMENT CALCULATION ASSUMPTIONS

RTG requirement	Assumption	Unit
Number of moves by RTG per hour	22	Per hour
RTG operating efficiency	85	%
RTG moves required per container	3	
Asset life	15	Years

TABLE 46: SIMPLE OPTION (BASE CASE) ESTIMATES OF RTG

Year	2017	2018	2019	2020	2025	2026	2030	2035	2040
RTG Requirements									
Container Throughput Yard (Boxes)	-	-	-	-	-	10,418	29,999	72,274	78,989
Annual RTG Yard Moves	-	-	-	-	-	31,253	89,997	216,822	236,966
Maximum Annual Moves per RTG	95,040	95,040	95,040	95,040	95,040	95,040	95,040	95,040	95,040
Annual Operational Moves per RTG	80,784	80,784	80,784	80,784	80,784	80,784	80,784	80,784	80,784
Number of RTGs Required	**-**	**-**	**-**	**-**	**-**	**1**	**2**	**3**	**3**

Source: Consultant's Analysis

6.2.1.3. *Phased Development*

In accordance with the traffic forecast, the development of the terminal area has been defined in phases. Initial phase includes the utilization of existing Khanpur Terminal premises as well as full-fledged use of shore foreland. The calculated capacity for this phase considering the layout pattern shown in the following figure is around 48,000 TEU per annum.

Subsequent phase considers the utilization of the same area with a gradual adjustment of the terminal layout by changing the storage yard operations from reach stacker operations to RTG operations.

Gradual preparation of especially the storage area has been assumed in order to adjust the capital expenditures as suitably as possible to meet the actual need of capacity. In 2016 it is recommended to build 65% of the total yard area and 70% of the buildings. Remainder 30% of buildings is mainly the extension of the container freight station (CFS) to 5,000 m² which will be executed in 2027. In 2022, 30% of the infrastructure costs will be invested followed by another 5% in 2027. Buildings are recommended to be built at the very beginning of the development phase. Basic infrastructure is mainly driving lane area as the development of storage yard will start close to the quay side and have to be connected to the gate and other facilities which are located on the land side. Area of the CFS includes the operation area on two sides (incl. ramps) of the facility. Constructed part of the storage yard should last at least five years from the capacity point of view. Based on above approach approximately 10 acres of land area will be developed for container terminal operations. Details of area development requirement are presented in the table below:

TABLE 47: SIMPLE OPTION (BASE CASE) ESTIMATES OF AREA

Required Ground Area (m²)	2016	2022	2027
Yard Area			
Net space for storage of full container		6,090	9,582
Net space for storage of empty container		694	1,332
Net space for traffic lanes and RS operations		12,599	20,269
Basic Infrastructure		7,200	7,200
Sub-total Yard Area needed		26,584	38,383
Recommended area to be paved/constructed	**26,967**	**12,446**	**2,074**
Total available yard area	26,967	39,413	41,487
Buildings			
CFS		5,960	9,360
Admin		278	278
Workshop		905	905
Gate		338	338
Scales		80	80
Sub-total Buildings		7,560	10,960
Recommended area to be covered with buildings	**7,560**		**10,960**
Total space needed	0	34,144	49,343
Total area to be constructed	34,527	46,973	52,447

Source: Consultant's Analysis

During the first development phase, 50m of the old jetty facility could be retained in order to continue the current bulk cargo handling to a certain extent. Technically the operations of bulk cargo and container handling could not be recommended as dust released by bulk operations could harm the container equipment.

Based on above infrastructure assessment, indicative master plan for the proposed development option is presented in the figure below. The layout has been superimposed over a technical drawing provided by BIWTA during the first stakeholder interaction phase in April 2015.

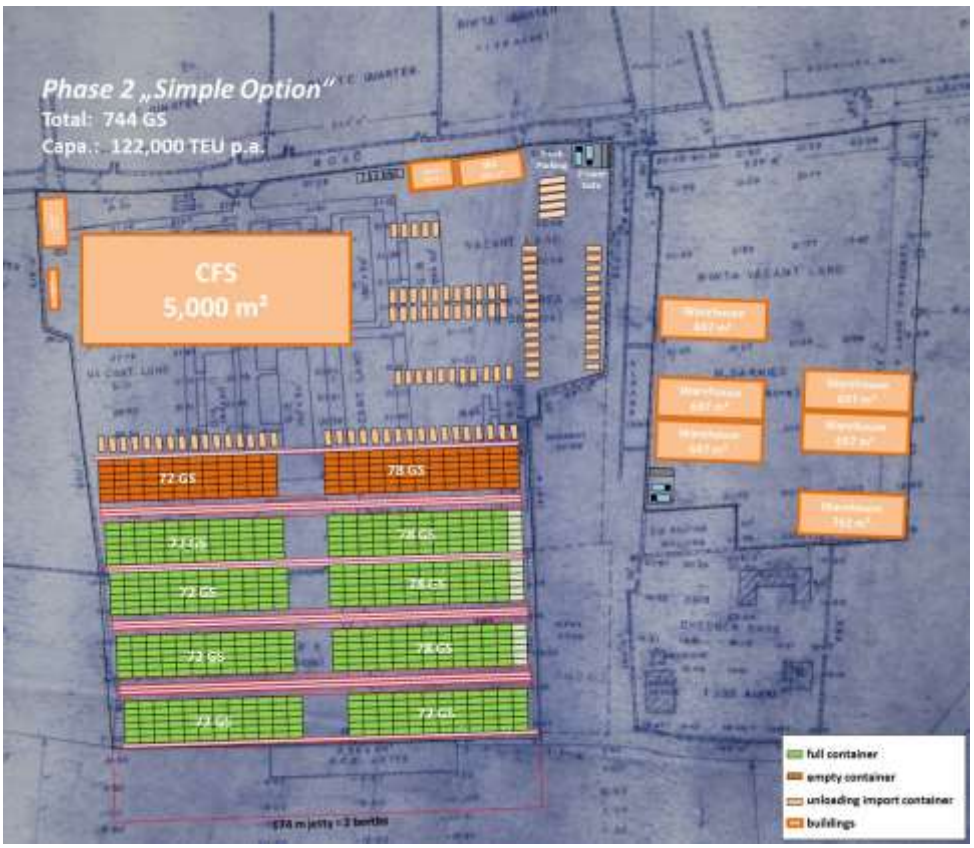


FIGURE 76: SIMPLE OPTION INDICATIVE MASTER PLAN

Source: Consultant's Analysis

TABLE 48: SIMPLE OPTION (BASE CASE) CIVIL COST ASSUMPTIONS

Civil Capex Assumptions (Million BDT)	2016	2022	2027	2032	2033
Jetty and Apron	281			302	162
Utilities	128	70	14	-	-
Site Clearance	19	-	-	-	-
Warehouse Relocation	84	-	-	-	-

Source: Consultant's Analysis

Above assumptions are taken from the operational model and are on nominal basis with an escalation of 3 % applied on an annual basis.

Assumptions related to civil capital expenditure mentioned in above table include 8% engineering costs and 10% contingencies and are nominal values escalated at the rate of 3% on annual basis.

TABLE 49 : BUILDING & PAVEMENT COST ASSUMPTION

Building & Pavement Capital Expenditure	Assumption	Unit
Preparation/pavement/landfill cost per sq. meter	5,000	BDT/sq. meter
Building cost per sq. meter	15,000	BDT/sq. meter

Assumptions related to Preparation/pavement/landfill capex mentioned in the above table includes BDT 9 million related to Foreshore Land Preparation.

TABLE 50 : EQUIPMENT UNIT COST ASSUMPTIONS

Equipment	Unit Cost (Million BDT)
Mobile Harbour Crane	259
RTG	133
Reach Stacker	31
Empty Container Handler	20
Terminal Tractor & Trailer	10
Utility Forklift (3-7t)	3
Terminal Vehicle	2
Spare Spreader	19
Reefer Rack	8
TOS	2

6.2.1.4. *Assessment of Capital Cost (Equipment International Standards)*

In accordance to the berth, yard and equipment requirements the following capital expenditures occurs during the project-related period of time. The first civil engineering and construction expenditures occur in 2016 to have the terminal available in 2017. Equipment costs occur in 2017 as the equipment will be procured to start operations in 2017. All equipment costs are benchmarked to the cost of equipment in Bangladesh and India. Civil construction costs include 8% engineering as well as 10% contingencies.

TABLE 51: SIMPLE OPTION (BASE CASE) - PROJECTIONS FOR TOTAL INVESTMENTS – INTERNATIONAL STANDARDS

Costs are in Million BDT	2016	2017	2018	2020	2021	2022	2023	2026	2027	2028	2030	2031	2032	2033	2034	2036	2037	2038	2040	Total
Equipment																				
Mobile Harbour Crane	-	280	-	-	-	-	-	-	-	-	-	-	-	470	-	-	-	-	-	750
RTG	-	-	-	-	-	-	-	197	-	209	-	-	235	-	-	-	-	-	-	641
Reach Stacker	-	67	-	-	-	-	-	-	96	-	-	-	-	-	-	-	126	-	-	289
Empty Container Handler	-	-	-	-	25	-	-	-	-	-	-	34	-	-	-	-	-	-	-	59
Terminal Tractor & Trailer	-	124	-	-	39	-	-	46	175	-	-	54	55	76	-	61	231	-	-	861
Utility Forklift (3-7t)	-	3	-	3	-	-	4	4	4	4	4	4	-	5	5	5	10	5	6	66
Terminal Vehicle	-	5	-	-	-	-	-	-	7	-	-	-	-	-	-	-	9	-	-	21
Spare Spreader	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	-	-	60
Reefer Rack	-	-	-	-	-	-	-	11	-	12	-	-	14	-	-	-	-	-	-	37
TOS	-	-	2	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	5
Subtotal	**-**	**500**	**2**	**3**	**64**	**-**	**4**	**259**	**282**	**226**	**4**	**92**	**303**	**553**	**5**	**66**	**415**	**5**	**6**	**2,790**
Civil Works																				
Jetty & apron	281	-	-	-	-	-	-	-	-	-	-	-	302	162	-	-	-	-	-	745
Preparation/pavement/landfill	140	-	-	-	-	81	-	-	16	-	-	-	-	-	-	-	-	-	-	237
Buildings	118	-	-	-	-	-	-	-	78	-	-	-	-	-	-	-	-	-	-	196
Utilities	128	-	-	-	-	70	-	-	14	-	-	-	-	-	-	-	-	-	-	212
Site clearance	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19
Relocation of Warehouses	84	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	84
Subtotal	**770**	**-**	**-**	**-**	**-**	**152**	**-**	**-**	**108**	**-**	**-**	**-**	**302**	**162**	**-**	**-**	**-**	**-**	**-**	**1,493**
Total Investment	**770**	**500**	**2**	**3**	**64**	**152**	**4**	**259**	**390**	**226**	**4**	**92**	**605**	**716**	**5**	**66**	**415**	**5**	**6**	**4,282**

Source: Consultant's Analysis

For investments in the future, inflation of equipment cost have been set with 50% of CPI p.a. and for civil construction costs with 50% of CPI p.a. for Preparation / Pavement / Landfill and Buildings cost.

The calculation of capital expenditures presented in the table above follow strictly the results of operational model calculation berth, yard and equipment requirements. The equipment costs consider costs of only new equipment along with replacement of equipment as per the asset life mentioned in the previous table. For civil construction works a life cycle of 50 years has been assumed.

The capital expenditure based on standards within the region for similar work and the industry benchmarks for Greenfield projects is estimated at BDT 4282 Million

6.2.2. Restricted Option (Base Case)

6.2.2.1. Berth and Yard Requirement

The table below shows the development of the BOR of the berth infrastructure at ICT Khanpur. The BOR of 50% will be reached in 2034 with a forecasted throughput 68,590 boxes (100,141 TEU). Thus, it is recommended to start the construction of an additional berth facility at least in 2033. The shown BOR for 2034 does already consider the availability of a second berth.

TABLE 52: RESTRICTED OPTION (BASE CASE) ESTIMATES OF CONTAINER BERTH

Year	2017	2018	2019	2020	2025	2030	2034	2035	2040
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	68,590	72,274	78,989
Vessel Calls	52	104	104	104	156	254	339	357	390
Average Container per Call (Boxes)	72	72	96	121	205	203	203	203	203
Duration per Call (Hours)	4	4	5	7	11	11	11	11	11
Berthing Idle Time (Hours)	2	2	2	2	2	2	2	2	2
Total Berthing Time (Hours)	313	625	765	904	2,088	3,361	4,488	4,729	5,168
No. of Berths required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
Berth Occupancy	**4%**	**7%**	**9%**	**10%**	**24%**	**38%**	**26%**	**27%**	**29%**

Source: Consultant's Analysis

The table below shows the development of required ground slots. Ground slots are the space needed to store one 20' container. Besides the dwell time the stacking height is also determining. For the full container yard area operated by reach stackers an average stacking height of two (ground level plus one additional layer above the ground level) is considered. In the first year no reefer container are handled.

TABLE 53: RESTRICTED OPTION (BASE CASE) ESTIMATES OF CONTAINER YARD AREA

Year	2017	2018	2019	2020	2025	2030	2035	2040
Full Container Yard - RS/RTG								
Containers in Yard (TEU)	2,746	7,167	11,384	14,230	36,286	58,313	82,034	89,655
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	194	308	385	982	1,579	2,221	2,427
Static Slots (TEU)	**81**	**212**	**336**	**420**	**1,072**	**1,722**	**2,423**	**2,648**
Number of Ground Slots (TEU)	***41***	***106***	***169***	***211***	***536***	***707***	***667***	***650***
Empty Container Yard - ECH/RTG								
Containers in Yard (TEU)	2,746	3,781	3,259	4,074	10,389	16,695	23,487	25,669
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	102	88	110	281	452	636	695
Static Slots (TEU)	**81**	**111**	**96**	**120**	**306**	**491**	**691**	**755**
Number of Ground Slots (TEU)	***16***	***22***	***19***	***24***	***61***	***98***	***138***	***151***
Reefer Container Storage & Plugs								
Containers in Yard (TEU)	-	108	342	427	1,089	1,749	2,461	2,690
Dwell Time (TEU)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	-	3	9	12	29	47	67	73
Static Slots (TEU)	**-**	**3**	**10**	**13**	**32**	**52**	**73**	**79**
Number of Ground Slots (TEU)	-	*2*	*5*	*6*	*16*	*26*	*36*	*40*

Reefer TEU Factor	2	2	2	2	2	2	2	2
Number of Reefer Containers (Boxes)	-	67	213	267	680	1,093	1,538	1,681
Dwell Time (Days)	7	7	7	7	7	7	7	7
Reefer Plugs Required	**-**	**2**	**5**	**6**	**14**	**21**	**30**	**33**
Number of Reefer Racks	-	*1*	*1*	*1*	*1*	*1*	*1*	*1*

Source: Consultant's Analysis

6.2.2.2. *Equipment Requirements*

In line with the proposed operational concept the equipment requirements are calculated for mobile harbour crane, reach stackers, rubber-tyred gantry cranes, terminal tractor-trailer units, utility forklifts, terminal vehicles and a terminal operating IT-system (TOS). The first development phase of the Restricted Option provides a capacity of around 60.000 TEU annually. The traffic forecast for the base case scenario defines a throughput larger than 60,000 TEU from 2028 on. Thus, the start of procurement of RTG is foreseen for 2027 to have the needed RTG in operation in 2028.

TABLE 54: RESTRICTED OPTION (BASE CASE) ESTIMATES OF MHC

Year	2017	2018	2019	2020	2025	2030	2035	2040
Mobile Harbour Crane Requirements								
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	72,274	78,989
Restows, hatch covers etc. (Boxes)	188	375	501	627	1,598	2,569	3,614	3,949
Total Annual Moves	3,949	7,874	10,531	13,164	33,568	53,944	75,888	82,938
Maximum Annual Moves per MHC	77,760	77,760	77,760	77,760	77,760	77,760	77,760	77,760
Annual Operational Moves per MHC	66,096	66,096	66,096	66,096	66,096	66,096	66,096	66,096
Number of MHCs Required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

Source: Consultant's Analysis

In 2033 the number of expected container moves will be higher than 66,096 moves per year which leads to a requirement of second mobile harbour crane. The number of expected container moves corresponds to the number of forecasted container throughput expressed in boxes (not TEU). Each box needs one move. Additional moves estimated at 5% of the total traffic volume due to restows on the vessel are also taken into account.

TABLE 55: RESTRICTED OPTION (BASE CASE) ESTIMATES OF REACH STACKERS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Reach Stacker Requirements								
Container Throughput Yard for RS (Boxes)	1,881	4,909	7,797	9,747	24,854	21,589	7,711	4,626
Annual RS Moves	6,582	17,181	27,290	34,113	86,988	75,563	26,987	16,192
Maximum Annual Moves per RS	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Annual Operational Moves per RS	73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440
Number of Reach Stackers Required	1	1	1	1	2	2	1	1

Source: Consultant's Analysis

The procurement of reach stackers and empty handler is assumed from the calculations of the operations model. But in the very beginning of the operations of the terminal, it could be decided to buy two reach stacker instead of buying one reach stacker and one empty handler. In general the attitude of "one stacker is no stacker" occurs when it comes to the involvement of operations manager. This is a decision to be agreed on by the future terminal management. Capacity-wise one reach stacker is sufficient within the first few years. Assumption used in the financial model is to retain 2 reach stackers until the end of operations period.

TABLE 56: RESTRICTED OPTION (BASE CASE) ESTIMATES OF ECH

Year	2017	2018	2019	2020	2025	2030	2035	2040
Empty Container Handler Requirements								
MTY Container Throughput for ECH Ops (Boxes)	1,881	2,590	2,232	2,790	7,116	11,435	16,087	17,581
Annual ECH Moves	4,701	6,474	5,581	6,976	17,789	28,588	40,217	43,953
Maximum Annual Moves per ECH	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800
Annual Operational Moves per ECH	55,080	55,080	55,080	55,080	55,080	55,080	55,080	55,080
Number of ECHs Required	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Source: Consultant's Analysis

TABLE 57: RESTRICTED OPTION (BASE CASE) ESTIMATES OF TERMINAL-TRACTOR-TRAILER-UNITS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Terminal Tractor-Trailer Units Requirements								
Number of MHC Working	1	1	1	1	1	1	2	2
Number of RS Working	2	2	2	2	2	2	2	2
Number of ECH Working	0	0	0	0	1	1	1	1
Number of RTG Working	0	0	0	0	0	1	2	3
Number of Terminal Tractors Required	**11**	**11**	**11**	**11**	**14**	**17**	**24**	**27**
Number of Terminal Trailers Required	**11**	**11**	**11**	**11**	**14**	**17**	**24**	**27**

Source: Consultant's Analysis

TABLE 58: RESTRICTED OPTION (BASE CASE) ESTIMATES OF UTILITY FORKLIFTS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Utility Forklift (3 - 7 Tons) Requirements								

Year	2017	2018	2019	2020	2025	2030	2035	2040
Container Throughput for UF (3-7 T) Ops (Boxes)	1,787	4,434	6,795	8,494	21,660	34,807	48,967	53,516
Annual UF (3 - 7 T) Moves	10,719	26,604	40,771	50,964	129,958	208,845	293,799	321,095
Maximum Annual Moves per UF (3 - 7T)	51,840	51,840	51,840	51,840	51,840	51,840	51,840	51,840
Annual Operational Moves per UF	44,064	44,064	44,064	44,064	44,064	44,064	44,064	44,064
Number of Utility Forklifts (3 - 7 Tons) Required	**1**	**1**	**1**	**2**	**3**	**5**	**7**	**8**

Source: Consultant's Analysis

TABLE 59: RESTRICTED OPTION (BASE CASE) ESTIMATES OF AUXILIARY EQUIPMENT

Year	2017	2018	2019	2020	2025	2030	2035	2040
Auxiliary Equipment Requirements								
Terminal Vehicle	2	2	2	2	2	2	2	2
Reefer Racks	-	1	1	1	1	1	1	1
TOS	1	1	1	1	1	1	1	1

Source: Consultant's Analysis

TABLE 60: RESTRICTED OPTION (BASE CASE) ESTIMATES OF RTG

Year	2017	2018	2019	2020	2025	2028	2030	2035	2040
RTG Requirements									
Container Throughput Yard (Boxes)	-	-	-	-	-	6,141	18,351	48,477	56,781
Annual RTG Yard Moves	-	-	-	-	-	18,424	55,053	145,431	170,344
Maximum Annual Moves per RTG	95,040	95,040	95,040	95,040	95,040	95,040	95,040	95,040	95,040
Annual Operational Moves per RTG	80,784	80,784	80,784	80,784	80,784	80,784	80,784	80,784	80,784
Number of RTGs Required	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**2**	**3**

Source: Consultant's Analysis

6.2.2.3. *Phased Development*

This option provides an annual terminal container throughput capacity of 60,000 TEU after the first phase of development. Gradually shift of storage pattern from RS operations to RTG operations has to commence in 2028 to provide an annual terminal capacity of 146,000 TEU after the second phase of development.

Gradual preparation of especially the storage area has been assumed in order to adjust the capital expenditures as suitably as possible to meet the actual need of capacity. In 2016 it is recommended to build 65% of the total yard area and 70% of the buildings. Remainder 30% of buildings is mainly the extension of the container freight station (CFS) to 5,000 m² which will be executed in 2027. In 2022, 30% of the infrastructure costs will be invested followed by another 5% in 2027. Buildings are recommended to be built at the very beginning of the development phase. Basic infrastructure is mainly driving lane area as the development of storage yard will start close to the quay side and have to be connected to the gate and other facilities which are located on the

land side. Area of the CFS includes the operation area on two sides (incl. ramps) of the facility. Details of area development requirement are presented in the table below:

TABLE 61: RESTRICTED OPTION (BASE CASE) ESTIMATES OF AREA REQUIREMENTS

Required Ground Area (m²)	2016	2022	2027
Yard Area			
Net space for storage of full container		6,090	11,688
Net space for storage of empty container		694	1,332
Net space for traffic lanes and RS operations		12,599	24,180
Basic Infrastructure		7,200	7,200
Sub-total Yard Area needed		26,584	44,400
Recommended area to be paved/constructed	**26,422**	**19,216**	**2,402**
Total available yard area	26,422	45,638	48,040
Buildings			
CFS		5,960	9,360
Admin		278	278
Workshop		905	905
Gate		338	338
Scales		80	80
Sub-total Buildings		7,560	10,960
Recommended area to be covered with buildings	**7,560**		**10,960**
Total space needed	0	34,144	55,360
Total area to be constructed	33,982	53,198	59,000

Source: Consultant's Analysis

During the first development phase 50m of the old jetty facility could be retained in order to continue the current bulk cargo handling to a certain extend. Technically the operations of bulk cargo and container handling could not be recommended as dust released by bulk operations could harm the container equipment.

Based on above infrastructure assessment, indicative master plan for the proposed development option is presented in the figure below. The layout has been superimposed over a technical drawing provided by BIWTA during the first stakeholder interaction phase in April 2015.

FIGURE 77: RESTRICTED OPTION INDICATIVE MASTER PLAN

Source: Consultant's Analysis

TABLE 62: RESTRICTED OPTION (BASE CASE) CIVIL COST ASSUMPTIONS

Civil Capex Assumptions (Million BDT)	2016	2022	2027	2032	2033
Jetty and Apron	281			302	162
Utilities	108	94	14	-	-
Site Clearance	19	-	-	-	-
Warehouse Relocation	84	-	-	-	-

Source: Consultant's Analysis

Above assumptions are taken from the operational model and are on nominal basis with an escalation of 3 % applied on an annual basis.

Assumptions related to civil capital expenditure mentioned in above table include 8% engineering costs and 10% contingencies and are nominal values escalated at the rate of 3% on annual basis.

Few operational challenges attached with this option are listed below:

a) Internal transport vehicles are required to cross the road connecting ferry ghat for stacking containers. This would result in operational inefficiencies including high operational time and costs.

b) Currently this road is busy with pedestrian traffic as this road connects with the ferry ghat. There can be issues related to safety and security of commuters accessing the road connecting the ferry ghat.

In short term these operational challenges can be suitably addressed by the operator by applying standard operating procedures and support from the local government authorities in terms of traffic management.

As understood from the discussion with stakeholders, in the long term, there is an alternate road coming up with a bridge over the river, this road will have the necessary transportation facilities and that will help in easing out the pedestrian traffic on the narrow road adjacent to the facility which has no transportation facility.

As per the discussion with the stakeholders, BIWTA is in the process of expanding its dredging operations. Due to this expansion they are in the process of procuring approximately 20 additional dredgers. Thus, there will be more space required in addition to six warehouses which are to be relocated on the playground area for storing the dredging equipment and spares for those equipment due to which the additional area considered for empty container handling in the playground area will not be available for expansion of the container handling operations.

Considering the technical challenges, this option is technically not feasible from implementation point of view and we have not considered this option for assessing the financial feasibility and for calculation of detailed capital cost estimates

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6.2.3. Full Option (Base Case)

6.2.3.1. Berth and Yard Requirement

The table below shows the development of the BOR of the berth infrastructure at ICT Khanpur. The BOR of 50% will be reached in 2034 with a forecasted throughput 68,590 boxes (100,141 TEU). Thus, it is recommended to start the construction of an additional berth facility at least in 2033. The shown BOR for 2034 does already consider the availability of a second berth.

TABLE 63: FULL OPTION (BASE CASE) ESTIMATES OF CONTAINER BERTH

Year	2017	2018	2019	2020	2025	2030	2034	2035	2040
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	68,590	72,274	78,989
Vessel Calls	52	104	104	104	156	254	339	357	390
Average Container per Call (Boxes)	72	72	96	121	205	203	203	203	203
Duration per Call (Hours)	4	4	5	7	11	11	11	11	11
Berthing Idle Time (Hours)	2	2	2	2	2	2	2	2	2
Total Berthing Time (Hours)	313	625	765	904	2,088	3,361	4,488	4,729	5,168
No. of Berths required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**
Berth Occupancy	**4%**	**7%**	**9%**	**10%**	**24%**	**38%**	**26%**	**27%**	**29%**

Source: Consultant's Analysis

TABLE 64: FULL OPTION (BASE CASE) ESTIMATES OF CONTAINER YARD AREA

Year	2017	2018	2019	2020	2025	2030	2035	2040
Full Container Yard - RS/RTG								
Containers in Yard (TEU)	2,746	7,167	11,384	14,230	36,286	58,313	82,034	89,655
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	194	308	385	982	1,579	2,221	2,427
Static Slots (TEU)	**81**	**212**	**336**	**420**	**1,072**	**1,722**	**2,423**	**2,648**
Number of Ground Slots (TEU)	***41***	***106***	***169***	***211***	***536***	***862***	***1,067***	***1,127***
Empty Container Yard - ECH/RTG								
Containers in Yard (TEU)	2,746	3,781	3,259	4,074	10,389	16,695	23,487	25,669
Dwell Time (Days)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	74	102	88	110	281	452	636	695
Static Slots (TEU)	**81**	**111**	**96**	**120**	**306**	**491**	**691**	**755**
Number of Ground Slots (TEU)	***16***	***22***	***19***	***24***	***61***	***98***	***138***	***151***
Reefer Container Storage & Plugs								
Containers in Yard (TEU)	-	108	342	427	1,089	1,749	2,461	2,690
Dwell Time (TEU)	7	7	7	7	7	7	7	7
Operational Slots (TEU)	-	3	9	12	29	47	67	73
Static Slots (TEU)	**-**	**3**	**10**	**13**	**32**	**52**	**73**	**79**
Number of Ground Slots (TEU)	-	*2*	*5*	*6*	*16*	*26*	*36*	*40*
Reefer TEU Factor	2	2	2	2	2	2	2	2
Number of Reefer Containers (Boxes)	-	67	213	267	680	1,093	1,538	1,681
Dwell Time (Days)	7	7	7	7	7	7	7	7
Reefer Plugs Required	**-**	**2**	**5**	**6**	**14**	**21**	**30**	**33**
Number of Reefer Racks	-	*1*	*1*	*1*	*1*	*1*	*1*	*1*

Source: Consultant's Analysis

6.2.3.2. Equipment Requirements

In line with the proposed operational concept the equipment requirements are calculated for mobile harbour crane, reach stackers, rubber-tyred gantry cranes, terminal tractor-trailer units, utility forklifts, terminal vehicles and a terminal operating IT-system (TOS). The first and second phase of the Full Option assume RS operations. Due to space RS operations are suitable up to an annual throughput of around 90,000 TEU. The traffic forecast for the base case scenario defines a throughput larger than 90,000 TEU from 2033 on. Thus, the start of procurement of RTG is foreseen for 2032 to have the needed RTG in operation in 2033. At this time the investment in RTG capacity seems only reasonable if the concession is valid beyond 2040.

TABLE 65: FULL OPTION (BASE CASE) ESTIMATES OF MHC

Year	2017	2018	2019	2020	2025	2030	2035	2040
Mobile Harbour Crane Requirements								
Container Throughput (Boxes)	3,761	7,499	10,030	12,537	31,969	51,375	72,274	78,989
Restows, hatch covers etc. (Boxes)	188	375	501	627	1,598	2,569	3,614	3,949
Total Annual Moves	3,949	7,874	10,531	13,164	33,568	53,944	75,888	82,938
Maximum Annual Moves per MHC	77,760	77,760	77,760	77,760	77,760	77,760	77,760	77,760
Annual Operational Moves per MHC	66,096	66,096	66,096	66,096	66,096	66,096	66,096	66,096
Number of MHCs Required	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

Source: Consultant's Analysis

In 2033 the number of expected container moves will be higher than 66,096 moves per year which leads to a requirement of second mobile harbour crane. The number of expected container moves corresponds to the number of forecasted container throughput expressed in boxes (not TEU). Each box needs one move. Additional moves estimated at 5% of the total traffic volume due to restows on the vessel are also taken into account.

TABLE 66: FULL OPTION (BASE CASE) ESTIMATES OF REACH STACKERS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Reach Stacker Requirements								
Container Throughput Yard for RS (Boxes)	1,881	4,909	7,797	9,747	24,854	39,940	37,529	35,184
Annual RS Moves	6,582	17,181	27,290	34,113	86,988	131,353	131,353	123,143
Maximum Annual Moves per RS	86,400	86,400	86,400	86,400	86,400	86,400	86,400	86,400
Annual Operational Moves per RS	73,440	73,440	73,440	73,440	73,440	73,440	73,440	73,440
Number of Reach Stackers Required	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**

Source: Consultant's Analysis

The procurement of reach stackers and empty handler is assumed from the calculations of the operations model. But in the very beginning of the operations of the terminal, it could be decided to buy two reach stacker instead of buying one reach stacker and one empty handler. In general the attitude of "one stacker is no stacker" occurs when it comes to the involvement of operations manager. This is a decision to be agreed on by the future

terminal management. Capacity-wise one reach stacker is sufficient within the first few years. Assumption used in the financial model is to retain 2 reach stackers until the end of operations period.

TABLE 67: FULL OPTION (BASE CASE) ESTIMATES OF ECH

Year	2017	2018	2019	2020	2025	2030	2035	2040
Empty Container Handler Requirements								
MTY Container Throughput for ECH Ops (Boxes)	1,881	2,590	2,232	2,790	7,116	11,435	16,087	17,581
Annual ECH Moves	4,701	6,474	5,581	6,976	17,789	28,588	40,217	43,953
Maximum Annual Moves per ECH	64,800	64,800	64,800	64,800	64,800	64,800	64,800	64,800
Annual Operational Moves per ECH	55,080	55,080	55,080	55,080	55,080	55,080	55,080	55,080
Number of ECHs Required	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Source: Consultant's Analysis

TABLE 68: FULL OPTION (BASE CASE) ESTIMATES OF TERMINAL-TRACTOR-TRAILER-UNIT

Year	2017	2018	2019	2020	2025	2030	2035	2040
Terminal Tractor-Trailer Units Requirements								
Number of MHC Working	1	1	1	1	1	1	2	2
Number of RS Working	2	2	2	2	2	2	2	2
Number of ECH Working	0	0	0	0	1	1	1	1
Number of RTG Working	0	0	0	0	0	1	1	1
Number of Terminal Tractors Required	**11**	**11**	**11**	**11**	**14**	**17**	**21**	**21**
Number of Terminal Trailers Required	**11**	**11**	**11**	**11**	**14**	**17**	**21**	**21**

Source: Consultant's Analysis

TABLE 69: FULL OPTION (BASE CASE) ESTIMATES OF UTILITY FORKLIFTS

Year	2017	2018	2019	2020	2025	2030	2035	2040
Utility Forklift (3 - 7 Tons) Requirements								
Container Throughput for UF (3-7 T) Ops (Boxes)	1,787	4,434	6,795	8,494	21,660	34,807	48,967	53,516
Annual UF (3 - 7 T) Moves	10,719	26,604	40,771	50,964	129,958	208,845	293,799	321,095
Maximum Annual Moves per UF (3 - 7T)	51,840	51,840	51,840	51,840	51,840	51,840	51,840	51,840
Annual Operational Moves per UF	44,064	44,064	44,064	44,064	44,064	44,064	44,064	44,064

Year	2017	2018	2019	2020	2025	2030	2035	2040
Number of Utility Forklifts (3 - 7 Tons) Required	**1**	**1**	**1**	**2**	**3**	**5**	**7**	**8**

Source: Consultant's Analysis

TABLE 70: FULL OPTION (BASE CASE) ESTIMATES OF AUXILIARY EQUIPMENT

Year	2017	2018	2019	2020	2025	2030	2035	2040
Auxiliary Equipment Requirements								
Terminal Vehicle	2	2	2	2	2	2	2	2
Reefer Racks	-	1	1	1	1	1	1	1
TOS	1	1	1	1	1	1	1	1

Source: Consultant's Analysis

TABLE 71: FULL OPTION (BASE CASE) ESTIMATES OF RTG

Year	2017	2018	2019	2020	2025	2030	2035	2040
RTG Requirements								
Container Throughput Yard (Boxes)	-	-	-	-	-	2,411	18,658	26,224
Annual RTG Yard Moves	-	-	-	-	-	7,233	55,974	78,671
Maximum Annual Moves per RTG	95,040	95,040	95,040	95,040	95,040	95,040	95,040	95,040
Annual Operational Moves per RTG	80,784	80,784	80,784	80,784	80,784	80,784	80,784	80,784
Number of RTGs Required	**-**	**-**	**-**	**-**	**-**	**1**	**1**	**1**

Source: Consultant's Analysis

6.2.3.3. Phased Development

This option provides an annual terminal container throughput capacity of 48,000 TEU after the first phase of development then an annual capacity of 190,000 TEU will be provided after second phase of development and after the final phase of development annual capacity of 250,000 TEU will be provided. The capacity of 48,000 TEU will be reached in the base case in year 2026, the throughput of 90,000 TEU will be reached in 2033. Thus, the third phase has to be initiated in 2032 which is the gradual shift from RS operations to RTG operations.

Gradual preparation of especially the storage area has been assumed in order to adjust the capital expenditures as suitably as possible to meet the actual need of capacity. In 2016 it is recommended to build 40% of the total yard area (100% include the extension area already) and 70% of the buildings. Remainder 30% of buildings is mainly the extension of the container freight station (CFS) to 5,000 m² of covered area which will be executed in 2027. In 2022, 30% of the infrastructure costs will be invested. Last construction measures covering the remainder 30% of unpaved area will be executed in 2027. Buildings are recommended to be built at the very beginning of the development phase. Basic infrastructure is mainly driving lane area as the development of storage yard will start close to the quay side and have to be connected to the gate and other facilities which are located on the land side. Area of the CFS includes the operation area on two sides (incl. ramps) of the facility. Details of area development requirement are presented in the table below:

TABLE 72: FULL OPTION (BASE CASE) ESTIMATES OF TERMINAL AREA

Required Ground Area (m²)	2016	2022	2027
Yard Area			
Net space for storage of full container		6,090	11,688
Net space for storage of empty container		694	1,332
Net space for traffic lanes and RS operations		12,599	24,180
Basic Infrastructure		7,200	10,100
Sub-total Yard Area needed		26,584	47,300
Recommended area to be paved/constructed	**29,616**	**22,212**	**22,212**
Total available yard area	29,616	51,828	74,040
Buildings			
CFS		5,960	9,360
Admin		278	278
Workshop		905	905
Gate		338	338
Scales		80	80
Sub-total Buildings		7,560	10,960
Recommended area to be covered with buildings	**7,560**		**10,960**
Total space needed	0	34,144	58,260
Total area to be constructed	37,176	59,388	85,000

Source: Consultant's Analysis

Allocation of the first part of the berth facility does not facilitate retaining a part of the old jetty. Thus, the current bulk cargo handling cannot be continued at that facility under this option.

Based on above infrastructure assessment, indicative master plan for the proposed development option is presented in the figure below. The layout has been superimposed over a technical drawing provided by BIWTA during the first stakeholder interaction phase in April 2015.

Phase 1 „Full Option"
Total: 612 GS
Capa.: 48,000 TEU p.a.
CFS
3,100 m²
Equipment
84 GS
84 GS
72 GS
84 GS
84 GS
84 GS
84 GS
30 GS
42 GS
full container
empty container
unloading import container
buildings

Phase 2 „Full Option"
Total: 1,142 GS
Capa.: 90,000 TEU p.a.
CFS
5,000 m²
Equipment
36 GS
48 GS
72 GS
96 GS
60 GS
108 GS
96 GS
60 GS
108 GS
84 GS
60 GS
120 GS
72 GS
30 GS
60 GS
30 GS
full container
empty container
unloading import container
buildings

FIGURE 78: RESTRICTED OPTION INDICATIVE MASTER PLAN

Source: Consultant's Analysis

TABLE 73: RESTRICTED OPTION (BASE CASE) CIVIL COST ASSUMPTIONS

Civil Capex Assumptions (Million BDT)	2016	2022	2027	2032	2033
Jetty and Apron	281			302	162
Utilities	127	114	132	-	-
Site Clearance	19	22	-	-	-
Warehouse Relocation	84	-	-	-	-

Source: Consultant's Analysis

Above assumptions are taken from the operational model and are on nominal basis with an escalation of 3 % applied on an annual basis.

Assumptions related to civil capital expenditure mentioned in above table include 8% engineering costs and 10% contingencies and are nominal values escalated at the rate of 3% on annual basis.

Few operational challenges attached with this option are listed below:

c) Internal transport vehicles are required to cross the road connecting ferry ghat for stacking containers. This would result in operational inefficiencies including high operational time and costs.

d) Currently this road is busy with pedestrian traffic as this road connects with the ferry ghat. There can be issues related to safety and security of commuters accessing the road connecting the ferry ghat.

In short term these operational challenges can be suitably addressed by the operator by applying standard operating procedures and support from the local government authorities in terms of traffic management.

As understood from the discussion with stakeholders, in the long term, there is an alternate road coming up with a bridge over the river, this road will have the necessary transportation facilities and that will help in easing out the pedestrian traffic on the narrow road adjacent to the facility which has no transportation facility.

As understood based on discussions with BIWTA, extension area required for implementing the Restricted option and the Full area option will not be available due the proposed capacity expansion of the existing dredger base. BIWTA is in the process of procuring 20 dredgers and majority of the extension area (required to implement the Restricted option as well Full area option) will be used for developing workshops, office space and warehouses for spare parts. However, there will be some space in the extension area to accommodate the relocation of existing warehouses which are presently used for storing spare parts for dredgers.

Accordingly, the Restricted option and the Full area option were excluded from the detailed financial analysis.

7. Preliminary Market Sounding

One of the main risks of the proposed ICT projects is the demand risk arising out of the nascent stage of Inland Water Transportation of containers in Bangladesh. The market assessment and demand analysis (presented in Section 4) provides an important foundation to determine the scope (definition and scale of outputs) of the project. The results form the basis of inputs into all the other parts of the feasibility analysis and support of the PPP due diligence.

Market Assessment and Demand analysis for the proposed project deals with the following sub-sections:

- **Needs analysis and identification of target users** – We have investigated the level and quality of existing services, and have identified shortcomings or deficiencies. As understood based on the investigations primarily involving interactions with end user and stakeholders, the proposed project is expected to result in reduction in logistics cost and de-congest the existing road network.
- **Options analysis** – We have investigated the options for meeting the service need and infrastructure required for suitably addressing the service levels. As for the proposed project, land for developing the required infrastructure is limited and therefore the existing terminal area with modern handling equipment and efficient operations has been recommended as a preferred option.
- **Definition of project outputs** – The primary objective of implementing the project should clearly state the output from the project and other basic parameters. Technical and Financial feasibility study conducted would determine the costs involved in the project, traffic mix and the level of service being assumed for implementing the project.
- **Demand projections** – We have estimated the potential demand for service among target users, and the expected growth rate of demand over the life of the project. Traffic study has been conducted for the project include estimation of traffic, growth rates on account of existing and likely future demand, competitive assessment to arrive the market share of the proposed project.

However, with the nascent stage of inland water transport system for transportation of containers, there is a significant risk around market acceptability of the proposed ICT at Khanpur. This can magnify the uncertainties associated with revenue projections and the total project income.

7.1. Market Risk associated with Bangladesh

Infrastructure in Bangladesh is one of the least developed in the world, a factor which has impeded economic growth in the country. In the World Economic Forum's Global Competitiveness Report 2014-2015[29], the country's infrastructure competitiveness has been ranked 103th out of 144 countries, the 3rd lowest ranking among its South Asian neighbors. Transport facilities are severely lacking in Bangladesh, causing traffic bottlenecks that drives up the cost of business and goods. As per a World Bank report, Bangladesh needs at least USD 74 billion to 100 billion (7.38% to 10.02% of its GDP) investment in the next 10 years in the infrastructure sector.

S.No	Name of the Country	Ranking
1.	India	71
2.	Bhutan	73
3.	**Bangladesh**	**103**
4.	Pakistan	129

Given the fact of its low investment as compared to its GDP (25%[30]), almost all the investment in the infrastructure space is currently financed from domestic sources (tax collections).

In order to reduce the dependence on domestic finances for financing infrastructure in the country and also to promote private sector funding by way of PPP projects, GoB has established various specialized agencies like

[29] *"The Global Competitiveness Report 2014-15" by Klaus Schwabb, World Economic Forum as retrieved on January 15, 2015*

[30] *Article on "Infrastructure and Governance deficits" in Financial Express dated April 22, 2013 retrieved from http://www.thefinancialexpress-bd .com /old /index.php? ref=MjBfMDRfMjJfMTNfMV82XzE2NzEyMA = on January 14, 2015*

Infrastructure Development Company Limited and Bangladesh Infrastructure Finance Fund Limited for financing private players for implementing infrastructure projects.

Market risk as per perceptions have decreased in Bangladesh over the last few years primarily due to a large number of structural and policy level reforms formulated by the current government regime. The stability in the domestic market combined with greater foreign investments have increased the confidence of the investment populace. However, the risk estimated by local and domestic construction players and financiers is high and as a result they demand a higher return to commensurate with the risk premium.

7.2. Stakeholder Consultations

The Transaction Advisors ("TA") met stakeholders associated with the value chain of container trade in Bangladesh. List of key stakeholders interacted is presented below:

- Chittagong Port Authority operating a ICT at Pangaon
- ICD Kamlapur operating ICD at Dhaka
- Summit Alliance Terminals,
- Portek International Pte Ltd – Operating container terminal in different parts of the world
- Western Marine Services Ltd- Manufacture of container vessels in Bangladesh
- Incontrade Limited – Operating one of the largest Off-Dock facility in Chittagong
- Novo Cargo Service Ltd – International logistics service provider and Freight Forwarder
- APL Logistics – One of the leading shipping line and logistics service provided in the World

Key things emerged from stakeholder consultations are listed below:

1. inland waterway transport for container is a new concept in Bangladesh, some general reservations of the market towards inland shipping service, attractiveness for end users, integration with Chittagong port were observed
2. traffic guarantee or commitment from BIWTA is required considering the demand risk due to nascent stage of ecosystem [31]required to attract containers and investment required to develop this terminal. This can be addressed by allowing the operator to handle existing bulk cargo during initial years of operations
3. sufficient availability of land free from all encumbrance is critical to attract global players
4. fast track implementation of this facility would be critical to address the likely future competitive environment.
5. safety and security of cargo in transit is critical to enhance confidence of the end users or cargo owners
6. given the limited availability of inland container vessels, operator should be allowed to invest in inland container vessels for integrated operations.
7. transaction process should be short and transparent
8. Conflicting role of Chittagong Port Authority which is competitor (ICT Pangoan) and lead facilitator. Therefore, it is important that this facility should be recognised by CPA, especially during the operational phase by providing efficient loading/unloading operations

Based on interaction with stakeholders it can be concluded that with existing arrangements including availability of transport operators, handling agents, labour and Customs, proposed ICT at Khanpur is attractive, if the issues mentioned above can be sufficiently addressed.

[31] Ecosystem would include General awareness about the benefits of IWT, availability of container vessels, recognition from Main Line Operators (MLO), Market compliant vessel schedule and other service providers.

7.3. Recommendation

Based on our discussions with various stakeholders including operators, shipping lines, freight forwarders and cargo owners, the following recommendations have been suggested to attract more private party participation for this project:

- ***Minimum Traffic Guarantee:*** Since variability in traffic is a major concern to operator as well as lenders, hence the operator should be allowed to handle exiting bulk traffic. This may act as a Traffic Guarantee from GoB to enhance attractiveness of this project for operators as well as lenders.
- ***Land Acquisition and Rehabilitation issues:*** The private parties have informed that acquiring land for any infrastructure project is a difficult task and so 100% of the land to be acquired and settlement of rehabilitation issues should be completed by the Government prior to the achievement of Financial Close.
- ***Fast Track Implementation:*** The private parties have informed that time to market is critical for this project and so transaction process should be short and transparent to attract international.
- ***Safety & Security of Cargo:*** Since safety and security of cargo is key concern for cargo owners including importers and exports, BIWTA should ensure round the clock availability of river police.

8. Environmental & Social Impact Assessment (ESIA)

8.1. Introduction

This Environmental and Social Impact Assessment (ESIA) Study has been conducted for the development of Inland Water Terminal (IWT) by Bangladesh Inland Water Transport Authority (BIWTA), at Khanpur near Narayanganj, Bangladesh.

8.1.1. Background of the Project

The Shitalakhya River originates from the Old Brahmaputra and bifurcates into two courses at Toke in Gazipur district. One of the courses called the Banar flows southwest and at Lakpur is renamed as the Shitalakhya. It then flows past the eastern side of Narayanganj town. The Shitalakhya falls into the Dhaleswari near Kalagachhiya. The length of the river is about 110 km and the width near Narayanganj is about 300 m but reduces to about 100 m in the upper reach.

A number of industries have been set up on the banks of Shitalakhya River over time. The important river port of Narayanganj is also situated on its bank.

To improve inland water transport, Bangladesh Inland Water Transport Authority (BIWTA) has proposed to develop an inland container terminal at Khanpur near Narayanganj. The proposed Inland Water Terminal (IWT) is located at the existing jetty facility which is located adjacent to Narayanganj port and has direct access to the Shitalakhya River.

8.1.2. Applicable Reference Framework

This ESIA Study for the Project is governed by the following applicable reference framework.

- Bangladesh Environmental Policy, Regulations, and Guidelines National Environmental Policy, 1992
- National Environment Management Action Plan (NEMAP), 1995
- The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)
- Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)
- The ESIA Guidelines for Industry, 1997
- International Finance Corporation's (IFC) Performance Standards on Environmental & Social Sustainability

8.1.3. Objective of the study

The ESIA study has been undertaken with the following objectives:

- To facilitate an understanding of the elements of the existing baseline conditions prevailing in the study area;
- To identify the aspects of the project likely to result in significant impacts to environmental and social resources/receptors;
- To analyse and map stakeholders and document the stakeholder consultation during the study;
- To predict and evaluate the significance of the impacts of the Project;
- To determine the significance of residual impacts, taking into account the implementation of mitigation measures; and

- To develop plans for the management and monitoring of impacts, including plans for ongoing stakeholder engagement.
- Identification and review of applicable local, state, national and international environmental and social regulatory and institutional frameworks;
- Establishment of environmental baseline conditions of the site and surrounding area through the following:
    - Detailed surveys to observe environmental and social characteristics of the project area
    - Discussions with the local community, Panchayats and identification key issues during planning, construction, operation and decommissioning phase of the project;
    - Primary baseline data collection of the site and study area with respect to water and soil quality, ambient air and noise quality, and ecology;
    - Ecological assessment on flora and fauna of the site and study area through primary and secondary surveys.
- Assessment of the socio-economic environment through collation of secondary information of the site, supplemented by consultations with the local communities to understand community perception with regard to the project and its activities. The approach includes:
    - Stakeholder identification;
    - Focussed group consultations with selected land sellers general community, and other impacted groups;
    - Field surveys and data compilation;
    - Group/Community Consultations: Group meetings and consultations with local and community representatives; and
- Preparation of the ESIA report which includes:
    - Project Description describing the proposed project and its geographic, ecological, social, health and temporal context, including any related facilities that may be required;
    - Applicable Environmental and Social Regulatory Framework including host country regulations, obligations for implementing relevant international social and environmental treaties, agreements, and conventions and IFC Performance Standards;
    - Environmental & Social Baseline Conditions on the basis of the above identified parameters to understand the profile of the study area and describe relevant physical, biological, socioeconomic, health and labour conditions in the project area of influence;
    - Analysis of Alternatives comparing reasonable alternatives to the proposed project site, technology, design, and operation in terms of their potential environmental impacts;
    - Impact Assessment and Mitigation Measures for environmental and social components for pre-construction/construction and operation phases. To minimize the adverse impacts mitigations measures will also be suggested.
    - Preparation of Social and Environmental Management Plan (SEMP) and Management System which includes the following:
        - Mitigations for adverse environmental and social impacts and associated risks;
        - Institutional arrangement - management tools and techniques for the implementation of environmental impacts and risk mitigations;
        - Monitoring and reporting of requirements and mechanisms for the effective implementation of the suggested mitigations;
        - Monitoring arrangements for effective implementation of suggested mitigations for the proposed project; and
        - Preparation of SEMS: Corporate level Social and Environmental Management System (SEMS) based on the current profile of activities of the organization and the findings of SEIA. The SEMS will be in accordance with the Performance Standards of IFC

8.1.4. *Structure of the Report*

This report is structured to provide an environment and social impact analysis of the project by incorporating the following sections:

- Project overview which describes project proponent, brief process of the plant, water consumption details, phases of implementation, etc.
- Environmental quality which details the baseline environmental quality of the surrounding region based on the available secondary information. The baseline information includes micrometeorology, air quality, noise quality, water quality, soil quality, flora and fauna, and socioeconomic and socio-cultural environments.
- Environmental and social impact assessment and the management plan to mitigate the anticipated impacts

8.2. *Approach and Methodology*

A participatory approach was adopted for ESIA of Inland Container Terminal project at Khanpur, Bangladesh. Various alternatives were discussed with the project team, keeping in mind their relative impact on the environment. The approach and methodology used for the ESIA project is summarized below:

FIGURE 79: APPROACH & METHODOLOGY - EIA

8.2.1. *Preliminary Discussions with Project Proponent*

- Discussions with the Client representatives and their subcontractors to understand the Project, current status of agreements, Project milestones, legal requirements and scope of ESIA; and
- Collation of relevant project documents such as organization charts, relevant drawings, project schedule, land purchase Process, company HR policies etc.

