Government of the People's Republic of Bangladesh
Ministry of Industries
Bangladesh Chemical Industries Corporation

Inception Report

on

Environmental Impact Assessment (EIA)

of Ghorasal Polash Urea Fertilizer Project, Polash, Narsingdi

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CEGIS Center for Environmental and Geographic Information Services
House 6, Road 23/C, Gulshan-1, Dhaka-1212. Bangladesh. Tel: 88 02 58817649-52; 9842581, 9842551. Fax: 88 02 9843128

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Acknowledgements

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Abbreviations and Acronyms

AEZ	Agro-ecological Zone
ALARP	As Low As Reasonably Practicable
APELL	Awareness and Preparedness for Emergencies at Local Level
BADC	Bangladesh Agriculture Development Corporation
BBS	Bangladesh Bureau of Statistics
BCIC	Bangladesh Chemical Industries Corporation
BMD	Bangladesh Meteorological Department
BOD	Biochemical Oxygen Demand
BPDB	Bangladesh Power Development Board
BSCIC	Bangladesh Small and Cottage Industries Corporation
BWDB	Bangladesh Water Development Board
CBOs	Community Based Organizations
CEGIS	Center for Environmental and Geographic Information Services
COD	Chemical Oxygen Demand
CORDEX	Coordinated Regional climate Downscaling Experiment
DAE	Department of Agricultural Extension
DCS	Distributed Control System
DoE	Department of Environment
DoF	Department of Fisheries
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPC	Erection, Procurement and Construction
ERP	Emergency Response Plan
ESF	Environmental and Social Framework
ETP	Effluent Treatment Plant
FGD	Focus Group Discussion
FRSS	Fisheries Resources Survey System
FS	Feasibility Study
GIS	Geographic Information System
GoB	Government of Bangladesh
GPS	Global Positioning System

GPUFP	Ghorasal Polash Urea Fertilizer Project
GRP	Grievance Redressal Plan
GT	Gas Turbine
HSBC	Hongkong and Shanghai Banking Corporation
IEE	Initial Environmental Examination
IESCs	Important Environmental and Social Components
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
JBIC	Japan Bank of International Cooperation
KIIs	Key Informant Interviews
km	Kilometer
KV	Kilo Volt
MCFD	Thousand Cubic Feet per Day
MD	Managing Director
MIGA	Multilateral Investment Guarantee Agency
MMSCFD	Million Standard Cubic Feet per Day
MoI	Ministry of Industries
MW	Mega Watt
NGOs	Non Government Organizations
NOA	Notification of Award
NWRD	National Water Resources Database
PCM	Public Consultation Meeting
PDM	Public Disclosure Meeting
PM	Particulate Matter
PRA	Participatory Rural Appraisal
PUFFL	Polash Urea Fertlizer Factory Ltd.
RMS	Regulating Metering Station
RO	Reverse Osmosis
RRA	Rapid Rural Appraisal
RS	Remote Sensing
SCC	Site Clearance Certificate
SRDI	Soil Resource Development Institute
SPM	Suspended Particulate Matter
ST	Steam Turbine
SWAT	Soil and Water Assessment Tool
TDS	Total Dissolved Solid
ToC	Table of Contents

ToR	Terms of Reference
TPD	Ton Per Day
UFO	Upazila Fisheries Office
UFFL	Urea Fertilizer Factory Ltd.
UNEP	United Nations Environment Programme
VECs	Valued Environmental Components
WARPO	Water Resources Planning Organization
WB	World Bank

Summary

Urea fertilizer has been keeping important role in meeting up the increased food and nutritional demand of the country. The performance of urea fertilizer is found satisfactory for rice production. Present domestic production coveres about 63% of the total demand of Urea. The installed capacity of existing six urea fertilizer factories under BCIC is about 2.32 million Ton. But due to shortage of gas, old technology and aging, these factories cannot sustain the installed capacity and gradually the production is decreasing. The annual production in 2012-13 is only 1.02 million Ton.

Realizing the importance of sustainable agriculture and meeting up the increasing demand, Government of Bangladesh (GoB) is going to establish a new modern, energy efficient Urea Fertilizer factory under the caption mentioned above with higher capacity of Urea 2,800 TPD and Ammonia 1,600 TPD.

The plan includes installation of a two Steam Turbine units with the capacity of 32 MW each and a Gas Turbine unit with the capacity of 9 MW as well as their auxiliaries and ancillaries.

Natural gas for the proposed GPUFP will be supplied from the existing Titas Gas Transmission and Distribution system through the proposed gas line and Regulating Metering Station (RMS). For cooling and other purposes, the plant anticipates to use surface water from the Shitalakhya River based on conventional technologies like RO (Reverse Osmosis). Reverse Osmosis is one of the distillation processes to make the Shitalakhya River free from all kinds of dissolved and un-dissolved substances, including TDS. However, to ascertain the viability of this, a separate study on the availability of Shitalakya River water for the entire plant's life of 30 years will be made and that will be made available for considerations in preparation of the EIA report. A new jetty will be constructed for loading of produced urea and transported all over the country mostly by water vessels. Commissioning of the GPUFP will add additional urea fertilizer to the national total, which will subsequently reduce the supply-demand gap of the country. The GPUFP will also help to improve the socio-economic conditions of people living in the Plant area by creating job opportunity and developing small and medium scale businesses. The Project will be financed by the Japan Bank of International Corporation (JBIC) and Hongkong and Shanghai Banking Corporation (HSBC), and guaranteed by Multilateral Investment Guarantee Agency (MIGA).

The proposed Project falls under the red category of industrial classification. To meet the environmental regulations of Bangladesh, BCIC has signed a contract with CEGIS on 16th October, 2018 for conducting the Environmental Impact Assessment (EIA) for environment approval/ clearance certificate from the Department of Environment (DoE), Government of Bangladesh.

As per the terms of the Agreement, the CEGIS has prepared a detailed methodology for conducting the EIA study. This Inception Report aims to elaborate the scope of work (including the issues that need to be resolved to progress the study), methodology for conducting the study, findings of the reconnaissance field visits, utilization of given manpower, proposed communication procedures with the Proponent (i.e., BCIC) regarding data, reporting, materials, factory components, etc.

1. Introduction

1.1 Overview

The Inception Report has been prepared as one of the deliverables of Environmental Impact Assessment (EIA) of the "Ghorasal Polash Urea Fertilizer Project" proposed to be constructed at Polash, Narsingdi. The proponent of the project is the Bangladesh Chemical Industries Corporation (BCIC), Ministry of Industries (MoI), Government of Bangladesh. The report addresses methodological aspects of the study, as well as requirements of the Japan Bank of International Cooperation (JBIC), the Hongkong and Shanghai Banking Corporation (HSBC) and the Multilateral Investment Guarantee Agency (MIGA) including timeline of the activities and deliverables.

The core objective of the EIA study is to assist BCIC in its effort to obtain the environmental clearance from the Department of Environment (DoE) and thus to secure the bank's commitment to finance the execution of the Project. The Project aims to build a new, modern, energy efficient and higher capacity Urea Factory in place of the existing UFFL and PUFFL by abondoning/shutting down the existing factories and utilizing committed natural gas by Titas Gas Transmission and Distribution Company Ltd. which are currently consumed by both factories.

1.2 Background

Meeting up the food and nutritional demand of the country is a prime issue. For this reason, special emphasis has been given on modernizing agricultural systems based on appropriate technology. Various reform measures have been taken for ensuring the availability of related agricultural inputs including fertilizer. The performance of Urea fertilizer is found satisfactory for rice production. It is preferable to nitrates for flooded rice since nitrates are reduced to N_2O or N_2 in the anaerobic zone of the paddy and hence lost to the atmosphere. Furthermore, the paddy, unlike most other crops, can utilize the ammonium form of nitrogen efficiently. Present domestic production coveres about 63% of the total demand of Urea. It is quite evident that fertilizer shortage is compensated by imported urea. The installed capacity of existing six urea fertilizer factories under BCIC is about 2.32 million MT. But due to shortage of gas, old technology and aging, these factories cannot sustain the installed capacity and gradually the production is decreasing. The annual production in 2012-13 is only 1.02 million MT.

Realizing the importance of sustainable agriculture and meeting up the increasing demand, Government of Bangladesh (GoB) is going to establish a new modern, energy efficient Urea Fertilizer factory under the caption mentioned above with higher capacity of Urea 2,800 TPD and Ammonia 1,600 TPD.

BCIC has therefore entered into an Agreement with CEGIS on 16th October 2018 for the tenure of three (03) months for conducting the Environmental Impact Assessment (EIA) of the proposed Project to obtain the IEE clearance certificate and EIA approval from the Department of Environment (DoE) by following the existing environmental rules and regulations.

Since the proposed Project is located on the same platform within the same boundary of the existing factories, the site clearance certificate may not be required from the DoE. The

proponent i.e., the BCIC, in this case shall apply to DoE seeking waiver for site clearance certificate and at the same time request DoE's approval to conduct the EIA study for the proposed Project in accordance with appended Terms of Reference (ToR).

CEGIS, as per the Agreement signed, has prepared a detailed methodology for conducting the EIA study and deployed a multidisciplinary team with relevant expertise to conduct the reconnaissance field visit to the proposed Project site in Ghorasal. This reconnaissance visit was carried out during 31 October to 1 November, 2018. Based on the review of the ToR and outcomes of the reconnaissance visit, this report focuses on the scopes of work (including issues that merit further discussions between BCIC and CEGIS to carry forward the process), methodology of conducting the work, field findings, utilization of services of various professionals, periodic communications and consultations with the BCIC regarding data and information about the various components of existing factories as well as reporting.

The major outputs of the study is EIA report including Environmental Management Plan (EMP), Monitoring Plan, Emergency Response Plan (ERP) and Grievance Redressal Plan (GRP).

1.3 Project Objectives

The overall objective of the GPUF Project is to build a new, modern, energy efficient and higher capacity Urea Factory in place of UFFL and PUFFL by decommissioning them.

The specific objectives are:

- To build the factory more energy efficient than other similar ones;
- To reduce load on gas supply;
- To enhance urea production to support the sustainability of dependent production sectors;
- To reduce import of urea and loss of foreign currency as well; and
- To reduce environmental pollution.

1.4 Study Objectives

The overall objective of the EIA study is to ensure that potential environmental and social impacts associated with development of the Project are identified, assessed and managed appropriately to meet the compliance requirement of the Government of Bangladesh (GoB)[1] and the World Bank. Mitigation measures are then developed and incorporated into the project to eliminate, minimise or reduce adverse impacts and, where practicable, to enhance benefits.

The specific objectives are:

i. To prepare a detailed environmental and social baseline situation;

ii. To predict and evaluate possible environmental and socio-economic impacts;

[1] The GoB requires 2 stages environmental assessment as perthe Environment Conservation Act 1995 and Environment Conservation Rule 1997: (i) initial environmental examination and site clearance; and (ii) environmental impact assessment and environmental clearance.

iii. To delineate Environmental Management Plan and Monitoring Plan;

iv. To develop Emergency Response Plan; and

v. To prepare Grievance Redressal Mechanism.

1.4.1 Use of EIA

- The use of EIA in project development may be regarded as a way of avoiding environmental impacts;
- This is also a way of avoiding costs due to these impacts;
- It is a tool for authority to prevent adverse environmental impact from the proposed projects;
- The EIA is a tool for authority in planning of resources; and
- It supports in policy development.

1.5 Project Description

1.5.1 Project Brief

The proposed Project "Ghorasal Polash Urea Fertilizer Project (GPUFP)" at Polash, Narsingdi is a natural gas based 2,800 ton per day (TPD), which is equivalent to about one million ton per year (357 days), granular urea producing factory. Bangladesh Chemical Industries Corporation (BCIC) is the proponent of this turnkey project. A consortium of Mitsubishi Heavy Industries Ltd. (MHI) of Japan and China National Chemical Engineering No.7 Construction Company Ltd. (CC7) is the EPC contractor for establishing factory. The proposed Project is a new, modern, energy efficient and higher capacity Urea Fertilizer Factory in place of old and inefficient UFFL and PUFFL. The information of the existing UFFL and PUFFL are attributed in the following table:

Issues	UFFL	PUFFL
Year of Construction	1970 (COD- 1972)	1985 (COD- 1986)
Installed Capacity of Urea	0.34 Mllion T/Year	95,000 T/Year
Renovated Capacity of Urea	0.47 Millionn T/Year	-
Operational Efficiency	80%	DD
Installed Capacity of NH_3	660 T/Day	56,000 T/Year
Designed Fuel Consumption (N. Gas)	32.4 MCF/MT of Urea	49.8 MCF/MT of Urea
Gas Supply Agreement	48 MMCFD (Max. 52)	16.7 MMCFD (Max. 18)
Economic Life	20 years	15 Years
Actual Life	43 years	28 Years
Equipment/Machineries	Deteriorated	Deteriorated
Economical viability	Very low	Very low

The proposed Project site is located inside the premise of PUFFL. The site is a raised land of about 110 acres having old buildings and large open space with vegetation. The site also includes the lagoon situated adjacent to PUFFL where urea factories discharge untreated or limited treated efflent. Most part of the lagoon will be filled up by the dredged materials of the

nearby Shitalakhya River. So, land acquisition as well as other associated issues are redundant in this case.

The site comprises of shrubs, trees, a number of old civil structures like buildings, etc. and a 132KV transmission line is running over the project site. The buildings are mostly vacant while some are functioning as office, store and pump house. These buildings need to be demolished, shrubs and trees to be cut and two ponds need to be filled. The major project units are:

- Urea plant
- Ammonia Plant
- Urea Granulation plant
- Power plant
- Other auxiliary and ancillary units.

Process flow (Urea Manufacturing)

The proposed project will have a 2x32 MW steam and one 09 MW Gas Turbine power plant as captive plants for its day to day use. Only in case of emergency the plant will draw power from national grid. Cooling of condenser and other heat exchangers will be done by surface water from the Shitallakha river using cooling tower. A water balance diagram will be provided in the EIA report.

The power plant will require about 16 MMSCFD of gas for generation of 2x32 MW Steam Turbine and one 09 MW Gas Turbine MW power which will be provided by Titas gas Transmission Co.

The major air pollutants that are produced from a fossil fuel based Power Plant are SOx, NOx, CO2, CO and SPM. The proposed plant is a natural gas based Power Plant. Natural Gas of Bangladesh contains negligible percentage of sulphur and hence formation of SO_2 would be insignificant.

Since the boiler is a small one, use of dry low- NOx burners with lean pre-mix firing would be good enough to keep NOx level well below the DoE and World Bank Group permissible limit. Modern digital DCS control system maintains combustion air about 1% (excess air) above the "stoichiometric" F/A ratio. Hence, formation of CO due to incomplete combustion is not expected. Normally, SPM contents in ambient air are filtered by gas turbine air filters and that in natural gas is negligible or near to negligible.

Substantial reductions in emissions of CO_2 could be achieved due to high efficiency of burning in modern boilers i.e., burning less fuel for same megawatt of electricity generation.

Moreover, development of green belts in and around the project site will also greatly reduce CO_2 from the environment. For continuous on-line flue gas pollutant monitoring, different electronic analysers like CO_2 analyser, NOx analyser, etc. shall be installed in analyser room.

These analysers, will collect samples of flue gas from chimney and shall display the result locally as well as will transmit electrical signals to the Distributed Control System (DCS) for displaying and warning in control room monitors.

Moveable air monitoring units can be kept near the sensitive receptors like school, mosque area, colony, nearest residential areas, etc.

Urea Manufacturing Process

Process design of the proposed urea Fertilizer Factory of Ghorasal will be prepared by EPC contractor. However, conceptual design of a modern Ammonia- Granular Urea complex consists of the following:

a) Process Plants

i. Ammonia Plant
ii. Urea Plant
iii. Urea Granulation Plant

b) Utility

i. River water intake Unit
ii. Water Treatment Unit plus distribution system
iii. Cooling water(Cooling Tower)
iv. Steam generation Facilities plus distribution system
v. Electrical Generation Facilities and Power Distribution System
vi. Instrument Air and Plant Air Facilities
vii. Natural Gas Metering Station
viii. Inert Gas Generation and Storage Facilities
ix. Effluent Treatment
x. Polyethylene plant/Bag Manufacturing plant
xi. Central Control room, Substation, Switch room, etc.
xii. Emergency Generator &UPS
xiii. Black Start Generator

c) Off-sites

i. Ammonia Storage Unit
ii. Urea Handling, Storage and Bagging facilities
iii. Laboratory facilities
iv. Ware House for Spares, Catalysts, Resins, Consumable, etc.
v. Maintenance shops(Mechanical, Electrical, Instrument)
vi. Fire Fighting System, First Aid Center
vii. Road, Paving, Fencing, lighting, Drainage net work
viii. Vehicle parking sheds including trucks
ix. Buildings for different uses (residential, administrative, technical, maintenance, engineering, Security etc.)
x. Ammonia Bottling station
xi. Heavy duty import jetty
xii. Dispatch jetty
xiii. Residential building

Basic Design of Ammonia

Ammonia is basically produced from water, air and energy. The energy source is generally natural gas/ hydrocarbon that provides hydrogen for fixing the nitrogen. The other energy input is required for steam and power. Steam reforming process of light hydrocarbons particularly Natural gas is the most efficient route for production of Ammonia. It may be mentioned that production of Ammonia from gas is best in respect of CO_2 emission.

Ammonia Process

Starting with a natural gas feedstock, the processes used in producing the hydrogen are:

The first step in the process is to remove sulfur compounds from the feedstock because sulfur deactivates the catalysts used in subsequent steps. Sulfur removal requires catalytic hydrogenation to convert sulfur compounds in the feed stocks to gaseous hydrogen sulfide:

$$H_2 + RSH \rightarrow RH + H_2S \text{ (gas)}$$

The gaseous hydrogen sulfide is then adsorbed and removed by passing it through beds of zinc oxide where it is converted to solid zinc sulfide:

$$H_2S + ZnO \rightarrow ZnS + H_2O$$

Catalytic steam reforming of the sulfur-free feedstock is then used to form hydrogen plus carbon monoxide:

$$CH_4 + H_2O \rightarrow CO + 3H_2$$

The next step then uses catalytic shift conversion to convert the carbon monoxide to carbon dioxide and more hydrogen:

$$CO + H_2O \rightarrow CO_2 + H_2$$

The carbon dioxide is then removed either by absorption in aqueous ethanolamine solutions or by adsorption in pressure swing adsorbers (PSA) using proprietary solid adsorption media.

