Environmental and Social Impact Assessment (ESIA)

of

SHUN SHING
CEMENT INDUSTRIES LTD

Shun Shing Cement Industries Ltd.

Bokteyar Para, Shikalbaha, Thana and Upazila-Karnafuli
District- Chattogram

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May 2019

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Abbreviation

ADB	Asian Development Bank
BBS	Bangladesh Bureau of Statistics
dB	Decible
CSC	Construction Supervision Consultant
CSR	Corporate Social responsibility
DG	Director General
DIZ	Directly impacted zone
DOE	Department of Environment
DMP	Disaster Management Plan
EA	Environmental Assessment
ECA	Environment Conservation Act
ECC	Environmental Clearance Certificate
ECoPs	Environmental codes of practice
EES	Environmental Evaluation System
E&S Cell	Environmental Evaluation System
EGL	Existing Ground Level
EIA	Environmental Impact Assessment
ESIA	Environmental and Social Impact Assessment
EMP	Environmental Management Plan
ESMP	Environmental and Social Management Plan
EQ	Environmental Quality
EQS	Environmental Quality Standards
FGD	Focus Group Discussion
FWOP	Future without-project
FWIP	Future-with-project
GLC	Ground Level Concentration
GOB	Government of Bangladesh
GTCL	Gas Transmission Company of Bangladesh
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
IZ	Influence zone
KII	Key Informer Interview
LGED	Local Government Engineering Department
MoEF	Ministry of Environment and Forest
MSDS	Material Safety Data Sheets
MW	Mega Watt
NSDWSSP	National Safe Drinking Water Supply and Sanitation Policy
NEMAP	National Environmental Management Action Plan
NGO	Non-government Organization
NOC	No Objection Certificate
OHSA	Occupational Health and Safety Act
PAPs	Project Affected Persons
PPE	Personal Protective Equipment

Glossary

Adverse impact: An impact that is considered undesirable.

Ambient air: Surrounding air.

Aquatic: Growing or living in or near water.

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".

Beneficial impacts: Impacts, which are considered desirable and useful.

Biological diversity: The variety of life forms, the different plants, animals and microorganisms, genes they contain and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecological diversity.

Ecosystem: a dynamic complex of plant, animal, fungal, 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 milligrams 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: An estimate or judgment of the significance and value of environmental effects for natural, socio-economic and human receptors.

Environment and social management plan (ESMP): A Plan to undertake an array of follow-up activities, which provide for the sound environmental and social 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.

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 Impact Assessment.

River: A large natural stream of water flowing in a channel to the sea, a lake, or another such stream.

Land use: Types include agriculture, horticulture, settlement, pisciculture and industries.

Mouza: 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.

Public involvement / Focus Group Discussion/ Stakeholders consultation: A range of techniques that can be used to inform, consult or interact with stakeholders" affected / to be affected by a proposal.

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.

Terrestrial: Living on land.

Union: Smallest unit of local self-government comprising several villages.

Union Parishad: A union parishad is the legal term for a local governing body, including villages, and boroughs.

Executive Summary

The proposed Shun Shing Cement Industries Ltd. (SSCIL) is set up at village Bokteyar Para, Shikalbaha, union and Upazila-Karnafuli, District-ChattogramChattogram. The project will enjoy the necessary infrastructure and service facilities for years, well-connected and established infrastructure facilities such as road, river and rail transport, electricity, gas, telecommunication etc. The plant capacity is 54,000 Tons/yr.

The Shun Shing Cement Industries Ltd. (SSCIL) is a newly cement manufacturing plant having modern infrastructure facilities covering 5 acres of land in a rural setting with many other industries and infrastructures within the area. There are no particularly sensitive ecological, cultural and archeological targets. The plant did not have to relocate any human settlement, as it is in the proponent's recognized owned industrial complex.

During construction of proposed project, the plant authority tried to adopt all necessary measures to reduce the environmental impacts. The project proponent has taken site clearance certificate from DOE for the plant, and discussed for ESIA study of the plant due to high demand of the cement in the market.

The construction of the plant may create some adverse impact on the environment. The land was developed earlier by the client and was vacant. Further dust and acoustic impacts during construction would be limited to construction of building and site preparation and due to installation of cement mill itself. As the plant site is on the west bank side of the river Shikalbaha, the project would have a jetty for unloading the clinker from barges. Clinker, fly ash and slag/ gypsum/lime stone and coal for hot gas will be imported in ships and therefore unloaded to barges, which will carry to the jetty. SSCIL will use ECO-hopper at Jetty for keeping the dust emission at minimum level. Rock/natural gypsum will be will be imported from Thailand, UAE, Oman etc. and will be taken to factory jetty by small barges after unloading at Chattogram port from mother vessels. Clinker, fly ash and slag/gypsum/limestone from the barges will be unloaded by hydraulic crane with ECO-hopper facility into a covered conveyor belt, which will carry the raw material separate storage shed. Cement will be produced through vertical roll mill (VRM).

Dust generated in various sections will be collected through Pulse Jet Type dust collector and it will be within DoE discharge limit. Noise will be control in each section within limit. In addition to this some water may be used for occasional floor, equipment washing and for domestic purposes which may contain some negligible amount of oil and grease that might affect the surface water quality. Domestic sewage including oil and grease will be treated through septic tank attached with soak pit. The other sources of pollution are generation of solid waste for which necessary measures will be taken in the plant. All the impacts are briefly described and at the same time mitigation measures are suggested and the plant authority will take effective steps to minimize the adverse effect. Fire fight system in place with automatic alam system. Health and safety will be taken care through modern equipment round the clock by the authority. SSCIL already established a hospital with all modern operation facilities for its employees and surrounding people. In addition to SSCIL provide the CSR including education

to its surrounding villages. In order to maintain the sustainable development, an environmental monitoring cell will be developed for monitoring of the environmental parameters.

During the preparation of this report for the development of the proposed project it was observed that the construction, installation and operation and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The positive impact is the creation of employment, economic growth, optimum utilization of the land, etc., hence maximum returns, availing building and construction materials for various individuals/ companies/ developers, improved economy, improved security, and increase in revenue base to the project proponent, tax to local and National Governments.

Noise generated from the VRM will be less through modern machinery and technology. Noise modelling results from noise software shows that generated noise is much lees that the ambient noise of surrounding industries.

Dust emission will be negligible since the closed eco-hopper at Jetty and closed conveyer belt will be used during unloading the raw material from the jetty for keeping the dust emission at minimum level. Unloading the delivery of the cement will be in a closed system hence there is no scope of dust emission.

The impact due to liquid discharge mainly from domestic liquid waste managed through septic tank attached with soak pit and solid waste generated are collected properly and dispose safely and considering others there are no environmental issues of sensitive nature, which might have any potential of serious ill effects due to the plant in this area.

In order to mitigate on the negative impacts associated with the project, the proponents shall put in place the following measures suggested in the table below:

Table 1 Summary of Environmental Management/Monitoring Plan

Sl. No	ACTIVITY/ISSUE	PROPOSED MITIGATION MEASURES
1	Dust (Fugitive and Cement dust)	• Paving of the Project Site and roads; • Sprinkling of water; • Workers to use dust/nose masks; • Sufficient ventilation at workplace; • Ensure de-dusting system (bag filters) is always efficient; • Workers to use appropriate PPE; • Strict enforcement on PPE use; • Ensure packed cement is carefully handled
2	Release of Sulphur gases SOx	• Use fuels with low Sulphur content
3	NOx Emissions	• Maintenance and servicing of vehicles and machine/equipment. Switch off engines when not in use

Conclusion

It is quite evident that the construction, installation and operation of the proposed project will have more positive than the negative impacts at the project site including creation of employment, economic growth, optimum utilization of the land, etc., hence maximum returns, availing building and construction materials for various individuals/ companies/ developers, improved economy, improved security, and increase in revenue base to the project proponent, tax to County and National Governments . However, although the project is highly regarded in terms of positive impacts, it is anticipated that there will be negative impacts such as those listed in the above table. Since the impacts associated with the Capacity Increase have been identifies, it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in this ESIA Report are adhered to and the ESMP is implemented.

The positive impacts are highly rated and will benefit all stakeholders of this project. The project proponent has proposed to adhere to prudent implementation of the environmental management plan and is obtaining all the necessary permits and licenses from the relevant authorities, has qualified and adequate personnel and has proposed adequate safety and health mitigation measures as part of the relevant statutory requirements.

However, although the project is highly regarded in terms of positive impacts, it is anticipated that there will be negative impacts such as those listed in above. Since the impacts associated with the expansion of the industries have been identifies, it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in this ESIA Report are adhered to and the ESMP is implemented.

The location of Shun Shing Cement Industries Ltd. (SSCIL) is environmentally acceptable as has already been mentioned. However, adequate and effective pollution prevention, abatement and control measure, proper and careful operation and maintenance, regular and effective environmental and social monitoring with adequate staff and budgetary provision, and reporting to DoE should be ensured. It is also expected that DoE will do surveillance monitoring of the project performance. DoE should also continue its encouragement for plants like Shun Shing Cement Industries Ltd. (SSCIL) for initiatives to take care of the factory targeting a better environment.

Since it is understood that the project proponent is committed to take necessary steps to address any environmental problems, the selected location of Seven Circle Bangladesh Ltd (SSCIL) is acceptable for the present project. So, issuance of expansion of existing plant environmental clearance in favor of Shun Shing Cement Industries Ltd (SSCIL) may be considered.

SECTION-1: INTRODUCTION

1.1 Background

Bangladesh is a developing country with a population of nearly 160.8 million in an area of about 1, 47,570 sq. km. It ranks eighth among the populous countries, 148th with respect of land area. The density of population in Bangladesh is one of the highest in the world. The growth rate is 1.37 percent and per capita income is US$ 1677. Eighty percent of the total population is engaged in agriculture. As population is increasing day by day, there is a pressure for producing more crops in a stipulated area. Though we have almost achieved self-sufficiency in food through agricultural revolution but socio-economic condition of the mass population is still very poor.

Cement is a substance which binds together other materials by a combination of chemical processes collectively known as setting.

Cement is a dry powder and should not be confused with concretes or mortars, but it is an important constituent of both of these materials, in which it acts as the 'glue' that gives strength to structures.

Globally, cement consumption is constantly growing due to increasing residential and commercial construction activities. Additionally, improving infrastructure in emerging nations are boosting the cement demand all over the world. Developed countries like the U.S. and western European countries are also constantly improving their civil works, leading to high cement consumption. Unlike, other countries, China is likely to witness a decline in its cement consumption volume. However, currently, China is the largest consumer of cement.

The proponent take initiative to eradicate poverty and unemployment to set up proper industries as per present socio-economic needs. Only through industrial revolution can improve our economic condition. Proper and planned industrialization can also solve unemployment and eradicate poverty.

Cement is a substance, generally in powder form that can be made into a paste, usually by the addition of water and when molded will turn into a solid mass. SSCIL will produce cement with various brand with specialty maturing with different ratio of gypsum, fly ash, slag with clinker as per demand and requirement. Though it is widely used in the country, there are existing cement manufacturing industries in the country which could not fulfill the local demand. The proposed cement manufacturing industries namely Shun Shing Cement Industries Ltd. (SSCIL) will add to the present production of the country, provide employment to a substantial number of personnel, save foreign exchange and contribute to the endeavors forward sustainable development of the country.

It is well-recognized fact that any development activity has an impact on the natural environment directly or indirectly. So before taking up of any project the environmental aspects of development activities must be taken into consideration and due attention must be paid to protect the environment. The first step in this direction is to identify the probable potential impacts of the project on the surrounding environment and evaluate the intensity of the impacts so that suitable effective mitigation measures could be taken in the early stages of the project to minimize adverse impacts.

Proper location, the production process and waste control are very important for an industry to be environmentally sound. To ensure this an Environmental and Social Impact Assessment (ESIA) is a very effective tool, which delineates what needs to be done to make an industrial

Sl. No	ACTIVITY/ISSUE	PROPOSED MITIGATION MEASURES
4	CO_2 Emission	• Planting trees onsite and offsite
5	CO emission	• Maintenance and servicing of vehicles and machine/ equipment; • Switch off engines within the site when not in use
6	High Noise Levels at workplace	• Develop and implement an effective noise control and hearing conservation programme; • Carry out periodic noise measurements; • Fit noisy machines with noise reduction devices; • Provide suitable hearing protection to all workers exposed to noise levels above 85dB(A); • Post notices and signs in noisy areas; • Carry out audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A); • Educate all workers on importance of marking correct use of PPE provided.
7	Process Solid waste management and disposal	• Recycle and Re-use where applicable; • Segregate for appropriate disposal; • Process improvement to minimize waste generations; • Material substitution to minimize waste generation; • Technological improvements to minimize waste generation.
8	Domestic waste management and disposal	• Sorting of waste at source; • Waste disposal as provided for in the Environmental Management and Coordination (Waste Management) Regulations, 2006; • Provide appropriate waste handling receptacles.
9	Office waste management and disposal	• Obsolete electronic equipment and other electronic waste to be returned to manufacturers for safe disposal
10	Utilities operations wastewater	• Adaption of water conservation methods
11	Sanitary Wastewater	• Segregation of wastewater streams; Treatment to meet national standards for sanitary wastewater discharge
12	Storm Water	• Storm water should be separated from process and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge; • Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the

Sl. No	ACTIVITY/ISSUE	PROPOSED MITIGATION MEASURES
		peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds); Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas.
13	Physical Hazards	• Good housekeeping; • Ensure surfaces are not slippery; • Clearly mark all uneven surfaces; • Guarding of machine moving parts; • Provide and mark safe passages and exits; • Spills to be promptly cleaned.
14	Parking within the factory	• The space for parking is already available, however, proper planning will be necessary to accommodate the increased numbers of trucks that will be parked awaiting to deliver materials and collect cement from the facility
15	Occupational Health and Safety	• PPE use; • Appropriate handling as per material safety data sheets; • Training and sensitizations; • Medical examination of exposed workers
16	Vehicular Traffic along National roads	• Liaise with the BRTA to find out whether the existing acceleration and deceleration lanes are enough for safe entry and exit of the highway; • Drivers to strictly observe the Highway Code; • Speed limits to be strictly observed
17	Demolition waste (wash rooms)	• Use of an integrated solid waste management system • Recycle/reuse recyclable solid waste where possible • All foundations must be removed and recycled, reused or disposed of at a licensed disposal site • Where recycling/reuse is not possible, waste should be taken to a licensed waste disposal site
18	Site Restoration (Decommissioning)	• Implement a re-vegetation programme to restore the site to its original status • Use indigenous plant species in re-vegetation

unit suitably located and environment friendly.

This report describes the findings of Environmental and Social Impact Assessment (ESIA) of the proposed Shun Shing Cement Industries Ltd. (SSCIL), Gray Cement manufacturing industries at 3 no Shikalbaha Union Parishad, Bokteyar Para, Shikalbaha, Chattogram. Total land for the industries is 5 acres.

1.2 Objectives

This report presents the finding of an Environmental Impact Assessment (EIA) of the project namely Shun Shing Cement Industries Ltd. (SSCIL) at village Bokteyar Para, Shikalbaha,and Thana- Karnafuli, District-Chattogram. Bangladesh. The objective of the study is to provide an examination and assessment of the principal environmental and social impacts of the industries.

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 ESIA are to:

- Assess the existing environmental conditions in the project area, including the identification of environmentally sensitive issues.
- Assess the proposed activities to identify their potential impacts, evaluate the impacts, and determine their significance.
- Prepare appropriate mitigation and monitoring measures that can be incorporated into the design of the proposed activities to minimize any negative impacts
- Identify the environmental and social impacts of the project under DOE and IFC EHS Guidelines (general and sector specific).
- Suggest the plan for management of the environment, during the implementation and operation of the plant.
- Prepare an ESIA report that conforms to the requirements of DOE and IFC.

1.3 Scope of The Study

This report presents the findings of an Environmental and Social Impacts Assessment (ESIA) of the Village Bokteyar Para, Shikalbaha, and Karnaphulithana, District-Chattogram, Bangladesh. The Main objective of the study is

- Relevant off-site construction activities
- Operation of the cement manufacturing plant including carrying of raw materials and distribution of finished product
- De-commissioning of the plant

1.4 Consistency with DoE Guidelines

Environment Conservation Act 1995 (ECA'95) is 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 (IEE) for site clearance, and secondly, if warranted, a full Environmental and Social Impact Assessment (ESIA) for technical clearance. The construction of Shun Shing Cement Industries Ltd. falls under red category in the list. The present environmental study called ESIA has been carried out as a follow up study of IEE, which is the requirement of DoE for such type of industrial set up.

1.5 Approach and Methodology

1.5.1 Overall Approach

The report has been prepared on the basis of information of the project activities supplied by the project proponent (SSCIL). The Consultant's multi-disciplinary team of experts made reconnaissance and exploratory site visits. The interaction between the project activity and the significant environmental components was made based on a checklist. The environmental data were collected from the project sites, through an environmental questionnaire. Stakeholders consultation was also made to obtain the people's view, as suggested in the ESIA guidelines.

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

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

1.5.2 Methodology

The Environmental and Social Impact Assessment (ESIA) study conducted through the following steps (Figure 1.1).

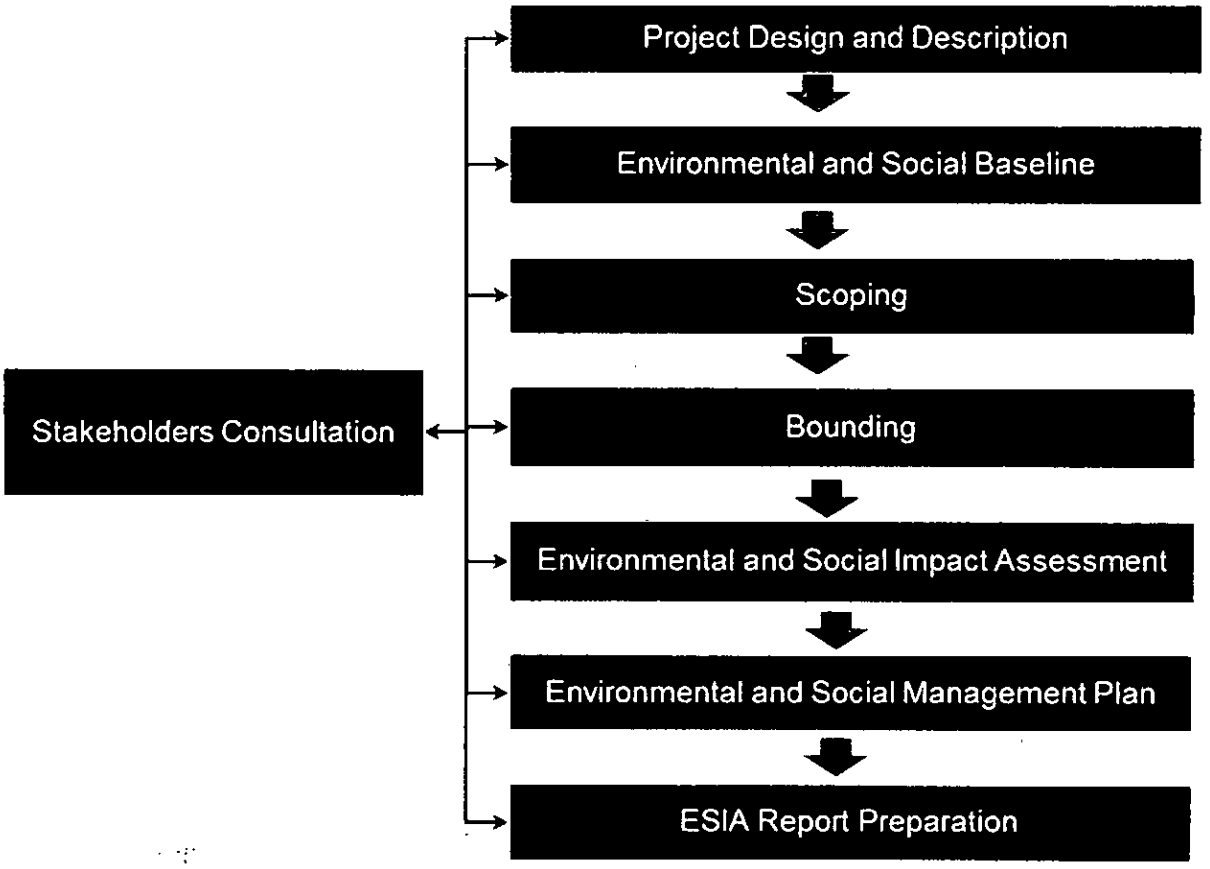


Figure 1.1 Steps of Environmental and Social Impact Assessment (ESIA)

1.5.2.1 Project Design and Description

Project consultant entrusted with the responsibility of EIA study of the project. Detailed information on the proposed locations of project collected from the project consultant by the multi-disciplinary ESIA team. The team members had thorough understanding of the proposed interventions and their possible environmental consequences. This information helped in designing data collection programs.