8.2.2. *Project's Area of Influence*

As per the IFC guidance notes, the project area of influence encompasses, as appropriate:

- The area likely to be affected by: (i) the project and the client's activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent.
- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

8.2.3. Document Review

Desk based review of the following shall be done in order to have a clear understanding of the Project and to assess environmental and social sensitivities around the Project.

- Relevant documents available
- Survey of India Topo-sheet
- Satellite imagery of the project site and its surroundings

8.2.4. Scoping Study

Scoping is depicted in the Exhibit below:

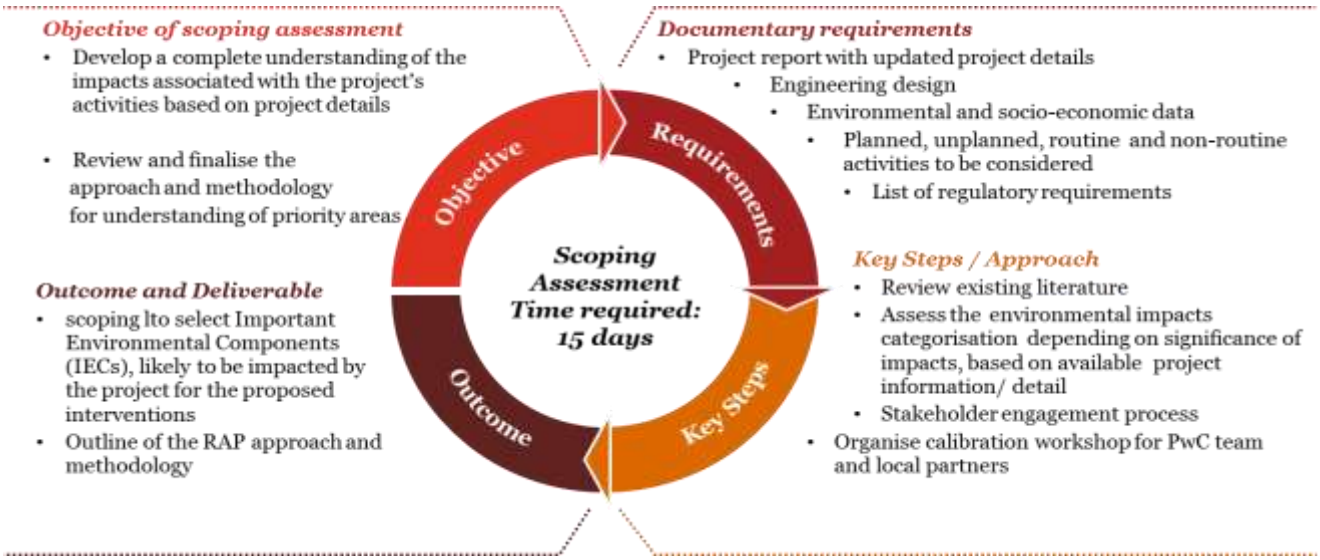


FIGURE 80: SCOPING ASSESSMENT

Identifying on a preliminary basis, the potential interactions between the Project and resources/receptors within the Project's Area of Influence. The focus is on collecting data for those resources/receptors which have a reasonable potential to experience significant impacts.

The main objective of this scoping study is to:

- Establish the Project and its various components;
- Outline the environmental and social interactions related with the Project, on which the ESIA study shall be focused;
- Define the study area comprising the Project site and its AoI;
- Define the scope of work and the approach and methodology to conduct the ESIA.

The main objective of the Scoping was to ascertain the environmental and social issues associated with the Project on which ESIA study will be focused. For this purpose, the project documents were reviewed and site survey was undertaken to understand the environmental and social sensitivities prevailing in the project area. Based on this, likely environmental and social issues associated with the Project activities were ascertained through matrices during both construction and operation phases.

8.2.5. Stakeholder Identification and Analysis

On the basis of the understanding developed in the initial stages, the potential stakeholders for the Project were identified. The purpose of such an understanding was to allow for a proper assessment and mitigation of the impacts. On the basis of this understanding, an exercise of stakeholder mapping was undertake, the purpose of which was to:

- Identify each stakeholder group
- Study their profile and nature of anticipated impacts;
- Understand each groups' specific issues, concerns and expectations from projects in the area; and
- Gauge their influence on the Project.

8.2.6. Site Survey and Preliminary Consultations

PwC team has undertaken multiple site visits from 11th August to 14th August and from 26th August to 28th August for site investigation and field survey to collect the primary data during the period and undertook following activities:

- Identification of key social and environmental risks/receptors in the study area;
- Understanding of human resource and labour issues, inclusive of potential occupational health and safety aspects;
- Overview of community health and safety, if any, linked to the operations;
- Understanding land-based impacts; livelihood impacts; issues of vulnerable groups; cultural heritage issues'
- Understanding significance of impacts on biodiversity and natural resource management;

8.2.7. Environmental Baseline Data Collection

Environmental baseline data was collected through field surveys of the area of influence from 11th August to 14th August, 2015. Secondary information through literature surveys was also collected for the study area. The baseline study included the following:

- Reconnaissance survey of the project site and surrounding area (defined as study area) to ascertain prevailing features of the biophysical and social environments;
- Primary environmental baseline data collection through field survey and monitoring with respect to socio-economic characteristic and ecology; and
- The secondary data was collected through various documents available in the public domain with respect to micrometeorology; air, noise, water, and soil quality; land use patterns, geomorphology, at regional level.

8.3. Applicable Legal and Regulatory Framework

This section highlights the regulatory requirements set out by Government of Bangladesh (GoB) and IFC in relation to protection of environment and its resources as well as protection of the social environment from adverse impacts associated with the project development. These requirements are summarized below.

8.3.1. *Bangladesh Environmental Policy, Regulations, and Guidelines National Environmental Policy, 1992*

The Bangladesh National Environmental Policy, approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines.

Key elements of the Policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protection and conservation of the environment;
- Protecting the country from natural disasters;
- Identifying and regulating all activities that pollute and destroy the environment;
- Ensuring environment-friendly development in all sectors;
- Ensuring sustainable and environmentally sound management of the natural resources; and
- Maintaining active association, as far as possible, with all international initiatives related to environment.

The Policy ensures that transport systems, including roads and inland waterways, do not pollute the environment or degrade resources. The Policy states that an Environmental and Social Impact Assessment (ESIA) should be conducted before the projects Commence.

8.3.2. *National Environment Management Action Plan (NEMAP), 1995*

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005, and sets out the framework through which various decisions, plans, legislative measures, rules and regulations toward safeguarding the environment and natural resources including those of biological diversities are to be implemented.

NEMAP was developed based on the following broad objectives:

- Identification of key environmental issues affecting Bangladesh;
- Identification of actions necessary to halt or reduce the rate of environmental degradation;
- Improvement of the natural environment;
- Conservation of habitats and bio-diversity;
- Promotion of sustainable development; and
- Improvement of the quality of life of the people.

To this end, it has grouped all the relevant necessary actions under four headings: institutional, sectoral, location-specific and long-term issues. The institutional aspects reflect the need for inter-sectoral cooperation to tackle environmental problems that need new and appropriate institutional mechanisms at national and local levels. The sectoral aspects reflect the way the Ministries and agencies are organized and make it easier to identify the agency to carry out the recommended actions. The location-specific aspect focuses on particularly acute environmental problems at local levels that need to be addressed on a priority basis. The long-term issues include environmental degradation of such degree that it might become more serious and threatening than they seem to be if their cognizance is not immediately taken.

According to the NEMAP, the GoB environmental policy makes specific statements on energy and fuel, including the aim to “Reduce and discourage the use of those fuels that pollute the environment and encourage the use of fuels that are environmentally sound and less harmful.”

8.3.3. *The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)*

The provisions of the Act authorize the Director General (DG) of Department of Environment to undertake any activity he deems fit and necessary to conserve and enhance the quality of environment and to control, prevent and mitigate pollution. The main highlights of the act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful for the environment;
- Regulation of development activities from an environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste; and
- Formulation of environmental guidelines relating to control and mitigation of environmental pollution, conservation and improvement of environment.

8.3.4. *Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)*

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules covers the following:

- The national Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise and vehicular exhaust;
- Categorization of industries, development projects and other activities on the basis of actual (for existing industries/development projects/activities) and anticipated (for proposed industries/ development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities; and
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

8.3.5. *The ESIA Guidelines for Industry, 1997*

The ESIA Guidelines is a handbook comprising procedures for preparing an ESIA and for reviewing an ESIA for the benefit of the development partners, ESIA Consultants, reviewers, and academics. While preparing these guidelines, the present environmental status as well as the need for rapid economic development of Bangladesh has been considered. These considerations have essentially resulted in simpler procedures to be followed for preparing and/or reviewing an EIA.

The process for ESIA approval and obtaining an Environmental Clearance Certificate (ECC) from the DoE is illustrated in Figure below:

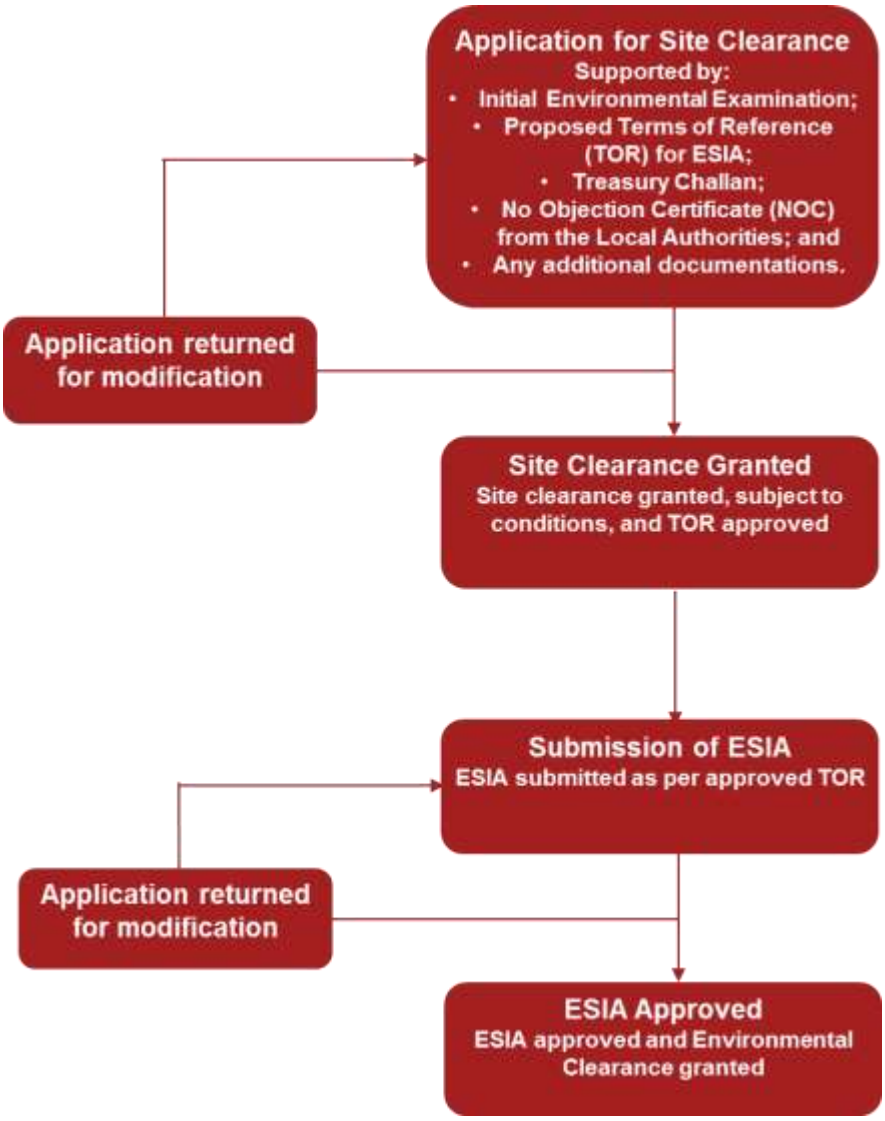


FIGURE 81: PROCESS FOR ESIA APPROVAL AND ENVIRONMENT CLEARANCE CERTIFICATE

8.3.6. *International Finance Corporation's Performance Standards on Environmental & Social Sustainability*

International Finance Corporation (IFC) applies the Performance Standards to manage environmental and social risks and impacts and to enhance development opportunities in its private sector financing in its member countries eligible for financing. The Performance Standards may also be applied by other financial institutions choosing to support them in the project.

Together, the eight Performance Standards establish standards that the client is required to meet throughout the life of an investment by IFC or other relevant financial institution:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labour and Working Conditions;
- Performance Standard 3: Resource Efficiency and Pollution Prevention;
- Performance Standard 4: Community Health, Safety and Security;

- Performance Standard 5: Land Acquisition and Involuntary Resettlement;
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- Performance Standard 7: Indigenous Peoples; and
- Performance Standard 8: Cultural Heritage.

These performance standards and guidelines provide ways and means to identify impacts and affected stakeholders and lay down processes for management and mitigation of adverse impacts, which in detail are described subsequently in the Table below:

TABLE 74: INTERNATIONAL FINANCE CORPORATION'S PERFORMANCE STANDARDS

Performance Standard	Outlines	Details
PS 1: Social and Environmental Assessment and Management Systems	Social and Environmental Assessment and Management Systems for managing social and environmental performance throughout the life cycle of the Project and runs through all subsequent PSs.	A Social and Environmental Assessment to understand the social and environmental impacts and risks; A Management Program for mitigating the impacts and minimizing the risks identified in the assessment; Establishing and ensuring organizational capacity and requisite trainings to the staff to implement the Management Programme; Engagement with the community to ensure free prior informed consultation (FPIC), community grievance redress constructive relationship all through the project life cycle; and Adequate monitoring and reporting systems to measure and report the effectiveness of the Management Programs.
PS 2: Labour and Working Conditions	The economic growth through employment creation and income generation is recognised and balanced protecting the basic rights of workers. This PS outlines the minimum requirements of working conditions, protection to the workforce (including issues of child and forced labour) and ensuring occupational health and safety of both its 'employees' as well as 'non-employees' working through contractors.	The PS requires: Establishment of a sound worker-management relationship; Encouraging equal opportunity and fair treatment of workers; Promoting compliance with national labour and employment laws; and Promoting healthy and safe working conditions for workers. PS 2 requires project proponents to conduct its activities in a manner consistent with the four core labour standards (child labour, forced labour, non-discrimination, and freedom of association and collective bargaining). In addition, PS 2 also addresses other areas such as working conditions and terms of employment,

		retrenchment, and occupational health and safety issues.
PS 3: Resource Efficiency and Pollution Prevention	PS 3 outlines the approach to pollution prevention and abatement in line with internationally disseminated technologies and practices	The objectives of PS 3 is to: Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from activities; Promote more sustainable use of resources including energy and water; and Promote the reduction of emissions that contribute to climate change. PS 3 outlines a project approach to Pollution Prevention and Abatement (PPA) in line with internationally disseminated technologies and practices. It recognises the need to implement technically and financially feasible and cost effective measures in the project for improving efficiency in its consumption of energy, water as well as other resources and material inputs. It also describes the measures to take into account the potential impact of emissions on the ambient conditions (such as ambient air quality) and seek to avoid or minimise these impacts within the context of the nature and significance of pollutants emitted.
PS 4: Community Health, Safety & Security	PS 4 requires a project to evaluate risks and impacts to the health and safety of the affected community during the Project life cycle and establish measures to avoid minimize and reduce risks and impacts from the Project.	PS 4 recognises that project activities, equipment, and infrastructure often bring benefits to communities including employment, services, and opportunities for economic development. However, projects can also increase the potential for community exposure to risks and impacts arising from equipment accidents, structural failures, and releases of hazardous materials. The performance standard details out project proponents responsibility to avoid or minimise the possible risks and impacts to community health, safety and security that may arise from project activities.
PS 5: Land Acquisition and Involuntary Resettlement	This PS applies to physical or economic displacement resulting from the following types of land transactions: Type I: Land rights for a private sector project acquired through expropriation or other compulsory procedures;	The objectives of this PS are to: Avoid or at least minimize the involuntary resettlement wherever feasible by exploring alternative project designs; Mitigate adverse social and economic impacts from land acquisition or restrictions on affected persons' use of land by: Providing compensation for loss of assets at replacement cost; and

	Type II: Land rights for a private sector project acquired through negotiated settlements with property owners or those with legal rights to land, including customary or traditional rights recognised or recognisable under the laws of the country, if expropriation or other compulsory process would have resulted upon the failure of negotiation; and	Ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. Improve or at least restore the livelihoods and standards of living of displaced persons; and Improve living conditions among displaced persons through provision of adequate housing with security of tenure at resettlement sites. PS 5 require a project to consider various processes and systems to avoid /minimise social and economic impacts related to land acquisition and resettlement. This PS does not apply to resettlement resulting from voluntary land transactions (i.e. market transactions in which the seller is not obliged to sell and the buyer cannot resort to expropriation or other compulsory procedures if negotiations fail).
PS 6: Biodiversity Conservation and Sustainable Management of Natural Living Resources	PS 6 aims at protecting and conserving biodiversity, the variety of life in all its forms, including genetic, species and ecosystem diversity and its ability to change and evolve, is fundamental to sustainable development.	This PS addresses how clients can avoid or mitigate threats to biodiversity arising from their operations as well as incorporate sustainable management of renewable natural resources. PS 6 recognises that protecting and conserving biodiversity—the variety of life in all its forms, including genetic, species and ecosystem diversity—and its ability to change and evolve, is fundamental to sustainable development. It reflects the objectives of the Convention on Biological Diversity to conserve biological diversity and promote use of renewable natural resources in a sustainable manner.
PS 7: Indigenous Peoples	PS 7 acknowledges the possibility of vulnerability of indigenous people owing to their culture, beliefs, institutions and living standards, and that it may further get compromised by one or other project activity throughout the life cycle of the project.	The PS underlines the requirement of avoiding / minimizing adverse impacts on indigenous people in a project area, respecting the local culture and customs, fostering good relationship and ensuring that development benefits are provided to improve their standard of living and livelihoods. PS 7 recognises that Indigenous Peoples, as social groups with identities that are distinct from dominant groups in national societies, are often among the most marginalised and vulnerable segments of the population. Objectives of PS 7 underscore the need to avoid adverse project impacts on Indigenous Peoples' communities living in the project's area of influence, or where avoidance is not feasible, to minimise, mitigate or compensate for such impacts through mechanisms that are tailored to their specific cultural characteristics and

		expressed needs of the Indigenous Peoples, in a manner commensurate with the scale of project risks and impacts.
PS 8: Cultural Heritage	PS 8 aims to protect the irreplaceable cultural heritage and to guide clients on protecting cultural heritage in the course of their business operations. In addition, the requirements of this PS on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.	PS 8 recognises the importance of cultural heritage with an objective to: Protect cultural heritage from the adverse impacts of project activities; Support its preservation; and Promote the equitable sharing of benefits from the use of cultural heritage in business activities.

8.3.6.1. Project Classification as per IFC Performance Standard

With reference to the IFC's environmental and social screening criteria, it is anticipated that the Project will fall under "*Category B*". The proposed project is classified as Category B if its potential environmental impacts environmentally important areas such as forests, grasslands, or natural habitats or human beings are lesser adverse than Category A projects. The potential impacts can be site specific and may be irreversible but can be mitigated by migratory measures more readily than for Category A projects.

- **Potential limited reversible:** The environmental and social impacts of the project during the construction phase includes increase noise & vibration and air quality during the site preparation including setting of batching plants, labour camps, excavations for Ground mounted structures. The construction phase may also result in temporary changes in water quality at terminal present at the Project site and water availability;
- **Project Specific impacts and addressed through mitigation measures:** The site specific impacts related to the project encompasses effluents associated with port activities, hazardous material handling at port in different operations including hazardous cargo, oil, fuel and maintenance, generation of air pollutants from port operations, vehicles, land based engines and activities of ships, generation of noise from cargo handling, vehicular traffic, and loading/unloading of containers and ships. The project will also have an impact on transport and communication and employment. Mitigation measures are taken to address above mentioned impacts and their magnitude will be reduced.

8.4. Existing Environmental Scenario

The main objective of establishing environmental baseline is to provide a baseline against which potential impacts from construction and operational phases of any project can be compared. The other objective is to establish a baseline for parameters such as physical and physico-chemical parameters such as air, soil and water quality to ensure that any problems arising from existing sources are not erroneously attributed to the project under study. In the present study, the different environmental components examined for setting baseline conditions of the project area are physico-chemical, biological and socio-economical. In physicochemical component, parameters included are land, water quality, air quality, climate, and noise.

8.4.1. Methodology

The environmental and social baseline has been assessed covering the project area of influence. The PwC team conducted initial reconnaissance survey of the study area to investigate the physical appearance, the structures, activities, and environment along the river bank, etc. Based on the survey, the sampling locations for environmental quality monitoring were identified. Environmental and social baseline data was collected through primary surveys as well as secondary sources by literature survey and discussions with the concerned

stakeholders. This chapter describes the existing environmental scenario of the study area based upon the secondary data and primary data collected by PwC during August 2015.

8.4.1.1. Primary Baseline Data Collection

Monitoring of parameters such as air, noise, water including surface water and groundwater and sediment was done to collect information on physical parameters. Rapid ecological surveys and consultations were conducted to collect the information related to the biological environmental conditions of the study area. Stakeholder consultations were carried out by PwC to collect information on socio-economic status of the study area.

8.4.1.2. Secondary Baseline Data Collection

Secondary baseline data collection involved identifying and collecting available published material and documents. Information's on various environmental aspects (like soil, geology, hydrogeology, hydrology, drainage pattern, ecology etc.) meteorology, and socio-economic aspects was collected from different government departments, institutions, literatures etc.

8.4.2. Air Environment

The description of the existing air environment in the project area is based on data collected by PwC during August 2015 and secondary data collected from the Bangladesh Meteorological Department (IMD) and other sources.

8.4.3. Meteorology

Air quality of a region depends to a large extent upon the local micrometeorological conditions. Dilution and dispersion of pollutants is determined by the wind speed, wind direction, and rainfall which are regulated by the variation in temperature. Thus micrometeorology plays a vital role in determining the baseline air quality of any region.

The region has a tropical climate. There are two marked seasons, the rainy season (May to October) and dry season (November to April). The rainy season witnesses more than 85% of the total annual rainfall. The mean annual rainfall in the area is about 2200 mm, with peak rainfall occurring during June to August.

8.4.4. Temperature

Seasonal variation of temperature is not significant. Rainy season in Dhaka prevails for six months, from May to October, and rest of the six months, November to April is dry season. Monthly minimum and maximum temperatures and average minimum and maximum temperatures for the period 2005-2014 for Dhaka are given in below tables (data obtained from Bangladesh Meteorological Department). From the above data it can be seen that the monthly minimum (average) temperature at Dhaka varies between 13.50°C and 26.60°C and maximum temperature varies between 24.46°C and 34.50°C.

The minimum temperature data indicates December to February months experience relatively cold conditions. There is not much seasonal variation in maximum temperatures throughout the year.

TABLE 75: MONTHLY MINIMUM AND AVERAGE MINIMUM TEMPERATURE DURING JAN 2005 TO DEC 2014

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average of 10 years
Jan	14.20	13.50	12.50	14.50	14.80	12.80	12.20	14.50	12.30	13.70	**13.50**
Feb	18.30	19.40	16.80	15.20	17.20	16.20	16.90	16.00	17.50	15.80	**16.93**
Mar	22.40	21.90	19.60	22.00	21.40	23.30	21.50	22.10	22.10	20.60	**21.69**
Apr	24.10	23.80	23.70	24.50	25.90	26.40	23.20	23.70	24.40	25.10	**24.48**

May	24.20	25.00	25.90	24.90	25.20	25.90	24.60	25.80	24.80	26.70	**25.30**
Jun	26.80	26.10	25.50	26.30	26.70	26.70	26.30	26.90	27.20	26.50	**26.50**
Jul	25.80	26.70	25.80	26.30	26.70	27.40	26.70	26.70	27.00	26.90	**26.60**
Aug	26.70	26.50	26.40	26.50	26.30	27.10	26.50	26.60	26.20	26.30	**26.51**
Sep	26.00	25.80	26.50	26.20	26.30	26.60	26.40	26.80	26.30	26.50	**26.34**
Oct	24.40	24.70	23.80	23.80	24.20	25.10	24.70	24.30	24.20	24.00	**24.32**
Nov	19.80	19.90	19.90	19.00	20.20	20.90	19.20	19.10	18.50	19.70	**19.62**
Dec	15.70	15.80	15.00	16.90	15.40	15.50	15.00	14.50	15.60	15.10	**15.45**

TABLE 76: MONTHLY MAXIMUM AND AVERAGE MAXIMUM TEMPERATURE DURING JAN 2005 TO DEC 2014

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average of 10 years
Jan	24.50	25.30	24.60	24.50	25.90	23.80	23.40	24.10	24.20	24.30	**24.46**
Feb	29.10	31.30	27.10	26.10	29.70	28.90	28.70	28.50	28.90	27.20	**28.55**
Mar	32.20	33.20	31.50	31.70	33.30	34.10	32.10	33.00	33.40	32.40	**32.69**
Apr	34.40	33.70	33.70	34.50	35.60	35.50	33.50	33.50	34.20	36.40	**34.50**
May	33.20	33.80	34.80	34.70	34.60	34.30	33.40	34.60	31.70	35.20	**34.03**
Jun	33.40	32.40	32.50	32.50	34.50	33.10	32.60	33.20	33.70	33.20	**33.11**
Jul	31.50	32.40	31.50	31.80	32.30	33.00	32.30	32.60	32.70	32.90	**32.30**
Aug	32.10	32.50	32.50	32.10	32.50	33.10	31.10	32.60	32.00	32.20	**32.27**
Sep	32.80	31.90	32.00	32.60	32.50	32.50	32.40	32.90	32.60	32.90	**32.51**
Oct	30.60	32.30	31.50	31.40	32.20	32.40	32.70	32.30	31.50	32.20	**31.91**
Nov	29.10	29.70	29.00	29.70	30.20	30.10	29.70	28.70	30.20	30.20	**29.66**
Dec	27.10	26.90	25.80	25.60	26.00	26.10	25.00	24.00	26.30	24.50	**25.73**

The above data indicate that the temperature and relative humidity in Dhaka are relatively high; thus the climate is hot and humid throughout the year.

8.4.5. Relative Humidity

As would be expected, relative humidity during the wet season is significantly higher than those occurring at other period of the year. The average relative humidity at Dhaka varies between 57.30 % in the month of March and 80.20 % in the month of August, as shown in the below Table.

TABLE 77: MONTHLY AVERAGE RELATIVE HUMIDITY DURING JAN 2005 TO DEC 2014

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average of 10 years
Jan	68.00	69.00	68.00	69.00	72.00	71.00	69.00	66.00	65.00	72.00	**68.90**
Feb	60.00	65.00	68.00	61.00	55.00	56.00	54.00	52.00	55.00	62.00	**58.80**
Mar	66.00	53.00	54.00	67.00	53.00	59.00	57.00	57.00	55.00	52.00	**57.30**
Apr	66.00	67.00	69.00	64.00	66.00	67.00	64.00	69.00	63.00	56.00	**65.10**
May	73.00	72.00	70.00	70.00	72.00	71.00	76.00	70.00	78.00	68.00	**72.00**
Jun	79.00	81.00	81.00	80.00	74.00	79.00	80.00	77.00	76.00	78.00	**78.50**
Jul	81.00	80.00	84.00	83.00	80.00	77.00	79.00	79.00	77.00	77.00	**79.70**
Aug	82.00	77.00	80.00	81.00	82.00	78.00	82.00	78.00	80.00	82.00	**80.20**
Sep	81.00	80.00	80.00	81.00	81.00	79.00	77.00	79.00	81.00	76.00	**79.50**
Oct	80.00	76.00	78.00	77.00	73.00	74.00	73.00	71.00	78.00	72.00	**75.20**
Nov	72.00	68.00	77.00	69.00	66.00	68.00	67.00	68.00	66.00	66.00	**68.70**
Dec	66.00	69.00	69.00	79.00	69.00	66.00	73.00	77.00	72.00	77.00	**71.70**

The above data indicate that relative humidity in the region is relatively high.

8.4.6. Rainfall

The data on monthly rainfall for Dhaka (obtained from BMD) are presented in the below Table. The average monthly total rainfall at Dhaka for the period Jan 2005 to Dec 2014 varied between 0.11 mm in the month of January and 13.32 mm in the month of July. The rainfall follows the general climate pattern with the highest rainfall in the summer month of June to September and minimum rainfall in the winter months of November to March.

TABLE 78: MONTHLY TOTAL AND 10 YEARS AVG MONTHLY RAINFALL DURING JAN 2005 TO DEC 2014

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average of 10 years
Jan	0.03	0.00	0.00	0.74	0.03	0.00	0.00	0.32	0.00	0.00	0.11
Feb	0.11	0.00	1.07	2.00	0.04	1.71	0.00	0.04	0.29	0.43	0.57
Mar	5.00	0.00	0.35	1.45	1.39	0.71	0.65	1.19	0.84	0.32	1.19
Apr	3.03	6.03	5.43	3.03	0.47	1.23	4.10	8.97	1.07	2.67	3.60
May	9.39	5.97	5.97	6.61	5.42	5.71	7.58	4.42	12.19	4.74	6.80
Jun	8.63	10.87	20.93	19.23	5.67	10.27	10.47	5.83	10.83	11.40	11.41
Jul	17.48	10.68	24.29	18.16	21.81	5.39	11.48	7.29	9.74	6.84	13.32
Aug	11.65	5.39	16.29	10.29	15.55	10.97	13.19	9.10	6.84	12.61	11.19

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	Average of 10 years
Sep	17.13	22.10	5.97	9.30	9.93	5.63	6.90	2.70	5.73	5.20	9.06
Oct	13.45	1.97	10.32	7.32	2.39	5.61	3.61	1.23	4.23	1.58	5.17
Nov	0.10	0.17	3.70	0.00	0.13	0.00	0.00	2.27	0.00	0.00	0.64
Dec	0.00	0.00	0.00	0.00	0.00	2.61	0.00	0.16	0.13	0.00	0.29

8.4.7. Wind Speed and Direction

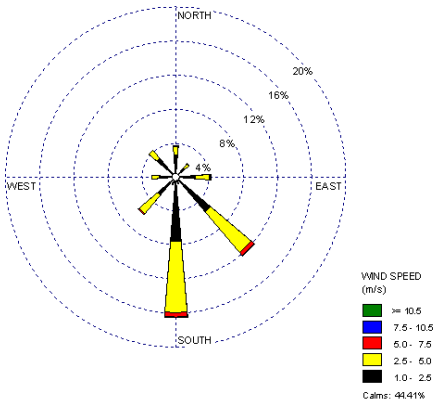
The wind speed and direction of Dhaka district are depicted by wind rose diagram. A wind rose gives a very succinct but information-laden view of how wind speed and direction are typically distributed at a particular location. Presented in a circular format, the wind rose shows the frequency of winds blowing from particular directions. The length of each "spoke" around the circle is related to the frequency of time that the wind blows from a particular direction. Each concentric circle represents a different frequency, emanating from zero at the centre to increasing frequencies at the outer circles.

January to December wind rose and monthly wind roses, and wind classes for Dhaka (collected from BMD) are presented in the below Exhibits. These wind roses and wind classes are average of last 30 years. It can be seen from these exhibits that at Dhaka, dominant wind speed is in the calm condition followed by 1 to 2.5 m/sec. The predominant wind direction from Jan to Dec is south followed by south-east.

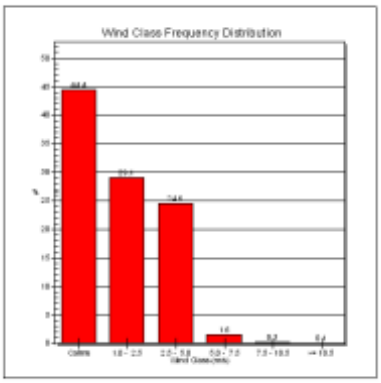
The monthly wind roses indicate the following trend: NW and northerly winds prevail in January, November and December; wind flows multi-directional in February and October; the predominant wind direction is south followed by SW in March; in April the wind direction is south, the predominant wind direction is south followed by SE from May to July; and in August and September the predominant wind direction is SE followed by south.

98% of time the wind speed is less than 5 m/s. Out of this half the time (44.4%of the time) is calm condition throughout the year. This indicates the weather conditions are not favourable for dispersion of pollutants released in the air. Month wise prevailing wind speeds are as follows: predominantly calm conditions prevail during January to March and September to December periods. The remaining five months experience lesser calm conditions and wind speeds 1 – 2.5 and 2.5 – 5 wind speeds prevail.

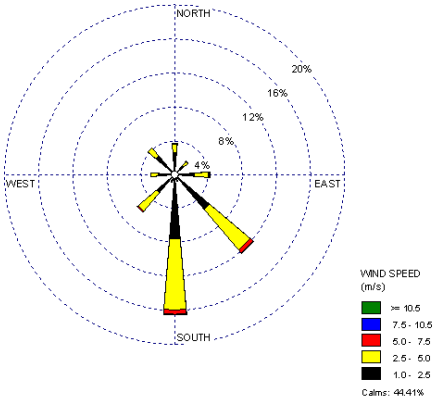
Wind Rose January - December



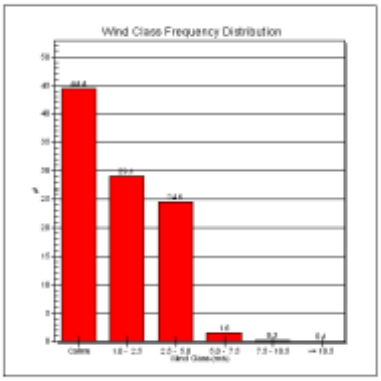
Wind Class January - December



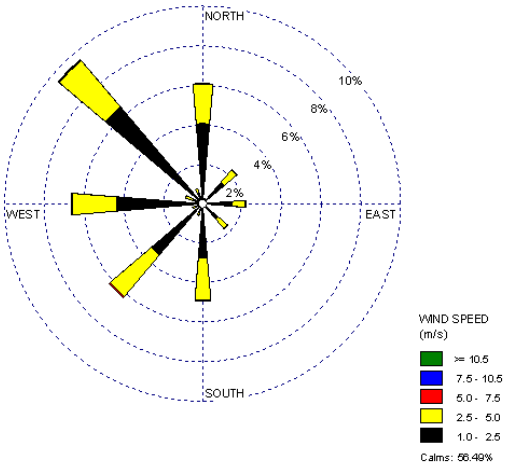
Wind Rose January - December



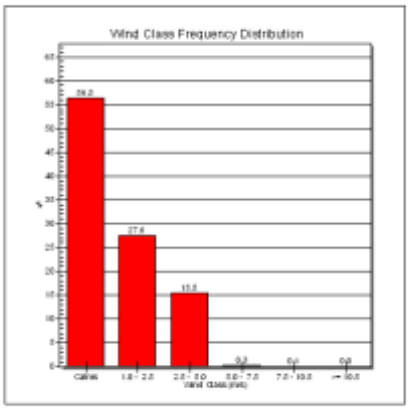
Wind Class January - December



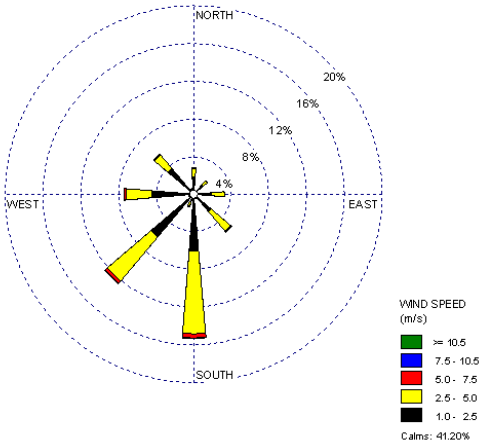
Wind Rose February



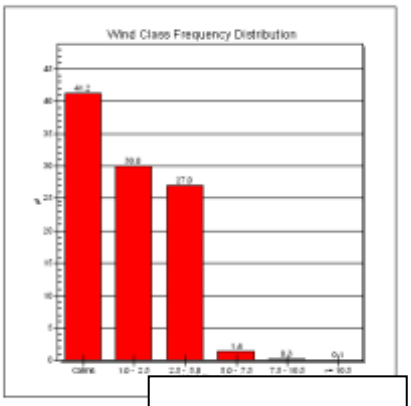
Wind Class February



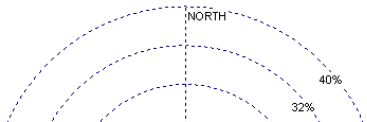
Wind Rose March



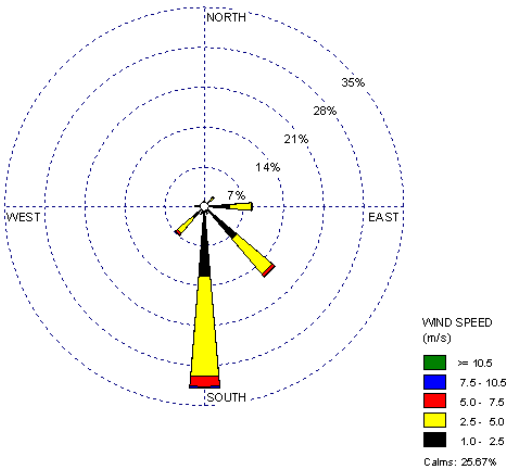
Wind Class March



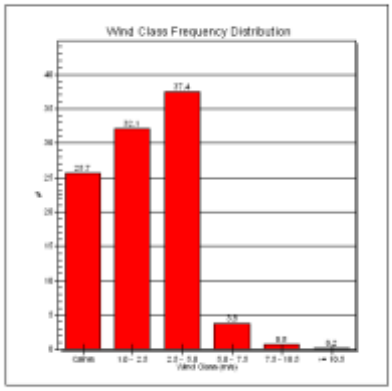
Wind Rose April



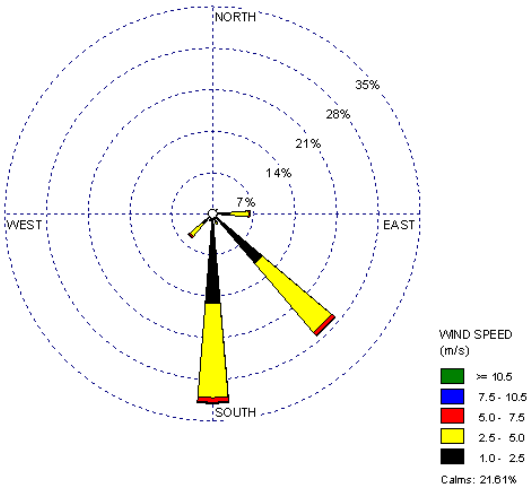
Wind Rose May



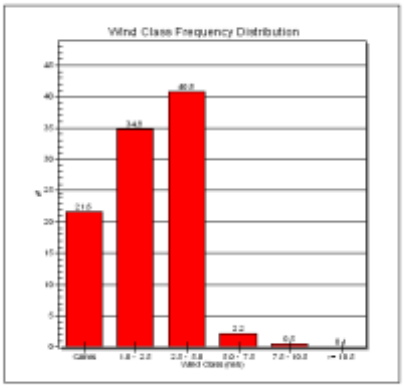
Wind Class May



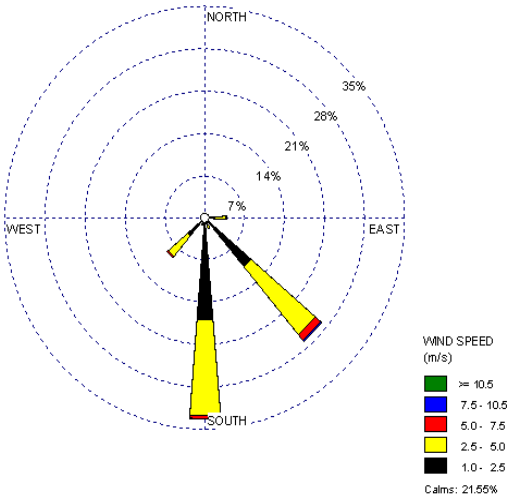
Wind Rose June



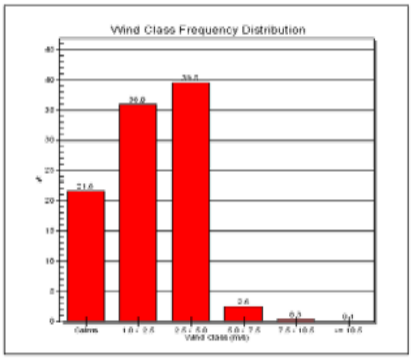
Wind Class June



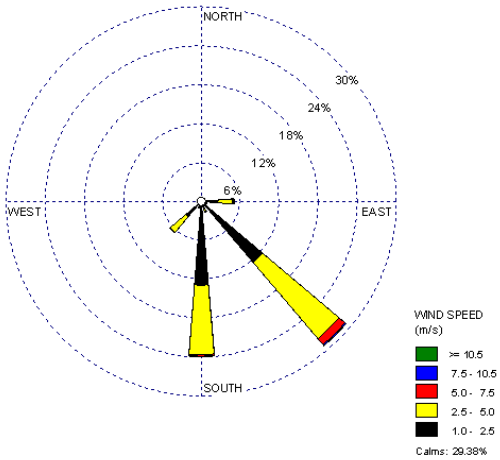
Wind Rose July



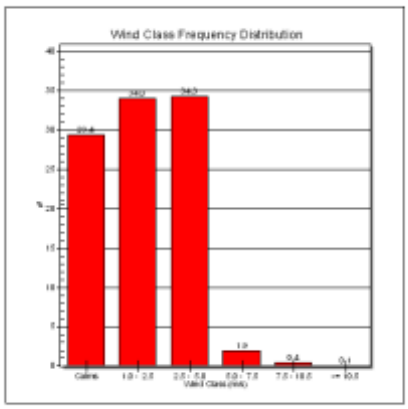
Wind Class July



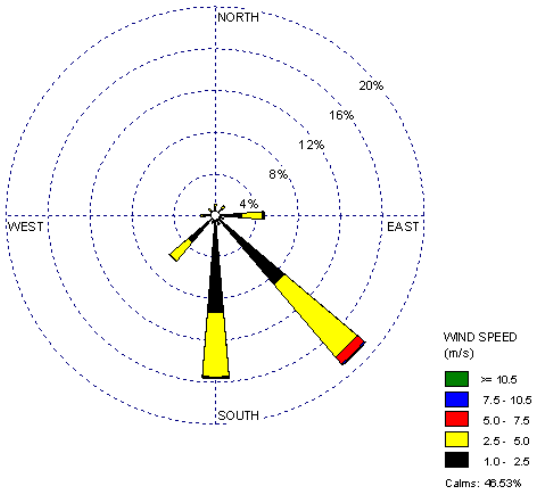
Wind Rose August



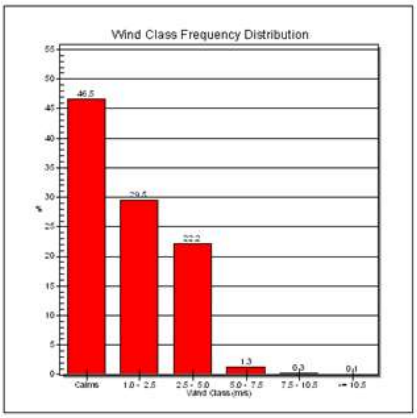
Wind Class August



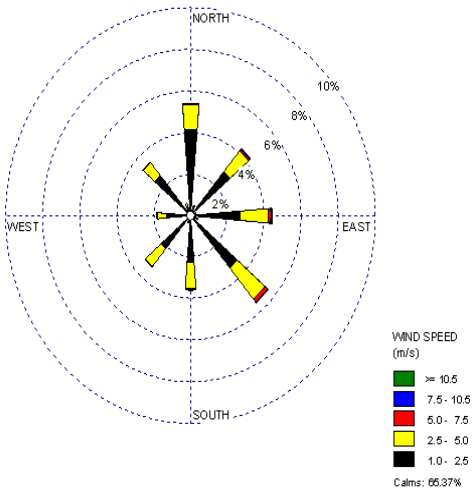
Wind Rose September



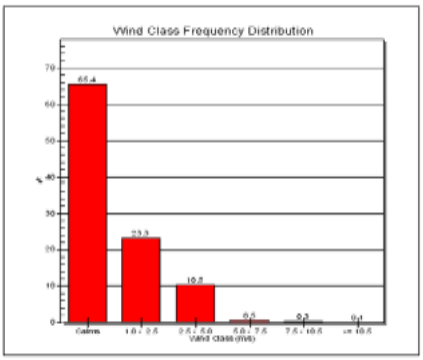
Wind Class September



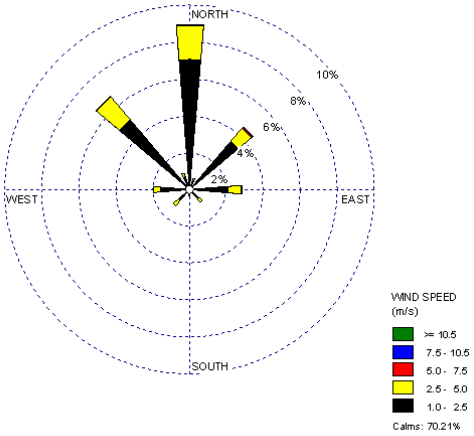
Wind Rose October



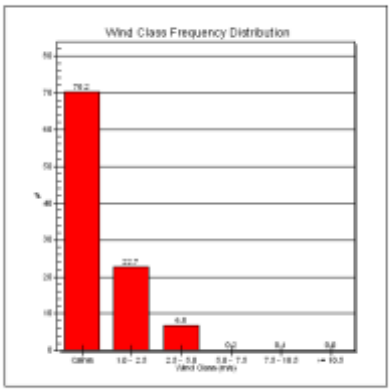
Wind Class October



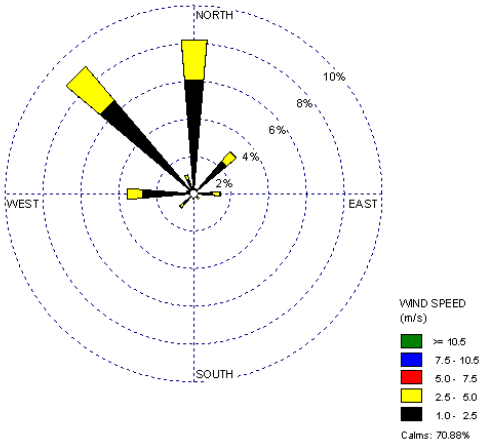
Wind Rose November



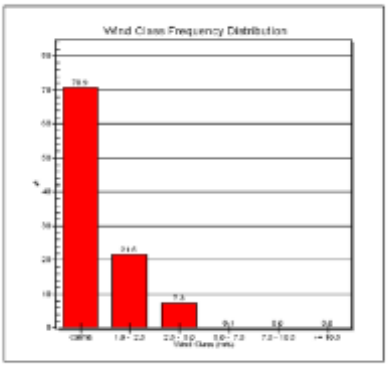
Wind Class November



Wind Rose December



Wind Class December



8.4.8. Ambient Air Quality

The ambient air quality presented in this section is collected from secondary data as well as primary monitoring. The following air quality is from a previous ESA study for a power plant in 2007 in Siddhirganj which is 7.3 km north of the proposed site. Air quality in Siddhirganj shows that the concentrations of SO_2, NOx, and CO are relatively low and below the national ambient air quality standard, while concentrations of SPM and PM_{10} are higher than the national standards.

Primary ambient air quality monitoring was carried out at four locations near the proposed site. The locations have been selected based on the probable impacts due to predominant wind directions. The selected locations are as follows:

- **Station 1**: Dredger base (representing proposed site)
- **Station 2**: Kellarpool village (500 m north to site)
- **Station 3**: Tolla village (approximately 1 km NW to the site)
- **Station 4**: Rosulbag go down (500 m SE to the site, other side of Shitalakhya River)

The monitoring has been carried out for SPM, PM_{10}, SO_2 and NOx at all the above locations.

8.4.9. Water Environment

Water environment includes surface water and groundwater. The only and major surface water body in the site is Shitalakhya River which is perennial in nature. The river flow from upstream contribute to the sediment load in the downstream, particularly during monsoon.

The Shitalakhya River originates from the old Brahmaputra and bifurcates into two courses at Toke in Gazipur district. One of the courses called the Banar flows SW and at Lakpur is renamed as the Shitalakhya. It then flows past the eastern side of Narayanganj town. The Shitalakhya falls into the Dhaleswari near Kalagachhiya. The length of the river is about 110 km and the width near Narayanganj is about 300 m but reduces to about 100 m in the upper reach. Its highest discharge has been measured at 2,600 cumec at Demra. The river is navigable throughout the year.

At present, a number of heavy industries are located on the banks of Shitalakhya. There are three thermal powerhouses located at Palash, north of Ghorashal, and one at Siddhirganj, on the bank of the river. The important river port of Narayanganj is also situated on its bank. The river was once famous for its clear and cool water. The river goes under tidal effect for about five months of the year but never overflows its banks.

8.4.10. Water Quality

Water quality was analysed from water samples taken in the Shitalakhya River and ground water. Two surface water samples one at upstream to the project location and another in the downstream were collected in August 2015.

8.4.10.1. Surface Water

The major surface water body in the area is Shitalakhya River. The river is one of the most prominent rivers in the flood plain region of Bangladesh. It is located in Narayanganj City, the second most vital industrial zone of the country. Various types of industrial units have been established on the bank of the Shitalakhya River; most of these industries directly or indirectly discharging a huge quantities of wastes and effluents into the river without any treatment and also municipal and domestic sewage sludge's from Narayanganj urban area, find their way untreated into this river.

Moreover, the river is the route of the communication with Chandpur, Chittagong as the port of cargo. Besides these, the people live on and around the Shitalakhya River utilizing its water for their household washing, bathing and other necessary daily works.

Primary water quality monitoring has been carried out in Shitalakhya River. These results along with secondary data results are presented in this section. Shitalakhya river water quality in upstream (7.3 km) in 2007 is presented in the below table (Taken from ESA of power plant at Siddhirganj 2007.

