Environmental Assessment Report

Full Initial Environmental Examination
Project Number: 44192
May 2010

BAN: Bangladesh India Electrical Grid Interconnection Project

Prepared by Power Grid Company of Bangladesh Ltd.

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

MINISTRY OF POWER, ENERGY & MINERAL RESOURCES

POWER GRID COMPANY OF BANGLADESH LTD. (PGCB)

Initial Environmental Examination (IEE) of

"400 kV Grid Interconnection between Bangladesh - India and 1X500 MW HVDC Back to Back station at Bheramara (Kushtia)"

May 2010

Dhaka

Submitted by:

Center for Environmental and Geographic Information Services

CEGIS

A public trust under the Ministry of Water Resources

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The Center for Environmental and Geographic Information Services (CEGIS), a public Trust under the Ministry of Water Resources, has been entrusted with the responsibility of conducting Initial Environmental Examination (IEE), for the "400 kV Grid Interconnection between Bangladesh-India and associate 1X500 MW HVDC back to back Station at Bheramara (Kushtia) Project" by the Power Grid Company of Bangladesh Ltd. (PGCB) for which CEGIS expresses its gratitude to the PGCB, specially to the Managing Director, Mr. Md. Ruhul Amin.

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Abbreviations

ADB	Asian Development Bank
AP	Angle Point
ASA	Association for Social Advancement
BBS	Bangladesh Bureau of Statistics
BMD	Bangladesh Meteorological Department
BRAC	Bangladesh Rural Advancement Committee
BWDB	Bangladesh Water Development Board
CEGIS	Center for Environmental and Geographic Information Services
CITES	Convention on International Trade in endangered species
DC	Deputy Commissioner
DEPC	Department of Environmental Pollution Control
DG	Director General
DIA	Direct Impact Area
DoE	Department of Environment
EC	Electrical conductivity
ECA	Environment Conservation Act
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EQS	Environment Quality Standards
FD	Forest Department
FGD	Focused Group Discussion
FWIP	Future-with-Project
FWOP	Future-without-Project
GIA	General Impact Area
GIS	Geographic Information Services
GOB	Government of Bangladesh
HES	Health Environment and Safety
HHs	Households
HTW	Hand Tube well
HYV	High Yielding Variety
IEC	Important Environmental Component
IEE	Initial Environmental Examination
IESC	Important Environmental and Social Component
IUCN	International Union for Conservation for Nature
KII	Key Informant Interview
Km	Kilometer
kV	kilo Volt
LGED	Local Government Engineering Department
LILO	Line In Line Out
MoEF	Ministry of Environment and Forest

MW	Mega Watt
NCA	Net Cultivated Area
NCS	National Conservation Strategy
NEMAP	National Environment Management Action Plan
NGO	Non-Governmental Organization
NOC	No Objection Certificate
NWRD	National Water Resource Database
OMS	Operation Management System
PCP	Project Concept Paper
PGCB	Power Grid Company Bangladesh Ltd.
PRA	Participatory Rural Appraisal
PWD	Public Works Department
RAP	Resettlement Assessment Plan
RCC	Reinforced Cement Concrete
RoW	Right of Way
RRA	Rapid Rural Appraisal
RS	Remote Sensing
SPM	Suspended Particulate Matter
SRDI	Soil Research Development Institute
TL	Transmission Lines
UNCED	United Nations Conference on environment and Development
Vegetable (S)	Vegetable Summer
Vegetable (W)	Vegetable Winter

Executive Summary

The proposed Bangladesh India Electrical Grid Interconnection Project will support the efforts of the governments of Bangladesh and India to establish a link between their electrical grids. The project is designed to facilitate the exchange of 500 MW of power between the two neighboring countries.

The major components of the proposed system include a 27.169 kilometer 400kV transmission line from Bahrampur in India to Bheramara in Bangladesh (Bangladesh portion), and a 500MW HVDC back-to-back station in Char Mokarimpur mauza under Bheramara Upazila in Kushtia district of Bangladesh. The main activities under the project are given in the following table.

Name of Project	Length of T/L and area	Main activities
400 kV Grid Interconnection between Bangladesh - India and 1 X 500 MW HVDC back-to-back station at Bheramara (Kushtia)"	27.169 Km	Construction of 400 kV Bahrampur (West Bengal, India) – Bheramara (Kushtia, Bangladesh) Double Circuit (DC) overhead transmission line (Bangladesh portion)
	5.00 Km	Construction of Line In and Line Out (LILO) of 230 kV Ishwardi –Khulna DC (Twin Conductor) overhead transmission line at Bheramara associated with the Bangladesh-India power exchange programme.
	113.4334 acre	Construction of a 1 X 500 MW HVDC back-to-back station at Bheramara (Bangladesh) associated with the Bangladesh-India power exchange programme.

The Right of Way (RoW) of the transmission and the location of the back-to-back station have been finalised and the exact tower locations will be known only when the transmission line contract is awarded and a final route survey is undertaken. Hence based on preliminary assessments, the project is classified as Category "B" as it is unlikely that there will be any significant adverse irreversible environmental impacts.

A. Assessment of Legal Framework and Institutional Capacity

1. Details of local regulations

The Bangladesh Wildlife Preservation Order (1973; amended to an Act in 1974). The Bangladesh Wildlife (Preservation) Order provides for the preservation, conservation and management of wildlife. The earlier legislations on wildlife preservation, namely, the Elephant Preservation Act, the Wild Bird and Animals Protection Act, and the Rhinoceros Preservation Act have been repealed and their provisions have been suitably incorporated in this law.

The National Forest Policy (1994). The National Forest Policy is the amended and revised version of the National Forest Policy of 1977 in the light of the National Forestry Master Plan. The target of the policy is to conserve the existing forest areas as well as bring about 20% of the country's land area under the forestation program and increase the reserve forest land by 10% by the year 2015 through coordinated efforts of government and non-government organizations (NGOs) and participation of the people.

The Electricity Act, 1910. Under this Act, any person can get a license to supply energy and to lay or place electric supply lines for the conveyance and transmission of energy. The licensee can open and break up the soil and pavement of any street, railway or tramway and can lay any line or do other work near other utility services, provided prior permission is taken from the respective authority. The licensee shall give full compensation for any damage, detriment or inconvenience caused. The licensee should take precautions in laying down electric supply lines near or where any metallic substance or line crosses in order to avoid the risk of electrocution.

The Telegraph Act (1885) Part III Power to place Telegraph Lines and Posts. Under the Act, the Government can build towers on public land without giving any land compensation.

The Power Policy, 1995. This is presently an integral part of the Energy Policy 1996. It has different policy statements on demand forecast, long-term planning and project implementation, investment and lending terms, fuels and technologies, power supply to the west zone, isolated and remote load centers, tariff, captive and stand by generation, system loss reduction, load management and conservation, reliability of supply, system stability, load dispatching, institutional issues, private sector participation, human resource development, regional/international cooperation, technology transfer and research programs, environment policy, and legal issues.

The Energy Policy (1996). The Energy Policy provides for the utilization of energy for sustainable economic growth, supply to different zones of the country, development of indigenous energy sources and environmentally sound sustainable energy development program. The policy highlights the importance of protecting the environment by requiring an environment impact assessment (EIA) for any new energy development project, or introduction of economically viable and environment friendly technology.

The Industrial Policy (1999). The Industrial Policy aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labor intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development, high growth of export, infrastructure development and environmentally sound industrial development. World Trade Organization guidelines have been proposed to be followed in the Industrial Policy.

2. The Environmental Clearance Process

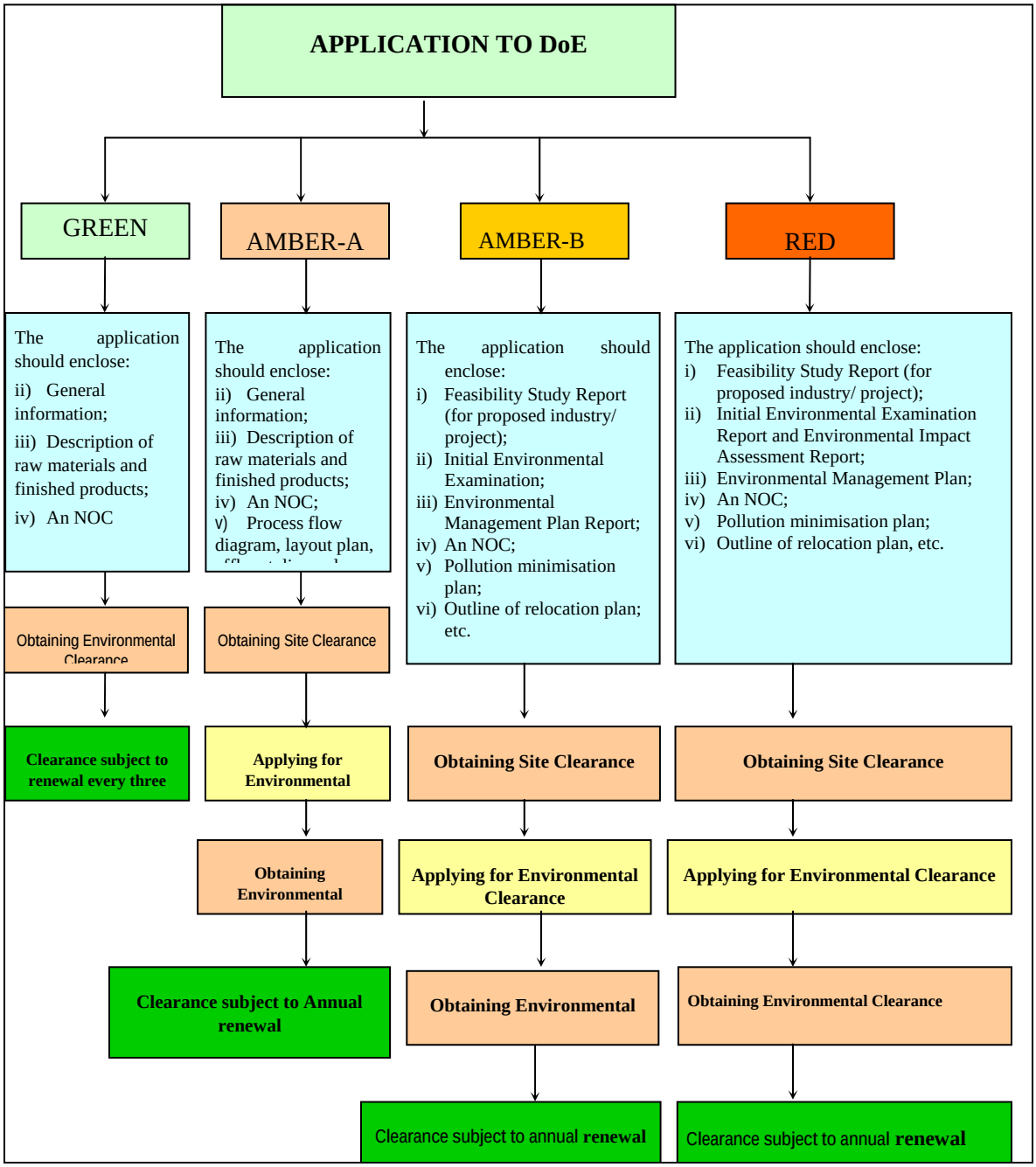
Requirement for Initial Environmental Examination (IEE) Report. All industries and projects in the Red[1] category have to conduct an IEE, which help in understanding the potential extent of environmental changes and to find ways to mitigate negative impacts by considering available information, past experience or standard operating practices. The steps for conducting an IEE are: (i) collection of baseline information in respect of a project and the environmental setting of the project and its site, (ii) setting of boundaries of an IEE by identifying the significant issues, (iii) impact assessment suggesting mitigation measures, Environment Management Plan (EMP), alternative sites or other project modifications, and (iv) in the event the IEE of the project or industry reveals that further investigations need to be carried out, the sponsors will have to conduct a detailed EIA.

EIA Procedure. After completion of the EIA report the project proponent should apply to the Department of Environment (DOE) in the prescribed format for site environmental clearance. The application for the environmental clearance for a project classified in the 'Red' category should be accompanied by the following documents: (i) Feasibility Study Report of the industry (project), (ii) EIA report, (iii) an NOC (No Objection Certificate) from the local authorities concerned, (iv) pollution minimization plan including emergency plan for the mitigation of adverse environmental impacts, (v) outline of relocation plans (where applicable), and (v) other information as deemed necessary.

It is also mentioned in the Environment Conservation Rules, 1997, that the Director General of the DOE can issue environmental clearance directly without issuing any site clearance to any industry or project if appropriate reasons are found for doing so.

As the proposed Project includes the construction of a high voltage direct current (HVDC) sub-station and the transmission lines, the Project falls under the 'Red' category, all applicable requirements have been adopted for the Project. Figure shows the activities involved in getting environmental clearance.

[1] As specified in the Environmental Conservation Rules 1997, all new industries and projects must apply for an Environmental Clearance certificate. Industries are classified according to their potential impact on the environment into four categories – Green(Assembling and manufacturing of TV, radio, clocks and watches, telephones, and toys (plastic made items excluded) etc), Orange – A (Dairy farm, (10 cattle heads or below in urban areas and 25 cattle heads or below in rural areas), poultry (up to 250 in urban area and up to 1000 in rural area), grinding /husking of wheat, rice, turmeric pepper, pulses (up to 250 Horse power) etc.), Orange – B (PVC items, artificial fiber (raw materials), glass factory, life saving drug (applicable to formulation only), edible oil, tar etc.) and Red (tannery, formaldehyde, urea fertilizer, T.S.P fertilizer, chemical dyes, polish varnish and enamels, power plants, all mining projects (coal, limestone, hard rock, natural gas, mineral oil, clay etc.), water/ power and gas distribution line laying /relaying /extension etc.).



NOC = No Objection Certificate, usually obtained from local government.

Note:
1. these requirements vary from those of the DoE (1997) in requiring EMPs for proposed, as well as current, projects.
2. Procedure of obtaining Environmental Clearance: for Green category projects the gestation period for granting Environmental Clearance has been fixed at within 15 days; for Orange A, Orange B and Red category projects at first Location Clearance and thereafter Environmental Clearance will be granted. The gestation period for Location Clearance is within 30 days for Orange A, and within 60 days for Orange B and Red category projects.

Source: Adapted from the Environmental Guidelines for Industry (DoE, 1997)

Figure: DoE Environmental Clearance Procedures

3. Differences between the regulations of Government of Bangladesh and Asian Development Bank regulations

The Asian Development Bank (ADB) issued a *Safeguard Policy Statement* 2009 (SPS 2009) according to which, the proposed Project falls in the 'B' category, which requires the preparation of an IEE only.

B. Anticipated Environmental Impacts

Drainage Congestion. The sub-station site is on the drainage path of this area. Hence, the civil works may cause drainage congestion.

Ambient Air Quality. Air quality may deteriorate slightly due to transport of materials to the tower locations and sub-station site. Further deterioration may occur due to associated excavation and concrete works at these sites.

Interference with Road Crossings. Road crossing sites will be temporary impacted while connecting the wires through the towers.

Construction Waste at Tower Locations and Sub-Station Sites. During the construction period, disturbances to the surrounding land, settlements, and communities may occur due to disposal of construction waste.

Storm Water Drainage System at Station Site. After construction of the sub-station, while it is in full operation, storm/flood water stagnation may create environmental hazards on surrounding agricultural land.

Total Crop Production. A total of around 1654 metric tons of different crops grow along the right of way (RoW) and sub-station site. During project implementation mainly during the Rabi season (mid November to end of May) around 837 metric tons of crop will be lost along the RoW.

Intercultural Operation or Cropping Pattern. At present the intercultural operation or cropping pattern is traditional. It will be partially impacted during the implementation period and under the post-project condition.

Soil Erosion. No soil erosion was observed at the tower locations or sub-station site. However during the construction period, top soil may be eroded at these sites.

Quality of Land. Construction waste (i.e. cement. bricks, stone chips, etc.) may impact the surrounding land and settlements. The impact on agricultural land may require continued implementation of the Environmental Management Plan for a long time.

Terrestrial and Aquatic Flora. Trees along the RoW and the sub-station site may have to be cut during the construction period. All tall trees such as coconut, mahogany, korai, mango trees, etc., will be removed from the RoW, especially at the tower locations.

Wildlife Population. During the construction work, wildlife is expected to be impacted. Many species of birds are home to these locations. Construction activity will have an impact on amphibian species such as the Tree frog, Skipper frog, Cricket frog, and the Indian Bull frog.

Different species of tortoises and turtles are found in the area's water bodies. The common house gecko, keeled grass skink, Bengal monitor, checkered keel back, common garden lizard, dark-bellied marsh snake, cantor's kukri snake, and the monocelate cobra would be affected by the project activities.

Involuntary Migration. People owning private land at the proposed sub-station site will be displaced due to acquisition of the proposed approach road. These people will be properly compensated from the project.

Land Price. The sale value of different types of land will be reduced under pre project, during project and post project situations. With time, people may gradually be interested to buy land in the area but at a much lower price.

Employment Opportunities during Construction (Technical and Non-Technical). Construction of the transmission line as well as the sub-station will require both skilled and non-skilled labor and thus the Project will create employment opportunities for the people in the of vicinity of as well as outside the proposed area. There are civil works, loading/unloading of goods, and other livelihood opportunities such as trade and small business will be created.

Agricultural Income Per Capita. The net income from agriculture at the Directly Impacted Area (DIA) is calculated to be Tk. 8,170,530. The total population of the DIA is calculated to be 7,107. Hence, per capita agricultural income loss is estimated to be Tk. 1,150/- per season.

Regional and National Economic Development. As per the treaty between the Prime Ministers of India and Bangladesh, the proposed transmission line will initially provide 500 MW of power from India to Bangladesh. The present power generation in Bangladesh is estimated to be deficit which is detrimental to regional as well as national development. This project is expected to improve the situation. Many developmental sectors such as irrigation, industries and garments sectors will be ensured improved power supply.

Training for Livelihood Restoration. The Project authorities will be responsible for institutional arrangements for implementing the infrastructures as well as training for the rehabilitation of displaced people. Local or national NGOs will be engaged for training displaced people to help restore their livelihoods and mitigate their poverty.

Human Safety. During implementation of the Project, human safety will be a most important concern. Different types of construction materials as well as heavy vehicles may be the cause for concern. Proper contingency measures will be needed for ensuring human safety.

C. Environmental Assessment for the Project

High resolution Remotely Sensed images have been used in deciding the route of the transmission lines to avoid settlements and ecologically sensitive areas. This has been reconfirmed by the IEE team members who walked along the entire length of the alignment. Observations of the team members suggest that the route finally selected passes mostly through agricultural crop fields and not through settlements or ecologically sensitive areas.

A minor negative impact of the Project will be felt during the pre-construction and construction phases which may involve removal of vegetation and cutting of trees for carrying construction materials to the sites and erection of towers and stringing of the transmission lines. These

problems would be overcome by paying adequate compensation when construction work is over and bringing back the lands to their original forms before being handed over to the owners. Crop production lost due to these activities during the pre-construction and construction phases will have to be compensated as well.

The Power Grid Company Bangladesh Ltd. (PGCB) has received the clearance from the DoE for implementing the transmission line and other ancillary works. The IEE report has been prepared with this end in view. The IEE study reveals that the Project has no major negative impact, but will contribute to national development by improving the supply of electricity.

Minor negative impacts like clearing of vegetation and cutting of trees at the pre-construction and construction phases should be taken care of by proper mitigation measures. Efforts should be made to avoid cutting of trees as much as possible. Cutting of some trees might be unavoidable which should be replanted in surrounding areas for the conservation of biodiversity. The season for implementing the work should be selected by adjusting with the cropping season so as to inflict minimum damage to field crops. In both cases proper compensation for all types of damages must be paid and the land should be brought back to its original form before being handed back to the owners.

The construction labor camps should be provided with water supply and sanitation facilities. The workers should be apprised of hygienic practices. The stores and equipment yards should be properly guarded so that all equipments remain safe. The sub-stations should be fully equipped with fire fighting equipments.

The Project is not likely to have any significant negative impact. The minor impact on noise level, and increase in traffic are within the existing levels experienced by the local people. The towers will be erected and the line installed under expert supervision. The monitoring plan, if properly implemented during the pre-construction, construction, post-construction, and operation phases will ensure taking corrective measures. Therefore, the proposed Project will have no residual adverse impact on the environment or the eco-system.

The estimated EMP cost including (i) compensation for private land, structures and trees for proposed RoW and back to back station site, (ii) compensation for crops in RoW and tower sites, (iii) mitigation plan and contingency, (iv) enhancement plan, (v) training of professionals and workers about accidental cases and safety measures, and (vi) monitoring plan (consultant for monitoring and transportation cost for monitoring team) is 266.2 lac Taka.

Mitigation measures

Impacts	**Mitigation**
Drainage congestion	A well-designed drainage system will have to be developed surrounding the sub-station site
Impact on ambient air quality	Spray water on roads, carry materials at night and put up temporary fencing at the construction sites
Interference with road crossing	Nets should be placed over the crossing points of roads while stringing the wires. Danger signs and public awareness campaigns are also required
Impact on flora (No net biodiversity loss)	Plantation of selected trees species of medium height and high productivity (lemon, guava, and timber yielding) should be done in the sub-station and

Impacts	Mitigation
	RoW location. More than five thousand trees will be cut for the project. So, it is expected that around ten thousand trees will be replanted in the surrounding areas. Homestead gardens with fruit trees and rapid growing timber trees will be given importance in this regard to reduce biodiversity loss due to the Project.
Impact on wildlife	-Avoid breeding season and destruction of nests and wildlife habitat. -Avoid killing wildlife. - Construction work during the dry season will minimize damage to wetland wildlife
Soil erosion	The contractor should carefully dig holes for erecting towers. The excavated soils should be properly stacked and the holes refilled with the stacked soils by maintaining the reverse sequence of profile. The loose topsoil must be compacted well so that no erosion takes place. Vegetative cover must be restored in the affected parts of the tower locations.
Impact on crop production	Sand and cementing material works should be done in fallow lands. The sand and concrete wastes should be cleared off from the construction sites immediately after completion of tower construction.
Impact on human safety	To ensure human safety awareness motivational programs should be participatory with adequate discussions, meetings and display of signboards. Posters should also be put up at the construction sites.

Compensation measures

Impacts	Compensation
Impact on crop production	Adequate compensation must be paid for damage to crops.
Impact on flora	Proper cash compensation should be provided to the households displaced when trees are removed.
Involuntary migration	Proper cash compensation should be provided to the households that would be shifted from the RoW as well as the actual landowners of the sub-station site at applicable rates.

Contingency measures

Impacts	Contingency
Interference with road crossings	Contingency cash will be needed to cover any un-expected situation
Involuntary migration	A contingency fund (adequate insurance coverage) should be created to meet emergency situations caused by accidents during line construction

Impacts	Contingency
Impact on human safety	A contingency fund should be created for construction labourers and the public in case of accidents during the construction of the transmission lines, towers and sub-station

Enhancement measures

Impacts	Enhancement plan
Vegetation	Plantation of selected tree species of medium height and high productivity should be done in the RoW to maintain plant diversity and density.
Agriculture	Garden crops should be grown in the fallow areas of the sub-station compound. Also, fruit trees of low height like mango, guava and lemon can be grown. Make farmers aware of proper intercultural operation in the tower location for avoiding accidents.
Non-agricultural employment	Local non-agricultural laborers should be employed for the construction of the transmission lines as well as the sub-station
Agricultural income	Proper agricultural extension services and training (i.e. which type of crops will be suitable, how to cultivate inside the towers etc.) will be ensured inside the tower locations.
Economic development	Government agencies should properly plan for the improvement of these areas and better electrification coverage in rural areas

D. Consultation, Information Disclosure, and Grievance Redress Mechanism

People all along the route of the transmission lines expressed keen interest in the sub-Project even after recognizing the fact that they will not get electricity directly from those lines. Their main interest is that the overall development in the power sector would contribute to the national development. However, local people along the transmission line alignment will be benefited as the Project will generate some employment opportunities for them during the pre-construction, construction, and operation phases. The contractor should be specifically instructed to employ local workers to the extent possible. The mechanism for resolving grievances is described in the table below.

Grievance Redress Mechanism

Step 1	DPs are informed of their losses and entitlements in writing and through personal contact by the PGCB through the workers of RAP implementation agencies. If satisfied, the DP claims resettlement payments from the PGCB. If confused, the matter is addressed in step 2.
Step 2	The DP approaches the EA workers for clarification. The EA workers clarify the provisions, and loss or entitlements as per the RAP. If resolved, the DP claims resettlement payments from the PGCB. If not resolved, the matter is addressed in step 3

Step 1	DPs are informed of their losses and entitlements in writing and through personal contact by the PGCB through the workers of RAP implementation agencies. If satisfied, the DP claims resettlement payments from the PGCB. If confused, the matter is addressed in step 2.
Step 3	The DP approaches the GRCs. EA staff assists the DPs producing the complaints and organises hearing in 30 days from receiving the complaints.
Step 4	GRC sessions are held with aggrieved DPs, minutes are recorded and duly circulated. If resolved, the Project Director approves. If not resolved, the matter is addressed in step 5
Step 5	The case is referred to the court of law for settlement.
Step 6	The GRC minutes are approved by the PD's field office. The approved verdict is communicated to the complainant DP. The DP then claims resettlement payments from the PGCB.

E. Institutional Arrangements and Responsibilities

The institutions involved in the resettlement plan project are mainly PGCB, the Deputy Commissioner's (DC's) Office, the Agricultural Marketing Directorate, the Department of Forestry (DoF), the Public Works Department (PWD), and donor agencies. The main tasks and responsibilities of the institutions are planning, negotiating, consulting, approving, coordinating, implementing, financing, monitoring and evaluating land acquisition and resettlement. In the case of land acquisition, representatives of DC concerned, PGCB staff, PWD, Forest officials and representatives from affected communities will carry out joint verification of the inventory of affected persons and assets acquired (land, crops, structures, trees and others) to finalise the list for implementation purposes, particularly for payments to be made by the DC office. Furthermore, PGCB will make a separate joint verification of affected properties for their relocation prior to Project implementation.

Responsibilities of Implementing Agencies. PGCB will assign a Deputy General Manager as a Project Director (PD) at the head office for overall execution of the project. The PD will ensure the acquisition of land with assistance from district administrations. The PD will carry out the following major specific tasks relating to land acquisition and RP implementation; (i) liaison with district administration; (ii) lead the planning, management, monitoring and implementation of resettlement and rehabilitation program; (iii) ensure availability of budget for all activities; (iv) hand over land to the contractor; and (v) form necessary committees for RP implementation, and monitor the effectiveness of entitlement packages and payment modalities.

ADB's Responsibilities. The responsibilities include screening projects to specify ADB's safeguard requirements; undertake due diligence; review the Borrower's social and environmental assessments and plans; determine the feasibility of ADB financing; help PGCB in building capacity to deliver the safeguards; and monitor and supervise the Borrower's social and environmental performance. ADB discloses safeguard plans and frameworks on its website. If PGCB fails to comply with legal agreements on safeguard requirements, the ADB will seek corrective measures and work with PGCB to ensure compliance. Further responsibilities include assessment of projects and their environmental and social impacts, reviewing required information including assessment reports and monitoring reports, and to ensure that contractors

appropriately implement the agreed measures including the safeguard requirements in bidding documents and contracts.

G. Monitoring and Reporting

Regular monitoring of the environmental performance will be needed and an external monitor will be engaged by PGCB for the task. A quarterly monitoring report will be submitted to the PGCB which will be provided to ADB as per schedule.

