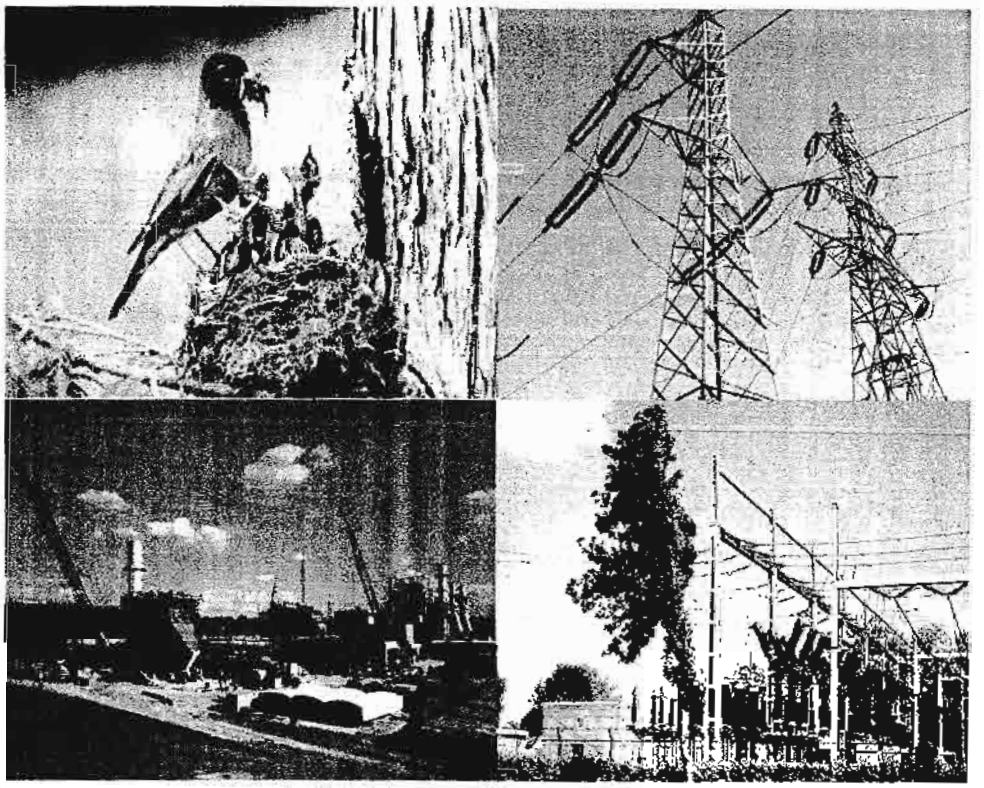
Environmental Impact Assessment (EIA)
Of
102 MW Power Plant of Summit Narayanganj Power Limited.
At
Madanganj, Narayanganj.



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EXECUTIVE SUMMARY

This report represents the results of Environmental Impact Assessment (EIA) of Summit Narayanganj Power Limited. The company will install 102 MW Power plant at Madanganj,Narayanganj. The objective of the study is to provide an examination and assessment of the principal environmental impacts of the industry. The main objective of Summit Narayanganj Power Limited 102 MW Power Plant Project is to establish, operate and maintain the facilities for power generation and transmission of electricity. The company has received the consent and approval from Government of Bangladesh for establishment of this Heavy Fuel Oil Based power plant.

Summit Narayanganj Power Ltd will establish 102 MW power plant for sale of electricity to **Bangladesh Power Development Board (BPDB)** under Build, Own and Operate (BOO) basis at Madanganj, Narayanganj. The entire generated electricity will be sold to **Bangladesh Power Development Board (BPDB)**. The company took initiatives and signed project agreements with **Bangladesh Power Development Board (BPDB)** and Government of Bangladesh for generation of electricity using Heavy Fuel Oil (HFO).

The load forecast by PDB shows that the demand is increasing more than 8.1% per annum with the present electricity production. Keeping the situation in mind, GoB decided to give permission to the private entrepreneurs to establish power plant in private sector in 1996. After getting the permission private sector installed 9 power plants by 2006 with total generation capacity of 1,222 MW and as such GoB planned to install another 9 power plants by 2009 with total generation capacity of 1510 MW.

Recognizing the need to improve the performance of the power sector, the government adopted a policy paper titled power Sector Reforms in Bangladesh (PSRB) in 2001. PSRB outlined the reform process to gradually remove constraints in the sector through improvements in the sector and corporate governance, introduction of competition, and public private partnerships. The PSRB envisioned in the long term a structure of the power sector based on (i) separation of sector regulation and operation; (ii) autonomy and commercial orientation of the sector entities; (iii) separation of generation, transmission, and distribution; and (iv) increased private sector participation. Transmission assets would remain in the public sector, while generation and distribution assets would have both public and private ownership.

The government has approved proposals for setting up another six quick rental power plants (RPPs) with a total capacity of 567 megawatt as part of its desperate efforts to improve the power situation. The Cabinet Committee on Government Purchase gave its nod to the proposals of Summit Power Ltd, Khulna Power Company Ltd, IEL Consortium and Associates, Sinha Power Company Ltd, Dutch Bangla Power Ltd and Bangla Track Ltd.

The Power Development Board has signed contracts with two local companies to install two rental power plants with a capacity of 217 MW. Summit Narayanganj Power Ltd will set up a 102MW power plant at Madanganj in Narayanganj and Khulna Power Company Ltd (unit 2) another 115MW plant at Goalpara in Khulna, according to the contracts.

The report comprises 10 Chapters. 1st Chapter of the report gives a background and objective of this study. The scope of work and methodology of the project followed by EIA process and EIA Team members are also described in this Chapter. Chapter 2 describes the different policy and legal requirements for installation of new power plant. In Chapter 3 the proposed project is being described with a detail study area, plants description and technical specification. Baseline environment is described in Chapter 4 with existing physical, chemical and biological conditions of the area where the plant is going to be set up. It has been found that the area of the plant is fallow land and air (in terms of SPM) & water (in terms of solid concentration) quality of that area is good like typical rural areas of Bangladesh. The meteorological condition of that area is tropical monsoon. Noise, air and water quality of this area is measured and showed in this Chapter.

Prediction and evaluation of impacts are done in Chapter 5. Simple checklists used to identify the impacts due to installation of the power plant. Both construction and operational stage of the project are considered separately to identify the short and long term impacts. All the prediction and evaluation of impacts are described in chapter 6 with a mitigation options.

The construction of the plant may create some adverse impact on the existing environment. Acoustic impacts during construction would be limited to construction of building and site preparation and due to installation of power plant itself. As the proposed power plant will utilize Heavy Fuel Oil (HFO) as fuel, the pollutants of potential concern are sulfur dioxide, oxides of nitrogen, carbon dioxide and carbon monoxide. Each of these pollutants is examined to ensure the Bangladesh emission limit standard, where appropriate, the required emission control techniques would be incorporated into the mitigation measures. During construction, the plant authority will try to adopt all necessary measures to reduce the environmental impacts. The project proponent has taken site clearance from Department of Environment.

Environmental Management Plan, Public Consultation, Alternative Analysis is also presented in Chapter 7 & 8 respectively in this report.

The present **EIA** report finds that though there are certain adverse environmental impacts associated with the industrial unit under consideration, those are however manageable. Given the location, proponent's commitments, measures undertaken and commitment for further measures to be adopted in due course of time if needed, **Summit Narayanganj Power Limited** is going to be a nationally important and environmentally compatible industrial venture.

ABBREVIATION

ADB	Asian Development Bank
AECL	Adroit Environment Consultants Limited
AER	Agro-Ecological Region
AQM	Air Quality Management
BBS	Bangladesh Bureau of Statistics
BCAS	Bangladesh Centre for Advanced Studies
BMD	Bangladesh Meteorological Department
BWDB	Bangladesh Water Development Board
CGS	City Gate Station
CSMC	Construction Supervision and Monitoring Consultants
DAE	Department of Agricultural Extension
DC	Deputy Commissioner
DOE	Department of Environment
DOF	Department of Fisheries
DTW	Deep Tube Well
ECA	Ecologically Critical Area
ECR	Environment Conservation Rules 1997
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPZ	Export Processing Zone
GIS	Geographic Information System
GOB	Government of Bangladesh
GPS	Global Positioning System
GSTP	Gas Sector Development Program
BGFCL	Bangladesh Gas Fields Company Limited
IEC	Important Environmental Component
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature and Natural Resources or World Conservation Union
KII	Key Information Interview
LGED	Local Government Engineering Department
MoEF	Ministry of Environment and Forests
NDT	Non Destructive Testing
NEMAP	National Environment Management Action Plan
NGO	Non-Government Organization
NWMP	National Water Management Plan
PAP	Project Affected Person
PCP	Project Concept Paper
SDC	Study and Design Consultant
SRDI	Soil Resource Development Institute
TBS	Town Border Station
TOR	Terms of Reference
UNDP	United Nations Development Programme.

GLOSSARY

Adverse impact: An impact that is considered undesirable.
Ambient air: Surrounding air.
Aquatic: Growing or living in or near water.
Bangla: Bengali language.
Baseline (or existing) conditions: The 'baseline' essentially comprises the factual understanding and interpretation of existing environmental, social and health conditions of where the business activity is proposed. Understanding the baseline shall also include those trends present within it, and especially how changes could occur regardless of the presence of the project, i.e. the 'No-development Option'.
Bazar: Market.
Beel: A 'back swamp' or depression. Can be either perennial or seasonal.
Beneficial impacts: Impacts, which are considered to be desirable and useful.
Biological diversity: The variety of life forms, the different plants, animals and micro organisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.
Char: Newly accreted land: Land , sometimes islands, within main river channels and nearby mainland or in the estuary, subject to erosion and accretion.
Ecosystem: A dynamic complex of plant, animal, fungal and microorganism communities and associated non-living environment interacting as an ecological unit.
Emission: The total amount of solid, liquid or gaseous pollutant emitted into the atmosphere from a given source within a given time, as indicated, for e.g., in grams per cubic meter of gas or by a relative measure, upon discharge from the source.
Endangered species: Species in danger of extinction and whose survival is unlikely if the existing conditions continue to operate. Included among those are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to suffer from immediate danger of extinction.
Environmental effects: The measurable changes, in the natural system of productivity and environmental quality, resulting from a development activity.
Environmental impact assessment (EIA) / Environmental assessment: The systematic, reproducible and interdisciplinary identification, prediction and evaluation, mitigation and management of impacts from a proposed development and its reasonable alternatives, sometimes known as environmental assessment.
Environmental Impact: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic and human receptors.
Environment Management Plan (EMP): A Plan to undertake an array of follow-up activities which provide for the sound environmental management of a project/ intervention so that adverse environmental impacts are minimized and mitigated; beneficial environmental effects are maximized; and sustainable development is ensured.
Environmental Management: Managing the productive use of natural resources without reducing their productivity and quality.
Erosion: Process in which wind and water removes materials from their original place; for instance, soil washed away from an agricultural field.
Evaluation: The process of looking back at what has been really done or accomplished.
Fauna: A collective term denoting the animals occurring in a particular region or period.
Field Reconnaissance: A field activity that confirms the information gathered through secondary sources. This field study is essentially a rapid appraisal.
Flora: All of the plants found in a given area.
Habitat: The natural home or environment for a plant or animal.
Household: A household is identified as a dwelling unit where one or more persons live and eat together with common cooking arrangement. Persons living in the same dwelling unit having separate cooking arrangements constitute separate household.

Important Environmental Component (IEC): These are environmental components of biophysical or socio-economic importance to one or more interested parties. The use of important environmental components helps to focus the environmental assessment.

Initial Environmental Assessment / Evaluation: Preliminary analysis undertaken to ascertain whether there are sufficient likely significant adverse impacts to warrant a 'full' EIA. In some countries, use of initial assessment forms a meaning of "screening" proposed projects.
Khal: Small Channel, canal.
Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.
Mauza: A Bangla word for the smallest government administrative area corresponding to village revenue unit.
Mitigation: An action, which may prevent or minimize adverse impacts and enhance beneficial impacts.
Negative Impact: Negative change from the existing situation due to the project.
Public involvement / Public consultation: A range of techniques that can be used to inform, consult or interact with stakeholders' affected / to be affected by a proposal.
Reversible impact: An environmental impact that recovers either through natural process or with human assistance (e.g. cutting off fish migration by an embankment might be reversible at a later stage if a proper regulator is built).
Stakeholders: Those who may be potentially affected by a proposal, e.g. Local people, the proponent, government agencies, NGOs, donors and others, all parties who may be affected by the project or to take an interest in it.
Taka: Unit of Bangladeshi currency.
Terrestrial: Living on land.
Thana: Sub-district level of government administration, comprising several unions under district.
Union: Smallest unit of local self government comprising several villages.
Upazila: Sub-district name. Upoziła introduced in 1982.
Ziła: Bengali word of district.

Chapter -1

INTRODUCTION

1.0 INTRODUCTION

1.1 Background

Electricity is the major source of power for country's most of the economic activities. It is the key ingredient of socio-economic development of the country. Adequate and reliable supply of electricity is an important pre-requisite for attracting both domestic and foreign investment. Reliable supply of electricity is a pre-condition for poverty reduction and economic development. In Bangladesh, 47% of total populations have access to electricity but reliable and quality power is still a faraway. To alleviate poverty in the face of resource limitations and high population density, Bangladesh requires an economic growth rate of more than 7% p. a. In order to achieve this growth rate, electricity growth needs to be achieved by 10%. By best utilizing the natural, human and agricultural resources the desired pace of GDP growth could be attained by increasing electricity generation at much higher rate, which is the key target for development.

According to Ministry of Power, Energy & Mineral Resources, Bangladesh presently total electricity generation capacity is 5376 MW. Of this capacity 3331 MW is from public sector and 2045 MW is from the private sector, which is 62% and 38% respectively of the total generation capacity. Considering 10 - 15 % Maintenance and Forced Outage, Available Generation Capacity is in the range of 4500 – 4800 MW without fuel constraint.

Problems in the Bangladesh's electric power sector include corruption in administration, high system losses, delays in completion of new plants, low plant efficiencies, erratic power supply, electricity theft, blackouts, and shortages of funds for power plant maintenance, diversion of electricity to irrigation in rural areas. Overall, the country's generation plants have been unable to meet system demand over the past decade.

A recent survey reveals that power outages result in a loss of industrial output worth $1 billion a year which reduces the GDP growth by about half a percentage point in Bangladesh. A major hurdle in efficiently delivering power is caused by the inefficient distribution system. It is estimated that the total transmission and distribution losses in Bangladesh amount to one-third of the total generation, the value of which is equal to US $247 million per year.

Recognizing the need to improve the performance of the power sector, the government adopted a policy paper titled power Sector Reforms in Bangladesh (PSRB) in 2001. PSRB outlined the reform process to gradually remove constraints in the sector through improvements in the sector and corporate governance, introduction of competition, and public private partnerships. The PSRB envisioned in the long term a structure of the power sector based on (i) separation of sector regulation and operation; (ii) autonomy and commercial orientation of the sector entities; (iii) separation of generation, transmission, and distribution; and (iv) increased private sector participation. Transmission assets would remain in the public sector, while generation and distribution assets would have both public and private ownership.

Government of Bangladesh has made vision and policy statement for power sector development. It is government's constitutional responsibility to provide electricity to all. In the vision statement it was mentioned that providing access to affordable and reliable electricity to all the people of Bangladesh by 2020 is a befitting national goal to usher the next millennium.

The government has approved proposals for setting up another six quick rental power plants (RPPs) with a total capacity of 567 megawatt as part of its desperate efforts to improve the power situation. The Cabinet Committee on Government Purchase gave its nod to the proposals of Summit Power Ltd, Khulna Power Company Ltd, IEL Consortium and Associates, Sinha Power Company Ltd, Dutch Bangla Power Ltd and Bangla Track Ltd.

The Power Development Board has signed contracts with two local companies to install two rental power plants with a capacity of 217 MW. Summit Narayanganj Power Ltd will set up a 102MW power plant at Madanganj in Narayanganj and Khulna Power Company Ltd (unit 2) another 115MW plant at Goalpara in Khulna, according to the contracts.

It is a well-recognized fact that each development activity has an impact on the natural molding of the environment. As development activities are of prime importance for the economic growth and fulfillment of basic needs of the society, the environmental aspects of development activities must be taken into account and due attention must be paid to protect the environment. The first step in this direction is to evaluate the probable impacts of the project on the surrounding environment so that suitable measures could be taken during early stages of the project to minimize negative impacts.

The socio-cultural roots of our present environmental crisis lie in the paradigms of scientific materialism and economic determinism, which fail to recognize the physical limits, imposed by ecological systems on economic activity. The economies must expand within ecosystems, which have limited regenerative capacities. Contrary to the neoclassical theory of continuous material growth, economic activities directly undermine the potential for development through over-exploitation of natural resources, and indirectly compromise future production through the discharge of residuals. The entrenchment with quantitative growth as a major instrument of social policy is thus quite paradoxical.

The emergence of the concept of sustainable development in recent years has brought in the general realization that societal perceptions must shift towards ecological determinism so as to achieve qualitative growth within the limits of ecosystem carrying capacity. The carrying capacity based planning process, innovative technologies for enhanced material and energy effectively of production and consumption, structural economic change towards less resource-intensive sectors, and preventive environmental management through increasingly interventionist policies are some of the strategies for reconciling developmental goals with ecological capabilities.

Proper location / sitting, its process and waste abatement and control are very important for a development activity to be environmentally sound. To ensure this, an **Environmental**

Impact Assessment (EIA) is a very effective tool, which delineates what needs to be done to make a development activity suitably located and operate in an environment friendly way.

The EIA will, therefore, examine the technical aspects of the project activities, which are likely to interact with the surrounding environment. This EIA study will cover possible activities and impacts with the environment and community. The report will also provide a suggestive EMP along with certain mitigation measures plan with a view to reduce effect of the adverse impacts.

1.2 Objectives

This report describes the findings of **Environmental Impact Assessment (EIA)** of the proposed 102 MW Stationary Power Plant project of Summit Power Limited. The objective of the study is to provide an examination and assessment of the principal environmental impacts of the extension of the power plant. The outline of an environmental management plan also suggested with an indication of the extent of work to be done to keep the development and environment compatible. **In this context, it should be noted that the term "environment" and its derivatives have been used in a wide sense, which covers not only physical and chemical aspect, but also the human dimension.**

The specific objectives of this EIA are to:

- Present a brief discussion on the EIA process and it's role in the planning and implementation of development projects;
- Present a general description of the project and the process;
- Present a description of the pre-project environment;
- Delineate the significant environmental issues found and believed to be involved;
- Identify the environmental impacts of the project and quantify them to the extent possible;
- Suggest the plan for management of the environment, during the implementation and operation of the plant.

1.3 STUDY AREA

The study area will cover the entire area of the project which belongs to Madanganj, Narayangonj, Bangladesh. The site is nearer to Dhaka-Chittagong Road.

1.4 SCOPE OF WORK

The description of the environment and social baseline conditions are made encompassing all relevant current baseline data on the environmental and social characteristics of the study area including physical, biological, ecological and social environments. In the backdrop of the above, scenarios, the relevant regulations and standards governing environmental quality,

health and safety, protection of sensitive areas, protection of endangered species, land use control, land acquisition, compensation, etc. at every level are described.

In action to the above, an analysis was conducted of reasonable alternatives in meeting the ultimate objects of the project including the 'no action' alternative, alternative means of meeting the energy requirements, alternative means of delivering gas, alternative methods of construction including cost and reliability factors.

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

Following identification of potential impacts, efforts have been taken to distinguish between positive and negative impacts, direct and indirect impacts including impacts from possible accidents and long-term impacts. Attempts are made to describe the impacts quantitatively in terms of environmental and social cost and benefits and assigning economic values where feasible.

Finally, an Environmental, Safety and Social Management Plan to mitigate negative impacts has been developed, including a detailed Environmental and Social Management Plan with feasible and cost-effective measures to prevent or reduce significant negative impacts to an acceptable level, and containing detailed implementation plans, monitoring indicators and clear allocation of responsibility among project sponsors construction contractors, government agencies, and community-based organization. Also, an Environmental and Safety Management Plan, focusing on mitigation measures to address the environmental and safety consequences associated with the project for both construction and operational phases has been prepared. Also, a Social Management Plan is developed which includes a Resettlement Action Plan to address the adverse impacts on project-affected persons displaced by the **power plant** construction. It is to be mentioned that before preparation on the above, construction and participation with the affected persons were undertaken formally.

1.5 LITERATURE REVIEW

During the preparation of this report, pertinent references were consulted and reviewed.

1.6 CONSISTENCY WITH DOE GUIDELINES

Environment Conservation Act 1995 (ECA'95) *and Environment Conservation Rules 1997 (ECR'97)* are currently the main legislative document relating to environmental protection in Bangladesh. Under this act, 'No industrial unit or project shall be established or adopted without obtaining environmental clearance, in the manner prescribed by the rules, from Director General'. Compliance with the provision of this Act is the responsibility *of Department of Environment (DoE)*. A set of the relevant rules to implement the ECA, 95 has recently been promulgated (August 1997). The rules mainly consist of:

- Categorized list (green, amber and red) of the projects;
- Application format to take environmental clearance;

- Ambient standards in relation to water pollution, air pollution and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by industries.

The Rules incorporate "inclusion lists" of projects requiring varying degrees of environmental investigation e.g. all the new projects under red category generally will require two-steps assessment procedure, firstly an Initial Environmental Examination for site clearance, and secondly, if warranted, a full Environmental Impact Assessment for technical clearance. Construction of power plant falls under red category in the list.

1.7 METHODOLOGY

The present environmental study called **Environmental Impact Assessment (EIA)** has been carried out as a follow up study of IEE, which is the requirement of DoE for such type of industrial set up. This report is based on the primary data generated during the study period, secondary data from various sources and information from field visits and from the project proponent. Several field visits were undertaken to the project location with a view to reconnaissance and detailed physical survey of the surrounding areas. These were followed by evaluation of the information to delineate the major environmental issues relating to the industry. During this process, the following steps have been followed:

- Compilation of survey/monitoring data. Field survey using a prepared questionnaire covering a wide cross-section of people in the study area to acquire field-level data on the existing environment and socio-economics and apprehended impacts due to the project. Monitoring of water quality (both ground and surface water) of adjoining areas was done;
- Understanding the process involved in the plant;
- Identification of potential impacts and evaluation of their consequences, to the possible extent. Identification of impacts was done using **Checklists** methods;
- Review of the adequacy & efficiency of proposed mitigation measures for the plant;
- Suggestion of mitigation measures for residual impacts.