TABLE 79: QUALITY OF SURFACE WATER SAMPLES OF SHITALAKHYA RIVER (7.3 KM UPSTREAM)

Concentration					
S.No	**Parameters**	**Unit**	**South Outlet 210 MW plant**	**Intake**	**North Outlet 50 MW plant**
1	Phosphate, PO_4	mg/l	0.58	0.91	0.85
2	Sulphate, SO_4	mg/l	51.10	49.70	51.20
3	Nitrate-Nitrogen, NO_3-N	mg/l	0.20	0.20	0.10
4	Ammonia-Nitrogen, NH_3-N	mg/l	7.86	7.99	7.59
5	BODj at 20°C	mg/l	18.00	22.00	23.00
6	COD ($KMnO_4$Demand)	mg/l	48.00	58.00	57.00
7	Total Dissolved Solids (TDS)	mg/l	449.00	504.00	499.00

From the above table, high concentrations of ammonia, BODj and COD in the river water may probably indicate the source of organic pollutants from domestic and industrial sources. High concentration of sulphate and TDS is probably due to discharge of effluents from textile dyeing units.

Shitalakhya river water quality is being monitored by Department of Environment at three locations: Demra Ghat, Ghorashal Fertilizer factory and ACI factory at Narayanganj. The key takeaways from the results of the surface water quality monitoring include the following:

- In 2013, pH value of Shitalakhya River at all locations was within the standards for inland surface waters (6.5-8.5) for the reported period.
- Do was below standards (5 mg/L) at all locations, except at Ghorashal in June, August and September.
- BOD was high or very high compared to standard (6 mg/L for fisheries) during dry period (February, March and April). In wet season BOD is either within the limits or marginally higher. At Ghorashal FF, BOD was very high 47 mg/L in March.
- COD found to be within standard limits (200 mg/L for waste water after treatment) at all locations
- TDS varied from 5.0 to 523 mg/L as against the standard (2100 mg/L for wastewater after treatment)
- Chloride was much below the standard (600 mg/L for waste water after treatment) at all locations for the reported period.
- Suspended solids concentrations were much higher at Demra Ghat and Ghorashal FF during dry period. It was within limits (150 mg/L for waste water after treatment) in all other reported months at all locations.
- Electrical Conductivity was within the standard limits (1200 mg/L for waste water after treatment) at all locations in all reported months. At ACI Narayanganj, the EC is very close to the standard in April.
- Total alkalinity was reported higher values during dry season at Demra Ghat and ACI compared to standards (150 mg/L for waste water after treatment). At ACI the alkalinity was 220 mg/L in April.

8.4.10.2. Groundwater

A groundwater sample has been collected from a bore well near the site. It is learnt that about 5000 people use this water for drinking and other purposes.

Arsenic in Narayanganj groundwater: The following table is taken from research paper "Status of groundwater arsenic contamination in Bangladesh: A 14-year study report", Water Research - November 2010.

TABLE 80: ARSENIC IN NARAYANGANJ GROUNDWATER

Division	District	Area (km^2)	Population	Total no. of thana	No. of surveyed thana	No. of thana As >50 µg/l	No. of samples analyzed	Distribution of total samples in different As concentration (µg/l) ranges								Maximum concentration detected (µg/l)
								<10	10–50	51–99	100–299	300–499	500–699	700–1000	>1000	
Dhaka	Dhaka[a]	1459.56	8511228	27(6)	6	3	574	449	29	26	63	7	–	–	–	352
	Narayanganj	687.76	2173948	5	3	2	412	54	42	34	147	68	36	26	5	1750

The above table indicates that high concentration of arsenic is prevalent in Narayanganj district groundwater.

8.4.10.3. Sediment

Seven heavy metal concentrations were analysed in a bottom sediment from Shitalakhya River (ESA of power plant at Siddhirganj 2007). The results are presented in below table. The heavy metal contents of the bed sediment were well below those of the same soil samples collected from the proposed site.

TABLE 81: HEAVY METAL CONTENTS OF BED SEDIMENT OF THE SHITALAKHYA RIVER

S.No	Parameters	Unit	Concentration
1	Cadmium, Cd	mg/kg	<I
2	Chromium, Cr	mg/kg	12.8
3	Iron, Fe	mg/kg	960
4	Lead, Pb	mg/kg	19.3
5	Copper, Cu	mg/kg	53.7
6	Zinc, Zn	mg/kg	46.7
7	Mercury, Hg	mg/kg	<0.1

8.4.11. Land Environment

8.4.11.1. General Features

The proposed project envisages redevelopment of an existing jetty at Khanpur in Narayanganj area. The total area to be considered for terminal development is 52,500 m². The terminal area includes 38,000 m² which is currently used for truck parking, outdoor storage of navigation aid devices, cargo and dredging equipment. Additionally 14,500 m² is for foreshore land which is currently not used for operations. The 14,500 m² foreshore land have to be filled up to reach the same ground level with approx. 45,000 m³ of suitable soil.

8.4.11.2. Geomorphology

Extensive areas throughout the flood plain are occupied by broad ridges on which rather yellowish, friable, silt loams and silty clay loams predominate. Some of those have dark grey topsoils, Topsoils are acid when dry, but slightly alkaline when flooded; subsoils are moderately alkaline, but non-calcareous. In the southern half of Narayanganj district there are extensive deep basins which have dark grey compact clays with moderately alkaline subsoils usually overlying a yellowish, loamier substratum. Flooding depths are mainly less than 5 feet in the east but increases to 10 feet in west.

There is riverine system and plain land near the study area. Regarding the soil types in the surrounding area, Narayanganj is characterised by the following soil types (Statistical Year Book of Bangladesh 2012):

TABLE 82: TYPES OF SOIL

Soil type	Description
Non-calcareous	Raw sandy and silty alluvial deposits, usually stratified either from the surface or below the cultivated topsoil in the active floodplain areas (young char lands) or massive in the older flood plain areas.
Non-calcareous grey floodplain soils	Prismatic and/ or blocky structured predominantly grey sandy loams to silty clay loams on young floodplain ridges and silty clay loams to clays in basins. Slightly acid to neutral. They become saline in dry season in the coastal areas.
Non-calcareous dark grey floodplain soils	Structured dark grey loamy soils on old flood plain ridges and clay in basins. Slightly acid to somewhat alkaline in reaction. The basin clays have heavy consistence.

8.4.11.3. Land Cover

The below table provides and overview of the Land classes of the District is given in the following table (Statistical Year Book of Bangladesh 2012):

TABLE 83: NARAYANGANJ DISTRICT LAND CLASSES

Name of District	Hill	Cultivated Land						Miscellaneous Land	Grand Total
		HL	MHL	MLL	LL	VLL	Total		
Narayanganj	-	5643	9612	15255	7268	2242	40020	12444	52464
		11	18	29	14	4	76	24	100

HL – High Land, MHL – Medium High Land, MLL – Medium Low Land, LL – Low Land, VLL – Very Low Land

Out of the total cultivated land area, medium low land (29%) and medium high land (18%). 24% of land is covered by settlements, ponds, water bodies, river, channels, brick fields, etc.

8.4.11.4. Soil Quality

The soil profile of the study area consists of about 12m thick clay deposit followed by sand, clay and progressively coarser sand as depth increases. The soil quality at the proposed site was measured at one location.

8.4.12. Biological Environment

The river is characterized by the seasonal influences. As the region is rich in rainfall and other inputs, which encourage rich biodiversity in the region. Almost the whole of Narayanganj district lies on the meander flood plain. Most of this area is now flooded only by rain- water.

The flora fauna information provided in this section is collected through secondary sources.

8.4.12.1. Aquatic Flora-Fauna

The major aquatic system in the region is Shitalakhya River. The aquatic fauna of the district include several species. The following are the aquatic fauna:

Reptiles and Amphibians

Some known reptiles of this district are ganges soft shell *(Trionyse gangeticus)*, common roofed turtle *(Kachuga tecta),* yellow turtle *(Morenia petersi)*, shanda *(Gekko gecko),*

Common amphibians include bull frog *(Rana tigrina),* skipper frog *(Rana cyanophlyctis),* cricket frog *(Rana limnocharis)* and common toad (Bufo melanostictus).

Fishes

Different water bodies like rivers, canals, beels and ponds constitute habitats for fish population. The common fishes that are usually found here are hilsha *(Hilsa ilisa),* ruhi *(Labeo ruhita)*, mrigel *(Cirrhinus mrigala),* katla *(Catla catla),* kalbaush *(Labeo calbasu*), chital *(Notopterus chitala)*, pabda *(Ompok pabda),* pangas *(Pangasius pangasius),* shing *(Heteropneustes fassilis),* magur *(Clarias batrachus),* koi *(anabas testudineus)*, boal *(Wallago attu*), gazar *(Channa marulius),* shoil *(Channa striaxtus)*, tengra *(Mystus vittatus),* shar punti *(Puntius sarana),* phali *(Notopterus notopterus)* etc. In addition, some exotic variety of fishes like tilapia (*Oreochromis mossumbicus*), nailotica (*Oreochromis nailoticus*), grass carp (*Cteopharyngodon idella*) and mirror carp (*Cyprinus carpio*) have also become popular in this area.

It was learnt that during the previous decades there were abundance of large fishes like Carp fishes, Cat fishes, etc. Other aquatic lives found in the Shitalakhya River include freshwater dolphins (Shusuk), water monitors (Guishap), snakes, leeches, snails and crabs. Previously a large number of turtles, frogs, kuicha and crocodiles were found in this river but these are not seen any more.

Rare and Endangered Species

The red lists of plants and animals is an inventory of threatened species whose numbers are declining due to various reasons. Endangered fishes identified in Shitalakhya River (Siddirganj area) are Kalbaus (Labeo kalbasu), Bata / Bhagna (Labeo bata), Goina (Labeo gonius), Chital (Notopterus chitala), Foli (Notopterus notopterus), Khoksa / Tila (Barillus vagra), Kalabata (Crossochelit~slatius), Dhela / Mawa (Osteobrama cotio), Bhol (Raiamas bola), Botya / Rani (Botia Dario), Guizza Ayer (Aorichthys seenghala), Pabda (Onzpok pabo), Modhu Pabda (Ompokpabda), Shilong (Silonia silondia), Bacha (Eutropinhthys b'acha), Bacha (Eutropinhthys b'acha), Pangus (Pangius pangius), Baghair (Bagarius bagarius), Cheua (Sisor rhabdophorus).

8.4.12.2. Terrestrial Flora-Fauna

Terrestrial Fauna

Mammals

Mammals that are commonly seen in the district are Indian pipistrelle *(Pipistrellus coromandra),* tickell's bat *(hesperotenus ticklli)*, jackal or shial (*Asiatic jackal*), benji *(Herpestes auropunctatus),* dura kathbirali *(Funambulus pennanti),* rat *(Bandicata bengalensis)* house mouse *(Mus musculus),* metho indur *(Mus booduga)*, ud biral *(Aonyxe cincrea)* etc.

Reptiles

House lizard (hemidactylus brooki), ghargini shap *(Lycodon jara),* rat snake (Ptyas nigromarginatus) paina shap (Enhydris enhydris), banded krait *(Bungarus fasciatus)* and common cobra *(Naja).*

Birds

The common birds of the district include doel *(Copsychus saularis),* bhat shalik *(Acredotheres tristis),* tila ghugu *(Streptopelia chinensis),* tia *(Psillacula Krameri),* babui *(ploceus philippinus),* sparrow or charui *(Domesticus),* house crow *(Corvus splendens),* brahminy kite *(Haliaster indus),* cacatua *(greater sulphur crested),* machhranga *(Alcedo atthis),* pond heron *(Ardeola grayii),* little cormorant *(Phalacrococan niger),* cuckoo *(Cuculus microplerus),* kali pencha *(Glaucidium radiatum)*, choto fingey *(Dicrurus macrocercus),*

haldey pakhi *(Oriolus xanthornus)*, laxmi pencha *(Tyto alba),* water rail *(Rallus aquaticus),* leser whistling teal *(Dendrocygna javanica),* dahuk *(Amaurorinis phoenicurus),* spotted munia *(Lonchura punctulata,)* kath thokra *(Picus myrmecophoneus)* etc.

Besides, a large number of migratory birds visit the district during winter season. They are mainly seen in wet land areas. However, some of them are also seen in this district. These include common pochard *(Aythya ferina),* plover (*Charadrius alenasdrinus),* herring gull *(Larus orgentatus),* marsh harrier *(Circus aeruginosus),* common tern *(Sterna hirusdo),* tufted *duck (Aythya fuligula),* little ringed plover *(Charadrius dubius*), greyleg goose *(Anser anser)*, common teal (*Nettapus coromandelianus),* pinail *(Anas acuta),* common shelduck *(Tadorna ferruginea)*, brahminy duck *(Fadorna firruginea),* pintailed snipe (*Gallinago stenura),* fantail snipe *(Gallinago gallinago),* tree pipit *(anthus hodgsoni),* brown shrike *(Lanius cristatus),* grey wagtail *(Motacilla cinera),* common sand piper *(Tringa hypoleucos),* large pariah kite *(Milvus migrant lineatus),* common swallow *(hirundo rustica)* etc.

Terrestrial Flora

The District represent various types of commonly planted trees. These are mango *(Mangifera indica),* jackfruit *(Artocarpus heterophyllus)*, kalojam *(Syzygium cumini*), betelnut pulm *(Areca catechu),* coconut palm *(cocos nucifera),* guava *(Psidium guajava),* jambura *(Citrus decumana)*, mandar *(Erythrina veriegata)*, kadam *(Anthocephalus cadamba)*, sheel koroy *(Albizzia procera)*, sajna *(Moringa obifera)*, dalim *(Punica granatum*), palash *(Butea monosperna)* etc.

Common way side trees are tetul *(Tamaraindus indica),* neem *(Azadirachta indica),* hijol *(Barringtonia acutangula),* banyan *(Ficus bengalensis*), ashatha *(Ficus religlosa)*, raintree *(Samanca saman),* pitraj *(Aphanamixls polystachia)*, simul (*Bobbax ceiba*), krishnachura (*Delonix regia*), debdaru (*Polyalathia longifolia*) etc.

Moreover, some vegetations like kachuripana (*Telanthera philoxeroides*), topa pana (*Pistiastratiotes lemna spirodela*), khudipana (*Lemna paucicastata*), paniphal (*Trapa bispinosa*) etc. are seen in different ponds of the district. And in the shallower waters are found species of shapla, padma, kalmi, helencha and the like.

8.5. Socio-Economic Environment

Narayanganj came into existence as a sub-division of former Dhaka District in 1882. It was upgraded to a zila in 1984. Narayanganj, the oldest and the most prominent river port of Bangladesh, grew into a prominent place of trade and commerce in the long past for which it was previously known as a Ganj.

Narayanganj district is bounded on the north by Gazipur and Narsingdi districts, on the east by Brahmanbaria and Comilla districts, on the south by Munshiganj district and on the west by Dhaka district. The total area of the district is 684.37 sq. km. It lies between 23033´ and 23 o 57´north latitudes and between 90 o 26´ and 90 o 45´ east longitudes.

Narayanganj subdivision was established in 1882 and was turned into a district in 1984. Narayanganj municipality was established in 1876. The area of the town is 18.7 sq. km. The district consists of 5 upazila, 41 union, 619 mauza, 1204 village, 6 paurashava, 54 ward and 282 mohalla. The upazilas are Araihazar, Bandar, Narayanganj Sadar, Rupganj and Sonargaon.

There are a few rivers and rivulets flowing through the district. Among those the Shitalakhya, the Dhaleshwari, the Buriganga, the Balu and the Meghna are important. Those are non-tidal and navigable throughout the year. They have been playing a vital role in the economy of the district as they facilitate irrigation, drainage, and water supply of the area. The riverine area is about 111.46 sq.

Almost the whole of Narayanganj district lies on the meander flood plain. Most of this area is now flooded only by rain- water. Only minor areas near the Lakhya, Old Brahmaputra, Meghna and Dhaleswari rivers are affected by river water and receive fresh silt deposits. A wide variety of soils occurs in this district. Extensive areas throughout the flood plain are occupied by broad ridges on which rather yellowish, friable, silt loams and silty clay loams predominate. Some of those have dark grey topsoils, Topsoils are acid when dry, but slightly alkaline when flooded; subsoils are moderately alkaline, but non-calcareous. In the southern half of Narayanganj district there are extensive deep basins which have dark grey compact clays with moderately alkaline subsoils usually overlying a yellowish, loamier substratum. Flooding depths are mainly less than 5 feet in the east but increases to 10 feet in west.

Narayanganj district is home for merchandising and manufacturing of jute, yarn, dying items and weaving industry. Majority of the population in this district is engaged in international trading, import and export business, garments industries, knitwear garments, shipyard, brickfield etc. The major income generating activities of the people in this district is business and working in the mill and factories.

The rural economy of Narayanganj is agricultural. Out of total 5,32,415 holdings of the district 22.44 % holdings are farms. Various fruits like banana, guava are grown and fish of different varieties abound in this district. Varieties of fishes are caught from rivers, channels, creeks and from paddy fields during rainy season. The major income generating activities of the people in this district is business and working in the mill and factories.

8.5.1. *Demographic Features*

The demographic features of Narayanganj Sadar upazila are listed in table below:

TABLE 84: NARAYANGANJ SADAR UPAZILA DEMOGRAPHIC FEATURES

Household	**3,13,312**
Population total	13,24,000
Male	6,91,000
Female	6,33,000
Sex ratio	109
Population density (per km²)	13,183

The total population of the area was 13.24 lakhs in 2011, with a population density of 13183 persons/km². The sex ratio indicates that the number of females marginally exceeded the number of males in the area.

8.5.2. *Literacy and Educational Facilities*

The overall literacy was moderate at 62.7% in Narayanganj Sadar upazila in 2011. The male literacy was 65.3% and female literacy was 60% in 2011.

The details of educational facilities in Narayanganj Sadar upazila in 2011 is presented in the table below:

TABLE 85: NARAYANGANJ SADAR UPAZILA EDUCATIONAL FACILITIES

Education facility	Number of schools in upazila	Number of students
Government primary school (class I-V)	104	134162
Registered primary school (class I-V)	7	3582
Private (non-registered) primary school (class I-V)	6	3016
Kindergarten school (pre schooling)	91	18548
NGO school	63	3465
Government secondary school	2	2375
Non-government secondary school	62	58114
School & college (operating jointly)	3	21876
Non-government college	6	23712
Madrasah schools under Madrasah education board	20	3816

Education facility	Number of schools in upazila	Number of students
Kawmi madrasah	31	1395
Ebtedayee madrasah	27	1161
Technical and vocational institutions	1	332
Medical college	1	307

It can be seen the enrolment of students for higher education, however, has declined.

8.5.3. *Fishermen Population*

In Madanganj Sadar upazila, there are 497 fishermen in 2010-11 and the total fish production was 5836 metric tonnes in the same year. Majority of fishing happens in ponds and flood plains in the district.

8.5.4. *Amenities*

The number of post offices and banks as off 2011 in Narayanganj Sadar upazila area is presented in table below:

TABLE 86: NUMBER OF POST OFFICE, BANK, AND PUBLIC LIBRARIES IN 2011

Facility	Number
Post office	24
All nationalized bank branches	51
All private bank branches	21
Public library	3

There are 88 number of daily hat-bazars and 2 number of weekly hat-bazars exist in Narayanganj Sadar upazila. There is a good network of roads in Narayanganj Sadar upazila. There is 606.9 km road is available in 2011. Out of this 148.3 km metalled, 19.5 km is semi-metalled, and 439 km is un-metalled (kacha) road.

8.5.5. *Health Care Facilities*

There is a 300 bed health complex in Narayanganj Sadar upazila as on 2011. The other health facilities are given in the table below:

TABLE 87: NUMBER AND TYPE OF HEALTH FACILITY IN NARAYANGANJ IN 2011

Type of Health facility	Number	Number of beds
Private hospital/clinic	35	495
Diagnostic centre	53	
Missionary hospital and charitable dispensary	1	

In addition, there are 1744 physicians, 1570 MBBS doctors, 114 LMF practitioners, 32 Unani/Ayurvedic practitioners and 28 homeopathy practitioners in the upazila.

8.5.6. *Industrial and Occupational Pattern*

The district is pioneer in merchandising and manufacturing of jute, yarn and dying items. Cottage industry like weaving abounds in this district. International trading, import and export business, garments industries, knitwear garments, shipyard, brickfield etc., create employment opportunities to the people facilitating additional income to the household population. The major income generating activities of the people in this district is business and working in the mill and factories.

Narayanganj has the oldest and most prominent river port handling passenger as well as freight traffic. In 2013-14, Narayanganj port handled about 45 million passengers and nearly 4 million tonnes of freight traffic.

The status of non-farm activities in the district is increasing. The below table shows the number of establishments and their distribution by major industries and the persons engaged by sex and activity.

TABLE 88: NUMBER OF ESTABLISHMENTS AND PERSONS ENGAGED BY ACTIVITY IN NARAYANGANJ DISTRICT AS OF 2011

Activity	Establishments			Persons Engaged		
	Total	Urban	Rural	Total	Male	Female
Mining and quarrying	5	4	1	213	206	7
Manufacturing	12805	7452	5353	208074	172734	35340
Electricity, gas and water supply	30	24	6	477	464	13
Construction	37	37	0	1641	1451	190
Wholesale & retail trade	46120	33010	13110	104872	102144	2728
Hotels and restaurants	4808	3333	1475	13543	12974	569
Transport, storage and communication	1389	850	539	5780	5177	603
Bank, insurance and financial institution	281	255	26	3743	2729	1014
Real estate and renting	862	669	193	2910	2850	60
Public administration and defence	226	160	66	3373	3086	287
Education	1635	645	990	8818	6813	2005
Health and social work	3790	3666	124	8039	6936	1103
Community, social and personal services	7569	4671	2898	19529	17572	1957
Narayanganj District	**79557**	**54776**	**24781**	**381012**	**335136**	**45876**

Table below presents various types of industries including small-scale and cottage industries in Narayanganj Sadar subzila area in 2011:

TABLE 89 NUMBER OF SELECTED INDUSTRY 2011

Type of Industry	Number	Number of workers
Textile mills	27	8904
Garment factory	7850	62800
Rice mill	38	54

Type of Industry	Number	Number of workers
Aluminium	38	
Handloom	148	151
Cottage industries	1263	6315
Bamboo and cane industry	12	84
Wooden furniture	1610	12830
Saw mills	54	398
Oil mills	4	53
Bakery	78	701
Printing press	22	242
Tailoring shops	2133	23786
Cold storage	6	
Flour mills	49	558
Plastic industry	5	40

8.5.7. Heritage Sites

The following are the notable archaeological heritage/monuments in Narayanganj District:

- Tomb of Sultan Giasuddin Azam Shah (1389-1411 AD),
- Baba Saleh Mosque (1481 AD),
- Three domed mosque of Sultan Jalaluddin Fateh Shah (1484 AD),
- Goaldi Mosque (1519 AD),
- Hajiganj Fort,
- Sunakanda Fort,
- Pagla Bridge,
- Kadam Rasul Dargah,
- Bandar Shahi Mosque

8.6. Impact Assessment

The development of Inland Container Terminal will have impacts of varying magnitude on different environmental components. These impacts could be categorized as

- primary impacts, i e, impacts which occur as a direct result of the project activities
- secondary and tertiary impacts, i e, impacts which occur as a result of primary and secondary impacts, respectively

Impacts could occur during the construction phase as well as the operational phase. Impacts during these phases are discussed separately in this chapter. Due to the phased manner of the entire development work, the environmental impacts will also occur in a phased manner instead of cumulatively. Thus the overall magnitude of impacts will be reduced to a large extent.

The project is envisaged to be developed in two phases. During the first phase starting in 2017 one jetty facility of 90 m will be constructed and 7,500 m² will be covered by buildings. The terminal storage and handling area will be developed gradually from 27,000 m² in 2017 to 41,500 m² in 2027. Also in 2027 the area covered by buildings will be increased to 11,000 m². In 2026 the storage structure will be changed gradually from reach stacker to RTG operations.

Thus the first development phase of the terminal is from 2017 to 2026/27. The berth facility will be extended to 174 m in 2033 to be operational in 2034.

8.6.1. Construction Phase

The construction of the terminal will include a 174 m long jetty facility in parallel to the river. This facility will be constructed by using steel piles mounted by a concrete head device. The whole terminal area includes 38,000 m² which are currently used for truck parking, outdoor storage of navigation aid devices, cargo and dredging equipment. Additionally 14,500 m² are so called foreshore land which is currently not used for operations. In total a terminal area of 52,500 m² will be considered for construction work. The 14,500 m² foreshore land have to be filled up to reach the same ground level with approx. 45,000 m³ of suitable soil. 11,000 m² of the terminal area will be covered with buildings like a container freight station, administration building, workshop etc. The remainder 41,500 m² will be prepared for container storage and vehicle traffic. Thus, a concrete pavement is considered. An area adjacent to the terminal area which is currently used as a public play ground will be partly used for the construction of 6 warehouses covering a total area of 4,300 m² plus 3,800 m² to be prepared as truck lanes for tucks operations respectively. Gravel truck lanes are expected to be sufficient to provide access to the warehouses.

The major activities during the construction phase of this project will be:

- Pre-construction activities which will include demolition of existing buildings (go downs), cut and fill operations, etc.
- Development of terminal, including storage and handling facilities
- Foreshore land filling
- Construction of roads and other paved areas`
- Construction of jetty inside water front (approximately 10 m inside to existing jetty)

As mentioned before, the project development is planned in a phased manner. Bank protection, however, is limited which will be involved in Phase I only. Phase wise development details: the project is proposed to be structured in two phases. During the first phase starting in 2017 one jetty facility of 90 m will be constructed and 7,500 m² will be covered by buildings. The terminal storage and handling area will be developed gradually from 27,000 m² in 2017 to 41,500 m² in 2027. Also in 2027 the area covered by buildings will be increase to 11,000 m². In 2026 the storage structure will be changed gradually from reach stacker to RTG operations. Thus the first development phase of the terminal is from 2017 to 2026/27. The berth facility will be extended to 174 m in 2033 to be operational in 2034.

Dredging is not anticipated in this project as sufficient depth and width is available in the Shitalakhya River.

The phasing of the project phases out the construction work as well. Hence pollution during the construction phase will occur in a phased manner. In addition, it will be temporary and localized.

8.6.1.1. Air Environment

Air quality can be affected by dust and particulates emitted from cut and fill operation, demolition/construction activities (roads, bank protection, etc.), site clearing, and emissions from vehicles transporting men and materials to and from construction sites, and handling of fine particulate materials. Gaseous emissions containing CO, HC, NOx, and lead may be released from vehicular movement and construction equipment in operation. Moderate to high speed wind, however, will minimise the impacts through dilution and dispersion of the pollutants.

8.6.1.2. Noise Environment

General noise levels at the construction sites will be higher due to vehicular movement, operation of construction equipment, and the excavation-demolition-construction activities. The impact, however, is expected to be temporary and localised.

8.6.1.3. Water Environment

During the construction phase, surface water quality can deteriorate due to runoff of loose exposed soil and sanitary wastes of the labour force. Construction of berths inside the river may create suspended solids in water and spread these SS to downstream areas.

8.6.1.4. Land Environment

The soil quality in the area if the cut soil (excavated soil from the construction site) is deposited on the banks along the river or on low-lying areas. If there is difference in soil quality (including textural class) between the excavated site and dumping site, there may be impacts on soil at dumping site. The Analysis of soil at/adjacent location to the jetty, however, showed that it did not contain appreciable quantities of heavy metals or radioactive elements, which can potentially have an adverse impact on the dumping site. Therefore a thorough soil analysis is necessary before dumping of removed soil, so that selection of dumping sites can be made based on similar soil characteristics.

The project envisages demolishing the existing warehouse structures leading to substantial debris which will constitute a significant challenge in the disposal. It is recommended that the debris should be used for filling operations as far as possible to reduce the impact. Indiscriminate disposal of these debris will create adverse impact on the disposal site.

Construction of access roads involving cut and fill operation may adversely affect the characteristics of top soil. All proposed access roads will be short, since paved roads already exist near the proposed terminal site; thus the impact of construction of access roads on the land environment will be marginal.

8.6.1.5. Biological Environment

Terrestrial Flora-Fauna

It was noticed that a number of plant species in the form of grown up trees and bushes are existing in the existing warehouse area, amusement park, and dredger base. Other vegetation has been observed on the land between river and go down area.

During the pre-construction phase, site clearing and cut and fill operations will be required for construction of terminal which will result in clearing of the existing flora and fauna during these operations. It is recommended that the felling of trees should be avoided where technically and financially feasible to reduce the impacts. Cut and fill operations could adversely affect the habitat of the natural flora and fauna in these areas. Terrestrial flora-fauna of surrounding areas could also be affected due to the emissions from construction equipment and fugitive dust. The emissions from construction equipment and fugitive dust will be temporary. Their impact on the terrestrial flora-fauna will, thus, be short-term.

Aquatic Flora-Fauna

The run-off from cut and fill operations and water side construction of terminal disturb the aquatic flora and fauna by increasing turbidity, which causes reduction of sun light in the water column, and reduction in photosynthesis. The indirect effects on fish community include

- reduced photosynthesis
- reduced visibility
- reduced vegetation cover

However, the project is proposed to be developed in phases. Consequently, the impacts are also expected to be through the phases, the effects are temporary and localised in nature. In addition, the natural aquatic flora-fauna of the region, which are subjected to disturbances due to frequent movement of existing large number of vessels, are expected to be highly adaptable. Considering their adaptive nature, the proposed development is not expected to have any additional impact on them.

8.6.1.6. Socio-economic Environment

Recreational activities such as swimming, bathing, etc. are noticed at some places in the river. The suspended solids during construction phase would adversely affect these activities. It is also noticed that children while

swimming come very close to ships/ barges. When bigger ships are introduced, the speed of propellers may prevent swimming activities

Number of families are residing just abetting the boundary wall of go down area. If the existing boundary wall is demolished and reconstructed, it will impact the families residing other side of boundary wall. A detailed study should be conducted to evaluate the impact of boundary wall demolition on the residing families and how many families will be affected.

On the positive side, additional jobs will be created for construction workers and labourers, which will be beneficial for the local unemployed population.

8.6.2. Operational Phase

The activities during operational phase include the terminal proposed as port of call for ships; initially at the rate of one ship per week which will be further augmented to 1.1 ships per day. The other activities include the following: the terminal will be used for loading and discharging inland container vessels, storage of containers before loading or after discharge, stripping and stuffing of container and loading and unloading trucks picking up or delivering container. The vessels are loaded or discharged by mobile harbour cranes (MHC) and then transported by terminal tractor-trailer units to the storage area. The storage will be served by reach stackers as well as rubber-tyre gantries for full container and by a special empty container handler for empty container. The containers are stored up to 5 layers high. The equipment is constructed to lift a container above the fifth layer. The stripping and stuffing of container is supported by utility forklifts with a capacity of 3 – 7 tons. Trucks entering or leaving the terminal are checked the at a truck gate regarding condition of the container as well as the required documents. Besides container trucks also regular trucks are entering the terminal to deliver cargo to be stuffed in a container or that has been stripped out of a container. Most of the terminal equipment will be maintained by terminal staff in a dedicated workshop.

Impacts during the operational phase will be primarily due to mechanised ship movement; disposal of liquid and solid wastes; movement of vehicles to evacuate and bring the containers to terminal, and operation of loading and unloading equipment. The general impacts anticipated during the operational phase are discussed in this section.

8.6.2.1. Air Environment

Analysis of micrometeorological data indicates the region has experienced with more calm conditions (44.4%), 29.1% 1 to 2.5 m/sec i.e. less than 9 km/h, 24.6% 2.5 to 5 m/sec i.e. less than 18 km/h and only 1.6% between 5 to 7.5 m/sec. The above 2.5 to 5 m/sec wind prevail only during rainy season. The calm conditions in other seasons are as follows: January – 62.48%, February – 56.49%, March – 41.2%, August – 29.38%, September – 46.5%, October – 65.4%, November – 70.2%, December – 70.9%. Thus, especially during dry season air pollutants may not be dispersed to longer distances. Another factor of concern is all the emissions either from ship or from the equipment will take place at low altitudes.

The air quality surrounding the proposed terminal is likely to be affected by

- gaseous emissions from the movement of mechanised ships
- loading and unloading equipment using liquid fuel
- emissions from vehicular movement in the terminal and on access roads

Loading and unloading at terminal may lead to some amount of fugitive emissions in the absence of proper housekeeping. Movement of vehicles to carry the materials to and from the terminals would also lead to emission of dust and other pollutants.

In addition to the above activities, air quality may be affected by secondary development such as urbanisation and the consequent increase in vehicular traffic.

The sources of pollution is due to ship movement near the terminal area. The ship will have a length of 82.5 m, a width of 15.0 m and a draft of 3.5 m. The engine is defined as 2 x 816 BHP (1217 kw) providing a speed of 10 knots. The cargo capacity of this vessel is 176 TEU.

The following are the equipment are proposed to be used in the terminal:

TABLE 90 PROPOSED EQUIPMENT TO BE USED AT KHANPUR TERMINAL

Equipment Year	Number 2017	 2040	Possible operating hours per day	Fuel type	Fuel Consumption [litres per operating hour]
Mobile Harbour Crane	1	2	12 h	diesel	40
Rubber-Tyred Gantry	0	3	12 h	diesel	25
Reach Stacker	2	2	12 h	diesel	16.5
Empty Container Handler (required from 2021 onwards)	0	0	12 h	diesel	13
Terminal Tractors	11	24	12 h	diesel	12
Utility Forklift	1	8	12 h	diesel	5
Terminal Vehicle (supervisor van etc.)	2	2	12 h	diesel	7
Reefer Rack (consumption per plug per hour)	1	1	24 h	diesel	0.3

In addition, large number of diesel trucks (approximately 176per day in Phase II) are expected to ply from warehouses towards Narayanganj.

The expected emissions from ships and the above equipment and trucks are tabulated in the below Table.

TABLE 91 EMISSION OF VARIOUS POLLUTANTS

Vessel/ equipment	NOx	PM_{10}	$PM_{2.5}$	HC	CO	SOx	CO_2
SHIPS (kg/hr): 176 TEU ship (1217 kw) – Assumption: MSD type engine, fuel Marine Diesel Oil, Sulphur – 1%	16.06	0.57	0.52	0.6	1.34	4.83	786
Highway vehicles (Trucks): gm/km per truck	4.05			1.31	6.45		
Port handling equipment: Emission factors will be provided after collecting per (HP) of the equipment							

In case of trucks, the emission factors given in the above table are for one truck and for one km. If we multiply with 176 trucks and atleast for 5 km running in and near terminal, the emissions would be as follows: NOx: 7.128 kg per 10 km, HC: 2.3056 kg per 10 km, CO: 11.352 kg per 10 km. If 10 kmph is considered the speed of truck at and around the terminal, the emissions mentioned can be considered are per hour.

These are regular emissions, thus, will have impact on surrounding air quality.

However, it is expected that the emissions from ships and operating equipment will be less compared road transport of the same cargo by road. Road transport typically produces much more air pollution than water transport.

8.6.2.2. Noise Environment

All project activities mentioned above which may affect the air environment will also generate noise. This will raise the ambient noise level around the terminal and along the river. From the earlier study in the upstream of Shitalakhya River, Siddhirganj (7.3 km north to present study area), it was noticed that the noise levels are on higher in the plant location before construction. During the operational phase, the ambient noise levels are expected to be even higher. The container terminal is surrounded by settlements all around. Thus, appropriate measures should be undertaken to reduce the noise levels from the mechanised operations generating noise, which would decrease the impact of noise on the people living on the banks of the river and around the terminal.

Maximum noise levels will be experienced at the time of ship approaching the terminal. A receptor on the bank would experience the maximum noise level. Earlier studies showed that when a typical mechanised vessel (200 T) passes, it was observed that at 30 m distance between the receptor and the vessel, the noise level was about 75 dBA. At 100 m from the vessel the receptor was exposed to a noise level of about 65 dBA. The noise level exposure by receptor at the storage areas who is more than 100 m away from jetty would be much lesser than 65 dBA.

Development of greenbelt around the terminal would reduce the noise levels in the residential areas. Within the terminal area, workers should be provided with ear muffs.

8.6.2.3. Water Environment

Shitalakhya River has been declared as Ecologically Critical Area in 2009. Thus, polluting activities are prohibited on this River. Discharge of any quantity of wastewater or solid waste into the river will further deteriorate the river quality. The sources of water pollution is discussed in this section. As it is already critical area, no more release of pollutants is allowed in the river. Thus, whatever small quantity of pollutants generated by the vessels should be collected in the terminal and treated.

Surface water quality may be affected due to the following project actions:

- Discharge of sanitary wastewater and other solid wastes from on-board vessels and terminal,
- Discharge of bilge water,
- Discharge of wastewater from washing and cleaning operations from container terminal,
- Runoff from adjacent land area (required to be denuded and thus prone to erosion) which may carry particulates, nutrients, and other pollutants to the river,
- Effluents from industries and sewage from urban areas along the river, and
- Alteration of hydrology including water flow and wave pattern of the river due to regular ship movement (this may also increase the erosion along the banks, if unprotected).
- The continuous spillage/leaks of oil and material from ships or accidents on the river may change the sediment quality.

Resuspension of the sediment due to the vessel movement will be negligible if the depth of the water column below the keel of the vessel is sufficient to absorb the viscous drag produced by movement of the vessel. If there is resuspension of sediments due to movement of vessels, these would be carried along with the vessel. If the bottom current is in the same direction of the vessel, the sediment would travel more distance than normal.

Wastewater Generation from Vessels

The wastewater generated from each vessel plying in the river would comprise sanitary wastewater from crew and bilge and oily water. The total amount of wastewater generated is estimated to be about 71.5 m3/d, as described below.

From the normal operation of ships, different oil liquid and semi-liquid wastes are produced in their machinery spaces which can be broadly distinguished to:

- Oil residues from the purification of fuel and lubricating oil
- Oily leakage from machinery spaces
- Exhausted or contaminated oils
- Oily bilge water

It is expected about 0.8% oil residues of the fuel consumption per day are generated. The total quantity of oil residues in a trip is calculated based on the fuel consumption of 176 KG (Kilo Gallon) per hour. Considering 13 hours travel time from Chittagong to Khanpur (10 knots speed and 240 km distance) the total quantity of oil residue would be 69 m^3 per trip when the ship reaches to Khanpur. In Phase I, the total quantity per trip per week is 69 m^3. Whereas the same quantity is generated every day of the week in Phase II. It is also expected that about 400 l /d of bilge water will be generated from each ship of 2500 T capacity ships. Thus the total amount of wastewater to be treated would amount to 69.5 m^3/d in phase II. Bilge water typically contains oil and grease, which can form a layer on the water surface preventing its contact with air, thereby leading to a decrease in the dissolved oxygen content of water. In addition to oil, bilge water can also contain other contaminants, such as cleaning agents and solvents, coolants and greases.

On each 176 TEU container ship, 12 crewmembers are assumed to be employed. In Phase I considering the ship calling as one ship per week, and a travel time of 13 hours from Chittagong, the total accumulation of sewage would be for one day per each week. Assuming 150 L/d of sanitary wastewater per crewmember, the total amount of wastewater generated would be about 1.8 m^3/d in a week for the day it reaches container terminal. In Phase II the calling rate is 1.1 ships per day. Total amount of wastewater generated per day would be 1.98 m^3 per day.

Sanitary wastewater contains organic matter, which contributes to the BOD of the receiving water body. This could lead to decrease in dissolved oxygen levels at the places where the wastewater is released into the waterway. The wastewater would also contain nutrients (N and P) which could lead to algal blooms. The wastewater will therefore have to be treated appropriately before being discharged into the waterway.

Staff working on terminal will generate also generate wastewater.

8.6.2.4. Land Environment

Erosion of banks, if unprotected, can occur due to vessel movement, which can deplete nutrients and thus reduce the fertility of the soil. Removal of vegetation on banks, if not followed by planned afforestation program, including ground cover, can lead to the opening up of the soil to the atmosphere, thus triggering erosion.

However, it is proposed that the complete water side is used for jetty facility in the final stage. Thus, no additional bank protection is necessary in Phase II. But until the second berth is established the existing bank has to be protected. From the existing jetty the bank towards north i.e. in front of amusement park is already protected. The bank, beyond the amusement park in front of dredger base in the north and south side in front of go down and the area where settlement is staying adjacent to go down, needs to be protected. It is proposed to protect by using rock layer on construction textile.

Soil quality could be affected by solid and liquid wastes dumped from vessels and terminal. Spills of materials on land during loading and unloading operations might affect soil quality in the immediate vicinity of IWT terminals. These impacts, however, are expected to be minor.

Land use pattern of the area could be altered in the areas where development did not take place especially riverfront area which was not developed earlier.

8.6.2.5. Biological Environment

Both terrestrial and aquatic flora-fauna can be affected due to regular vessel operation.

Aquatic

It was reported that there are no appreciable fish population in Shitalakhya River due to release of pollutants into the river. Small fishes and other aquatic organisms may be present.

The river is already facing heavy traffic, which might have caused disturbance to the aquatic organisms. This disturbance may further increase due to the proposed large ship movement. Turbulence and noise in river could affect the migration pattern of the aquatic life. Fish spawning could be affected, which could lead to decreased fish population. This impact, however, is expected to be limited only to the immediate vicinity.

Discharge of untreated effluents from ships and container terminal could lead to a decrease in the dissolved oxygen concentration of water, which can in turn affect aquatic life. Oil washings from container berths may could affect aquatic flora-fauna by preventing atmospheric oxygen from dissolving in the water. Increased turbidity would decrease the depth of the euphotic zone, thereby decreasing photosynthesis and primary productivity. Nevertheless, good housekeeping and other management practices can help minimise these impacts.

Terrestrial

As pointed earlier, there is already heavy vessel movement in Shitalakhya River. Thus, the existing floral species along the river are capable of withstanding the ill effects of the stressed conditions created due to anthropogenic activities. Nevertheless, arrangements will be made to replant the same floral species which are removed from the go down and other areas during construction phase in an identical environment at an alternative location. Migration pattern and free flight of the birds might be affected due to vessel movement and higher noise level from increased activity along the river.

8.6.2.6. Socio-economic Environment

The development of the waterway will affect the socio-economic pattern in several ways.

- Water transport is the most energy-efficient way of transporting cargo. Due to the project, a substantial fraction of cargo transport could shift from road and rail transport to water transport. This will reduce the energy requirement for the transportation sector. The energy thus saved could be made available to other sectors. Savings in fuel used for transportation will lead to savings in valuable foreign exchange.
- The transportation cost by road or rail is much higher than water transportation; therefore the waterway will provide a more cost-effective surface transport alternative.
- New job opportunities will open up for the local population. The proposed development will create direct employment at various levels including the jobs at terminal including environmental management cell.
- Development of waterway is expected to catalyse industrial growth in the region since a cost-effective alternative for the transport of raw materials and products will be available. This industrial growth will create further employment opportunities for the local population.
- Secondary growth such as new industries, business centres, and urbanisation will improve the income level of the local population, the purchasing power, and the economic status. There will be a positive impact on the economy of the region.
- The quality of life will also improve due to the improvement in the air quality expected due to the shifting of cargo transport from road to water. Road transport typically produces much more air pollution than water transport.
- Water transport through Shitalakhya River from Chittagong to Narayanganj is an alternative to highway transport between Dhaka and Chittagong, which is already busy and congested. Thus the waterway will be an attractive alternative to the highway for cargo transportation.
- Turbulence, noise, and water pollution due to the vessel movement along with already busy river will disturb fish community and may affect fish landings in the downstream, hence the income of fishermen. This impact, however, is expected to be limited only to the immediate vicinity of the waterway. Fishing could still be continued in the wider stretches.

The following impacts on human health can result from the proposed development:

- respiratory illness from dust and particulates
- hearing impairment due to high noise levels
- communicable diseases

These impacts, however, are expected to be limited to the immediate vicinity of the terminal site. The other impacts due to terminal construction are as follows:

- Recreational activities such as swimming, bathing, etc. are noticed at some places in the river. It is also noticed that children while swimming come very close to ships/ barges. When bigger ships are introduced, the speed of propellers may prevent swimming activities in the vicinities.
- River congestion: The existing traffic in the river is as follows:
    - 60 passenger launches every day cross the river from one side to other carrying the passengers
    - Movement of oil tankers which are 150 feet long and 50 feet wide along the river – 100 per month (Three to four per day)
    - Cargo vessels of same size carrying fly ash, cement material, clinker, etc. – 200 per month (6 to 7 vessels per day)
    - Bulk cargo (sand) vessels of size 80 feet x 25 feet – 50 vessels per day

  The above existing numbers indicate that the river is already busy near Narayanganj area. These numbers may increase in future due to yearly growth causing more traffic.

  Due to this existing traffic and future growth, the project after developed may add to further congestion.

- **Access Road Congestion**: Access road to terminal is narrow and already crowded with traffic which is further expected to increase after project development. In phase I, the unloading of ship will happen once a week. The unloaded containers are expected to be either taken away or be stripped and the cargo will be taken away from the terminal. As the ship carries 176 containers, at least these number of trucks (without considering the stripped cargo separately) are expected to reach and leave the terminal. In Phase I this activity happens once a week. On an average 25 trucks per day are expected if evacuation is uniformly distributed in the week which is unlikely. In Phase II, every day 176 trucks are expected to move into the terminal. This indicates, there will be 176 heavy trucks on the access road every day. If the existing road is considered as it is, then the road will face traffic congestion with this additional traffic.
- Shitalakhya River in the upstream is wider. It suddenly narrows down at the proposed jetty. It is proposed to construct the new berth at least 10 m inside the river from the existing jetty. When ship is berthed, along with its 15 m width, the total river width occupied would be 30 m from the existing berth. In Phase II continuously one ship would be in berthing condition. This may cause congestion for other ships/ vessels to pass through.
- If the playground and the amusement park are merged with the terminal area, local population will permanently loose these recreation areas.

8.7. Stakeholders Engagement

"Stakeholder Analysis" is understood as the process of identifying the individuals or groups that are likely to affect or be affected by a proposed project, and sorting them according to their impact on the project and the impact the project will have on them. This information is then used to assess the manner in which the interests of the stakeholders should be addressed in the project plan, policy, program, or other action.

- The importance of such an analysis lies in the role played by this understanding in the assessment of the socio-political environment surrounding the project. It allows for the:
- Identification of key stakeholders, their primary groupings and sub groupings;
- Identification of the interests, concerns and potential risks surrounding the stakeholders, as well as conflicts of interests (if any);

- Identification of relations between stakeholders that may enable "coalitions" of project sponsorship, ownership and co-operation as well as the mechanisms which may have a role in influencing other stakeholders;
- Key groups/ individuals to be pin pointed who need to be informed about the project;
- Identifying stakeholders (those who are likely to have an adverse impact on the project) and taking appropriate measures to combat their influence;
- Identification of the impact and influence of the project on the stakeholders and of the stakeholders on the project;
- Generation of information essential to the planning, implementation and monitoring of the project; and;
- Development of a framework for participatory planning and implementation of various project activities.

This Section provides an overview of the Stakeholder Engagement Process and describes what engagement activities have been undertaken to date and includes the next steps in the stakeholder engagement process.

8.7.1. Stakeholder Identification and Characterization

A stakeholder is "a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the Project/organization's actions, objectives, and policies".

Stakeholders thus vary in terms of degree of interest, influence and control they have over the project. While those stakeholders who have a direct impact on or are directly impacted by the project are known as Primary Stakeholders, those who have an indirect impact or are indirectly impacted are known as Secondary Stakeholders.

The approach for the stakeholder identification and characterisation is based on a combination of formal, informal meetings, key informant interview (KII) and focus group discussions (FGDs).

8.7.2. Phases of the Stakeholder Engagement Process

The Stakeholder Engagement has been designed around five phases within the ESIA process, namely:

I. Initial Consultation

- Identification of direct project proponents
- Identification of additional stakeholders other than the direct project proponents;
- Planning suitable mode of engagements with key stakeholders including representatives from the local municipalities, any local worker's association and environmental NGO's;
- Planning for the provision of information of the Project and the associated processes to stakeholders;
- Develop mechanism to collect information around issues of concern, comments and suggestions from key stakeholders; and

II. Pre-scoping Phase

- Officially initiates, and notifies the public of, the formal ESIA process;
- Distribution of a Project Background Information Document (BID), placement of statuary adverts and site notices;
- Engagements with key stakeholders including representatives from the local and district municipalities, worker's and women association, directly affected landowners and environmental NGOs;
- Obtain issues of concern, comments and suggestions from stakeholders;

III. Scoping Phase

- Acknowledge and forward suggestions for enhanced Project benefits and reasonable alternatives to the applicant;
- Verify that issues raised by stakeholders have been accurately recorded; and
- Record and address concerns, suggestions and comments about the Project, the Draft Scoping Report and the Draft Plan of Study for EISA phase.

IV. Impact Assessment Phase

- Provide the draft ESIA Report and ESMP for Affected Parties review;
- Allow Affected Parties to comment on findings of the impact assessments as well as in the development of appropriate mitigation measures; and
- Verify that issues raised by stakeholders have been accurately recorded.

V. Decision Making Phase

- Notifying Affected Parties of the outcome of the decision by the relevant authorities; and
- Notifying Affected Parties of the appeals process and how they can engage this process.

8.7.3. Initial consultation – Identification of Affected Parties (direct project proponents and other key additional stakeholders)

Based on the local surrounding and social setting of the proposed project areas, it is vital to establish a social baseline and develop an understanding of the existing usage pattern of the proposed site area. On the basis of the initial site survey and assessment, the key Affected Parties can be grouped into the following categories:

- Landowners: Directly affected and surrounding landowners;
- Government: National, Provincial, District and Local authorities;
- Communities: Surrounding communities;
- Adjacent Landowners: Neighbouring residential and commercial land owners and communities;
- Non-Governmental Organisations (NGOs): social focused organisations like women's group or any other workers organisations
- Business: small medium enterprises , formal organisations or setups , informal establishments if any; and
- Worker's Unions.

