

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT ON ISPAHANI SUMMIT ALLIANCE TERMINAL LIMITED (ISATL)



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Prepared by



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ABBREVIATIONS

ADB	Asian Development Bank
AQMP	Air Quality Modeling Project
BCAS	Bangladesh Centre for Advanced Studies
BDT	Bangladesh Taka
BEZ	Bio-ecological zones
BMD	Bangladesh Meteorological Department
BNBC	Bangladesh National Building Code
BOD	Bio-Chemical Oxygen Demand
BRTC	Bureau of Research Testing and Consultation
BPDB	Bangladesh Power Development Board
BPC	Bangladesh Petroleum Corporation
BWDB	Bangladesh Water Development Board
CFS	Container Freight Station
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DOE	Department of Environment
DSC	Design and Supervision Consultant
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
ECR	Environment Conservation Rules
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECNEC	Executive Committee of the National Economic Council
ESIA	Environment and Social Impact Assessment
EMP	Environmental Management Plan
ESMU	Environmental and Social Monitoring Unit
FGD	Focus Group Discussions
FC	Fecal Coliform
FCC	Fixed Cargo Cranes
FI	Financial Intermediary
GOB	Government of Bangladesh
GSB	Geological Survey of Bangladesh
Hac	Hector
IA	Implementing Agency
ICD	Inland Container Depot

IDCOL	Infrastructure Development Company Limited
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
KII	Key Informant Interview
NGO	Non-Governmental Organization
NO _x	Oxides of Nitrogen
NMT	Non-Motorized Transport
OSHA	Occupational Safety and Health Administration
OHSAS	Occupational Health and Safety Advisory Services
PCBs	Poly-chlorinated biphenyls
PM	Particulate matter
PMO	Project Management Office
PM 10	Particulate Matter with Aerodynamic Diameter $\leq 10 \mu\text{m}$
PM2.5	Particulate Matter with Aerodynamic Diameter $\leq 2.5 \mu\text{m}$
PPA	Power Purchase Agreement
PPM	Parts Per Million
PRIME	Plume Rise Model Enhancement
SO ₂	Sulfur di Oxide
SPM	Suspended Particulate Matters
TDS	Total Dissolved Solid
TC	Total Coliform
ToR	Term of Reference
TEUs	Twenty-feet Equivalent Units
TSS	Total Suspended Solid
WB	World Bank

EXECUTIVE SUMMARY

A joint initiative of M.M. Ispahani Limited (40%), Summit Group (30%) and Alliance Holdings Limited (30%) with the objective to convert the former jute factory (Victory Jute Products Limited) into a modern Bonded Warehouse and Inland Container Depot. With a 31 acre plot at North Kattoli, Pahartali on the Dhaka - Chittagong Trunk Road (near Chittagong City Gate) and only 12km from Chittagong Port the project is ideally located to provide the planned services.

The Sponsors have a strong track record of implementing large-scale infrastructure projects and have expertise of constructing & operating Inland Container Depots, namely Summit Alliance Port Limited - the market leader in this sector.

According to the Environmental Conservation Rules, 1997 of Bangladesh Government, industrial projects have been categorized into four classes—Green, Orange A, Orange B and Red. Considering the magnitude of environmental impacts, Container Terminal project have been classified as Red Category project. So, the proposed project has fallen into the Red Category. According to the ADB guidelines, such kind of project like ISATL is to be fallen into Category B as the environmental impacts of these type of project are mostly project site specific. In addition, based on the criteria of categorization of Environmental and Social Safeguards Framework (ESSF) of Infrastructure Development company limited (IDCOL), the project seems to be Moderate Risk Project in regard of environmental categorization, whereas it is Low Risk Project in regard of indigenous people.

As a part of environmental compliance, there is a requirement for preparation of an Initial Environmental Examination (IEE) report. Accordingly, this IEE report has been prepared based on the guidelines of Department of Environment (DOE), Government of Bangladesh (GOB) and Asian Development Bank's (ADB's) Safeguard Policy Statement (SPS, 2009). In addition, relevant general and sector specific guidelines of IFC EHS were also consulted.

As part of the ESIA, baseline surveys (physical, ecological and socio-economic) of the project area have been carried out. The approach taken to carry out the baseline survey was to identify the project activities during both construction and operational phases and screen for the most applicable or sensitive environmental and social impacts the project activities might have. Based on this the environmental data like air quality, noise level measurements and surface and ground water analysis has been carried out. Apart from these the baseline information on flora and fauna of the project area has also been carried out. Secondary literature was used for identifying the climatic condition of the project area. For identifying the socio-economic baseline of the area a sample survey was carried out in the area. As part of the disclosure and public consultation process Focus Group Discussions (FGDs), Key Informant Interview (KIIs), one large consultation meeting and several informal meetings have also been carried out.

The ISATL project site is located on historical Victoria Jute Mills area near to AK khan Road of Chittagong. The proposed project area of 15 acres site was developed by the ISATL authority.

The areas surrounding the project site are primarily industrial in nature. A wide range of industries are present in areas surrounding the project site, including chemical industries, garment factories, cold storage, and textile mills.

Incremental traffic due to the port activities is an important issue as the traffic in the existing roads are high and any increase may hamper the transportation and communication of the area. Traffic data were collected from on-spot surveys at key location just adjacent to the proposed project site during November 2016 by physically counting the different types of vehicular transport plying over 24 hours continuously. The spot were chosen in view of the future use of the roads for the proposed project activities. In general traffic along the roadway is dominated by NMT (non-motorized transport) and 3-wheelers. Other important vehicle types include mini-bus, trucks, pick-ups, motor cycle and freight vehicles. During the container Terminal depot operation there is need for proper traffic management by the project proponents. A traffic plan based on staggered incoming and outgoing container trucks and a communication system needs to be in place in order to avoid traffic congestion on the access road.

Baseline Air quality is major problem in the project area. There is a number of industries located near the proposed project which is primary reason for high concentrations particulate matter. The most significant being the concentration of PM₁₀ in the vicinity of the project area resulting from the particulate matter generated by these . The existing baseline air quality was found to be already exceeding the national ambient air quality standards for SPM as well as PM₁₀ significantly. On the other hand Sox, NO_x and CO concentrations have been found to be well within the national standards. Air quality monitoring was carried out using high volume sampling equipment for measurement of particulate matter and for measuring the concentrations of SO_x, NO_x and CO gas analysers were used.

The baseline noise level measurements show that the noise level on the access road side is moderate and is within the limit of DOE standards. The noise level in the neighborhood of the project site is higher than that within the site. The noise level within the project site is within the acceptable limit set by the Department of Environment for industrial area.

Over the years of industrialization of this area the biodiversity of the area has been altered. The previously flood plain ecology has been changed. Most of the river-bank areas have well established industrial structures and current ecological feature of these areas seems to be very minimal. There are only some adaptive floral and faunal diversity now observed. Water pollution from industrial and domestic sources has also affected the aquatic biodiversity.

The common aquatic floral species in the study areas include Water hyacinth, Khudipana, Kalmi, and Helencha. Most terrestrial floral species particularly the trees and shrubs are cultivated and planted and these have commercial values. No aquatic tree and aquatic shrub were indentified within the study area. According to the IUCN Red Book 2002 a total of 41 floral species have been identified in the project area, which include 18 tree, 17 herb, and 6 shrub species. According to the IUCN Red Book a total of 32 aquatic faunal species have been identified in the

study area which include one amphibian, three reptile, four avis, one mammal, and 23 freshwater fish and a total of 56 terrestrial faunal species have been identified in the area, which include four amphibia, nine reptile, 33 avis and 10 mammals. No threatened floral species has been identified in the study areas; however, some threatened wildlife and fish species have been identified in and around the proposed project site. As the project area and its vicinity is highly industrialized the biodiversity has been impacted. During the baseline survey not all the species were observed. However, during the various consultations with the stakeholders at the project site the residents of the area mentioned that all the species mentioned above are not threatened but are rarely observed.

A socio-economic survey was carried out over a radius of 1km and a sample size was 100. This survey report gives a more in-depth insight into population. The density of population is high in the project area compared to the rural areas of the other Upazila according to BBS 2011. This is due to the presence of high numbers of industries the area. The percentage of children being less in number as compared to the percentage being in the adolescent and old age group. The educational status in this area is much better than areas in the rural setting. There is a higher population of students who have achieved the higher secondary certificate. The primary occupation of the area comprises of business, services and overseas employment.

Agricultural practices are minimal due to decline in the agricultural land availability in the area due to industrialization. According to BBS 2011 the household income and expenditure is higher in the surveyed area compared to rural areas in the Upazila.

The impacts on the environment due to the project activities were analyzed. The impact will be minimal on the air quality as there will be no significant emission of SO_x, NO_x and CO from the project activities. For particulate matter (PM₁₀) the baseline concentration was found above the limits set by DoE due to the number of cement industries in the area. The PM₁₀ generated by the project will marginally increase the PM₁₀ baseline concentration of the area. The liquid effluent generated by the project will below the limits set by the DoE. In order to assess the impact of noise from the project activities use was made of International Energy Agency approved noise model. The modeled results indicate that the nearest households will be exposed to noise level standards set by the DoE.

An Environment Management Plan (EMP) has been furnished. The primary objective of EMP is to identify the potential environmental and Health and Safety impacts of the project and how they are going to be mitigated. The EMP essentially will indicate the individual impacts which will need monitoring to ensure that the mitigation measures recommended is complied with.

A Monitoring Plan has been included with the primary objective of monitoring key environmental parameters to assess the impacts on a regular basis and keep the records. This will help the project sponsors to take corrective actions so that there is minimal impact on the environment and continued improvement. Apart from monitoring key environmental parameters there is need for strong monitoring of traffic flow during the operation phase of the project.

Chapter-1

INTRODUCTION

1.1 Background

A joint initiative of M.M. Ispahani Limited (40%), Summit Group (30%) and Alliance Holdings Limited (30%) with the objective to convert the former jute factory (Victory Jute Products Limited) into a modern Bonded Warehouse and Inland Container Depot. With a 31 acre plot at North Kattoli, Pahartali on the Dhaka - Chittagong Trunk Road (near Chittagong City Gate) and only 12km from Chittagong Port the project is ideally located to provide the planned services.

The Sponsors have a strong track record of implementing large-scale infrastructure projects and have expertise of constructing & operating Inland Container Depots, namely Summit Alliance Port Limited - the market leader in this sector.

Total estimated project cost stands at around BDT 1,258.80 million (equivalent to USD 15.74 million) comprising of a total cost of BDT 435.23 million (USD 5.44) for the bonded warehouse as well as total costs of BDT 460.23 million (USD 5.75 million) for off-dock infrastructure development and BDT 363.32 million (USD 4.54 million) for procuring off-dock equipment. It may be noted here that, discussions are currently under way between ISATL and Summit Alliance Port Limited (SAPL) whereby will enter a management for the Bonded Warehouse and inland Container Depot/Off-Dock activities. Notably, an existing client of IDCOL, SAPL has over 25 years of experience in this sector and strong relationships with all the large clients (Freight forwarders, Main Line Operators & Importers)

According to an Asian Development Bank report (ADB Asian Outlook 2014: “Fiscal Policy for Inclusive Growth”, Bangladesh’s GDP can grow by more than 1 percent and foreign trade by 20 percent, if the inland water transportation system is made effective, efficient, competitive and free of bureaucratic influence.

Considering these issues, Ispahani Summit Alliance Terminal Limited (ISATL) is developing a container terminal project that consists of an inland container depot located on 14 Acre of owned land at the BISCIC Industrial zone.

ISATL has appointed Bangladesh Centre for Advanced studies (BCAS) as a Consultant for carrying out the Environmental and Social Impact Assessment (ESIA) of the proposed project. In response to the request, BCAS has carried out the ESIA of the proposed inland container Terminal project. The ESIA has been carried out following the guidelines (GoB, ECR 1997) of the Department of Environment (DoE, GoB) and relevant Safeguard Policies Statements (SPS 2009) of ADB and operational Procedures of the World Bank.

Project Area

The proposed Ispahani Summit Alliance Terminal Limited (ISATL) is a private inland container depot and container freight station. It is located at Holding No.-185/260, Dhaka Trunk Road, North Kattali, Pahartali, Chittagong. But in recent time, the occurrence of environment pollution has become a problem for the whole Bangladesh. This situation has raised with the rapid growth of industries and impact reflecting on rapid growth of population, increasing urbanization, expansion of unplanned industrial activities, and exploitation of natural resources, etc.

Extent of the Study

Bangladesh Environmental Conservation Rules (ECR, 1997) and ADB Safeguard Policy Statement (SPS) 2009 require that the environmental and social impacts of development projects are identified and assessed as part of the planning and design process. Based on the magnitude of potential adverse impacts, mitigation measures are to be planned before starting the implementation of the project.

Bangladesh Centre for Advanced Studies (BCAS) has been carried out detailed Environmental and Social Impact Assessment (ESIA) study to comply with DoE Guidelines as well as the ADB Safeguard Policy Statement (SPS) 2009 for the proposed Ispahani Summit Alliance Terminal Limited (ISATL) on BOO basis.

Objectives of the ESIA

The objective is to carry out a due diligence of the ISATL's Depot Project by carrying out an Environmental and Social Impact Assessment (ESIA) which will include baseline data collection and analysis to identify the anticipated environmental and social impacts due to the project and suggest mitigation actions that need to be taken complying with the DOE regulations 1997, ADB SPS 2009 and IFC Performance Standards.

- ✚ A technical review on all technical data provided by ISATL relevant to the preparation of the ESIA.
- ✚ Review legal and policy frameworks applicable to the preparation of the ESIA (Bangladesh Environmental Regulations 1997 and updated in 2002, IFC performance standards, Equator Principles of ILO conventions, World Bank Group EHS guidelines ADB SPS 2009 and IDCOL's ESSF);
- ✚ Review Compliance of the TOR provided by IDCOL
- ✚ Preparation of the ESIA documents
- ✚ Obtaining of the Environmental Clearance from the Department of Environment;
- ✚ Obtaining the acceptance of the ESIA report by IDCOL

1.2 Scope of ESIA study

The description of the environment and social baseline conditions are made encompassing all relevant current baseline data on the environmental and social characteristics of the study area including physical, biological, ecological and social environments. In the backdrop of the above scenarios, the relevant regulations and standards governing environmental quality, health and safety, protection of sensitive areas, protection of endangered species, land use control, land acquisition, compensation, etc. at every level are described.

In action to the above, an analysis was conducted of reasonable alternatives in meeting the ultimate objects of the project including the 'no action' alternative, site alternatives and alternative means of meeting the energy requirements.

Viewed against these, all significant impacts were identified and evaluated including atmospheric emissions and changes in ambient air quality, discharge of effluent and ambient water quality impacts, changes in ambient noise and local land use patterns, impacts of the project and its activities on the community's access to social infrastructure (e.g. potable water, health centers, school, irrigation and extension services), and local developments.

A socio-economic study was undertaken through sample survey within 1 km radius of the project to assess the demographic distribution, household income and expenditure and type of employment etc. of the local community.

One of the major aspects covered in the ESIA is the stakeholder's consultation. These consultations were through Focused Group Discussion (FGD) with various groups including women, KII with key stakeholders. At the draft stage of the ESIA a general consultation meeting was held to discuss the various findings and get their opinion on the findings and incorporate their concerns in the ESIA.

Following identification of potential impacts mitigation measures has been suggested including an Environmental, Safety and Social Management Plan (ESSMP) to mitigate negative impacts has been developed, including a detailed Environmental and Social Management Plan with feasible and cost-effective measures to prevent or reduce significant negative impacts to an acceptable level, and containing detailed implementation plans, monitoring indicators and clear allocation of responsibility among project sponsors construction contractors, government agencies, and community-based organization. In addition, Grievance Redress Mechanism (GRM), Disaster Management Plan and impact of climate change on the project has been included.

1.3 Study Methodology in detail

Based on the above Scope of Work, the study built upon the baseline survey carried out by BCAS as Environment and Social Consultant for the Environmental and Social Impact Assessment (ESIA) during October- December 2016. The ESIA exercise resulted in a stand-alone report together with a schedule devised by and as per the requirement of DoE and IDCOL.

This ESIA have been carried out primary data generated during the period from October-December 2016 by BCAS. Secondary data have been obtained from various sources and field visits. Several field visits had been undertaken to the project location with a view to collect the baseline data and public consultations, the following steps were followed and biodiversity including:

- + Understanding the technical aspects of the proposed Container Terminal Depot through secondary literature and consultations
- + Collection and confirmation of environmental baseline data on air, water, noise flora and fauna.
- + Identification of potential environmental impacts and evaluating the consequences through using a checklist method;
- + Identification of impacts was undertaken using Checklist Matrix and Issues forecasting tabular methods and modeling if required;
- + Review of the adequacy and efficiency of proposed mitigation measures for the proposed ISATL project through public consultations;
- + For the socio-economic study primary data collection from 30% of the total households within 1 km radius of the project area included in the baseline study carried out by BCAS. The criterion for choosing 30% of households within 1 km radius of the project site is based on the expected results of getting a profile of the area. Additionally, since the area is in a Industrial cum rural zone the number of household and business institutions are numerous in numbers therefore the survey target group was a mix of rural and commercial households. A number of Focus Group Discussions (FGDs) with the different categories of stakeholders were held including women;
- + Formulation of a monitoring plan for both environmental and social issues. This will be done through primary data collection with emphasis on the tenure of the settlement and the state of the displaced persons livelihood;
- + Detailed survey work was undertaken throughout the impact zone (1km radius) of the project air-shed to inform the preparation of the land use map. During the mapping exercise, in-depth consultations with local stakeholders were carried out to aide accurate identification of suitable plots. Use of maps and also utilization of the historic maps was undertaken for identifying the plots and ground level. Field verification was undertaken by the team leader after the field data collection. Updated GIS version was applied to finalize the land use map; and

This ESIA report has been prepared with the following documents:

- Asian Development Bank (ADB), *Safeguard Policy Statement*, June 2009;
- EIA Guidelines for Mix zone Industrial and residential, DOE, June 1997.
- EHS guidelines for River Terminal Container Depot of IFC.

1.4 Limitation of the Study

The environmental and social baseline data were data collected within a limited time frame due to the requirement of the project to go into commercial operation within the first quarter of 2015. The ESIA has been prepared with an emphasis to cover all important environmental and social impacts and formulate pragmatic recommendations for mitigating any adverse environmental impacts.

1.5 The ESIA Team-the qualification and competence of Team member in brief.

BCAS consultants have prepared this report under the guidance and supervision of Dr. Moinul Islam Sharif. The total team composition and their expertise have been given in the following Table.

Name	Qualification and Expertise	Competencies
Dr. Moinul Islam Sharif	PhD Team Leader ESIA and Emission Modeling Expert	He has highly experienced on conducting EIA of various nature in home and abroad. Have vast experience on identifying different environmental impacts and suggesting mitigation measures for any project. Experienced on emission and noise modeling of various projects. Experienced on Project stakeholder engagement – Public consultation and Disclosure Plans.
Khandaker Mainuddin	MSS in Economy Socio-economist	Experienced on Social baseline studies, community needs assessment, Social and Community Health Impact Studies /Assessments etc.
Mr. Osman Goni Shawkat	MSS in DU, MSESM, NSU Project Coordinator ESIA Expert	Make Liaison with all field staff and Consultants; allocate staff & resources to different places when necessary. Background of organizing site visits, surveys, liaison with community, public and govt. organizations, etc.
Mr. Shaker Ali	Electrical Engineer Modeling Expert	Expert on power plant operation and EIA report.
Mr. Nabir Mamnoon	MSS in Geography, JU GIS and landuse Expert	Having expertise on GIS mapping
Dr. Tajul Islam Chowdhury	Ph D Bio- diversity Expert	Having expertise on bio diversity
Mr. Moniruzzaman	MBA, SA Field Enumerator	Base line data collection, secondary data collection, sample collection and site survey
Mr. ZH Khan	MA, NU	Base line data collection, sample collection from site, sample preservation and laboratory analysis.
Mr. Sohel	MSc. in Computer Science	Data Analyst and SPSS expert

1.6 Acknowledgement

In preparing the ESIA, various stakeholders were consulted. It comprises a number of government agencies, Ward Councilor, NGOs, Financing Organizations, Bangladesh Inland Water Transport Authority (BIWTA), Bangladesh Water Transport Corporation (BIWTC), Bangladesh Meteorological Department (BMD), Soil Resource Development Institute (SRDI), Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Department of Environment (DOE), Chittagong and Dhaka, Ispahani High School, Department of Roads and Highways, Fire Service and Civil Defense Office etc. The ESIA team is grateful to these stakeholders for their contribution to enrich the ESIA report and present the accurate data in the concern section of the report.

Chapter 2

POLICY, LEGAL ADMINISTRATIVE FRAMEWORK

2.1 Bangladesh environment policy, regulation and guidelines

The emerging environmental scenario calls for attention on conservation and judicious use of natural resources. There is a need to integrate the environmental consequences of the development activities and for planning suitable measures in order to ensure sustainable development. The environmental considerations in any developmental process have become necessary for achieving sustainable development. To achieve such goals the basic principles to be adopted are:

- To enhance the quality of environment in and around the project area by adopting proper measures for conservation of natural resources;
- Prevention of adverse environmental and social impact to the maximum possible extent;
- To mitigate the possible adverse environmental and socio-economic impact on the project-affected areas.

The proposed Project is covered under several environmental Policies & legislations pertained with GOB, ADB's Environmental and Social Safeguards Framework (ESSF), IDCOL's Environmental and Social Management Framework (ESMF) and as well as IFC/World Bank Environmental Safeguards (relevant policies). All of the policies or legislation aimed at the conservation and protection of the environment. The existing policies and legislation, which are relevant to the environment, are described in the following sections.

POLICIES

2.2 Industrial Policy 1991

The Industrial policy of 1991 contains the following clauses in respect of environmental protection

- To conserve ecological balance and prevent pollution during industrialization
- To take effective steps for pollution control and conservation of environment during industrialization

To ensure embodying of necessary pollution control and preventive measures by industrial investment project endangering environment.

2.3 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.

2.4 Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)

A set of the relevant rules to implement the ECA“ 95 has been promulgated (August 1997). The rules mainly consist of:

- 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 pollution activities of the existing or proposed industries/development projects/activities.
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities;
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation.

Green: Industries/development projects/activities are considered relatively pollution-free and therefore do not require an environmental clearance certificate from the DOE and no environmental study.

Orange: Industries/development projects/activities fall into two categories. Orange “A” are less polluted and Orange “B” are moderately polluted required to submit general information, a process flow diagram and schematic diagrams of waste treatment facilities along with their application to DOE for obtaining environmental site clearance and environmental clearance.

Red: Industries/development projects/activities are those which may cause “significant adverse” environmental impacts and are therefore required to submit an EIA report. It should be noted that they might obtain an environmental site clearance on the basis of an IEE report, and subsequently submit an EIA report for obtaining environmental clearance along with other necessary papers.

Environmental standards in operation in Bangladesh also Promulgated under the Environment Conservation Rules 1997. There are standards prescribed for varying water sources, ambient air, noise, odor, industrial effluent and emission discharges, vehicular emission etc.

The Bangladesh standards intend to impose restrictions on the volume and concentrations of wastewater/solid waste/gaseous emission etc. discharged into the environment. In addition a number of surrogate pollution parameters like Biochemical Oxygen Demand, or Chemical Oxygen Demand; Total Suspended Solids, etc. are specified in terms of concentration and/or total allowable quality discharged in case of waste water/solid waste. Additionally specific parameters depending on the manufacturing process are specified such as phenol, cyanide, copper, zinc, chromium etc. Air emission quality standards refer mostly to concentration of mass emission of various types of particulate, sulfur dioxide, and oxides of nitrogen and in some cases volatile organic compounds and other substances.

The Bangladesh standards in general are less stringent compared to the developed countries. This is in view to promote and encourage industrialization in the country. The Bangladesh standards are not for any specific period of time. There is no provision for partial compliance too.

The ambient standard of water quality, air quality and noise are presented in Table 2.1 to Table 2.5 in the following page. Standards refer to discharges to freshwater bodies with values in parentheses referring to direct discharges to agricultural land.

Table 2.1: Inland Surface Water Quality Standards

Best practice based Classification	PH	BOD mg/l	DO mg/l	Total Coliform No./100
Source of drinking water for supply only after disinfecting	6.5-8.5	2 or less	6 or above	50 or less
Water usable for recreational activity	6.5-8.5	3 or less	5 or above	200 or less
Source of drinking water for supply after conventional treatment	6.5-8.5	6 or less	6 or above	5,000 or less
Water usable by fisheries	6.5-8.5	6 or less	5 or above	-
Water usable by various process and cooling industries	6.5-8.5	10 or less	5 or above	5,000 or less
Water usable for irrigation	6.5-8.5	10 or less	5 or above	1,000 or less

Source: ECR- Schedule 3

Table 2.2: Standards for Waste from Industrial Units

Parameters	Unit	Inland surface Water	Irrigated Land
Biological Oxygen Demand (BOD5) at 200 C	mg/l	50	100
Chemical Oxygen Demand (COD)	mg/l	200	400
Dissolve Oxygen (DO)	mg/l	4.5-8	4.5-8
Total Dissolved Solids (TDS)	µmho/cm	2,100	2,100
PH		6-9	6-9

Suspended Solid (SS)	mg/l	150	200
Chloride	mg/l	600	600
Iron	µmho/cm	2	2

Source: ECR- Schedule 10

Table 2.3: Ambient Air Quality Standards

AIR POLLUTANT	STANDARDS	AVERAGE TIME
1	2	3
Carbon Monoxide (CO)	10 mg/m ³ (9 ppm) ^(Ka)	8-hour
	40 mg/m ³ (35 ppm) ^(Ka)	1-hour
Lead (Pb)	0.5 µg/m ³	Annual
Oxides of Nitrogen (NO _x)	100 µg/m ³ (0.053 ppm)	Annual
Suspended Particulate Matter (SPM)	200 µg/m ³	8-hour
PM ₁₀	50 µg/m ³ (Kha)	Annual
	150 µg/m ³ (Ga)	24-hour
PM _{2.5}	15 µg/m ³	Annual
	65 µg/m ³	24-hour
Ozone (O ₃)	235 µg/m ³ (0.12 ppm) ^(Gha)	1-hour
	157 µg/m ³ (0.08 ppm)	8-hour
Sulfur di Oxide (SO ₂)	80 µg/m ³ (0.03 ppm)	Annual
	365 µg/m ³ (0.14 ppm) ^(Ka)	24-hour

Source: ECR- Schedule 2 (Amended in 2005; Abbreviation: ppm: Parts Per Million)

Notes: (Ka) Not to be exceeded more than once per year, (Kha) Annual average value will be less than or equal to 50 microgram/cubic meter, (Ga) Average value of 24 hours will be less or equal to 150 microgram/cubic meter for one day each year., (Gha) Maximum average value for every one hour each year will be equal or less than 0.12 ppm.

At national level, sensitive areas include national monuments, health resorts, hospitals, archaeological sites and educational establishments.

Table 2.4: Standards for Gaseous Emission from Industries (Source: ECR- Schedule 11)

Parameters for power plant (<200 MW)	Standard present
Particulate	350 mg/Nm ³
Oxides of Nitrogen	30 ppm

Table 2.5: Ambient Noise Standards (Source: ECR- Schedule 1, Amendment in 2006)

Areas	Day Time (dBa)	Night Time (dBa)
Silence Zone: Zone A	50	40
Residential Area: Zone B	55	45
Mixed Activity Area: Zone C	60	50
Commercial Area: Zone D	70	60
Industrial Area	75	70

The second column of limits values refer to day time (06.00 to 21:00) and the third column to night time (21.00 to 06.00). A silence zone is defined as an area within 100m, around hospitals or educational institutions.

2.5 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 2.1 below.

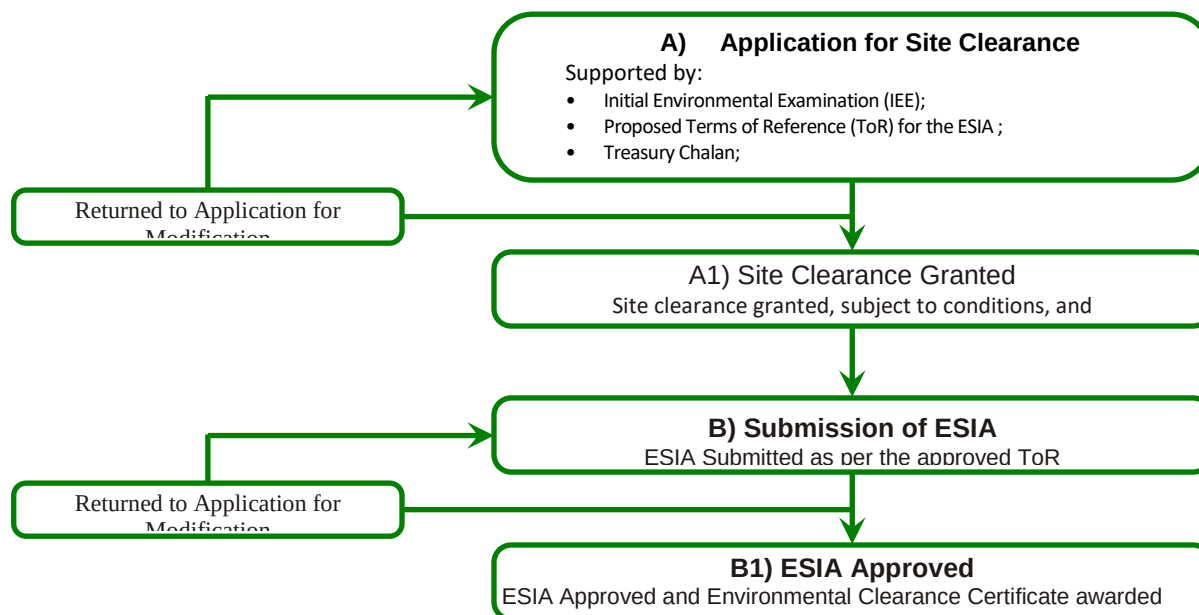


Figure 2.1: Process of ESIA Approval and ECC at DoE

Application for Environmental Clearance at A requires 60 working days to reach A1 with Site Clearance. Submission at B of ESIA as per ToR approved at A1 needs another 90 working days to reach B1 with ESIA approval and Environmental Clearance Certificate (60 working days for ESIA approval and 30 working days for ECC after the applicant/project sponsor completes the formalities as specified in the ESIA approval letter and reports to DoE). ECC issued through such a process remains valid for 1 (one) year, after which renewal is necessary. During stages between A and A1 and between B and B1, observations are made and the applicant may be asked for modification of his/her information/data/reports submitted to DoE for necessary clearance.

2.6 Environmental and Social Requirements of the Asian Development Bank

The Asian Development Bank (ADB) Safeguard Policy Statement ('the SPS') 2009 sets out the requirements for ADB's operations to undertake an environmental assessment for projects funded by the bank. The goal of the SPS is to promote the sustainability of project outcomes through protecting the environment and people from potential adverse impacts. The overall objectives of the SPS are to:

- ✚ avoid adverse impacts of projects on the environment and affected people, where possible;
- ✚ minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is impossible; and
- ✚ help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

The SPS sets out the ADB policy objectives, scope and triggers, and principles for following three key safeguard areas:

- ✚ Environmental Safeguards;
- ✚ Involuntary Resettlement Safeguards along with those vis-à-vis Land Acquisition; and
- ✚ Indigenous Peoples Safeguards.

ADB implements the SPS through the safeguard review procedures as outlined in Section F1/OP of its Operation Manual (OM) and the documents cited therein. However, the third area of the above three areas is beyond the scope of IEE consideration for this particular project (ISATL) as the project area does not involve any *indigenous peoples*¹.

According to ADB Operation Manual activated since 2010, a proposed project is assigned to one of the following categories depending on the significance of the *potential environmental impacts and risks*:

Category A – a proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental and Social Impact Assessment (ESIA), including an Environmental Management Plan (EMP), is required.

Category B – a proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.

Category C – a proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. An ESIA or IEE is not required, although environmental implications need to be reviewed.

Category FI – a proposed project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary (*refer to paragraphs 53–58, Safeguard Review Procedures, Operational Procedures, ADB Operations Manual*).

A project's environment category is determined by the category of its most environmentally sensitive component, including direct, indirect, induced, and cumulative impacts. Each proposed

¹ As defined by the Asian Development Bank policy on Indigenous Peoples, April 1998.

project is scrutinized as to its type, location, scale, sensitivity and the magnitude of its potential environmental impacts. The level of detail and comprehensiveness of the ESIA or IEE are commensurate with the significance of the potential impacts and risks.

The proposed Ispahani Summit Alliance Terminal Limited (ISATL) project falls under Category B according to ADB environmental categorization of projects, as the potential exists for significant adverse environmental impacts but there are no irreversible impacts and environmental and social impacts of the proposed project can be mitigated which is not the case in Category A projects. Therefore, for the proposed project an Initial Environmental Examination (IEE) including an EMP will be required.

The IEE must include an Environmental Management Plan (EMP) that outlines specific mitigation measures, environmental monitoring requirements, and related institutional arrangements, including budget requirements. Loan agreements include specific environmental covenants that describe environmental requirements, including the EMP. The provisions for the EMP must also be fully reflected in the project administration memorandums. To ensure proper and timely implementation of the EMP and adherence to the agreed environmental covenants,

With regards socio-economic impacts, ADB screens all projects to determine whether or not they involve Involuntary Resettlement or have potential impacts on Indigenous Peoples. A project's involuntary resettlement category is determined by the category of its most sensitive component in terms of involuntary resettlement impacts. The Involuntary Resettlement Impacts of an ADB-supported project are considered significant if *"...200 or more persons experience major impacts, which are defined as (i) being physically displaced from housing, or (ii) losing 10% or more of their productive assets (income generating)."* The level of detail and comprehensiveness of the Resettlement Action Plan (RAP) are commensurate with the significance of the potential impacts and risks. A proposed project is assigned to one of the following categories depending on the significance of the probable involuntary resettlement impacts:

ISATL project site is the owned land of Ispahani Group and land was vacant with no settlements or any agricultural activities and the issue of involuntary resettlement and economic displacement was not required to be addressed. The project falls under Category B as per ADB SPS-2009 as the potential adverse environmental impacts are less adverse and site specific and mitigation measures readily than those of category A projects. This implies that the ESIA must include the mitigation actions that need to be taken and additionally the ESIA must have to be taken by the project sponsors environmental pollution caused by the project needs to also include an Environmental Management Plan (EMP).

2.7 Performance Standards Of The World Bank Group

In accordance with OP 4.03, the World Bank has adopted the eight IFC Performance Standards as 'WB Performance Standards'. These standards are to be used in lieu of the World Bank Safeguard Policies. The eight IFC Performance Standards are outlined in the following section.

2.7.1 International Finance Corporation Performance Standards and Environmental, Health and Safety Guidelines

The IFC has set out eight Performance Standards, as listed below, in respect of various parameters pertaining to a proposed project.

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts;
- Performance Standard 2: Labor 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.

Of the above eight Performance Standards set by IFC, Performance Standard 1 envisages establishing the importance of:

- (i) integrated assessment to identify the social and environmental impacts, risks and opportunities;
- (ii) effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and
- (iii) the client's management of social and environmental impacts throughout the life of the project.

The remaining seven Performance Standards, i.e., Performance Standards 2 to 8 seek to ascertain establish requirements to avoid, reduce, mitigate or compensate the impacts on people and the environment, and to improve conditions where appropriate.

In addition to the eight Performance Standards, the IFC General Environmental, Health and Safety (EHS) Guidelines are considered pertinent to the Project. The EHS Guidelines comprise technical reference documents with general industry-specific examples of Good International Industry Practice. The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, which provide guidance to users on EHS issues in specific industry sectors. During preparation of this EIA for the SBPL Power Plant project, the General EHS Guidelines were applied and relevant guidance in the Industry Sector Guidelines for Thermal Power Plants(dated December19,2008) and Gas Distribution Systems (April 30, 2007) was followed (where applicable).

The IFC *Policy on Disclosure of Information*, The Access to Information Policy is effective as of

January, 2012 supersedes the IFC Disclosure of Information Policy of April 2006. The policy seeks to provide accurate and timely information regarding its activities to clients, partners and stakeholders including the Affected Communities and other interested parties.

For each proposed Category A and B project, IFC disclose as summary of its review findings and recommendations, the Environmental and Social Review Summary (ESRS). The ESRS includes:

- i) reference to the Performance Standards and any applicable grievance mechanisms, including the CAO;
- ii) the rationale for IFC's categorization of a project;
- iii) a description of the main environmental and social risks and impacts of the project;
- iv) key measures identified to mitigate those risks and impacts, specifying any supplemental actions that will need to be implemented to undertake the project in a manner consistent with the Performance Standards, or where required by IFC, the Environmental and Social Action Plan (ESAP);
- v) where greater than 25,000 MTCO₂ equivalent, the expected GHG emissions of the project;
- vi) electronic copies or web links, where available, to any relevant EIA documents prepared by or on behalf of the client; and
- vii) for those projects where the verification of the Free, Prior, and Informed Consent (FPIC) of indigenous peoples is required, a description of the status of that consent process;

2.8 Safeguard Requirements of Equator Principle Financial Institutions

The ten requirements of the Equator Principle Financial Institutions (EPFIs) correspond to the following parameters:

- *Principle 1 (Review and Categorization):* When a project is proposed for financing, the EPFI will, as part of its internal environmental and social review and due diligence, categorize it based on the magnitude of its potential environmental and social risks and impacts. Such screening is based on the environmental and social categorization process of the IFC. Projects are classified, relating to social or environmental impacts, in Category A (significant impacts), Category B (limited impacts) and Category C (minimal or no impacts).
- *Principle 2 (Environmental and Social Assessment):* For all Category A and Category B Projects, the EPFI will require the client to conduct an assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed project (which may include the illustrative list of issues found in Exhibit II to the EPs). The Assessment Documentation should propose measures to minimize, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.

- *Principle 3 (Applicable Environmental and Social Standards):* The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. The EPFI will require that the assessment process evaluates compliance with the applicable standards as follows:

For projects located in Non-Designated Countries, the assessment process evaluates compliance with the then applicable IFC Performance Standards and the World Bank Group EHS Guidelines; and

- *Principle 4 (Environmental and Social Management System and Equator Principles Action Plan):* For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards;
- *Principle 5 (Stakeholder Engagement):* For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to the risks and impacts of the project, the project's phase of development; the language preferences of the Affected Communities, their decision-making processes and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation.

To facilitate Stakeholder engagement, the client will, commensurate to the project's risks and impacts, make the appropriate Assessment Documentation readily available to the Affected Communities, and where relevant Other Stakeholders, in the local language and in a culturally appropriate manner.

The client will take account of and document, the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts, disclosure should occur early in the assessment process, in any event before the project construction commences, and on an ongoing basis.

EPFIs recognize that indigenous peoples may represent vulnerable segments of project affected communities. Projects affecting indigenous peoples will be subject to a process of informed Consultation and Participation, and will need to comply with the rights and protections for indigenous peoples contained in relevant national law, including those laws implementing host country obligations under international law. Consistent with the special circumstances described

in IFC Performance Standard 7 (when relevant as defined in Principle 3), projects with adverse impacts on indigenous people will require their Free, Prior and informed Consent (FPIC)³.

- *Principle 6 (Grievance Mechanism)*: For all Category A and, as appropriate, Category B projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance.

The grievance mechanism is required to be scaled to the risks and impacts of the project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.

- *Principle 7 (Independent Review)*: For all Category A and, as appropriate, Category B projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible.
- *Principle 8 (Covenants)*: For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Further more for all Category A and Category B Projects, the client will covenant the financial documentation:
 - to comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and
 - to provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that i) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and
 - to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan

Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI

reserves the right to exercise remedies, as considered appropriate.

- *Principle 9 (Independent Monitoring and Reporting):* To assess project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.
- *Principle 10 (Reporting and Transparency):* For all Category A and, as appropriate, Category B Projects:
 - The client will ensure that, at a minimum, a summary of the EIA is accessible and available online; and
 - The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO₂ equivalent annually.

2.9 International Convention

Quite a significant number of international conventions have relevance to activities related to power plant project and associated facilities. Bangladesh is a party to almost all of such conventions. Such conventions include those on biological diversities, endangered species, desertification, climate change, hazardous wastes, persistent organic pollutants, wetlands, ozone layer depleting substances, nuclear test ban, etc.

Among the above, the following have a greater degree of relevance to the Proposed Development, and include policies that have been acknowledged as well as accepted throughout the world as applicable to projects including those related to power generation of the types similar to the proposed one at the Project Site.

a) *Basel Convention:* Signed and ratified by 170 Parties, the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal is the most comprehensive global environmental agreement on hazardous and other wastes. The Convention aims to protect human health and the environment against the adverse impacts of generation, management, trans-boundary movements and disposal of hazardous and other wastes. The Basel Convention came into force in 1992.

Although policies and rules are yet to be adopted, in Bangladesh the Department of Environment pursues the spirit of Basel Convention and undertakes, more than often, actions toward indiscriminate use and disposal of such wastes and substances throughout the country.

b) *Kyoto Protocol:* Defined by the United Nations Environment Program, the Kyoto Protocol treaty is a legally binding agreement providing for industrialized countries to reduce their

collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal of the Protocol has been to lower overall emissions of six greenhouse gases—carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs—over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland (Kyoto Protocol website, 2014).

Although the protocol is not binding on developing countries, such countries have to ensure that they act responsibly and avoid greenhouse gas emissions at levels that have been found to be undesirable. The Proposed Development forms part of an overall development of power station, transmission lines, HFO transportation and related infrastructure.

(c) *Stockholm Convention on Persistent Organic Pollutants*: The Governing Council of the United Nations Environment Program (UNEP), in 1995, had made a call for global action on the Persistent Organic Pollutants (POPs), which it defined as “chemical substances that persist in the environment, bio-accumulate through the food web, and pose a risk of causing adverse effects to human health and the environment”.

This was followed by assessment of the 12 worst offenders, known as the *dirty dozen*, made by the Intergovernmental Forum on Chemical Safety (IFCS) and the International Program on Chemical Safety (IPCS). The negotiations for the Convention were completed on 23 May 2001 in Stockholm. The convention entered into force on 17 May 2004 with ratification by an initial 128 parties and 151 signatories. Co-signatories agree to outlaw nine of the *dirty dozen* chemicals, limit the use of DDT to malaria control, and curtail in advertent production of dioxins and furans.