This report is prepared following the IEE/EIA methodology as described in the Asian Development Bank (ADB, 1988) manual of IEE/EIA guidelines, World Bank Environment guidelines (WB, 1992), and also EIA guidelines for Industries (*DoE, 1997*) to a certain extent, but not limited to those.

1.8 THE EIA PROCESS

a. Definition of EIA

Although the term "**Environmental Impact Assessment**" is widely used, it is still not clearly defined. There is no general and universally accepted definition of EIA. Several authors and organizations have put forward several definitions, which provide a broad indication of the objectives of EIA but illustrate differing concepts of EIA. Some of these definitions are given below:

a. The United Nations Environment Program (1978) defined EIA as a method "to identify, predict and to describe in appropriate terms the pros and cons (penalties and

benefits) of a proposed development. To be useful, the assessment needs to be communicated to terms understandable by the community and decision makers and the pros and cons should be identified on the basis of criteria relevant to the countries affected".

b. Munn (1979) provided a definition of EIA "as an activity designed to identify and predict the impact on the bio-geophysical environment and on man's health and well-being of legislative proposals, policies, programs, projects and operational procedures, and to interpret and communicate information about the impacts".
c. Clark (1979) defined EIA as "as the systematic examination of the environmental, social and economic consequences of projects, plans and polices".
d. The IAIA (International Association of Impact Assessment) has defined EIA very simply as "Future consequences of development actions".

b. EIA Methodologies

The process of EIA essentially comprises of three sequential elements-identification, prediction and evaluation.

Impact Identification: It is involved in describing the existing environmental system as well as determining the components of a development project, which shall have effects on the environment. Identification can be chosen by the following methods-

a) Checklists
b) Matrices
c) Networks
d) Environmental Evaluation System (EES)

Checklists: Checklists methodologies range from listings of environmental factors to highly structured approaches involving importance weightings for factors and the application of scaling techniques from the impacts of each alternative on each factor. There are different types of checklists; some of them are as follows:

- Simple Checklist
- Descriptive Checklist
- Scaling Checklist
- Weighting-Scaling Checklist

Matrices: Interaction matrices as mentioned by Canter (1983), were one of the earliest types of methodologies utilized in the U.S. The simple matrix refers to a display of project actions or activities along one axis, with appropriate environmental factors listed along the other axis of the matrix. When a given action or activity is anticipated to cause a change in an environmental factor, this is noted at the interaction point in the matrix.

Networks: It is capable of identifying direct and indirect impacts, higher-order effects and interactions between impacts and, hence, are able to identify and incorporate mitigation and management measures into the planning stages of a project. They are suitable for expressing ecological impacts but of lesser utility in considerations involving social, human and aesthetic aspects. This is because weightings and rating of impacts are not features of network analysis.

Networks generally consider only adverse impacts on the environmental and hence decision - making in terms of the cost and benefit of a development project to a region is not amenable to network analysis.

Environmental Evaluation System (EES): It is an example of weighting- scaling checklist methodology, which is developed by Battelle Columbus Laboratories in the USA. Lohani and Soo (1982), and Lohani & Halim (1983) made an application of this EES method for evaluation water resources projects in Thailand. The EES is used to evaluate the expected future conditions of the environmental quality, both "with" and "without" the project. A difference in Environmental Impact Units (EIU) between these two conditions constitutes either an adverse impact, which corresponds to a loss in EIU units, or a beneficial impact, which corresponds to a gain in EIU units.

Impact Prediction: The purpose of or impact prediction exercise is "to estimate the extent of changes and to quantify them as far as practicable. Prediction scientifically characterizes the cause and effects of impact and its secondary and synergistic consequences for the environment and the local community. Prediction follows an impact due to a project activity and investigates its subsequent effects on the environmental components and aspects such as strain on available infrastructure, adverse impacts on crops, forests, fisheries, economic effects on fishing villages and resulting socio-cultural changes. For prediction we need to use data on physical, biological, socio-economic and anthropological aspects and resort to experimental/ mathematical techniques. In quantifying impacts it may employ mathematical models, economic models, experiments or expert judgments.

To avoid unnecessary expense, the sophistication of the prediction methods to be used should be kept in proportion to the "scope" of EIA. For instance, a complete mathematical model of atmospheric dispersion should not be used if only a small amount of relatively harmless pollutant is emitted. Simpler models are available and are sufficient for the purpose.

All prediction techniques, by their nature, involve some degree of uncertainty. Hence along with quantifying an impact uncertainty of prediction should be mentioned in terms of probabilities of margins of error. It is necessary that social and cultural impacts be given the prominence they deserve in describing the changes expected to result from major development projects. It is the socio-cultural impacts which the local community will feel most acutely in their everyday lives.

Impact Evaluation: The evaluation step in EIA calls for conversion of the predicted values for various environmental parameters to comparable set of units some system of normalization. Battelle Environmental Evaluation System (BEES) is a useful method of impact evaluation.

The BEES is based on scaling, weighting checklists consisting of a description of environmental factors related to the project along with the instructions for scaling the values of each parameter and assigning importance units.

The major feature of BEES is that environmental impact is expressed in commensurate units providing common units for comparison. The steps involved in the development of commensurate units include transformation of parameter estimates into an environmental

quality (EQ) scale, assignment of importance units to individual parameters (PIU) and the multiplication of scale value by importance values to obtain environmental impact units.

1.9 THE EIA TEAM

Adroit Environment Consultants Ltd. (AECL) has prepared this report under the guidance and supervision of Dr. Nasir Uddin Khan. The other members of the team are Mukul Ashraf, Engr. Md. Shafiqul Islam, Engr. Masroor Abedin, Md. Masud Rana &Md. Shaker Ahmed Biplob. Dr Khan is a Civil Engineer having PhD in Environmental Engineering. Mr. Mukul is a Socio-Economist completed M. S. S. in Economics. The other members of the team are B.Sc. in Civil Engineering and Diploma in Civil & Electrical Engineering respectively with a specialization of IEE, EIA and EMP.

1.10 LIMITATIONS

An IEE/EIA is generally carried out as an integral part of the Feasibility Study (FS) or together with it and before going into the final design phase and into the construction phase of a particular development project. If so than the findings of the EIA could be incorporated in the project design, overall planning and budget and that the project could be implemented accordingly. When an EIA is conducted separately as just an add-on, often it does not get due importance in the overall implementation of the project, which undermines the role of the EIAs and can contribute to environmental damages.

In case of Summit Narayanganj Power Ltd., an IEE has been prepared at the initial stage of the project. Though the IEE was prepared as a separate document of Feasibility Study (FS), but all the Significant Environmental Impacts (SEIs) were identified in IEE for the above project and conclusions for site clearance were made accordingly. DoE has cleared the present site with subject to undertaking an EIA and adoption of necessary and effective pollution control measures. So, this report has been prepared to fulfill the requirement of DoE and emphasizes have been on the issues which has been considered to be significant in IEE and the conditions imposed in site clearance by DoE. Keeping all into consideration the present report delineates the environmental factors and conclusions are made accordingly.

Services performed by the consultant are conducted in a manner consistent with that level of care and skill generally exercised by members of the engineering and consulting profession. The report may not exhaustively cover an investigation of all possible aspects and circumstances that may exist. However, an effort is made to discover all meaningful areas under the stipulated time available.

In evaluating subject site, consultant relies in good faith on information provided by client's management or employees. The Consultant assume that the information provided is factual, accurate and accepts no responsibility for any deficiency, misstatement or inaccuracies contained in this report as a result of omission or misrepresentation of any person interviewed or contacted. However, the consultant notifies the contradictions and errors in the data, where it seems appropriate.

It should be recognized that the information given in the report is time specific and with the passage of time the relevancy of data and analysis may suffer. Specific circumstances and condition of site can change due to which conclusion and opinions may also change

1.11 ACKNOWLEDGMENT

In this EIA study many individuals and agencies helped in gathering data and providing information & services. Almost all of them were most helpful & cooperative to provide data & related information and discus with them surrounding environmental issues. We also are thankful to the DoE personnel of Dhaka Division for their Co-operation in various aspects of this study.

Chapter -2

POLICY AND LEGAL CONSIDERATIONS

Chapter-2

Policy and Legal Considerations

2.1 BACKGROUND

The severe floods of 1987, 1988, 1998, 2004 and 2007 and the resurgence of concern about environmental issues have heightened in improving environmental conditions of the country through promulgation of numbers of policies and legislation in the country. All of the policies or legislation aimed at the conservation and protection of the environment. The existing policies and legislation, which are relevant to the environment, are described in the following sections.

2.2 POLICIES

2.2.1 Industrial Policy 1991

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

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

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

2.2.2 National Environmental Policy 1992

Bangladesh National Environmental Policy (*GoB, 1992*) was approved in May 1992, and sets out the basic framework for environmental action, together with a set of broad sectoral action guidelines. Key elements of the policy are:

- Maintenance of the ecological balance and overall progress and development of the country through protection and improvement of the environment.
- Protection of the country against natural disasters
- Identification the regulation of all types of activities which pollute and degrade the environment
- Ensuring sustainable utilization of all natural resources
- Active association with all environmentally-related international initiatives

Environmental policy contains the following specific objectives with respect to the industrial sector:

- To adopt corrective measures in phases in industries that causes pollution.
- To conduct Environmental Impact Assessments for all new public & private industries.
- To ban the establishment of any industry that produces goods cause environmental pollution, closure of such existing industries in phases and discouragement of the use of

such goods through the development and/or introduction of environmentally sound substitutes.

- To ensure sustainable use of raw materials in the industries to prevent their wastage.

2.2.3 National Conservation Strategy

National Conservation Strategy *(GoB/IUCN, 1992)* was drafted in late 1991 and submitted to the Government in early 1992. This was approved in principle; however the final approval of the document is yet to be made by the cabinet. It underwent a number of modifications over the last five years, and is waiting to be placed before the cabinet finally sometime in late September 1997. For sustainable development in industrial sector, the report offered various recommendations; some of those are as follows:

- Industries based on nonrenewable resources should be made to adopt technology which conserves raw materials, and existing industries should be given incentives to install technical fixes to reduce wastage rate
- All industries, especially those based on imported raw materials, should be subjected to EIA and adoption of pollution prevention/control technologies should be enforced.
- No hazardous or toxic materials/wastes should be imported for use as raw material.
- Import of appropriate and environmentally sound technology should be ensured.
- Complete dependence on imported technology & machinery for industrial development should gradually be reduced so that industrial development is sustainable with local skills and resources.

2.2.4 National Environmental Management Action Plan (NEMAP)

National Environmental Management Action Plan, also referred to as NEMAP (GoB, 1995) is a wide-ranging and multi-faceted plan, which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005, and sets out the framework within which the recommendations of the National Conservation Strategy are to be implemented.

NEMAP has the broad objectives of:

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

One of the key elements of NEMAP is that sectoral environmental concerns are identified. In outline, the environmental issues of the industrial sector include the following:

- Pollution arising from various industrial processes and plants throughout the country causing varying degrees of degradation of the receiving environment (Air, Water, and Land).

- There is a general absence of pollution abatement in terms of waste minimization and treatment.
- Low level of environmental awareness amongst industrialists and entrepreneurs.
- Lack of technology, appropriate to efficient use of resources and waste minimization leading to unnecessary pollution loading in the environment.
- Economic constraints on pollution abatement and waste minimization such as the cost of new technology, the competitiveness of labor, and intensive production methods as compared to more modern methods.
- Concentration of industry and hence pollution in specific areas which exacerbate localized environmental degradation and exceed the carrying capacity of the receiving bodies.
- Unplanned industrial development has resulted in several industries located within or close to residential areas, which adversely affects human health and quality of human environment.
- Establishment of industries at the cost of good agricultural lands and in the residential areas.
- Lack of incentives to industrialists to incorporate emission/discharge treatment plant in their industries.

2.2.5 Conventions, Treaties and Protocols

Bangladesh has consented to be bound by the terms of some 21 of the 44 principal international conventions, treaties and protocols relating to the environment (*Islam, 1996*). Those with partial and indirect relevance to industrial projects are the Paris convention of 1972 concerning the protection of the World cultural and natural Heritage, Convention concerning safety in the use of chemicals at work, Geneva 1990, Biodiversity convention, Rio-de-Janeiro, 1992, Convention concerning occupational health services, Geneva 1985 etc.

2.3 NATIONAL LEGISLATION

2.3.1 Environment Conservation Act 1995 (ECA 1995)

Formal concern at the national level, for the state of environment in Bangladesh can be traced back to at least Independence and passing of the Water Pollution Control Act in 1973. Under this a small unit was established in the Directorate of Public Health Engineering (DPHE) to monitor pollution of ground water and surface water.

In order to expand the scope of environmental management and to strengthen the powers for achieving it, the Government issued the Environmental Pollution Control Ordinance in 1977. The ordinance provided for the establishment of an Environmental Pollution Control Board, which was charged with formulating policies and proposing measures for their implementation. In 1982, the board was renamed as Department of Environmental Pollution Control (DEPC). Four divisional offices were established in Dhaka, Chittagong, Khulna and Bogra. A special presidential order again renamed the DEPC to the Department of Environment (DOE) and placed under newly formed ministry of Environment and Forest (MoEF) in 1989.

The national environmental legislation known as **Environmental Conservation Act, 1995 (*ECA'95*)** is currently one of the main legislative document relating to environmental

protection in Bangladesh, which repealed the earlier environment pollution control ordinance of 1997 and has been promulgated in 1995. The main objectives of ECA'95 are:

- Conservation and improvement of environment, and
- Control and mitigation of pollution of environment.

The main strategies of the act can be summarized as:

- Declaration of ecologically critical areas, and restriction on the operation and process, which can be carried, out or cannot be initiated in the ecologically critical areas.
- Regulation in respect of vehicles emitting smoke harmful for the environment.
- Environmental clearance
- Regulation of the industries and other development activities - discharge permit.
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes.
- Promulgation of standard limit for discharging and emitting waste.
- Formulation and declaration of environmental guidelines.

Department of Environment (DOE) is implementing the Act. DOE is under the ministry of Environment and Forest and is headed by a Director General (DG). The DG has complete control over the DOE. The power of DG, as given in the Act, may be outlined as follows:

- The DG has the power to close down the activities considered harmful to human life or the environment. The operator does have 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. DOE governs the type of work or process, which can take place in such an area.
- Before going for any new development project, the project proponent must have to take Environmental Clearance from DOE. The procedures to take such clearance are in place.
- Failure to comply with any part of ECA'95 may result in punishment by a maximum of 05 years imprisonment or a maximum fine of Tk. 100,000 or both.

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

- Categorized list (green, orange and red) of the projects;
- Application format to take environmental clearance;
- Ambient standards in relation to water pollution, air pollution and noise, as well as permitted discharge/emission levels of water and air pollutants and noise by industries.

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

Green List Industries are considered relatively pollution-free and therefore do not require an environmental clearance certificate from the DOE and no environmental study.

Orange List Industries fall into two categories. Category "A" industries are required to submit general information, a feasibility report, a process flow diagram and schematic diagrams of waste treatment facilities along with their application for obtaining DOE environmental clearance. Category "B" industries are required to submit an Initial Environmental Examination (IEE) report, along with their application and the information and papers specified for Category "A" industries.

Red List Industries are those which may cause 'significant adverse' environmental impacts and are therefore required to submit an EIA report. It should be noted that they might obtain an initial site clearance on the basis of an IEE report, and subsequently submit an EIA report for obtaining environmental clearance along with other necessary papers, like the feasibility study report, no objection from local authority.

As per ECR '97 all **existing** industries/projects in Orange B and Red category require an **Environmental Management Plan (EMP)** (not IEE or EIA) to be prepared and submitted along with necessary other papers while applying for environmental clearance.

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

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

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

Application format for environmental clearance is in place can be collected from divisional offices of DOE.

2.3.2 Other Legislation

Bangladesh legislation contains numerous laws, which are indirectly related to the environment. A compendium of these laws has been prepared recently (Farooque & Hasan,

1996). Other legislation, which is relevant, to various aspects of industrial project in general includes:

- The workman's Compensation Act of 1923, which provides legal basis for the payment by certain classes of employers to their workmen of compensation for injury by accident.
- The Forest act of 1927 (amended in 1989), which provides legal protection for wild flora and forest.
- The Factories Act of 1965, which insists to keep clean and hygienic environment within the factories.

2.4 BANGLADESH NATIONAL LEGISLATION

2.4.1 Key Legislation

a. The Environmental Protection Act 1995 (EPA)

The EPA repeals the Environmental Protection Control Ordinance of 1997 and provides general legislation laying down basic requirements for obtaining environmental clearance for major new development projects and expansion or modernization of existing industries in Bangladesh. The Act is administered by DoE through the Rules and Regulations document described below.

b. Rules and Regulations under the EPA of 1995

Specific and detailed guidelines to implement the requirements of the Environmental Protection Act have been prepared in 1996 by Resource Control Company of Bangladesh, AIC Watson Consultants ltd. of India and Planning and Development Services ltd. of Bangladesh in document titled "Rules and Regulations EPA/1995".

The Rules and Regulations were slightly revised and recently became enforceable under Bangladesh law by publication in the official Gazette on August 27, 1997. This ESSA has been prepared to comply with these regulations. If there are future changes to the standards and procedures published in the Gazette, these will be taken into account by project management at the appropriate time.

The Rules and Regulations address two main issues. First, to establish procedures to be followed by the developer of a new facility, or operator of any existing facility, to obtain environmental clearance allowing the construction and operation permits for air emissions, noise, and inland water discharge those new and existing facilities must follow. Standards for ambient air quality and noise are also established. The ambient standard of water quality, air quality and noise are presented in Table 2.1 to Table 2.5 in the following page. Standards refer to discharges to freshwater bodies with values in parentheses referring to direct discharges to agricultural land.

Table 2.1: Inland Surface Water Quality Standards

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

Source: ECR- Schedule 3

Table 2.2: Standards for Waste from Industrial Units

Parameters	Unit	Inland Surface Water	Irrigated Land
Biological Oxygen Demand (BOD_5) at 20^0 C	mg/l	50	100
Chemical Oxygen Demand (COD)	mg/l	200	400
Dissolve Oxygen (DO)	mg/l	4.5-8	4.5-8
Total Dissolved Solids (TDS)	µmho/cm	2,100	2,100
P^H		6-9	6-9
Suspended Solid (SS)	mg/l	150	200
Chloride	mg/l	600	600
Iron	µmho/cm	2	2

Source: ECR- Schedule 10

Table 2.3: Ambient Air Quality Standards
(All units are in µg/m3)

Categories of Area	Suspended Particulate Maters	Sulphur-dioxide	Carbon Monoxide	Oxides Nitrogen
Industrial and mixed	500	120	5000	100
Commercial and mixed	400	100	5000	100
Residential and rural	200	80	2000	80
Sensitive	100	30	1000	30

Source: ECR- Schedule 2

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

Table 2.4: Standards for Gaseous Emission from Industries

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

Source: ECR- Schedule 11

Table 2.5: Ambient Noise Standards

Areas	Day Time dBa	Night Time dBa
Silence Zone: Zone A	45	35
Residential Area: Zone B	50	40
Mixed Activity Area: Zone C	60	50
Commercial Area: Zone D	70	60
Industrial Area	75	70

Source: ECR- Schedule 4

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

c. The Gas Safety Rules (1991)

This document is derived mainly from published American Society of Mechanical Engineers (ASME) and American National Safety Institute (ANSI) codes practices. These rules prescribe engineering design and construction requirements for works involving flammable gases and pressure vessels. They are primary technical reference used by the GoB Chief Inspector of Explosives to certify the design, construction and operation of gas pipeline in Bangladesh.

d. The Civil Construction Act (1984)

This law is applicable in both urban and rural areas controlling development in combination with the Local Government Engineering Department. This law is applicable to the project because land is required for the construction of the power plant and surface facilities.

e. The Building Construction Laws-Second Edition

This law addresses regulation applicable to building construction activities.

f. East Bengal Protection and Conservation of Fish Act (1950), amended (1982)

Designed to project fisheries, the Act can prohibit the use of certain fishing techniques and fishing in specified waters. It would be applicable to pipeline river crossing and other works potentially impacting surface water quality in streams and other water bodies containing fish stocks.

g. Acquisition and Requisition of Immovable Property Ordinance (1982)

Establishes procedures for buying or leasing land for development, which may be applicable when acquiring the land necessary for the gas pipeline right-of-way and surface facilities.

2.4.2 Other Legislation

- **Water Supply & Authority Act (1996)**

No details are currently available.

- **Bangladesh Wildlife (Preservation) Amendment Act (1974) replaced The Bangladesh Wildlife (Preservation) Order (1973)**

The Act enables the government, through notification in the official Gazette, to declare any area a wildlife reserve affording it all the protection that title provides. Probably not applicable within the study area as no protected wildlife has been identified.

- **Antiquities Act (1968)**

Ensures antiquities of historical, Anthropological, religious, military or scientific interest are protected. Land holding an antiquity may be purchased by the government; otherwise the owner of the antiquity is held responsible for its protection. This Act is probably not applicable to the project.

- **The Forest Act (1989)**

Enacted to project endangered flora and fauna during construction in forest habitats. Not applicable to the project as no important flora or fauna have been identified.

- **Additional Requirements for Land Acquisition & Construction-Related Activities**

National environmental legislation directly applicable to the major elements of the proposed power plant project can be divided into two general categories: land acquisition and construction. Relevant legislation and rules governing these categories are discussed below.