Below table provides brief profile of relevant stakeholders which are identified within the project in the initial consultation phase:-

TABLE 92: STAKEHOLDER PROFILES DERIVED FROM INITIAL CONSULTATION

S.No	Relevant Stakeholders	Profile/Status	Impact / Influence on the project
1.	Shops and other establishment on the road connecting the main road and ferry Ghat.	There are almost 35-40 temporary establishments on both sides of the road connecting the main road to the ferry point. The owners of these establishments are vendors dealing in the sale of small food items. The most common size of	In case the proposed project involves utilising the connecting road, this establishment on both sides of the road will be displaced from their current location. However, a similar displacement will be observed for their

S.No	Relevant Stakeholders	Profile/Status	Impact / Influence on the project
		such an individual establishment is around 6 ft *8 ft and few (5-6) establishments are of the size 8ft*16 ft These establishments' owners do not have any ownership rights over their shops. As per the discussion, they do not pay any periodic rent to an authority but however, they do pay a security amount to a local influential person to run their business. Their monthly earning is in the range of 6000-8000 BDT. Their key customers are the rickshaw pullers providing last mile connectivity to the commuters using the ferry point and up to some extent the commuters themselves.	customers who will also be displaced from their existing location. On the basis of the discussion, these establishment owners are looking for permanent employment opportunities and are eager to move to a new location in case a secured proposition is offered.
2.	Contractor who collects toll on the ferry boats for to and fro transportation of local people	The contractor is not associated to any regulatory body or any other registered organization. He is responsible for managing the parking and movement of the motor drawn and hand drawn boats. He is responsible for collection of toll from the commuters either entering or alighting the ferry point.	Due to the proposed project concept, the contractor may get displaced from his current job profile or he may be accommodated in a similar setup in the vicinity of the proposed project area.
3.	Local community utilising the playground for recreation purposes	The ownership of land lies completely with BIWTA. It has been temporarily been converted to a playground. The playground has the following usage currently: It is being used by the children and adolescents of the surrounding residence for soccer and cricket practice. It is also being used as a resting place for commuters travelling on the main road.	Due to the proposed project concept, the playground has a possibility of being used under project related activities. There is no direct displacement of local community arising due to the playground utilization; however, it might leave the local neighbourhood children and adolescents without an adequate playing and recreational field area. However, another similarly

S.No	Relevant Stakeholders	Profile/Status	Impact / Influence on the project
			sized playing field exists within a 10 km radius of the current playground, which can be evaluated as an alternative to the current setup.
4.	Land owners for the proposed Amusement park setup	The land owner has signed a formal agreement with BIWTA for setting up an amusement park in the foreshore area.	Due to the proposed project concept, the entry to the Amusement park has a chance of being blocked and also the land leased to the amusement park may also be required for the project activities.
5	Land owners for the Spindle manufacturing unit	The land owners are individual private owners of the land parcel.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated.
6.	Owner of the spindle manufacturing unit and employed workers	The owners of the spindle manufacturing unit have rented out the establishment from the original land owner and are paying a monthly rental amount. They have currently employed 14 female and 12 male workers in their unit. These workers are mostly deployed on a daily wage rate basis and do not have a fixed association or employment terms with the unit owner.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated and the employed workers will have to be provided an opportunity of alternate employment in the vicinity of the project area.
7.	Owner of the automobile repair workshop and employed workers on both sides of the road connecting main road to ferry point.	The owners of the automobile repair unit have rented out the establishment from the original land owner and are paying a monthly rental amount. They have currently employed 2 – 3 workers and all of them equally share the earning as well as the rent between themselves.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated and the employed workers will have to be provided an opportunity of alternate employment in the vicinity of the project area
8	Land owners for the garment dyeing and spinning unit	The land owners are individual private owners of the land parcel.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated.

S.No	Relevant Stakeholders	Profile/Status	Impact / Influence on the project
9.	Owner of the garment dyeing and spinning unit and employed workers	The owners of the garment dyeing and spinning manufacturing unit have rented out the establishment from the original land owner and are paying a monthly rental amount. They have currently employed 15 workers in their unit. These workers are mostly deployed on a daily wage rate basis and do not have a fixed association or employment terms with the unit owner.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated and the employed workers will have to be provided an opportunity of alternate employment in the vicinity of the project area.
10.	Local Commuters utilising the existing road connecting the main road to the boat point.	The local commuters profile includes the following: Cement factory workers who work across the river at the cement factory, they utilize the services of the ferry boats in morning at 8 am and evening at 5 pm on a daily basis. Market goers of mix social class levels from both the genders use this route to travel to and fro from their residence to market areas located at various locations in Narayanganj. Other ordinary workers who cross the river to reach their sources or destinations of employment.	In case the project is conceptualized over the existing road, the commuters will definitely be affected since their ferry route will cease to exist at the current location. However, we have observed that another ferry route exists at 500 m distance and it is more favourable situated since it hosts a full-fledged bus and auto rickshaw stand. This ferry route can be developed for increased capacity and can be proposed as a suitable alternative to the existing route.
11.	Local rickshaw pullers and three wheeler drivers who provide last mile connectivity to commuters using the ferry boats.	There exist almost 10-15 manual rickshaw pullers who service the commuters using the ferry boat service. The rickshaw pullers earn their living mainly by driving the commuters to and fro from the market.	In case the proposed project involves utilising the connecting road, these rickshaw pullers will be displaced from their current location. However, a similar displacement will be observed for their customers who will also be displaced from their existing location. On the basis of the

S.No	Relevant Stakeholders	Profile/Status	Impact / Influence on the project
			discussion, these rickshaw pullers are looking for permanent employment opportunities and are eager to move to a new location in case a secured proposition is offered.
12	Private land parcel owners on both sides of the road connecting the main road to the ferry point.	The land owners are individual private owners of the land parcel.	In case the project activity requires private land consolidation, the owners will have to be adequately compensated.

9. Financial Assessment

9.1. Revenues

Based on services envisaged, revenue can be broadly categorized into accruals from vessel related charges, cargo handling charges at berth & yard, container storage charges and reefer plug in charges.

The approach, assumptions and rationale adopted for estimating various revenue heads are described in detail in the subsequent sections.

9.1.1. Types of revenues

9.1.1.1. Vessel related charges

TABLE 93: VESSEL RELATED CHARGES

Revenue category	Charges Assumption	Unit
Effective tug charges	0	BDT/movement
Effective berthing charges	1500	BDT/movement
Berthing time – 100% vessel utilization	12	Hours/call
Berth hire charges	1000	BDT per hour
Minimum berth hire charges	5000	BDT/call

Tug Charges

All ports have tug boats, which are required to manoeuvres vessels by pushing or towing them. Tugs are required to move vessels that either should not move themselves, such as ships in crowded harbour or a narrow canal. So there are certain charges levied for towing the vessels.

Berthing charges

A berth is a designated location in a port or harbour used for mooring vessels when they are not at sea. It's a place commonly used by ships or vessels to halt or for the purposes of loading and unloading for which certain charges are levied for the vessel to berth at a particular port. Berthing charges means bringing / removing a vessel to / from her berth until the ship is made fast.

Berth hire charges

Berth hire charges generally involve a particular time for which a berth is hired for a ship to unload to load the cargo material. It also includes the charges of ground staff helping in navigating the protocol from berthing a ship to loading and unloading of cargo materials.

9.1.1.2. Container handling charges at berth

These charges include revenues from container handling at the berth. The tariff has been assumed based on existing rates and available benchmarks for similar services at other facilities. These charges are for handling the container from the vessel till hook point or vice versa. The following table presents the assumptions used for revenue estimation under each service envisaged:

TABLE 94: CARGO HANDLING CHARGES AT BERTH

Revenue category	Assumption	Unit	Description
Handling charges at berth – loaded – TEU	480	BDT/TEU	Charges levied for handling loaded containers (TEU's)
Handling charges at berth – loaded – FEU	720	BDT/FEU	Charges levied for handling loaded containers (FEU's)
Handling charges at berth – empty – TEU	240	BDT/TEU	Charges levied for handling empty containers (TEU's)
Handling charges at berth – empty – FEU	360	BDT/TEU	Charges levied for handling empty containers (FEU's)
No. of TEU equivalent to FEU	2	TEU/FEU	Conversion factor from FEU to TEU

9.1.1.3. Cargo / Container handling charges at yard

These charges include revenues from cargo and container handling at the yard. The tariff has been assumed based on existing rates and discounted from the available benchmarks for similar services at other facilities. The following table presents the assumptions used for revenue estimation under each service envisaged:

TABLE 95: CARGO HANDLING CHARGES AT YARD

Revenue category	Actual Values	Discounted Package Rates	Unit	Description
Handling charges TDS / TS - TEU	3900	3800	BDT/TEU	Package charges for container handling from hook point for TEU containers to be de-stuffed / stuffed at the terminal
Handling charges TDS / TS - FEU	5850	5700	BDT/TEU	Package charges for container handling from hook point for FEU containers to be de-stuffed / stuffed at the terminal
Handling charges FDS / FS - TEU	3900	3800	BDT/FEU	Package charges for container handling from hook point till delivery on customer transport vehicle for TEU containers to be de-stuffed / stuffed at the factory
Handling charges FDS / FS - FEU	5850	5700	BDT/FEU	Package charges for container handling from hook point till delivery on customer transport vehicle for FEU containers to be de-stuffed / stuffed at the factory
Handling charges-empty-import / export-cycle-TEU	600	500	BDT/TEU	Package charges for Empty import cycle / Empty export cycle for TEU containers
Handling charges-empty-import / export-cycle-FEU	900	750	BDT/FEU	Package charges for Empty import cycle / Empty export cycle for TEU containers

Average tonnage per TEU	10.1	N/A	Tonnes / TEU	Capacity in tonnes for twenty feet equivalent container
Container stuffing charges	300	300	BDT/tonne	Labour charges for stuffing export containers at the terminal
Container de-stuffing charges	300	300	BDT/tonne	Labour charges for de-stuffing import containers at the terminal

* Discounted prices are used for calculations in the financial model.

Terminal De-stuffed (TDS) cycle package consists of the following charges:

1) Loaded container transport charges from berth to yard
2) Loaded container Lift off charges at the yard
3) Loaded container Lift on charges at the yard
4) Loaded container transport charges from yard to CFS / Examination area
5) Loaded container Lift off charges at CFS / Examination area
6) De-stuffing (Charges not included in this cycle)
7) Empty container Lift on charges at CFS / Examination area
8) Empty container transport charges from CFS / Examination area to yard
9) Empty container Lift off charges yard

Factory De-stuffed (FDS) cycle package consists of the following charges:

1) Loaded container transport charges from berth to yard
2) Loaded container Lift off charges at the yard
3) Loaded container Lift on charges at the yard
4) Loaded container transport charges from yard to CFS / Examination area
5) Loaded container Lift off charges at CFS / Examination area
6) Custom Examination (Charges not included in this cycle)
7) Loaded container Lift on charges at CFS / Examination area
8) Received Empty container Lift off charges at yard

Terminal Stuffed (TS) cycle package consists of the following charges:

1) Empty container Lift off charges at yard
2) Empty container transport charges from yard to CFS
3) Empty container Lift off charges at CFS
4) Stuffing (Charges not included in this cycle)
5) Loaded container Lift on charges at CFS
6) Loaded container transport charges from CFS to yard
7) Loaded container Lift off charges at yard
8) Loaded container Lift on charges at yard
9) Loaded container transport charges from yard to berth

Factory Stuffed (FS) cycle package consists of the following charges:

1) Dispatched Empty container Lift on charges at yard
2) Loaded container Lift off charges at CFS / Examination area
3) Custom examination (Charges not included in this cycle)
4) Loaded container Lift on charges at CFS / Examination area
5) Loaded container transport charges from CFS / Examination area to yard
6) Loaded container Lift off charges at yard
7) Loaded container Lift on charges at yard
8) Loaded container transport charges from yard to berth

Empty container Import cycle package:

1) Empty container transport charges from berth to yard
2) Empty container Lift off charges at yard

Empty container Export cycle package:

1) Empty container Lift on charges at yard
2) Empty container transport charges from yard to berth

9.1.1.4. Storage charges

These charges include revenues from storage of containers at the yard. The tariff has been assumed based on existing rates and set as per the available benchmarks for similar services at other facilities. The following table presents the assumptions used for revenue estimation under each service envisaged:

TABLE 96: CONTAINER STORAGE CHARGES

Loaded – Import Containers	Assumption
Volume distribution % - loaded – import (free 4 days)	50%
Volume distribution % - loaded – import (1 – 7 days)	35%
Volume distribution % - loaded – import (8 – 20 days)	10%
Volume distribution % - loaded – import (above 20 days)	5%
Dwell time – loaded- import – TEU (free 4 days)	4 days
Dwell time – loaded- import – TEU (1 - 7 days)	10 days
Dwell time – loaded- import – TEU (8 – 20 days)	18 days
Dwell time – loaded- import – TEU (above 20 days)	24 days
Storage charges – loaded TEU – import (Free 4 days)	0 BDT/TEU – Day
Storage charges – loaded TEU – import (1 -7 days)	500 BDT/TEU - Day
Storage charges – loaded TEU – import (8 - 20 days)	1000 BDT/TEU – Day
Storage charges – loaded TEU – import (above 20 days)	2000 BDT/TEU - Day
Loaded – Export Containers	
Volume distribution % - loaded – export (free 7 days)	100 %
Dwell time – loaded – export – TEU (free 7 days)	7 Days
Dwell time – loaded – export – TEU (1 - 7 days)	0 Days
Dwell time – loaded – export – TEU (8 - 20 days)	0 Days
Dwell time – loaded – export – TEU (above 20 days)	0 Days
Storage charges – loaded TEU – export (free 7 days)	0 BDT/TEU – Day
Storage charges – loaded TEU – export (1 - 7 days)	500 BDT/TEU – Day
Storage charges – loaded TEU – export (8 - 20 days)	1000 BDT/TEU – Day
Storage charges – loaded TEU – export (more than 20 days)	2000 BDT/TEU - Day
Empty – Import Containers	
Volume distribution % - empty –import (free 4 days)	50%
Volume distribution % - empty –import (1 - 7 days)	35%
Volume distribution % - empty –import (8 - 20 days)	10%
Volume distribution % - empty –import (8 - 20 days)	5%
Dwell time – empty – import – TEU (free 4 days)	4 Days

Dwell time – empty – import – TEU (1 - 7 days)	7 Days
Dwell time – empty – import – TEU (8 - 20 days)	15 Days
Dwell time – empty – import – TEU (above 20 days)	21 Days
Storage charges – empty TEU – import (free 4 days)	0 BDT/TEU - Day
Storage charges – empty TEU – import (1 - 7 days)	300 BDT/TEU – Day
Storage charges – empty TEU – import (8 - 20 days)	600 BDT/TEU – Day
Storage charges – empty TEU – import (above 20 days)	1200 BDT/TEU – Day
Empty – Export Containers	
Volume distribution % - empty –export (free 7 days)	100%
Volume distribution % - empty –export (1 - 7 days)	0%
Volume distribution % - empty –export (8 - 20 days)	0%
Volume distribution % - empty –export (above 20 days)	0%
Dwell time – empty – export – TEU (free 7 days)	7 Days
Dwell time – empty – export – TEU (1 - 7 days)	0 Days
Dwell time – empty – export – TEU (8 - 20 days)	0 Days
Dwell time – empty – export – TEU (above 20 days)	0 Days
Storage charges – empty TEU – export (free 7 days)	0 BDT/TEU – day
Storage charges – empty TEU – export (1 - 7 days)	300 BDT/TEU – day
Storage charges – empty TEU – export (8 - 20 days)	600 BDT/TEU – day
Storage charges – empty TEU – export (above 20 days)	1200 BDT/TEU – day

9.1.1.5. *Reefer plug in charges*

A **reefer container** is a refrigerated cargo container; typically used to transport perishable commodities which require temperature-controlled transportation, such as fruit, meat, fish, vegetables, dairy products and other foods. These containers generally require frequent electricity supply for maintaining the inside temperature. There is a monitoring charge involved as well as there are periodic temperature checks but because different reefer containers have different requirements in terms of technicalities, we have not incorporated the charges in our assumptions as it is difficult to estimate the charges/revenues.

TABLE 97: REEFER PLUG IN CHARGES

Revenue category	Assumption	Unit
Reefer plug in charges	800	BDT/day/FEU
Average dwell time – Reefer – export FEU	3	Days
Average dwell time – Reefer – import FEU	7	Days

9.1.2. *Container Terminal Revenues*

The table below summarizes the revenues from container terminal for concession period of 30 years excluding bulk handling under each category for base case traffic under Simple Option.

TABLE 98: CONTAINER TERMINAL REVENUE SUMMARY

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Vessel related charges	0	1	1	1	1	2	4	7	10	12	13
Cargo handling charges at berth	1	4	6	8	10	14	31	55	80	94	102
Container handling charges at yard	10	49	78	102	127	180	407	714	1,030	1,213	1,320
Storage charges	5	20	28	36	44	63	143	250	361	425	462
Reefer plugin charges	-	0	0	1	1	1	2	4	6	7	8
Container operating revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	1,905

9.1.3. *Combined Terminal Revenues*

In addition to the container terminal operations, there is an option to handle bulk traffic along with container traffic for initial 10 years.

Assumptions for bulk handling charges are mentioned below:

TABLE 99: BULK HANDLING CHARGES

Bulk Handling	Assumption
Bulk handling tariff	200 BDT/tonne
Bulk traffic operations duration	10 Years or 55,000 TEU container traffic whichever occurs earlier
Bulk traffic	10,00,000 Tonnes/annum

* As per the information gathered, bulk handling charges currently being charged at the existing facility are 450 BDT / tonne which includes transportation charges for 14 kms and assuming 5 BDT / tonne – km transportation charge, it comes out to be 70 BDT / tonne for transportation and 30 BDT / tonne is paid to BIWTA as royalty. Effective bulk handling tariff comes out to be 350 BDT / tonne and the proposed charges of BDT 200 / tonne present in the table above is approximately 40% less than the existing tariff.

Table below summarises, the combined terminal revenue for 30 years concession period assuming bulk handling for initial 10 years of operations.

TABLE 100: COMBINED TERMINAL REVENUE SUMMARY – 30 YEARS

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Terminal Revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	1,905
Bulk Handling Revenue	109	225	234	243	252	261	152	-	-	-	-
Combined terminal revenues	125	300	347	391	435	521	739	1,031	1,487	1,751	1,905

Summary of Operating revenue for high traffic case is present in the Annexures.

9.2. Operating Cost

For the purpose of financial analysis, the operating expenditure likely to be incurred at proposed Inland Container Terminal facility at Khanpur, has been segregated into following six heads:

- Personnel costs
- Equipment Costs
- Labour cost (Stuffing/de-stuffing cost)
- Infrastructure maintenance cost
- Utility Costs
- Miscellaneous Costs

Combined together, these cost heads will cover all the fixed and variable operating expenses of the proposed ICT Khanpur. Each of the cost items has been discussed in details in the subsequent sub-sections. To the extent of availability of information, these expenses have been referenced to their respective drivers for estimation of amount of expenses. In absence of the required information, normative industrial benchmarks have been considered for estimation of these expenses.

9.2.1. Types of Operating Costs

9.2.1.1. Personnel cost

The approach for estimation of personnel costs has been to estimate the number of employees required at the proposed facility at different level of hierarchy for different types of business functions and to assess their respective compensation packages. For assessment of number of employees, an indicative organogram was prepared and considered. Under the current analysis, an organogram with key departments is considered for operating this facility and includes the following:

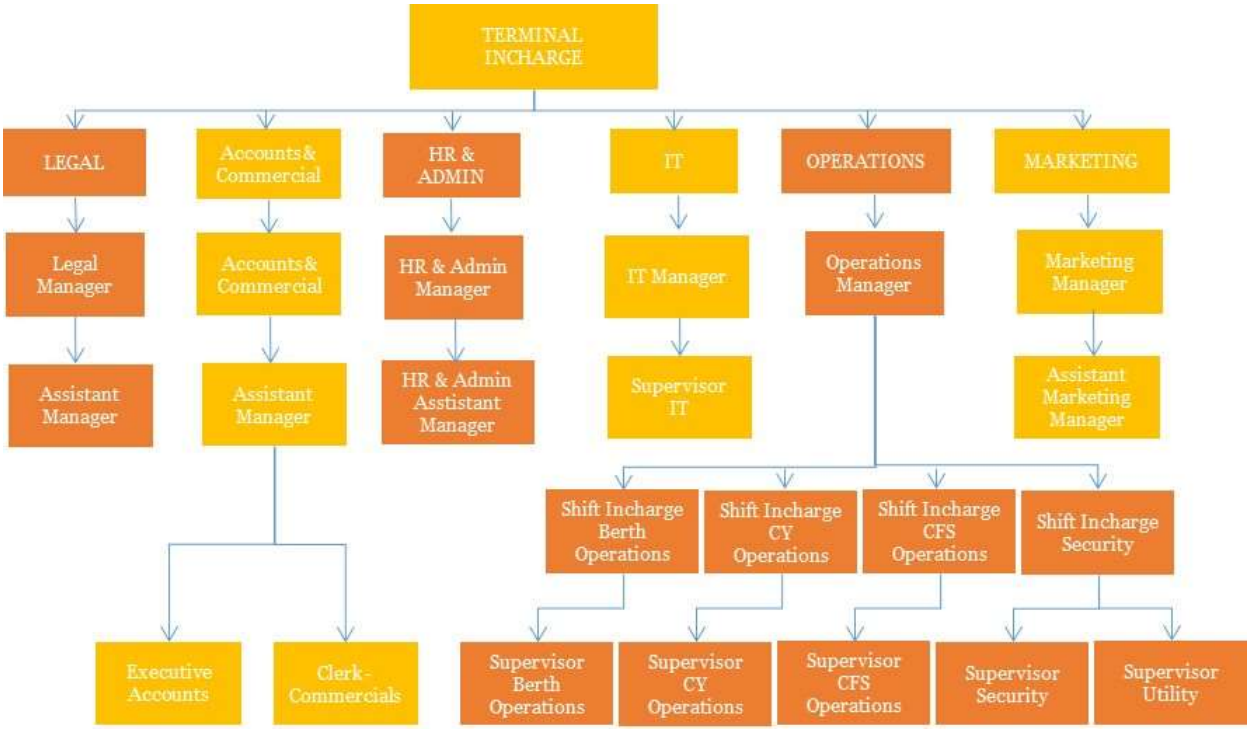


FIGURE 9: STAFF ORGANOGRAM

The total staff requirement for ICT Khanpur is highlighted in the figure below:

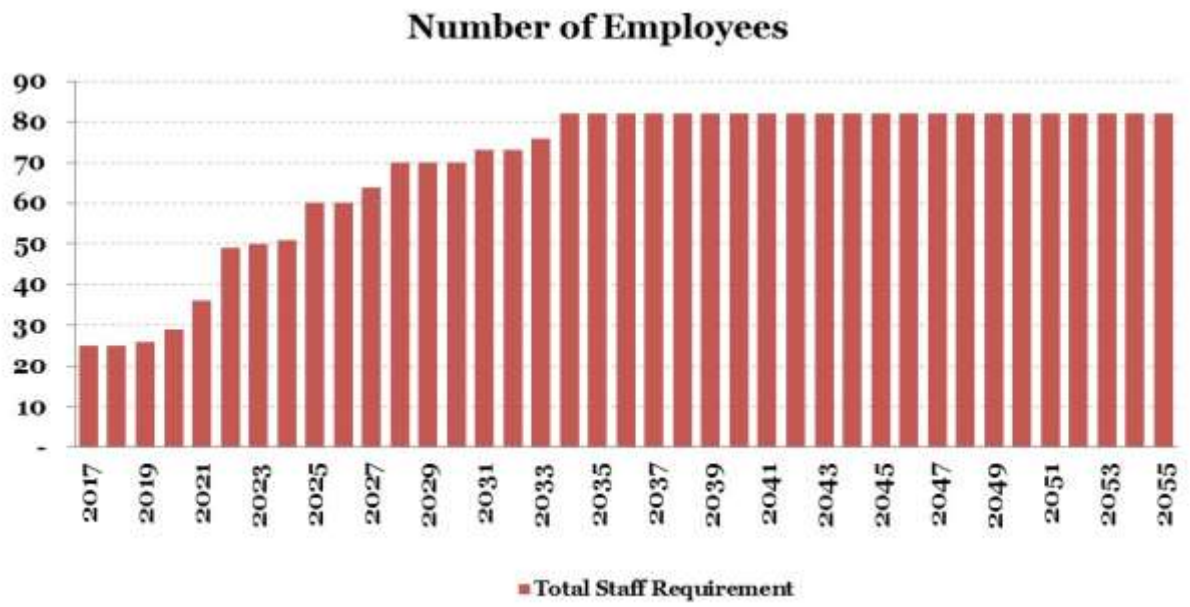


FIGURE 9: STAFF PROJECTIONS

Table below contains the assumptions related to the monthly salary of each position in the staff hierarchy in Real terms:

TABLE 101: STAFF SALARY ASSUMPTIONS

Personnel category	Assumption	Unit
Terminal/facility incharge	150,000	BDT/month
Operations manager	100,000	BDT/month
Shift incharge – Berth operation	50,000	BDT/month
Shift incharge - supervisor	25,000	BDT/month
Shift incharge – CY operations	50,000	BDT/month
Supervisor – CY Operations	25,000	BDT/month
Shift incharge – CFS operations	50,000	BDT/month
Supervisor – CFS operations	25000	BDT/month
Supervisor – Utilities	25,000	BDT/month
Marketing Manager	100,000	BDT/month
Asst. manager - Marketing	50,000	BDT/month
Account & Commercial Manager	100,000	BDT/month
Asst. Manager - Commercials	50,000	BDT/month
Asst. Manager - Accounts	50,000	BDT/month
Clerk - Commercials	25,000	BDT/month
Executive – Accounts	25,000	BDT/month
HR & Admin Manager	100,000	BDT/month
Asst. Manager – HR &Admin	50,000	BDT/month
Shift incharge - security	50,000	BDT/month

Supervisor - security	25,000	BDT/month
IT Manager	70,000	BDT/month
Supervisor - IT	30,000	BDT/month
Legal Manager	100,000	BDT/month

Following the above approach, the personnel costs derived for ICT Khanpur for each organisation level is presented in the Table below:

TABLE 102: PERSONNEL COSTS

Organizational Level (BDT Million)	Designations	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2055
Level 1	Terminal Incharge	-	-	2	2	3	3	4	5	7	8	10
Level 2	Functional Managers	4	8	9	9	10	11	20	26	38	49	56
Level 3	Asst managers Shift incharge	3	6	6	8	10	14	26	39	60	76	87
Level 4	Clerk / Supervisor / Executive	2	4	4	5	8	13	23	35	50	64	73
Total Personnel Costs		8	17	21	25	31	40	72	106	155	197	226

9.2.1.2. Equipment cost

For the estimation of equipment costs, requirement for different type of equipment is estimated and all the expenses incurred for operating these equipment are categorised in two heads namely fixed and variable. Fixed costs are independent of volume of traffic handled by these equipment and include all the expenses that are fixed in nature such as operator salary and insurance cost of these equipment. Whereas variable costs are the derivate of the output and include cost of fuel, spares, tyres, lubricants and maintenance costs etc.

The fixed and variable costs are estimated based upon the benchmarks at the similar facilities and conceptualised based upon the market inputs.

Table below contains the assumptions related to the monthly salary of operators required to operate different types of equipment, in Real terms:

TABLE 103: EQUIPMENT OPERATOR SALARY ASSUMPTIONS

Equipment operator	Assumption	Unit
MHC Operator	95,000	BDT/month
RTG operator	80,000	BDT/month
Reach stacker operator	50,000	BDT/month
ECH operator	50,000	BDT/month
Terminal tractor & trailer operator	35,000	BDT/month
Fork lifts operator	25,000	BDT/month

TABLE 104: EQUIPMENT OPERATOR REQUIREMENT PROFILE

Equipment operators Requirement	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
MHC	1	1	1	1	1	1	2	2	3	3	3
RTG	-	-	-	-	-	-	1	5	6	6	7
Reach Stacker	2	2	2	2	2	2	2	2	-	-	-
ECH operator	-	-	-	-	1	1	1	-	-	-	-
Terminal tractor & trailer operator	11	11	11	11	14	14	19	16	14	14	14
Fork lifts operator	1	2	2	3	3	4	8	12	15	15	15

Table below contains the assumptions related to equipment insurance cost:

TABLE 105: EQUIPMENT INSURANCE COST ASSUMPTIONS

Insurance Cost	Assumption	Unit
Equipment insurance cost %	1%	%

Table below contains the assumptions related to variable equipment operating cost per TEU:

TABLE 106: EQUIPMENT OPERATIONS VARIABLE COST ASSUMPTIONS

Equipment operating cost	Assumption	Unit
MHC Operating cost per TEU	300	BDT/TEU
RTG operating cost per TEU	230	BDT/TEU
Reach stacker operating cost per TEU	200	BDT/TEU
ECH operating cost per TEU	120	BDT/TEU
Terminal tractor & trailer operating cost per TEU	150	BDT/TEU
Fork lifts operating cost per TEU	55	BDT/TEU

Following the approach mentioned above, the equipment costs for ICT Khanpur is presented in the Table below:

TABLE 107: EQUIPMENT COSTS

Equipment cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Fixed Cost											
MHC operators salary cost	1	1	1	1	2	2	4	6	12	16	19
RTG operator's salary cost	-	-	-	-	-	-	2	12	20	26	36

Equipment cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Reach stacker operators salary cost	1	1	1	2	2	2	2	3	-	-	-
EHC operator's salary cost	-	-	-	-	1	1	1	-	-	-	-
Terminal tractor & trailer operator's salary cost	2	5	6	6	8	8	15	17	20	27	32
Fork lifts operator's salary cost	0	1	1	1	1	2	5	9	15	20	24
Equipment insurance cost	1	5	5	5	4	5	7	10	13	8	2
Total	**5**	**13**	**14**	**15**	**17**	**19**	**36**	**57**	**80**	**97**	**113**
Variable cost											
MHC operating cost	1	4	5	7	8	12	27	47	67	79	86
RTG operating cost	-	-	-	-	-	-	7	33	52	61	66
Reach stacker operating cost	0	2	3	3	4	6	8	3	-	-	-
EHC operating cost	-	-	-	-	1	1	2	-	-	-	-
Terminal tractor & trailer operating cost	0	2	3	3	4	6	13	23	34	40	43
Forklifts operating cost	0	0	1	1	1	1	3	6	8	10	11
Total	**2**	**8**	**11**	**14**	**19**	**26**	**60**	**111**	**161**	**190**	**207**

9.2.1.3. Labour cost (Stuffing / De-stuffing cost)

Labour cost includes the labour charges incurred for stuffing and de-stuffing the export and import containers respectively at the terminal.

Table below contains the assumptions related to labour cost per TEU for stuffing and de-stuffing the containers at the terminal:

TABLE 108: LABOUR COST ASSUMPTIONS

Labour cost	Assumption	Unit
Container stuffing/DE stuffing cost	1000	BDT/TEU

Summary of the labour cost is presented in the table below:

TABLE 109: LABOUR COST – STUFFING / DE-STUFFING

Labour cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Stuffing/DE stuffing cost	1	7	12	15	19	27	60	106	152	179	195

9.2.1.4. *Infrastructure Maintenance Cost*

Infrastructure maintenance expense are the expenses related to routine maintenance of the civil infrastructure. These costs are estimated based upon the various hard and soft infrastructure.

Table below contains the assumptions related to maintenance cost of civil infrastructure:

TABLE 110: INFRASTRUCTURE MAINTENANCE COST ASSUMPTIONS

Maintenance cost	Assumption	Unit
Infrastructure Maintenance cost %	2 % of the infrastructure asset balance	%

Summary of the maintenance costs is presented in the table below:

TABLE 111: INFRASTRUCTURE MAINTENANCE COST

Infrastructure Maintenance Cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Infrastructure Maintenance Cost	15	15	15	14	14	16	15	17	14	6	2

9.2.1.5. *Utility Cost*

The utility costs, including costs for electricity and water at the proposed facility. These are estimated based upon the various activity centres estimated along with benchmarks at the similar facilities and conceptualised based upon the market inputs gathered from various site visits.

Table below contains the assumptions related to maintenance cost of civil infrastructure:

TABLE 112: UTILITY COST ASSUMPTIONS

Utility cost	Assumption	Unit
Water & electricity charges	142	BDT/sq. meter/annum

The total projected utility cost for ICT Khanpur is mentioned in the table below:

TABLE 113: UTILITY COST

Utility cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Water & electricity cost	2	4	5	6	6	7	12	19	24	27	29

9.2.1.6. *Outsourcing costs*

Outsourcing costs include annual payments to the agencies responsible for providing security and housekeeping services. It is forecasted based on the prevailing market rates.

These costs are further compared with requirement of similar facilities and conceptualised based upon the market inputs.

Table below contains the assumptions related to outsourcing costs:

TABLE 114: OUTSOURCING COST ASSUMPTIONS

Outsourcing cost	Assumption	Unit
Security personnel cost	15,00,000	BDT/annum
Cleaning service cost	500,000	BDT/annum

Total projected outsourcing cost for ICT Khanpur is mentioned in the table below:

TABLE 115: OUTSOURCED COSTS

Outsourced cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Security Cost	1	2	2	2	2	2	2	3	3	3	4
Cleaning Service Cost	0	1	1	1	1	1	1	1	1	1	1
Total	**1**	**2**	**2**	**2**	**3**	**3**	**3**	**4**	**4**	**5**	**5**

9.2.1.7. Miscellaneous costs

Table below contains the assumptions related to miscellaneous costs:

TABLE 116: MISCELLANEOUS COST ASSUMPTIONS

Outsourcing cost	Assumption	Unit
Miscellaneous cost	1 %	% of total operating costs

TABLE 117: MISCELLANEOUS COSTS

Outsourced cost (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Miscellaneous Costs	4	7	8	9	10	11	16	21	29	35	39

9.2.2. Container Terminal Operating Costs

The table below summarizes the operating costs incurred for running container terminal operations for concession period of 30 years excluding bulk handling for base case traffic under Simple Option:

TABLE 118: CONTAINER TERMINAL OPERATING COSTS – 30 YEAR CONCESSION

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Personnel Costs	8	17	21	25	31	40	72	106	155	197	226
Equipment Costs	7	21	25	29	36	46	96	168	241	287	320

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Labour Costs	1	7	12	15	19	27	60	106	152	179	195
Maintenance Costs	15	15	15	14	14	16	15	17	14	6	2
Utility Costs	2	4	5	6	6	7	12	19	24	27	29
Outsourced Costs	1	2	2	2	3	3	3	4	4	5	5
Miscellaneous expenses	4	7	8	9	10	11	16	21	29	35	39
Container operating costs	**39**	**75**	**88**	**100**	**117**	**150**	**275**	**441**	**619**	**736**	**815**

9.2.3. *Combined Terminal Operating Costs*

In addition to the container terminal operations, there is an option to handle bulk traffic along with container traffic for initial 10 years. In order to undertake the bulk operations in addition to container terminal operations, there are costs associated with bulk handling operations which are outsourced.

Assumptions for costs related to bulk handling are mentioned below:

TABLE 119: BULK HANDLING CHARGES

Bulk Handling	Assumption
Bulk handling tariff	70 BDT/tonne
Bulk traffic operations duration	10 Years or 55,000 TEU container traffic whichever occurs earlier
Bulk traffic	10,00,000 Tonnes/annum

Table below summarises, the combined terminal operating costs for 30 years concession period assuming bulk handling for initial 10 years of operations.

TABLE 120: COMBINED TERMINAL OPERATING COSTS – 30 YEAR CONCESSION

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Terminal Operating Costs	39	75	88	100	117	150	275	441	619	736	815
Bulk Handling Costs	38	79	82	85	88	91	53	-	-	-	-
Combined Terminal Operating Costs	**77**	**154**	**169**	**185**	**206**	**241**	**328**	**441**	**619**	**736**	**815**

Summary of Operating costs for high traffic case is present in the Annexures.

10. Feasibility Assessment and Financial Analysis

This chapter presents a detailed financial viability assessment. The results of the financial model, as well as sensitivity analysis are presented and a recommendation is made on whether PPP procurement is viable for the project.

10.1. Introduction

The main objective of the financial analysis is to assess the financial viability of the project under a Public-Private Partnership (PPP) mode of implementation. A financial viability assessment of the Project has been conducted to provide a validation of whether:

- The development and operation of the Inland Container Terminal can offer sufficient risk-reward balance to a prospective private sector partner to facilitate private sector commitment to the Project;
- The private sector is likely to be incentivised to bid for developing and operating the Inland Container Terminal while adhering to meet the GoB's objectives from the ICT facility;
- The project can be made affordable to all the stakeholders through appropriate structuring and optimum design such that users of the facility are willing to pay for use of the facilities offered by the terminal, the GoB can afford the commitments required to the facility and the private sector meets its objectives stated in points above.

In order to make such an assessment, a detailed financial model which underpins the assessment has been constructed with a degree of detail and accuracy appropriate for a feasibility study rather than for capital-raising purposes.

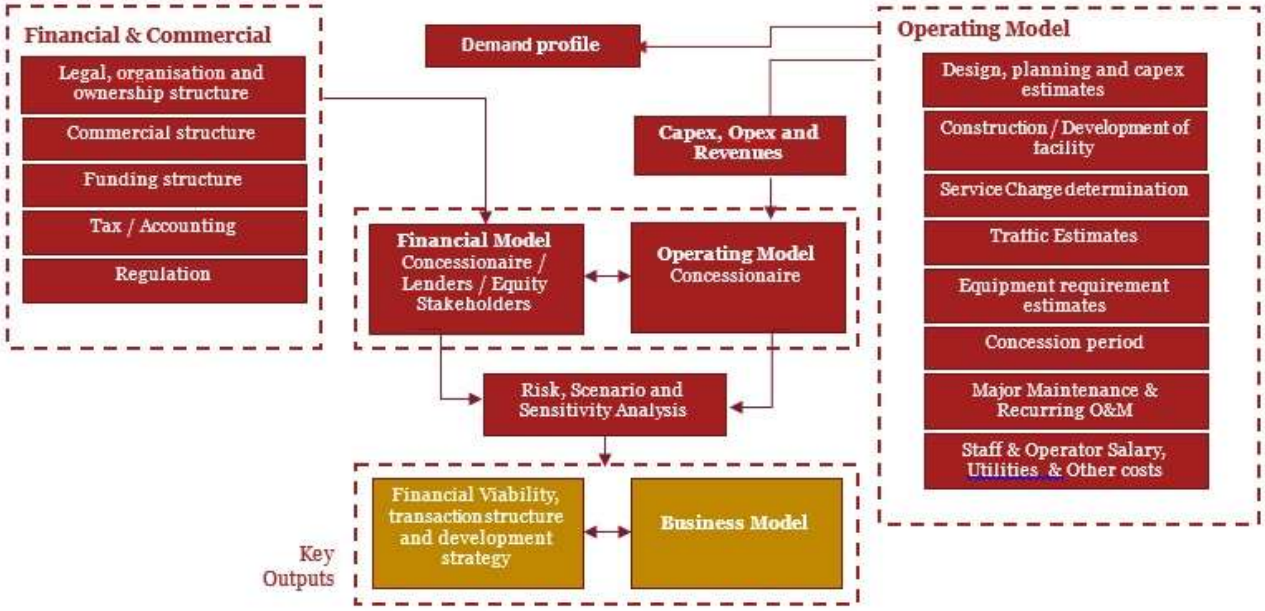
A financial model was constructed on a base case with the following assumptions:

- The facility is developed in two separate phases
- Construction duration is 18 months for each phase
- Construction period is modelled on quarterly frequency
- Operations period is modelled on annual frequency

10.2. Methodology

Our methodology of financial analysis can be encapsulated in the following format:

FIGURE 10: FINANCIAL FRAMEWORK



The analysis would require a large number of assumptions to be realistically made at this stage, in order to reflect the actual financial environment at the time of implementation. With these assumptions and the above framework, a financial spreadsheet is prepared which shall determine the viability of the project which shall fulfil to give:

- Equity IRR of 18% as required, for investors' comfort
- Debt Service Coverage Ratio of 1.2, for lenders' comfort

10.3. Approach to Financial Evaluation

This section has been prepared for documenting the financial evaluation for the development of Inland Container Terminal at Khanpur. The main objective of financial analyses is to assess the financial viability of the project under Public-Private Partnership (PPP) mode of implementation. Such an analysis would typically require a large number of assumptions to be made at this stage, in order to reflect the realistic financial environment at the time of project implementation.

The analysis attempts to ascertain the extent to which the investment can be recovered through container terminal operations and the gap therein, if any, will be bridged by performing bulk handling operations for few initial years in addition to the container terminal. The financial analysis covers aspects like financing through debt and equity, loan repayment, debt servicing, taxation, depreciation, coverage ratios, returns etc.

The viability of the project is evaluated on the basis of returns that the project shall provide on investments made. These returns are computed on a discounted cash flow basis, where both costs and revenues have been indexed to account for inflation. For the purpose of financial analyses, the major indicators of project viability are the ability of the project to service the debt raised for the project and generate returns on equity investment more than or equal to their opportunity cost of capital. These are measured by computing the Financial Internal Rate of Return (FIRR) for the project, Debt Service Coverage Ratio (DSCR), Financial Internal Rate of Return for Equity etc.

10.4. Concession Period for the project

The Concessionaire shall be selected to develop, finance, construct and operate the ICT for a pre-determined Concession period. During the concession period concessionaire shall be entitled to charge fee for the Container handling and storage services and Bulk handling services if required, provided by them. Concession period plays a vital role in the success of any PPP project. Concession period and structure should be designed so as to provide optimum win-win situation for both Authority and Concessionaire. Concession period should be determined to minimize the impact of variations in base case assumptions like:

a) Delay in construction due to Authority default, like delay in land acquisition, utility shifting, environment or forest clearance as applicable in Bangladesh
b) Increase in project costs
c) Decrease in traffic volumes

For Financial analysis and assessment of financial viability, we will be running and analysis multiple scenarios with difference concession duration i.e. 40 years, 35 years and 30 years and propose the duration which creates a win-win situation for both Authority and Concessionaire

10.5. Determination of Minimum acceptable rate of return

Investors shall invest in those projects which offer returns above their minimum acceptable return based on their risk appetite and mark-up for profits. In setting up a project, the minimum acceptable rate of return, often abbreviated MARR, or hurdle rate is the minimum rate of return a company shall secure from a project, given its risk and the opportunity cost of forgoing other projects. The hurdle rate calculation would vary for each stakeholder.

For example: whether or not a project is financially viable can be determined by comparing it's Project IRR vis-à-vis project's Working average Cost of Capital (WACC), which should be typically greater than WACC with some mark-up for profits depending upon the risk appetite of the concessionaire.

WACC calculation for the project:

WACC = Debt proportion x debt rate of interest x (1- corporate Tax rate) + Equity proportion x cost of equity

WACC of the Inland Container Terminal at Khanpur project is estimated approximately around **10.76%**.

Risk adjusted Return on Equity:

Similarly, a project developer would like to maximize its equity return from the project. In developing countries like Bangladesh bidders typically look at the equity return greater than 17%. However, considering Inland Water Transportation is at nascent stage and relatively riskier country rating profile, developer from outside the country may look for Equity return of more than 18%.

Since privatization of ports has not yet taken place in Bangladesh, we did not have enough information on the systematic risk i.e. Beta coefficient for comparable projects to assess the about the related to the risk Cost of Equity thus, we have referred the Beta coefficient of 1.1[32] based on a comparable private port in India.

Based on Capital Asset Pricing Model (CAPM) as discussed in the discussion note we had arrived at equity return of 18.03%

TABLE 121: EXPECTED RETURN ON EQUITY INVESTMENT

[32] MARG Karaikal Port Beta - http://www.icra.in/files/pdf/2012-Mar-Marg.pdf

S.No	Item	Value
1.	Risk free return: Rate of return on a 10 year Bangladesh Treasury Bond[33]	8.39%
2.	Market rate of return on Dhaka Exchange	17.15%
3.	Value of Beta (Comparable company)	1.1
Risk adjusted Return on Equity		**18.03%**

10.6. Model Assumptions

Based on the project requirement, economic environment, fiscal policies and interaction with the stakeholders and other prevalent conditions, following are the general assumptions used in the financial model for assessing the financial viability of the project and conducting the financial analysis of different scenarios:

10.6.1. Timing Assumptions

As per the standard industry practice related to EPC duration of the container terminal projects, timing assumptions for the financial model are mentioned in the table below:

TABLE 122: TIMING ASSUMPTIONS

Description	Value
Construction Phase 1 Start Date	01 Jan 2016
Construction Phase 2 Start Date	01 Jan 2032
Operations Period Start Date	01 Jul 2017
Construction Phase 1 Duration	18 months
Construction Phase 2 Duration	18 months
Construction phase 1 end date	30 Jun 2017
Construction period modelling frequency	Monthly
Operations period modelling frequency	Annual

10.6.2. Economic Assumptions

Prevalent and forecast economic assumptions related to the Bangladesh and US economy and the base date of the cost assumptions based on which forecast cost assumptions are used in the model are mentioned in the table below:

TABLE 123: ECONOMIC ASSUMPTIONS

Description	Value
Base exchange rate BDT / USD - 2015	78.07 BDT / USD
Tariff escalation frequency	Every year

[33] https://www.bb.org.bd/monetaryactivity/treasury.php

US PPI inflation base date	31 Dec 2015
Bangladesh CPI inflation base date	31 Dec 2015
Civil costs estimate base date	31 Dec 2015
Equipment costs estimate base date	31 Dec 2015
Salary & wages estimate base date	31 Dec 2015
Equipment variable cost estimate base date	31 Dec 2015
% of CPI growth to be passed to tariff	50.00%
% of CPI growth to be passed to capital cost	50.00%
% of CPI growth to be passed to equipment variable Cost	50.00%
US PPI Growth Rate	2.5% from 2015 to 2055
Bangladesh CPI Growth Rate	8% till 2020, 7% till 2025, 6% till 2030, 5.5% till 2035, 5% till 2040, 4.75% till 2045 and 4.5% till 2055
Equipment operators salary costs growth rate	6% from 2015 to 2055

10.6.3. *Fiscal Assumptions*

Fiscal assumptions like corporate tax rate, VAT, capital allowances and accounting depreciation rates applied on different asset class are mentioned in the table below:

TABLE 124: FISCAL ASSUMPTIONS

Description	Value
Corporate Tax Rate	27.5%
VAT Rate	0%
Capital Allowance – Hard Costs	10% per annum
Capital Allowance – Equipment Costs	20% per annum
Accounting Depreciation Rate – Hard Costs	SL, Depreciated over the remaining tenor of the operations
Accounting Depreciation Rate – Equipment Costs	SL, Depreciated over the remaining tenor of the operations

10.6.4. *Project Financing Assumptions*

In general, the developer shall raise the finances for the project by optimizing equity returns keeping in view the project cash flows, and terms and conditions of various financing options available. Further, the credit rating and financial strength of the developer would largely determine the terms and conditions of finance offered by various lending agencies. For the purpose of this financial analysis and based on the market sounding inputs, a Debt: Equity ratio of 70:30 has been envisaged for the facility. It has further been assumed that if grant is provided to the concessionaire, the Debt and Equity funding amount shall be modified proportionally keeping the Debt: Equity ratio unchanged i.e. 70:30.

The financing assumptions are mentioned in the table below:

TABLE 125: FINANCING ASSUMPTIONS

Description	Value
Debt : Equity Ratio	70 : 30
Expected Equity IRR	18.00%
Senior Debt Structure	Separate BDT Term Loans are assumed to be availed for both phases of construction
Interest Rates During Construction	Phase 1 Loan – 11% Phase 2 Loan – 11%
Interest Rates During Operations	Phase 1 Loan – 11% Phase 2 Loan – 11%
Agency Fee to Lenders	Phase 1 Loan – BDT 1.17 Million per annum Phase 2 Loan – BDT 1.17 Million per annum
Arrangement Fee to Lenders	Phase 1 Loan – 1% of Commitment amount Phase 2 Loan – 1% of Commitment amount
Commitment Fee to Lenders	Phase 1 Loan – 1% of Undrawn amount Phase 2 Loan – 1% of Undrawn amount
Loan Tenor	Phase 1 Loan – 20.5 years Phase 2 Loan – 11.5 years
Moratorium Period	Phase 1 Loan – 2 years Phase 2 Loan – 1 year

Senior Debt Repayment Profile (Phase 1 Loan) is mentioned in the table below:

TABLE 126: SENIOR DEBT REPAYMENT PROFILE – PHASE 1

Phase 1 Loan Repayment Profile	
Year	**Repayment %**
31 Dec 2019	1%
31 Dec 2020	1%
31 Dec 2021	1%
31 Dec 2022	1%
31 Dec 2023	1%
31 Dec 2024	4%
31 Dec 2025	4%
31 Dec 2026	4%
31 Dec 2027	4%
31 Dec 2028	7%

Phase 1 Loan Repayment Profile	
Year	**Repayment %**
31 Dec 2029	7%
31 Dec 2030	8%
31 Dec 2031	8%
31 Dec 2032	9%
31 Dec 2033	10%
31 Dec 2034	11%
31 Dec 2035	11%
31 Dec 2036	8%

Senior Debt Repayment Profile (Phase 2 Loan) is mentioned in the table below:

TABLE 127: SENIOR DEBT REPAYMENT PROFILE – PHASE 2

Phase 2 Loan Repayment Profile	
Year	**Repayment %**
31 Dec 2034	6.25%
31 Dec 2035	12.5%
31 Dec 2036	12.5%
31 Dec 2037	12.5%
31 Dec 2038	12.5%
31 Dec 2039	12.5%
31 Dec 2040	12.5%
31 Dec 2041	12.5%
31 Dec 2042	6.25%

10.6.5. Operational Funding

Additional funding is required during operations period for funding the additional civil capex, buying additional equipment and for funding the cash shortfall. Separate loans are considered for each type of funding requirement during operations period. Assumptions related to these sources of funds are mentioned in the table below:

TABLE 128: OPERATIONAL FUNDING ASSUMPTIONS

Description	Value
Incremental Capital Expenditure Loan Funding %	75%
Incremental capex loan premium to senior debt interest rate	1%
Incremental loan repayment duration	10 years
Incremental loan repayment profile	Linear Repayment
Equipment loan funding %	75%

Equipment loan premium to senior debt interest rate	0%
Equipment loan repayment duration	5 years
Equipment loan repayment profile	EMI basis
Overdraft Facility premium to senior debt interest rate	0%

10.7. Project Scenarios and Analysis

As mentioned in Sec 6.2 there are three broad level scenarios i.e. Simple Option, Restricted Option and Full Option based on the land availability due to which the container handling capacity of the facility under different options varies.

For the purpose of assessing the financial viability of the project only Simple Option is considered keeping in mind the fact that Restricted Option and Full Area Option are not feasible for implementation from technical point of view.