Parties to the convention have agreed to a process by which persistent toxic compounds can be reviewed and added to the convention, if they meet certain criteria for persistence and trans-boundary threat. The first set of new chemicals to be added to the Convention was agreed at a conference in Geneva on May 8, 2009.

Whilst the use of electrical transformers containing Polychlorinated biphenyls (PCBs) – a chemical substance belonging to the above dirty dozen that have been banned under the Stockholm convention – is an issue at some power generating facilities, it has been confirmed by the equipment supplier that PCB containing oils and equipment will not be used at the proposed Power Plant.

2.10 Environmental Clearance

Formal EIA guidelines in Bangladesh are set out in “Rules and Regulations under the 1995 Environmental Protection Acts” as published in the official Gazette on August 27, 1997. Any

proponent planning an industrial project is currently required under Paragraph 12 of the Environmental Protection Acts, 1995 to obtain “environmental clearance letter:” from the Department of Environment

The first to obtain environmental clearance is for the project proponent to complete & submit an application form which may be obtained from the appropriate DoE regional offices as per the category. The application is accompanied by other supporting documents (i.e. project profile, lay-out plan, NOC from local authority, Govt fees etc.) reviewed by the divisional and district offices of DOE who has the authority to request supporting documents as applicable. The divisional office has the power to take decision on Green and Amber-A & B category projects and the Red category projects are forwarded to head office for approval. The proposed projects receive an environmental site clearance at the beginning and the environmental clearance subject to the implementation of the project activities and all mitigation measures suggested in the IEE report or in the application. In case of Red category, the client needs to submit an IEE report for site clearance and EIA to obtain EIA approval and environmental clearance.

Chapter 3

DESCRIPTION OF PROJECT

3.1 Background and Rationale of the Project

3.1.1 Information on the proposed project history

A joint initiative of M.M. Ispahani Limited (40%), Summit Group (30%) and Alliance Holdings Limited (30%) with the objective to convert the former jute factory (Victory Jute Products Limited) into a modern Bonded Warehouse and Inland Container Depot. With a 31 acre plot at North Kattoli, Pahartali on the Dhaka - Chittagong Trunk Road (near Chittagong City Gate) and only 12km from Chittagong Port the project is ideally located to provide the planned services.

The Sponsors have a strong track record of implementing large-scale infrastructure projects and have expertise of constructing & operating Inland Container Depots, namely Summit Alliance Port Limited - the market leader in this sector.

Planned Business Activities

a. Bonded Warehousing:

ISATL holds a unique permission from National Board of Revenue (NBR) which allows for export cargo to be stored on a long-term basis as well as for carrying out Quality Control related activities. ISATL is presently constructing an 83,000sft custom-built warehouse for a client named Gildan who's main focus is on "undecorated blank active wear" such as t-shirts & fleeces which are exported to various distributors worldwide. Unlike traditional RMG products which are made to order against a shipment deadline Gildan's items have to be produced beforehand and kept in stock in anticipation of orders. As a result the need for storage is very important and this is where ISATL's permission from NBR and the customized warehouse will assist Gildan to a great extent.

Gildan and ISATL have already signed a Letter of Intent (LOI) whereby the rent (BDT 53/sft), tenure (5 years) and advance (USD 1.50m) have been agreed. As per present schedule the plan is to start operations in September 2016. As per the terms of the LOI Gildan shall have the option to extend the warehouse by a further 80,000sft, something which is expected to take place around 2020. Expected Annual Revenue: BDT 52.78m, Estimated Pre-tax Profit: BDT 37m

REVENUE: Revenue from Rent calculated at BDT 53/sft x 83,000sft x 12

PRE-TAX PROFIT: 75% (of Revenue) conservatively estimated as the warehouse maintenance and staffing expenses will be low.

b. Inland Container Depot / Off-Dock:

Aside from the above mentioned Bonded Warehouse the company is also constructing traditional Off-Dock facilities such as Container Freight Station (CFS) for handling Export and Import Cargo and Container Storage Yard.

The Phase 1 infrastructure will include a 90,000sft Export CFS, a 18,000sft Import Warehouse and approx. 15 acre of Container Yard. Expected container handling from the mentioned infrastructure is expected to be 2,100 TEUs of Export and 1,000 TEUs of Import cargo along with storage of 2,500 TEUs of Empty containers.

With the existing Off-Docks at Chittagong becoming congested it is envisaged that ISATL shall be coming into operation (approx. March 2017) in order to take advantage of the capacity shortage.

Expected Annual Revenue: BDT 126m (Export) + BDT 90m (Import) + BDT 50m (Empty Storage) = BDT 266m, Estimated Pre-tax Profit: BDT 53.20m

REVENUE: Export Revenue calculated from Avg. Revenue / TEU of BDT 5,000 x 25,200 TEU; Import Revenue from Avg. Revenue / TEU of BDT 7,500 x 12,000; Empty Revenue from Avg. Storage of 1,500 TEUs per day x BDT 90 / TEU, PRE-TAX PROFIT of 20% (of Revenue) is the present level at ISATL

c. Non-Bonded / Traditional Warehousing:

With the Phase 1 and upcoming Phase 2 infrastructure being accommodated within 15 acre the remaining land (approx. 16 acre) shall continue to be utilized for the traditional warehousing activities that are presently taking place using the old jute mill buildings. The items presently stored are clinker, grains, and bitumen. While not directly related to the Off-Dock business it is expected that the option of non-bonded warehousing will offer a convenient option for the Off-Dock Import clients who can store their products once the goods have been Custom cleared.

Expected Annual Revenue: BDT 33.60m

Estimated Pre-tax Profit: BDT 21.84m

Revenue: Revenue from Rent calculated at BDT 14/sft x 225,000sft x 12

Pre-tax profit: 65% (of Revenue) conservatively estimated as the warehouse maintenance and staffing expenses will be low

Total Phase 1 Expected Annual Revenue: BDT 352.38m

Total Phase 1 Estimated Pre-tax Profit: BDT 112.04m

Type and Category of the Project

The Ispahani Summit Alliance Terminal Limited (ISATL) obtained Site Clearance Certificate from Department of Environment (DoE) to commence the construction activities. The project is fall under Category B as per ADB SPS-2009 as the potential adverse environmental impacts are less adverse. This implies that the ESIA must include the mitigation actions that need to be taken and

additionally the ESIA must include an Environmental Management Plan (EMP). According to ADB SPS, 2009 and ADB Environmental Assessment Guidelines 2003, the project will fall under Category-B as the project does not have any irreversible environmental impacts and mitigation measures are available. As the requirement of ADB SPS 2009 the ESIA will include an EMP. According to Department of Environment (DoE) Bangladesh, the project is fall under the Red Category which requires an ESIA study including an EMP.

There are no particularly sensitive ecological, cultural and archeological sites in the area. The Container Terminal will not involve any resettlement and hence ADB SPS 2009 IR is not triggered. The project is situated on the vacant land of Ispahani group. The area enjoys necessary infrastructure facilities, which include transport, electricity, telecommunication etc.

Basic information

Table-3.1: Basic data on ISATL is given below:

1	Name of the Project	Ispahani Summit Alliance Terminal Limited (ISATL)
2	Project Proponent	Syed Yasser Haider Rizvi
3	Project Location	Holding No.-185/260, Dhaka Trunk Road, North Kattali, Pahartali, Chittagong
4	Corporate Office	Summit Centre(7 th Floor), 18 Kawran Bazar, Dhaka-1215
5	Main Sponsor	Summit Alliance Port Limited
6	Type of Business	River Port Container Terminal
7	Raw Materials	The main raw material of the project is Export import oriented goods
8	By-product, if any	None
9	Net Container Capacity	1. Total capacity of each warehouse (a) Bonded warehouse capacity 10,952 pallet (b) CFS-1 capacity 1000 TUES/ month (c) Import capacity 1000 TUES/ month 2. How many warehouses will be setup (a) Three (o3) warehouse 3. Length, wide and height of the warehouse (a) Bonded warehouse 397' X 210' X 52' H , area- 83,000 sft (b) CFS-1 : 200' X150' X 48' H ,area- 30000X3= 90,000 sft (c) Import shed 270' X 60' X45'H area 16,200 sft
10	Project Cost	130cror BDT
11	Total Area of Land	15.0 Acres
12	Total Covered Area	10.0 Acres
13	Total Developed Land	15.0 Acres
14	Employment	a) At construction period Permanent including security guards 31 nos, Contractual 11nos b) At operation period will be 600nos
15	Fuel Requirement	Diesel
16	Generator	500KVA, 400KW, Diesel Engine, Ferbo, Italy.
17	Sub station	2500 kVA

Table 3.2: List of machineries like forklift, loaders and cranes etc.

SN	Equipments	Capacity	Quantity
1	Load Reach Stacker	45 Ton	03
2	Empty Side Stacker		02
3	Forklift: Fuel Driven	10 Ton	02
4	Forklift: Fuel Driven	08 Ton	01
	Forklift: Fuel Driven	05 Ton	02
5	Forklift: Fuel Driven	03 Ton	03
6	Forklift: Battery Operated	03 Ton	02
7	Hydraulic Hand Trolley	03 Ton	04
8	Prime Mover with Chassis		20
9	Chassis Trailer		20

Infrastructural Facilities:

1. Whole area of 31.12 acre land is faced with 9ft height brick wall
2. A RCC bridge (18ft width) is built to make easy access of heavy truck, lorry, or Crane in the factory ground. 20 ft width road is prepared for the same purpose
3. An office & a residential shed are built for employees refreshment & accommodation
4. 30 feet height production shed is closed with brick & wall
5. A closed carbon black storage & steel wire storage for are built here
6. Washing center, prayer room are available here for all employees
7. 12 feet height oil storage shed, an ETP shed, a generator shed have been separately built here

3.1.2 Project Rationale

The cost to transport a 20 foot container by rail between Dhaka and Chittagong is BDT 13,500 per TEU. It must be said that these containers are usually carrying less cargo, around 9 to 10 ton. According to the “Due Diligence Report” 2014 carried out by Royal Haskoning DAV there are good potentials for a Container Terminal for the following reasons:

- Shippers (cargo owners): The shipper would need to pay only for the moves of cargo from their warehouses to the Dhaka ICD. This will cost approx. BDT 8,500 per TEU(US\$ 109) / It takes around 8 to 10 hours to reach the ICD Dhaka;

3.1.3 Outline of project objectives

The following outline have been followed to perform the study

- To assess the baseline environmental and social conditions in the project area (air-shed of 5km radius)

- To identify, evaluate and determine the significance of the potential environmental, social and occupational impacts due to the project activities during construction, operation and decommissioning phases
- To propose appropriate mitigation measures and monitoring plan to minimize adverse environmental, occupational and social impact as per the reference frameworks mentioned above

3.2 Project Site and Location

3.2.1 Description of the location of the proposed project, including location maps at appropriate scales

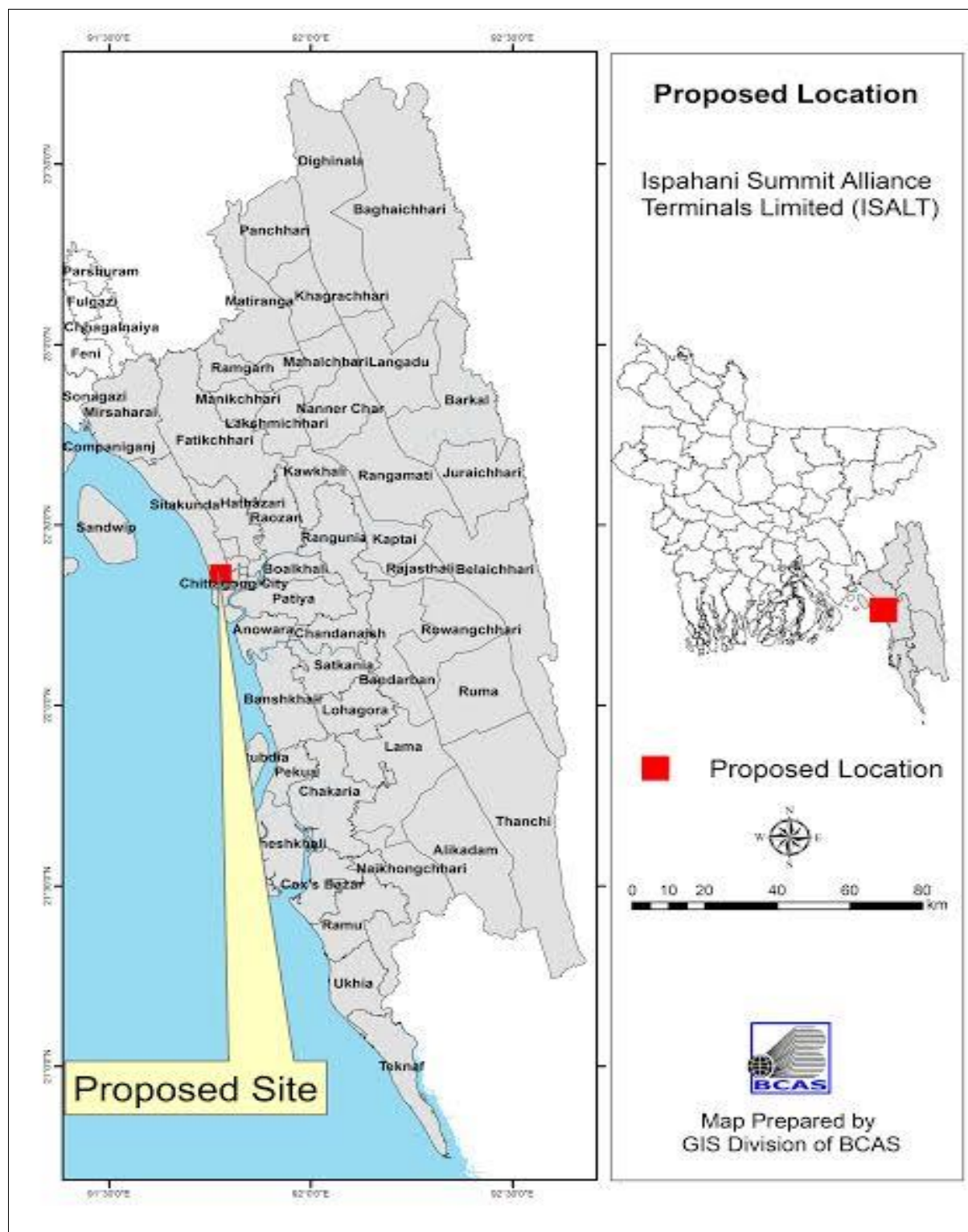
The proposed container terminal will be located on a 15.0 acre plot of land on Victoria Jut Mills adjacent to Sagorika BISCIC of Chittagong, the Holding No.-185/260, Dhaka Trunk Road, North Kattali, Pahartali, Chittagong. The satellite map of the project site is shown in Map 3.1; the GPS coordinates of the plot is:

Point	Latitude	Longitude
NW corner	22°21'54.26"N	91°46'31.88"E
SE Corner	22°21'55.84"N	91°46'39.50"E
NW Corner	22°21'47.35"N	91°46'40.98"E
NE Corner	22°21'45.94"N	91°46'34.06"E

The following Google image shows the location of the project site:



Map: 3.1: Location of ISATL with respect to Bangladesh



Map 3.2: Proposed project site in the district map

3.2.2 Proximity to nearby communities, designed environmentally sensitive areas and heritage sites.

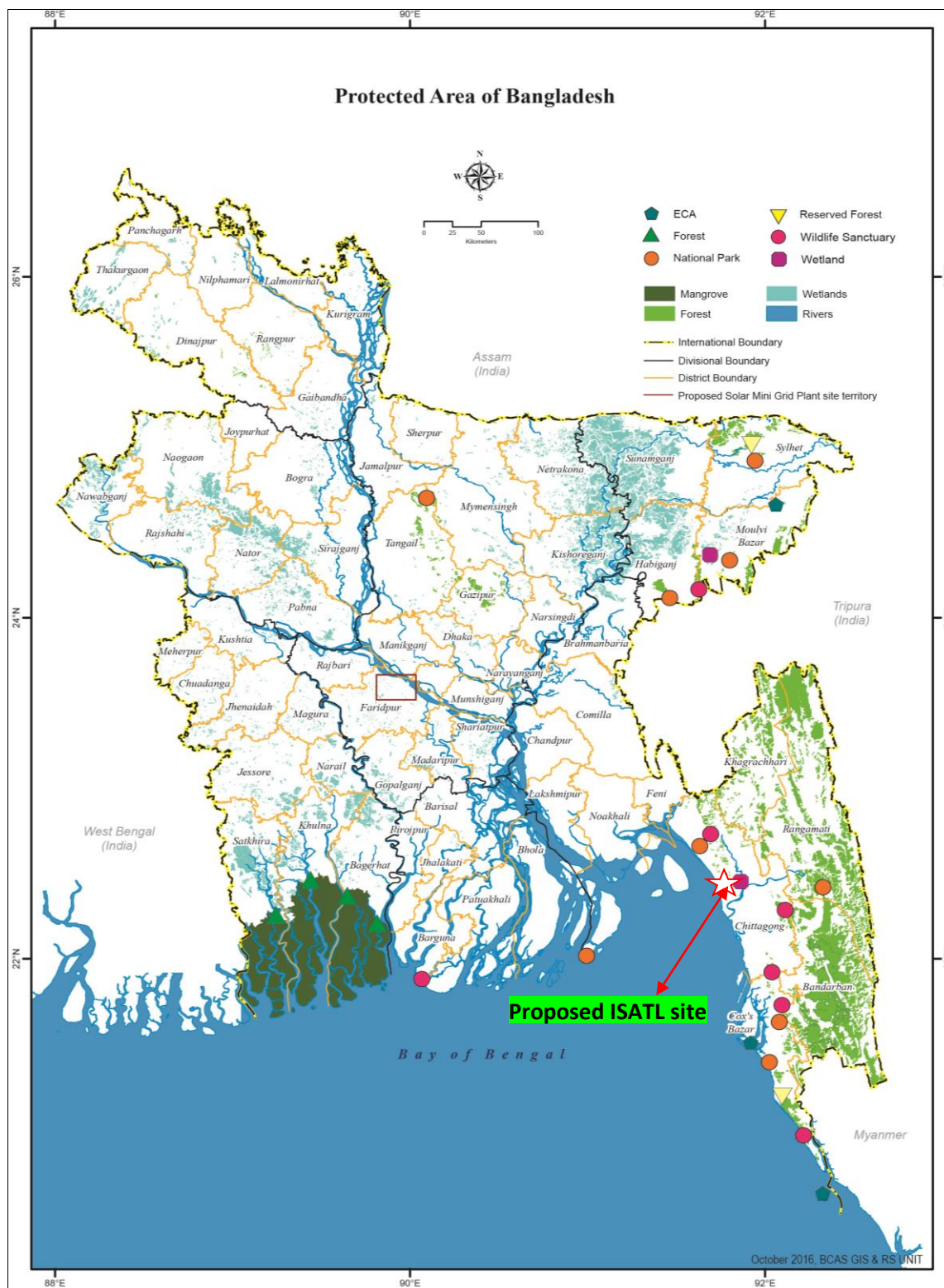
1. East side : Dhaka Chittagong High way N1, settlement
2. South side : Sagorika BISCIC area and a container Terminal
3. North side : Ispahani High School and Settlement
4. West Side : Settlement, social forestry and pond

In addition to these, different types of industries are present in this area and new industries are being set up. Among major industries, textiles mills, chemical factories, packaging factory, cold storages, and paper mill have been identified. Some pictorial views of the project site are given below:



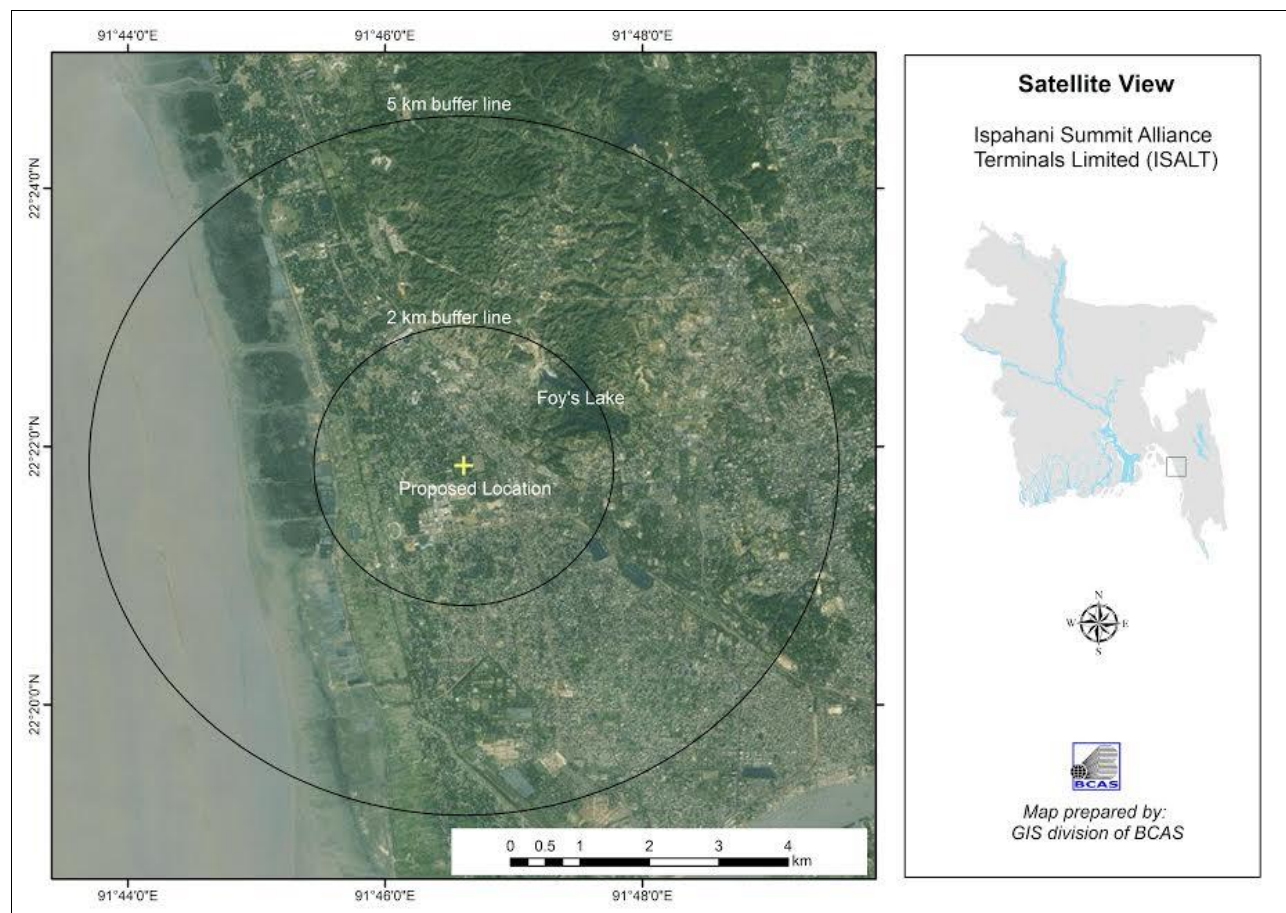
Photo 3.1 : Water body inside the Terminal





The Airshed of the project area

A 2km and 5 kilometer radius from the project as the centre has been considered as the air shed for the project. As shown in MAP 3.4.



Map 3.4: Air shed area of 2km and 5 kms radius and 1 Km radius of the project is showing in the satellite image

The 2 kilometer air shed has been considered to examine the social impact of the project and 5 kilometer air shed has considered for assessing the environmental impact due to the project.

Suitability of the site

While selecting a site for ISATL some aspects needed to be considered. In the following section, the site for ISATL is evaluated based on these aspects:

Site preparation of ISATL comprised of land filling and compaction in 15.0 acres of land prior to construction a 1m thick carpet of crushed stone has been spread in the container lay-down areas. The sand used for filling the land was procured through sand supply contractors who were authorized by the local DC. The permission states the areas where sand mining is allowed

from. All known underground services should be flagged up and all redundant services coming onto the site should be blanked off and removed.

3.2.3 Contour Map with level, existing drainage and so on

Topography of the Project Site

The topography of the project site was undertaken in 2016. The project site is a flat region with a constant height above the sea level which is approximately 7.0 m. as shown in Fig 3.1. The project site was raised by 1.5m ensuring that that level is above the highest flood levels as recorded in 1998. Fig.3.1 is shown the existing topography of this region.

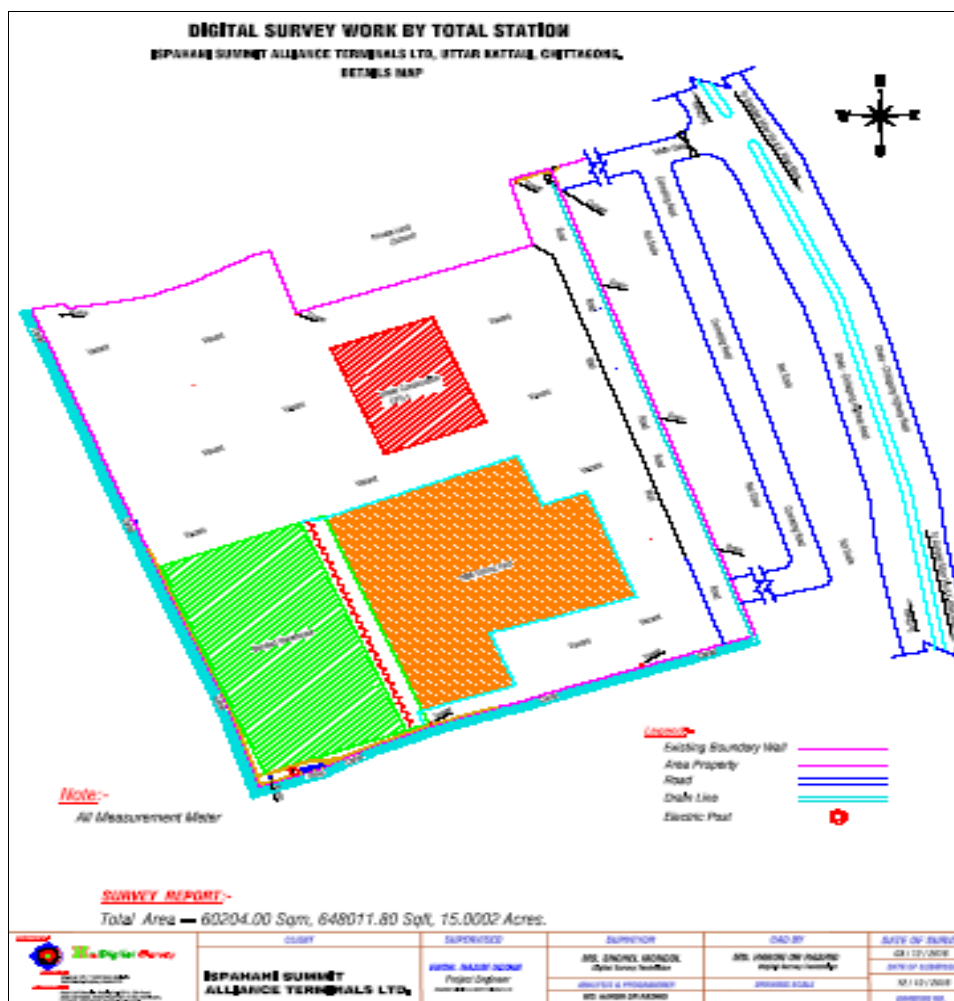


Figure 3.1: Contour Map with existing drainage system

3.2.4 Accessibility to the project site

Accessibility is an important parameter for ISATL. The project will involve movement of heavy vehicles through the roads and rivers. The site has been found to have satisfactory accessibility. A 5 meter wide link road has connected to the site with Dhaka –Chittagong highway.

3.3 Project Facilities and Design

3.3.1 Description of the project components

All kinds of Container Terminal design, regardless of the type of project, must be in accordance with the rules and regulations which have been established by the relevant BIWTA under the Ministry of Shipping. ISATL is committed to comply with all applicable national and international standards. Moreover, the ambient condition of the site is suitable for the proposed Container Depot project. This has been discussed in the site alternative section. Detail layout plan are shown in Fig.3.2

Project Layout Plan

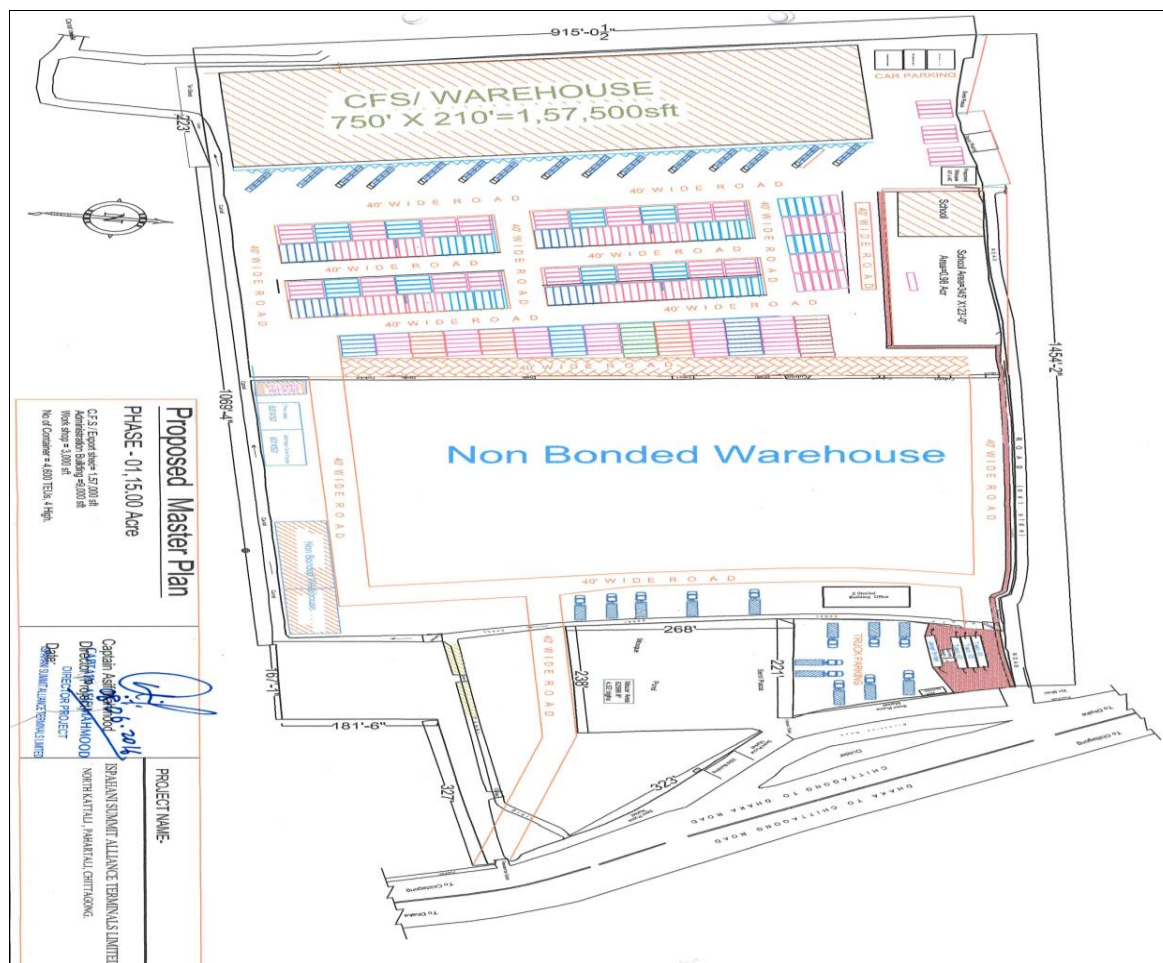


Figure 3.2: Master Layout Plan

The above project master layout described the architectural design and the infrastructure where will be setup. The drainage system, access road, container handling space, Reach stacker, Forklift, Truck, administrative building, custom house and ware bonded house etc.

Water supply

Water supply should be adequate to meet present and future project requirements. The supply may be available from a local municipal or privately owned system, or it may be necessary to utilize surface and sub-surface sources. To meet the required water demand, ISATL has already set up two deep tube-wells with a capacity of 2 cusec each and a water reservoir tank. The main uses of water is to provide cooling water for the diesel generator, washing the jetty, fire fighting and drinking water for workers, office staff and sanitation purposes. It is understood that no servicing of the container vessels will be carried out in the project site.

Storm water drainage system

All sewage drainage has been constructed having a length of 850 running meters. A septic tank is a long retention time tank where solids deposit out in an anaerobic bottom layer. The dimensions of the septic tank are 4.5m depth and 1.5 m in diameter which is sufficient to cater for the normal and incidental load arising from the container depot. The septic tank should be connected to a soak way by means of an overflow pipe whereby the liquid effluent can be drained.

The project activities will not generate any liquid effluent that can be harmful to the environment. Therefore, there will be no necessity of an Effluent Treatment Plant (ETP) for the project. There will be small quantities of spent fuel that will be generated during the maintenance of the equipment. Special care must be taken during maintenance so that no spent lubricating oil is spilled. The spent oil must be stored in secure containers and sold to outside contractors who are approved by the DOE. It is recommended that the surface water and foul drainage systems should be separate and should be designed in accordance with BS EN 752 Parts 1 to 4 "Drain and sewer systems outside buildings".



Photo 3.2: Storm water drainage system

Transportation

The access road is 750m long and 6.3 meters wide. The roads should be designed to be capable of carrying all the vehicles likely to be used during construction and throughout the life of the project including articulated vehicles and transporters used for the removal and replacement of major items of the project. Truck and Car parking should be of similar construction to the roads. The road pavements should be of reinforced concrete and in conformity with relevant British or equivalent Bangladesh National Code of Practice.

Access Road to the project

The access land for the access road has been prepared the ISATL Authority. Some salient features of the access road improvement are:

The elevation of the access road have been made 1 meter high

- Road lighting arrangement was done
- Road markings and signs have been provided in accordance with the requirements of the vehicle movement



Photo 3.3: Existing 5m wide and 400m long access road.

A typical diagram of the access road which will be used for the ISATL project purposes is seen in the above diagram

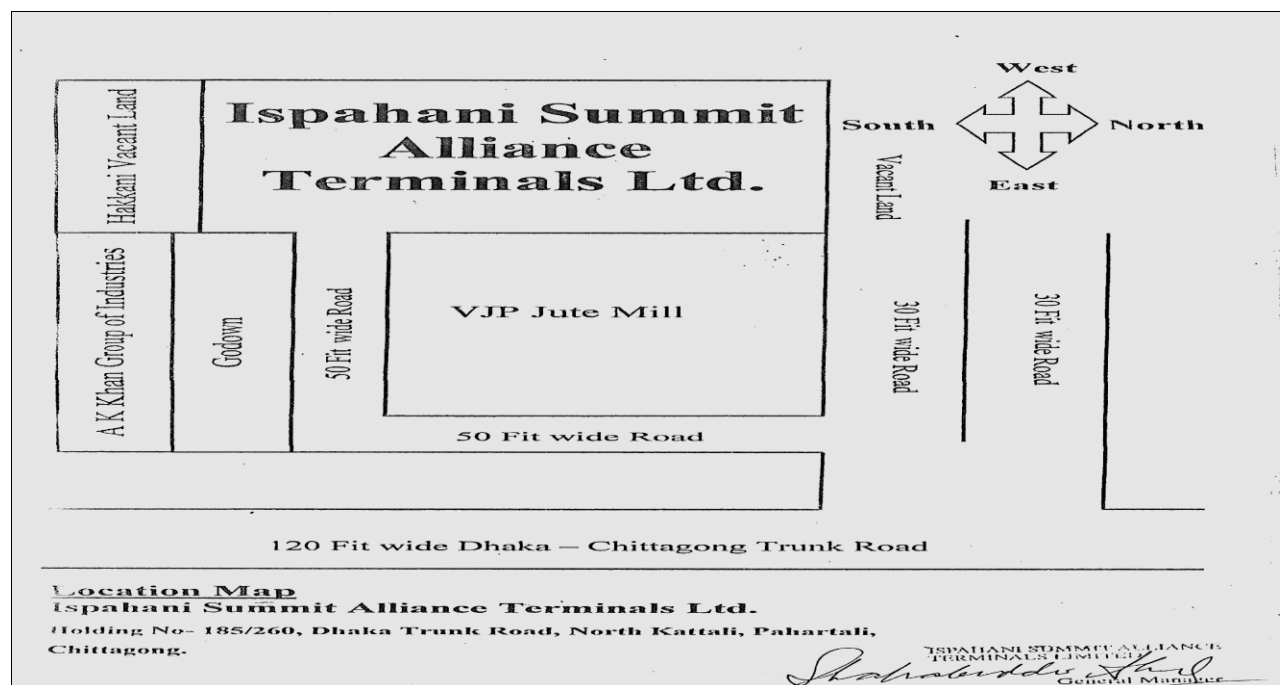


Figure 3.3: Layout of the access road

Technology and Major Components of the Project

A range of highly specialized machineries and tools will be used for the operation of the river terminal and container freight station (CFS). Reach Stackers, Forklifts, and other handling equipments. Container vessels will be used for transportation of containers between Dhaka and Chittagong.



Fig. 3.3.: Reach Stackers used for handling of containers

Reach Stackers are used for flexible handling of containers (Fig. 3.4) and are usually designed to lift containers as heavy as 45 metric tons into heights of six containers. Reach Stackers are able to transport a container over a short distance very quickly and pile those rows as required. Forklifts as shown in Fig. 3.4 are used to handle 20ft empty containers and for stuffing, unstuffing of palletize cargo, bales, bags, etc.

On recommendations of Seaport Innovations, ISATL has decided to procure FCCs from a company; other equipment and machineries (e.g., reach stacker, empty stacker) will be procured from a two companies named Kalmar and Fantuzzi. For barges/ vessels for carrying containers (see Fig. 3.4), ISATL has selected Ship broker Shipwright Bangladesh Limited; initially ISATL plans to procure four vessels.



Fig 3.4: Fork lifts

The following equipment will be used at the ICD during operational conditions. Table 3.2 includes the expected date of delivery of equipment.

Administration Buildings

The various buildings comprising the works should have a common architectural concept in order to unify the various elements and should be suitable for the operating and climatic conditions at site. The design should make selective use of materials to produce a pleasing concept throughout and a working environment, which is safe, durable and functional. The dimension of all the buildings should be such as to provide generous space for the safe installation and proper operation and maintenance of the port and its equipment. In particular generous space should be provided immediately in front of, behind and beside all items of the port. In all rooms or buildings housing switchgear, a clear working space should be provided around switchboards of at least 1.0 m behind and in front of the fully withdrawn trucks.

It is recommend that the floors should be constructed in reinforced concrete and designed to accommodate all foreseeable static and dynamic loads. They should be provided with surface finish appropriate for their intended usage and properly drained bounded areas should be provided wherever necessary to contain accidental spillage of oil or other harmful liquids. The design of all buildings must ensure that noise, vibration and temperature levels are within permissible limit.

Sub-station

The substation will be installed with 2500 KVA transformers with high voltage and low voltage circuit breakers. The transformer compounds should be constructed with oil containment facilities. Compounds should each be provided with suitable fencing and a lockable access gate. Fences to transformer compounds and other electrical areas within the

site boundary should be of 5 m minimum height. The containment tank should be fitted with a suitable overflow system, air vents, access hatches, ladders, a sump and a means of emptying the tank.

Site Fencing

A security fence has been built around the permanent boundary of the site which is 5m high above the site formation level and 850m in length. The main gate has been fabricated from galvanized steel.



Photo 3.5: Boundary wall

BASELINE ENVIRONMENTAL CONDITION

4.1 Topography, Geology and Soils

General Consideration

Base line information of existing environment is essential to take decision regarding lay out, mitigation measures and plant operation process. Information was gathered on the existing physical environment including meteorology, geology, topography, soils, hydrology and drainage, surface water quality, air quality and noise levels.

Physical Environment

The proposed Container Terminal is located on a 15.0 acre plot of land in Victoria Jute Mills of Ispahani group. At present, the project site is mostly vacant; there is a tin-shed office building on the southern side of the project and recently constructed drainage channels runs through the project site along north-south direction. A relatively narrow approach road (about 5m wide) connects the project site with the Dhaka Chittagong roads (Area of the project site is known as Victoria Jute Mills).

4.1.2 Topography

Chittagong city has a unique topography and is well known for the panoramic view of its hilly landscape. This is the only mega city of the county having wide variety of morphological features, the spectacular undulating hill topography in one side and the low lying coastal mud flats on the other side. It is not the urban planners; rather it is the natural process that has given the city morphology in to its present shape. The Karnafully River in the east, the Bay of Bengal in the West and the Tertiary hill landscape in the North are three major determinants for origin, development, and horizontal and vertical expansion of the city. A total of eight geomorphic units have been identified, which are Tertiary hills, piedmont and valleys, alluvial plain, ancient point bar, tidal mud plain, supra tidal plain, natural levee and sandy beach. The soil is made up of 93% loamy mainly with non-calcareous alluvium and non-calcareous flood plain soil. The remaining 7% has clayey texture.