1.5.2.2 Environmental and Social Baseline Data Collection

Environmental and social baseline condition of the project area established through a series of field visits, surveys and intensive consultation with local people. Detailed data collected on land resources, water resources, agriculture, fisheries, ecosystems and socio-economic condition. In addition to the professional inputs of the multi-disciplinary ESIA team members; this included intensive consultation with the stakeholders to obtain their perceptions on the proposed interventions and the possible impacts.

1.5.2.3 Scoping

Important Environmental Components (IECs) likely to be impacted by the proposed project locations followed in the scoping process. Initially the ESIA team prepared a list of IECs based on secondary information and reports, on site assessment and satellite image. Finally, after

consultation with stake holders carried out to screen and finalize the list of IECs for the proposed components. Specific IECs were included during ESIA study of each location.

1.5.2.4 Bonding

A bounding exercise carried out by the consultant to delineate area likely to be impacted by the proposed project. Based on proposed project location a 1 km radius area centering the proposed location delineated as a directly impacted zone (DIZ). The influence zone (IZ) covered more that the DIZ. These zones were finalized based on the particular location, specific hydro-morphological and socio-economic considerations.

1.5.2.5 Environmental and Social Impact Assessment and Possible Computation

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

1.5.2.6 Environmental and Social Management Plan

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

1.5.2.7 ESIA report preparation

This ESIA report also included for necessary rehabilitation or compensation of property damage. All the findings of ESIA are presented in this report.

1.6 Structure of the ESIA Report

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

Section 1: Introduction: The introduction Section presents a brief overview of the assignment along with its background, brief description, scope of study, methodology, limitation and ESIA team etc.

Section 2: Policy, Legal and Administrative Framework: Section Two outlines the Policy and Legislation on environmental issues covering the potential legal, administrative, planning and policies framework within ESIA will be prepared.

Section 3: Project Description: Section three describes the proposed interventions including alternative options suggested by the project, background, project category, need

for the project, location, size and magnitude of operation.

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

Section 5: Identification of Potential Impacts: The potential impacts due to implementation of cement industries cover the area will be identified through checklist method in this section.

Section 6: Evaluation of Potential Environmental Impacts Prediction and Mitigation Measures: This section deals with the environmental impacts of the proposed project and possible mitigation measures. Opinions of the local people have also been elaborated in this chapter.

Section 7: Environmental and Social Management Plan: The section mainly deals with the environmental and social management plan, which includes an implementation plan of mitigation measures, institutional requirements and environmental monitoring program of the project. The ESMP also includes specific compensation, monitoring and enhancement plan.

Section 8: Disaster Management Plan : This section is describe a catastrophic situation in which, people are plunged into helplessness and suffering. As a result, need protection, clothing, shelter, medical and social care and other necessities of life.

Section 9: Stakeholders consultation: This section mainly describes the public opinion of the project as well as the major problems, impacts and probable solutions recommended by the project.

Section 10: Conclusion and Recommendations: This section presents the findings, conclusion and recommendations of the project.

1.7 The ESIA Team

Enviro Consultants Ltd. has prepared this report under the guidance and Supervision of Dr. Jagadish Chandra Saha. Md. Muklesur Rahaman, Md. Golam Muktadir, Mohammad Saad, Zisan Binte Walid, Md. Humayun Kabir, Sujoy Mandal, Md. Nazmur Rahman, Bekash Chandra Sutradhar, Amaresh Chandra Biswas. The Team Leader is a Civil Engineer having PhD in Environmental Engineering. The other members are Chemical Engineer, Environmentalist, Ecologist, Chemist, Sociologist, coordinator, data analyst and monitoring officers respectively with the specialization in ESIA.

This report has been prepared by Enviro Consultants Limited. The consultant team consists of the following experts who have contributed to develop and prepare this report with their sound knowledge and specialization in their consequences fields and guidance to resolve every critical technical issue. The Environmental Impact Assessment Team is shown in Table 1.1

Table 1.1 Environmental Impact Assessment Team

Sl. No	Name of the Consultant	Proposed Position	Job Description
1.	Dr. Jagadish Chandra Saha	Team Leader	• Overall supervision, lead the team and management of the project

	Ph.D. in Environmental Engineering		• Formation of team and design of data collection • Prepare and present power point presentation and maintaining liaison with client and other agencies.
2.	Md. Muklesur Rahaman	Process Engineer	• Identify the production process • Identification and evaluation of impact • Prepare mitigation measure and EMP tools • Review environmental management and monitoring plan report and • Quality check of the ESIA report • Assist Team Leader
3	Md. Golam Muktadir	Environmentalist and GIS Expert	• Assist Team Leader in collection of data, documents and reports from secondary and primary source. • Prepare GIS based maps. • Assist Team Leader in collection of primary data on from the field and analysis of results & recommendation in writing ESIA reports. • Assist the Team Leader in the data compilation, checking and interpretation; • Assist the Team Leader in the impact identification of waste generated and preparation of the reports. • Identification of PAPs and conduct Stakeholders consultation, FGD and KII process.
4	Mohammad Saad	Chemist	• Monitoring and collection of ambient air, noise and water quality in the project area. • Laboratory test and analysis of various parameters • Collection of primary data on from the field and analysis of results • Assist the Team Leader in the data compilation, checking and interpretation; • Assist the Team Leader in the impact identification and preparation of the report.
5	Zisan Binte Walid	Ecologist	• Data collection on ecology, biodiversity, geology, water, air, noise and soil • Assist in environmental survey and socio-economic survey data collection. Assist in identification of PAPs and FGD and KII • Assist Team leader in preparing ESIA report process.
6	Md. Humayun Kabir	Sociologist	• Collection of relevant information from the secondary sources • Design and develop questionnaire for socio-economic survey, Checklist for FGD/KII; • Collection of baseline data on the Social Characteristics of the project sites and the impact area. • Organization and holding of consultative

			meetings with affected persons. • Assessment of the Social Impacts during project design and construction phases. • Assessment of Socio-economic Impact caused by operation of the project, etc. • Identification of people to be affected and compensated; • Preparation of Social Management plan. • Assist in the preparation of relevant sections reports of the ESIA
8	Sujoy Mandal	Project Coordinator	• Coordinate with project team members and liaison with the client. • Lead the meeting and coordinate with the client; • Team meeting, Prepare work responsibilities to the team member • Reviewing environmental legislation related activities
9	Md. Nazmur Rahman, Bekash Chandra Sutradhar, and Amaresh Chandra Biswas.	Field Survey/Data Analyst	• Assist in environmental survey and socio-economic survey data collection. Assist in identification of PAPs and FGD and KII process. Assist in sample collection • Data collection from BMD and another department

1.8 Limitations

There were some limitations in this ESIA study. Those are given below:

- First of all, the study held on January 2019. So, there is no relation of this study with the other existing activities and it represent only the construction period of the plant.
- Only winter season was found during this study which did not represent the overall yearly situation.
- Time for preparing the report was less then we needed. More time will help to prepare the report more fruitful.

1.9 Acknowledgment

The successful completion of this ESIA study report was made possible by several individuals, local bodies, agencies, establishments and institutions helped in gathering data and providing information and services. The Expert acknowledges the input of the proponent in terms of providing resources, documentation and logistical support that was necessary for data collection as well as compilation of this ESIA study report.

To obtain baseline information on the project site, the firm of experts relied on site visits, literature review of information available from government offices and previous ESIA studies undertaken by lead consultants.

The firm of experts thanks the local body, neighbors for their input during the Stakeholders consultation process for accepting to participate in informal meetings and interviews as well as

SECTION-2: LEGISLATIVE, REGULATORY AND POLICY CONSIDERATION

2.1 Literature Review

During the preparation of this report, pertinent references were consulted and reviewed. Many environmental legislative were reviewed that have implication to the project. 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. Those with partial and indirect relevance to 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.

A wide range of laws and regulations related to social and environmental issues are effective in Bangladesh. Many of these are cross-sectoral and only partially related to environmental and social issues. The laws and regulations such as National Water Policy, 1999; Forest Act 1927 (modified up to 30th April 2000); National Forest Policy, 1994; National Conservation Strategy; National Environmental Management Action Plan (NEMAP); Environment Conservation Act 1995 (ECA 1995); Environmental Conservation Rules 1997; Environment Conservation (Amendment) Act (2002) and Draft Environment Conservation (Amendment) Act 2009; Coastal Zone Policy, 2005; Coastal Development Strategy, 2006; National Agricultural Policy, 1999; National Fisheries Policy, 1996; National Livestock Development Policy, 2007; Standing Orders on Disaster, 1999; Climate Change Strategy and Action Plan, 2009; National Plan for Disaster Management, 2008-2015; and Other Legislation are considered here.

Some of the most important legislation that have implication with the project activities:

- Bangladesh Environmental Conservation Act (ECA), 1995
- Environment Conservation Rules (ECR), 1997
- National Water policy, 1999
- National Safe Drinking Water Supply and Sanitation Policy 1998
- National Fisheries Policy, 1996
- National Agricultural Policy, 1999
- National Livestock Development Policy, 2007

The most important of these are the Environment Conservation Act, 1995 (ECA, 1995), and the Environment Conservation Rules (ECR, 1997). The ECA 1995 is primarily an instrument for establishing the Department of Environment (DoE), and for controlling industrial pollution. The Act also defines in general terms that if any particular activity is causing damage to the ecosystem, the person responsible will have to apply corrective measures. Until the appearance of ECR, 1997, enforcement of the Act was not possible, as many of the clauses refer to specifications spelled out in the Rules. A list of this review has been presented in This Chapter.

2.2 Government Policies, Laws, Regulations

The severe floods of 1987 and 1988, 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.

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

2.2.1 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 and 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.

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

- To adopt corrective measures in phases in industries that cause pollution.
- To conduct Environmental Impact Assessments (EIAs) for all new public and private industries.
- To ban the establishment of an industries that produces goods that cause environmental pollution, closure of such 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 industries and to prevent their wastage.

2.2.2 National Safe Drinking Water Supply and Sanitation Policy 1998

National Safe Drinking Water Supply and Sanitation Policy (NSDWSSP, 1998) was drafted in 1998, and sets out the basic framework for the improvement of public health quality and to ensure improved environment, together with a set of broad sectoral action guidelines. The draft policy offered various objectives to achieve the goal and these are:

- To manage water supply and sanitation-related basic needs for all.
- To bring the positive change in people's attitude, regarding water and sanitation.
- To reduce the outbreak of water-borne diseases.
- To increase the efficiency of the Local Government and associated community for handling more effectively the problems related to water supply and sanitation.
- To improve sustainable water supply and sanitation system.
- To ascertain proper conservation, management and use of surface water, and to control water pollution due to the scarcity of underground water.
- To take necessary steps to use and conserve rainwater.
- To ascertain the rainwater disposal in the urban areas.

2.2.3 National Conservation Strategy 1992

National Conservation Strategy (GoB/IUCN, 1992) was drafted in late 1991 and submitted to the Government in early 1992. This approved in principle; however, the final approval of the document is yet to be made by the cabinet. Meanwhile, it underwent a number of modifications over the last five years and waiting for approval. For sustainable development in the 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 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 and 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 Plan

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 the 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.
- The concentration of industries 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 National Water Management Plan

The Government commenced preparation of this National Water Management Plan, with the intention of operationalizing the directives given by Policy. In reflecting the objective of rationalizing and decentralizing management of the sector, the Plan is a framework plan within which line agencies and other organizations are expected to plan and implement their own activities in a coordinated manner. The Plan is presented in three phases: in the short-term (2000-05), it is considered a firm plan of ongoing and new activities; in the medium-term (2006-10) it is an indicative plan, and in the long-term (2011-25) a perspective plan. Implementation of the plan is to be monitored regularly and it will be updated every five years.

The National Water Management Plan has been prepared to respond to these challenges and paradigms, with three central objectives consistent with Policy aims and national goals. These objectives are:

- Rational management and wise-use of Bangladesh's water resources

- People's quality of life improved by the equitable, safe and reliable access to water for production, health and hygiene
- Clean water in sufficient and timely quantities for multi-purpose use and preservation of the aquatic and water dependent eco-systems

2.2.6 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.

2.2.7 Environment Conservation Act 1995, amended in 2000 & 2002

Provides for the conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. In line with these provisions of the act, the Environment Conservation Rules, 1997 have been framed. This act provides for (i) remedial measures for injury to the ecosystem; (ii) any person affected by environmental pollution to apply to DoE for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity or testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to the environment; and (vi) penalty for non-conformance to the Environment Act under the various sections.

The provisions of the act apply to the entire project interventions in the construction and operation stages.

The main objectives of ECA '95 are:

- Conservation and improvement of the environment; and
- Control and mitigation of pollution of the environment.

The main strategies of the Act can be summarized as:

- Declaration of ecologically critical areas and restriction on the operations and processes, which can or cannot be carried/initiated in the ecologically critical areas;
- Regulations in respect of vehicles emitting smoke harmful for the environment;
- Environmental Clearance;
- Regulation of the industries and other development activities' discharge permits;
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines.

Before any new project can go ahead, as stipulated under the rules, the project promoter must obtain Environmental Clearance from the Director General. An appeal procedure does exist for those promoters who fail to obtain clearance. Failure to

comply with any part of this Act may result in punishment to a maximum of 3 years imprisonment or a maximum fine of Tk. 300,000 or both. The Department of Environment (DOE) executes the Act under the leadership of the Director General (DG).

Bangladesh Environmental Conservation Act (Amendment 2000)
This amendment of the Act focuses on: (1) ascertaining responsibility for Compensation in cases of damage to ecosystems, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.

Bangladesh Environmental Conservation Act (Amendment 2002)
This amendment of the Act elaborates on: (1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like polythene bags, (3) assistance from law enforcement agencies for environmental actions, (4) break up of punitive measures and (5) authority to try environmental cases

The Environmental Conservation Act (Amendment 2010)
The amendment of ECA '95 has been published on 5 October 2010 as Bangladesh Environmental Conservation Act, 2010. Some changes and inclusions has been made in different clauses particularly in defining the Ecological Critical Area, farming certain rules and conditions in cutting and/or razing hills, handling disposal of hazardous wastes, managing ship braking industries & wetlands, fixing responsibilities of environmental and safety management, obligations of obtaining and issuance of environmental clearance certificates and imposing penalties for violations including but not limited to filing cases for compensations, fixing fees and framing different rules under this Act.

2.2.8 Environment Conservation Rules (ECR, 97) (Subsequent amendments 02-03)

Empowers the GoB to declare ecologically critical areas, classification of industries and projects into various categories, procedures for issuing the environmental clearance certificate, and determination of environmental standards. According to the Rule 7 (1) of the Environmental Conservation Rules 1997; for the purpose of issuance of Environmental Clearance Certificate (ECC), every industrial units or projects, in consideration of their site and impact on the environment, will be classified into the four categories and they are: Category I (green), Category II (Orange-A), Category III (Orange B) and Category IV (Red). Development or restoration or upgradation of Khal are not included in any of these categories.

2.2.9 Acquisition and Requisition of Immovable Property Ordinance (1982)

This Ordinance has replaced the Land Acquisition Act of 1894 and the East Bengal (Emergency) Requisition of Property Act of 1948. The Ordinance governs acquisition and requisition by the government of immovable property for any public purpose or in the public interest. It may be noted that contrary to the previous Acts (i.e. Act XIII of 1948), this Ordinance deals only with immovable property.

The Ordinance has well-defined procedures 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, and access to transportation and related infrastructure factors. The current compensation and resettlement provisions are however inadequate both in terms of timing of payments and quantum. The procedures involved are cumbersome, time consuming, and often causes hindrance to the smooth execution of the project. Legal provisions covering adequate compensation to the project affected persons, particularly disadvantaged groups such as women & squatters and such other vulnerable groups are yet to be framed.

2.2.10 Environment Conservation Rules 1997

The rules outline the processes and requirements of environmental clearances for specific types of projects indicated therein, and stipulates that "no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General" of the Department of the Environment. Schedule 1 of the rules classify industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) orange-A, (iii) orange-B, and (iv) red. The rules specify the procedures for issuing ECC for the various categories of projects.

The Project is categorized as red and requires two stages of clearance, location clearance, and environmental clearance. All requisite clearances (LCC and ECC) from the DoE shall prior to being obtained commencement of civil works.

2.2.11 Environment Court Act 2000 Amendment in 2010

Enacted to establish environment courts and make rules for protection against environmental pollution. Environment courts are situated at the district level, but the government may, by notification in the official Gazette, establish such courts outside the districts. Environment courts were given power to directly take into cognizance any offense relating to environmental pollution. Proceedings of this court will be similar to that of criminal courts. One important feature of this act is that it has been given retrospective effect on any crime committed against environmental laws; thus, any crime previously committed but not taken before any court can be taken before the environment court or any special magistrate. Here summarizes the applicable national and local laws, regulations, and standards for environmental assessment and management.