Twelve different scenarios are considered for determining the financial viability of the project by keeping the general assumptions mentioned in Section 10.6 unchanged and by varying the following parameters under Simple Option:

- Bulk traffic to be handled in initial years
- Concession period duration
- Traffic volume

Under this option, following 12 scenarios are prepared and analysed:

10.7.1. Scenario 1 – Simple Option-40 years-Without Bulk-Base case traffic

This scenario considers concession period of 40 years with base case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 129 Summary of Project Capex – Scenario 1

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-
DSRA Pre-Funding	99
Working Capital Pre-Funding	-
Total Project Cost	**2,470**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 130 Summary of Operating revenue and Operating Cost – Scenario 1

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	2,010	2,298	2,460
Operating Cost	37	71	84	96	114	146	274	445	628	756	906	1,073	1,176

Key Financial Indicators

Table 131 Key Financial Indicators – Scenario 1

Description	Financial Indicator Value
Equity IRR	11.10%
Post-tax Project IRR	11.20%
Post-tax Project NPV	282.54 Million BDT
Minimum DSCR	0.2269
Average DSCR	2.7342

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.2. Scenario 2 – Simple Option-40 years-With Bulk-Base case traffic

This scenario considers concession period of 40 years with base case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 132 Summary of Project Capex – Scenario 2

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-

DSRA Pre-Funding	100
Working Capital Pre-Funding	4
Total Project Cost	**2,474**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 133 Summary of Operating revenue and Operating Cost – Scenario 2

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	125	300	347	391	435	521	739	1,031	1,487	1,751	2,010	2,298	2,460
Operating Cost	77	154	170	185	206	242	330	445	628	756	906	1,073	1,176

Key Financial Indicators

Table 134 Key Financial Indicators – Scenario 2

Description	Financial Indicator Value
Equity IRR	19.04%
Post-tax Project IRR	15.60%
Post-tax Project NPV	1005.00 Million BDT
Minimum DSCR	1.5060
Average DSCR	3.0962

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.7.3. Scenario 3 – Simple Option-35 years-Without Bulk-Base case traffic

This scenario considers concession period of 35 years with base case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 135 Summary of Project Capex – Scenario 3

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-
DSRA Pre-Funding	99
Working Capital Pre-Funding	-
Total Project Cost	**2,470**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 136 Summary of Operating revenue and Operating Cost – Scenario 3

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	2,010	-	-
Operating Cost	37	71	84	96	113	146	273	443	625	750	894	-	-

Key Financial Indicators

Table 137 Key Financial Indicators – Scenario 3

Description	Financial Indicator Value
Equity IRR	10.76%
Post-tax Project IRR	11.04%
Post-tax Project NPV	229.80 Million BDT
Minimum DSCR	0.2278
Average DSCR	2.7435

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.4. Scenario 4 – Simple Option-35 years-With Bulk-Base case traffic

This scenario considers concession period of 35 years with base case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 138 Summary of Project Capex – Scenario 4

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-
DSRA Pre-Funding	100
Working Capital Pre-Funding	4
Total Project Cost	**2,474**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 139 Summary of Operating revenue and Operating Cost – Scenario 4

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	125	300	347	391	435	521	739	1,031	1,487	1,751	2,010	-	-
Operating Cost	77	154	170	185	206	242	329	443	625	750	894	-	-

Key Financial Indicators

TABLE 140 KEY FINANCIAL INDICATORS – SCENARIO 4

Description	Financial Indicator Value
Equity IRR	19.04%
Post-tax Project IRR	15.57%
Post-tax Project NPV	952.62 Million BDT

Description	Financial Indicator Value
Minimum DSCR	1.5069
Average DSCR	3.1064

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.7.5. Scenario 5 – Simple Option-30 years-Without Bulk-Base case traffic

This scenario considers concession period of 30 years with base case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 141 Summary of Project Capex – Scenario 5

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-
DSRA Pre-Funding	99
Working Capital Pre-Funding	-
Total Project Cost	**2,470**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 142 Summary of Operating revenue and Operating Cost – Scenario 5

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	16	75	114	147	183	261	587	1,031	1,487	1,751	-	-	-
Operating Cost	37	71	83	96	113	145	272	441	619	736	-	-	-

Key Financial Indicators

Table 143 Key Financial Indicators – Scenario 5

Description	Financial Indicator Value
Equity IRR	9.90%
Post-tax Project IRR	10.67%
Post-tax Project NPV	134.29 Million BDT
Minimum DSCR	0.2289
Average DSCR	2.7892

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.6. Scenario 6 – Simple Option-30 years-With Bulk-Base case traffic

This scenario considers concession period of 30 years with base case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 144 Summary of Project Capex – Scenario 6

Description	Amount in BDT Million
Civil Works Cost	1,234
Equipment Cost	1,053
Financing Cost	83
Land Acquisition Cost	-
DSRA Pre-Funding	100
Working Capital Pre-Funding	4
Total Project Cost	**2,474**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 145 Summary of Operating revenue and Operating Cost – Scenario 6

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	125	300	347	391	435	521	739	1,031	1,487	1,751	-	-	-
Operating Cost	77	154	169	185	206	241	328	441	619	736	-	-	-

Key Financial Indicators

Table 146 Key Financial Indicators – Scenario 6

Description	Financial Indicator Value
Equity IRR	18.94%
Post-tax Project IRR	15.44%
Post-tax Project NPV	857.61 Million BDT
Minimum DSCR	1.5081
Average DSCR	3.1531

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.7.7. Scenario 7 – Simple Option-40 years-Without Bulk-High case traffic

This scenario considers concession period of 40 years with high case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 147 Summary of Project Capex – Scenario 7

Description	Amount in BDT Million
Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	-
Total Project Cost	**1,904**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 148 Summary of Operating revenue and Operating Cost – Scenario 7

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	37	117	170	206	275	331	733	1,259	1,628	1,838	2,061	2,304	2,463
Operating Cost	43	81	97	110	135	163	310	507	661	781	915	1,078	1,184

Key Financial Indicators

Table 149 Key Financial Indicators – Scenario 7

Description	Financial Indicator Value
Equity IRR	14.03%
Post-tax Project IRR	12.89%
Post-tax Project NPV	695.85 Million BDT
Minimum DSCR	0.5592
Average DSCR	3.9839

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.8. Scenario 8 – Simple Option-40 years-With Bulk-High case traffic

This scenario considers concession period of 40 years with high case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 150 Summary of Project Capex – Scenario 8

Description	Amount in BDT Million
Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	5

Total Project Cost	**1,909**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 151 Summary of Operating revenue and Operating Cost – Scenario 8

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	146	342	404	450	526	592	885	1,259	1,628	1,838	2,061	2,304	2,463
Operating Cost	83	164	183	199	228	259	366	507	661	781	915	1,078	1,184

Key Financial Indicators

Table 152 Key Financial Indicators – Scenario 8

Description	Financial Indicator Value
Equity IRR	23.02%
Post-tax Project IRR	17.46%
Post-tax Project NPV	1417.53 Million BDT
Minimum DSCR	1.7762
Average DSCR	4.3994

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.7.9. Scenario 9 – Simple Option-35 years-Without Bulk-High case traffic

This scenario considers concession period of 35 years with base case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 153 Summary of Project Capex – Scenario 9

Description	Amount in BDT Million

Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	-
Total Project Cost	**1,904**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 154 Summary of Operating revenue and Operating Cost – Scenario 9

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	37	117	170	206	275	331	733	1,259	1,628	1,838	2,061	-	-
Operating Cost	43	81	97	110	135	162	309	505	657	775	904	-	-

Key Financial Indicators

Table 155 Key Financial Indicators – Scenario 9

Description	Financial Indicator Value
Equity IRR	13.91%
Post-tax Project IRR	12.81%
Post-tax Project NPV	642.74 Million BDT
Minimum DSCR	0.5601
Average DSCR	3.9969

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.10. Scenario 10 – Simple Option-35 years-With Bulk-High case traffic

This scenario considers concession period of 35 years with high case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 156 Summary of Project Capex – Scenario 10

Description	Amount in BDT Million
Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	5
Total Project Cost	**1,909**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 157 Summary of Operating revenue and Operating Cost – Scenario 10

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	146	342	404	450	526	592	885	1,259	1,628	1,838	2,061	-	-
Operating Cost	83	164	183	199	228	258	365	505	657	775	904	-	-

Key Financial Indicators

Table 158 Key Financial Indicators – Scenario 10

Description	Financial Indicator Value
Equity IRR	23.05%
Post-tax Project IRR	17.46%
Post-tax Project NPV	1364.29 Million BDT
Minimum DSCR	1.7771
Average DSCR	4.4124

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.7.11. Scenario 11 – Simple Option-30 years-Without Bulk-High case traffic

This scenario considers concession period of 30 years with high case traffic volume and only container terminal operations are being carried out. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 159 Summary of Project Capex – Scenario 11

Description	Amount in BDT Million
Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	-
Total Project Cost	**1,904**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue and operating cost under this scenario is mentioned below:

Table 160 Summary of Operating revenue and Operating Cost – Scenario 11

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	37	117	170	206	275	331	733	1,259	1,628	1,838	-	-	-
Operating Cost	43	81	97	110	135	162	308	502	652	763	-	-	-

Key Financial Indicators

Table 161 Key Financial Indicators – Scenario 11

Description	Financial Indicator Value
Equity IRR	13.40%
Post-tax Project IRR	12.48%
Post-tax Project NPV	512.50 Million BDT

Minimum DSCR	0.5613
Average DSCR	4.0161

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is below the hurdle rate of 18% and Minimum DSCR is below the required Minimum DSCR threshold of 1.2000x thus, this scenario is not viable from Financial Feasibility point of view.

10.7.12. Scenario 12 – Simple Option-30 years-With Bulk-High case traffic

This scenario considers concession period of 30 years with high case traffic volume and Bulk handling operations are carried out in addition to container terminal operations. Summary of key outputs from the model is presented below:

Project Costs

Summary of the project cost under this scenario is mentioned below:

Table 162 Summary of Project Capex – Scenario 12

Description	Amount in BDT Million
Civil Works Cost	1,256
Equipment Cost	500
Financing Cost	73
Land Acquisition Cost	-
DSRA Pre-Funding	76
Working Capital Pre-Funding	5
Total Project Cost	**1,909**

**Exchange of BDT USD estimated at 78.07*

Operating Revenue & Operating Cost

As per the details of operating revenue and operating cost mentioned in Section 9.1 and Section 9.2 respectively, summary of the operating revenue including bulk handling revenue and operating costs including bulk handling costs under this scenario is mentioned below:

Table 163 Summary of Operating revenue and Operating Cost – Scenario 12

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2047	2052	2055
Operating Revenue	146	342	404	450	526	592	885	1,259	1,628	1,838	-	-	-
Operating Cost	83	164	183	199	227	258	364	502	652	763	-	-	-

Key Financial Indicators

Table 164 Key Financial Indicators – Scenario 12

Description	Financial Indicator Value
Equity IRR	23.00%
Post-tax Project IRR	17.34%
Post-tax Project NPV	1233.82 Million BDT
Minimum DSCR	1.7783
Average DSCR	4.4314

As can be seen from the values of the key financial indicators mentioned in the above table, Equity IRR is above the hurdle rate of 18% and Minimum DSCR is also above the required Minimum DSCR of 1.2000x thus, this scenario is viable from Financial Feasibility point of view.

10.8. Preferred Option

Financial results of the individual scenarios represented under Sec 11.7 are summarized below:

Table 165 Summary of Alternate Scenarios

Scenario Name	Description	Equity IRR	Post-tax Project IRR	Pre-tax Project NPV	Post-tax Project NPV	Average DSCR	Financial Viability
Simple Option							
Scenario 1	Without Bulk Traffic - 40 year concession	11.10%	11.20%	576.67	282.54	2.7342	FAIL
Scenario 2	With Bulk Traffic - 40 year concession	19.04%	15.60%	1426.37	1005	3.0962	PASS
Scenario 3	Without Bulk Traffic - 35 year concession	10.76%	11.04%	499.47	229.80	2.7435	FAIL
Scenario 4	With Bulk Traffic- 35 year concession	19.04%	15.57%	1349.17	952.62	3.1064	PASS
Scenario 5	Without Bulk Traffic - 30 year concession	9.90%	10.67%	362.48	134.29	2.7892	FAIL
Scenario 6	With Bulk Traffic - 30 year concession	18.94%	15.54%	1212.17	857.61	3.1531	PASS
Scenario 7	Without Bulk Traffic - High Case - 40 year concession	14.03%	12.89%	1139.32	695.85	3.9839	FAIL
Scenario 8	With Bulk Traffic - High Case - 40 year concession	23.02%	17.46%	1989.01	1417.53	4.3994	PASS
Scenario 9	Without Bulk Traffic - High Case - 35 year concession	13.91%	12.81%	1061.65	642.74	3.9969	FAIL
Scenario 10	With Bulk Traffic - High Case- 35 year concession	23.05%	17.46%	1911.34	1364.29	4.4124	PASS
Scenario 11	Without Bulk Traffic - High Case - 30 year concession	13.40%	12.48%	876.77	512.50	4.0161	FAIL
Scenario 12	With Bulk Traffic - High Case - 30 year concession	23.00%	17.34%	1726.46	1233.82	4.4314	PASS

* All the scenarios marked in are financially viable.

Based on the summary of alternate scenarios present in the table above Scenario 6 i.e. "**Simple option – 30 years Concession, Base case Traffic with Bulk handling operations"** is the preferred option. This option assumes Debt-Equity ratio of 70:30, Concession period of 30 years, VAT exemption for entire concession period of 30 years and Base case traffic projections.

Detailed financial statements for the preferred option are presented as annexure to this report.

10.9. Financial Summary of Preferred Option

Financial summary of the proposed preferred option is shown below:

1. Cash flow profile

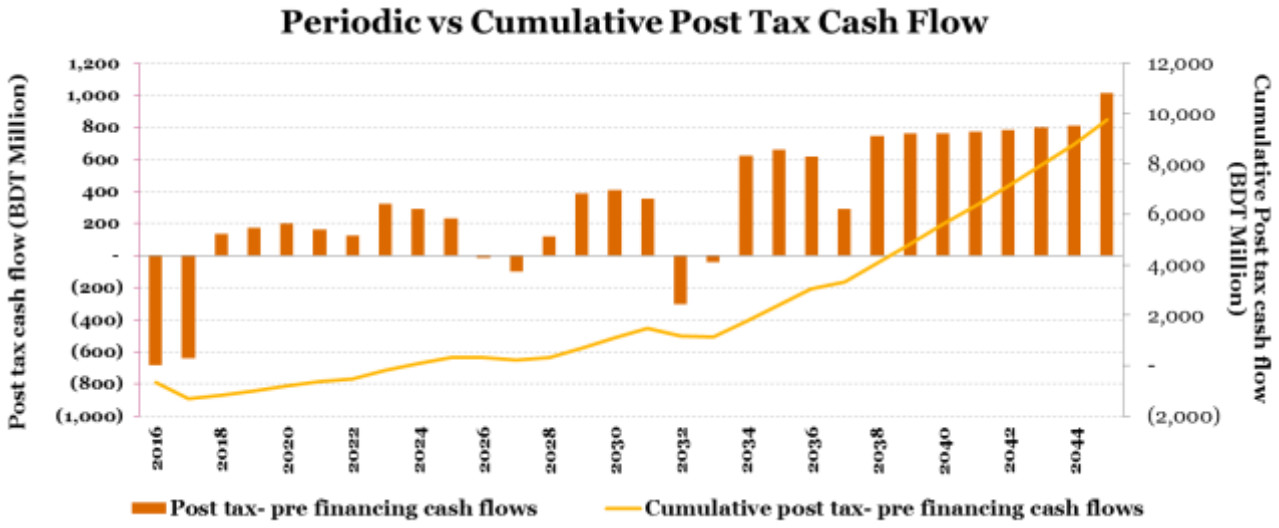


FIGURE 82: PERIODIC VS CUMULATIVE CASH FLOW

2. The profile of cash outflows during operations is:

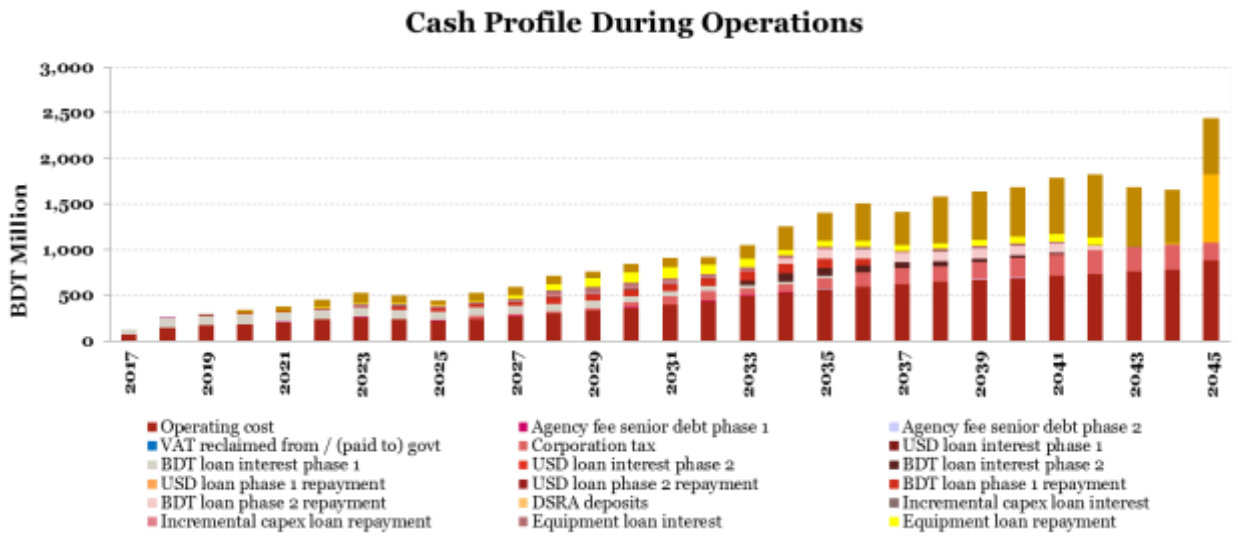


FIGURE 83: CASH FLOW PROFILE

3. Asset created profile

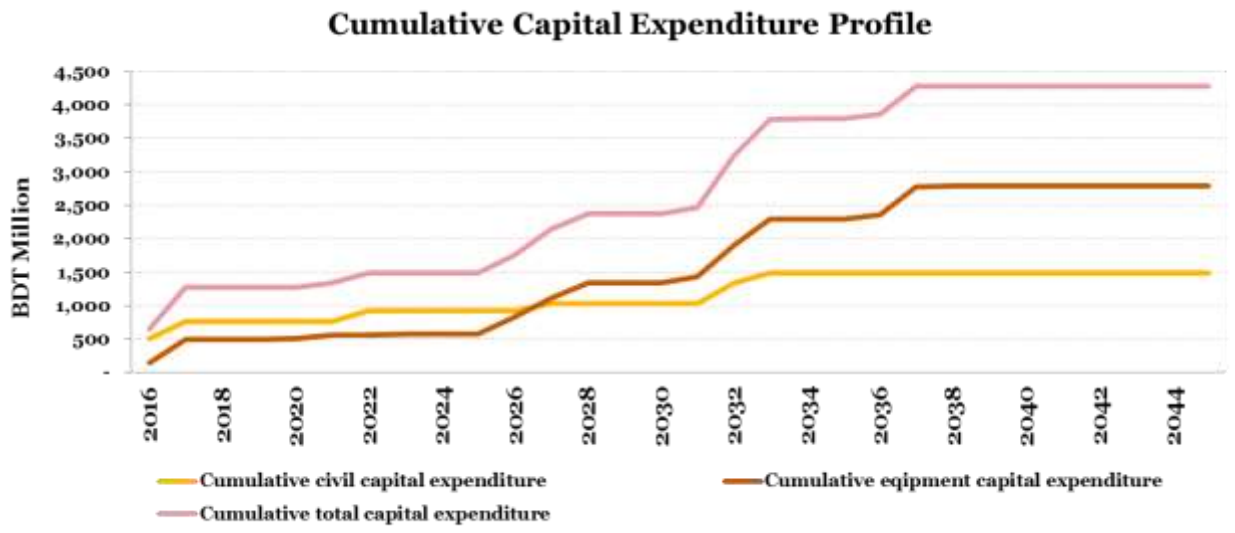


FIGURE 84: ASSET CREATED PROFILE

4. CFADS vs Debt Service profile

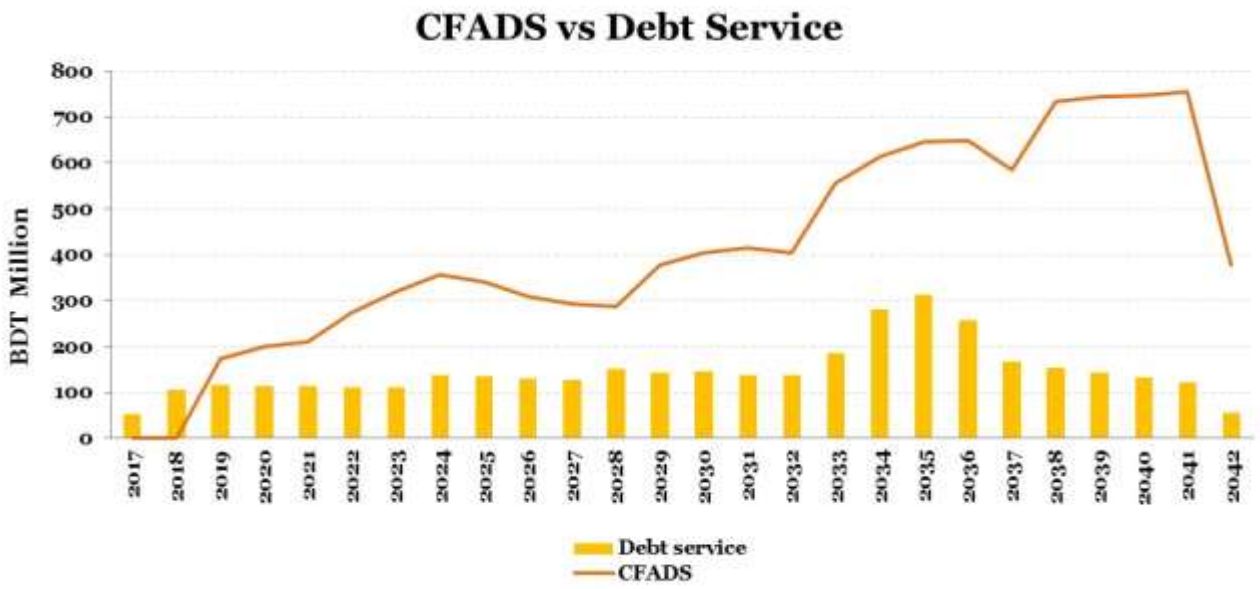


FIGURE 85: CFADS VS DEBT SERVICE

5. Operating Revenue vs Operating Cost and EBIDA Margin Profile

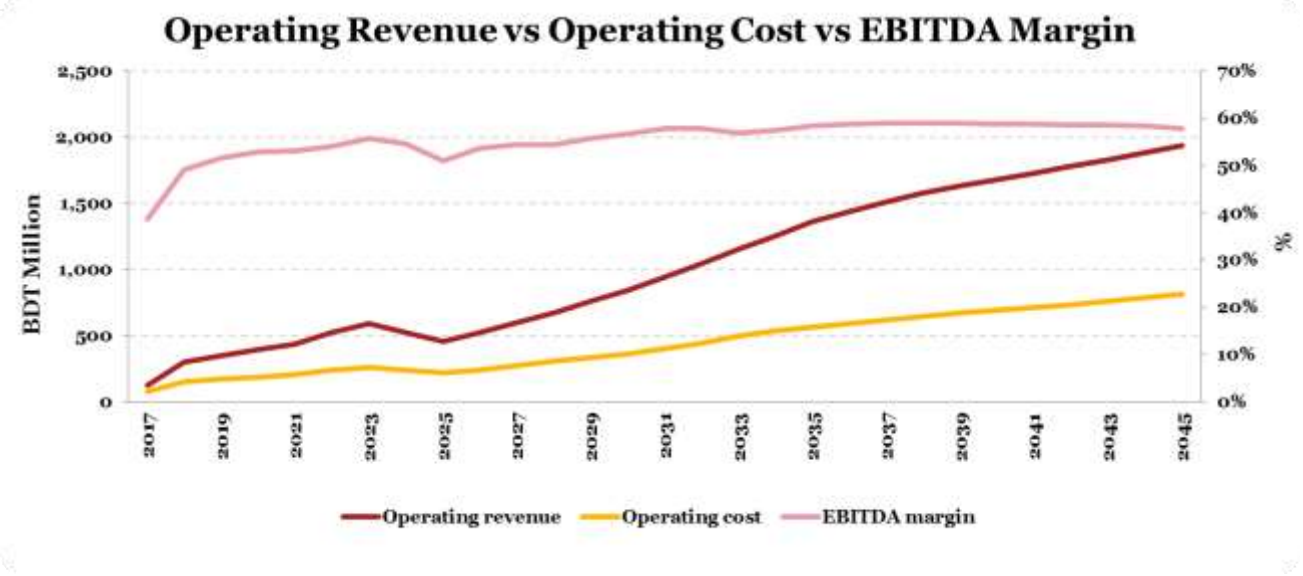


FIGURE 86: OPREV VS OPCOST VS EBITDA MARGIN

6. Debt Structure

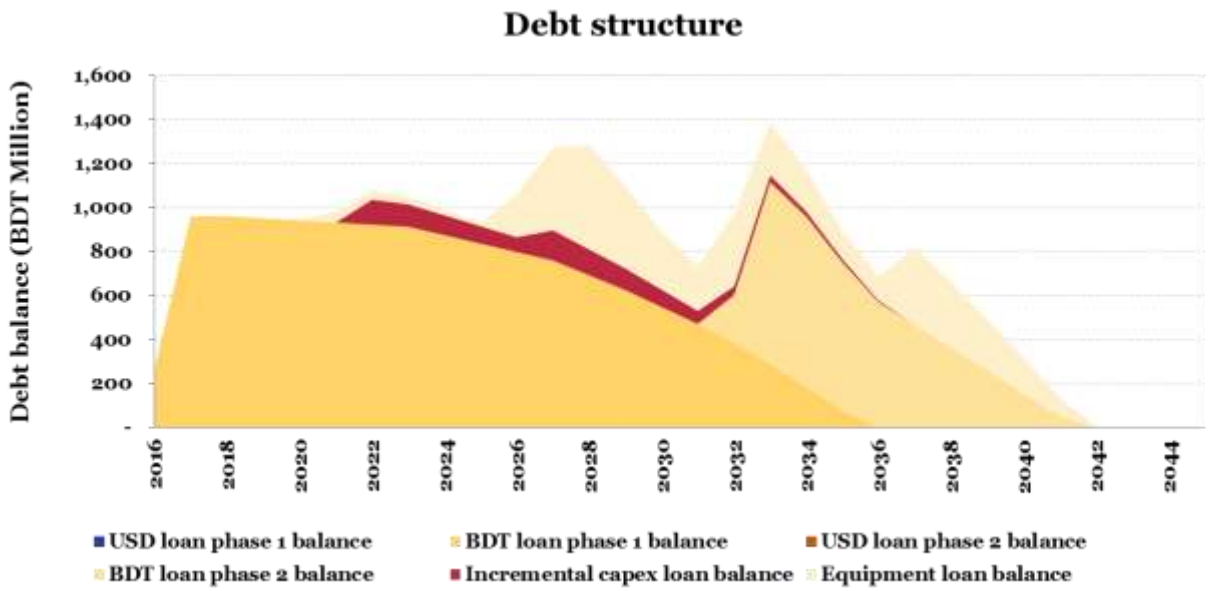


FIGURE 87: DEBT STRUCTURE

7. Coverage Ratios

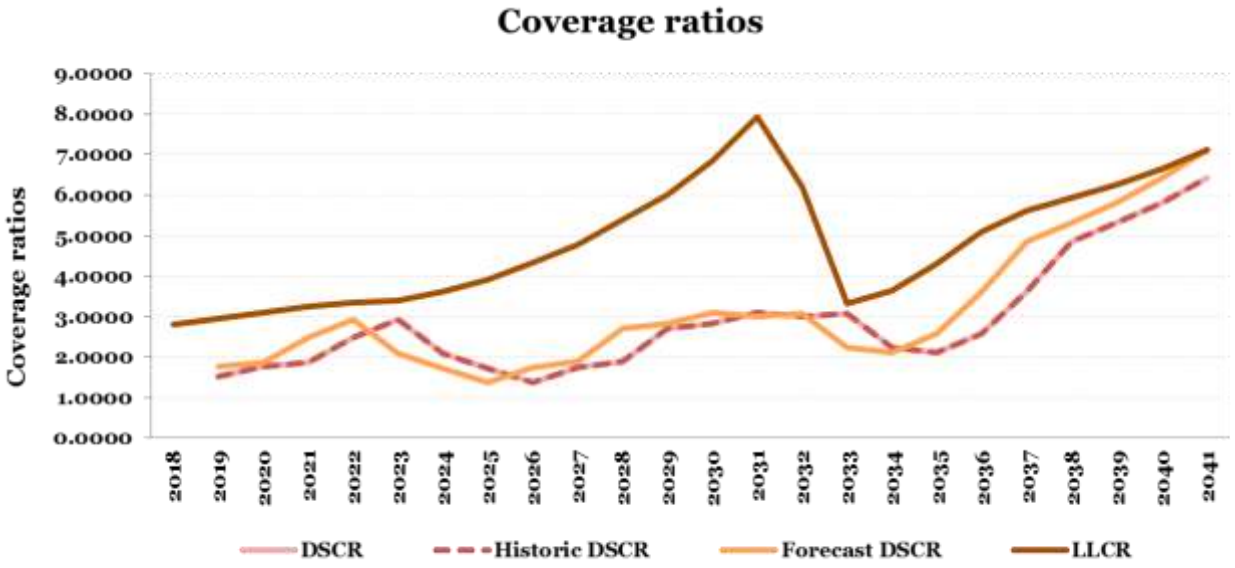


FIGURE 88: COVERAGE RATIO PROFILE

8. Sources and Uses Profile

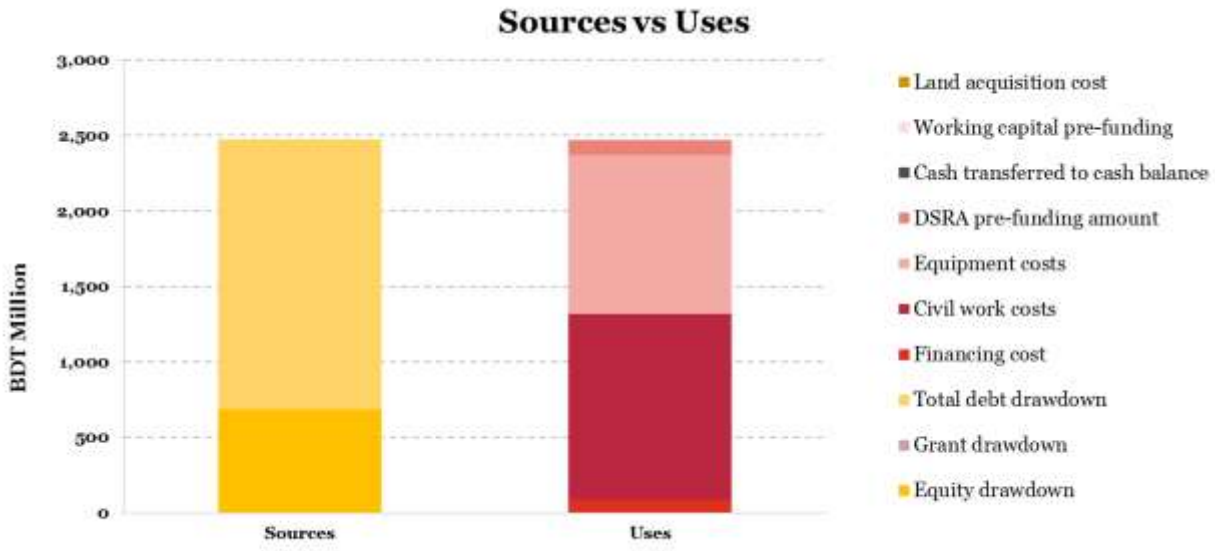


FIGURE 89: SOURCES AND USES PROFILE

9. Financing Mix

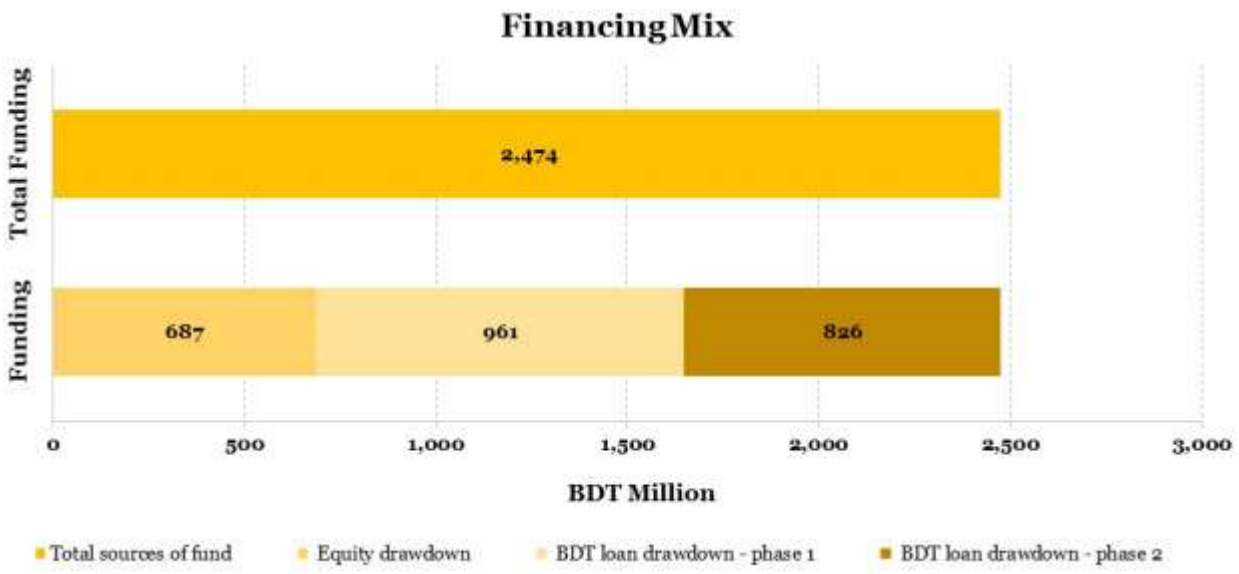


FIGURE 90: FINANCING MIX

10.10. *Sensitivity analysis of Preferred Option*

Sensitivity analysis of the proposed preferred option mentioned in Sec 11.8 is performed by running upside and downside sensitivities on following different input parameters:

- Capital expenditure
- Traffic
- Operating costs
- Senior Debt Interest rate

TABLE 166 SENSITIVITY ANALYSIS RESULTS

Sensitivity on Base Case Model	Equity IRR	Minimum DSCR
Upside Sensitivities		
Capital Expenditure reduced by 20%	25.03%	1.9269
Capital Expenditure reduced by 10%	21.67%	1.6944
Traffic increased by 20%	28.64%	2.1010
Traffic increased by 10%	23.91%	1.8048
Operating Costs reduced by 20%	23.61%	1.7982
Operating Costs reduced by 10%	21.31%	1.6532
Interest Rate reduced by 2%	21.31%	1.8286
Interest Rate reduced by 1%	20.10%	1.6538
Downside Sensitivities		
Capital Expenditure increased by 10%	16.67%	1.3555
Capital Expenditure increased by 20%	14.67%	1.2282
Traffic decreased by 10%	13.55%	1.2109

Sensitivity on Base Case Model	Equity IRR	Minimum DSCR
Traffic decreased by 20%	7.65%	0.9133
Operating Costs increased by 10%	16.55%	1.3628
Operating Costs increased by 20%	14.06%	1.2174
Interest Rate increased by 1%	17.82%	1.3849
Interest Rate increased by 2%	16.79%	1.2793

Graphical representation of the impact of each sensitivity factor on Equity IRR of the project is illustrated with the Tornado Diagram shown below:

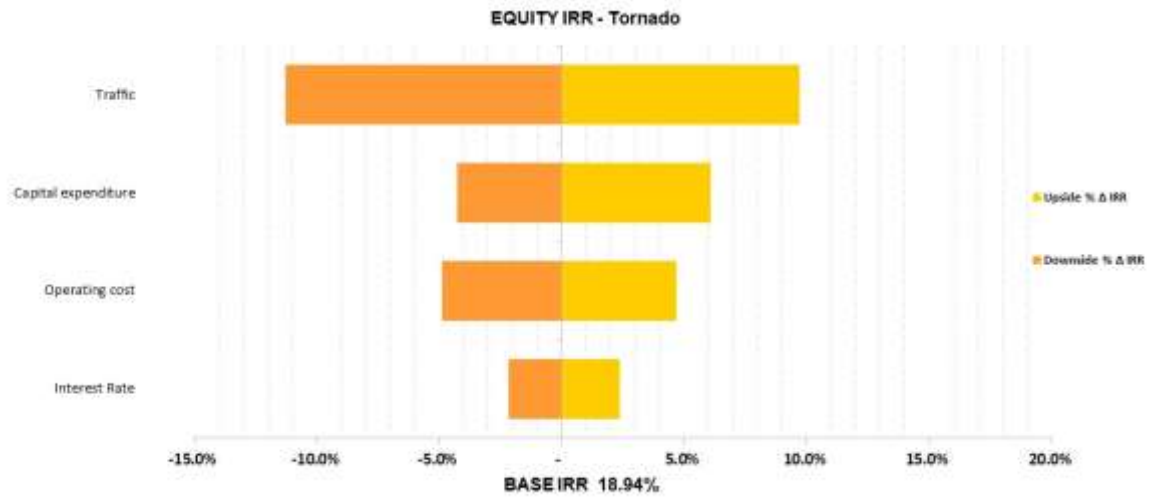


FIGURE 91: EQUITY IRR – TORNADO DIAGRAM

Notes for tornado:

1. The X axis shows % change from the base IRR of 17.42%
2. The Y axis show the driver and their base values
3. Red bars are for downside scenarios
4. Orange bars are for upside scenarios
5. Beside the bar absolute value for drivers are mentioned

Above analysis shows that, Traffic has the most impact on Equity IRR as compared to other sensitivity factors. Therefore, the project is most sensitive to traffic volume estimation thus, traffic estimation needs utmost attention as compared to other sensitivity factors.

Based on the financial feasibility analysis of the project, it can be concluded that standalone container operations will not be sufficient to achieve financial viability for the proposed ICT at Khanpur. It is recommended that container operations should be combined with the bulk operation for initial 10 years or till the time container traffic volume reaches 55000 TEU annually.

After combining the bulk handling operations with the container terminal operations for initial 10 years, project can attain equity return of 18.9%. Considering the nascent stage of Inland Water Transportation of containers in Bangladesh, Equity return of more than 18% is desirable.

In further sections, we shall look at identifying and reallocating risks and structuring the project further to enable the project find higher acceptability amongst the investors.

11. Economic Analysis

The objective of this analysis is to quantify the impact of the development of the proposed Inland Container Terminal at Khanpur on the economy of Bangladesh. Financial analysis (or Financial IRR) estimates the return accruing to the project operating entity (ICT developer), whereas EIRR estimates the return on the investment to the national economy. Economic analysis is essential to develop a rationale for the public sector (the Government of Bangladesh) to intervene in the investment and support the development of the proposed facility and illustrate the measure of the economic benefits due to the intervention.

11.1. Economic IRR (EIRR) Framework

EIRR is a holistic approach which takes into consideration the following stakeholders (directly/ indirectly) associated with the project:

- The project financers (whose return was calculated as the financial internal rate of return),
- The employment (both direct and indirect employment) generated because of the project,
- The suppliers and customers of the project,
- Competitors of the project,
- Residents who are being affected by the implementation of the project and
- Others

Determination of EIRR is directly aligned with the objectives of the multilateral agencies i.e. alleviation of poverty, employment generation and overall development of the country. A two-stage process has been adopted for the calculation of EIRR[34].

EIRR= Private Returns+ Cost Gains

Where, Private Returns= Actual Revenues- Actual Costs

Cost Gains= Actual Cost- Opportunity Cost

All taxes and subsidies have been excluded for computation of EIRR

Economic analysis requires quantification of various costs and benefits converted to 'economic equivalent' terms. EIRR also requires identification of 'externalities' and valuation of inputs and outputs at their true economic prices, or the 'opportunity costs'.

Financial analysis only looks at the project from the perspective of the implementing agency. Financial analysis is only concerned with line items that entail monetary outlays. Economic analysis on the other hand looks at cost and associated benefits to the economy. In economic analysis, a resource must be priced at its opportunity cost (its value in the best possible use), even if it is obtained free since use of the resource is a cost to the economy. Economic analysis measures both the positive and negative impact of the project. The economic cost reflects the degree to which the consumption elsewhere in the ecosystem is sacrificed due to the diversion of the resources required for the project. Whereas, the economic benefit portrays the extent to which the project contributes to the increasing value of consumption available to the society.

Some important aspects to be considered while undertaking economic analysis are:

[34] Benjamin Esty, Frank Lysy, & Carrie Ferman, "An Economic Framework for Assessing Development Impact", Harvard Business School Case 9-202-052, February 7, 2003.

- For undertaking the economic analysis, financial costs are to be converted to their economic cost equivalents. By and large the financial components are capex (construction cost, equipment cost etc. as there is no land acquisition required for this facility) and opex (operational expenditure).

- Items like taxes included in the financial cost are excluded as these are market distortions.

- Debt service costs (interest during construction and operations) and other financing costs like agency fee and upfront fee are not included as economic cost in the analysis as the same doesn't require usage of resources.

- Social costs such as Resettlement and rehabilitation are included in the economic cost calculation.

11.2. Assumptions

The Economic IRR for the project has been calculated considering economic costs and benefits generating out of the project over a period of 30 years. The assumptions adopted for computation of economic IRR are based on the assumptions as depicted in our financial analysis. Base case i.e. **Simple option – 30 years Concession, Base case Traffic without Bulk handling operations** is used for calculating the EIRR for the project as under this case only container terminal operations are considered for revenue calculations and only container terminal operations should be used to assess the impact on the economy. In addition to the above, the following assumptions were considered for arriving at the EIRR:

- **Cost of land**: There is no requirement of land acquisition for the development of the facility thus, conversion of land acquisition cost to economic cost is not required.

- **Social costs**: The social cost of site development is considered as zero. Social cost for the project is the cost associated with the Resettlement and Rehabilitation of the squatters currently residing at the project site.

- **Capital Expenditure (Capex)**: The capex incurred for various components of the project is obtained from the financial model. This has further been segregated into two components:

    - Equipment cost (Related to purchase of equipment for container handling and storage operations)

    - Civil cost (Related to development of the facility). This civil capex is further divided into three components:

        - Material – 50% of civil capex

        - Equipment – 30% of civil capex

        - Labour – 20% of civil capex

- **Operating Expenditure (Opex)**: The opex incurred for various components of the project is obtained from the financial model. This has further been segregated into two components:

    - Operating cost excluding personnel costs, which has been further divided into following three categories:

        - Material – 50% of opex

        - Equipment – 30% of opex

        - Labour – 20% of opex

    - Personnel cost is calculated separately in the financial model.

- **Import of Equipment**: We have assumed that 100% of the equipment and machinery used for the project would be imported.

- Capex and Opex have been converted to economic equivalents/ market costs using the following assumptions:

    - Estimation of employment generation is done by assuming 30% of the personnel costs will be comprise of the expats salary costs which will hold the top level positions in hierarchy. These staff will be hired from outside the country. Rest 70% of the staff salary will be a benefit to the economy due to generation of local employment.

    - Shadow Wage Rate Factor (SWRF) of 1.00 for skilled labour and 0.75 for unskilled labour was assumed[35]. Further it was considered that the project will have a mix of 75% skilled labour and 25% unskilled labour. Hence, SWRF of 0.94 has been arrived.

      SWRF is the ratio of the shadow wage rate of a unit of a certain type of labour, measured in the appropriate numeraire, and the project wage for the same category of labour. Alternatively, the SWRF factor when applied to labour and salary costs contributing to the economy, can be used to convert the financial cost of labour into economic benefits.

      These figures are in conformity with the information provided by Bangladesh Planning Commission and ADB economic analysis reports for Bangladesh. These were applied to tradable inputs and labour component to get domestic equivalents.

    - VAT rate (for capex) has been considered as 15% according to the prevailing rate for Bangladesh.

      Therefore a factor of 0.85 has been considered for converting the material and equipment cost related to civil capex and equipment capex (calculated separately in the financial model) into economic costs.

      Operating costs calculation in the financial model assumes 0% VAT and thus Material and equipment cost related to opex can be directly used for the calculation of economic costs.

- Tax Treatment: Since tax, subsidies and incentives are distortionary in nature; their impact needs to be nullified by making necessary adjustments.

11.3. Approach and Methodology

The economic analysis for proposed ICT, Khanpur project was undertaken in three major steps:

Step 1: In this step, the total economic cost for the project was calculated. All the direct costs associated with the project development and operations were enlisted and broken down into the three factors of production viz. capital (material and equipment) and labour. The pertinent financial costs were converted to the economic costs. All the assumptions mentioned in section 12.3 were taken into consideration for the conversion.

Step 2: The financial benefits from the proposed ICT, Khanpur project were calculated and converted to economic terms to capture the economic benefits which (directly/indirectly) impact the economy of Bangladesh. In this step, the cumulative economic benefit accrued from this project was computed.

Step 3: Economic return for the project tenure of 30 years was calculated by deducting the economic cost from the total economic benefit. The total employment (direct and indirect) to be generated from the proposed EZ project was calculated both in number and in economic term.

The approach and methodology adopted has been illustrated in the following diagram:

[35] Similar assumption was taken for Mongla Economic Zone Project, Bangladesh

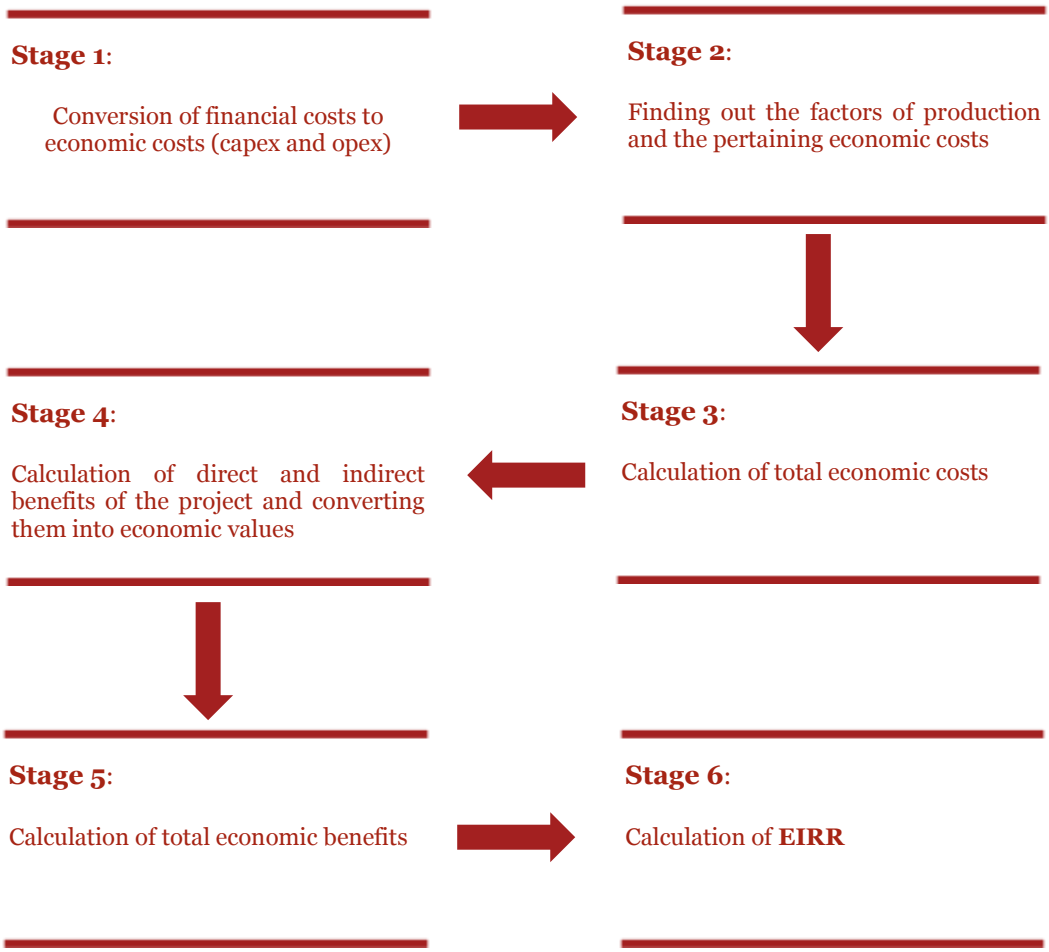


FIGURE 92: CALCULATION OF EIRR- APPROACH & METHODOLOGY

11.4. Illustration of EIRR Calculation

The EIRR calculation has broadly two parts viz. calculation of economic cost and calculation of economic benefits.

11.4.1. Economic Cost Calculation

For the calculation of economic cost, capital expenditure and the operational expenditure was taken into consideration.

Calculation of Factors of Production for Capex: From the project cost, land cost (not applicable), interest paid during construction and other upfront financing costs were subtracted to arrive at the total cost for the private developer. Further this was split into two capital expenditure streams i.e. Civil costs and Equipment costs. Civil costs were further divided into three factors of production viz. material, equipment and labour. The cost associated with the three factors of production was calculated based on the split weightage assigned to each of the three factors.

The economic cost for material and equipment cost portion of civil costs and equipment cost calculated separately to be used for the project was calculated by eliminating the VAT component included in the cost assumptions. To eliminate this VAT component a factor of 0.85 was used.

For the labour, SWRF was used to find out the impact on economy due to the respective factor of production. The converted economic value was then added to the economic benefit section as this is a benefit to the local economy in terms of direct and indirect employment generation.

Calculation of Factors of Production for Opex: In the operational expenditure section, personnel costs / staff salary costs was calculated separately. In the O&M stage, operating costs excluding personnel costs were converted to three factors of production based on the split weightage assigned to each of the three factors.

The economic cost for material and equipment cost portion of opex costs to be used for the project was calculated by eliminating the VAT component included in the cost assumptions. To eliminate this VAT component a factor of 0.85 was used.

For the labour, SWRF was used to find out the impact on economy due to the respective factor of production. The converted economic value was then added to the economic benefit section as this is a benefit to the local economy in terms of direct and indirect employment generation.

Personnel costs calculated separately were divided into two categories i.e. personnel cost towards Expats salary and personnel cost towards local staff salary by considering a split factor of 30%. This split factor of 30% was used in the calculation by assuming 30% of the salary cost will be paid to the expats which will be holding top positions in the hierarchy.

Thus, 30% portion of the cost was added to the economic cost section and remaining 70% of the cost was added to the Economic benefit section after applying the SWRF factor.