Pre-construction Phase

Indicators	Locations	Frequency	Monitoring Agency
Proper compensation for landowners, crops and properties.	Sub- station site and two RoW sites	Every month	Project Director, PGCB
Soil samples need to be tested in the laboratory. .	Every tower site and sub-station site	Once before construction	Project Director, PGCB
Loss in crop production, Notify farmers well ahead of time. Provide adequate compensation.	Sub- station site and tower site	Every month	Project Director, Design Section, PGCB, (External Monitoring Agency) (EMA) and DC office
Un-hygienic condition for workers including water supply and sanitation	Labor shed at the site	Every month	Project Director, PGCB, Design Section, PGCB and EMA
Conflict with local community. Use local labourers as much as possible	Sub-station site and tower sites	Every month	Project Director, PGCB, Design Section, PGCB and EMA
Preparation of approach roads for transportation of heavy equipment.	Sub-station site and tower sites	Once before construction	Project Director, Design Section, PGCB and EMA

Construction Phase

Indicators	Locations	Frequency	Monitoring Agency
Spray water on roads before movement of vehicles by contractors	RoW sites as well as sub-station site	Every day	Project Director, PGCB and EMA
Transportation of materials by truck should be done at night by contractors	RoW sites as well as sub-station site	Every day	Project Director, PGCB and EMA
Preparation of sanitary waste disposal site for solid and liquid wastes.	RoW sites as well as sub-station site	Every week	Project Director, PGCB and EMA

Indicators	Locations	Frequency	Monitoring Agency
Adequate number of drains to carry storm water runoff	Sub-station site	Once a month	Project Director, PGCB and EMA
Adequate compensation for trees	RoW and sub-station site	Once a month	Project Director, PGCB and EMA
Avoid killing of animals	RoW and sub-station site	Every day	Project Director, PGCB and EMA
Crop compensation for affected land	RoW and sub-station site	Every week	Project Director, PGCB and EMA
Placement of adequate signs and posters for warning people	RoW and sub-station site	Once a month	Project Director, PGCB and EMA
Announcements to make communities aware about the risks of accidental events	RoW and sub-station site	Every week	Project Director, PGCB and EMA
Fire fighters with materials	RoW and sub-station site	Every day	Project Director, PGCB and EMA
Awareness of workers about hazardous materials and proper handling methods.	RoW and sub-station site	Every day	Project Director, PGCB and EMA

Post-Construction/ Operation Phase

Indicators	Locations	Frequency	Monitoring Agency
Land recovery after waste removal by contractor	Labor sheds	Once after implementation	PGCB and EMA
Failure in setting up tower and accident by electrocution	Tower sites and sub-station site	Every month	PGCB and EMA
Accident and power failure	Tower sites and sub-station site	Every month	PGCB and EMA
Vegetation with regular pruning.	Tower sites and sub-station site	Every three months	PGCB and EMA
Prevention of pilferage with proper security measures	Tower sites and sub-station site	Every three months	PGCB and EMA_

Chapter 1

Introduction

1.1 Background of the Study

The Honorable Prime Minister of the People's Republic of Bangladesh recently visited India. During this visit the Government of Bangladesh (GoB) signed an agreement with India to bring 250 megawatts of power from India. However, there is no transmission line between the two countries. In this context, the Power Grid Company of Bangladesh Ltd. (PGCB) is planning to construct transmission line facilities under the project "Proposed 30 km. long 400 KV Electricity Transmission Line Interconnection Project between the Eastern part of India (Bahrampur, West Bengal) and the Western Part of Bangladesh (Bheramara, Kushtia) and Associated back to back station Project". The PGCB has finalized the suitable route for the proposed transmission line from Bheramara, Kushtia to Bahrampur, West Bengal, India. The PGCB will now need an environmental clearance from the Department of Environment (DoE), Ministry of Environment and Forest, Government of the People's Republic of Bangladesh for implementing the transmission line and other ancillary works. With this end in view, the PGCB intends to conduct Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) studies including a Resettlement Action Plan (RAP) study.

The PGCB is required to take clearance from the DoE, Ministry of Environment and Forest, Government of the People's Republic of Bangladesh for implementing the transmission line and other ancillary works. With this end in view, an application in the prescribed format is to be submitted to the DoE along with copies of IEE and EIA reports and other necessary papers for the environmental clearance.

1.2 Study Area

The location of the project is shown in Figure 1. The proposed 400 kV transmission line will be constructed from Bheramara, Kushtia to Bahrampur, West Bengal, India. A 1X500 MW back to back-station will be constructed at Bheramara in Kushtia. The total length of the line is about 27.2 km. Beside this 5km LILO line will be constructed from back-to-back station site to Khulna-Ishwardi grid line.

The transmission line will be connected from the Indian border to the Mokarimpur back to back-station at Bheramara. It will avoid major settlements and pass mostly over agricultural and fallow lands. A 50 m wide Right of Way (RoW) will be required for the line. So a 50m wide path of the line is defined as the Direct Impact Area (DIA). As per baseline information, a 100 meter buffer impact zone on both sides of the line is considered to be the General Impact Area (GIA) of the study area. Both the DIA and GIA have been evaluated in this IEE study.

1.3 Objectives of the IEE

According to the EIA guidelines for Industries of the DoE, power plant and electricity distribution, construction /re-construction/ extension fall under the Red Category *(Category-D).* Red Category projects require EIAs that should be preceded by IEEs. As this project falls under the Red Category it is required to undertake an IEE which is a pre-condition for obtaining clearance by the DoE.

Hence, the PGCB has carried out an IEE through an Environment Impact Assessment Consultant to fulfill the requirement of the DoE. The main objectives of the IEE study included:

- Describing the existing environment of the area
- Assessing the potential environmental impacts, including any residual impact of the proposed project
- Identifying mitigation measures to minimize the impact
- Preparing an Environmental Monitoring Program
- Preparing a ToR for an EIA

1.4 Physical Components of the Project

The project has two major components which are:

i. Construction of a 27.2 km. 400 kV double circuit transmission line including 14 angle point towers and 75-80 load bearing towers

ii. Construction of a 5 km. 230 kV transmission line including 5 angle point tower and 15 load bearing towers.

iii. Construction of a new back to back-station (113.4334 acre land) at Mokarimpur mauza, Mokarimpur, Bheramara, Kushtia.

1.5 Scope of Work

The IEE will provide information on the baseline environmental condition (physical, biological and social environment) of the project area. Following DoE guidelines, the IEE will help to identify potential impacts of the proposed project activity on the environment of the project area. It will also be used as a basis to prepare the Terms of Reference (ToR) for the EIA and the Environmental Management Plan (EMP) against adverse impacts. The EMP shall also include an Environmental Monitoring Plan and institutional arrangements for future monitoring.

1.6 Limitations

An IEE is generally carried out as an integral part of the Feasibility Study prior to the selection of a project site. In the case of the present project, the IEE is being prepared as a separate document from the FS as the site of the project has already been finalized. Identification of the best site from environmental and engineering considerations was done by evaluating alternate sites. The best sites have been chosen for the environmental impact assessment.

1.7 The EIA Team

The EIA team of the proposed project comprises the following Professional Experts:

Mr. Mujibul Huq, Environmental Planner, IEE Study Team Leader

Mr. Ahmadul Hassan, Planning Engineer

Dr. Dilruba Ahmed, RAP specialist

Mr. Subrata Kumar Mondal, Socio-Economist

Mr. Sazzadul Haq, GIS/RS Specialist

Mr. Abdur Rashid, Agronomist

Mr. Shibly Sadik, Ecologist

A group of field workers with multidisciplinary backgrounds helped the team by collecting data from the field.

1.8 Methodology

The report has been prepared based on information on the project activities supplied by the project proponent (PGCB). The Consultant's multidisciplinary team of experts also made reconnaissance and exploratory site visits. The interaction between the project activity and the significant environmental components was made based on a checklist. This checklist was prepared following the DoE Guidelines for selected industries (DoE, 1997), Environmental Guidelines for selected industrial and water development projects (ADB 1990) and the Consultants' experience with similar projects.

At the IEE stage socio-economic data and environmental data were collected from the project area (along the transmission line and back to back-stations) by using socioeconomic and environmental questionnaires in 500 m wide areas on both sides of the line and back to back station site.

Environmental and socio-economic data from different sources (B.B.S., DoE, Department of Meteorology, BWDB; Agro-climatic survey of Bangladesh and other IEE reports) of the proposed project area were collected to prepare the baseline environmental and socio-economic profile of the study area. The Consultant's multi-disciplinary team of experts made a reconnaissance visit to observe the condition of the project site and its surroundings and to identify alternate sites for investigation.

The environmental baseline, project components, possible environmental impacts, mitigation measures and environmental monitoring plan are presented in a report following the ADB and DoE guidelines.

1.9 Structure of the Report

The report has been structured in compliance with the requirement of the TOR.

Chapter 1: Introduction: The introduction chapter presents a brief overview of the assignment along with its background, objectives, scope of work, methodology etc.

Chapter 2: Policy and Legislation: Chapter Two outlines the Policy and Legislation on environmental issues.

Chapter 3: Project Description: Chapter Three describes the proposed interventions including alternative options suggested by the project, background, project category, need for the project, location, size and magnitude of operation.

Chapter 4: Description of Environmental Baseline: Chapter Four presents a description of the environmental baseline condition (socioeconomic, physical and biological) of the project area.

Chapter-5: Evaluation of Potential Environmental Impacts and Mitigation Measures: This chapter deals with the environmental impacts of the proposed project and possible mitigation measures. Opinions of the local people have also been elaborated in this chapter.

Chapter 6*: *Institutional Requirement and Environmental Monitoring Program: The chapter mainly deals with the monitoring program of the project.

Chapter 7: Public Consultation: This chapter mainly describes the public opinion of the project as well as the major problems, impacts and probable solutions recommended by the project.

Chapter 8: Findings Recommendations and Conclusion: This chapter presents the findings, conclusion, and recommendations of the project.

Chapter 2

Policy and Legislations

2.1 Overview

The construction and extension of back-to-back grid stations including transmission line facilities of the project proposed to be implemented by the PGCB requires strict compliance with laws, rules and regulations pertinent to the environment. The DoE is responsible for ensuring the application of environmental laws and issuance of necessary clearances.

The procedures and requirements for EIA under the power sector are dictated by the Environment Conservation Act of 1995, which introduced a requirement for any proposed "industrial unit or project" to obtain prior approval from the DoE.

The Environment Conservation Act has classified projects to be assessed (by the DoE) in four categories (Green, Amber A, Amber B, and Red). The power development projects are allocated to the red category, which triggers an automatic requirement for an Initial Environmental Examination (IEE) followed by a full EIA. Subject to a satisfactory review of the environmental assessment, the DoE issues an authorization for the project to proceed. The authorization consists of two parts: a "site clearance", which gives approval to the site proposed for the project and "environmental clearance", which approves the content of the project.

The PGCB, as project proponent, is responsible for carrying out an EIA study of the proposed project. Therefore, it has the responsibility for administering the environment assessment process with the consultants, review the findings, and submit the documents to the DoE for review.

A key requirement of the EIA for projects classified in the Amber and Red categories is an Environment Management Plan (EMP). The function of the EMP is to enable the project proponent PGCB to show the DoE how it will deliver the environmental performance assessed in the EIA (for which DoE approval is sought). The EMP must describe in detail organization and management responsibilities, give details of how mitigation measures identified in the EIA will be implemented and explain how monitoring will be carried out.

Possession of a "clearance" from the DoE does not relieve the developer of a project from the requirement to comply with other environmental regulations. In particular, the Bangladesh national Environment Quality Standards (EQS) for industrial effluent have been set and compliance is mandatory. In addition, there are statutory instruments applicable to power development projects, which are not primarily environmental but which influence environmental impacts. Compliance with such statutory instruments is mandatory.

2.2 Procedure for Obtaining Site/Environmental Clearance

2.2.1 Requirement for Initial Environmental Examination (IEE) Report

All industries and projects in the Red category have to conduct IEEs, which help in understanding the potential extent of environmental changes and finding ways to mitigate

negative impacts by considering available information, past experience or standard operating practices. The steps for conducting IEEs are:

(i) Collection of baseline information in respect of a project and the environmental setting of the project and its site.

(ii) Setting of boundaries of an IEE by identifying the significant issues.

(iii) Impact assessment suggesting mitigation measures, Environment Management Plan (EMP), alternative sites or other project modifications.

(iv) In the event the IEE of the project or industry reveals that further investigation is to be carried out, the sponsors will have to conduct a detailed EIA.

2.2.2 Procedure

After completion of the EIA report the project proponent should apply to the DoE in the prescribed format for site/ environmental clearance. The application for the environmental clearance for a project classified in the 'Red' category should be accompanied by the following documents:

a) Feasibility Study Report of the industry (project)

b) EIA report

c) An NOC (No Objection Certificate) from the local authorities concerned

d) Pollution minimization plan including emergency plan for the mitigation of adverse environmental impacts

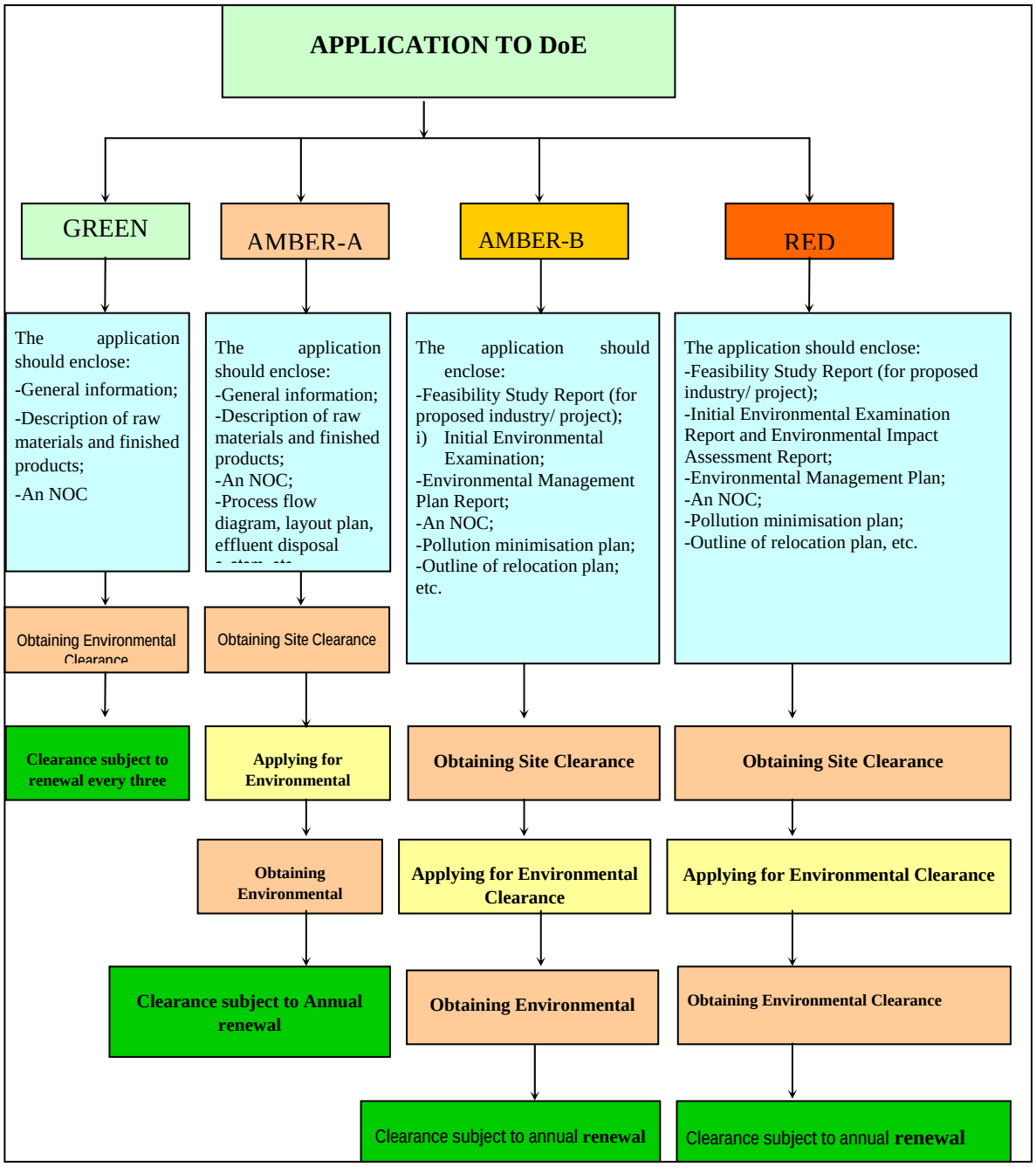
e) Outline of relocation plans (where applicable)

f) Other information as deemed necessary

It is also mentioned in the Environment Conservation Rules, 1997 that the Director General of the DoE can issue environmental clearance directly without issuing any site clearance to any industry or project if he (the Director General) finds appropriate reasons for doing so.

As the proposed construction and extension of the Back-To-Back Grid Stations Including Transmission Line Facilities Project falls under the "Red" category, all necessary requirements mentioned above have been adopted for the project.

Figure 2.1 shows the activities involved in environmental clearance.



NOC = No Objection Certificate, usually obtained from local government.

Note: 1. These requirements vary from those of the DoE (1997) in requiring EMPs for proposed, as well as current, projects.

2. Procedure of obtaining Environmental Clearance:

for Green Category Projects the gestation period for granting Environmental Clearance has been fixed at within 15 days; for Orange A, Orange B and Red Category Projects at first Location Clearance and thereafter Environmental Clearance will be granted. The gestation period for Location Clearance is within 30days for Orange A, and within 60days for Orange B and Red Category Projects.

Source: Adapted from the Environmental Guidelines for Industry (DoE, 1997)

Figure 2.1: DoE Environmental Clearance Procedures

2.3 Organization Related with Enforcement of Environmental Standards

The roles and responsibilities of different ministries and departments related with enforcement of environmental requirements are described below in brief:

2.3.1 Ministry of Environment and Forest (MoEF)

The Ministry of Environment and Forest (MoEF) is the key government institution in Bangladesh for all matters relating to national environmental policy and regulatory issues. Realizing the ever-increasing importance of environmental issues, the MoEF was created by replacing the Ministry of Agriculture and Forest in 1989 and is at present a permanent member of the Executive Committee of the National Economic Council. This group is the major decision-making body for economic policy issues and is also responsible for approving all public investment projects. The MoEF oversees the activities of the following technical/implementing agencies:

- Department of Environment (DoE)
- Forest Department (FD)
- Forest Industries Development Corporation (FIDC)

Department of Environment (DoE)

In order to expand the scope of environmental management and to strengthen the power for achieving it, the Government adopted the Environmental Pollution Control Ordinance in 1977. The ordinance provided for the establishment of an Environmental Pollution Control Board, which was assigned with the responsibility of formulating policies and proposing measures for their implementation. In 1982, the Board was renamed as the Department of Environmental Pollution Control (DEPC). Six divisional offices were established in Dhaka, Chittagong, Khulna, Barisal, Sylhet and Rajshahi.

A special presidential order again renamed the DEPC as the Department of Environment (DoE) and placed it under the newly formed MoEF in 1989.

The DoE is a department of the MoEF and is headed by a Director General (DG). The DG has complete control over the DoE. The power of the DG, as given under the Act, may be outlined as follows:

- The DG has the power to close down activities considered harmful to human life or the environment. The operator has the right to appeal and procedures are in place for this. However, if the incident is considered an emergency, there is no opportunity for appeal.
- The DG has the power to declare an area affected by pollution as an ecologically critical area. The DoE governs the type of work or process, which can take place in such an area.
- Before undertaking any new development project, the project proponent must take an Environmental Clearance from the DoE. The procedures to take such clearance are in place.
- Failure to comply with any part of the Environment Conservation Act (ECA) 1995 may result in punishment by a maximum of 5 years imprisonment or a maximum fine of Tk. 100,000, or both.

Forest Department

This Department under the MoEF is responsible for the protection and management of all Reserve Forests of the country. The personnel of the department extend down to the union level in areas where there are Reserve Forests. It has recently started some agro forestry programmes. The Forest Department officers are also responsible for the protection of wildlife in the forests.

Related Other Organizations

There are several other organisations, which are related with certain social and environmental functions. These organisations include:

g) Ministry of Land: Land Reform and Land Acquisition Directorate

h) Ministry of Water Resource: Bangladesh Water Development Board (BWDB)

i) Ministry of Fisheries and Livestock: Department of Fisheries

2.4 Relevant National Policies and Legislation Relevant to Environment

National Strategies, Policies, Acts and Rules related to the environment include the following:

- The Environment Pollution Control Ordinance, 1977.
- The Environmental Quality Standards for Bangladesh, 1991
- The National Conservation Strategy (NCS) 1992
- The Environment Policy (1992)
- The National Environment Management Action Plan (NEMAP) 1995
- The Environment Conservation Act (1995)
- The Environment Conservation Rules (1997)

The 1997 Rules were adopted under the provision of the ECA 1995.

Other relevant laws related with the environment include:

2.4.1 The Bangladesh Wildlife Preservation Order (1973; amended to Act in 1974)

The Bangladesh Wildlife (Preservation) Order of 1974 provides for the preservation, conservation and management of wildlife in Bangladesh. The earlier legislations on wildlife preservation, namely, the Elephant Preservation Act, 1879, the Wild Bird and Animals Protection Act, 1912, and the Rhinoceros Preservation Act, 1932 have been repealed and their provisions have been suitably incorporated in this law.

2.4.2 The National Forest Policy (1994)

The National Forest Policy of 1994 is the amended and revised version of the National Forest Policy of 1977 in the light of the National Forestry Master Plan. The major target of the policy is to conserve the existing forest areas and bring about 20% of the country's land area under the forestation programme and increase the reserve forest land by 10% by the year 2015 through coordinated efforts of GO-NGOs and active participation of the people.

2.5 Policy Related with Energy Development

2.5.1 The Electricity Act, 1910

The Electricity Act was enacted in 1910 to amend the laws relating to the supply and use of electrical energy. Under this Act, any person can get a license to supply energy and to lay down or place electric supply lines for the conveyance and transmission of energy. The licensee can open and break up the soil and pavement of any street, railway or tramway and can lay down any line or do other work near other utility services (like gas, T&T, water, sewer, etc.), provided prior permission is taken from the respective authority, as stated in Section 12 – 18 of this Act.

According to Section 19 (1) of this Act, the licensee shall give full compensation for any damage, detriment or inconvenience caused by him or by anyone employed by him.

Sub-section (1) of Section 51 of the Electricity Rules, 1937; advise that the licensee should take precautions in laying down electric supply lines near or where any metallic substance or line crosses in order to avoid electrocution.

2.5.2 The Telegraph Act (1885)

Part III Power to place Telegraph Lines and posts

Under the Act 10-19, the government can built towers on public land without giving any land compensation.

2.5.3 The Power Policy, 1995

Like the Petroleum Policy, this is presently an integral part of the National Energy Policy 1996. It has different policy statements on demand forecast, long-term planning and project implementation, investment and lending terms, fuels and technologies, power supply to the west zone, isolated and remote load centers, tariff, captive and stand by generation, system loss reduction, load management and conservation, reliability of supply, system stability, load dispatching, institutional issues, private sector participation, human resource development, regional/international cooperation, technology transfer and research program, environment policy and legal issues.

As the proposed project is a Power Transmission Project, all necessary requirements mentioned above will be adopted for the project.

2.5.4 The Energy Policy (1996)

The National Energy Policy provides for the utilization of energy for sustainable economic growth, supply to different zones of the country, development of the indigenous energy source and environmentally sound sustainable energy development programmes. The policy highlights the importance of protecting the environment by requiring an EIA for any new energy development project, or introduction of economically viable and environment friendly technology.

2.5.5 The Industrial Policy (1999)

The National Industrial Policy, 1999 aims to ensure a high rate of investment by the public and private sectors, a strong productive sector, direct foreign investment, development of labor intensive industries, introduction of new appropriate technology, women's participation, development of small and cottage industries, entrepreneurship development,

high growth of export, infrastructure development and environmentally sound industrial development. WTO guidelines have been proposed to be followed in the Industrial Policy.

2.6 Compliance with International Requirements

Bangladesh has acceded to, ratified or signed a number of major international treaties, conventions and protocols related to environment protection and conservation of natural reSource.

2.6.1 Rio Declaration

The 1992 United Nations Conference on Environment and Development (UNCED) adopted the Global Action Program for sustainable development called 'Rio Declaration' and 'Agenda 21'. Principle 4 of The Rio Declaration, 1992, to which Bangladesh is a signatory along with a total of 178 countries, states, "In order to achieve sustainable development, environmental protection should constitute an integral part of the development process and cannot be considered in isolation from it".

2.6.2 Convention on Biological Diversity, (1992)

The Convention on Biological Diversity, 1992 was adopted on 05 June 1992 and entered into force on 29 December 1993. Bangladesh ratified the Convention on 20 March 1994. This is the overarching framework for biodiversity and the signatories are required to develop a National Biodiversity Strategy and Action Plan that incorporates the articles of the convention into national statutes.

The obligations have been placed on state parties to provide for environmental impact assessments of projects that are likely to have significant adverse effects on biological diversity.

2.6.3 Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar (1971)

This convention is also known as the Ramsar Convention. It was adopted on 02 February 1971 and entered into force on 21 December 1975. Bangladesh ratified the Convention on 20 April 2002. This provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their reSource. There are 127 Parties with 1085 wetland sites designated as 'Wetlands of International Importance'.

This is an intergovernmental treaty, which provides the framework for international cooperation for the conservation of wetland habitats. Obligations for Contracting Parties include the designation of wetlands to the "List of Wetlands of International Importance', the provision of wetland considerations within their national land use planning, and the creation of Natural reserves.

Bangladesh has two Ramsar sites- Parts of the Sundarbans Reserved Forest (Southwest of Bangladesh) and Tanguar Haor (Northeast of Bangladesh). The proposed project will not have any effect on these two Ramsar sites.

2.6.4 United Nations Convention on the Law of the Sea, Montego Bay, (1982)

This Convention was adopted on 10 December 1982 at Montego Bay, Jamaica. Bangladesh has ratified this Convention.

2.6.5 Others (Conventions and Agreements)

The following conventions and agreements may include provisions relevant to different aspects of oil and gas operations for environmental management, nature protection, and biodiversity conservation:

- Convention relative to the Preservation of Fauna and Flora in their Natural State 1933; International Convention for the Protection of Birds, Paris, 1950;
- International Plant Protection Convention, Rome, 1951;
- Convention concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 has been ratified by 175 states. This defines and conserves the world's heritage by drawing up a list of natural and cultural sites whose outstanding values should be preserved for all humanity. Of the 730 total sites, there are currently 144 natural, 23 mixed and 563 cultural sites that have been inscribed on the World Heritage List (distributed in 125 State parties). These are the 'Jewels in the Crown' of conservation;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973 (Popularly known as CITES): This provides a framework for addressing over harvesting and exploitation patterns, which threaten plant and animal species. Under CITES governments agree to prohibit or regulate trade in species which are threatened by unsustainable use patterns; and
- Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979 (Amended 1988): This provides a framework for agreements between countries important to the migration of species that are threatened.

2.7 Compliance with ADB Safeguard Policy Statement, 2009

The ADB has issued Safeguard Policy Statement in June 2009 (SPS, 2009). According to the ADB SPS 2009, the proposed 400 kV power grid connection project and 500 MW HVDC back-to-back substation projects have fall in category – "B", which requires IEE only. The present study was carried out considering the ADB guidelines along with Bangladesh rules and regulations which are almost the same as the present SPS, 2009, ADB.

Overarching Statement on ADB's Commitment and Policy Principles

The goal of the SPS, 2009 is to promote the sustainability of project outcomes by protecting the environment and people from projects' potential adverse impacts.

The objectives of ADB's safeguards are to: (i) avoid adverse impacts of projects; (ii) minimize, mitigate, and/or compensate for adverse project impacts; and (iii) help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

By adhering to its social and environmental safeguards, ADB enhances the predictability, transparency, and accountability of its actions and decision making; helps borrowers/clients manage social and environmental impacts and risks; and promotes the longterm sustainability of investments.

Key safeguard areas: (i) environmental, (ii) involuntary resettlement, & (iii) Indigenous Peoples.

ADB adopts a set of specific safeguard requirements that borrowers/clients are required to meet in addressing environmental and social impacts and risks.

ADB will not finance projects that do not comply with its safeguard policy statement, nor will it finance projects that do not comply with the host country's social and environmental laws and regulations.

This safeguard policy statement applies to all ADB-financed and/or ADB-administered sovereign and non-sovereign projects, and their components regardless of the source of financing.