The project area is near Sagorika BISCIC area which is ancient point bar in terms of land form. The land use pattern and landform in Chittagong City is given in the following **Table 4.1**

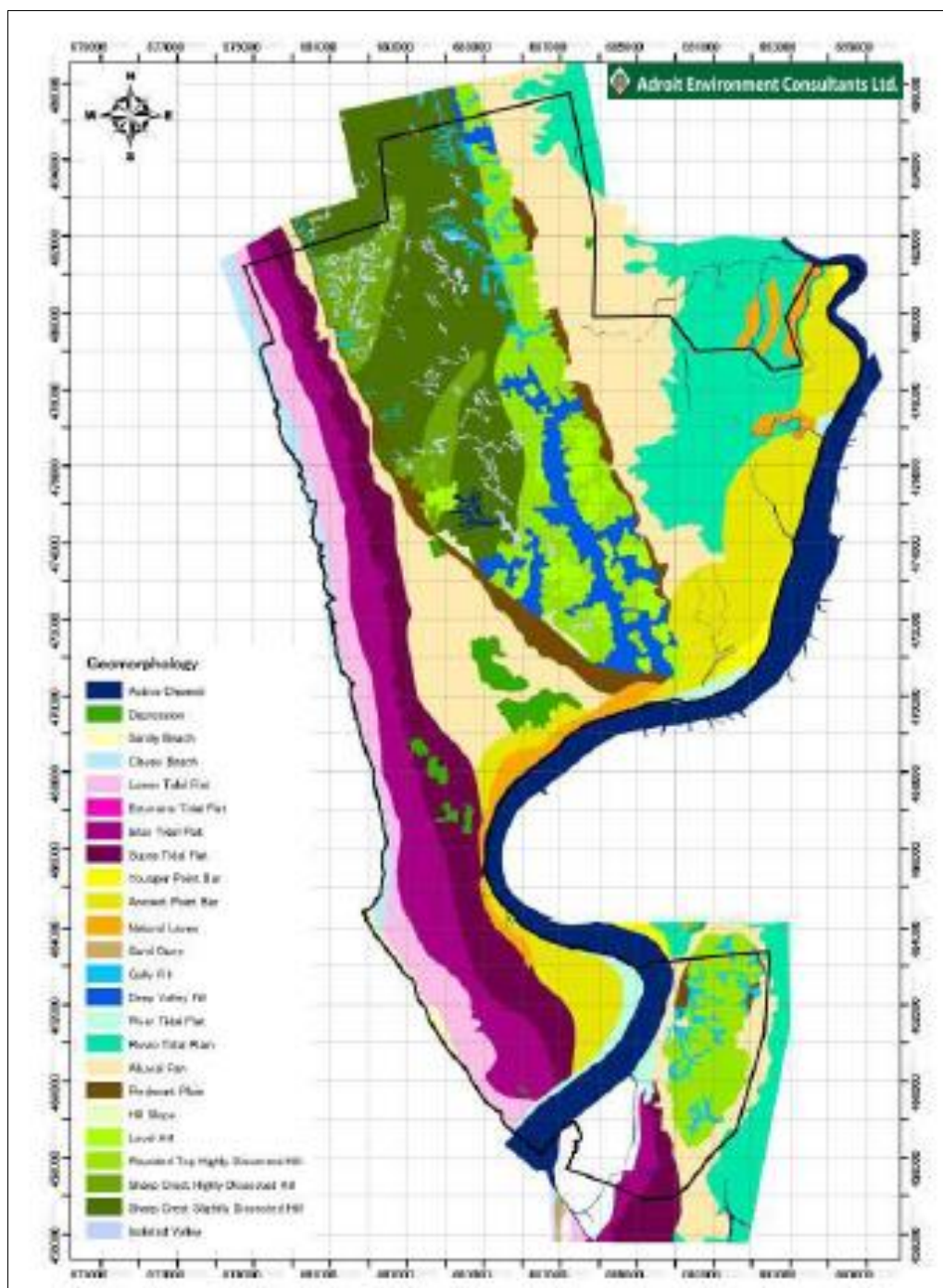
Table 4.1: Interrelation between Land use and Landform in Chittagong City

Landforms	Major Land uses
1. Hill	High Class Residential Area, Vegetation Coverage, Vacant Land, Government Buildings
2. Piedmont	Middle Class Residential Area, Roads & High Ways, Commercial Area, Industrial Area, Administrative Uses, Slums and Squatters, Educational Institutes, Religious Places, Park and Playground etc.
3. Alluvial Plain	Agricultural Uses Middle Class, Residential Area, Agrabad Commercial Area, Industrial Area, Administrative Uses
4. Ancient Point Bar	Agriculture, Mixed Residential Area, Industrial, EPZ Airport and Commercial Activities.
5. Supra Tidal Plain	Agriculture Area, Low Income, Residential
6. Tidal Mud Plain	Vacant, Mangrove forest, Shrimp farms
7. Natural Levee	Port Activities, Navy office and residents, Mixed Residential use
8. Sandy Beach	Recreational (Tourism), Vacant Land

(Source: Department of Geography and Environment, University of Dhaka)

The river Karnafully with its strong tidal behaviour has been playing a major role to determine the land-ocean interface in city morphology. Except the hilly, valley and piedmont areas, remaining of the city is generally a plain land. The project area is located near to the Bay of Bengal which contains the inter fingering of sand and silt-clay layers. The type of landform of west Bay of Bengal is recent alluvial, point bar and tidal deposits and abandoned channel and depression. The Physiographic Map of Bangladesh, Digital Elevation Model of Bangladesh & Geomorphic map of Chittagong is shown in *Map- 4.1, Map- 4.2 & Map- 4.3* respectively.





Map 4.3: Geomorphic Map of Chittagong (Source: CDMP)

Geological cross section

Physiographically the project area occupied within Bay of Bengal tidal floodplain and the western part of Trough of Bengal Fore deep. It has low relief compared with Ganges river flood plain. Soils are described in terms of general soil type. A general soil type is a group of soil, which is broadly similar in appearance and characteristics because they have been developed in response to similar environmental factors such as climate, physiography and drainage. In the study region the soil is general type 5b Non-calcareous Floodplain unit (seasonally saline). These are seasonal flooded soils, which have either dominantly dark grey pressure faces and calcareous within 125 cm from surface. The soil of study area in many cases is moderately acidic to neutral with some areas with moderately alkaline. A recent surface geology study of Chittagong area shows that the surface geology of the area consists of "csd" and "ava" types of formation, which stands for beach and dune sand formation and valley alluvium and colluvium. The following figure 4.4 shows the Geographical cross section of the project site.

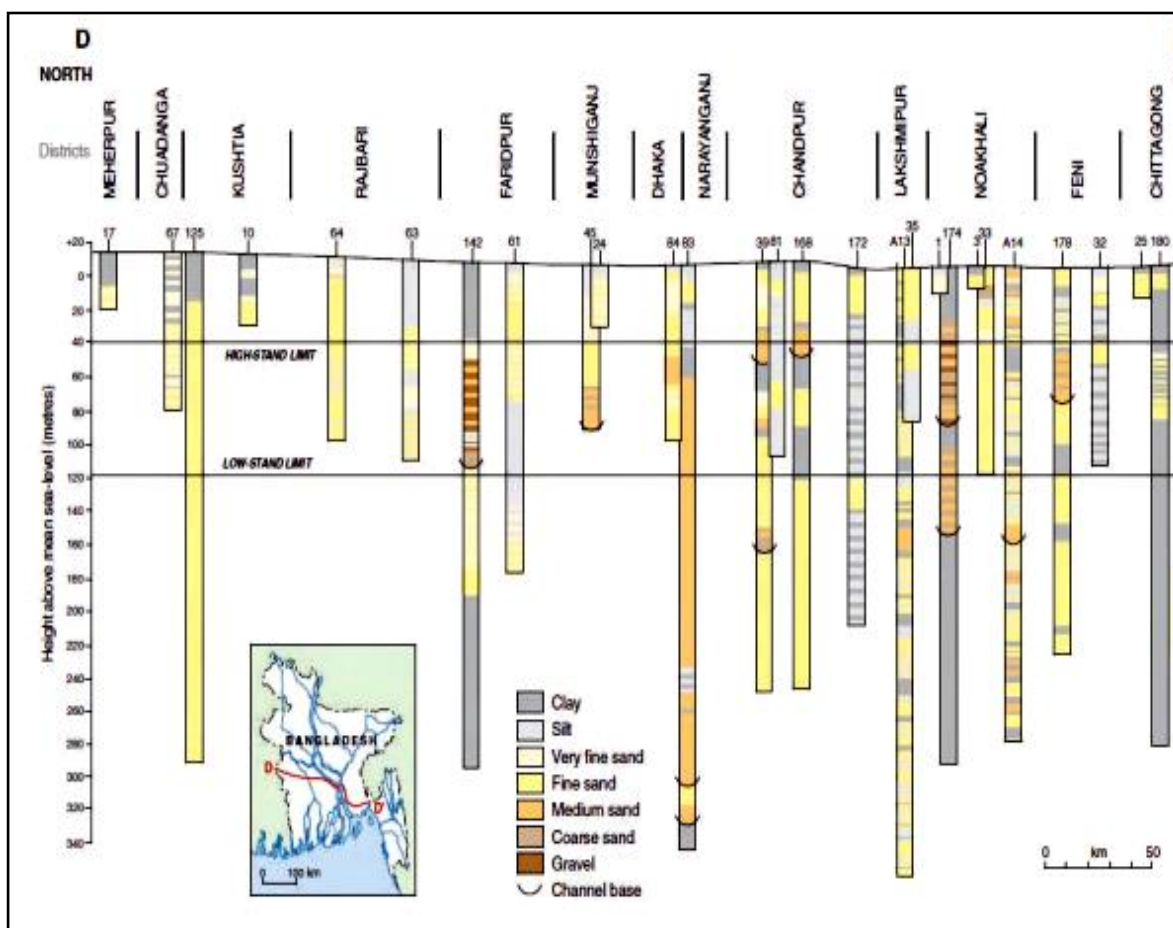


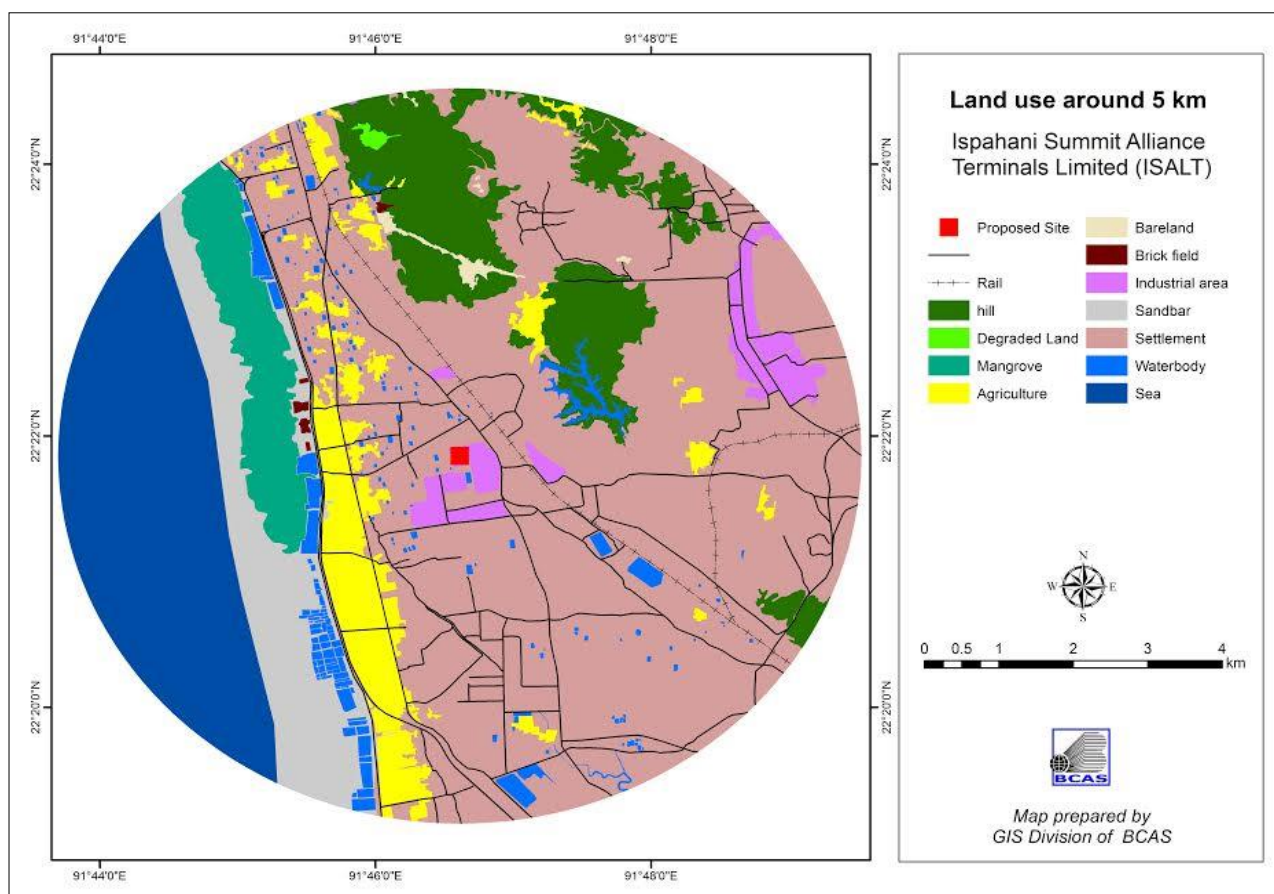
Figure 4.1: Geological Cross-section

4.2: Ambient Landuse

The project area has agricultural cultivable land 23%. There are two main crops grown in a year depending on the water availability. Irrigation water is taken from the Bay of Bengal, surface water and nearby water bodies. Paddy (aus, aman and boro rice), potato and vegetables are the main crops. A small amount belongs to fallow land in the surveyed area which is left unutilized. There is no mineral or forest coverage reserve in the close vicinity of plant site.

Settlement Area

Settlement area occupies 65% of the surveyed area and consists of homesteads and vegetation with local, indigenous fruit bearing trees. Some exotic species and medicinal plants could also be observed during the survey process. Various occupation groups comprising day labourers, business men, service holders, rickshaw/van pullers, transport workers live in the area. A major settlement enclave has been developed in the north-eastern part of the project area with easy access to the town. The settlement area is overwhelmingly covered with various species of fruit and other trees. Each homestead is associated with a kitchen garden where seasonal vegetables and spices are grown for domestic consumption.



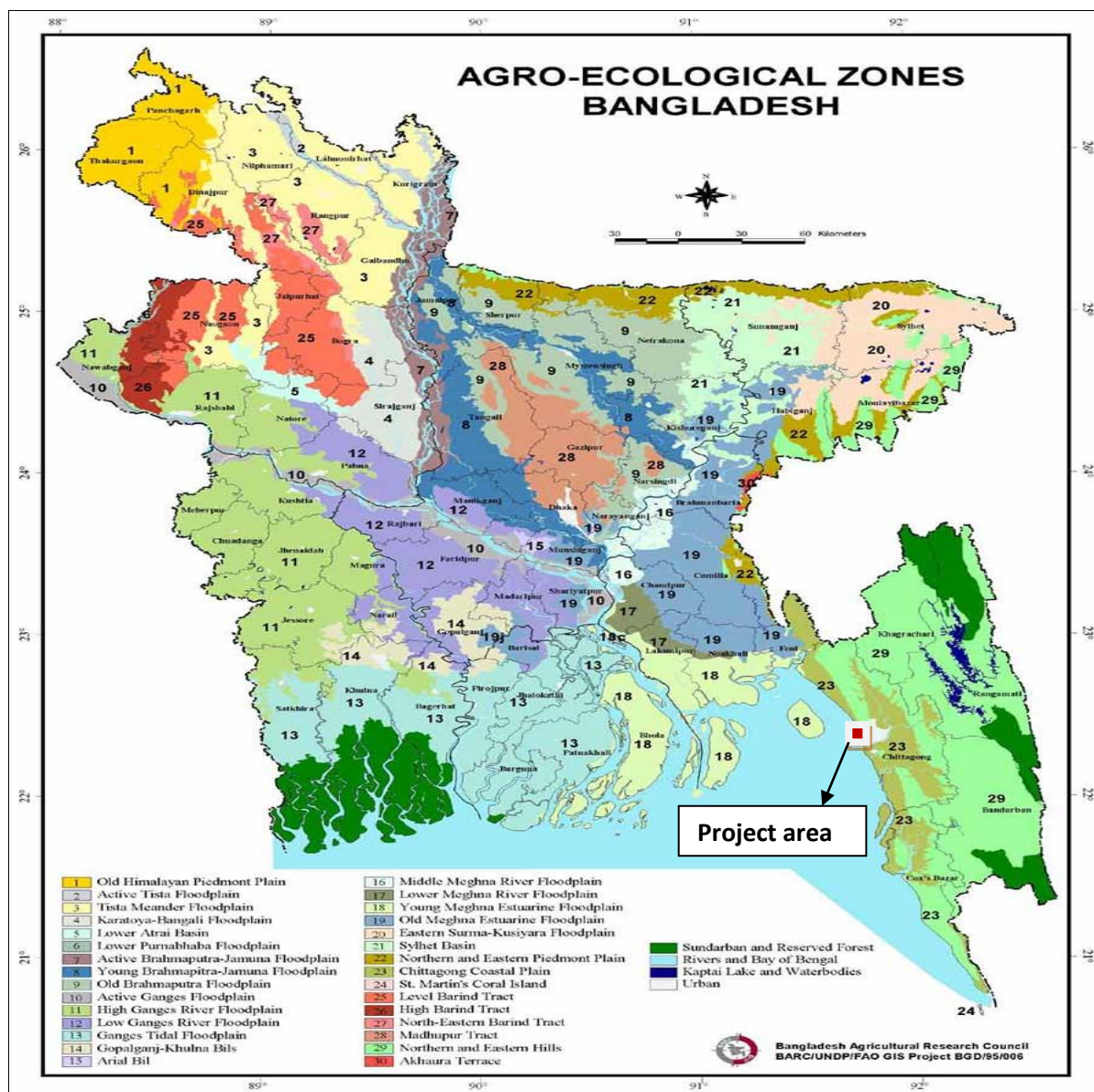
Map 4.4: Landuse map over 5 km areas

Housing

Majority of housing in this area is of pacca, semi-pacca, semi-permanent building i.e. walls made of 5 inch brick works and corrugated iron roof. The homestead areas are relatively medium.



Map 4.5: Google image described the project surrounding



Map 4.6: Agro-ecological zone of Bangladesh

4.3: Terrestrial Flora

4.3.1 List of available trees, herbs, shrubs at project area

Flora: Almost the whole of Chittagong district lies on the meander flood plain. Most of this area is now flooded only by rain water. Only minor areas near the Bay of Bengal 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 topsoil, Top soils are acid when dry, but slightly alkaline when flooded; subsoil are moderately

alkaline, but non-calcareous. In the Chittagong district there are extensive deep basins which have dark grey compact clays with moderately alkaline sub soils usually overlying a yellowish, loamier substratum. Flooding depths are mainly less than 5 feet in the east but increases to 10 feet in west.

Moisture is retained well in the dry season except where the soils overlie sand at a shallow depth, as frequently happen in the northern half of Chittagong district. Where they are deep, these are excellent soils, producing good crops of jute, aus, transplanted and broadcast aman as well as rabi crops in some areas. Around the ancient town of Chittagong, man-made soil platforms have been raised on which intensive cropping is practiced. On the highest platforms, banana, betel leaf, sugarcane and vegetables are major crops, together with aus, jute and transplanted aman. On lower platforms the latter are major crops in the monsoon season and vegetables in the dry season. Among rice crops boro covers the largest area followed by aman and aus. Other crops include wheat, potato, pulses, sweet potato, spices, cheena, kaun etc.

The groves that surround the village homesteads represent various types of commonly planted trees.

List of available trees

Sl.No	Local Name	Scientific name
1.	Mango	<i>Mangifera indica</i>
2.	Jackfruit	<i>Artocarpus/ heterophyllus</i>
3.	kalojam	<i>Syzygium cumini</i>
4.	betelnut pulm	<i>Areca catechu</i>
5.	coconut palm	<i>cocos nucifera</i>
6.	guava	<i>Psidium guajava</i>
7.	jambura	<i>Citrus decumana</i>
8.	mandar	<i>Erythrina veriegata</i>
9.	kadam	<i>Anthocephalus cadamba</i>
10.	sheel koroy	<i>Albizzia procera</i>
11.	sajna	<i>Moringa obifera</i>
12.	dalim	<i>Punica granatum</i>
13.	palash	<i>Butea monosperma</i>

Refer to IUCN red list

List of common way side trees

Sl No	Local Name	Scientific name
1	tetul	<i>Tamaraindus indica</i>
2	neem	<i>Azadirachta indica</i>
3	hijol	<i>Barringtonia acutangula</i>
4	banyan	<i>Ficus bengalensis</i>
5	ashatha	<i>Ficus religlosa</i>
6	raintree	<i>Samanca saman</i>
7	pitraj	<i>Aphanamixls polystachia</i>
8	simul	<i>Bobbax ceiba</i>
10	krishnachura	<i>Delonix regia</i>
11	debbaru	<i>Polyalathia longifolia</i>

Refer to IUCN red list



Photo 4.1: Terrestrial flora (**tree**) closed to the project site

Terrestrial Flora

In addition to the aquatic macrophysics mentioned earlier, there are few natural types of vegetation listed below:

Sl. No.	Local Name	Scientific Name
1.	Dubla gash	<i>Cynodon dactylon</i>
2.	Hargoza	<i>Acanthus illicifolius</i>
3.	Telakachu	<i>Coccinea cordifolia</i>
4.	Bet	<i>Calamus sp</i>
5.	Akanda	<i>Calotropis procera</i>
6.	Nishinda	<i>Vitex negundo</i>
7.	Tulshi	<i>Ocimum canum</i>
8.	Venna	<i>Ricinus communes</i>
9.	Babla	<i>Acacia nilotica</i>
10.	Dumur	<i>Ficus sp</i>
11.	Gab	<i>Diospyros peregrina</i>

Besides, various herbs, shrubs and thickets along with some climbers and twiners are seen in the village homesteads of this district. Few epiphytes and parasites on the large trees are not uncommon. People with aesthetic values grow some flower plants at their homestead. Terrestrial flora(Herb) are shown in the following photos



Photo 4.2 and 4.3: Terrestrial flora (**herb**) close to the project site

While most of the aquatic plant species of the Project area is subject to seasonal water level fluctuations, the abundance of wetlands supports a wide variety of aquatic biota. The common aquatic plants are listed below:

Aquatic flora in the project area

Sl. No.	Local Name	Scientific Name
1.	Helencha	<i>Enhydro fluctuans</i>
2.	Kalmi	<i>Ipomoea aquatica</i>
3.	Dhol Kalmi	<i>Ipomoea fistulosa</i>
4.	Kochuripana	<i>Eichorina crassipes</i>
5.	Shapla	<i>Nymphaea nouchali</i>
6.	Duckweed	<i>Spiredella sp.</i>
7.	Khudi pana	<i>Lemna minor</i>
8.	Topa pana	<i>Pistia stratiotes</i>
9.	Hogla	<i>Typha angustata</i>
10	kachuripana	<i>Telanthra philoxeroides</i>
11	topa pana	<i>Pistiastratiotes lemna spirodela</i>
12	khudipana	<i>Lemna paucicastata</i>
13	paniphal	<i>Trapa bispinosa</i>

4.4: Terrestrial Fauna

List of endangered Fish Species in the Study Area

Family	Species	English Name	Local Name
Stromateidae	Pampus Chinensis	Chinese Pomfret	Rup chanda
Trichiuridae	Lepturacanthus savala	Hairtail	Chhuri mach
Sparidae	Argyrops spinifer	Long spine sea	Lal datina
Harpadontidae	Harpadon nehereus	Bream	Loittya mach
Centropomidae	Lates calcarifer	Bambay duck	Bhetki/koral
Ariidae	Arius sp.	Gaint sea perch	Mach
Bagridae	Mystus gulio	Cat fish	Kata mach
Sciaenidae	Johnius argentatus	Bagrid catfish	Nuna tengra
Stromateidae	Pampus argenteus	Silver pennah	Lalpoa
Sciaenidae	Protonibea	Croaker	Foli chanda
Pangasidae	diacanthus	Silver pomfet	Kala poa
Palaemonidae	Pangasius pangasius	Spotted croaker	Pangas
	Macrobrachium Rosenbergii	Fatty catfish	Golda chingri
		Gaint river prawn	
Penaeidae	Penaeus monodon	Giant tiger prawn	Bagda chingri
Carangidae	Parastromateus niger	Black pomfret	Hail chanda

4.5 Aquatic Ecology

- Fish species, mammals, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area and any associated wetlands

Aquatic Fauna

Fish is the most important aquatic fauna of the Project area, along with other groups. The aquatic fauna includes Prawns (*Macrobrachium* spp.) crabs, snails etc. are listed in bellow:

Aquatic Fauna and aquatic birds

Sl. No.	Local Name	Scientific Name
1.	Kolabang	<i>Rana tigrina</i>
2.	Guishap	<i>Varanus bengalensis</i>
3.	Matia sap	<i>Enhydris enhydris</i>
Aquatic birds		
1.	Pancowri	<i>Phalacrocorax carto</i>
2.	Kanibok	<i>Ardeola grayii</i>
3.	Sadabok	<i>Egretta garzetta</i>
4.	Borobok	<i>Egretta alba</i>
5.	Machranga	<i>Halcyon pileata</i>
6.	Dahuk	<i>Gallicrex cinerea</i>
7.	Kadakhosa	<i>Gallinago stenura</i>
8.	Balimash	<i>Dendrocygna javanica</i>
9.	Chakha	<i>Tadorna ferruginea</i>

Terrestrial Fauna

Wild mammals are relatively scarce in the Project area. The available amphibians are listed in below:

Showing the Terrestrial Fauna

Sl. No.	Local Name	Scientific Name
1.	Toad	<i>Bufo melanostictus</i>
2.	Bull frog	<i>Rana tigrina</i>
Common reptiles		
1	Wall lizard	<i>Hemidactylus flaviviridis</i>
2	Roofed turtle	<i>Kachuga tecta</i>
3	Spotted tortoise	<i>Lissemys punctata</i>
4	Gharia	<i>Gavialis gangeticus</i>
5	Water snake	<i>Enhydris enhydris</i>
6	Dora sap	<i>Xenochrophis piscator</i>
7	Darajgap	<i>Ptyas mucosus</i>
Aquatic birds/ common arboreal/ terrestrial birds		
1	Back kite	<i>Milvus migrants</i>
2	Black Wing kite	<i>Elanus caeruleus</i>

3	Kestrel	<i>Falco tinnunculus</i>
4	Ring dove	<i>Streptoplia decaocto</i>
5	Magpie robin	<i>Copsychus saularies</i>
6	Red-vented bulbul	<i>Pycnonotus jacosus</i>
7	House crow	<i>Corvus splendens</i>
8	House sparrow	<i>Passer domestica</i>
9	doel	<i>Copsychus saularis</i>



Photo 4.3: Common aquatic birds

Reptiles and Amphibians: Some known reptiles of this district are listed below:

Sl. No.	Local Name	Scientific Name
1	ganges soft shell	<i>Trionyx gangeticus</i>
2	common roofed turtle	<i>Kachuga tecta</i>
3	shanda	<i>Gekko gekko</i>
4	yellow turtle	<i>Morenia petersi</i>
5	house lizard	<i>hemidactylus brooki</i>
6	ghargini shap	<i>Lycodon jara</i>
7	rat snake	<i>Ptyas nigromarginatus</i>
8	paina shap	<i>Enhydriis enhydriis</i>
9	banded krait	<i>Bungarus fasciatus</i>
10	common cobra	<i>Naja naja</i>
Common amphibians		
11	bull frog	<i>Rana tigrina</i>
12	skipper frog	<i>Rana cyanophlyctis</i>
13	cricket frog	<i>Rana limnocharis</i>
14	Common toad	<i>Bufo elanostictus</i>

Refer to IUCN red list

Common mamal

Sl. No.	Local Name	Scientific Name
1	Indian pipistrelle	<i>Pipistrellus coromandra</i>
2	tickell's bat	<i>hesperotenus ticklli</i>
3	jackal or shial	<i>Asiatic jackal</i>
4	benji	<i>Herpestes auropunctatus</i>

5	dura kathbiral	<i>Funambulus pennanti</i>
6	rat	<i>Bandicata bengalensis</i>
7	house mouse	<i>Mus musculus</i>
8	metho indur	<i>Mus booduga</i>
9	ud biral	<i>Aonyxe cinerea</i>

Common birds

Sl. No.	Local Name	Scientific Name
1	House sparrow	<i>Passer domestica</i>
2	doel	<i>Copsychus saularis</i>
3	bhat shalik	<i>Acredotheres tristis</i>
4	tila ghugu	<i>Streptopelia chinensis</i>
5	tia	<i>Psillacula Krameri</i>
6	babui	<i>ploceus philippinus</i>
7	sparrow or charui	<i>Domesticus</i>
8	house crow	<i>Corvus splendens</i>
9	brahmny kite	<i>Haliaster indus</i>
10	cacatua	<i>greater sulphur crested</i>
11	machhranga	<i>Alcedo atthis</i>
12	pond heron	<i>Ardeola grayii</i>
13	little cormorant	<i>Phalacrocorac niger</i>
14	cuckoo	<i>Cuculus microplerus)</i>
15	kali pencha	<i>Glaucidium radiatum</i>
16	choto finge	<i>Dicrurus macrocercus</i>
17	haldey pakhi	<i>Oriolus xanthornus</i>
18	laxmi pencha	<i>Tyto alba</i>
19	water rail	<i>Rallus aquaticus</i>
20	leser whistling teal	<i>Dendrocygna javanica</i>
21	dahuk	<i>Amaurorinis phoenicurus</i>
22	spotted munia	<i>Lonchura punctulata</i>
23	kath thokra	<i>Picus myrmecophoneus</i>

Refer to IUCN red list



Photo 4.4: Some common birds in the vicinity of the project site

The flora fauna in the project area have been compared with IUCN Red List and none of the species are found to be extinct or threatened. FGDs and KIIs have been used to evaluate the flora fauna apart from visual observation.

Fishes

Fish is still reasonably available in the area as it is a part of coastal area in Bangladesh. Sea fish is available in this area. Among reptiles, narrow headed soft-shell turtle deserves special mention. Among birds, Bok, Salik, Finge, Machranga etc. deserve special mention. The fishes include Pomfrets (Rup chanda, Foli chanda and Hail Chanda), prawns (Golda Chingri, Bangda Chingri), catfishes (Katamachh, Nuna Tengra), other (Churi Mach, Koral/Bhetki Mach, Loitya Macch).

Wildlife and Reptile

The common types of reptiles are found in the area, water snake, house lizard, soft-shell, turtle etc.

Birds

A number of those are including common kingfishers, House crow, House sparrow, little fern etc.

4.6 Meteorological Condition

Climate

The climate of this region is tropical, with monsoons, characterized by a change of four seasons: pre-monsoon (March to May), monsoon (June to September), post-monsoon (October to November) and dry season (December to February). Typical parameters of the weather elements, as recorded for the period of last few years of observations (2006-2015) at Chittagong Meteorological Station are presented in Table 4.1 to 4.5 below.

4.6.1 Rainfall

The annual rainfall is about 2000mm and approximately 80% of it occurs during the monsoon. Average monthly rainfall during monsoon period varies between 300mm to 450mm. Maximum daily rainfalls during this period recorded in September 2010 is 668 mm.

The rainfall follows the general climate pattern with the highest rainfall in the summer month of June to September and minimum rainfall in the cooler and drier months of November to March. Table 4.1 presents average monthly rainfall for the period of last 67 years (1953-2009), average number of rainy days per month and average number of days per month when rainfall is greater than 10 mm. It is evident that extreme rainfall events occurred during the monsoon (June-September). Average monthly rainfall values for Chittagong area since 2006 are presented in Table -4.1.

Table - 4.2 Monthly Average Rainfall in the project area (2015- 2006)

Year	Rainfall in mm											
	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
2015	10	1	37	269	137	175	226	361	513	412	2	0
2014	0	0	20	123	235	314	356	409	207	112	0	0
2013	0	48	22	37	177	308	167	340	169	174	0	81
2012	1	1	43	14	168	170	676	482	298	74	4	0
2011	23	56	45	91	205	577	563	319	279	227	0	0
2010	0	30	11	163	185	668	753	505	179	320	111	0
2009	0	0	0	181	185	326	331	167	663	61	5	0
2008	1	3	155	91	291	259	542	361	514	417	3	0
2007	0	0	9	167	162	476	295	191	839	208	0	0
2006	0	25	96	123	140	473	191	202	264	134	0	45

Source: BMD

4.6.2 Ambient Air Temperature

In the summer months April to September the temperature of the country varies with the amount of rainfall. During the monsoon period the temperature drops compared to the temperature between March-June. In general the winter season coincide with the period of lowest rainfall. Table 4.3 - Table 4.5 respectively shows the monthly average maximum and minimum temperature at Chittagong for the period 2006 -2015. (till March). During this period maximum e temperature of 39.6 degree Celsius was observed in April, 2009 where average minimum temperature was 8.2 degree Celsius in January, 2011. Rainfall pattern in the project area likely to be more or less similar that of Chittagong.

Table - 4.3 Monthly Ambient Temperature of the Project Area in 2015, 2014 and 2013

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	22.4	24.5	14.1
Feb	24.45	29.1	18.3
March	24.55	32.2	22.4
April	26.43	34.4	24.1
May	24.44	33.2	24.2
June	25.43	33.4	26.8
July	23.45	31.4	25.8
Aug	24.33	32	26.6
Sep	25.40	32.7	26
Oct	23.45	30.5	24.3
Nov	18.12	29	19.8
Dec	19.55	27	15.6

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.32	25.3	13.4
Feb	23.4	31.2	19.4
March	23.23	33.2	21.9
April	19.32	33.7	23.8
May	26.34	33.7	24.9
June	26.43	32.3	26.1
July	23.33	32.3	26.6
Aug	32.43	32.5	26.5
Sep	26.43	31.9	25.8
Oct	24.30	32.2	24.6
Nov	23.44	29.6	19.9
Dec	53.44	26.8	15.8

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.34	23.5	14
Feb	21.20	28.2	15.9
March	26.02	32.7	22.4
April	25.23	32.5	23.8
May	25.34	35.1	26.3
June	23.50	32.2	25
July	23.44	31.5	25.4
Aug	22.22	32.2	26.5
Sep	24.22	30.4	25.5
Oct	24.32	30.9	23.3
Nov	25.15	29.4	18.6
Dec	15.5	26.9	16.2

Table - 4.4 Monthly Ambient Temperature of the Project Area in 2012, 2011 and 2010

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.6	28.8	9.6
Feb	19.2	30.8	12.6
March	23.2	36.7	15.0
April	26.7	35.9	18.1
May	29.3	37.5	22.3
June	28.5	35.9	22.0
July	28.5	34.8	23.4
Aug	29.3	35.9	24.2
Sep	28.3	34.9	24.5
Oct	26.8	35.6	19.5
Nov	23.1	31.8	16.8
Dec	17.4	28.2	11.3

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	16.7	29.0	10.5
Feb	18.0	30.6	10.8
March	24.3	34.6	16.5
April	27.0	36.9	19.6
May	27.9	36.7	20.3
June	28.4	35.4	22.5
July	28.8	34.0	24.6
Aug	28.6	36.0	23.6
Sep	28.7	34.8	24.4
Oct	26.3	34.8	18.0
Nov	22.1	32.3	16.3
Dec	19.1	29.0	13.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	17.0	28.1	11.1
Feb	20.4	33.9	12.2
March	23.9	36.0	15.8
April	27.2	39.6	20.4
May	27.6	37.8	21.6
June	29.8	36.5	22.6
July	29.6	35.7	24.4
Aug	28.9	34.3	24.3
Sep	29.3	35.3	24.5
Oct	26.5	35.8	20.6
Nov	22.2	33.9	15.2
Dec	17.3	29.0	11.4

Table 4.5 Monthly Ambient Temperature of the Project Area in 2009, 2008 and 2007(Source: BMD)

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	14.5	29.0	9.6
Feb	19.8	34.2	12.0
March	25.6	37.3	18.4
April	28.3	37.9	20.8
May	28.8	36.9	21.3
June	28.8	35.8	23.2
July	29.6	35.1	25.3
Aug	29.5	35.1	25.0
Sep	28.8	34.0	24.8
Oct	26.9	35.7	21.5
Nov	23.1	33.2	16.6
Dec	17.8	29.7	11.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	14.2	27.8	8.2
Feb	19.8	31.0	13.0
March	24.0	34.5	16.0
April	26.4	35.8	20.2
May	27.6	35.3	21.3
June	29.1	36.0	23.2
July	29.2	35.4	23.9
Aug	29.0	35	24.5
Sep	29.0	36.2	23.7
Oct	27.4	34.5	22.0
Nov	21.9	32.4	17.2
Dec	16.8	30.0	11.0

Month	Mean temp (°C)	Max temp (°C)	Min temp (°C)
Jan	15.5	28.5	10.5
Feb	19.2	33.0	12.2
March	23.4	37.3	18.3
April	26.2	35.2	20.2
May	27.3	35.3	21.3
June	29.2	36.0	23.2
July	29.1	35.4	23.4
Aug	29.1	35	24.3
Sep	29.3	36.2	23.7
Oct	27.2	34.5	22.0
Nov	21.3	32.4	17.4
Dec	16.4	30.0	11.2

Characterization of air temperature in the project area is also made based on 8 years average air temperature which is presented in 2 graphical formats. Figure 4.2 (a) and 3(b) shows the mean monthly distribution of maximum and minimum temperature over Chittagong from 2007 to 2015, respectively. (Source BMD)

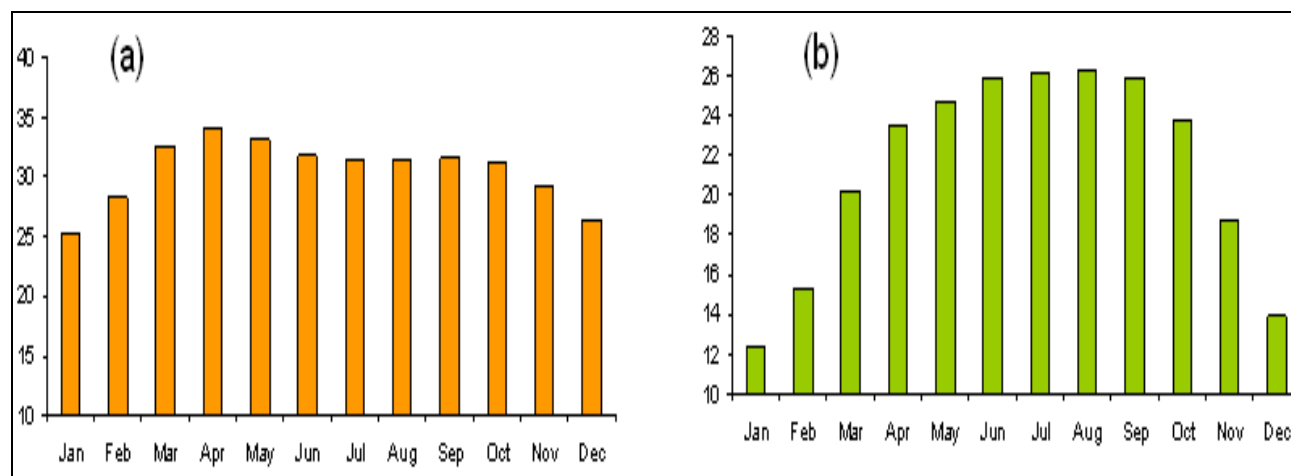


Figure-4.2: Monthly (a) maximum and (b) minimum temperature (°C) of Chittagong based on observation (2007-2015).

The monthly average temperature variation in Chittagong division has remained largely uniform over the last 8 years. There have been hotter days in some years but it had negligible effect on the average the temperature over this period.

4.6.3 Relative Humidity

As would be expected, relative humidity during the wet season is significantly higher than those occurring at other period of the year. This is well depicted by the data as shown in the Table - 4.2 for relative humidity of Chittagong during the period 2016-2005 (till May).

Table -4.6 Average Monthly Relative Humidity of the Project Area in last 6 years (Source: BMD)

Humidity in %	Monthly Mean Humidity												
Year	Jan.	Feb.	Mar	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2015	66	52	57	69	74	73	81	81	75	72	63	75	71
2014	69	54	57	64	76	80	79	82	77	73	67	73	70
2013	71	56	59	67	71	79	77	78	79	74	68	66	70
2012	72	55	53	66	72	74	80	82	81	73	66	69	70
2011	69	61	67	64	70	80	83	81	81	77	69	79	73
2010	68	68	54	69	70	81	84	80	80	78	77	78	73
2009	73	55	57	68	70	76	74	76	74	72	65	67	70
2008	70	57	54	62	71	72	78	81	82	71	63	66	71
2007	64	65	66	62	74	73	81	82	78	72	66	75	74
2006	62	61	51	63	68	77	82	81	81	75	74	73	75

4.6.4 Wind Speed

Monthly Prevailing Wind Speed and Direction in Knots of Chittagong for the period of 2010-2015 (till June) are presented in **Table - 4.7**.

Table - 4.7 Monthly Prevailing Wind Speed and Direction in Knots of Chittagong

Year	Month	wind Speed (Knots)	Wind Direction
2015	Jan	2.9	North-West
	Feb	3.1	North-West
	March	4.2	North-West
	April	3.8	South
	May	3.5	South
	June	3.1	South
	July	3.1	South
	Aug	3.1	South
	Sep	3.2	South
	Oct	4.1	North-East
	Nov	5.5	North-East
	Dec	2.9	North-West
2014	Jan	3.6	North
	Feb	3.2	North
	March	3.8	South
	April	3.4	South
	May	3.4	South
	June	3.3	South
	July	3.4	South
	Aug	2.8	South
	Sep	2.8	South
	Oct	9.6	North-East
	Nov	2.5	North-East
	Dec	3.3	West
2013	Jan	3.3	West
	Feb	4.1	West
	March	4.0	West
	April	4.1	South
	May	3.8	South
	June	3.1	South
	July	4.3	South-East
	Aug	2.8	South
	Sep	4.2	South-East
	Oct	2.3	East
	Nov	2.8	North
	Dec	2.4	North - West
2012	Jan	2.9	North - West
	Feb	3.3	West
	March	3.8	South
	April	4.1	South
	May	3.7	South
	June	3.0	South
	July	2.4	South
	Aug	2.2	South
	Sep	2.6	South-East
	Oct	2.0	North- East
	Nov	2.9	North
	Dec	2.4	North
2011	Jan	2.2	West

	Feb	2.4	West
	March	3.8	South
	April	2.4	South
	May	3.0	South
	June	2.7	South-East
	July	2.4	South-East
	Aug	2.4	South-East
	Sep	2.6	South-East
	Oct	2.0	North- West
	Nov	2.3	West
	Dec	2.1	North-West
2010	Jan	2.4	West
	Feb	3.0	West
	March	2.5	South
	April	2.6	South
	May	2.5	South
	June	3.0	South
	July	2.3	South-East
	Aug	2.5	South-East
	Sep	2.2	South-East
	Oct	2.1	North- West
	Nov	2.2	West
	Dec	2.3	South-East

4.6.4 Wind roses for the proposed ISATL project area

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 center to increasing frequencies at the outer circles. The wind roses shown here contain additional information, in that each spoke is broken down into discrete frequency categories that show the percentage of time that winds blow from a particular direction and at certain speed ranges. All wind roses shown here use 16 cardinal directions, such as north (N), NNE, NE, etc. The wind roses for four different months are shown in the Figures 4.1 to Figure 4.2 for the months January, April, July and October.