VAT effect was not required to be eliminated from the operating costs as VAT rate assumption was 0% while calculating the operating costs in the financial model.

Social cost: The cost associated with the Resettlement and Rehabilitation (R&R) activities was computed separately while undertaking the Social Impact Assessment (SIA) and Abbreviated Resettlement Action Plan (ARAP) study for proposed Mongla EZ.

Calculation of Total Economic Cost: The following components were added to arrive at the total economic cost of the project:

a) Material (Capex)
b) Equipment (Capex)
c) Social Cost (R&R cost)
d) Material (Opex)
e) Equipment(Opex)
f) Expats salary costs (Opex)

11.4.2. *Economic Benefit Calculation*

Calculation of Total Economic Benefit: For calculating the total economic benefit, all the revenue generating activities of the project were considered from the revenue calculation of the financial model. Further, all the revenue components were summed up in addition to the economic benefits occurring due to employment generation as calculated in the capex and opex section to arrive at the total economic benefit generating from the project.

The revenue sources as enlisted in the financial model were considered for calculation of economic benefit. The revenue sources are as mentioned below:

a) Vessel related charges
b) Cargo handling charges at berth
c) Container handling charges at yard
d) Container storage charges
e) Reefer plugin charges
f) Bulk handling charges

Employment benefits:

a) Labour benefits calculated in Capital Costs section
b) Labour benefits calculated in Operating Costs section
c) Staff salary costs towards local staff salary calculated in Operating Costs section

11.5. EIRR Results and Sensitivity Analysis

Economic Return or EIRR: Economic Return is calculated by deducting the Total Economic Cost from the Total Economic Benefits. BDT Million has been used as the base unit in the model.

TABLE 11ECONOMIC CASH FLOW SUMMARY

Year	Cash flow (BDT Million)	Year	Cash flow (BDT Million)	Year	Cash flow (BDT Million)
2016	(380)	**2026**	210	**2036**	1,140
2017	(422)	**2027**	198	**2037**	905
2018	47	**2028**	364	**2038**	1,308
2019	83	**2029**	626	**2039**	1,363
2020	111	**2030**	693	**2040**	1,401
2021	89	**2031**	704	**2041**	1,448
2022	136	**2032**	312	**2042**	1,492
2023	258	**2033**	540	**2043**	1,536
2024	314	**2034**	1,035	**2044**	1,582
2025	371	**2035**	1,128	**2045**	1,625

Based on the annual economic cash flows for the project, mentioned in the above table, calculation for EIRR results in a value of **23.12%** which indicates that the project is providing fair return throughout the tenure of the project from economic perspective thus, it is economically viable.

A sensitivity analysis on Economic NPV has also been carried out by varying the discount rate from 9% to 15%. The results are tabulated below:

TABLE 11 ECONOMIC NPV SENSITIVITY ANALYSIS SUMMARY

Discount Rate	**9%**	**10%**	**11%**	**12%**	**13%**	**14%**	**15%**
Economic NPV (BDT Million)	**2,959**	**2,415**	**1,970**	**1,604**	**1,301**	**1,050**	**841**

Graphical representation of the variation of Economic NPV with Discount rate is portrayed in the figure below:

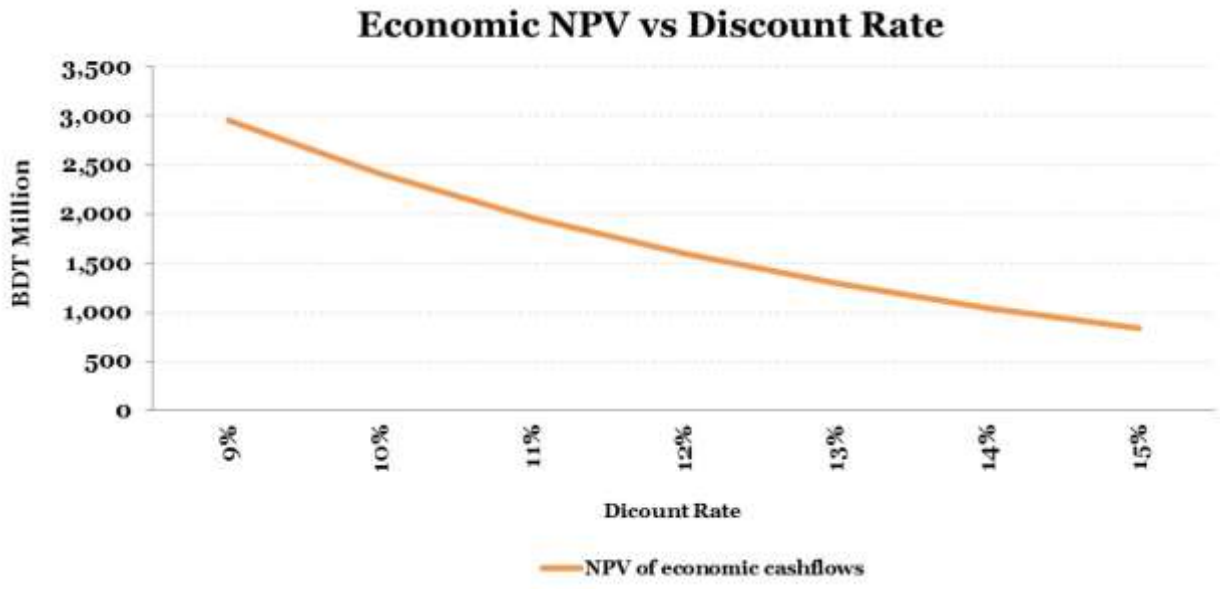


FIGURE 93: ECONOMIC NPV VS DISCOUNT RATE

12. Risk Assessment

This chapter aims at identifying the risks associated with the project and to develop a Risk Management Plan based on suitable mitigation measures. As a part of the Risk Management Plan, a detailed risk register is developed to identify, evaluate and manage all risks associated with this project or any work stream of this project.

For developing the Risk Management Plan, entire project lifecycle was structure in four different stages including Pre-development, Implementation, Operations and Life-cycle. Various risks present at each stage of the project lifecycle were identified, assessed for their significance and allocated among the stakeholders (likely to be involved in the PPP arrangement) based on their abilities to handle such risks. Identification of the risks was done based on interaction with various stakeholders including BIWTA, CPA, cargo owners, freight forwarders, transporters, vessel manufacturers, shipping lines, off-Dock Facility Operators, and potential bidders.

Risks associated with the project were evaluated based on their probability of occurrence. The impact of these risks was assessed using qualitative approach. Parameters used for ascertaining the risk of occurrence are presented in the table below:

TABLE 167 PROBABILITY OF OCCURRENCE OF RISK

Probability	Description
High	Has occurred many times in the past, or has occurred a few times in recent history
Medium	Has occurred a few times in the past, or, has occurred infrequently in recent history
Low	Has occurred infrequently in the past, or, a “one off” from the past

12.1. Risk Management Plan

The Risks Management Plan identifying and explaining various risks associated with the Khanpur ICT project is presented in the table below:

TABLE 168 RISK MANAGEMENT PLAN

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
Pre- Development Risk							
1.	Design Risk	Inadequate Design	Risk arising because of design defects and/or non-conformance of the specified drawings with the scope of the project, and the specifications & standards set by the government	May impact project development in terms of time & cost due to inappropriate FEED and may also effect the useful life of project, significantly impacting the actual benefit realisation	Medium	Developer	1. Review of designs by third party experts (Independent engineer) 2. Cover with a performance bond or a contractor's insurance
2.	Design Risk	Clearance & Approval Risk	Refers to the risk that delays in approvals to be obtained during the construction phase will result in a delay in the construction of the assets as per the construction schedule	May effect the project development deadlines leading to significant cost & time overrun of project	Medium	Developer	1. Government should ensure all necessary approvals are in place before start of the construction by making them part of the condition precedent. 2. Authority shall facilitate the process.
3.	Design Risk	Change in design and construction standards	Changes in standards applicable to the project following contract signature. These may be due to legislative or regulatory changes or unforeseen Change of Scope (CoS)	Significance can be medium to high because it can delay project completion and thereby increase costs.	Low	Developer	1. The period between contract signature and construction starting should be relatively short, minimising the risk of changes in standards affecting the project. 2. Developer should be compensated for any change is designed, resulting from change in

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
							standards or any other reason not in control of the Concessioner.
4.	Environmental Risks	Environmental & Social Impact Risk	Risk of Liability for environmental and social damages arising from construction of ICT at Khanpur due to improper implementation of Environment management Plan/unanticipated social safeguard risks	Environmental & Social Issues	Medium	Developer	1. Comprehensive review and validation of existing Environmental Management Plans and Social Management Plans. 2. Procurement of environmental and social impact insurance
5.	Right of Way Risks	External Linkages Risk	Site is currently connected by R110 & R111 which are used for mixed traffic including passenger and cargo. This may be a potential risk in terms of impacting the pace of development of project, especially during later stages when traffic increases. This may restrict cargo movement due to limited connectivity	Limited accessibility to project site may effect timely procurement of materials/equipment from outside site during project development phase and may cause delay in cargo movement to & from Khanpur site effecting operational effectiveness of terminal	Medium	GoB	Government should plan for strengthening external linkages of the project site either by upgradation of external infrastructure or by having proper traffic diversion plan in place in order to reduce traffic load on connecting road and also ensuring safety of passenger vehicle movement
6.	Land Availability	Land Availability Risk	Currently an amusement park is operational on a parcel of land which is being considered for the development of the Inland Container Terminal at	Restriction in terms of berth capacity and expansion of the Inland Container Terminal at Khanpur will negatively impact the returns from the project to the developer and decrease the attractiveness	High	GoB	BIWTA to ensure land availability free from all encumbrance

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
			Khanpur	amongst the bidders			
Implementation Risk							
7.	Construction Risks	Quality Assurance Risk	Risk that the construction will not be up to the standards/ specifications envisioned due to poor engineering/ construction supervision/contractor's performance. Thereby increasing maintenance costs, reducing lifespan and lowering terminal value during handover	May enhance maintenance cost and lower lifespan as well as terminal value of the project	Medium	Developer	1. Review and inspection of design by independent engineers 2. Effective construction supervision during project implementation 3. Issuance of Completion certificate should be based on commissioning tests 4. Proper Handback regime
8.	Construction Risks	Force Majeure Events during construction	Risk that events beyond the control of either Parties may occur, resulting into a material adverse impact on either party's ability to perform its obligations under the PPP contract	Adversely impact either party's ability to perform its obligation and may effect overall project viability	Low	Developer & GoB	1. Pre-agreed clauses with adequate compensation from GoB to cover lender and Developer risks 2. Force majeure insurance to cover such events
9.	Construction Risks	Project Cost & Time Overrun	Refers to the risk that the construction of required assets will not be completed on time, on budget.	Effect overall project viability	Medium	Developer	Use integrated planning approach (for developing detailed project plan) & conduct periodic reviews, monitoring of project to

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
							highlight flagging issues which needs immediate action to expedite project progress
Operations Risk							
10.	Operations Risk	Traffic Risk	The risk that the actual demand varies from the initial projections thereby impacting the actual revenue realization and eventually the project viability.	Effect the actual revenue realization and eventually impacting the overall project viability	High	Developer	1. Given that IWT for containers is new concept, operator should be allowed to handle existing bulk traffic, especially for the initial years of operations. 2. To encourage the usage of IWT for transportation of containers, GoB should consider VAT exemption on tariffs for full concession period
11.	Operations Risk	Competition Risk	The proposed facility is going to compete with other 5-6 river based inland container terminals and two ICDs including Kamlapur (existing) and Dhirasram (proposed)	Affect actual revenue realization and eventually impacting the overall project viability	High	Developer	1. For addressing the Competitive Risk, "Time to market" for the proposed project should be as early as possible. This will enable Developer to educate and develop the market for the IWT 2. Given the requirement of early time to market, GOB should implement the procurement process based on "Single Stage Bidding" which is less

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
							time consuming.
12.	Operations Risk	Maintenance Cost Overrun	Risk of maintenance cost overrun due to improper planning	Effect the operational expenses & will reduce the anticipated benefit realisation	Low	Developer	1. The Developer should submit an O&M Plan for the facility at Condition Precedent stage 2. The O&M Plan should be approved by Independent Engineer 3. The Developer should submit Annual Report highlighting details on maintenance expenditure
13.	Operations Risk	Inefficiency of Developer related to Port/ICT operations	Limited technical Knowhow/past experience of Developer in developing as well as Operating the container terminal (ICD/CFS/Dry Port/Port/Logistics Parks) projects	Inefficiency in terminal operations will result in increased cost and time for imports and exporters. This will also reduce the attractiveness of the typical IWT system	Medium	Developer	1. Eligibility criteria for selecting the Developer should include experience in operating similar project. 2. Suitable performance regime should be included in the contract. 3. Failure to achieve the required performance would result in penalties
14.	Operations Risk	Inefficiency of Developer related to handling Bulk and Container operations together	Operations of bulk cargo and container handling is not recommended as dust released by bulk operations could harm the container equipment	Ability to handle bulk cargo with container handling for initial 10 years is a key successful factor in achieving financial viability of the project i.e. for generating the minimum returns from the project	Medium	Developer	1. This risk can be mitigated by following the standard operating procedures while performing the handling operations.

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
15.	Operations Risk	Sufficient Vessel availability risk	Available vessels not being recognized by Mainline operators (because of not fulfilling their quality/safety norms/standards) or lesser availability of vessels in general, for operation	Timely vessel availability and market compliant vessel schedule are the key success factors for an Inland Container Terminal. This will reduce the attractiveness of the terminal as well as IWT system	Medium	GoB	2. The Developer should be allowed to deploy his own vessels (leased/owned/Third Party) 3. Any further licensing of the Vessel Operators should be based on the technical and financial eligibility. 4. The Developer should be allowed to procure the vessel operator license for the existing licensees
16.	Operations Risk	Delay at Chittagong port for handling of inland containers vessels serving the other ICTs	With ICT Pangaon, Chittagong port is a competitor as well as lead facilitator.	Efficient handling at Chittagong port is critical to attract cargo. This will establish market compliant scheduled service. This is also important to encourage the private sector participation in procurement of inland vessels and	Medium	GoB	Facility should be recognized by Chittagong Port Authority
17.	Operations Risks	In-transit Safety and security of cargo/containers	Unavailability of river police for managing round the clock vessel operations in the inland waterways	In the absence of river police to ensure safety and security of in-transit containers, Inland container vessels will not be able offer reliable services. This will reduce the attractiveness of the IWT for transportation of containers.	Medium	GoB	GoB should ensure round the clock availability of river police.

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
18.	Operations Risk	Congested river network	Miss management of river traffic including bulk vessels and country boats carrying passengers. Most of the bulk vessels are anchored in mid-stream, especially the one carrying cement raw material for Akij Cement factory. This leaves limited scope for vessel movements while berthing.	Miss management of river traffic will reduce the safety of vessels and may leads to accidents. Also, with delayed berthing operation, cost of transporting containers will increase.	Medium	GoB	GoB should ensure the efficient management of river traffic including bulk vessels and country boats carrying passengers.
Lifecycle							
19.	Political, Government and External Risks	Government Event of Default	Risk that the government will not fulfil its contractual obligations and that the private entity will be unable to either enforce those obligations against the government, or recover some form of compensation or remedy from the government for any loss sustained by it as a result of the breach	May lead to significant financial damages to Developer	Low	GoB & Developer	1. Compensation or remedy from the Government for any loss sustained by senior lenders. 2. Compensation to developer to recover the equity invested
20.	Political, Government and External Risks	Operational Force Majeure	Risk that a force majeure event will affect the use of the Terminal and impact operations	Adversely impact either party's ability to perform its obligation and may effect overall project viability	Low	GoB & Developer	Pre-agreed clauses with adequate compensation from GoB to cover lender and Developer risks

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
21.	Political, Government and External Risks	Political sabotage/terrorism risk	Terrorism and/or political sabotage	May effect project development and operations	Low	GoB & Developer	1. Availability of terrorism/ political sabotage cover in commercial insurance market at economic rates 2. The Developer should be compensated for any such event.
22.	Regulatory Risks	Laws & Framework	Risk of non-compliance with applicable laws	May effect project development and operations	Low	Developer	Review all agreements and project documents to ensure compliance with existing laws and policies
23.	Financial and Market Risks	Inflation Risk	Risk that actual inflation exceeds projected inflation, increasing operating and maintenance expenses	Will affect the O&M cost and project development cost	Medium	Developer	1. Benchmark tariff to inflation 2. Exemption of VAT on tariffs will reduce the impact of inflation on the end user
24.	Financial and Market Risks	Forex Risk	Risk of exchange rate fluctuations affecting cost of imported inputs required for construction or maintenance. Or increased repayment including interest and principal for Forex Loan	Will impact the operating and maintenance cost of the project. In case of Forex loan, this will reducing returns for investors including reduced dividend and increased debt repayment	Medium	Developer	Financial Closure should clearly highlight sources of financing and hedging provision in case applicable
25.	Contracting	Developer event of default	Risk that the Developer will not fulfil its contractual obligations and that the	May lead to significant financial damages to	Low	GoB	1. Penalty Deduction clause in the concession agreement (on Developer for failure to meet

S. No	Risk Category	Description	Cause	Importance	Likelihood	Risk Allocation	Control/Mitigation
			government will be unable to either enforce those obligations against the Developer, or recover some form of compensation or remedy from the Developer for any loss sustained by it as a result of the breach	government			contractual obligations) to be incorporated 2. Compensation or remedy from the Developer for any loss sustained by it as a result of the breach. 3. Compensation measures for the Senior Lenders
26.	Contracting	Disputes	Dispute among the Parties during concession term including construction, operations and handover	May effect project development and operations	Low	GoB & Developer	A dispute resolution procedure should be included that satisfies international developers and finance providers.
27.	Contracting	General Insurance	Loss/damage of project assets during accidents or any other risk event	May effect project development and operations	Low	Developer	Insurance cover should be Sufficient to cover all facility assets

The risk mitigation strategy suggested in the table above is based on the best industry practices and past experience in risk mitigation. These measures need to be effectively implemented by the respective risk owners in order to mitigate them from successful project implementation and operations point of view. Therefore, it is quite important for the stakeholders specifically the developer & the authority to be well versed with the impact of these risks and the effective risk management process to be followed in order to mitigate them in an efficient way.

13. Regulatory Framework

This chapter aims at identifying potential regulatory restrictions (including permits and licencing) and ascertaining the status of land ownership along with the potential encumbrances (if any) that may restrict usage by the private sector. An implementation plan will be prepared considering time and costs required to resolves such issues.

This will form as input for procurement planning and preparation of the main bid documents, namely the RfP and Concession Agreement.

Effective regulations address market failures that inhibit productive investment and reconcile private and public interests. The existing legislation of a country also determines the mixed of legal forms private firms take and determines the level of protection for investors thus affecting the incentives to invest. The list of approvals required along with authority concerned is mentioned below

TABLE 169 APPROVALS REQUIRED

S No.	Details
1.	Exemption from Section 3D(2), Insurance Act, 1938 (Act IV of 1938) to permit Concessionaire, to obtain insurance for Project from companies outside Bangladesh.
2.	Certificate under section 3D(1) Insurance Act, 1938 (Act IV of 1938) to enable Concessionaire, their foreign vendors and contractors, to obtain reinsurance for the Project from companies outside Bangladesh.
3.	The tax and fiscal incentives and facilities provided to all Foreign Direct Investment (FDI) as enumerated by the BOI in its publication "Bangladesh Investment Handbook 2007".
a)	Tax exemption on the interest on foreign loans.
b)	Avoidance of double taxation in case of foreign investors on the basis of bilateral agreements.
c)	Exemption of income tax up to three years for the expatriate personnel employed in connection with the Project.
d)	Foreigners employed in Bangladesh shall be entitled to remit up to 50 percent of their salary and to enjoy facilities for full repatriation of their savings and retirement benefits at the time of their return.
e)	Facilities for full repatriation of profits, dividends and invested capital.
f)	Re-investment of repatriate able dividend to be treated as new foreign investment.
g)	Tax exemption on capital gains from the transfer of shares or sale of assets by the investing company.
PART B: Approvals	
1.	Work Visas and national security clearance for expatriate employees of Concessionaire, and their contractors.

S No.	Details
2.	All import permits, certificates, licenses and other required approvals allowing Concessionaire to import into and re-export from Bangladesh all plant, machinery, equipment, spare parts, materials and supplies required for the Project.
3.	Approval of commission start-up and operation of Port based on the implementation of measures identified in the environmental impact assessment ("Environmental Clearance Certificate").
4.	EIA Clearance, Site Clearance Certificate from DOE
5.	Approval of Project as satisfying the fire and safety protection Standards under the Fire Service Ordinance, 1959 (Ord. No. XVII of 1959) and Civil Defence Act 1952 (Act. XXXI of 1952).
6.	Maintenance of safety against security, fire and any other disaster within the project area under ISPS code from DG and Department of Shipping
7.	Permission / clearance for setting up of wireless system, if required.
8.	Approval for electrical connection for Port construction and operation.
9.	Approval for foreign loan.
10.	Permit for abstraction of groundwater.
11.	Permit for the felling of trees.
12.	Construction permits.
13.	Land use clearance certificate.
14.	No Objection Certificate from the local authority in relation to Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)
15.	The service rules in any establishment submitted for approval to the chief inspector who shall, within six months of the receipt thereof make such order therein as he deems fit as per Bangladesh Labour Act, 2006
16.	Prior to the construction, the approval must be obtained from the authorized officer under the act under Building and Other Construction Workers Act, 1996;
17.	Clearance will be required if any agriculture produce is being stored in the warehouse as per Warehouses Ordinance, 1959

14. Project Implementation Structure

Subsequent to the assessment of financial viability of the proposed ICT at Khanpur, current chapter aims at identifying a suitable structure for implementing the project on Public Private Partnership (PPP) basis.

The inputs required for identifying suitable project implementation structure were collected based on site visit, interactions with stakeholders and other project participants. The information so obtained was triangulated using various secondary sources including World Bank reports, preferred PPP structures for development of ports in Asia and PPIAF Port Reform Tool Kit.

Accordingly, this chapter is organized in following sub-sections:

PPP Structuring Options

Preferred Option

14.1. PPP Structuring Option

Traditionally, development of infrastructure was an exclusive function of the government. However, recognizing the economic importance of infrastructure development and considering constrained public resources and other social as well economic priorities, governments around the world are encouraging the participation of private sector in delivering the infrastructure. The collaboration between the government (Public) and the private sector with common objective of delivering infrastructure or provision of services is termed as Public Private Partnership (PPP). Private sector competencies including financing, efficiencies, project management, innovations etc. required for delivering an infrastructure project depends on the complexities of the project.

Depending on the complexity of a port project, level of private sector involvement can vary to efficiently perform multidisciplinary functions including construction, operations, maintenance, marketing etc. The basic form of PPP arrangements in port sector include:

- Management Contracts
- Turnkey Contracts
- Lease Contracts
- Joint Venture Contracts
- Concession Contracts

Brief description of each PPP arrangement is presented in the table below:

TABLE 170 PPP ARRANGEMENTS

PPP Option	Relevance	Description
Management Contract	Existing port assets	In this form of PPP arrangement, ownership of the port assets remains with the government entity and key functions, such as budgetary resources, staff policy, tariff determination etc. are controlled by the government. Private sector entity is responsible for managing port operations such as vessel handling, stevedoring, internal transportation, equipment maintenance etc. However, based on the complexity of a project, the level of private sector involvement may vary significantly.
Turnkey Contracts	Existing port assets	In this form of PPP arrangement, ownership of the port assets remains with the government entity and all functions including operations, commercial and financial are performed by the government entity. In this form, private sector involvement is limited to the construction.
Lease Contracts	Existing port assets	In this form of PPP arrangement, assets owned by the government entity are leased to the private sector. The private sector entity is responsible for operating and maintaining the infrastructure facility and controls all

		functions such as commercial strategy, staff policy, tariff determination etc. The government performs regulatory functions such as service quality, dispute settlement etc.
Joint Venture Contracts	New port assets	In this form of PPP arrangement, port assets are jointly owned by the government and the private sector. The parties (Government and private) are jointly responsible for developing and operating a specific port facility. In addition, government entity performs regulatory functions such as tariff determination, service quality, dispute settlement etc.
Concession Contracts **(Specialised Concession– Forms of BOT)**	New and Existing port assets	In this form of PPP arrangement, ownership of the public assets is transferred to private sector entity for developing and operating a specific port facility for a fixed period of time. The private sector is responsible for design, finance, construction, operations and maintenance of the assets. However, government entity remains the ultimate owner of the public assets and performs regulatory functions such as tariff determination, service quality, dispute settlement etc.

Each PPP arrangement is different in terms of their profile including operating arrangement, risk allocation, revenue sharing etc. However, these PPP arrangements can be combined to deliver a complex infrastructure project.

Brief profile highlighting salient features of each of the PPP arrangements are presented in the table below:

TABLE 171 PPP ARRANGEMENT DETAILS

Parameter	Management Contracts	Turnkey Contracts	Lease Contracts	Joint Venture	Concession incl. BOT
Scope	Management of Operations or specific function	Management of Construction	Management of operations and maintenance of assets	Design, development, construction, operations and maintenance of assets	Design, development, construction, operations and maintenance of assets
Asset Ownership	Public	Public	Public	Public/Private	Public/Private
Duration	2 – 5 Years	1 – 2 Years	5 – 10 Years	Varies	Varies
Capital Investment	Public	Public	Public	Private/Public	Private
Operations & Maintenance of the assets	Private	Public	Private	Private/Public	Private
Commercial Risk	Public	Public	Private	Shared	Private
Risk Assumed by Private Sector	Moderate	Minimal	Moderate	High	High
Revenues	Fixed Fee	Unit Price or Fixed Fee	Tariff Revenues	Tariff Revenues	Tariff Revenues
Compensation to Government	-	-	Fixed fee	Share of Tariff Revenues	Fixed fee or share of tariff revenues or both
Pros	- Easy to implement. - Least complex of all PPP models	- Easy to implement - Construction risk are allocated to private sector	- Easy to implement - Operations and commercial risk are allocated to private sector	- Gains from private sector efficiency - Government control/involvement in port operations - Profit sharing with the government	- High potential for efficiency gains and innovation - Majority of risks are allocated to private sector - Attractive for private

Parameter	Management Contracts	Turnkey Contracts	Lease Contracts	Joint Venture	Concession incl. BOT
					investors - Profit sharing with the government
	- Limited Efficiency gain - Majority of risks are allocated to public sector	- No incentive for private sector for early completion - Majority of risks are allocated to public sector	- No incentive for private sector to invest - No upside for government	- With controlling rights with the government, interest from investor is limited - Overlapping of roles and responsibilities - Government has to share financing risk	- Complex to implement - More time required for implementation - Managing the contract to address the evolving business issues over long term is challenging.

As can be seen from the above table, involvement of private sector in terms of financing, risk sharing and management of operations is limited in Turnkey Contract and Management Contract option for PPP. With the flexibility and control over business, the Leasing option is attractive enough for private sector, but at the same time, upside (profit sharing) for government is limited. In addition, incentives for the private sector to invest are limited in the Leasing option due to short duration of the contract.

In Joint Venture option, while the involvement of private sector in terms of design, development, financing, risk sharing and management of operations is sufficient, all the risks including financing, construction and operations are jointly shared by the government and the private sector.

For the Concession option including different forms of BOT, involvement of private sector for all key functions is highest among all of the PPP models. In this PPP option, most of the risks associated with the project are transferred to the private sector and the government is responsible for regulatory functions required to satisfy the objectives of the project.

Each PPP model has its own pros and cons and there is no single model that can address all project requirements. However, concerning the project objectives, these models can be combined or tweaked to arrive at a suitable PPP arrangement.

14.2. Preferred Option

Suitable structure for delivering a port project using PPP arrangement depends on range of factors including country's social-economic environment, political and regulatory framework, maturity of PPP market, financial and technical project requirements and risks associated with the project. Suitable PPP structure in the one which maximise the value a project can potentially generate by satisfying all or majority of the project objectives.

For arriving at a suitable PPP structure for the proposed ICT at Khanpur, provisions under each PPP model were mapped against the project objectives. These provisions were assessed to ascertain the PPP model that can satisfy all or majority of the project objectives that ICT Khanpur wishes to achieve. Qualitative assessment comparing project objectives with modalities under each of the PPP model is presented in the table below:

Project Objectives	Management Contract	Turnkey Contracts	Lease Contracts	Joint Venture Contract	Concession Contract (incl. BOT)
Infrastructure Development by Private Sector?	-	+	-	+	++
Best practices in Operations & Maintenance?	+	-	+	++	++
Capital Investment by Private Sector?	-	-	-	+	+++
Strong Marketing Capabilities?	+	-	++	++	+++
High level of efficiency & innovations?	+	-	+	++	+++
Upside for the government?	-	-	-	++	++
Commercial and Financing Risk for Government?	-	-	++	+	+++

Project Objectives	Management Contract	Turnkey Contracts	Lease Contracts	Joint Venture Contract	Concession Contract (incl. BOT)
Involvement of MLO by leveraging global network?	-	-	+	+	+
Regulatory control with the Government?	+	+	+	+	+
Government to monitor performance?	+	+	-	++	++
Private Sector to handle majority of risks?	-	-	++	+	++

- Poor + Fair ++ Good +++ Very Good

TABLE 172 QUALITATIVE ASSESSMENT OF PPP OPTIONS

As can be seen from the table above, majority of the project objectives can be satisfied by delivering the proposed ICT at Khanpur under both the PPP options including Joint Venture Contract and Concession Contract. In Joint Venture Contracting option, government will have to contribute for the capital investment and it is also envisaged that the government will share some of the risks such as commercial, financing etc. associated with the project. Whereas, in Concession Contract option, private sector is responsible for managing all investment requirements as well as risks associated with the project. Given the objectives that the proposed ICT at Khanpur wishes to achieve, PPP arrangement based on Concession Contracting options appears to be suitable for the project. The typical project implementation structure based on the Concession Contract under PPP arrangement is presented in the figure below:

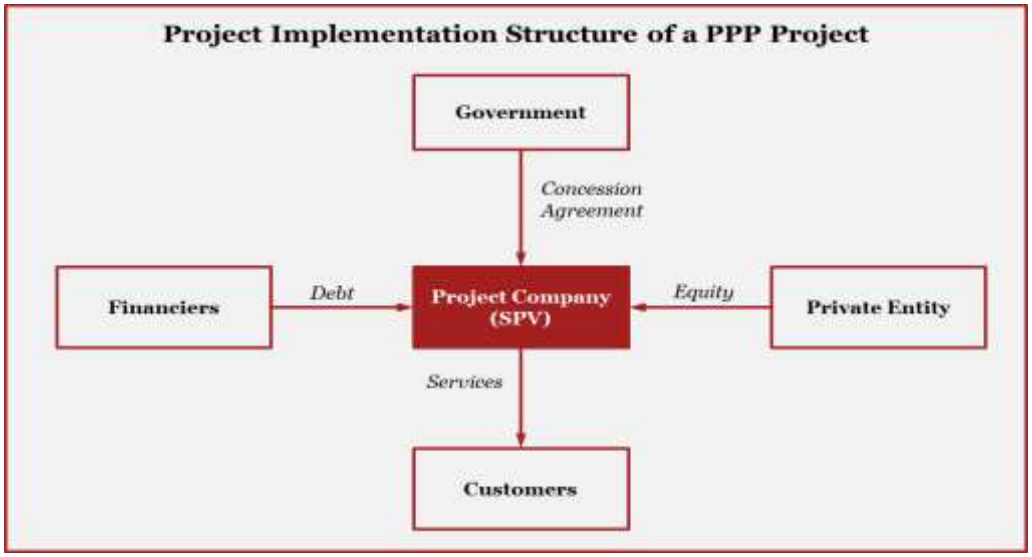


FIGURE 94: PPP PROJECT – IMPLEMENTATION STRUCTURE

Implementation of PPP project using Special Purpose Vehicle (SPV) is most preferred form of delivering a port sector PPP project. SPV is a special purpose company created by a private player (the Concessionaire) exclusively for the purpose of implementing the project.

Considering that PPP in port sector, especially inland port projects is at very nascent stage in Bangladesh and traffic risk involved in the project, Government may consider providing some sort of traffic guarantee to take care of operation and maintenance costs and loan repayment risk. Traffic guarantee can be in the form of

permission to carry out bulk operations, particularly for the initial years of operations when cash flows are limited to cover debt obligations.

Given the complexities associated with the proposed project and considering the objectives this project wishes to achieve, the Authority may wish to evaluate and consider deploying a PPP arrangement that combines features of other PPP models discussed in the section above. However, for arriving at suitable PPP arrangement, the authority should look at structures that can accommodate inherently uncertain variables such as traffic and ensures that developers compete on efficiency factors rather than speculative variables which they have no ability to manage.

15. Conclusion

- Dhaka Capital Region is the largest and most developed industrial city in Bangladesh and is in the close vicinity (within 50 Km radius) of the proposed facility. In addition, strategic location of the proposed ICT at Khanpur can suitably serve the container traffic originating/destined from/to Adamjee EPZ located at distance of about 6 Km from the proposed project.

- Based on the road connectivity assessment, it can be concluded that Demra-Narayanganj road is critical for the proposed ICT at Khanpur. Existing freight traffic on this road is estimated at around 80 to 100 trucks per day. With development of ICT Khanpur, the freight traffic on this road is expected to reach 180 to 200 trucks per day by 2025 (800 PCU). Considering 2000 PCU/h as the capacity of a two lane road with mixed traffic conditions, the existing road is sufficient to handle 300 trucks per day. However, to ensure smooth evacuation of containers/cargo and to provision for peaking in the absence of buffer yard (parking area), additional road capacity is desirable

- Based on the detailed SWOT analysis of the competing players, the proposed facility can suitably address competitive issues (upcoming/existing) with its strategic location, existing ecosystem, early mover advantage and support from the government.
- Potential demand for the proposed ICT at Khanpur is estimated at 5,500 TEU for the first year of operations and is expected to cross 100,000 TEU mark in the 18 year of operations, by providing suitable & market compliant services.
- Service portfolio of the proposed ICT Khanpur will be governed by the market requirements and the strengths of the operator considering backward and forward linkages with industry and vessel operators.
- By involving key stakeholders during facility planning will create awareness about the pros and cons of facility under consideration and also streamline critical issues related to successful project implementation.
- It is recommended that an institutional framework should be put in place for implementing the EMP and Grievance Redress Mechanism.
- Given the land availability and considering operational issues, simple is the most preferred options for implementing the proposed ICT at Khanpur.

- Standalone container operations will not be sufficient to achieve financial viability for the proposed ICT at Khanpur. It is recommended that container operations should be combined with the bulk operation for initial 10 years or till the time container traffic volume reaches 55000 TEU annually.

- With equity IRR of 18.94%, Simple option with base case traffic for 30 years duration along with bulk handling operations is proposed as preferred option. Preferred option is also viable from economic perspective.
- Based on sensitivity analysis of the preferred option, equity returns are most sensitive to traffic volumes estimation for the project.
- To mitigate the major risks including traffic, competition and land availability, it is recommended that:
    - Operator should be allowed to handle bulk traffic along with containers
    - VAT exemption for entire concessions period is required from the government
    - Time to market should as early as possible
    - BIWTA to ensure land to be free from all encumbrances

Based on the above recommendations, procurement plan and head of terms of the concession agreement are detailed in the subsequent sections.

16. Procurement Plan

The purpose of the PPP procurement phase would be to select the best qualified private sector player for implementation of the PPP project and to ensure that the contract is achieved with that partner. At the completion of this phase, the financial closure for the project is completed and it is ready to enter into the construction phase. Given the requirement shortest possible time to market for the proposed project, steps involved in the procurement plan for implementing the proposed project on PPP basis are outlined below:

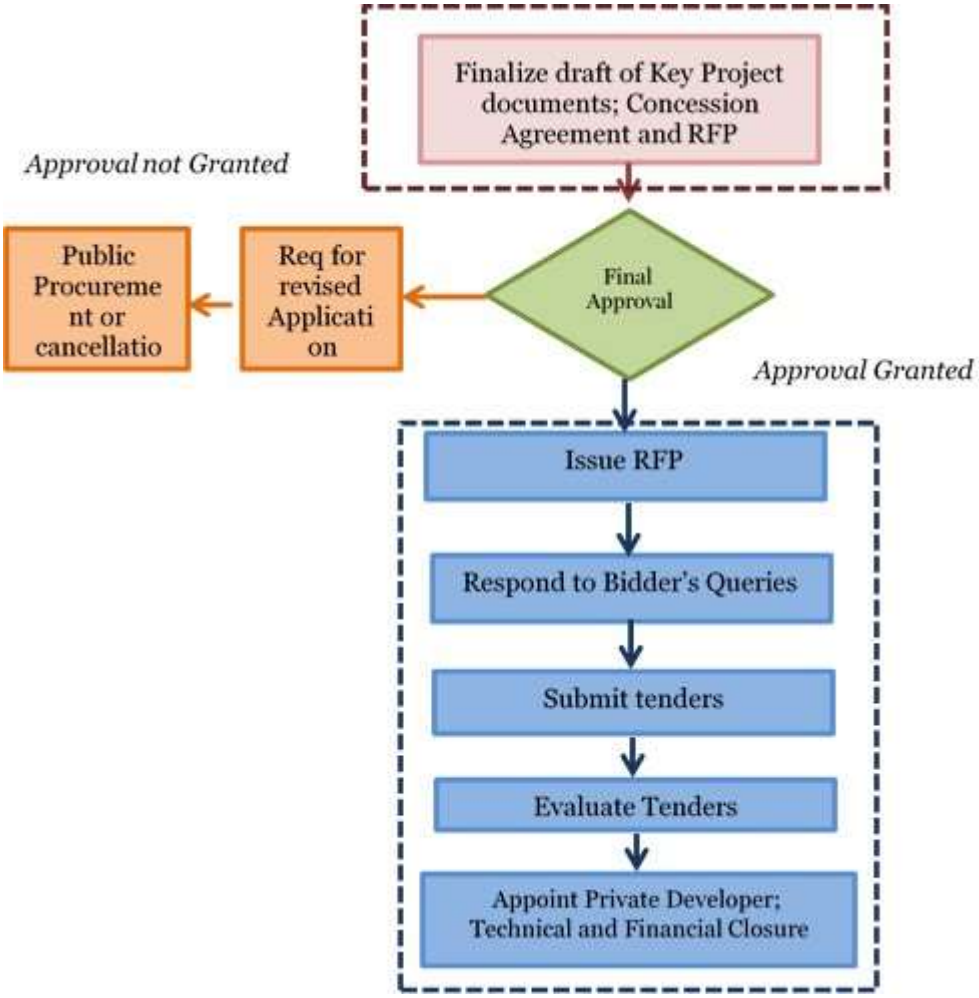


FIGURE 95: BIDDING / RFP STAGE PROCESS

16.1. Marketing Documentation Preparation & Market Engagement

In this stage, the TA would assist in creation of Project Information Memorandum (PIM) for potential bidders, along with advertisements[36] and notices required for the launch of the procurement process.

To promote the project and to draw interest in the market, marketing strategy will be developed based on the discussions with BIWTA and considering inputs from the earlier stages. This will include assistance to the

[36] We understand that the cost of advertisement would be borne directly by BIWTA.

authority in conducting marketing events including assistance in shaping advertisements, bidder conference and presentation / discussions with reputed international operators to discuss the project context and requirements.

16.2. Contract Documentation

In this stage, the TA would assist in drafting all the PPP Contract Documents which would include the following documents:

1) Request for Proposal
2) Draft Concession Agreement & Technical Schedules

The ADB designed MCA or any other MCA (as may be decided in consultation with PPP Office) would be taken as the base document and improvisation on the same would be done to suit the PPP structure identified as well as the objectives that this project wishes to achieve. In addition, based on the experience of drafting documents in various other countries, best practices would be studied to be incorporated in these documents. Special attention to aspects like bonus, penalty, key performance indicators, technical schedules, termination payments, obligations of concessionaires and Authority, dispute resolution so as to ensure smooth and effective contract management.

16.2.1. Activity: Bidding process

In line with the best practices prevalent and followed in procurement route for PPP projects, single stage bidding procedure would be adopted. As understood from the Risk identification exercise, time to market is very critical for the success of this project, there is high competition in the market and environment for IWT is not present in Bangladesh. Considering these risks and as per discussion with the interested parties, it is important to keep the duration of bidding process short, we are proposing a single stage bidding process however authority may choose to conduct a two stage bidding process by keeping in consideration that the process is efficient and less time consuming.

16.2.1.1. Activity: Bidding / Request for Proposal Stage

This is an important stage of bid process management as the most important document. At this stage, Draft Concession Agreement is provided to the short listed bidder. The TA intends to follow a pragmatic process under this stage which has been depicted below:

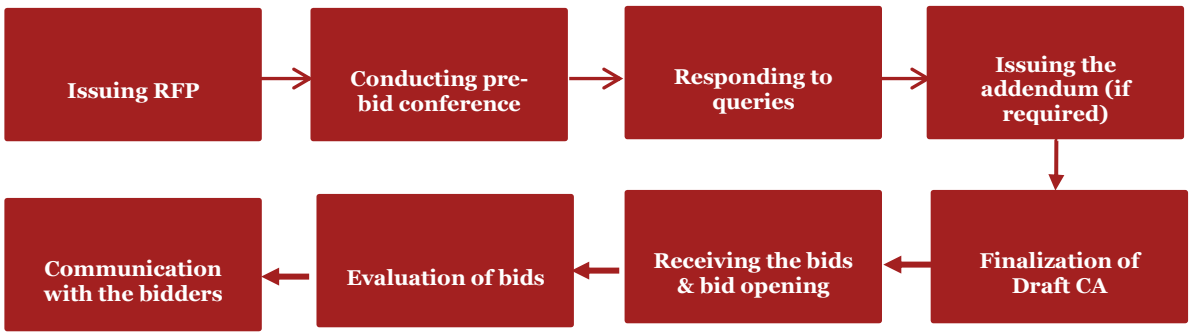


FIGURE 96: BIDDING / RFP STAGE PROCESS

*As an attempt to attract only the interested parties to participate in the bidding process, it is advised to keep the proposal charges and bid security requirement high for the bid.

Activity: Approval & Issue of Bid Documents

While, drafting of Bid Documents would be complete by this stage, approval from Tender Evaluation Committee would be sought as appropriate. Following receipt of approvals, the documents shall be uploaded on the e-procurement website of PPP Office or distributed to the bidders.

Activity: Conducting pre-bid conference and responding to queries

To discuss the various technical & financial aspects of the projects as well as the bidding process with the prospective bidders, the TA would assist PPP Office in organizing the pre-bid conference. The TA would also assist the client in preparation of responses to the questions raised / discussed during the pre- bid meeting and making any changes required in the RFP document for finalizing it. Addendum will be issued in case there are any changes made to the RFP document.

The key stages for the bid process management have been listed step by step:

Activity: Receipt of bids, bid evaluation

Usually, 2-3 months of time is provided to bidders for submission of the Bid, which will be decided in discussion with PPP Office and BIWTA depending on the complexity of the bid prepared. After the bids are received, financial proposals will be opened at a designated date and time in presence of PPP officials and representatives of bidders. The TA will provide necessary administrative support to the PPP Office/BIWTA for efficient and professional management of the bidding process. This includes the following activities such as

(a) Facilitating structured engagement between the PPP Office/BIWTA and bidders

(b) Helping PPP Office/BIWTA communicate effectively with bidders

(c) Receiving bids

(d) Opening of the bids.

On receipt of the bids, the TA would assist PPP Office in evaluation of the RFP based on the evaluation criterion as finalized and approved prior to the issuance of the RFP. Evaluation of proposals would involve checking the compliance with the bid document requirements and financial proposal evaluation.

Preparation of the Bid Evaluation Report

Once the bid evaluation is complete, the TA would assist PPP Office in the submission of a detailed bid evaluation report which would identify the preferred bidder and the second ranked bidder. The report would also establish how selection of the preferred bidder for the development of the project would be the best option for PPP Office/ BIWTA. The TA shall assist PPP Office/ BIWTA in final negotiations with the preferred bidder. This will involve preparing suitable negotiations teams, categorizing issues appropriately, time-lines for completion, negotiation tactics and process for reaching agreement.

The TA shall provide support to PPP Office/ BIWTA in presenting the cases to appropriate committees for approval of the Bid acceptance / rejection recommendation. Comments from the committee shall be appropriately incorporated while finalizing the Preferred Bidder.

Issue of Letter of Intent (LOI) and checking SPV documents

The letter of intent to be issued to the selected party will be prepared. As the part of this LOI, the selected bidder will be asked to complete certain documentation and formalities. These documents would be checked by the TA before signing the concession agreement would chalk out a clear negotiation strategy prior to the commencement of negotiations. A document setting out recommendations on negotiation will be prepared. This will cover the general principles which will be followed and will address any key issues identified during due diligence where investors may have concerns.

16.2.1.2. Contract Award, Negotiation & Financial Closure

Activity: Letter of Award / Acceptance

The TA shall provide support to PPP Office/BIWTA in drafting and communicating Letter of Award/Acceptance to the preferred bidder.

Activity: Signing of the Concession Agreement

As per industry practices, the Concession Agreement is to be signed within 45 days of issue of Letter of Award/Acceptance. During this period, the preferred bidder shall incorporate a Special Purpose Vehicle under relevant laws of Government of Bangladesh to act as concessionaire. However, before signing of agreement, there are multiple documents that are needed to be submitted by Concessionaire and the TA will assist PPP

Office/BIWTA in vetting of the same in association with the legal consultant of PPP Office. That would include, but not limited to

- Introduction of SPV
- Letter of Award as issued by PPP Office/BIWTA
- Acceptance of LOA from Bidder
- Acceptance of LOA from the SPV
- Board Resolution of SPV for entering into concession agreement and authorization of signature
- Board Resolution of Bidder authorizing formation of SPV, shareholding, authorization for signature
- Board resolution from bidder on maintenance of shareholding as required under bidding documents
- Certificate of incorporation of SPV
- Memorandum and articles of Association of SPV
- Confirmation of the representation and warranty under CA
- CA and legal certificate with respect to incorporation of SPV and shareholding details of the SPV

Following vetting of documents and ensuring compliance as per provisions of concession agreement, the TA shall assist PPP Office to facilitate the signing of concession agreement between the PPP Office/BIWTA & the Concessionaire.

16.2.1.3. Support till Financial Closure

Following signing of concession agreement by PPP Office/ BIWTA & Concessionaire, the TA shall provide appropriate support to the Authority in monitoring the Condition Precedents of both Authority & the Concessionaire. A weekly status review meeting shall be organized to ensure timely actions by Authority and Concessionaire in fulfilling the Condition Precedent. At this stage, contract management, communication strategy would be the key aspects to be monitored.

The TA would assist PPP Office/ BIWTA in reviewing the following documents (in association with the Legal Consultant of PPP Office) which are important for achieving financial close:

- Performance Security
- Shareholders Agreement
- Trust & Retention Account
- Escrow Agreement
- Loan Agreement
- Substitution Agreement
- Other relevant financing agreement

The purpose of review of the above documents is to make sure that no clause/ provisions are added in the above documents which are detrimental to the interest of PPP Office/ BIWTA. The TA intends to bring out their views on the above documents but the final decision would need to be taken by PPP Office/ BIWTA.

In case any clarification is required, the TA would assist PPP Office/ BIWTA in asking those clarifications from the Concessionaire. The TA would also assist PPP Office/ BIWTA in ensuring that all the required permits as required under the Concession Agreement ("CA") are obtained by the Concessionaire so as to satisfy condition precedent as mentioned in the CA. It is to be noted that TA will only assist the Authority in carrying out the tasks mentioned and final decision as well as responsibility of any outcome lies with the Authority.

Commercial and Financial support will be provided to the preferred bidder

This stage involves re-calibration of all project financial parameters based on the winning bid, and identifying potential sources of funding. This involves updating the financial model developed in Phase 1 of the project,

with assumptions based on the winning bid. The financial model of the selected developer will be scrutinized with specific focus on the following parameters:

- Determination of the project's revenue projection, income statement projection, balance sheet and cash flow statement over the life of the project
- Projection of working capital requirement
- Sensitivity analysis on major parameters such as capital cost, O&M cost etc.
- Assess whether the project requires additional support (such as VGF) to be commercially viable.

16.3. Detailed Procurement Plan

The detailed procurement plans along with the tentative timelines have been provided below. The key deliverables for this phase of work are

- Preparation of Contract Documents
- Engagement with the market
- Project management and Governance Arrangement
- Administration of the Bidding Process which would include
    - Issuance of RFP and Evaluation
    - Signing of Concession Agreement
    - Financial Close
- Commercial and Financial Support
- Early operations Support
- Training & Transfer of Knowledge
- Project Closure and Completion Report

TABLE 173 DETAILED PROCUREMENT PLAN

Task No.	Activity No.	Description of Activity	Duration (Months)											
			1	2	3	4	5	6	7	8	9	10	11	12
Preparation of Contract Documents														
1.1		Preparation of Project Information Memorandum												
1.2		Preparation of Advertisement and Notices												
1.3		Preparation of Draft RFP												
1.4		Preparation of inputs in Draft Concession Agreement												
1.5		Preparation of Strategy paper on Tender Evaluation												
Engagement with the market														
2.1		Interaction with Potential Bidders / Stakeholders												
2.2		Preparation of Presentation Material/ report on outcome from Tenderer's meeting												
Project Management and Governance Arrangement														
3.1		Preparation of a Project Governance Strategy												
3.2		Preparation of Project Management Report												
Administration of Bidding process														
		Request for Proposal Stage												
4.1		Approval & Issue of RFP & Bid Documents												
4.2		Creation of a Virtual Data Room												
4.3		Conducting pre-bid conference, responding to queries, issuing addendum if required												
4.4		Receipt of bids, bid evaluation												

Task No.	Activity No.	Description of Activity	Duration (Months)											
			1	2	3	4	5	6	7	8	9	10	11	12
4.5		Preparing & submission of Bid Evaluation Report												
4.6		Contract Award, negotiation & financial closure												
4.7		Letter of Award / Acceptance												
4.8		Signing of Concession Agreement												
Commercial & Financial Support														
5.1		Assessment and Optimization of Funding Strategies												
5.2		Updation of Project Financial Model												
5.3		Development of a Project Risk Report												
5.4		Financial Assessment Report												
Early Operations Support														
6.1		Development of an Operations Governance Plan												
6.2		Presentation of roles allocation												
6.3		Presentation on key commercial issues and risk management												
7		**Training and Transfer of Knowledge**												
Project closure & Completion report														
8.1		Project Completion report												
8.2		Delivery of Final Report to Client												

Legend
Activity Duration

16.4. Organizational Assessment

A Project Implementation Unit ("PIU") is a vehicle to plan and implement a project or a series of projects. Most PIUs are established to support large capital investment projects and the life span of the PIU is linked with the project life cycle. Recent examples cited is in the case of National Highway Authority of India ("NHAI") where they have established PIU for efficient management and supervision of a group of projects under its jurisdictions. We recommend a PIU to be established by BIWTA for development of Inland Container Terminal at Khanpur.