The final step in producing the hydrogen is to use catalytic methanation to remove any small residual amounts of carbon monoxide or carbon dioxide from the hydrogen:

$$CO + 3H_2 \rightarrow CH_4 + H_2O$$

$$CO_2 + 4H_2 \rightarrow CH4 + 2H_2O$$

To produce the desired end-product ammonia, the hydrogen is then catalytically reacted with nitrogen (derived from process air) to form anhydrous liquid ammonia. This step is known as the ammonia synthesis loop (also referred to as the Haber-Bosch process):

$$3H_2 + N_2 \rightarrow 2NH_3$$

Due to the nature of the (typically multi-promoted magnetite) catalyst used in the ammonia synthesis reaction, only very low levels of oxygen-containing (especially CO, CO2 and H2O) compounds can be tolerated in the synthesis (hydrogen and nitrogen mixture) gas. Relatively pure nitrogen can be obtained by Air separation, but additional oxygen removal may be required.

Because of relatively low single pass conversion rates (typically less than 20%), a large recycle stream is required. This can lead to the accumulation of inert in the loop gas.

The steam reforming, shift conversion, carbon dioxide removal and methanation steps each operate at absolute pressures of about 25 to 35 bar, and the ammonia synthesis loop operates at absolute pressures ranging from 60 to 180 bar depending upon which proprietary design is used. There are many engineering and construction companies that offer proprietary designs for ammonia synthesis plants. Haldor Topsoe of Denmark, Thyssenkrupp Industrial Solutions GmbH of Germany, Ammonia Casale of Switzerland and Kellogg Brown & Root of the United States are among the most experienced companies in that field.

Ammonia to Urea Process

Urea synthesis

Urea is made from ammonia and carbon dioxide. The ammonia and carbon dioxide are fed into the reactor at high pressure and temperature, and the urea is formed in a two-step reaction

$$2NH_3 + CO_2$$

$$NH_2COONH_4 \text{ (ammonium carbamate)}$$

$$NH_2COONH_4 \quad H_2O + NH_2CONH_2 \text{ (urea)}$$

The urea contains unreacted NH_3 and CO_2 and ammonium carbamate. As the pressure is reduced and heat applied the NH_2COONH_4 decomposes to NH_3 and CO_2. The ammonia and carbon dioxide are recycled. The urea solution is then concentrated to give 99.6% w/w molten urea, and granulated for use as fertilizer and chemical feedstock.

Requirement of Natural Gas

Urea can be manufactured from several different hydrocarbons. In case of proposed Ghorasal Polash Urea Fertilizer Factory, Natural Gas has been chosen as the raw material and energy for the plant. The plant would require about 22 MCF for producing one ton of Granular Urea Fertilizer. Production capacity of the plant is estimated as 2800 TPD. About 66 MMSCFD gas will be required to produce such quantity of urea per day. Currently, about 66 (48+18) MMSCFD gas is being supplied to Ghorasal and Polash Urea Fertilizer Factory from the City Gate Station (CGS) of Titas Gas Transmission and Distribution Company Ltd. (TGTDCL) located at Ghorasal Urea Fertilizer Factory area. So, basic infrastructure is there to supply gas to the proposed plant. However, following two issues has to be ensured:

a) Contract with TGTDCL for supply of gas up to the plant life; and

b) A hookup line from CGS to the proposed plant with ancillaries.

The design capacity of UFFL is 32.8 MCF/ton and that of PUFFL is 49.8 MCF/ton. It may be noted with same quantity of gas consumed by Polash and Ghorasal Urea Fertilizer Factory (combine) the proposed plant will produce more than double per year. This will be big saving of gas and compliance of National Energy Policy of Bangladesh (1995).

1.6 The Project Site and Study Area

The Project site is located on the left bank of the river Shitalakhya and on the western side of the Polash-Issakhali Road (see Figure 1.1). The site is bounded on the North-West at around 23°59'27.87"N latitude and 90°38'40.32"E longitude, on the North-East 23°59'27.53"N latitude and 90°38'58.47"E longitude, on the South-East 23°59'4.35"N latitude and 90°38'47.33"E longitude and on the South-West 23°59'7.64"N latitude and 90°38'36.98"E longitude.

Administratively, the site is located at Polash Mauza of the Ghorasal Municipality under Polash Upazila of Narsingdi district (see Figure 1.1). The site is located at about 4.7 km northeast of the Ghorasal Municipality Office, 6.0 km northeast of the Railway Bridge and 4.7 km northeast of the Polash Upazila Headquarters. The site is aerially about 38 km northeast of Dhaka Zero Point.

The site is surrounded by Ghorasal Power Station on the South, the Shitalakhya River on the West, country side on the Northand East. The Project area is of about 110 acres of land having grasses, bushes, trees, old structures including store houses mostly shabby in condition, lagoon, etc.

Centering the mid-point of the proposed GPUFP an area of 10 km radius is considered as the study area for the assessment of impacts associated with the interventions. The land belongs to BCIC and is within the boundary of the Polash Urea Fertilizer Factory Ltd. Hence, no new land acquisition is required and issue of compensation and resettlement is redundant.

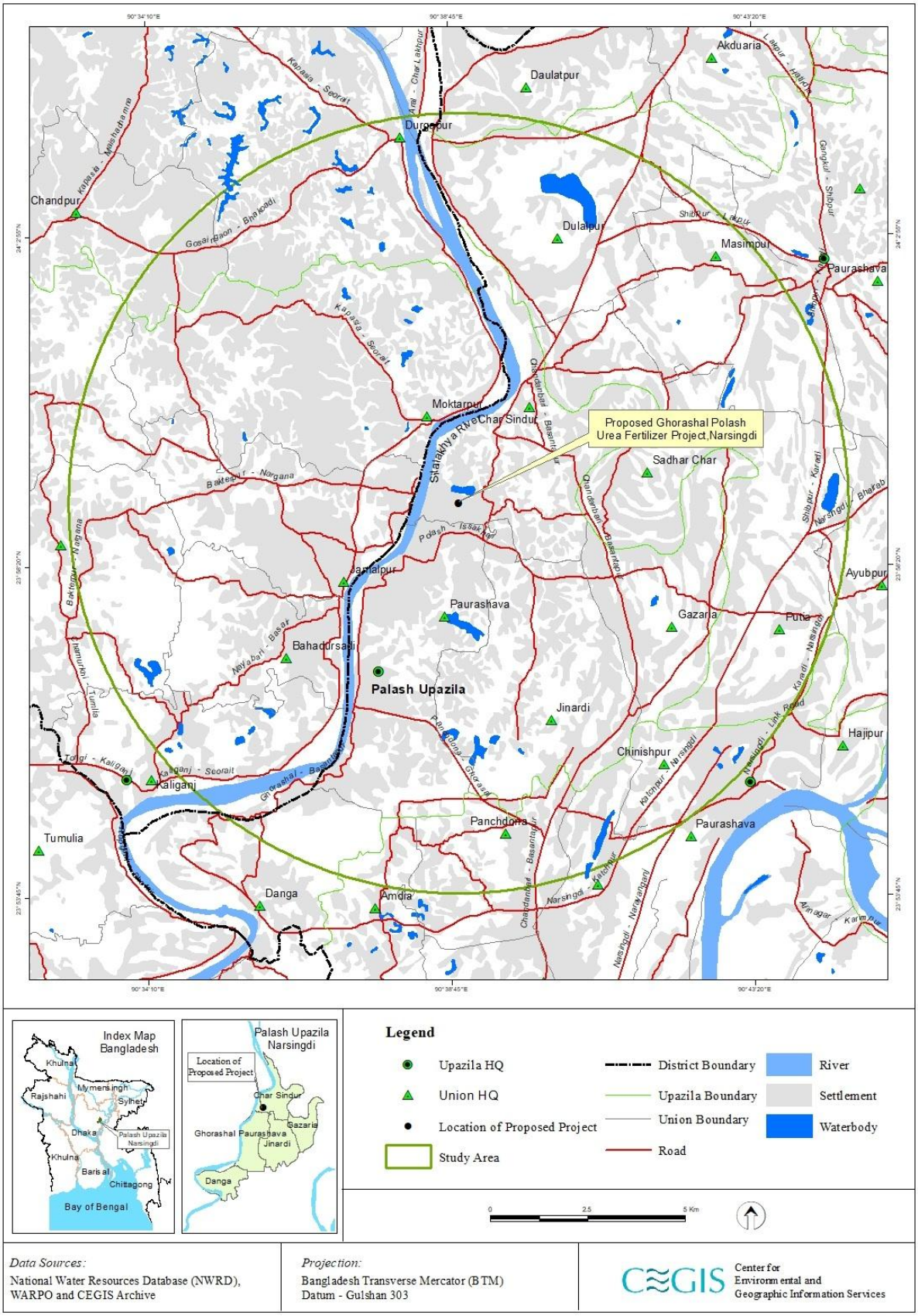


Figure 1.1: GPUFP Site and Study Area Boundary

1.7 Rationale of the Study

The Urea Fertilizer Factory construction Project generally falls under 'Red Category" defined by the Department of Environment. This requires Initial Environmental Examination (IEE) followed by a detailed Environmental Impact Assessment (EIA) study orderly for issuing Site Clearance Certificate (SCC) and the Environmental Clearance Certificate (ECC) as per Section 12 of the Environment Conservation Act, 1995 (Amended Section 1 in 2000) and Environmental Conservation Rules, 1997. Since the Project site belongs to existing premise of PUFFL, so Site Clearance may not be required. Accordingly, the Proponent may seek exemption of IEE study to DoE. This study will identify and evaluate potential impacts of the proposed Urea Factory on environmental and socio-economical conditions in pre-construction, construction and operation phases. A detail Environmental Management Plan (EMP) will be proposed to mitigate the Project induced negative impacts. It is expected that the study will facilitate the planning and design of the proposed Project in more environment friendly manner so that implementation of the Project exerts lesser negative impacts and generate greater benefits. The study, would therefore, contribute in better understanding of whole range of environmental and socio-economic dimensions of the proposed interventions and help the BCIC to be judicious in implementing the activities that are outlined in the Project and realize the Project objectives.

1.8 Scopes of Service for EIA Study

The EIA study aims to explain the legal context through identification of statutory requirements of law of the land, following the guidelines of the DoE and the World Bank Group's (e.g., JBIC, HSBC and MIGA) Environmental and Social Framework (ESF) and International Finance Corporation (IFC) guidelines including health and safety guidelines, against which the Project interventions are to be judged. Detailed assessment and evaluation of potential environmental and socio-economic impacts of the Project will then form the basis for designing the EMP.

Task 1: Description of the proposed Project;

Task 2: Analysis of alternatives;

Task 3: Description of the Environment (baseline situation);

a. Physical environment (Land resources, topography, climate and meteorology, hydrology, environmental quality, etc.);
b. Biological environment (Agricultural resources, fisheries and ecological resources); and
c. Socio-cultural environment (Social, cultural and archaeological issues).

Task 4: Policy, rules and regulatory framework;

Task 5: Identification, selection and rationalization of Important Environmental and Social Components (IECs) or Valued Environmental Components (VECs) likely to be impacted by the interventions;

Task 6: Determination of potential environmental and social impacts of the proposed Project;

a. Pre-construction (including Decommissioning) phase;
b. Construction phase; and
c. Operation phase.

Task 7: Cummulative impact assessment;

Task 8: Conduction of consultation meetings with the local stakeholders;

Task 9: Development of an Environmental Management Plan (EMP) including Monitoring Plan;

Task 10: Development of Emergency Response and Disaster Management Plan;

Task 11: Risk and Hazard Assessment; and

Task 11: Conduction of Consultation and Disclosure Meeting and Grievance Redress.

1.9 Limitations of the Study

The time allotted for completion of the study is in total three (03) months, which is extremely inadequate to cover all issues in great details and thus may become limiting factor to realize all the outputs of highest scientific standard. For example, according to the World Bank Standard covering the JBIC, HSBC and MIGA requirements and guidelines/instructions issued by the DoE, the EIA study should be carried out considering seasonal aspects of a complete hydrological cycle. However, in the DoE instructions there are provisions that in case of priority projects and emergency of work, EIA might be carried out in limited time frame covering parts of both dry and wet seasons if possible or otherwise use secondary data from authentic source(s). The current study will take the above noted timeframe as reference in conducting the EIA and present the results for acceptance by all parties including the DoE.

A Table of Contents (ToC) of the EIA study has been appended with this report in Appendix 1 for approval of the DoE. CEGIS expects BCIC to be proactive in soliciting DoE's cooperation for early approval of the ToC of EIA report to avoid unexpected delay and submission of the report to all parties concern within such a limited time frame.

1.10 Water Balance Study

As per ToR, the consultant is expected to prepare a water balance for this Project. (SL. 12 of the objective of the assignment) and assess whether any rehabilitation of river would be required or not. The same section also instructs to carry out impact assessment of rehabilitation of the river and upgrading water front structures (if required), and to identify mitigation and monitoring measures accordingly. To this effect, CEGIS comment is, ***"whether any rehabilitation of river would be required or not"*** would be findings of a detail feasibility study, not from EIA study. If the Project proponent (i.e., BCIC) has any plan to upgrade the water front structures, that plan should be shared with the EIA consultant at the Inception stage of the study. CEGIS also wishes to note that, if the BCIC plan for large scale upgrading and rehabilitation of the river, then it would require a separate feasibility study including the engineering analyses with mathematical modeling; and results of such feasibility study would call for approval from the relevant organization of the Bangladesh Government. Though it is not mentioned in the Technical proposal, CEGIS feels that Water Balance Study needs to be done for better understaning of water availability and requirements of river rehabilitation works. For the scientific integration of the study the Consultant however will carry out an indicative water availability study subject to availability of relevant information and data from the relevant agencies for such assessment.

1.11 Need for Project Plans, Design, Drawing and Description of Work

The EIA studies are to be carried out on the basis of detail description, design and planning of the Project. The possible environmental impacts and their remedial measures are to be

identified understanding the nature of work for each component of the proposed Project and activities for installing the Urea Factory and establishment of site. Besides, it is mandatory to include detail Project description with layout, design, plan and project data sheet in EIA report. Otherwise, the DoE may not issue the environmental clearance certificate. Hence, detail information on Project plan, layout, design, drawing, and description of work shall have to be provided by the Proponent.

2. Mobilization

After obtaining the Notification of Award (NOA) on 16 October, 2018, CEGIS has mobilized a core group of highly skilled professionals as proposed in the Technical Proposal. Initiatives have been taken for accomplishing the study within the expected time-frame through formulation of an action plan, setting up of Project Monitoring Cell at the CEGIS office in Dhaka for providing all necessary logistics and technical support to perform required investigations and production of the reports.

2.1 Management of the Study

The consultant (CEGIS) shall work in consultation with the Project Director of BCIC and shall maintain close liaison with BCIC offices (both field and central offices). The Team Leader of the study is functionally responsible for direct supervision of the study and ensuring its quality. As per the ToR of the study, two (2) man-months are stipulated for the Team Leader while the total study period is three (3) months. So, it is bit difficult to afford his guidance, suggestions and inputs throughout the study period. Realizing the issue, the CEGIS management has selected Mr. Mohammed Mukteruzzaman, a Biologist as Co-Team Leader for expediting the study. He will supervise and guide the study team in harmony with the expatriate Team Leader to achieve the study goal. The progress of the study will be reviewed by CEGIS management in its weekly progress review meeting. Each report and deliverable shall be reviewed carefully by the team members, Team Leader and finally shall be checked by an experienced reviewer.

The Co-Team Leader, selected by CEGIS will be responsible to carry out project management activities in consultation with the Team Leader with communication to the office of the Project Director. The Project Director office shall assist the study team as and when required to ensure smooth completion of the study. Understanding the importance and time limitation of the study, the Project Director will be regularly updated on the activities undertaken and progress achieved.

2.2 Office Setup

A study and monitoring cell has been setup at the CEGIS central office, located at Gulshan-1, Dhaka for this study. The office will ensure all kinds of technical, administrative and logistic supports for carrying out the study. The Co-Team Leader will maintain close communication with the Team Leader and all other professionals and experts involved in the study. The Co-Team Leader and the accounts department will be keeping close communication with the office of the Project Director regarding all financial matters.

2.3 Team Formation

A multidisciplinary EIA team has been formed as defined in the ToR and proposed in the Technical Proposal with given allocation of time. The study team and their responsibilities as per direction of the ToR, is presented in **Table 2.1** below.

Table 2.1: Team Composition for the EIA Study

Sl. No.	Name of Professional	Position Assigned
1.	Dr. Kazi Md Noor Newaz	Team Leader and Environmental Expert
2.	Kazi Kamrull Hassan	Deputy Team Leader and EMP Specialist
3.	Nasir Ahmed	Chemical Engineer
4.	Dr. Maminul Haque Sarker	Morphologist
5.	Md. Sarfaraz Wahed	Hydrologist
6.	Mohammad Abdur Rashid	Agriculture Engineer
7.	Dr. Ashraful Alam	Fisheries Specialist
8.	Subrata Kumar Mondal	Sociologist
9.	Mr. Pronab Kumar Halder	Environmental modeler (air, water and noise)
10	Mir Fahim Shaunak	GIS and RS Specialist
11	Tanvir Ahmed	Hydrodynamic modeler
12	Rafiqul Islam	Chemist
13	Sharmin Akter	Field Researcher

In addition to the above mentioned professionals some additional professionals listed below are to be engaged in this study to complete it within the stipulated time.

Sl. No.	Name of Professional	Position Assigned
1	Motaleb Hossain Sarker	Overall Project Management and Water Resources Expert
2	Mohammed Mukteruzzaman	Project and Co-Team Leader and Biologist
3	Jalal Ahmed Choudhury	Power Plant and Instrumentation Expert
4	Md. Maqbul-E-Elahi	Geologist and Primary Energy Expert
5	Gazi Md. Riasat Amin	Water Balance Specialist
6	Hasan Tawfique Imam	GIS Specialist
7	H. M. Nurul Islam	Limnologist (Benthic and Water Quality)
8	Mr. Mohammad Kamruzzaman	Ecology and Biodiversity Specialist
9	Roland Nathan Mondal	Jr. Fisheries Specialist
10	Deeba Farzana Moumita	Disaster Specialist
11	Md. Mutasim Billah	Risk and Hazard Specialist
12	Redwan Hossain Jeshan	Occupational Health and Safety Specialist
13	Md. Ashis Mawla	Jr. Anthropologist
14	Most Tania Karim	Jr. Agriculture Specialist
15	Amena Binte Ariff	Junior Water Resources Engineer

3. Reconnaissance Field Visit

3.1 Site Visit

3.1.1 Purpose

Considering NOA as equivalent to the Agreement, as part of the inception phase, a reconnaissance field visit has been made to the proposed site of the Project at Polash, Narsingdi District from 31 October to 01 November, 2018.