Table 2.1 Government Policies, Laws, Regulations, and Environmental Standards

SL. No.	Laws, Regulations, and Standards	Details	Relevance
1	Environment Conservation Act, 1995	Provides for the conservation of the environment, improvement of environmental standards and control and mitigation of environmental pollution. In line with these	The provisions of the act apply to the entire Project interventions in the

SL. No.	Laws, Regulations, and Standards	Details	Relevance
		provisions of the Act, the Environment Conservation Rules, 1997 have been framed. This Act provides for (i) remedial measures for injury to ecosystem; (ii) provides for any affected person due to environmental pollution to apply to DOE for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity for testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to environment; and (vi) penalty for non-conformance to environment act under the various sections.	construction and operation stages.
2	Environment Conservation Rules (ECR), 1997	The Rules outline the processes and requirements of environmental clearances for specific type of projects indicated therein, and stipulates that "no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General" of the Department of the Environment. Schedule 1 of the Rules classifies industrial units and projects into four categories according to their site and impact on the environment, namely (i) green, (ii) orange-A, (iii) orange–B, and (iv) red. The Rules specify the procedures for issuing ECC for the various categories of projects. For Red Category: (i) completed application for ECC, and the appropriate fee; (ii) report on the feasibility of the project; (iii) report on the IEE for the project, and Terms of Reference for the ESIA (Annex 1); plus (in the case of an industrial project): layout plan showing location of ETP, process flow diagram, design and time schedule of the ETP; (iv) report on the EMP; (v) no objection certificate from the local authority; (vi) emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; and (vii) outline of the relocation and rehabilitation plan (where applicable).	The project activities are categorized under this rule and as per categorization required environmental assessments were done
3	Environment Court Act, 2000	Enacted to establish Environment Courts and make rules for the protection of environmental pollution. Environment Courts are situated at the District-level but Government may by notification in the official Gazette, establish such courts outside the districts. Environment Courts were given power to directly take into	The Court has jurisdiction over, in accordance with the Act provisions, the trial of an offense or for compensation

SL. No.	Laws, Regulations, and Standards	Details	Relevance
		cognizance any offense relating to environmental pollution. Proceeding of Environmental Courts will be similar to Criminal Courts. One important feature of this Act is that it has been given the retrospective effect of any crime committed under environmental laws and thus any crime previously committed but is not taken before any court can be taken before the Environment Court or any special Magistrate.	under an environmental law, imposing penalties for violation etc.
4	Pourashava Ordinance (Second Amendments) 1988; Municipal Administration Ordinance 1960	These ordinances have clearly assigned responsibilities to the LGIs to ensure urban health for their residents. It has given them the mandate to ensure and provide a wide range of primary and public health services including primary health care, sanitation, water supply, drainage, food and drink, birth and death registration, vector and infectious disease control, etc. As independent autonomous bodies, the LGIs, as necessary, may take all required actions to ensure good health for tourist and concerned population within its jurisdiction. They have the authority to address all related issues with their legal and administrative mandate.	The Project integrated community and workers health and hygiene at the construction stage, and this will be taken forward during the operation and maintenance of the infrastructure facilities for tourists, local community and other concerned peoples.
5	Bangladesh Labor Act, 2006	The Act provides the guidance on employer's extent of responsibility and workers' extent of rights to compensation in case of injury by accident while working.	Provides for the safety of workforce during the construction period.
6	National Water Policy, 1999	The Policy explicitly states 6 main objectives: (i) address the use and development of groundwater and surface water in an efficient and equitable way; (ii) ensure the availability of water to all parts of the society; (iii) accelerate the development of public and private water systems through legal and financial measures and incentives, including appropriate water rights and water pricing rules; (iv) formulate institutional changes, encouraging decentralization and enhancing the role of women in water management; and (v) provide a legal and regulatory framework that encourages decentralization, consideration of environmental impacts, and private sector investment.	Water supply should be under this consideration
7	National Agriculture Policy, 1999	The act deals with the programs related to make the nation self-sufficient in food through increasing production of all crops, including	Ministry of Agriculture

SL. No.	Laws, Regulations, and Standards	Details	Relevance
		cereals, and ensure a dependable food security system for all	
8	National Biodiversity Strategy and Action Plan (2004)	Conserve, and restore the biodiversity of the country for well-being of the present and future generations; Maintain and to improve environmental stability for ecosystems; Ensure preservation of the unique biological heritage of the nation for the benefit of the present and future generations; Guarantee the safe passage and conservation of globally endangered migratory species, especially birds and mammals in the country; and Stop introduction of invasive alien species, genetically modified organisms and living modified organisms.	Ministry of Environment and Forest Bangladesh Wild Life Advisory Board
9	The embankment and Drainage Act 1952	Describe the protection of embankment and drainage facilities	Ministry of Water Resources
10	Inspection and Enforcement Manual 2008	This manual has been written to provide national standard and uniformity environmental sampling for the inspections, investigations in the Department of Environment (DOE) in Bangladesh.	Will be considered at the time of environmental monitoring during the implementation of EMP

EIA = Environmental Impact Assessment, EMP =Environmental Management Plan, ETP = effluent treatment plant, IEE = Initial Environmental Examination, km = kilometer, LGI = Local Government Institution, TOR = terms of reference

2.2.12 International Conservations, Treaties and Protocols

The following are the International Environmental Conservations, Treaties, and Protocols:

- Rio Declaration, Convention on Biological Diversity, Rio De Janeiro, 1992 (Ratified 1994)
- RAMSAR, 1971(Ratified 1992)
- International Plant Protection Conservation, Rome, 1951 (Ratified 1978)
- Basel Convention, Basel, 1989 (Ratified 1993)
- United Nations Framework Conservation on Climate Change, New York, 1992 (Ratified 1994)
- Montreal Protocol, 1987 (Ratified 1994)
- World Heritage Convention, 1972 (Ratified 1983)

Among them, here summarizes the relevant to this International environmental convention relevant to the project activity.

Table 2.2 International environmental conventions relevant to the project activities

Sl. No	International	Details	Relevance
1	Rio Declaration 1992	United Nations Conference on Environment and Development (UNCED) adopted the global action	No sensitive species are located

		program for sustainable development called 'Rio Declaration' and 'Agenda 21 'Principle 4 of the Rio Declaration', 1992, to which Bangladesh is a signatory along with a total of 178 countries.	in the project area. There is no threat to the conservation of flora or fauna.
2	Convention on Wetland of International Importance Especially as Waterfowl Habitats, Ramsar (1972)	The Ramsar Convention was adopted on 2 February 1971 and entered into force on 21 December 1975. Bangladesh ratified the Convention on 20 April 2002. Bangladesh has two Ramsar Sites (i) parts of Sundarban Reserved Forest (Southwest of Bangladesh), and (ii) Tanguar Haor Northeast of Bangladesh).	No impact

2.2.13 Relevant Occupational Health and Safety Laws and Rules

During construction, the Project will confirm about the safety of occupational and health-related rules as outlined in below.

Table 2.3 Relevant occupational health and safety laws and rules

Sl. No	Title of Laws and Rules	Descriptions
1	Social Security under the Act, 1923 and an amendment in 1980	According to the Act social impact assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.
2	The Employer's Liability Act, 1938	The Act declares that the doctrine of common employment and of assumed risk shall not be raised as a defense in suits for damages in respect of employment injuries. Under the Maternity Benefit Act, 1939, the Maternity Benefit Act, 1950, the Mines Maternity Benefit Act, 1941, and finally the rules framed thereunder, female employees are entitled to various benefits for maternity, but in practice, they enjoy leave of 6 weeks before and 6 weeks after delivery.
3	Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas an emergency has arisen, it is necessary to make special provision for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective community and workers in particular during the construction related work.
4	The Employees State Insurance Act, 1948	It has to be noted that health, injury and sickness benefit should be paid to people, particularly respective workers at workplace under the Act.
5	Bangladesh Factory Act, 1979	The Act requires every workplace including small- or large-scale construction where women are employed to have an arrangement of childcare services. Based on this Act and Labor Laws - medical facilities, first aid and accident and emergency arrangements are to be provided by the authority to the workers at workplaces.

2.2.14 Obtaining Environmental Clearance

Steps Followed for Environmental Clearance Procedure of Red Category Project is pictorially presented in the next point. The project proponent has taken site clearance certificate from DOE for the proposed plant, and discussed for the plant due to high demand of the cement in the market (Annex 2). The project proponent is received the no objection certificate (NOC) from 3 no Shikalbaha Union Parishad, Bokteyar Para, Shikalbaha, Chattogram (Annex 3).

2.2.15 Environmental Standard

Drinking water standard from DoE and WHO water quality standard and surface water quality standard for different environmental parameters have been described in the Environmental Conservation Rules 1997 as described in the Annex 4.

2.3 ADB Safeguard Policy (ADB Safeguards Policy Statement, 2009)

The ADB SPS stipulates addressing environmental concerns, if any, of a proposed activity in the initial stages of project preparation. For this, the SPS categorizes the proposed components into categories (A, B or C) to determine the level of environmental assessment required to address the potential impacts. All three-safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that

- impacts are identified and assessed early in the project cycle;
- plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and
- Affected people are informed and consulted during project preparation and implementation.

The policies apply to all ADB-financed projects, including private sector operations, and to all project components. The internal procedural requirements are detailed in the *Operations Manual* sections and involve similar implementation processes as follows:

- screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle;
- impacts are assessed, safeguard plans summarizing mitigation measures, monitoring program, and institutional arrangements are prepared, and arrangements are made to integrate safeguards into project design and implementation;
- affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them; and
- Safeguard plans are disclosed to the public and the information is updated at various stages in the project cycle. ADB's safeguard policies require that both ADB's and DMCs' safeguard requirements are complied with.

A screening process for all ADB projects classified them into four environmental assessment categories as described table 2.4.

Table 2.4 ADB Projects Environmental Classification

Sl. No	Category	Category A	Category B	Category C	Category FI
1	Description	The project is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works	The project has potential adverse environmental impacts on human populations or environmentally important areas—including wetlands, forests, grasslands, and other natural habitats—are less adverse than those of Category 'A' projects. These impacts are site-specific; few if any of them are irreversible; and in most cases, mitigatory measures can be designed more readily than for Category A projects.	The project is likely to have minimal or no adverse environmental impacts	The project involves investment of IFC funds through a financial intermediary, in subprojects that may result in adverse environmental impacts.
2	EA Requirements	For a Category A project, the project sponsor is responsible for preparing a report, normally an EIA	EA is narrower than that of Category A EA. Like Category A EA, it examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.	Beyond screening, no further EA action is required for a Category C project	For FI category subproject sponsors requires to carry out appropriate EA for each subproject

2.4 IFC guidelines for cement manufacturing

Environmental issues in cement and lime manufacturing projects primarily include the following:

- Air Emissions
- Energy consumption and fuels

- Wastewater
- Solid waste generation
- Noise

Depending on those issues IFC provided substitute plan or suggestion to solve those problems. The recommended pollution prevention and control techniques include the following:

- Using of enclosed conveyer belts, storage of all material in closed or covered bays and capturing mill dust using filter to prevent particulate matter emission.
- Maintaining secondary air flow, developing a staged combustion process to prevent NOx emission.
- Using of a vertical mill, Injection of absorbents, using of wet or dry scrubbers to prevent SOx emission.
- Selection of fuel with a lower ratio of carbon or selection of raw materials with lower organic matter content to decrease CO_2 emission.
- Improving the efficiency of the machine and use modern technology to prevent excess energy and fuel consumption.
- Using of modern technologies and good practice techniques for wastewater management.
- Controlling of noise emissions may include the use of silencers.

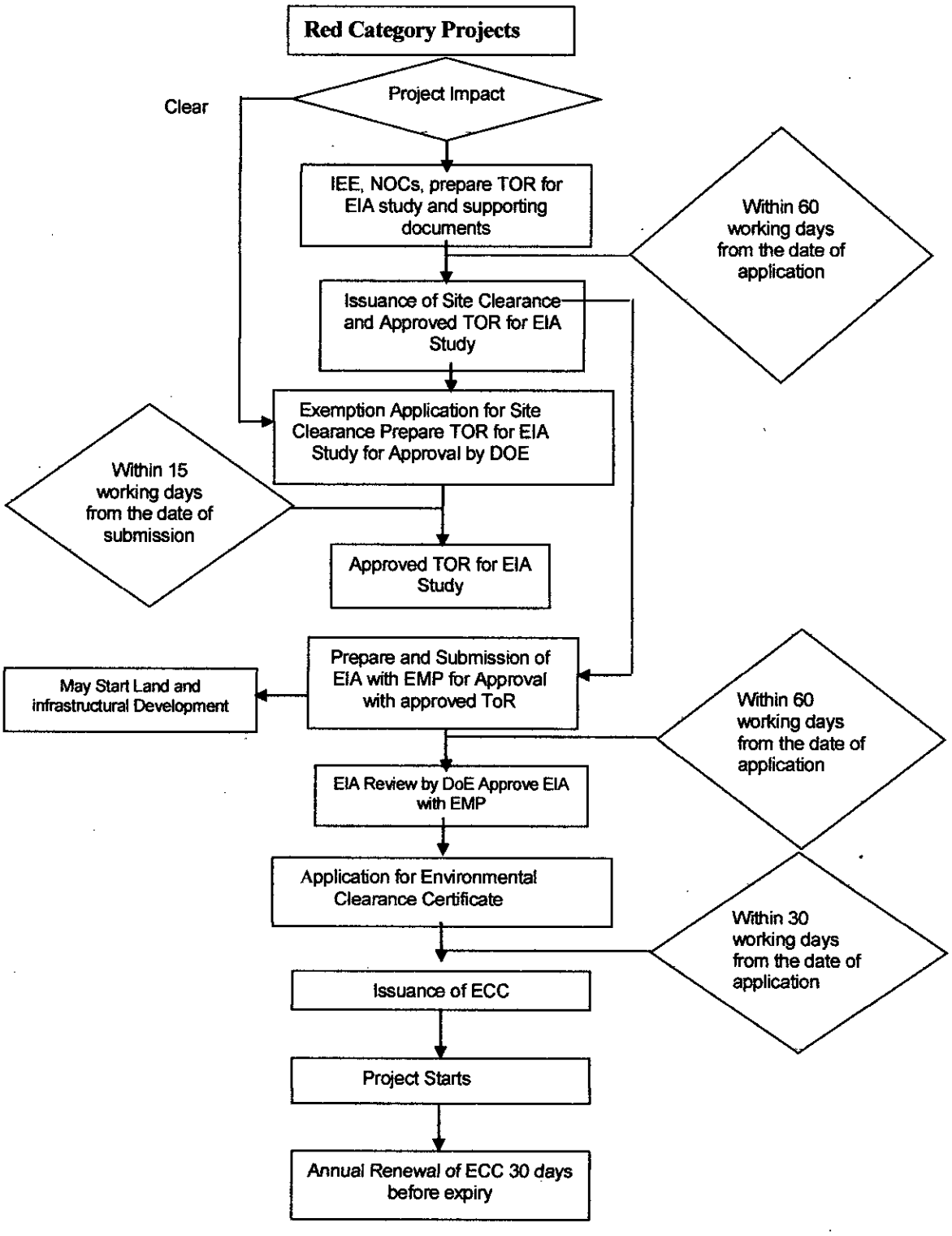


Figure 2.1 Steps Followed for Environmental Clearance of Red Category Project

SECTION-3: DESCRIPTION OF THE PROJECT

3.1 Product Overview

Cement is a substance which binds together other materials by a combination of chemical processes collectively known as setting. Cement is a dry powder and should not be confused with concretes or mortars, but it is an important constituent of both of these materials, in which it acts as the 'glue' that gives strength to structures.

SSCIL will produce following brands cement:

- which is Portland Composite Cement (PCC)
- which is Portland Composite Cement (PCC)
- which is Ordinary Portland Cement (OPC)

Specific Surface is ≥4000 cm2/g
Setting time: as per BDS EN 197-1:2003

The physical properties of the product are given below Table 3.1.

Initial setting time : shall be not less than 45 minutes
Final setting time : shall be not more than 10 hours

"The compressive strength of cement at two days and twenty -eight days will be as follows on the basis of the desired strength class"

Table 3.1 Physical Properties of the Cement (BDS EN 197-1:2003)

Properties	No. of days		Cement type
Compressive Strength (MPa)	2	28	
	≥ 10	≥42.5	PCC , 42.5N
	≥ 20	≥52.5	OPC, 52.5 N

3.2 Type of the Project

The product is gray cement. The plant capacity is 3.5 MT/year. The project type is red category in the DoE list.

3.3 Location of the Project

The cement plant set up at village-Bokteyar Para, Shikalbaha, Shikalbaha, and Chattogram. Within a distance of 13 KM from Chattogram City. .Murari canal. The East side of the project is Karnaphuliriver, settlement, agricultural land, North side of the project Karafuli river, power station, South side of the project is dockyard, SSCIL truck stand, public road, scattered settlement, open space, Four H Dyeing and Printing Ltd. and West side is public road,

agricultural land, scattered settlement, S. Alam Cement Limited, S. Alam Vegetable Oil Limited, Modern Polymer Industries Limited. Plant location is shown in the Figure 3.1 and land use pattern adjacent in the project area in Figure 3.2 and. The study area will cover the entire area of the project which belong to Shikalbaha, Chattogram mainly along to the existing roads of LGED/Union Parishad /other agencies and the surrounding environment within the acquired land. There is a plan of Chattogram city corporation to increase the city corporation area in future. In this time whole area will come under the city corporation authority. Source: Chattogram City Corporation (CCC)