- **Land Acquisition**

a. Government of Bangladesh's Obligations

Since proponent of this project has undertaken the responsibility of all land acquisition, they will take responsibility for ensuring that all necessary actions will be in compliance with the existing national policies and practices. It is therefore the Government's obligation to acquire the requisite land for the project, irrespective of its current ownership and use, and/or any current or future use, either for agriculture, aquaculture/capture fisheries or wildlife habitats.

b. Compensation

There are well-defined procedures set out in the legislation relating to land acquisition regarding payment of compensation for an acquired piece of land. If, for example, the land is used for rice-growing, then an amount equivalent to approximately 1.5 times the market value of a given variety of rice (e.g. paddy) that is currently being (or could be) produced

annually is fixed as a yearly lease value. In case of outright purchase (carried out on a 99-year lease), the compensation-value of acquired land varies widely according to the locality, soil fertility, access to transportation and infrastructures.

c. Construction-Related

Land acquisition will be followed by construction of the necessary structures and buildings (e.g. field office, latrines, sheds) and other necessary facilities. Construction activities can be divided into two main categories:

1. Civil construction including all buildings, drainage, sewerage, boundary walls, security fencing etc, and
2. Mechanical and electrical construction

d. Civil Construction

Although civil construction regulations do exist in Bangladesh, they have at present only been developed for urban areas (e.g. Dhaka, Chittagong, and Khulna). Strictly speaking, there are also legal provisions for civil constructions in rural areas (i.e. those areas that fall outside a Municipality's jurisdiction). These civil construction regulations are developed by Rajdhani Unnayan Katripakkha (RAJUK), and should be adhered to in close construction with and approval of the Local Government Engineering Department (LGED) responsible for all engineering works at the Thana level. Any large development project, which is carried out in a rural area should follow RAJUK as a means of ensuring 'best practice'.

The Civil Construction Act, 1984 (RAJUK) stipulates the following in paragraph (3, p 5-6) under 'Building Construction for Industrial Units':

- An industrial unit should be constructed at least 1.5 m. from the edge of the nearest road or 4.5 m. from the center-line of such a road which is adjacent to the site, whichever is greater:
- Provision should be made for drainage of waste materials; and
- Appropriate fire-fighting installations should be incorporated.

2.5 WORLD BANK GUIDELINES

- **World Bank Environment, Health and Safety Guidelines and Standards (1995)**

The World Bank has developed atmospheric emission, wastewater discharge and environmental protection standards for hydrocarbon projects including gas pipelines and surface facilities. The Guidelines set standers for the discharge of process effluent such as from gas treatment plants to surface waters (e.g. oil and grease in water <20 mg/l), but there are no specific standards for releases from pipelines or surface facilities such as those contemplated for the western Zone Pipeline Project. Ambient noise levels at the site boundary during operations should not exceed 75 dBA during day and the 70 dBA at night. Solid and Liquid wastes should be recycled where possible, or disposed in an environmentally acceptable manner. Equipment containing PCBs or ozone-depleting chemical should not be installed.

2.6 INTERNATIONAL LEGISLATION RATIFIED BY BANGLADESH

2.6.1 Key legislation

UN Framework Convention on Climate Change (UNFCCC)

Bangladesh ratified UNFCCC in 1994. The signatory countries have to submit GHG emission inventory to UNFCCC with a mitigation options to reduce emission of contributing to climate change (six contributory gases are the main agent for greenhouse effect and global warming).

2.6.2 Other Legislation

- **The Convention of Biological Diversity (1992)**

Signed by over 150 countries and ratified by Bangladesh in 1994, requires each signatory nation to develop national strategies, plans or programs for the conservation and sustainable use of biological diversity. No rare or sensitive ecosystems have been observed within the biological habitats covering the pipeline route and surface facilities.

- **Vienna Convention for the Protection of the Ozone Layer (1985)**

Bangladesh ratified it in 1990 which led to the Montreal Protocol (1987) aimed at eliminating the use of Chloro-Fluoro Carbons (CFCs) and ozone-reducing chemicals.

- **Convention Concerning the Protection of the World Cultural and Natural Heritage (1972) (World Heritage Convention)**

Bangladesh ratified it in 1983. Aims to protect outstanding natural or man-made features considered the heritage of more then one state. Mankind as a whole has certain rights with respect to conserving such features. The Convention can be applied to habitats but is unlikely to be applicable within the study area.

- **Convention on Wetlands of International Importance as Waterfowl Habitats (1971) RAMSAR**

Bangladesh ratified it in 1992. The main aims to stem encroachment on habitats including coastal beaches, coastal waters and tidal flats through promoting the wise use of all protected, names areas. It encourages competency in the management of wetlands which may affect the current project.

- **International Plant Protection Convention. Rome (1951)**

Ratified by Bangladesh in 1978. Unlikely to affect the project

2.7 INTERNATIONAL LEGISLATION NOT RATIFIED BY BANGLADESH

- Radioactive Substances Act (1993) Radioactive Substance (Phosphoric Substance, Rare earths, etc.) (Exception) Order (1962)

A license is required for disposal of all radioactive wastes, unless deemed low-level or containing radioactive scale. Pipe weld testing by X-ray will involve high-energy gamma radiation sources.

- **Convention on the Conservation of Migratory Species of Wild Animals. Bonn(1979)**

To protect animals in danger from extinction as they migrate from one territory to another Unlikely to affect the project.

- **Convention of the Conservation of European Wildlife and Natural Habitats**

To protect all breeding and nesting sites of the species listed in the appendices through international co-operation. Not applicable to the project.

- **Convention Concerning the Protection of Workers against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration.**

No direct application to the project. These matters are addressed under other regulations and codes.

2.8 POLICIES AND PLANS (REGIONAL AND NATIONAL)

2.8.1 Bangladesh Environmental Policy-1992

This is a board- based document setting out the national government's desire for the commitment to environmentally sustainable development in Bangladesh. No specific codes of practice are specified for power plant construction and operations.

2.8.2 Fifth Five Year Plan (1997-2002): Environment & Sustainable Development

The Constitution of Bangladesh asserts that 'it shall be a fundamental responsibility of the state to attain, through planned economic growth, a constant increase of productive forces and a steady improvement in the material and cultural standard of living of the people' (Article-15). In pursuit of this goal of prosperity of the people through planned development, the individual and the society come to interact with the environment and have to take care of it, lest not to speak of global warming, excessive use of natural resources like land, water and forest turn this land into a 'dust bowl' with 'individuals scratching a living like a scrawny hen'.

With the awareness of the above potential threat, Bangladesh has so far signed, ratified and acceded to 22 international conventions, treaties and protocols related to environment. The important ones, among them, signed at the UN Conference on Environment and Development (UNCED), held at Rio de Janeiro, Brazil in 1992, are the Agenda 21, Climate Change Convention and Biodiversity Convention. The Agenda 21 is a basis to attain sustainable development through policies initiated and co-ordinated at the national level. The second phase of the Bangladesh National Conservancy Strategy (BNCS), the Forestry Master Plan and the National Environment Management Action Plan (NEMAP) all reiterate Bangladesh's commitment to implement the international conventions and treaties signed from time to time.

As a signatory of these international and regional treaties/conventions/protocols, and in fulfilling the constitutional obligation, further efforts will be continued to chart the course to prosperity ensuring that no irreparable damage is inflicted on the environment and prosperity is sustained in the long run.

Major Environmental Issues in Bangladesh

Environment, as per the Environment Protection Act, 1995 includes water, air, land and physical properties and the inter-relationships which exist among and between them and human beings, other living creatures, plants and micro-organisms. The environment is thus the sum total of all social, physical, biological and ecological factors. Social environment is centered round human beings. It is their institutions, group behavior, habitation and interaction in production and consumption of their wealth. The human activities entail using natural resources and interfering with natural environment, increasingly with the increase in growth. Environmental concerns have, therefore, assumed vital importance. It is now widely accepted that there must be an integrated approach between environment and development. As such, there is a need for integration of environment into development planning and activities. Environment is where we live and development is what we all do in attempting to improve our standard of living. Bangladesh has many environmental problems, natural or man-made, such as frequent natural disasters, industrial pollution, poor health and sanitation, deforestation, desertification, changes in climatic conditions, salinity, deteriorating habitat of flora and fauna, etc. which we have to face, solve or compensate for.

Agricultural resource base: The vast majority of the population depends on agricultural and natural resources for a large part of their food and income. Thus, a more dynamic agricultural sector, better use of natural resources and increased concern for environment are essential. No growth or poverty alleviation strategy can bring success without a healthy agricultural sector. Land and water are the two natural resources for agricultural development. One of the difficult strategic issues is how to allocate limited supplies of water to its uses for agriculture, salinity control, fisheries, navigation and a growing urban population for sustained development. There is also competing demand on land from non-agricultural uses of land. As a result, agricultural resources in Bangladesh are already under severe pressure and environmental strain. It is essential to reverse this trend and rebuild, and where possible, augment the productive capability of scarce and essential agricultural resource base. To produce enough food for an increasing population, it is necessary to maximize the benefits that can be derived from the existing technologies and to maintain the sustainability of the food production system beyond the medium term of the Fifth Plan, it is essential that Bangladesh continues to make all out efforts to bring about a major breakthrough in agricultural technology.

Biodiversity: In making a breakthrough in agricultural technology, it is necessary to preserve the variety of life, i.e. biodiversity. The preservation of biodiversity is both a matter of insurance and investment, necessary to sustain and improve agriculture, forestry, and livestock and fisheries production systems in order to keep future options open as a buffer against harmful environmental changes and as a raw material for scientific and industrial innovations. Moreover, we must conserve biodiversity as a matter of survival. The variety of life helps make the earth fit for balanced enjoyment of life. It plays an important role in all major life-support services, from maintaining the chemical balance of the earth and stabilizing climate to protecting the watershed and renewing soil. Maintaining a nation's

biodiversity is integral to maintaining its wealth. The Plan, therefore, attaches due weight to the development of our biological resources. The importance of species and ecosystems will be considered in the formulation of development policies and programs. Institutions assigned responsibility for conserving biodiversity will be supported by necessary financial and organizational resources. The species and ecosystems on which our survival depends will be clearly identified and appropriate technology applied to make our survival worthy of human beings.

Biomass: In Bangladesh, especially in the rural areas, where about 80 per cent of people live, biomass plays an important and complex role. The problem is not merely the supply of wood or of fuel or of food. These products are linked by competition for land and by different product's end uses that may compete with, or complement one another. Thus shortage of any form of biomass will affect the quantity and composition of different end-uses. At the moment, there is an acute crisis of biomass fuel, which constitutes 73 per cent of total energy consumed. The per capita supply of biomass fuel is declining. There is an increased use of crop residues and dung as fuel which is depriving soil of valuable nutrient and organic matter.

Impact of chemicals: Modernization of agriculture has led to an extensive use of fertilizers and pesticides. Although production of food grain and other crops has increased significantly by the use of fertilizers and pesticides, quality of land has suffered due to indiscriminate use of chemicals. Farmers spraying pesticides and using fertilizers, in many cases, are suffering from heart and skin diseases. Cows, goats and other domestic animals eating fertilizer-fed and pesticides-affected grasses are also suffering from diseases. Fish population in the rivers and other water bodies have drastically decreased due to water pollution by chemicals including fertilizers and pesticides.

Industrial pollution: The growth of industries in the country has generally been unplanned without keeping the issue of environmental protection in careful consideration. There are many industries in the residential areas causing air and water pollution through smoke emission and dumping of untreated effluent. Industrial wastes have polluted the water of the Buriganga, the Shitalakhya, the Karnafuli and the Rupsha rivers. Effluents from tanneries are extremely harmful to human beings since they contain high concentration of chromium compounds. About 250 tanneries in Hazaribagh area within the Dhaka city are causing serious environmental pollution and health hazard making the area unsuitable for human habitation.

Deforestation: Bangladesh has a classified natural forest area of around 6-8 per cent of the total land area which is far below the desired level. According to a study, 50 per cent of destruction of forests took place during the last 20 years affecting top soil and causing land erosion. Such deforestation could not yet be compensated by social forestry and backyard plantations.

Wetland and fisheries: Bangladesh has a high proportion of wetland area, which has, of late, been declining. Rivers, rivers, beels, lakes and haors are the open wetlands while baors, dighis, ponds and ditches constitute the closed ones. They are significant sources of sweet water fishes. The decline in fish production has been attributed to a general deterioration of the wetlands, characterized by silting up of bed levels, water logging as well as water pollution.

Mangrove ecosystem: The Sundarbans, located in the south-western part of Bangladesh is the largest single expanse of mangrove forest in the world. It is a dynamic, fragile and complex ecosystem in delicate balance with land and water. It is a good habitat for offshore fisheries and onshore shrimp cultivation, a natural coastal protection, a highly valuable forest resource and a recreational resort. But a gradual degradation of environment in the Sundarbans has been taking place due to rapid deforestation, top-drying, saline water intrusion, killing of wild lives, inadequate reforestation and lack of efficient conservation programs.

Coastal and marine water: Disposal of chemical fertilizers, insecticides and industrial effluent into water are leading to a severe pollution of the coastal and marine environment. Rare species living in these areas will disappear if they are not preserved.
Salinity: Diversion of the Ganges water has thus far drastically reduced the down stream flow of its distributaries. Consequently, saline sea water entered into the mainland rivers. It has adverse effects on agriculture and sweet-water shrimp cultivation and also on availability of sweet water for domestic and other uses. Following signing of the long term treaty on sharing of water of the Ganges with India on December 12,1996, there has been an improved inflow of water down the Ganges in Bangladesh. This seems to be having an improving effect, which needs to be further improved through building a barrage across the Ganges.

2.8.3 ISO 14000

The International Organization for Standardization (ISO) is in the process of developing a series of standards, under the designation ISO 14000, which will establish a framework for business enterprises to manage the present and potential effects of their operations and products on the environment. The core of the standards series is ISO 14001 which defines a model environmental management system (EMS).ISO 14001 is unique in the series. It is a specification of the elements of an EMS that should be in place for an enterprise to be able to manage environmental matters effectively. The other standards in the series are guidelines for the evaluation of an organization and its products. The distinction between a "specification' and a "guideline" is an important one. It is intended that the ISO 14001 specifications will provide a basis for a company's EMS to be reviewed by a third party and a determination made and a registration issued that states that the standard has been met by the enterprises. The guidelines, on the other hand, provide a basis for the enterprise itself to assess how well it is able to evaluate the performance of its environmental management program and the effects of its products on the environment. Neither the specification nor the guidelines set a standard for what a company's performance should be. They only establish what management tools and processes need to be in place for a company to consistently meet appropriate performance standards and to improve upon them.

ISO standards are voluntary and it may not be advisable for an enterprise to seek 14001 registrations or follow the guidance provided by the other standards in the series. The level of environment risk posed a company's operations and products and the size and simplicity of its organization may not justify the installation of a fully integrated environmental management system. Marketplace and other stakeholder concerns about a company's environmental impacts vary from company to company. Furthermore, the extent to which the standards become references in the rules and police of the regional, national, and local jurisdictions in which a company does business will vary.

Companies whose products and services and whose operations have a potentially significant impact on the environment are obliged to deal with a world that is concerned about what that impact might be. Customers want products that reduce and minimize their own environmental exposure and costs. Communities do not want facilities in their midst that can cause health problems as well as ecological or aesthetic damage. Employees want to work companies that consistently operate in a prudent manner, shareholders, investors, and lenders understand the impact that environmental problems can have on profits and the value of assets. Overlapping and frequently conflicting government agencies never occur. Companies operating in this scenario with these concerns should be following the ISO 14000 development closely and using it in whatever ways make good standards is not expected to be finalized completely for several years, the development of ISO 14001 and the related environmental auditing standards has been completed and will become final international standards in 1998. Companies that know if their operations and products present potential environmental concerns should evaluate whether;

- The ISO 14001 Environmental management System provides a useful model framework
- A third party review and registration is worth the cost and effort involved, and
- Using the ISO 14001 EMS Specification as the basis for an internal assessment and as a framework for program improvement is appropriate.

2.9 PERMITS AND CONSENTS

2.9.1 Environmental Clearance

Formal EIA guidelines in Bangladesh are set out in "Rules and Regulations under the 1995 Environmental Protection Acts" as published in the official Gazette on August 27, 1997. Any proponent planning an industrial project is currently required under Paragraph 12 of the Environmental Protection Acts, 1995 to obtain "environmental clearance letter:" from the Department of Environment.

The first to obtain environmental clearance is for the project proponent to complete an application form which may be obtained from the appropriate DoE regional office. The completed application form with a covering letter is then addressed either to the Regional Director General (RDG) or to the Deputy Director (DD) of DoE. The application is actually reviewed by the Regional Deputy Director (Dhaka, Khulna regions, etc.) who has the authority to request supporting documents on such issues as the proposed process technology or the proposed mitigation options for environmental management. In cases where it is perceived that there may be considerable environmental damage, then the DoE may request to see a copy of the project feasibility study (if one was carried out).

In cases where the proponent has submitted the application directly to the Director, then it is Director's responsibility to issue the clearance or refusal letter; but if the application has been addressed to the DG, then the Director passes on his opinion to the DG who is responsible for issuing the clearance or refusal letter. Environmental clearance is required for the current power plant project prior to start of construction.

Table 2.6: Laws and Regulations Applicable to the Project

Concerned Issues	Protective Legislations Title
Air Quality	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, 1997; Environmental Pollution Control Ordinance 1977; Factories Act 1965; Smoke-Nuisance Act 1905.
Agriculture, land- use planning and soil management	Agricultural & Sanitary Improvement Act, 1920; Agricultural Pesticides Ordinance, 1971; Agricultural Pesticides Ordinance (Amendment), 1980; Pesticide Rules, 1985; Local Government Ordinance, 1982; Municipal Ordinance, 1977; Town Improvement Act, 1953; Building Construction Act (Amendment), 1990; Bangladesh Water& Power Development Ordinance, 1972; Forest Act, 1927.
Noise Pollution	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, J 997; Factories Act 1965
Forest conservation	The Environmental Conservation Act. 1995; the Environmental Conservation Rules, 1997; forest Act, 1927 amended, 1973); Sylhet Forest Transit Rules 1951.
Toxic & hazardous substances	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, 1997; Municipal Ordinance, 1977
Solid wastes	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, 1997; Municipal Ordinance, 1977
Wildlife Conservation	Bangladesh Wildlife Preservation Order, 1973; Bangladesh Wildlife Preservation Act (Amendment), 1974
Mineral resources development	Mines Act, 1923: Petroleum Act, 1934; The Bangladesh Petroleum Act 1974; and The Bangladesh Petroleum Policy, 1993
Conservation of biodiversity	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, 1997; Bangladesh Wildlife Preservation Order, 1973; Bangladesh Wildlife Preservation Act (Amendment), 1974
Occupational Health & Safety	Factory Rules, 1979; Factory Act, 1965.
Radiation	Radiation Protection Act, 1993
Water resources, sanitation and water supply	The Environmental Conservation Act, 1995; The Environmental Conservation Rules, 1997; Bangladesh Water & Power Development Ordinance, 1972; Factories Act 1965; Local Government Ordinance 1976 & 1982

Chapter -3

PROJECT DESCRIPTION

Project Description

3.1 Description of the Project

Summit Narayanganj Power Limited. is a Heavy Fuel Oil based power generation plant. The power plant is designed for continuous base load operation. The operation principle is according to electrical demand. The control of electrical production bases on parallel with grid operation.

Electrical power will be generated by six generating sets .The engines are capable of running at rated output continuously. For other conditions the power will be adjusted.

3.2 Type of the Project

The basic data of the project are furnished in Table-3.1

Table-3.1: Basic data on Summit Narayanganj Power Limited

1. Name of the Project	Summit Narayanganj Power Limited.
2. Project Proponent	A. N. M. Tariqur Rashid, Managing Director on Behalf of Summit Narayanganj Power Limited.
3. Project Location	Factory: M.N. Ghoshal Road, Madanganj Narayanganj, Bangladesh. Head Office: Summit Centre, 18 Karwan Bazar C/A, Dhaka-1215.
4. Type of Business	Power Generation
5. Final Product	Power generation from Heavy Fuel Oil.
6. By-product, if any	None
7. Net Plant Capacity	102 MW
8. Project Cost	BDT Tk. 468 Crore
9. Total Area of Land	539.5 Decimal
10. Total Covered Area	400 Decimal
11. Total Developed Land	539.5 Decimal
12. Employment	Total 85, Admin 15, production process 70
13. Power Requirement	Own generator: 800 KW
14. Fuel Requirement	Heavy Fuel Oil 450 Tons(Apx) Daily
15. Source of Water	Deep tubewell
16. Water Requirement	Household and Industrial: 2000 lit/day
17. Waste Storage	No waste storage is required as no effluents will be produced by the plant

3.3 Location of the project

The proposed power plant will be set up at Madanganj, Narayangonj, Bangladesh. The site is nearer to Dhaka-Chittagong Road. All infrastructure facilities like electricity, natural gas, labour, tele communication, etc. are available at the project site. The River Sitalakhya is situated in the west side of the project. Basundhara Cement Factory is also situated near the project. The layout plan and location map of the project presented in **Figure 3.1 and Figure 3.2.**

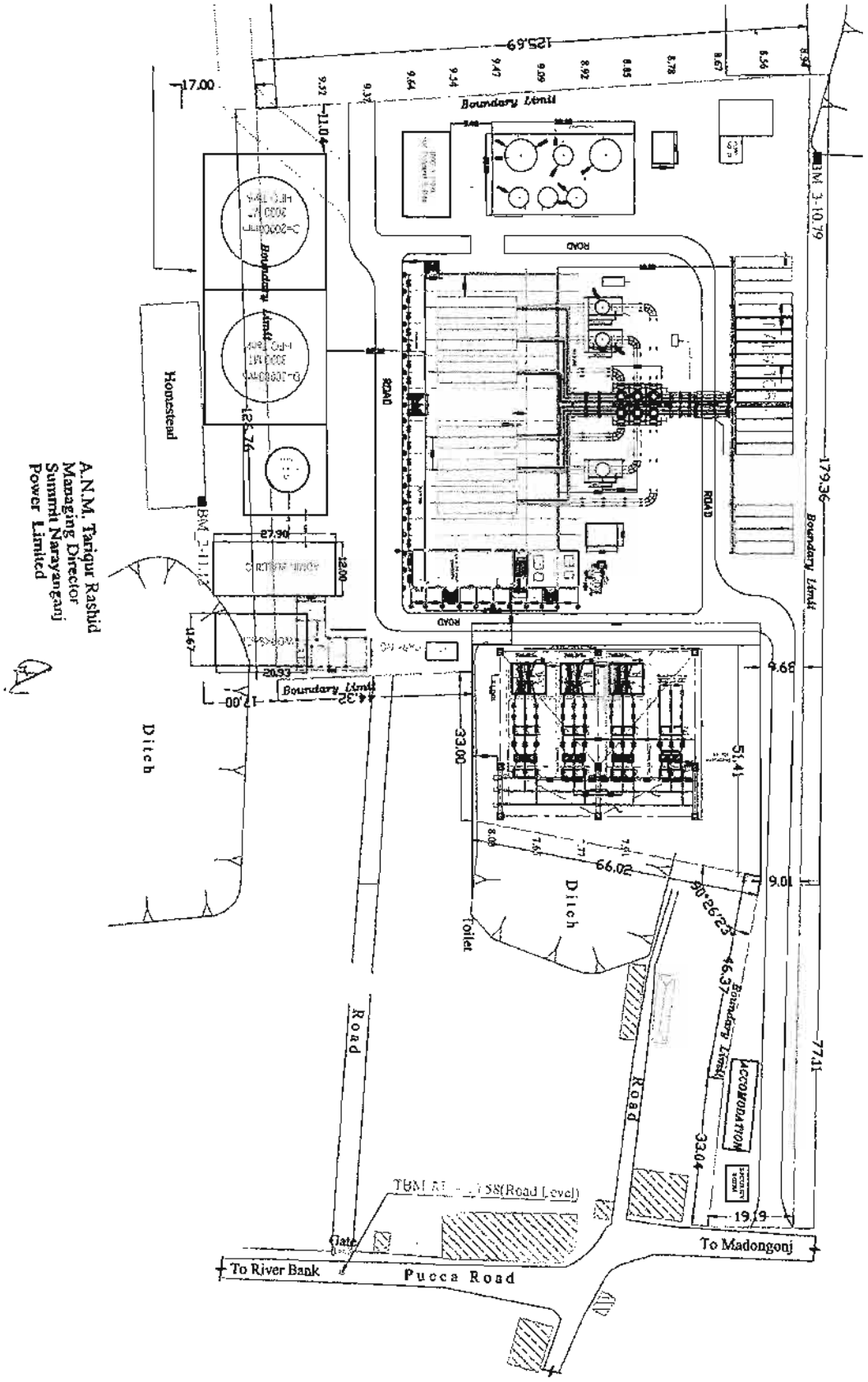


Figure: 3.1 Plant Layout of Proposed 102 MW Power Plant of Summit Narayanganj Power Limited