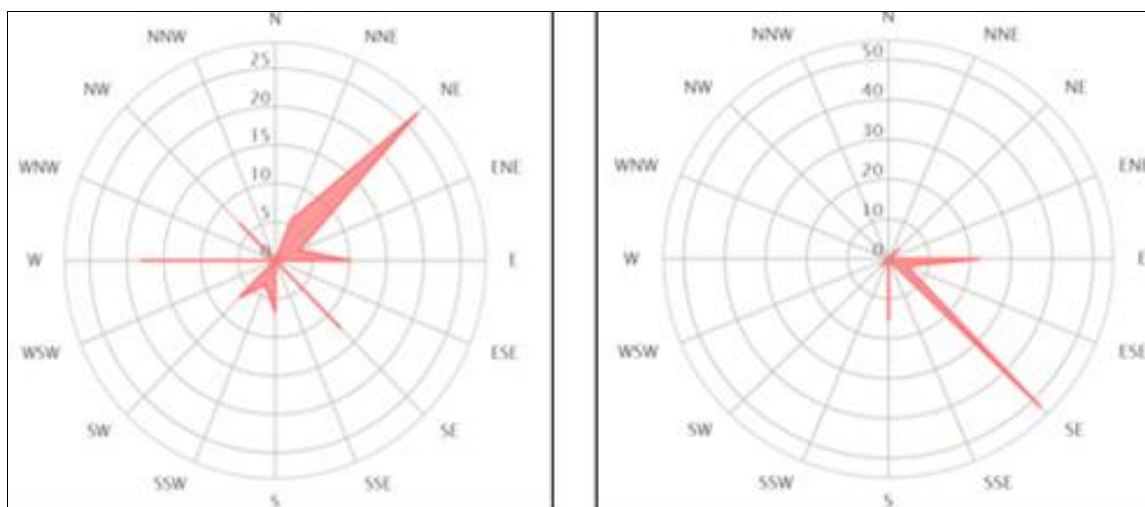


Figure 4.4: Wind rose diagram for the month of January-March and April-June 2015

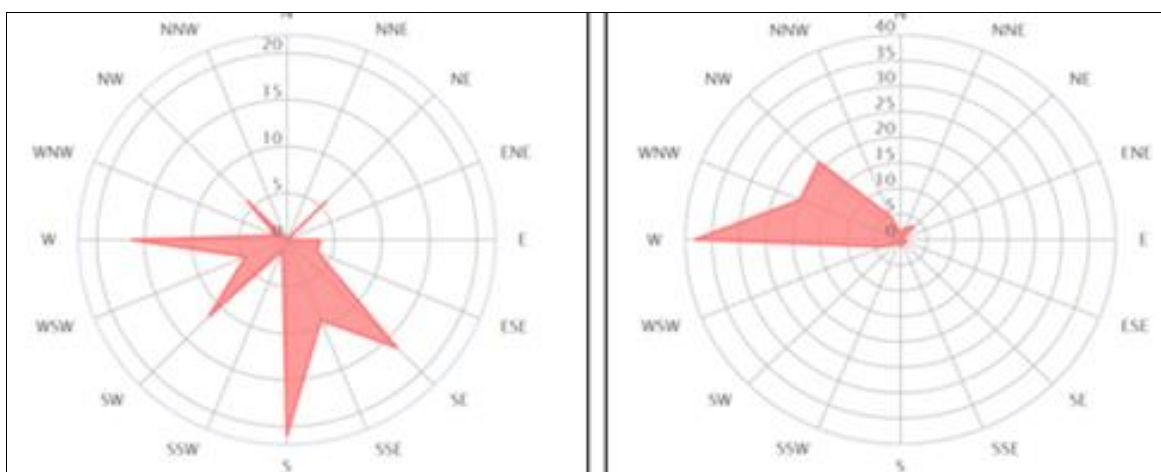


Figure 4.5: Wind rose diagram for the month of July-September and October-December 2015

The seasonal wind roses indicate that in Bangladesh the predominant wind direction are from North West in the winter months and from South West direction in the monsoon months. The prevalent wind directions will determine the location of air quality measurement points. During the preparation of the ESIA the wind roses determines the effective points where the air quality needs to be measured. This is primarily guided by the most prevalent wind direction in the project area at the time of measurements. In addition, during environmental monitoring after commissioning of the project, depending on the time of the year when monitoring is done, wind rose indicating the prevalent direction of wind at the time where the air quality will be measured as the concentrations of the pollutants will be the highest in that direction.

4.7 Air Quality

Air quality in the Chittagong City and its neighborhoods is deteriorating both from natural and manmade causes. It is one of the most dangerous and common kind of environmental pollution that is reported in most industrial towns and metropolitan city in Bangladesh. Major atmospheric pollution is caused by human induced activities like - burning fossil fuels, industrial processors, construction works and agriculture, transportation industry. In the rural areas however the ambient air quality is relatively good. It is assumed that accepting the small areas near the urban growth centre air quality in the most of the area would be far below the Environmental Quality Standards of Bangladesh. It is necessary for ESIA to establish the baseline air quality specially the PM concentration to determine the air shed of the project area.

BCAS has conducted a 24 hours continuous air quality monitoring for 5 days in the project area. The monitoring result of the air quality collected is shown in Table 4.7. It shows that the ambient air quality in terms of PM₁₀ and SPM is higher than the NAAQs level, NO_x and SO₂ are considered to quite good and still has reasonable buffer/assimilation capacity to absorb air pollutants to a certain extent. These are within the prescribed limit of the National Air quality Standards. The distances of measurements points from the centre of the project area is shown in Table 4.8 and Map 4.2. The air quality measurements have been taken at different distances from the project to enable to find the concentration profiles at different distances from the project centre.

Table - 4.8 Ambient Air Quality Analysis of the project area

SN	Description of data collection point	Ambient Air Pollution Concentration						
		Distance from the centre	SPM (µg/m ³)	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	SO ₂ (µg/m ³)	NO _x (µg/m ³)	CO (mg/m ³)
1	North side of the site (Date :27/10/2016) N 23° 34' 31.05'' E 90° 30' 40.85''	120m	278	46.2 (24hours)	119.1 (24 hours)	23.6 (24 hours)	22	70 (8 hours)
2	West side of the site (Date :28/10/2016) N 23° 34' 30.58'' E 90° 30' 46.68''	120m	281	49 (24hours)	124 (24 hours)	25 (24 hours)	25	65 (8 hours)
3	South side of the site (Date :29/10/2016) N 23° 34' 21.68'' E 90° 30' 45.95''	120m	283	48 (24hours)	123 (24 hours)	26 (24 hours)	21	56 (8 hours)
4	East side of the site (Date :29/10/2016) N 23° 34' 22.54'' E 90° 30' 40.17''	120m	279 (24hours)	42 (24hours)	117 (24 hours)	22 (24 hours)	19	57 (8 hours)
	Method of analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob and Hochheiser	Indicator Tube

	Test Duration (Hours)	24	24	24	Annually	Annually	24
	Bangladesh (DoE) Standard for ambient Air	150	65	150	365	100	1000
	WHO /World Bank Standard	50	25	50	20		NF

Remarks

Pollution source from ongoing activities, the weather was sunny and the wind direction was from the north-west to south-east corner.

Note: 1. Fine Particulate Matter (PM_{2.5}). 2. Respirable Dust Content (PM₁₀). 3. Suspended Particulate Matter (SPM).
4. Oxides of Nitrogen (NO_x). 5. Sulphur Di-Oxide (SO₂). 6. Carbone Mono-Oxide (CO).

(Source BCAS, sampling has been done by Respirable Dust Sampler & Fine particulate Sampler, Instrumex, manufacture by India, USEPA Certified).



Map 4.5: Google image showing the points of AQM, Noise monitoring and water sample collection



Photo 4. 1: BCAS field representative collecting Air Quality data in the project site

4.8 Noise Level

As noted earlier, the proposed site of the Container Terminal is located in the place of old Victoria Jute Mills. There is a small area of residential houses with a market and a mosque between the main road and the proposed site. There is heavy traffic flow through both the main road. The major noise sources at the project site as well as in the surrounding areas are:

- ✚ Transportation vehicles running through Dhaka - Chittagong highway,
- ✚ Activities of the surrounding industries,
- ✚ Adjacent market place and equipments business



Table 4.9 shows the maximum and minimum noise level at different location of sound monitoring in the project site at day time and Table 4.10 at night time. The results reveal that the noise level in the project area and in the vicinity is higher than the DoE and WBG EHS guideline standards. The primary reasons are high volume of road traffic in the Dhaka-Chittagong road and high density of industries in the area.

Table 4.9 : Measured Noise level at the project site in different locations at day

Date of survey	Time (Day)	Location: Riverside (South) Date: 26.10.2016 N 23° 34' 31.12'' E 90° 30' 40''		Location # 2 : North side Date: 27.10.2016 N 23° 34' 30.54'' E 90° 30' 47.75''	
		Max	Minimum	Max	Minimum
Day time	8.10am-9-10am	66	56	69	59
	9.15am-10.10am	62	55	68	58
	10.15am-11.10am	65	57	67	56
	11.15am-12.10am	61	56	66	57
	12.15am-1.10pm	66	52	65	55
	2.00pm-3.00pm	67	52	68	52
	3.00pm-4.00pm	68	53	69	53
	4.00pm-5.00pm	65	55	65	55
	5.00pm-6.00pm	68	52	68	54
Night time	6.00pm-7.00pm	65	53	63	52
	7.00pm-8.00pm	64	53	63	53
	8.00pm-9.00pm	55	54	54	53
	9.00pm-10.00pm	56	53	52	51
	10.00pm-11.00pm	56	54	56	54
	11.00pm-12.00pm	56	54	54	53
	12.00pm-1.00am	55	53	54	53
	1.00am-2.00pm	54	53	54	53
	4.00am-5.00pm	55	54	54	53

Table 4.10 : Average Noise level at the project site in different locations at night

Date of survey	Time (Day)	Location # 3: Gate side Date: 28.10.2016 N 23° 34' 21.64'' E 90° 30' 44''		Location # 4: Central point Date: 29.10.2016 N 23° 34' 22.58'' E 90° 30' 39.19''	
		Max	Minimum	Max	Minimum
Day time	8.10am-9-10am	71	66	68	66
	9.15am-10.10am	72	65	72	68
	10.15am-11.10am	65	57	71	66
	11.15am-12.10am	65	56	64	57
	12.15am-1.10pm	62	52	64	57
	2.00pm-3.00pm	68	52	66	58
	3.00pm-4.00pm	69	53	68	56
	4.00pm-5.00pm	67	55	66	57
	5.00pm-6.00pm	68	52	65	58
Night time	6.00pm-7.00pm	65	53	66	56
	7.00pm-8.00pm	62	53	64	57
	8.00pm-9.00pm	52	51	55	55
	9.00pm-10.00pm	53	52	56	54
	10.00pm-11.00pm	53	52	56	53
	11.00pm-12.00pm	55	54	55	54
	12.00pm-1.00am	57	57	56	52
	1.00am-2.00pm	58	58	54	52
	4.00am-5.00pm	59	59	58	53

Figure 4.4: Baseline noise level mapping at the site and the neighboring service road**Table 4.11:** Acceptable Noise Level (Bangladesh ECR 1997).

Type of Area	Description of the area	Noise level, dB(A),Leq	
		Day time (6AM-9PM)	Night time (9PM-6AM)
Silent zone	Hospitals, schools, offices, etc	50	40
Residential Zone	Family housing quarter	55	45
Mixed zone	Mixed residential, industrial, etc	60	50
Commercial Zone	Markets, shops, business, offices, etc	70	60
Industrial Zone	One or more factories, industries, etc	75	70

Table 4.12: Standards of noise level of WBG EHS Guidelines 2008

Standard	Zone	Day time dBA	Night time dBA
World Bank EHS Guideline 2007	Residential, institutional, educational	55	45
	Industrial, commercial	70	70
Bangladesh ECR, 1997	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

It is evident that other than in early morning, the noise level in the neighborhood of the project site (mixed industrial-cum-commercial area) is higher than that inside the site. The noise comes from the neighboring industries, traffic through main road, loud speakers, cassette players, human gathering, activities in small factories and the bazaar on the street side, etc. Table 4.10 shows the acceptable noise level as per Bangladesh gazette: September 7, 2006.

According to the gazette notification, the proposed port site, at current condition, may be characterized as an industrial zone. The ongoing developments in the zone around the site will ultimately turn the area to a full-fledged industrial zone. Although the noise level within the project site appears to be within the acceptable limit prescribed by the Department of Environment for industrial area, the noise level in the neighborhood of the site is relatively higher than the limits.

4.9 Surface and Ground Water Quality

4.9.1 Analysis of Surface and Ground Water Quality

Water was collected from a pond adjacent to the project site and analysis in SGS laboratory. The water quality of limited parameters of the ditch near the project site as analysed is given below:

Table 4.13: Surface Water quality (limited parameters) of the pond

Parameter	Unit	Concentration
		Sample
pH	--	6.21
Color	Pt.-Co.	56
Total Dissolved Solids (TDS)	mg/l	1010
Total Suspended Solids (TSS)	mg/l	34
Total Ammonia as NH ₃	mg/l	0.485
Sulfate	mg/l	17.7
Sulfide	mg/l	0.004
Phosphate	mg/l	0.127
Nitrate	mg/l	0.7
Nitrite	mg/l	0.045
Lead (Pb)	mg/l	0.048
Cadmium (Cd)	mg/l	0.001
Chromium (Cr)	mg/l	0.013
BOD ₅	mg/l	0.5
COD	mg/l	6.0
Total Coliform (TC)	cfu/100 ml	7,650
Fecal Coliform (FC)	cfu/100 ml	4,050
Alkalinity	Mg/l	126

Source: SGS Lab (sample collected on 25.10. 2016 and reporting on 06.11. 2016)



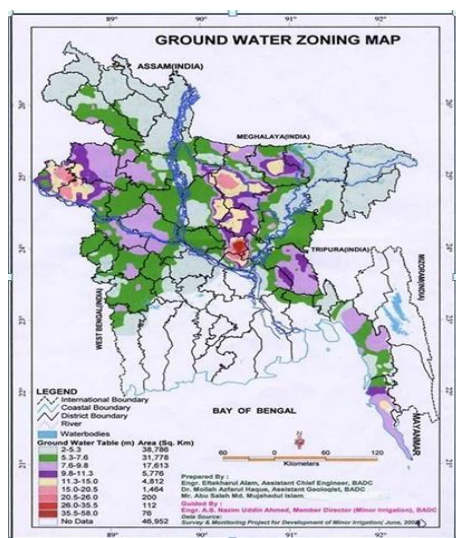
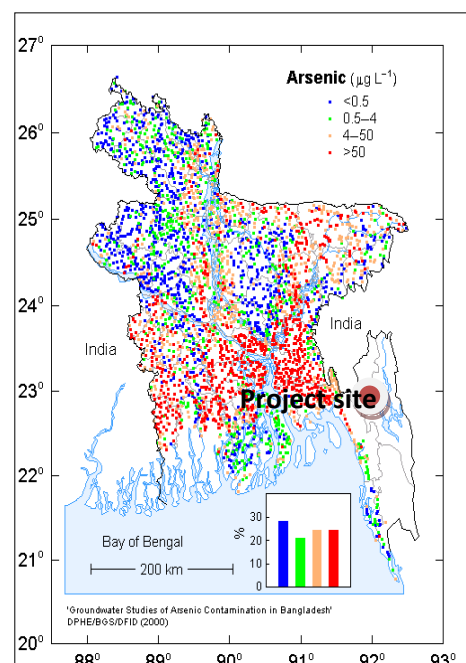
4.9.2 Ground Water

Ground water level exists at a moderate (Generally below 8.0 m) depth, which is being recharged mainly by infiltration of rainwater. The ground water zoning map is shown in Fig. 4.3. Ground water is the source of water for domestic use in this area. Usage of ground water for irrigation is limited here. The recharge capacity of the ground water level seems to be adequate. To determine quality of ground water, water sample was collected from a nearby tube well of the existing plant of the ISATL and analyzed for different parameters. The results shows that all the parameters remain within the allowable limit of drinking water value as per as Environmental Quality Standards for Bangladesh. The parameters which have been analyzed during this study are presented below in Table 4.14

Table 4.14: Ground water quality (limited parameters) from deep tube located at ISATL

Parameter	Units	Value	Bangladesh Standard For Inland Surface Water
pH at 26.9°C	mg/L	7.1	6.0 - 9.0
TDS	mg/L	280	1000
Iron	mg/L	1.2	(.3 – 1.0)
Alkalinity	mg/L	62.0	-
Hardness	mg/L	68.0	(200 – 500)
Chloride	mg/L	16.4	(150 – 600)
TSS	mg/L	4.8	10
COD	mg/L	11.7	NS
BOD	mg/L	5.5	NS
Arsenic	mg/L	0.050	0.05
Conductivity	μS/cm	696	NS

Source: SGS Lab (sample collected on 25.10. 2016 and reporting on 06. 11. 2016)

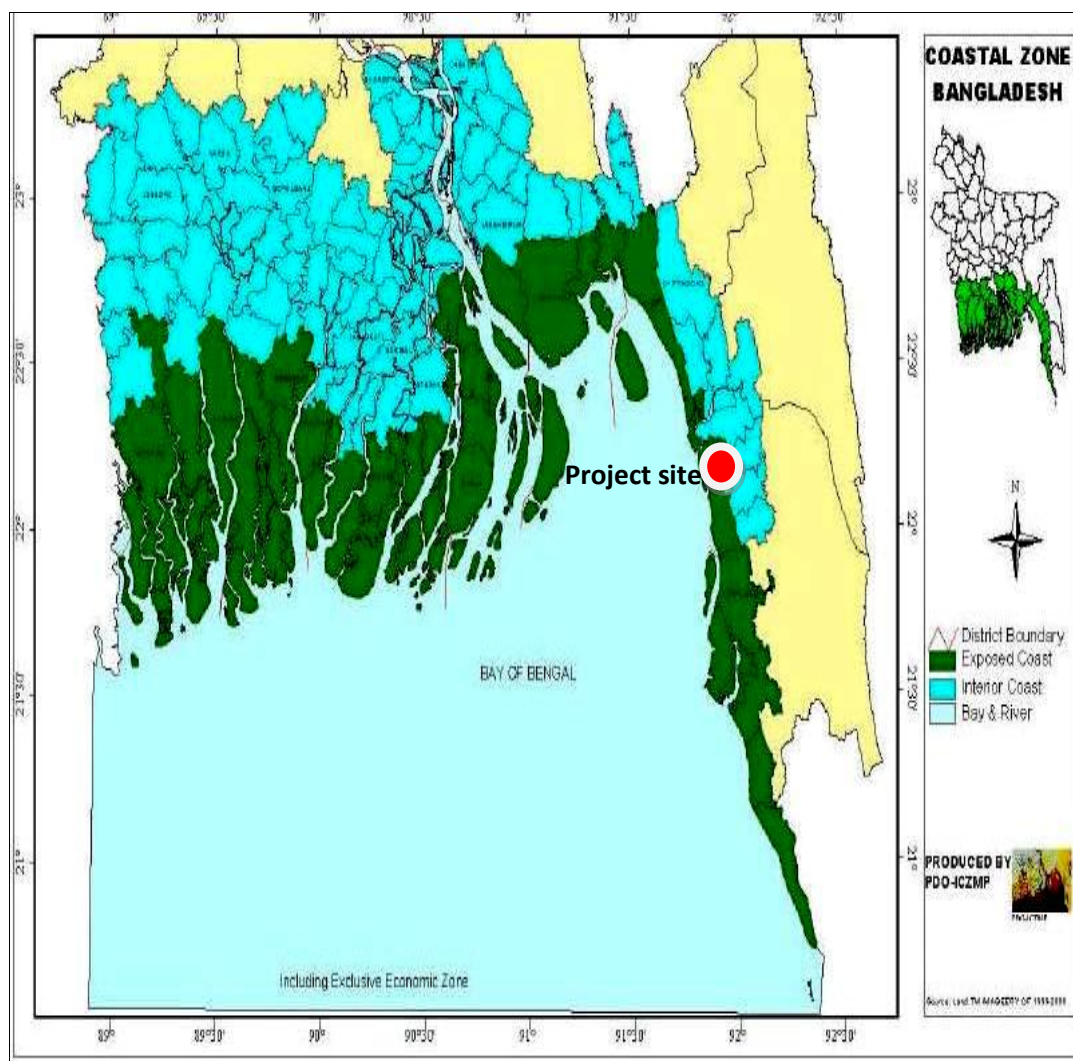


Map 4.6 : Ground water zoning map of Bangladesh

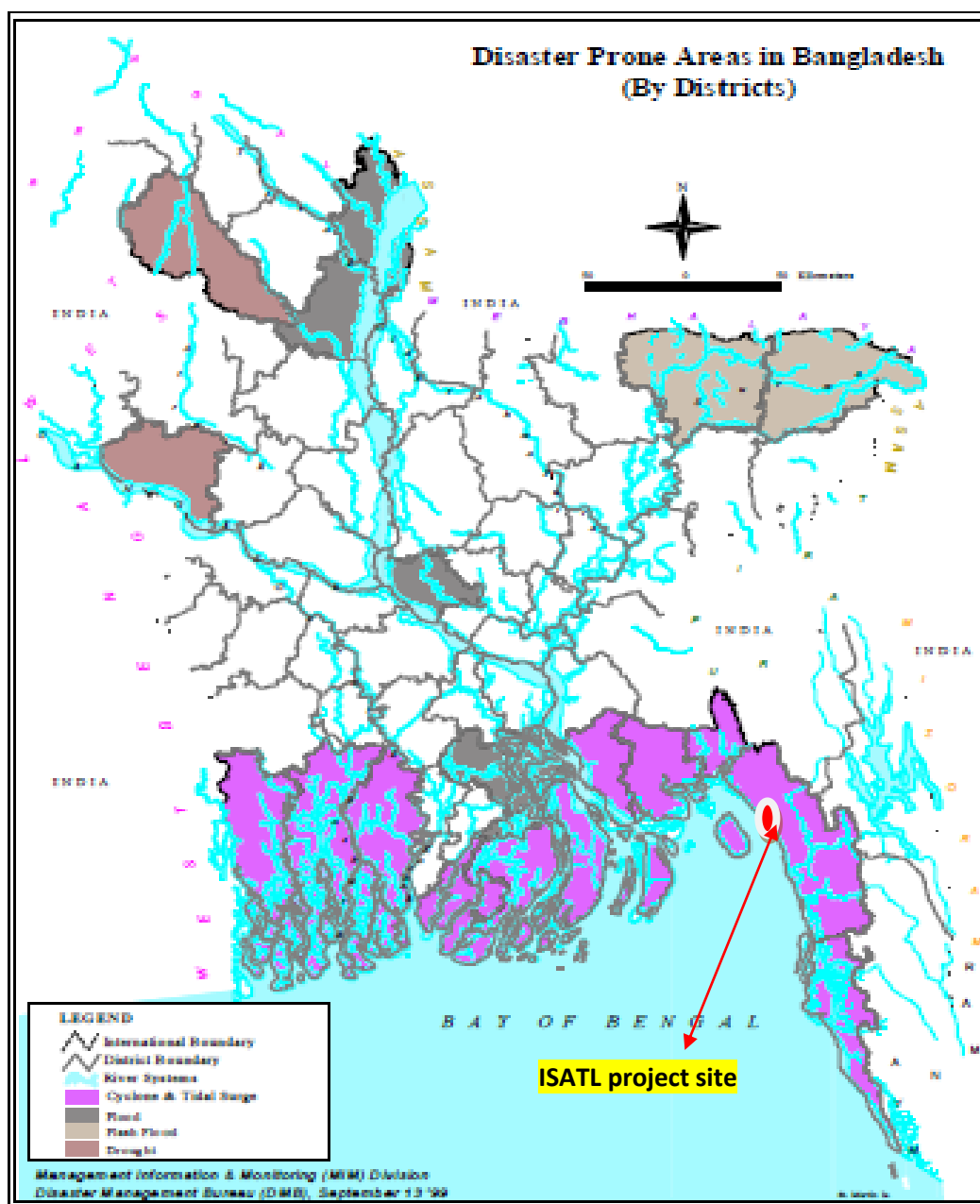
4.10 Vulnerability to Climate Change and Natural Hazard

Coastal Region

Bangladesh is one of the largest deltas in the world and it is formed mainly by the Ganges-Brahmaputra- Meghna river system, except for the hilly regions in the northeast and southeast and terrace land in northwest and central zones. It has about 710 km long coastline. About 28% of the populations live in coastal region. The coastal region of Bangladesh is prone to multi hazard threats such as cyclones, storm surges and floods, as well as earthquakes and above all, climate change. It is frequently visited by the cyclone-induced storm surge. *Map 4.7 & Map 4.8* shows the coastal region of Bangladesh as well as the disaster prone areas in Bangladesh. Chittagong where the project site is located falls in the exposed coastal zone as shown in the figures below.



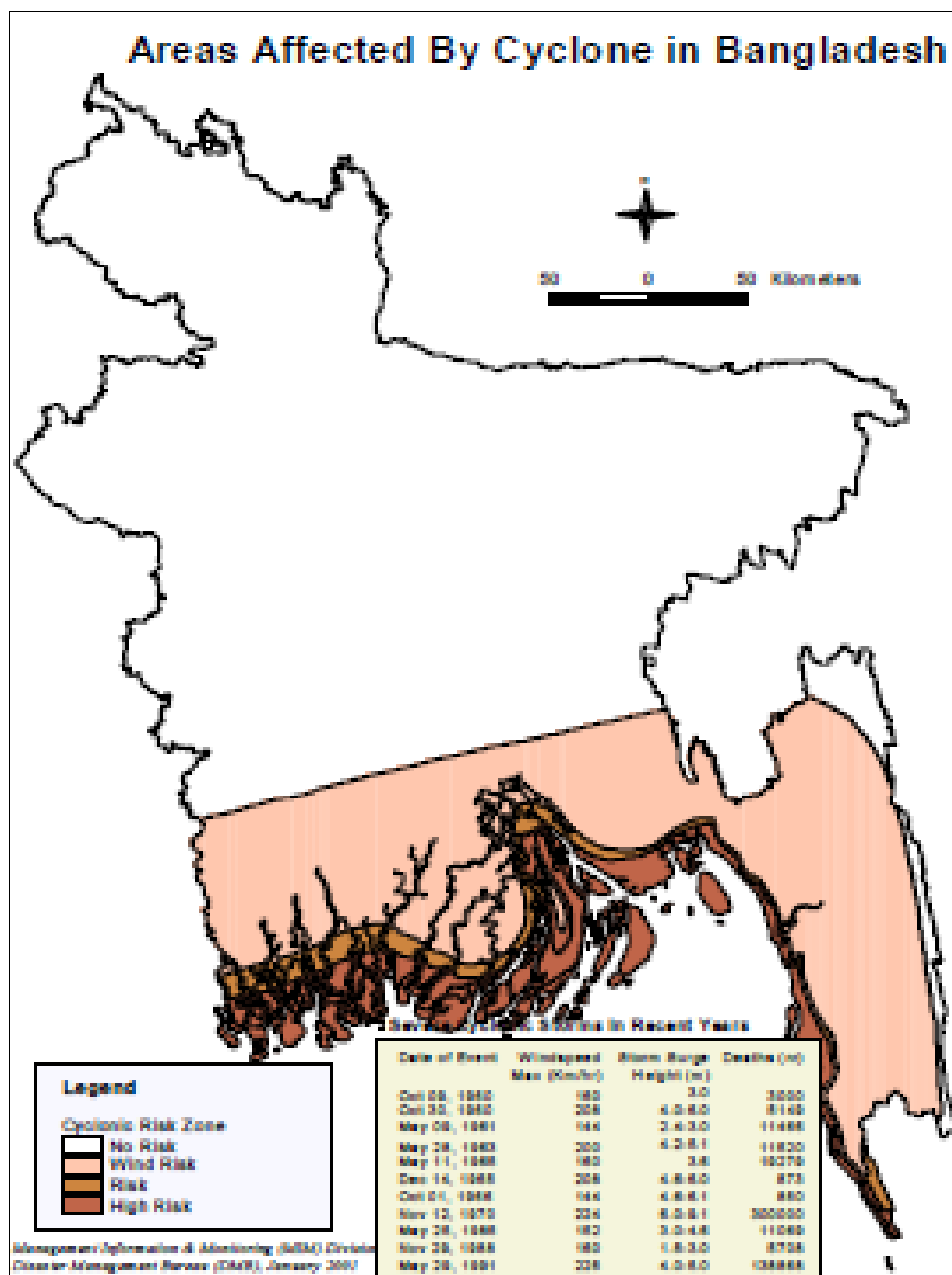
Map. 4.7: Map of the Coastal Zone of Bangladesh



Map 4.8: Disaster Prone Areas in Bangladesh

Cyclone and Tidal Surge

Bangladesh very often becomes the landing ground of cyclones formed in the Bay of Bengal. This is because of the funnel shaped coast of the Bay of Bengal, Most of the damage occurs in the coastal regions of Khulna, Patuakhali, Barisal, Noakhali and Chittagong and the offshore islands of Bhola, Hatiya, Sandwip, Manpura, Kutubdia, Maheshkhali, Nijhum Dwip, Urir Char and other newly formed islands. The coastal zone of Bangladesh is disaster prone. Chittagong is in the exposed coastal area which is frequently subjected to cyclone and storm surges.



Map 4.9: Areas Affected by Cyclone in Bangladesh

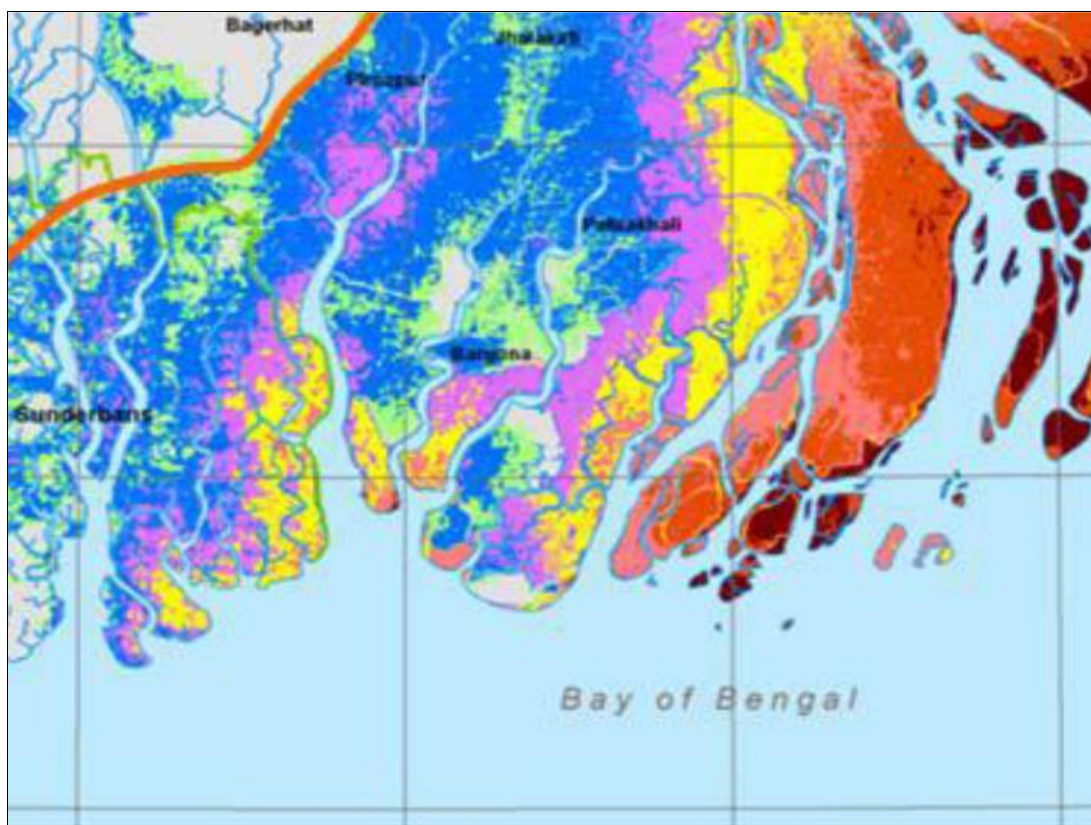
A cyclone risk map, prepared by the Management Information & Monitoring (MIM) Division of the Disaster Management Bureau (DMB) in 2001 (Map4.10), was available that distinguishes between the following risk zones:

- No risk
- Wind risk
- Risk (low risk as mentioned in 2003)
- High Risk

Further communications have happened with the Disaster Management Bureau (DMB) in 2003.

Both the “risk” and “high risk” zones have been incorporated as coastal zone.

The inundation risk map for storm surge (*Map: 4.10*) shows that the highest inundation depth having range between 5 m and 7.5 m lies in the Noakhali coast, Bhola, Urir Char, Sandwip and small islands in the Meghna Estuary. The eastern coast experiences maximum inundation between 4m and 6 m. The Tropical cyclones from the Bay of Bengal accompanied by storm surges are one of the major disasters in Bangladesh.



Map. 4.10: Inundation risk map generated from 18 cyclones from 1960-2007 (Source: IWM)

The country is one of the worst sufferers of all cyclonic casualties in the world. The high number of casualties is due to the fact that cyclones are always associated with storm surges. Storm surge height in excess of 9m is not uncommon in this region. For example, the 1876 cyclone had a surge height of 13.6 m and in 1970 the height was 9.11 m (WARPO, 2005). Another high intensity cyclone of 1991 caused large scale destruction to coastal embankments along the Chittagong area, destroyed runways of Chittagong airport, ceased port activities by sinking a number of ships in the Patenga channel and also in offshore anchorage. The storm surge height with respect to ground was within the range of 3.0 m to 3.7 m. A list of devastating cyclones in Bangladesh is given in *Table 4.15*.

Table 4.15: Major Cyclones in Bangladesh (Source: BMD)

Date	Year	Maximum Wind speed (km/hr)	Storm Surge height (metres)	Death Toll
11 May	1965	161	3.7-7.6	19,279
15 December	1965	217	2.4-3.6	873
01 October	1966	139	6.0-6.7	850
12 November	1970	224	6.0-10.0	300,000
25 May	1985	154	3.0-4.6	11,069
29 April	1991	225	6.0-7.6	138,882
19 May	1997	232	3.1-4.6	155
15 November(SIDR)	2007	223	-	3363
25 May(AILA)	2009	92	-	190

Chronology of major cyclonic storms in Chittagong

1960 (30-31 October) Chittagong, Noakhali, Bakerganj, Faridpur, Patuakhali and eastern Meghna estuary; severe cyclonic storm, maximum wind speed 210 km/h, surge height 4.5m - 6.1m; about 10,000 persons killed, 27,793 cattle lost and 568,161 houses destroyed (especially 70% of houses in Hatiya blown off), two large ocean liners washed ashore, 5-7 vessels capsized in Karnafuli river.

1963 (28-29 May) Chittagong, Noakhali, Cox's Bazar and the offshore islands of Sandwip, Kutubdia, Hatiya and Maheshkhali were badly affected; severe cyclonic storm with storm wave rising 4.3-5.2m in Chittagong, maximum wind speed 203 km/hr and at Cox's Bazar 164 km/hr; more than 11,520 people killed, 32,617 cattle lost, 376,332 houses, 4,787 boats and standing crops destroyed.

1966 (1 October) Sandwip, Bakerganj, Khulna, Chittagong, Noakhali and Comilla; severe cyclonic storm with storm-waves of 4.7-9.1m, maximum wind speed 146 km/hr; affected 1.5 million people, loss of human life and livestock were 850 and 65,000 respectively in Noakhali and Bakerganj.

1970 (12-13 November) The most deadly and devastating cyclonic storm that caused the highest casualty in the history of Bangladesh. Chittagong was battered by hurricane winds. It also hit Barguna, Khepupara, Patuakhali, north of Char Burhanuddin, Char Tazumuddin and south of Maijdi, Haringhata and caused heavy loss of lives and damage to crops and property. Officially the death figure was put at 500,000 but it could be more. A total of 38,000 marine and 77,000 inland fishermen were affected by the cyclone. It was estimated that some 46,000 inland fishermen operating in the cyclone affected region lost their lives. More than 20,000 fishing boats were destroyed; the damage to property and crops was colossal. Over one million cattle head were reported lost. The maximum recorded wind speed of the 1970 cyclone was about 222 km/hr and the maximum storm surge height was about 10.6m and the cyclone occurred during high-tide.

1974 (24-28 November) Coastal belt from Cox's Bazar to Chittagong and offshore islands; severe cyclonic storm with a wind speed of 161 km/h and storm surge of 2.8-5.2 m; 200 people killed, 1000 cattle lost and 2,300 houses perished.

1977 (9-12 May) Khulna, Noakhali, Patuakhali, Barisal, Chittagong and offshore islands; cyclonic storm with a wind speed of 112.63 km/h.

1983 (14-15 October) Offshore islands and chars of Chittagong and Noakhali; severe cyclonic storm with a wind speed of 122 km/h; 43 persons killed, 6 fishing boats and a trawler lost, more than 150 fishermen and 100 fishing boats missing and 20% Aman crops destroyed.

1983 (5-9 November) Chittagong, Cox's Bazar coast near Kutubdia and the low lying areas of St Martin's Island, Teknaf, Ukhia, Moipong, Sonadia, Barisal, Patuakhali and Noakhali; severe cyclonic storm (hurricane) with a wind speed of 136 km/h and a storm surge of 1.52m height; 300 fishermen with 50 boats missing and 2,000 houses destroyed.

1985 (24-25 May) Chittagong, Cox's Bazar, Noakhali and their offshore islands (Sandwip, Hatiya, and Urirchar); severe cyclonic storm, wind speed Chittagong 154 km/h, Sandwip 140 km/h, Cox's Bazar 100 km/h and storm surge of 3.0-4.6m; about 11,069 persons killed, 94,379 houses damaged, livestock lost 135,033 and road damaged 74 km, embankments damaged.

1986 (8-9 November) Offshore island and chars of Chittagong, Barisal, Patuakhali and Noakhali; cyclonic storm hit 110 km/h at Chittagong and 90/h at Khulna; 14 persons killed, damaged 97,200 ha of paddy fields.

1991 (29 April) The Great Cyclone of 1991, crossed the Bangladesh coast during the night. It originated in the Pacific about 6,000 km away and took 20 days to reach the coast of Bangladesh. It had a dimension of more than the size of Bangladesh. The central overcast cloud had a diameter exceeding 600 km. The maximum wind speed observed at Sandwip was 225 km/hr. The wind speeds recorded at different places were as follows: Chittagong 160 km/hr, Khepupara (Kalapara) 180 km/h, Kutubdia 180 km/h, Cox's Bazar 185 km/h, and Bhola 178 km/h. The maximum wind speed estimated from NOAA-11 Satellite picture obtained at 13:38 hours on 29 April was about 240 km/h. The cyclone was detected as a depression (wind speed not exceeding 62 km/h) on the 23rd April first in the satellite picture taken at SPARRSO from NOAA-11 and GMS-4 satellites. It turned into a cyclonic storm on 25 April. The cyclone in its initial stage moved slightly northwest and then north. From 28 April it started moving in a north-easterly direction and crossed the Bangladesh coast north of Chittagong port during the night of the 29th April. The cyclone started affecting the coastal islands like Nijhum Dwip, Manpura, Bhola and Sandwip from the evening of that day. The maximum storm surge height during this cyclone was estimated to be about 5 to 8m. The loss of life and property was colossal. The loss of property

was estimated at about Tk 60 billion. The death toll was estimated at 150,000; cattle head killed 70,000.

1991 (31 May to 2 June) Offshore islands and chars of Patuakhali, Barisal, Noakhali and Chittagong; cyclonic storm, maximum wind speed 110 km/h and surge height of 1.9m; people killed, cattle head perished, boats lost and standing crops destroyed.

1997 (16-19 May) Offshore islands and chars of Chittagong, Cox's Bazar, Noakhali and Bhola; severe cyclonic storm (hurricane) with a wind speed of 225 km/h, storm surge of 3.05m (similar strength to that of 1970 cyclone); only 126 people killed because of better disaster management measures taken by the government and the people.

1997 (25-27 September) Offshore islands and chars of Chittagong, Cox's Bazar, Noakhali and Bhola; severe cyclonic storm (hurricane) with a wind speed of 150 km/h, storm surge of 1.83 to 3.05m.

1998 (16-20 May) Offshore islands and chars of Chittagong, Cox's Bazar and Noakhali; severe cyclonic storm (hurricane) with a wind speed of 150 km/h, storm surge of 1.83 to 2.44m.

2007 (12-15 May) Upon striking Bangladesh, Cyclonic Storm Akash produced a moderate storm tide, along with strong winds and heavy rains. The storm left dozens of boats missing, with three fisherman confirmed killed and another 50 missing. Near the coast, thousands of houses were damaged from the flooding caused by the storm. Cyclone Sidr formed in 2007 did not put much affect in this area.

2009 (14-17 April) Cyclonic Storm Bijli formed from an area of Low Pressure on April 14. As the storm neared landfall, ports in Chittagong raised their warning level to seven. Following the increased warning level, an estimated 10,000 evacuated from coastal regions. Weather officials estimated that the storm would produce a storm surge of 2.1 to 3 m (7 to 10 ft). On April 17, all flights in and out of Bangladesh were cancelled due to dangerous conditions. Shelters were also opened and were reportedly able to accommodate about one million people.