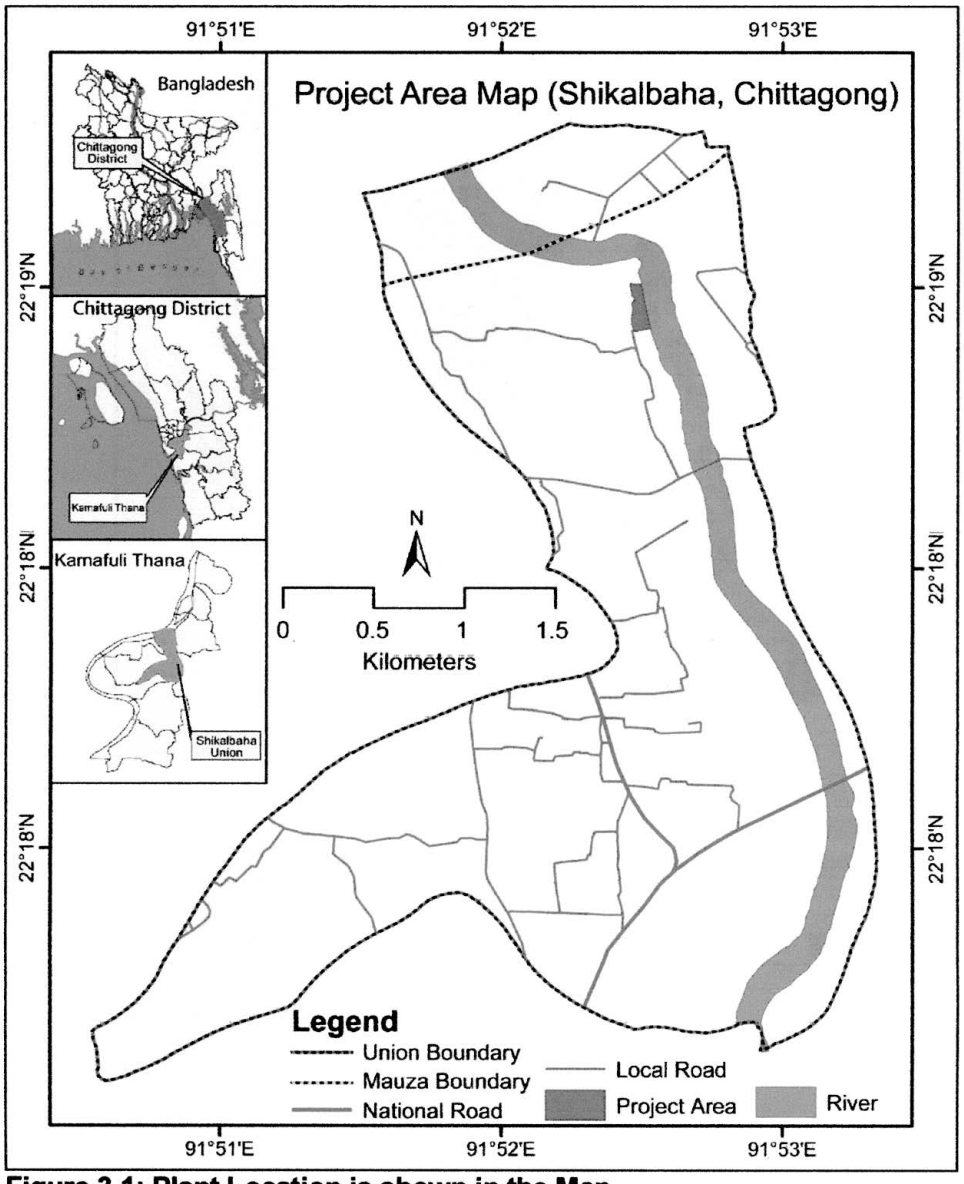


Figure 3.1: Plant Location is shown in the Map

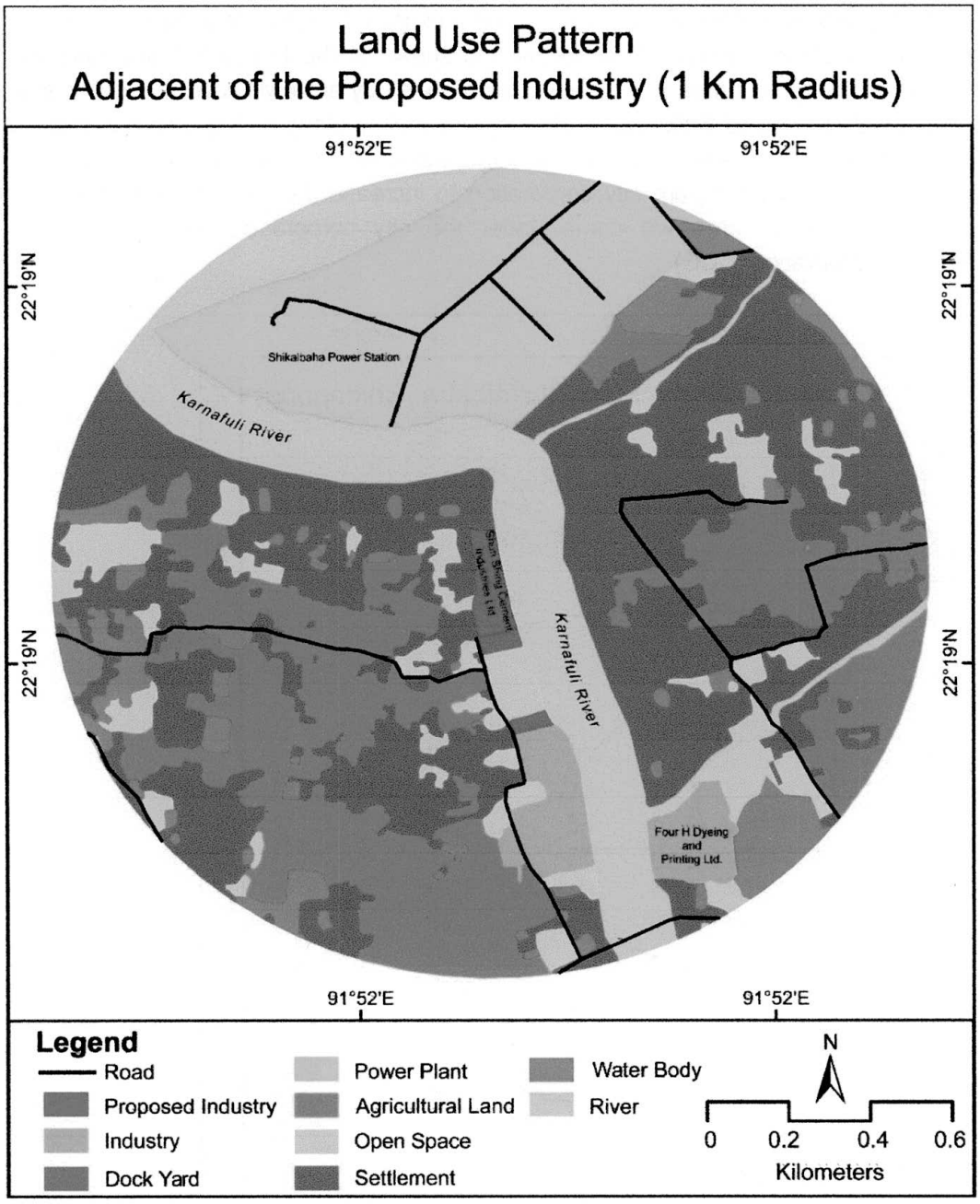


Figure 3.2: Land Use Pattern adjacent of the project area

3.4 Plant Layout

The plant layout is presented below in Figure 3.3.

SL	Section Description
01	ECO Hopper for Clinker
02	Hopper for Slag / Limestone / Gypsum
03	Raw Materials Unloading Crane (E-Crane)
04	ECO Hopper (Future)
05	Raw Materials Unloading Crane (Future)
06	Clinker Silo
07	Slag & Gypsum Storage Shed
08	Limestone Storage and Feeding Silo
09	Slag & Gypsum Feeding Bin
10	Coal Storage Shed
11	Pneumatic Fly ash Unloading System (Future)
12	Fly ash Storage Silo (Future)
13	Coal Grinding Mill
14	Cement Silo for OPC
15	Cement Silo for PCC
16	Hot Gas Generating System
17	VRM (180 TPH)
18	Process Equipment Section for VRM
19	Packing Machines
20	Truck Loading System
21	Jumbo Bag Packing System
22	Barge Loading System
23	Truck Weighing Bridges
24	Admin Office ,CCR & Lab Building
25	Central Store
26	Water Pump and Water Circulating System
27	Workshop
28	33 / 11 KV Electrical Sub-station
29	33 / 11 KV Transformer
30	Main Entrance & Security Post.
31	Compressed Air Station
32	Fire Hose Cabinet (13 Nos)
33	Green Area = 2,670.00 Sqm = 13.20 % of Total Land

Note:-Total Land Area= 5 Acre
= 4046.83 X 5
= 20,234.15 Sqm

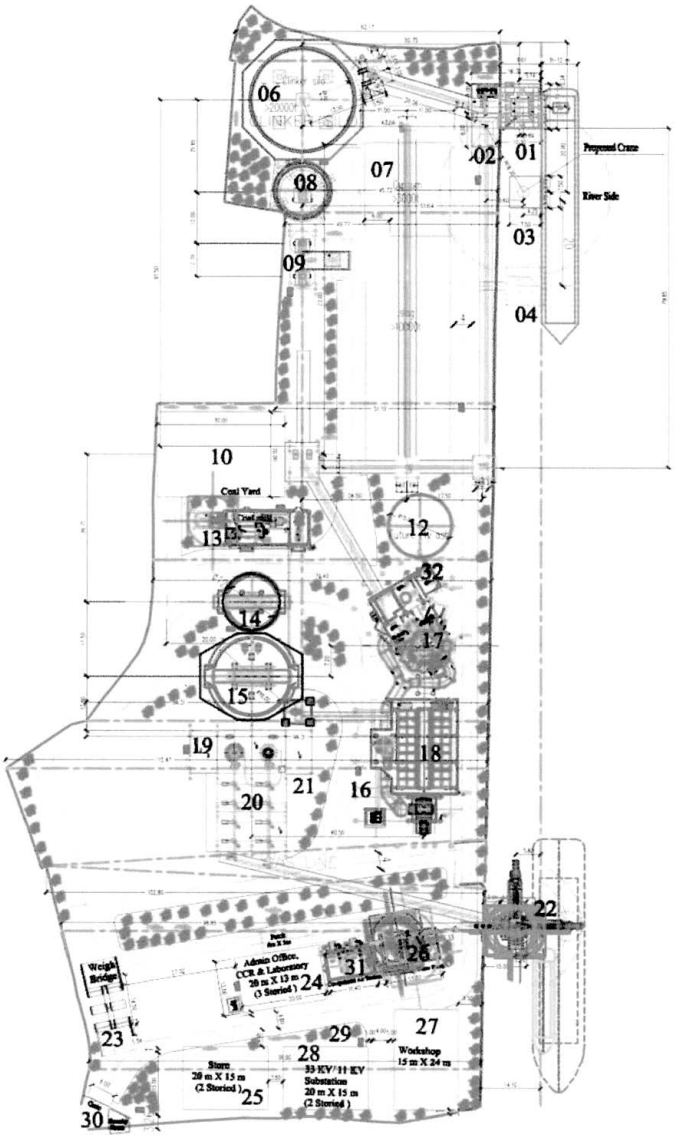


Figure 3.3 The plant layout

3.5 Present Status of the Project

The present status of the project is construction phase. The commercial production will be started in December 2019.

The basic data on Shun Shing Cement Industries Ltd. are furnished in Table-3.2

Table 3.2 Basic Data on Shun Shing Cement Industries Ltd.

Sl. No	Topic	Information
1	Name of the project	: Shun Shing Cement Industries Ltd. (SSCIL)
2	Project proponent	: Mohammed Ali Pasha
3	Project Location	Village- Shikalbaha, District- Chattogram. Within a distance of 13 km from Chattogram City. This Factory on the Bank of River Karnafuli.
4	Office Address	: Land view (7th & 9th Floor), 28 Gulshan North C/A, Dhaka 1212.
5	Contact Person with Address	: Mohammed Ali Pasha, Shun Shing Cement Industries Ltd, Shikalbaha, Karnafuli, Patya, Chattagong
6	Final Product	: Seven Rings Cement (Portland Composite Cement), Seven Rings Special (Portland Composite Cement), Seven Rings Gold (Ordinary Portland Cement)
7	By Product, if any	: None
8	Plant Capacity	: 900,000 MT Per Year
9	Major Raw Materials	a. Clinker, b. Gypsum c. Fly Ash d. Lime Stone e. Slag
10	Other material	: a. Grinding Media, b. Empty Bag (50 Kg Packing)
11	No. of Employees	: 250
12	Project Cost	: 2384.24 Million Taka (BDT)
13	Electricity (Operation Load)	: 7.5 MW
14	Water Requirement	: 100 m^3 Per Hour
15	Gas Requirement	: 50,000 m^3 Per Day
16	Total Land	: 5 Acres

3.6 Cement Manufacturing Process in Bangladesh

Grinding of clinker with the admixture of gypsum is the main process activities associated with the manufacturing of cement. The major operation for the manufacture of cement would involve-

- Collection of cement clinker, gypsum, fly, slag and limestone

- Storage of cement clinker, gypsum, fly ash, slag and limestone
- Blending the clinker with gypsum, fly ash, slag and limestone as per requirement
- Grinding
- Cement storage in cement silo
- Cement packing
- Dispatching of packed cement

As the plant side is on the side of the Murari canal, the project would have a jetty for unloading the clinker from barges. Clinker will be imported in ships and therefore unloaded to barges, which will carry the clinker to the jetty. Clinker from the barges will be unloaded by conveyors into a covered conveyor belt, which will carry the clinker-to-clinker storage shed. Rock/natural gypsum will be imported from Thailand, UAE, Oman etc. and will be taken to factor to jetty by small barges after unloading and Chattogram port from his Mothers vessel.

Depending upon the design, a pneumatic pump or bucket elevator will be used to lift the cement from grinding mill to cement silo top. RCC silos will be used to store cement.

The flow chart diagram attached with this report describes the manufacturing process. Belt and bucket elevators to the respective hoppers will convey clinker and gypsum from the storage. From these two hoppers desired proportion of both clinker and gypsum will be fed into the grinding mill for blending. Grinding mill, the basic equipment, is complemented by a number of additional sets e.g. dedusting, feeding and weighing equipment. The mill will be equipped with automatic control of the mill charging. The individual component materials to be ground i.e. clinker and gypsum pass over the feeder weigher into the two compartments tube mill where successive grinding is carried out. Ground materials pass over the distributing equipment into the bucket elevators. The air separator separates the ready product from the pulse mesh fractions. Grits return back through a classifier into the mill and grinding circuit is thus closed the closed-circuit system has the advantage over open circuit system in that the products from closed circuit system are finer and more homogenous in terms of particle size.

A pneumatic pump to the top of the cement silos will lift the cement from the grinding mill where cement will be stored by air slides. RCC silos will be used for storage of cement.

3.7 Manufacturing Process Used By SSCIL

The entire production process has 05(five) major departments as below:

1. **Raw materials (Clinker, Gypsum, Limestone, Slag, Coal) unloading & conveying and storage**:

The materials are unloaded by the world-renowned E-Came brand hydraulic equilibrium cranes and then transported to the respected storage location through ECO-Hopper, belt conveyors, bucket elevator, tripper car. As coal will be used in this grinding plant for Hot Gas generation so, facilities of unloading coal from Jetty has been kept. 2000 MT coal storage shed also been considered in the plant design.

In this system there is 1-Φ24 X 42.75 m clinker silo, having storage capacity 20,000 MT. The clinker extraction as well as weighing system is from the bottom of the clinker silo and is transported to the grinding section (Annexure-2) through rod gates, sector gates, belt conveyors and bucket elevator.

The additives storage [covered steel shed] shed total capacity is considered 14,000 MT and Wheel Loader is considered for taking additives from shed to raw materials proportioning station. Separate storage area for slag (10000 MT) and gypsum (4000 MT) has been considered. However, limestone (3000 MT) storage will be in a silo. The flow sheet of this department given as Annexure-1

2. Fly ash unloading, conveying, storing and feeding [Future provision]:
The fly ash unloading and conveying system is Pneumatic. The fly ash storage capacity is 3000 MT and the silo size is considered Φ15 X 32 m. Required process and non-process bag filters are considered in the system. For better extraction, aeration system is set in the bottom part of the fly ash silo. The air supply for air inflation is provided by roots blower through air inflation pipelines and valve system.

The feeding of fly ash is to mill [VRM] by weigh feeders via air slides, pneumatic flow control valves and bucket elevator. The flow sheet of this section given as Annexure-3.

3. Mill feeding system/Raw Materials Proportioning system

Clinker proportioning [by weigh feeders] will be underneath the clinker silo. Limestone proportioning [by weigh feeders] will be underneath the limestone silo. For gypsum and slag, two intermediate feeding bins are considered and proportioning system [by weigh feeders] will be installed under the feeding bins. According to the proportion set by the given cement type, these materials are transported to the vertical mill by belt conveyors. The flow sheet of this section given as Annexure-2

4. Cement Grinding system and cement storage

This system uses the Loesche- Germany make Vertical Roller Mill (VRM having model: LM 53.3 +3 CS as the Grinding mill. The inlet of the mill locks air by the Rotary Air Valve [RAV].
The mill has capacity 180 TPH @ ≥4000 cm2/g for Portland Composite Cement (PCC) with 40 % clinker, 50 % slag, 4 % gypsum and 6% limestone. This mill can handle 15 % moisture. The mill is designed for using 11 % fly ash also.

After proportioning, the cement raw materials are delivered by belt conveyors, magnetic separator, metal detector and pneumatic three-way valve, the materials without iron materials are delivered to the vertical cement mill for grinding, and the one with iron materials are delivered to the reject bin. The cement raw materials are crushed/grind in the mill and dried and sorted by inbuilt separator/classifier. The coarse powder is returned to the grinding table for regrinding and the qualified finished product along with the gas out of mill is collected through bag filter and passed through air slide conveyor entered into the cement silo via bucket elevator. The gas coming out of bag filter, after passed through circulating fan, a part of the gas

re-enters into the atmosphere. Hot gas generator with bituminous coal as fuel is served as the auxiliary heat source.

Part of the coarse powder, which was grinded in the cement mill, discharges from the slag-drip opening, and after pass through belt conveyor, and bucket elevator and belt conveyor, and then the coarse powder will be grinded in the vertical cement mill once more or into the reject bin; the rejected materials will be de-ironed by magnetic separator before it returns to the vertical mill. After passed through slide gate, belt conveyor, metal detector and electric three-way valve under the bin, the iron-free materials in the reject bin enter into bucket elevator and belt conveyor and then collectors. An axial flow fan is set at the bottom of each silo as to ventilate space of the silo bottom.

There are 02(two) cement storage silos in this project. PCC silo storage capacity is 8000 MT and OPC silo storage capacity is 2000 MT.

Cement will be stored into cement silo. During packing, cement will be taken into packing machines by a set of flow control gate, air slides, bucket elevators, vibrating screen and a constant volume bin. The cement mill is connected to each cement silo. Each cement silo is connected with each packing machine. The flow sheet of this section given as Annexure-4

5. Cement packing & bag cement dispatching to trucks and barge loading:

Packing plant involves 2 rotary packer unit consisting each 8 nozzles, the 8 nozzles rotary packer unit having each capacity of 120 t/h (2400 bags per hour).

Cement coming from silo is conveyed by bucket elevator into vibration sieve to remove the foreign particles and discharged to constant volume bin (equipped with load cell). Under constant volume bin there is a set-up of manual gate valve and packing feeder (pneumatic flow control gate). Packing feeder is controlled by level indicator of the packing machine to ensure that the stable material level in constant volume bin and packing machine. The 8 nozzles rotary packer unit is driven by 8 impeller motors. The filled-up cement bag is pushed to bag receiver, bag trimmer and bag cleaner, through serial of belt conveyors to bag loader for truck delivery or to the jetty for cargo delivery.

In packing plant there are 2 bag filters to collect dust, the collected dust together with dust leaked and collected in packing line would be conveyed by screw conveyor into bucket elevator and back to packing machine.

The packed cement will be loaded to trucks/river vessels by truck loader/barge loader. The capacity of each packing machine will be 120 tons per hour [2400 bags per hour @ 50 kg bag]. There will be four packing machines in SSCIL. The bagged cement transported by belt conveyors to the jetty where a barge loader [Yuntian Machinery Co -China make] is set to loading the bagged cement to the river vessels. The flow sheet of this section given as Annexure-5

3.8 Plant Process Flow Diagram

The plant production process flow diagram of Shun Shing Cement Industries Ltd. (SSCIL) is presented below in Figure 3.4.

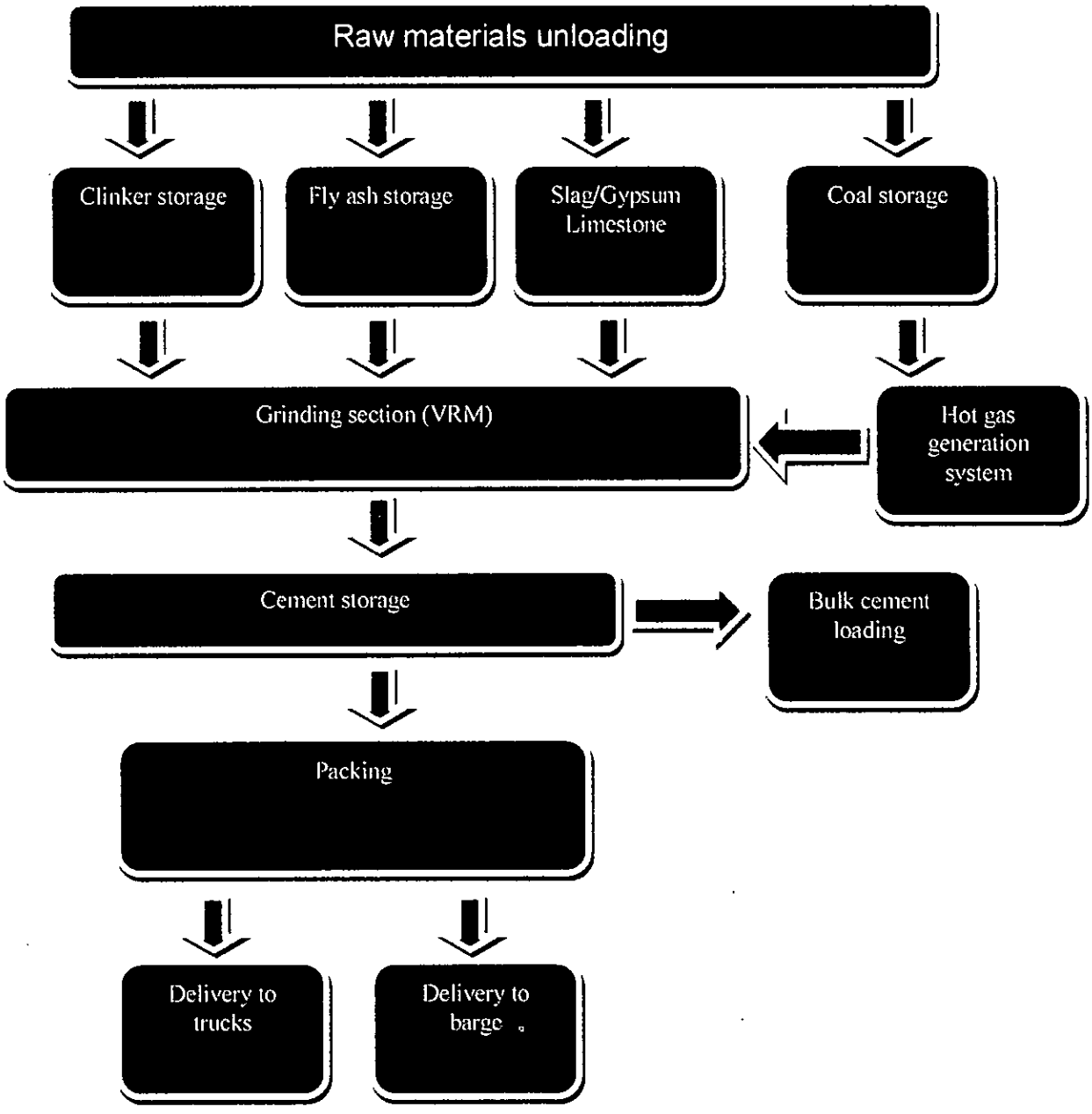


Figure 3.4 Plant Process Flow Diagram of Shun Shing Cement Industries Ltd. (SSCIL)

3.9 Rationale for the Project

It is a well-known fact that the rate of development keeps growing as is evidenced by the multi-billion development projects being undertaken in Bangladesh such as infrastructural and housing developments. The construction of such humongous developments needs readily available construction materials in large quantities. Such materials include cement and cement products. As per requirement of cement form construction and infrastructure development production of cement in the Chattogram area is less. The proponent intent to produce a part of the cement requirement in this area and hence the project involves of 180 TPD cement production facilities. The conceived project is designed to satisfy the current and future development trends' demands of Cement in the country which is critical for Industrial development and attainment of flagship projects under the government vision 2021 middle income and 2040 as a developed country.