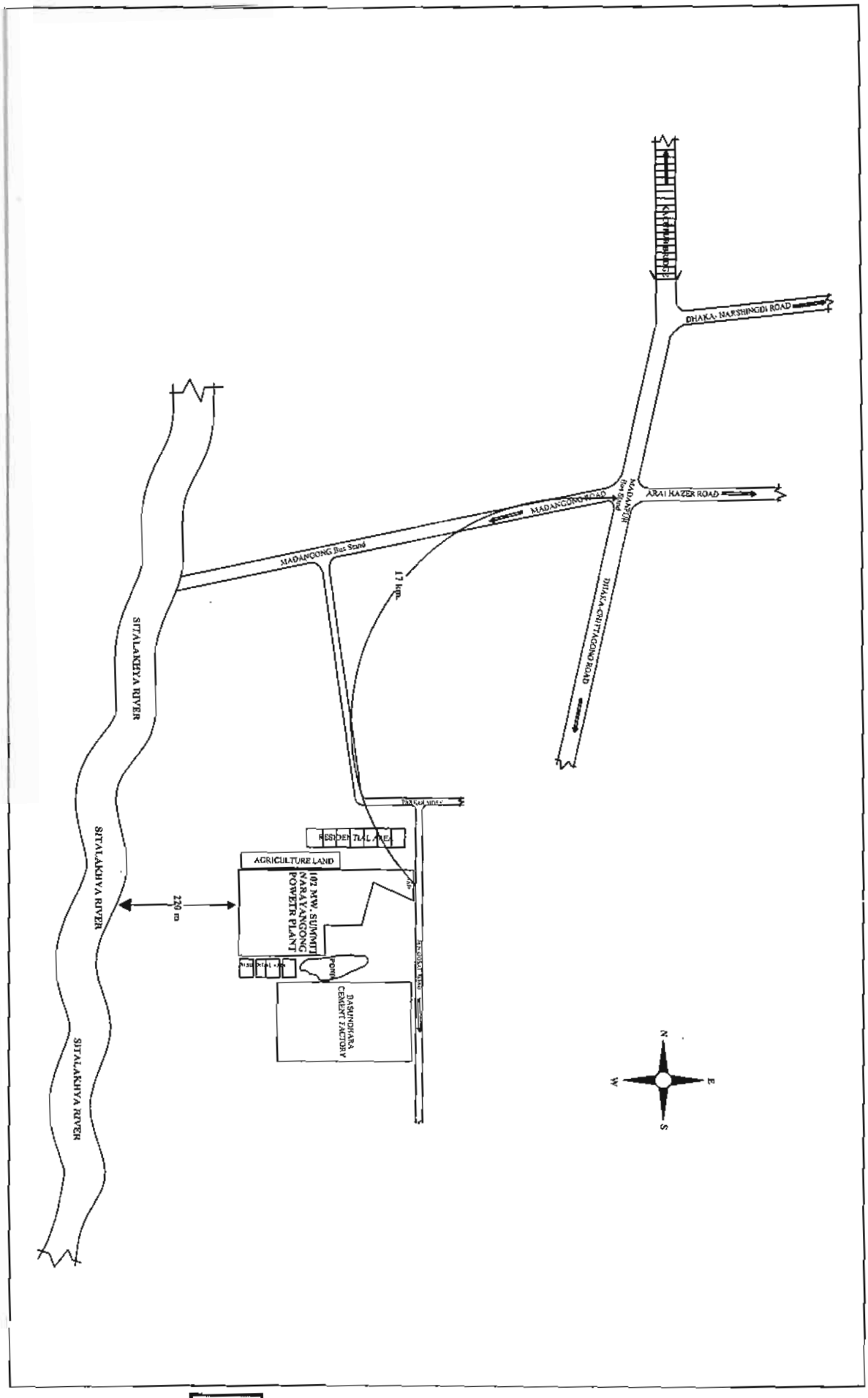


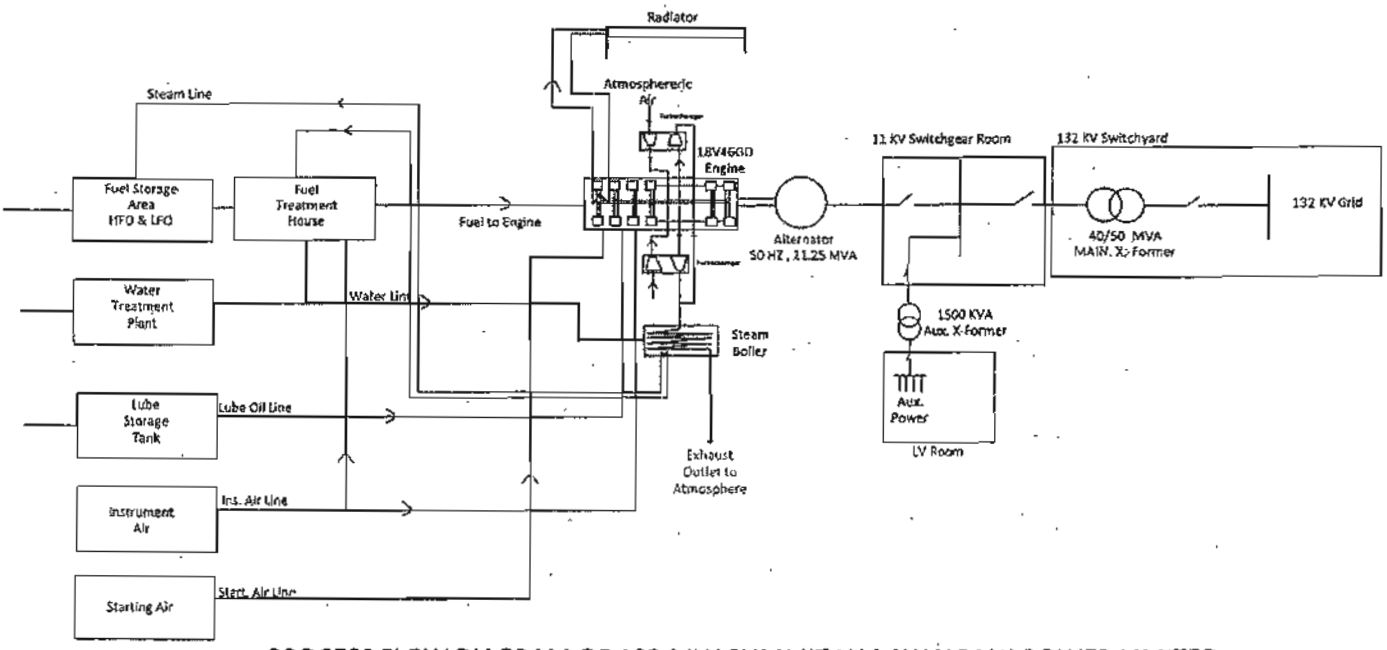
FIGURE 3.2 : LOCATION MAP OF SUMMIT NARAYANGONG POWER PLANT

3.4 Present Status of the Project

The physical Launching of the project has been started. The factory authority has got the IEE report approved by DOE Bangladesh.

3.5 Power Generation Method

The proposed power plant will use imported Heavy fuel oil for generation of electricity. These supplied fuel after purification will burnt in internal combustion engine for complete combustion, the generated pressure as a result of combustion will operate the generator sets by some rotating mechanism and will produce electricity. The heat of exhausted gas will be used for the boilers that will produce steam. These steams will be used for heating fuel oil. The Process flow diagram has been shown in **figure 3.3.**



PROCESS FLOW DIAGRAM OF 102 MW SUMMIT NARAYANGANJ POWER LIMITED

Figure: 3.3 Process Flow Diagram of 102MW Power Plant of Summit Narayanganj Power Limited

3.5.1 Generating Set

The Wartsila 18V46GD engine and the generator are mounted on a common base frame. The common base frame is flexibly mounted on a concrete foundation by means of steel springs. The Wartsilla 18V46GD generating set main dimensions are:

Lenth	**18.100**	**M**
Width	**5.350**	**M**
Height	**5.490**	**M**
Weight	**350,500**	**Kg**

Engine

General Engine description

The engine is of the four strokes, direct injected, trunk piston, turbocharged and intercooled design.

The engine is designed for continuous operation on heavy fuel oil / crude oil at any load between 25 -100% and can be started and stopped on heavy fuel oil / crude oil provided that the fuel is heated to operating temperature.

Engine main data

Configuration	v Engine form
Number of cylinders	18
Cylinder bore	460 mm
Stroke	580 mm
Speed	500 rpm
Mean piston speed	9.67 m/s
Mean effective pressure	2.34 bar
Swept volume per cylinder	96.4 dm^3
Compression ratio	15:8:1
Number of inlet valves	2
Number of outlet valves	2
Direction of rotation faced towards flywheel	clockwise
Length	13.580 m
Width	5.347 m
Height	45.488 m
Weight	237,000 kg

The high degree of function integration on the engine requires only a minimum of external system support and therefore minimizes the interconnections to external systems. The engine comprised of the following components/Syetems:

- **Fuel Oil system**
- **Lubricating oil system**
- **Starting Air System**
- **Cooling Water System**
- **Combustion Air System**
- **Exhaust Gas System**
- **Speed& Load Regulating System**
- **Sensor for Alarm and Monitoring**

This engine will be manufactured gas enabled meaning that engine can be capable of converting into gas operation.

Fuel Oil System

All the high pressure fuel injection equipment is located in a closed compartment with a removable cover ;(hot box), providing maximum reliability and safety for preheated fuel.

The fuel system comprises the following equipment:

- Low pressure pipes made of steel
- High pressure pipes, double wall with common leak alarm
- Injection pumps, individual for each cylinder
- Pneumatic stop cylinder at each injection pump

- Fuel and gas injector in each cylinder
- Fuel limiter to limit smoke at start up
- Solenoid valve for fuel limiter at start up

Lubricating Oil System

The lubricating oil system lubricates the main moving parts of the engine and also cools the piston tops. The engine has a wet lubricating oil sump.

The lubricating oil system comprises the following equipment:

- Pipes made of steel
- Oil sump of wet type
- Engine driven main lubricating oil pump with pressure regulating valve
- Pre-lubricating pump with electrical motor
- Lubricating oil cooler
- Lubricating oil thermostatic valve
- Lubricating oil automatic back-flushing fine filter, with integrated safety filter
- Centrifugal filter to clean the back-flushing oil from the automatic filter
- Start up/running in filters Non-return valves in oil supply pipes
- Crankcase ventilation pipe

Starting Air System

All Wartsilã 46 engines are started by means of compressed air with a nominal pressure of 30 bars. The start is performed by direct injection of air into the cylinders through starting air valves in the cylinder heads.

The starting air system comprises the following equipment:

- Pipes made of steel
- Starting air master valve
- Start blocking valve to prevent starting when turning gear is engaged
- Starting air distributor
- Starting air valves
- Slow turning device
- Air container for emergency stop system
- Flame arrestors

Cooling water system

The engine cooling system is divided into three circuits, the jacket cooling circuit, the 1st stage charge air cooler circuit and 2nd stage change air cooler circuit.

The cooling water system comprises the following equipment:

* Pipes made of steel
* Engine driven pump for jacket cooling circuit
* Engine driven pump for low temperature cooling circuit
* Non-return valves after circulating pumps

Combustion air system

The compressor side of the turbocharger feeds air into the cylinders via the charge air cooler. The engine is equipped with one turbocharger per cylinder bank. The turbocharger is of the axial turbine type.

- ✓ The combustion air system comprises the following equipment:
- ✓ Compressor on the turbocharger
- ✓ 1st stage charge air cooler
- ✓ 2nd stage charge air cooler
- ✓ Fresh water cleaning device for the compressor

Exhaust Gas System

The engine mounted exhaust gas pipes are made of cast iron, with separate sections for each cylinder. Stainless steel bellows are installed between the sections to absorb heat expansion. The pipes are fixed by brackets, but are free to move axially. The engine exhaust gas pipes are fully covered by an insulation box.

The exhaust gas system comprises the following equipment:

- ✓ Single Pipe Exhaust System (SPEX) exhaust manifold with bellows
- ✓ Flexibly mounted insulation box
- ✓ Turbine on the turbocharger
- ✓ Fresh water turbine washing system

Speed & Load Regulating System

The engine is provided with the following control and protection equipment.

- ➢ Hydraulic actuator mounted on the engine.
- ➢ Speed measuring system, with magnetic pick-ups for engine an turbocharger speed

Generator

Generator type

The generator is of the synchronous, three-phase, brush less, salient pole type.

Generator main data

Generator apparent power	21,345	KVA
Rated power factor	0.80	
Nominal voltage	11,000	V
Rated current (In)	1,120	A
Voltage adjustment range	±5	%
Frequency	50	Hz
Speed	500	rpm
Over speed	600	rpm
Continuous short circuit current	>2.5 x I_n	
Insulation class	F	
Temperature rise	F	
Cooling method	Air cooled	
Enclosure	IP23	
Standard	IEC60034	

Cooling (air cooled)

The generator is of a air cooled. A fan mounted on the generator shaft takes cooling air from the engine hall, through washable filters, and passes it through the generator.

3.5.2 Mechanical Auxiliary System

The proper function of the stationary power plant depends on the mechanical auxiliary systems. The proposed systems have been optimized for this particular application. The function of this system is to provide the engine with fuel, lubricating oil, starting air, cooling water, and charge air of the required quantity and quality, as well as to dispose of exhaust gases in a proper manner.

3.5.3 Fuel System

The main function of the fuel system is to provide the engine with fuel of correct flow, pressure and degree of purity.

Heavy Fuel Oil System

Heavy Fuel Oil is the main fuel for the power plant. A preheated engine can be started directly on HFO provided that the fuel has been circulated through the fuel system and has achieved the correct temperature and pressure. The engine can also be stopped on HFO provided that the fuel circulation can be restarted after the outage or the external system has to stay in operation i.e. fuel must be circulated through the stopped engine continuously for heating purposes.

Heavy fuel oil separator unit

Centrifugal separators are installed to remove water and solids from the fuel. The separator unit receives fuel from the buffer tank and sends clean fuel to the day tank.

The following is included:
3 Separator
Separators of automatic discharge type.
Capacity, each 13.30 m3/h
3 Delivery pump
3 Strainer
Single strainers on pump suction side.
3 Steam heater
Steam heaters for the heating of heavy fuel oil.
1 Sludge tank
1 Sludge pump
1 Steel frame
1 Control panel

Local control panel for manual and automatic operation.

1 Interconnection pipes, flanges, seals and valves

1 **Heavy / light fuel oil feeder unit**

The Following is included
2 Heavy Fuel Oil Feeder Pump

1 Light Fuel Oil Feeder Pump
1 Automatic Filter
1 Manual Bypass Filter
1 Viscosity Control System

Lubricating Oil System

The lubricating oil system provides required lubrication for all moving parts on the engine. It consists of the engine related lubricating oil system which handles the cooling and filtration of the lubrication oil and the plant related lubricating oil system, with storage of new and old lubrication oil

The lubricating oil system consists of the following equipment:

6 Lubricating oil separator unit

Centrifugal separators are installed to remove water and solids from the oil.

The following components are built on a steel frame, which forms a compact skid unit.

1 Separators of automatic discharge type
Capacity 5.00 m3/h
1 Separator delivery pumps

Single strainers on pump suction side

1 Steam heater for the lubricating oil

1 Sludge tank

1 Sludge pump

1 Steel frame

1 Local control panel for manual and automatic operation

1 Set of interconnection pipes, flanges, seals and valves

1 Separator cleaning device (mobile), cleaning unit

1 Separator cleaning device (mobile), connection kit

1 Separator cleaning device (mobile), Cleaning Liquid

Cooling System

The main task of the cooling system is to provide adequate cooling of critical engine components such as cylinder jackets, cylinder heads and turbochargers as well as to cool the lubrication oil and charge air entering the cylinders after it has been compressed by the turbocharger.

The engine cooling water-cools the low temperature charge, lubricating oil cooler, high temperature charge air cooler and engine jackets in a common single-circuit radiator.

Charge Air System
Charge air filter
Charge air silencer
Expansion bellows charge air system

Exhaust System

Expansion bellows exhaust system
Safety vent counter flanges including rupture disk
Ventilation fan unit

3.5.4 Electrical Systems

Operator's Station

WOIS workstation

The power plant is controlled and supervised from the Wartsila Operator Interface System (WOIS workstation). All actions necessary for the normal operation, such as start and stop of the generating sets, load increase and load reduction are activated and supervised via the WOIS workstation, using a mouse, keyboard and display. The operator can also supervise key data from the plant such as various temperatures and pressures as well as measurements of electrical variables such as generator output, voltage and frequency. The WOIS workstation also includes an alarm matrix printer and a hardcopy laser printer.

WOIS workstation includes the following functionality:

Process status displays, where the status and operation of the processes are displayed

Using various dynamic objects, such as images of pumps, valves and other components and units. The status of these objects is displayed graphically. By interacting with an object, the function and operational status can be displayed.

Process trends can be displayed as a free combination of six (6) measured values such as pressures, temperatures, speed, generating set load , etc. the operator may combine the values of interest in one graph to get a good view of the total process for further analyzing. The trends are stored for up to 180 days, and the operator may call back a trend for any time interval within these limits.

An alarm banner in the uppermost part of the displays informs about the latest occurred alarm. The active alarm list informs the operator of possible problem in the process. An alarm will remain on the active alarm list until the process has returned to normal state and the alarm has been acknowledged. The alarms are printed on the alarm printer immediately as they appear. Historical alarm and event lists can be called up for further evaluation of events.

Chapter -4

BASELINE EXISTING ENVIRONMENT

Baseline Existing Environment

4.1 General Consideration

Baseline condition of environment states the present states of different components of environment in absence of the project. The main objective of examining the present environment is to provide an environment baseline against which potential impacts from construction and operational phases of any project can be compared. A second important function of establishing a baseline for parameters such as air and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the project under study. In the present study the different environmental components examined for setting baseline conditions of the project area, are physic-chemical, biological and socio-economical.

In physic-chemical component, parameters included are land, water quality, air quality and climate.

4.2 Physico-Chemical Environment

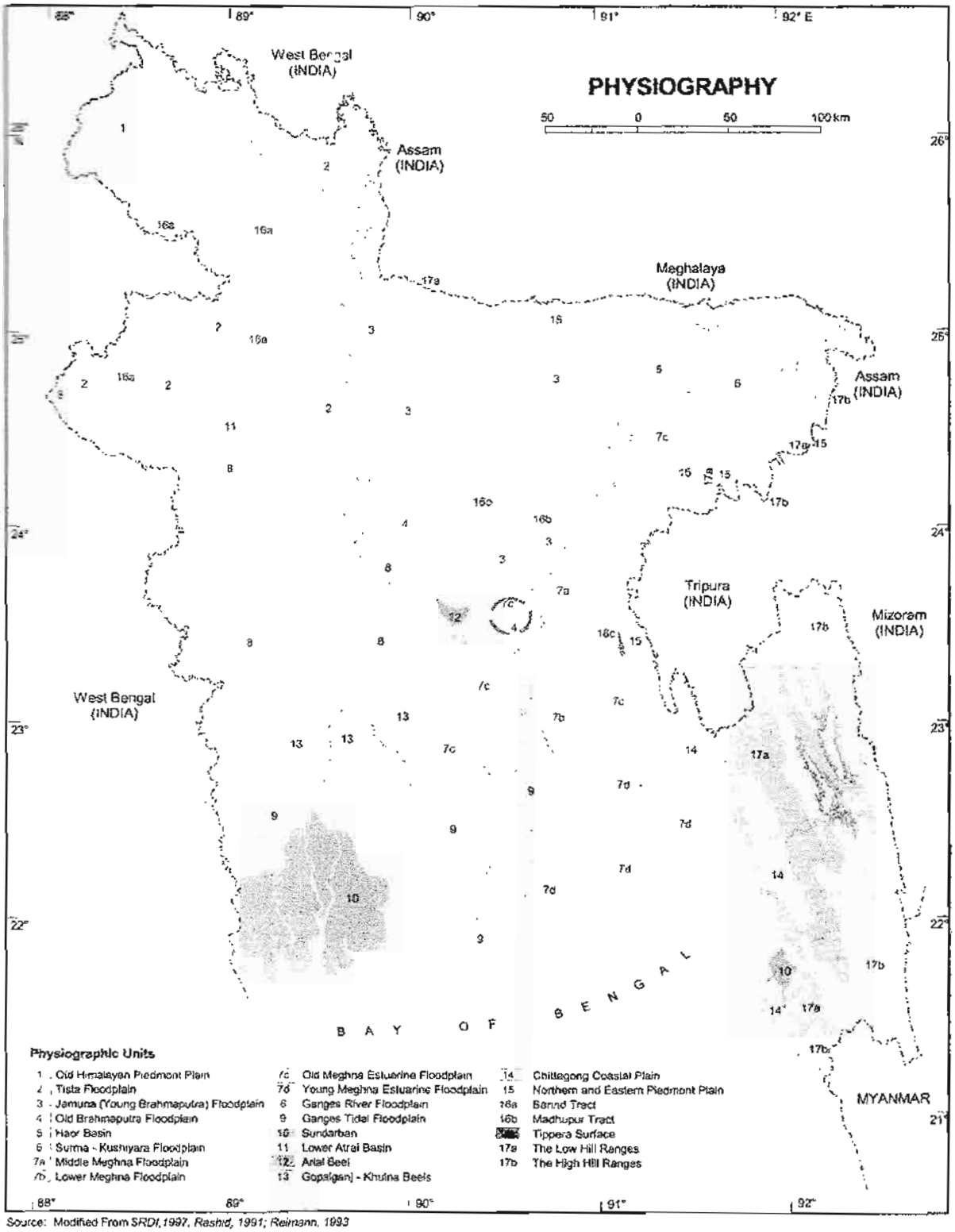
4.2.1 Surrounding Land Uses

The **Summit Narayanganj Power Limited.** a Bangladesh company, intends to build and operate a Heavy fuel Oil Based Power Plant in Narayangonj. The proposed power plant will be constructed to produce 102 MW Electric Power. The total land area of this project is 5.39 acres and covered area 400 decimals.