Environmental Safeguards: Policy Principles:

1. Use a screening process for each proposed project, as early as possible.

2. Conduct an environmental assessment for each proposed project. Assess potential trans-boundary and global impacts, including climate change.

3. Examine alternatives to the project's location, design, technology, and components.

4. Avoid/minimize, mitigate, and/or offset adverse impacts. Prepare an environmental management plan (EMP)

5. Carry out meaningful consultation with affected people and facilitate their informed participation.

6. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.

7. Implement the EMP and monitor its effectiveness. Document and disclose monitoring results.

8. Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area.

9. Apply pollution prevention and control technologies and practices consistent with international good practices such as the World Bank Group's Environmental, Health and Safety Guidelines.

10. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease.

11. Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys.

2.8 Compliance with PGCB HES Requirements

Compliance with PGCB HES Requirements will be ensured for this project.

The PGCB has its own policy and requirements to ensure compliance relating to environment, health and safety issues for its operations. The company is committed to managing its operations in a safe, efficient and environmentally responsible manner. The PGCB's HES manuals,

guidelines, procedures and plans are important tools of their commitment. HES manuals include:

- Environmental Impact Assessment Module
- Guideline on Integrated Impact Assessment
- Health Impact Assessment Module, and
- Social Impact Assessment Module

In addition, their requirement for impact assessment is affirmed in the PGCB's Statement of General Business Principles. The PGCB is committed to:

- Pursuing the goal of no harm to people
- Protecting the Environment, and
- Managing Health Environment and Safety (HES) as any other critical business activity.

The mandatory company Operations Management System (OMS), Environmental Care Element/ Standards, issued in March 1997, makes reference to Environmental Assessment as "Environmental Impact Assessment (including a consideration of social impacts) shall be conducted prior to all new activities and facility developments, or significant modifications of existing ones'.

2.9 The Building Construction (Amendment) Act.1990 and Building Construction Rules '96

The Building Construction Act dates back to the early fifties of the last century. Documents however, indicate the existence of the Government Buildings Act, 1899, which is to provide for the exemption from the operation of municipal building laws of certain building and lands, which are the property or in the occupation, of the Government and situated within the limits of a municipality. The provision of Municipal Building Laws to regulate the creation, recreation, construction, alteration or maintenance of buildings within the limits of any municipality has been superseded by this Act. Subsequently, the need to provide for the prevention of haphazard construction of buildings was felt by the East Bengal Legislative Assembly in 1952. Accordingly the "Building Construction Act, 1952" was promulgated on 21 March 1953 as the East Bengal Act II of 1953.

The B.C. Act 1952 was conceived to enforce the activities towards streamlining planned development and beautification programmes of the government.

Since its promulgation in 1953 the Act was in force with very little or no amendment up to 1986 when a very important modification of far-reaching consequence was added through proclaiming an Ordinance titled, "the Building Construction (Amendment) Ordinance, 1986 (Ordi No. LXXII of 1986)" by the then government. Later in 1987, the National Assembly in its March session adopted the ordinance for enactment as "The Building Construction (Amendment) Act, 1987 (Act No. 12 of 1987)". The preamble to state the objectives of the amendment reveals that "although the trial court has the power to order removal of unauthorized construction after passing the order of conviction under section 12, this power has been found to be insufficient, as a criminal case can not normally be finally disposed of quickly, besides even after disposal of the criminal case by the trial court, the prosecution is lingered by way of appeals". In order to take steps to prevent unauthorized construction or to remove such construction, the

authorized officer is empowered through this amendment so that he/she can take necessary action in this respect without intervention of the court.

The Act was subjected to another amendment in 1990 allowing some power to the A/O issuing limited sanction to cut down or raze any hill within the area to which this Act applies.

To support the implementation of the provisions laid down in the B.C. Act, 1952, the Government made the B.C. Rules, 1953. This was superseded by the Imarat Nirman Bidhimalas, 1984. Later in 1996 the Government framed the Imarat Nirman Bidhimala, 1996 (Building Construction Rules, 1996). The Rules are more comprehensive for taking care of the present day circumstances and issues of building construction and other related development activities.

2.10 Land Acquisition Rules and Regulations:

The acquisition of Immovable Property Rules, 1982 (No. S. R. O. 172-U82): The Government made these rules in exercise of the powers conferred upon by section 46 of the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordi. No. II of 1982). The rules spell out the procedural details required for the acquisition of immovable properties in the following subheads:

a) Proceedings for acquisition,
b) Notices under section 3, 6, and 7,
c) Declaration of acquisition and possession,
d) Declaration of abatement and revocation of proceedings,
e) Transfer of acquired land,
f) Assessment of compensation, and
g) Unutilized acquired property.

Forms A, B, C, D, E, F. G. and H, which need to be appended to these rules, have also been specified. Consequent upon these rules the Ministry of Lands has issued several circulars to regulate the land acquisition process. The circular No. 4/95 issued on 14/03/1995 specifies some actions required to be taken to process land acquisition cases.

2.11 Rules and Policies in Related Fields

In addition to the policies, rules and regulations related to the environment and energy, the following rules and regulations, listed in Table-2.1, are to be checked for compliance for maintaining a sustainable environment.

Table 2.1: Environmental Laws, Regulations and Standards of Bangladesh

Year	Title	Objectives
1885	The Telegraph Act (Act XIII of 1885)	Under the law sections 10-19, Government built transmission line through the country.
1910	The electricity Act (Act IX of 1910)	Under the law section 51, Government built transmission line through the country.
1950	East Bengal Protection and	Protection and conservation of fish in

Year	Title	Objectives
	Conservation of Fish Act	Bangladesh.
1985	The Protection and Conservation of Fish rules	Prevention of harming fisheries resource and fisheries habitat in coastal and inland waters.
1953	Town Improvement Act	Improvement and development of Dhaka City.
1958	Antiquities Act	Protection and preservation of archaeological and historical artifacts
1960, 1966	Port rules, shipping operation	Control of discharges in ports; waterway rules.
1965	Factories Act	Industrial workers' health and working conditions.
1971	Pesticide Ordinance	Pesticide use, production, selection and importation.
1976	Antiquities (Amendment) Ordinance	Protection and prohibition export of archaeological artifacts.
1977	Municipal ordinance	Municipal activities in health, sanitation, water supply, drainage, etc. in the city.
1979	Factory Rules	Disposal of wastes and effluents.
1980	Agricultural Pesticides (Amendment) Act	Selection, use and handling of pesticides in the agricultural sector.
1982	Municipal Act	Drainage, sewerage, water supply and sanitation.
1982	Acquisition and Requisition of Immovable Property ordinance	The Acquisition of Immovable Property Rules, 1982 (No. S. R. O. 172-U82) The Government adopted these Rules in exercise of the powers conferred upon by Section 46 of The Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance No. II of 1982).
1983	Agricultural Pesticides (Amendment) Ordinance	Revised Agricultural Pesticides Ordinance.
1985	The Pesticide Rules	Pesticide selling, use and safety measures.
1990	Bangladesh standard specification for drinking water.	Formulation and revision of national standards.
1860	The Penal Code	This contains several Articles related with environmental protection and pollution management.
1996	Building Construction (Amendment) Act and Building Construction Rules	The Rules are more comprehensive for taking care of the present day circumstances and issues of building.

Chapter 3

Description of the Project

3.1 Major Components of the Project

The proposed 400 kV grid interconnection between Bangladesh and India and associated back-to-back station project is planned to be set up from Pakuria mauza of Ramkrishnapur union in Daulatpur upazila to Char Mukarimpur mauza of Mukarimpur union in Bheramara upazila under Kushtia district. One new back-to-back station will be constructed (in around 113.4334 acres of land) at Char Mokarimpur and Mokarimpur mauza of Mokarimpur union in Bheramara upazila. The main activities under each sub-project are given in the following table.

Name of Sub-project	Length of T/L and area	Main activities
400 kV Grid Interconnection between Bangladesh - India and 1 X 500 MW HVDC back-to-back station at Bheramara (Kushtia)"	27.169 Km	Construction of 400 kV Baharampur (West Bengal, India) – Bheramara (Kushtia, Bangladesh) Double Circuit (DC) overhead transmission line (Bangladesh portion)
	5.00 Km	Construction of Line In and Line Out (LILO) of 230 kV Ishwardi –Khulna DC (Twin Conductor) overhead transmission line at Bheramara associated with the Bangladesh-India power exchange programme.
	113.4334 acre	Construction of a 1 X 500 MW HVDC back-to-back station at Bheramara (Bangladesh) associated with the Bangladesh-India power exchange programme.

The alignment of the proposed line will pass through mainly agricultural and fallow lands avoiding major settlements. The alignment has been chosen out of three alternative options. The criteria considers open agricultural land the distance of which from connecting roads should not be more than 1 km, rural and regional road crossings, avoiding settlements and urban areas as much as possible, as well as avoiding river crossings, water bodies and existing power distributing lines and the location of the back-to-back station.

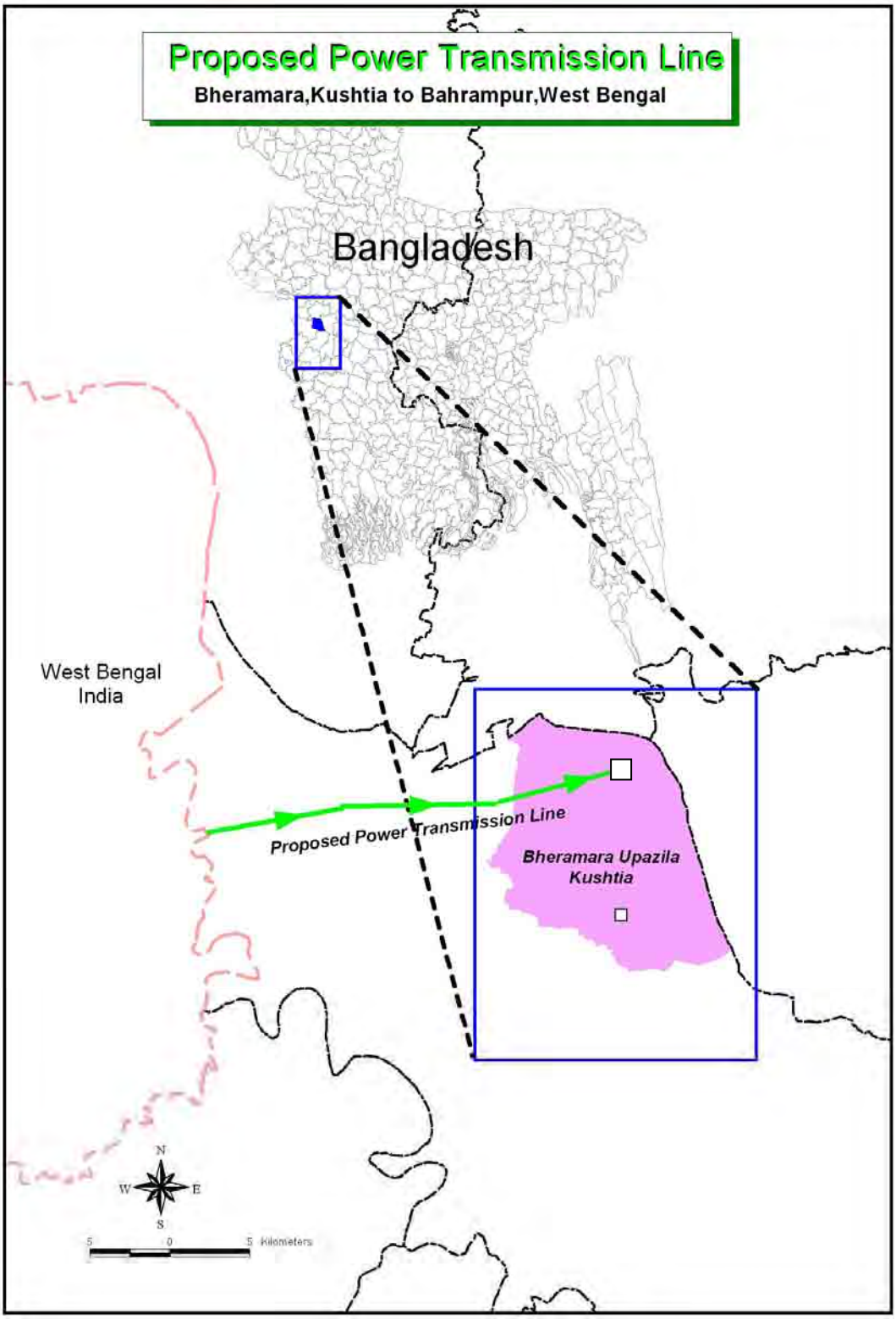
The alignment of the proposed line will pass through mainly agricultural and fallow land avoiding major settlements. The alignment has been fixed considering these issues. However, the line will cross rural and regional roads.

3.2 Project Category

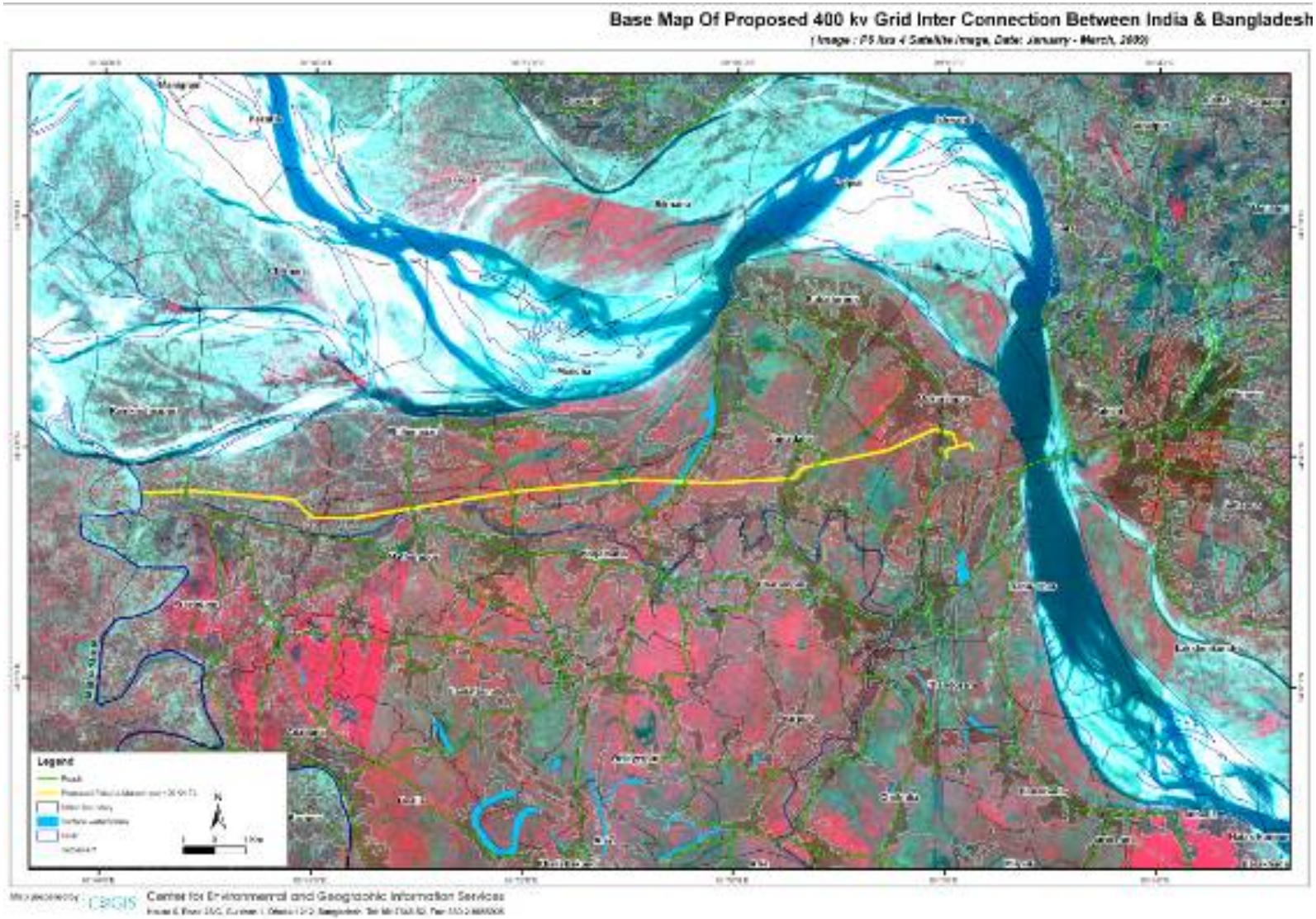
Under the criteria of the DoE the power grid line falls under Category - D (Red Category) that requires an EIA. As per the EIA Guidelines of the DoE, it is mandatory to carry out an IEE for Category-D projects prior to conducting EIA. The IEE report should be submitted to get environmental clearance. Therefore, this report has been prepared to fulfill the requirement of the IEE. But for ADB concern, the proposed project falls under Category "B" and likely it requires only IEE.

3.3 Project Location

The project is located in the south-west zone of Bangladesh covering only one district. The locations of the project are shown in Map 3.1, 3.2 and 3.3. Two A3 size maps are also attached in the last of the report.



Map 3.1: Location of the transmission line in Bangladesh



Map 3.2: Proposed line and back-to-back station site

Map 3.3: Proposed back-to-back station site

3.3.1 Alignment Selection Factors

The following criteria were considered for selecting the alignment of the route:

- Consider open agricultural land
- Distance from connecting road should not be more than 1 km
- Avoid settlement areas as much as possible
- Avoid urban areas as much as possible
- Avoid river crossings
- Avoid water bodies
- Consider the existing power distributing line
- Location of grid back to back-station

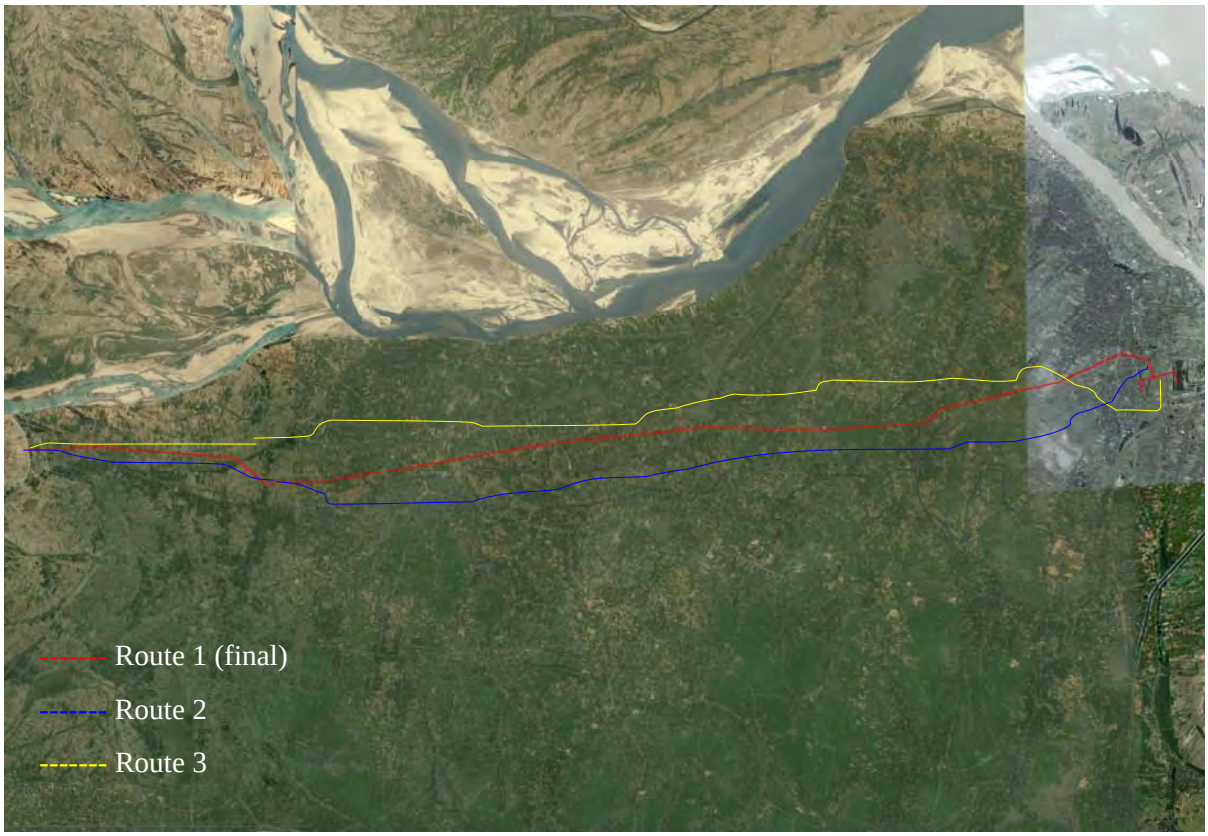
3.3.2 Alternative Considerations

Three alternative transmission lines were selected through consulting maps and satellite images and a comparative analysis was done. The comparison with length and different characteristics are shown in the following Table 3.2. The alternative routes are also shown in Figure 3.2.

Table 3.2: Comparisons of alternative routes of each lines

Sub-project	Route option	Length (Km) approximate	Characteristics
Pakuria-Char Mokarimpur	1	27.169	- Shortest route - Crossing less number of settlements than the second and third options
	2	29.5	- Moderate length - Crossing more settlements than the first option
	3	32.00	- The longest route Crossing more settlements than the second option

The Pakuria-Char Mokarimpur 400 kV transmission line (about 27.169 km) will pass over various mauzas under Daulatpur and Bheramara upazila (the table shows the administrative units traversed by the proposed line). A back-to-back station will be constructed (113.4334 acre) at Char Mokarimpur and Mokarimpur mauza in Bheramara upazila of Kushtia district.



Map 3.4: Alternate route alignment of the Pakuria-Char Mokarimpur 400 kV Transmission Line

3.3.3 Alignment Suitability

Based on the comparative analysis the final alignment (option-1) was found to be the most suitable. This option will require the least land acquisition. Heavy equipment may easily be transported to the location while disturbance to the host community will be the least and no important site will b e affected. Good communication to the proposed transmission line will allow the project to start immediately.

3.4 Physical Features of the Transmission Line

The major physical features of 400 kV transmission line are given in Table 3.3. The transmission line will be double circuit, made of Alluminium Alloy conductor materials. The line supporting towers will be steel towers which are of two types – Tension and Suspension. Tension towers will be installed in angles (Fig. 3.1a & 3.1b) and suspension towers will be installed along the line (Fig. 3.2a & 3.2b) as load bearing support. A disc type insulator will be used in the towers to bear the wire (Fig. 3.3a & 3.3b).

Table 3.3: Physical features of transmission line

Sl. No.	Physical Features	Attribute
1	Voltage Rating	400 kV
2	Type of Transmission Line	Double Circuit
3	Width of T/L Right of Way	50 m
4	Type of Line Support	Steel Towers – tension for angles & suspension

Sl. No.	Physical Features	Attribute
		for load bearing
5	Conductor Material	Alluminium alloy (AAAC)
6	Line Insulator	Disc type
7	Type of Connection	Back-to-back station
8	Duration of Project Implementation	Approximately 24 months

Figure 3.1a: Tension towers in the angle points

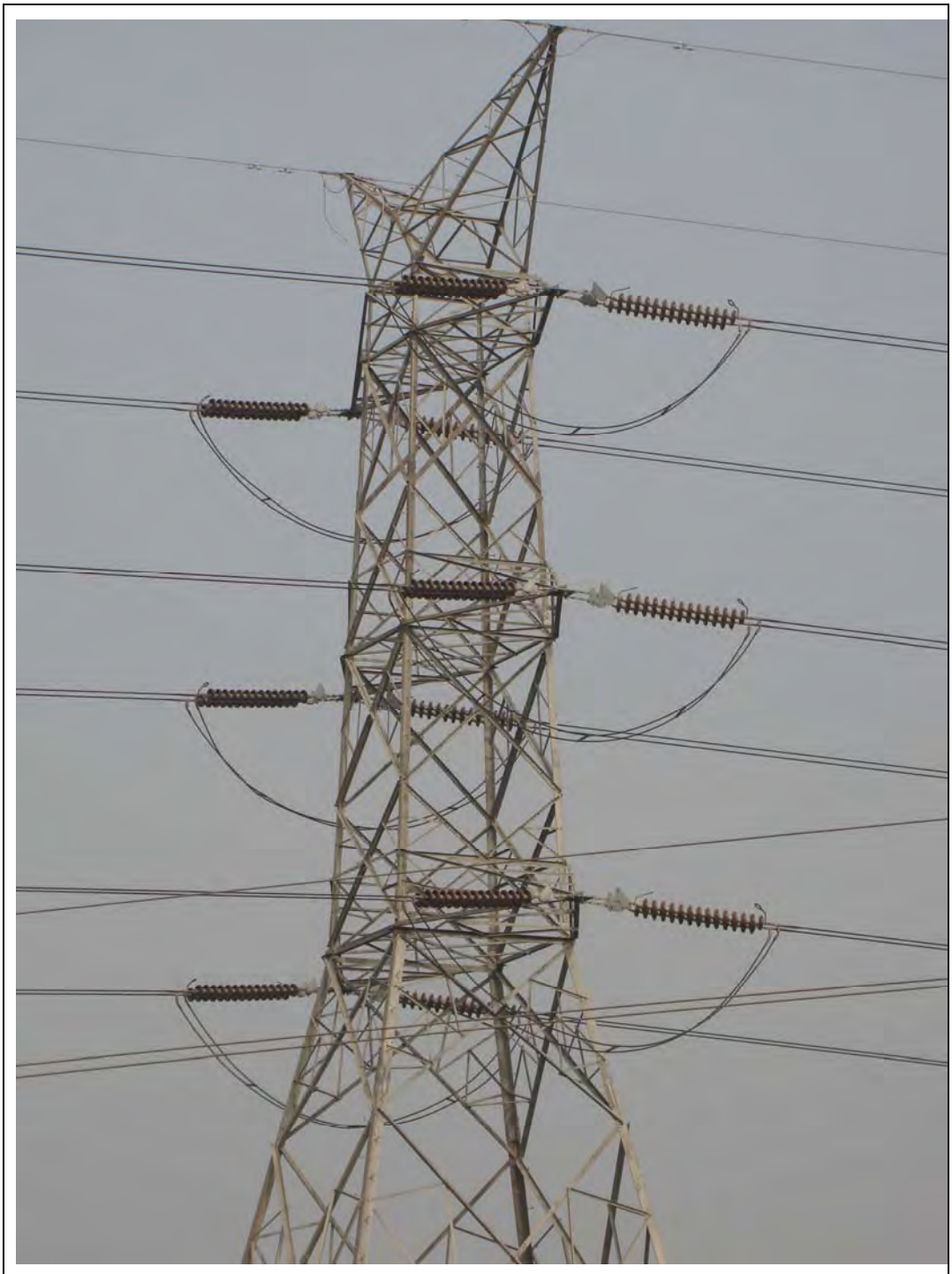


Figure 3.1b: Tension towers in the angle points

Figure 3.2a: Suspension towers along the transmission line

Figure 3.2b: Suspension towers along the transmission line

Figure 3.3a : Disc Insulator

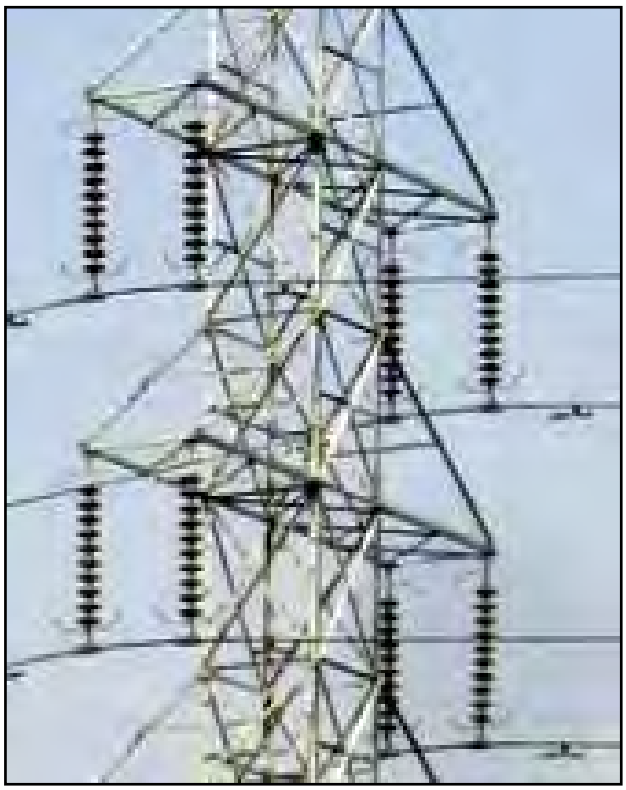


Figure 3.3b : Disc Insulator

3.5 Physical Features of the Back to back-stations

Back to back station has mechanical specifications for voltage, switchgear, circuit breaker, transformer, and protection systems. The key physical features of the back to back-stations are given in Table 3.4. The back to back-stations will be newly constructed.