2009 (23-26 May) Cyclonic Storm Aila was about 475 km southwest of Chittagong port, 435 km southwest of Cox's Bazar port and 345 km south southwest of Mongla port. Maritime ports of Chittagong and Cox's Bazaar had been advised to keep hoisted danger signal number 6. Maximum sustained wind speed within 54 km of the storm centre was about 70 km/h rising to 90 kph in gusts or squalls. (Source: DMB). The tracks of few major cyclones that hit Bangladesh are shown in **Figure 4.3**

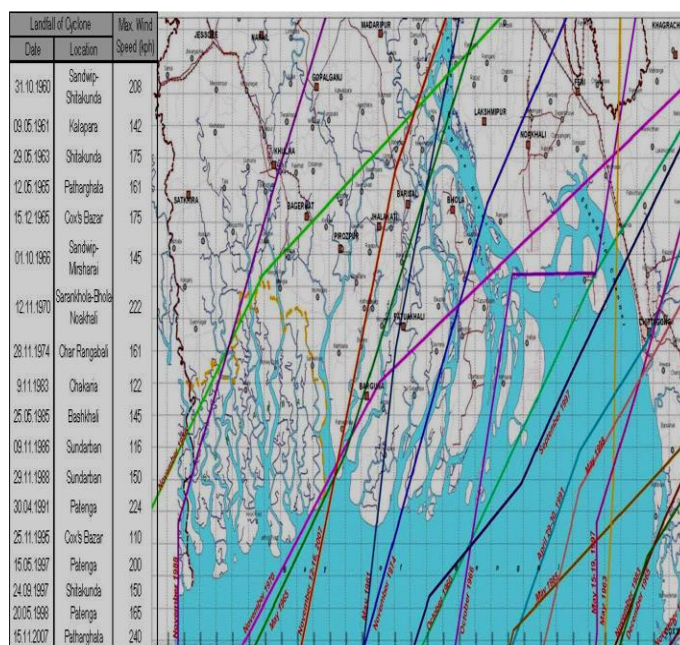


Fig. 4.3: Tracks of major cyclones crossed Bangladeshi coast during the period 1960- 2007 with information on landfall date and maximum wind speed

Physiographic of the project area:

This area is occupied by permeable silt loam to silty clay loam soils on the ridges and impermeable clays in the basins which are neutral to slightly acidic in reaction. General soil types include predominantly Grey Floodplain soils. Organic matter content is low in ridges and moderate in basins. Within this area, elevations are less than 7.276m above sea level, which is shown in above

Seismicity

Bangladesh is possibly one of the most vulnerable to potential earthquake threat and damage. Earthquake vulnerability of any place largely depends on its geology and topography, population density, building density and quality, and finally the coping strategy of its people and it shows clear spatial variations. Most of the parts of Chittagong, the port city of Bangladesh consisting of fine sand and silt deposits are susceptible to liquefaction. Chittagong City is mostly a hilly region, but it also consists of alluvial flood plain and sandy sea-shore area. Although the hilly region is less susceptible to liquefaction, it is formed by sandy and clayey soil and the area bottom of the hill also liquefy if the intensity of shaking is high, which may cause landslide in the highly region. On the other hand, flood plains and sea shore areas consisting of fine sand and silt deposit with shallow water table in most of the places, which may liquefy during a strong earthquake. According to the Global Seismic Hazard Assessment Program (GSHAP), the most hazardous division in Bangladesh is the port city, Chittagong. Chittagong metropolis together

with its surroundings is situated in the seismic zone 2, which has a basic seismic coefficient, $Z=0.15$ (BNBC, 1993). The Seismic zoning map is shown in *fig 4.10*

Bangladesh, a densely populated country in South Asia, is located in the north-eastern part of the Indian sub-continent at the head of the Bay of Bengal. Tectonically, Bangladesh lies in the north-eastern Indian plate near the edge of the Indian croton.

Chittagong is slightly elevated above the surrounding floodplains and represents mostly flat land with minor undulations. Topographically Chittagong is of low relief with many low depressions.

Fig. 4.4 is the Digital Elevation Model (DEM) which showing geological faults of Bangladesh and surroundings potential sources of major earthquakes.

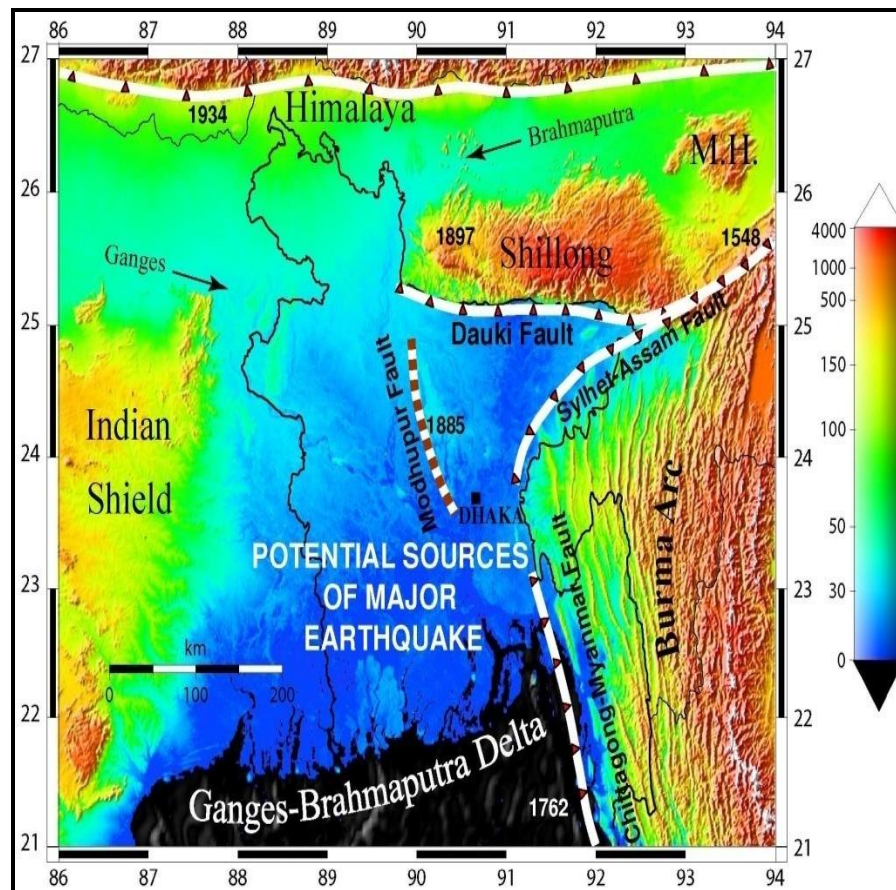
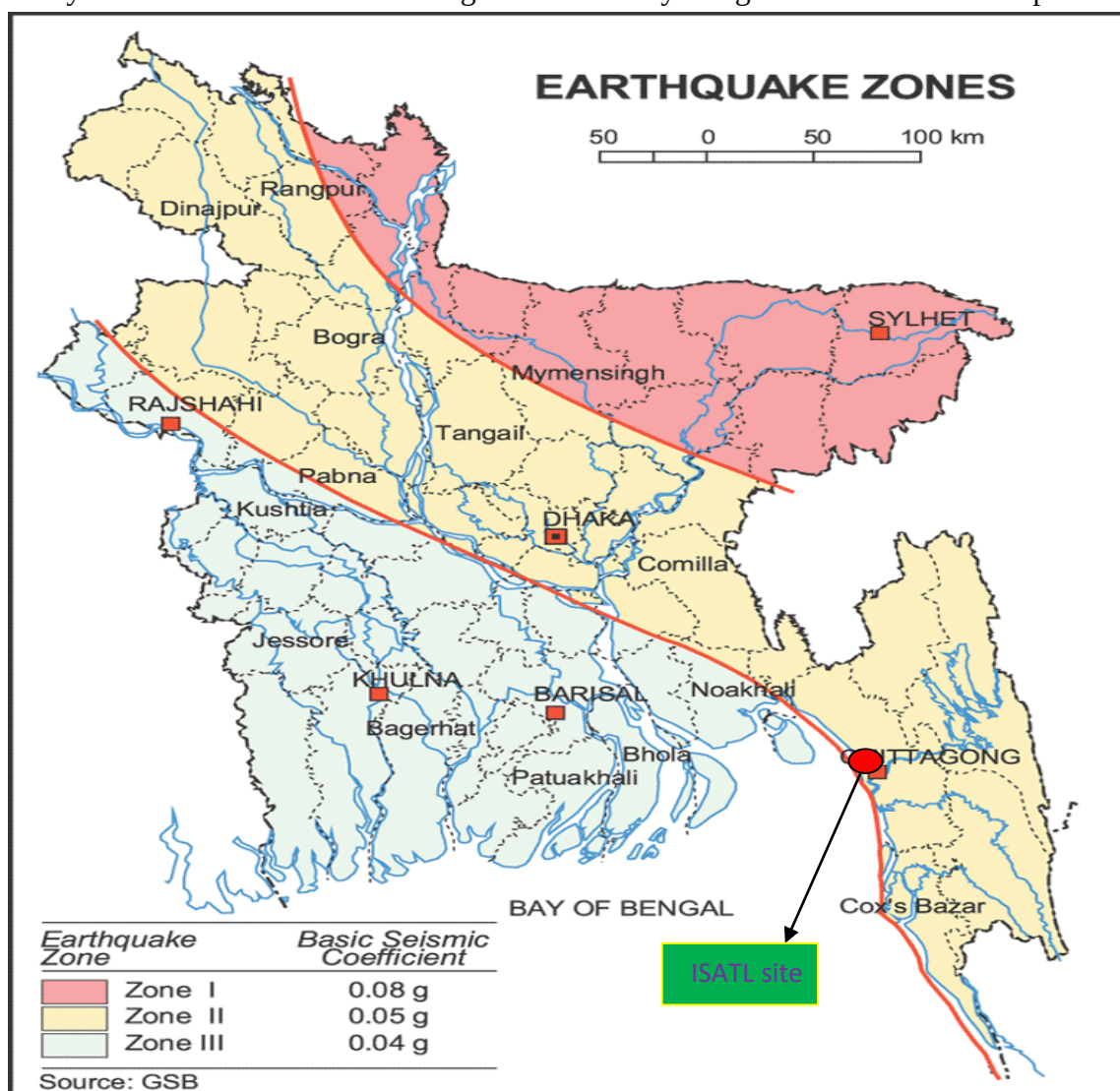


Fig. 4.4: Potential sources of major earthquakes in Ganges-Brahmaputra Delta.

The most hazardous division in Bangladesh is Chittagong division. Northern and southern sections could expect to have maximum peak ground acceleration (PGA) ranging between 0.24g to 0.40g. The Chittagong Hill Tracts region can expect the highest PGA of up to 0.4g to 0.48g. In the basic seismic zoning map of Bangladesh, Chittagong and its surrounding region has been shown under Zone II with basic seismic coefficient of 0.15 (BNBC-1993), but recent repeated shocking around this region indicating the possibilities of potential threat of even much higher

intensity like 0.35g than projected. If the Indian seismic zones were extended across the border into Bangladesh, the country would lie in zones IV and V. Southern Chittagong division also would lay in zone IV with a PGA of 0.4g. The seismicity Bangladesh is shown in Map. 4.11



Map 4.11: Earthquake Zoning Map of Bangladesh

Chittagong suffered ground shaking of the order III to VIII on the Modified Mercalli (MM) scale from both teleseismic (distant) and local earthquakes during historic and recent times. Among all the earthquakes that Chittagong has suffered from, the earthquakes of 1762, 1812, 1865, 1885 and 1897 were the most severe earthquakes in recent recorded history.

4.11 Traffic condition

The roadway from Chittagong to Dhaka is very important for maintaining vital communication between Dhaka and the industrial areas of inter city and other district town as well as parts of surrounding districts. It also supports the densely populated residential and commercial areas of Chittagong. The roadway is 2 lane divided and without any geometric treatment. Observation on geometric and operational conditions of the roadway shows that the corridor suffers from uncontrolled movements of pedestrians, non- motorized and motorized vehicles.

As a part of baseline study, traffic data were collected from on-spot surveys at key location of gate point of the Victoria jute mills roadway during October 2016, on a weekday (Thursday) during peak traffic hours shown in Table: 4.16 and 4.17 for daytime and night respectively. During the survey both number and type of traffic along the roadway were recorded; however, origin-destination survey was not conducted. The survey was carried out for 24 hours. In general traffic along the roadway is dominated by NMT (non-motorized transport) and 3-wheelers. Other important vehicle types include mini-bus, trucks, pick-ups, motor cycle and freight vehicles shown in Fig 4.5 and Fig. 4.6

Table: 4.16 Traffic movement at the Dhaka-Chittagong road (6.00am- 6.00pm) : Day Time Data

Vehicle name	6-7 am	7-8 am	8-9 am	9-10 am	10-11 am	11-12 am	12-1 pm	1-2 pm	2-3 pm	3-4 pm	4-5 pm	5-6 pm	Total
Bus, Minibus	3	5	6	12	12	19	18	18	16	19	19	14	161
Truck, pickup	14	10	8	14	16	16	13	13	11	21	27	33	196
Three wheeler	28	42	48	62	102	140	132	107	90	67	153	138	1109
Car,Jeep,Taxi, Micro	4	7	9	39	23	29	39	37	35	22	29	16	289
Freight Vehicle	13	12	24	23	14	25	31	24	22	21	11	13	233
Motor Cycle	12	22	32	38	31	29	42	33	17	19	37	10	322
NMT	4	5	6	3	6	7	8	9	6	7	5	6	72
Others	12	13	12	11	21	11	21	31	11	11	11	21	186

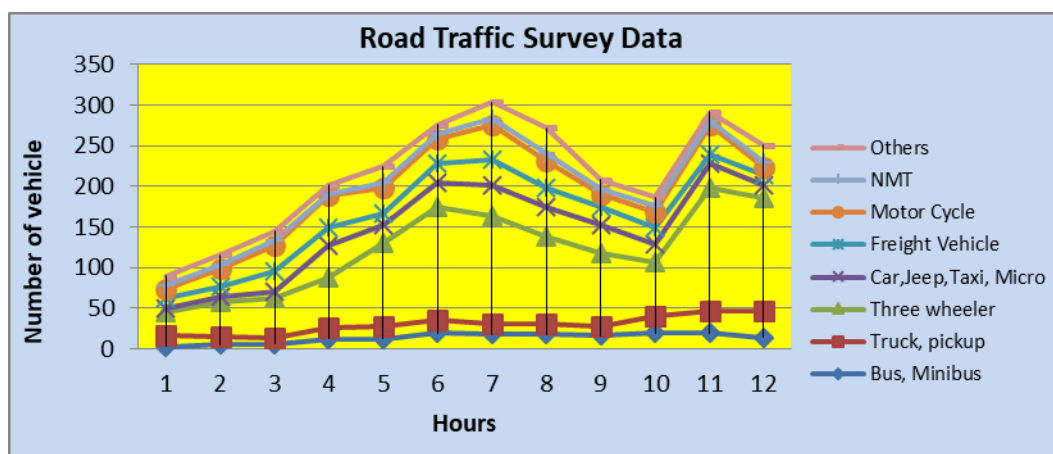


Figure 4.5: Traffic volume counted by BCAS representative at the project site

Table: 4.17 : Traffic movement at the survey spot of Dhaka-Chittagong highway(6.00pm-6.00am): Night Time Data

Vehicle name	6-7 pm	7-8 pm	8-9 pm	9-10 pm	10-11 pm	11-12 pm	12-1 am	1-2 am	2-3 am	3-4 am	4-5 am	5-6 am	Total
Bus, Minibus	13	16	19	10	17	16	3	4	2	3	3	2	70
Truck, pickup	12	17	48	42	50	48	52	32	24	12	7	9	353
Three wheeler	190	170	120	102	70	52	43	17	20	9	2	28	823
Car, Jeep, Taxi, Micro	9	7	12	11	4	2	1	0	0	0	1	2	49
Freight Vehicle	14	16	12	14	13	19	16	17	12	10	11	12	46
Motor Cycle	45	62	22	42	12	11	10	2	0	2	2	0	231
NMT	6	7	5	3	4	6	7	4	7	8	9	7	73
Others	4	5	6	1	2	4	4	5	3	4	4	3	45

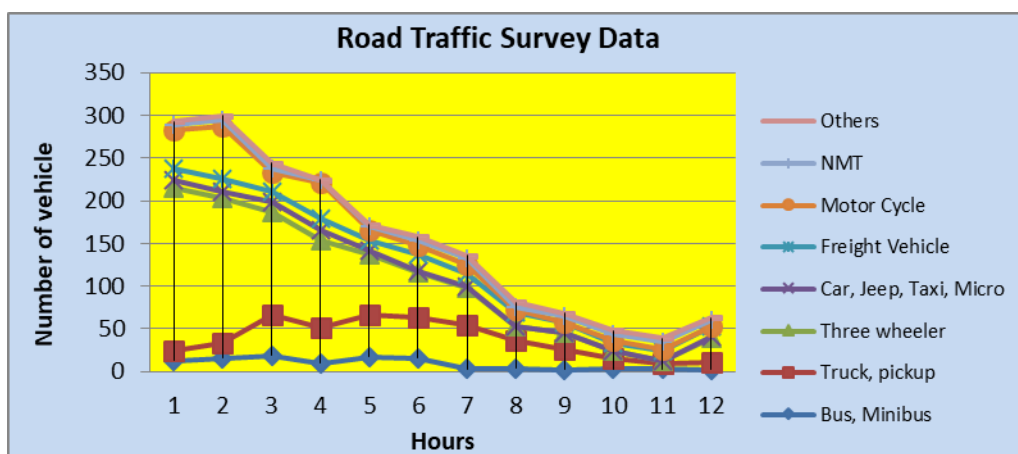


Fig. 4.6: Road Traffic counted by Vehicle type at night

Chapter 5

BASELINE SOCIO-ECONOMIC CONDITION

Population and Social Structure

According to Statistical Pocket Book Bangladesh 2009 (Zilawise Household And Population of Bangladesh, 2009) , the total population of Chittagong was 6611000, where the total household is 1241000, total male 3475000 and total no of female 3136000 respectively. The population density was 1251 persons per sq.km. Being rather lowest compared with 1584 of the country. However according to statistical year book 2009 Upazila wise population, census 20011, total population of Pahartali Thana was 213598, where the total household no. is 41,466, Total male115,058 and female 98,513. The average literacy rate is 72.59%, with male 75.35% and female 69.32%.

Living and Cultural Standard

The study area of ISATL is located at Kattali, Pahartali, Chittagong District and connected by Dhaka Chittagong Highway. The heavy vehicles are running on the main road and lightweight vehicles like scooters, cars, rickshaws and rickshaw-vans are running on both the roadway and branch road. According to Banglapedia Main occupations of this area: Agriculture 1.46%, fishery 1.29%, transport 6.3%, agricultural labourer 1.99%, wage labourer 3.02%, industry 2.04%, commerce 11.70%, construction 1.4%, services 53.20%, house rent 1.82%, others 15.78%

The average annual population growth rates were 6.3% according to City Mayors statistics. Such a rapid population increase must have been one of the most important factors, which restricted the alleviation of poverty, and satisfaction of basic human needs in the area.

Socio-economic condition

In order to assess the baseline conditions of the population living within the air-shed of 5 kilometers from the Project site, a socio-economic questionnaire survey of 100 families was carried out. The 100 families represent a sample of the total households which were covered by the baseline survey carried out by BCAS in October 2016.

The total number of households surveyed was 100, which constitutes the total number of households affected by the Project-related land acquisition. The households affected by the land acquisition have been covered by the survey.

Study Methodology

The methodology for the social baseline study included different methods and tools, as follows:

- Collection of Secondary Data through literature survey;
- Sample-based household survey of 100 HHs;

- Focus Group Discussions (FGD) with day laborers, women groups and the land owners who have lost the land to the power plant project; and
- Consultations with project affected persons, representatives of the local elite, local government, local administration and chairman of the local Ward Counselor (the local government administration).

Secondary data on demographic and socioeconomic issues of the study area have been collected from various sources including the population census of Bangladesh Bureau of Statistics (BBS) and from Upazila level offices and Ward Council.

Household Survey

For the purposes of the household survey, the overall impact area of the Project was divided into two zones, namely: high impact zone and low impact zone. The geographical area within a radius of 1km to 5km from the power plant site has been defined as the low impact zone and the area within 1 km radius is considered as high impact zone. The HH baseline survey was carried out in the high impact zone. BCAS representatives taking interviews with the household heads and business community in the project site



Data Processing and Analysis

Survey data have been processed and analyzed using SPSS package programme. Statistical outputs such as one way and two-way tables and descriptive statistics including mean, median, and percentage have been calculated for interpretation of results obtained from survey data.

Site and sample selection

For the purposes of the household survey, the overall impact area of the Project was divided into two zones, namely: high impact zone (0.6km) and low impact zone (0.4km). The geographical area within a radius of 1 km from the power plant site has been defined as the impact area. 60 households are considered from high impact zone and 40 households are from low impact zone amounting in total to 100 households surveyed in all the impact areas.

Socio-Demographic Characteristic of the Project Area

A socio-economic study was undertaken in Uttar Kattali within 1km radius of the project site. The high impact zone has been considered as households within 500m radius from the centre of the project site and the low impact zone as between 500m to 1000m radius.

According to the household survey, the Table 5.1 shows that the average household size is 4.4 in all impact area (i.e. the average number of persons per household). Overall, the average household size in the Project area is lower than the national average household size which is 4.5 persons (BBS, 2011).

Table-5.1: Average Family Size and Sex Ratio of Household Members of Study Area

Study Area	Average Family Size (number)	Sex Ratio
High	4.5	134.2
Low	4.3	140.3
All	4.4	136.6

Age Distribution of the Population and Marital Status

Age distribution of the population in all impact zone obtained from survey data shows that 4.8% of the population is children (0-4 years), 20.2% are adolescents in the 5-14 years old group, 37.3% are 15-30 years of age, 19.8% are of age 31-45, 15.0% are of age 46-60 and the remaining 2.9% are above 60 years (Table-5.2 and Fig. 5.1). In the high impact zone, 17.6% population is aged between 46-60 years whereas it is 11.0% in the low impact zone.

Table-5.2: Age Distribution of Household Members

Age Group (Year)	Percentage		
	High	Low	All
Up to 4	3.7	6.4	4.8
5-14	19.5	21.4	20.2
15-30	37.5	37.0	37.3
31-45	18.0	22.5	19.8
46-60	17.6	11.0	15.0
Above 60	3.7	1.7	2.9
Total	100.0	100.0	100.0

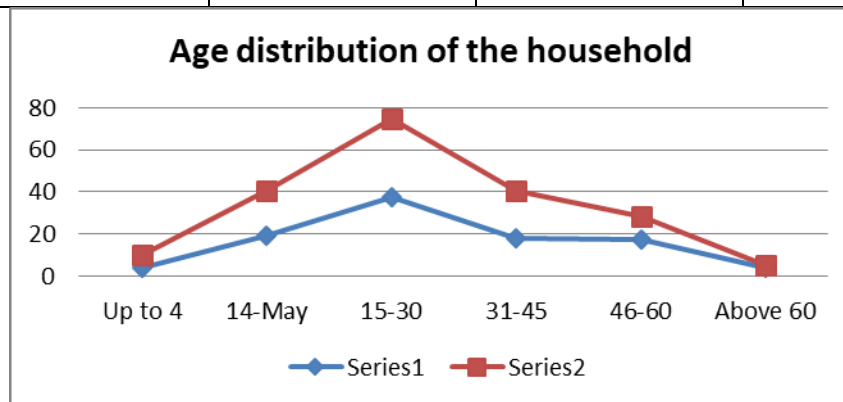


Fig.5.1: Age distribution of the household

Educational Status

According to the survey, in all impact zones of the study area, 2.6% of the population is illiterate and 12.4% of the population can sign their name, although they can neither read nor write. The population in both the impact zones having primary level education (upto 5 years of schooling) and secondary level education (up to 10 years of schooling) are 28.6% and 29.6% respectively. Based on the data collected from the socio-economic survey, 15.0% of the population in both the

impact zones has a Secondary School Certificate (S.S.C) and equivalent. It has been found that 9.1% of population has Higher Secondary Certificate (H.S.C) and equivalent and 2.7% of the population in all impact zones has Bachelors/equivalent degree and above (Table-5.3, Fig.5.2). The national literacy rate is estimated at 57.91%, according to BBS 2011.

The population having primary level education in the high impact zone is 26.6% whereas it is 31.9% in the low impact zone of the study area. 16.0% of the population in the high impact zone has Secondary School Certificate (S.S.C) and equivalent whereas it is 13.5% in the low impact zone of the study area.

Table-5.3: Educational Status of Household Members of Study Area

Educational Status	Percentage		
	High	Low	All
Illiterate	3.1	1.8	2.6
Can sign only	12.1	12.9	12.4
Primary	26.6	31.9	28.6
Secondary	30.8	27.6	29.6
S.S.C and equivalent	16.0	13.5	15.0
H.S.C and equivalent	9.8	8.0	9.1
Degree and above	1.6	4.3	2.7
Total	100.0	100.0	100.0

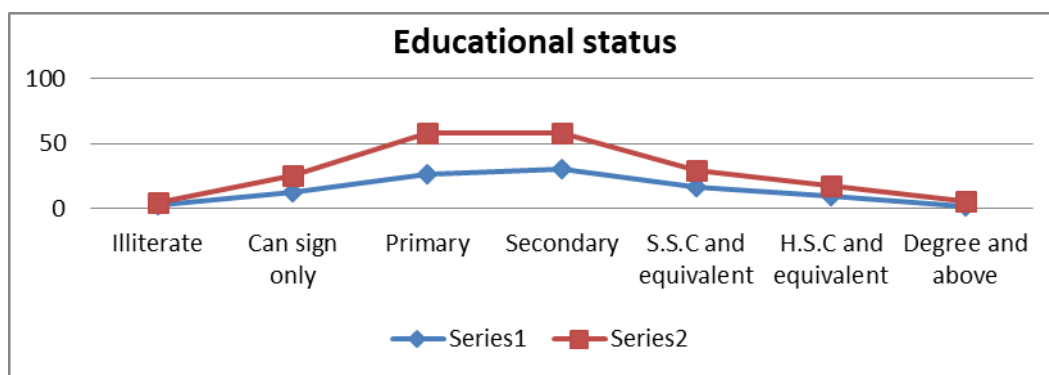


Fig. 5.2: Educational status

Occupation and Employment

The household heads in the surveyed are engaged in different types of primary occupation such as service, business, handicrafts, fishing, work in abroad etc. The survey reveals that the highest percentage (27.1%) of the workforce in all impact zones is engaged in household work. 24.2% of the population in all impact zones is engaged in different types of business in the surveyed area (Table-5.4, Fig. 5.3). In the all impact zones, 10.6% of the population is in service 16.2% of population is engaged in handicrafts and 19.6% of the populations are students. According to survey, only 0.5% of population works in abroad in the study area.

In the high impact zone, 12.2% of the population is engaged in service whereas it is 8.1% in the low impact zone of the study area. 23.2% of the population is engaged in business in the high impact zone compare to 25.6% are engaged in same occupation in the low impact zone. The survey reveals that 2.5% of the populations are wage laborer in the low impact area; however, 0.6% of the population in the low impact zone is engaged in fishing. Handicrafts constitute 14.6% and 18.8% in the high and low impact zones, respectively.

Table-5.4: Percentage Distribution of Primary Occupation of Household Members by Study Area

Primary Occupation	Percentage		
	High	Low	All
Service	12.2	8.1	10.6
Business	23.2	25.6	24.2
Wage labor	-	2.5	1.0
Household work	26.8	27.5	27.1
Handicrafts	14.6	18.8	16.2
Fishing	-	0.6	0.2
Student	21.7	16.3	19.6
Work in abroad	0.4	0.6	0.5
Others	1.1	-	0.6
Total	100.0	100.0	100.0

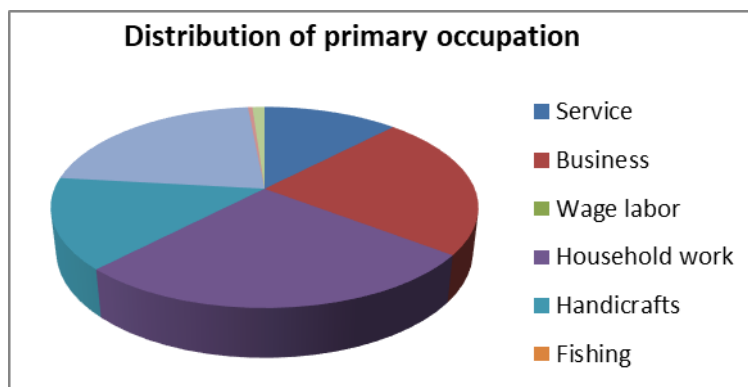


Fig. 5.3: Distribution of primary education

The household heads in the surveyed are engaged in different types of primary occupation such as service and business etc. The survey reveals that, in all impact zones, the highest percentage (76.0%) of the workforce is engaged in Business followed by different types of services (15.0%); only 3.0% household heads are wage laborer and 5.0% of the household heads is engaged in household work (Table-5.5 and Fig 5.4).

In the high impact zone, 78.3% of the household heads is engaged in business compare to 72.5% in the low impact zone. Service constitutes 16.7% and 12.5% in the high and low impact zones

of the study area. Only 7.5% of the household heads are wage laborer in the low impact zone whereas 2.5% of the household heads is engaged in fishing in the low impact zone.

Table-5.5: Percentage Distribution of Household Heads by Main Occupation

Main Occupation	Study Area		
	High	Low	All
Service	10 (16.7)	5 (12.5)	15 (15.0)
Business	47 (78.3)	29 (72.5)	76 (76.0)
Wage labor	0	3 (7.5)	3 (3.0)
Household work	3 (5.0)	2 (5.0)	5 (5.0)
Fishing	0	1 (2.5)	1 (1.0)
Total	60 (100.0)	40 (100.0)	100 (100.0)

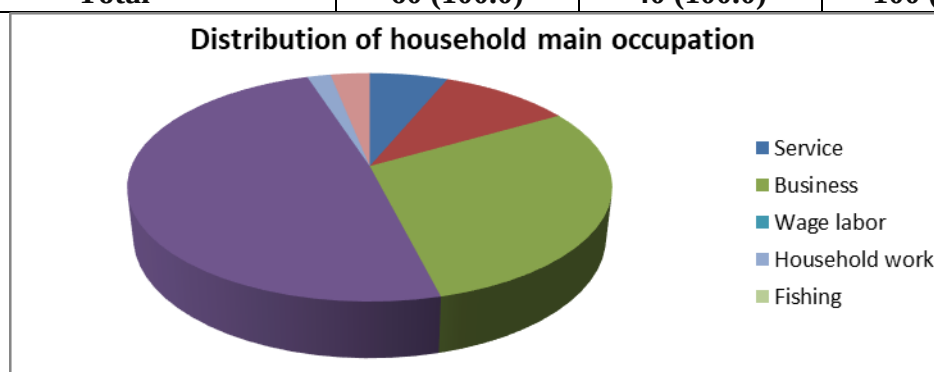


Fig. 5.4: Distribution of Household as a main occupation

Household Income, Expenditure and Distribution

According to the survey, average annual income per household in all impact zone is Taka 326,910 in the study area. However, the average annual expenditure per household in all impact zone is Taka 126,875 in the study area. Average annual income per household in the high impact zone is Taka 341,167 whereas it is Taka 305,525 in the low impact zone. Average annual expenditure per household in the high impact zone is Taka 132,117 compare to Taka 119,011 in the low impact zone of the study area (Table-5.6).

Table-5.6: Average Annual Income and Expenditure Per Household by Study Area

Study Area	Average Annual Income Per Household (Tk.)	Average Annual Expenditure Per Household (Tk.)
High	341,167	132,117
Low	305,525	119,011
All	326,910 (US\$ 4086.37)	126,875 (US\$ 1585.93)

Sources of Household Income

According to the survey, service is one of the major sources of livelihood accounting for 17.3% of household income in the study area, preceded by the largest income source – business - that

contributes 62.7% to household income. The survey also reveals that, 15.1% of the households' income source is house rent.

In the high impact zone, 54.6% of household income is business compare to 76.4% in the low impact zone. 18.7% of household income in the high impact zone is service whereas it is 16.1% in the low impact zone. In the high impact zone, 23.5% of household income is house rent in the study area (Table-5.7 and Fig.5.5).

Table-5.7: Percentage of Annual Income of Households from Different Sources

Source	Percentage		
	High	Low	All
Rice/Wheat production	0.3	-	0.2
Vegetables	-	1.6	0.6
Daily wages	-	1.1	0.4
Service	18.7	16.1	17.3
Business	54.6	76.4	62.7
Foreign remittance	0.6	1.3	0.9
Livestock	-	0.3	0.1
House rent	23.5	1.0	15.1
Others	2.3	2.2	2.3
Total	100.0	100.0	100.0

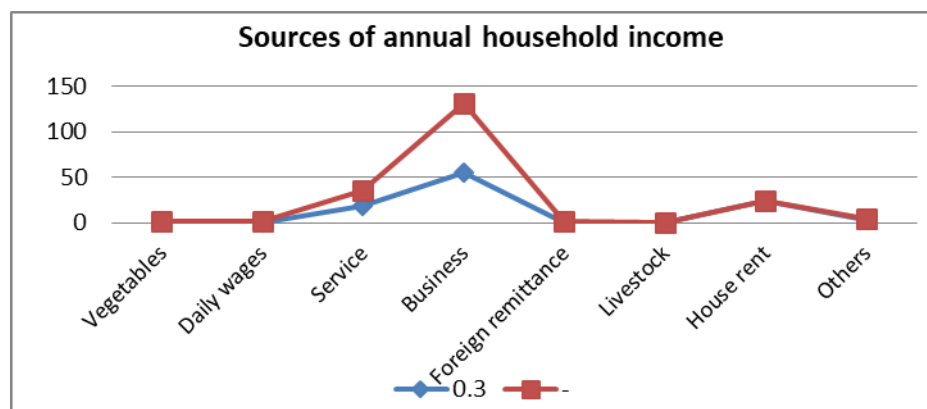


Fig. 5.5: Source of annual household income

Economic Status

The analysis of the households' economic situation has been focused on accessibility and affordability of food, clothing, educational facilities, medical facilities, transport facilities etc.

With respect to availability of food, it is considered "satisfactory" by 48.4% of the households under the survey. Food availability is considered "good" by 51.6% of the households in the study area. The situation with respect to clothing is considered "satisfactory" by 48.5% of the respondents and considered "good" by 51.5% of the respondents in the study area. As for housing /accommodation facilities, they are found "satisfactory" by 41.8% of the respondents, 51.1% of the respondents found them "good" and 7.1% of the respondents found them "unsatisfactory". Educational facilities are considered "good" and "satisfactory" by 43.3% and

52.3% of the respondents, respectively. Medical facilities are generally considered “satisfactory” by 52.5% of the respondents in the study area whereas 38.4% of the respondents found them “unsatisfactory”. However, transportation facilities were scored as “satisfactory” by 48.5% of the respondents, while only 8.1% considered them as “unsatisfactory”. Entertainment facilities are considered “satisfactory” by 51.6% of the respondents whereas 34.0% of the respondents found them “unsatisfactory” in the study area (Table-5.8 and Fig 5.6).

Table-5.8: Economic Status of Households

Sector	Percentage			
	Good	Satisfactory	Unsatisfactory	Total
Food availability	51.6	48.4	-	100.0
Clothing	51.5	48.5	-	100.0
Accommodation/houses	51.1	41.8	7.1	100.0
Educational facilities	43.3	52.3	4.4	100.0
Medical facilities	9.1	52.5	38.4	100.0
Transport facilities	43.4	48.5	8.1	100.0
Entertainment	14.4	51.6	34.0	100.0

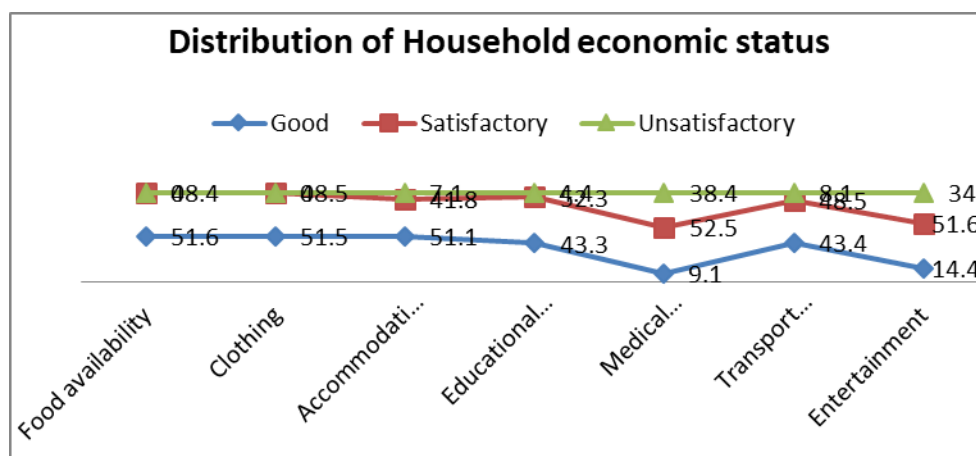


Fig. 5.6: Distribution of household economic status

Involvement with NGOs/CBOs

About 93.0% households in the study area are not involved with non-governmental and community-based organizations (NGOs/CBOs) whereas 7.0% family member has involvement in NGOs/CBOs (Table-5.9).

In the high impact zone, 95.0% of households in the study area are not involved with non-governmental and community-based organizations (NGOs/CBOs) compare to 5.0% involvement of the family member. In the low impact zone, 90.0% of households in the study area are not involved with NGOs/CBOs compare to 10.0% involvement of the family member.

Table-5.9: Percentage Distribution of Households Surveyed Having Family Member Involvement in NGOs/CBO

Study Area	Yes	No	Total
High	3 (5.0)	57 (95.0)	60 (100.0)
Low	4 (10.0)	36 (90.0)	40 (100.0)
All	7 (7.0)	93 (93.0)	100 (100.0)

Note: Figures within parentheses represent percentages

Housing Structures

Housing structures in the project impact area are of different types in terms of construction materials used. Most of the housings (57.3%) are brick floor with tin wall and roof in the study area. Housings with tin roof, tin wall and earthen floor constitute 25.0% of all HHs in the study area (Table-18). 11.3% of the households are buildings, 2.4% of the households are thatched and 4.0% of the households are made of earthen floor, thatch wall and tin roof in all impact zones of the project area. According to BBS 2011, at the national level the highest 38.46% of the household heads lived in house made of CI sheet/wood in the walls, 16.72% of the households were found living with wall made of mud/brick/wood whereas, same material was found in the roof of 1.52% households, fence/straw/bamboo was observed in the wall of 19.29% households and 3.09% roofs of the households.

In the high impact zone, most of the housings (63.4%) are brick floor with tin wall and roof compare to 49.1% in the low impact zone. 30.2% of the households are with tin roof, tin wall and earthen floor in the low impact area whereas it is 21.1% for the similar housing structure in the high impact area (Table-5.10 and Fig 5.7).

Table-5.10: Percentage Distribution of Households Surveyed by Housing Structure

Housing Structure	Study Area		
	High	Low	All
Building	14.1	7.5	11.3
Brick floor+tin wall+tin roof	63.4	49.1	57.3
Earthen floor+tin wall+tin roof	21.1	30.2	25.0
Earthen floor+thatch wall+tin roof	-	9.4	4.0
Thatch	1.4	3.8	2.4
Total	100.0	100.0	100.0

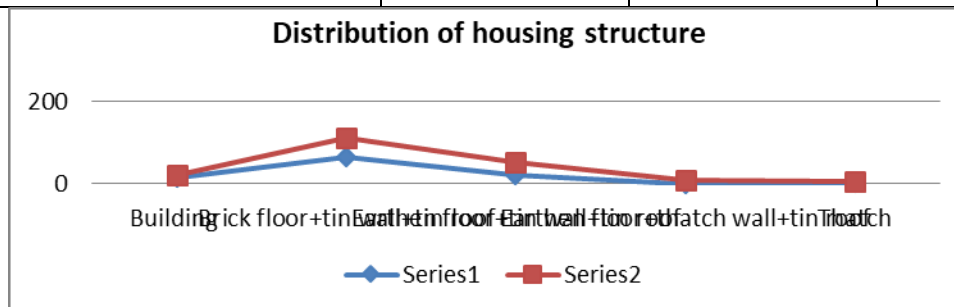


Fig. 5.7: Distribution of housing structure

Survey of Environmental Issues

Environmental problems that are perceived by the respondents in the study area includes water pollution, air pollution, industrial pollution, noise pollution over population, deforestation, diseases, poor sanitation, arsenic contamination of ground water, river bank erosion, sedimentation of water bodies etc.

According to the survey, the most pressing problem is air pollution in terms of the percentages of responses. The survey reveals that, air pollution have been mentioned by 37.8% followed by industrial pollution (3.0%), water pollution (2.0%), and Burning fuel, trees and agriculture residue (1.0%). Besides, health and sanitation problem and over population have also been mentioned by 97.0% and 91.9% respectively as low status of problem. The survey also reveals that 6.2% of the households mentioned noise pollution as moderately impacted problem in the study area (Table-5.11 and Fig 5.8).

Table-5.11: Percentage Distribution of Households Surveyed Showing the Status of Environmental Problem

	Status of Environmental Problem				
	No problem	Severe	Moderate	Low	Total
Water pollution	15.3	2.0	3.1	79.6	100.0
Air pollution	-	37.8	22.4	39.8	100.0
Industrial pollution	-	3.0	4.1	92.9	100.0
Burning fuel, trees and agriculture residue	53.2	1.0	-	45.8	100.0
Over population	1.0	-	7.1	91.9	100.0
Deforestation	100.0	-	-	-	100.0
River/canal bank erosion	92.8	-	-	7.2	100.0
Land erosion	99.0	-	-	1.0	100.0
Flash floods	97.9	-	-	2.1	100.0
Arsenic contamination	94.6	-	-	5.4	100.0
Sedimentation of water bodies	99.0	-	-	1.0	100.0
Health and sanitation problem	3.0	-	-	97.0	100.0
Disease	-	-	-	100.0	100.0
Noise pollution	46.9	-	6.2	46.9	100.0

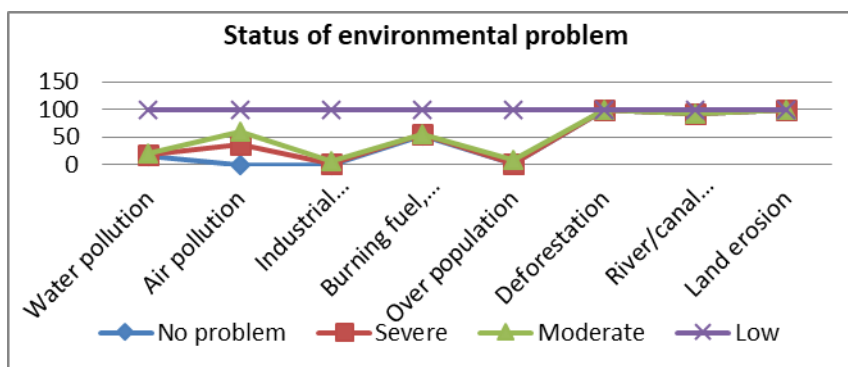


Fig. 5.8: Status of environmental problem

Sources of Water Pollution

Respondents attribute water pollution to different sources including human waste, water transport, animal waste etc. Industrial waste has been identified by 1.0% of the respondents as the most pressing source of water pollution in the study area; other sources identified as low by the respondents include human waste (54.5%), urban waste (95.8%) and pollution from water transport is 54.1% in all impact zones of the study area (Table-5.12 and Fig. 5.9).