The proposed power plant will be set up at Madanganj, Narayangonj, Bangladesh. The site is nearer to Dhaka-Chittagong Road. All infrastructure facilities like electricity, natural gas, labour, tele communication, etc. are available at the project site. The River Sitalakhya is situated in the west side of the project. Basundhara Cement Factory is also situated near the project. The north side of the project is mainly the Bandar areas and the east side of the project area is mixed in nature with industries and residential area.

4.2.2 Land **From and Soil Classification**

The general Physiography of Bangladesh is shown in **Figure 4.1.** Most of the area of Bangladesh is a vast, low-lying alluvial plain, sloping gently to the south and southeast. The project area falls in Old Meghna Flood plain. Within this area, elevations are about 3m above sea level, which is shown in **Figure 4.2.**



Source: Modified From SRDI,1997, Rashid, 1991; Reimann, 1993

Figure 4.1: Physiographic Map of Bangladesh Including the Project Area

10

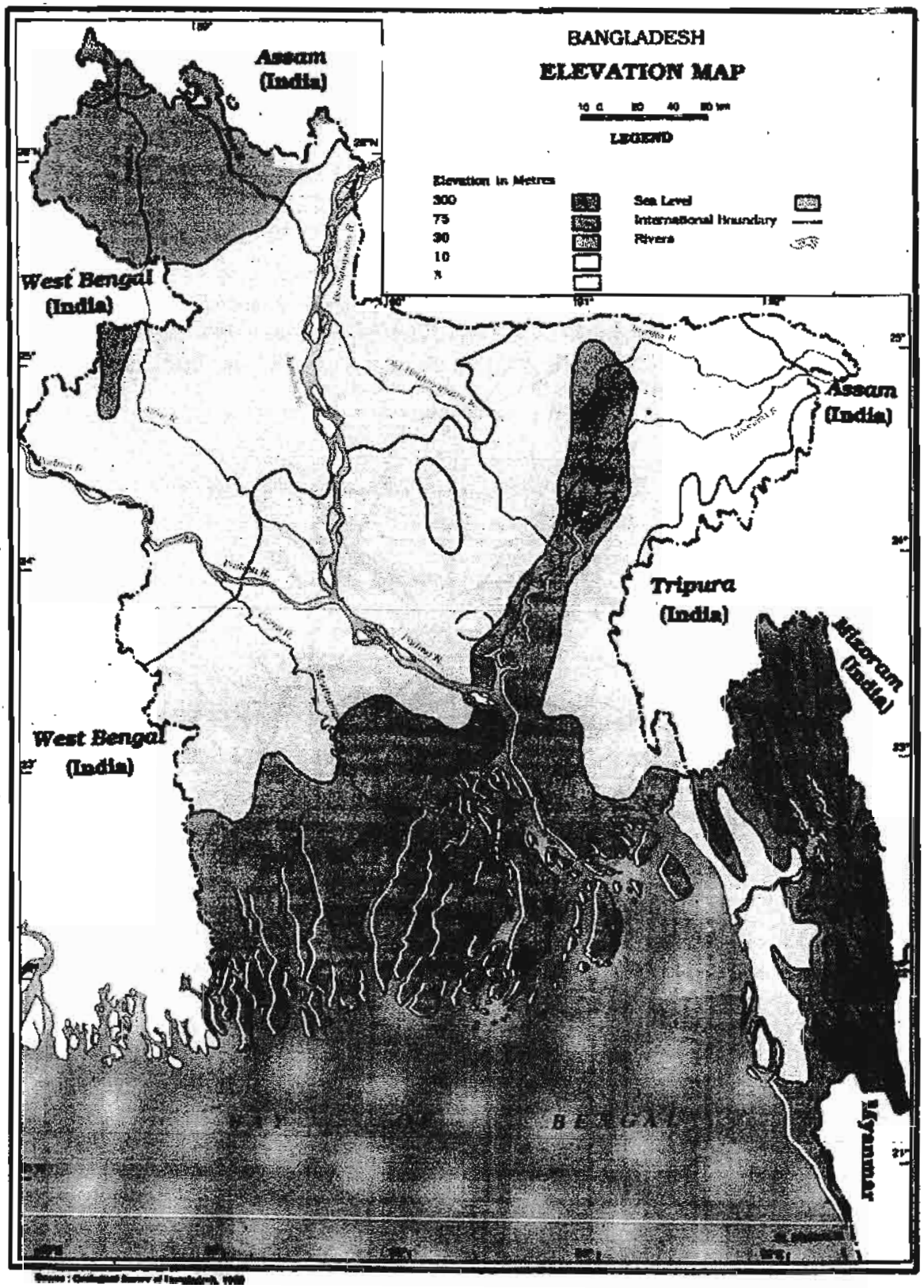


Figure 4.2: Elevation Map of Bangladesh Including the Project Area

4.3 Hydrology

Surface Water of Project Area

As other parts of the country this area also receives sufficient amount of rainfall and there is a good availability of ground water, which is being, used by hand pumps for drinking and domestic purposes.

4.3.1 Water Quality

4.3.1.1 Surface water

There is a river, the Shitalakshya is at the west of the project which may be considered as a permanent water body near the project site. The river carries run-off water from adjoining agricultural lands, which might contain pesticides and residual fertilizers. The study shows that the water quality of the river is good enough. Water was collected from the river and analyzed in our Laboratory. The water quality of limited parameters of the ditch near the project site as analyzed is given below in Table 4.1.

Table-4.1: Surface Water quality (limited parameters) of the Shitalakshya River

Sl No	*Parameter*	Result	(DoE) Bangladesh Standard for Waste Water
01	pH	6.8	6.0 – 9.0
02	Total Dissolved Solid	192 mg/l	2100 mg/l
03	DO	6.6 mg/l	4.5-8.0 mg/l
04	Suspended Solid	62 mg/l	150 mg/l
04	BOD_5 at 20°C	2.5 mg/l	50 mg/l
05	COD	12.0 mg/l	200 mg/l

Source: AECL Lab (water collected on 11.10. 2010 and tested on 16.10.2010)

4.3.1.2 Ground water

Ground water level exists at a shallow to moderate (Generally below 5.0 m) depth, which is being recharged mainly by infiltration of rainwater. Ground water zoning map has been shown in **Figure 4.3.** Ground water is a stable source of water for domestic use in this area. Usage of ground water for irrigation is limited here. There is no complaint regarding non-availability of ground water in this area. Ground water is assumed to be available as because rainfall is good and there is the river Shitalakshya passing by the side of the site. That means the recharge capacity of the ground water level seems to be adequate. To determine quality of ground water, water sample was collected from the existing ground water source. According to project authorities of **Summit Narayanganj Power Limited** water will be collected from underground by deep tube well for cooling, household and drinking purpose. Results shows that all the parameters remain within allowable limit of drinking water value as per Environmental Quality Standards for Bangladesh. The parameters which have been analyzed during this study are presented below in Table 4.2.

Table-4.2: Ground Water quality (limited parameters) of the Plant Site

Sl No	*Parameter*	*Result*	(DoE) Bangladesh Standard for Ground Water
01	pH	7.3	6.0-9.0
02	Total Dissolved Solids	240 mg/l	1000 mg/l
03	Iron	0.1 mg/l	0.3-1.0 mg/l
04	Alkalinity	60 mg/l	-
05	Hardness	72 mg/l	(200-500) mg/l
06	Chloride	6.5 mg/l	(150-600) mg/l

Source: AECL Lab (water collected on 11.10. 2010 and tested on 03.10.2010)

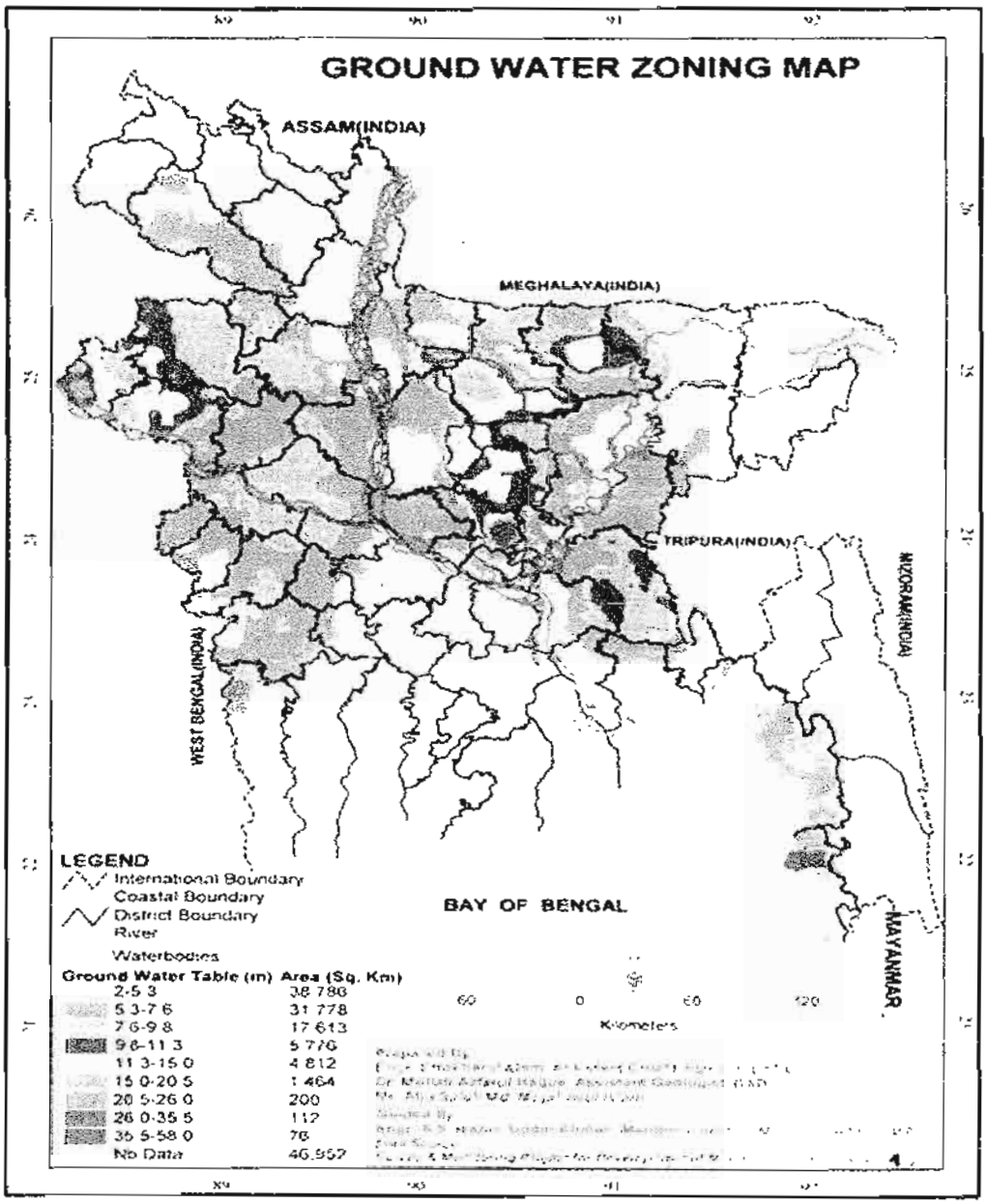


Figure 4.3: Ground Water Zoning Map of Bangladesh Including the Project Area

4.4 Air Quality

Air quality depends on substances, which are present in atmosphere in such concentrations that they produce undesirable effects on human beings, animal and as well as plant life. These substances include gases (SOx, NOx, CO_2, etc.), Suspended Particulate Matter (smoke, dust, fumes, etc.), and many others. Concentration of different pollutants above allowable level can have adverse impacts on plant, animal and human life. In order to identify air quality, monitoring program was undertaken at the area. An eight hourly air sample was collected through high volume air sampler. Monitoring was done for SPM, $PM_{2.5}$ and PM_{10} and monitoring results are given in Table 4.3.

Table-4.3: Ambient air quality of the project

Sl No	Sample Location	*Duration (Minutes)*	Ambient Air Pollution Concentration $\mu g/m^3$			
			PM_{10}	**SPM**	**SO_2**	**NO_x**
01	In font of project area	360	139	317	37.17	41.37
DoE (Bangladesh) Standard			150	200	80	100
Method of Analysis			**Gravimetric**	**Gravimetric**	**West-Geake**	**Jacob and Hochheiser**

Note: -

1. PM_{10} - Respirable Dust Content.
2. SPM - Suspended Particulate Matter.
3. SO_2 - Sulphur dioxide
4. NO_X- Oxides of Nitrogen

This area is mixed in nature; all parameters were within allowable limit. During construction phase some air is polluted for shipment of heavy equipment and others like vehicle movement.

4.5 Noise Level

The most sophisticated machineries have been installed in **Summit Narayanganj Power Limited,** which will produce little significant noise. It is suggested that the proponent should create a green belt around the factory building, which would reduce the noise level. The ambient noise level data were collected from different side locations of the factory premises by Sound Label Meter and they are given below in Table 4.4. At present, by comparing all the data with Bangladesh Standards, it is very clear that there would be no sound pollution created by **Summit Narayanganj Power Limited.**

Table 4.4: Ambient Noise Quality Analysis

Sl No	Location	Site Condition	*Result*
			Day Time
1	West Side (Project Main Gate)	Construction	62.11
2	East Side (50 m away)	Construction	58.27
3	North Side (Inside boundary area)	Construction	59.37
4	South Side (Insideboundary area)	Construction	58.44
DoE (Bangladesh) Standard for Industrial area			**70**

All units are in dBA
Source: AECL Lab (Measured on 11.10. 2010 by Sound Level Meter of AECL)

4.6 Climatic Condition

The project area is under the typical monsoon climate prevailing in the country. It has three main seasons:

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

The summer is hot and dry interrupted by occasional heavy rainfall. The rainy season is also hot and humid having about 88 percent of the annual rainfall. The winter is predominantly cool and dry. The average low temperature occurs in November to January while the average high temperature high temperature may be occurring in May. The normal maximum temperature is 33.7 °C and lowest 12.7 °C.

4.6.1 Rainfall

According to *Statistical pocket book Bangladesh 2009* annual average rainfall was 2385 mm in 2008. Seasonal distribution is too much skewed as shown in following **Tables 4.5 and 4.6** it appears that about 62% of the total annual rainfall occurs during this monsoon period.

Table 4.5 Average Normal Rainfall at Dhaka

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	D
Rainfall (mm)	7.7	28.9	65.8	156.3	339.4	340.4	373.1	316.5	300.4	172.3	34.4	1

Source: Bangladesh Meteorological Department
http://www.bmd.gov.bd/Document/climateofbangladesh.doc

The project area is marked on the average annual rainfall map of Bangladesh in **Figure 4.4.**

4.6.2 Temperature and Humidity

The relative humidity rises to above 90% during the wet season. The mean annual evaporation is high, with the highest daily figures occurring during March to May when the

mean daily temperatures are at their highest. The mean monthly maximum temperature in **Dhaka** varies from 25.4°C in January, to 33.7°C in April. **Table-4.7:** Presents the long term temperature data of Dhaka, the nearest Meteorological station of the proposed project area.

Table 4.6 Long Term Temperature at Dhaka

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Norm. Max.	25.4	28.1	32.5	33.7	32.9	32.1	31.4	31.6	31.6	31.6	29.6	26.4
Norm. Min.	12.7	15.5	20.4	23.6	24.5	26.1	26.2	26.3	25.9	23.8	19.2	14.1

Source: *Bangladesh Metrological Department*

4.6.3 Wind

According to BNBC, 1993 the average wind speed at Narayanganj is 195 Kmh^{-1}.

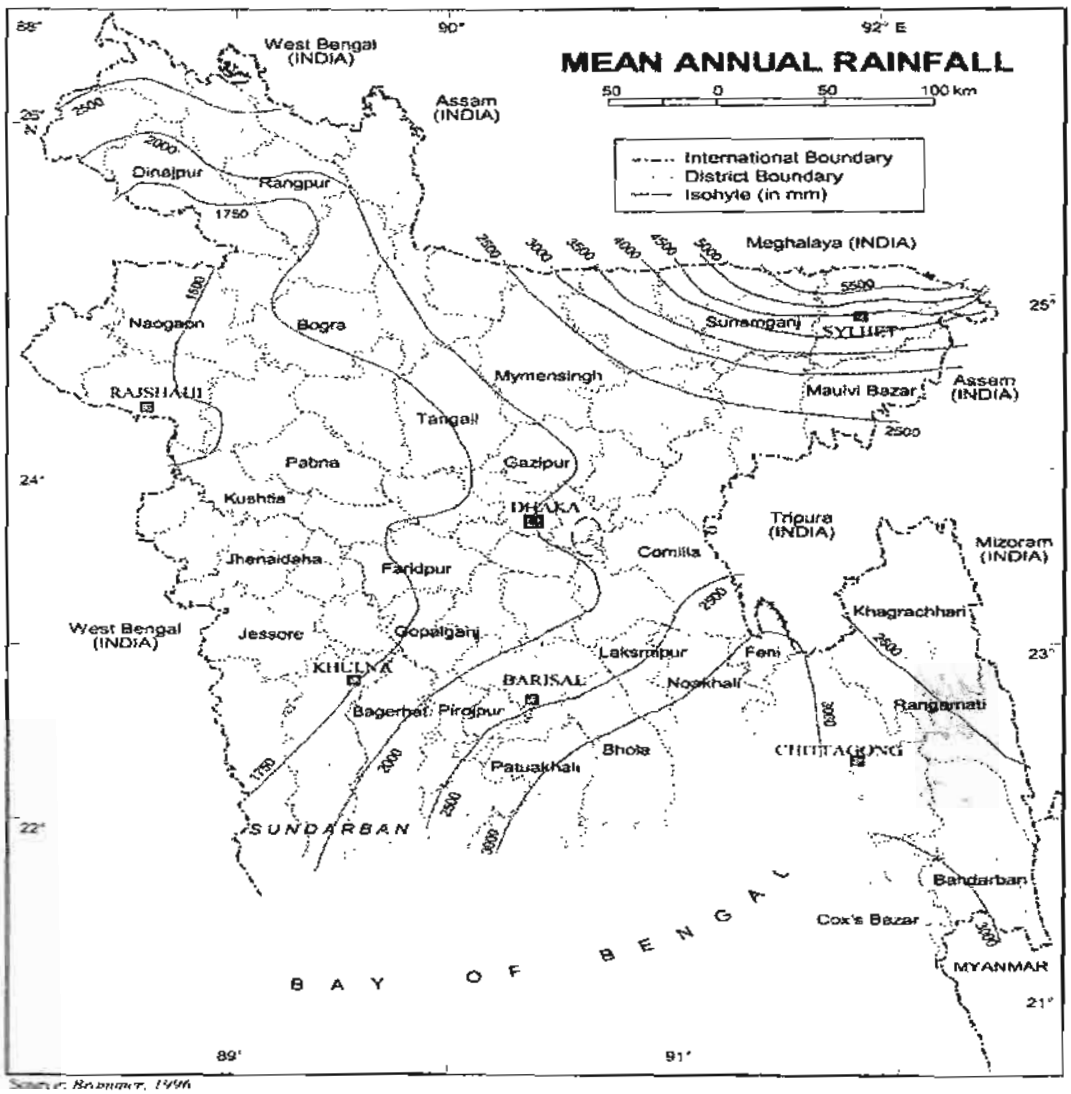


Figure 4.4: Mean Annual Rainfall Map of Bangladesh Including the Project Area

4.7 Biological Environment

4.7.1 Flora and Fauna

4.7.1.1 General Consideration

Forests, pasture lands, rivers, surface water and other water bodies etc. are the most important natural ecosystems. There is the foundation on which conservation of biological diversity depends. Biological diversity, which refers to genetic variation as wells to the diversity of human populations and ecosystems, is a resource that belongs not only to regions and to nations but also to all of humankind. Although it is a renewable resource, it can be irreversibly destroyed. Future uses of this resource (medicine, plant breeding. Etc) cannot be foreseen at present, although they will certainly be extensive in scope, and they even are crucial to the survival of humankind.

It is extremely rare to encounter completely natural areas nowadays. On the other hand, both extensive and local use of natural flora and fauna can be regarded as normal occurrence in natural ecosystems. Although the transition from hunting and gathering to settle agriculture in established agro ecological zones is complete almost everywhere, traditional forms of resource use continue to play an important role in the lives of rural populations. Current pressure to increase production and extend the area of land under cultivation is leading to more intensive use of remaining predominantly natural areas. These frequently result in environmental stress and rapid loss of biological diversity, as well as permanent conversion of land to agricultural use.

Opening up natural areas in order to exploit their resources with modern technology frequently leads to additional forms of resource use. For example, forests opened up to commercial forestry are more exposed to uncontrolled over exploitation, as well as being subjected to ecological stress by migrants who practice agriculture.