The objective of reconnaissance field visit was to get a better understanding of the proposed Project site and its surrounding in terms of the baseline status of physical, biological and social environment of the Project site through visual survey, factory components inspection and stakeholder consultations. At this stage the stakeholder consultations were made mainly with the UFFL anf PUFFL authority, residents of the campus and local stakeholders outside the factories.

The purpose of the visit was also to inspect the field for understanding the general environmental and socio-economic condition on which the methodology of the study would be based on. Considering the scope of the work, contact and liaison with relevant government departments, autonomous organizations and agencies were made during the visit. The members of the multidisciplinary team that visited the Project site were:

Name	Working Area
Jalal Ahmed Choudhury	Water Treatment Plant, Power Plant, Boiler, Equipments, etc.
Maqbul-E-Elahi	Ground Water, Gas, etc.
Dr. Kazi Noor Newaz	Ecosystem and Biodiversity
Mohammed Mukteruzzaman	Fisheries and overall issues
Ashish Mawla	Socio-Economical issues
Amena Binte Ariff	Water resources issues

3.1.2 Field Activities

Reconnaissance Survey

Itinerary of the field program along with the activities performed during the reconnaissance survey has been as follows:

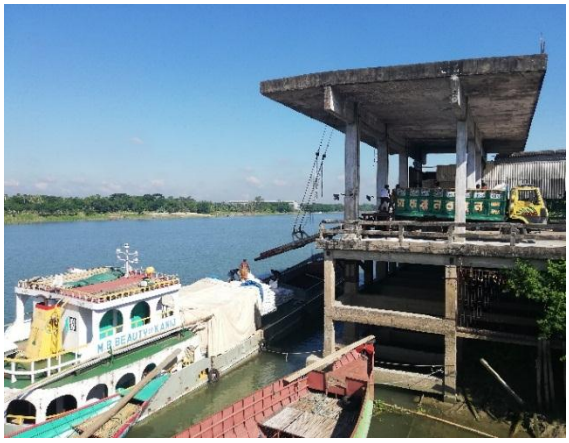
Date	Time	Offices/Sites Visited	Night Halt
31.10.2018 (Wednesday)	Morning	Departure from Dhaka for Ghorasal, Narsingdi.	BCIC Rest House, Narsingdi
		Arrived at Ghorasal, Narsingdi at about 11:30hrs.	
	Morning to Evening	After Johr prayer and lunch around 15:00 hrs the sudy team met Mr. Md. Saddat Hossain, Managing Director, UFFL and Mr. Md. Moazzem Hossain, Managing Director, PUFFL for collection of factory related information and data. With the instruction of MD, UFFL Ms. Abida Sultana, Laboratory of UFFL	

Date	Time	Offices/Sites Visited	Night Halt
		provided some of the required data which were available with them.	
	Evening	The study team returned to the UFFL rest house.	
01.11.2018 (Thursday)	Morning	The study team met with Mr. Alamin and other officials of Water Treatment Plant for obtaining information on water intake, treatment, uses and effluent. The team members respectively performed their jobs to collect relevant information during the transect walk across the site with the officials of UFFL. The team visited intake pump house to get relevant information and also visited Laboratory, Project site, existing RMS site, location of jetty to be used during loading-unloading of machinery and equipment, effluent discharge, etc.	
	Afternoon	The team went to the colony inside the PUFL and study area and observed the physical condition of the site, recorded GPS reading of different important points, collected information on water resources, physical environment, agriculture, livestock, fisheries, ecosystem, socio-economic activities etc. The team members consulted different level of stakeholders like farmers, fishers, members of local government institutions, traders, teachers, elderly people, local elites etc. on relevant issues. The team also looked into the site in respect of dismantling activities and possible scrap site.	
	-	In sum results that have been achieved based on the activities that were carried out during this field visit are: ▪ Establishment of the coordinates of the site using GPS; ▪ Assimilation of various kind of physical data; and ▪ Clear idea about the proposed Project site based on Rapid Rural Appraisal (RRA) in different locations	-
	Evening	Departure for Dhaka	-

Attempts were made to identify potential socio-economic constraints, if any and environmental issues related to the proposed site as well as with the construction and operation of the proposed Urea Fertlizer Factory. **Figure 3-1** shows field activities of the team members at Ghorasal.

Project site (Partial View)

Understanding the Project site



Existing Jetty

Discussion with MD, UFFL

Meeting with MD, PUFFL

Discussion with Local Stakeholders

Figure 3.1: Field Activities at the Proposed GPUFP Site

Observation and Suggestion on Project Boundary

The team made an attempt to identify the environmental and socio-economic issues related to the Project. Based on the preliminary observations it is noted that the existing urea fertilizer factories of Ghorasal has so far been using surface water from the Shitalakhya River through pipeline supported by cooling tower (close cooling system). In the proposed Project, the intention is using the same source of water. To ascertain this, the Project may need cooling tower as the Shitalakhya River discharge is in declining trend and the river gets cut off in dry

season from the Old Brahmaputra. This could become a constraint. This preliminary observation, however, will further be substantiated during the course of the study.

Observation on the Physical Environment

Attempts were made to understand the general physical settings of the locality. This covers issues such as physiographic condition, physical and atmospheric environment, land type, landuse, drainage system, river morphology, extent of erosion, accretion, and agricultural practices, fisheries and ecological resources. A transect walk along the road side and across the Project area was made to observe the topography and landform of the Project and study area. It was carried out following a draft base map and a pre-developed checklist for each of the disciplines. Resource wise descriptions of the observation results are given in the following **Table 3.1**.

Table 3.1: Factory Wise Resource Description

Sectors	Description
Water resources	Surface Water: The proposed site for GPUFP is located on the left bank of the Shitalakhya River. The river is one of the distributary of the Brahmaputra River and is navigable round the year. The quality of the water of the river is reasonably good having a pH of 7.6. The existing Ghorashal Urea fertilizer factory is withdrawing about 1000 m3 water/per hour (0.28 m3/sec) from the river for industrial and drinking purpose after purifying the water at different levels depending on the purpose of use. Water purification process and level will be discussed in the EIA of report. However, about 50% of the water is discharged back to the river without any use. The minimum discharge of the Shitalakhya River is 83 m3/sec (January) and water level is 0.94 m PWD. Maximum discharge of water of the Shitalakhya River is about 1181 m3/sec and water level is 6.62 m PWD. Tidal effect is also observed in the Shitalakhya River and the variation between low and high tide is 20 cm. The proposed Urea Fertilizer factory would be an efficient plant. Basically there will not be any wastage of water. So, the River Shitalakhya would be able to provide required quantity of water for the proposed Urea Fertilizer Factory round the year. Ground Water: In the residential area of the Urea fertilizer factory for drinking and other purposes water is used from deep tube well sunk in the premise in 19/01.07(last). The depth is about 620 feet. Quality of water is good (Ph7.6, Iron 0.39, and Arsenic negligible). But aquifer test of the well was not conducted. As such effect of water withdrawal from the well(s) could not be ascertained. However, GoB does not encourage much withdrawal of ground water as the water table is gradually lowering which may affect the ecosystem of the area. So, it would be prudent to restrict ground water use limited to household level. Surface water from the Shitalakhya river is expected to be used for all purposes where water required for the proposed Project needs to be determined. However, a further indicative study on the availability of Shitalakhya River water for the entire Project life of 30 years will be made and will be presented in EIA report.
Water quality	At present, surface water from the Shitalakhya river is being used to run the cooling system of the urea factories using five pumps (three pumps for UFFL and two for PUFL) through syphoning action. After cooling, the hot water gets discharged in the lagoon first then to the same river (**Figure 3-2**). The existing factories produce

<table>
<tr><th>Sectors</th><th>Description</th></tr>
<tr><td></td><td>ammonia, which is used as one of the raw materials for producing urea. In this process some ammonia become excess which needs to ventilate. The ammonia that is to be ventilated mixes with water and the ammonia mixed water injects into the lagoon water. Being diluted in the lagoon the effluent is discharged finally into the river. As a result, the adverse impact of ammonia mixed water become minimal on the aquatic organisms. Through this process, the river water quality may be deteriorated to some extent. The water quality of discharged point will be tested and result will be presented in the EIA report.</td></tr>
<tr><td></td><td> 
Figure 3.2: Water Intake Pump</td></tr>
<tr><td></td><td> 
Figure 3.3: Water Clarifier</td></tr>
<tr><td>Physical environment</td><td>The proposed Project site is located within the Polash Urea Fertilizer Factory having installed capacity of 95,000 MT/Year. The nearby UFFL has the installed capacity of 0.34 million MT/Year. The UFFL factory has a captive Power Plant of 8 MW. The Ghorasal Power Station, having 7 units, is located just on the South of the urea fertilizer factories. The Ghorasal Power Plant uses water from the Shitalakhya River for cooling and other purposes. After cooling and meeting other uses, huge quantity of hot water is released to the downstream of the river. A number of food processing, chemical industries are situated on the bank of the Shitalakhya river. The Project area is characterized as industrial area.
Wind was relatively calm and the direction was from South-East to North-West much of the time as observed during the field visit (End of October). Odour of NH_3 was felt very intense as start up of UFFL was going on and thus ventilation of NH_3 becomes a usual practice. For the same reason, noise level was very high and ear-tiring and gradually went down as the team moved farther from the factory area.</td></tr>
<tr><td>Land & agriculture resources</td><td>The total Project area is about 110 acres. The proposed area is mostly covered with bushes, trees, different types of old aged structures, lagoon, etc. Small patches of Project site periphery are used by the lower level employees of the urea factory for growing seasonal vegetables.</td></tr>
<tr><td>Fisheries</td><td>The riverine fish habitats of the study area are repoted to be contaminated with the effluents of different industries that are discharged into the river some with or without treatment. This has resulted in the decline of fish production. Species those sustained in the given condition are native to different types of capture fish habitats including river, khal, beel and floodplain. Among the habitats floodplain is seasonal and remains suitable for fish habitation for 3-4 months. Some beels are also seasonal which retain water for 7-8 months and after that get converted into crop fields. The Shitalakhya river flows beside the proposed Project site. The study area has also aquaculture practices in homestead and commercial fish ponds.</td></tr>
</table>

Sectors	Description
	The riverine major fish species are: Shilo Baim (*Mastacembelus armatus*), Tengra (*Mystus tengara*), Punti (*Puntius spp*.), Kalibaus (*Labeo kalbasu*), Ayer (*Sperata aor*), Kaikya (*Xenontedon cancila*), Chanda (*Chanda nama*), Gurachingri (*Leander styliferus*), Taki (*Channa punctatus*), Chtal (*Notopterus chitala*), etc. The floodplain and beel fish species include: Rui (*L. rohita*), Mrigel (*Cirrhinus mrigala*), Boal (*Wallago attu*), Koi (*Anabas testudineus*), Kholisa (*Colisa fasciatus*), Punti (*Puntius spp.*), Shing (*Heteropneustes fossilis*), Magur (*Clarius batrachus*), Gurachingri (*Leander styliferus*), etc. The Shitalakhya river functions as an important corridor of fish migration from the Old Brahmaputra to the Balu and other rivers particularly during wet season.
Ecological resources	The proposed site covered part of industrial plot of Polash and Ghorasal Urea Fertilizer Factories and falls under the Bio-ecological zone, namely Madhupur Sal Tract and the edge of the Brahmaputra-Jamuna Floodplain. The Ecosystem feature which has been mainly observed during the reconnaissance field visit are briefly discussed on the flowing section. The proposed site is terrestrial land dominated by undergrowth vegetation containing tall grasses, local herbs, creepers and number of shrubs. Few numbers of small fruit yielding trees, timber trees have also been noted. Excessive growth of grasses, seasonal herbs and creepers already developed in some portion of the proposed area due to abandonment of those locations for a long time which ultimately provided support and developed good habitat for local birds like Munia, Larks, flycatchers, starlings etc. Major terrestrial plants as briefly noted during the visit are Bel, Supari, Khanthal, Debdaru, Neem, Papaya, Narikel, KBatabilebu, Krishnochura, Bot, Raindee Kory, Mahogoni, Sagun, Aum, Daruchini, Sirish, kajubadam, jam, amloki, jhau, Kamini, Koroi etc. The Fig ..xx shows photographs of terrestrial habitat of the proposed project area. The details floral species diversity will be assessed during the major field investigation stage. From interview it was noted that some wildlife like Jackal, mongoose, rats and snakes also occasionally found in the area. No bird nest observed inside the said vegetation at the proposed site. The terrestrial habitat patterns within the study area are homesteads, agriculture lands, urban and village roads. These areas covered with planted trees, wild shrubs and herbs. Scattered low bush have seen along the roads which is restrain with creepers, climbers, grass and frequently contain hedge-like shrub. The proposed project site is covered with many planted tree species and plenteous of herbs and shrubs species. Except the proposed factory premises, the major surrounding ecosystems observed are urban and village settlements, covering with natural and cultivated plants, agricultural lands and river, canals and ditches. Settlements are dominated by Betel nut, Coconut, Wood apple, Neem, Mango, Raintree, Mahagoni and numerous bush plants. Common native mammals, reptiles, amphibians are available in each homesteads forest. Utilization of agricultural lands is mainly for paddy and vegetable cultivation. The propose project is situated along the Shitalakhya River. River possessed very few species of aquatic plants and fishes for having degraded quality of water. A major part of agricultural lands are inundated in monsoon called floodplain create

<table>
<tr><th>Sectors</th><th colspan="2">Description</th></tr>
<tr><td></td><td colspan="2">vast habitats of aquatic biota for luxurious growth of seasonal hydrophytes. However, aquatic species will be assessed during detail field survey.</td></tr>
<tr><td rowspan="2"></td><td>  </td><td>  </td></tr>
<tr><td>Figure 3.4: Herb Dominant Vegetation Cover</td><td>Figure 3.5: Tree Dominant Vegetation Cover</td></tr>
<tr><td>Socio-economic conditions</td><td colspan="2">The existing Polash Urea Fertilizer Factory Ltd. constructed in 1985 and its designed production capacity was 500MT per day. But due to aging and prolonged operation, capacity of many equipment/ machinery, the efficiency of the plant has been drastically reduced. In this context, the Government has planned to demolish the existing plant and construct a new plant. The total area of the proposed GPUFP plant is about 110 acre. It is surrounded by existing PUFFL on the western side, PDB metering station for distribution of power to the local consumers and local residential area on the western side, Titas gas metering station with 8" NG pipe line installed for PUFFL and Internal road of PUFFL from factory to Jetty intake station intersecting Asian Highway is on the Northern Side and Residential area of the locality is at the southern side.

At present total 1,633 employee are working at UFFL and PUFFL plant. Among them 1205 are permanent where 700 at UFFL and 505 at PUFFL. On the other hand, rest 428 employees are working in the factories on temporary basis where 250 at UFFL and 178 at PUFFL. The temporary workers are also divided into four categories (Clerk/Driver, Semi-Skilled, Unskilled, Loading and Unloading labor) and their wage rate also varies according to the classification. For constructing the new factory a number of structures need to be demolished. Among them a Medical Centre, a Mosque, a Ladies Club, a Multi storied VIP guest house, two quarters (Officers and Staff) etc. will be demolished.

Most of the employees are living in the residential area with their families. There have two medical centres at UFFL and PUFFL respectively. The employees and their family members of these two factories normally seek treatment from these medical centres for common diseases. The most prevailing disease of the area is skin diseases. There have two schools at UFFL and PUFFL respectively and only a college at PUFFL. Children of the employees get preference to get admitted into the educational institutions, after that students from the outside community also can get admitted into the school and college. In the past treated water from their own treatment plant were the main source of drinking water and other household uses. About five years ago three deep tube wells were installed into the residential area of UFFL and one in the PUFFL. But till now at UFFL a limited amount of treated water is using for household purpose for fulfilling the demand of water. Due to leakage of the plants especially NH3 gas has spread out during the startup period and from the lagoon where the waste water stored, spread odor in the surrounding community especially in the dry season.</td></tr>
</table>

Sectors	Description
	There are good numbers of factories (small and medium) and industries found along the left bank of the river Shitalakhya. Major establishments found around the proposed Project site : • Bangladesh Jute Mill; • Janata Jute Mill; • Pran Food Processing Industry; • Co-operative Jute Mill; • Ghorasal Power Station; • Urea Fertilizer Factory Ltd.; • Fouji Jute Mill; • Desh Bandhu Jute Mill; • Policon Cement Factory**.** As to the above establishments, the area is known as an industrial region. Thus, social issues are eminent for the subsequent study. It is reported that there is a shortage of local labour in this area.

List of Officials and other Stakeholders with whom the Study Team had discussion during the visit.

Sl. No.	Name	Designation	Mobile
	Urea Fertilizer Factory Ltd.		
1.	Md. Saddat Hossain	Managing Director, Urea Fertilizer Factory Ltd.	
2.	Kazi Shamim Hasan	GM, Technical	01913940796
3.	Ekramullah khondokar	GM, Admin	01915891376
4.	Md. Shahjahan Miya	Chemist, Laboratory	01718744859
5.	Md. Abdur Rahim	Secretary, CBA	01720031013
6.	Prodip Chondro Vokto	DC Chemist, Laboratory	01760605916
7.	Abida Sultana	DC Chemist, Laboratory	0191291914082
8.	Md. Moazzem Hossain	Managing Director, Polash Urea Fertilizer Factory Ltd.	01721441789
9.	Md. Wahidujjamn Miya	GM, Operation	01950456619
10.	Md. Azizur Rahaman	GM, Technical	01712727161
11.	Md. Saleh Ahmed	GM, Maintenance	01715070496
12.	Md Ashraful Islam	Deputy Manager, Admin.	01716611573
13.	Md. Humayun Kabir	President, CBA	01911871411
14.	MD. Tajul Islam	GM, Admin	01720965884
	Other Stakeholders		
15.	Mr. Bachhu Mollah	Cook	01781-349378
16.	Mr. Md. Haris Uddin	Farmer	01715-649800

4. Approach and Methodology

4.1 Understanding the Objectives of the Assignment

The objective of the assignment as outlined in the ToR, is to conduct an Environment Assessment (EA) study of the Ghorasal Polash Urea Fertilizer Project to meet the compliance requirements of the Government of Bangladesh (GoB)[2]and the World Bank Group.