Table 3.4: Physical features of the Char Mokarimpur back to back-station

Features	Specification
Type	Proposed (on going)
Land ownership	Most of the land to be acquired are owned by Bangladesh Railway in the south-west zone, as well as some private land owned by local people.
Scheme	Main Busbar scheme
No & Capacity	1 x 500 MW HVDC back-to-back station
Voltage	400 kV
Switchgear Type	Air-insulated
Insulation Medium Power Circuit Breaker	Gas
Transformer	Mineral oil
Protection System Description	Auto fire extinguisher

3.6 Component of the Construction Works

The activities in each component of the transmission line are almost similar. The activities to be undertaken include:

400 kV overhead transmission line

- Land acquisition and resettlement (if required)
- Clearing of RoW
- Establishment of temporary access tracks
- Establishment of material storage areas and work sites
- Transport of materials and equipment to site
- Establishment of construction camps for workers
- Pole erection
- Wire stringing

Transformer installation

- Land acquisition and clearing (if required)
- Transport of materials and equipment to site
- De-energizing of back to back station
- Equipment installation
- Testing and Commissioning of Equipment

Safety Measures

The proposed projects have the following security measures:

Fire fighting Equipment

As the back to back-station is vital installations, fire fighting equipment of appropriate specification will be procured and installed.

First aid Materials

First aid boxes are to be kept at the installation.

Boundary Wall and Security

A boundary of reasonable height will be constructed and protection wire will be put up on the walls. Trained security guards will also be provided.

3.6.1 Civil Construction Works

Earth Work in Foundation

Construction of the back-to-back station needs earthwork for excavating the foundation up to the required depth. The excavated earth should be kept in a nearby vacant place and after finishing the foundation work back filling of the excavated area will be done with local sand.

Foundation Treatment

The foundation area will be investigated geo-technically. The test result will help in designing the foundations of the structures. It will help to identify if foundation treatment is required. The type of treatment like bullah piling, pre-cast RCC piling or in situ concrete piling, sand piling, removal of peat or loose soil will be suggested after geo-technique investigation.

RCC Work

The RCC works would be required for roof, column, beam, floor, foundation of transformer, circuit breaker and steel structure etc

Brick Work up to Plinth Level and Superstructure

Brickwork will be done for constructing the back to back station building with first class bricks and coarse sand and cement up to roof level.

Back Filling with Local Sand

Back filling of the excavated area of the foundation and floor of the building will be done with local sand.

Plastering and Finishing (electric wiring, distemper or plastic paint)

Concealed electric wiring of good quality and proper size is to be done and bulbs and switchboards are to be provided. Plastering of walls inside and outside as well as the roof of the building will be done accordingly and curing works will be done for at least three weeks. After that distemper of plastic painting will be done on the walls and roof of the building.

Wood Works/Thai Aluminum for Doors and Windows and Glass Fittings

Wood/Thai aluminum works are to be done on door shutters and windows of the building along with glass fittings.

Sanitary Works

Sanitary works such as laying of sewerage line (either PVC or RCC), installation, fittings and fixing of toilet accessories (BISF) will be done in the building.

Water Supply System

The water supply system where available will be activated for the workers and staff of the back to back-station. In places where there is no supply system, tube wells will be set up.

Boundary Fencing with Concrete Pillar and Barbed Wire

The project area will be protected from encroachment and unauthorized entrance of the public by fencing the boundary either with a six feet high wall or with barbed wire fitted with concrete pillars 3 meters apart.

3.6.2 Electrical Works

Installation of equipment (transformers, circuit breakers, isolators, lightening arresters, panel boards, batteries and battery chargers etc.)

After completion of the building, all equipment will be installed at the back to back-station (outdoor and indoor) as per specification and standard. For this project all back to back station material will have to be procured from foreign countries. Therefore, domestic resource utilization will be minimum; only local materials like bricks, sand, cement, rods, etc. will be utilized for the installation works.

Transformers are heavy equipment. The transportation of such equipment may require grading of river embankment and skidding through open field. The landowners may be required to be paid compensation.

Erection of Tower

The towers will be constructed to take the load of the tower, cables, accessories as well as wind load and earthquake load. The towers in paddy fields will have proper clearance at the sag (lowest point on line). At homesteads, if any, the sag will be above the canopy.

A total of 75-80 towers will need to be constructed including 14 angle towers for this 400 kV line. The towers require approximate land area shown below:

Table 3.5: Land area required for each tower site in 400 kV Grid

Sl No.	Land required for each tower site	No. of towers	Total area (sq. ft.)
1.	70 feet X 70 feet = 4900 sq.ft.	8 Angle Towers	41,200
2.	60 feet X 60 feet = 3600 sq.ft.	1 Angle Tower	3,600
3.	50 feet X 50 feet = 2500 sq.ft.	5 Angle Towers	12,500
4.	40 feet X 40 feet = 1600 sq.ft.	65 Angle Towers	104,000

The angles of the angle points and locations are presented in Table 3.6:

Table 3.6 Land area required for each tower sites for 230 kV Grid

Sl No.	Land required for each tower site	Number of towers	Total area (sq. ft.)
1.	60 feet X 60 feet = 3600 sq.ft.	7 nos. Angle Towers	25,200
2.	30 feet X 30 feet = 900 sq.ft.	12-13 nos. Suspension Towers	11,700

Table 3.7: Angle points and AP location in 400 kV gridline

Sl. No.	Angle Points	Angle (degree)	AP location with length (km)
1	TT- 1	-	0
2	AP -1	58°8’24”	0.46
3	AP -2	37°2’55”	1.09
4	AP -3	12°44’32”	2.11
5	AP -4	36°26’55”	4.90
6	AP -5	44°32’11”	5.36
7	AP -6	5°41’28”	7.88

Sl. No.	Angle Points	Angle (degree)	AP location with length (km)
8	AP -7	7°49'32"	10.48
9	AP -8	3°44'33"	14.46
10	AP -9	8°48'45"	19.54
11	AP -10	43°23'35"	20.89
12	AP -11	37°55'40"	21.77
13	AP -12	7°15'59"	25.02
14	TT-2	-	27.169

Drawing of Transmission Line

The transmission line will be drawn keeping suitable clearance at all locations. The lowest sag point will be considered in drawing the transmission cables.

3.6.3 Testing and Commissioning of Equipment

After installation of (outdoor and indoor), each and every equipment will be tested as per specification and standard. If all the tests are successful the back to back-station will be commissioned accordingly.

3.7 Construction Equipment

For this project all back to back-station equipment to be installed will have to be procured from foreign countries. Therefore, domestic resource utilization in the project will be minimum; only local materials such as bricks. sand, cement, rods, etc. will be utilized for installation/construction works.

3.8 Work Schedule

The definite work plan for implementing the project is yet to be drawn. However, the work will take approximately 24 months from July, 2010.

Chapter 4

Environmental Baseline Condition

4.1 Project Bounding

The geographical boundary of the "Project area" and the potential “Impact area” is delineated as a requirement of the environment assessment study. The "project area" is the physical location of the proposed power transmission line and grid back to back-stations of the project while the "Impact area" covers the geographic extent of the considerable environmental and socioeconomic impacts resulting from implementation of the proposed power transmission line including pre, during and post construction conditions. It is recognized that the benefits of the proposed 27.169 km of 400 kV transmission line will considerably extend to the regional as well as national scale. For the IEE, the focus of the study will be limited to the area where the physical impacts of the activity will be directly felt. A 50 m area through the RoW has defined the directly impacted area. A 500 m buffer along both sides of the power transmission line has been considered for environmental analysis. A general socioeconomic profile has been prepared for union-based administrative units (table 4.1) over which the power transmission line shall traverse. The impacted area for the project is shown in Table 4.2.

Table 4.1: List of administrative units traversed by the Pakuria-Char Mokarimpur 400 kV TL

District	Upazila	Union	Mauza	JL/No.
Kushtia	Daulatpur	Ramkrishnapur	Mohiskundi	2
		Pragpur	Gopalpur	17
		Mathurapara	Char Selimpur	142
			Char Majdia	26
			Mahadevpur	29
			Bagoan	16
		Maricha	Khanda	21, 23
			Chaipara	123
		Hogolbaria	Char Junaidaba	47
			Chak Niamatpur	22
	Bheramara	Junaidaba	Jhiki Parankhali	17
			Jogeshwar	22
			Gobindapur	20
			Dolua	19
		Mokarimpur	Char Mokarimpur	13
			Mokarimpur	14
			Fakirabad	16
One district.	Two upazilas	Seven unions	17 mauzas	-

4.2 Water resources

4.2.1 Climate

The sub-project area located under a typical monsoon climate area within country. It has three main seasons:

- Summer/pre-monsoon - March to May
- Rainy season/monsoon - June to October
- Winter season - November to February

The rainy season is hot and humid having about 80 percent of the annual rainfall. The winter is predominately cool and dry. The summer is hot and dry interrupted by occasional heavy rainfall.

The Pakuria-Mokarimpur transmission line sub-project lies in the southwestern part of Bangladesh where monsoon comes in the month of July and recedes in late October. The Bangladesh Meteorological Data (BMD) at the Jessore station show that the maximum temperature varies from 25 to 35^{0}C. The maximum temperature in the months of April and May is around 35^0 C and the maximum average temperature during monsoon is about 33^{0}C. The monthly average of relative humidity varies from 65% to 85% in a year. Even in winter season the humidity is above 50%. The monthly minimum temperature ranges from 10 to 26^{0}C in the winter season. The annual average rainfall of this area is 1849 mm/yr of which 77% occurs during monsoon. The maximum monthly rainfall was recoded at 450 mm in June. The BMD data are shown in Figure 4.1.

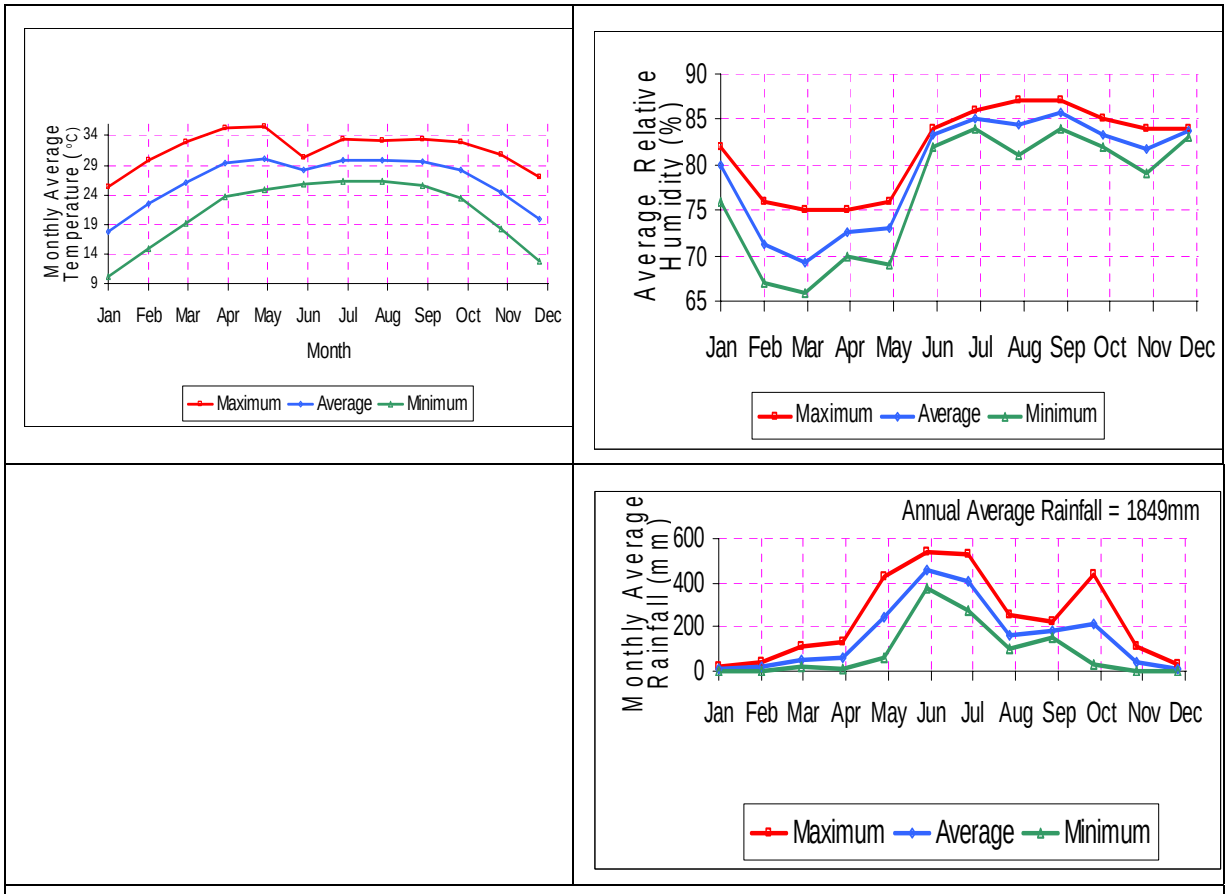


Figure 4.1: Climatic Information, Jessore-Kushtia area

4.2.2 Water level/flooding

The Pakuria-Mokarimpur transmission line will traverse through flood free area (i.e. F0 land type, sources: NWRD, SRDI). The transmission line will cross the 50 meter wide Hisna River at Bheramara Sadar. The river is completely dry during dry season while water flows only 4-6 months during monsoon.

The water level historic records of the cross boundary river the Mathabhanga are available with the BWDB. Based on the historic records, the probable maximum water level near the crossing was estimated for different return periods.

At the crossing point with the Mathabhanga River, water level in the 20 year return period is 7.19 m, PWD as shown in Table 4.2. Around 5m high vessels/mechanized boats run in that river.

Table 4.3: Water level of Mathabhanga River at different return periods

Return Period (Years)	Water Level (m, PWD)
2.33	6.17
5	6.56
10	6.88
20	7.19
50	7.58
100	7.88

Source: BWDB

4.2.3 Air Quality

Air pollution is a primary social and environmental concern for health and sustainability of the ecosystem. When the presence of solid particles, liquid droplets or gaseous compounds in the air is higher than normal it becomes harmful to living organisms and the air becomes polluted.

There are five primary pollutants which together contribute more than 90% of global air pollution. These are: CO, NOx, HC, SOx, and PM. The standard values of ambient air for the area of different categories are shown in the following table.

Table 4.4: Concentration of micrograms per meter cube in the air

Area	Categories	Concentration micrograms per meter cube			
		SPM	SO2	CO	NOx
A	Industry	500	120	5000	100
B	Commercial	400	100	5000	100
C	Residential and rural area	200	80	2000	80
D	Sensitive	100	30	1000	30

The transmission line will avoid rural and urban settlements. Since the proposed transmission line will not have any lasting impact on air quality, no data on air quality has been collected.

The main concern is suspended particulate matter (SPM), which is often higher in concentration than the national air quality standard during the pre and construction period.

Heating is the main biological effect of the electromagnetic fields produced from the high voltage transmission line. To date, no adverse health effects from low level, long-term exposure to power frequency fields have been confirmed.

4.2.4 Ambient Noise Quality

The standard values for noise as per ESQ of Bangladesh is shown in the following table:

Table 4.4: Standard value (dBa)

Area	Categories	Standard value (dBa)	
		Day	Night
A	Quiet place (hospitals, education institutions, etc.)	45	35
B	Areas which are used mainly for residential purpose	50	40
C	Areas which are used for residential and commercial purposes	60	50
D	Commercial	70	60
E	Industry	75	70

As the transmission line will cross mainly residential areas, the standard value for ambient noise should be bellow 50 dBa i.e. Area "B". Noise levels in urban and rural areas are near or above standards. This is consistent with the findings of social surveys which indicate that high noise levels in urban areas are noticeably affecting the daily lives of people.

The sources of noise in the urban and sub-urban area are industrial plants, vehicles on roads, and mechanized vessels in rivers. Social survey data, however, indicate that the noise level in rural areas is within the allowable limits of the standard set by the DoE.

The 400 kV power transmission line will not increase the present level of noise outside the electro magnetic field, so no field data have been collected on noise for the IEE.

4.2.5 Water availability and quality

Surface Water: There are a number of rivers i.e. the Mathabhanga, the Hisna etc. as well as ponds and borrow pits in the project area. These rivers are used for local navigation and other purposes during monsoon and to carry runoff water from adjoining agricultural lands, which might contain pesticides and residual fertilizers. The water quality data of this river are not available. However, during site visit the water quality of the river was observed to be good.

As the transmission line will not have any impact on water bodies, a further detailed analysis of the water quality was not required for the project. However, the construction of the back to back-station facilities may have some impacts on the floodplain, specially on the drainage system. Therefore, further detailed analyses may be required during the EIA study.

Groundwater: As other parts of the country, this area also receives sufficient amount of rainfall and there is a good availability of groundwater used by hand pumps for drinking and domestic purposes. Some industries also use deep tube wells within their premises to meet the requirement of good quality water for various purposes.

4.2.6 Natural Hazards

Seismicity

Bangladesh and northeast Indian states have long been one of the seismically active regions of the world, and they have experienced numerous large earthquakes during the past 200 years at an average rate of one in every 30 years.

The catastrophic earthquakes of 1762 and 1782 are believed to have been partially responsible for the diversion of the Old Brahmaputra Rive from the west of its main Arial Khan distributory to the

present Padma channel. Similarly it may have assisted the change of the Teesta, which formerly flowed southwards down the Atrai, Purnarbhaba courses to the Atrai basin and all the way to its present east-southeast course to the Brahmaputra-Jamuna at Ulipur. Since 1860 over 20 shallow and intermediate major earthquake epicenters have been recorded in Bangladesh and surrounding areas.

Sesmotectonic studies have been undertaken by various workers in Burma comprising the Indo-Burma ranges and their western extension in the northern India. A complete list of references is provided in Haque, (1990), using data from various sources. A seismicity map of Bangladesh and its adjoining areas has also been prepared by Mominuddin (1991).

Bangladesh has been classified by BGS as a country that falls into seismic zones with zone-III the most severe and zone-I.

The Pakuria-Char Mokarimpur transmission line falls into the seismic zone-III. As such the land buildings and land-based structures for this project should be designed to withstand ground accelerations of O.04g.

Erosion

There is no significant evidence of erosion in the major rivers or flood prone areas in the path of the transmission line.

Flooding

The transmission line does not run through flood prone area and so there is no risk from flood hazard. However, the back-to-back station site may be further investigated as because the proposed area is a local drainage path and proper mitigation measures should be proposed in the EIA study.

Tornado

There are some evidences of local seasonal storms, popularly known as nor'westers *(Kalbaishakhi).* Severe nor'westers are generally associated with tornadoes. The frequency of nor'westers usually reaches a maximum in April, whereas it is low in May, and minimum in March. Nor'westers and tornadoes are more frequent in the afternoon. Nor'westers may occur in late February due to early withdrawal of winter from the Shillong Plateau of India.

There would be an effect of tornados on the towers of the transmission line. However, improved design could protect the towers from accidents.

4.3 Land Resources

The proposed transmission line will cross only Eleven High Ganges River Floodplain agro-ecological region. Most areas have a complex relief of broad and narrow ridges and inter ridge depressions separated by areas with smooth, broad ridges and basins. The upper part of the high ridges stand above normal flood level. The lower part of the ridges and basin margins are shallowly flooded seasonally.

The major soils of the areas are olive brown, silt loams and silty clay loams on the upper part of the ridges and dark grey, mottled brown, mainly clay soils on the lower part of the ridges and basins.

The areas are generally non-flooded to shallowly flooded.

4.4 Soil and Agriculture

4.4.1 Land Resource

The proposed transmission lines will cross only one Agro ecological region (AEZ). The AEZ is the High Ganges River Floodplain. The region includes the western part of the Ganges River Floodplain which is predominantly highland and medium high land. Most areas have a complex relief of broad and narrow ridges and inter ridge depressions separated by areas with smooth, broad ridges and basins. The upper part of the high ridges stands above normal flood level and the lower part of the ridges and basin margins are shallowly flooded seasonally. These are generally non-flooded to shallow flooded areas.

The major soils of the areas are olive- brown, silt loams and silty clay loams on the upper part of the floodplain ridges and dark grey, mottled brown, mainly clay soils on the lower part of the ridges sites and in the basins. Most ridge soils are calcareous throughout. Soils are slightly alkaline in reaction.

4.4.2 Land use

The Direct Impact Area (DIA) for the 400kV electricity transmission line from Pakuria, Ramkrishnapur, and Daulatpur Upazila to Char Mokarimpur, Mokarimpur, Bheramara Upazila under Kushtia district is about 135ha. The area is mainly used for agricultural purposes. Moreover, there is a proposal for constructing one substation on about 46 ha of land. Therefore, the total gross area for the whole project is about 181 ha, the utilization of which is outlined in Table-6.4.

Table 6.4 Present land use of the study area

Land use	Area (ha)	Total cropped area (ha)
Single crop	13@1	13
Double crop	143@2	286
Triple crop	50@3	150
		449
Net cultivable area		206
Cropping intensity (%)		223

Source: RRA, CEGIS

4.4.3 Agriculture Resource

The project consists of mainly two parts. The gross area of the project is 206 ha (160 ha of agricultural land is required for the transmission lines and 46 ha for the back-to-back station). The area of the back-to-back station is *khash* land belonging to the Bangladesh Railway. The *khash* lands are also being used for agriculture. Therefore, 206 ha of area is used for agriculture practices. The base information on the DIA for the 400kv line, 230kV line and back-to-back station is presented in tables 6.5, 6.6 and 6.7. Detailed information on the RoW is given in Annex I.

Table 6.5 Base information of 400 kV in DIA (Char Mokarimpur to Pakuria)

Kilometer	Description of Right of Way (50m wide)

Kilometer	Description of Right of Way (50m wide)
0-1	TT-1 AP-1 (463.88 m.) - Bamboo-500nos -Jackfruit-10nos.6m -Mango-20nos.3m -Tree Bakon Nim -10nos.3m - House- 2nos. Mr Azizzul Islam -House- 2nos.Md. Jamal -Shop-1nos
1-2	AP-2 (1.094km.) -Agriculture Land Major Cropping patterns: i. .Jute-Fallow-Tobacco/ Maize/ Wheat ii. Jute-T.Aman-Tobacco/ Maize/Wheat -Lice Garden-10nos.2m high.
2-3	AP-3 (2.11 km.) -Agriculture Land Major Cropping patterns: i. .Jute-Fallow-Tobacco/ Maize/ Wheat ii. Jute-T.Aman/Fallow-Tobacco/ Maize/Wheat iii. Sugarcane-Sugarcane Sugarcane
3-4	Major Cropping patterns: i. .Jute-Fallow-Tobacco/ Maize/ Wheat ii. Jute-T.Aman-Tobacco/ Maize/Wheat
4-5	AP-4 (4.90 km.) Major cropping patterns: -Jute- T.Aman (HYV)/Fallow- Tobacco/maize -Fallow-T.Aman-Boro(HYV)
5-6	AP-5 (5.36 km.) Major Cropping patterns -Jute-T.Aman-Tobacco/Maize -Fallow-Fallow-Boro -Banana-Banana-Banana -Fallow-T.Aman-Boro(HYV -Betalvine-Betalvine-Betalvine
6-7	- Betel leaf plants-3nos -Tree Bamboo-300nos.10m high. - Tree Jackfruit -30nos. 4m high. -Tree Mango -12nos.2m high.
7-8	AP-6 (7.88 km.) -House-2nos.Mr.Afzal -Tree Coconut –2nos.7m - Betel leaf plants-1nos
8-9	- Major Cropping patterns -Jute-T.Aman-Tobacco/Maize -Banana-Banana-Banana -Fallow-T.Aman-Boro(HYV

Kilometer	Description of Right of Way (50m wide)
9-10	- Major Cropping pattern: -Jute-T.Aman/Fallow-Tobacco/Maize -Banana-Banana-Banana -Fallow-T.Aman-Boro(HYV)
10-11	AP-7 (10.48 km.) Major Cropping patterns -Jute-T.Aman-Tobacco/Maize
11-12	-Tree Palm-1nos.7m - Tree Jackfruit -1nos.5m. high. -Tree Banana-50nos Major Cropping patterns -Jute-T.Aman-Tobacco/Maize -Fallow-Fallow-Boro -Banana-Banana-Banana -Fallow-T.Aman-Boro(HYV -Betalvine-Betalvine-Betalvine
12-13	- Tree Karai -20nos. 7m high. Major Cropping patterns -Jute-T.Aman/Fallow-Tobacco/Maize -Fallow-Fallow-Boro -Banana-Banana-Banana -Fallow-T.Aman-Boro(HYV -Betal vine-Betal vine- Betal vine -11kv TL
13-14	- Tree Bamboo-200nos.8m high -11kv TL -Tree Babla -2nos.3m high. - Major Cropping patterns -Jute-T.Aman-Tobacco/Maize/wheat -Fallow-T.Aman-Boro(HYV
14-15	AP-8 (14.46 km.) - Tobacco/Jute/T.Aman -Tree Mahogany -4nos. 4m high. -Tree Shisu -15nos. 8m high. -Tree Epil-epil -10nos. 9m high.
15-16	- Betel leaf plants-2nos -Tree Mehuguni-20nos 4m high. -Tree Shisu -30nos. 8m high. -Tree Epilipi-35nos.9m high. Pond 1 no.130 decimal. Major Cropping patterns - Jute-Fallow--wheat
16-17	-Tree Mahogany -8nos. 4m high. -Tree Babla -1nos. 6m high. -Tree Karai -4nos. 8m high. -Tree Jackfruit -5nos. 6m high. - Betel leaf plants-1nos Major Cropping patterns

Kilometer	Description of Right of Way (50m wide)
	-Jute-T.Aman-Tobacco/Maize/Chili -Betalvine-Betalvine-Betalvine -Hisna river cross
17-18	-Tree Babla-1nos. 4m high. -Tree Bamboo -50nos. 6m high. Major Cropping patterns -Jute-T.Aman-Tobacco/Maize/wheat -Fallow-Fallow-Spices -Betal vine-Betal vine- Betal vine
18-19	Major Cropping patterns -Jute-T.Aman-Tobacco/Maize -Betal vine-Betal vine- Betal vine
19-20	AP-9 (19.54 km.) -Crossing the Hosnabad to Philipnagar pacca road Major Cropping patterns -Jute-T.Aman-Tobacco/Maize
20-21	AP-10 (20.89 km.) Major Cropping patterns -Jute-T.Aman-Tobacco/Maize -Tree Babla-1nos. 2m high.
21-22	AP-11 (21.77 km.) -Tree Mahogany -2nos. 3m high. Major Cropping patterns -Jute-T.Aman-Tobacco/Maize
22-23	-Tree Mahogany -nos. 4m high. -Tree Babla -5nos. 4m high. -Tree Karai -5nos. 7m high. -Tree Jackfruit -3nos. 5m high. - Major Cropping patterns -Jute-T.Aman/Fallow-Tobacco/Maize
23-24	-wheat - jute- T.Aman -Maize - jute- T.Aman -Tree Bamboo -50nos. 7m high.
24-25	Major Cropping patterns -Jute-T.Aman-Tobacco/Maize
25-26	AP-12 (25.02 km.) Major Cropping patterns -Jute-T.Aman-Tobacco/Maize/wheat
26-27	-Tree Mahogany -8nos. 3m high. -Tree Nim-8nos. 5m high. -Tree Kadam 2-3nos.4m high. -Tree Babla -2nos. 5m high. Major Cropping patterns -Jute-T.Aman-Tobacco/Maize/wheat
27-end	-Tree Mahogany -8nos. 4m high. -Tree Babla -3nos. 4m high. -Tree Karai -2nos. 6m high. -Tree Jackfruit -3nos. 5m high. -Tree Bamboo-30nos. 5m high.