Both extensive resource use over large areas and selective, intensive use of every favorable site can severely damage an ecosystem. Small-scale operations preservation of remaining natural areas and resource use in harmony with natural is important if the resources of a region are to be managed in an ecologically appropriate manner. Proper monitoring is needed in order to obtain reliable information about significant changes in an ecosystem.

Every region needs sets aside to preserve ecological balance (nature reserves, of natural vegetation, fallow land) in order to confer its biological diversity. The form, extent and location of these areas must be carefully evaluated in each individual case.

Because many different products in predominantly natural areas are not traded in great volume and do not appear in statistics on trade., their immediate value to the local population is often underestimated. The use of such areas is often of great economic Importance to the poorer segments of rural populations. Intense exploitation of such areas is therefore usually accompanied by corresponding social consequences and social costs, even when it appears reasonable on economic grounds.

Many predominantly natural areas are of environmental and economic value beyond their own borders. Forests for instance, guarantee safe and regular supplies of water because they protect headwaters. The protective function of forests is often recognized only after its neglect has produced negative consequences (deforestation that leads to erosion, landslides, sedimentation in reservoirs, floods).

Intensification of resource use in harmony with nature should be based primarily on indigenous knowledge and modes of production established in the local culture. There is a need to undertake scientific studies in this area since information based on such studies is presently lacking. Locally established responsibility for conservation of natural resources requires appropriate local right of use. These rights must be regulated by grass-roots organizations.

Regarding the ecological setting of the area as has been already mentioned, the area is mostly low-lying and wet ecosystem with forest and other forms of greenery quite at abundance. There had been extensive field survey during the study to assess and also quantify to a certain extent the flora and fauna richness. These concentrated among others, on the wildlife (reptiles, amphibians, mammals and birds) separately on fishes and also a floral species (grass, shrubs, timber/ fuel wood trees and fruit trees). Finding of the survey have been presented in Table 4.7, Table 4.8, Table 4.9 respectively.

Table 4.7: Floral Species in the project area

Scientific Name	English Name	Local Name
Reptiles		
Enhudris enhydris	Smooth Water Snake	Painnya Shap/ Huriha
Hemidactylus	House Lizard	Goda Tik Tiki
Naja naja Kaouthia	Narrwo headed Softsheel	
Chitra indicated	Turtee	Chitra katchap
Amphibians		
Bafo melanostictus	Common Toad	Bang
Rana Cyanophyctis	Skipper Frog	Bang
Mammals		
Callosciurus sp.	Squirrel	Kat Biral
Cynopterus spinex	Short nosed fruit Bat	Badur
Funumbalus pennanti	Squirrel	Kat Biral
Herpestes	Mongoose	Bheji
Auropuncatus		
Mus booduga	Field Mouse	Idure
Mus musculus	House Mouse	Nengti Idur
Pteropus Giganteus	Gaint Flying Fox	Boro Badur

Bird		
Alcedo atthis	Common Kingfisher	Machranga
Copsychus saularis	Robin	Doel
Corvus splendens	House Crow	Kak
Egretta albe	Great Egret	Boro Bak
Egretta gazetta	Small Egret	Shoto Bak
Dirrurus adsimilies	Black Drongo	Fingry
Passer domesticus	House Sparrow	Choroi

Source: Field visit

Table- 4.8 Plant Species in the project area.

English Name	Scientific name	Local Name	Main Name
Grass			
Grass	Spontaneum	Khar	Ful / Covering
	Saccharum	Gash (kaichi Kash, Dubla etc.)	
	Cynondon dactylon		Soil Binder
Trees			
Bettle nut	Areca Catechu	Supari	
Lichi	Lichi chinensis	Lichu	Fruit
Mango	Mangifera indica	Aam	Fruit, Timber.
Date Palm	Phoenix sylvestris	Khejur	Fruit, Timber.
Black Berry	Syzygium cumini	Jam	Brown sugar.
Jackfruit	Heterophyllus	Khatal	Fruit, Timber
Coconnut	Cocos nucifera	Narikle	Fruit, Timber
Papya	Carica Papaya	Pape	Fruit, Fuel
Gauva	Psidium guajva	Piara	Fruit,
Banana	Musa Sepientum	Kala	Fruit Fuel
Wood Tree (Timber/Fuel wood)			
Mehagani,			
Shilkoroi,	Shorea Robusta	Shil kiroi	Fuel, Timber
Shimul	Albizia procea Salmalia malabaricum	Silk cotton	Fuel, Timber Fuel, Pillow

Source: Field visit

Table 4.9: Fish Species in the Study Area

Fish Group	Scientifec Name	Local Name
Prawn	Macrobrachium malcolmsoni	Icha
Cat Fish	Mystus vittatus Mystus vittatus Wallago attu	Tengra Golisha Tengra Boal Pangash
Major Carps	Labeo rohita Catla catla Carrhinus mrigala	Rui Catla Mrigel

Minor Carps	Puntius sophere	Puti
Snakehead	Channa punctatus	Taki
Eel	Mastacembelus armatus	Bain
Others	Amblypharyngodon mola	Mola
	Pscudeutropicus atberinoides	Batasi

Source: Field visit.

As this is obvious from the above-mentioned tables, the area is quite rich in flora and fauna. However, many of those are quite common for a different other areas in Bangladesh. The important thing is their abundance.

The already existing industries in the study area not just brought, some of the utility services, but have also provided with a different look of infrastructure setting in the area. This is still not something, which can be called aesthetically unacceptable or directly detrimental to the floral growth of an area. However, the industrial activities along with their discharges may prove quite detrimental to both flora and fauna in the area eventually, provided no appropriate corrective measures are taken.

4.8 Socio-economic Condition

4.8.1 Population and Social Structure

According to the 2001-population census, the total population of **Narayanganj Bandar Upazila was** 250000, where the total household is 53000, total male 129000 and total no of female 121000 respectively with Muslim 95.49%, Hindu 4.47%, others 0.04% The population density was 4464 person per sq. km. Average literacy 44.1%; male 51.2%, female 36.2%.

4.8.2 Living and Cultural Standard

The study area is connected to Dhaka-Chittagong Highway. The whole plant is located at about 17 km from Madanpur Bus Stand. The transportation facilities are available in the study area. The type of vehicles running on the roadway and lightweight vehicles like scooter, cars, rickshaw, and rickshaw van are running on both the roadway and branch road. Literacy and educational institutions Average literacy 44.1%; male 51.2%, female 36.2%.

4.8.3 Occupation

Agriculture 4%, agricultural labourer 7.09%, wage labourer 4.04%, industries 4.91%, commerce 19.7%, transport 4.48%, construction 1.85%, service 34.27%, others 19.66%

4.8.4 Land use

Total cultivable land 1774.99 hectares, fallow land 3808.98 hectares; single crop 18.94%, double crop 61.44% and treble crop 19.62%. Cultivable land under irrigation 1887.49 hectares. Among the peasants 25% are landless, 38% small, 31% medium and 6% rich.

4.8.5 Housing

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

4.8.6 Public Health

The nearest hospital of the **Madanganj** Upazila hospital is at a distance of about 1 km from the site. The main purpose of the hospital is for the prevention of disease by providing vaccination and educating in improving sanitation. There are few medicine shops established in the Market where the doctors are also privately practice.

Chapter -5

IDENTIFICATION OF POTENTIAL IMPACTS

IDENTIFICATION OF POTENTIAL IMPACTS

5.1 General Consideration

As in the case of most industrial projects, potential negative impacts are far more numerous than beneficial impacts. The regional and national economic benefits associated with the implementation of any development project are considered to fall outside the scope of an EIA, and therefore not considered here. However, it is fully recognized that these long-term benefits will ultimately trickle down to the local population and will contribute to an improvement in the quality of life.

Likewise, the indirect benefits of strengthening of technical capabilities of local persons through association with the foreign experts and other training elements, which may form part of a project, have been considered to fall outside the scope of EIA.

5.2 Scoping of Impacts

Identification of potential impacts due to the plant location, construction and operation of the plant has been done using **Checklist**. Checklists are comprehensive lists of environmental effects and impacts indicator designed to stimulate the analysis to think broadly about possible consequences of contemplated actions (Munn, 1979). **Table-5.1** represents the checklists developed for the plant.

In this checklist, actions, which may affect at the various stages of the project activities, are listed and the degrees of **Significant Environmental Impacts (SEIs)** are shown. The terms not significant, small, moderate and major are used in checklists to classify the magnitude of SEIs. In the checklists, both the construction and operational phases are considered separately in order to distinguish the short term and long-term impacts. It can be observed from the checklists, the major activities, which have the potential of creating moderate/major SEIs either negative or positive are, water, air and noise pollution and employment.

Table: 5.1 Checklists

Project Phase	Action Affecting Environmental Resources and values	SEIs without mitigation measures				Type		Comments
		None	Minor	Medium	Major	Adverse	Beneficial	
Plant Location	Land value depreciation	x						No land value changes anticipated
	Loss of and displacement from homestead land		X					No loss of and displacement from homesteads land; no impact
	Loss of and displacement from agricultural land	x						Loss of and displacement from Agricultural land will not occur; no impact
	Damage to nearby operation	x						No impact anticipated
	Disruption to drainage pattern		x			X		Land development would create problems in local drainage pattern
	Inadequacy of buffer zone		x			X		Buffer strip is absent.
	Encroachment into precious ecological	x						No precious ecological issues; no impact
Operation Stage	Pollution from liquid discharge	x						No process liquid waste will be generated; No significant impact.
	Pollution from solid waste		x			X		No significant solid waste; minor impact.
	Air quality		x			x		No emission of toxic pollutants; minor impact
	Occupational health hazard			x		X		Inherently will occur.
	Odor hazard	x						No obnoxious odor will be generated; no significant impact.
	Traffic congestion		X			X		No carrying of product to and raw materials from outside.
	Noise hazard		X			X		No heavy noise generation is expected; minor impact.
	Employment				x		x	Major employment opportunity during operation

Chapter -6

EVALUATION OF IMPACTS & MITIGATION MEASURES

EVALUATION OF IMPACTS & MITIGATION MEASURES

6.1 General Considerations

The Impacts, which are likely to be occurred in the different phases of the project, are identified in section 5.0. In this section, evaluation of these impacts was done mentioning their origin and characteristics along with their possible mitigation/enhancing measures. At the end of each sub section, status of residual impact is also mentioned.

6.2 Adverse Impacts and Mitigation

6.2.1 Impact due to project location

a) Loss and Displacement from Agricultural Land

Impact Origin

The project is proposed to be set up in high and fallow land, which will result no loss of agricultural land hence agricultural product in the country.

Mitigation Measures

For economic development, Bangladesh has no option other than going for industrialization. To do so, some portion land would have to be converted to industrial land. But attention should be given so that conversion of such land use should take place in comparatively less fertile area. The present land for proposed plant is not so fertile and hence ultimate loss in economic value due to loss in agricultural products will be overcome by industrial production in near future.

b) Disruption of Earth Surface

Impact Origin

As mentioned earlier that land raising would be required to develop the site up to road level. This land rising from its original level certainly disrupt the natural surface of earth which will obstruct the natural drainage system of the area and as a result water logging will occur in certain area. Water logging would be serious problem if filling soil is collected from nearby land because this will make more difference in reduced levels between filling and cutting site. Water logging results numerous problems like it damages roads, agricultural activities etc.

Mitigation Measure

Cutting of nearby land should be avoided. Cross drainage works should be constructed to bypass the surface run-off and other discharges.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

c) Change in Landscape

Impact Origin

A landscape is a subjective concept that cannot be precisely quantified. However, in general, any project when not designed considering the local landscape, then it creates visual intrusion to the people. The present project, changes the local landscape to some extent.

Mitigation Measure

Any built up part of the Plant should be designed considering key criteria of landscape like coherence, readability, hierarchy and stability. It is understood that **Summit Narayanganj Power Limited.** will have a modern architectural view, which does not provide any significant visual intrusion. One simple way by which the altered green area can be turned into its original visual quality is the plantation of trees around the project area.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

6.2.2 Impacts during construction

a) Construction of Gas line

Impact Origin

Titas Gas Transmission & Distribution Limited station to the proposed site along the side of the road is to be constructed. During pipeline construction short term impacts would occur in terms of traffic congestion, soil erosion and temporary inconvenience of the people.

Mitigation Measure

The gas line from the plant to substation would be constructed along the side of the road so minimum impacts would occur due to the installation of the line.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant

b) Air and Acoustic Impacts

Impact Origin

During construction of the power plant building and other structures at the site there would be some particulate matter generation. Further, acoustic impacts during construction would be limited to construction of building and site preparation and due to installation of power plant itself. As the time involvement for these works would be a shorter period so the nature of the impacts would be short-term.

Mitigation Measures

Vehicles and trucks used for carrying construction materials should always be covered. Sufficient water should spread over the exposed earth so that no dust is created in the construction site.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

c) Sanitation Hazard

Impact Origin

During construction stage lot of local labors will be worked and hence they would generate considerable amount of human waste. These are the potential source for spread of diseases, as various insects will play dominating role in the spread of diseases. There are chances for the spread of water borne diseases also.

Mitigation Measures

Proper sanitation system should be provided and at the same time regular, proper and safe disposal of human waste should be ensured. Adequate number of toilets and bath rooms should be made for the workers and proper disposal system of sewage waste should be implemented for sanitation purpose.

The project activities shall make higher demand on the local utilities and service facilities particularly potable water, health and sanitary facilities. There should be sufficient number of tube-wells for drinking purpose.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

d) Socio-economic Impacts

Resettlement would not be necessary for the project. People in the neighborhood are expected to get benefit from the employment that would be generated and from the increased business activities during construction period. There is no religious, cultural or historic place near the site, so the noise and air pollution during construction of the project would not create any potential impact.

6.2.3 Impact during Operation Stage

a) Impacts on Air Quality

Impact Origin

Emission from the engine and generator stack may affect the ambient air quality. Unburned gases from the engine operation may affect the air quality. The situation aggravates when gas contains high percentage of impurities like sulfur, hydrocarbon etc. The high temperature of flue gases also impacts the air quality in terms of thermal pollution. The combustion of heavy fuels for power Generation inevitably results in emission of gaseous pollutants to the atmosphere. As the proposed power plants would be fired with Heavy fuel, the air pollutants emitted by the power plant will be carbon monoxide and nitrogen oxides and sulfur dioxide. The fuel oil that will be supplied has low sulfur and particles. Each of these pollutants is examined below to ensure the Bangladesh emission limits and, where appropriate, the required emission control techniques would be incorporated into the mitigation measures. Since the location of the proposed power plant is in rural area it is expected that the site would be affected by major pollution sources. Except that ambient air qualities of rural areas

of Bangladesh are relatively good and also the emissions from the proposed power plant are expected to have only minor impacts.

In order to be able to assess the environmental impact that the power station's atmospheric emissions may be having over a period of time, it is necessary to set up an emissions inventory. Initially this is expected to include carbon dioxide; the principal greenhouse gas emitted, and oxides of nitrogen, the oxides of sulfur; the principal gas release.

Sulfur dioxide (SO_2) Emissions from the power plant

SO_2 is a colorless gas. It smells like burnt matches. It can be oxidized to sulphur trioxide, which in the presence of water vapour is readily transformed to sulphuric acid mist. SO_2 can be oxidized to form acid aerosols. SO_2 is a precursor to sulphates, which are one of the main components of respirable particles in the atmosphere.

Health Effects

Health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, changes in the lung's defenses, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to SO_2. It also damages trees and crops. SO_2, along with nitrogen oxides, are the main precursors of acid rain. This contributes to the acidification of lakes and streams, accelerated corrosion of buildings and reduced visibility. SO_2 also causes formation of microscopic acid aerosols, which have serious health implications as well as contributing to climate change.

The emissions of SO_2 are dependent on the sulfur content of the fuel. Estimated emission of sulfur oxides is within allowable limit under normal operating conditions at the rated output, based on the normal oxygen concentration.

Nitrogen Oxides (NOx) Emissions from the Proposed Plant

Nitrogen gas, normally relatively inert (unreactive), comprises about 80% of the air. At high temperatures and under certain other conditions it can combine with oxygen in the air, forming several different gaseous compounds collectively called oxides of nitrogen (NO_x). Nitric oxide (NO) and nitrogen dioxide (NO_2 - the criteria pollutant) are the two most important.

Sources

Major sources of nitrogen oxides include

- Fuel combustion in power plants and automobiles.
- Processes used in chemical plants.

Health Effects

Certain members of this group of pollutants, especially nitrogen dioxide (NO_2), are known to be highly toxic to various animals as well as to humans. High levels may be fatal, while lower levels affect the delicate structure of lung tissue. In experimental animals this leads to a lung disease that resembles emphysema in humans. As with ozone, long-term exposure to nitrogen oxides makes animals more susceptible to respiratory infections. Nitrogen dioxide exposure lowers the resistance of animals to such diseases as pneumonia and influenza. Humans exposed to high concentrations suffer lung irritation and potentially lung damage. Increased respiratory disease has been associated with lower level exposures.

The human health effects of exposure to nitrogen oxides, such as nitrogen dioxide, are similar to those of ozone. These effects may include:

- Short-term exposure at concentrations greater than 3 parts per million (ppm) can measurably decrease lung function.
- Concentrations less than 3 ppm can irritate lungs.
- Concentrations as low as 0.1 ppm cause lung irritation and measurable decreases in lung function in asthmatics.
- Long-term lower level exposures can destroy lung tissue, leading to emphysema.

Children may also be especially sensitive to the effects of nitrogen oxides.

Other Effects

Oxides of nitrogen also can:

- Seriously injure vegetation at certain concentrations. Effects include:
  - Bleaching or killing plant tissue.
  - Causing leaves to fall.
  - Reducing growth rate.
- Deteriorate fabrics and fade dyes.
- Corrode metals (due to nitrate salts formed from nitrogen oxides).
- Reduce visibility.

Oxides of nitrogen, in the presence of sunlight, can also react with hydrocarbons, forming photochemical oxidants. Also, NO_x is a precursor to acidic precipitation, which may affect both terrestrial and aquatic ecosystems.

Dust

Amount of dust will be in allowable limit normal operating conditions at the rated output.

Carbon monoxide and carbon dioxide Emissions from the Proposed Plant

Carbon monoxide is generated when incomplete combustion takes place. The emission of carbon dioxide depends on the fuel burn and the carbon content in the fuel. The proposed power station is a heavy fuel oil fired modern design with optimum designed cycle efficiency in order to maximize the MW output and less consumption of fuel and water, CO & CO_2 emission per unit of fuel burnt will be smaller amount compare to other power stations.

Mitigation Measures

It has been discussed earlier that the proposed power plant would be constructed with a mode design and sophisticated machinery setting. The emission from the power plant would be kept minimum with optimum designed cycle efficiency in order to maximize the MW output. Moreover, for the well dispersion of the hot air from the generator, the proponent will construct a 30 m high stack from the ground level. The stack would be connected with a silencer to prevent the noise from the engine. The stack heights have been designed using thumb rule of two times higher than nearest building to facilitate undisturbed and free dispersion of the emitted air pollutants.

Residual Impact

It is clear from above study that the project proponent will adopt necessary options suitable to their needs meeting the national standards. Adoption of measures set out above is not expected to provide total mitigation, because no machine works at 100% efficiency. After

adopting proper mitigation measures to maintain national/international standards, **Summit Narayanganj Power Limited.** will emit some residual pollutants, which can affect the environment in the long run. On the other hand, as there are no other industries located in the area, emits air meeting the national requirement as **Summit Narayanganj Power Limited.**, the cumulative residual pollutants will not create any adverse situation in the ambient air quality of the area.

b) Impact due to liquid discharge

Impact Origin

Proposed power plant will not create any process liquid from the production process; small amount of water will be required for makeup water for closed-loop cooling system. In addition to this, small amount of water will be used for occupational floor, equipment washing and for domestic purposes. This wash water will not contain significant amount of pollution, which may impact the surface water quality.

Oily waste water may be produced from the oil water separator units. This oily water must be treated before drain.

Mitigation Measures

The cooling water will be recycled after cooling through a cooling system. The domestic liquid waste from the power plant will be disposed through a septic tank with a soak pit, to minimize the resulted impact on land. For the treatment of oily water from the separator units a treatment plant will be installed which is described below

Oily Wastewater Treatment Plant:

Process Description:

The oily wastewater is collected in the sumps around the power plant. It is then pumped by air diaphragm pump to the oily water buffer tank (by others). The air diaphragm pump will come complete with the air regulator and solenoid valve.

The pump set will be installed near the collection sump and end at the suction and discharge isolating valve. 220V/50H supply must be provided to the solenoid valve and compressed air of 120 Nm^3/hr to each individual pump set. A local junction box will be provided with volt free contact for the pump on/off operation.

From the Oily Water Buffer Tank, the wastewater is pumped into the DAF unit for treatment. in the 1st DAF tank, the free oil in the wastewater will float to the top with assistance from recycled effluent from the 2nd DAF tank.

In the 1st DAF tank the oil will be collected and skimmed from the surface into the sludge tank. After that the wastewater will be dosed with alum and caustic soda for coagulation followed by flocculation with polymer dosing. Inline mixer will facilitate the coagulation and the flocculation process.

The chemicals — alum and polymer must be prepared daily by the operators, the agitator is electrical: -

a) Alum — 10% solution
b) Polymer — 0.1% solution

The caustic soda 40% solution has to be purchased and transferred to the dosing tank every 7 days. The operators must manually check if the dosing tanks are empty.

The dosage of the chemical will be determined after the operators perform the jar test on the incoming wastewater every morning before starting the wastewater system so that it is being operated at proper condition.

Then the chemically treated wastewater goes into the second DAF tank, mixing with the air-saturated recycled treated effluent. Once the air-saturated stream is released into the DAF tank, micro bubble will form and attach to the flocs in the wastewater stream forcing them to float to the tank surface where it will be skimmed off into the slop oil tank.

The recycled treated effluent will be pumped into a air saturator tank to be mixed with compressed air at 1.5 Nm^3/hr @ 7 bar.

Meanwhile, the clarified wastewater will be pumped through the sand filter before being discharged to sewer. The sand filter will remove most of the suspended solids down to 100 microns. The operators must monitor pressure drop across the filter, approximately 1 bar drop before the filter is being backwashed. Either that the filter must be backwashed everyday at the minimum.

The operation of filter will be in manual mode, with the operators opening and closing corresponding manual butterfly valves on the filter face piping.

All piping material will be PVC Schedule 80 with ANSI connection.