16.4.1. Recommended Team Structure

Based on our study of the organogram for various port project, we recommend the following team structure for the PIU:

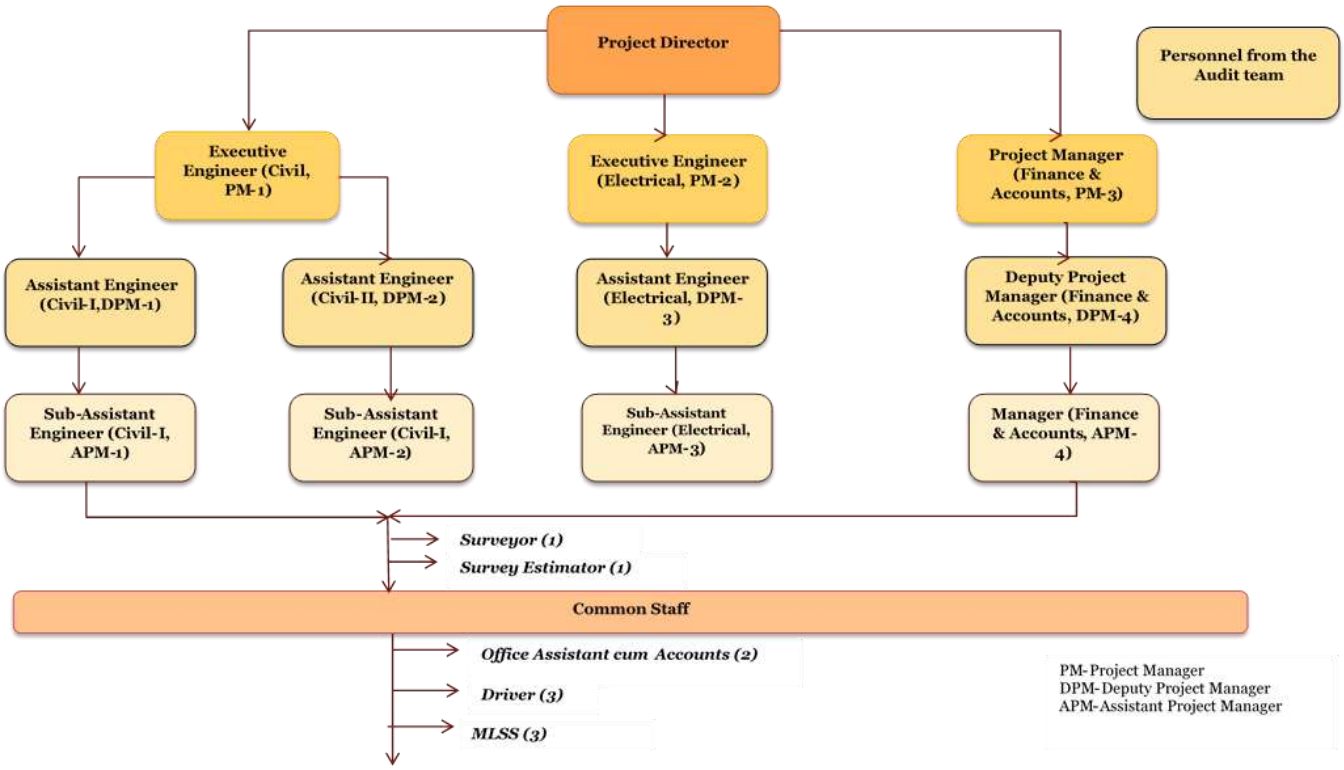


FIGURE 97: RECOMMENDED PIU TEAM STRUCTURE

16.4.2. Governance structure for ensuring project

As discussed previously, a Project Implementation Unit ("PIU") has been recommended for effective implementation of the project. Currently, there is one Project Director who works with in close –coordination with the PPP Office, BIWTA and the TA. However, during the project delivery stage (construction and operation) the amount of work would increase manifold and hence a team has been proposed for the project. The project team would work in co-ordination with the concessionaire and the supervision consultants for execution of the project.

The team would consist of 1 Project Director and 11 other personnel (in various ranks) who would be reporting to him. Besides, a support team of 10 members would also be engaged who would be assisting the core team during the construction and operation phase.

Assistance from the PPP office and finance team would also be required who would be managing the procurement process in close co-ordination with the implementing agency. The procurement expert would be responsible for conducting the market sounding exercises, review and launching of the contract documents, facilitating the signing of the concession agreement. Legal assistance would also be sought for review of the draft documents prior to be publication so as to verify that the documents are in conformity with the relevant

laws in Bangladesh. Assistance from the Finance team is important as timely reimbursement of funds in the form of grant during the construction stage for expenses incurred by the concessionaire.

16.5. Transfer of knowledge

As discussed earlier, transfer of knowledge will be an underlying principle of our approach. We will conclude the assignment by conducting an off-shore training session for 4 government officials. Our global network and links with other government authorities will help us to arrange a tour that helps the GoB to gain maximum value from the tour.

We anticipate that as part of the training program, the host government authority will share their learning with regard to PPP. This will support the officials in adopting the best practices and at the same time, foresee the kind of challenges they can face during PPP growth trajectory. This will be supported by analysing PPP case studies (both failures and successes).

17. Heads of Terms of a Concession Agreement

Concession Agreement[37] is defined as "A negotiated contract between a company and a government that gives the company the right to operate a specific business within the government's jurisdiction, subject to certain conditions. A concession agreement may also refer to an agreement between the owner of a facility and the concession owner or concessionaire that grants the latter exclusive rights to operate a specified business in the facility under specified conditions. Regardless of the type of concession, the concessionaire usually has to pay the party that grants it the concession, ongoing fees that may either be a fixed amount or a percentage of revenues".

17.1. Features of a Concession

1. ***Establishment of relationship between government and private agency:*** The contract governs the relationship between the concession-granting authority and the private concessionaire. The concession granting authority is the government/ government agency.
2. ***Right to use the asset:*** The concession is awarded for a limited but potentially renewable period, during which the concessionaire enjoys the exclusive right to use the assets, exploit the existing facilities and develop new ones. The contract determines conditions under which concessionaire uses these facilities and the prices at which it provides the service.
3. ***Allocation of investments:*** The concessionaire is responsible for all investments and for developing all new facilities, many of which are specified in the contract under the supervision of the state/ regulator. The concessionaire retains control and use of rights over the new assets until they are handed over at the expiration of the contract. The contract might contain a clause specifying compensation for investments not fully amortized by the end of the concession period, and clause specifying causes and remedies for early termination of contract and stating penalties and fines for non-compliance with agreed-upon terms.

For port projects to be awarded on PPP basis, a concession agreement is signed between the Concessionaire and the Awarding Authority which delineates the roles and responsibilities of both the parties thereby resulting in efficient contract management. The terms and conditions detailed in the CA actually depend on the identification and allocation of risks between both the stakeholders.

17.2. Key Commercial Terms and Condition

Details of the proposed key terms of the Concession Agreement that are to be detailed in the Draft Concession Agreement have been mentioned below:

TABLE 174 KEY COMMERCIAL TERMS AND CONDITIONS

S.No	Clause	Details
1.	Concession Period	The guiding principle for determining project specific concession period is the traffic handling capacity of the respective terminal at the end of the proposed concession period. The time required for construction should be included in the concession period so as to incentivize early completion, implying greater toll revenues.

[37] *"Definition of Concession Agreement" as retrieved from http://www.investopedia.com/terms/c/concessionagreement.asp dated January 19, 2015*

S.No	Clause	Details
		As per the Financial Feasibility study, the concession period has been considered as 30 years which includes two phases of construction, each of 18 months duration.
2.	Selection of the Concessionaire	Selection of the Concessionaire should be based on open competitive bidding. The bidding criteria would be decided in consultation with PPP Office and BIWTA.
3.	Risk Allocation	As in course during structuring of the project, the risks have been allocated to the parties that are best suited to manage them. In this project, it has been assumed that the construction and the traffic risk have been entirely borne in by the private party. There is no minimum traffic guarantee assumed in the base case plan. Identification and allocation of risks would be done at the time of finalization of the Concession Agreement.
5.	User Fee	Operator is free to determine tariff as project is financially feasible without any support required from the government in terms of Capital Grant. Tariff estimates assumed for the purpose of analysing financial viability are determined as per the benchmark from the competing facilities and are discounted from 0 – 15% based on type of service. In order to neutralize the variable cost of operations and maintenance, Tariff has been increased by 40% of Consumer Price Index on annual basis.
6.	Construction	Construction period has been assumed to be in two phase of 18 months each. Obligations of both the Authority and the Concessionaire would be decided at the time of finalization of Concession period.
7.	Operation and Maintenance	Operations duration for the project has been considered as 28.5 years. In case when actual traffic exceeds design traffic, second phase of development can start earlier to meet the additional requirement.
8.	Substitution Right	Details of the substitution rights would be done prior to the finalization of Concession Agreement. Rights of the Lenders would be kept in mind prior to finalization.
9.	Force Majeure	Aspects to be covered and compensation provided would be finalized while drafting the Concession Agreement
10.	Termination	Since this is one of the most critical elements of the Concession Agreement, deliberation on the scope, redressal and compensation would happen prior to finalizing the same.

S.No	Clause	Details
11.	Monitoring and Supervision	Monitoring and supervision of construction, operation and maintenance is proposed to be undertaken through a supervision consultant (a qualified firm) that will be selected by the Authority through a transparent process. This would be decided at the time of finalization of the Concession Agreement.
12.	Support and guarantees by the Authority	No support or guarantee from the authority has been recommended. Based on market response to the project, additional supports and guarantees can be contemplated and incorporated in the Concession Agreement.
13.	Effective Dispute Resolution	Effective dispute resolution mechanism to be formulated prior to finalization of the Concession Agreement.

17.3. Payment Mechanism

17.3.1. Escrow Mechanism

Escrow mechanism is typically followed in all PPP transaction projects where all the transactions related to the inflow and outflow of cash in the project are governed by the details as stipulated in the Concession Agreement. The operative account normally opened for this purpose is the Escrow Account. The terms and conditions followed in operating the account is detailed in the Escrow Agreement.

The proposed waterfall mechanism to be detailed in the Concession Agreement detailing the withdrawal of monies during the operation period and during termination period has been mentioned below. The flows of funds have been tentatively mentioned and would be subjected to change on discussion of the same with BIWTA / PPP Office.

17.3.2. Withdrawals during the Concession Period

The priority of payments with respect to withdrawals from the escrow account during the concession period is as detailed below:

- All taxes due and payable by the Concessionaire;
- All payments relating to construction of the Inland Container Terminal, subject to and in accordance with the conditions, if any, set forth in the Financing Agreements;
- All cost and expense incurred by the Authority, provided it certifies to the Escrow Bank that it had incurred such expenses in accordance with the provisions of the Concession Agreement and that the amounts claimed are due to it from the Concessionaire;
- Monthly proportionate provision of Debt Service;
- Debt service payments in respect of Subordinated Debt;
- Reserve requirements set forth in the Financing Agreements; and
- Balance, if any, in accordance with the instructions of the Concessionaire.

17.3.3. Withdrawals while terminating the project

The order of priority of payments at the time of termination has been detailed below:

- All taxes due and payable by the Concessionaire;
- Debt Due excluding Subordinated Debt;
- Outstanding Concession Fee;
  All payments and Damages certified by the Authority as due and payable to it by the Concessionaire;
- Retention and payments relating to the liability for defects and deficiencies as detailed in the Concession Agreement;
- Outstanding Debt Service including the balance of Debt Due;
- Outstanding Subordinated Debt;
- Incurred or accrued O&M Expenses;
- Any other payments required to be made under this Agreement; and
- Balance, if any, in accordance with the instructions of the Concessionaire:

Annexure

Appendix 1 A.A - Profit & Loss Statement Summary for Preferred option

TABLE: PROFIT & LOSS STATEMENT SUMMARY

Particulars (BDT Million)	2016	2017	2018	2019	2020	2025	2030	2032	2033	2035	2040	2045
Total revenue	-	125	300	347	391	735	831	1031	1134	1339	1656	1905
Total operating cost	-	(77)	(154)	(169)	(185)	(328)	(365)	(441)	(497)	(567)	(692)	(815)
Operating profit	**-**	**48**	**146**	**178**	**206**	**407**	**466**	**590**	**637**	**772**	**964**	**1090**
Depreciation of hard cost asset	-	(9)	(27)	(27)	(27)	(34)	(40)	(40)	(64)	(76)	(76)	(76)
Depreciation of equipment cost asset	-	(3)	(18)	(18)	(18)	(21)	(63)	(70)	(106)	(139)	(199)	(200)
Amortization of finance cost – phase 1	-	(1)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	-	-	-
Amortization of finance cost – phase 2	-	-	-	-	-	-	-	(2)	(4)	(4)	-	-
Profit before interest & taxes (PBIT)	**-**	**35**	**99**	**131**	**158**	**350**	**361**	**477**	**462**	**550**	**684**	**813**
BDT loan interest accrued & paid phase 1	-	(54)	(106)	(106)	(105)	(96)	(69)	(52)	(42)	(20)	-	-
BDT loan interest accrued & paid phase 2		-	-	-	-	-	-	-	(46)	(85)	(28)	-
Overdraft facility interest accrued & paid	-	-	(1)	(1)	-	-	-	-	-	-	-	-
Incremental capex loan interest accrued & paid	-	-	-	-	-	(11)	(12)	(7)	(5)	(3)	-	-
Equipment loan interest accrued & paid	-	-	-	(0)	(0)	(3)	(41)	(22)	(36)	(21)	(26)	(0)
Total interest earnings	-	-	-	-	-	-	-	-	-	-	-	-
Agency fee senior debt phase 1 – operations	-	(1)	(1)	(2)	(2)	(2)	(3)	(4)	(4)	(4)	-	-
Agency fee senior debt phase 2 – operations	-	-	-	-	-	-	-	-	(2)	(4)	(5)	-
Profit before tax (PBT)	**-**	**(19)**	**(9)**	**23**	**52**	**238**	**236**	**393**	**327**	**413**	**625**	**813**
P&L tax charge	(0)	5	2	(6)	(14)	(65)	(65)	(108)	(90)	(114)	(172)	(224)
Profit after tax (PAT)	**(0)**	**(14)**	**(6)**	**16**	**38**	**173**	**171**	**285**	**237**	**299**	**453**	**589**
Dividend declared/paid	-	-	-	-	(34)	(173)	(79)	(70)	(136)	(295)	(529)	(589)
Net profit	**(0)**	**(14)**	**(6)**	**16**	**4**	**-**	**92**	**214**	**101**	**4**	**(76)**	**0**

Appendix 1 A.A - Balance Sheet Summary for Preferred option

Table: Balance Sheet Summary

Particulars (BDT Million)	2016	2017	2018	2019	2020	2025	2030	2032	2033	2035	2040	2045
Assets												
Net asset balance	683	1302	1256	1209	1165	1116	1564	2234	2622	2184	1389	(0)
Long term asset	**683**	**1302**	**1256**	**1209**	**1165**	**1116**	**1564**	**2234**	**2622**	**2184**	**1389**	**(0)**
Debtor balance	-	10	25	29	32	60	68	84	93	110	136	-
DSRA balance	-	54	84	114	113	130	137	184	326	258	120	-
Retained cash balance	(0)	(0)	(0)	21	74	257	-	-	-	-	-	-
Current assets	**(0)**	**64**	**109**	**164**	**220**	**447**	**205**	**269**	**419**	**368**	**256**	**-**
Total assets	**683**	**1366**	**1365**	**1373**	**1384**	**1563**	**1769**	**2503**	**3042**	**2552**	**1646**	**(0)**
Liabilities												
Creditor balance	-	6	13	14	15	27	30	36	41	47	57	-
BDT loan phase 1 balance	272	961	961	951	941	836	548	384	288	77	(0)	(0)
BDT loan phase 2 balance	-	-	-	-	-	-	-	218	826	671	155	0
Overdraft facility balance	-	6	7	-	-	-	-	-	-	-	-	-
Incremental capex loan balance	-	-	-	-	-	80	79	40	32	16	-	-
Equipment loan balance	-	-	1	1	3	13	261	329	238	125	163	-
Deferred tax liability	(0)	(5)	(8)	(1)	13	158	219	229	248	265	164	-
Total Liabilities	**272**	**968**	**974**	**965**	**973**	**1113**	**1136**	**1236**	**1674**	**1201**	**539**	**(0)**
Net assets	**412**	**398**	**392**	**408**	**412**	**450**	**633**	**1267**	**1368**	**1351**	**1106**	**(0)**
Equity balance	412	412	412	412	412	450	476	752	752	752	752	-
Retained earnings balance	(0)	(14)	(20)	(4)	-	-	157	515	616	599	355	0
Shareholder's fund	**412**	**398**	**392**	**408**	**412**	**450**	**633**	**1267**	**1368**	**1351**	**1106**	**0**

Appendix 1 A.A - Cash Flow Statement Summary for Preferred option

TABLE: CASH FLOW STATEMENT SUMMARY

Particulars (BDT Million)	2016	2017	2018	2019	2020	2025	2030	2032	2033	2035	2040	2045
Total revenue received	-	115	286	344	387	729	824	1023	1125	1331	1652	2057
Total operating cost paid	-	(70)	(147)	(168)	(184)	(325)	(363)	(438)	(492)	(564)	(690)	(880)
Operating cash flow	**-**	**44**	**138**	**175**	**204**	**404**	**462**	**585**	**633**	**766**	**962**	**1177**
Construction cost – Capitalised	(513)	(257)	-	-	-	-	-	(309)	(155)	-	-	-
Equipment cost – Capitalised	(150)	(350)	(2)	-	(3)	-	(4)	(469)	(387)	-	(6)	-
Upfront fee senior debt phase 1	(10)	-	-	-	-	-	-	-		-	-	-
Upfront fee senior debt phase 2	-	-	-	-	-	-	-	(8)		-	-	-
Commitment fee senior debt phase 1	(10)	(3)	-	-	-	-	-	-		-	-	-
Commitment fee senior debt phase 2	-	-	-	-	-	-	-	(8)	(3)	-	-	-
Agency fee senior debt phase 1 DC	(1)	(1)	-	-	-	-	-	-		-	-	-
Agency fee senior debt phase 1 – operations	-	(1)	(1)	(2)	(2)	(2)	(3)	(4)	(4)	(4)	-	-
Agency fee senior debt phase 2 DC	-	-	-	-	-	-	-	(1)	(1)	-	-	-
Agency fee senior debt phase 2 – operations	-	-	-	-	-	-	-	-	(2)	(4)	(5)	-
Interest during construction senior debt phase 1	-	(21)	-	-	-	-	-	-	-	-	-	-
Interest during construction senior debt phase 2	-	-	-	-	-	-	-	-	(17)	-	-	-
DSRA pre funding amount	-	(54)	-	-	-	-	-	-	(46)	-	-	-
Working capital pre funding	-	(4)	-	-	-	-	-	-	-	-	-	-
Working capital prefunding cash released	-	4	-	-	-	-	-	-	-	-	-	-
Pre-tax-pre financing cash flows	**(683)**	**(641)**	**135**	**174**	**199**	**402**	**454**	**(215)**	**18**	**758**	**951**	**1177**
Corporation tax due & paid	-	-	-	-	-	(60)	(54)	(102)	(71)	(112)	(207)	(188)
Post tax – pre financing cash flows	**(683)**	**(641)**	**135**	**174**	**199**	**341**	**400**	**(317)**	**(53)**	**646**	**744**	**989**
Senior debt drawdown phase 1	272	689	-	-	-	-	-	-	-	-	-	-
Senior debt drawdown	-	-	-	-	-	-	-	218	609	-	-	-

Particulars (BDT Million)	2016	2017	2018	2019	2020	2025	2030	2032	2033	2035	2040	2045
phase 2												
Equity injection	412	-	-	-	-	-	-	275	-	-	-	-
Equipment loan drawdown	-	-	1	-	2	-	3	227	-	-	4	-
Cash flow available for senior debt service	**(0)**	**47**	**136**	**174**	**201**	**341**	**403**	**404**	**556**	**646**	**748**	**989**
BDT loan interest accrued & paid phase 1	-	(54)	(106)	(106)	(105)	(96)	(69)	(52)	(42)	(20)	-	-
BDT loan interest accrued & paid phase 2	-	-	-	-	-	-	-	-	(46)	(85)	(28)	-
BDT loan phase 1 repayment	-	-	-	(10)	(10)	(38)	(77)	(86)	(96)	(106)	-	-
BDT loan phase 2 repayment	-	-	-	-	-	-	-	-	-	(103)	(103)	-
Cash flow available for DSRA	**(0)**	**(6)**	**31**	**59**	**87**	**207**	**258**	**266**	**371**	**332**	**616**	**989**
DSRA deposits	-	-	(31)	(30)	-	-	-	(46)	(96)	-	-	-
DSRA withdrawal	-	-	-	-	1	4	8	-		56	11	-
Cash flow available for incremental capex loan	**(0)**	**(6)**	**0**	**29**	**88**	**211**	**266**	**220**	**276**	**388**	**628**	**989**
Incremental capex loan interest accrued & paid	-	-	-	-	-	(11)	(12)	(7)	(5)	(3)	-	-
Incremental capex loan repayment	-	-	-	-	-	(11)	(19)	(19)	(8)	(8)	-	-
Cash flow available for equipment loan	**(0)**	**(6)**	**0**	**29**	**88**	**189**	**235**	**193**	**263**	**377**	**628**	**989**
Equipment loan interest accrued & paid	-	-	-	(0)	(0)	(3)	(41)	(22)	(36)	(21)	(26)	(0)
Equipment loan repayment	-	-	-	(0)	(0)	(12)	(115)	(100)	(91)	(62)	(73)	(1)
Cash flow available for overdraft facility interest	**(0)**	**(6)**	**0**	**28**	**88**	**174**	**79**	**70**	**136**	**295**	**529**	**988**
Overdraft facility interest accrued & paid	-	-	(1)	(1)	-	-	-	-	-	-	-	-
Cash flow available for overdraft facility	**(0)**	**(6)**	**(1)**	**28**	**88**	**174**	**79**	**70**	**136**	**295**	**529**	**988**
Overdraft facility drawdown	-	6	1	-	-	-	-	-		-	-	-
Overdraft facility repayment	-	-	-	(7)	-	-	-	-		-	-	-
Cash flow available for equity redemption	**(0)**	**-**	**-**	**21**	**88**	**174**	**79**	**70**	**136**	**295**	**529**	**988**
Equity redemption	-	-	-	-	-	-	-	-	-	-	-	(752)
Cash flow available for dividend	**(0)**	**-**	**-**	**21**	**88**	**174**	**79**	**70**	**136**	**295**	**529**	**236**
Dividend declared /paid	-	-	-	-	(34)	(173)	(79)	(70)	(136)	(295)	(529)	(589)

Particulars (BDT Million)	2016	2017	2018	2019	2020	2025	2030	2032	2033	2035	2040	2045
Net cash flow	(0)	-	-	21	53	2	-	-	-	-	-	(354)

Appendix 1 A.A - Financial Assessment – High Case Traffic

In this section, summary of operating revenue and operating cost is shown for Simple Option with 30 years of concession period and Bulk operations for initial 10 years with High Case traffic projections as mentioned in Section 4.6.3. Rest other assumptions for the calculation of Operating Revenue and Operating cost mentioned in Section 9.1 and Section 9.2 remain unchanged.

Appendix 1 A.A.B - Operating Revenue – High Case

TABLE: CONTAINER TERMINAL REVENUE SUMMARY – HIGH CASE

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Vessel related charges	0	1	1	1	2	2	5	9	12	14	15
Cargo handling charges at berth	2	7	9	11	15	18	39	67	87	98	105
Container handling charges at yard	23	75	118	143	190	230	507	872	1127	1272	1365
Storage charges	12	34	41	50	67	80	178	306	395	446	478
Reefer plugin charges	-	0	1	1	1	1	3	5	7	8	8
Container operating revenue	37	117	170	206	275	331	733	1259	1628	1838	1972

TABLE: COMBINED TERMINAL REVENUE SUMMARY – HIGH CASE

Operating revenue profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Terminal Revenue	37	117	170	206	275	331	733	1259	1628	1838	1972
Bulk Handling Revenue	109	225	234	243	252	261	152	-	-	-	-
Combined terminal revenues	146	342	404	450	526	592	885	1259	1628	1838	1972

Appendix 1 A.A.B - Operating Cost – High Case

TABLE: CONTAINER TERMINAL OPERATING COST SUMMARY – HIGH CASE

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Personnel Costs	8	17	21	25	31	40	72	106	155	197	226
Equipment Costs	10	26	31	35	46	53	116	203	260	305	331
Labour Costs	3	11	17	21	28	34	75	129	167	188	202
Maintenance Costs	17	16	16	15	15	17	14	18	12	5	1
Utility Costs	2	4	5	6	6	7	12	19	24	27	29
Outsourced Costs	1	2	2	2	3	3	3	4	4	5	5
Miscellaneous expenses	4	8	9	9	11	12	17	24	31	36	40
Container operating costs	**44**	**85**	**101**	**114**	**139**	**167**	**310**	**502**	**652**	**763**	**834**

TABLE: COMBINED TERMINAL OPERATING COST SUMMARY – HIGH CASE

Operating Costs profile (BDT Million)	2017	2018	2019	2020	2021	2022	2027	2032	2037	2042	2045
Container Terminal Operating Costs	44	85	101	114	139	167	310	502	652	763	834
Bulk Handling Costs	38	79	82	85	88	91	53	-	-	-	-
Combined Terminal Operating Costs	83	164	183	199	227	258	364	502	652	763	834

Appendix 1 A.A - Profile of Influence Area

Dhaka District

Appendix 1 A.A.C.A - Geographic & Demographic Profile

Dhaka district is situated almost at the middle place of the country. Dhaka (city) stands on the bank of the river Buriganga. Surrounded on the north by Gazipur and Tangail districts, on the east by Narayanganj district, on the south by Munshinganj and Faridpur districts and on the west by Manikganj district. The total area of the district is 1463.60 sq. km. (565.00 sq. miles)[38], with total population of 12,043,977.

Appendix 1 A.A.C.A - Economic Situation

The economy of Dhaka rural area is agro-based and Dhaka urban area is industry based. The main business districts of the city include Motijheel, Panthapath and Gulshan. Bashundhara City is a recently developed economic area that houses many high-tech industries and corporations and a shopping mall that is one of the largest in Southeast Asia. The Export Processing Zone in Dhaka was set up to encourage the export of garments, textiles and other goods.

The economy of Dhaka rural area is agro-based and Dhaka urban area is industry based. Out of total 2,266,479 holdings of the district 10.65% holdings are farms, which produce varieties of crops. Non-farm activities are very much significant in Dhaka district. The following table shows the total establishments in the urban and rural areas:

TABLE: NUMBER OF INDUSTRIAL ESTABLISHMENT – DHAKA DISTRICT[39]

Activity	Number of Establishment
Mining and quarrying	33
Manufacturing	35,344
Electricity, gas and water supply	183
Construction	858
Wholesale & retail trade	245,502
Hotels and restaurants	16,217
Transport, storage and communication	9,519
Bank, insurance and financial institution	2,138
Real estate and renting	6,431
Public administration and defence	2,557
Education	5,352
Health and social work	6,790
Community, social and personal services	27,868

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Industry Profile

[38] District Statistics 2011, Bangladesh Bureau of Statistics

[39] Census of Non-Farm Economic Activities 2001-2003

Ceramic industry, beverage industry, press and publication, garments industry, foot ware, jute mills, textile mills, printing and dying factory, transformer industry, automobile industry, biscuit and bread factory, pharmaceutical industry, cosmetic industry, soap factory, rice mill, flour mill, ice factory, ball pen industry, polythene industry, saw mill, brick field etc. are main sectors of manufacturing industries of this district.

A breakup of number of selected major industrial establishment has been shown below:

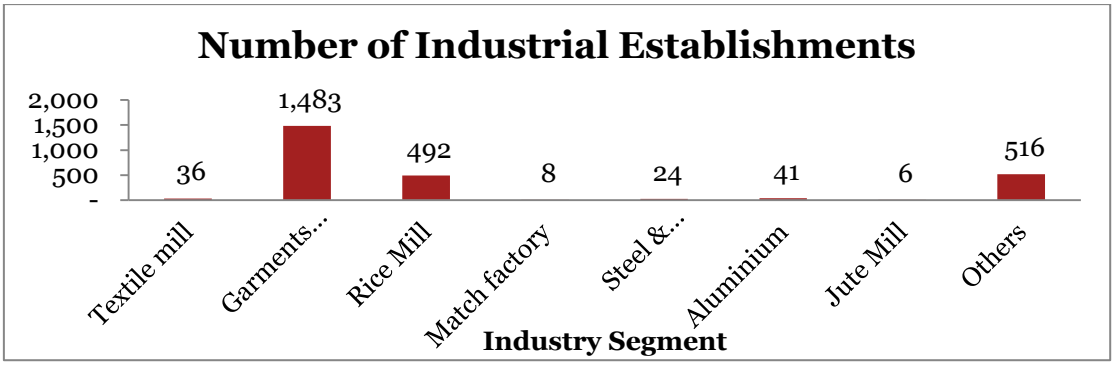


FIGURE: KEY INDUSTRIAL ESTABLISHMENTS – DHAKA DISTRICT [40]

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Major industrial Areas

Export processing zone, Dhaka & Tejgaon Industrial Area are the major industrial hub in this region.

Appendix 1 A.A.C.A - Major Import Export Commodities

TABLE: MAJOR IMPORT EXPORT COMMODITY – DHAKA DISTRICT

Major Import Commodities	Major Export Commodities
Machinery and Equipment, Chemicals, Iron and Steel, Textiles, Foodstuffs, Petroleum products, Cement, Chemicals, Precious Stones & Jewellery, Plastic & Rubber Granules	Garments, Fish, Jute goods, Leather products, Frozen Goods

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Existing/Proposed Inland Container Terminal/Depot

TABLE: EXISTING/PROPOSED INLAND CONTAINER TERMINAL – DHAKA DISTRICT

[40] District Statistics 2011, Bangladesh Bureau of Statistics

Existing/Proposed Container Terminals	Brief Profile
Pangaon River Terminal	Operational since 2014, is a container river terminal at Pangaon along the Buriganga River (South Keraniganj, Dhaka). It is the first Bangladeshi inland container terminal. The container river terminal at Pangaon connects Dhaka with the ports of Chittagong and Mongla. In total the terminal has a storage capacity of 3,500 TEU of containers and can handle 116,000 TEUs containers annually.
ICD Kamlapur	Located in the heart of Dhaka city and is operational since 1987, with an annual handling capacity of this facility is around 90,000 TEU. Train services between Chittagong port and Kamlapur ICD are provided by Bangladesh Railways (BR)

Source: Consultant's Analysis

Narayanganj District

Appendix 1 A.A.C.A - Geographic & Demographic Profile

Narayanganj was a sub-division of former Dhaka district. It was upgraded to a district on 15th February, 1984. Narayanganj, the oldest and the most prominent river port of Bangladesh, grew into a prominent place of trade and commerce in the long past for which it was previously known as a Ganj. Narayanganj district is bounded on the north by Gazipur and Narsingdi districts, on the east by Brahmanbaria and Comilla districts, on the south by Munshiganj district and on the west by Dhaka district. The total area of the district is 684.37 sq. km., with total population of 2,948,000[41].

Appendix 1 A.A.C.A - Economic Situation

The district is pioneer in merchandising and manufacturing of jute, yarn and dying items. Cottage industry like weaving abounds in this district. International trading, import and export business, garments industries, knitwear garments, shipyard, brickfield etc., create employment opportunities to the people facilitating additional income to the household population. The rural economy of Narayanganj is agricultural. Out of total 532,415 holdings of the district 22.44 % holdings are farms.

The status of non-farm activities in the district is increasing. The following table: shows the number of establishments and their distribution by major industry

TABLE: NUMBER OF INDUSTRIAL ESTABLISHMENTS – NARAYANGANJ[42]

Activity	Number of Establishment
Mining and quarrying	5
Manufacturing	12,805

[41] District Statistics 2011, Bangladesh Bureau of Statistics

[42] Census of Non-Farm Economic Activities 2001-2003

Electricity, gas and water supply	30
Construction	37
Wholesale & retail trade	46,120
Hotels and restaurants	4,808
Transport, storage and communication	1,389
Bank, insurance and financial institution	281
Real estate and renting	862
Public administration and defence	226
Education	1,635
Health and social work	3,790
Community, social and personal services	7,569

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Industry Profile

Narayanganj is Centre of business and industry, especially the jute trade and processing plants, and the textile sector of the country.

A breakup of number of selected major industrial establishment has been shown below:

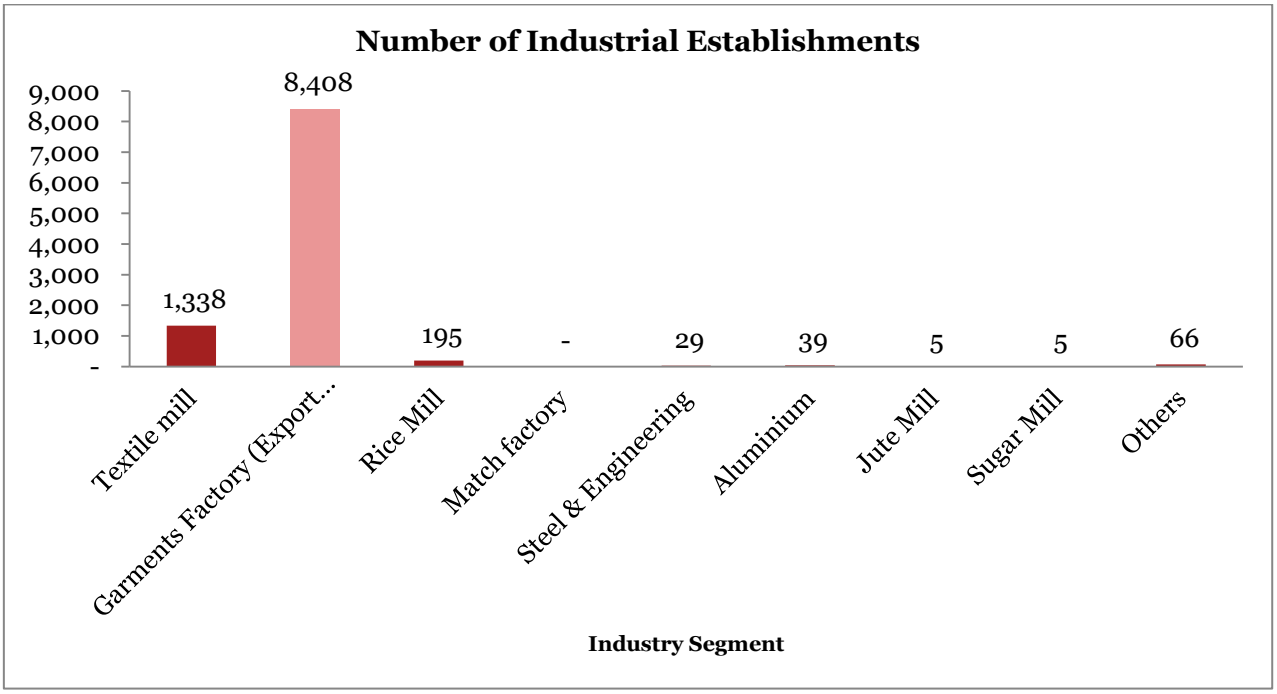


FIGURE: KEY INDUSTRIAL ESTABLISHMENTS - NARAYANGANJ[43]

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Major industrial Areas

[43] District Statistics 2011, Bangladesh Bureau of Statistics

Adamjee Export Processing Zone, Kamal Industrial area, BSCIC Industrial area are the major industrial hub in this region.

Appendix 1 A.A.C.A - Major Import Export Commodities

TABLE: MAJOR IMPORT EXPORT COMMODITY - NARAYANGANJ

Major Import Commodities	Major Export Commodities
Textile yarns, Textile fabric, Chemicals, Plastic & Rubber Granules	Readymade Garments (Knitwear), Jute goods,

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Existing/Proposed Inland Container Terminal/Depot

TABLE: EXISTING/PROPOSED INLAND CONTAINER TERMINAL - NARAYANGANJ

Existing/Proposed Container Terminals	Brief Profile
Ananda Container Terminal (Proposed)	Planned the bank of Meghan River, being developed by Ananda group. The proposed site is located 30 km east of Dhaka city and north east of Narayanganj city
Rupayan Port & Logistic ICT (Under Construction)	Planned on the eastern river bank of the Shitalakhya River in Dhamgarh. It is approx. 6 km up the river from the Khanpur Terminal location and commencement of phase 1 commercial operations is expected in 2016
Kumudini Container Terminal (Proposed)	Planned in direct vicinity towards south of the Khanpur Terminal, at about 500 m down the Shitalakhya River

Source: Consultant's Analysis

Gazipur District

Appendix 1 A.A.C.A - Geographic & Demographic Profile

Gazipur District is located at just north of capital city of Dhaka, Bangladesh and was previously a sub-division of Dhaka district. It is bounded on the north by Mymensingh and Kishoreganj Districts, on the east by Narsingdi District, on the south by Narayanganj and Dhaka Districts and on the west by the Tangail District. The total area of the district is 1806.36 sq. km of which 17.53 sq. km was riverine and 273.42 sq.km. is forest area, with a population of 123531.[44] Dhaka-Tongi diversion road has connected Gazipur with Dhaka. Apart from this there are 7 railway stations in the Gazipur district: Rajendrapur, Sripur, Dhirasram, Joydevpur, Tongi, Satkhamair and Pubail.

[44] District Statistics 2011, Bangladesh Bureau of Statistics

Appendix 1 A.A.C.A - Economic Situation

Agrarian economy prevails almost in all the corners of the district. Out of total 538,597 holdings, about 42.74% holdings are performing agricultural activities. The only machine tools factory of the country, Bangladesh Rice Research Institute, Agricultural Research Institute for post graduate studies in Agriculture and the national park etc. create employment opportunities to the local people, Non-Agricultural activities are still sparse.

TABLE: NUMBER OF INDUSTRIAL ESTABLISHMENTS - GAZIPUR[45]

Activity	Number of Establishment
Mining and quarrying	8
Manufacturing	6,642
Electricity, gas and water supply	43
Construction	30
Wholesale & retail trade	44,934
Hotels and restaurants	5,229
Transport, storage and communication	1,395
Bank, insurance and financial institution	304
Real estate and renting	1,129
Public administration and defence	153
Education	1,532
Health and social work	688
Community, social and personal services	7,952

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Industry Profile

Garments industry, Aluminium factory, Textile mill, Pharmaceutical industry, Cosmetics industry, Machine tools factory, Diesel plant, Security printing press, Ordnance factory, Ceramics factory, Packaging industry, Brick field etc. are major manufacturing industries that exist in this area.

A breakup of number of selected major industrial establishment has been shown below:

[45] Census of Non-Farm Economic Activities 2001-2003

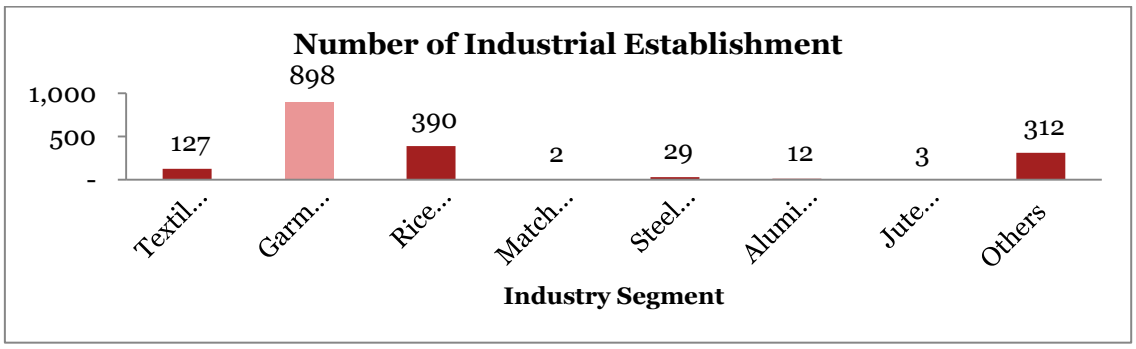


FIGURE: KEY INDUSTRIAL ESTABLISHMENTS - GAZIPUR[46]

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Major Industrial Areas

Garment Clusters of Mirpur, Tejgaon & Demra, BSCIC Industrial Estate Tongi, Tongi Industrial Estate are the major industrial hub in this region.

Appendix 1 A.A.C.A - Major Import Export Commodities

TABLE: MAJOR IMPORT EXPORT COMMODITY - GAZIPUR

Major Import Commodities	Major Export Commodities
Chemicals, Plastic & Rubber Granules, Raw Cotton, Textile Yarn and fabrics	Vegetables, fruits, medicine, cosmetics, cigarettes, aluminium products, readymade garments, mosquito coil, beverage (soft drinks)

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Existing/Proposed Inland Container Terminal/Depot

TABLE: EXISTING/PROPOSED INLAND CONTAINER TERMINAL - GAZIPUR

Existing/Proposed Container Terminals	Brief Profile
ICD Dhirasram	To cater the limited capacity of ICD Kamlapur Bangladesh Railway (BR) is planning to develop a full-fledged ICD near Dhirasram railway station with capacity of around 3, 54,000 TEU. The facility is proposed in Gazipur district and is in the close proximity to the garment cluster including Mirpur, Tejgaon, and Demra

Source: Consultant's Analysis

Narsingdi District

Appendix 1 A.A.C.A - Geographic & Demographic Profile

[46] District Statistics 2011, Bangladesh Bureau of Statistics

Narsingdi District was previously a sub-division of Dhaka District. The district is bounded on the north by Kishoreganj District, on the east by Kishoreganj and Brahmanbaria Districts, on the south by Brahmanbaria and Narayanganj Districts and on the west by the Gazipur District. The total area of the district is 1150.13 sq. km and a total population of 2,224,944.

Appendix 1 A.A.C.A - Economic Situation

The economy of Narsingdi is mixed type with agriculture and non-agriculture. Out of total 414,892 holdings, 212,498 holdings (51.22%) are agriculture farm holdings that produce varieties of crops. Different types of vegetables are grown here. Most of the vegetables available in Dhaka city are from Narsingdi. Besides crops, livestock and fishery are the main source of household income. Non-farm activities are economically significant in Narsingdi District. Non-farm activities are economically significant in Narsingdi District. The following table-1shows the number of establishments[47]:

TABLE: NUMBER OF INDUSTRIAL ESTABLISHMENTS - NARSINGDI[48]

Activity	Number of Establishment
Mining and quarrying	2
Manufacturing	9,635
Electricity, gas and water supply	10
Construction	24
Wholesale & retail trade	34,752
Hotels and restaurants	3,083
Transport, storage and communication	1,376
Bank, insurance and financial institution	153
Real estate and renting	513
Public administration and defence	212
Education	2,301
Health and social work	854
Community, social and personal services	8,104

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Industry Profile

Textile craft industry is major industrial establishments in Narsingdi. Narsingdi is also rich by several number of jute mills.

A breakup of number of selected major industrial establishment has been shown below:

[47] District Statistics 2011, Bangladesh Bureau of Statistics

[48] Census of Non-Farm Economic Activities 2001-2003

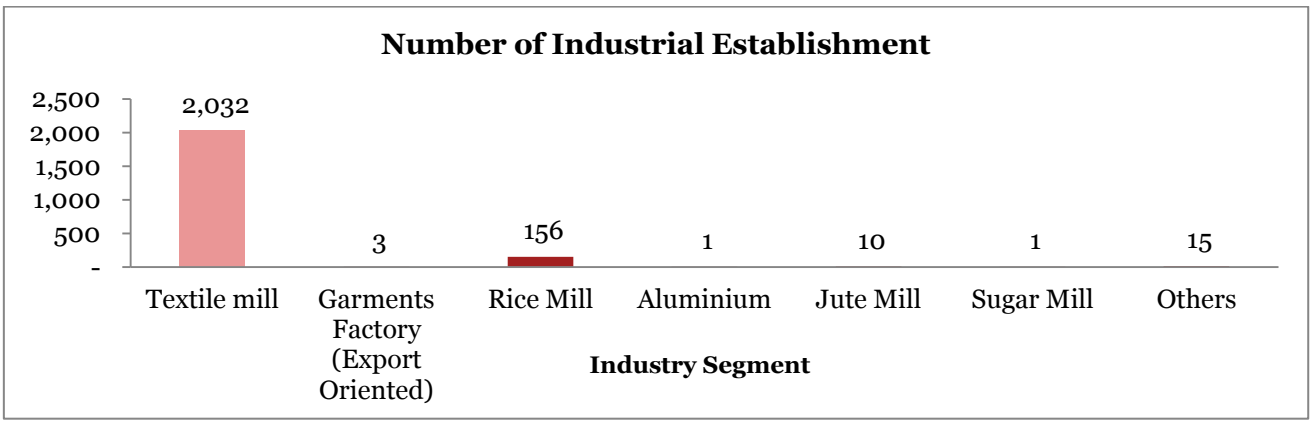


FIGURE: KEY INDUSTRIAL ESTABLISHMENTS – NARSINGDI[49]

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Major Industrial Areas

Shibpur (home to many textile mills), ShekherChaur/Baburhaat (Biggest haat for textiles), Palash (fertilizer industry & sugar mills) are the major industrial hub in this region.

Appendix 1 A.A.C.A - Major Import Export Commodities

TABLE: MAJOR IMPORT EXPORT COMMODITY - NARSINGDI

Major Import Commodities	Major Export Commodities
Raw Cotton, Leather Hides, Textile Yarn & Textile Fabrics, Chemicals	Textile and Textile articles

Source: Consultant's Analysis

Appendix 1 A.A.C.A - Existing/Proposed Inland Container Terminal/Depot

TABLE: EXISTING/PROPOSED INLAND CONTAINER TERMINAL - NARSINGDI

Existing/Proposed Container Terminals	Brief Profile
A K Khan Container Terminal (Under Construction)	Located in the northeast of Dhaka in Polash area of Narsingdi district, on the bank of river Shitalakhya, developed and financed by AK Khan Group. Proposed location is connected to the national road network using road R 30 Located in the northeast of Dhaka in Polash area of Narsingdi district, on the bank of river Shitalakhya, developed and financed by AK Khan Group. Proposed location is connected to the national road network using road R 302 2

Source: Consultant's Analysis

Appendix 1 A.A - Profile of Key Industry Players

Textile Industry

[49] District Statistics 2011, Bangladesh Bureau of Statistics

Dhaka Region:

- **Greenland Garments**: Greenland Garments Ltd. is a vertically integrated knit manufacturer. Their siege of the garment production process begins with the knitting of yarn into fabric and extends into and beyond the dyeing and manufacturing of various types of knit garments. Head Office: Hasney Tower (6th Floor), 3/A Kawran Bazar, Dhaka - 1215, Bangladesh.

  Factory location – Mirpur, Dhaka

  Capacity – 350,000 Pcs/Month

- **Hameem Group:** Hameem Group is one of the largest Bangladeshi conglomerates in textile and garments sector. It owns 26 garments factories, sweater factory, poly bag industry, label factory, jute mill, chemical formulation plant, tea states, Transport Company, news channel and Samakal, a widely circulated national daily newspaper.

  Its key Customers**:** Lee, GAP, ZARA, KOHLS, H&M, CK, Nautica, Mango, Walmart, JC

  Location – Tejgaon Industrial area, Dhaka

  Turnover – 400 Million USD

  Production – 6 Million Pcs/Month

- **Biswas Group:** Biswas Textiles Ltd. Is a leading textile company in Bangladesh, manufacturer of (a) Woven: Polyester Based Micro Fabrics and Nylon Taffeta (b) Knitted Fabrics: Polar Fleece, Valor, Safra, Cotton Fleece, Printed Fabrics (c) Tri-Coat and others.

  Factories: 9 automated garment factories in Dhaka.

  Monthly Capacity: 430,000 pcs woven bottoms, 300,000 pcs woven tops, 380,000 pcs pants, 600,000 pcs knit tops, 300,000 pcs knit bottoms.

Gazipur District:

- **Bextex Ltd**. (the "company") – It was incorporated in Bangladesh as a Public Limited Company with limited liability on 8 March 1994 and commenced commercial operation in 1995 and also went into the public issue of shares and debentures in the same year. The shares of the company are listed in the Dhaka and Chittagong Stock Exchanges of Bangladesh.

  Bextex Ltd. is the most modern composite mill in the region. It has an installed capacity of 288 high-speed air-jet looms in its weaving section and a high-tech dyeing and finishing section with a capacity of 100,000 yards of finished fabric per day. This company is located at the Beximco Industrial Park.

  Production capacity: 28 Million Linear Meters

  Factory Location: Beximco Industrial Park, Gazipur, Bangladesh

- **Silver Line group**: SilverLine Group had started initially with Knit Yam manufacturing in the form of a Spinning Mill. The textile group has vertically integrated into Yarn Dyeing, Weaving, Continuous Dyeing & Finishing and Garment manufacturing.

  Factory location: Gazipur, Bangladesh

- **Greenland garments ltd:** Greenland Garments Ltd. is a vertically integrated knit manufacturer. Our siege of the garment production process begins with the knitting of yarn into fabric and extends into and beyond the dyeing and manufacturing of various types of knit garments.

  Factory location: Gazipur, Bangladesh

  Capacity: 450,000 pcs/month

Narayanganj District:

- **Benetex Industries LTD**: The Company has been one of the leaders in Bangladesh's textile industry. They are the manufacturer of men's, women's & kid's – fashion, work, lounge, sports, inner and outer wear.

They are manufacturing over 20 tons of fabrics every-day.

Factory location: Narayanganj, Bangladesh

- **Antim Knitting Dyeing & Finishing Ltd and Antim Knit Composite Ltd**.

  It's a 100 percent export oriented Knit Composite Textile Factory. It is the pioneer in manufacturing state of the art in its production process.

  Factory location: Rupganj, Narayanganj

Narsingdi District:

- **Abed Textile processing mills Ltd**: Abed Textile Processing Mills Limited is a leading manufacturer of Textile processing, printing and dyeing section in Bangladesh.

  Factory location: Goradia, Narsingdi Sadar, Narsingdi, Bangladesh

- **AlvenousTextile Ltd:** It is exposed as 100 percent export oriented Ready Made Garments manufacturer.