The specific objectives are:

i. To conduct Environmental Impact Assessment with detail environmental baseline survey, prediction and evaluation of possible environmental and socio-economic impacts, triggering policy with impact and detail Environmental Management Plan along with monitoring plan;

ii. To prepare Emergency Response Plan and Grievance Redressal Plan; and

iii. To prepare a plan for decommissioning of the existing structures.

The details of the objectives are given below:

- The team of the consultant will assess appropriately the impacts of a range of reasonably and technically feasible alternatives as well as the proposed Project. The alternatives to the Project must include a “no action” alternative, indicating the changes would occur in absence of the proposed Project as well as consideration of best practices that may not otherwise have been incorporated in the proposed Project. Other alternatives should be developed as needed to address significant issues with the proposal.
- The assessment of all relevant plans related to the proposed Project will be considered, for example, engineering and site preparation plans, operations and decommissioning/ closure, environmental management and mitigation in whatever form these may take.
- A water balance for the different uses of water for urea fertilizer factory and captive power plant from the Shitalakhya river using existing close cooling for the next 30 years will be prepared by the study team and assessed whether any rehabilitation of river would be required or closed cycle cooling to be adopted to meet the water requirement of the urea fertilizer factory and other consumers.
- In addition to the impacts of the proposed Project activities, the EIA will also investigate possible cumulative impacts through the combination of Project impacts and other economic activities (secondary impacts).
- The study team will consider uncertainty on availability of water and fuel supply and suggest way of such uncertainty to be addressed through monitoring and contingency plans as may be needed to reduce risk of adverse impacts in the future.

[2] The GoB requires 2 stages environmental assessment as per the ECA 1995 and ECR 1997: (i) initial environmental examination and site clearance; and (ii) environmental impact assessment and environmental clearance.

- The EIA report will provide specific plan on the responsibility as to how the environmental actions, monitoring, reporting and auditing will be made. Special attention will be placed on the remediation and abetment programs necessary to consider any potential chemicals/hazardous material contamination rebuild by the site assessment.
- The study team will prepare presentations on EIA report to the Prpoponent, the consortium of lenders JBIC, HSBC and MIGA and the DoE at the draft and final stage.
- The consultant will respond to DoE's and the Lender Consortium clarifications and queries in respect of application submitted for DoE's environmental clearance certificate and the Lender Consortium's clearance on EIA report.
- The Erection, Procurement and Construction (EPC) contractor will be selected after the EIA report has been prepared. As a consequence, the EIA report will not capture the details on design or technology choices, but will be based on the assessment of available information and standards to be met. Based on the EIA report, the EPC contractor will prepare the detailed environmental action plan with the implementation schedule considering the detailed design and technology options.

4.2 Preparation of Base Map

A base map showing location of the Project site and study area will be prepared using remote sensing image and GIS tools for the proposed Project and surrounding areas covering land use, land cover, river network, road and rail networks, infrastructures and natural resources to understand the situation. After preparing the base map, the survey tools and techniques will be selected.

4.3 Methodology of Completing Scope of Services for EIA Study

The scopes of work of the proposed Project includes carrying out of Environmental Impact Assessment (EIA) that will satisfy the applicable environmental requirements; including the laws, bylaws and rules of Bangladesh and the World Bank Group's Enviromental and Social Framework, guidelines including health and safety guidelines. The Figure 4.2 below depicts the EIA process as per the DoE and World Bank guidelines.

4.3.1 Description of the Proposed Project

The Project Description will be prepared by collecting Project related information from the Feasibility Study. Among the information, specifications of the major equipment/machineries, environment friendliness measures in equipment or abatement measures already considered in equipment and consumption of water, natural gas and air are important. These information are required for assessing impacts of the Project on the surrounding environment and society and social amentities. However, a tentative sketch or flow diagram of the proposed process/Project will be developed depending on the feasibility study report. These data and information will be used for delineating the study area. Moreover, rationale for selection of technology will also be considered keeping in view the social acceptability and environmental sustainability concerns.

4.3.2 Analysis of Alternative

In the feasibility study, selection of technologies for the proposed Project has been assessed from techno-economic point of view. Feasibility report has justified the rationale of establishment of new urea fertilizer factory in place of UFFL and PUFFL with higher efficiency and capacity. Therefore, decision making for “No Action” alternative is excluded by this study.

The construction site of the components of the proposed Plant will be brought under alternative analysis for positioning if these are not earmarked by BCIC. This analysis will be carried out through multi-criteria analysis.

As closed cycle cooling option has been selected so alternative analysis for this issue is found redundant.

In EIA study these alternative options will be explored to rectify and/or enhance environmental sustainability and social acceptability. In such way, selection of equipments and process of decommissioning and construction will be optimized in the EIA study. Environmental protection and social acceptability will be highly weighted during analysis. Compliance with the environmental and social standards and reducing the potential risks, the consultant will suggest the best financially optimizing solution through alternative analysis.

4.3.3 Decommissioning Plan

The Project site is located inside the premise of the Polash Urea Fertilizer Factory Ltd. A decommissioning plan of different structures prevailed in the Project site will be devised following the steps mentioned below:

Firstly, identification and listing of structures available in the proposed Project site will be made. The list will be prepared based on the chronological activities of the assignment. A scope of structures decommissioning work will be prepared by a team of civil structure experts. A comprehensive methodology will be developed for decommissioning of individual types of components. Finally, an action plan for execution of the decommissioning work will be developed based on the scope of the work.

Highest priority will be given on safety of labour force that will carry out the task and due attention will also be given on the choice of materials, equipments and disposal process under the assignment.

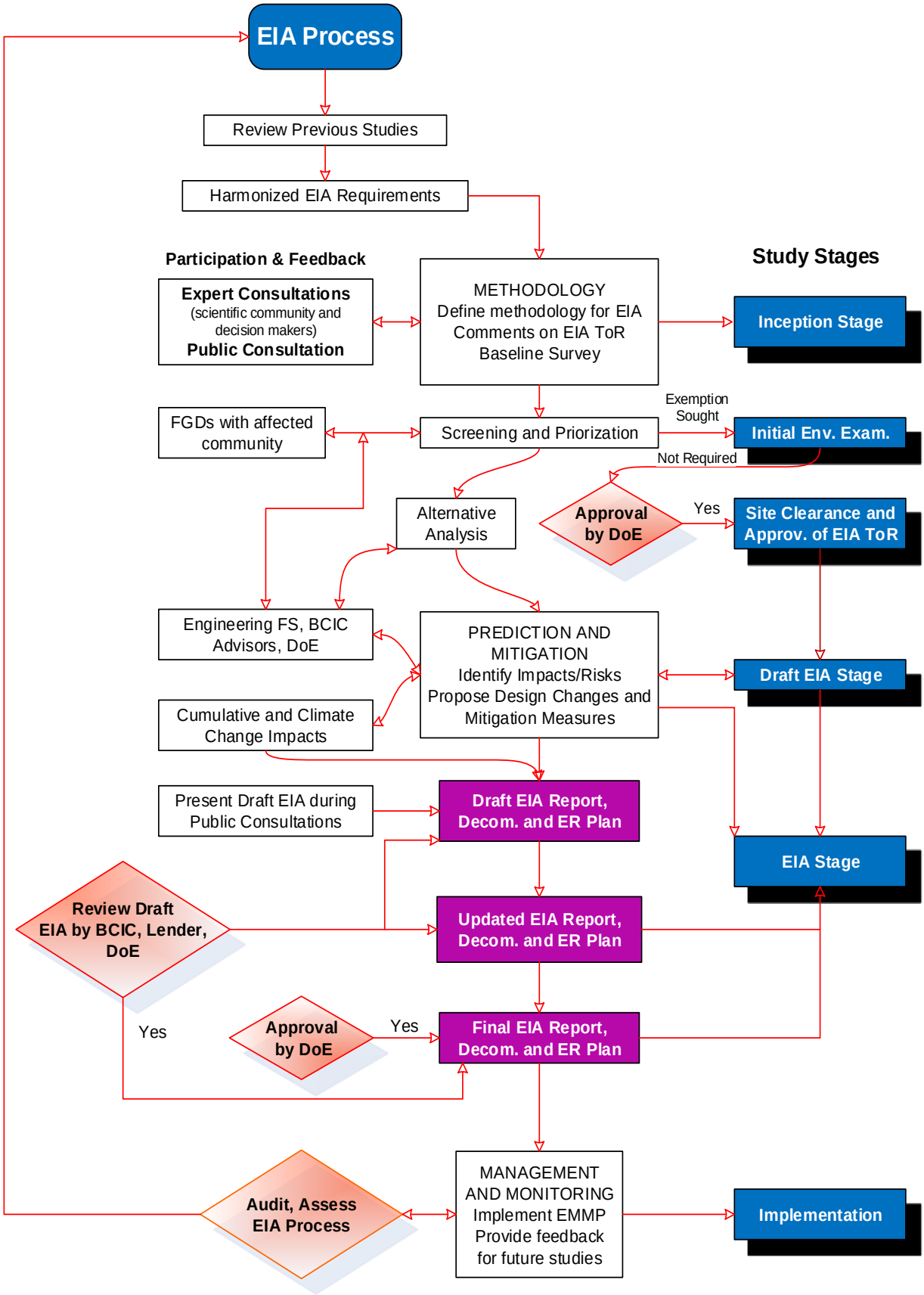


Figure 4.1: Steps of Carrying Out EIA Study

4.3.4 Description of the Environment (Baseline Conditions)

The contemporary and standard tools will be used in investigating the physical, biological and social environment. Physical observation, Key Informant Interview (KII), stakeholder consultation, water and ambient air quality sampling and analysis, noise level measurement, transect walk, macro level fish catch assessment and fish market survey, analysis of satellite image and geographic information system are the major tools and techniques which will be employed for detail baseline study. A number of physical, biological and socio-cultural parameters are selected after brainstorming of the experts and reconnaissance field investigation.

Assemble and evaluate baseline data on the physical, biological, socioeconomic characteristics of the study area which will be restricted up to 10 km radius from the middle of the proposed Project site, i.e., area of interest. The environmental parameters have to be collected, measured and presented in ways which are consistent with applicable environmental standards, norms and requirements of both national (i.e., ECR '97 and its latter amendments) and international (i.e., WB's ESF and guidelines). Secondary data will be used to comprehend precisely of the study area.

Physical Environment

Land Resources

The characteristics of land resources of the study area will be identified by clipping the Agro-ecological Zone prepared by FAO/UNDP falls in the study area. The land use, and land type data will also be collected from Upazila Land and Soil Resources Utilization Guide (Upazila Nirdeshika) of Soil Resource Development Institute (SRDI). The secondary data of these parameters will be verified at field level through physical observations as well as in consultation with the local people and officials of the Department of Agricultural Extension (DAE) during field visit.

Geology,Topography and Soils

The general geological features and the seismicity of the project and its surrounding areas will be collected from available secondary literature and Geological Survey of Bangladesh (GSB). The topographical data will be collected from Geological Survey of Bangladesh and National Water Resources Database (NWRD) of Water Resources Planning Organization (WARPO). The soil characteristics will be collected from SRDI, Bangladesh and bore log report provided in the FS report of the proposed fertilizer plant.

Climate and Meteorological

Meteorological data including precipitation, humidity, sunshine hour, cloud coverage, wind flow and direction, evaporation rate will be collected from the BMD Dhaka station which is the nearest to the Project site. To assess the baseline climatic condition of the study area a reference period of say 20-25 years will be considered. However, the reference will dependent on data availability and its quality. For precise assessment of the atmospheric status of the study area, upper atmospheric data (MM5 – Preprocessed Meteorological Data; Resolution-4 km; Domain Size-50 km x 50 km) will be procured. However, wind rose diagram, rainfall and other weather situation will be comprehensively depicted in this baseline study.

Wind Pattern

Wind pattern and direction will be complied and analysed using subjective methods, which involves a subjective post analysis of the measured time series data. A monthly rose diagram will be developed based on time series data for getting the idea of the wind pattern (wind speed) and direction. The parameters for establishing wind pattern include wind direction and wind velocity. The data on above parameters will be collected continuously for a month from the Polash Urea Fertilizer Factory and the location of the monitoring point will be marked in the map and will be attributed in the EIA report.

Precipitation Pattern

Time series precipitation data at least for last 30 years will be collected from the Bangladesh Meteorological Department (BMD) for the nearest BMD station in view of water availability assessment.

Noise Level

A number of noise generating sources have been identified during the reconnaissance field visit in the study area. The level of noise of the existing PUFFL and UFFL will be accounted at certain distances from the ventilation points and main boiler complex. The sensitivity of the receptors, place and duration will be considered for selecting noise monitoring locations both day and night. Noise level will be measured in Leq (dBA) at each of the locations.

Ambient Air Quality

Air quality monitoring will be conducted at four locations in the study area. These locations are selected on the basis of wind direction, potentiality to pollute and sensitivity of the areas. Based on the World Bank's recommendation on air quality monitoring, continuous air quality monitoring will be conducted for one location inside the power plant station. The sampler will be run continuously for 24 hrs at each of the locations. The major sampling parameters will be NH_3, SO_2, NOx, $PM_{2.5}$, PM_{10}, SPM, O_3 and CO. Moreover, field investigation and image analysis will be used to identify the line, volume and other point sources in the study area.

Reparable Dust Sampler (Model-Envirotech India APM-460BL) and Fine Particulate Sampler (Model-Envirotech India APM-550) will be used to collect the air sample. The PM2.5, PM10, and SPM will be tested by gravimetric method. The SO_2 will be absorbed and tested by West-Gaeke method. The NO_2 will be absorbed and tested by Jacob and Hochheiser method.

All information related to the emission of gaseous pollutants will be collected from the Feasibility Study Report. The main product of the proposed Project is Urea. The chemical formula of urea is NH_2CONH_2; chemical name of which is carbamide or carbonyl diamide. It is marketed as a solution or in solid form. Emissions from urea manufacture are mainly ammonia and particulate matter. Ammonia is emitted during the solution synthesis and solid production processes. Particulate matter is emitted during all kinds of processes of urea.

In the synthesis process, some emission control is inherent in the recycle process where carbamate gases and/or liquids are recovered and recycled. Typical emission sources from the solution synthesis process are non-condensable vent streams from ammonium carbamate decomposers and separators. Emissions from synthesis processes are generally combined with emissions from the solution concentration process and are vented through a common stack. Combined particulate emissions from urea synthesis and concentration operations are

small compared to particulate emissions from a typical solids-producing urea plant. The synthesis and concentration operations are usually uncontrolled except for recycle provisions to recover ammonia. Uncontrolled emission rates from prilled urea towers may be affected by the following factors: (1) product grade being produced, (2) air flow rate through the tower, (3) type of tower bed, and (4) ambient temperature and humidity. However, the rate of emission of air pollutants i.e. NH3 and urea dust will be simulated though sophisticated air dispersion modeling technologies.

Surface Water Hydrology and Water Availability

State of the current water resources will be assessed on the basis of historic and existing situation in and around the study area. The EIA study area is 10 km around the proposed Project, but hydrological analyses have to be considered based on water system alignment. The impact of the proposed intervention on water system will be assessed for next 30 years considering the projected water demands and climate change scenarios. CORDEX (Coordinated Regional climate Downscaling Experiment) data will be used to generate the future scenarios for rainfall and temperature using scenarios RCP 4.5 and RCP 8.5.

Also, a "no-Project" condition future assessment will be made considering the water demand projections and climate change. The steps and processes that will be followed for data collection and carrying out the are as follows:

a) Data Collection

All water bodies will be mapped from satellite images including the river networks, khals, ponds and other water storages. Meteorological data (rainfall, temperature etc.) will be collected from BWDB and BMD. Data on water levels will be collected from the BWDB water level stations at Lakhpur (Stn: 177) and Demra (Stn: 179). For data on meteorology Station Dhaka will be used. National Digital Elevation Model, Soil data of the SRDI, land use maps of CEGIS archive will be used in the surface water analyses.

b) Data Analysis

All the collected data (both primary and secondary data) will be processed. Then data analysis will be done using different software and tools. Further model based analyzed data will be interpreted as per requirement of the study. The analyze data will be represented in the report in both tabular and graphical format. The spatial data will be analyzed using ArcGIS software and outputs will be presented in GIS format. The availability of water at the Shitalakhya river will be assessed through hydrological and hydrodynamic computational analyses. Analyses will be performed to assess high flow, low flow, environmental flow, navigational flow and the impact due to the abstraction of water for the Project over a defined period of time.

Water Quality

Baseline water quality measurement is important for continuous monitoring to keep track on the changes if any. Water quality parameter will be selected dependent on the use of the ambient water use and potential polluting agents from the Project. Different observations to be measured for measuring water quality is given below in Table 4.1:

Table 4.1: Different Observations for Measuring Water Quality

Environmental component	Source of secondary data	Plan for Primary data
Surface water quality	▪ Environmental Impact Assessment (EIA) Study for Re-Powering of Unit-4 of Ghorasal Power Station to 403.5 MW Combined Cycle Power Plant, Polash, Narsingdi District, Under Bangladesh Power Development Board (BPDB) Source: http://documents.worldbank.org/curated/en/663721478725744181/Environmental-impact-assessment; ▪ Regular monitoring data of Polash Urea Fertilizer Factory Ltd. (PUFFL); and ▪ Regular monitoring data of Urea Fertilizer Factory Ltd. (UFFL).	The water quality will be checked in the following six (6) locations: • 500 m upstream from the intake point at the Shitalakhya river; • Intake points of the existing PUFFL and UFFL; • Mid point of water intake at and discharge in the Shitalakhya river; • Effluent discharge points of the existing PUFFL and UFFL in the Shitalakhya river; • 500 m downstream from the effluent discharge point at the Shitalakhya river • One ground water sampling point inside the Urea Fertilizer factory complex. Standard practices will be maintained during sampling and analysis of the collected samples. The selected water quality parameters would be Temperature, pH, NH_3, DO, BOD-5, COD, Oil and Grease, TOC, Total Hardness, Cl-, NO3-, PO43-, SO42-, EC, TDS, TS, Turbidity, HCO3-, CO32-, Alkalinity etc. All the samples will be tested through the standard procedure of APHA.