Kilometer	Description of Right of Way (50m wide)
	-House-2nos Mr.Safayet Ullah Driver -House-2nos Mr. Keyam Uddin Major Cropping patterns Jute-T. Aman/ Fallow- Tobacco /Wheat /maize

Source: EIA study, CEGIS.

Table 6.6 Base information of 230 kV in DIA

Km.	Description of Right of Way (50m)
1-5	Agriculture Land Major Cropping patterns: i. .Jute-Fallow-Tobacco/ Maize/ Wheat ii. Jute-T.Aman-Tobacco/ Maize/Wheat

Table 6.7 Base information of back-to-back station site

Area	Description of site
113.4334 acre	Agriculture Land Major Cropping patterns: i. .Jute-Fallow-Tobacco/ Maize/ Wheat ii.Banana

Existing Cropping Patterns

The major cropping patterns along with area of the project under study are presented in Table 6.8 and photo gallery (Annex III). There are a sizeable number of cropping patterns in the study area. The double cropping pattern is the most dominant in the study area. About 65% of the net cultivable area (NCA) is covered under the double cropping pattern, which is followed by the triple cropping pattern (28%) and the rest of the area (7%) is covered by single crops.

Table 6.8: Existing cropping pattern of the study area

Kharif-I	Kharif-II	Boro/Rabi	Area (ha)	% NCA
Jute	Fallow	Wheat	65	31
Jute	T.Aman (HYV)	Wheat	18	9
Jute	Fallow	Maize	36	18
Jute	T.Aman(HYV)	Maize	18	9
Jute	Fallow	Tobacco	33	16
Jute	T.Aman(HYV)	Tobacco	14	7
Vegetables	Fallow	Vegetables	5	2
Fallow	T.Aman (HYV)	Boro (HYV)	4	2
Fallow	Fallow	Boro (HYV)	7	3
Betalvine	Betalvine	Betalvine	4	2
Banana	Banana	Banana	2	1

Kharif-I	Kharif-II	Boro/Rabi	Area (ha)	% NCA
			206	100

Source: EIA study, CEGIS.

Jute is the main crop grown in Kharif-I season which covers about 90% of the NCA. Vegetables, betel vine and banana cover about 3%, 2% and 1% respectively. However, about 6% of the NCA remains fallow in Kharif-I season.

In Kharif-II season, about 30% of the NCA is covered by HYV T. Aman. About 67% of NCA remains fallow. Vegetables, betel vine and banana cover about 6% of the NCA.

In Rabi season, about 40% of NCA is occupied by wheat, 30% by maize, 26% by tobacco, 6% by boro (HYV), 3% by vegetables, 2% by betel vine and 1% by banana.

The cropping intensity of the study area is about 223%.

Crop Area

The existing area of different crops is presented in Table-6.9. It is observed that the total annual cropped area is 449 ha of which wheat covers about 14.4%, maize 13.5%, Boro (HYV) 2.8%, T.Aman (HYV) 13.5%, jute 39.8% and tobacco 11.8%. The remaining 4.0% is covered by vegetables, banana and betel vine.

Crop Yield

The yield of different crops is presented in Table-6.9. It is observed that the yield of wheat, maize, Boro(HYV), T.Aman(HYV), jute and tobacco are 3.2, 5.75, 5.2, 3.0, 2.8, and 1.8 tons / ha respectively. The yield of vegetables (S), vegetables (W), banana and betel leaves are 15, 18, 32, and 4 tons respectively. The yields of different crops are presented in Table 6.9.

Crop production

The total crop production is generally calculated on the basis of damaged free areas and damaged areas. In damaged free areas, normal yield of crops have been considered along with the damaged yield of damaged areas. This may be expressed as: *Total crop production* = damaged free area × normal yield + damaged area × damaged yield. In the present study, it has been observed that there has been no crop damage for the last 3 (three) years. Therefore, crop production has been calculated on the basis of crop yield against crop area.

The detailed existing crop production of the study area is presented in Table 6.9. It is noticed that the total production of wheat is contributing by about 266 tons, maize 311 tons, Boro (HYV) 57 tons, T. Aman(HYV) 162 tons, jute 515 tons, tobacco 113 tons, vegetables(S) is 75 tons, vegetables (W) 90 tons, banana 64 tons and betel leaves 1 ton.

Table 6.9: Cropped area, yield (m. ton/ha) and production

Name of crop	Area (ha)	Yield (ton/ha)	Total prod-uction (Tons)	Total cost of production (TK)	Total value of products (Tk.)	The net income from Agriculture (TK)
Mid-November- Mid-April (Rabi)						
Wheat	83	3.2	266	2,863,500	4,258,730	1,395,230
Maize	54	5.75	311	20,84,400	31,10,000	10,25,600

Name of crop	Area (ha)	Yield (ton/ha)	Total prod-uction (Tons)	Total cost of production (TK)	Total value of products (Tk.)	The net income from Agriculture (TK)
Tobacco	47	1.8	113	3384,000	84,75,000	50,91,000
Boro(HYV)	11	5.2	57.2	594,000	915,200	321,200
Vegetab-les(W)	5	18	90	337,500	675,000	337,500
Mid-April-Early November (Kharif)			Sub-total			8,170,530*
Jute	184	2.8	515	6,569,201	8,280,505	1,711,304
T.Aman (HYV)	54	3.0	162	2079,000	25,92,000	513,000
Vegetab-les(S)	5	15	75	290,000	562,500	272,500
Through out the year (Perenial crop)			Sub-total			2,496,804
Banana	2	32	64	90,000	1,600,000	15,10,000
Betel Leaves	4	4	1	1,500,000	3,200,000	1700,000
Gand Total Taka.						13,877,384

Source: EIA study, CEGIS.

***N.B.** It is observed that the total net income from crops is only about Tk. 13,877,334/= (one core thirty two lac twenty four thousand five hundred) annually. However, the dry season (Rabi season) is the best time for construction of transmission lines. During this period, the net income from crop production would be about Tk. 8,170,530. Therefore, this amount may be considered as compensation to the farmer. It may also be noted that crop damage can be made minimum during the construction period in the transmission line areas provided necessary precaution measures could be undertaken.

Crop damage

Field investigation revealed that there has been no significant crop damage during the last 3 (three) years.

4.5 Biological Resource

4.5.1 Biological Environment

The proposed project area consists of the left bank of the Mathabhanga River and the right bank of Ganges River formed from the tidal sediment deposition carried by the Ganges River. Consolidation of these sediments creates large shoals and extensive inter-tidal mudflats, which in time with further consolidation become suitable habitat for pioneer vegetation communities, wildlife and ultimately become settled enough for human habitat. Ecologically the area lies between the two branches of the Ganges, the Mathabhanga, the Kapotaksha and the Gorai River system. These are among the most stable lands of old Ganges floodplains. Starting from Mokarimpur near Bheramara town, the transmission lines move to Pakuria, Ramkrishnapur union under Daulatpur Upazila. In its course the transmission line route crosses minor rivers such as the Hisna as well as diverse croplands and floodplains.

4.5.2 Bio-Ecological Zone

The proposed 400 kV grid interconnection between Bangladesh and India and associated back to back station consists of two different bio-ecological zones of the country (Nishat *at el*, 2002), namely the Ganges floodplain and major rivers.

The Ganges floodplain: The Ganges floodplain basically consists of the active floodplain of the Ganges River and the adjoining meandering floodplains, and is mostly situated in the administrative districts of greater Jessore, Kushtia, Faridpur, Rajshashi and Barisal. The adjoining meander floodplains mainly comprise a smooth landscape of ridges, basins and old channels. A noteworthy aspect here is that the Gangetic alluvium is readily distinguishable from the old Brahmaputra, Jamuna and Meghna sediments by its high lime content. Besides, the relief is locally irregular alongside the present and former river courses, especially in the west, comprising a rapidly alternating series of linear low ridges and depressions. The Ganges channel is constantly shifting within its active floodplain, eroding and depositing large areas of new char lands in each flooding season, but it is less braided than that of the Brahmaputra-Jamuna. Interestingly enough, both plants and animals move and adapt with the pattern of flooding (Brammer, 1996)

Bangladesh consists mainly of riverine and deltaic deposits of three large and extremely dynamic rivers entering the country: the Brahmaputra, Ganges and Meghna rivers *(Maminul Haque Sarker et al).* Newly accreted land, if it does not erode quickly, is initially colonized by grass, particularly catkin grass (*Saccharum spontaneum*, for example). Dense growth of catkin grass can accelerate silt deposition on chars. The Jamuna River creates the highest number of char lands. Many of the species' natural distribution, migration and storage are primarily functioned via these rivers into other wetland ecosystems (GoB-IUCN, 1992). A diverse range of waterfalls are directly or ecologically dependent on these rivers and associated ecosystems. However, it is quite alarming that with the exception of a few species of turtles, all other river biodiversity is threatened with extinction.

4.6 Ecosystem

4.6.1 Terrestrial Ecosystem

The major divisions found within the terrestrial ecosystems of the area are: a) Homesteads, and b) Agricultural land. Terrestrial ecosystem provides habitat for all terrestrial plant and wildlife species. Photographs 6.1 & 6.2 show the different ecosystems within the project area.

Homestead

Homestead and roadside vegetation are in good condition. Most of the houses are vegetated by local cultivated plants and a big portion of the coverage is occupied by wild shrubs and herbs. These types of vegetation have a major contribution in meeting food, fodder, medicine, fuel and other household requirements of the local people. Homestead vegetation also provides good shelter to many wildlife species for their nesting, roosting and feeding. Homestead bushes and gardens provide very good support to wildlife, especially birds. Marginal bushes create a good ecological niche. These niches support bush dwellers like foxes, jackals, mongooses, monitor lizards and a wide variety of birds.

In the study area homestead vegetation is among the most important plant communities in terms of diversity. This vegetation generally includes two types of plants: those cultivated for their economic value and those that are self-propagating. Settlement vegetation is not as diverse as natural forest since only economic species are cultivated. Despite this, there is significant variation in the composition of settlement vegetation. The most dominant species in the study area is bamboo which occupies more than half of the canopy cover in many areas. Other common species are, coconuts

(Cocos nucifera), dates *(Phonix sylvestris),* mangoes *(Mangifera indica*), betel nut *(Areca catechu),* Gab *(Diospyros perigrina),* Nim, Ipil-epil, Tal *(Borassus flabelifer),* Raj Sirish *(Albizia richardiana),* Bot *(Ficus benghalensis)* etc. Guavas, jackfruits and blackberries are the most popular fruiting trees and almost every house has at least one plant of such kind. The proposed project area has some orchards of fruits such as bananas, lichis etc.

Agricultural land

The agricultural lands are mainly used for growing tobacco, paddy, wheat, potato, brinjal, mustered, and maize. The agricultural lands are fragmented around the homesteads and used for producing one or two rice crops and some vegetables. The crop field vegetation has low diversity of all types, but it is more important as source of food and shelter for wildlife.

Photograph 6.1: Different ecosystems within the project area

Photograph 6.2: Different ecosystems within the project area

4.6.2 Aquatic Ecosystem.

The project area has a moderate number of wetlands such as beels, ponds and rivers. All these water bodies play a great role in the aquatic ecosystem.

Wetlands

Wetlands are a common feature in the project area and govern necessary nutrients and other elements for the whole ecosystems. The area supports two types of wetlands such as permanent wetland and seasonal wetland. Most of the perennial wetlands are going to be silted up gradually. Permanent wetlands include rivers, beels, canals and perennial water bodies and fishponds. Seasonal wetlands are mainly floodplains, which get inundated in the monsoon.

Seasonal wetlands of the project area are mostly used for both capture and culture fisheries in the monsoon but are converted into paddy field in the dry season. Moreover, nearby seasonal aquatic ecosystems abound with not only with numerous aquatic floras but also with many aquatic wildlife species including birds, mammals, amphibians and reptiles. Permanent wetlands provide refuge and shelter to most of the aquatic flora and fauna while seasonal wetlands serve as grazing grounds for fish and other aquatic animals such as freshwater turtles. Seasonal wetlands may also provide substratum for many species of turtles to lay eggs.

4.7 Species Diversity

4.7.1 Terrestrial Flora

Homestead gardens abound with timber trees and fruit yielding and vegetable species. The common cultivated plants are Bamboo, Aum (*Mangifera indica*), Supari (*Areca catechu*), Narikel (*Cocos nucifera*), Shimul (*Bombax ceiba*) ,Date palm (*Phoenix sylvestris*) , Tetul (*Tamarindus indica*), Koroi *(Albizia procera),* Shaora *(Streblus asper),* Gab *(Diospyros peregrina),* Babla *(Acacia nilotica),* Kadam *(Anthocephalus chinensis),* Banyan *(Ficus bengalensis),* Jam *(Syzygium* spp), Mandar *(Erythrina indica),* Sonalu *(Cassia fistula),* Toddy palm *(Borassus flabellifer),* Ipilipil, Mehogani (*Swietenia mahagoni*), Aswatha (*Ficus religiosa*), Kola (*Musa* sp.), Gogon Siris (*Albizia richrdiana*). Homesteads are commonly founds near the wetland which favour good growth of wetland trees like Pitali (*Trewia nudiflora*), Baroon (*Crataeva nurvala*), Hizal (*Barringtonia acutangula*) etc.

Among the shrubs Daton (*Glycosmis pentaphylla*), Vat (*Clerodendrum viscosum*) is the most common of all species. In agricultural land the species most commonly found are weeds, *Alternanthera sessilis*, *Amaranthus spinosus*, *Cynodon dactylon*, *Polygonum* sp., *Oxalis corniculata* etc. The major species (weed) growing with crops in this area are *Heliotropium indicum*, *Sagittaria sagittifolia*, and *Commelina benghalensis*. A big portion of crop fields is inundated in the rainy season. The area is mostly used for paddy cultivation. The lower parts of the crop fields are used for Aman cultivation and the comparatively higher portion are used for boro and aus crops. The species diversity in charlands is comparatively lower than in other ecosystems. Most of the plant species in this ecosystem comes from the Cyperaceae or Gramineae family.

4.7.2 Aquatic Flora

The following types of aquatic flora exist in the wetlands of this area: a) Submerged plants; b) Free floating plants; c) Rooted floating plants; d) Sedges and meadows; e) Reed swamp (on ridges) and g) Marginal (on surrounding saturated soil)

Free-floating plants are commonly observed throughout the project area. *Eichhornia crassipes, Pistia strateotes, Salvina cucullata, Azolla and Lemna* are common for this type. The most dominant rooted floating plants are *Nymphaea nouchali, Nymphoides indicum, Ludwigia abscendens, Myriophyllum sp., Hygroryza aristata* etc. Among the submerged species, *Hydrilla verticillata, Aponogeton natans, Hydrocharis dubia, Ceratophyllum desmersum, Vallisneria spiralis* etc are found. Sedges and meadows are amphibian plants and are available in most of the perennial wetlands. *Marsilea* and *Scirpus* sp are common species. At the species level *Inhydra fluctuant, Nymphaea nouchali, Nymphoides cristatum, Nymphoides indicum* and *Hygroryza aristata* are the most common. However their abundance is only in perennial and deeply flooded seasonal wetland. *Cyperus* sp. *Eleocharis dulcis* and *Fimbristylis* sp. are common in all the beels as well as seasonal flood plains. Marginal plants are not defined as community; rather they are a composition of both wetland plants and small dry land herbs occupying surrounding saturated soil. The composition of the marginal plants depends on the degree of water logging and the flood tolerance of each species. Cyperaceae is the dominant family followed by Amaranthaceae and Gramineae. The dominant floral types are Panimorich

(*Polygonum orientale*), Dhol Kalmi (*Ipomoea fistulosa*), Jhanji (*Hydrilla verticillata*), Helencha (*Alternanthera philoxeroides*), Topapana, (*Pistia strateotes*), Chechra (*Schenoplectus articulatus*), Shada shapla (*Nymphaea nouchali*), Keshordam (*Ludwigia adscendense*), Kolmi (*Ipomoea aquatica*), Dhol kolmi (*I. fistulosa*). Appendix Table: (A1) shows the Dominant terrestrial and aquatic flora within the project area.

4.7.3 Diversity of Avian Fauna

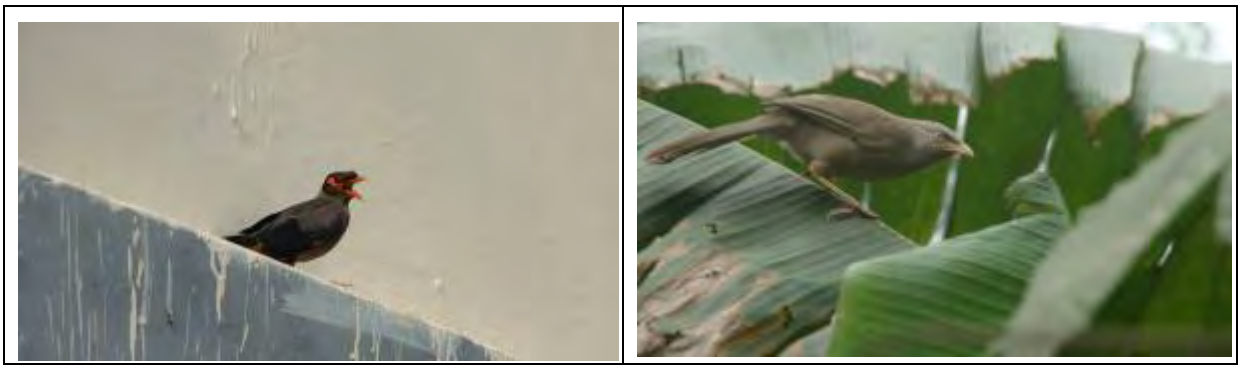
The surroundings of the proposed site are ecologically important for resident as well as migratory birds. Water bodies and channels, rivers and tributaries support a habitat of rich biodiversity. Homestead, aquatic vegetation and reeds land have supported feeding and roosting wild birds. Major groups of the oriental birds are represented in this zone by many species.

Terrestrial birds can be divided into two main groups; birds observed in floodplains and wetland, and birds observed in dry land habitat such as homestead, open woodland, scrub grass and reed land. Common terrestrial bird species in the area are Cattle Egret, Black Drongo, Brown Shrike, Jungle Myna, Bank Myna, Rock pigeon, House crow, House Sparrow, Common Myna, Large-billed crow, Spotted Dove, Long tailed Shrike, Asian Pied Starling. Birds of prey survive well in the area. Common bird of prey species found in the project area are Brahminy Kite (*Haliastur indus*), Black-winged Kite (*Elanus caeruleus*), Crested Serpent Eagle and Common kestrel. In addition, some species found within the project area are listed in the Schedules of the *Convention on International Trade in Endangered Species of Flora and Fauna* (CITES). Those listed are, Barn Owl *(Tyto alba),* Grey-headed Fish Eagle (*Ichthyophaga ichthyaetus) etc.*

4.7.4 Aquatic Bird

The hydrological cycle and the presence of perennial and seasonal wetland provide a diversified habitat for all biota, especially for fish. The life cycle of the aquatic or wetland related fauna is dependent on the riverine ecosystem's natural fluctuations and isolation and connection with the Ganges, Mahananda, Kapotaksha, Gorai, Atrai River and other nearby wetlands.

The common and uncommon bird species found in the project areas are India Pond Heron, Cinnamon Bittern, Purple Swamp hen, Water Cock, Cotton Pigmy Goose, Little cormorant, White breasted Water Hen, Stock-billed Kingfisher, White-throated Kingfisher, and Pied Kingfisher. Common wetlands bird species available are Lesser Whistling Duck, Bronzed winged Jacana, Ruddy Shelduck, Indian Spot bill Duck, etc. A good number of migratory birds come in winter at Chalan Beel. Several species listed in the IUCN *Red Data Book* occur within the project area. These species include River Lapwing (*Vanellus duvaucelii*) shown in photographs 6.3 and 6.4.



Photograph 6.3: Different terrestrial and aquatic birds within the project area

Photograph 6.4: Different terrestrial and aquatic birds within the project area

4.7.5 Diversity (Mammals, Reptiles and Amphibians)

The geographical location of Bangladesh is such that there is a high possibility of occurrence of animals and plants. It supports a wide range of floral and faunal community throughout the country. The project area supports many important aquatic and terrestrial wildlife species. Like all over Bangladesh, this area also inhabits a unique and threatened biota. A few threatened species were found along with the common wildlife species during the study.

Within the study site the number of amphibian and reptilian populations is moderate. The amphibians and reptilians are the major components of their respective biological ecosystems, both as predator and prey. They are the valuable part of the biotic community, and have not received as much attention as birds and mammals. However, they do play an important role in the balance of nature. During the study, it has been found that the reptilian population (number of individual reptiles) was lower than the amphibians. The turtle and tortoise populations were found to be much lower than others. Their main habitat and habitat niche is being destroyed by the local people for rapid urbanization and drastic changes in type of land use. The Indian roofed turtle *(Pangshura tectum)* and Median Roofed Turtle *(Pangshura tentoria)* are common whereas the Brown Roofed Turtle *(Pangshura smithii)* is very rare. This species is confined to large rivers and expected to mainly exist in the Ganges River. The Ganges Soft shell Turtle *(Aspideteres gangeticus)* and Spotted Flapshell Turtle *(Lissemys punctata)* are listed in the IUCN Red List as endangered and vulnerable respectively. Most of the turtle species are susceptible to accidental capture in different fishing gear. A detailed checklist of observed mammals, amphibians and reptiles species is provided in the Annex II (tables No A3, A4, and A5).

Many lizards and skinks were seen during the survey. Among the lizards, Brook's House Gecko *(Hemidactylus brookii)*, Common House Gecko *(Hemidactylus frenatus)* and Common garden lizard (*Calotes versicolor)* were found most frequently. These reptiles prefer the places around or within human habitation, homestead forest edges etc. Keeled grass skinks were found in almost all the terrestrial habitats within the study site. These lizards and skinks are terrestrial and prefer their niche habitats as low-lying vegetation, leaf litter, grassy areas, bushes, river banks, under logs, burrows etc. The Burrow-dweller Bengal monitor (*Varanus bengalensis)* has been found within study area. These species are categorised as endangered (EN) in the IUCN Red list category. Gharial (*Gavialis gangeticus)* was known to occur in the Ganges River and was last recorded in 2010 from this river. It is a critically endangered species in Bangladesh. The snake population was found to be less in number. The Checkered Keelback *(Xenochropis piscator),* Common Wolf Snake *(Lycodon aulicus),* Striped Keelback *(Amphiesma stolatum),* Indian Rat Snake *(Ptyas mucosus),* Olive Keelback *(Atretium schistosum)* are commonly observed in this area. The Common Krait *(Bungarus caeruleus),* Spectacled Cobra *(Naja naja)* and Monocled Cobra *(Naja kaouthia)* are occasionally seen, which are also recorded in the IUCN Red List. The *Xenochrophis piscator* was the most common snake among all the snakes recorded in the survey. They are aquatic to semi terrestrial, usually found in water or

next to water bodies like stagnant, temporary or permanent ponds, rivers and large puddles and are rarely found among dense grasses and low vegetation nearby water bodies. For being adapted in various types of habitats their population is higher than other snake populations.

The Common Toad *(Duttaphrynus melanostictus)* is the only toad found within the site. The Asian Brown Tree Frog *(Polypedates leucomystax)* is a tree dwelling frog that belongs to the family Rhacophoridae, usually found in homestead forests, roadsides, around human habitation etc. It is arboreal whose niche preferences are branches of trees, tree holes, lower to mid canopy, bushy areas, nearby stagnant water bodies etc. This frog is very common and was found to be the highest in number than other tree frogs.

The Green Frog (*Euphlyctis hexadactylus*), Pointed-headed Frog *(Nasirana alticola)*, Two-striped Grass Frog *(Sylvirana taipehensis)*, Indian Tree Frog *(Polypedates dolphins)* etc also exist within the site. These are not very common but are seen in bamboo grooves, charlands and cropfields. The Ornate Microhylid *(Microhyla dolphin)*, Cricket Frog *(Fejervaryal imnocharis)*, and Skipper Frog *(Euphlyctis cyanophylctis)* are also seen in newly accreted char land. According to the IUCN Red List, 2 endangered and 3 vulnerable amphibian species were found at the site, of which the Green Frog *(Euphlyctis hexadactylus)* is also listed in the CITES Database. Almost all large mammals are facing habitat predicament due to human pressure. Common mammals that were found within the area are the Mole Rat *(Bandicota bengalensis)*, Northern Palm Squirrel, Bandicot Rat *(Bandicota indica)*, House Shrew *(Suncus murinus)*, Field Mouse (Mus booduga), House Mouse (Mus musculus), House Rat (Rattus rattus), Small Indian Mongoose *(Herpestes autopunctatus)*, Golden Jackal *(Canis aureus)* etc. Short-nosed Fruit Bat *(Cynopterus sphinx)*, Indian Flying fox, and Indian Pipistrelle (*Pipistrellus coromandra*) are other flying mammals. There is evidence that the Common Otter (*Lutra lutra*) are at risk of extinction and are categorised as endangered by the IUCN. The *Platanista gangetica*, the Ganges River dolphin, is among the important endangered aquatic mammals within the project site. A good number of dolphins sighted in the Mathabhanga offtake near the concurrent point of the Ganges River.

4.8 Socio-Economic Condition

4.8.1 Administrative Bounding

The geographical boundaries of the "project area" and potential “impact area” are delineated as a requirement of the environment assessment study. The "project area" is the physical location of the proposed power transmission lines and back-to-back grid station of the project while the "impact area" covers the geographic extent of the considerable environmental and socioeconomic impacts resulting from implementation of the proposed power transmission lines including pre, during and post construction conditions. It is recognized that the benefits of the proposed 27.169 km of 400 kV transmission lines will considerably extend to the regional as well as national scales. For the IEE, the focus of the study will be limited to the area where the physical impacts of the activity will be directly felt. A 50 m area through the Right of Way (RoW) has defined the directly impacted area. A 500 m buffer along both sides of the power transmission lines has been considered for environmental analysis. A general socioeconomic profile has been prepared for the union based administrative units (Table 6.10) over which the power grid lines shall traverse.

Table 6.10: Administrative units traversed by the Pakuria-Char Mokarimpur 400 kV Grid

District	Upazila	Union	Mauza	JL/No.
Kushtia	Daulatpur	Ramkrishnapur	Mohiskundi	2

District	Upazila	Union	Mauza	JL/No.
		Pragpur	Gopalpur	17
		Mathurapara	Char Selimpur	142
			Char Majdia	26
			Mahadevpur	29
			Bagoan	16
		Maricha	Khanda	21, 23
			Chaipara	123
		Hogolbaria	Char Junaidaba	47
			Chak Niamatpur	22
	Bheramara	Junaidaba	Jhiki Parankhali	17
			Jogeshwar	22
			Gobindapur	20
			Dolua	19
		Mokarimpur	Char Mokarimpur	13
			Mokarimpur	14
			Fakirabad	16
District 1 no.	Upazila -2 nos.	Unions-7nos.	Mouza-17nos.	-

Source: EIA study, CEGIS.

4.8.2 Demographic Features

The GIA for the 400 KV power lines covers 1 district, 2 Upazilas and 7 unions. The number of households calculated in the GIA is 60,675 and the population is about 275,790, which will increase (Table 6.11). The average household size is 4.55 persons. The male female ratio is 51.46: 48.54. The literacy rate in the GIA is lower than the national level. Age distribution is presented in Table 6.12. It is observed in the table that 44% of the population (age group within 0-14 years and above 59 years) is depended on the other 56% (age group 15 to 59 years) who are able to work. Therefore, the dependency ratio is estimated to be 56:44.