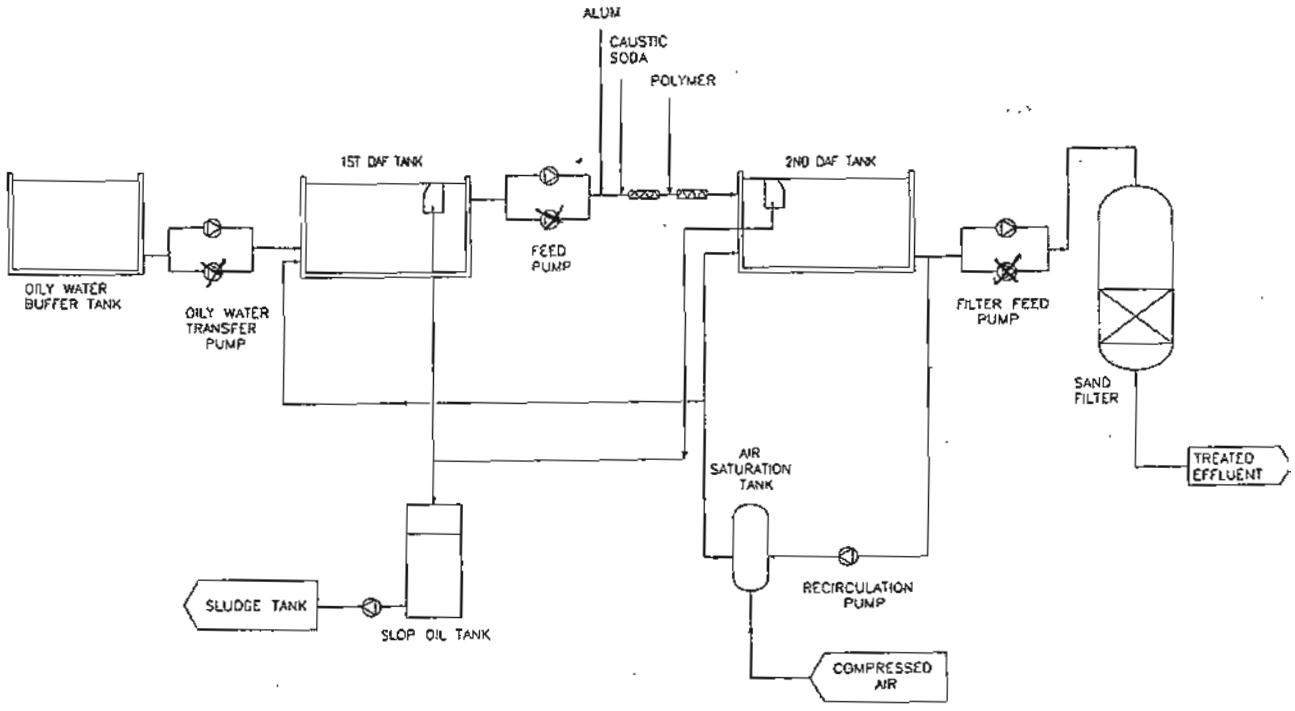


Figure 6.1 Flow Diagram of Oily Wastewater Treatment Plant Treatment Capacity 2 m^3/hr

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

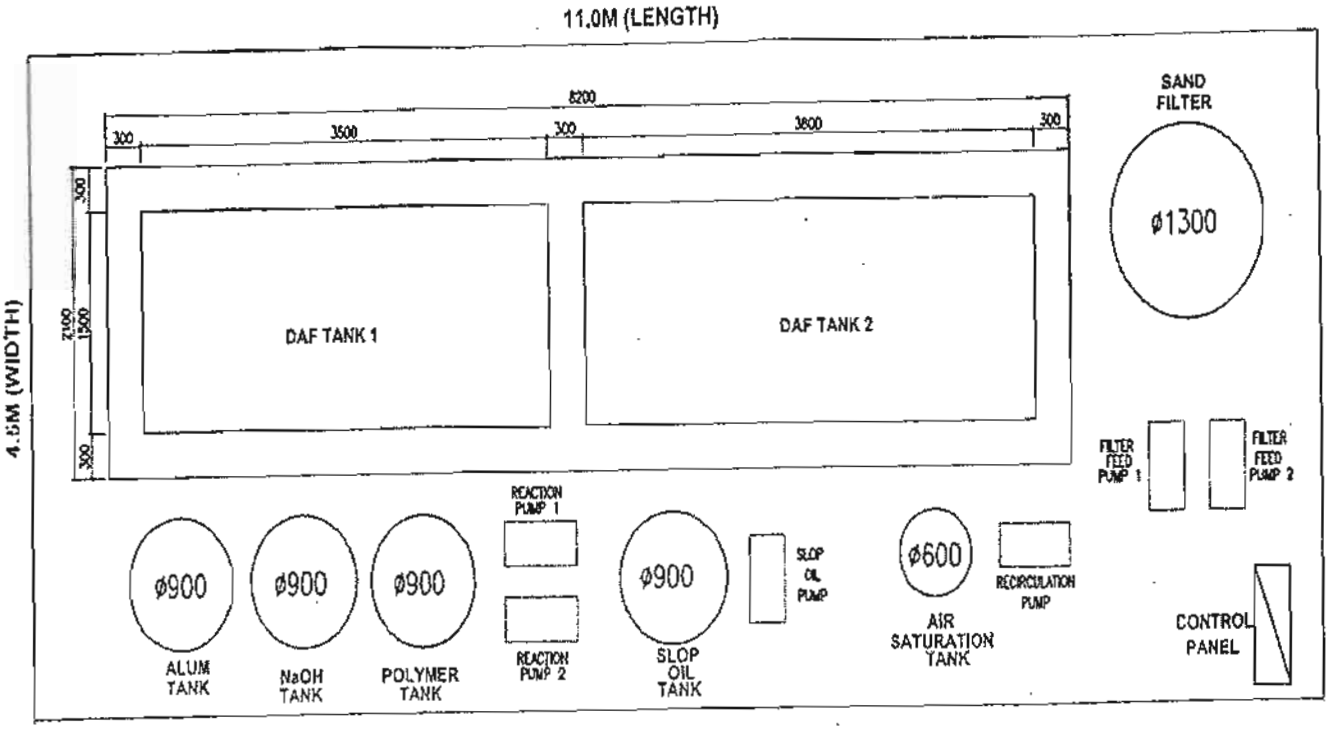


Figure 6.2 Layout Plan of Oily Wastewater Treatment Plant, Treatment Capacity 2 m^3/hr

c) Impact due to Solid Waste

Impact Origin

The operation of the plant itself would not generate any solid waste. Solid waste generated by the people working at the proposed site is paper, cartoons, bags, boxes, office wastes, pallets, empty drums etc. along with negligible quantity of domestic waste. Air filters will produce some hazardous waste. All these materials are non-toxic and does not require specialist disposal.

Mitigation Measures

All solid waste will be segregated properly. Some solid Waste has tremendous secondary demand and sold to the secondary dealers. Other solid wastes will be disposed to the safe places carefully.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

d) Impact due to Lubricating Oil

Impact Origin

Insignificant amount of used lubricating oil would be generated from the plant. The generated waste oil will be stored in a sealed tank.

Mitigation Measures

The waste lubricated oil thus collected will be supplied /sold to the venders or the Lube Oil Re-cycling plants approved by DoE at throwaway price. As there is no chance of mixing and disposal of oil onto land or water, so there is no mitigating measure to be suggested.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

e) Noise and vibration impacts

Impact Origin

There will be possibility of noise pollution and vibration hazard during the operation period of the power plant if proper management and preventive measures would not be considered.

Mitigation Measures

Necessary abatement measures will be taken as required avoiding adverse noise & vibration impact on the neighborhood.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

f) Occupational Health

Impact Origin

The workers who work inside the plant will face occupational health hazards due to different operational processes. Safe and good occupational health status of the employees and workers is important for only the persons working in the plant, but also for the better plant operation and maintenance.

Mitigation Measures

Protective clothing, earplug, helmets, shoes and accessories should be provided to the workers. Adverse impact on worker's safety would be minimized by implementing an occupational health program. Regular medical checkup would be done to ensure the soundness of health of employees and workers. Pollution control measures would duly adopt if necessary, including noise and air pollution.

Residual Impact

Provided that the mitigation measure indicated above is fully implemented, residual impact to be very insignificant.

6.3 Beneficial Impacts and Enhancement

6.3.1 During Construction

Impact Origin

During construction the plant will create job opportunities for a good number of skilled and semi skilled labors. However, the impact will be a relatively short duration, being restricted locally to the construction period. In addition to this, all construction sites attract small traders, who supply food and other consumable to the work force. Although the numbers of people who benefit in this way are relatively small, the impacts on individuals can be disproportionately high compare to the other local people.

Benefit Enhancement Measure

Although labor recruitment is a matter of construction contractor who has the right to determine whom he shall not employ, but still the project proponent shall encourage him to hire local people wherever possible and to give preference to employment of the land less people.

6.3.2 During Operation

Impact Origin

The most significant positive impact of the plant would be the generation of electricity, which will reduce the gap between supply and demand of electricity. The other important positive impact of the plant would be the employment of personnel for the operation of the plant. The project envisages employing some skilled and unskilled personnel during its operational phase. Apart from the positive impacts other beneficial impacts include benefit to local economy due to employment, community development etc.

Benefit Enhancement Measure

Although labor recruitment is a matter of company who has the right to determine whom he shall and shall not employ, but still the project proponent should take initiative to employ local people wherever possible and to give preference to employment of the jobless people.

Chapter -7

ENVIRONMENTAL MANAGEMENT PLAN OUTLINE

ENVIRONMENTAL MANAGEMENT PLAN OUTLINE

7.1 GENERAL CONSIDERATIONS

In the context of a project, Environmental Management Plan (EMP) is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and to enhance beneficial impacts. All the measures are said to be successful when they comply with the Environmental Quality Standard (EQS) of Bangladesh. Thus the objectives of EMP for the present project would be

- Mitigation measures to reduce or eliminate negative impacts
- Enhancement measures to maximize positive impacts
- Monitoring requirement and
- Monitoring indicators

The following surveys have identified the potential positive and negative impacts and in enabling development of the Environmental Management Plan (EMP).

- Environmental baseline condition survey
- Socio-economic survey
- Biological resource survey

In preparation of the EMP, the above studies were carefully reviewed. Environmental components and sub-components were identified and their magnitude and duration of impacts were examined. The functional components of the EMP for the project are described in the following sections.

7.2 Social Management Study

Socio-economic development

Urbanization will take place in some pockets especially around the growth centers and industrial areas through this process the local people will be exposed to modern facilities that will accelerate the socio-economic development. The number of new physical infrastructures will be developed such as new connecting roads, industries, commerce centers, shops, etc. these new infrastructures will enhance the development of the locality.

Re-settlement Action Plan

The proposed site is low lying agricultural land. So, resettlement problem will not arise.

7.3 Organizational Aspects

Executive responsibility for project management commonly involves a number of organizations, each with specific responsibilities for particular aspects during the pre-construction, construction and operation & maintenance phases.

An important aspect of environmental management is the accumulation of a database of environmental measurements. The management measures shall have to be taken with regard to controlling the potential impacts that could occur during the pre-construction, construction and operation and maintenance phases of the project and indicates responsibilities for the various actions concerned. The environmental management team should, at an early stage of

project planning, prepare a detail schedule of management actions required along with fixation of specific individual responsibilities for these actions:

- Policy and Leadership
- Continuous Improvement
- Safety and Health
- Risk Management
- Incident Reporting and Investigation
- Emergency Preparedness and Response
- Environmental Protection
- Training and Orientation
- Community Relations
- Regulatory requirements

7.4 Environmental Safety Management System (*ESMS*) Process

Besides defining management's requirements regarding Environmental Specialist, the **Summit Narayanganj Power Ltd.** establishes processes to apply the system to their operations. These processes include steps to clarify accountability. These steps are listed as follows:

7.4.1 Specific Activities and Responsibilities

The first step is to clearly assign responsibility to meet each ES requirement at all levels of the organization. This process begins at the top of management and continues down through each level of the organization, so that until each affected person understands his/her, Environmental Specialist responsibility. Managers and supervisors at every level of Company organization review each procedure and then make one of three choices:

1. Determines that accountability for fulfilling a particular procedure more appropriately belongs to a higher management level; or
2. Assumes personal responsibility either by (a) taking personal responsibility for fulfilling the procedure or b) delegating responsibility for fulfilling the procedure to others in the organizations; or
3. Pass the procedure along to those that report to him or her, who will then decide which ones to keep and which to pass on.

This process will continue in organization until all procedures have an assigned responsible person who will assure that the procedure is implemented. In many cases, several people will be accountable for implementation of a procedure. For example, at power plant house and at electric substation more than one person would be responsible for fulfilling the procedure regarding correct waste management.

7.4.2 Implement the System

In the implementation step, all of those responsible for implementing each Environmental Specialist procedure will develop the approach and the systems needed for procedure implementation. Clearly defined roles and responsibilities are critical, along with the necessary training, to support implementation.

7.4.3 Measure, Assess and Audit Progress

Measuring ESMS progress is critical to improving performance. A successful Environmental and Safety Management System (ESMS) must be a continually improving process. The company ESMS includes several ways that this measuring can be done:

1. Co-worker assessment-this is an evaluation, conducted by a trained co-worker, of how well each requirement/procedure is being fulfilled by the responsible person. Trained co-workers from the same or other facilities with the same or similar responsibilities would conduct the co-worker assessment.
2. Self assessment-each responsible person assesses his/her own progress.

In this assessment, a simple, three-point scale will be used to score performance in implementing the ESMS:

1. No evidence that the procedure is being implemented
2. Procedure is partially implemented
3. Procedure is fully implemented
4. Best practice (the absolutely exemplary performance of procedure implementation) to be held up as a model for others to emulate.
5. Another way of measuring ESMS performance is monitoring by the Company Environmental Specialist Manager.
3. ES audit conducted annually by corporate ESD and they will also evaluate the degree of ESMS implementation and ES performance.

7.4.4 Mitigation/Benefit Enhancement Measures

For effective and environment friendly operation of an industry, a set for guiding tools and suggestions are necessary which need to be followed at various stages of plant installation, operation and maintenance. This plan generally has various components of management depending on the type of industry or plant activity and types of discharge and their pollution potential.

This Environmental Management Plan (EMP) once prepared forms the basis of environmental management actions from the part of the plant authority may need modification or up-gradation because of changes in the plant operation or accurate pollution load/environmental problems detected afterwards. The plant authority may also be needed to expand the suggested outline of the EMP proposed in this report.

All beneficial and adverse impacts which may likely to occur at different phases of the project is identified in section 5.0.predictions, evaluation and aspect of mitigation and benefit enhancement measures have also been discussed concurrently with impacts prediction and evaluation.

In view of the earlier discussion summary of recommended mitigation and benefit enhancement measures are presented in Table 7.1.

Table 7.1: **Recommended mitigation/enhancement measures**

Potential Impacts	Mitigation/Benefit Enhancement Measures
Impact on surface water quality	Dispose all domestic waste after treatment by septic tank
Impact on ground water quality	o Collect all solid wastes properly o Dispose all solid waste in proper place in proper way
Impact on Air Quality	Proper stack height has to be installed
Impact on health and safety	o Set up warning signs, signals and provide helmets for workers in accordance with relevant accident prevention and work safety procedure o Restrict access to plan site o Supply good quality drinking water to the workers o Provide well-planed sanitary facilities o Provide regular health inspection among workers o Promote health education campaign among workers
Noise/vibration hazard	o Proper acoustic design should be made o Provide sufficient buffer strip
Traffic congestion	o Avoid carrying of materials in peak hour of road traffic
Impact on employment & family finance	o Employ local people wherever possible

7.5 Company's Environment Policy Statement

Summit Narayanganj Power Ltd is committed to the protection of the environment and will conduct its operations in compliance with all relevant local, national and international environmental legislation and standards.

Summit Narayanganj Power Ltd will Endeavour to ensure the protection of human health and the environment by complying with the letter and spirit of the national environmental policy, environmental legislation, and promulgated (Gazetted) environmental rules and regulations of the GOB and international treaties and conventions accepted by the government.

7.7 Environmental Management Plan of Summit Narayanganj Power Ltd

The Administrative Division will oversee the environmental & safely aspects of the Company. There will be a Committee headed by the Administrative Head to oversee implementation of the recommendations made in the report of ESMS project of the power plant.

The committee will also ensures effective implementation of guide lines and directives of DoE and other GoB agencies, so far as environment and safety issues are concerned and provide periodical reports to concerned authorities as asked for.

Under Organogram Environment and Safety (ES) Section is the administrative unit will be directly involved with Environment and safety issues. The section is responsible for formulating guidelines; developing procedures and assisting operating personnel to implement environment friendly and safe procedures in their works. Personnel of this section

regularly visit power plant and consult with field authorities. They will also carry out safety audit.
There will be also a committee to carry out/ implement various works for improvement of environmental and safety aspects of the facilities in consultation of ES Section.

Purpose of EMP is to eliminate/ minimize negative impacts and monitoring effects. Environment friendly natural gas will be used in generation of electricity.

7.7 Environmental Monitoring Plan

7.7.1 Monitoring Requirement

Environmental monitoring is an essential tool in relation to environmental management as it provides the basic information for rational management decisions. The success of environmental control measure can only be understood by proper monitoring of the environmental parameters.
The prime objectives of monitoring are-

- To check on whether mitigation and benefit enhancement measures are actually being adopted and are providing effective in practice
- To provide a means whereby impacts which were subject to uncertainty at the time of preparation of EIA, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures.
- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in future.

There are two basic forms of monitoring:

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

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

It is desirable that the mitigation measures for the negative impacts and environmental enhancement for positive impacts are implemented according to the suggestions presented in this report. There are three types of environmental monitoring activities associated with the project: pre-construction, construction and post construction. Each of the components are to be dealt with according to the requirement of suggested measures. Pre construction and during construction monitoring is important to setup benchmark of management options and implement environmental management during construction period.

7.7.2 Post-construction Monitoring

Post construction monitoring is limited to a number of impact parameters to see the actual performance of the project. It is expected that there will remain a few residual impacts after implementing the mitigating measures and environmental enhancement. Some of these

impacts may include soil pollution, drainage congestion/water logging. Of these, soil pollution may originate from improper handling of the oils, grease, lubricants and solvents associated with left over debris of constructions works. This will not be of great concern if normal precautions as suggested are taken. The drainage congestion/water logging will not also occur as during construction adequate monitoring will be performed to see the performance of the drainage facilities and corrective measures will then be applied, some monitoring may be necessary during post-construction and the **Summit Narayanganj Power Ltd** . local staff can perform that efficiently and can take needed corrective measures.

Environmental monitoring requires set of indicators that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality.

To be an environmentally acceptable industrial unit, the present plant should have its own environment monitoring unit/cell with trained manpower with necessary equipment and other logistics along with required budget. **Summit Narayanganj Power Ltd** . should develop a working relationship with the Department of Environment (DoE) by undertaking a joint monitoring program to monitor the parameters given below in Table 7.2 or they may exchange data and information or submit periodic report on self-monitoring to the DoE or as the situation may require.

Table 7.2: Post-construction Monitoring parameters

Environmental component	Parameters	Location	Sampling No/year
Air	SPM, NOx & SO_2	4 directions around the plant	04
Noise	Noise Level	Around Factory site	04

7.7.3 Monitoring During Operational Phase

7.7.3.1 Overview of Impacts and Mitigation Measures

Power plants invariably have potential for environmental impacts during the operational phase of the project. The following impacts are normally of most significant:

- Impacts on air quality;
- Acoustic and vibration impacts
- Socio-economic impacts;

Over viewing of mitigation measures due to impacts arises from the operation of power plant is atmospheric pollutant emissions, which are being controlled at source by the following mitigation measures:

- Sulfur dioxide- Very low concentration of sulfur in the gas fuel will ensure that the Bangladesh emission limits will be met.
- Nitrogen dioxide-a stack height of 20 m will ensure compliance with the National air quality limits.
- A septic tank will be provided to ensure that effluent discharge standards are met.
- Environmental noise from engine will be controlled through proper design within the plant.

7.7.3.2 Monitoring Indicators

Environmental monitoring requires a set of indictors that could be conveniently measured, assessed and evaluated periodically to establish trends of impacts. The indicators may be independent or may be functionally related. The physico-chemical, ecological and human interest including socio-economic indicators should be well understood. The monitoring program, in view of the possible impacts as assessed earlier, should consider the indicators for the impact assessment related to following issues is presented in Table 7.3 in the following page.

Table 7.3: Environmental Monitoring Parameters

Environment Component	Parameter(s)	Sampling Number/Year	Remarks
Property damages	Proper damages	Occasional or opportunities	Monitoring by consultants and **Summit Narayanganj Power Ltd .**
Socio-economic disruption	construction and operation of the project	Occasional or opportunities	
Drainage congestion/water	Visual Inspection	Continuous during monsoon period	
Surface water level/navigation	Visual Inspection	Continuous during flood	
Surface water quality	TDS, COD, BOD, pH, DO,TSS	2 (During dry and monsoon)	Baseline value to be established at the beginning of construction
Ground water	PH, Fe, Mn, As	1 (During dry season)	
Drinking water	Fe, Mn, As	2 (During dry and monsoon)	To be tested for each of the installed DTWs
Soil	Heavily metal, oil, and grease	1 (During dry season	Number of samples is dependent on the identified source of pollution
Solid wastes	Ground water quality at dump site	2 (before starting and after construction)	Test of ground water parameter before and after dumpling
Road traffic/boat traffic	Arrangement, safety	Continuous	Monitoring by consultants and **Summit Narayanganj Power Ltd .**
Air	SPM, NOx , SO2	4	Number of samples is source dependent. Baseline value to be set prior to construction
Noise	Noise level in dB(A)	4	
Health and safety	Inspection of health and safety of laborious and others in the construction field	Continuous for safety and routine for health	Monitoring by consultants and **Summit Narayanganj Power Ltd .**
Dust load on plantations/trees	Visual inspection	Occasional	

7.7.3.3 Materials, Supplies and Equipment (In house monitoring Capability)/ Monitoring Budget

The materials, supplies, equipment and personnel requirements are largely guided by technical aspects of monitoring and such requirements thus, largely control the budget of the monitoring program too. **Summit Narayanganj Power Ltd. should** have capability of conducting all kinds of monitoring which could be made successful by arranging all kinds of equipments, laboratory, laboratory instruments, chemicals and engaging technically efficient personals. In case of lack of in house monitoring facility the company may engage any government approved private organization or apply to DoE to conduct monitoring.