Flood Hazard Potential

Using the model results (water levels) flood inundation extent and flood depth map will be produced using GIS technology for both baseline and "with-Project" condition with reference to climate change scenarios. CORDEX (Coordinated Regional climate Downscaling Experiment) data will be used to generate the future scenarios for rainfall and temperature using scenarios RCP 4.5 and RCP 8.5. The changes in flooding and probable affected areas and entities will be found out using spatial analyses. The analyses will consider impacts on agriculture, settlement, industries etc. The result will be produced in maps and tables.

The current practice in the facility is to collect the storm water through a network of roadside drains, which are connected with the canal carrying condenser cooling water for final disposal to Shiatalkhya. The Consultant has requested the BCIC authority to share with us the existing drainage network drawing for us to present in the EIA. A more detailed plan will be developed during the detailed design stage.

Biological Environment

Agricultural Resources

Agriculture resources data like existing farming practices, cropping patterns, cropping intensity, crop variety, crop yield, crop damage and agricultural inputs (used) will be collected through consultation with both local people and concerned agricultural officials. Agricultural resources data will also be collected from DAE. Focus Group Discussion (FGD) will be conducted with farmers, dealers of fertilizer and pesticides, officials of DAE and BADC. The average yield value (ton/ha) of different crops in the study area will be calculated based on the collected information.

High resolution recent image will be used for the computation of net cropped area, the total existing crop production estimated using the formula: Total crop production = damaged free area × normal yield + damaged area × damaged yield. The crop damage (production loss) will be calculated using the formula: Crop production loss = Total cropped area ×normal yield-(damaged area × damaged yield+ damage free area × normal yield). The crop damage data will be collected from the field for last five years.

Fisheries Resources

Fisheries resources will be assessed based on primary and secondary data. The primary data will be collected from the field by selecting representative sites considering capture and culture fishery. The major sets of primary data will include physical condition of different fish habitats in the Shitalakhya river, catch status, fish species diversity, composition, fishermen and fishers status etc. Secondary data will be collected from concerned Upazila Fisheries Office (UFO) and review of Fisheries Resources Survey System (FRSS) of Department of Fisheries (DoF).

The spatial extent and area of fish habitats will be obtained from the land use data that will be generated by analyzing image and water resources database. The habitat quality will be assessed based on the measured water quality data. Fish yield and production for individual habitats of capture and culture fisheries will be estimated using both primary and secondary data.

Ecological Resources

Ecological components of the EIA study focuses on terrestrial and aquatic ecology including both floral and faunal resources which include amphibians, reptiles, birds and mammals. Information on bio-ecological zones and their characteristics will be adopted from the publication of the International Union for Conservation of Nature (IUCN). The information relevant to ecological resources will be included as ecosystem and habitat information, and will be assessd to determine ecological changes over the periods and potential ecological impacts due to the Project. In addition, relevant secondary documents will be reviewed to get an idea about the previous status of the ecological condition. Homestead vegetation survey will be conducted for understanding the vegetation patterns of the area along with its dependent wildlife and their interactions. Consultations with local people will be conducted following different tools and techniques such as Rapid Rural Appraisal (RRA) and Key Informant Interview (KII), etc. Field visits will be carried out for delineating the ecological baseline condition. Using IUCN database, a preliminary inventory of common flora and fauna will be constructed for designing the field survey. Vegetation and wildlife information will also be collected through physical observation.

Physical observation for compiling data on flora and fauna will adopt the following approaches; namely a) Strip line transects (1 km) and b) Plot count method.

Socio-cultural Environment

Clear understanding of the socio-economic context of any project intervention is a mandatory task and a legal requirement under the Government of Bangladesh rules and regulation and also of the World Bank.

Socio-Economic environment will include social and economic baseline condition of the study area. From the reconnaissance field visit, major socio-economic indicators were opted for perceiving potential impacts on them by the proposed Project. The indicators are demography; occupation and employment; education; health, utility services (present water supply and water uses, sanitation, gas distribution facilities and electricity facilities), economic information in terms of income expenditure, land ownership pattern, self-assessed poverty status; migration, social overhead capitals and quality of life; disasters, conflicts of the study area; cultural and heritage features, ethnic community and transportation system will be collected.

Data for this Social Impact Assessment will be collected from both primary and secondary sources. Secondary data will be collected from Housing and Population Census, 2011 and other available relevant literatures and documents from different agencies. On the other hand, primary data will be collected from the field visit in the study area. Before immersing into the field, the relevant secondary data on the selected indicators will be reviewed so as to triangulate with primary data during the field level investigation. A semi-structured questionnaire, and a checklist will be followed for primary data collection.

The methods for data collection will include semi-structured interview, informal interview, group discussion, key informant interview and observation. For a semi-structured interview, a semi-structured questionnaire (open ended and guided questions) will be followed. For informal interview, the field investigator will discuss with the project related stakeholders without formal informed consent. For group discussion and key informant interview, a checklist will be followed. The following data/information will be collected from different sources:

Area of Studies	Indicators	Secondary Sources	Primary Data Acquisition Process
Community structure	Population density , demography, education, culture, age and workforce distribution, gender	BBS	Field survey, FGD, RRA
Economic condition	Distribution of income, labor market, employment, dependency ratio	BBS	Field survey, FGD, RRA
Archeological site, Aboriginal people, Cultural heritage	Declared archeological site, tribal groups, indigenous customs	Document of Asiatic Society BBS	Field study

4.3.5 Policy, Rules and Regulatory Framework

Policy, Act and Administrative Framework that are consired relevant for the construction and operation of the Project will be reviewed to ensure whether the proposed Project in congruent with the national policy, guidelines and legislations as well well in conformity to Bangladesh

Government commitment to multilateral environmental agreements. The proposed Project falls under “red”category according to the Bangladesh Environment Conservation Rule, 1997 and category “A” as per the World Bank Guideline (IFC, 2008). This study will analyse relevant national and international law acts and rules that are of relevance at different phases of the Project.

4.3.6 Scoping

A scoping process will be will be followed for selecting Important Environmental and Social Components (IESCs) or Valued Environmental Components (VECs) which are likely to be impacted by the proposed fertilizer plant.

Scoping will be done in two stages. Individual professionals of EIA study team will make a preliminary list of the components pertaining to their disciplines, which are likely to be impacted by the project activities.

The second stage will include village scoping sessions where stakeholder perceptions will be obtained about the important environmental and social components. Professional judgment of the EIA team members as well as the stakeholder opinion obtained in the scoping sessions will be considered in selecting the IESCs/VECs.

4.3.7 Bounding

The Project boundary, prepared on the basis of information available from the feasibility report, will be firmed up to finalize the study area boundary based on the nature of impacts to be exerted by different activities of the Project all along the pre-construction, construction and operation phases. The boundary of the study area will include the areas likely to be impacted around the proposed Project site.

4.3.8 People’s Participation

Public consultation meetings will be conducted in the study area during field investigation. One public consultation meeting will be conducted in the study area near the proposed Project site (i.e., Urea Fertilizer Factory Complex). Participation of local people (both male and female) consisting of elected people’s representatives, different professional groups– government and non-government officials, teachers, fishers, laborers, riverside people, power plant authority, etc. will be invited to public consultation meetings and their participation will be ensured to have their opinins and judgements on the various VECs. A checklist will be used for conducting the consultation meetings to maintain uniformity on points of discussion and recording the opinions and views of the participants properly.

4.3.9 Identification, Selection and Rationalization of VECs

A scoping process will be followed for selecting Valued Environmental and Social Components (VECs), likely to be impacted by the proposed Project. VECs likely to be impaced by the Project are water resources, land resources, agriculture, fisheries, and ecological resources and socio-economic situation. These will be further screened for finalization through integration of professional assessment of the study team members and feedback received from the local people during the village scoping sessions. Rationale of selection of VECs will also be provided in the report.

4.3.10 Determination of Potential Environmental and Social Impacts of the Proposed Project

The impact assessment will be based primarily on the selected valued environmental and social components. Field investigation, public consultation, literature survey and expert judgment will be applied for screening the valued environmental and social components. Impacts and their depth and significance will be outlined with refrence to environmental and social settings on a temporal and spatial basis. However, to qualify the impacts a stepwise approach will be followed.

a) Identification of impacts

i. The impact identification will be accounted at every stages of the Project.
   - Impact of decommissioning of the existing civil structures;
   - Impacts of urea fertilizer plant's pre-construction and construction activities;
   - Impacts of construction of fertilizer plant associated infrastructure (e.g. installation of gas pipe line); and
   - Impacts of fertilizer plant operation.

ii. Impact identification and assessment would cover:
   - Air quality, noise, and meteorology;
   - Impacts on water resources and water quality;
   - Impacts on the biological resources like fisheries and agricultural resources;
   - Local ecosystems and biodiversity;
   - Occupational health and safety analysis; and
   - Overall socio-economic impact.

iii. The impact assessment would be based on mixed approach of quantitative and qualitative assessment.

iv. In some cases, impact assessment would be based on numerical modeling e.g. noise, air quality, water availability, etc (as required).

b) Quantification of impacts

Air Quality Modeling

AERMOD will be used to conduct air quality assessment subject to availability of required resources from the proponent (BCIC). Three year hourly average metdata from the closed met station will be procured to feed into the modeling analysis.

Features of AERMOD

AERMOD is a steady-state model which assumes that a plume disperses in the horizontal and vertical directions resulting in Gaussian (i.e., bell shaped) concentration distributions.

The level of pollution dispersion will be modelled through AERMOD pollution dispersion modeling software for the prediction of impact to be exerted on ambient air quality by the Project activities at its different phases from construction to operation. This model will be done for determining the level of pollution at different sensitive locations from the stack(s). Emission

types, inversion situation, atmospheric stability, wind speed and direction, land elevations will be considered in this model. The predicted concentration of NH_3 and Urea dust will be specified on temporal and spatial basis through this model. All predicted pollution will be presented graphically in the report. The micro meteorological parameters will be collected from the adjacent BMD station and upper atmospheric data will be purchased from relevant international bodies (e.g., Breeze Trinity Consultants, USA). Local or regional land elevation data will be collected through Satellite image analysis

Noise Modeling

The major noise sources around the Project site are existing power plants, fertilizer factories and bazar. The sources of noise from different Plants are equipment and machineries, ventilation point, etc. Noise level data from such sources will be collected from secondary sources and also through filed level measurement. The collected data will be compared with the Bangladesh as well as World Bank standards for both day and night times for the corresponding area class for understanding whether there is any exceedance or within the permissible limit. The baseline will be delineated based on these data.

The baseline noise level data will be input data for the modeling exercise to predict future scenario. The specification of equipment and machineries in terms of noise generation will be given as input data for assessing the impact of the proposed Project. In this case, a sophisticated US EPA approved noise model software, SoundPlan 4.0 will be used. The model will consider different factors, having influence potentials, are physical obstruction, atmospheric absorption, land elevation etc. Finally, the propagation of noise level to the sensitive receptors will be computed for the day and night times.

Chemical Explosion Model

The Project will use hazardous chemicals like pressured gas, Cl_2, H_2SO_4 and NaOH which will be conveyed through gas pipeline and be preserved in different tanks. Environmental consultant will figure out the vulnerable location in the Project site. The US EPA approved ALOHA model developed by the United States National Oceanic and Atmospheric Administration (US-NOAA) will be used to determine for accidental explosion risk zone in the study area.

Hydrological and Hydrodynamic Analyses

Water system will be analyzed for historic, current and potential future change in water system in and around the study area. Hydrological and hydrodynamic estimates will be done using available hydro-meteorological data. The estimates will be done for existing and “with-Project” (considering climate change scenarios) conditions to investigate the changes in water depth, water level, discharge, surface and ground water recharge. Available tools might be used for hydrodynamic computation along the river network. Simple hydrological analyses will be done to estimate the water balance (daily, decadal, seasonal or annual – as required) and ground water recharge for same existing and “with-Project” conditions. The amount of runoff will be estimated using the hydrological analyses of the study area, for this, Soil and Water Assessment Tool (SWAT) could be used.

The SWAT model is a physically-based, continuous simulation model developed for watershed assessment of short and long term hydrology and water quality. It is a widely used catchment-scale model that can predict the impact of land management practices and climate change

over time on water, sediment and agriculture. CEGIS has the required database, information and skilled knowledge and experiences of using SWAT model in several projects in Bangladesh and outside for the last several years. IWFM-BUET and IWM has been using SWAT for hydrological analyses in many water resources projects. For this study, all related data is available in CEGIS data bank, and the SWAT model can be used at ease for the assessment of water balance and climate change impact on the water balance within the limited period of the study.

The output of the hydrological analyses will be used as input to the hydrodynamic estimation process to find river water levels, depths and flows. The analyses will consider upstream water abstraction and downstream water requirement scenarios to assess the future water availability and the impact on water availability due to the abstraction of water for the Project.

The water depth in terms of navigational draft will be assessed from river cross sections and water levels for existing, “no-Project” and “with Project” conditions.

The main river near the Ghorasal power plant is the Shitalakhya river. The BWDB water level station at Lakhpur (Stn: 177) which is 8 km upstream from the proposed Project sitewill be considered as upstream boundary for analysis. BWDB water level data at Demra (Stn: 179) will be taken as downstream boundary (Figure 4.2). The downstream boundary is 40 km from the location of the Project. The available BWDB water level, discharge and river cross-section data will be used.

The hydrologic and hydrodynamic analyses will be done for the last 30 years based on the availability of data to assess the availability of water at the Shitalakhya river. The availability of water for the Project will be assessed considering the climate change scenarios and projected water demand, upstream water abstraction and downstream water requirement for the next 30 years:

- Water balance of the study area
- Surface water availability and its spatial and temporal distribution
- Impact on surface water availability due to climate change
- Historical maximum discharge and water level for the study area
- Historical minimum flow and water level
- Depth of river water around the project site for navigation
- Impact on river flow due to the abstraction of water for the urea fertilizer plant
- Climate change impact on flow and river depth.

CORDEX (Coordinated Regional climate Downscaling Experiment) data will be used to generate the future scenarios for rainfall and temperature using scenarios RCP 4.5 and RCP 8.5. These have been selected because of the prediction of higher temperature increase by IPCC in AR5.

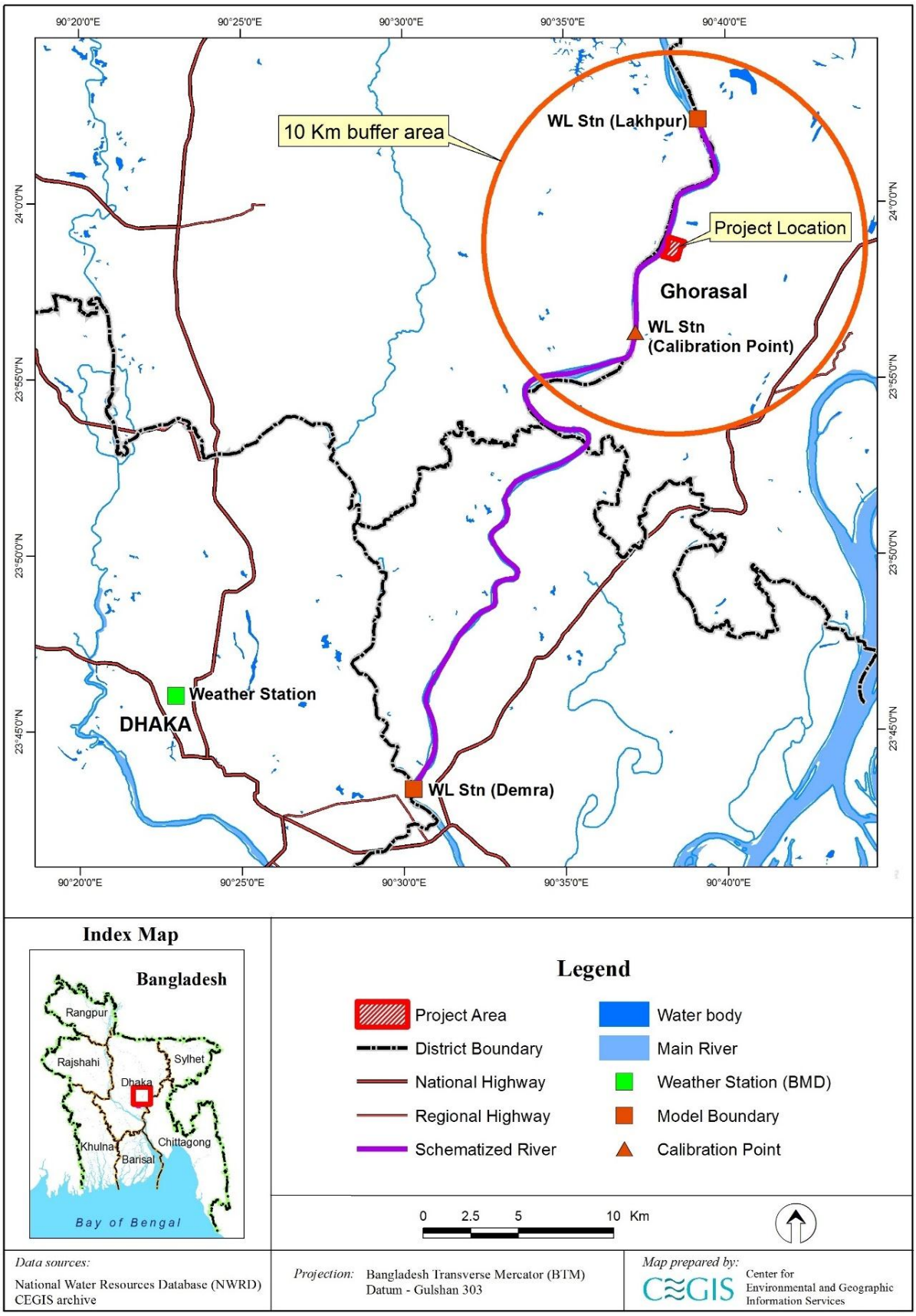


Figure 4.2: Schematization of the Hydrodynamic Analysis

c) Evaluation of impacts

The potential impacts on environmental and social components will be examined. The impact evaluation will be made following the ESF of the World Bank and EIA guideline of the DoE. All associated impacts from the Project planning to operation and decommissioning will be described elaborately. All environmental and social consequences will be synthesized and presented in matrix form.