Table 6.11: Households, population and literacy by sex and locality in GIA

District	Upazila	Union	House-holds	Population			Literacy rate		
				Total	Male	Female	Total	Male	Female
Kushtia	Bheramara	Mokarimpur	7677	36032	18341	17691	40.23	41.93	38.46
		Juniadaha	8122	36397	18688	17710	33.65	36.02	31.14
	Daulatpur	Hoglabaria	12004	53706	27914	25791	42.66	45.8	39.27
		Maricha	6551	29450	14983	14468	26.32	27.18	25.44
		Mathurpur	9811	43843	22463	21380	36.87	40.16	33.43
		Prayagpur	9851	45712	23587	22125	37.72	39.88	35.44
		Ramkrishnopur	6660	30650	15935	14715	37.46	40.68	33.97
		Total	60675	275790	141911	133879			
	% of Male Female				51.46	48.54	35.55	37.99	32.94

Source: BBS, 2001 Enumerated by CEGIS for 2010

Table 6.12: Age distribution

Percentage of male / female population by age range

0-4 Years		5-9 Years		10-14 Years		15-17Years		18-34 Years		35-59 Years		60+Years	
Male (M)	Female (F)	M	F	M	F	M	F	M	F	M	F	M	*F*
6.20	5.68	6.47	5.97	7.29	5.98	3.38	2.30	13.64	15.90	11.08	9.54	3.40	3.17
11.88		12.44		13.27		5.68		29.54		20.62		6.57	

Source: BBS, 2001 Enumerated by CEGIS for 2010

In the DIA 12 houses will be displaced by the RoW and back-to-back station (table 6.13). In the RoW approximately 90 households (HHs) and in the back-to-back station site approximately 90 households (total 200 HHs) will be displaced for their livelihoods. Approximately 960 persons will be displaced by the DIA area within the RoW and back-to-back station area. Detailed land information on the back-to-back station site is presented in Table 6.14.

Table 6.13: Households and population in DIA

Name of projects	Upazilas	Transmission line (km)	Direct Impacted Area	Total Houses displaced	Approximate households displaced for livelihood at tower and station sites	Approximate households displaced for livelihood at RoW sites	Approximate population displaced
Pakuria -Char Mokarimpur 400 kV Grid	Bheramara	14.46	0.72 km^2	5	50	583	2903
	Daulatpur	12.70	0.63 km^2	2	40	517	2543
Char Mokarimpur to Khulna-Ishwardi 230 kV Grid	Bheramara	5	0.25 km^2	0	20	250	1229
Back-to-back station	Bheramara	-	113.2529 acre	5	88	-	432
Total				12	198	1350	7,107

Source: EIA and RAP study, CEGIS.

Table 6.14: Details of the acquired land for sub-station

SL No:	Mauza Name & JL No:	Khatian No:	Plot No:	Area Of Land (Acre)		Land Owner	Comments
				Total	Proposed		
1	Char Mukarimpur, JL No: 13	02	320	336.63	94.410 (Part)	Bangladesh Railway (BR)	Back to back station
2	Mukarimpur JL No:14	01	4025	0.15	0.1500 (Full)	*Khash*	Entrance Road
			4205	0.12	0.1200 (Full)	"Do"	"Do"
			4234	0.035	0.0350 (Full)	"Do"	"Do"
		02	4233	6.14	0.1025 (Part)	BR	"Do"
			4234	5.19	3.2100 (Part)	"Do"	Back to back station
			4275	14.69	14.6900 (Part)	"Do"	"Do"

				Area Of Land (Acre)			
			4279	4.20	0.1800 (Part)	"Do"	Entrance Road
		1604	4276	0.93	0.1500 (Part)	Private Land	"Do"
		2129	4204	0.77	0.1350 (Part)	"Do"	"Do"
		2128	4016	0.15	0.0550 (Part)	"Do"	"Do"
			4017	0.04	0.0150 (Part)	"Do"	"Do"
			4018	0.14	0.0800 (Part)	"Do"	"Do"
		268	4021	0.29	0.1000(Part)	"Do"	"Do"
3	Govt. Khash					0.270 Acre	
4	Bangladesh Railway					112.6284 Acre	
5	Private Land					0.535 Acre	
	Total					113.4334 Acre	

Source: PGCB.

4.8.3 Land Price Situation

The prices of different land categories in the study area are presented in Table 6.15.

Table 6.15: Price of different land categories

Sl. No.	Land categories	Price per acre (Tk.)
1	Homesteads land	2,000,000
2	Agricultural land	1,000,000
3	Floodplains	800,000
4	Commercial land (high land for industries, school, play ground etc.)	3,000,000

Source: EIA study, CEGIS.

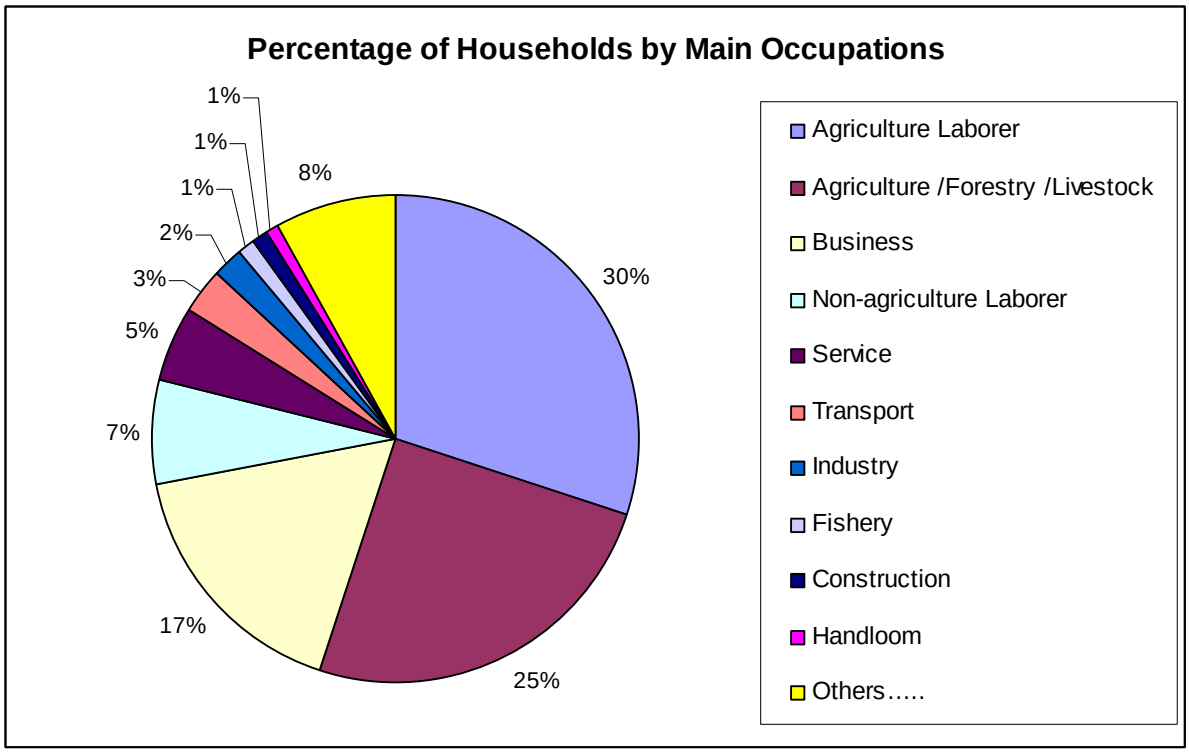
4.8.4 Occupation and Employment in GIA

The percentage of population both male and female by different occupations in the GIA is presented in Table 6.16. Household work is the main occupation which is followed by agricultural work. A significant percentage (29%) of population has no work in this area. The percentage of households by main occupations is presented in Figure 6.9.

Table 6.16: Percentage of population by main occupation

Main occupation	% of population
Household work	33
Not working	29
Agriculture	21
Business	6
Looking for work	2
Industry	2
Transport	1
Others	6

Source: BBS report



Source: BBS report

Figure 6.2: Pie chart shows main occupations

4.8.5 Labor Availability and Wage

The male labor availability of farming and non-farming sector in the project area is reported as medium. Female labor is not available in this area. The females of this area are not used to farming and non-farming activities. The average wage if male labor is reported in Table 6.17. Wage for betel vine labor is relatively higher than farming labor. Taka 250 as wage with food is claimed for betel vine labor per day.

Table 6.17: Average maximum and minimum wage rate for male and female labor

Wage for	Male labor wage (taka)		Female labor wage (taka)	
	Ave. maximum	Ave. minimum	Ave. maximum	Ave. minimum
For farming activities	200	150	-	-
For non-farming activities	200	150	-	-

Source: EIA study, CEGIS.

4.8.6 Migration

The seasonal out migration from this area is relatively lower than other parts of the country. Around 2-3% of labourers used to migrate regularly to Faridpur, Bagura, Rajshahi, Pabna and adjacent areas for boro (HYV) crop harvesting. Some people migrate to urban areas for rickshaw/ van pulling. The in migration to this area is relatively low while permanent in and out migrations are not observed in this area.

4.8.7 Annual Expenditure and Income

The average annual income and expenditure of the project area are presented in Table 6.18. People of this area are relatively well off than other areas of Bangladesh. Around 65% of households reported that they earned more than 5000/- taka per month.

Table 6.18: Average expenditure and income within project area

Range (in taka)	Percentage of households	
	Income	Expenditure
<=12,000	00	00
12,000-24,000	00	05
24,000-60,000	35	45
60,000-108,000	32	25
108,000-240,000	23	15
>=240,000	10	10

Source: EIA study, CEGIS.

4.8.8 Self-Assessed Poverty

Households of the GIA assessed poverty themselves which is reported in Table 6.19. Year round availability of food and income status have been considered for the assessment of poverty. Around 10% of households mainly assessed themselves to be in deficit.

Table 6.19: Self assessed poverty for year round

Sl. No.	Poverty status	Percentage of households
1	Deficit	13
2	Balance/Breakeven	45
3	Surplus	42

Source: EIA study, CEGIS.

4.8.9 Land Ownership Pattern

It is reported in the BBS, 2001 report that 52 % of households have agricultural land in the GIA area. During the RRA study, the land ownership pattern was also investigated for the area. Table 6.20 shows that 43% of people of the area were reported to be landless and marginal farmers.

Table 6.20: Percentage of households with different land ownership

Land ownership classes	Percentage of household
Land less/ No land (0 decimal)	03
Land less (up to 49 decimal)	22
Marginal (50-100 decimal)	18
Small (101-249 decimal)	32
Medium (250-749 decimal)	18
Large (750 + decimal)	07

Source: EIA study, CEGIS.

4.8.10 Quality of Life

Housing Status

The housing status of the GIA is presented in Table. 6.21. Around 50% of houses have been reported as semi-*pucca* and *pucca* in the area which indicates a relatively better housing condition in the area than in other parts of the country.

Table 6.21: Housing Status

Sl. No.	Housing status	% of hhs having
1	Jhupri	00
2	*Kancha*	52
3	Semi *pucca*	45
4	*Pucca*	03

Source: EIA study, CEGIS.

Drinking water

The sources of drinking water in the GIA are presented in Table 6.22. It is reported in the BBS report that 94% of households have used HTWs water for drinking purposes. However, during the RRA it was reported that 100% of households have used HTWs water for drinking purposes.

Table 6.22: Drinking water source within GIA

Sl. No.	Drinking water source	Reported % of HHs by BBS	Reported % of HHs by RRA
1	Tap	1	00
2	Tube well	94	100
3	Well	00	00
4	Pond	00	00
5	Others (rivers, *khals* etc.)	05	00

Source: EIA study, CEGIS.

Sanitation

The sanitation status of the GIA is present in Table 6.23. Most of the households in the area have ring slab latrines while 2 % of households have no sanitation facilities at all.

Table 6.23: Toilet facilities within GIA

Sl. No.	Toilet types	Percentage of households
1	Water sealed	07
2	Ring slab	78
3	*Kancha*	13
4	No facilities	02

Source: EIA study, CEGIS.

Diseases and treatment facilities in GIA

The common diseases by ranking and treatment facilities in the GIA are presented in tables 6.24 and 6.25 respectively.

Table 6.24: Incidence of diseases by ranking in GIA

Sl. No.	Disease	Ranking by incidence
1	Influenza/ common fever	1
2	Cough/cold	2
3	Appendicitis	5
4	Diabetes	3
5	Gastric	4
6	Hypertension	6

Source: EIA study, CEGIS.

Table 6.25: Source of treatment facilities in study area

Sl. No.	Source of treatment facilities	% of hhs received
1	Trained physicians	30
2	Paramedic/ diploma physicians	65
3	Quack doctors and informal treatments	05
4	No treatment facilities at all	00

Source: EIA study, CEGIS.

Electricity

In the BBS report, 24% of households in the GIA have electricity facilities. It may be presently increased to some extent. However, people in the Ramkrishnapur area want electricity in their locality.

Social overhead capital:

Roads: A lot of local *pucca* / muddy roads are observed to across the RoW within the GIA (Table 6.26). There is not much movement of vehicles through these roads, but the roads are very important for the locality.

Table 6.26: Rural roads of the GIA

Kilometer	Pucca	Kancha	Comments
0-1	1	1	-Crossing the Bheramara to Golapnagar *pucca* road -Crossing the Munshiget to Golapnagar *kancha* road
1-2	-	1	-Crossing the Munshiget to Golapnagar Fakirabad *kancha* road
3-4	1	-	-Crossing the Fakirabad to Mollahaspur *pucca* road
5-6	1	-	-Crossing the Golapnagar to Jagshar *pucca* road
7-8	1	-	-Crossing the Parankhali to Jagshar *pucca* road
11-12	1	-	-Crossing the Allardarga to Dolla bazzar *pucca* road
12-13	1	-	-Crossing the Gobindapur to Gasherdia *pucca* road
13-14	1	1	-Crossing the Bhurki to Gasherdia (Toltolipara) *pucca* road

Kilometer	Pucca	Kancha	Comments
			-Crossing the Toltolipara to Balirdoba *kancha* road
14-15	1	-	-Crossing the Bodnapara to Sttarpara Road
15-16	1	1	-Crossing the Baka bottola to Balirdoba *kancha* road -Crossing the Baka bottola toBoiragir char *pucca* road
20-21	1	-	-Crossing the Muthrapur to Baiarmardi *pucca* road
21-22		1	-Crossing the Bagan to Phulbari *kancha* road
22-23	1	-	- Crossing the Palbari to Mohish Kunda Road
25-26	1	-	- Crossing the Mohish Kunda to Borobandi bazzar *pucca* road
27-end		1	- Insafnagar to off take of Mathabhanga River *kancha* road
Total	12	06	

Source: EIA study, CEGIS.

Educational Institutions: It has been observed during the RRA that each and every mauza has a primary level educational institution. Secondary level educational institutions are also available within the GIA in sufficient numbers. However, there is no educational institution in the proposed RoW area.

Markets: There are some major markets observed within the GIA. However, there is no market in the RoW area.

4.8.11 Natural Disaster

The details of natural disasters in the GIA are presented in Table 6.27.

Table 6.27: Natural disasters in GIA

Sl. No.	Major Disaster	Severely affected year	% of area	% of hhs	% of crop damage	Major crop damaged
1	Flood	1998	25	10	20	Vegetable and T. Aman
2	Drought	almost every year but 2009 is severe	25	25	25	Jute, Boro

Source: EIA study, CEGIS.

4.8.12 Safety Nets of the GIA

The detailed social safety nets programmes are presented in Table 6.28.

Table 6.28: Name and activity of GO/ NGOs working in this area

Name	Activity	% of HHs coverage
BRAC	Credit, health and education	10
Uddipon	credit	5
Disha	credit	5
Asha	credit	10
Grameen Bank	credit	15
Government Bank i.e. Krishi, Agrani, Janata, Sonali and Pubali	credit	10

Source: EIA study, CEGIS.

Chapter 5
Impact Analysis

5.1 Introduction

All environmental and social components are not impacted by project interventions. Some components are impacted while others are independent of the interventions. Environmental and social components likely to be impacted by project interventions are termed as Important Environmental and Social Components (IESCs). Important Environmental & Social Components (IESCs), likely to be impacted by the construction of the 400 KV electricity transmission lines have been selected based on the rationale presented against each IESC in the following section.

5.2 Selection of IESCs and its Rationale

5.2.1 Water and Physical Environment

Important Environmental and Social Components (IESCs) for water and physical resource and the rationales are described in Table 7.1.

Table 7.1: Important IESC on water and phisycal environment and its rationale

IESCs	Rationale for selection
Drainage congestion	Due to civil work in back to back station site, some drainage congestion may be occurred in future.
Ambient air quality	The construction of overhead transmission line will generate minor amounts of air pollution from fuel combustion (light fuel oil) used for supplying lorries and equipment. These may impact air ambient quality.
Interference with road crossing	There may be interference in crossing points of rural roads and regional highways during stringing the transmission lines.
Construction waste at tower and back-to-back station sites	Construction wastes in the back-to-back station and tower site may create hazard to the surroundings. Therefore, this is considered as IEC.
Storm water drainage system at back-to-back station	Land development in proposed back-to-back station site may disturb storm water drainage path for nearby area, especially at back to back station.

5.2.2 Soil and Agriculture

Important Environmental and Social Components (IESCs) for the soil and agriculture resource and its rationales have described in the table 7.2.

Table 7.2: Important IESC on Soil, agriculture and its rationale

IESCs	Rationale for selection
Total crop Production	The tower legs will occupy some land. So, the total crop production of this land may be impacted. Under this condition, crop production has been considered as an IEC.
Intercultural operation or Cropping pattern	The crops grown under the transmission line may be affected by heat wave of the power line. The rabi crops which are very sensitive to temperature may be impacted by the project. Farmers may change the cropping pattern. Because of this reason, cropping pattern has been considered as an IEC.
Quality of land	Quality of agricultural land in tower sites may be degraded due to construction materials i.e. brick, cement, sand metals etc. So, Quality of agricultural land has been selected.
Soil erosion	The soil will be dug during erection of towers whish will loosen the topsoil in the vicinity. These valuable top soils are likely to be eroded from higher part of the ridges to the basins. Farmers of the higher ridge sites will be affected while farmers of the basins will benefit by receiving the topsoil.

5.2.3 Biological Environment

Important Environmental and Social Components (IESCs) for the biological environment and its rationales have described in the table 7.3.

Table 7.3: Important IESC on Biological environment and its rationale

IESCs	Rationale for selection
Terrestrial and aquatic flora	Flora provides habitat for all the terrestrial and aquatic wildlife species. Flora supports critical functions in the biosphere, at all possible spatial scales. First, flora regulates the flow of numerous biogeochemical cycles (see biogeochemistry), most critically those of water, carbon, and nitrogen; it is also of great importance in local and global energy balances. Such cycles are important not only for global patterns of vegetation but also for those of climate. Second, flora strongly affects soil characteristics, including soil volume, chemistry and texture, which feed back to affect various vegetation characteristics, including productivity and structure. Third, flora serves as wildlife habitat and the energy source for the vast array of animal species on the planet (and, ultimately, to those that feed on these). Perhaps most importantly, and often overlooked, global vegetation (including algal communities) has been the primary source of oxygen in the atmosphere, enabling the aerobic metabolism systems to evolve and persist. Several indicators such as biodiversity, species richness and habitat suitability can be used to assess the physical condition of the ecosystem. Therefore, assessing the population dynamics of local plants and wildlife communities can measure the health of terrestrial ecosystem as well as its inhabitants. Physical settings of the existing ecosystem may be changed due to noises, disturbance and fragmentation caused by the proposed project and hence it may modify the local biotic communities.

IESCs	Rationale for selection
	Consequently, we selected terrestrial and aquatic flora as one of our environmental component likely to be impacted.
Wildlife population	Wild life refers to all living organisms in their natural habitat other than cultivated plants and domesticated animals.Wildlife includes all non-domesticated plants, animals and other organisms. Domesticating wild plant and animal species for human benefit has occurred many times all over the planet, and has a major impact on the environment, both positive and negative. Wildlife can be found in all ecosystems like deserts, rain forests, plains, and other areas-including the most developed urban sites—all have distinct forms of wildlife. While the term in popular culture usually refers to animals that are untouched by human factors, most scientists agree that wildlife around the world is impacted by human activities. During the construction period wildlife would be impacted within the project area.

5.2.4 Socio-Economic Environment

Important Environmental and Social Components (IESCs) for the socio-economic environment and its rationales have described in the table 7.4.

Table 7.4: Important IESC on socio-economic environment and its rationale

IESCs	Rationale for selection
Involuntary migration of HH	Normally people in the area reside without any encroachment in their households. Intervention through power line construction causes: (i) immediate effect on their staying in existing households to allow for construction of towers and pillars requiring resettlement and (ii) medium (five years span) long run (beyond 5 years) effect on their health due to ultimate threats of radiation and other pollutions. These have implications for involuntary migration of households.
Land price	Land price increases normally as a result of increasing demand and scarcity effect. As a result of power line encroachment through present land under cultivation, future productivity of land is most likely to diminish. This will revert the trend of increase of price of land.
Employment opportunities during construction (technical and non-technical)	Unemployment of unskilled labor is a problem in the area. Temporary employment of unskilled and skilled labor may be a component for impact analysis due to transmission line construction activities.
Agricultural income per capita	Decrease of productivity of land under cultivation due to power line construction is directly correlated with its return to the farmers.
Regional as well as national economic development	The present trend of extension of urban installations into the rural area is related locally to the proposed power line which inhibits population immigration due to anticipated health hazards and threats of accidents.
Training for livelihood restoration	Training will be helpful for restoration their livelihood for the displaced people.
Human safety	Movement of people in the potential DIAs is free now. Physical and biological implications of high power transmission lines in future will have correlation with human safety.

5.3 Potential Environmental Impacts (Pre, During and Post-Construction).

5.3.1 Drainage Congestion

The back to back station site is a drainage path of this area. So, the civil work may cause huge drainage congestion for the area.

5.3.2 Ambient Air Quality

Air quality may deteriorate slightly due to transport of materials to the tower/ back-to-back station sites. Further deterioration may occur due to soil digging, concrete works at tower / back-to-back station sites.

5.3.3 Interference with Road Crossing

The road crossing sites will be temporary impacted while stringing wires through the towers.

5.3.4 Construction Waste at Tower and Station Site

During construction period it may create disturbance to the surrounding land, settlements and communities.

5.3.5 Storm Water Drainage system at Station Site

After construction of back to back station site, while it will be in full operation, storm water may create environmental hazards on surrounding agricultural land.

5.3.6 Total Crop Production

Total around 1654 metric ton different crops are growing in the RoW and back-to-back station sites. During implementation mainly Rabi season (mid November to end of May) in the RoW of project around 837 metric ton of crops will be lost.

5.3.7 Intercultural Operation or Cropping pattern

At present the intercultural operation or cropping pattern is traditional. During implementation period and under post-project condition, it will be partially impacted.

5.3.8 Soil Erosion

No soil erosion was observed in the tower site as well as back-to-back station site. But during construction period, top soil may be eroded at tower site as well as back to back station site.

5.3.9 Quality of Land

Construction waste (i.e. cement. brick, metal things etc.) may create disturbance in the surrounding land, and settlements. The impact on agriculture land may continue Environmental Management Plan for long time.

5.3.10 Terristorial and Aquatic Flora

Trees on the row and tower sites may be need top be cut during the construction period. All tall trees like coconut, Mahogany, Kory, Mango trees etc will be removed from the row, especially at the tower sight. Therefore, the trees on the row and tower site are a great concern. The proposed back-to-back station site is fully agricultural land and no trees were found at the back-to-back station site. Most households have separate lands near the homesteads (locally known as *Baganbari*) where commercial species of plants are dominant. These include mango (*Mangifera indica*), betel nut, coconut (*Cocos*

nucifera), bamboo (*Bambusa spp*) or mixed vegetation. Vegetable gardens in and around settlements or in orchards are common sights.

Activities that have significant impact during the construction phase are the selection of structure alignment, acquisition of land for these structures and site preparation. The most important impact is the removal of vegetation and crops from the construction sites. During the pre-construction period, all the vegetation including trees would be removed from the structure alignment and its surroundings. This might create a temporary scarcity of fuel as well as other plant product in nearby areas. Moreover, it could generate a provisional loss of habitat for the local wildlife population that depends on those habitats.

A few hectares of real homestead vegetation have to be removed, even if in a small dimension. Matured mango, Banana and other fruit bearing trees and timbers have to be chopped down and a whole lot of smaller herbs and shrubs must be cleared out. This cleansing process would not only create a negative impact on the local plant diversity but also generate harmful effects on its wild life population, especially on the avi-fauna. Some dominant tree species would be cut on the ROW of transmission line. A detail about the tree species mentioned on the flowing table 7.5.

Table 7.5: Impacts on the trees

Trees (Local Name)	Scientific Name	Socio-economic value	Ecological value
Aam	*Mengifera indica*	Fruit, Timber, Firewood	Nesting, feeding and Sheltering element of bird and mammals
Babla	*Acacia nilotica*	Timber, Firewood	Nesting, Sheltering element of bird, Snake and mammals
Bash	*Bambusa sp*	Timber	Nesting, feeding and Sheltering element of bird, Snake and mammals
Ipil-epil	*Leucaena glauca*	Firewood	Sheltering element of bird, Snake and mammals
Kadom	*Anthocephalus chinensis*	Timber, Firewood	Nesting, feeding and Sheltering element of birds and mammals
Khanthal	*Artocapur heterophyllus*	Fruit, Timber	Nesting, feeding and Sheltering element of bird, Snake and mammals,
Kala	*Musa sp.*	Fruit	Feeding element of bird and flying mammals
Kory	*Albizia procera*	Timber, Firewood	Nesting and Sheltering element of birds
Mahogany	*Swietenia mahagoni*	Timber, Firewood	Nesting and Sheltering element of bird.
Narikel	*Cocos nucifera*	Fruit, Timber, Fiber	Nesting, feeding and Sheltering element of bird, Snake and mammals
Nim	*Azadirachta indica*	Medicine, Timber	feeding and Sheltering element of birds
Sissu		Timber, Firewood	Nesting and Sheltering element of birds

5.3.11 Wildlife Population

Habitats of some wildlife (e.g. rates, mungoes, birds, reptiles etc.), living at the surrounding tower site, back-to-back station site will be affected due to construction of back-to-back station and other sites. Although the land area is small, countless local habitats of those wild species will be disturbed. Hope fully they can survive in surrounding areas as the ecological composition is very similar. Some birds, reptiles, snake will leave the place due to tree cutting and earth work at the tower and back to back station site.

During the construction work it is expected that the wildlife would be impacted. Major groups of resident birds are represented in this zone by many species. Construction activity impacted on amphibian's species like Tree frog, Skipper frog, Cricket frog and Indian Bull Frog. Different species of tortoises and turtles are found in water bodies. Common House gecko, Keeled Grass Skink, Bengle monitor, checkered keelback, Common Garden Lizzard, Dark-bellied Marsh Snake, Cantor's Kukri Snake, Monocelate Kobra, Indian Black Turtle, and Spotted Flap shell Turtle would be affected when the constrction and other activity will run.

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Some terrestrial and aquatic bird species such as Black Kite, Black Drongo (*Dicrurus macrocercus*), Rose-ringed Parakeet (*Psittacula krameri*),Oriental Magpie Robin (*Copsychus saularis*), Spotted Dove (*Streptopelia chinensis*), Red vented Bulbul (*Pycnonotus cafer*), Rufous Treepie (*Dendrocitta vagabunda*), Common myna (*Acridotheres tristis*), asian Koel (*Eudynamys scolopacea*), Common Hawk Cuckoo (*Hierococcyx varius*), Black Hooded Oriole (*Oriolus xanthornus*). Little Egret (*Egretta gazatta*), White throated Kingfisher (*Halcyon smyrnensis*), Little Cormorant (*Phalacrocorax niger*), Indian Pond Heron (*Ardeola grayii*) Red-wattled Lapwing (*Vanellus indicus*), Common Kingfisher would be impacted for tree cutting. Aquatic and Terresterial wildlife life would be temporarily disturbed due to the movement of the vessels of the dredging unit and due to the dredging activities.