However, for conducting the monitoring program by third party a proposed budget has been tabulated in Table-7.4. Laboratory analysis fees considered as per monitoring fees of DoE/Private laboratories.

Table 7.4 Environmental Management and Monitoring Budget

Particulars	Yearly Cost (in BDT.) Including consultancy Fee
Analysis Fee of Air Quality	25000 / per stack
Analysis Fee of Noise Level Assessment	10000 (LS)
Total	-

7.8 Management of Environmental Quality

7.8.1 Atmospheric emission management

The combustion of fossil fuels for power generation inevitably results in emission of gaseous pollutants to the atmosphere. As the proposed power plant is fired with Heavy Fuel Oil, the pollutants of potential concern are sulfur dioxide (SO_2), oxides of nitrogen (NO_X), carbon monoxide (CO) and carbon dioxide (CO_2).The exhaust gas extraction and analysis facilities as well as the data acquisition and processing facilities shall be designed in accordance with the requirements of Bangladesh Legislation. When the plant goes into operation, gaseous emissions are released to the atmosphere through the stacks. The emissions will contain NOx, CO and CO_2. Since, the proponent will take necessary step to minimize the emission level to meet the nation standards of Bangladesh.

7.8.2 Management of Solid wastes

Low-lying areas surrounding the site if available can be used to dispose solid waste. Beside office, household waste and waste packing material, various water endangering or hazardous wastes from repair and maintenance of the equipment has to be disposed. Hazardous wastes generated on-site comprise, e.g., waste laboratory chemicals, oily sludge from oil-water interceptors. The solid waste which has secondary demand will be sold to the local traders after inspection and other waste will be properly managed and disposed of off-site. The air

filter system shall be equipped with pressure measuring devices to indicate the operating conditions and the degree of filter contamination. Therefore, no significant ecological impacts arising from solid waste management are anticipated. Any excavated earth will be stored on-site and later used for landscaping activities.

7.8.3 Domestic Sewage Management

All domestic sewage along with occasional floor and machine wash will be treated in a septic tank. The treated water will be discharged through soak pit.

7.8.4 Noise and Vibration Level Management

Adequate measures have been proposed for the control of noise and vibration from the equipment installed in the plant. Noise level monitoring would be performed periodically and the workers exposed to noise would have adequate protective device. Vibration protecting pad (shoe) would be provided under the generator during installation to protect the vibration during operation. An inlet silencer shall be incorporated to reduce the noise level to the specified level. The silencer shall consist of individual noise absorbing exchangeable elements filled with mineral wool.

7.8.5 Greening program

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

7.9 Safety and Hazard Mitigation Plan

Safety management system

Safety is an integral part of the company's work. It is part of the company's operations and there to protect employees, clients, property, the environment and the public. There are many costs to accidents and unsafe work practices. The greatest costs are human cost. Protecting employees also protects their friends, families, fellow workers, management, the public and the environment from the far-reaching effects of serious accidents. In addition to protecting lives, a safety program contributes to employee morale and pride because employees participate in identifying safety needs and developing safe work procedures.

Visitors to the worksite may also face legal action if they knowingly disobey safety rules. In addition, the company may face legal action and fines for violations of regulatory requirements. Those individuals who do not fulfill their safety responsibilities will become accountable for any problems their negligence creates and may be liable under the law.

Everyone employed by a company is responsible for maintaining the safety program. Managers and supervisors are responsible for identifying safety needs, communicating safety hazards, investigating hazardous conditions and accidents, providing training, supply or wearing appropriate safety and personal protective equipment, and ensuring all equipment is

properly maintained and meets legislated safety standards. Their role is supported by input from all employees.

All company employees are responsible for obeying all safety rules, following recommended safe work procedures, wearing and using personal protective equipment when required, participating in safety training programs and informing supervisors of any unsafe work conditions. Everyone has the right and responsibility to refuse to do work when unsafe conditions exist. By fulfilling safety responsibilities, workers will share the benefits of a safety place.

The company must have its own safety management and mitigation plan and policy. Listed below are the important features that need proper attention of company management.

Company Safety Policy

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

Safety Responsibilities

All personnel should have safety responsibilities assigned to them. The documented responsibility should be included in the program manual. Compliance with the responsibilities should be monitored and if these are not carried out for some good reason, corrective measures should be taken.

Management Communication

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

Inspections

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

Safety Rules

Detailed rules and procedures identifying company and legislative requirements and operations must be communicated to all employees and contractors. They serve as a reference and describe the minimum standard by which business is conducted. Most important rules and procedures ensure consistency in the performance of tasks by all employees. The current rules should be reviewed and assessed as to whether they are appropriate for the operation/facility/employees. The formulated rules must be communicated to the workers effectively, and workers must ensure that they understand the rules and have no difficulty to comply with the rules.

Standard Work Procedure

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

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

Safety Orientation and Training

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

- Employees
- Contactors
- Sub contractors
- Visitors

The orientation shall also include a review of the following:

- Company safety policy and procedures
- Specific job hazards
- Safety precautions
- Job responsibilities
- Regulatory requirements
- Company enforcement policy, and
- Worker right-to-know and authority to refuse unsafe work.

Protective Equipment

The main reason for protecting workers is to eliminate or reduce the possibility of injury. The Occupational Health and Safety Act (USA) requires that every worker shall "wear or use such personal protective clothing, equipment or devices and is necessary for his or her protection from the particular hazards to which he or she is exposed".

There are some people who resist wearing protective clothing or devices, and will only wear protective equipment when forced to do so. This is not the right attitude to take for the worker's own safety. The consequences of an accident to his quality of life can be major. He can also lose his life. Personal protective equipment provides the worker with a measure of

protection, but for it to be really effective; it must be accompanied by the right attitude towards during his job the right way. The wearing of personal protective equipment does not guarantee that he won't get injured. However, when coupled with a good safety attitude it will reduce the likelihood and severity of accidents.

Maintenance and Training Regarding Personnel Protective Equipment (PPE)

The work site should be assessed to determine what personal protective and safety equipment is needed and the equipment must be available. A maintenance schedule must be developed for PPE and records for maintenance retained on file. Employees must be trained in fitting, care, maintenance and use of PPE

Body Parts That Require Protection

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

- Head
- Arms
- Eyes
- Chest
- Hearing
- Legs
- Hands
- Feet

The worker's head houses his brain, which controls all the motor and sensory functions of his body. Any blow to his head, no matter how slight, can be very dangerous and result in injuries ranging from dizziness to total disability and even death. One of our most valuable senses is light. One must protect his eyes from the dangers of flying objects, bright light and chemicals. Without eyes one would live a life in total darkness. Hearing damage is not often a result of an accident, unless someone has had a head injury. A more common problem is hearing loss which can occur one exposed to noise levels above the exposure limits, as outlined in the Noise Regulation. In Table 7.4 Occupational Exposure Limits are described with a maximum permitted duration in the following page. Without hearing protection in a sound level of 100 dBA maximum permitted duration is 1 hour/day.

Table 7.5: Occupational Exposure Limits
(Without hearing protection)

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

The longer one is expected to high noise levels, the greater the potential hearing loss. Hearing loss associated with exposure to noise tends to be gradual. It may take several years before one can realize that for some reason he has difficulty hearing normal conversation. Hearing is a valuable asset that should be preserved, so the worker can have a full and productive life. In Table 7.6, Safety hazard prevention, control and mitigation measures are described for particular event.

Table 7.6: Safety Hazard Prevention, Control and Mitigation Measures

Event	Prevention, Control and Mitigation Measures
General Instruction of Workers	o Personal and continuous visual supervision of the worker who is not competent to perform the job. o Workers to be conversant on the codes and standards of safety. o Workers must be confident that they have adequate training on handling or unsafe hazards material.
Maintenance of Equipment	o Employer shall ensure that all equipment used on a work site is maintained in a condition that will not compromise the health and safety of workers using or transporting the equipment. o Will perform the function foe which it is intended or was designed o Is of adequate strength for that purpose o Is free from potential defects.
Traffic Hazard	o Where there is a danger to workers from traffic, an employer shall take appropriate measures to ensure that the workers are protected from traffic hazards. o Ensure that workers who are on foot and who are exposed to traffic hazards on traveled rural roads wear reflective vests or alternative clothing that is cleanly distinguished. o Where the operator of vehicle does not have a clear view of the path to be traveled on a work site, he shall not proceed until he receives a signal from a designated signaler who has a clear view of the path to be traveled.
Illumination	o Ensure that illumination at a work site is sufficient to enable work to be done safely. o Where failure of the normal lighting system would endanger workers, the employer shall ensure that emergency lighting is available that will generate sufficient dependable illumination to enable the workers to a) Leave the work site in safety b) Initiate emergency shut down procedures c) Restore normal lighting

Event	Prevention, Control and Mitigation Measures
House keeping	o Ensure that each work site is clean and free from stepping and tripping hazards o Waste and other debris or material do not accumulate around equipment, endangering workers
Falling Hazards	o Ensure that where it is possible for a worker to fall a vertical distance greater than 3.5 meters the worker is protected from the falling by guard rail around the work area a safety net fall arresting device
Overhead power Lines	o Ensure that no worker approaches and that no equipment is operated and no worker shall approach or operate equipment, within 7 meters of a overhead power line.
Sanitary facilities & drinking water	o Ensure that an adequate supply of drinking fluids is available at the work site. o Ensure that work site is provided with toilet facilities in accordance with the requirement of general health protection guidelines.
Working proper clothing	o Ensure that where is a possibility that a worker or worker's clothing might come in to contact with moving parts of machinery, the worker: a. wears close-fitting clothing b. confines or cuts short his head and facial hair c. avoids wearing jewelry or other similar items
Head protection	o Ensure that during the work process adequate alternative means of protecting the workers head is in place.
Eye protection	o Where there is a danger of injury to or irritation of a worker's eyes, his employer shall ensure that the worker wears property fitting eye protective equipment.
Foot protection	o Where there is a danger of injury to a worker's feet, ensure that the worker wears safety footwear that is appropriate to the nature of the hazard associated with particular activities and conditions.
Respiratory protective equipment	o Where the worker is exposed to hazards gases, gums, vapors, or particulates appropriate respiratory protective equipment to be supplied.
Transportation of water	o A worker in a vehicle shall not allow any part of his body to produce from the vehicle where this action creates or may create danger to the worker. o A worker shall ensure that no equipment or materials for which he is responsible is carried in the compartment of a vehicle in which another worker is traveling unless it is so placed and secured as to prevent injury to himself and other workers.

Event	Prevention, Control and Mitigation Measures
Testing & commissioning	o Mobilize test rigs at site o Ensure that the test equipment is in good condition o Ensure other equipment and facility conforms to the approved specification of test. o Public notice to be served before testing.

7.10 Emergency Response and Disaster Management Plan

The initial response to an incident is a critical step in the overall emergency response. Like all other Industries and installations; electricity generation and supply facilities must have adequate measures against accidents or incidents to meet the emergency. The purpose of having an Emergency Response Plan (ERP) is to:

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

As a general rule the initial response is guided by three priorities Ranked in importance these priorities are:

1. People
2. Property
3. Environment

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

1. **Emergency**

- Fire,
- Explosion,
- Medical emergency,
- Leaks
- Spillage of lube oil

II. Natural Disasters

- ❖ Flood,
- ❖ Earthquake/ cyclone,
- ❖ Storm/ typhoon/ tornados, and
- ❖ Cloud burst lightning.

III. External Factors

- ❖ Food poisoning/water poisoning,
- ❖ Sabotage, and
- ❖ War.

7.11 Six Steps in Emergency Response

Step-1)

a) Determine the potential hazards associated with the incident, substance or circumstances and take appropriate action identify the type and qualities of dangerous goods involved and any known associated hazards.

b) Determine potential hazards stemming from local conditions such as inclement weather water bodies etc and ensure that the initial response team is aware of these conditions.

Step-2)

Determine the source/ cause of the event resulting to the emergency and prevent further losses.

Step-3)

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

Step-4)

Initiate redress procedures.

Step-5)

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

Step-7)

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

7.12 Reporting Incidents and Accidents

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

Pipeline construction and operation facilities have been and will continue to be designed to comply with the legal elements of both national and international standards, legislation, codes of practice and design specifications, and best practices. As a part of this process, measures to

minimize the probability of releases and reduce potential impacts through selection of alternative processes to be considered as an integral part of the development.

Mitigation should reflect the intent and regulatory framework outlined in the GoB environmental policy and in applicable World Bank Operational Directives. The purpose of impact mitigation and counter measures is to avoid creating negative impacts wherever possible, to minimize impacts where they may be unavoidable, and to generate opportunities for improvements or positive impacts where appropriate.

7.10 Approaches to Emergency Response

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

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

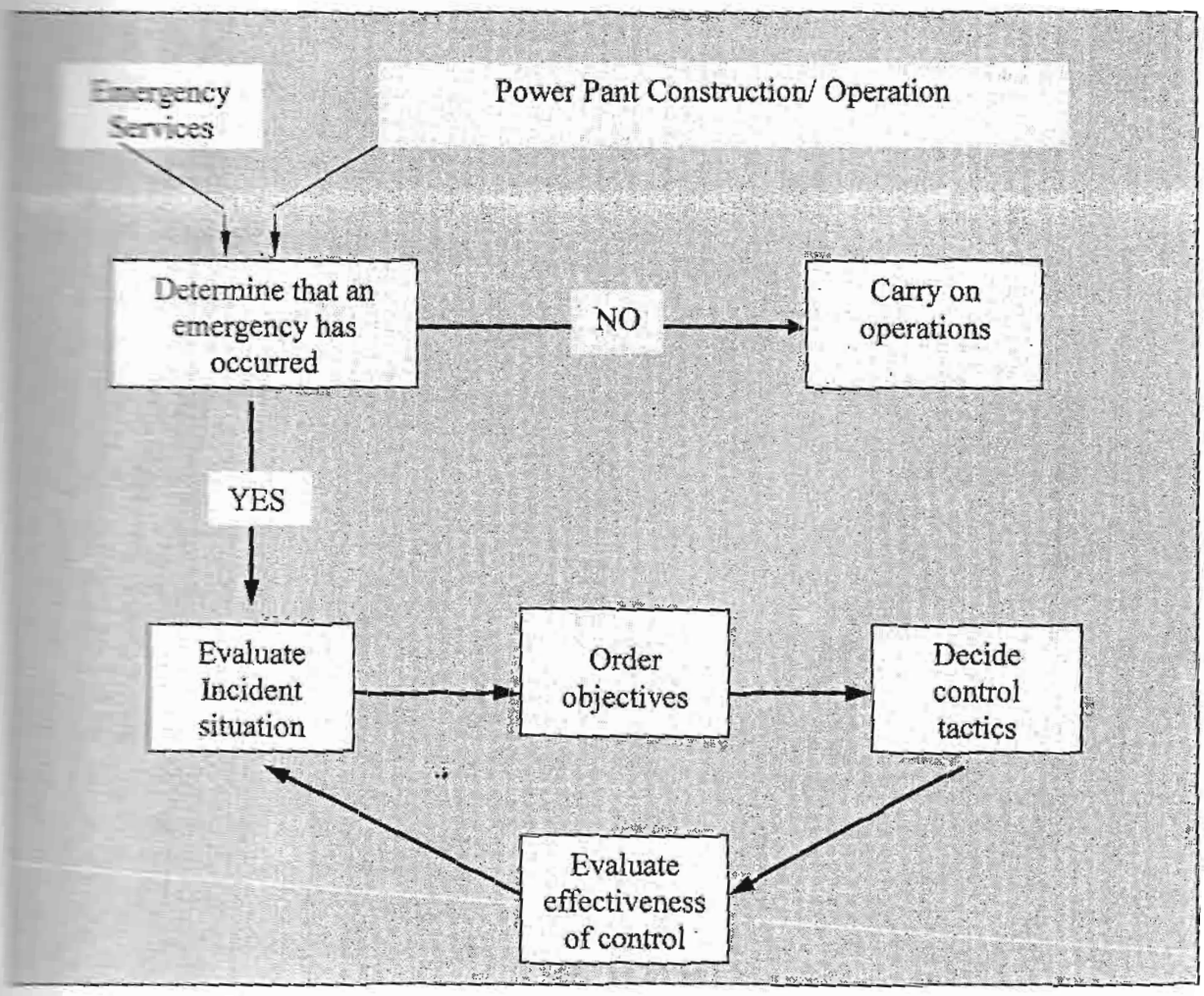


Figure-7.1: Illustrates an example system approach to Power Plant construction & operations.

Disaster Management Plan

In normal operation of the plant, when all environmental protection equipment works according to design specification, then there would be no environmental problems for the present plant. Disaster (to certain degree) would be occurred if the environmental protection equipment fails to work at normal condition. This situation may arise for any of the following causes-

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

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

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

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

Chapter -8

PUBLIC CONSULTATION

Public Consultation

8.1 Public meetings and survey

Public consultation was initiated with an explicit objective to ensure peoples participation right from the planning stage of the project. More specially, this was aimed at improving the study taking into account opinions from the people of the impacted area. While undertaking household survey through semi-structured questionnaire, knowledgeable persons, community leaders and local chairman & members were identified and contacted. The company arranged a public meeting at project site. The meeting was attended by about 15 persons who include local people, local community leaders (members & chairman) and other interested persons from different corners.

8.2 General findings of the meetings and survey

In general, the local people's response to **Summit Narayanganj Power Ltd.** is positive. Most of the people who live close to the plant site have no objection towards the plant being set up at the selected site. Most the people as interviewed are not aware of pollution hazard and also do not feel that **Summit Narayanganj Power Ltd**. would be source of any hazard to them.

As understood from gathered information, the same approach of not involving the local public during the project planning as prevailing in the country was adopted in case of **Summit Narayanganj Power Ltd.** This is a top-down approach of not asking the opinion of the people who themselves or whose environment and socio-economies might have been affected due to the project. There should have been a bottom up approach taken while designing the project with opportunity and arrangements for public participation.

The people of the area seem to be happy for the installation of such plant since they would not face jobless further after operation of the plant. Presently public participation is limited to engaging some local people in various construction and other related activities during the implementation of the plant. The same will imply on when there would be some local people recruited permanently or temporarily as the plant staff during its operation. In addition, some people will participate indirectly in various economic activities and support systems associated with **Summit Narayanganj Power Ltd.**

8.3 Summary of special concerns

8.3.1 Issues

Some issues, as described by those who attended the meetings are summarized below:

- Power Generation
- Employment for local people
- Contribution to the local development projects

8.3.2 Suggested measures

Suggestions were also provided of persons who attended the meetings. The suggested measures for above issues are as follows:

- Increase current power generation capacity in Bangladesh.
- Wherever possible local people should be given priority for employment in the factory.

- **Summit Narayanganj Power Ltd.** should contribute both in cash and in kind for different development projects like Total Literacy Program (TLP), development in medical facility, local road, etc. in the local area.

Chapter -9

ALTERNATIVE ANALYSIS

Chapter-9

ALTERNATIVE ANALYSIS

9.1 The 'No Build' Scenario

From a purely physical environmental point of view, the 'do-nothing' is preferable to any project implementation, since it would avoid creation of any of the adverse impacts associated with the project. However, the potential socio-economic benefits to the nation would be foregone and industrial growth would be hampered.

It is concluded that the 'No Build' alternative is unacceptable, and the potential socio-economic benefits of implementation of such project far outweigh the adverse impacts, all of which can be controlled and minimized to an allowable level.

9.2 Site Alternative

Since the proposed site is situated in an isolated barren land with no settlement nearby and the site is on the side of a high way and the surrounding area is industrial in nature beside a river. Moreover, the proponent has already been invested a substantial amount by purchasing the land for his purpose, so the proposed site is an ideal for such factory, hence there is no logic to look into alternative site.

Chapter -10

CONCLUSION AND RECOMMENDATIONS

CONCLUSION AND RECOMMENDATIONS

10.1 Conclusion

Summit Narayanganj Power Limited a 102 MW power generation plant would be setup at Madanganj, Narayangonj, Bangladesh. An IEE has been prepared for the project according to the requirement of DoE for necessary environmental clearances as it is made mandatory in ECA'95, for any new industrial set up. The IEE has been prepared through identifying the potential impacts, assessing them and recommendation possible mitigating and enhancing measures for negative and positive impacts, respectively.

The environmental analysis has revealed that the project can be set-up according to the proposed design and configuration in the proposed site and location. The environmental impacts are of limited nature, whereas the benefits of the project are many.

The primary reason why the environmental impact from the plant is minimal is that the project proponent is abide by Bangladesh /World Bank Standards and build a plant, which will meet the emission standards of Bangladesh and the World Bank. The excellent characteristics of the fuel used, equipment and machinery, which conform to international standard and good operation practices all combine to make the proposed power plant project acceptable one.

The main potential environmental problems, which may arise as a result of construction of power plant, can be grouped as follows-

- Atmospheric emissions and Air quality
- Water pollution and waste water disposal
- Noise
- Ecology.

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

Atmospheric Emission and Air Quality: The proposed power station will fire Heavy Fuel Oil. Emission of sulfur dioxide and particulates would be insignificant. Emission of NO_x will also be very low as the air-fuel ratio is high. For NO_x reduction, the gas turbines will be equipped with low NO_x combustion chambers.

Liquid Discharge: The power station will use oil water separator and close loop cooling water. So no extra water would be discharged to the environment. Implementation of the EMP would include checking of any release of oil and grease in wastewater.

Noise: The main source of noise is the operation of the gas engine. To reduce this silencer would be used. In order to protect workers, these engines would be fitted with special acoustic enclosures to reduce noise levels. Also to reduce vibration, vibrating pad would be used.

10.2 Recommendations

Having reviewed all the potential environmental impacts, and following our proposed mitigation measures the project is expected to proceed without having unacceptable environment. The area is likely to witness growth of Industries and the growth can become certain if electric supplies could be provided to the area without much of load shedding. In

this context, the proposed power station of a 102 MW capacity would be a welcome relief for the people in that area.

However no development can be expected without any adverse impact on the environment. The beneficial impacts on the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project. All this would need vigilant care and cost money, and the project authority should take these into consideration.

However no development can be expected without any adverse impact on the environment. The beneficial impacts on the nation as well as human beings would only be meaningful and sustainable development would only be possible if adverse impacts are minimized through strict maintenance and control measures as mentioned for this project. All this would need vigilant care and cost money, and the project authority should take these into consideration.