Generally, all the identified impacts will be evaluated based on nature, extend, spatial and temporal nature, likelihood, and reversibility. Evaluation will be made following expert judgment as per "Delphi" method. Evaluation will be carried out to indicate the magnitude of each impact. Each impact will be evaluated based on a word scale defined by word scenario instead of numeric scale. The scaling will be finalized by structured expert judgment following Delphi method.

Then based on this word scale and scenario each impact will be evaluated and presented in a matrix form considering the weight to demonstrate the significance of each of the impact.

4.3.11 Cumulative Impact Assessment

Cumulative impacts are the successive, incremental and combined impacts of one, or more, activities on society, the economy and the environment (Franks et al., 2010). The cumulative impact will be assessed considering the impacts of the proposed Project along with the impacts of other presently operating and future planned industries including power plant, fertilizer factories, food factories etc in the study area. These impacts can be both positive and negative and can vary in intensity as well as spatial and temporal extent (Daniel et al., 2010). The assessment will cover the cumulative impacts on Valued Environmental Components like air quality, noise, water quality, community health, ecosystem, etc. The numerical models of air pollutants dispersion, operational noise, water availability etc. as discussed above will be helpful to assess the cumulative impacts. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time (USEPA, 1999).

The cumulative impact will be assessed for water availability, air quality and noise level. For water availability, water balance study will be conducted considering water consuming industries located at around the Project site along with similar kind of water dependent Projects already planned by the Government and private entrepreneurship.

For air quality, the model will consider the release of pollutants from the existing urea fertilizer factories, nearby power plants and other industries located around the Project site for simulating baseline scenario. Prediction of impact on air quality by the Project interventions will be done by simulating project scenario. In this case, input data will be addition of contribution of gaseous pollutants from the Project scenario with base situation. In case of cumulative impact assessment, the input data will be the combination of pollutants coming from baseline, Project scenario and upcoming planned Projects (if available).

The sources, nature and amount of the pollutants will be accounted through field investigation, literature review. Finally, the future plan of industrial development, vehicular movement will also be accounted during the cumulative impact assessment on the sensitive receptors. The numerical model of air pollutants dispersion will be helpful to assess the cumulative impacts.

Four most recent (past 3 years) EIA reports will be selected from power sector Projects and be analyzed for their content and context. Present industrial development in the study area will be significantly reflected during impact assessment. Moreover, the future development

plan in next 30 years both for public and private sectors in the study area will be considered for collective impacts on particular environmental or social components. The stakeholders including the local people will be engaged in the process of assessment of socio-economic through different participatory approach of stakeholder engagement like PRA, RRA and FGD in the study area. Data will be analyzed regarding their correspondence to best practices or literature on cumulative impact assessment.

4.3.12 Development of an Environmental Management Plan

The Project impacts will be evaluated on the basis of local bio-physical and social settings. In this stage a number of measures will be suggested to avoid or minimize the negative impacts of the Project, if observed. All of the environmental impacts mitigation measures will be assessed basing on the financial viability, technically feasibility and low risk potential. Furthermore, mitigation measures (including technological choices and mangment options) will be suggested to minimize the negative impacts as low as reasonably practicable (ALARP) level. The cumulative impact of NH_3, NOx, PM_{10}, $PM_{2.5}$, noise, water effluent will be quantified at the sensitive receptors. Finally, the air pollutants and noise level will be quantified after taking the mitigation measures which must comply with the national and international standards. Ecological and social issues will also be taken care in the EIA study. A number of techniques and tools will also be suggested to reduce the impacts with respect to minimum cost.

The detail of the management plan covering water quality, air quality, noise level, fire fighting, chemical spilling, community management, emergency response to accidental events as well as occupational health and safety plan will be elaborated in the forthcoming studies.

To minimize the accidental risk or abnormal situation, a detail emergency response plan will be developed taking into account various stages of decommissioning, construction and operation. The risk assessment and emergency response plan will include institutional arrangement for securing occupational health safety, on-site or off-site disaster management plan depending on EMS 14001 and OHSAH 18001. A number of contingency plans will be recommended for safe operation of the Project. The EMP will be formulated in a manner so that the implementing agency can easily develop their environmental action plan for the Project.

A feasible environmental monitoring plan will be suggested at the end of the study for future environmental compliance monitoring. The monitoring parameters will be carefully selected depending on the Project activities coherent with the monitoring procedure of the International Finance Coorporation (IFC) 2008 guideline for thermal power plant. The monitoring plan will also suggest location of monitoring station and frequency of data collection. The EIA report will also outline the institutional arrangement delineating roles and responsibilities of various agencies and officials involved.

4.3.13 Development of Emergency Response and Disaster Management Plan

Emergency response plan will be developed in six phases- identification and assessment of potential hazards, prevention of hazards through alternative options, mitigation of hazards, hazard preparedness, emergency response taken during hazard scenario and recovery after hazard scenario. At present, no guidelines for emergency response scenario in Bangladesh are available to prevent and mitigate hazard in power plant. However, other national and international guidelines will be followed and will be incorporated in this Project. These will

include; The Awareness and Preparedness for Emergencies at Local Level (APELL) process as promoted by the United Nations Environment Programme (UNEP), Environmental health and safety (EHS) guidelines of the IFC, and Emergency Response Plan and EIA Guidelines for Projects in the Natural Gas Sectors of the DoE (2009). Noise level standard are complied under the Noise Control rules of Bangladesh (2006), which sets the daytime noise level at 75 dB and night time noise levels at 70 dB. Some of the potential hazards that may affect workers and employees' health may include:

- Fire/explosion;
- Injuries from burns, cuts, bruises, slips and falls;
- Inhalation of small particulates (P.M2.5, P.M10), noxious fumes (NH3, NOx, SO2, CO) and other toxic substances;
- Loud noise levels (75 dB during daytime and 70 dB during night time);
- Previous illness; and
- Tiredness/fatigue.

4.3.14 Risk and Hazard Assessment

The purpose of the Risk Assessment Study is to provide the following information on the nature and extent of risk impacts arising from the construction and operation of the projects. The objectives of the risk assessment will include the followings:

- Identification of all hazardous scenarios associated with transport, storage and processing of dangerous goods (DG) taking the equipment failures and human errors into account;
- Execution of risks assessment tools and technique in both individual and societal terms;
- Comparison of individual and societal risks with Government Risk Guidelines and comment on the acceptability of the assessed risk;
- Identification of the risk management strategies required to render the risks acceptable; and
- Identification and assessment of practicable and cost effective risk mitigation measures.
- The risk and hazard analysis will have two major components:

Occupational Hazard and Safety Assessment

In the EIA, hazard assessment will be carried out to identify the potential hazards associated with or inherent in the design process and to identify possible measures to avoid the hazards along with the safety plan for minimizing the risk. Incorporating these measures and safety plan in design, planning and operational procedure of the proposed plant, the potential hazard points can be eliminated. Steps to be followed include identification of potential hazard points, hazard cause identification, consequences of exposure, risk management and safety plan.

Environmental Risk Assessment

Hazards and associated risks with construction and implementation of the proposed project will be identified using risk matrix that results the consequence. The risk of the proposed project will be accounted through qualitative risk assessment technologies.

4.3.15 Consultation and Disclosure Meeting and Grievance Redress

Stakeholder engagement is a legal requirement within the purview of Bangladesh Government legal system and donor'sinvestment guiding principle. As part of obligation for EIA study, Public Consultation and Disclosure will be conducted taking into consideration the Project location, administrative jurisdiction of the study area, and stakeholders'convenience and preference as to time for holding such events. Two stage consultations will be conducted one during the early stage (by end November, 2018) and one during the draft EIA disclosure. Stakeholder engagement will be an ongoing and multifaceted process dedicated to inform and consult.

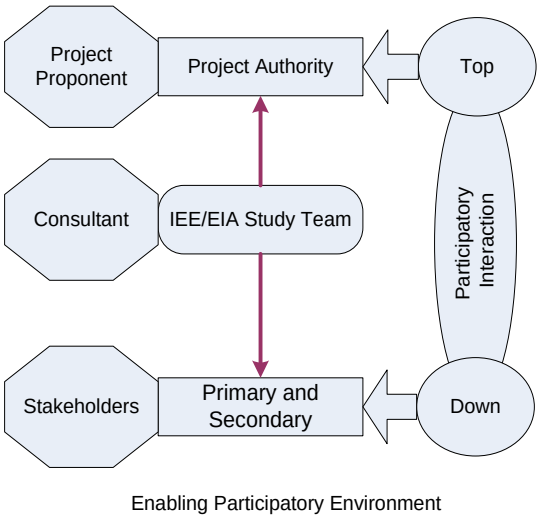


Figure 4.3: Overall Consultation Approach

Public Consultation Meeting (PCM) will be conducted to ensure people's participation in the proposed Project; to unearth people's attitudes towards the Project; to unveil the potential impacts either negative or positive of the proposed Project; and to outline potential mitigation measures to address negative effects, if any; as well as to qualify measures to enhance the positive effects. On the other hand, Public Disclosure Meeting (PDM) will be held at the end of the study with intentions to share the study findings and to seek stakeholders' opinion and suggestion on the key outcomes. Public consultation and disclosure meetings will cover both primary and secondary stakeholders. Primary stakeholders include those local people who would be directly benefited or impacted by the proposed Project, whereas secondary stakeholders are the ones who may not be directly affected but have interests that could contribute to the study, may playsome rolesduring the implementation, or influence the decision making at varying scales.

For conducting PCM and PDM, convenient date, place and time will also be selected based on consultation with the stakeholders. Formal invitation letter will be distributed to the potential participants informing them the Project objectives, its scope and execution modalities. For realizingthe objectives of such consultation meetings, favorable participatory environment will be ensured so that the participants of all social strata can express their opinions. Meeting findings will be documented through visual and written form and will be presented as aseparate chapter of the EIA report.

Other than formal consultation meetings, a number of Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) will be conducted. KIIs will be conducted with both primary and secondary stakeholders, whereas FGDs will be conducted comprising of concerned occupational groups whose livelihoods are likely to be impacted by the Project.

The study report will elucidate all potential grievances that may come to surfaceduring the implementation phase of the Project and/or thereafter. In the final report a realistic and comprehensive Grievance Redressal Plan (GRP) will be outlined so that the Project management body can use them as a guide to mitigate the grivances. The redress mechanism will be designed through a participatory process.

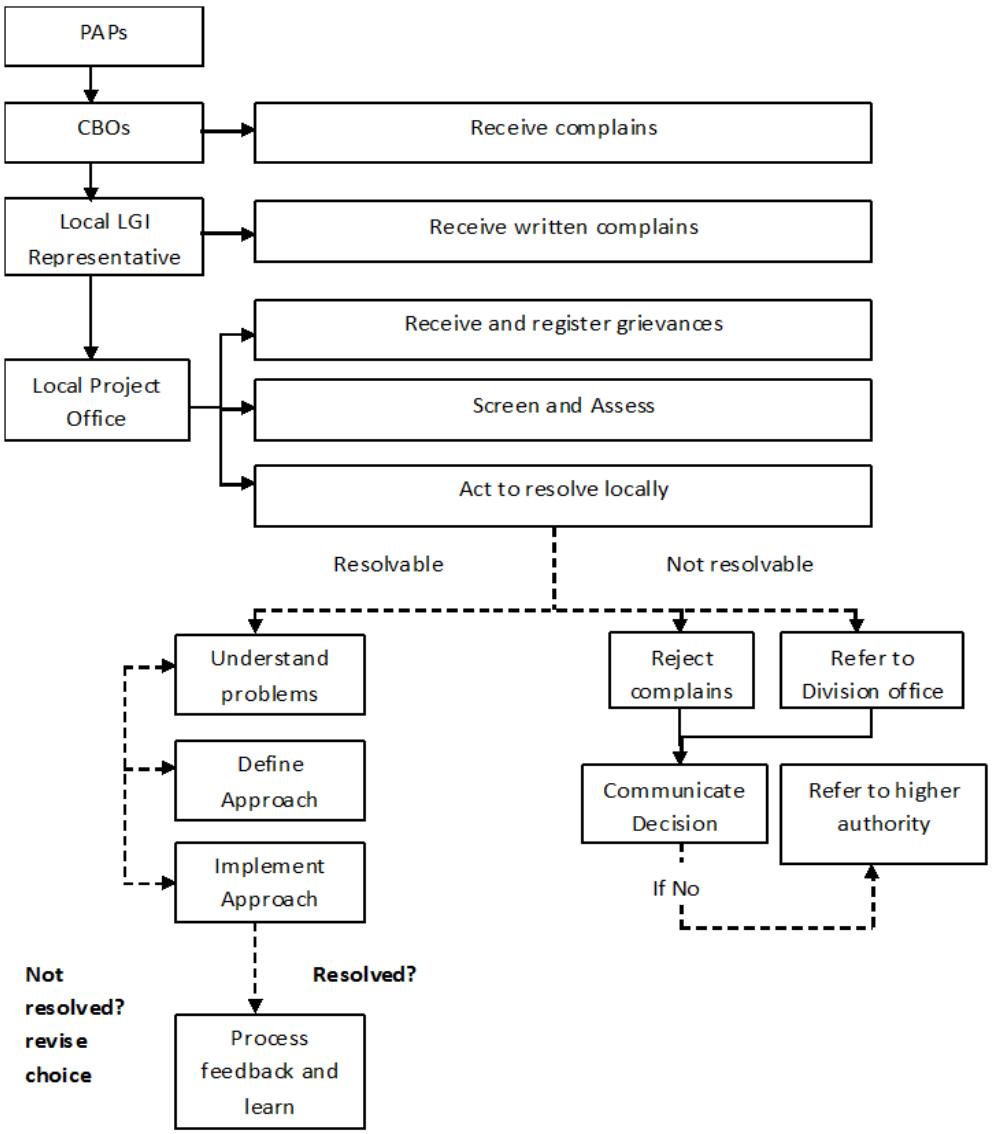


Figure 4.4: Sample Grievance Redressal Plan

- Define the Project affected people and other stakeholders such as NGOs, media, academics, government authorities,
- Provide and interactive system to give free, objective and prior information, seek feedbacks at local and national levels during the planning, construction and operation of Projects
- Specifying the role and opportunities for stakeholders especially to community based organizations (CBOs) and NGOs to participate in Project activities throughout the Project cycle, and
- Define detail action plan, monitoring and reporting especially for the redress of the grievance

5. Work Plan and Schedule

5.1 Work Plan, Organization and Staffing

5.1.1 General

The Work Plan set out for the EIA study is designed as an innovative and interactive framework for timely and efficient implementation of activities with inputs from key experts. To this effect, a detail implementation plan has been developed considering the Project objectives, technical considerations, work load and availability of resources.

5.1.2 Work Schedule

The contract period of the proposed assignment is three (03) months from the date receiving Notification of Award (NOA). As per the Agreement, the Inception report to be submitted after 1 month; the draft EIA report at the end of 2 months and the final report to be submitted at the end of 3 months after due consultation and revising the report based on all comments received. The time-line for the major implementing events and detail work schedule are shown in **Table 5.1** and **Table 5.2** respectively. Manning schedule is given in **Table 5.3**.

Table 5.1: Overall Work Schedule

Sl. No.	Activity	Start	Finish	Duration	Oct-18	Nov-18	Dec-18	Jan-19
1	Inception Stage	16-Oct-18	15-Nov-18	4w				
2	Decommissioning Plan	16-Oct-18	29-Nov-18	6w 2d				
3	Public Consulation and Disclosure Meetings	2-Dec-18	26-Dec-18	N/A				
4	Draft Final EIA Report	16-Oct-18	31-Dec-18	10w 2d				
5	Final EIA Report	1-Jan-19	16-Jan-19	2w 1d				

Table 5.2: Detailed Work Schedule

Sl. No.	Study Components	Months			
		Oct-18	Nov-18	Dec-18	Jan-18
A	**Inception Stage**				
B	**Literature Review**				
C	**EIA Study Stage**				
C-1	Preparation of Project Description				
C-2	Preparation of Environmental Baseline				
C-3	Selection of IECs/VECs				
C-4	Impact Assessment				
C-5	Impact Evaluation				
C-6	Preparation of Environmental Management and Monitoring Plan				
C-7	Risk and Hazard Assessment				
C-8	Emergency Response Plan				
C-9	Preparation of Draft EIA Report				
D	**Meetings**				
D-1	Meeting on Inception Report				
D-2	Public consultation and Disclosure meetings				
D-3	Meeting on Draft EIA Report				
D-4	Finalization of EIA Report				
E	**Report Submission**				
E-1	Inception Report				
E-2	Draft EIA Report				
E-3	Final EIA Report				

Continuous input	Discrete input	Report Submission	Meetings

5.1.3 Staffing

Table 5.3: Manning/Staffing Schedule

Sl. No.	Proposed Position	Input of Professional (Month wise)		
		1	2	3
1	Team Leader/ Environmental Expert			
2	Deputy Team Leader/ EMP Specialist			
3	Chemical Engineer			
4	Hydrologist			
5	Morphologist			
6	Agriculture Engineer			
7	Fisheries Specialist			
8	Sociologist			
9	GIS and RS Specialist			
10	Hydrodynamic Modellor			
11	Environmental Modellor			
12	Chemist			
13	Field Researcher			

N.B: — — — The line indicates discrete input of individual professional

6. Expected Support and Assistance from the Proponent

For the successful completion of the EIA study along with other associated studies like Decommissioning Plan, etc as scheduled, would require unfettered flow of information from and among the key Parties involved (i.e., the BCIC, the banks like HSBC, JBIC and MIGA, and CEGIS). CEGIS will carry out all activities mentioned in the scope of services with guidance and assistance of the BCIC and the Lenders. CEGIS expects to have access to all relevant Project documents to distil required data for production of the EIA report.

CEGIS also expects technical and administrative support from BCIC field personnel in conducting field investigations In case any pertinent data and information which BCIC or the Lenders may not have in their disposal, they should cooperate with CEGIS to faciliuate access to institutions/agencies which have such information. It is important to note that CEGIS will finalize its report based on the information and data generated through concerted effort. Furthermore, the BCIC is also expected to to be present and contribute as needed in the public disclosure meetings that will be organized to share the findings of the EIA.