Impact on aerial wildlife: The evidence of bat colony was found in the proposed project area. It is a flying mammal's of Bangladesh. Some flying mammals would be impacted due to the transmission line. Greater short nosed fruit bat, Greater False vamppier, Indian pipistrelle also would be impacted after completion of the transmission line. Flying mammalas may be affected by electric wire. It would also create disturbance to free moment of the bat and some other birds.

5.3.12 Involuntary Migration

People owning private land of the proposed back-to-back station site will be displaced due to acquisition of proposed approach road to the back-to-back station. Those people will be properly compensated from the project.

According to the electricity rule 1910, power division, Bangladesh does not give any compensation money to the displaced people for the land of tower site. But crop compensation will be given to the displaced people for the back to back station site (approximate 93 households and 450 people) as well as the tower sites (approximate 90 households, 450 people). During construction period for the stringing of cable, the displaced people of RoW's will be also paid compensation for standing crops and trees. In the RoW site approximate 1350 households will be compensated for crops and trees (if available) for the both grid line.

Approximate 7 nos. households under RoW will be dismantled doe to grid line construction. These seven houses will be constructed further and owner of the houses will get better houses than those they have if they will properly compensated and rehabilitated.

5.3.13 Land Price

The sale value of different type of land will be reduced under pre project situation. The sale value of different type of land will be reduced drastically during project. But in post project the sale value of different type of land will be reduced. With time, people may gradually be interested but at a much lower price.

5.3.14 Employment Opportunities During Construction (Technical and Non-Technical)

Construction of the grid line as well as back-to-back station requires both skilled and non-skilled laborers and thus will create employment opportunities for poor people in the of vicinity of the proposed area and out side proposed area. A lot of civil works will also be done in this area, which will create employment opportunities. Besides, some other livelihood opportunities like trade and small business will be created in the project site in addition to those opportunities. Transportation, loading and unloading of goods/materials will also create employment opportunities for the poor people.

Continuous power supply will create different employment opportunities in different sectors, i.e. in agricultural sectors, industries sectors, garments sector, business sectors and other sectors. So, this project will create nation wide employment opportunities no doubt.

5.3.15 Agricultural Income Per Capita

The net income from agriculture of the DIA site is calculated as Tk. 8,170,530. In the DIA total population has calculated 7,107 nos. So, per capita agricultural income will be loss is estimated Tk. 1,150/- per season.

5.3.16 Regional, National Economic Development

As per treaty with Prime Ministers of India and Bangladesh, the proposed grid line will provide 250 MW power from India to Bangladesh. In Bangladesh, at present the power is estimated as deficit. So, regional as well as national development works would be hampered severely. But when the power supply will be started from India to our national grid, the power supply will be restored for regional level as well as national level. All type of development sectors i.e. irrigation sector in agriculture development, industries sector, garments sectors will be ensured continuous power supply. As such our regional as well as national development will be continued, which will reduce poverty and thus, Bangladesh will be a middle stage income earning country in the world in near future.

5.3.17 Training for Livelihood Restoration

The project would be responsible for institutional arrangements for implementation of the infrastructures as well as arrangement of training for rehabilitation of the displaced people. Some

local or national NGOs may help in this context. The NGO should have training programme for the displaced people for their livelihood restoration. This type of training works may help displaced people directly to remove their poverty.

5.3.18 Human Safety

During implementation of the project, the safety of human is most important thing. Different type of construction materials as well as different type of heavy vehicle may caused for the human safety. Proper contingency measures will be needed for the human safety.

5.4 Impact Matrix

Potential environmental impacts on the IESCs during pre-construction, construction as well as post-construction and operation stages of the proposed 400 kV grid are presented below in a matrix form (Table 7.6).

Table 7.6: Impact matrix for proposed transmission line

IESCs	Baseline Condition	Impact of the interventions during		
		Pre-construction	Construction	Post-construction
Drainage congestion	The proposed back-to-back station site is a seasonal water path.	No impact	Drainage congestion will be created	With proper mitigation measures Drainage congestion will be removed
Ambient air quality	Normal	Air quality may deteriorate slightly due to transport of materials to the tower/ back-to-back station sites.	Further deterioration may occur due to soil digging, concrete works at tower / back-to-back station sites.	Gradual improvement.
Interference with road crossing	No impact	No impact	Temporary impact while stringing wires.	No impact
Construction waste at tower and back to back station sites	None	No impact	May create disturbance to the surrounding land, water and settlements.	No impact
Storm water drainage system at back to back station	None	No impact.	No impact	Storm water should be drainage to proper path
Total crop Production	1654 tons	Partially damaged	Partially damaged	No damage

IESCs	Baseline Condition	Impact of the interventions during		
		Pre-construction	Construction	Post-construction
Intercultural operation or Cropping pattern	Traditional	Partially impacted	Partially impacted	Moderately impacted only in the tower area
Soil erosion	No soil erosion	No soil erosion	Top soil in the tower site will be eroded	No soil erosion
Quality of land	None	Dismantling of towers may create disturbance in the locality	Construction waste may create disturbance in the surrounding land, and settlements.	The impact on agricultural land may continue.
Terrestrial and aquatic flora	More than 5000 plants with different species like Mango, Bash, Mahogany, Kory etc. are in the RoW. Small plants like herb and shrub are under the RoW	Cutting of the trees pre-construction of towers.	The plants in the RoW will be cut down while the construction will run Small vegetation like Herb and Shrub would be affected due to construction. Little disturbance to wetland's vegetation for construction	Gradually improve. But large tree in the RoW or beside the both side of the RoW is not growing up. It should be pruning. No disturbance for wetland vegetation
Wildlife population	Over all existing wildlife species and wildlife habitat species is moderate based on research work	Undisturbed for wildlife species and habitat.	Some wildlife species like bird, reptiles will be scared and leave the place for tree cutting, material storage, and sound pollution. During the construction some wildlife habitat will be affected. (Should need to avoid nesting or breeding period)	Gradually improvement of bird and reptiles habitat. But flying mammals like Bat, Vampire and Indian pipistrelle would be dying for electric shock of transmission wire. Should be use cover of the transmission line wire to avoid the impact of aerial wildlife such as bat, vampire etc. Little disturbance for free moment of the bat and as well as the birds.

IESCs	Baseline Condition	Impact of the interventions during		
		Pre-construction	Construction	Post-construction
Involuntary migration of HH	12 HHs	12 household will be displaced	12 household will be displaced	Due to proper compensation payment they will be able to rebuild their houses
Land price (in taka/acre):		Sale value of different type of land will be reduced	Sale value of different type of land will be reduced drastically	Sale value of different type of land will be reduced. With time, people may gradually be interested to buy land, but at a much lower price.
Homesteads land	2,000,000 taka/acre			
Agricultural land	1,000,000 taka/acre			
Floodplains	800,000 taka/acre			
Commercial land (high land for industries, school, play ground etc.)	3,000,000 taka/acre			
Employment opportunities during construction (technical and non-technical)	Moderate	No impact	Positive impact due to employment facilities in technical and non-technical sector	Positive impact indirectly power supply will help growth of our national economy. Then employment opportunities will be increased.
Agricultural income per capita	1,150/-	No impact	Income will be reduced	Income will be reduced to some extent
Regional as well as national economic development	Low	No impact	No impact	Regional as well as national economic development will be ensured.
Training for livelihood restoration	No training	No training	Training will be included	Training for livelihood restoration will be helped for their further development.
Human safety	Good	No impact	May be negatively impacted	Due to mitigation and contingency measures safety will be ensured.

Chapter 6
Environmental Management Plan

6.1 Mitigation Compensation and Contingency Plan

Impacts	Mitigation	Compensation	Contingency	Cost (in lac taka)	Responsible Institutions
Drainage congestion	Drainage system will need to be developed surrounding the back-to-back station site	-	-	50	PGCB design unit and Contractor
Impact on Ambient air quality	Water spray on roads, carry materials at night and temporary fencing at construction sites	-	-	5	PGCB and Contractor
Interference with Road Crossing	Nets should be placed over the crossing points of roads while stringing wires. Danger signs and public awareness are also required	-	Contingency cash will need to cover any un-expected situation	5	PGCB
Storm Water Drainage Congestion near back to back station site	The surrounding area should be kept open and dug to retain storm water during monsoon. Otherwise, storm water will create problems for the surrounding crop lands.	-	-	5	PGCB
Impact on flora	Plantation of selected trees species of medium height and high productivity (lemon, guava, and timber yielding) should be done in the back-to-back station area and RoW location. Total around five Thousand Five Hundred Trees will be cut for the project. So, it is expected that, around ten thousand trees will be replanted in the surrounding area. In this case, homesteads garden with fruits trees and rapid growing timber trees will be more emphasis.	-	-	5	PGCB
Impact on wildlife	-Avoid breeding season and destruction of nest and wildlife habitat. -Avoid killing wildlife so that they can at least escape to other places. -Avoid destruction of nest			5	PGCB and Contractor

Impacts	Mitigation	Compensation	Contingency	Cost (in lac taka)	Responsible Institutions
	-Construction work should be taken up in the dry season; it would minimize damage to wetland wildlife -Covered transmission line should be used to avoid the impact on aerial wildlife such as bats.				
Soil Erosion	During construction period, the contractor should carefully dig holes for erecting towers. The excavated soils should be properly stacked and the holes refilled with the stacked soils by maintaining the reverse sequence of the profile (i.e. sub stratum – subsoil – topsoil). The loosened topsoil must be compacted well so that no erosion can take place. Vegetative cover either with crops or grass must be restored in the affected part of the tower.	-	-	3	PGCB and Contractor
Impact on Crop Production	Sand and cementing material works should be done in fallow lands. The sand and concrete wastes should be cleared off from the construction sites just after completion of tower construction so that agricultural land remains productive in the future.	Adequate compensation for damage of crops has to be paid.	-	82	PGCB and Contractor
Involuntary Migration from Right of Way and back to back station	-	Proper cash compensation should be provided to the households that would have to be shifted from the RoW. Proper compensation should be provided to the actual landowners at the present market value for the back-to-back station site. Tower sites might be acquired in the	A contingency fund should be created to meet emergency situations caused by accidents during line construction	50*	PGCB, DC office and Contractor

Impacts	Mitigation	Compensation	Contingency	Cost (in lac taka)	Responsible Institutions
		future when such law is enforced for power projects.			
Impact on Human safety	To ensure human safety awareness and motivational programmes should be participatory with adequate discussions, meetings, display of signboards and posters at the construction sites.	-	A contingency fund should be created for construction labourers and public in case of accidents during construction of the transmission lines, towers and back-to-back station	15	PGCB and Contractor

** amount may be changed subjected to RAP study*

6.2 Enhancement Plan

Impacts	Enhancement plan	Cost (in lac taka)	Responsible Institutions
Vegetation	Plantation of selected tree species of medium high and high productivity (e.g. fruit or wood) should be done in the right of way to maintain plant diversity and density.	2	PGCB and Contractor
Agriculture	After the construction of the back to back stations, garden crops should be grown in the fallow areas of the back to back station compound. Also fruit trees of low high like mango, guava and lemon can be grown. Aware the farmers for proper intercultural operation in the tower location for avoiding any possible accident.	2	PGCB and Contractor
Non-agricultural employment	Local non-agricultural labors should be employed for the construction work of the transmission lines as well as the back to back stations	5	PGCB and Contractor
Agricultural income	Proper agricultural extension services and training (i.e. which type of crops will be suitable, how to cultivate inside towers etc.) will be ensured inside the towers sites.	2	PGCB and Contractor
Regional as	Government development agencies should plan	5	PGCB and

Impacts	Enhancement plan	Cost (in lac taka)	Responsible Institutions
well as national economic development	properly for the improvement of their areas and better electrification coverage in rural areas		Contractor

6.3 Compensation Plan

Compensation should be given to the actual owners for land, crops and settlement at the RoW, tower sites and back-to-back station site. The detailed compensation plan (Resettlement Action Plan- RAP) for displaced persons is given in another report which will be prepared as per ADB requirement within May 15, 2010.

6.4 Institutional Requirements and Monitoring Plan

The environmental monitoring plan will help in detecting changes taking place during as well as after establishing the transmission lines so that necessary steps can be taken to rectify defects or deficiencies, if any. The monitoring plan will focus on the implementation of the mitigation/ enhancement measures during the pre-construction, construction and post-construction/operation stages as shown in Table 8.1. The project implementation will be carried out under the overall supervision of the Project Director. For detailed supervision and monitoring, an external agency with experience in conducting environmental studies and monitoring with the application of Remotely Sensed (RS) satellite images and GIS facilities will be engaged.

The responsibilities include screening projects to specify ADB's safeguard requirements; undertaking due diligence; and reviewing the borrower's/client's social and environmental assessments and plans; determining the feasibility of ADB financing; helping the PGCB in building capacity to deliver the safeguards; and monitoring and supervising the borrower's/client's social and environmental performance. The ADB discloses safeguard plans and frameworks on its website. If the PGCB fails to comply with legal agreements on safeguard requirements, the ADB will seek corrective measures and work with the PGCB to bring it back into compliance.

Further responsibilities include assessing projects and their environmental and social impacts, preparing safeguard plans, and engaging with affected communities through information disclosure, consultation and informed participation. Submission of all required information, including assessment reports, safeguard plans/frameworks and monitoring reports to the ADB for review. To ensure that contractors appropriately implement the agreed measures, include the safeguard requirements in bidding documents and civil works contracts.

Table 8.1: Monitoring Plan (Pre-Construction Phase)

Indicators	Locations	Frequency	Monitoring Agency
Proper compensation for landowners, crops and properties.	Back-to-back station site and two RoW sites	Every month	Project Director, PGCB

Indicators	Locations	Frequency	Monitoring Agency
Soil samples need to be tested in the laboratory. Test results will be checked with previous soil report.	Every tower site and back-to-back station site	Once before construction	Project Director, PGCB
Loss in crop production, Notify farmers well ahead of time. Provide adequate compensation.	Back-to-back station site and tower sites	Every month	Project Director, Design Section, PGCB, Consultant and DC office
Un-hygienic condition for workers including water supply and sanitation	Labor shade in site	Every month	Project Director, PGCB, Design Section, PGCB and Consultants
Conflict with local community to use as much as possible local labors for avoiding cultural problems	Back-to-back station site and tower sites	Every month	Project Director, PGCB, Design Section, PGCB and Consultants
Preparation of approach roads for transportation of heavy equipment.	Back-to-back station site and tower sites	Once before construction.	Project Director, Design Section, PGCB and Consultants

Source: IEE study CEGIS.

Table 8.2: Monitoring Plan (Construction Phase)

Indicators	Locations	Frequency	Monitoring Agency
Spray water before movement of vehicles by contractors	RoW sites as well as back-to-back station site	Every day	Project Director, PGCB and Consultants
Transportation of materials by truck should be done at night by contractors	RoW sites as well as back-to-back station site	Every day	Project Director, PGCB and Consultants
Preparation of sanitary waste disposal site for solid and liquid waste.	RoW sites as well as back-to-back station site	Every week	Project Director, PGCB and Consultants
Adequate drains to carry storm water runoff	Back-to-back station site	Once a month	Project Director, PGCB and Consultants
Adequate compensation for trees	RoW and back-to-back - station site	Once a month	Project Director, PGCB and Consultants
Avoid killing of animals so that they can, at least, escape to another place.	RoW and back-to-back station site	Every day	Project Director, PGCB and Consultants
Crop compensation for the affected land	RoW and back-to-back station site	Every week	Project Director, PGCB and Consultants

Indicators	Locations	Frequency	Monitoring Agency
Placement of adequate signs and posts warning people	RoW and back-to-back station site	Once a month	Project Director, PGCB and Consultants
Announcements using mike to make communities aware about the risks of accidental events	RoW and back-to-back station site	Every week	Project Director, PGCB and Consultants
Fire fighters with materials	RoW and back-to-back station site	Every day	Project Director, PGCB and Consultants
Awareness of workers about hazardous materials and proper handling methods. Warning signs, labels and signals. Provide helmets, safety shoes and other PPE for workers in accordance with accident prevention and work safety procedures	RoW and back-to-back station site	Every day	Project Director, PGCB and Consultants

Source: IEE study CEGIS

Table 8.3: Monitoring Plan (Post-Construction/Operation Phase)

Indicators	Locations	Frequency	Monitoring Agency
Land recovery after waste removal by contractor	Labor shade	Once after implementation	PGCB
Failure of tower and accident by electrocution	Tower sites and back to back -station site	Every months	PGCB
Accident and power failure	Tower sites and back to back -station site	Every months	PGCB
Vegetation growing under the transmission line with regular pruning.	Tower sites and back to back -station site	Every three months	PGCB
Pilferage with proper security measures	Tower sites and back to back station site	Every three months	PGCB

Source: IEE study CEGIS

6.5 Budget for the Environmental Management Plan (EMP)

For implementing the Environmental Management Plan (EMP), about **Tk. 266.2 million** will be required. The major cost will be for land acquisition of the back-to-back station site and crop compensation in the RoW. The detailed estimate of the compensation is given in another Resettlement Action Plan (RAP) report as per the requirement of the ADB. The breakdown of budget for the EMP is given in Table 6.4.

Table 8.4: Budget for the Environmental Management Plan

Item	Qty	Rate	Total Taka (lac)
Compensation for private land, structures and trees for proposed RoW and back to back station site	As per RAP estimate		50*
Compensation for Crops in RoW and Tower sites	As per RAP and IEE estimation		82
Mitigation Plan and contingency		LS	93
Enhancement plan		LS	16
Training of Professionals and Worker about accidental cases and safety measures		LS	5
Sub total			246
Monitoring Plan	From revenue budget		
Consultant (for monitoring)	12 person – month	Tk.80,000 per month	9.6
Transport (for monitoring team)	120 days	Tk.8000 per day	9.6
Sub Total			19.2
Reporting		LS	1
Total Cost			266.2

Chapter 7

Public Consultations

7.1 Introduction

To disseminate the project aim and objectives to the local level stakeholders i.e. land owners, sharecropper, leaseholders, landless people, local government representatives etc. public consultations have been done during reconnaissance visits for the project.

7.2 Objectives

The objectives of the public consultation meetings were to inform local people about:

- the concept of the proposed project
- the proposed project
- temporary problems that could be created from the proposed project;
- possible suggestions to resolve those temporary problems;

7.3 Methodology

Social team from CEGIS visited the project sites for conducting the consultation meetings. Local people were invited to attend the meetings at specific venues and times (A list of participants have attach within the report as Annex II). A structured questionnaire was used by the senior professionals of the social team. People raised questions/issues and the facilitators took notes and gave answers and explanations. The issues that were raised by the local people are described in the following sections.

7.4 People's perceptions

People of the back to back station and RoW sites were already aware of the proposed line to be put up in their area. They learned about the proposed project from television as well as from high officials of the PGCB, ADB representatives, WB representatives, CEGIS representative, Ministry representatives, Railway Representatives etc. who frequently visited the project sites and spoke with local people about the project. As the route survey had been done, people in the RoW were also aware about the tentative route alignment of the project. However, they needed to be informed about when the project would start and how much time will be needed to complete it.

7.5 Major findings

7.5.1 Major problems identified by local people

Local people think that the proposed 400kV grid may create a few problems. In the agricultural sector some farmers will not be able to cultivate land due the project. Moreover, there are around 90 households in the back to back-station sites who will lose their lands and livelihoods due to the project. Some households would even have to change their professions due to un-availability of share-cropped-land as a result of the intervention. This unemployment situation may create some social

imbalance such as disruption in the law and order situation, increase in social crime, illegal passing of goods to neighboring countries etc. There are five households both in the back to back-station sites and the RoW who would need dismantle their houses for the project. Some agricultural production will also be lost due to the tower site.

The local people also expressed concern that it may become difficult to cultivate under this high power line, particularly during the rainy season. It may also create problems for cattle rearing throughout the season.

7.5.2 Suggested Solutions

Local people suggested that people who would lose their own land for the project should be compensated with land and properly resettled, if possible. People who would lose their livelihoods such as sharecroppers and leaseholders will have to be compensated with cash. For displaced people employment should be arranged from the project as per their academic qualifications. It will be very helpful if the government takes the initiative to ensure social safety nets programs for landless people, sharecroppers and leaseholders living in the back to back-station sites.

7.5.3 Suggestions for compensation:

- The compensation money should be given through bank accounts in a transparent manner supervised by an independent NGO.
- Compensation money should be paid through bank accounts of displaced people.
- Real land owners and sharecroppers should be identified and paid compensation money properly
- Proper compensation rate should be ensured for different crops
- No work will be started for implementing the project until proper compensation is paid to the displaced people
- A neutral monitoring agency should be engaged for monitoring the compensation activities

Chapter 8
Conclusion and recommendations

8.1 Conclusion

People all along the route of the transmission line expressed keen interest in the sub-project even after recognizing the fact that they will not get electricity directly from the transmission line. Their main interest is that the overall development in the power sector would contribute to the national development. Local people along the three transmission line alignments will be benefited as the project will generate some employment opportunities for them during the pre-construction and construction phases.

High resolution Remotely Sensed (RS) images have been used in deciding the route of the transmissions line avoiding settlements and ecologically sensitive areas. This has been reconfirmed by the IEE team members who walked along the entire length of the alignment to ground truth the signatures of the satellite images. Observations of the team members suggest that the route finally selected passes mostly through agricultural crop fields, not through settlement or ecologically sensitive areas.

A minor negative impact of the project will be felt during the pro-construction and construction phases which may involve removal of vegetation and cutting of trees for carrying construction materials to the sites and erection of towers and construction of the transmission line. These problems would be overcome by paying compensation and bringing back these lands to their original form before handing them over to the owners after the construction is over. Crop production lost due to these activities during the pre-construction and construction phases will have to be compensated as well.

The project is not likely to have any significant negative impact; therefore no major mitigation is required. The minor impact of noise and increase in traffic are within the existing level experienced by the local people. The tower will be erected and the line installed under expert supervision. The contractor will be under specific orders for providing PPE to the workers engaged for the job.

The monitoring plan, if properly implemented during the pre-construction, construction and post-construction and operation phases will ensure taking corrective measures.

The proposed project will have no residual adverse impact on the environment or the eco-system.

The PGCB is required to take clearance from the DoE for implementing the transmission line and other ancillary works. The IEE report has been prepared with this end in view.

8.2 Recommendations

The IEE study reveals that the Pakuria-Mokarimpur 400 kV transmission line has no major negative impact, but will contribute to national development by improving the supply of electricity. Local people will have employment opportunities during the pre-construction and construction phases and operation phase also. The contractor should be specifically instructed to employ local laborers as much as possible (not less than 50%).

Minor negative impacts like clearing of vegetation and cutting of trees at the pre-construction and construction phases should be taken care of by taking proper mitigation measures. Efforts should be

made to avoid cutting of trees as much as possible. Some trees might be unavoidable of cutting which or more should be replanted in surrounding area for conservation of biodiversity. In this case, homesteads gardening will be emphasize with fruit and rapid growing timber trees in surrounding area. Selection of the season for carrying out the work should be made by adjusting with the cropping season so as to inflict minimum damage to field crops. In both cases proper compensation for all types of damages must be paid and the land should be brought back to its original form before they are handed back to the owners.

The construction labour camps should be provided with water supply and sanitation facilities. The workers should be apprised of hygienic practices. The transportation of heavy equipments should be done by river craft where wheeling is not feasible. The stores and equipment yards should be properly guarded so that all equipments remain safe. The back to back-stations should be fully equipped with fire fighting equipments.

Finally, on proper examination it is observed that the project has been proposed to be implemented safely and in an environment friendly manner. So it is recommended that the project may be cleared to proceed with the works.

Annex 1
ToR of EIA

The Environmental Impact Assessment (EIA) 400 kV Grid Interconnection between Bangladesh – India and Associated back-to-back station"

Introduction:

The Honorable Prime Minister of the People's Republic of Bangladesh recently visited India. During this visit the Government of Bangladesh (GoB) signed an agreement with India to bring 250 megawatts of power from India. However, there is no transmission line between the two countries. In this context, the Power Grid Company of Bangladesh Ltd. (PGCB) is planning to construct transmission line facilities under the project "Proposed 30 km. long 400 KV Electricity Transmission Line Interconnection Project between the Eastern part of India (Bahrampur, West Bengal) and the Western Part of Bangladesh (Bheramara, Kushtia) and Associated back to back stations Project". The PGCB has finalized the suitable route for the proposed transmission line from Bheramara, Kushtia to Bahrampur, West Bengal, India. The PGCB will now need an environmental clearance from the Department of Environment (DoE), Ministry of Environment and Forest, Government of the People's Republic of Bangladesh for implementing the transmission line and other ancillary works. With this end in view, the PGCB intends to conduct Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) studies including a Resettlement Action Plan (RAP) study. The Center for Environmental and Geographical Information Services (CEGIS) has been requested to submit a proposal to conduct the above-mentioned studies. The EIA, and SIA including RAP studies will remain confined within the Bangladesh portion.

After the Memorandum of Understanding (MoU) between the Government of Bangaldesh and Government of India, the PGCB has finalized a suitable line from Char Mokarinpur mauza in Bheramara upazila to Pakuria in Daulatpur upazila under Kushtia District. The power line will run through agricultural land, cross local roads and water bodies i.e. ponds and floodplain. A preliminary survey shows that the proposed 30km. power line needs 70-80 tower sites including 14 angle points. The proposed back to back station will require 113.4334 acre land in Char Mokarinpur mauza in Bheramara upaila under Kushtia district. The maximum portion of the proposed land is owned by the Bangladesh Railway (112.6284 acre) and rest of the portion is under private and government (*khas)* ownership. During the construction phase the tower sites will be temporarily requisitioned for facilitating construction works as per governments electricity Acts 1910 and relevant updates amendments.

PGCB is committed to conduct all its activities in compliance to country regulations and as per DoE and World Bank guideline. PGCB is entirely conscious of the environmental issues and will always conduct its activities in an environmental compatible and socially responsible manner with commitment to conserve eco-diversity. In accordance of the environmental legislation in Bangladesh [Bangladesh Environmental Conservation Act 1995, amendment in 2000 and 2002 and the Environmental Conservation Rules 1997 and updated amendments in 2002 and 2003], any development project requires environmental clearance from the Department of Environment. The proposed power transmission line construction activities falls under "Red Categories" as per the Environmental conservation Rules 1997 and requires conduction an Environmental Impact Assessment (EIA).

Therefore, prior to commencement of the proposed work, PGCB wish to conduct the necessary Environmental Impact Assessment (EIA) in compliance with the environmental regulatory requirement.

In Bangladesh specific guideline does not exist for conducting the EIA for the power sector. However, EIA guideline for the industries and water sector provide a general framework of conducting EIA for the all sectors. Therefore, proposed EIA will be conducted following DOE Environmental Guideline. Besides, it is recommend to follow the world Bank environmental guidelines. This ToR for preparing the EIA for the proposed project has been prepared in light of the said guidelines and standards.

Objectives of the Study:

The EIA is aimed at examining all the interactions of proposed power line activities both construction and operation stages, which may result in impacts upon the physical, natural as well as social environment.

The EIA will attempt to identify all major aspects of environmental, socio-economic and ecological impacts, both positive and negative, short and long term, direct and indirect, reversible and irreversible. The EIA will consider the physical disturbance to existing environment as well as potential impacts on various stakeholders and overall bio-diversity due to the proposed activities. Based on the analysis of impacts the EIA shall identify the potential mitigation measures to reduce and offset the negative impacts. The EIA will also suggest an Environmental Management Plan (EMP) including the social Management Plan (SMP). This will also address the compensation aspects for the project affected persons (PAPs).