  Factory: Chowala, Narsingdi Sadar, Narsingdi, Bangladesh

Raw Cotton

Key Players in the RMG/Spinning industry:

- **Prime Textile Spinning Mills Ltd:** It is one of the largest textile mills in Bangladesh. It was incorporated in 1989 as Publicly Listed Company and started production in 1992.

  Factory 1 Location: Prime City, Narayanganj. Factory 2 Location: Dhaka, Bangladesh

- **Dulamia Cotton Spinning Mills Ltd:** It has more than 30 years of experience in the Textile business, is one of the pioneer spinning mills in the private sector of Bangladesh. It produces yarn which can be directly used in garmenting.

  It is operating with approximately 27,000 spindles with a production capacity of 75, 00,000 pounds (lbs) of 100% cotton yarn per annum.

  Factory Location: Dhamrai, Dhaka

- **Youth Spinning Mills Ltd:** It is one of the vertically incorporated leaders in export of Garments, Textile and Spinning in Bangladesh. While textiles remain a core enterprise, Youth Group has diversified into several business areas including yarn manufacturing.

  Factory Location: Mirzapur, Tangail (Dhaka region)

Key Players in the Soap Industry:

- **Unilever Bangladesh Limited**: UBL is the leading fast moving consumer goods company in Bangladesh. It started its journey with production of soaps and now has 20 brands spanning across Home care, Personal care and Foods.

  Factory location: Chittagong

- **Advanced Chemical Industries (ACI) Limited**: It is one of the leading conglomerates in Bangladesh, with a multinational heritage.

  The company is into pharmaceutical, consumer brand & commodity products and has subsidiaries in edible oil, chemical related manufacturing.

- **Kohinoor Chemical Company**: It is popularly known for its beauty product under the brand "Tibet". They are the pioneer amongst the soap, cosmetics and toiletries manufacturing industries of Bangladesh.

  Factory location: Tejgaon, Dhaka

Plastics and Rubber Articles

Key Players in the plastic/Rubber industry:

- **RFL Plastics Ltd.**: It is a sister concern of PRAN-RFL group. It is one of the major players in the plastic industry.

  It has factories with two located in the Dhaka region.

  Partex Plastics Ltd: It began its commercial production in the year 2004 with an objective to produce high quality plastic products for both industrial and home use. These products include: Pipes, Furniture and Storage Boxes.

  PPL has now become one of the largest producers of plastic products in Bangladesh, and are available to buy all over Bangladesh.

  Factory Location: Gazipur

- **Meghna Group:** It is the largest bicycle manufacturer & exporter in Bangladesh. In addition, the group is consisting of 12 interrelated industries where in Meghna has facilities of producing a large number of bicycle components as backward linkage for making complete bicycle.

- **Alita (BD) Ltd:** It is also one of the exporters of bicycles in Bangladesh. Factory Location**:** Chittagong

Chemical & Pharmaceutical

Key Players in Chemical & Pharmaceutical industry:

- **Drug International Limited:** DIL was the first company to formulate medicines in soft capsule form for the purpose of retaining excipients of some particular medicines such as vitamins. Till date DIL remains the leader in the field of soft gelatine capsules in Bangladesh.

  Location: Dhaka

- **Opsonin Pharmaceuticals Limited**: It is also one of the major leaders in the pharmaceutical industry.

  Location: Dhaka Capital region

- **Incepta Pharmaceuticals**: It is leading pharmaceutical company in Bangladesh established in 1999.

  Location: Savar, 35 Kilometre away from the centre of the capital city Dhaka.

Garment Industry

<u>Dhaka Region:</u>

- **Greenland Garments**: Greenland Garments Ltd. is a vertically integrated knit manufacturer. Their siege of the garment production process begins with the knitting of yarn into fabric and extends into and beyond the dyeing and manufacturing of various types of knit garments. Head Office: Hasney Tower (6th Floor), 3/A Kawran Bazar, Dhaka - 1215, Bangladesh.

  Factory location – Mirpur, Dhaka

  Capacity – 350,000 Pcs/Month

- **Hameem Group:** Hameem Group is one of the largest Bangladeshi conglomerates in textile and garments sector. It owns 26 garments factories, sweater factory, poly bag industry, label factory, jute mill, chemical formulation plant, tea states, Transport Company, news channel and Samakal, a widely circulated national daily newspaper.

  Its key Customers**:** Lee, GAP, ZARA, KOHLS, H&M, CK, Nautica, Mango, Walmart, JC

  Location – Tejgaon Industrial area, Dhaka

  Turnover – 400 Million USD

  Production – 6 Million Pcs/Month

- **Biswas Group:** Biswas Textiles Ltd. Is a leading textile company in Bangladesh, manufacturer of (a) Woven: Polyester Based Micro Fabrics and Nylon Taffeta (b) Knitted Fabrics: Polar Fleece, Valor, Safra, Cotton Fleece, Printed Fabrics (c) Tri-Coat and others.

  Factories: 9 automated garment factories in Dhaka.

  Monthly Capacity: 430,000 pcs woven bottoms, 300,000 pcs woven tops, 380,000 pcs pants, 600,000

  Pcs knit tops, 300,000 pcs knit bottoms.

Gazipur District:

- **Bextex Ltd**. (the "company") – It was incorporated in Bangladesh as a Public Limited Company with limited liability on 8 March 1994 and commenced commercial operation in 1995 and also went into the public issue of shares and debentures in the same year. The shares of the company are listed in the Dhaka and Chittagong Stock Exchanges of Bangladesh.

  Bextex Ltd. is the most modern composite mill in the region. It has an installed capacity of 288 high-speed air-jet looms in its weaving section and a high-tech dyeing and finishing section with a capacity of 100,000 yards of finished fabric per day. This company is located at the Beximco Industrial Park.

  Production capacity: 28 Million Linear Meters

  Factory Location: Beximco Industrial Park, Gazipur, Bangladesh

- **Silver Line group**: SilverLine Group had started initially with Knit Yam manufacturing in the form of a Spinning Mill. The textile group has vertically integrated into Yarn Dyeing, Weaving, Continuous Dyeing & Finishing and Garment manufacturing.

  Factory location: Gazipur, Bangladesh

- **Greenland garments ltd:** Greenland Garments Ltd. is a vertically integrated knit manufacturer. Our siege of the garment production process begins with the knitting of yarn into fabric and extends into and beyond the dyeing and manufacturing of various types of knit garments.

  Factory location: Gazipur, Bangladesh

  Capacity: 450,000 pcs/month

Narayanganj District:

- **Benetex Industries LTD**: The Company has been one of the leaders in Bangladesh's textile industry. They are the manufacturer of men's, women's & kid's – fashion, work, lounge, sports, inner and outer wear.

  They are manufacturing over 20 tons of fabrics every day.

  Factory location: Narayanganj, Bangladesh

- **Antim Knitting Dyeing & Finishing Ltd and Antim Knit Composite Ltd**.

  It's a 100 percent export oriented Knit Composite Textile Factory. It is the pioneer in manufacturing state of the art in its production process.

  Factory location: Rupganj, Narayanganj

Narsingdi District:

- **Abed Textile processing mills Ltd**: Abed Textile Processing Mills Limited is a leading manufacturer of Textile processing, printing and dyeing section in Bangladesh.

  Factory location: Goradia, Narsingdi Sadar, Narsingdi, Bangladesh

- **AlvenousTextile Ltd:** It is exposed as 100 percent export oriented Ready Made Garments manufacturer.

  Factory: Chowala, Narsingdi Sadar, Narsingdi, Bangladesh

Jute and Jute Goods

- **Asia Jute:** Asia Jute makes diversified products i.e. Jute bags & jute handicrafts of superior quality.

  It has a production capacity of 24000 Jute shopping bags/month.

  Nature of Business: Manufacture of jute bags, jute handicrafts, jute apparel, jute furnishing and jute textile.

  Factory location: Narayanganj

- **Cotheeka Jute industry**: It is the leading manufacturer and exporter of high quality Jute products in Bangladesh. Jute sacs/bags, jute clothes, jute yarn, jute rope, jute textiles, jute fabric, jute handicrafts are the main jute products exported by Cotheeka jute industry.

- **Jute World Exports:** It is the major manufacturer and supplier of Jute bags to farmers, coffee producers, rice supplier, army, civil services and NGO.

  Factory Location: Dhaka

Appendix 1 A.A - Strategic advantages of Dhaka EPZ

Trade Profile of Dhaka EPZ

The main export commodities are Readymade Garments, Garment accessories, Knitting & other Textile, Footwear & leather goods, Electronic & electrical goods, Plastic Goods, Textile, Leather finished products, out of which Garments have a share of 60-70% of total export volume. Major import commodities include Garment raw material (with an import share of close to 50-60%), accessories viz. buttons, chains etc. (with a share of 10-15%) and other material viz. paper, plastic, building materials etc. (with a share of 20-35%) .

Further based upon our interaction with close to 15-20 C&F agents at Dhaka EPZ, we came to know that export and import of commodities to & from Dhaka EPZ is mostly done by three modes of Transport – Truck, Containers (By Road), Containers (By Rail). Further the information gathered is presented below in the table:

TABLE: CARGO MOVEMENT AT DHAKA EPZ

Mode of Transportation	Import Vol. (2014-15)	Export Vol. (2014-15)	Total Vol. (2014-15)
Covered Vans	100-125/day	130-150/day	**230-275/day**
Containers (by Road)[50]	25-30/day	30-35/day	**55-65/day**
Containers (by Rail)	50-60/day	15-20/day	**65-80/day**

Source: Consultant's Analysis

During our market sounding, the C&F agents further indicated a possibility of 20-30% modal shift from road to IWT (with state of art facility) for cargo.

Cargo potential of Dhaka EPZ

Based upon the information gathered through our primary interaction & secondary research along with following assumptions current cargo potential from Dhaka EPZ has been derived.

Assumptions

- Working Days : 300 days[51]

[50] Containers are mix of TEU & FEU (in a ratio close to 40:60

- One TEU is Equivalent to : 1 Truck[52]

Further based upon the information gathered during our primary interaction with C&F agent and suitable assumptions as discussed above a current cargo potential of IWT have been derived in the table below:

TABLE: CURRENT DHAKA EPZ CARGO SHARE AVAILABLE FOR IWT

Mode of Transportation	Current Vol. (Per day)	Equivalent TEU/day	Equivalent TEU/Year	Share of IWT (@20% Shift)
Covered Vans	230	230	69000	13800
Containers (by Road)	65	104	31200	6240
Total (TEU's)			**100200**	**20040**

Source: Consultant's Analysis

Appendix 1 A.A - Strategic advantages of Adamjee EPZ

Trade Profile of Adamjee EPZ

The main export commodities are Readymade Garments, Jewellery, Textile, Leather finished products, out of which Garments have a share of 60-70% of total export volume. Major import commodities include Garment raw material (with an import share of close to 50-60%), accessories viz. buttons, chains etc. (with a share of 10-15%) and other material viz. paper, plastic, building materials etc. (with a share of 20-35%) .

Further based upon our interaction with General Manager & BD team of Adamjee EPZ we came to know that total export volume/day of Adamjee EPZ is close to 150-200 trucks, of which 15-20% of the cargo goes to DTA and rest are export oriented. Out of this remaining volume, 95% of the cargo goes to Chittagong Port by road & rest 5% by railways (through Kamlapur ICD). Total import volume is close to 140-180 trucks/day. Further the information gathered is presented below in the table:

TABLE: CARGO MOVEMENT AT ADAMJEE EPZ

Mode of Transportation	Import Vol. (2014-15)	Export Vol. (2014-15)	Total Vol./day (2014-15)
Total Covered Vans	140-180/day	150-200/day	**290-380**
Covered Vans from & to Chittagong	140-180/day	114-152/day	**254-332**
Covered Vans to DTA	-	30-60/day	**30-60**
Covered Vans to ICD	-	6-8/day	**6-8**

During our market sounding, the C&F agents further indicated a possibility of 20-30% modal shift from road to IWT (with state of art facility) for cargo transportation.

Cargo potential of Adamjee EPZ

Based upon the information gathered through our primary interaction & secondary research along with following assumptions current cargo potential from Adamjee EPZ has been derived.

[51] Being on conservative side we have considered 300 working days in a year which further can close to 350 days/year

[52] On an average a truck carries 30 CBM of pay load, almost equivalent load is being carried by I TEU

Assumptions

- Working Days : 300 days[53]
- One TEU is Equivalent to : 1 Truck[54]

Further based upon the information gathered during our primary interaction with C&F agent and suitable assumptions as discussed above a current cargo potential of IWT has been derived in the table below:

TABLE: CURRENT ADAMJEE EPZ CARGO SHARE AVAILABLE FOR IWT

Mode of Transportation	Current Vol. (Per day)	Equivalent TEU/day	Equivalent TEU/Year	Share of IWT (@20% Shift)
Covered Vans	254	254	76200	15240
Total (TEU's)			**76200**	**15240**

Thus it can be observed that current share of cargo available for IWT are 20040 TEU's/Annum & 15240 TEU's/annum from Dhaka & Adamjee EPZ's individually & 35280 TEU's/annum collectively.

Appendix 1 A.A - Projections for National Container Traffic

Appendix 1 A.A.G - Bottom-Up Approach

Commodity-wise break-up of Import & Export cargo Projections are presented in the tables below:

TABLE: FUTURE IMPORT CARGO PROJECTION – BOTTOM UP APPROACH

Sr. No	Key Import Commodity		2011-12	2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
1	**Textile Yarn, Textile Fabric & Textile Articles**	Growth (%)	1%	1%	1%	1%	1%	1%	1%	1%	
		(TEU's)	179262	181054	190290	199997	210199	220921	232190	236857	1%
2	**Plastic & Rubber Articles**	Growth (%)	17%	17%	16%	12%	11%	8%	6%	5%	
		(TEU's)	112040	131087	275327	485221	817625	1201360	1607691	1772479	10%
3	**Raw Cotton**	Growth (%)	8%	8%	8%	8%	7%	7%	6%	6%	
		(TEU's)	85863	92732	136254	200202	280794	393829	527031	592173	7%
4	**Chemical & Pharmaceutical Products**	Growth (%)	16%	16%	20%	16%	14%	11%	8%	7%	
		(TEU's)	12292	14258	35479	74519	143479	241771	355241	406715	13%
5	**Others**	Growth (%)	5%	6%	6%	6%	6%	6%	6%	6%	
		(TEU's)	301799	319907	428108	572905	766676	1025985	1372999	1542702	6%

[53] Being on conservative side we have considered 300 working days in a year which further can close to 350 days/year

[54] On an average a truck carries 30 CBM of pay load, almost equivalent load is being carried by I TEU

Sr. No	Key Import Commodity		2011-12	2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
	Total (Loaded Containers)	TEU's	691,256	739,039	1,065,459	1,532,843	2,218,773	3,083,865	4,095,152	4,550,926	6.96%

Appendix 1 A.A.G - Top - Down Approach

Commodity-wise break-up of Import & Export cargo Projections are presented in the tables below:

TABLE: FUTURE IMPORT CARGO PROJECTION – TOP DOWN APPROACH

Sr. No	Key Import Commodity		2012-13	2017-18	2022-23	2027-28	2032-33	2037-38	2039-40	CAGR
1	**Garments**	Growth (%)	15%	15%	15%	12%	9%	5%	5%	
		(TEU's)	315277	634134	1275470	2247815	3458542	4414073	4866516	11%
2	**Jute & Jute Goods**	Growth (%)	7%	7%	6%	6%	5%	4%	4%	
		(TEU's)	47516	66643	89184	119348	152322	185322	200445	5%
3	**Frozen Goods**	Growth (%)	7%	7%	7%	6%	5%	4%	4%	
		(TEU's)	6849	9606	13472	18029	23010	27996	30280	6%
4	**Leather**	Growth (%)	16%	16%	14%	12%	10%	8%	8%	
		(TEU's)	1829	3842	7397	13035	20993	30846	35979	12%
5	**Others**	Growth (%)		6%	6%	6%	6%	6%	6%	
		(TEU's)	71864	95266	127487	170607	228310	305531	343295	6%
	Total (Loaded Containers)	TEU's	443334	809491	1513011	2568834	3883177	4963768	5476514	9.76%

High Case Scenario

The high case development of the ICT Khanpur is based on a (high case) national container traffic demand. In comparison to the base case the following assumptions have been adjusted. The annual growth rate from 2015 to 2040 is influenced by a GDP growth rate (constant price) which is in the low case scenario half a percentage point above the forecasted rate of the IMF.

It is expected, that the ICT Khanpur with the provision of a reliable service and short distances to consuming and producing areas will contribute the national development of inland waterway transport of container. By providing suitable and market-compliant services the sales team of ICT Khanpur is able to attract 35.2% of the national container volume likely to be transported by inland shipping which totals in 12,813 TEU in 2017.

The forecasted development of the overall national container demand under high case scenario is shown in the following table:

TABLE: HIGH CASE – POTENTIAL CARGO DEMAND

National Container Traffic Forecast - High Case		2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030	2035	2040
Traffic Potential Bangladesh														
Container Handling	1,000 TEU	1,373	1,513	1,672	1,862	2,083	2,332	2,603	2,900	3,210	5,074	7,394	9,823	11,829
Growth	%	-9.08	10.13	10.57	11.35	11.83	11.94	11.66	11.38	10.71	8.86	7.15	5.00	3.00
GDP Growth	%	6.26	6.07	6.11	6.81	7.26	7.50	7.50	7.50	7.24	6.87	6.50	6.25	6.00
Multiplier				1.71	1.67	1.63	1.59	1.55	1.52	1.48	1.29	1.10	0.80	0.50
Traffic Potential Mongla														
Container Handling	1,000 TEU	30.05	43.87	46.98	50.69	54.95	59.73	64.92	70.56	74.07	74.07	74.07	74.07	74.07
Share in Total		0.022	0.029	0.028	0.027	0.026	0.026	0.025	0.024	0.023	0.015	0.010	0.008	0.006
Traffic Potential Port Projects Sonadia OR Payra														
Container Handling	1,000 TEU	0	0	0	0	0	100	200	400	600	1,480	2,670	4,229	5,914
Share in Total		0.000	0.000	0.000	0.000	0.000	0.043	0.077	0.138	0.187	0.292	0.361	0.431	0.500
Traffic Potential Chittagong														
Container Handling	1,000 TEU	1,343	1,469	1,626	1,812	2,028	2,172	2,339	2,429	2,536	3,520	4,650	5,519	5,840
Share in Total		0.979	0.971	0.972	0.973	0.974	0.931	0.898	0.838	0.790	0.694	0.629	0.562	0.494

Source: Consultant's Analysis

Low Case Scenario

The low case development of the ICT Khanpur is based on a (low case) national container traffic demand. In comparison to the base case the following assumptions have been adjusted. The annual growth rate from 2015 to 2040 is influenced by a GDP growth rate (constant price) which is in the low case scenario one percentage point below the forecasted rate of the IMF.

It is expected, that the ICT Khanpur with the provision of a reliable service and short distances to consuming and producing areas will contribute the national development of inland waterway transport of container. Although providing suitable and market-compliant services the sales team of ICT Khanpur is only to attract 5.4% of the national container volume likely to be transported by inland shipping which totals in 1,830 TEU in 2017.

During the first three years only one weekly vessel call can be established. The average utilization of this one call is expected to be very low starting with 10% in 2017 in order to increase to 30% in 2019. A second vessel departure can be established in 2020 which reduces the average utilization again to 20%. In 2022 a third call can be established. After 2022 the average vessel utilization is increasing from year to year. Average vessel utilization will increase up to 85% in 2030 and remains constant from that year on. The weaker general economic development of Bangladesh is slowing down the container volume development.

The forecasted development of the overall national container demand is shown in the following table:

TABLE: LOW CASE – POTENTIAL CARGO DEMAND

National Container Traffic Forecast - Low Case		2012	2013	2014	2015	2016	2017	2018	2019	2020	2025	2030	2035	2040
Traffic Potential Bangladesh														
Container Handling	1,000 TEU	1,373	1,513	1,672	1,821	1,991	2,182	2,385	2,602	2,823	4,176	5,984	7,802	9,071
Growth	%	-9.08	10.13	10.57	8.85	9.39	9.56	9.33	9.10	8.49	7.89	7.15	4.40	2.25
GDP Growth	%	6.26	6.07	6.11	5.31	5.76	6.00	6.00	6.00	5.74	6.12	6.50	5.50	4.50
Multiplier				1.71	1.67	1.63	1.59	1.55	1.52	1.48	1.29	1.10	0.80	0.50
Traffic Potential Mongla														
Container Handling	1,000 TEU	30.05	43.87	46.98	49.87	53.20	56.90	60.85	65.09	69.42	74.07	74.07	74.07	74.07
Share in Total		0.022	0.029	0.028	0.027	0.027	0.026	0.026	0.025	0.025	0.018	0.012	0.009	0.008
Traffic Potential Port Projects Sonadia OR Payra														
Container Handling	1,000 TEU	0	0	0	0	0	100	200	400	600	1,218	2,161	3,359	4,535
Share in Total		0.000	0.000	0.000	0.000	0.000	0.046	0.084	0.154	0.213	0.292	0.361	0.431	0.500
Traffic Potential Chittagong														
Container Handling	1,000 TEU	1,343	1,469	1,626	1,771	1,938	2,025	2,124	2,137	2,154	2,884	3,749	4,369	4,461
Share in Total		0.979	0.971	0.972	0.973	0.973	0.928	0.891	0.821	0.763	0.691	0.627	0.560	0.492

Source: Consultant's Analysis

Appendix 1 A.A - Minutes Of Meeting

Discussion Notes: Meeting with APL (Shipping Line)

Minutes of Meeting			
Meeting 1: APL Shipping Line			
Date & Time	17th May, 2015 (12:30 pm- 2:00 pm)	Location	Dhaka, Bangladesh
Representative/Experts	1. Harun –Ar – Rashid (Manager, Terminal Operations); Phone: +880-2-8813705 (Ext. 246)	Email Id: harun_ar_rashid@apl.com	
Agenda	To understand the potential demand for the upcoming Khanpur IWT		
Discussion	1. Around (90-95)% of the export import cargo is handled through Chittagong port & rest from Mongla port 2. During 1985-87 government decided for Inland container terminal to be developed and this was the time when ICD Kamlapur evolved 3. Major challenge that the railways is facing is the limited availability of locomotive although it has sufficient coaches available at its disposal. 4. It takes around 72 hrs. (48 hrs. at the port before loading & 24 hrs. for transportation) for transportation of containers (regular) for a lead distance of 370 Km from Chittagong to Dhaka and 62 TEU's can move/train trip. 5. For special containers (over dimension cargo, hazardous cargo, dangerous goods etc.) special permissions are required which include permission for unloading at ICD and permission from Bangladesh Railway. 6. Nearly 5% to 8% of the total EXIM (Export Import) cargo originating to & from Dhaka is handled at ICD Kamlapur. 7. Share of APL at ICD Kamlapur a. 8-10% of the total export handled at the ICD b. 10-12% of total import handled at the ICD 8. Container traffic is imbalance with import cargo accounting for approx. 1.5 times higher than the export 9. Transportation cost charged by Bangladesh Railways: 10. Charges to be paid to ICD Kamlapur (includes handling and storage -free		

	Bangladesh Railway	Road
Empty Containers	BT 7500	BT 25000
Loaded Containers	BT 11000	

	time): Approx. BT 4450 11. Major commodities being handled @ ICD Kamlapur: a. Import: Electrical Goods (approx. 30%), Fabrics (finished goods), Machineries Export: Garments (approx. 10% of total volume being exported), Bicycle (from Tezgaon & Gazipur area, going to Europe & US), Dry fruit, Puffed rice.

Discussion Notes: Meeting with Pangaon Terminal

Minutes of Meeting			
Meeting 2: Pangaon Terminal			
Date:	18th May, 2015	**Location:**	Pangaon, Bangladesh
Time:	10:30 am- 12:00 pm		
Representative/Expert:	1. Md. Mizanur Rahman (Terminal Manager) Phone: +880-2-9354085 (Ext. 246)	Email: NA	
Agenda	1. To understand the functioning of Pangaon Terminal and operational challenges(if any)		
Discussion	1. No Techno commercial study available for this project 2. For this project land acquisition has been done by BIWTA & this project has been finance by CPA, construction & design has also been taken care by BIWTA 3. During its first year of operation i.e. during 2014 total 1332 TEU's were handled 4. Major reasons cited by the authority for underutilization of the terminal: a. Lack of fiscal incentives viz. Tax holiday, b. High tariffs for terminal (as while determining tariff, cost plus approach was followed instead of market governed tariff structure) c. High transportation costs d. Inefficient Customs e. Lack of shipping line support – Being a state owned facility, unable to market the terminal to shipping lines based on business contracts/alliances. f. Non availability of empty containers and high empty repositioning cost 5. Transit Time: (18-30 Hrs by road), (12-20 Hrs by train) 6. Handling Time: (8-10 Hrs) 7. Combined capacity of various off-docks facilities operating in Chittagong is about 70,000 TEU (static capacity) 8. Tariff at Pangaon: ($150 for 20 feet container), ($320 for 40 feet container); more such data is readily available on Pangaon Terminal's website 9. Ground rent at Pangaon is BT 500/day for TEU whereas ICD Kamlapur charges BT 115/day for TEU as the ground rent. 10. Major Import commodities handled @ Pangaon: (White Goods viz. TV, Freeze, A/C etc.) 11. Currently no export commodity is being handled at Pangaon Terminal & empty containers are being sent back to Chittagong port 12. Target commodities are commercial goods, Industrial machineries (especially for textile industry), raw cotton and target areas are Dhaka, Gazipur, and Narayanganj etc. 13. Future Plans: Proposed reduction in tariff by 60%		

	14. Developed area available with Pangaon ICT: 55,000sq.m. 15. Container handling capacity: 2400 TEU's (static capacity of yard) 16. Dwell Time (which is also a function of Nature of cargo, Custom Clearance etc. :) a. for import container: 10 days and for export containers 3-4 days b. Free time for storage: 4 days including day of landing/unloading

Discussion Notes: Meeting with BGMEA

Minutes of Meeting			
Meeting 3 – Bangladesh Garment Manufacturers & Exporters Association (BGMEA)			
Date:	18th May, 2015	**Location:**	Dhaka, Bangladesh
Time:	2:30 pm- 4:00 pm		
Representative /Expert:	1. Md. Azizur Rahman (Sr. Addl. Secretary, BGMEA) Phone: +880-2-8140310 – 20	Email: azizurds@gmail.com info@bgmea.com.bd	
Agenda	1. To understand the potential of Garment Industry & it's growth in Bangladesh		
Discussion	1. Readymade garments are only exported through Chittagong port to Europe & America 2. Most of the RMG factories are located in Gazipur, Asuliya, Sabha area and most of the knit factories are located in Narayanganj area 3. To enhance the operational effectiveness of the Inland terminal, assurance of on time delivery shall be given by the operator in terms for sending the buyers good immediately to feeder vessels in Chittagong to be further sent to Mother vessel 4. The most desired factors for attracting RMG exports: a. The operator shall have a schedule & it shall be maintained & strictly followed. As in case of RMG a very tight time line is being followed by the buyers & hence any kind of waiting will not be acceptable b. Security and safety of cargo at the terminal and while in transit to/from Chittagong port c. Competitive Tariffs d. 24X7 Customs e. Transit warehouse for stuffing containers f. Involvement of stakeholders including Forwarding Agents and Shipping lines g. Adequate availability of empty containers h. Ease in accessing the terminal, probably 24X7 5. River port will play a vital role in achieving target export of USD 50 billion by 2021. This will also reduce congestion on highway and railways 6. RMG contributes 80-85% of total export volume and it's major production cluster are – Gazipur, Tongi, Narayanganj, Asuliya 7. Gazipur's share of total RMG export from Dhaka Region is (60-65) % 8. 10% custom rebate received by importer on showing GIP.		

Discussion Notes: Meeting with BIWTA

Minutes of Meeting			
Meeting 4 – BIWTA			
Date:	19th May, 2015	**Location:**	Dhaka, Bangladesh
Time:	10:30 am- 2:00 pm		
Representative /Expert:	1. Mr. Russel 2. Director Planning, BIWTA 3. Md. Sadiqul Islam (Dy. Director), BIWTA	Email: NA	
Agenda	1. Data collection & coordinating for arranging meetings with other authorities		
Discussion	1. World bank wants to finance the development of 53 identified waterways 2. Water Police department has been constituted to prevent theft & loots 3. Bangladesh Delta plan 2100 (Formulation project, sustainable transportation & Infrastructures) can be a good source of information		

Discussion Notes: Meeting with Chittagong Port Authority

Minutes of Meeting			
Meeting 5 – Chittagong Port Authority (CPA)			
Date:	20th May, 2015	**Location:**	Chittagong, Bangladesh
Time:	10:30 am- 12:00 pm		
Representative/Expert:	1. Md. Mahbub Morshed Chowdhury (Chief Planning, CPA) Tel.: +8801820575534	Email: mchy_2005@yahoo.com	
Agenda	1. Data collection & to understand the dynamics of Chittagong Port		
Discussion	1. Chittagong is a riverine port with a length restriction of 190 m (due to 2 sharp bends), with available draft of 8.5-9.0 m. 2. CPA handled 1.74 Mn. TEU's in 2014 with a growth rate of 14% and by 2018 it is expected to achieve 2.0 million TEU 3. Strategic master plan for Chittagong port, interim report 1 & 2 can be a good data point prepared by HPC 4. Chittagong port has 3 major Terminals – a. Chittagong Container Terminal (CCT) (also a multipurpose terminal, which carries containers as well as break bulk, it has 6 general cargo berths which are dedicated for container vessels. Total length of jetty @ CCT is 2,222m which includes 13 berths and length of each berth is approx. 200m). At present, this terminal is operated using ship gears b. New Container Terminal (NCT) (A container terminal of 450 m length was built with all state of art equipment and a handling capacity of 5 Lakh TEU's currently), c. New Moorie Container Terminal (Constructed in2008 with berth length of 1000m for handling general cargo, containers. Port authority is planning to concession this facility based on SOT model. At present, this terminal is operated using ship gears) 5. Transit time for container vessels from CPA to Pangaon 26 Hrs 6. Limitations – No length is available in downstream for any future development, any structure beyond 45 m can't be built due to height restrictions imposed by the Airport) 7. CPA is planning to develop overflow yard for stacking of containers & CFS facility		

Discussion Notes: Meeting with CPA Traffic Department

Minutes of Meeting			
Meeting 6 – Chittagong Port Authority (CPA), Traffic Department			
Date:	20th May, 2015	**Location:**	Chittagong, Bangladesh
Time:	1:00 pm- 2:00 pm		
Representative/ Expert:	1. Md. Enamul Karim (Terminal Manager, CPA) Tel.: +8801824666450	Email: NA	
Agenda	1. Data collection & to understand the dynamics of Chittagong Port.		
Discussion	1. As per Bangladesh Norms no authority can charge terminal handling 2. Average stay at port for import cargo is 7-10 days 3. 75% of FCL import containers are handled inside port 4. Efficiency Norms for quay moves/Hr.: for Import – (25-26 moves); for Export – (12-15 moves) 5. Vessel turnaround time from outer anchorage is 3 days 6. Key commodities for Import – Raw material for Garment, Raw Cotton, Plastic raw material 7. Transfer from port yard to off-dock is taken care by off-dock facility provider 8. In 2014 – 516,000 TEU's were handled by off-dock operators 9. 65-70% of containers (Import Cargo) are de-stuffed inside the port and empty containers are allowed to be stacked with in the port 10. % Containerization is close to 40% (Container cargo 20 Mn.T. Bulk+Liquid Cargo 20 Mn. T, Others 10 Mn. T) major bulk cargo commodities include wheat, rice, fertilizer, cement clinker.		

Discussion Notes: Meeting with INCONTRADE (CFS)

Minutes of Meeting			
Meeting 7 – INCONTRADE (CFS)			
Date:	20th May, 2015	**Location:**	Chittagong, Bangladesh
Time:	1:00 pm- 2:00 pm		
Representative/ Expert:	1. Md. Mohasin Sarkar (Managing Director, INCONTRADE) Tel.: +	Email: NA	
Agenda	1. Data collection & to understand the dynamics of Chittagong Port		
Discussion	1. Dwell Time: 3-4 days 2. Entire stuffing for export was done @ Chittagong port but later on Pvt. ICD's were promoted for export & now almost 90-95% of export cargos are handled at ICD's and rest are serviced at EPZ's 3. Market share of Incontrade is 12-13% 4. 85-90% of total import cargo is handled by CPA & rest by ICD's 5. Top import commodities include – raw cotton (30% of total volume), wooden log, Pulses (provisions) and key industrial clusters are Dhaka, Narayanganj, Gazipur, Chittagong, Sabha 6. Major challenge is availability of skilled work force (experienced professionals are hired from India & Sri Lanka 7. Number of unions in CPA is close to 30 7 and number of labourers are >30000		

Discussion Notes: Meeting with Khanpur Jetty

Minutes of Meeting			
Meeting 8 – Khanpur Jetty			
Date:	21st May, 2015	**Location:**	Chittagong, Bangladesh
Time:	10:00 am- 12:00 pm		
Representative /Expert:	1. Store I/C, Khanpur Jetty	Email: NA	
Agenda	1. Site visit & Data collection		
Discussion	1. Existing Jetty is more than 45 years old 2. There are 6 warehouses; out of which 1 warehouse is controlled by custom and rest are managed by BIWTA. Different departments of BIWTA use these space for storage of spare parts and equipment 3. Authority is being paid BT 30/ton as royalty by the handling agent / operators at the jetty 4. Adamjee EPZ, Narayanganj is 6.5 Km from the proposed facility 5. Preliminary site findings of site visit will be incorporated in the technical assessment section		

Discussion Notes: Meeting with Adamjee EPZ

Minutes of Meeting			
Meeting 9 – Adamjee EPZ			
Date:	21st May, 2015	**Location:**	Narayanganj, Bangladesh
Time:	1:00 pm- 2:00 pm		
Representative/ Expert:	1. Md. Mehboob Ali (General Manager, BEPZA) Tel.: +8801713043004	Email: gmaepz@gmail.com	
Agenda	Data collection		
Discussion	• All cargo produced at the EPZ is mostly sent to Chittagong port and 5% of total export volume is being routed through Kamlapur ICD • Total export volume is 150-200 trucks every day, out of this 95% goes to Chittagong port by road & 5% by railways • Breakup of major export commodities: 60-70% Export of garments, • At present total import volume is 140-180 trucks (which comes inside everyday) • Breakup of major import commodities: • Garment raw material (50-60%), • Accessories viz buttons, chains (10-15%), • Others which include paper, plastic, building materials (20-35%) • Out of total export from EPZ 15-20% is exported to DTA.		

Discussion Notes: Meeting with Newtop Textile BR. LTD.

Minutes of Meeting			
Meeting 10 – Newtop Textile BR. LTD. (Textile Industry within Adamjee EPZ)			
Date:	21st May, 2015	**Location:**	Narayanganj, Bangladesh
Time:	3:00 pm- 4:00 pm		
Representative/Expert:	1. Musharaf Hossain Bhuiyan (General Manager, Newtop Textile BD. LTD.) Tel.: +8801199832812	Email: mushrafntp@yahoo.com	
Agenda	Data collection		
Discussion	• Company is involved in manufacturing and exports of grey (raw) fabric. For this, company is importing textile yarn. • Export volume: (1-2) FEU/month & (12-15) FEU/year • Import volume: 20-22 FEU/year • Average transportation time: 2-3 days is required to get/send cargo to Chittagong or receive it back in Dhaka • Volume of cargo in each container: (26-30) T per FEU for fabric & (12-13) T per TEU • Cost of transportation of cargo from factory premise to Chittagong port: BT 35,000 (BT 31000 for transportation & BT 4000 for custom fees) by road & BT 20,000 (BT 8000 ICD fees & BT 12000 for Rail freight), demerge charge for 1 day delay is BT 5000 • Labour charge for stuffing a 40 feet container is BT2500		

Discussion Notes: Meeting with Dhaka EPZ

Minutes of Meeting			
Meeting 4 – Dhaka EPZ			
Date:	11th June 2015	**Location:**	Dhaka, Bangladesh
Time:	10:00 am- 13:00 pm		
Representative/ Expert:	Md. Suman (C&F Agent with another group of 15-20 C&F Agents) Phone: +880-1711150212	Email: NA	

Agenda	To understand the Trade pattern (Import & Export) & cargo movement trend at Dhaka EPZ
Discussion	• The main export commodities are Readymade Garments, Garment accessories, Knitting & other Textile, Footwear & leather goods, Electronic & electrical goods, Plastic Goods, Textile, Leather finished products, out of which Garments have a share of 60-70% of total export volume. • Major import commodities include Garment raw material (with an import share of close to 50-60%), accessories viz. buttons, chains etc. (with a share of 10-15%) and other material viz. paper, plastic, building materials etc. (with a share of 20-35%) • Based upon our interaction with close to 15-20 C&F agents at Dhaka EPZ we came to know that total export volume/day of Dhaka EPZ through various modes which includes – covered van close to130- 150 trucks/day, through containers close to 30-35 containers/day (which is a mix of20' TEU & 40'FEU in a ratio close to 40:60) and through Kamlapur ICD the volume transported is close to 15-20 (20' TEU) containers/day. • Total import volume through various modes which includes – covered vans is close to 100-125 trucks/day, through containers close to 25-30 containers/day (which is a mix of20' TEU & 40'FEU in a ratio close to 40:60) and through Kamlapur ICD the volume transported is close to 50-60 (20'TEU) containers/day . :

Mode	Import Vol.	Export Vol.	Total Vol.
Covered Vans	100-125/day	130-150/day	230-275/day
Containers (by road)	25-30/day	30-35/day	55-65/day
Containers (Rail, ICD)	50-60/day	15-20/day	65-80/day

- The C&F agents further indicated a possibility of 20-30% modal shift from road to IWT (with state of art facility & proper schedule for Vessel movement) for cargo transportation during initial years of operation of Khanpur ICT
- Further following transportation cost figures have also been shared:

Mode	Transportation Cost (BT)	
	Chittagong to EPZ	Kamlapur ICD to EPZ

TEU 20'	40000	8000
FEU 40'	35000	8000

On top of the figures mentioned above a fees of 0.15% (on declared value of Good) is levied as C&F fees.

Discussion Notes: Meeting with Bangladesh Railway

Minutes of Meeting			
Meeting 3 – Ministry of Bangladesh / Bangladesh Railway			
Date:	09th June, 2015	**Location:**	Dhaka, Bangladesh
Time:	2:30 pm- 4:00 pm		
Representative/ Expert:	2. Md. Monzurul Islam (Chief Planning Officer) Phone: 88-02-9563441 3. Md. Habibur Rahman (Add. Director General Operation) Phone: +880-02-9562030	Email: Islam: cplo@railway.gov.bd Rahman: adgop@railway.gov.bd	
Agenda	2. To understand the operations of railway transportation as well as the cost structure of national railway transport		
Discussion	• Loading and discharging operations are executed at CCT (Chittagong Container Terminal) as well as at ICD Kamlapur by CPA • CPA needs 6-8 h to discharge and reload a complete train (but 4 h could be possible according to BR) • BR is purely providing rail equipment and traction services • BR is the only rail company operating between Chittagong and Dhaka • There a no other rail companies in Bangladesh except BR; no competition • The disposition (matching of container and wagon number) is executed by BR • The shunting is provided by BR only • Import cargo trains are shunted from the CCT to the so-called Chittagong Port Yard which is a rail facility operated by BR where the train is waiting for departure to Dhaka • In general the time from completion of rail loading to departure from BR rail yard is about 2-4 h although the net driving time for the transfer from CCT to rail yard takes 30 min.; due to technical inspections/checks and operational issues like schedule's program waiting time occurs for the train. • Usually the trip from rail yard to ICD takes 20h; sometimes more than 24h; by optimization of operations and infrastructure this could be reduced to 14h according to BR • Due to this long travel time staff has to be changed per trip at Akawa (?) which almost half of the distance; if travel time will be shortened staff does not have to be changed. • The rail connection between Chittagong and Dhaka is 80% doubled lined • There are 74 km left to be double lined; this civil construction work will be start in first quarter of 2016 and is expected to be accomplished in 2019. • The total track length between Chittagong and Dhaka is about 320 km. • There are at least two trains running per direction • The construction of by the new ICD is expected to take four years-time including 1 year of planning		

- Capacity of new ICD is expected to be 1.3 m TEU p.a.
- The existing ICD at Kamlapur will stay in operations even if new ICD is established
- To shorten the block distances (instead of building new infrastructure) will be another project which is not even in the "planning pipeline"
- On a certain section of the track between Chittagong and Dhaka which is around 60 km long currently a project has been established to improve the signalling system.
- A train has a capacity of 60 TEU
- It consists out of 30 Wagons with a capacity of 2 TEU each
- Currently 65 – 70,000 containers are transported per rail annually; the maximum capacity of the rail network between Dhaka and Chittagong is 80,000 containers; if no improvements will be done
- Train speed is 60 km/h maximum
- For operating a train up to 7 employees are necessary during shunting (2 engine/locomotive, 3-5 shunting staff located on the wagons) and up to 8 are necessary during the long trip (2 engine/locomotive, 1 operations guard, 3-5 security guards)
- The BR currently has a pool of 400 container rail wagons (all are 40' capacity)
- Currently there are at least two departures per direction daily; maximum three
- All wagons are always loaded; with full or empty container as each container brought to Dhaka by train has to be transported by train back to Chittagong; this is required from the shipping lines
- The transport rate for a loaded container is 21,000 BDT and for an empty 5,000 BDT
- The transport costs (!) by train per container are around 12,000 BDT (in comparison to that: cost for road transport 40-50,000 BDT)
- The land on which the ICD Kamlapur has been established belongs to BR
- BR earns 20-30 crore BDT with container handling at Kamlapur and CCP through revenue sharing mode (75% by Kamlapur; 25% by CCP) with CPA, whereas through freight charges BR earns 50 Cr BDT
- Earnings are generated as per handled container CPA has to pay a %-share to BR; therefore no land rent is invoiced
- No additional costs occur for using infrastructure and/or energy provision; BR has no cost centres for these;
- A dedicated freight railway line between Chittagong and Dhaka is very necessary
- The planned express line will shorten the distance by 100 km to 220 km
- The core business of BR is the passenger transport
- Besides container also food grain, fertilizer and POL products (?) are transported by rail in Bangladesh
- Trains are operating 360 day per year
- Double line track work is in progress, 80% work has been completed. Entire Dhaka Chittagong line will be made double line by 2019
- BR is planning to implement computer based signalling system (CBSS) to optimize the train utilization 13 stations have already this.
- At Chittagong port BR have 2 lines on which they can place 60 TEU's.
- Avg. total length of train 1200-1300 feet

	• Avg. time presumed by BR for loading & unloading is 4 hrs. whereas in actual it takes around 6-8 hrs. by Chittagong Port • Travel time between Chittagong Port Yard (where the train reaches to/leaves from post custom clearance to/from Chittagong port) and Dhaka ICD (321 Km) is ideally 6-8 hrs. where as in actual it takes around 12-18 hrs. or even >24 hrs. at times. • BR has 400 container wagons i.e. 800 containers can be carried • Maintenance is done at Chittagong Port yard, where it has a separate line for train standing idle for maintenance • Fuel cost rationing – By Rail BDT 12000/TEU, whereas by Road BDT 40K-50K/TEU

Discussion Notes: Meeting with Tower Freight Logistics Ltd.

Minutes of Meeting			
Meeting 2: Tower Freight Logistics Ltd.			
Date:	10th June, 2015	**Location:**	Dhaka, Bangladesh
Time:	10:30 am- 12:00 pm		
Representative/ Expert:	2. Md. Nurul Amin (Managing Director) Phone: +880-1713007228 3. Md. Tushish Ghosh (Managing Director Aviation)	Email: Amin: Nurul@towerfreight.com Ghosh: tushish@toweraviationbd.com	
Agenda	1. To understand what are the major aspects to attract cargo to the (new) transport mode IWT for containers		
Discussion	1. The recently agreed cooperation on political level of India and Bangladesh (June 2015) are definitely supporting projects like ICT Khanpur in the sense of generation of additional potential cargo volume and therefor making the project more viable. 2. Mr Amin is well connected to the Head of Ministry of Shipping (arrangement of meeting even on short notice possible) 3. There are 179 border crossings/stations between in India and BD across 4600Km boundary; but only 31 are open/available currently. 4. Indian trucks are not allowed to transport cargo on BD roads and BD trucks are not allowed to do in India. Therefore freight centres like Banapole, BD and Petrapole, India have been established at the border. 5. These change of vehicles (e.g. stripping the Indian truck at Banapol, transfer cargo (approx. 200 m) to Petrapol to load it on a Bangladeshi truck) is time consuming and therefore expensive); leading to the fact, that BD exports to India and imports from India are in comparison to international trade quite low. 6. It is likely that these measures described before will be changed by the intensified relations between India and BD 7. The rates for road transport are varying between 150 US$ to 400 US$. 8. Only 20' chassis are allowed on BD roads; due to narrow curves, U-turns etc. 9. 70% of the BD garment industry is based/located in Dhaka area; 30% of RMG in Chittagong area 10. 70% of cargo coming to Chittagong comes to Dhaka 11. Rail transport could be time consuming as the capacities (tracks and wagons) are not matching the demand; by this a could take up to 12-18 days for a container to arrive at Kamlapur after being discharged from the ocean going vessel 12. Import container are mainly stripped/destuffed at Chittagong because - Customs procedures for transport of FCL containers are "quite time intensive" - Only 20' container can be transported; 40' containers therefore have to be stripped anyway - The shipping lines request a "bank guarantee" that covers the value of the container to ensure that the empty container will be brought back to the shipping line stock. 13. Customs clearance process has to be provided at the ICT to become attractive for forwarding companies 14. Today the shipping line decides, whether the container is supposed to be transported by rail or by road 15. Transport charge for rail is around 300-400 US$ 16. The advantage of the ICD is mainly given for exporters as they can stuff their		

	goods close to their factories in the container (at Kamlapur) 17. CPA charges 3 BDT per stuffed carton as a port fee 18. As well as 130 BDT as a landing charge while loading or discharge of each container 19. 8% of the cargo handled by CPA is passing through ICD Kamlapur

Discussion Notes: Meeting with Western Marine Shipyard Ltd. & Portek Int. Pte Ltd. (Terminal Operator)

Minutes of Meeting			
Meeting 1 – Western Marine Shipyard Ltd. & Portek Int. Pte Ltd. (Terminal Operator)			
Date:	07th June 2015	**Location:**	Dhaka, Bangladesh
Time:	10:00 am- 13:00 pm		
Representative/ Expert:	2. Islam, Saiful (Chairman, Shipyard) Phone: +880-31 712177 3. Hasan, Sohail (Director, Shipyard) 4. Keong, Lai Wye (Head of Business Development, Portek) Phone: +65 6873 11 14	Email: Islam: picardbd@picardbangladesh.com Hasan: sohail@wms.com.bd Keong: wk.lai@portek.com	
Agenda	To understand the availability of and the requirements towards the vessels serving terminals like ICT Khanpur. Also to understand challenges related to vessel cargo and commercial/regulatory changes required to support the growth of vessel owners		
Discussion	• It's the only port operating bulk cargo from India. Further as the coastal shipping agreement has been signed which will lead to cargo movement from south western part of India to Bangladesh • 80% of infra work is in place and in addition Khanpur has license from customs. • The current measures of ICV (inland container vessels) are:		

length	82.5	m
breadth	15.0	m
loaded draft	3.5	m
capacity	176.0	TEU
speed	10.0	knots
costs	250,000,000	BDT
	3.3	m US$

- Currently 12 ICV are under construction by Western Marine Shipyard (8 for private operators; 4 for public operator). These vessels will be operational within next 1 year.
- The current national fleet of ICV includes 4 vessels (3 operated by CPA for Pangaon; 1 operated by Summit for Summit River Port; these are all second-hand vessels approx. 10 years old)

- The coastal shipping agreement, which will be signed by Bangladesh and India on a near-term basis, will be the major trigger for generating cargo for IWT.
- But RSV (river sea vessels; 6-7 m US$; with max draft of 4m) are currently not ready; ten of them are under construction by WMS for Jindal Group, India
- The WMS is expected to build 80% of the IVC
- The Summit River Port is almost ready for operations
- The main client of Summit is Maersk; by this it is likely to happen that Summit River Port will become an almost dedicated facility
- Rupayan and Ananda terminals projects have "financial problems"
- Advantage of Khanpur location: not much land fill needed and license for customs clearance provided
- The disadvantage of the IWT of container is that it is not an as robust/experienced industry as the trucking industry. The IWT has first to prove that it can provide reliable services
- Another disadvantage of container IWT towards trucking is the high start investment for new vessels and terminal facility in comparison to already depreciated truck equipment and established handling facilities (CFS)
- An advantage of IWT is the fact, that the BOL (bill of lading) per container could be processed when loaded on the ICV; which is much earlier than during loading on the ocean going vessel at CPA; which means that the exporter can generate its invoice much earlier (FOB basis)
- CPA to Dhaka currently takes 12h by truck; this might be shortened to 6h by widening the road to up to4 lanes
- Establishment of road restrictions likely in the future: weight / axel load restriction; maximum weight per truck => leading to the necessity to transport heavy containers by IWT or rail
- CPA-Dhaka would take 16h (net travel time) to 36h (including temporary anchorage)
- A dedicated berth for IWT vessels does exist at CPA
- Picard is doing the container stuffing for export at the ICD Kamlapur
- An express railway line between Chittagong and Dhaka is planned
- A market-compliant schedule has at least three departures per week
- Currently no awareness towards IWT does exist within the transport and manufacturing industry; not trust in IWT = actually no trust in CPA services
- Probably it should be checked if RoRo cargo from Mongla can also be attracted for IWT
- What about the combination of bulk and container handling during the starting phase ICT Khanpur?
- Bulk handling has a low margin but is an increasing commodity
- The mandatory use of pilots does not generate much costs (300 BDT per 8 h)
- The right project marketing is very important for the success of the Khanpur project in the market
- 150 US$ per 20´move is "an interesting rate" for Portek
- The future operator of the ICT Khanpur has to be allowed to adjust his tariffs and rates self-reliant
- The "most uncontrollable part" of the IWT logistic chain via Khanpur are the CPA operations at the IWT berth/terminal in Chittagong as CPA does also operate the ICT Pangaon which is supposed to be competitor to ICT Khanpur; to eliminate discrimination at the berth a very well elaborated service agreement

	will be necessary • From the Portek view Summit is no competitor as the communicated extensions are not possible and the FCC (fixed column cranes) are too inflexible • Kamlapur Tariff (only Freight Charge): a. 40' (FEU): $225-235 b. 20' (TEU): $125-135 • Important parameter for successful implementation of IWT project are – Awareness (Market sounding) & right business plan