3.10 Pollution Sources

Pollution Source of the Cement Industries
The pollution source of the cement industry is following

1. Dust emission: Dust will be emitted from grinder when grinding process run and dust will be produced from loading and unloading of raw materials.
2. Noise pollution: Many machineries will be produced a continuous noise pollution in this industry. There will be engine, generator or mill.
3. Sanitary waste: Sanitary waste will be produced from toilet and it will be depended on the number of workers or mother staffs. Sanitary waste will increase the presence of coliform bacteria which is a main cause of diarrheal disease in Bangladesh.
4. Spent lubricating oil and grease generate from engine moving parts
5. Solid waste from the plant and kitchen.

SECTION-4: EXISTING ENVIRONMENTAL CONDITIONS

4.1 General Consideration

Baseline condition of environment states the present states of different components of environment in absence of the project. The main objectives of

- To examine the present environment and to provide an environment baseline against which potential impacts from construction and operational phases of any project can be compared.
- To establish a baseline for parameters such as air and water quality to ensure that any problem arising from existing sources are not erroneously attributed to the project under the study.

In the present study the different environmental components examined for setting baseline conditions of the project area, are physico-chemical, biological and socio-economical.

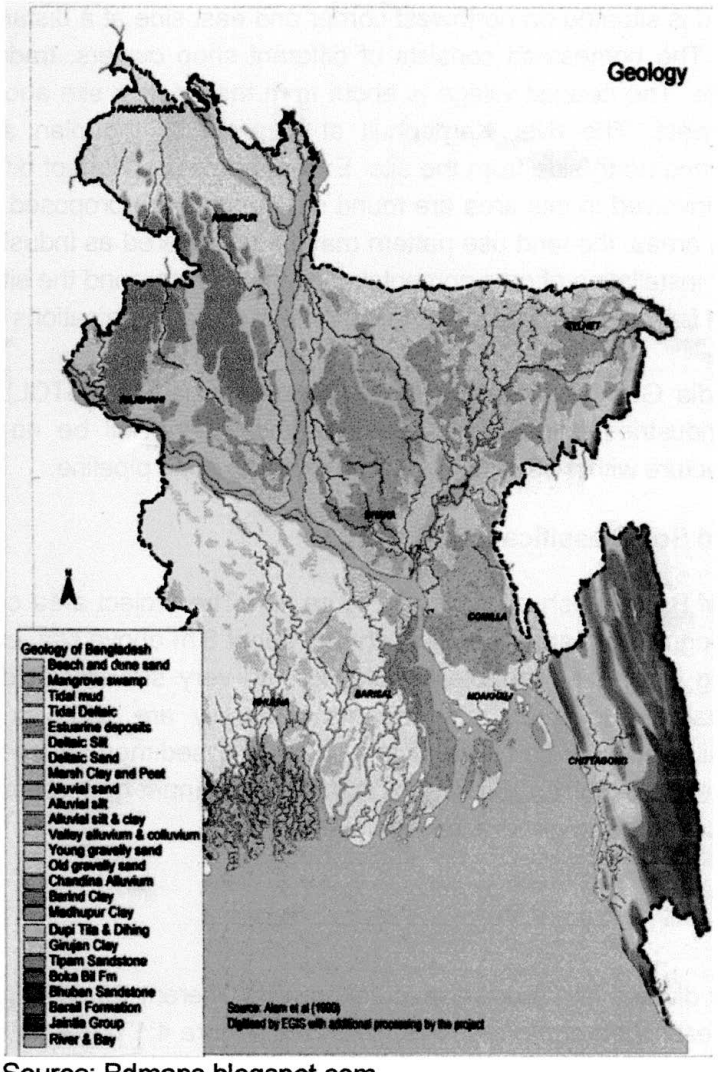
4.2 Physico-Chemical Environment

4.2.1 Topology, Geology and Soil

Bangladesh is a small country; it has considerable topographic diversity. It has three distinctive features: (i) a broad alluvial plain subject to frequent flooding, (ii) a slightly elevated relatively older plain, and (iii) a small hill region drained by flashy rivers. Elevation of the project location is 15ft.

As per Tectonic framework the project is located within the Calcareous and non-calcareous brown floodplain soil. Calcareous Brown Floodplain soils have cambic B-horizon that is predominantly oxidized, containing lime in the profiles. They comprise pale brown to olive brown, friable, loamy and clay soils occurring on the upper parts of ridges on the Ganges river floodplain and on the river bank of the Ganges tidal floodplain. Most of these soils belong to Calcaric Gleysols.

Non-calcareous Brown Floodplain soils occur largely on the Old Himalayan Piedmont Plain, mostly on the ridges. They also occupy minor areas in the Tista, Karatoya - Bangali, Jamuna and Old Brahmaputra floodplains, and in some western parts of the Ganges floodplain. These soils are non-calcareous and having Cambic B-horizon which is fully or predominantly oxidized. There are two kinds of soils in this group. One class belongs to deep soils with dark colored topsoil, occurring extensively on the Old Himalayan Piedmont Plains. Another class is mainly shallow soils, lacking thick dark colored topsoil occurring mainly outside the Old Himalayan Piedmont Plain. Most of these soils are Dystric/Eutric Gleysols or Cambisols.



Source: Bdmaps.blogspot.com

Map 4.1 Map showing geology of the project area Land use

4.2.1.1 Surrounding Land Uses

The Shun Shing Cement Industries Ltd. (SSCIL) is to be set up on at Shikalbaha of Karnaphuli thana. There is bus stand at west side of the project road which is about 13 km from Chattogram. The land is little bit low and will require about 2.0 m earth filling to develop it. The existing side is barren. And the surrounding is char land that become turns to be as industrial plots. The locality is surrounded from the site. There is the meeting point of river Karnaphuli at the adjacent to the site, which would be the water transport route. The total covered area of 5 acre of land, which has already been purchased by the company. There are other land use and projects like at the East side of the project is Karnaphuli river, settlement, agricultural land, North side of the project Karnaphuli river, power station, South side of the project is dockyard, public road, scattered settlement, open space, Four H Dyeing and Printing Ltd. and West side is public road, agricultural land, scattered settlement, S. Alam Cement Limited, S. Alam Vegetable Oil Limited, Modern Polymer Industries Limited.

The nearest homestead is situated on northwest corner and east side at a distance of 0.34 km from the existing site. The homestead consists of different shop owners, trader's temporary dwellers around the site. The nearest village is about from the existing site about 1 km at the Southwest and Northwest. The river Karnaphuli at adjacent to the plan area and river Karnaphuli in the east and north side from the site. Except a few numbers of different types of trees, no forestland is involved in this area are found surrounding the proposed site. From the nature the surrounding areas, the land use pattern may be considered as industrial and mixed area. There is no other installation of environmental concern exists around the site. The site will enjoy all infra-structural facilities like, electricity, telephone, road communications etc.

Gas pipe line: A 12" dia Gas Transmission Company of Bangladesh (GTCL) gas pipe line passes through the industries followed by river crossing. There will be no activities and construction of any structure within 30 m both side along the existing pipeline.

4.2.1.2 Land Form and Soil Classification

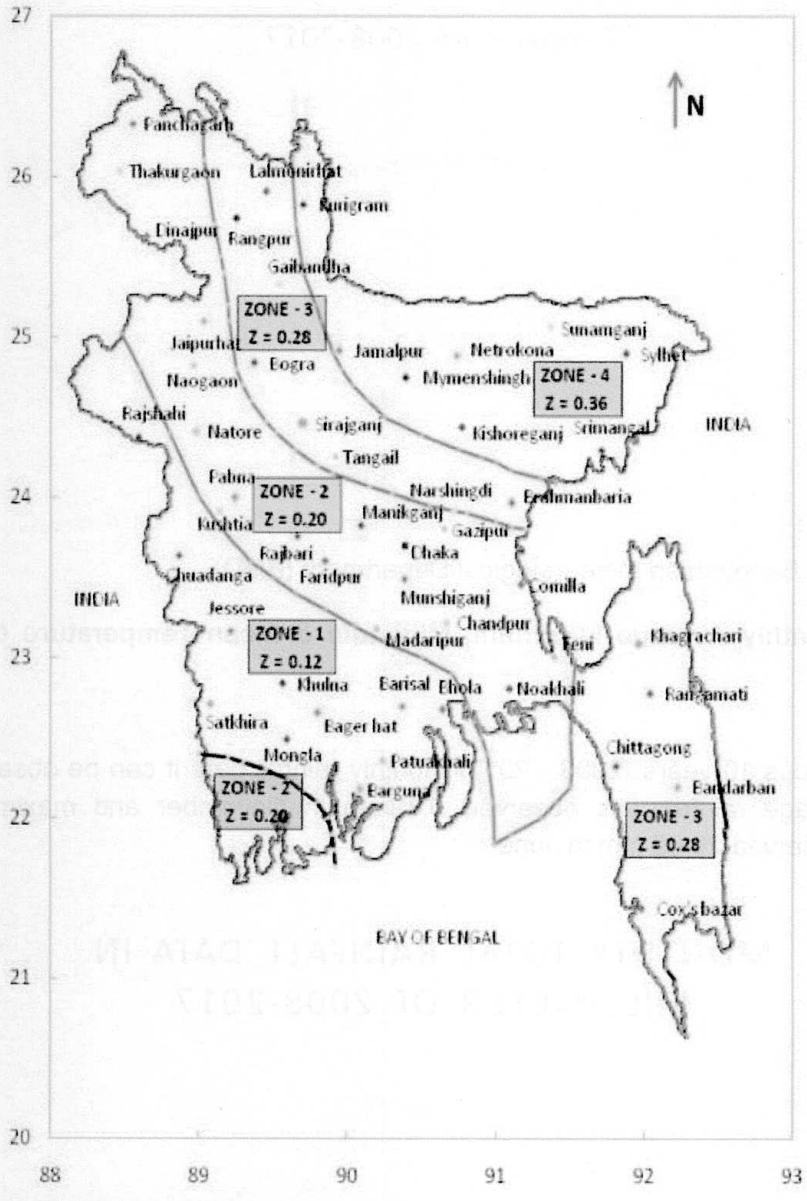
The general geology of Bangladesh is shown in Figure 4.1. The project area comprises flood plain in the general Geographic map of Bangladesh and about 8 m above sea level. The soil is yellow-brown to strong brown, permeable, friable, loamy; very strongly acidic and low in moisture holding capacity. However, soil patterns generally are complex due to local differences in sand, silt and clay contents of the underlying sedimentary rocks and in the amount of erosion that has occurred. Brown soil is the predominant general soil types of the area. Organic matter content and general fertility level are low.

4.2.2 Seismology

The country has been divided into four seismic zones with different levels of ground motion. Table 4.1 includes a description of the four seismic zones. Figure 4.1 presents the boundaries of the four seismic zones and the project location. The project located in seismic zone 2, which is a moderate seismic zone. Seismic zone coefficient of zone 2 is 0.20 and seismic zone coefficient of Barisal is 0.20.

Table 4.1 Seismic Zones of Bangladesh

Seismic Zone	Location	Seismic Intensity	Seismic Zone Coefficient, Z
1	South-western part including Barisal, Khulna, Jessore, Rajshahi	Low	0.12
2	Lower central and North-western part including Noakhali, Dhaka, Pabna, Dinajpur as well as south-western corner including sundarbans	Moderate	0.20
3	Upper central and north-western part including Brahmanbaria, Sirajganj, Rangpur	Severe	0.28
4	North-western part including Sylhet, Mymensingh, Kurigram	Very Severe	0.36



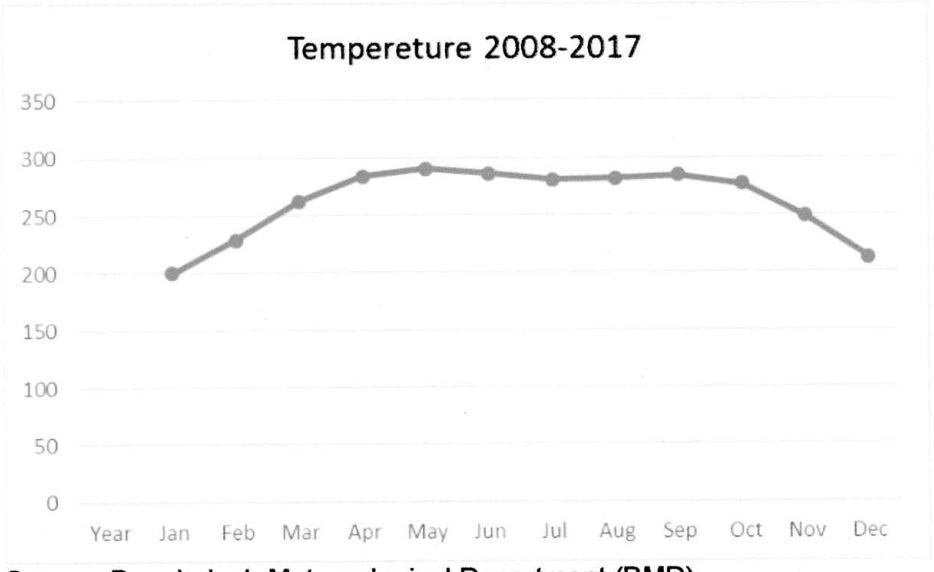
Source: Bdmaps.blogspot.com

Figure 4.1 Seismic Characteristics of the Project Location

4.2.3 Meteorology

Temperature

From the previous 10 years (2008 – 2017) monthly temperature data it can be observed that the minimum temperature was observed 18.7 degree centigrade in January of 2013 and maximum temperature 30.0 degree centigrade was observed in April 2014.

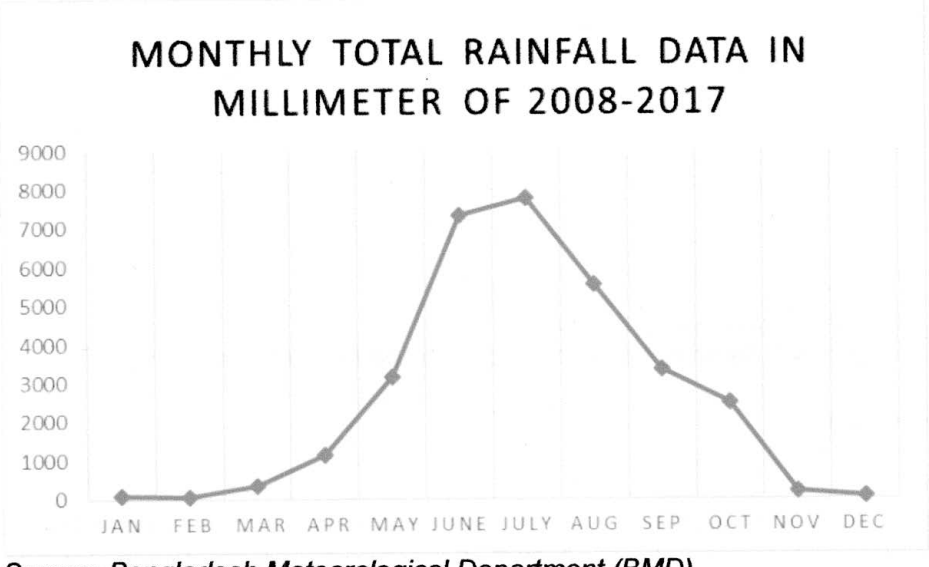


Source: Bangladesh Meteorological Department (BMD)

Figure 4.2 Monthly Average Maximum, Minimum & Mean Temperature during 2008-2017

Rainfall

From the previous 10 years (2008 - 2017) monthly rainfall data it can be observed that the minimum average rainfall was observed 0.19mm in November and maximum average rainfall was observed 28.59 mm in June.

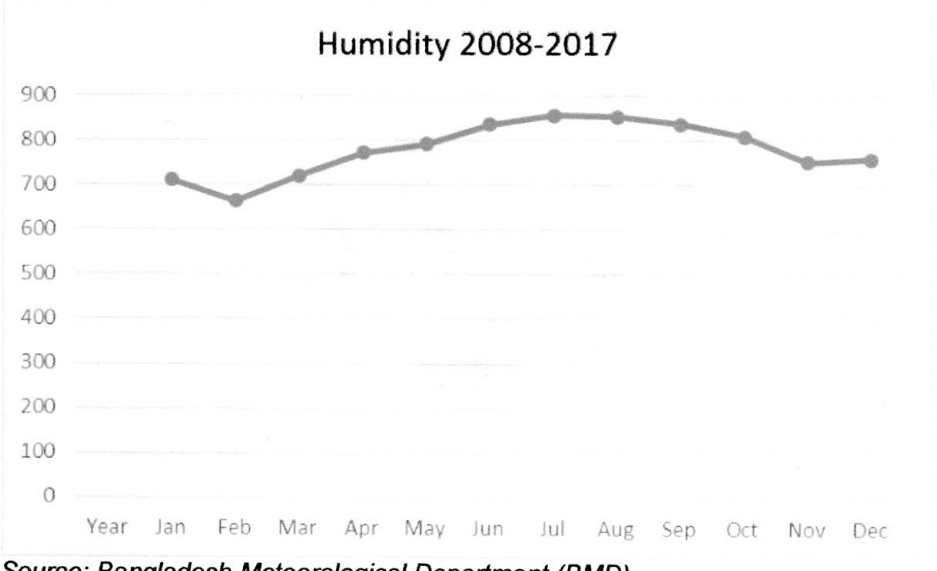


Source: Bangladesh Meteorological Department (BMD)

Figure 4.3 Monthly Average Rainfall Pattern during 2008-2017

Humidity

From the previous 10 years (2008 – 2017) monthly humidity data it can be observed that the minimum average humidity was observed 19.00mm in March and maximum average humidity was observed 60.1 mm in July.