6.1 Providing Detail Information of the Project

The EIA study along with the Civil Structures Decommissioning Plan, Occupational Health and Safety Plan, Emergency Response Plan formulation would require access to detailed information about the proposed Project. As noted earlier it is expected that the DoE will issue waiver for site clearance certificate of this Project. Additionally, approval of the EIA report, as per the DoE rules, the final EIA report must annex some key documents pertaining to the Project. These include detailed layout of the proposed Project showing Effluent Treatment Plant (ETP), drainage plan, tentative Project implementation time frame, detailed design of the Project, manpower requirement for construction and operation phases of the Project, machine specification, catalogs of major equipment from manufacturers, etc. The above, BCIC has to share with CEGIS within earliest possible time so that they could be reviewed and any issue that may merits attention could be addressed in the EIA report as well. CEGIS also requests BCIC for to provide the following information within 10 days of submitting the Inception Report for the successful completion of the study in time with quality.

Sl. No.	Information/Data Type	Sl. No.	Information/Data Type
1	Urea Plant area	8	Area and location for construction of new RMS
2	Mouza (Plot) map of site	9	Oil separator
3	Space for storing of decommissioned civil structures	10	Manpower required during construction and operation
4	Space for solid waste disposal	11	Water balance diagram
5	Capacity, design and area of land for ETP installation	12	Tender and Bid documents
6	Lube oil handling, storage tank and capacity	13	Time frame for Project or the implementation schedule
7	Length and alignment of new gas pipeline with diameter	14	Septic tank size & sludge handling

6.2 Data Acquisition

- Assistance of the BCIC will also be required in acquiring data from the concerned Government Departments. In such case, the BCIC is expected to facilitate communications and securing commitments of the concerned Departments in releasing such data to CEGIS. A tentative list data, for which BCIC's intervention would require is noted below. All available hydrological, meteorological, morphological data and records of the Project areas;
- Available topographical data and data on existing and future plans of Jetty;
- Future industrial plan along the Shitalakhya River from the Ministry of Industry/BSCIC/BCIC;
- Available agricultural, soil sedimentation, fisheries and water resources data;
- Information on Project design and the activities during pre-construction, construction and post-construction phases; and
- Latest study reports on the topic concerned and future plans if available.

6.3 Flow of Payment

Timely flow of funds from BCIC to CEGIS will therefore be of crucial importance to achieve the results as stipulated in the Agreement. Reporting Requirements.

The study includes submission of following deliverables (reports) as proposed and shown in the following **Table** during the study period.

Table 6.1: Schedule for the Submission of the Reports

Reports	Tentative Submission Date
Inception Report	In the TOR and Agreement no definite time line is noted. However CEGIS decided to submit the Inception Report within 30 days of receiving NOA.
Draft Final EIA Report	Two (02) months from the date of receiving NOA
Final EIA Report	Three (03) months from the date of receiving NOA by receiving and incorporation of the relevant comments on draft final EIA report from the BCIC and Lenders etc.

Source: Kick-off meeting agreement

Note:

1. BCIC is to apply for waiver of IEE study and obtain site clearance and also arrange approval of ToR for the EIA study from the DoE. If there is any delay in receiving the approved ToR, submission of EIA report will also be delayed accordingly.
2. All reports shall be submitted to BCIC in 5 (five) hard copies and a soft copy in CD.

References

Daniel, M. F., Brereton, D. and Moran, C.J. 2010, Managing the cumulative impacts of coal mining on regional communities and environments in Australia. Impact Assessment and Project Appraisal, 28(4), pages 299–312

Franks, DM, Brereton, D, Moran, CJ, Sarker, T and T, Cohen. 2010. cumulative impacts - a good practice guide for the australian coal mining industry. Centre for Social Responsibility in Mining & Centre for Water in the Minerals Industry, Sustainable Minerals Institute, The University of Queensland. Australian Coal Association Research Program. Brisbane

U.S. EPA. 1999. Consideration of Cumulative Impacts in EPA Review of NEPA Documents, www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf

Appendix 1: Tentative ToC of EIA Report

The EIA report has to be completed following the DoE's guideline. The following are additional and detailed points of some chapters/sections. The consultant is also required to include the points given below. The followings are additional guidance which the consultants have to follow based on their judgment for best presentation of the report.

I. Acronyms and abbreviations

All acronyms and abbreviations used in the document should be defined, so that the reader will not have to look for their first occurrence.

II. Executive Summary

The ES should mirror the main report both in form and content. It should be concise and self explanatory.

III. Introduction

III.1. Background
III.2. Purpose of the Study
III.3. Need of the Project
III.4. Importance of the Project
III.5. Scope of EIA Study
III.6. EIA Team

IV. Legal and Legislative Framework, Regulations and Policy Considerations

(including inter alia National Policies, Laws and rules on relevant issues such as Environment, Energy , Industry, Water , , Land use, , Fisheries , Natural gas policy, etc.; Relevant WB ESF and operational policies and Guidelines, Relevant international Treaties and obligations)

V. Project Data Sheet

V.1. Project Proponent
V.2. Project location and area
V.3. Nature and Size of the Project
V.4. Project Concept
V.5. Project Components
V.6. Project Activities
V.7. Project schedule
V.8. Resources and utilities demand
V.9. Sources of NG and Quality
V.10. Pipelines for NG

VI. Project Description

VI.1. Project Site
VI.2. Project Layout including site drainage
VI.3. Land Requirement

VI.4. Fuel Requirement
VI.5. Water Requirement and Hydrology of Shitalakhya
VI.6. Technology Selection and Process Description
VI.7. Description of Major Sub-Systems
VI.7.1 Urea fertilizer plant
VI.7.2 Ammonia plant
VI.7.3 Power station facilities (Steam Generator)
VI.7.4 Plant Control System
VI.7.5 Cooling Water system
VI.7.6 Water Supply and Treatment System
V1.7.7 Wastewater Treatment System
V1.7.8 Sludge Treatment
VI. 7.9 Boiler Blowdown
V1.7.10 Cooling Tower (if any)
VI. 7.11 Cooling water discharge
VI. 7.12 Gas pipeline with RMS construction
VI. 7.13 Material Storage and Handling
VI. 7.14 Fire Fighting and emergency management
VI.8. Material Balance
VI.9 Construction
VI.9.1 Site Preparation
VI.9.2 Existing Civil Structure Decommissioning
VI.9.3 Access Roads
VI.9.4 Natural Gas pipeline relocation including RMS
VI.10 Operation and Maintenance
VI.11 Pollution Mitigation Measures (Units & Devices especially for NH3 and NOx reduction)
VI.12 Dispatch of Urea
VI.13 Dispatch of Power
VI.14 Life Cycle Overview

VII. **Analysis of Suitability for Different Alternatives** (this analysis shall be performed, among other approaches, in a GIS based Spatial Decision Support System (SDSS) presenting the suitability of different options for both the interventions)

VIII. **Detail description of the land cover/land use** (with all the existing resource classes along with area coverage shall be shown in the respective maps derived from updated image of proper spatial and spectral resolution. Basic information (name of satellite, date and time of acquisition with atmospheric condition, spatial resolution, color composite etc.) of the image data to be used for making landuse/landcover maps shall be mentioned; Should also include land use plan map for Ghorasal Urea Fertilizer Complex showing all current and planned activities within the compound.)

Description of Baseline Environment

VIII.1 Study Area (10 Km. radius), Period, Component and methodology (Seasonal Variation should be covered)

VIII.2 Topography

VIII.3 Seismicity

VIII.4 Hydrogeology

VIII.5 Meteorology

VIII.6 Ambient Air Quality

VIII.7 Ambient Noise Quality

VIII.8 Surface & Ground Water Quality

VIII.9 Aquatic Monitoring

VIII.10 Soil Quality

VIII.11 Ecology

VIII.12.1 Forests

VIII.12.2 Flora

VIII.12.3 Fauna

VIII.12 Demography Profile and Occupational Pattern

VIII.13 Land use and Cropping Pattern

VIII.14 Socio-economic and cultural Scenarios

VIII.15 Distance to urban and rural communities (proximity to sensitive receptors)

VIII.16 Transmission capacity/options for linking to grid

VIII.17 Distance to existing infrastructure such as roads, etc.

VIII.18 Current and surrounding land use and associated communities

IX. Environmental Impacts

IX.1 Identification of Impact

IX.2 Sustainability of Quality of Gas and Continuity of Supply

IX.3 Construction Stage Impact

IX.3.1 Impact on Landform

IX.3.2 Impact on Natural Resources

IX.3.3 Impact on Eco-systems

IX.3.4 Impact on Ambient Air

IX.3.5 Impact on Ambient Noise

IX.3.6 Impact on Water Bodies

IX.3.7 Impact on Soil

IX.3.8 Impact on Workers Health, Sanitation and Safety

IX.3.9 Impact on Key Point Installations & others

IX.3.10 Solid Waste Disposal

IX.3.11 Social Impact due to industrial set up

IX.3.12 Impact due to transportation of raw materials

IX.4 Operation Stage Impact

IX.4.1 Impact on Natural Resource

IX.4.2 Impact on eco-systems

IX.4.3 Impact due to collection of Resources from Local Sources within the Country (if any)

IX.4.4 Impact on Ambient Air (including dispersion modelling)

IX.4.4.1 Cumulative Effect on Ambient Air quality

IX.4.4.2 Greenhouse Gas Emission

IX.4.5 Impact on Ambient Noise (including modelling for noise profile)

IX.4.6 Impact on Water Bodies (both surface & ground)

IX.4.7 Solid Waste Disposal

IX.4.8 Soil and Agriculture

IX.4.9 Impact on Ground Water

IX.4.10 Impact of Cooling water discharge including heat plume modelling

IX.4.11 Ecology (Flora and Fauna)

IX.4.12 Impact on Occupational Health

IX.4.13 Impact on Public Health and Safety

IX.4.14 Impact on Traffic Movement

IX.4.15 Social Impact

IX.4.16 Impact on Tourism

IX.4.16 Impact due to transportation of primary fuels

X. Evaluation of Impacts

The impacts should be evaluated in terms of their local, regional and national importance. The impact should be assessed in terms of the magnitude, significance, frequency of the occurrence, duration and probability. The confidence level in the prediction must be stated. The judgment of significance of impacts can be based on one or more of the following, depending on the environmental factor being evaluated. These are:

i. comparison with laws, regulation or accepted national or international standards
ii. reference to pre-set criteria such as conservation or protected status of a site, feature or species
iii. consistency with pre-set policy objectives
iv. consultation and acceptability with the relevant decision makers, civil society, local community or the general public.

XI. Mitigation of Impacts

Mitigation measures which may be of the following categories and coverage:

i. changing Project layout, transport routes, disposal routes or locations, timing or engineering design

ii. introducing pollution controls, waste treatment, phased implementation and construction, engineering measures, monitoring, landscaping, social services or public education;

iii. rehabilitation, compensation to restore, relocate or provision of concession for damage

XII. Environmental Management Plan

XII.1 EMP during Construction Phase

XII.1.1 Site Preparation including civil structures decommissioning plan

XII.1.2 Infrastructure Services

XII.1.3 Construction Equipment

XII.1.4 Safety Measures

XII.2 EMP during Operation Phase

XII.2.1 Air Pollution Management

XII.2.1.1 Transportation and handling of raw materials

XII.2.1.2 Operation Stage

XII.2.2 Waste Water Management

XII.2.3 Used Lubricant Management

XII.2.4 Noise Management

XII.2.5 Solid Waste Management

XII.2.6 House Keeping

XII.2.7 Safety and Occupational Health

XII.3 Greenbelt Development

XII.4 Rain Water Harvesting Plan

XII.5 Rehabilitation and Resettlement Plan

XII.6 Thermal pollution management

XII.7 CDM Intent

XII.8 Budget for EMP

XII.9 Contingency Plans

The Project authority shall:

a) Provide a conceptual contingency plan that considers environmental effects associated with operational upset conditions such as serious malfunctions or accidents;

b) Describe the flexibility built into the plant design and layout to accommodate future modifications required by any change in emission standards, limits and guidelines.

XIII. Risk Assessment

XIII.1 Consequence Analysis

XIII.2 Emergency Response Plan

XIII.3 Risk Mitigation Measures

XIV. Environment Monitoring Plan

XIV.1 Monitoring Plan

XIV.1.1 Stack Emission

XIV.1.2 Ambient Air

XIV.1.3 Meteorological

XIV.1.4 Ambient Noise

XIV.1.5 Surface Water & Waste Water

XIV.1.5.1 River Morphology

XIV.1.5.2 Ambient River Temperature

XIV.1.5.3 Cooling water

XIV.1.5 Ground Water XIV.1.6 Solid & Hazardous Waste including used lubricant XIV.1.7 Flora and Fauna

XIV.1.8 Workers Health and Safety XIV.1.9 Community Health XIV.1.10 EMP Implementation

XIV.1.11 Monitoring and CSR

XIV.2 Action During Abnormal Operating conditions

XIV.3 Budgets for Monitoring

XIV.4 Reporting

XV. Public Consultation and Information Disclosure

XV,1 Introduction and definitions

XV.2 Regulatory Requirements

XV.2.1 Bangladesh Guidelines

XV.2.2 World Bank Group Guidelines

XV.3 Consultation Methodology

XV.4 Results of Consultation

XV.4.1 Stakeholder Identification

XV.4.2 Local Level Consultation

XV.4.3 National Level Consultation

XV.4.4 Integration of Public Consultation Findings into EIA

XV.5 Disclosure

XV.5.1 Information Materials and Responsibilities

XV.5.2 Project Level Disclosure

XV.5.3 Disclosure in Lenders Infoshop

XV.6 Grievance Redress Mechanism

XVI. Discussion and Conclusions

Appendix 2: Photo Album

Chimney of Urea Fertilizer Factory

Ammonia Plant

Clarified Water for Plant Use

Lagoon

Shitalakhya River (Partial View)

Water Teament Plant Visit

Appendix 3: Questionnaires and Checklists

Checklist for Water Resources Information Collection

A. Administrative Information

Name of Area:	Hydrological Zone
Power plant name:	
District (s):	Upazila (s):
Union (s):	Mauza (s):

B. Project Description, Physical Resources and Water Resources System (BCIC)

General Information			
a. Type of project:		b. Area of scheme (Ha):	
c. Objectives of the scheme:			
d. New problems (if any) created by the project activities:			
e. Year of Starting:		f. Year of completion:	
g. Proposed plant comonents			
h. Name of surrounding industries			
i. Name of the projects hydro-morphologically dependency			
j. Water requirement, sources and management			
k. Cumulative hydraulic and morphological impacts as anticipated by local people			
l. Fuel type, sources and amount			
m. Drainage system			
n. Water resources system			
o. Erosion and accretion			
p. Flooding level			
Flood/Inundation Condition	Area (%)	Reasons of Flooding	Onset:
F0 (< 30 cm)			
F1 (30-90 cm)			Peak:

General Information			
F2 (90 – 180 cm)			
F3 (180 – 360 cm)			Recession:
F4 (> 360 cm)			
Flood/Inundation Condition	Area (%)	Reasons of Flooding	
q. Discharge pattern			
r. Topography			
s. Gound water resources			
t. Water Quality (Peoples perception)			
Ground water (Presence of pollutant)			
Arsenic (Yes/No)		Location:	
Iron (Yes/No)		Location:	
Surface water			
River/Khal name	Quality of water (Good/Bad/Avg.)	Type of Pollutant	Sources of pollutant

Checklist for Land Resources, Agriculture and Livesock Information Collection

Land Resources

1. Land Degradation

Factors	Year from starting LD	Result of LD
Soil erosion		
Sand carpeting		
Salinisation		
Acidification		
Nutrient deficiency		
Farming practices		
Water logging		
Others		

Agriculture Resources: (For small project information collection from filed. For large project both primary and secondary information collection from field and DAE office)

2. Cropping Pattern by Land Type

Land Type	Kharif-I (March-June)	Kharif-II (July-October)	Rabi (Nov-February)	% of area

3. Crop calendar

Crop name	Seedling		Transplanting/Sowing		Harvesting	
	Start	End	Start	End	Start	End

4. Crop yield

Crop Name	Damage free Yield (ton/ha)	Damage area (%)	Damage Yield (ton/ha)

**Damage area and yield loss calculation: Last 3 years average value*

5. Crop damage

Name of hazard	Ranked	Timing	Causes
Flood			
Drought			
Pest infestation*			
Others:			
*List name of pest and pesticide by crop			

6. Fertilizer and pesticide application

Crop Name	Seed (Kg/ha)	Fertilizer (Kg/ha)				Pesticide		
		Urea	TSP	MP	Other	No of Appli.	Liq. (ml/ha)	Gran. (Kg/ha

7. Irrigation, Land preparation and Labour

Crop Name	Irrigation			Land preparation			Labour	
	Mode	% of Area	Charge (Tk/ha)	Power (%of Area)	Animal (% of Area)	Tk/ ha	Nos./ ha	Tk/ labour

Livestock Resources: Primary and Secondary Information collection from field and DLS offices

8. Livestock and poultry production

Name of Livestock/poultry	% of HH having Livestock/Poultry	No. of Livestock/poultry per HH
Cow/Bullock		
Buffalo		
Goat		
Sheep		
Duck		
Chicken		

9. Feed and Fodder

Name of Livestock/poultry	Feed/Fodder Scarcity (Timing)	Causes	Remarks
Cow/Bullock			
Buffalo			
Goat			
Sheep			
Duck			
Chicken			

10. Diseases

Name of Livestock/poultry	Name of Disease	Disease (Timing)	Causes	Remarks
Cow/Bullock				
Buffalo				
Goat				
Sheep				
Duck				
Chicken				
Note: Support Services-				

Fisheries Data Collection Checklist

Vill: **Mauza:** **Union:** **Upazila:** **District:** **Division:**

Background Water bodies: *Name: Alphabetic, Area: in Ha/% of area/Ana, Length: in km, Depth/Inundation depth: in Meter, Flood Duration: in Months, Production: MT*

Problem/Issue	Fishing Effort	Habitat Type	Water Quality	Avg. Production	Production Trend (+/-) and Reason	List of Gears	% of gears	List of Habitat Name	Present					Past (15-20 yrs back)				
									Area	Length	Width	Depth	Duration	Area	Length	Width	Depth	Duration
Capture Fisheries: 1. 2. 3. Culture Fisheries: 4. 5. 6.	a. Total No. of fisher HHs: b. %/No. of CFHHs: c. %/No. of SFHHS: d. No. of Days	River																
		Beel (Leased/ non leased)																