Table-5.12: Percentage Distribution of Households Surveyed for Status of Water Pollution

Source	Status of Water Pollution Problem				
	No problem	Severe	Moderate	Low	Total
Industrial waste	7.1	-	1.0	91.9	100.0
Human waste	45.5	-	-	54.5	100.0
Water transport	45.9	-	-	54.1	100.0
Chemical feature/personnel	84.7	-	-	15.3	100.0
Siltation	100.0	-	-	-	100.0
Animal waste	100.0	-	-	-	100.0
Pollution from up stream	71.4	-	-	28.6	100.0
Urban waste	4.2	-	-	95.8	100.0

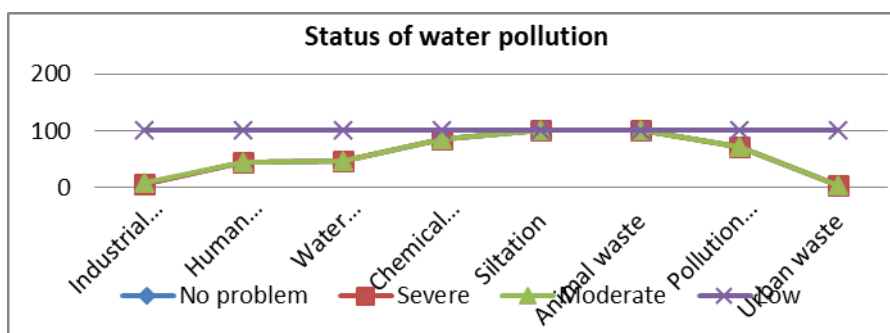


Fig. 5.9: Status of water pollution

Sources of Noise Pollution

According to the survey, respondents have attributed noise pollution to different types of vehicles that ply over the roads in all impact zones of the study area. 4.0% of the respondents attributed noise pollution to vehicles, construction work (7.1%) and pollution from big industries (3.0%) as moderate; whereas 84.9% and 26.3% mentioned commercial areas and small industries as low impacted sources of noise pollution respectively (Table-5.13 and Fig.5.10).

Table-5.13: Percentage Distribution of Households Surveyed for Status of Noise Pollution Problem

Source	Status of Noise Pollution Problem				
	No problem	Severe	Moderate	Low	Total

Vehicles	39.4	-	4.0	56.6	100.0
Big industries	23.2	-	3.0	73.8	100.0
Small industries	73.7	-	-	26.3	100.0
Construction work	28.3	-	7.1	64.6	100.0
Households sources Generator)	100.0	-	-	-	100.0
Power supply (irrigation engine)	100.0	-	-	-	100.0
Commercial areas	13.1	-	2.0	84.9	100.0

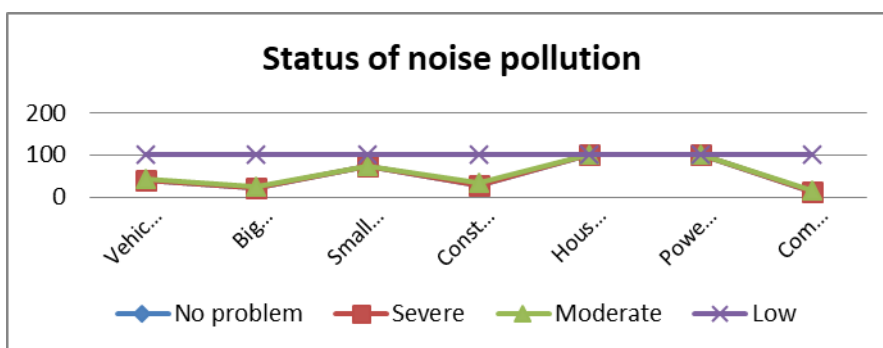


Fig. 5.10: Status of noise pollution

Sources of Air Pollution

According to the survey, 16.2% of the respondents mentioned big industries as the most pressing source of air pollution in the study area (Table-5.14 and Fig. 5.11). Various sources which contribute to air pollution, identified as low problem by the respondents, include vehicular emission (78.8%), open defecation (2.2%), small industries (26.3%), diesel engine (22.7%) and commercial areas (92.9%). Construction work (2.0%) has been identified as moderately impacted source of air pollution in all impact zones of the study area.

Table-5.14: Percentage Distribution of Households Surveyed for Status of Air Pollution Problem

Source	Status of Air Pollution Problem				Total
	No problem	Severe	Moderate	Low	
Brick field	100.0	-	-	-	100.0
Vehicles	21.2	-	-	78.8	100.0
Construction work	23.2	-	2.0	74.8	100.0
Small industries	73.7	-	-	26.3	100.0
Big industries	22.2	16.2	-	61.6	100.0
Diesel engine	77.3	-	-	22.7	100.0
Commercial areas	7.1	-	-	92.9	100.0
Gas field	97.9	-	-	2.1	100.0
Burning fuel, trees and agriculture residue	69.1	-	-	30.9	100.0
Open defecation	97.8	-	-	2.2	100.0

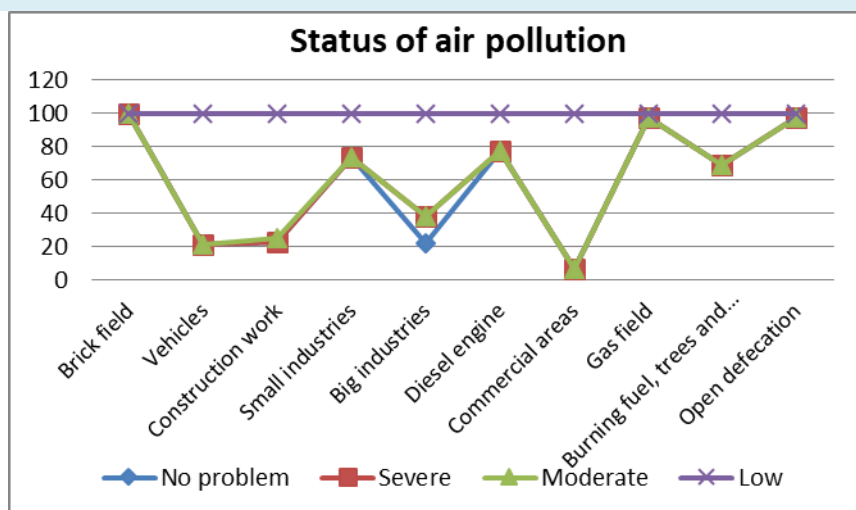


Fig. 5.11: Status of air pollution

Respondents' Awareness and Perception about the Proposed Project

i) Respondents' Awareness about the Project

The survey reveals that 97.0% respondents in the study area are generally aware and have heard of the project. The survey also reveals that, rests of the 3.0% of the respondents do not have knowledge about the proposed project. In the high impact zone, 98.3% of the respondents have knowledge about the proposed project compare to 95.0% in the low impact zone of the study area (Table-5.15).

Table-5.15: Percentage Distribution of Households having knowledge about the Proposed Project

Study Area	Yes	No	Total
High	59 (98.3)	1 (1.7)	60 (100.0)
Low	38 (95.0)	2 (5.0)	40 (100.0)
All	97 (97.0)	3 (3.0)	100 (100.0)

Note: Figures within parentheses represent percentages

Project Affected People

According to the survey, 100.0% households would not be affected due to the project activities. 60 households in the high impact zone and 40 households in the low impact zone mentioned that they would not be personally affected due to the project (Table-5.16).

Table-5.16: Percentage Distribution of Households Surveyed Personally Affected due to the Project

Study Area	Yes	No	Total
High	-	60 (100.0)	60 (100.0)
Low	-	40 (100.0)	40 (100.0)
All	-	100 (100.0)	100 (100.0)

Note: Figures within parentheses represent percentages

Expectation for Assistance from the Government/Project to Mitigate Losses

In general, the Project Affected People have expressed their willingness to get assistance/help from the government and the Project sponsors as part of mitigation of the possible losses due to the project implementation. However, 95.8% of the households surveyed is completely unaware about the make up the loss due to the project. The survey reveals that 2.1% of the respondents would like the provision to open their shops for longer period to make up the loss. 2.1% of the respondents would like to receive opportunities for business to mitigate loss due to the proposed project (Table-5.17).

Table-5.17: Percentage Distribution of Households for Make up the Loss

Make up the Loss	Study Area
Open shop long time daily	2.1
Through business	2.1
Don't know	95.8
Total	100.0

The respondents (79.0%) have expressed that they do not need any assistance from the government and the project. In the high impact zone, 86.7% of the respondents do not have any demand from the government or the project to make up the loss compare to 67.5% in the low impact zone of the study area (Table-5.18)

Table-5.18: Percentage Distribution of Households Demanding Help from Government or Project to Make up the Loss

Study Area	Percentage			
	Yes	No	No response	Total
High	-	86.7	13.3	100.0
Low	-	67.5	32.5	100.0
All	-	79.0	21.0	100.0

Perceived Positive Impacts of the Project

Respondents also perceived that various benefits were expected to result from the implementation of the project. These benefits, as perceived by the respondents, include; creation of employment opportunity, access to roads, enhanced socio-economic conditions, and overall national development in the area.

According to the survey, creation of employment opportunities is perceived as a beneficial effect of the project for 98.0% of the respondents. The implementation of the project will lead to national development, according to the opinion of 87.0% of the respondents. Enhanced local socio-economic activities and access to road infrastructure in the local area have been mentioned

as positive outcomes of the project by 36.0% and 94.0% of the respondents respectively. Access to electricity (30.0%) and availability of irrigation water (10.0%) have also been mentioned by the respondents (Table-5.19).

In the high impact zone, creation of employment opportunities have been mentioned by 98.3% of the respondents whereas 97.5% of the respondents expect better access to infrastructure road in the low impact zone.

Table-5.19: Percentage Distribution of Households Surveyed Expecting Positive Impacts

Positive Impact	Study Area		
	High (n=60)	Low (n=40)	All (N=100)
More employment opportunity	98.3	97.5	98.0
Access to electricity	26.7	35.0	30.0
Access to infrastructure road	91.7	97.5	94.0
More local socio economic activities	33.3	40.0	36.0
Availability of irrigation water	15.0	2.5	10.0
National development	85.0	90.0	87.0

Average Number of People Affected by Different Diseases

According to the survey, on an average 1.5 adult male get cold fever whereas 1.2 adult female and 1.1 young boys get affected by the same disease. The survey reveals that on average 1.2 number of young girl get affected by asthma in the study area (Table-5.20 and Fig 5.12)

Table-9.20: Average Number of People Affected by Different Diseases

Name of Disease	Average Number of People Affected by Different Diseases			
	Male	Female	Boy	Girl
Cold fever	1.5	1.2	1.1	1.1
Diarrhea	1.0	1.0	1.0	-
Jaundice	1.0	1.0	1.0	1.0
Typhoid	-	1.0	1.0	1.0
Asthma	1.0	1.0	1.0	1.2
Hypertension	1.0	1.0	-	-
Diabetes	1.0	1.0	-	-
Others	1.0	1.0	1.0	-

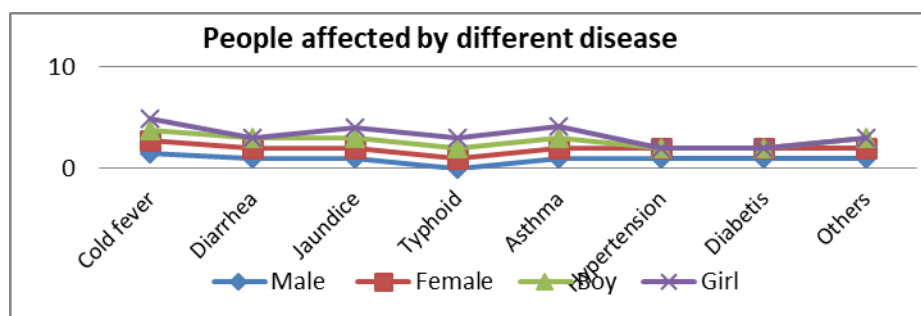


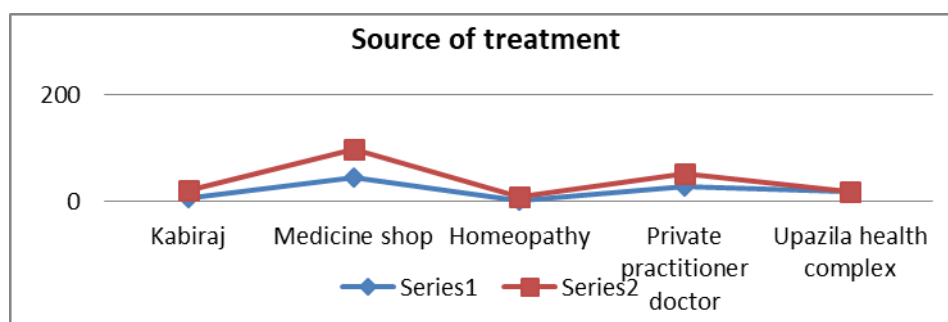
Fig. 5.12: People affected by different disease**Sources of Treatment**

For the purpose of medical treatment, people in the study area depend on different sources including private practitioner/doctor, upazilla health complex, pharmacy, homeopath etc. The survey shows that medicine shops/pharmacy is the main source of treatment for 47.8% of the households in the study area followed by private practitioner doctor (26.9%). Other sources of medical treatment services are kabiraj (9.1%), homeopathy (3.8%) and Upazila health complex (12.4%) in the study area (Table-5.21 and Fig.5.13).

In the high impact zone, 45.6% of the households mentioned medicine shop as source of treatment compare to 52.5% in the low impact area. 28.8% of the households in the high impact zone mentioned private practitioner doctor as source of treatment whereas it is 23.0% in the low impact zone of the study area.

Table-5.21: Percentage Distribution of Households Surveyed by Source of Treatment

Source of Treatment	Study Area		
	High	Low	All
Traditional Doctors (Kabiraj)	5.6	16.4	9.1
Medicine shop	45.6	52.5	47.8
Homeopathy	2.4	6.5	3.8
Private practitioner doctor	28.8	23.0	26.9
Upazila health complex	17.6	1.6	12.4
Total	100.0	100.0	100.0

**Fig. 5.13: Sources of treatment****Conclusion:**

This survey report gives a more in-depth insight into the urban population. The population is large in the survey area, with the percentage of children being less in number as compared to the percentage being in the adolescent and old age group. The educational status in this area is much better than areas in the rural setting. There is a higher population of students who have achieved the higher secondary certificate. The primary occupation of the area comprises of business,

services and overseas employment. Agricultural practices are minimal as compared to rural areas though they have better irrigation facilities.

The household income is higher in the urban area as compared to rural areas. Likewise, the household expenditure in this area is more. Majority of the expenditure includes food, clothing, education and healthcare. The economic status of the people is far better than those living in the rural areas. The housing structure is better; availability of food, clothing, medicine, transport facilities is also very good. They also have better access to amenities and infrastructure such as sanitation, market, bus stand, school, drinking water etc. The health condition of the study area is far better than the rural area population. They suffer from fewer diseases and they have better accessibility to medicine facilities. The households in the study area have more access to electricity and also to natural gas along with other sources and have good road connectivity.

The environmental issues in the project area are not that severe as compared to rural areas. A very small percentage of the population in the survey area has problems with noise pollution. Pollution from particulate matter is of major concern for the area. dust and of any form is not a problem for the population in the area. The respondents' in the study area are aware about the project and they feel that the project will provide them with more employment opportunity.

Chapter-6

ANTICIPATED ENVIRONMENTAL, OCCUPATIONAL IMPACTS AND MITIGATION MEASURES FOR CONSTRUCTION AND OPERATION PHASES

6.0 Environmental Impacts

A Rapid Environmental Assessment (REA) Checklist was prepared and was used to screen the proposed Project for determining the tentative environmental impact through this ESIA. The REA is given as Annex. The environmental impacts of the River Terminal Container Depot can be divided into three phases:

- a. Construction phase
- b. Operation Phase
- c. Post-operation phase or decommissioning phase

6.1 Environmental Impacts during Construction Phase

The activities carried out during the construction phase were (a) mobilization of construction equipment, materials and personnel; piling and bank protection works; (b) Construction of embankment and yard facilities; (c) Construction of drainage facilities; (d) Construction of internal roads; (e) Construction of buildings and related civil facilities; and (f) Electro-mechanical works..

Impact on Topography

During construction of the proposed Project, the topography of the Project site has changed due to leveling of the site as well as container yard land filling to increase the height. The filling will involve raising the 15 acres of the project site by 1.5 meters therefore there would be some loss of biodiversity because of filling operation through loss of some vegetation. Therefore the restoration of the lost biodiversity will have to done by the project sponsors.

In order to restore the loss in biodiversity due to the pre-construction phase and the construction phase it is suggested that plantation of trees along the boundary wall of the project be undertaken. This will compensate for the loss in biodiversity. Since the site was used as construction equipment and material storage during the mill operation.

Impact on Micro-Climate

The Project involves no deforestation and/or removal of significant vegetation. So, the significant increase of local temperature is not anticipated, impact on climate is not anticipated.

6.2.1 Impact on Environmental Resources

Impact on Air quality

During the construction phase of the proposed container depot, the interterminal sources of emissions would include those being generated from the operations of construction equipment and machineries, vehicles carrying construction materials to the site and taking construction debris out of the site. If construction equipment, such as stone (aggregate) crushers are used at the site, this may result in significant emission of particulate matter during its operation. Since construction of the proposed Container Terminal Depot is likely to involve significant

earthworks, increase in particulate matters in air from wind-blown dust is also a concern.

Localized and temporary air pollution may be generated from the remaining civil construction works. The air pollution generated from these activities is likely to be localized (affecting immediate surroundings of the emission source/ project site). The number of project-related vehicles is likely to be small compared to the existing traffic in the area. The emission of gaseous CO, NO_x, SO_x from the heavy trucks and earth moving equipment are expected to be within Bangladesh vehicular emission standards.

As mitigation measure, construction materials at the site should be properly covered while hauled and stored. Access roads and internal roads are to be properly cleaned and water sprayed in order to minimize concentration of dust in air. Vehicle movement to and from the site should be properly managed to ensure that it does not significantly aggravate the traffic problem and air pollution. The noise level from automatic brick crusher will be high and emit dust particles. In order to mitigate the impact of noise and dust the workers involved in this operation needs to use protection through using nose masks and ear plugs. In terms of general health and safety it has to be ensured all construction workers use Personal Protective Equipment (PPE) like hard hats, nose masks and hand gloves etc

6.2.2 Ambient Air Quality Standards

National Ambient Air Quality Standards (NAAQS) for Bangladesh is given in Table 6.1

Table 6.1: National Ambient Air Quality Standards (NAAQS) for Bangladesh

Pollutant	Objectives	Averaging period
Carbon Monoxide (CO)	10 mg/m ³	8 hours(a)
	40 mg/m ³	1 hours(a)
Lead (Pb)	0.5 µg/m ³	Annual
Nitrogen Dioxide (NO ₂)	100 µg/m ³	Annual
Particulates of ~10µm (PM ₁₀)	50 µg/m ³	Annual (b)
	150 µg/m ³	24 hours (c)
Particulates of ~2.5µm (PM _{2.5})	15 µg/m ³	Annual
	65 µg/m ³	24 hours
Ozone (O ₃)	235 µg/m ³	1 hours (d)
	157 µg/m ³	8 hours
Sulphur Dioxide (SO ₂)	80 µg/m ³	Annual
	365 µg/m ³	24 hours (a)

6.2.3 Impact on Noise Levels

During the remaining construction phase, medium to low level of noise shall be generated. The major sources of noise pollution are construction activities, movement of vehicles transterminaling the construction material and equipment to the site. Accordingly, the

Bangladesh Standard for noise level is 70 dBA at daytime and 70 dBA at night (ECR, 1997) for projects located in industrial zone.

The major work of construction has been completed at the time of the baseline survey carried out in October 2016. For the remaining construction work the possibilities of any increase from the baseline values are not expected.

As mitigation step towards maintaining noise levels below DOE standards all construction work will end at 6:00 P.M. and all vehicle movement is to be regulated to avoid traffic congestion in the access road and to ensure that no hooting is allowed. The noise pollution is a significant issue to consider for the construction worker but it will have negligible impact to the surrounding locality as it is not situated in close proximity of the Project site. But for protecting the permanent hearing loss of construction workers, it is to be ensured that they are not exposed for a prolonged period. Because most of these equipment produce high level of noise at close range and exposure to high level of noise for a long period in most cases results into permanent hearing loss. ISATL has to follow the OSHA guideline for exposure to specific noise levels for human beings as is provide in the following Table 6.2.

Table 6.2: OSHA noise exposure limits for the work environment

Noise (dBA)	Permissible Exposure (hours and minutes)
85	16 hrs
90	8 hrs
96	3 hrs 30 min
102	1 hr 30 min
108	40 min
115	15 min
121	6 min
127	3 min
130	1 min

Source: Marsh, 1991, p. 322

Note: Exposure above or below the 90 dBA limit has been 'time weighted' to give what OSHA believes are equivalent risks to a 90 dBA eight-hour exposure.

Table 6.3 shows the typical noise levels generated by some of the construction equipment expected to be used during the construction phase. As seen from the table, the local peak noise level for non-continuous construction activity may reach to as high as 90 dB(A), depending on the type of equipment.

Table 6.3: Noise Levels Generated By Construction Equipment (measured at 1 m distance),

Equipment	Noise Level (dB(A))
-----------	---------------------

<i>Earth Movers</i>	
Front Loaders	72-84
Backhoes	72-93
Tractors	76-96
Scrapers, Graders	80-93
Pavers	86-88
Bull dozer	86-88
Excavator	84-86
Trucks	82-94
<i>Material Handlers</i>	
Concrete Mixers	75-88
Concrete Pumps	81-83
Cranes	75-86
Winch	85-88
Brick and stone crusher	85-88
<i>Stationary</i>	
Generators (in canopy)	71-82
Electric Saw	81-85
Wood Planer	81-85

Source: ISATL

6.2.4 Impact of Diesel Storage

The diesel l required to run the standby generator will be procured from Bangladesh Petroleum Corporation (BPC) by Tanker Lorries. The Tankers will unload the fuel into the storage Tanks of the project. There may be spillages during the unloading operation. Adequate preventive measures will be needed to ensure that no spillage of oil will take place into the surrounding environment. This can be ensured by building a catchment area having a capacity of 1.5 times the maximum capacity of the storage tank.

6.2.5 Impact on Surface Water Quality

The construction and operation of the proposed Project will have major impact on the surface and ground water quality in the Project area. Contamination to water bodies may result due to oil spilling during construction activities and/or surface runoff from the construction site to the nearby water body. Turbidity levels of the immediate water body may increase, if the surface runoff from the river terminal container depot cannot be controlled.

Spent lubricating oil will be generated during the construction period from the heavy construction equipment like the tractors, piling equipment and cranes. The spent oil should be collected and put into drums and sold to outside contractors.

6.2.6 Impact on Ground Water Quality

Ground water pollution can take place, if chemical substances and oily waste get leached by precipitation of water and percolate to the ground water table. Reducing spilling at the construction site will minimize the chances of leaching chemicals to the ground water. There will be minimal use of chemicals in the construction phase of the project. It should be mandatory by the company for disallowing any trucks to do maintenance work within the project site so that no spent lubricant is spilled.

6.2.7 Impact on Ecological Resources

Impact on Terrestrial Ecology

There is no designated wildlife sanctuary, wetland or reserve forest in the close vicinity of the proposed container depot. The Project activities do not associate with any type of disturbance to terrestrial ecology.

Impact on Wild Life

The faunal species in the project area is mainly of those associated with manmade habitat. As there is no wild life that faces extinction (Reference IUCN Red List) in the project area, no adverse impact on wild life is expected.

Impact on Aquatic Ecology

Aquatic ecology can be affected due to surface runoff. During the construction phase there will be little potentials of chemical use and therefore the runoff from the project area in the surrounding water body. There are chances of surface runoff during construction activity to adjacent water body. The only possible is spent lubricating oil from the construction equipment. This has been discussed. In order to prevent contaminated and muddy water runoff into the adjacent water bodies use of boom should collected and disposed.

6.2.8 Impacts on Occupational Health and Safety

Implementation of Occupational Health and Safety Programme as outlined in the IFC EHS guidelines needs to be complied with to address all aspects of workers health and safety in relation to the construction period of the project. Job specific medicals checkup for all employees is mandatory. The employees newly recruited must be given EHS training prior to resumption of work.

ISATL authority will need to prepare an Occupational Health and Safety Manual which must cover the following issues:

- Policy and Objectives;
- Appointment of qualified EHS specialist(s)
- Detailed section wise OHS guidelines
- Details of how rules and updates (if required) will be communicated to workers
- Identification and risk assessment of hazardous activities and high risk areas;
- Emergency Response Plan;

- Training on Emergency Response Plan;
- Safe working methods for hazardous activities;
- Ensure all personnel are provided with all required Personal Protective Equipment (PPE) for the environment they are in and the tasks they are performing;
- Implementation of a Grievance Redress Mechanism;
- Implementation of a Lock-out Tag-out program; and
- Reterminaling and investigation procedure for all severe and minor accidents, and near misses.

Ensuring all subcontractors (if any) sign and agree to the site EHS Plan. Provide training for all subcontractors to ensure site procedures are fully understood and complied with.

6.2.9 Traffic, Transterminal, Road and River Safety

Road traffic flows to and from the Project site is going to increase during the remaining part of the construction phase due to increased movement of vehicles carrying construction materials, equipment and machinery, and personnel. During the construction remaining construction phase, traffic disturbance needs to be minimized by avoiding high-density areas, proper traffic signs, ensuring using designated access roads and avoiding road blockage through traffic volume management.

In addition, there is a potential risk of the access road being adversely affected during carrying of construction equipment. The highway from Dhaka to Chittagong is designed to bear 10-12 Ton. This is adequate for the transterminalation of the construction equipment. However, the access road from the highway to the project site will need upgrading. In order to minimize the risk due to increase traffic of heavy Lories and trucks it is recommended that the movements should be done in the night time but with care.

6.2.10 Waste Generation and Disposal

Construction Debris, Waste and House- keeping Arrangement

Project construction activities will result in generation of considerable amount of inert solid wastes, including lumber, excess concrete, metal and glass scrap, and empty containers used for non-hazardous substances. Management of these wastes will be the responsibility of the Contractors as recommended in the EMP section of this reterminal. Typical management practice includes proper temporary storage of waste and debris, and good housekeeping of work areas. No part of this construction waste should be mixed with the domestic solid waste. Separation of saleable solid waste through screening process and dispose to the secondary users can be mitigation measures. Rest of the insignificant waste shall be disposed in a safe manner.

6.2.11 Accommodation Facility

There were no accommodation facilities in the project area during the construction phase as all the workers belonged to that area.

6.2.12 Sewerage Management

As mentioned in the previous section there were no workers shed existing in the project site during the baseline study in October 2016. According to the project sponsors all the workers are from the local area and no accommodation facilities were provided. Therefore, the requirement of an elaborate sewerage disposal system was not required. However, adequate numbers sanitary latrines and soak pits were installed for the workers during the construction phase. For this purpose, a wastewater generation rate of 50 litres per capita per day has been assumed for 50 to 100 workers.

Wastewater generated from different construction activities is not likely to be significant in volume. Disposal of such waste water may be carried out by draining them in the municipal drainage system.

6.3 Environmental Impacts during Operation Phase

Typical environmental issues related to operation phase of the proposed project operations include (IFC, 2007):

- (i) Wastewater and waste management;
- (ii) Hazardous material and oil management;
- (iii) Air emissions;
- (iv) Noise; and
- (v) Biodiversity.

6.3.1 Waste water and Waste management

For the proposed ISATL project, other important issues include impact of the project on terminal and communication (especially on road traffic), employment and economy in general.

Typical effluents associated with the project activities may include storm-water and sewage from terminal operations. Storm water drainage needs to be built and septic tank of suitable size needs to be built.

6.3.2 Hazardous Material and Oil Management

The proposed ISATL has been designed keeping in mind the fast-growing volumes of both internal and external. The Terminal is not likely to handle any hazardous material. There will be regular fuel handling will be the diesel used in the standby power generation. The diesel storage tank capacity is estimated to be 2000 liter. There are potentials of leakage from this diesel storage tank therefore there is a need to install a containment tank having a capacity of 1.5 times the maximum storage capacity of 2000 liters.

There is requirement of management of different types of oil and fuel used in different maintenance activities. The spent lubricating oils should be stored in drums and disposed through

outside authorized contractors for either recycling or dumping in approved landfills.

6.3.3 Air Pollution

During the operational phase, the sources of environmental pollution can be categorized into three groups

- the diesel vehicles (trucks) carrying goods to and from the container terminal,
- the container handling equipment (e.g., Cranes, Reach Stacker and Forklifts) which are mostly run by diesel engines terminal (2000 kVA capacity) for electricity supply at the Terminal. There may be minor emissions from diesel fuel storage also.

As emissions from trucks will be intermittent in nature it is not possible to predict the exact impact as modeling cannot be done using AERMOD, however as the trucks reach the warehouse it should be mandatory that the truck engines are shut off and once the unloading operation is completed the trucks should leave the project area.

6.3.4 Noise impacts

There is a settlement on the north side of the project which is about 50 meters from the project boundary wall. The baseline noise is higher and which becomes dominant. On the east side of the project there is the access road connected with Dhaka Chittagong highway where the baseline noise level is dominant and the noise generated from the project will not impact the noise level. On the south side is Sagorika BISCIC where the impact due to noise will be negligible as the settlements and receptors will be more than 500 meters. In the west side of the project is social forestry, settlement and the noise levels predicted from the proposed project will not impact the dwellers. Overall there will be incremental impact due to noise for the proposed project activities.

The ambient noise standard of IFC and Bangladesh Government is mentioned in the following Table 6.5 and 6.6

Table 6.5: Standards of noise level

Standard	Zone	Day time dBA	Night time dBA
World Bank EHS Guideline 2007	Residential, institutional, educational	55	45
	Industrial, commercial	70	70
Bangladesh ECR, 1997	Mixed area	60	50
	Commercial	70	60
	Industrial	75	70

Table 6.6: The combined noise levels at locations in the vicinity of the site based on modeling at various distances from the project location

Location	Approximate distance from the Source (m)	NIGHT dB(A)			DAY dB(A)		
		Baseline	Source Sound (estimated from	Combined effect	Baseline	Source Sound (estimated from	Combined effect

			simulation)			simulation)	
Project site (east boundary point)	105	41.2	29.33	42.75	47.06	29.33	48.46
North side of the terminal	223	37.3	18.91	38.57	43.76	18.91	44.93
South side of the terminal	208	41.3	28.07	42.74	48.23	18.07	49.48
East side of the terminal	207	42.4	37.60	44.04	49.65	25.90	50.06
West side of the terminal	175	37.5	26.23	38.91	37.41	26.23	38.82

Above shows the combined effect of the resultant sound at various points where the baseline noise levels were measured. The combined effect is a sum of the baseline value and logs of modeled results at various distances from the source of the noise the four directions during night time and day time based on the formula

Noise Modeling calculation

The noise modeling is based upon the method documented by the International Energy Agency. It is a simple model which assumes spherical spreading from a point source either in free space (spherical) or over a reflective plane (hemi-spherical). For this case, spherical spreading has been used because sound wave is propagating uniformly in all directions and the crests and troughs of the sound waves can be pictured as spheres centred on the source location. The total noise from each turbine is logarithmically added according to the formulae given below:

$$L_A = 10 \log_{10} (10^{L_A/10}) \text{ dBA}$$

Where: LA = Sound Source 1 (i.e. LBPL power plant)

The model presents a ‘worst-case scenario’ as it does not take into account factors which would reduce noise propagation, such as:

- Uneven topography
- Large obstructions in the propagation path, e.g. barriers etc
- Refraction of noise, e.g. due to atmospheric effects such as temperature inversion
- Wind speed or direction effects
- Any change in the propagation with changing frequency
- The maximum noise level during peak of operation is conservatively assumed to be 85 dB

The mathematical formula for the noise model is shown below:

$$L_P = L_W - 10 \log_{10} (2m^2) - ar$$

$$L_P = L_W - 10 \log_{10} (4m^2) - ar$$

Where: r is the distance from source to receiver;
 a is the absorption due to the atmosphere (dB/m), which is most commonly used as 0.005dB/m;
 L_w the sound power level of the truck in running condition; and
 L_p the maximum sound output during peak operation.

Based on the results in Table 6.6, it is clear that the proposed ISATL project will have a negligible noise impact at the nearest sensitive receptors. Such an increase is considered to be negligible and is compliance with both IFC and DoE guidelines. The model presents a 'worst-case scenario' as it does not take into account the normal abatement techniques to be used like installing silencer pipes at the generator exhaust and intermittent operation of the Fixed Cargo Cranes.

6.3.5 Solid waste

During operation phase, solid waste will be generated from production process i.e. oil filter, air filter, scrap tires, batteries, other wastes of maintenance workshop and from kitchen and Project personnel daily uses. Improper disposal of solid waste may interrupt the drainage system as well as may pollute the surface water body.

ISATL has to confirm the compliance of good house-keeping policy and procedure. Personnel should be trained accordingly. Two separate waste bins should be placed to collect the daily waste as organic and inorganic. All plastic materials would be sold to DOE enlisted secondary users for recycling. Biodegradable waste could be compost and later use as fertilizer.

It is already mentioned that ISATL is found to consider the waste management issue with due interminance. Already they have introduced a number of dustbins including the approach of separating the waste at source.

6.3.6 Liquid waste and lube oil disposal

Main liquid waste of the proposed Terminal will be spent for lube oil as in the construction phase heavy equipment will be used which can be possible source of spent lube waste generation. Additionally, there are potentials of accidental spillage of fuel oil and spent lubricating oil during the construction and operation phase. The points from where these spills can occur are as follows:

- oil spill during unloading from tankers;
- leakage from storage tanks;
- leakage from transfer pipes;
- leakage from machines during operation; and
- oil spill during maintenance of machines.

Spillage of oil will be collected in a Tank and pass through three Tanks and finally send to the process where a polymer will be added to separate the oil from water. The separated oil will be collected in drums and sold to DOE approved recyclers. ISATL will not procure poly-chlorinated

biphenyls (PCBs) transformer oil. Pure hydrocarbon mineral oil will be used for transformers, current transformers, potential transformers and capacitors under the project which will not have any adverse environmental impacts.

6.3.7 Sanitary waste-water

Sanitary wastewater will be generated from the office and dormitory building, which will be treated by septic tank connected with soak pit. ISATL has informed that they will adopt septic tank and soak pit by considering the required standards of best practices as are applicable for 100 persons. A soak pit having a diameter of 1.5m and a depth of 4.5m having a volume of 21.19 cubic meters will be constructed.

6.4 Environmental Impacts during Decommissioning Phase

The major environmental impacts during post-operation or decommissioning phase of a Container Depot are noise and vibration; solid waste generation and leakage of spent lube-oil and other raw materials; dust generation; and risk of human health and property. As the demolition workers are likely to lead to significant deterioration of the acoustic environment, carrying out the demolition work at day time can be a mitigation measure. In case of waste and leakage of spent lube-oil and other raw materials, ISATL has to make sure proper collection and disposal. To address the dust generation due to demolition work, watering in bare area can be an option. For mitigating the risk of human health and property damage, vehicles as are to be used in demolition work, have to be operated with due care

6.4.1 Community Health and Safety Impact

Community health and safety risks and mitigation measures during construction, operations are similar to those of other large industrial facilities. According to Environment, Health and Safety (EHS) Guidelines of IFC, the major occupational health and safety issues relevant with the project are as follows:

6.4.2 Exposure to Electro Magnetic Field

In a terminal, the workers have a high exposure to electro-magnetic field (EMF) than the general public due to working in proximity to electric power generators, equipment and connecting high-voltage transmission lines. ISATL has planned to provide earthing network around the generator room. Mesh system is expected to be used as safety measure.

6.4.3 Fire and Explosion Hazards

The daily activities of terminal include store, transfer and use large quantities of fuels; therefore, careful handling is necessary to mitigate fire and explosion risks. To avoid the risk of fire and explosion hazard, ISATL has to arrange sufficient number of fire protection equipments like buckets, fire extinguishers, fire water tank should be provided for emergency needs. At the site, the safety and emergency manual should be accessible to all employees.

6.4.4 General Safety

To reduce the risk of general accidents, ISATL has planned to provide personal protective equipments like safety gloves, helmet, mufflers etc. during construction period and during the maintenance work while the terminal is in operation.

Chapter-7

ANALYSIS OF ALTERNATIVES

7.1 ‘No Project’ Alternative

From physical and environmental points of view, the ‘do-nothing’ is preferable to any project implementation, since it would avoid creation of any of the adverse impacts associated with the project. But the ‘without project alternative’ is not acceptable since this will strongly reduce the potential for socio-economic development of the country. In spite of having greater potentiality, the industrial growth is retarded mainly due to timely transportation from the production point to port and extra transport cost. ISATL is the easiest way to handling the goods from Chittagong port to proposed project site. Considering these, ISATL has decided to ahead with the project. Therefore, it is concluded that the ‘No Project’ alternative is not an option.

7.2 Analysis of Technology

The technology used in the operation of the project is not highly specialized and will include, Reach Stackers, Forklifts, and other handling equipments.

Reach Stackers are used for flexible handling of containers and are usually designed to lift containers as heavy as 45 metric tons into heights of six containers. Reach Stackers are able to transport a container over a short distance very quickly and pile those rows as required. The straightforward operation of loading and unloading do not have any technology alternative.

7.3 Analysis of Site Alternatives

Analysis of Site Alternatives (AoA) helps to identify potentially viable project locations and provide comparative cost, effectiveness, and risk assessments of each site to a baseline; this baseline is typically the proposed operating system. In identification of project site for a Container Terminal depot, some parameters are taken into consideration like:

- i) availability of river navigation in terms of adequate draft all round the year
- ii) availability of adequate river front space for the river port,
- iii) availability of fuel transport facility through sea and road,
- iv) availability of infrastructure facility (electricity, telecommunication, etc).
- v) availability of land transport parking spaces etc.
- vi) availability of wide road connection to carry the container by road
- vii) environmental and social suitability

7.4 Location and Area of Available Land

During site visit, information about alternative sites considered was assessed. Based on the available information two alternative sites were selected for further analysis. Table 7.1.and Google Map 6.1 which includes the three alternative sites considered and the proposed site.

Table 7.1: Comparison of sites with respect to location, area and communication

Site	Physical Location			Geographic location		Area in acre
	Mouza	Union/pourasava	Ward	Latitude	Longitude	
Proposed site	Kattali	Uttar Kattali	10	22°21'54.26"N	91°46'31.88"E	15.
Alternative site	Kattali	Uttar Kattali	10	22°21'51.26"N	91°46'29.88"E	15

**Google Map 7.1:** Two alternative sites view for the alternative port indicated in the above image

Four site scenarios of the proposed alternative site are shown in the following photos:



Photo 7.1: West side



Photo 7.2: East side



Photo 7.3: North side



Photo 7.4: South side

Photo 7.5: Proposed ISATL project site

Table 7.2: Comparison of sites with respect to communication and other suitability with the proposed site and alternative site

Location	Topography	Land use Pattern
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Proposed site	▪ The site is basically a plain terrain. ▪ The site requires about 3-4 feet land filling. ▪ The overall shape of the site is rectangular making it more suitable for a Container Terminal ▪ The site is situated on the Dhaka Chittagong Highway site ▪ Road connectivity from Port to project site is good ▪ Road connectivity from Dhaka to Chittagong and other places is good ▪ The place is in the BISCIC area and outside from the settlement and ▪ The price of the land is cheaper than the Alternative site ▪ It has no more infrastructure handling issue like alternative site	Prepared land for any kind of industrial activities
Alternative Site	▪ The site is basically a plain terrain. ▪ The site requires about 5-6 feet land filling. ▪ The overall shape of the site is rectangular making it more suitable for a river port container terminal. ▪ It has infrastructure replacement issue ▪ Godown for victory Jute mills is exist ▪ The site comparatively costly than alternative site ▪ Having temple issue inside the boundary	Prepared land for any kind of industrial activities

7.5 Distances from Major Infrastructure

While selecting a Container Terminal Depot site, distance from major infrastructure is important consideration. Because of construction of container and crane supporting basement requires considerable amount of financial involvement and sophisticated technology. As the proposed project will be an export import oriented materials load and unload from the Chittagong and other port, proximity to container depot facility is also a major issue to deal with. In the following Table 7.3, the sites are evaluated based on distance from some important infrastructures.