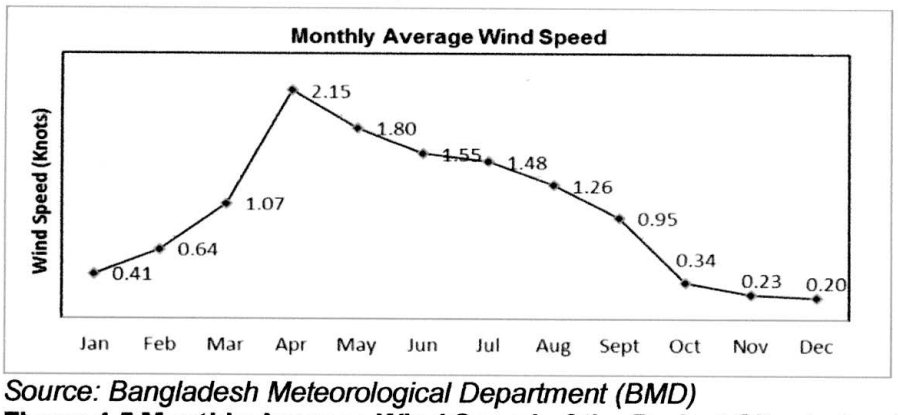


Source: Bangladesh Meteorological Department (BMD)

Figure 4.4 Monthly Average Humidity of the Project Site during 2008-2017

Wind Speeds and Wind Directions

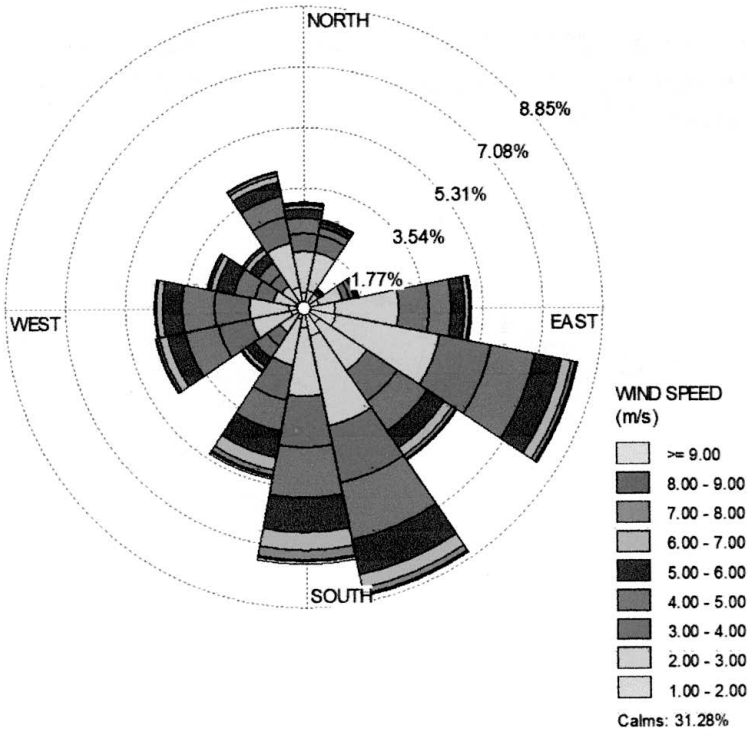
From the 10-year's average maximum wind speed in Barisal station is 2.15 knots and the 10-year's average minimum wind speed is 0.20knots. Figure 4.5 shows the monthly average wind speed of Rajshahi station for the years 2008 to 2017, and is assumed to reflect the project corridor conditions.



Source: Bangladesh Meteorological Department (BMD)

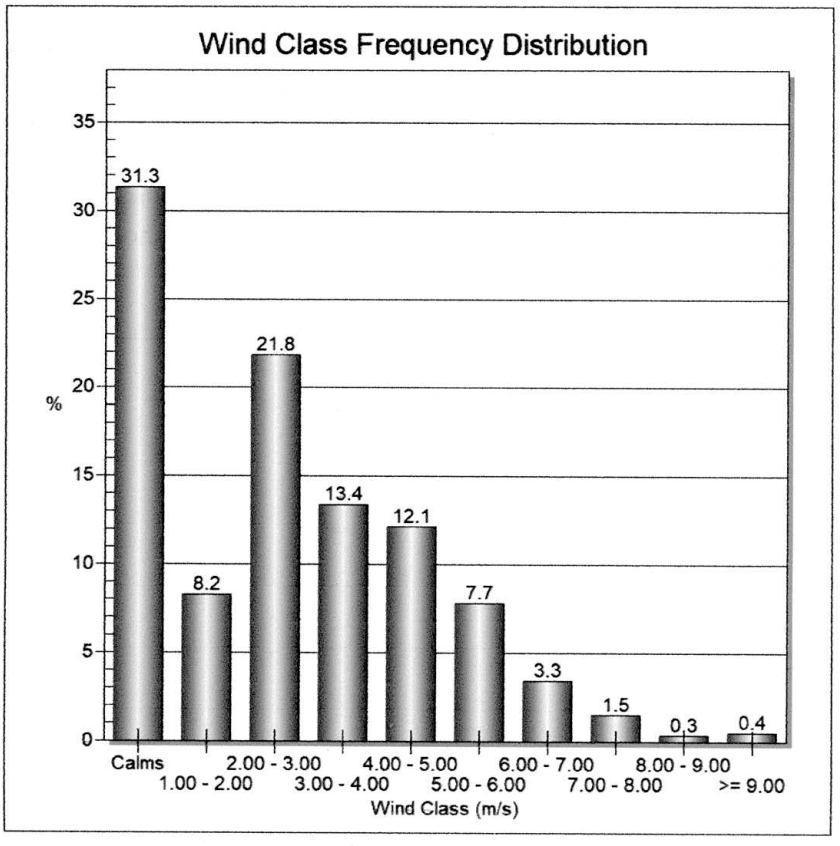
Figure 4.5 Monthly Average Wind Speed of the Project Site during 2008-2017

The wind rose for Chattogram generated using the data of the Meteorological Department of Barisal (Figure 4.6) shows average wind directions and speeds for different periods of a year. The yearly average wind rose shows that the prevailing wind direction is south direction during most of the year.



Source: Bangladesh Meteorological Department (BMD)

Figure 4.6 Monthly Maximum Wind Speeds & Directions in Wind Rose Plot 2008-2017

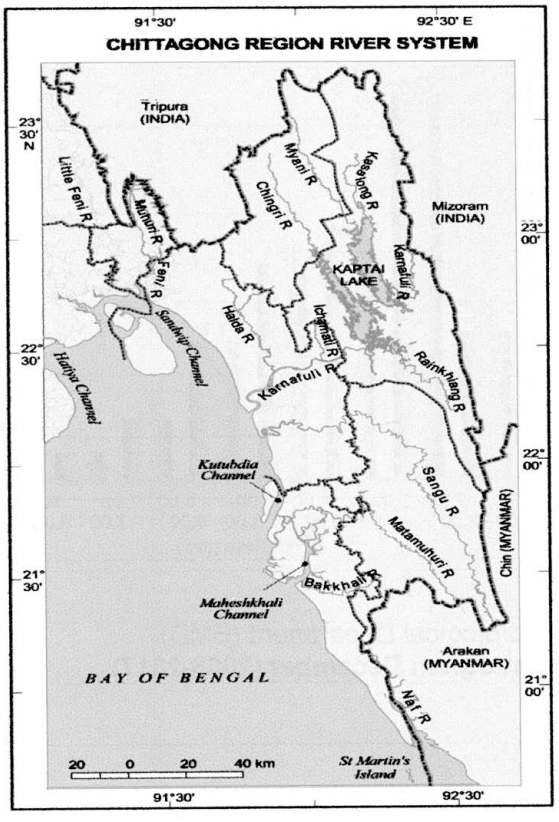


Source: Bangladesh Meteorological Department (BMD)
Figure 4.7 Wind Class Chattogram December (2008-2017)

Hydrology

Karnaphuli river the largest and most important river in the project area and the Chattogram hill tracts, originating in the Lushai hills in Mizoram State of India. It travels through 180 km of mountainous wilderness making a narrow loop at Rangamati and then follows a zigzag course before it forms two other prominent loops, the Dhuliachhari and the Kaptai. The Rangamati and the Dhuliachhari loops are now under the reservoir of the Kaptai earth-filled dam. The hydroelectric dam is situated just before the entrance of the river into the Kaptai loop. After coming out from the Kaptai loop the river follows another stretch of tortuous course through the Sitapahar hill range and flows across the plain of Chattogram after emerging from the hills near Chandraghona. Therefore, the river drains into the Bay of Bengal cutting across several hill ranges, viz the Barkal, Gobamura, Chilardak, Sitapahar and Patiya of the Chattogram Hill Tracts and Chattogram. It has possibly maintained its older course keeping pace with the uplift of the hill ranges and can be classified as an antecedent river. The Karnaphuli is narrow and straight from Prankiang to Waggachhari along Kaptai-Chandraghona road. The straightness of the river is probably due to a fault, which controlled the channel from Prankiang to Wagga. The main tributaries of the Karnaphuli are the Kasalong, Chengi, Halda and Dhurung on the right and the Subalong, Kaptai, Rinkeong and Thega on the left.

Flowing to the west through Rangunia upazila and then keeping Raozan upazila on the north and Boalkhali upazila on the south, it receives the waters of the Halda river at Kalurghat just above the railway bridge. It then turns south, receives the waters of the Boalkhali and other khals and turns west circling round the eastern and southern sides of Chattogram Town. From the extreme corner of the Chattogram port to the west, it moves southwest to fall into the Bay of Bengal 16.89 km below. It is navigable throughout the year by sea-going vessels up to Chattogram Port and by large boats, shallow draughts and all sorts of freighters and launches up to Kaptai River in the Hill Tracts. River system in the project area is shown in Map 4.2.



Source: Bdmaps.blogspot.com

Map 4.2 River system in the project area

4.2.4 Water Quality

4.2.4.1 Surface water

The Murari canal beside of the plant is mainly used for navigation purposes. The river is only water-route for the Chattogram ports activities. The Murari canal has mixed water used. Beneficial water uses are primarily for riverain fishery and irrigation. It is also widely used for industrial water supply. Regarding pollution load concern, Murari canal receives discharge from all the industries situated on the upstream and downstream that include fertilizer, cement, textiles, paper industries etc. A few of them have effective treatment plant. The Murari canal though not a fishing zone still contains various species of fishes and a number of fishermen earn their livelihood by fishing in this river. Active fishing prevails near the river mouth demonstrating the movement of migratory fishes.

Though cement plant does not produce any harmful liquid discharged, so the impact on water quality due to the implementation of the plant is almost negligible. Water quality of the Murari canal near the plant side has been analyzed and it appears the normal properties of Murari canal are significantly good. As the industrial and urban activities are concentrated at the bank of the river which contributing to the changes in the river water quality, most of which is due to community discharges.

Murari canal has no erosion effect during monsoon. Lean and wet season variation of water is not very considerable, but still the water volume is sufficient to ensure a good dilution effect. It should be mentioned here that carrying/assimilation capacity of a river depends on the river discharge, the present water quality and the total quality of effluent received by the river. Considering these, river has a good carrying capacity. Water Quality of Murari canal (Selected Parameters) is shown in Table 4.2.



Photo 4.1 Baseline Surface water monitoring

Table 4.2 Water Quality of Murari canal (Selected Parameters

Sl. No	Parameter	Unit	Concentration of Surface Water	*Bangladesh (DoE) Standard for Surface Water (ECR 1997, Schedule- 3-A)*
1	pH		7.6	6.5 – 8.5
2	Temperature	^{0}C	23^{0}C	NYS
3	DO	mg/L	7.2	≥5
4	BOD_5	mg/L	2.4	≤10
5	COD	mg/L	32	NYS
6	EC	µS/cm	1522	2250
7	*TDS*	*mg/L*	761	NYS

Source: Enviro Quality Lab

Note:

NYS - Not Yet Set

1. EC – Electrical Conductivity
2. TDS – Total Dissolved Solid
3. DO -Dissolved Oxygen
4. COD – Chemical Oxygen Demand

4.2.2.2 Ground water

The quality of the ground water in the vicinity of the proposed plant site would be representative of the quality. The ground water analysis has been done from the tube well near the project site and the result of found are given in the following Table 4.3.

Table 4.3 Results of Ground Water Parameters

Sl. No	Parameter	Unit	Concentration of Drinking Water	*Bangladesh (DoE) Standard for Drinking Water (ECR 1997, Schedule-3-B)*
1	pH		7.5	6.5 – 8.5
2	EC	µS/cm	1962	NYS
3	TDS	mg/L	981	1000
4	DO	mg/L	6.8	6
5	*COD*	*mg/L*	6.4	4

Source: Enviro Quality Lab

Note:

NYS - Not Yet Set

1. EC – Electrical Conductivity
2. TDS – Total Dissolved Solid
3. DO -Dissolved Oxygen
4. COD – Chemical Oxygen Demand

4.2.5 Air Quality

The practice of air quality impact analysis is of recent origin, even in the industrialist countries of the world. As a result, air quality impact analysis is a developing science. The analysis addresses the interaction of emissions, chemical changes, transport of pollutant species in the atmosphere, etc. the interactions of which are a complex subject. Various methods of impact analysis, especially the mathematical models for plume rise and atmospheric dispersion is being practiced. At the same time, many new models are being developed and the existing models improved to get more accurate results. However, the basic concepts of all models are procedures are to have an idea of the most problem impacts of the estimated emissions from the development projects on the surrounding air quality. But there is no such industrial installation near the site which can emit significant amount of toxic gases or particulate into the atmosphere. With this view, ambient air quality is given in the Table-4.4



Photo 4.2 Baseline ambient air quality monitoring

Table 4.4 Ambient Air Quality

Sl. No	Parameter	Unit	Location		Duration (hrs)	DoE (Bangladesh) Standard (Schedule-2)	Method of Analysis
			Middle of the project area	Near office			
1	PM_{10}	$\mu g/m^3$	148.64	122.44	8	150	Gravimetric
2	$PM_{2.5}$	$\mu g/m^3$	66.67	26.25	8	65	Gravimetric
3	SO_2	$\mu g/m^3$	< LOD	< LOD	8	365	West-Geake
4	NO_x	$\mu g/m^3$	26.70	35.60	8	100	Jacob & Hochheiser
5	CO	mg/m^3	0.00	0.00	1	35	Sensor

Source: Enviro Quality Lab

Note:

- During monitoring the day was sunny and the weather condition is good.
- Regular checkup and calibration of the equipment are done by the manufacturers and ECL personnel to avoid any error
- The LOD of SO_2 is 5 $\mu g/m^3$
- LOD = Lower Detection Limit
- During monitoring construction work was going on

1. $PM_{2.5}$ - Fine Particulate Matter
2. PM_{10} - Respirable Particulate Matter
3. NO_X-Oxides of Nitrogen.
4. SO_2 -Sulfure di Oxide.
5. CO – Carbon Monoxide

4.2.6 Noise Level

The most sophisticated machineries have been installed in Shun Shing Cement Industries Ltd. (SSCIL), which will produce little significant noise. The generator would have inbuilt silencer to reduce the noise level. 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 and they are given below. By analyzing all the data with Bangladesh Standards, it is very clear that there would be no sound pollution created by Shun Shing Cement Industries Ltd. (SSCIL). Ambient Noise Level data is shown in Table 4.5.

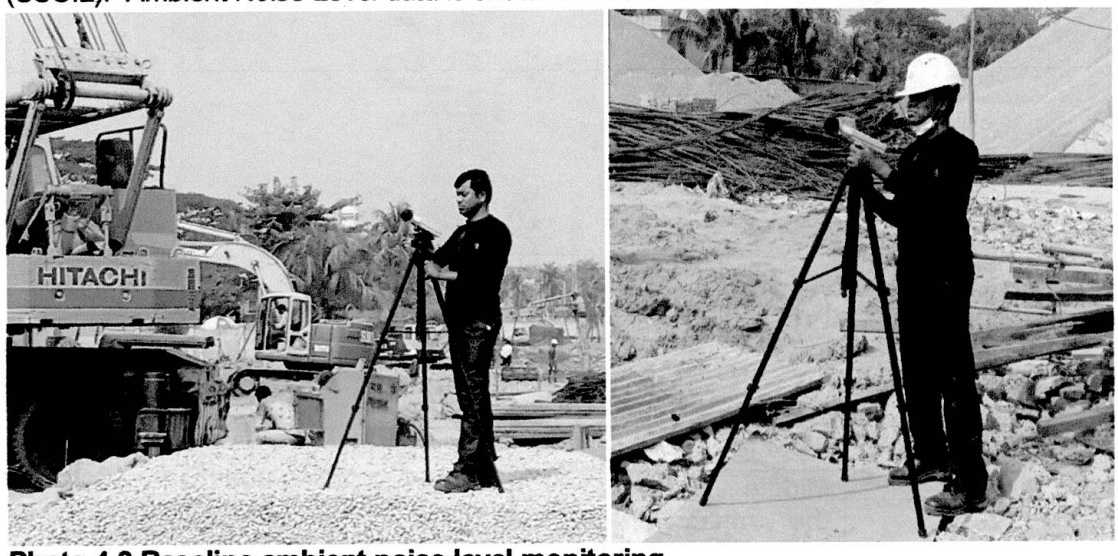


Photo 4.3 Baseline ambient noise level monitoring

Table 4.5 Ambient Noise Level

SN	Location	Day Time (6 AM-9 PM)	Night Time (9 PM- 6 AM)	DoE (Bangladesh) Noise Standard for Mixed Area (Schedule-1), Leq	
		Results in dB-A (Leq)	Results in dB-A (Leq)	Day Time (6 AM-9 PM)	Night Time (9 PM-6 AM)
1	Near Project Office	65.40	53.52	60	50
2	Middle Point of the Project	65.19	57.72	60	50
Method/Instrument				Sound Level Meter Model: SL – 4033SD	

Source: Enviro Quality Lab

4.3 Biological Environment

4.3.1 Flora and Fauna

4.3.1.1 General Consideration

Forests, pasture lands, rivers, surface water and other water bodies etc. are the most important natural ecosystems. These are 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.

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). Faunal Species in the project area is shown in Table 4.6. and Floral species in Table 4.7. Fish Species in the Study Area is shown in Table 4.8. Those data gathered depending on the stakeholder's consultation during field visit.

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.

Table 4.6 Faunal Species in the project area

Sl. No	Scientific Name	English Name	Local Name
	Reptiles		
1	Crotalus scutulatus	Green rattlesnake	Galtoa shap
2	Varanus salvator	Water monitor	Guishap
3	Python molurus	Python	Ajogor
4	Chitra indicated	Turtle	Chitra katchap
	Amphibians		
5	Bufo bufo	Common Toad	Bang
6	Bufo melanostctus	Pond frog	Bang
7	Euphlyctis cyanophlyctis	Indian skipper frog	Bang
8	Lithobates catesbeianus	Bullfrog	Bang
	'Mammals		
9	Prionailurus bengalensis	Small cat	Chita biral
10	Prionailurus viverrinus	Fishing cat	Mecho bagh
11	Felis chaus	Forest cat	Bon biral
12	Vulpes bengalensis	Fox	Khekshyal
13	Canis aureus	Jackal	Shiyal
14	Harpestes edwarsi	Common mongoose	Bheji
15	Sciuridae	squirrel	Kat Biral
	Auropuncatus		
16	Mus booduga	Field Mouse	Idure
17	Pteropus Giganteus	Gaint Flying Fox	Boro Badur

	Bird		
18	Acridoth errestrisis	Martin	Shalik
19	Dicurus macrocercus	Black drongo	Fingry
20	Picnonotus cafer	Red-vented bulbul	Bulbuli
21	Cophychus saularis	Magpai	Doel
22	Orthotomus sutorius	Tailor bird	Tuntuni
23	Gracula religiosa	Pied moyna	Moina
24	Alcedo atthis	Common Kingfisher	Machranga

Source: Field visit & stakeholder's consultation

Table 4.7 Floral Species in the project area.