Problem/Issue	Fishing Effort	Habitat Type	Water Quality	Avg. Production	Production Trend (+/-) and Reason	List of Gears	% of gears	List of Habitat Name	Present					Past (15-20 yrs back)				
									Area	Length	Width	Depth	Duration	Area	Length	Width	Depth	Duration
Indiscriminate Fishing Activities: 7. 8. 9.	spend annually in fishing by CFHHs: SFHHs: e. Hrs/Day spend in fishing by CFHHs: SFHHs:	Khal																
		Floodplain																
		Swamp Forest																
		Fish pond																
		Baor																
		Other																

Fish Migration		Fish Biodiversity		Species List					Species Composition				
				River	Khal	Beel	Pond	Other	Group	River	Khal	Beel	Pond
Previous Migration Status		Fish diversity status (Poor/Moderate/Rich) /%							Major carp				
									Exotic carp				
									Other carp				
									Catfish				
									Snakehead				

Fish Migration				**Fish Biodiversity**		**Species List**					**Species Composition**				
						River	**Khal**	**Beel**	**Pond**	**Other**	**Group**	**River**	**Khal**	**Beel**	**Pond**
Present Obstacle to fish migration:	1. 2. 3.			Reasons of increase or decrease	1. 2. 3. 4. 5.						Live fish				
											Other fish				
											Prawn				
											Hilsa				
Important breeding, feeding and over wintering ground															
											Rui				
											Catla				
Horizontal Migration pattern	Species: 1. 2. 3. 4. 5.	Season (Months):	Routes:	Significant areas	1. 2. 3.						Mrigel				
											Koi				
											Sarpunti				
											Large prawn				
											Small Pprawn				
Vertical Migration Pattern	Species: 1. 2. 3. 4. 5.	Season (Months):	Habitats:	Species of Conservation Significance	Rare:						Silver carp				
											Carpu				
											Grass carp				
											Tengra				
					Unavailable:						Chapila				
											Others				
Post Harvest Activities						**Fishermen Lifestyle**									

Fish Migration		Fish Biodiversity	Species List					Species Composition				
			River	Khal	Beel	Pond	Other	Group	River	Khal	Beel	Pond
			Socio-economic Status of subsistence level fishermen:									
Source of pollution in each habitat:			Socio-economic Status of Commercial fishermen:									
Seasonal vulnerability:			Fishermen community structure (Traditional/Caste/Religion)									
Fish market (Number, location and name):			Traditional fishermen vulnerability (Occupation change/others):									
Fish diseases (Name, Host species, Season, Syndrome, Reason, etc.):			Enforcement of fisheries regulation (Weak/strong):									
Others information:			Department of Fisheries (DoF) activity:									
Major issues concerning power plant effluents			NGOs activities:									

Note: 1. Major Carp - Rui, Catla, Mrigal, 2. Exotic Carp - Silver Carp, Common Carp, Mirror Carp, Grass Carp, 3. Other Carp - Ghania, Kalbasu, Kalia, 4. Cat Fish - Rita, Boal, Pangas, Silon, Aor, Bacha, 5. Snake Head - Shol, Gazar, Taki, 6. Live Fish - Koi, Singhi, Magur, 7. Other Fish - Includes all other fishes except those mentioned above.

Beels: Rui (Labeo rohita), Catla (Catla catla), Mrigal (Cirrhinus mrigala), Kalbasu (Labeo calbasu), Gonia (Labeo gonius), Boal (Wallago attu), Air (Mystus aor / Mystus seenghala), Shol/Gazar (Channa spp.), Chital/Phali (Notopterus chitala / N. notopterus), Koi (Anabas testudineus), Singi/Magur (Heteropneustes fossilis /Clarias batrachus), Sarpunti (Puntius sarana), Large Shrimp (Macrobrachium rosenbergii /M. malcomsonii), Small Shrimp, Silver Carp (Hypophthalmichthys molitrix), Carpio (Cyprinus carpio), Grass Crap (Ctenopharyngodon idellus), Pabda (Ompok pabda), Punti (Puntius spp.), Tengra (Mystus spp.), Baim (Mastacembelus spp.), Chapila (Gudusia chapra), Others.

Pond: Rui (Labeo rohita), Catla (Catla catla), Mrigal (Cirrhinus mrigala), Kalbasu (Labeo calbasu), Mixed Carp, Silver Carp (Hypophthalmichthys molotrix), Grass Carp(Ctenopharyngodon idellus), Mirror Carp (Cyprinus carpio var. specularis), Tilapia (Oreochromis mossambicus / O. niloticus), Shrimp, Aor (Mystus aor / Mystus seenghala), Boal (Wallago attu), Shol/Gazar & Taki (Channa spp.), Chital/Phali (Notopterus chitala / N. notopterus), Koi (Anabas testudineus), Singi/Magur (Heteropneustes fossilis / Clarias batrachus), Sarpunti (Puntius sarana), Thai Sarpunti (Puntius gonionotus), Punti (Puntius spp.), Others.

D. Checklist for Ecological Information Collection

D1. Basic Information

Date		Prepared by			
Name of the Plant					
Type of PP					
Total Capacity (MW) of PP				Number of Unit	
Amount of Acquired land (if any)				Base Fuel	
District/s		Upazila/s			

D2. Major habitat Information/Ecosystem Types within 10 km radius (Please put tick where applicable)

Agriculture land		Forest patches including social forest	
Settlement/Homesteads		Canal and ponds	
Orchard		Mangroves	
Fallow		Reserve forest	
Ridges		Shoreline/ Sea shore	

D3. Components of the habitat of direct impact area (Project Area)

Flora	Fauna	Anticipated Impacts		Major impacts on existing ecosystem
		Flora	Fauna	

D4. Information on forest (within 10 km radius from project site)

Forest	Type *	Location	Area (ha)	Ecosystem Status	Distance from proposed PP

* [1] Swamp Forest, [2] Reserve Forest, [3]Vested Forest, [4] Reed forest, [5] Other (specify)

D5. Information on river system/waterways/wet lands close to proposed power plant

Name	Distance (km.) from PP	Type	Width (m.)	Mean depth		Connectivity	Turbidity (put √ or X mark)	Biodiversity
				Dry season	wet season			

[1] seasonal [2] perennial [1]abundant [2]moderate [3]low

D6. Possible impacts by exhausted/spills from the power plant

Fuel (gas)	Exhausted particulates	Anticipated Impacts	Anticipated Impacts on Species*	Range of Impacts (Spatial)	Extent of Impacts (Temporal)

* Flora[1] Fauna [2]

D7. Terrestrial flora (List of Major Plant Species within 10 km radius)

Type	Status*	Canopy coverage (%)	Habit	Pathogen (s)
Homestead vegetation				
Cropfield vegetation (weeds)				
Roadside vegetation/Marginal vegetations				
Orchard Vegetation				

* [1]Very common, [2]Common, [3] Rare, [4] Very Rare

D8. Terrestrial fauna especially wildlife (within 10 km of radius from project point)

Group	Habitat*	Status**	Mode of impact	Impacts on core habitat (put tick or cross mark)
Amphibians				
Reptiles				
Birds				
Mammals				

*[1] Homestead forest, [2] Floodplains, [3] Wetlands, [4] River, [5]Pond, [6] Forest; **Status: [1]Very common, [2]Common, [3] Rare, [4] Very Rare

D9. Aquatic vegetation

Species	Habit*	Status**	Interventions	Impacts

*[1]Submerged, [2]Free floating, [3]Rooted floating, [4] Sedges, [5]Marginal; **[1] High, [2] Moderate, [3] Low

D10. Aquatic fauna especially Wildlife

Group	Species	* Status	**Habitat	Interventions	Impacts
Amphibians					

Group	Species	* Status	**Habitat	Interventions	Impacts
Reptiles					
Birds					
Mammals					

* [1]Very common, [2]Common, [3] Rare, [4]Very Rare; ** [1] Homestead forest, [2]Floodplains, [3]Wetlands, [4]River, [5]Pond, 6Forest

D11. Information on major wetland within the study area (10 km radius from project site)

Wetland	*Type	Area (ha)	Connectivity		Interventions	**Impacts
			Canal	River		

* 1 Beels, 2 Rivers, 3 Open water wetlands, 4 Floodplains, 5 Closed water wetlands, 6 Ponds, 7 Baors (oxbow lake)

** 1Fish 2 migratory bird 3 other wildlife; 4 aquatic flora

D12. Anticipated Impacts due to proposed plant installation on particular ecosystems (Impact from changed land use, noise, human presence etc.)

Activities	Impacts during construction
Civil structures decommissioning	

Activities	Impacts during construction
Heat recovery steam installation	
Machines or labor movement	
Gas pipe installation	
Lighting and sound generation	
Discharge of hot water from PP	
Construction of new connecting roads/and other infrastructures	

D13. Comments (If any):

RRA/FGD Data Collection Format for Socio-economic Survey

Date of Survey:..... **Name of Urea Fertilizer Plant:**

1. Place of Interview:

Name of Mauza(s).....

Union(s)/Ward(s).....

Municipality(s).ifany ..... Upazila(s)/Thana(s) .....

District(s)/.....

2. Demographic information:

2.1 Total Households, Population (male, female, rural and urban) in Project area

Total Households	Population		
	Male	Female	Total

Source: BBS

2.2 Age distribution

Age range													
0-4 Years		5-9 Years		10-14 Years		15-17Years		18-34 Years		35-59 Years		60+Years	
M	F	M	F	M	F	M	F	M	F	M	F	M	F

Source: BBS

2.3 Literacy rate

% of Literacy (Over 7 years)		
Total	Male	Female

2.4 Occupation and employment

Main occupation by population	% of population
Not working	
Looking for work	
Household work	
Agriculture	
Industry	
Water, Electricity & Gas	
Construction	
Transport	

Main occupation by population	% of population
Hotel & Restaurant	
Business	
Service	
Others…..	

Main occupation by households:

Main occupation by households	% of households
Agriculture/Forestry/Livestock	
Fishery	
Agriculture Laborer	
Non-agriculture Laborer	
Handloom	
Industry	
Business	
Hawker	
Construction	
Transport	
Religious	
Service	
Rent	
Remittance	
Others…..	

2.5 Labor availability and wage

a. Labor (Male) for farming (High/Medium/Low), Av. Wage/Day (Tk.) Max:.....Min: .....

b. Labor (M) for non-farming (High/ Medium/ Low), Av. Wage/Day (Tk.) Max:.....Min: .....

c. Labor (Female) for farming (High/Medium/Low), Av. Wage/Day (Tk.) Max:.....Min: .....

d. Labor (F) for non-farming (High/ Medium/ Low), Av. Wage/Day (Tk.) Max:.....Min:..

2.6 Migration (seasonal/permanent)

a. Seasonal out migration from study area (% per year with location):

b. Seasonal in migration to study area (% per year with location):

c. Permanent out migration from study area (Number per 1/2 years with location):

d. Permanent in migration to study area (Number per 1/2 years with location):

2.7 Annual Expenditure and Income by range

a. Expenditure

Expenditure group (in taka)	Percentage of households
<=12,000	
12,000-24,000	
24,000-60,000	
60,000-1,08,000	
1,08,000-2,40,000	
>=2,40,000	

Sources: RRA

b. Income

Expenditure group (in taka)	Percentage of households
<=12,000	
12,000-24,000	
24,000-60,000	
60,000-1,08,000	
1,08,000-2,40,000	
>=2,40,000	

Sources: RRA

2.8 Self assessed poverty for year round

Sl. No.	Poverty status	Percentage of households
1	Deficit	
2	Balance/Breakeven	
3	Surplus	

2.9 Housing (photographs)

Sl. No.	Housing status	% of hhs having
1	Jhupri	
2	Kutcha	
3	Semi Pucka	
4	Pucca	

2.10 Drinking water (photographs)

Sl. No.	Drinking water sources	Percentage of households use
1	Tap	
2	Tube well	
3	Well	
4	Pond	
5	Other.....	

2.11 Sanitation (photographs)

Sl. No.	Toilet types	Percentage of households under each type
1	Water Sealed	
2	Ring Slub	
3	Kacha	
4	No facilities	

2.12 Diseases in polder area

a. Diseases in area

Sl. No.	Disease	Ranking by incidence	Sl. No.	Disease	Ranking by incidence
1	Influenza/ Common fever		9	Chicken pox	
2	Cough/cold		10	Skin disease	
3	Diarrhoea		11	Diabetes	
4	Dysentery		12	Hypertension	
5	Hepatitis		13	Asthma	
6	Malaria		14	T B	
7	Dengue fever		15	Gastric	
8	Typhoid		16	Arsenicosis	

Sources: RRA

b. Health facilities in study area (photographs)

Sl. No.	Type of facility	Number of facilities with name
1	Number of District level Hospitals	
2	Number of Upazila Health Complex	
3	Union Health Center	
4	Private Health Clinic/ Hospitals	

Sources: RRA

b.1 Status of peripheral health facilities used by the study area people:

_____

b.2 Source of treatment facilities in study area

Sl. No.	Source of treatment facilities	% of hhs received
1	Trained Physician	
2	Paramedic/ Diploma Physician	
3	Quack Doctor and Informal Treatments	
4	No treatment facilities at all	

Sources: RRA

2.13 Electricity

a. Percentage of household having electricity facility: .....BBS

b. Percentage of household having electricity facility: .....(During Survey)

3. Social overhead capital (photographs)

3.1 Existing road networks in study area and it's level of benefit

a. National Road (km.) .....**(GIS)** Beneficial: Highly /Moderately / Poorly

b. Regional Road (km.) ..... **(GIS)** Beneficial: Highly /Moderately / Poorly

c. Local Road Pucca (km.) .... **(GIS)** Beneficial: Highly /Moderately / Poorly

d. Local Road Kancha (km.) .... **(GIS)** Beneficial: Highly /Moderately / Poorly

3.1.1 Status of peripheral road networks (with name) used by the study area people:

_____

3.2 Existing railway network in study area and it's level of benefit

a. Railway (km.) ..... (GIS) Beneficial: Highly /Moderately / Poorly

3.2.1 Status of peripheral railway service used by the study area people:

_____
_____
_____

3.3 Existing waterways in study area and it's level of benefit

a. National Route (km.) ..... (GIS) Beneficial: Highly /Moderately / Poorly

b. Local Route (km.) .... (GIS) Beneficial: Highly /Moderately / Poorly

3.3.1 Status of peripheral water ways (with name) used by the study area people:

_____
_____
_____
_____

3.4 Status of the navigation route by season

a. National Route: Served Seasonally/Through out the year

b. Local Route: Served Seasonally/ Through out the year

3.5 Major waterways handicapped

a. by structures..... location

b. by siltation..... location

3.6 Nos. of major ghats/ports and name:

3.7 Academic Institution (school, colleges) (photographs)

Sl. No.	Type of facility	Nos. of Institution	Type of facility	Nos. of Institution
1	Primary School		Ebtedayee Madrasha	
2	High School		Dakhil Madrasha	
3	College		Alim/ Fazil Madrasha	

Sources: RRA

3.6.1 Status of peripheral academic institutions (with name) used by people of the study area:

_____
_____
_____
_____

3.8 Markets and GC (photographs)

Sl. No.	Type of facility	Nos. of markets	Comments with name
1	Major markets		
2	Minor markets		
3	Growth Centers		

3.8.1 Status of peripheral markets used by people of the study area:

_____
_____
_____
_____

4. Land holding categories

4.1 Percentage of HH who have owned agricultural land: .....(BBS)

4.2 Percentage of households with different land ownership category in the area:

Land ownership classes	Percentage of household
Land less/ No land (0 decimal)	
Land less (up to 49 decimal)	
Marginal (50-100 decimal)	
Small (101-249 decimal)	
Medium (250-749 decimal)	
Large (750 + decimal)	

Sources: RRA

5. Conflict between different land owner group and professional group

Reasons of Conflicts	Present status of problem	Solution they want with location
Water control infrastructures		
Land elevation		
Cross-interest		

6. Disaster related information: (photographs)

6.1 Type of major disaster and damage occurred in the area after completion of the Project

Sl. No.	Major Disaster	Severely affected year	% of area affected	% of hhs affected	% of crop damage	Major crop damaged
1	Flood					
2	Drought					
3	Tidal flood					
4	Storm					
5	Cyclone					
6	Hail storm					
7	Salinity intrusion					
8	Water logging					
9	Erosion					

Sources: RRA

7. Safety Nets and Poverty Reduction Measures in the area:

7.1 Name and activity of GO/ NGOs working in this area

Name	Activity (Credit, Education, Health, Forestry, Fishery, Livestock Rearing, Women Empowerment, Human Rights, VGF, Boyosko bhata, etc.)	% of HHs coverage

8. Information on Water Management Organizations (WMOs) (photographs of office building, committee members, resolution etc)

8.1 Do you know about the CEIP project? Y/N

8.2 Existence of WMOs: Yes/No

8.2.1 If WMO exists:

Sl	Issue/Question	Response/Suggestion		
a)	Year of formation (date if possible)			
b)	Registered by whom?			
c)	Number of members (male-female)	Male	Female	Comments
	Farmer			
	Trader			
	Labor			
	Landless			
	Fisher			
	Service holder			
	Others			
d)	No. of villages covered			
e)	Existence of fund			
f)	AGM			
g)	Election			
h)	EC meetings			
i)	Present water resources management activities			

8.2.2 Name of EC members with address/phone number:

Sl. No.	Name	Address	Phone Number
1			
2			
3			
4			
5			
6			
7			

8.2.3 If WMO does not exist, please state the reasons for

_____

_____

_____**Are people willing to form WMO? Y/N**

(If yes, give demonstrative proof of their capacity if any)

8.3 Is WMO willing to take up management responsibilities? Y/N

8.3.1 If yes, please give some idea about what to do on management

9 Some other Issues

9.1 Any land acquisition to be needed for the rehabilitation of the polder ? Yes/No

9.1.1 If yes, size of the area? _____(acre)

9.1.2 If yes, are they willing to provide land for acquisition? Yes/No

9.2 Any replacement of people to be needed for the rehabilitation of the scheme? Yes/No

9.2.1 If yes, how many? _____ (number of household)

9.3 Have any cultural heritage /archeological sites in the polder? Yes/No

a. Give some description

9.4 Have any vulnerable communities (e.g. landless, fishermen, boatmen, destitute women without food and/or shelter) in the scheme area? Yes/No

a. Give some description

9.5 Have any common property resources (e.g. irrigation systems, fishing grounds (wetlands), pastures, forests, graveyard, cremation ground, mosque, temple, etc.) in the scheme area? Yes/No

a. Give some description

10 Comments of Facilitator:

Name of the RRA/FGD Participants:

Name	Age	Occupation	Address/Phone No.