Table 7.3: Comparison of sites with respect to distance from major infrastructure

Sl. No	Major Infrastructure	Approx Distance from Site (km)	
		Proposed Site	Alternative Site
1	Upazila office of Pahartali	6.0	6
2	PDB office	6.0	6
3	Dhaka Chittagong bus stand	1	1
4	BIWTA office	60	6.0
5	LGED office	6.0	6.0
6	Zila parishad office	6.0	6.0
7	Hospital and clinic	6	6
8	Fire service	7	7
9	Counselor Office	2	2

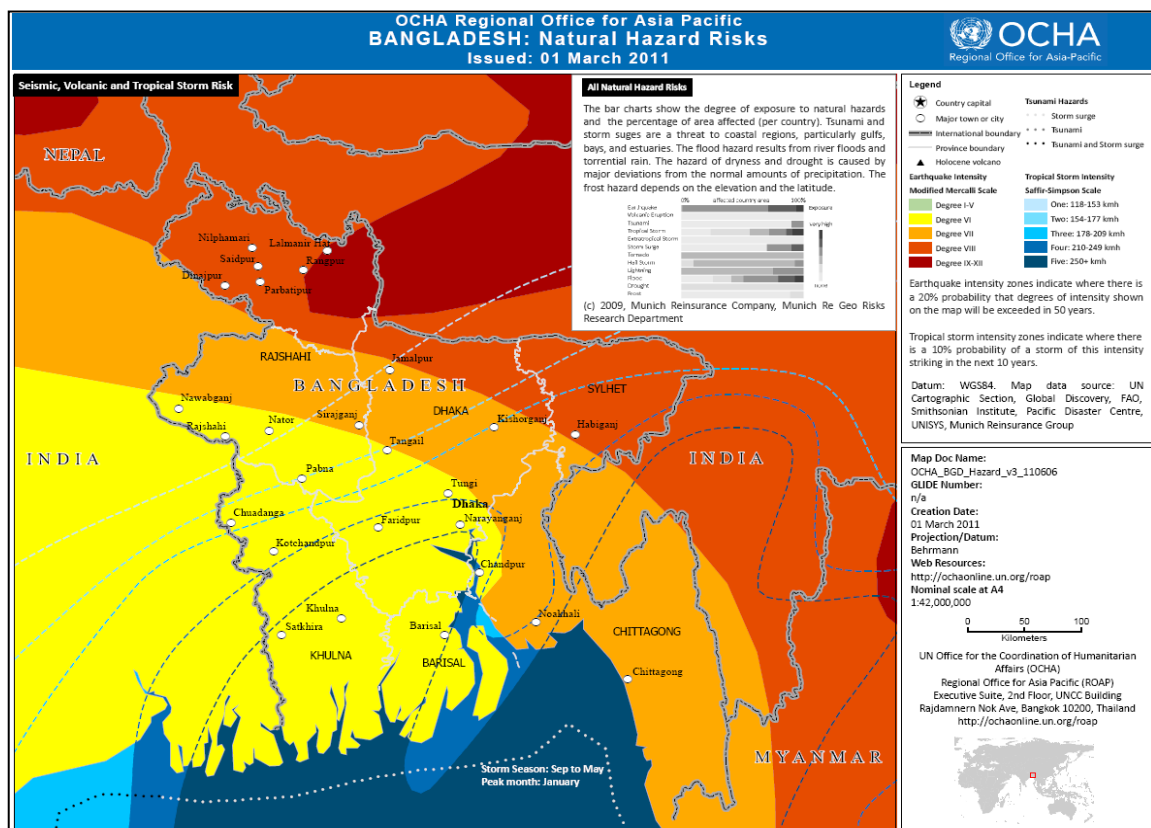
Source: BCAS field representative through local information

The analysis shows that even the alternative locations size and areas are adequate for the proposed project but for the following reasons the proposed ISATL project by the sponsors seems to be the most advantageous and suitable.

- Close proximity to the riverside
- No natural wetlands will not be disturbed
- Close proximity to the main road for transportation of construction equipments
- Proximity to electricity connection
- Land filling requirement will be less and the area is more suitable for a Container Terminal

7.6 Vulnerability to Natural Calamity

According to the earthquake zoning of Bangladesh the three sites have fallen under Zone II, which means that the sites have moderate risk of earthquake. On March 1, 2011 UN Office for the Co-ordination of Humanitarian Affairs (OCHA) published a composite map of vulnerability to natural calamity for Bangladesh. According to this map, the sites have less significant risk associated with Tsunami and storm surge. But the tropical storm intensity is about 210 kmh. There is no risk of volcanic eruption for these sites. According to this map earthquake risks for the three sites is Degree VI according to the Modified Mercalli Scale. The following Map 7.2 depicted the Natural Hazard Risk of Bangladesh.



Map 7.2: Natural Hazard Risk Map of Bangladesh prepared by OCHA

7.7 Comparative Valuation of the Proposed Sites

Land price is dependent on a number of factors. Among this factors accessibility to the site and proximity to major infrastructure are two major factors. Similarly the land rate was found to vary from site to site. The price of road side land is high than the river side land. The location of the proposed project is covered both the road and river, therefore the price is comparatively high and suitable for the river port terminal. The other two sites also suitable and the location is riverside which price is less than proposed site but it is not prepared land, it would take time. BCAS team discussed the local people for sites evaluation. **Table 7.4**, the tentative unit price of three sites is evaluated.

Table 7.4: Land price of short-listed sites Add proposed land price

Site	Market price (taka/decimal)
Proposed site	700,000
Alternative Site	750,000

Source: BCAS representative

Chapter-8

ENVIRONMENTAL AND OCCUPATIONAL MANAGEMENT PLAN (EOMP)

8.0: Environmental and Occupational Management Plan (EOMP)

8.1 General Considerations

Environmental and Occupational Management Plan (EOMP) of the Ispahani Summit Alliance Terminal Limited (ISATL) project is concerned with the implementation of the measures necessary to minimize and offset the adverse impacts and to enhance beneficial impacts. Unless the mitigation and benefit enhancement measures are identified in ESIA and fully implemented, the prime function of the ESIA cannot be achieved. Thus, the objectives of EOMP for the present project are:

- (i) Identification of monitoring requirements and monitoring indicators;
- (ii) Mitigation measures to reduce or eliminate negative impacts; and
- (iii) Enhancement measures to maximize positive impacts.

Environmental and Occupational Management plan has to be considered as part of the Terminal's overall management and it would be part of the project operational manual. Monitoring of the performance of a project is very important and sometimes vital. Industrial units in Bangladesh generally do not monitor the environmental parameters related to project operation, thereby neglecting the environment. For surveillance of the environmental performance of an industry, and monitoring of the quality of the local environment, environment in the work-zone and the general impact zone have to be performed on a regular basis. A management set up has to be created for the environmental monitoring program which can ensure compliance with national environmental standards. To this end a committee (Environmental Management and Safety Committee) will be created with project manager as head and with 2-4 other members. The committee must meet at least once in a quarter and take stock of the environmental status of the project. Any additional monitoring required should be defined and resources allocated for the purpose. The proceeding of the committee should be recorded and used to produce quarterly and annual environmental reports indicating compliance or otherwise of the environmental regulations. These reports should be submitted to the DOE and shared with the funding agency. The quarterly and annual monitoring reports will also be placed on the company website for public scrutiny. The cost of the Environmental and Occupational Management Plan (EOMP) has to be divided into several parts to reflect the different phases of the project and the requirements of each phase. The cost of EOMP must include the costs of the capacity building, public consultation and the quality control requirements and the budget allocation should be made in the yearly operational budget of the project.

8.2 Mitigation/Benefit Enhancement Measures

For effective and environment friendly operation of an industry, a set for guiding tools and suggestions are necessary which need to be followed at various stages of project installation, operation and maintenance. This plan generally has various components of management depending on the type of industry or project activity and types of discharge and their pollution potential. This Environmental and Occupational Management Plan (EOMP) once prepared forms the basis of environmental management actions from the part of the project authority may need modification or up-gradation because of changes in the project operation or accurate pollution load/environmental problems detected afterwards. The project authority may also be needed to expand the suggested outline of the EOMP proposed in this report. All beneficial and adverse impacts which may likely to occur at different phases of the project are identified in following section. The section described the predictions, evaluation and aspect of mitigation and benefit enhancement measures have also been discussed concurrently with impacts prediction and evaluation. In view of the earlier discussion summary of recommended mitigation and benefit enhancement measures are presented in Table 8.1.

Table 8.1: Recommended mitigation/enhancement measures

Potential Impacts	Mitigation/Benefit Enhancement Measures
Impact on surface water quality	• Dispose all domestic waste water through septic tank • Surface drainage should be disposed through an interceptor.
Impact on solid waste	• Collect all solid wastes properly, recycle where possible and dispose in proper place. Follow national 3R strategy • Waste rugs and waste air filters are collected properly and disposed to the landfill site
Impact on Air Quality	Collect dust if any from the container and container land properly with dust collector machine
Impact on health and safety	• Set up warning signs, signals and provide helmets for workers in accordance with relevant accident prevention and work safety procedure • Restrict access to project site • Supply good quality drinking water to the workers • Provide well-planned sanitary facilities • Provide regular health inspection among workers • Promote health education campaign among workers
Noise/vibration hazard	• Proper acoustic design should be made for the power house building and silencer in the exhaust of each engine. • Provide sufficient buffer strip around the project site
Traffic congestion	Avoid carrying of materials in peak hour of road traffic
Impact on employment & family finance	Employ local people wherever possible

8.3 Environmental Management during Operation Phase

8.3.1 Overview of Impacts and Mitigation Measures

Inland Container Depots have little potential for environmental impacts during the operational phase of the project. The following impacts are the most significant in the present case:

- Impacts on air quality;
- Acoustic and vibration impacts
- Wastewater discharge
- Occupational Health and Safety

Over viewing of mitigation measures due to impacts arises from the operation of Inland Container Depot is Particulate Matter emissions, which are being controlled at source by the following mitigation measures:

- Dust collector machines will be in operation to control Particulate matter pollution.
- Environmental noise from vehicle will be controlled through proper traffic management within the project.
- A septic tank will be provided to ensure that effluent discharge standards are met.
- Containment for Oil tank will reduce hazards from oil spillage

8.3.2 Atmospheric Emission Management

Increase vehicular volume would create air pollution. At the moment the project is running at about 50-50% of its full capacity. ISATL authority is monitoring the air quality of the project area every 6 (six) months, recommended by the Department of environment, Chittagong and keeping records of the reports in the factory premises. None of the parameters exceed the standard limits set by the DoE so far. It is recommended that a full air quality modeling and traffic exhaust emission modeling should be done when the project will be running at full capacity.

8.3.3 Management of Solid Wastes

The area has no municipal solid waste collection system. So, the ISATL authority will have its own solid waste collection and disposal system in place to abate the pollution from the solid waste. The solid waste which has secondary demand will be sold out to the local traders after inspection and other waste will be properly managed and disposed of off-site. Therefore, no significant ecological impacts arising from solid waste management are anticipated. Any excavated earth will be stored on-site and later used for landscaping activities.

8.3.4 Water & wastewater Management

The project would have water use for the domestic use and vehicle washing. But there will be no process water usage. There is insignificant chance of polluting surface water from either sources since there will be small amount of discharge from the transporting vehicles to the surrounding environment. The surface drainage network would be connected with an interceptor prior to discharge through natural water. The interceptor will trap all oily matter present in the water which will be disposed separately.

8.3.5 Domestic Sewage Management

All domestic sewage will be treated in a septic tank. The treated water will be discharged through soak pit.

8.3.6 Noise and Vibration Level Management

Adequate measures have been proposed for the control of noise and vibration from the operating equipment and electric generator in the project. Noise level monitoring would be performed periodically and the workers exposed to noise would have adequate protective wool.

8.3.7 Greening Program

A green belt development program with different kinds of trees should be undertaken. The vegetation would purify the air, reduce noise level, maintain ecological balance and generally contribute to the scenic beauty of the air. Soil in and around the plan site is fertile and plenty of water is available. Hence, the green belt as an environmentally sound and friendly project with a buffer zone surrounding the project area may be created in a short time and therefore green area will be increased and reduce the environmental impacts.

8.4 Monitoring Requirement

Environmental monitoring is an essential tool in relation to environmental management as it provides the basic information for rational management decisions. The prime objectives of monitoring are-

- To check on whether mitigation and benefit enhancement measures are actually being adopted and are providing effective in practice
- To provide a means whereby impacts which were subject to uncertainty at the time of preparation of ESIA, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures.

- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in future

There are two basic forms of monitoring:

- Visual observation or checking, coupled with inquiries
- Physical measurement of selected parameters

In the case of industrial projects in general, monitoring is done by physical measurement of some selected parameters like air, water, noise etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the project does not create adverse environmental changes in the area and providing a database of operations and maintenance, which can be utilized if unwarranted complaints are made.

8.5 Monitoring Indicators

Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to establish trends of impacts. The indicators may be independent or may be functionally related. The physico-chemical, ecological and human interest including socio-economic indicators should be well understood. The monitoring program, in view of the possible impacts as assessed earlier, should consider the indicators for the impact assessment related to following issues is presented in Table 8.2 in the following page. It is desirable that the mitigation measures for the negative impacts and environmental enhancement for positive impacts are implemented according to the suggestions presented in this report. There are two types of environmental monitoring activities associated with the project, during construction and during operation of the project. Each of the components is to be dealt with according to the requirement of suggested measures.

8.5.1 Monitoring during Construction Phase

The Environmental and Occupational Management Plan should be carried out as an integrated part of the project planning and execution. It must not be seen merely as an activity limited to monitoring a regulating activities against a pre-determined checklist of required actions. Rather it must interact dynamically as project implementation proceeds, dealing flexibly with environmental impacts, both expected and unexpected. The environmental management during the construction phase should primarily be focused on addressing the possible negative impacts arising from:

- Generation and disposal of sewage, solid waste and construction waste;

- Increased traffic;
- Generation of dust (particulate matter);
- Generation of noise.

The environmental management should also focus on enhancing the possible beneficial impacts arising from employment of local workforce for construction works. Table 8.2 summarizes the potentially significant environmental impacts associated with the pre-operation phase, mitigation measures and institutional responsibility.

Table 8.2: Potential impacts and mitigation measures at Construction phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Influx of workers	Generation of sewage and solid waste	▪ Construction of sanitary latrines and septic tank system ▪ Erecting “no litter” sign, provision of waste bins/cans, where appropriate ▪ Waste minimization, recycle and reuse (as required) ▪ Proper disposal of solid waste	ISATL Responsibility
	Possible spread of disease from workers	▪ Clean bill of health a condition for employment ▪ Regular medical monitoring of workers	
Transportation of equipment, materials and personnel; storage of materials	Deterioration of air quality from increased vehicular movement, affecting people in the surrounding areas	▪ Keeping vehicles under good condition, with regular checking of vehicle condition to ensure compliance with national standards and EHS guidelines (where applicable)	ISATL Responsibility
	Wind-blown dust from material (e.g. fine aggregate) storage areas	▪ Watering the access road ▪ Sprinkling and covering stock piles ▪ Covering top of trucks carrying materials to the site and carrying construction debris away from the site	
Site clearance	Topographic change by cutting existing trees, shrubs, herbs, and filling land	▪ Adopt such type design as is required minimum cutting of trees, shrubs, herbs, and low-land filling ▪ Use waste shrubs, herbs as organic fertilizers ▪ Adopt required measures to prevent waste shrubs, herbs as fuel to cook or for any localized burning	ISATL Responsibility

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
		purpose.	
Noise from construction equipment operations and maintenance	Noise could exceed the allowable limit and result in hearing loss	▪ Avoiding, as much as possible, construction equipment producing excessive noise ▪ Avoiding prolonged exposure to noise by workers ▪ Creating a green belt around the Project site ▪ Follow construction scheduling to avoid evening and nighttime disruption	ISATL Responsibility
Dust during construction and exhaust gases from construction machinery and vehicles (particulate matter, PM2.5, PM 10, NO_x, SO₂)	Increased SPM, PM 2.5, PM 10, NO _x , SO _x levels at construction sites, and surrounding areas	▪ Try to avoid using equipment such as stone crushers at site, which produces significant amount of particulate matter ▪ Immediate use of construction spoils as filling materials ▪ Immediate disposal/sale of excavated materials ▪ Continuous watering of bare areas	ISATL Responsibility
Fires, explosion and other accidents	Risk of human health and property damage	▪ Use of personal protective equipments during construction and maintenance. Prepare and implement safety and emergency manual. ▪ Regular inspection of lines for faults prone to accidents. ▪ Provision of fire protection equipments. ▪ Provision of Lightning arrestors	ISATL responsibility with Environmental and Social Monitoring Unit (ESMU) oversight

8.5.2 Operation Phase

ISATL is fully responsible for overall environmental management during operation phase of the Project. In this regard it is expected that ISATL will establish Environmental and Social Monitoring Unit (ESMU) for ensuring effective environmental and social compliances.

The environmental management during the operation phase should primarily be focused on addressing the following issues:

- emission from the vessels and crane
- generation of noise from the equipment
- waste generation at the

Table 8.3 summarizes the potentially significant environmental impacts during operation phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 8.3: Potential impacts and mitigation measures at operation phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Project site, Access Road	Road Traffic and Transportation	Prepare a traffic and transportation plan for the construction phase, which includes (but not limited to): • avoid the transportation of materials or machinery during peak traffic periods; • stick to agreed traffic routes, avoiding narrow roads and villages; • implementation of a safety program (signage, speed restrictions, lights on trucks, truck load restrictions etc.) within the construction area; • provide training on safe driving; • prevent unauthorised access (i.e. public access) to the project site; • load trucks in accordance with legal requirements and cover transported materials to prevent them falling off during transit; and • maintain and/or repair any private and public highways that have been damaged by vehicles from the construction site. • a grievance mechanism established as part of a stakeholder engagement plan.	ISATL authority
Air emission generator	Emission from the container yard construction	• Installation of stack emission monitoring equipment for major pollutants • Planting of trees around the Project site	Environmental and Social Monitoring Unit (ESMU)
	Generation of	• Reduce noise emission by following	Environmental

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
	noise from generators and associated sub-stations, which could exceed 70 dB(A) at site boundary	mitigation methods discussed in Chapter 5. Locate; • Use walls, fencing, and/or greenbelt to provide partial noise barrier • Provision of critical silencers or generators (if need arises) • Use of ear-muffs and ear-plugs by port personnel working in the generator and turbine facilities of the port	and Social Monitoring Unit (ESMU)
	Suspended particulate matter (SPM) and PM _{2.5} , PM ₁₀ generation from the engine, which can adversely affect health	Maintain adequate air fuel ratio to ensure complete combustion of fuel which will reduce emission of particulate matter from the standby generator. Instrumentation of generator and other construction equipment should be calibrated on a regular basis.	Environmental and Social Monitoring Unit (ESMU)
	NOx generation from the engine, which can negatively affect health	▪ Maintain adequate air fuel ratio to ensure complete combustion of fuel which will reduce emission of particulate matter from the standby generator. Instrumentation of generator and other construction equipment should be calibrated on a regular	Environmental and Social Monitoring Unit (ESMU)
	CO and VOC, which can negatively affect health	▪ Maintain adequate air fuel ratio to ensure complete combustion of fuel which will reduce emission of particulate matter from the standby generator. Instrumentation of generator and other construction equipment should be calibrated on a regular	Environmental and Social Monitoring Unit (ESMU)
	Electro-magnetic wave or electrical	▪ All equipments should be grounded earthing with mesh system.	Environmental and Social Monitoring Unit (ESMU)

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
	interference, which may result in occupational health risk.		
Occupational Health and safety	Solid wastes	• Apply the waste hierarchy and reduce, reuse or recycle wastes wherever possible. • Segregate wastes by types and provide appropriate waste containers for the storage of all waste streams. • Provide a specific area for the storage of solid hazardous wastes (i.e. batteries, fluorescent lighting tubes, used oil filters, aerosol cans etc.). • Prohibit the burning of wastes. • Arrange a waste removal contract and schedule at least weekly waste collections to prevent the build-up of waste materials. • Audit waste contractors to ensure appropriate disposal methods are applied according to the waste stream.	ISATL authority
	Hazardous Materials Management	• Refueling, washing and maintenance of port site and vehicles will be prohibited in the vicinity of water bodies. • Spill kits will be available to contain any accidental release of hazardous materials. • All hazardous materials will be provided with secondary containment.	ISATL authority
	Risk of human health and property damage	• All necessary safety equipment should be ready at the port. • Regular training on safety needs to provide.	Environmental and Social Monitoring Unit (ESMU)
	Human and Sanitary Wastes	• Provision of an appropriate number of toilets and hand-washing points. • Provision of on-site treatment of sanitary wastes. • Training on sanitation practices.	ISATL authority
	Labour conditions	Bangladesh has ratified key International Labour Organisation (ILO) conventions, to	ISATL authority

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
		ensure the work conditions are reasonable and safe, and employees are free from any form of discrimination.	
	Emergency Response (i.e. Fire, Earthquake, Flood etc.)	Appoint a suitably qualified Emergency Coordinator(s). Develop an Emergency Response Plan (ERP), Covering all foreseeable emergencies, for approval by ISATL authority The ERP will include: • what should be done and who should do it; • what equipment is required and where this will be located; and • staff training requirements and inductions for new workers and site visitors. In addition, the ERP will include: • a method for communication of the ERP to all workers and people arriving on-site; • an emergency contacts document which is maintained up to date; • a review of local emergency services capability and resources. Where they cannot respond to a foreseeable emergency, ensure suitable resources are available at the site and trained/equipped to respond; and • liaison with local emergency services to ensure they are familiar with the site layout and potentially hazardous locations.	ISATL authority
Fires, explosion and other accidents	Risk of human health and property damage	▪ Use of personal protective equipments during operation and maintenance. ▪ Prepare and implement safety and emergency manual. ▪ Regular inspection of lines for faults prone to accidents. ▪ Provision of fire protection equipments. ▪ Provision of Lightning arrestors	ESMU

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
Domestic wastewater and sewage	BOD, fecal coliform contamination in groundwater and surface water	Need to provide septic tank with soak pit for treatment of sewage.	ISATL authority to build to required infrastructure with proper specification
Wastes oil from Project (scrap metal, waste, lube oils, spill oil etc)	Potential soil and groundwater contamination	Secure on-site storage, waste sell to the DOE authorized vendor for discharge in a safe place.	ISATL has primary responsibility. Disposal / treatment vendors have secondary responsibility
Public Relations & Stakeholder Engagement		Conduct proactive public relations (PR) exercises consisting of news/information dissemination to increase understanding of the project. The PR will be carried out using local media, leaflets and meetings/seminars on the progress of the project and environmental and social enhancement measures associated with the project. A Public Relations Plan will be prepared by ISATL authority in order to: - establish clear stakeholder engagement channels. People in the neighbouring villages should have clear lines of communication to ISATL; - communicate how environmental mitigation measures will be implemented throughout the project; - receive, investigate and address any complaints and/or concerns from all stakeholders.	ISATL authority

8.5.3 Decommissioning Phase

ISATL is fully responsible for overall environmental management during post-operation phase or decommissioning phase of the Project. In this regard it is expected that ISATL will establish Environmental and Social Monitoring Unit (ESMU) for ensuring effective environmental and social compliances.

Table 8.4 summarizes the potentially significant environmental impacts during decommissioning phase, the measures needed to eliminate or offset adverse impacts and institutional responsibility.

Table 8.4: Potential impacts and mitigation measures at decommissioning phase

Project Activity	Potential Impacts	Mitigation Measures	Institutional Responsibility
The demolition works will lead to significant deterioration of the acoustic environment.	Noise and Vibration	Demolition work is to be carried out only at day time	Environmental and Social Monitoring Unit (ESMU)
Demolition of the proposed Port Terminal will result in generation of solid waste and leakage of spent lube oil and other raw materials.	Solid waste generation and leakage of spent lube oil and other raw materials.	The waste is to be collected and disposed properly.	ESMU
Some dust will be generated during demolition works of the proposed .	Dust generation	Continuous watering of bare areas	ESMU
During decommissioning movement of trucks carrying heavy demolition equipment and demolished materials will cause adverse impacts.	Risk of human health and property damage	Vehicle is to be operated with proper care	ESMU

Protecting employees also protects their friends, families, fellow workers, management, the public and the environment from the far-reaching effects of serious accidents. In addition to protecting lives, a safety program contributes to employee morale and pride because employees participate in identifying safety needs and developing safe work procedures. Visitors to the worksite may also face legal action if they knowingly disobey safety rules. In addition, the company may face legal action and fines for violations of regulatory requirements. Those individuals who do not fulfill their safety responsibilities will become accountable for any problems their negligence creates and may be liable under the law. Everyone employed by a company is responsible for maintaining the safety program.

Managers and supervisors are responsible for identifying safety needs, communicating safety hazards, investigating hazardous conditions and accidents, providing training, supply or wearing appropriate safety and personal protective equipment, and ensuring all equipment is properly maintained and meets legislated safety standards. Their role is supported by input from all employees. All company employees are responsible for obeying all safety rules, following recommended safe work procedures, wearing and using personal protective equipment when required, participating in safety training programs and informing supervisors of any unsafe work conditions. Everyone has the right and responsibility to refuse to do work when unsafe conditions exist. By fulfilling safety responsibilities, workers will share the benefits of a safety place. The company must have its own safety management and mitigation plan and policy. Listed below are the important features that need proper attention of company management.

Company Safety Policy

The company must have its own safety policy. The safety policy should be updated from time to time. The policy should be signed and dated by the chief safety officer. The policy should be discussed with all personnel. The chief safety officer should periodically review the policy and re-issue the policy.

Safety Responsibilities

All personnel should have safety responsibilities assigned to them. The documented responsibility should be included in the program manual. Compliance with the responsibilities

should be monitored and if these are not carried out for some good reason, corrective measures should be taken.

Management Communication

The management should decide how it communicates periodically with the personnel regarding safety. A site schedule for conducting site tasks should be developed; this should be included in the safety program manual. Documentation of site tours should be retained for verification.

Inspections

A list of all work sheets, equipment, vehicles and work practices requiring inspection should be developed. Checklists and schedules should be developed as part of the inspection program. A system for correcting deficiencies noted during the inspection process must be developed. The system should prioritize deficiencies noted so that serious hazards are dealt with immediately.

Personnel Protective Equipment (PPE)

The work site should be assessed to determine what personal protective and safety equipment is needed and the equipment must be available. A maintenance schedule must be developed for PPE and records for maintenance retained on file. Employees must be trained in fitting, care, maintenance and use of PPE. Detailed rules and procedures identifying company and legislative requirements and expectations must be communicated to all employees and contractors. They serve as a reference and describe the minimum standard by which business is conducted. Most important rules and procedures ensure consistency in the performance of tasks by all employees. The current rules should be reviewed and assessed as to whether they are appropriate for the operation/facility/employees. The formulated rules must be communicated to the workers effectively, and workers must ensure that they understand the rules and have no difficulty to comply with the rules.

Standard Operating Procedure

The intent of SOP is to ensure consistency in the performance of hazardous work and it must form the minimum standards by which specific tasks are performed. Workers must have clear understanding of the procedures they are required to follow. A system for periodic review of procedures must be developed. The employees involved in the work will be given an opportunity to suggest steps that would provide for continuous improvement to the procedures. The SOP shall also ensure that all hazardous tasks have been accounted for. Procedures and codes of practice have to be developed for hazardous work. To determine compliance with safety and hazard issues while performing a task by a worker, efforts should be made to ensure the following:

- Confirm that employees affected by these tasks participate in the development of safe work procedures,
- Confirm that the employees are involved in the maintenance of safe work procedures,
- Interview workers to determine if they know what tasks have work procedures, where these procedures are located and generally what makes up to content,
- Review records to ensure that employees receive training on hazardous work procedures and codes and practices,
- Where practical, observe employees performing critical tasks to confirm use of standard work procedures and codes of standards.

Emergency Procedures

Emergency procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge of the co-ordination of emergency actions shall be identified. The procedures shall be easily referenced, concise and understandable. All employees shall be aware of the content and location of the procedures. The content lists associated with the procedures will be current. The procedures will be updated and tested on a regular basis. The training record and level of training gained by an employee shall be verified so as to ensure his first aid training. Subcontractor employees will also be trained in first aid. The following are the important events that need emergency procedures.

- Fire
- Injury/death
- Leakages and other releases of hazardous substances
- Natural disasters

Safety Orientation and Training

Initial safety training is one of the most important aspects of any safety program. All employees and contractors must receive some level of basic training, specific to the facility and nature of the job. It must be ensured that appropriate orientation is given to:

- Employees
- Contractors
- Sub-contractors
- Visitors

The orientation shall also include a review of the following:

- Company safety policy and procedures
- Specific job hazards
- Safety precautions
- Job responsibilities

- Regulatory requirements
- Company enforcement policy, and
- Worker right-to-know and authority to refuse unsafe work.

Reporting Incidents and Accidents

All accidents and near-miss incidents shall be investigated to determine what caused the problem and what action is required to prevent a recurrence. Employees required to perform investigations shall be trained in accident investigation techniques. The incident/accident investigation should be a fact-finding exercise rather than faultfinding. The investigations will focus on collection of evidence to find out the “root cause” of the incident. The recommendations of the investigation report are implemented in phases. Power project construction and operation facilities have been and will continue to be designed to comply with the legal elements of national and international standards, legislation, codes of practice and design specifications, and best practices. As a part of this process, measures to minimize the probability of releases and reduce potential impacts through selection of alternative processes to be considered as an integral part of the development. Mitigation should reflect the intent and regulatory framework outlined in the GoB Environmental policy and in applicable World Bank Operational Directives. The purpose of impact mitigation and counter measures is to avoid creating negative impacts wherever possible, to minimize impacts where they may be unavoidable, and to generate opportunities for improvements or positive impacts where appropriate.

Protective Equipment

The main reason for protecting workers is to eliminate or reduce the possibility of injury. The Occupational Health and Safety Act (USA) requires that every worker shall “wear or use such personal protective clothing, equipment or devices and is necessary for his or her protection from the particular hazards to which he or she is exposed”. There are some people who resist wearing protective clothing or devices, and will only wear protective equipment when forced to do so. This is not the right attitude to take for the worker’s own safety. The consequences of an accident to his quality of life can be major. He can also lose his life. Personal protective equipment provides the worker with a measure of protection, but for it to be really effective; it must be accompanied by the right attitude towards during his job the right way. The wearing of personal protective equipment does not guarantee that he won’t get injured. However, when coupled with a good safety attitude it will reduce the likelihood and severity of accidents

Body Parts That Require Protection

The body and its internal organs can be seriously injured, by any violent impact with an object. A direct blow to any part of a worker’s body, even with protection, can easily result in some injury, either major or minor. The following eight areas or parts of the body require protection:

(i) Head, (ii) Arms, (iii) Eyes, (iv) Chest, (v) Hearing, (vi) Legs (vii) Hands and (viii) Feet. The worker's head houses his brain, which controls all the motor and sensory functions of his body. Any blow to his head, no matter how slight, can be very dangerous and result in injuries ranging from dizziness to total disability and even death. One of our most valuable senses is light. One must protect his eyes from the dangers of flying objects, bright light and chemicals. Without eyes one would live a life in total darkness. Hearing damage is not often a result of an accident, unless someone has had a head injury. A more common problem is hearing loss which can occur one exposed to noise levels above the exposure limits, as outlined in the Noise Regulation. In Table 8.5 Occupational Exposure Limits are described with a maximum permitted duration in the following page. Without hearing protection in a sound level of 100 dBA maximum permitted duration is 1 hour/day.

Table 8.5: Occupational Exposure Limits (Without hearing protection)

Sound level (dBA)	Maximum Permitted Duration (hours per day)
85	8
90	4
95	2
100	1
105	2
110	1/4
115	1/8
Greater than 115	0

The longer one is expected to high noise levels, the greater the potential hearing loss. Hearing loss associated with exposure to noise tends to be gradual. It may take several years before one can realize that for some reason he has difficulty hearing normal conversation. Hearing is a valuable asset that should be preserved, so the worker can have a full and productive life. In Table 8.6, Safety hazard prevention, control and mitigation measures are described for particular event.

Table 8.6: Safety Hazard Prevention, Control and Mitigation Measures Event

	Prevention, Control and Mitigation Measures
General Instruction of Workers	• Personal and continuous visual supervision of the worker who is not competent to perform the job. • Workers to be conversant on the codes and standards of safety. • Workers must be confident that they have adequate training on handling or unsafe hazards material.

Maintenance of Equipment	• Employer shall ensure that all equipment used on a work site is maintained in a condition that will not compromise the health and safety of workers using or transporting the equipment. • Will perform the function for which it is intended or was designed • Is of adequate strength for that purpose • Is free from potential defects.
Traffic Hazard	• Where there is a danger to workers from traffic, an employer shall take appropriate measures to ensure that the workers are protected from traffic hazards. • Ensure that workers who are on foot and who are exposed to traffic hazards on traveled rural roads wear reflective vests or alternative clothing that is clearly distinguished. • Where the operator of vehicle does not have a clear view of the path to be traveled on a work site, he shall not proceed until he receives a signal from a designated signaler who has a clear view of the path to be traveled.
Illumination	• Ensure that illumination at a work site is sufficient to enable work to be done safely. • Where failure of the normal lighting system would endanger workers, the employer shall ensure that emergency lighting is available that will generate sufficient dependable illumination to enable the workers to a) Leave the work site in safety b) Initiate emergency shutdown procedures c) Restore normal lighting
House keeping	• Ensure that each work site is clean and free from stepping and tripping hazards • Waste and other debris or material do not accumulate around equipment, endangering workers
Falling Hazards	Ensure that where it is possible for a worker to fall a vertical distance greater than 3.5 meters the worker is protected from the falling by guard rail around the work area a safety net fall arresting device
Overhead power Lines	Ensure that no worker approaches and that no equipment is operated and no worker shall approach or operate equipment,

	within 7 meters of a overhead power line.
Sanitary facilities & drinking	Ensure that an adequate supply of drinking fluids is available at the work site.
Water	Ensure that work site is provided with toilet facilities in accordance with the requirement of general health protection guidelines.
Working proper clothing	Ensure that where is a possibility that a worker or worker's clothing might come in to contact with moving parts of machinery, the worker: a. wears close-fitting clothing b. confines or cuts short his head and facial hair c. avoids wearing jewelry or other similar items
Head protection	Ensure that during the work process adequate alternative means of protecting the workers head is in place.
Eye protection	Where there is a danger of injury to or irritation of a worker's eyes, his employer shall ensure that the worker wears property fitting eye protective equipment.
Foot protection	Where there is a danger of injury to a worker's feet, ensure that the worker wears safety footwear that is appropriate to the nature of the hazard associated with particular activities and conditions.
Respiratory protective Equipment	Where the worker is exposed to hazards gases, gums, vapors, or particulates appropriate respiratory protective equipment to be supplied.
Transportation of water	• A worker in a vehicle shall not allow any part of his body to produce from the vehicle where this action creates or may create danger to the worker. • A worker shall ensure that no equipment or materials for which he is responsible is carried in the compartment of a vehicle in which another worker is traveling unless it is so placed and secured as to prevent injury to himself and other workers.
Testing & commissioning	• Mobilize test rigs at site • Ensure that the test equipment is in good condition • Ensure other equipment and facility conforms to the approved specification of test. • Public notice to be served before testing.

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Chapter 9

EMERGENCY RESPONSE AND DISASTER MANAGEMENT PLAN

9.1 Emergency Response

The initial response to an incident is a critical step in the overall emergency response. Like all other industries and installations, The ISATL facilities will handle large quantities of cargo on a regular basis with incoming and outgoing container vessels and trucks, it is essential that ISATL have adequate measures against accidents or incidents to meet the emergency. The preparation of an OHS manual is essential. The operational manual prepared need to be followed through total commitment of the Management and practiced by the project site management. The general purpose of having an Emergency Response Plan (ERP) is to:

- ✚ Assist personnel in determining the appropriate response to emergencies.
- ✚ Provide personnel with established procedures and guidelines.
- ✚ Notify the appropriate Company Emergency Response Team personnel and regulatory/ Govt. agencies.
- ✚ Manage public and media relations.
- ✚ Notify the next-to-kin of accident victims.
- ✚ Promote inter-departmental Communications to ensure a “Companywide” Co-ordinated emergency response.
- ✚ Minimize the effects that disruptive events can have on company operations by reducing recovery times and costs.
- ✚ Respond to immediate requirements to safeguard the subtending environment and community.

Generally, the initial response is guided by three priorities Ranked in importance these priorities are:

1. People
2. Property
3. Environment

Emergency Response Procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge and their coordination of emergency actions shall be identified. Nature of Emergency & Hazardous Situations may be of any or all of the following categories:

I. Emergency

- + Fire and Explosion: The fire hazard is a special threat not in terms of human lives working within the facility but also to nearby communities who in this case are situated very near the project site. Additionally, the storage space will have high volumes of merchandise waiting to be shipped and therefore poses serious financial losses. The critical points for potential breakout of fire are the fuel storage tanks, short circuits from electrical connection. Adequate fire fighting capability within the project and good liaison and communication with the local fire service is essential to tackle any such hazards. Proper warning and evacuation system needs to be developed by ISATL management through drawing up operational health and safety manual and training of its staff on these aspects on a regular basis.
- + Accidents: The operations of the project has high risks of accidents as there will be high volumes of cargo handling
- + Electric short circuit
- + Medical emergency

II. Natural Disasters

- + Storm/ typhoon/ tornados
- + Cloud burst lightning
- + Sudden Tidal Surge and Cyclone
- + Sudden Flooding
- + Earth Quake
- + Fire

III. External Factors

- + Food poisoning/water poisoning,
- + Sabotage, and
- + Warehouse

9.1.1: Six Steps in Emergency Response

Step-1:

- a) Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.
- b) Determine potential hazards stemming from local conditions such as inclement weather water bodies etc. and ensure that the initial response team is aware of these conditions.

Step-2 : Determine the source/cause of the event resulting to the emergency and prevent further losses.

Step-3: Conduct an assessment of the incident site for any further information on hazards or remedies.

Step-4: Initiate redress procedures.

Step-5: Report the incidence its nature cause impact applied redress procedures and any further assistance required etc. to the appropriate company, government and/or land owner.

Step-6: Take appropriate steps with respect to hazards to wildlife, other resources and addressing public and media concerns and issues, as applicable. Response priorities are to protect human lives, property and the environment.

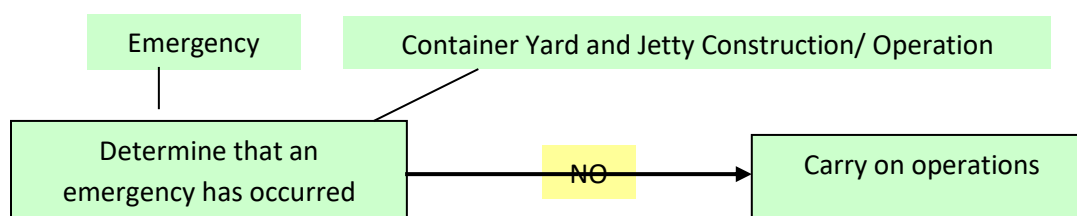
9.1.2 Reporting Incidents and Accidents

All accidents and near-miss incidents shall be investigated to determine what caused the problem and what action is required to prevent a recurrence. Employees required to perform investigations shall be trained in accident investigation techniques. The incident/accident investigation should be a fact-finding exercise rather than faultfinding. The investigations will focus on collection of evidence to find out the “root cause” of the incident. The recommendations of the investigation report are implemented in phases.

9.1.3 Approaches to Emergency Response

For this project, emergency response systems should be in place to deal with dangerous goods uncontrolled releases of dust and gaseous emission, natural calamities fires burns and injuries. There are to be trained emergency response teams, specific contingency plans and incidence specific equipment packages in place to cope with these types of emergencies. In case of an emergency incident occur, immediate action must be taken to mitigate the impacts.

In order to minimize the possibility of injury to the responders and others it is important that emergency responders follow a specific sequence of actions as stepped out in the preceding paragraphs



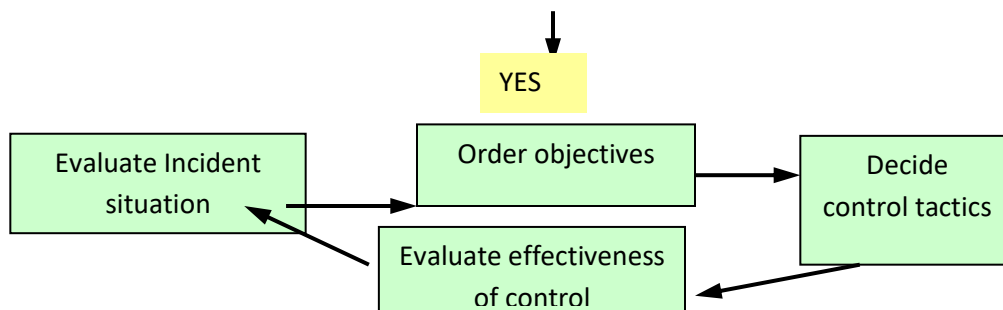


Figure-9.1: An Example System Approach to Project Construction & Operation Phases.

9.2 Disaster Management Plan

In normal operation of the project, when all mitigation measures recommended made are effective it is expected that there will be minimum environmental impact due to the project activities. site.

Disaster (to certain degree) may occur if the environmental protection equipment fails to work at normal condition. This situation may arise for any of the following causes-

- ✚ When Terminal runs at abnormal situation e.g. if emission level increases than its normal level or if the engines give unwanted noise than normal level
- ✚ If liquid waste over flows and pollutes the surroundings

Therefore, appropriate management plan should have to be taken by the project proponent to prevent any unwanted disaster in the project. In this regard, there should be a provision to stop the production immediately during any process failure as discussed above.

The disaster management plan should consist of preventive measures including, among others, the following.

- ✚ Formulation and strict implementation of safety codes and measures;
- ✚ Periodic inspection of safety relief valves provided with pressure vessels and equipment;
- ✚ Preventive maintenance;
- ✚ Aware the workers about electric shock
- ✚ Declaring the project area a “no smoking zone”
- ✚ Mock drills by the fire fighting cells/ groups
- ✚ Provision and inspection of firefighting equipment and fire hydrant system in all the sections;
- ✚ Proper training of the employees about the importance of codes;
- ✚ Training the employees and the residents of the surrounding villages about the actions to be taken during an accident, disaster etc.

It is imperative to develop entire facility environment policy and display necessary documentation for ease in accessing information. Some of these documents include:

- ✚ Emergency contacts;
- ✚ Emergency response procedures for fires

The facilities operations and monitoring are carried out under the management and help from both the employees and relevant government lead agencies. In order to take care of any hazards the following control should be adopted:

- ✚ All safety precautions and provisions covering the general cleanliness of the entire facility down to, ventilation, lighting, sanitary, waste collection, smoke detector, heat detector, sand bucket, water bucket, fire blanket, first aid box provision, adequate fire extinguishers and site security by fencing.

9.3 Environment, Health and Safety (EHS)

Health and safety aspects of the entire facility should be given due attention. Protective devices as provided should continuously be used within the unit's operations to ensure the safety of the natural resources and boat owners is guaranteed.

The maintenance of Material Safety Data Sheets (MSDS) will be followed to ensure safety all section of the facility that chemicals are utilized.

An Environment, Health and Safety register is essential for monitoring of performance of the entire facility community in relation to the environment. The management will use this as a self-auditing tool. This register should include:

- ✚ Fire extinguisher servicing records
- ✚ EHS meeting schedules and training records
- ✚ Electrical installations
- ✚ Generator inspection and maintenance records
- ✚ Waste disposal records
- ✚ Inventory records (fuels, paints, cleaning agent
- ✚ Emergency response procedure.
- ✚ Record off all incidents, accidents, near miss etc.