Scope of Work

The scope of work includes:

viii. Conduct environmental baseline survey

ix. Assessment and evaluation of impacts

x. Preparing environmental management plan

xi. Prepare EIA report

Proposed Project Location:

The location of the project is shown in Figure 1. The proposed 400 KV transmission line will be constructed from proposed Bheramara, Kushtia to Bahrampur, West Bengal, India. A 400/232 KV back to back station will be constructed at Bheramara in Kushtia. Total length of the line is about 30 km. (See Figure 1)

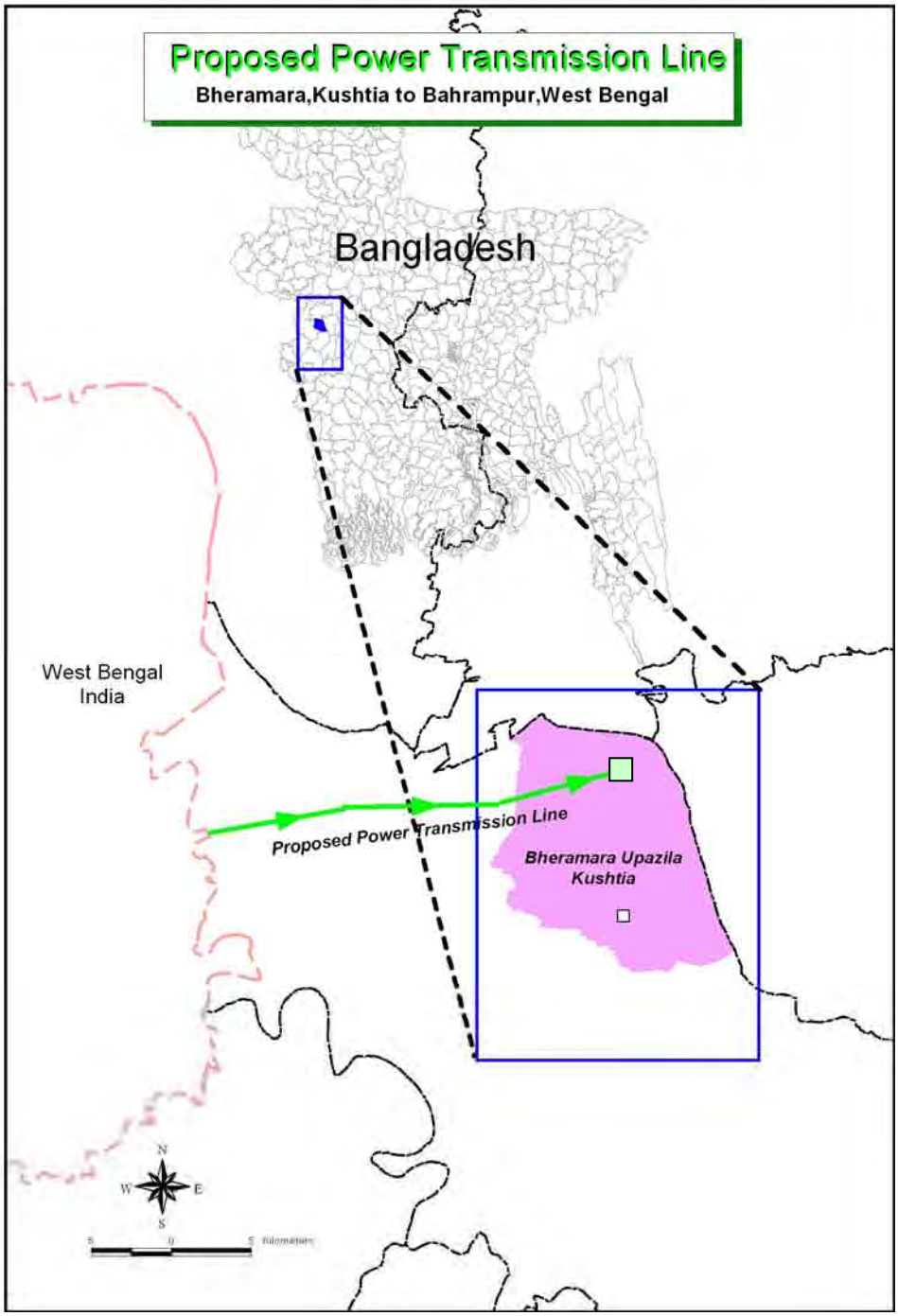

Figure 1: Proposed Power transmission line and back-to-back station

Methodology for EIA

The Environmental Impact Assessment (EIA) study will be conducted through the following steps (Figure 2).

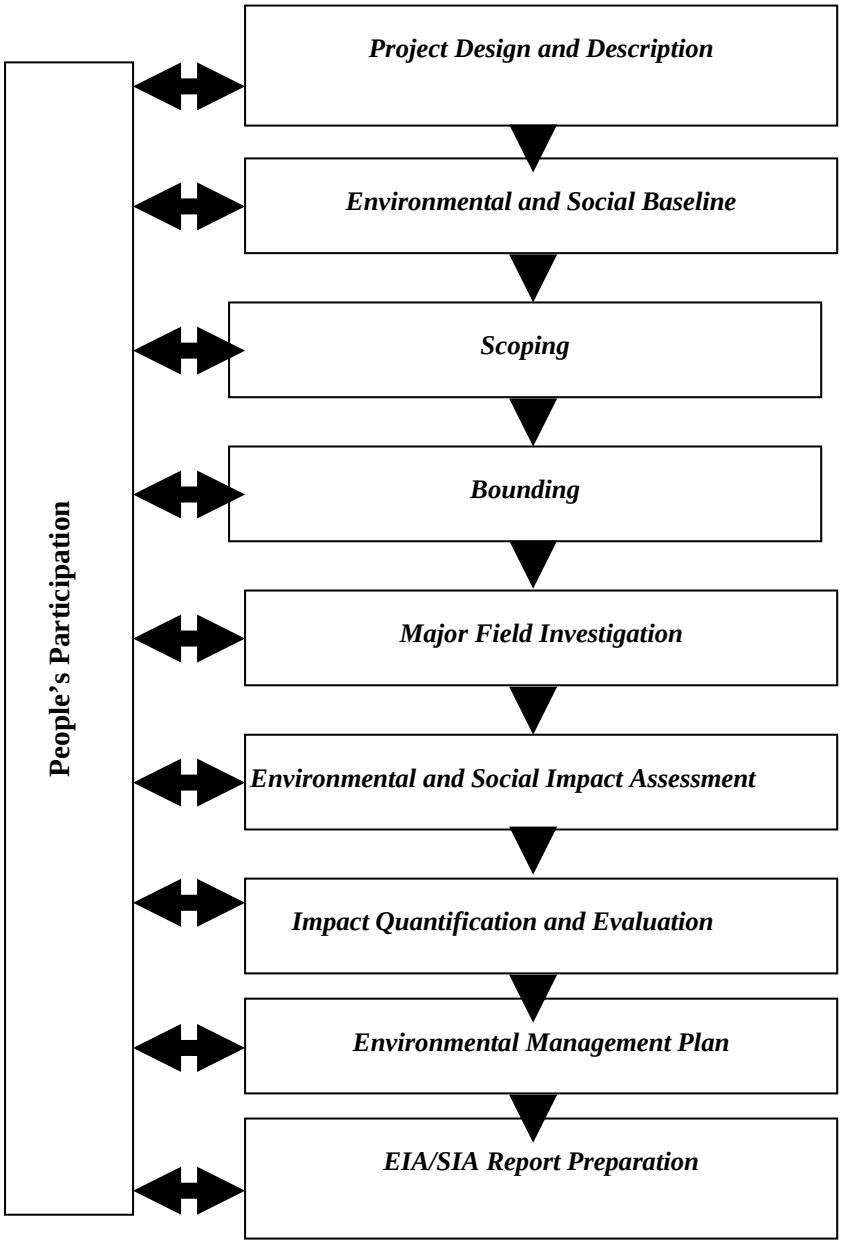

Figure 2: Steps of Environmental Impact Assessment (EIA).

Project design and description

Detailed information on the proposed transmission line within Bangladesh portion will be collected from the project proponents by the multi-disciplinary EIA team members to have a thorough understanding of the proposed interventions and their possible environmental consequences. These information will help in designing data collection programs.

Environmental and social baseline

Environmental and social baseline condition in Bangladesh portion of the project area will be established through a series of field visits, surveys and intensive consultation with local people. Detailed data will be collected on land resources, water resources, agriculture, fisheries, ecosystems and socio-economic condition. In addition to the professional inputs of the multi-disciplinary EIA team members, this will include intensive consultation with the stakeholders to obtain their perceptions on the proposed interventions and the possible impacts. These will specifically involve the following:

- General socio-economic survey of the Project Affected Persons (PAPs) for preparation of the Resettlement Action Plan (RAP) following the Guidelines of the World Bank and ADB;
- Community profile of the villages adjacent to project;
- A summary review of Bangladesh's storms;
- Ecological surveys and IUCN classification;
- Archaeological and cultural site survey;
- Detailed land use survey based on the land use information generated at the IEE stage by using available image in CEGIS.

Scoping

Important Environmental & Social Components (IESCs), likely to be impacted by the 400 kV transmission line, selected at the EIA stage will be revisited for finalizing their selection based on detailed information on the proposed interventions collected at step 1.

Bounding

A bounding exercise will be carried out to delineate area likely to be impacted by the 400 kV transmission line.

Major Field investigation

At this stage, detailed investigation will be carried out to obtain information on the possible impact of the 400 kV transmission line on the IESCs.

Assessment of Environmental Impacts

The future-without-project (FWOP) condition will be generated through trend analysis using information collected at step 5. The future-with-project (FWIP) condition will be predicted using professional judgment of the multi-disciplinary EIA team members based on information collected at the major field investigation stage and feedback received through intensive stakeholder consultation. Difference between the three scenarios i.e. pre construction, during construction and post construction conditions will be taken as impact of the proposed interventions.

Evaluation of impacts

Impact assessed on different IECs will be evaluated assigning score ranging from 1 to 10 for both positive (+) and negative (-) impacts considering magnitude, immediacy, reversibility and sustainability.

Environmental management plan

The environmental management plan (EMP) will be prepared suggesting mitigation measures for minimizing the effect of the negative impacts, compensation plan for the negative impacts which can not be mitigated, enhancement measures for increasing the benefits of the positive impacts, contingency plan for taking care of natural hazards and accidental events. An environmental monitoring plan will also be suggested in the EMP. Each component of the EMP will be divided into pre-construction, construction, operation and maintenance phases. Responsibilities of the institutions in the implementation of the EMP will be suggested to ensure efficient utilization of all the parties involved. Cost estimate of each of the measure suggested under the mitigation plan, compensation plan, contingency plan and the monitoring plan at the pre-construction, construction, operation and maintenance phases will be prepared. The cost estimate should be included into the cost of the transmission line for economic and financial analysis.

The Resettlement Action Plan (RAP) will also be included for necessary rehabilitation or compensation of property damage.

All the findings of EIA will be presented in final report.

Duration of the Study:

One and a half Month –Mid February to the end of March, 2010.

List of Professionals:

1. Environment Expert
2. Socio-Economist
3. Ecologist
4. Agriculture Specialist
5. Research Associates

Public Consultation:

During the course of preparation of the EIA, public consultation will be undertaken and necessary baseline environmental, socio-economic, biological and ecological information will be colleted.

EIA Report Structure

The EIA report will be prepared following the DoE and World Bank guidelines in general. The following proposed Table of Contents (ToC) illustrates the major sections of the report and outlines the contents under each section.

Table of Contents (ToC)

EXECUTIVE SUMMARY:

The executive summary will include issues presented in a short and focused description of the project, environmental, ecological, biological and social setting, significant findings, major environmental, ecological, biological and social impacts on the proposed activities, recommended actions to mitigate/minimize potential negative impacts and suggested enhancement measures for the positive impacts and monitoring of ecological, biological and social performances.

1. INTRODUCTION

This section of the report shall provide the background and justification of the project and scope of the EIA report.

1.1 Background of the study
1.2 Study area
1.3 Objectives of the EIA
1.4 Scope of work
1.5 Limitations
1.6 The EIA team
1.7 Structure of the EIA report

2. ENVIRONMENTAL REGULATIONS AND GUIDELINES

This section shall include descriptions of the pertinent environmental policies and guidelines, rules and regulations. It shall also include rules and regulations on health safety, protection of ecologically sensitive areas, protection of endangered species, land acquisition, compensation, resettlement, as well as international rules and regulations related to the protection of the environment.

2.1 Overview

2.2 Procedure for obtaining environmental clearance

2.2.1 Requirement for EIA report

2.2.2 Procedure

2.3 Organizations related to enforcement of environmental standards

2.3.1 Ministry of Environment and Forest (MoEF)

2.4 Relevant national policies and legislation relevant to the environment

2.4.1 The Bangladesh Wildlife Preservation Order (1973; amended to Act in 1974)

2.4.2 The National Forest Policy (1994)

2.5 Policy Related with Energy Development

2.5.1 The Electricity Act, 1910

2.5.2 The Power Policy, 1995

2.5.3 The Energy Policy (1996)

2.5.4 The Industrial Policy (1999)

2.6 Compliance with international requirements

2.6.1 Rio Declaration

2.6.2 Convention on Biological Diversity, (1992)

2.6.3 Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar (1971)

2.6.4 United Nations Convention on the Law of the Sea, Montego Bay, (1982)

2.6.5 Others (Conventions and Agreements)

2.7 Compliance with WB /ADB EIA guidelines

2.8 Compliance with PGCB requirements

2.9 The Building Construction (Amendment) Act. 1990 and Building Construction Rules ' 1996

2.10 Land acquisition rules and regulations

2.11 Rules and policies in related fields

3. METHODOLOGY

This section will describe the approach and methodology followed to conduct the study

3.1 Overall approach

3.1.1 Project design and description

3.1.2 Environmental and social baseline

3.1.3 Scoping

3.1.4 Bounding

3.1.5 Major field investigation

3.1.6 Impact assessment and possible computation

3.1.7 Impact quantification and evaluation

3.1.8 Environmental Management Plan

3.1.9 EIA including RAP report preparation

4. DESCRIPTION OF THE PROJECT

This chapter will present a description of the proposed project interventions and cover relevant activities.

4.1 Major components of the project

4.2 Project location (location of the proposed Pakuria-Bheramara power line and back to back-station)

4.3 Physical features of the transmission line

4.4 Physical features of the back to back-stations

4.5 Component of the construction works

4.5.1 Civil construction works

4.5.2 Electrical works

4.5.3 Testing and commissioning of equipment

4.6 Construction equipment

4.7 Work schedule

5. ANALYSYS OF SUITABILITY FOR ALTERNATIVE ROUTES

This will review the alternative route options available and discuss the comparative advantages and disadvantages.

5.1 Alignment selection factors

5.2 Alignment suitability analysis

5.3 Suitable alternative routes

6. ENVIRONMENTAL BASELINE CONDITION

This chapter will assemble and provide baseline data on the physical environment as well as social environment, sourced from secondary data as well as primary data obtained by the EIA team.

6.1 Water resources

6.1.1 Climate

6.1.2 Water level/flooding

6.1.3 Air quality

6.1.4 Ambient noise

6.1.5 Water quality

6.1.6 Natural hazards

6.2 Soil and agriculture

6.2.1 Land resources

6.2.2 Agricultural resources

6.3 Biological resources

6.3.1 Terrestrial ecosystem

6.3.2 Aquatic ecosystem

6.4 Socio-economic condition as a result of the transmission line

6.4.1 Introduction

6.4.2 Demographic features (including gender, literacy and age classification)

6.4.3 Social baseline description (including occupation, employment, communication, water and sanitation, archeological sites, tribal people, diseases, communication etc)

6.4.4 Land price situation

6.5 Socio-economic condition for proposed Char Mokarimpur back to back-station

6.5.1 Introduction

6.5.2 Demographic features (including gender, literacy and age classification)

6.5.3 Social baseline description (including occupation, employment, communication, water and sanitation, archeological sites, tribal people, diseases, communication etc).

6.5.4 Land price situation

7. IMPACT ANALYSIS

This will identify and assess positive and negative environmental impacts likely to result from the proposed project. Assessment of the impacts will be carried out at the pre-construction, during construction and post construction phases of the project.

7.1 Introduction

7.2 Selection of Important Environmental and Social Components (IESCs)

7.3 Potential environmental impacts (pre, during and post project)

8. ENVIRONMENTAL MANAGEMENT PLAN

This section will include an Environmental Management Plan (EMP). For negative impacts it will suggest mitigation measure and for positive impacts it will suggest an enhancement plan.

8.1 Mitigation Plan

8.1.1 Mitigation for impact on ambient air quality

8.1.2 Mitigation for impact on interference with road crossing

8.1.3 Mitigation for impact of construction wastes at tower and back to back-station sites

8.1.4 Mitigation for storm water drainage congestion near back to back station sites

8.1.5 Mitigation for impact on vegetation

8.1.6 Mitigation for impact on plant species composition

8.1.7 Mitigation for impact on habitat for wildlife

8.1.8 Mitigation for impact of land sliding

8.1.9 Mitigation for impact on crop production

8.1.10 Mitigation for impact on natural fisheries

8.1.11 Mitigation for impact on involuntary migration from Right of Way

8.1.12 Mitigation for impact on land price

8.1.13 Mitigation for impact on agricultural income

8.1.14 Mitigation for impact on access to common property resources

8.1.15 Mitigation for impact on human safety

8.2 Enhancement Plan

8.2.1 Vegetation

8.2.2 Agriculture

8.2.3 Non-agricultural employment

8.2.4 Agricultural income

8.2.5 Urbanization

8.3 Contingency Plan

8.3.1 Involuntary migration from right of way

8.3.2 Safety of workers

8.3.3 Human safety

8.4 Compensation Plan

8.5 Institutional requirements and Monitoring Plan.

8.6 Budget for the Environmental Management Plan (EMP)

9. SIA INCLUDING RESETTLEMENT ACTION PLAN (RAP) FOR BACK TO BACK-STATIONS

This will deal with the resettlement of possible project affected persons including identification of project affected persons, their socio-economic status and their assets likely to be affected and also indication of compensation policy matrix for the properties required due to the project.

9.1 Introduction.

9.2 Resettlement Planning Process

9.2.1 Identification of PAPs

9.2.2 Objective and Policy Frame

9.2.3 Socio-Economic Survey (SES)

9.2.4 Summary of socio-economic information of the affected parties at back to back-station site s

9.2.5 Compensation mechanism for PAPs at tower sites and RoW

9.2.6 Compensation mechanism for loss of land and assets at back to back-station sites

9.2.7 Fixing modalities for payment of compensation

9.2.8 Tentative schedule of compensation plan implementation

10. PUBLIC CONSULTATION AND DISCLOSURE

Consultation with interested parties, stakeholders and the general public (affected and non-affected) takes place and their views taken into account in the planning and execution of the project. A contract will be made and meeting/interviews and discussions set up with appropriate GOs, NGOs and local leaders and stakeholders.

10.1 Public consultation approach and methodology

10.2 People's perceptions

10.3 Major findings of Public Consultation

11. CONCLUSION AND RECOMENDATIONS

11.1 Conclusion

11.2 Recommendation.

(TABLES, FIGURES, ANNEXES, PHOTOGRAPHS)

Annex 2
Participants List in Public Consultation

Power Grid Company Limited (PGCB)

(400 kV Grid Interconnection between Bangladesh-India)

Public Consultation arranged by CEGIS

Participants List

Venue: Ramkrishnapur Govt. Primary; Upazila: Bheramara Date: 18.04.2010

Sl.No.	Participants List	Occupation	Address and Mobile No.	Signature
1.	Benjir Ahammad Benu	Chairman	Golapnagar	Signed
2.	Mostafizur Rahman	Member	Ramkrishnapur	Signed
3.	Safiqul Islam	Farmer	Ramkrishnapur	Signed
4.	Mostafizur Rahman	Farmer	Ramkrishnapur	Signed
5.	Feroz Aamed	Farmer	Ramkrishnapur	Signed
6.	Md.Asadul Haque	Farmer	Ramkrishnapur	Signed
7.	Md. Mannan	Farmer	Golapnagar	Signed
8.	Mojzel	Farmer	Ramkrishnapur	Signed
9.	Md. Shahidul Islam	Farmer	Ramkrishnapur	Signed
10.	Md. Rakibul Islam	Farmer	Golapnagar	Signed
11.	Md. Torikul Islam	Farmer	Golapnagar	Signed
12.	Md. Shamim Ahamad	Farmer	Ramkrishnapur	Signed
13.	Amir Ali	Farmer	Sholodag	Signed
14.	Md. Shaheb	Farmer	Sholodag	Signed
15.	Md. Rakibul Islam	Farmer	Sholodag	Signed
16	Md. Hazrat Ali	Farmer	Sholodag	Signed
17	Md. Shapan Ali	Farmer	Sholodag	Signed
18	Asanur	Farmer	Sholodag	Signed
19	Md. Montaz	Farmer	Ramkrishnapur	Signed
20	Md. Salam Mondol	Farmer	Ramkrishnapur	Signed
21	Md. Azizul Haque	Farmer	Ramkrishnapur	Signed
22	Enamul Haque	Farmer	Ramkrishnapur	Signed
23	Md. kamal Uddin	Farmer	Ramkrishnapur	Signed
24	Md.Omar Ali	Farmer	Ramkrishnapur	Signed
25	Md. Rabiul islam	Farmer	Ramkrishnapur	Signed
26	Md.Samim	Farmer	Sholodag	Signed
27	Md. Abdul Dablu	Farmer	Sholodag	Signed
28	Md. Amirul	Farmer	Sholodag	Signed
29	Md. Asraful Haque	Service	Sholodag	Signed
30	Md. Zahangir	Farmer	Sholodag	Signed
31	Md. Biplob	Farmer	Ramkrishnapur	Signed
32	Sree Amreto Krmokar	Farmer	Ramkrishnapur	Signed
33	Md.Shahadad Hossain	CEGIS	Dhaka	Signed
34	Ashfaq Uzzaman	CEGIS	Dhaka	Signed
35	Monirul Islam Manik	CEGIS	Dhaka	Signed

Power Grid Company Limited (PGCB)

(400 kV Grid Interconnection between Bangladesh-India)

Public Consultation arranged by CEGIS

Participants List

Venue: Mathurapur Govt. Primary; Upazila: Daulatpur Date: 19.04.2010

Sl.No.	Participants List	Occupation	Address & Mobile No.	Signature
1.	Md. Hanif	Chairman	2no: Mothurapur	Signed
2.	Md. Shajahan Ali	Businessman	Mothurapur	Signed
3.	Md. Abu Hanif	UP Member	Mothurapur	Signed
4.	Most. Amena Khatun	UP Member	Mothurapur	Signed
5.	Md. Kamal Pasha	Teacher	Mothurapur	Signed
6.	Md.Jadu Mondal	Farmer	Mothurapur	Signed
7.	Md. Faruque Ahammed	Farmer	Mothurapur	Signed
8.	Md. Anowar Hossain	Farmer	Mothura pur	Signed
9.	Tofi	Farmer	Mothura pur	Signed
10.	Altaf	Farmer	Mothura pur	Signed
11.	Ziarul	Farmer	Mothura pur	Signed
12.	Md. Dukhu	Farmer	Mothura pur	Signed
13.	Md. Liton Hossain	Farmer	Mothura pur	Signed
14.	Md. Naharul	Farmer	Mothura pur	Signed
15.	Aksod Ali	Farmer	Mothura pur	Signed
16.	Ruhul	Farmer	Mothura pur	Signed
17.	Jobbar	Farmer	Mothura pur	Signed
18.	Md. Shiraz Uddin	Farmer	Mothura pur	Signed
19.	Md. Azizul Haque	Farmer	Mothura pur	Signed
20.	Md. Shohidul Islam	Farmer	Mothura pur	Signed
21.	Md. Meser Ali	Farmer	Mothura pur	Signed
22.	Md. Amirul Islam	Village Doctor	Mothura pur	Signed
23.	Md. Nurol Islam	Farmer	Mothura pur	Signed
24.	Md.Shahadat Hossain	CEGIS	Dhaka	Signed
25.	Ashfaq Uzzaman	CEGIS	Dhaka	Signed
26	Monirul Islam Manik	CEGIS	Dhaka	Signed

Power Grid Company Limited (PGCB)

(400 kV Grid Interconnection between Bangladesh-India)

Public Consultation arranged by CEGIS

Participants List

Venue: Mahal Registered Primary School; Upazila: Daulatpur Date: 19.04.2010

Sl.No.	Participants List	Occupation	Address & Mobile No.	Signature
1.	Zakat Ali	U.P Member	Craftnagar	Signed
2.	Khazironnesa	U.P Member	Craftnaga	Signed
3.	Sukur Ullah	U.P Member	Craftnaga	Signed
4.	Mizanur Rahman	U.P Member	Craftnaga	Signed
5.	Bilkis Begum	U.P Member	Ramkrishnapur	Signed
6.	Khedu Mondol	Farmer	Ramkrishnapur	Signed
7.	Md. Abdul Mannan	Farmer	Craftnagar	Signed
8.	Hatem Ali	Businessman	Craftnagar	Signed
9.	Alkas Mondol	Farmer	Ramkrishnapur	Signed
10.	Haidul Isalam	Businessman	Craftnagar	Signed
11.	Babu Ali	Businessman	Craftnagar	Signed
12.	Joynal Abedil	Farmer	Khajuria	Signed
13.	Habibur Rahman	Farmer	Munsigang	Signed
14.	Abdur Rashid	Service	Munsigang	Signed
15.	Amzad	Farmer	Insafnagar	Signed
16	Mohiuddin	Service	Insafnagar	Signed
17	Md. Hafizul	Farmer	Craftnagar	Signed
18	Ayzuddin	Farmer	Pakuria	Signed
19	Azizul Haque	Farmer	Craftnagar	Signed
20	Akram Hossain	Farmer	Craftnagar	Signed
21	Md. Safadh Sardar	Farmer	Craftnagar	Signed
22	Md.Faraz	Businessman	Craftnagar	Signed
23	Md.Shahadat Hossain	CEGIS	Dhaka	Signed
24	Ashfaq Uzzaman	CEGIS	Dhaka	Signed
25	Monirul Islam Manik	CEGIS	Dhaka	Signed

Power Grid Company Limited (PGCB)

(400 kV Grid Interconnection between Bangladesh-India)

Public Consultation arranged by CEGIS

Participants List

Venue: Parankhali Madrasa ; Upazila: Daulatpur **Date: 20.04.2010**

Sl.No.	Participants List	Occupation	Address & Mobile No.	Signature
1.	Md. Shihabul Islam	Chairman	Juniadah (Poran Khali)	Signed
2.	Md. Owajed Hossain	Teacher	Poran Khali	Signed
3.	Md. Abul Kasem	Village Doctor	Poran Khali	Signed
4.	Md. Haiat Ali	Farmer	Poran Khali	Signed
5.	Md. Nazrul Islam	UP Member	Poran Khali	Signed
6.	Most. Aktiara Khatun	UP Member	Poran Khali	Signed
7.	Rebeka Sultana	Social Worker	Poran Khali	Signed
8.	Amirul Islam	Farmer	Poran Khali	Signed
9.	Soumitro kumar Ray	Social Worker	Poran Khali	Signed
10.	Romiz Uddin	Farmer	Poran Khali	Signed
11.	Dr. Md. Shahabuddin	Village Doctor	Poran Khali	Signed
12.	Md. Nazrul Islam	Farmer	Poran Khali	Signed
13.	Md. Abul Kalam Azad	Farmer	Poran Khali	Signed
14.	Md. Faruk Hossain	Farmer	Poran Khali	Signed
15.	Md. Shihabul Islam	Teacher	Poran Khali	Signed
16.	S.M.Jakaria	Businessman	Poran Khali	Signed
17.	Md. Johurul	Farmer	Poran Khali	Signed
18.	Md. Tofazzal Ali	Businessman	Poran Khali	Signed
19.	Md.Shahadat Hossain	CEGIS	Dhaka	Signed
20.	Ashfaq Uzzaman	CEGIS	Dhaka	Signed
21	Monirul Islam Manik	CEGIS	Dhaka	Signed

Annex 3
Photo Gallery

	
Photograph-1 Bamboo and tobacco field	**Photograph-2 Banana and tobacco field**
	
Photograph-3 Local road cross	**Photograph-4 Wheat field**
	
Photograph-5 Maize field	**Photograph-6 Tobacco and betal leaf plant**
	
Photograph-7 Trees under RoW	**Photograph-8 discussion with local people**