Sl. No	English Name	Scientific name	Local Name	Purpose
	Grass			
1		*Spontaneum*	Khar	Ful / Covering
2		*Saccharum*	Gash (kaichi Kash, Dubla etc.)	
3		*Cynondon dactylon*		Soil Binder
	Trees			
4	Bettle nut	*Areca Catechu*	Supari	Fruit
5	Lichi	*Lichi chinensis*	Lichu	Fruit
6	Mango	*Mangifera indica*	Aam	Fruit, Timber.
7	Date Palm	*Phoenix sylvestris*	Khejur	Fruit, Timber.
8	Jackfruit	*Heterophyllus*	Khatal	Fruit, Timber
9	Coconnut	*Cocos nucifera*	Narikle	Fruit, Timber
10	Papya	*Carica Papaya*	Pape	Fruit, Fuel
11	Gauva	*Psidium guajva*	Piara	Fruit,
	Wood Tree (Timber/Fuel wood)			
12	Shilkoroi,	*Shorea Robusta*	Shil kiroi	Fuel, Timber
13	Shimul	*Albizia procea*	Silk cotton	Fuel, Timber

Source: Field visit & stakeholder's consultation

Table 4.8 Fish Species in the Study Area

Sl. No	Fish Group	Scientifec Name	Local Name
1	Salmon	*Labeo Rohita*	Ruhi
2	Carp	*Cirrhina mrigala*	Mrigel
3	Carp	*Labeo calbasu*	Kalbous
4	Carp	*Catla catla*	Katla
5	Cat Fish	*Channa striatus*	Shoel
6	Clown knife fish	*Notopterous chitala*	Chital
7	Indian river shad	*Gudusi chapra*	Chapila
8	Cat Fish	*Mystus vittatus*	Tengra
9	Indian glassy fish	*Mene muculat*	Chanda
10	Tank goby	*Glossogobius giuris*	Baila
11	Indian potasi	*Pseudoutrpius atherinoidu*	Batashi
12	Snakehead	*Channa punctatus*	Taki
13	Crab	*Scylla serrata*	Kakra
14	Giant danio	*Danio devario*	Bashpata
15	Eel	*Mastacembelus armatus*	Bain

Source: stakeholder's consultation

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 area in Bangladesh. The important thing is their abundance. No endangered species have found according to the list of IUCN 2015 for Bangladesh in the project area.

The low-lying land is used as a drainage pattern in the area from west to east and this low land has joins up to the Murari canal. These low lands carry rainwater and runoff from various sources including industrial wastewater from a number of industries in the area and reach all discharge into the rivers that is adjacent to the project site.

The proposed 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.

4.3 Socio-Economic Condition

4.3.1 Background, Geographic Area and Location:

Chattogram District is bounded on the north by Tripura State of India, on the east by Khagrachhari, Rangamati and Bandarban Districts, on the south by Cox's Bazar District and on the west by the Bay of Bengal, Feni and Noakhali Districts. The total area of the district is 5282.92 sq. km. (2039.74 sq. miles) of which land area 3620.92sq. km. (1487.23 sq. km. agricultural land), forest area 111.98 sq. km riverine area 549.99 sq. km. and 1700 sq. km. (456.37 sq. miles) including coastal area. The district lies between 21°54' and 22°59' north latitude and between 91°17' and 92°13' east longitude.

4.3.2 Population and Social Structure

The population and housing census are the unique source of reliable and comprehensive data about the size of the population of the country, major socio-economic and socio-demographic characteristics. According to the 2001-population census, the total population of Chattogram district is 76,16,352 (Male-38,38,854 and Female-37,77,498), Sex ratio 102:100, Population Density 1442 sq. km. and annual growth rate is 1.40%. It is also a divisional headquarter. The district consists of 14 upazila and 12 thana, 194 unions, 985 mauzas, 1267 villages, 1 city corporation, 41 city ward, city mahalas 207, 10 Pourashavas, 90 wards and 199 mahallas. The Literacy Rate of Chattogram district is 58.90% (Male-61.10% and Female 56.70%). School attendance rate is 52.30% for 5 to 24 years age group.

The numbers of educational institutions of this district are university 3, medical college 2, Bangladesh institute of technology 1, govt. college 14, non-govt. college 121, college of physical education 1, teachers training college 1, regional public administration institute 1, polytechnic institute 1, homeopathy college 2, nursing institute 1, forest research institute 1, veterinary college 1, home economics college 1, Bangladesh military academy 1, vocational institute 1, law college 2, art college 1, marine academy 1, marine fisheries academy 1, cadet college 1, madrasa 395, govt. secondary school 12, non-govt. secondary school 698,

govt. primary school 1665, registered primary school 512, private (non-registered) primary school 208 and kindergarten school 1011. The numbers of religious institutions of this district are Mosque 7021, Tomb 220, Temple 992, Church 126 and Pagoda 126. There are 21 River, 232 NGOs, 14 Upazila Health Complex, 326 Community clinic, 215 Private hospital, 516 diagnostic centers.

4.3.3 Administrative/Geographic Unit

Shikalbaha is a union of Karnaphuli upazila consists of 5 Unions, 20 Mouzas, 35 villages. Total area is 54.32 sqkm. Distance from District Sadar 5 km. It is situated south of Chattagram City Corporation, West of Patia Uapzila, North of Anowara Upazila, and East of Bandar Upazila.

Housing and Household Characteristics: In the Upazila, there are 81,292 households. Distribution of household by type shows that there are 99.60% general unit 0.26 % institutional and 0.13% other unit.

Household Size: The average household size (General) for the Upazila is 4.5 persons, for rural
area the size is also 4.5 and for urban area the size is slightly lower i.e. 4.4.

Type of Housing *Structure:* In the Upazila, 6.9% general household live in pucca house, 22.1% in semi-pucca house, 692% in kutcha house and the remaining 1.8% live in jhupri.

Sanitation: In the Upazila, 37.93% of dwelling households use sanitary latrines and 51.08% of dwelling houses use non-sanitary latrines; 10.99% of households do not have latrine facilities.

Access to Electricity: All the 5 unions of the Upazila have brought under the Rural Electrification program. However, a total of 78.2% general household reported to have electricity connection in the entire Upazila in 2011 as against 55.2 % in 2001

4.3.4 Population Characteristics of Karnaphuli upazila

Area 136.59 sq km, located in between 22'11' and 22'24' north latitudes and in between 91'48' and 91'52' east longitudes. It is bounded by bakalia and chandgaon thanas and boalkhali upazila on the north, Anwara upazila and Bay of Bengal on the south, patiya and anowara upazilas on the east, patenga, kotwali, bandar and double mooring thanas and KarnaphuliRiver on the west.

Population:

Total: 179148; male 94472, female 84676, Muslim 166755, Hindu 10226, Buddhist 523, Christian 1526 and others 118.

4.3.5 Literacy and Education

Literacy: Average literacy 45.70%; male 50.30%, female 40.70%. Noted educational institutions: Ayub Bibi City Corporation School and College, Achhia Motaleb Rizia Nasrin

School and College, Shah Niamat (R) Grammar School, Ureka Shishu Niketan, Char Lakshya Sirajul Munir Waijunnur Gauchhia Dakhil Madrasa, Marine Academy, Bangladesh Fisheries Academy.

In the Upazila Government Primary school 34 nos, Non-government primary school 30 nos, Junior high 3 nos, High school 35 nos. Girls high school 1 no, Madrasa 5 nos, College 2 2nos. Literacy rate 80.5%

4.3.6 Living and Cultural Standard

The study area is connected to Cox'sbazar-Chattogram Highway 13 km South from Chattogram city and 2 km West from Cox'sbazar-Chattogram high way. The transportation facilities are available in the study area. The connecting roads are generally pacca and remaining is the kacha road. The river Karnaphuli flows adjacent with the project at north and west site. All kind of boats and vessels move over those rivers also a major transportation of the local people. Other type of vehicles running on the local roadway and lightweight vehicles like scooter, cars, and rickshaw van are running on both the roadway.

Sources of income: Agriculture 18.04%, non-agricultural laborer 10.09%, industries 0.73%, commerce 17.25%, transport and communication 6.66%, service 19.25%, construction 2%, religious service 0.57%, rent and foreign remittance 4.91 and others 20.08%.

BRAC and Mamata are the two major NGO are working in the area for social development. Most of the women are involving in brittle nut cutting for selling in the market.

4.3.7 Agriculture

According to the 2008-09 agricultural censuses the study area of this area agriculture 18.04%, non-agricultural laborer 10.09%, industries 0.73%, commerce 17.25%, transport and communication 6.66%, service 19.25%, construction 2%, religious service 0.57%, rent and remittance 4.91 and others 20.08%.

Rice is still the dominant crop in this area and most of the lands are under paddy cultivation for a least a part of the year. Oilseeds, vegetables and other seasonal crops are the significant crops in this area. The low-lying areas, which remain under water for most of the time only, support the paddy cultivation. According to local people, the production capacity in the low-lying lands has decreased in recent years.

Fertilizers and pesticides are used, particularly on rice and vegetable, but in general, such use is at a fairly low level. Mechanization still plays small role in agriculture in this area, although many farmers spoken to during field visits and that they commonly used a combination of drought animals and hired-in mechanical cultivators for land preparation. Some of the villagers and semi-urbanites also practiced limited animal husbandry for the production of milk, eggs or meat. Animal kept includes cattle, goats, and poultry.

4.3.8 Public Health

The nearest Shikalbaha health complex with 50 beds is at a distance of about 10 km from the site. The hospital having all the facilities. Like outdoor, indoor department, emergency department, laboratory, EPI activity, X-Ray, ECG, TT and Dental facility.

4.3.9 Industries and Commerce

S Alam Group, Cheman Steel Limited, Weaving Factory of TK Group, Jobeda Steel Mills Limited, Sikalbaha Electric Station, Urea Fertilizer Factory, Kafco, Diamond Cement Factory, Korean EPZ, JB Oil Mills, JB Food Industries, Fish Processing and Dried Fish Factory and Madhumati Salt Industries.

4.4.10 Sources of drinking water

Limited pipe water supply for 2 hours at the morning and evening everyday are provided in word no 1, 2 and 3 of the 3 no Shikalbaha union porishod area. Rest of the area are used hand tube well, deep tube well water and other sources.

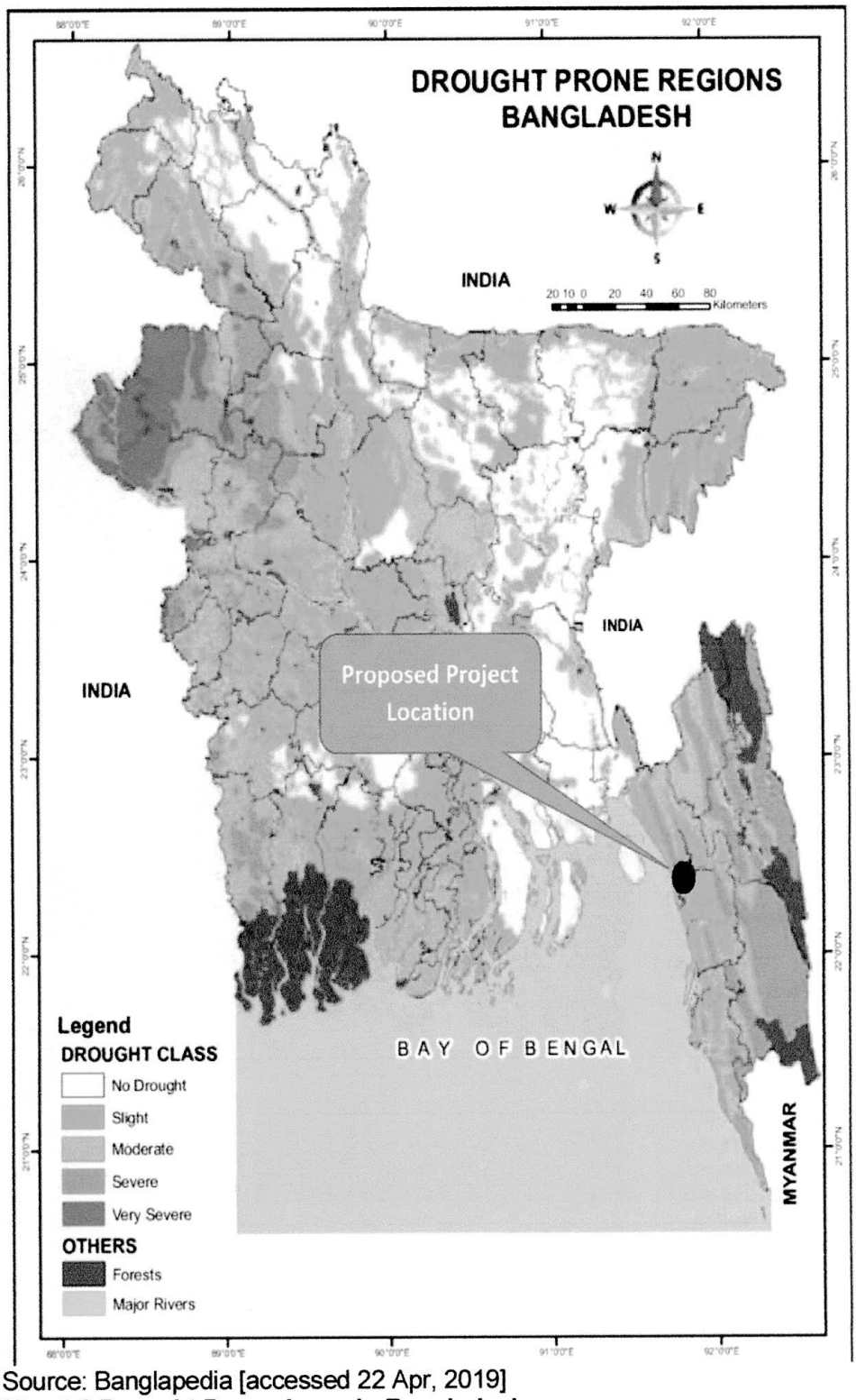
4.4.11 Drainage System

There is a small canal drain out all the rain water to the river. During excessive rain water are logged in the whole area and hamper the daily activities of the village people.

4.4.12 Water Stress

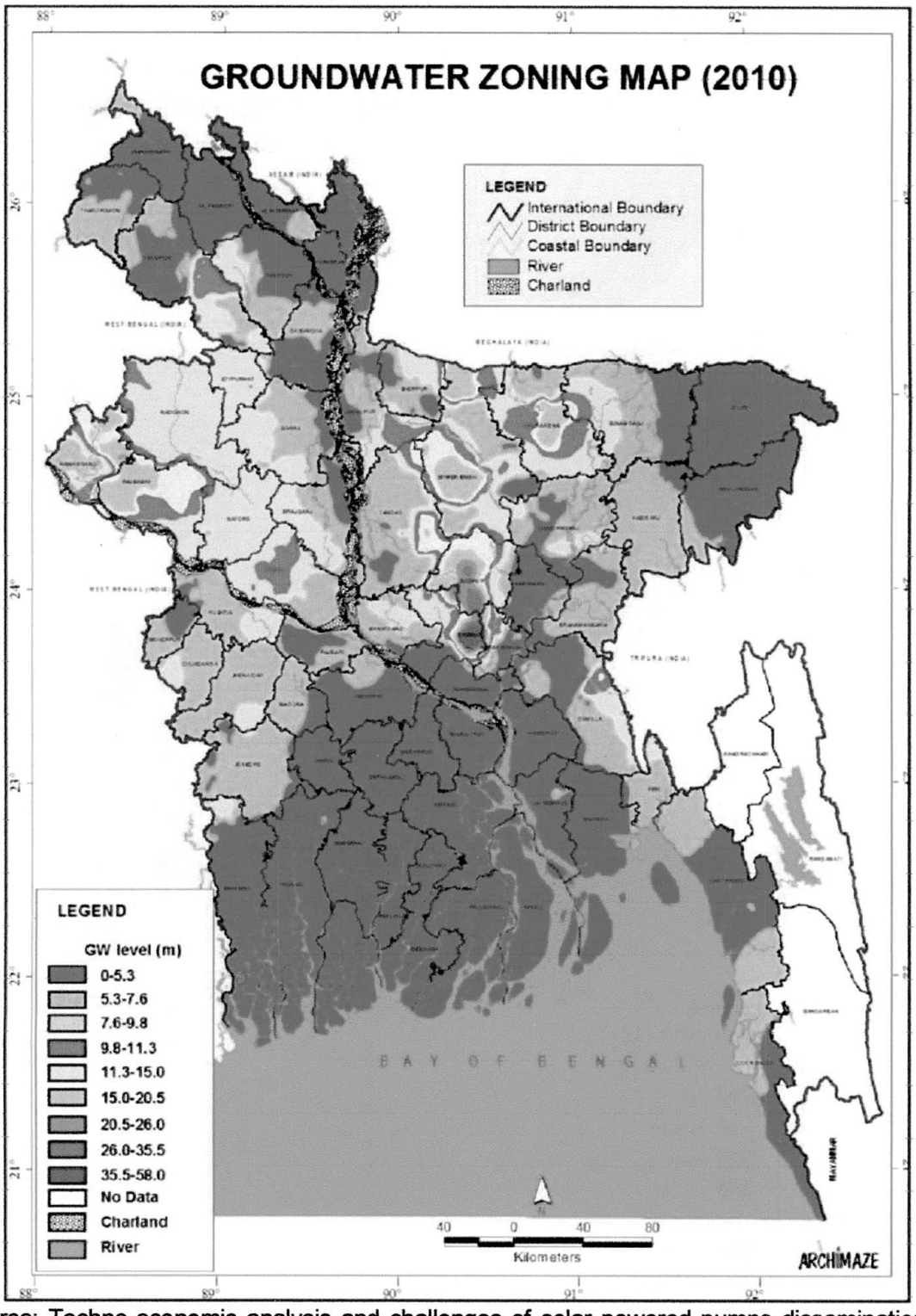
Bangladesh has one of the highest population densities in the world, with a population of 160 million living within 57,000 square miles. Of those 160 million people, 4 million lack safe water. Lack of access to safe water facilities in rural areas, overcrowded conditions, and a lack of healthy ways of disposing waste in urban centers, all contribute to the water crisis in Bangladesh.

Again, Draught is a problem in Bangladesh. It is common in the northwestern districts. Drought is a prolonged, continuous period of dry weather along with abnormal insufficient rainfall. It occurs when evaporation and transpiration exceed the amount of precipitation for a reasonable period. The proposed project is located in slightly drought prone region. Drought causes the earth to parch and a considerable hydrologic (water) imbalance resulting water shortages, wells to dry, depletion of groundwater and soil moisture, stream flow reduction, crops to wither leading to crop failure and scarcity in fodder for livestock. Its located in a coastal and hilly region and normal annual distribution of rainfall is more than 3000mm in that region. Most of the people use tube well water. 91.67% people use tube well water, 3.12% use pond water, tap 1.69% and 3.52% depend on other sources.
Figure 4.3 shows the project area is a moderate drought prone area. Figure 4.4 shows the ground water table in 25.5-26 m from the ground surface. The Figure 4.5 shows the normal annual distribution of rainfall in the project area around 2001-2500 mm. Since there is no heavy water consumption based like textile dyeing, paper mill in the project area hence, water withdrawal stress on the groundwater is comparatively less than other areas.