9.4 Fire Hazard & Fire Evacuation Plan

Fire hazards such as large quantities of fuel, combustible/flammable liquids, electrical hazards and combustible dusts. Although fires are not a daily occurrence, they usually will cause severe property damage and business interruption. Sometimes the fire protection equipment systems have not received attention since they were installed. If these systems are needed, however, they are counted upon to perform reliably and protect vital port and equipment and cargo from fire. Fire protection systems are a combination of mechanical and electrical components and, like power generation equipment, need regular attention.

The local fire service under the Civil Defense Department should be engaged for train the key staff of ISATL dedicated to handling emergencies. Demonstrations on fire evacuation and associated fire

drills should be conducted by the local Civil Defense Department on a yearly basis for all staff and site management. The dedicated fire emergency staff must train new employees in coping with emergencies due to fire.

Fire protection shall consist of wet pipe, automatic deluge systems, hydrants, CO₂ gas flooding systems, and portable extinguishers of CO₂ and dry powder in sufficient quantities.

Areas to be covered by fixed protection installations shall be included but not be limited to:

- ✚ All oil filled transformers
- ✚ Standby Generator
- ✚ Lube oil system
- ✚ Electrical Cables Connection and Circuit Breakers
- ✚ Container Storage areas.

The standby generators are to be protected against fire by a CO₂ total flood system within the enclosures. The only other significant fire risks are associated with the lube oil systems on the gas engines, cable areas, stores and with oil contained within the substation. Such systems will be protected from fires by water deluge sprays. All necessary systems are required to be fire 'protected' with suitable extinguishing agents. Additional protections are to be provided by a ring main and hydrant system with hose/equipment cabinets located at strategic points. This ring main shall be provided with suitable section valves located in valve pits.

The firefighting water will be taken from the water storage tank and will be pumped by a dedicated electric pump with a diesel powered back-up pump available in case of electrical failure. Pressure in the firefighting mains is maintained using an electric jockey pump.

A site wide fire and gas detection system will be provided to initiate the fire protection and alarms. Manual "break glass" fire alarms shall also be situated at strategic locations around the site and inside the buildings.

A modern electronic fully addressable master fire alarm panel shall be located in the Central Control Room. All local fire panels shall be linked into the master fire alarm panel. This master panel should have a separate section for the gas detection system. A repeater panel should be provided in the site gatehouse to allow swift identification of the affected fire zone to incoming local fire-fighting appliances. This master fire panel shall be provided with its own dedicated battery system.

Chapter-10

LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT

The site previously used for Victoria Jute Mills, the authority of Ispahani group decided to change it into Container Terminal, therefore they made an agreement with Summit group and jointly they started this development work. There is no issue of resettlement or compensation due to livelihood loss, Ispahani group is the owner of this land.

Table 10.1 The list of Dag number, Khatian and Mouza are given below:

Name of the land owner	Mouza	Khatian	Dag Number
Mirza Sakir Ispahani	Uttar Kattali	Uttar Kattali	6234,6235,6236,6237,6238,6239,6240,6241,6244,6245,6246,6247,6248,6249,6250,6980,6981,6982,6983,6984,6992,6993,6994,6995,6996,6997,6998,6999,7000,7001,7002,7003,7004,7005,7006,7007,7008,7009,7010,7011,7012,7013,7014,7015,7017,7018,7020,7021,7022,7023,7024,7025,7026,7027,7028,7029,7030,7031,7032,7033,7035,7036,7037,7038,7039,7040,7041,7042,7043,7044,7045,7046,7047,7048,7049,7050,7051,7052,7053,7054,7055,7056,7057,7058,7059,7060,7061,7062,7063,7064,7066,7067,7068,7069,7070,7071,7072,7073,7074,7075,7076,7077,7078,7079,7080,7081,7085,7086,7087,7088,7089,7090,7092,7093,7096,7098,7099,7100,7101,7102,7104,7116,7120,7122,7123,7124,7125,7126,7127,7128,7129,7130,7131,7141,7142,7143,7144,7145,7147,7148,7149,7133/7320,7157/7350,7034/7351,7034/7352,7034/7353,7034/7354,7034/7355,7034/7356,6120,6121,6122,6123,6232,6242,6243,6251,6252,6970,6971,6985,6990,6991,7012,7034,7097,7103,7110,7111,7112,7113,7114,7115,7117,7118,7119,7121,7132,7133,7140,7146,7153,7154,7159,7160 Part of Dagadir, BS Dag No.8671,8672,8673,8674,8675,8676,8677,8678,8679,8680, 8701,8702,8714,8715

Chapter 11

STAKEHOLDER ANALYSIS, CONSULTATION, PUBLIC AWARENESS AND DISCLOSURE

11.1 Information disclosure

During baseline survey an information disclosure about the project was carried out in the project area. The approach was based on a combination of formal, informal meetings, key informant interview (KII) and focus group discussions (FGDs). The formal meetings were held through prior notice and invitation of the households, district administration, local administration, Civil Defense Fire Service, TNO, Ward Counselor, Women Group, Local Elite and School Teacher etc. The following groups identified for disclosure:

- Project Affected People
- Government agencies connected with the project
- Local elites and academicians of the area
- Closest households and commercial institutions of the project site
- Local NGOs working in the area

The methodology used for the disclosure process was as follows:

- Preliminary Informal meetings with various categories of people and households were completed
- Several formal meetings specifically including all categories of People in the project site
- One large public consultation meeting which included all the peoples, representatives from the project impacted areas, district and local administration, as well as other community representatives including prominent local people, lawyers, journalists and academicians.

11.2 Stakeholder's Consultation

The objectives of the consultations were as follows:

- dissemination of information about the project among the stakeholders;
- have a better understanding of existing environmental conditions and their concerns;
- aware stakeholders to contribute meaningfully to in different phases of project;
- reduce psychological distance between project sponsor and stakeholders; and
- ensure the sustainability of the project.

Stakeholder consultation meeting is an important part of the ESIA study. The main objective of the consultation meeting is to apprise the local inhabitants about the Proposed Project and to seek their opinion regarding the tentative impacts. It is a fundamental principle of any environmental

assessment study. The inclusion of the feedback of public consultation helps to ensure that the decision making process is equitable and fair and leads to more informed choice and better environmental outcomes. The findings from the public consultations carried out as a part the ESIA study were utilized in the development of the EMP, especially in identifying the significant impacts of the proposed project and developing the corresponding mitigation measures.

11.3 Consultation and Participation Mechanism

Public consultation has been carried out during different activities in the Project cycle, using different techniques such as public meeting, small group meeting, informal meeting as per social environment and procedures of BCAS. During the consultations the stakeholders were informed about the project in general and in particular about the following:

1. Finalization of the Project plan.
2. Ispahani Summit Alliance Terminal Limited (ISATL) design standards in relation to the applicable international standards.
3. Environmental and Social impacts due to the project and mitigations suggested in the draft ESIA.
4. Health Impacts and their mitigation as part of the Environmental Management Plan (EMP).
5. Measures taken to avoid public utilities and other social infrastructure such as school, hospital, roads, etc as well as to generate employment opportunities, and assist with the development of a small enterprise.
6. Other impacts associated with Access Road with an approach to minimize and mitigate the effects of increased traffic due to the project.

11.4 Stakeholders' Participation

A series of public consultation activities were undertaken by BCAS representative. These included rapid appraisal and discussion with the groups of Project Affected People and community leaders. Exchange the opinion with the local people, knowing individual perception. Results of Stakeholders consultation through KII and FGDs are given below:

1. KII with the Thana Nirbahi Officer (TNO)

According to the local government structure of Bangladesh Government, North Kattali Industrial Area is a ward under the jurisdiction of Pahartali Thana, Chittagong. The administrative authority of the Ward is the Upazila Parishad. As a part of consultation with local government representative, there were consultations with Thana Nirbahi Officer (TNO).

- The interviewee was aware about the proposed Container Terminal of ISATL at North Kattali which is being established by Ispahani Summit Alliance Terminal Authority.
- The interviewee raised concerns about the existing high dust concentration in the area and recommended that the proposed project should ensure that no further dust will create by the

proposed project. Concerns about oil spillage will be raised and hoped that proper emergency response to tackle any accidental spillage should be in place.

- Incremental movement of container trucks through the present road, need to manage the traffic system by own security of the authority. The access road needs to be widened and upgraded to ensure smooth traffic movement. A traffic management plan needs to be in place.
- There was concern about noise pollution in the close proximity of the settlement area in the west side of the proposed project may be affected by high noise levels because of port activities.
- Another concern about the Ispahani Ideal High School as it is situated in the premises of the proposed project area. Measures need to be taken to check the noise level.
- The interviewee suggested that the project should employ local people in the port on a priority basis provided they have the required skills.
- The project sponsors should ensure timely completion of the access road.

2. Key Informant Interview with Civil Defense (Fire Service) of Chittagong district

Mr. Md. Yahia

Assistant Director

Civil Defense Fire Service Department

Dewanhut, Paharstali, Chittagong

Date of Interview : 6 November 2016

Cell No.: 01556-401273

BCAS Field Research Team conducted an interview with the Civil Defense Fire Service of Chittagong district regarding the Environmental and Social Impact issues by Ispahani Summit Alliance Terminal Limited (ISATL) on 11th November 2016 at the Fire Office of Dewanhut, Pahartali.

He expressed that:

Such kind of port will help in the growth of country's economy through creation of job and business opportunities of the people but there will be some impact on sound when the ship will harbor at the port and when leave the port.

The project has various kinds of hazards like electricity hazards, fire hazard, vehicle accident hazard, water quality changing hazard, air quality changing by smoke and other parameters. All kind of hazards are harmful for the human health and basically will be affected the nearest settlement directly. As we are the concerned agency for fire fighting the project activities has to follow our rules and regulations. The department has training option if the company requires. The



department will periodically check the condition of the firefighting equipment. The project personnel should be aware of the telephone numbers of the station so that quick communication can be established in case of fire emergencies. They suggested that the company should arrange the fire safety training of the in-house staffs so that they can readily use during the disaster.

He urged on the listed equipment have to be procured and keep ready in the premises of the project building.

- a. Hidden point have to be constructed in the project site
- b. Pumping system should develop for the emergency period
- c. Reservoir
- d. Adequate Distinguisher have to be placed in the corridor of the building
- e. Finally the NOC from Fire service Office have to be collected

3. Key Informant Interview (KII) with the Ward Counselor of 10 No. North Kattali Ward

Alhaj Nisar Uddin Ahmed(Monju)

MA English, PhD, Researcher

Panel Mayor (Ward Counselor), Chittagong City Corporation

10 No. Ward, Uttar Kattali, Pahartali, Chittagong

Cell no.: 01711311797

Date: 12 November, 2016



Mr. Monju is the elected Ward Counselor of 10 No. Ward, Uttar Kattali, Pahartali, Chittagong BCAS representative met with him for an interview on 12 November, 2016 in council office. As a public representative he highlighted a lot of issues related to his village, the issues are as follows:

- I am aware about ISATL, appreciate and giving thanks to the authority to installed this Terminal, by this project work opportunity will be created and our unemployment youth will get opportunity to work here
- He was of the opinion that the river port may not pollute the environment except container vessel engine sound. He expected that the project sponsors will take steps to mitigate the sound that may be generated. Any kind of toxic pollution by the ship like oil spillage and chemicals in the river water, transport emissions, needs to be considered.
- As local member he appealed to the authority that they should provide jobs to the local unemployed youth based on their skill and should give business opportunities to the local people.

- As part of social development the local mosque near to the project site should be expanded by the project sponsors to overcome the current congestion especially during Friday prayers.
- There are no a hospital in our village. They will appreciate if the project sponsors establish one in the village.
- He requested to make provisions for a car parking outside of the port for better management of container carrying vehicles.
- Finally he gave the assurances that local government will give all help for smooth operation of the project activities.

4. Key Informant Interview with Head Master of Ispahani Ideal High School

Md. Shah Alam,

Date: 5 November, 2016

Cell No.: 01817720138

BCAS team met with the Head Master of Ispahani Ideal High School, North Kattali, Pahartali, Chittagong

The discussing issues were the pollution due to the Terminal installation and operation. Mr. Alam has given his view to:



- The Terminal will be a new addition for carrying the container and goods at lower rate. Once the port is in operation they will use it to ship their export goods which will be cheaper by road transport that they are currently using.
- Export import business will be improved due to this Terminal
- Employment opportunity will be increased
- The only source of pollution from this Terminal is sound pollution. The project sponsors needs to take steps to abate the noise pollution. Now we are in safe zone, we can tech our children within the silent position, if any kind of pollution generated by the Terminal, the authority should take measures on it.
- My school is closed to the port therefore, I will help ISATL authority to operate the terminal activity smoothly
- Adequate transport/vehicle parking place should be provided to avoid traffic congestion.
- Need to work in close cooperation to ensure that no water logging takes place due to the project by integrating the drainage systems in the area.
- Fire team should kept ready for avoiding any kind of disaster.

5. Businessman

Md.Jashim Uddin

North Kattali,

Pahartali, Chittagong

Cell: 01962381648



Opinion of the businessman

I heard that Ispahani group wants to setup a container Terminal in the premises of the Victoria Jute Mills. It is good, it will increase the employment opportunity, our unemployment youth will get job in this place, during construction period we will get business facilities by supplying Rod, cement, Brick, Stone etc. On the other hand we are concern about the sound pollution, if any kind of sound polluted our environment; the authority should take mitigation measures

6. Local Elite

Md. Washim Uddin

Uttar Kattali

Pahartali, Chittagong

Contact Number: 01832268811

This group generally expressed optimism for the potential of improved socio economic condition, eliminate the poverty of the locality. However, there were concerns about the environmental impact aspects of the project and that proper mitigation steps must be ensured.

He requested to give job to the unemployment people of the area.

He also requested to give attention to the environmental issue during construction and operation period



7. General Manager, ISATL

Shahabuddin Ahmed

Ph: 01713064329

Mr. Ahmed said that the project proponent trying to resolve the community problem which was existed in long time. These are:

1. Water logging was a severe problem; we constructed a sewerage line through ISATL project
2. We constructed a mosque for the community prayer
3. We founded 4 stair school building where about 1000-12000 students are studing, this school run by the supervision of Ispahani group and all kind financial aid goes from Ispahani group.
4. We elevated the low land by sand filling which was the community problem
5. We employed a large group people in our site
6. Brick, sand, cement, rod and other material supplying business doing by the local community.

Finally we are ready to do social work by which people will be benefited

FGD with different types of people

1. Women Group



FGD was held with the women group during the socio-economic survey in the house premises of Belal's house on 5th November 2016. They gave opinion that during project implementation in the past in other areas their family members were not employed especially during the construction period, we expect ISATL authority will give us business and employment opportunity.

They are afraid of sound pollution and request to take mitigation measures if arise any problem.

The list of participants is given below:

Name	Occupation	Address	Contact Number
Mrs. Mahmuda Akhter,	Housewife	South Agra Para	018513973791
Mrs. Fatima Akhter Popi	Housewife	South Agra Para	01811803131
Mrs. Rawsan Ara	Housewife	South Agra Para	Not available
Alhaj Hosne Ara Begum	Housewife	South Agra Para	Not available
Rina Akhter, Service holder	Housewife	South Agra Para	01855856998
Mrs. Maksuda Khatun	Housewife	South Agra Para	01831192132
Marium Begum	Housewife	South Agra Para	Not available
Parbin Akhter	Housewife	South Agra Para	01814743321
Hasina Begum	Housewife	South Agra Para	01829461765
Khaleda Begum	Housewife	South Agra Para	01814743321
Monira Dilshat Tania	Housewife	South Agra Para	01835618830
Nasima Akhtar	Service holder	South Agra Para	01835618830

2. Day labourer living within 2km radius of the project location

FGD was held with the poor vulnerable group in the area during socio-economic survey. The people's concerns were recorded on the household level. One formal meeting took place to discuss all issues/impacts resulting from the project. During the surveys the environmental issues were communicated to the stakeholders. The major concern was the environmental aspect of the project and how it may affect their health



List of the participants are given below:

Name	Occupation	Address	Contact Number
Mr. Saiful Islam	Day Labourer	South Agra Para	01953526877
Mr. Rasel	Day Labourer	South Agra Para	01828726577
Mr. Tipu	Day Labourer	South Agra Para	Not available
Mr. Rubel	Day Labourer	South Agra Para	Not available
Mr. Alamin	Day Labourer	South Agra Para	01729731878
Mr. Maznu	Day Labourer	South Agra Para	Not available
Mr. Sukur Mia	Day Labourer	South Agra Para	Not available
Mr. Abdul Karim	Day Labourer	South Agra Para	Not available
Mr. Jashim	Day Labourer	South Agra Para	01937680716

Mr. Sher Ali	Day Labourer	South Agra Para	Not available
Mr. Abu Hanif	Day Labourer	South Agra Para	Not available
Mr. Rasel	Day Labourer	South Agra Para	01765489663
Mr. Kabir Uddin	Day Labourer	South Agra Para	01729731878

3. FGD with School teachers of Ispahani Ideal High School

This FGD was held in the class room of the High School on 5th November 2016. The meeting was presided over by the Head Master of Ispahani High School. Participants discussed on different issues which are quoted below:

- The Terminal will be a new addition for carrying the container and goods at lower rate. Once the port is in operation they will use it to ship their export goods which will be cheaper by road transport that they are currently using.
- Export import business will be improved due to this Container Terminal
- Employment opportunity will be increased
- The only source of pollution from this Terminal is sound pollution. The project sponsors needs to take steps to abate the noise pollution. Now we are in safe zone, we can teach our children within the silent position, if any kind of pollution generated by the Terminal, the authority should take measures on it.
- My school is closed to the port therefore, I will help ISATL authority to operate the terminal activity smoothly
- Adequate transport/vehicle parking place should be provided to avoid traffic congestion.
- Need to work in close cooperation to ensure that no water logging takes place due to the project by integrating the drainage systems in the area.
- Fire team should kept ready for avoiding any kind of disaster.



The list of participants is as follows:

Name	Occupation	Address	Contact Number
AKM Shah Alam	Head Master	South Agra Para	01817720138
ASM Faijul Karim	Sr. Teacher, MA BEd.	South Agra Para	01715512802
Noor Mohammad	Sr. Teacher, BSC BEd	South Agra Para	01815668484
Md. Golam Rasul	Sr. Teacher, BSC BEd	South Agra Para	01817764474
Lucki Rani Ghos	Sr. Teacher, BA BEd	South Agra Para	01849202680
Md. Moniruzzaman	MSS in Economic	South Agra Para	01816575090
Md. Mosarraf Hossain	Asstt. Teacher, BA (Hons), MA	South Agra Para	018155722236
Sabina Khatun	Asstt. Teacher, BA Hons), MA	South Agra Para	01737174808
Gouranga Saha	Asstt. Teacher, BSC BEd	South Agra Para	01818854079
Sakhina Khatun	Asstt. Teacher, PTI	South Agra Para	017371744808

Md. Nurul Alam	Asstt. Teacher, BSC BEd	South Agra Para	01823987055
Kakoli Chowdhuri	Asstt. Teacher, B. Com BEd	South Agra Para	01818437938
Monirul Islam	Asstt. Teacher, BSC BEd	South Agra Para	01818466507
Md. Saiful Alam	BA(Hons), MA English	South Agra Para	01814484790

11.5 The Results of Consultation meeting and Concerns Raised

The results of the focus group discussions and stakeholder's consultation meeting with project affected people was held in the administrative building of Ispahani Summit Alliance Group on 27th November 2017. The meeting was presided over by the General Manager of ISATL. Stakeholders from local community, school teacher, Ward Counselor, Imam from the mosque, Journalist, Businessman, Supplier, Labour, women were participated in the meeting. Local people raised their problem due to project and how they mitigate it. From the ISATL, Mr. Nur Alam address all kind of quarries. The information presented below discusses how concerns raised and recommendations made during the consultation process were addressed. The following queries were raised by the affected people during Public consultation and informal group meetings in and around the project site:

Stakeholders concern raised

- ✚ Whether there will be any environmental hazard due to container Terminal especially noise, water and air pollution?
- ✚ Whether the local people will be engaged in the project site during construction and operation works?
- ✚ Whether the people know about the installation of proposed Container Terminal
- ✚ Whether they will get job, business or working facilities in this project site
- ✚ Whether the project create any traffic congestion
- ✚ Whether this project will be helpful for the locality and for the national revenue etc.

Observations from the Consultation Meetings

- ✚ The participants of the meetings have been found to be very supportive of the proposed project; they believe that the project would ultimately improve the overall socio-economic condition of the area.
- ✚ Participants expect that local businessmen will benefit from the construction and operation work of the proposed river terminal.
- ✚ Land and house owners expect that land prices and house rents in the area would increase due to the establishment of the river terminal.
- ✚ Participants expect that employment opportunities will be generated during both construction and operational phases of the proposed project.
- ✚ According to the participants, air pollution (from cement industries and rice mills) and water pollution (from industrial effluent) are already major concerns in the area; noise pollution

from project activities and incremental road and river traffic movement of water transport can be added concerns.

- ✚ Possible adverse impact of the project as identified by the participants include increased traffic congestion, possible increase in road accidents, increased ship movement in the river, and adverse impact on fishermen.
- ✚ Some participants raised the issue of possible interference of the proposed project in getting easy access to the river for different domestic purposes (e.g, washing, bathing).

Dr. MI Sharif of BCAS and Mr. Nur Alam from ISATL addressed the issues raised by the stakeholders and explain how to mitigate these:

- ✚ Appropriate measures would be taken so that air, water and noise pollution are not aggravated by the proposed project activities.
- ✚ The project sponsors will be give job opportunities for local people depending on qualification and requirement.
- ✚ Project activities (e.g., movement of material and equipment) are carried out following a schedule such that it causes minimum impact on movement of people and vehicles. Initiatives has already been undertaken by the project sponsors for widening of the existing access road, providing road lights, and improving drainage condition surrounding the project site and social work like mosque improvement, institutions development are going on.

11.6: Participants List of Stakeholder's Consultation Meeting on Ispahani Summit Alliance Terminal Limited (ISATL)

Organized by : Bangladesh Centre for Advanced Studies (BCAS), ESIA Consultant
Venue : Project Office, ISATL, North Kattali, Chittagong
Date : 27th November, 2016

SN	Name of the participant	Address	Mobile No.
1	Md. Shahidul Islam	South Agra Para North Kattali	01716100382
2	Probir Kanti Paul	South Agra Para, North Kattali	01816823086
3	Yasmin Akhter	South Agra Para ,North Kattali	01771616254
4	Md. Nurul Alam	South Agra Para,North Kattali	01823987055
5	Noor Mohammad	South Agra Para, North Kattali	01815668484
6	Md. Solaiman Khan Masum	SIMCO	01819310537
7	Md. Harunur Rashid	South Agra Para,North Kattali	01912202255
8	Md. Moshihur Rahman	South Agra Para, North Kattali	01920818196
9	Md. Abul Hossain	South Agra Para ,North Kattali	01936013097
10	Md. Imtiaz Hossain	South Agra Para, North Kattali	01737725525
11	Md. Saiful Islam	South Agra Para ,North Kattali	01723446096
12	ABM Imrul	South Agra Para ,North Kattali	01717421508
13	Mahmud Rahman	South Agra Para ,North Kattali	Not available
14	Dedarul Alam	South Agra Para ,North Kattali	Not available
15	Md. Belal Ahmed	South Agra Para ,North Kattali	01856848237
16	Md. Moniruzzaman	South Agra Para ,North Kattali	01816575090

17	Md. Saiful Alam	South Agra Para, North Kattali	01814484790
18	Md. Masudur Rahman	South Agra Para, North Kattali	01991945053
19	Md. Shorab Hossain	South Agra Para ,North Kattali	01834880044
20	Md. Moinul Islam	South Agra Para ,North Kattali	01818466507
21	Md. Abdul Khalek	South Agra Para ,North Kattali	01814298652
22	Md. Abdus Sabur	South Agra Para ,North Kattali	01829387995
23	Syed Golam Noor	South Agra Para, North Kattali	01820174464
24	Moshrepa Golnahar	South Agra Para ,North Kattali	01630313922
25	Tumpa Paul	South Agra Para ,North Kattali	01924290618
26	Gouranga Chanra Shill	South Agra Para, North Kattali	01818854079
27	Rajib Paul	South Agra Para ,North Kattali	01864137500
28	Tridip Paul	South Agra Para ,North Kattali	01911755967
29	Md. Golum Rashul	South Agra Para, North Kattali	01817734474
30	Md. Kaiser Khan	South Agra Para,North Kattali	01911932710
31	Lucky Ray Ghosh	South Agra Para,North Kattali	01849202680
32	Nasrin Akhter	South Agra Para,, North Kattali	01835891284
33	Ferdoushi Begum	South Agra Para, North Kattali	01712882077
34	Sokhina Khatun	South Agra Para, North Kattali	01991945061
35	Md. Nurul Alam	South Agra Para, North Kattali	01818105198
36	AKM Shah Alam	IAHS	0181770138
37	Md. Shahab Uddin	ISATL	01713064329
38	Belal Hossain	ISATL	031 751833
39	Mr. RTarikul Islam	ISATL	031751833
40	Dr. MI Sharif	BCAS	01746748198
41	M.Osman Goni Shawkat	BCAS	01677964053
42	Md. Nazimuddin	ISATL	01629089203





Photo 11.4 : Consultation meeting for sharing the information with different types of people in the ISATL site office.

Chapter-12

GRIEVANCE REDRESS MECHANISM

12.1 Grievance Redress Mechanism

The objective of a grievance procedure is to ensure all comments and complaints from any project stakeholder, including local/regional authorities, residents of nearby residential areas, ISATL employees and other interested parties, are acknowledged and responded to within a reasonable timeframe.

ISATL will accept all comments and complaints associated with the project. The comments and complaints will be summarized and listed in a Complaints/Comments Log Book. Any person or organization may send comments and/or complaints in person or via post, email or facsimile using the contact information.

All comments and complaints will be responded to either verbally or in writing, in accordance with preferred method of communication specified by the complaint in the Comments and Complaints Form. All grievances will be registered and acknowledged within 5 days and responded to within 20 working days. ISATL will keep a grievance log and report on grievance management, as part of half-yearly project progress reports, available at ISATL website www-isatlbd.com and on request at the project office

12.2 Stakeholders Engagement Plan

ISATL stakeholder's engagement will take place in a variety of contexts, and using a range of vehicles. Against this background, engagement will include consultation, joint planning, capacity building, partnerships, community-based monitoring and reporting. Table 12.1 presents the scope and duration of existing and planned stakeholder engagement initiatives.

Table 12.1: Stakeholder engagement plan

Engagement vehicle	Stakeholders Involved	Engagement Tools	Duration of Initiatives	Frequency of structured meeting/ consultation
Public liaison Committee	All stakeholders in the project impacted (direct and indirect) area	Interaction between Stakeholder Liaison Officer, ISATL and representatives of stakeholders.	Life time of the project	Half-yearly
Community Development Plan	Communities in the project impacted area	Stakeholder Liaison Officer, ISATL	Life time of the project	Half-yearly
Community Health Safety Plan	Communities in the project impacted area	Stakeholder Liaison Officer, ISATL	Life time of the project	Quarterly
Corporate	All stakeholders	Corporate	Life time of	Half-yearly

Engagement vehicle	Stakeholders Involved	Engagement Tools	Duration of Initiatives	Frequency of structured meeting/ consultation
Communication Programme		Communication Manger, ISATL	the project	
Grievance Management Mechanism	Directly/indirectly affected stakeholders	Stakeholder Liaison Officer and Corporate Communication Manager, ISATL and representatives of stakeholders.	Life time of the project	Quarterly

12.3 Resources and Responsibilities

To ensure proper caring on grievances raised by stakeholders the resource and responsibilities to be allocated in two levels as are mentioned in the following sections:

12.3.1 Port Level Resource and Responsibilities

Management of ISATL will have dedicated persons to play the role of Stakeholder's Liaison Officer at port site. He will have the overall responsibility for handling the consultation and information disclosure process, including:

- Organization of consultation process,
- Communication with identified stakeholder groups
- Collecting and processing comments/complaints,
- Responding to any such comments and complaints, and
- Depending on the nature of a comment/complaint, some comments/complaints will be provided to the appropriate person in the company for a response.

12.3.2 Corporate Level Resource and Responsibilities

As a senior representative of ISATL authority will play the role as required at the corporate level in dealing with addressing stakeholder's consultation. He is expected to review the findings/observations forwarded to port level and who will be responsible for implementing the decisions.

Table 12.2: Contact detail of resource persons

Level	Name of the person and tentative title	Phone	e-mail
Corporate level	Mr. Yasser Rizvi Addl. Managing Director	01971539960 9130845-54	yasser.rizvi@isatl.com
Project level	Mr. Nur Alam	01818105198	

12.4 Reporting

There is requirement of two tiers reporting as are discussed briefly in the following section.

12.4.1 Internal Reporting

Local reporting relevant to the stakeholder's engagement will be undertaken under the corporate Communication Programme. At a corporate level, stakeholder's engagement will be reported in Annual Reports and in other relevant corporate documentation.

Management reporting on the stakeholder's engagement will take place through the Stakeholder's Liaison Officer. The Corporate Communication Manager will receive a quarterly report on engagement activities.

12.4.2 External Reporting

External Reporting means the reporting requirement for external client including funding agency, government and other regulatory bodies and so on. ISATL will provide stakeholders Engagement Report to them according to the requirement of them. Corporate Communication Manager is expected to manage the external reporting requirement also.

12.4.3 Sample Grievance Reporting Form

A grievance form is presented below in Table 12.3 and hard copies of both English and Bangla will be made available at the ISATL project office.

Table 12.3: Sample Grievance Reporting Form

Contact Details	Name:		
	Address:		
	Telephone Number/ Cell Phone Number:		
	Email:		
How would you prefer to be contacted (please tick box)	By Phone By Email		
Details of your Grievance (Please describe the problems, how it happened, when , where, and how many times, as relevant)			
What is your suggested resolution for the grievance?			
Signature:		Date:	

12.4.4 Disclosure

The disclosure process during the preparation of the ESIA was done during the Socio-Economic Survey, FGDs KII and the large public consultation meeting. The medium of communication was in Bangla. It is expected that for ADB financing the ESIA will be on the web site for a fixed period of time.

Chapter-13

INSTITUTIONAL ARRANGEMENT AND ENVIRONMENTAL MONITORING

13.1 Institutional Requirements

For ensuring the construction and operation of the Container Terminal Depot according to the required compliance, there should be designated entity/institution or unit. The institution will be fully responsible to maintain the safeguard compliances. ISATL authority has realized the importance of establishing a separate entity for environmental monitoring and management. So, to maintain the environmental and social compliances, ISATL authority has planned to establish an individual compliance unit operating under the guidance of Head of Operation. They are planning to name the unit as Environmental and Social Monitoring Unit (ESMU). The detail of the ESMU has been discussed in the following sections.

13.1.1 Environmental and Social Monitoring Unit

ISATL authority is in principal obligated to relevant national and international environmental and social compliances and standards. It has informed that it will try to maintain all relevant compliances during construction and operational phases. In doing so, it has planned to form ESMU as is mentioned in the earlier section. The duties of the ESMU will include to:

- ensure environmental and social safeguard compliances;
- coordinate environmental monitoring process;
- act as liaison with the public, local organizations and government;
- ensure and supervise record keeping, data storage for follow-up actions;
- monitor hazardous materials storage and handling;
- promote environmental awareness and safety measures; and
- prepare environmental management and periodic monitoring reports as required by IDCOL, DOE and ADB .

13.1.2 Composition of Environmental and Social Monitoring Unit

The ESMU will be based on three tiers operational mechanism. It will be led by Head of Operation of the Container Terminal River Port. Head of Operation will serve as General Manager (Planning, Administration and Safeguard Compliance). Under his guidance there will be one Compliance Manager, who will be supported by two Compliance Officers. One Compliance Officer will be responsible for all sorts of environmental aspects and standards and another one will be assigned to maintain social and occupational health and safety aspects and standards.

Consulting services will be mobilized as necessary to assist in initial operations, to ensure that the ESMU will be self-sufficient for EMP implementation, submission of progress reports, and preparation of environmental assessment for subsequent construction works. Additional third-

party services may be employed by the ISATL as necessary. Qualified and experienced construction contractor will be responsible for implementation of mitigation measures during the construction phase.

To look after the EHS aspects during the Construction Phase, ISATL authority has already deployed an EHS Officer having Master Degree in Environmental Engineering. Based on the performance, he will be extended for the Operation Phase or a new EHS officer will be recruited. The major responsibilities of the EHS Officer are as follows:

- Monitor the environmental, health, safety, fire protection and emergency response matters;
- Ensure the compliance of the Department of Environment;
- Ensure the compliance of other external stakeholders;
- Monitor the implementation of the EMP;
- Develop standard operational procedure (SOP) for EHS aspects;
- Conduct safety inspections; provide safety training to promote a safe working environment for the employees.

13.1.3 Environmental Training

Training is an integral part of a preventive strategy. Environmental and disaster management training will be required to ensure proper implementation of effective environmental management and monitoring plan; and disaster management plan. However, training could be organized by ESMU involving relevant staff. As a trainer, competent Consultant can be outsourced. Important training under the spectrum of ESMU needs to include:

- Training on fire fighting;
- Training on environmental regulations and standards;
- Staff training on environmental monitoring;
- Training on environmental health and safety measure.

13.2 Environmental Monitoring

Environmental monitoring is an essential component of environmental management plan, as it provides the basic scenario of the impact of the project on baseline condition. The prime objectives of environmental monitoring are:

- assess the effectiveness of proposed mitigation measures by comparing monitoring result with baseline data/environmental standards;
- identify the extent of environmental impact;
- determine project compliance with regulatory requirements;
- adopt remedial action and further mitigation measures if found to be necessary.

During the Construction Phase, the construction contractor will ensure that activities like land leveling, clearing work, access road construction, putting proper traffic signals etc. have been

accomplished properly to minimize the level of impact. This in turn has to be monitored by the Compliance Manager and Compliance Officers of ESMU of the Container Depot, in operation phase. Preventive maintenance should be carried out to identify and resolve problems related to cooling oil, gaskets, circuit breakers, vibration measurements, and other monitoring activities at regular intervals. Monitoring of oil water separation and sanitary waste treatment should be done periodically to avoid water pollution. Other environmental good practices include noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment etc. and clearing of grass should be done periodically and medium height teleplantation around the substation wall should be done at the port areas.

ISATL authority should develop a working relationship with the DOE by undertaking a joint monitoring program to monitor ambient air quality and also to assess whether there exists any significant noise problem; or they may exchange data and information or submit periodic report on self monitoring to the DOE or as the situation may require.

The proposed monitoring program should be in compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the Terminal does not create adverse environmental changes in the area and provide a database of operations and maintenance, which can be utilized if unwarranted complaints are made.

13.2.1 Environmental Monitoring Parameters

Environmental monitoring requires set of parameters that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality. A list of possible parameters to be tested, sample number and sampling frequency are given in **Table 13.1**.

Table 13.1: Monitoring parameters and frequency of monitoring during trial run

Key parameters to be monitored: (1) Ambient Air Quality			
location	frequency	parameter	submission
At Project site, residential/institutional/commercial areas within 500m outside from project boundary (4 locations)	Once during trial run	SOx, NOx and CO	Submit to Dhaka Divisional Office of DOE and stakeholders as required
Key parameters to be monitored: (2) Noise			
location	frequency	parameter	submission
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from port boundary	Hourly basis for 24 hours during trial run	Limits in dBA	Submit to Dhaka Divisional Office of DOE and stakeholders as required

Table 13.2: Monitoring parameters and frequency of monitoring during operation phase

Key parameters to be monitored: (1) Ambient Air Quality			
location	frequency	parameter	submission
At Project site, residential /institutional /commercial areas within 500m outside from project boundary	Quarterly (routine) analysis	SPM, PM10, PM 2.5, SOx, NOx and CO	Report compilation and quarterly submission to Chittagong Divisional Office of DOE and stakeholders as required
Key parameters to be monitored: (2a) Surface Water			
location	frequency	parameter	submission
Project site at Victoria Jute Mills, Uttar Kattali, Pahartali	Bi-annual basis in each year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS, TSS, Oil and grease	Report compilation and yearly submission to chittagong Divisional Office of DOE and stakeholders as required
Key parameters to be monitored: (2b) Ground Water			
location	frequency	parameter	submission
Project site at Victoria Jute Mills, Uttar Kattali, Pahartali	Bi-annual basis in every year (pre-monsoon and post-monsoon)	pH, Temperature, DO, BOD, COD, TDS, Oil and grease	Report compilation and yearly submission to Chittagong Divisional Office of DOE and stakeholders as required
Key parameters to be monitored: (3) Noise			
location	frequency	parameter	submission
At four corners of Project boundary, residential/institutional /commercial areas within 100m and 300m outside from project boundary	Quarterly (routine) analysis (four times in each year)	Limits in dBA	Report compilation and quarterly submission to Chittagong Divisional Office of DOE and stakeholders as required

13.3 Environmental Monitoring and Management Budget

Environmental monitoring is conducted to compare the change between baseline condition and after project scenario, by testing some environmental parameters of air, water and noise and in case of necessity soil is tested. ESMU is fully responsible for environmental monitoring as well as implementation of environmental management plan. As testing environmental parameters required sophisticated instruments, it is suggested that ESMU should outsource consulting firm for testing and analyzing environmental parameters. But it will have to be equipped with required instruments gradually by purchasing required instruments. However, a tentative environmental monitoring budget has been proposed in **Table 13.3**. Laboratory analysis fees considered as per monitoring fees format of DOE/private laboratories.

Table 13.3: An annual tentative budget for environmental monitoring (Operation Phase)

Activity	Units	Total Cost (Tk.)
Fire fighting and suppression equipments, training and annual fire safety drill	1 site	150,000
Cost of occupational health and safety equipment	1 site	125,000
Quarterly test of ambient air quality (SPM, SO _x , NO _x)		75,000
Half yearly test of surface water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Half yearly test of ground water (pH, Temperature, DO, BOD, COD, TDS, Oil and grease)		75,000
Quarterly noise monitoring		25,000
Environmental Training	lump sum	125,000
ESMU Staff's annual salary (3 persons)	lump sum	800,000
Sub Total in Tk.		14,50,000
Contingency (10 %)		145,000
Total in BDT		15,95,000
Note: (Considering USD 1 = Tk. 80.0)		USD 19937.5

13.4 Financial Arrangement for Environmental Monitoring and Management

ISATL authority will provide the full financial support to Environmental and Social Monitoring Units (ESMU). For ensuring smooth and uninterrupted functioning of ESMU, it is suggested that ISATL authority will allocate the required fund based on analysis of estimated budget proposed by ESMU early in the every financial year. So, ESMU can run its operation to ensure environmental monitoring as well as implementation of proposed environmental management plan as may cause due to the unavailability of fund.

13.5 Environmental Monitoring and Management Reporting

As a part of environmental and social compliances, ISATL authority will submit quarterly EHS compliance report of the Project to IDCOL. This report will contain the analysis of testing various environmental parameters during monitoring phase. It will also describe in detail about the status of implementation of environmental management plan. IDCOL will monitor the EHS compliance half-yearly. Based on the findings of half-yearly monitoring, IDCOL will submit annual EHS monitoring report to ADB. The schedule of reporting the monitoring arrangement has been presented in the following Table 13.4.

Table 13.4: Reporting schedule

Reporting entity	Frequency of Report	Entity to whom the report will be submitted
ISATL	Quarterly EHS Compliance Report	IDCOL
ISATL	Annual Monitoring Report	DOE
IDCOL	Annual ESDDR Report based on the findings of half-yearly monitoring of ISATL	ADB

Chapter 14

CONCLUSION AND RECOMENDATION

The ESIA carried out for Ispahani Summit Alliance Terminal Limited (ISATL) has shown that the environmental and social impact of the project is manageable. The project is significant importance as it will expedite the export of goods to Chittagong port which otherwise is more expensive. In addition the customs formalities will be done at the project site which will reduce shipment time as it will avoid port congestion at Chittagong.

It is recommended that for implementing the EMP and Grievance Redress Mechanism the institutional arrangement suggested in the ESIA is put in place.

Ispahani Summit Alliance Terminal Limited (ISATL) is a Bangladeshi private company intends to build and operate a Container Terminal at Historical Victoria Jute Mills area near to Sagorika BISCIC of the Chittagong district. An ESIA has been prepared for the project according to the requirement of DoE for necessary environmental clearances as it is made mandatory in ECA'95 for any new industrial set up. The ESIA has been prepared through identifying the potential impacts, assessing them and recommendation of possible mitigating and enhancing measures for negative and positive impacts, respectively.

The environmental analysis has revealed that the project can be set-up according to the proposed design and configuration in the proposed site and location. The environmental impacts are of limited nature, whereas the benefits of the project are many. The primary reason why the environmental impact from the plant is minimal is that the project proponent is abide by Bangladesh/World Bank/ADB Standards and build a plant, which will meet the emission standards of Bangladesh and the World Bank. The excellent characteristics of the fuel used, equipment and machinery, which conform to international standard and good operation practices all combine to make the proposed power plant project acceptable one.

The main potential environmental problems, which may arise as a result of construction of Container Terminal, can be grouped as follows:

- Air pollution through dust generation
- Atmospheric emissions and Air quality
- Water pollution and waste water disposal
- Noise pollution

All these aspects have been examined and the findings are as follows:

Atmospheric Emission and Air Quality: Emission of sulfur dioxide, Nitrogen Oxides, carbon dioxides and particulates would be the major concern of air pollution for the project. The project will have a generator and equipments for handling the TUEs and container.

Liquid Discharge: The project will not produce any wastewater since it has mainly only transportation issue. The surface drainage network would be connected with an interceptor prior to discharge through natural water. The interceptor will trap all oily matter present in the water.

Noise: The noise impact generated by operation of the project will be minimal. Adverse noise which will be generated from transportation and generator will be mitigated through vegetation around the project site.

Appropriate noise controls will be installed to keep the neighborhood impact due to noise emissions within the limit of DoE and international standards.

12.2 Recommendations

Having reviewed all the potential environmental impacts, and following our proposed mitigation measures the project is expected to proceed without having unacceptable environment. However, the following recommendation may be outlined for the project:

1. Follow the Mitigation measures suggested in the chap-6 during the construction and operation of the project
2. Follow the Environmental Management Plan (EMP) suggested in chap-8 properly.
3. Develop an Environment Management System (EMS) for the project.
4. Conduct a post operational environmental study to evaluate the environmental impacts from the project and compare these with the ESIA.

However no development can be expected without any adverse impact on the environment. The beneficial impacts on the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project.

All this would need vigilant care and cost money, and the project authority should take these into consideration.

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