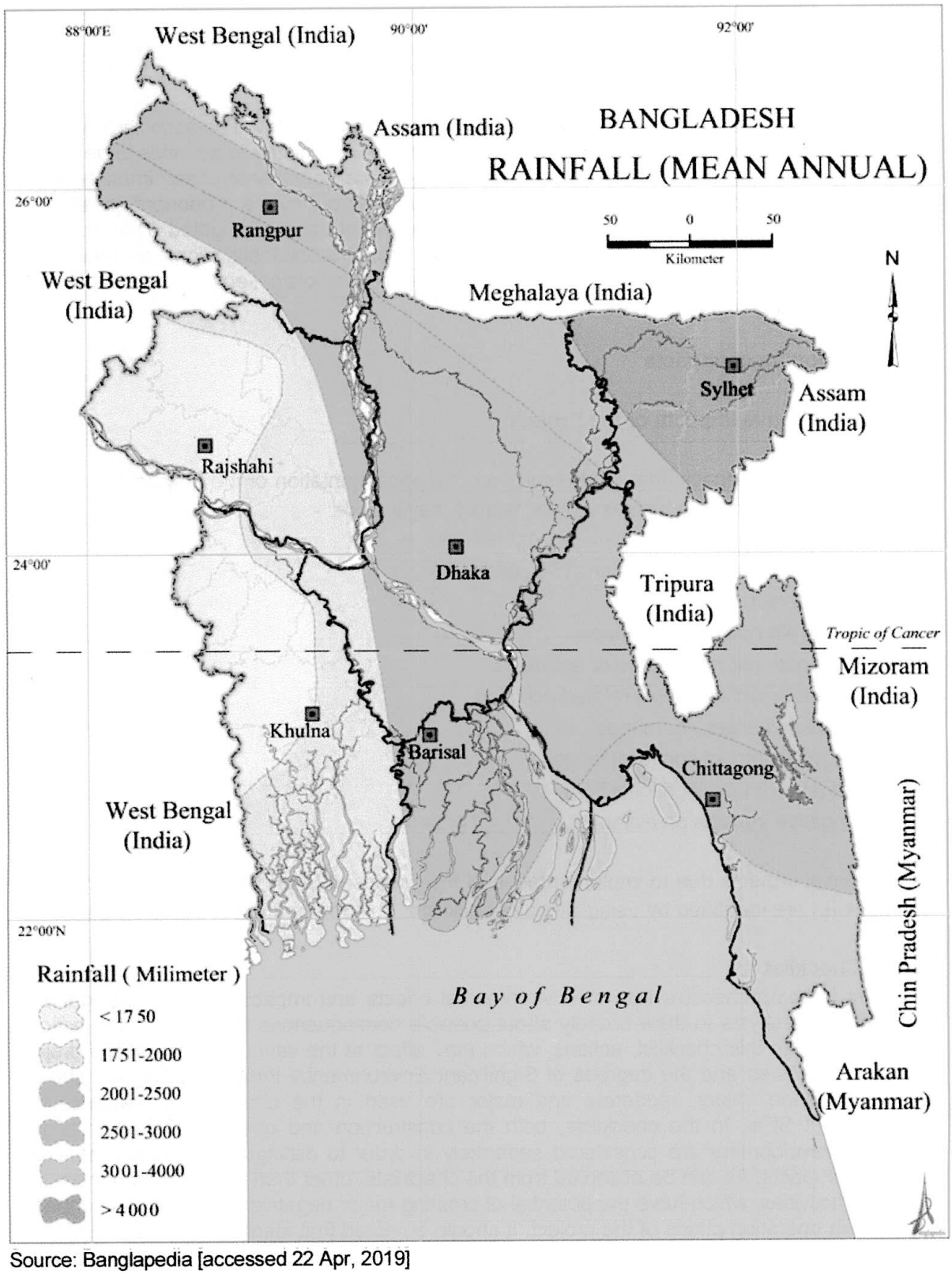
Source: Banglapedia [accessed 22 Apr, 2019]

Map 4.3 Drought Prone Areas in Bangladesh



Source: Techno-economic analysis and challenges of solar powered pumps dissemination in Bangladesh - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Groundwater-zoning-map-of-Bangladesh-14_fig1_313807249 [accessed 22 Apr, 2019]

Map 4.4 Ground Water Table Conditions of Bangladesh



Source: Banglapedia [accessed 22 Apr, 2019]

Map 4.5 Normal Annual Distribution of Rain

SECTION-5: IDENTIFICATION OF POTENTIAL IMPACT

5.1 General Considerations

This chapter outlines the potential negative and positive impacts that will be associated with the proposed expansion of the existing project. The impacts will be related to activities to be carried out during construction/installation phase of the project; the operational phase impacts of the project will be associated with the grinding activities carried out by the proponent. In addition, closure and decommissioning phase impacts of the project are also highlighted. The impacts of the project during each of its life cycle phases (construction/installation, operation and decommissioning) can be categorized into: impacts on the biophysical environment; health and safety impacts; and socioeconomic impacts.

5.2 Scooping of Impacts

Potential Negative Impacts of the Project

Potential negative impacts that may result from the implementation of the proposed project of the Shun Shing Cement Industries Limited factory may include: -

- Generate gaseous emissions (SO_x and NO_x)
- Generate dust emissions
- Generate noise disturbance
- Occupational injuries and or accidents
- Waste (liquid and solid) related pollution
- Increased energy demands
- Negative impacts on local fauna
- Negative impacts on local flora
- Negative impacts on avifauna

The potential impacts due to implementation of the proposed Shun Shing Cement Industries Ltd. (SSCIL) are identified by using Simple checklists. This method is described below:

5.2.1 Checklist

Checklist is comprehensive lists of environmental effects and impacts indicator designed to stimulate the analysts to think broadly about possible consequences of contemplated actions (Munn, 1979). 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 none, minor, moderate and major are used in the checklists to evaluate the magnitude of SEIs. In the checklists, both the construction and operational phases of the proposed development are considered separately in order to distinguish the short term and long-term impacts. As can be observed from the checklists, other than dust emission there are no major activities, which have the potential of creating major negative SEIs. All these impacts will arise in operation phase of the project. It should be noted that identification indicated in the Checklists relates to the significant level of impact, assuming no mitigation of negative impacts.

Table 5.1 Checklist identification of potential impacts

Project Phase	Actions Affecting Environmental Resources and Values		SEIs without mitigation measures				Type		Comments/ Observations
			None	Minor	Medium	Major	Adverse	Beneficial	
Location Phase	Land value Depreciation		X						No negative land value changes anticipated
	Loss of land displacement from homestead land			X					No loss of land displacement from homestead land; no impact
	Loss of land displacement from agricultural land		X						No Impact
	Damage to nearby operation		X						No impact anticipated
	Disruption to drainage pattern		X						No Impact
	Change in landscape			X					Invariably occur
	Impact on Bio diversity	Loss of habitat	X						No Impact
		Threat to endangered species	X						No Impact
		Interruption to environmentally protected area	X						No Impact
		Encroachment into precious ecological resources	X						No precious ecological resource, No Impact
		Blockage to wildlife passage	X						No wild life in the area, no impact
	Impacts on human and social interest	Increase in sanitation related disease	X						No Impact
		Change in profession	X						No Impact
		Damage of historical and cultural sites	X						No Impact
		Disruption to navigation	X						No impact

Table 5.2 Checklists (Cont.)

Project Phase	Actions affecting Environmental resources and values		SEIs without mitigation measures				Type		Comments/ Observations
			None	Minor	Medium	Major	Adverse	Beneficial	
Construction Phase	Pollution from solid, toxic and hazardous waste/ soil (cutting & filling)			X					Minor Impact
	Soil erosion and sedimentation			X					Minor Impact
	Water quality			X					No Impact
	Pollution from liquid discharge			X			X		Minor Impact
	Air Pollution			X			X		Minor Impact
	Noise/vibration hazard				X		X		Minor Impact
	Traffic congestion			X			X		Minor Impact
	Damage to nearby operation		X						No Impact
Flood			X			X		Minor Impact	
Disruption to drainage pattern		X						No Impact	
Impacts on human and social interest	Worker accident		X			X		Minor Impact	
	Employment			X*			X*	Employment opportunity generated	
	Sanitation disease hazard		X					Minor Impact	
	Socio economy			X*			X*	Will Improve	

Table 5.3 Checklists (Cont.)

Project Phase	Actions affecting Environmental resources and values	SEIs without mitigation measures				Type		Comments/ Observations
		None	Minor	Medium	Major	Adverse	Beneficial	
Construction Phase	Pollution from solid, toxic and hazardous waste/ soil (cutting & filling)		X					Minor Impact
	Soil erosion and sedimentation		X					Minor Impact
	Water quality		X					No Impact
	Pollution from liquid discharge		X			X		Minor Impact
	Air Pollution		X			X		Minor Impact
	Noise/vibration hazard			X		X		Minor Impact
	Traffic congestion		X			X		Minor Impact
	Damage to nearby operation	X						No Impact
Flood		X			X		Minor Impact	
Disruption to drainage pattern	X						No Impact	
Impacts on human and social interest	Worker accident	X			X		Minor Impact	
	Employment		X*			X*	Employment opportunity generated	
	Sanitation disease hazard	X					Minor Impact	
	Socio economy		X*			X*	Will Improve	

5.3 Environmental Impact Due to Project location

5.3.1 Environmental Impacts due to Project Location

There is no significant impact due to project location in this area except for some minor changes on drainage pattern due to the disruption of normal earth surface. This would be serious if filling of earth surface is not done carefully.

5.3.2 Environmental Impacts during the construction phase

Impact during Construction Phase

This includes the following activities related to leveling of site, construction and erection of plant components:

Impact on Land use

The total land area of the plant is 5 acres. The construction of plant will not bring any changes in the land use pattern of the project area as the land is already categorized as Industrial land use category.

Impact on Air Quality

Impacts of construction activities on air quality are cause for concern mainly in the dry months due to dust particles. The main sources of emission during the construction period are the movement of equipment at the construction site and dust emitted during construction related activities. The dust emitted during the above-mentioned activities depend upon the ambient humidity levels. The impact will be for short duration and confined locally to the construction site. The composition of dust in this kind of operation is, however, inorganic and non-toxic in nature. Exhaust emissions from vehicles and equipment deployed during the construction phase are also likely to result in the levels of SO_2, NOx, SPM, $PM_{2.5}$, PM_{10}, CO and un-burnt hydrocarbons. It may, therefore, be deduced that construction activities may cause changes in the SPM, $PM_{2.5}$, PM_{10} levels locally. The impact will, however, be reversible, marginal and temporary in nature and will be confined within the project boundary and is expected to be negligible outside the plant boundaries.

Impact on Noise Levels

The major sources of noise during the construction phase are vehicular traffic, construction equipment like dozers, scrapers, concrete mixers, cranes, pumps, compressors, pneumatic tools, saws, vibrators etc. The operation of these equipment's will generate noise ranging between 85-100 dB (A) near source. These noises will be generated mostly within the plant boundary and will be transient in nature. Due to greenbelt all around the periphery of the plant boundary, these noises will be attenuated to a large extent and are not likely to have any significant impact on the nearby villages. Overall, the impact of noise due to construction on the environment is likely to be insignificant, reversible and localized in nature.

Impact on Water Quality

The peak requirement of water during construction will be about 10 m^3/hr., which will be supplied from the water system. The construction equipment is more related to mechanical fabrication, assembly and erection. Temporary sanitation facilities (soak pits/septic tanks) will be set up for disposal of sanitary sewage generated by the work force as per the prevailing labor laws. Since most of the construction work force will consist of floating population, the demand for water and sanitation facilities will be low and it will be managed by the existing

the SPM, $PM_{2.5}$, PM_{10} levels locally. The impact will, however, be reversible, marginal and temporary in nature and will be confined within the project boundary and is expected to be negligible outside the plant boundaries.

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Impact on Terrestrial Ecology

The initial construction work at the project site involves land clearance and filling and leveling to the plant formation level, which has already been done during the construction of the plant. Since the land is already under the possession of SSCIL and is utilized for the proposed plant facilities, there will not be any loss of agricultural productive land or loss of vegetation. The construction activities lead to inward migration of labor force in the area and thus there would be increase in fuel demand. The construction site falls under the category of Industrial land use and does not harbor any fauna of importance; therefore, the impact of construction activities on fauna will be insignificant.

Impact on Aquatic Ecology

There will not be any adverse effect on aquatic life during the construction phase, since the water requirement for the construction phase is less. There are no water bodies near the construction site, which will get polluted due to the construction activities.

5.3.3 Environmental Impacts During Operation

The following activities related to the operational phase will have varying impacts on the environment and are considered for impact assessment:

- Land use
- Soil quality
- Topography and climate
- Air quality
- Hydrology
- Water resources and quality
- Solid waste
- Noise levels
- Terrestrial ecology
- Aquatic ecology
- Traffic load
- Demography and socio-economics
- Infrastructural facilities
- Cumulative impact due to industries

5.4 Adverse Impacts

5.4.1 Effects of Dust Emission

From a plant like SSCIL there may be a significant emission of cement dust of the very nature of the project. A part of the fine dust finally escapes to the air through different section of the plant and pollutes the atmosphere.

This will mainly be fugitive dust due to unpaved roads and within the project site. Dust, like other emissions, causes upper respiratory illnesses in human beings apart from aesthetic impacts. Health effects of Cement dust may include occupational lung diseases, skin irritation, stomach ache, headache, fatigue and carcinoma of lung, stomach and colon.

The pollution of atmosphere by particulate matters may have the following effects (*Shina, 1973*):

- reduce visibility;
- general dustiness of the area;
- retards the growth of the vegetation;
- nuisance to the inhabitants;
- health hazards to the workers and inhabitants.

However, the nature and extent of the effects depend on the concentration of particulate, length of exposure and the presence of other atmospheric contaminants (*BRTC, 1991*). Dry cement dust of low concentration is known to have little damaging effect on plants. But, in presence of moisture, cement dust is notorious for damaging agricultural productivity in wide areas around the plant.

It also imparts damages by interfering with photosynthesis activity and inhibits growth of plant tissue (Rau & Wooten, 1989). Cement dust may also deteriorate the quality of water bodies.

To assess the quality of air within the factory premises the air samples are collected and analyzed for different parameters of air pollutants and results are presented in Table-5. From the Table 5.1 it was observed that the parameters are within the Bangladesh standard.

In the proposed project, the following dust emission sections are pointed out:

5.4.1.1 Clinker Unloading Section

Impact Origin

In the jetty, grab buckets operated by the winches available on the jetty unload barges carrying up the clinker. For SSCIL plant, there will be one set hydraulic crane at the Jetty. The crane will be fixed with clamshell grab. This crane will unload the clinker from Barges /cargoes etc. and will discharge to the ECO-Hopper, which are feeding to the belt conveyors which will carry the clinker from Jetty to Clinker silo.

There is limited or no dust pollution occurs from the top of the fixed ECO hoppers, when the grab unloads the clinker Another source of pollution of the jetty area is due to unsatisfactory condition of the skirt where the rubber is missing or is worn out as well as due to practically no scraping by the belt cleaner at the head end of belt discharge drum.

5.4.1.2 Clinker Storage Section

Impact Origin

Belt conveyor transports the clinker from the jetty to the top of the clinker silos and discharges by belt conveyors and bucket elevator into the clinker silo. There is one clinker silo with 22,000 MT storage capacity. At the bottom of the clinker silos, there are two discharge chutes below each silo. Thus, there are four loading points on belt conveyor and when the clinker is discharged; dust nuisance is generated from all these points.

5.4.1.3 Clinker Transfer Section (Conveyor Belt to Grinding Mill)

Impact Origin

During transferring of clinker from silo to grinding mill, if not properly handled, there is chance of dust generation on transfer point.

5.4.1.4 Cement Storage Section

Impact Origin SSCIL will make total two cement silos [silo #1 –8000 MT capacity, silo #2-- 2000 MT capacity]. Cement will be fed to the cement silo from grinding section through a set of

Air slides and bucket elevator. If there were no dust trapping arrangement the air used for carrying the cement are discharged through the vent openings creating a lot of dust nuisance and also loss of cement.

5.4.1.5 Other Dust Emission Sections

The bag filters are found to be in operation at other dust emission sections, like grinding mill, packing section gypsum and clinker loading hoppers etc.

5.4.2 Effects of Hauling Operations

Impact Origin

Hauling operations involving unloading of clinker from the river to plant site and transport of finished cement from plant to port or elsewhere could lead to significant dust escape if careful precautions are not adopted. The crucial points of dust escape in these operations are during loading of finished cement from grinding plant and during unloading of clinker for storage in clinker silo. The loading operation of finished cement is even more critical if loosely woven jute bags are used for cement dispatch as proposed by the plant proponents.

5.4.3 Effect of Noise Due to Grinding

Impact Origin

Industrial machinery and processes are composed of various noise sources such as rotors, stators, gears, fans, vibrating panels, turbulent fluid flow, impact processes, electrical machines, and internal combustion engines among others. The basic mechanism of noise generation can be due to mechanical noise, fluid noise and/or electromagnetic noise. Sound fields in the workplace are usually complex, due to the participation of many sources which may include propagation through air (air-borne noise), propagation through solids (structure-borne noise), diffraction at the machinery boundaries, reflection from the floor, wall, ceiling and machinery surface, absorption on the surfaces among others. The mechanisms of noise generation depend particularly on the noisy operations and equipment including grinding, shake out (foundries), punch presses, drop forges, drilling, lathes, pneumatic equipment, tumbling barrels, plasma jets, cutting torches, machine tools for forming, dividing and metal cutting, such as punching, pressing and shearing, milling machines and grinders, pumps and compressors, drive units, hand-guided machines, self-propelled working machines, in-plant conveying systems and transport vehicles.

Health Effects of noise

Elevated noise levels can cause health effects such as hearing loss, hypertension, ischemic heart disease, annoyance, bowel movements and sleep disturbance. Noise exposure has also been known to induce tinnitus, hypertension, vasoconstriction and other cardiovascular impacts. Elevated noise levels can create stress, workplace accident rates, and stimulate aggression.

The discomfort caused by noise is difficult to assess; it includes auditory fatigue and temporary lessening of hearing ability. Perception of noise is often relative to the background sound level,

Notes:

1. Day time is from 0600 hr in the morning to 1900 hr at night
2. Night time is from 2100 hr from night to 0600 hr at the morning
3. Clam area is the 100m radius within hospital or school or any government designated special areas /installations

5.4.4 Impacts from Liquid Discharge

Impact Origin

Liquid waste generated from the proposed project includes, sanitary wastewater, storm water and waste oil. Wastewater is likely to be generated mainly from sanitary facilities from the plant, from cleaning of floors and other surfaces and from tools and equipment cleaning such as motor vehicles. Potential negative impacts of wastewater generation include:

- Water shortage due to high use;
- Water contamination due to high dissolved solids and other contaminants;
- Contamination of ground water if untreated contaminated wastewater is discharged into the environment;
- Odor from untreated contaminated wastewater;
- Degradation of the quality of water of the receiving water body if contaminated wastewater is discharged into aquatic environment prior to treatment;
- Contamination of soils if contaminated wastewater is discharged into the ground prior to treatment.

SSCIL requires substantial amount of process cooling water, though this water does not contain any harmful substances but its high temperature impacts the water quality in terms of thermal pollution in the receiving water bodies. To cool the various moving component of the plant, water is circulated around these components. There is no pollution except blow down effluent. This cooling water has slightly higher temperature but don't contain any harmful parameters. Cooling water will be recirculated in the process. Water will be cooled in cooling tower. Cooling water blow down may be impacted which will be treated in the septic tank.

5.4.5 Solid Waste

Impact Origin

Sources of solid waste in the proposed grinding plant will consist of production waste, domestic waste and office waste. Production waste consists of mainly of rejected and damaged packaging materials, discarded bags, bad quality clinkers and used oil are is generated from SSCIL, domestic waste will include waste from canteen and other eating places within the plant, while office waste will include wastepaper, electronic waste and sweepings. Potential negative impacts associated with the above will be water pollution, odor, blockage of drainage system and impacts associated with E-Waste disposal. These solid wastes need proper management after their generation.

5.4.5 Occupational Health injuries and/or accidents

Impact Origin

The workers who work inside the factory are face occupational health hazard due to high dust concentration of cement. Safe and good occupational health status of the employees and workers is important for not only the persons working in the plant, but also for the better plant operation and maintenance.

The most significant occupational health and safety impacts occurring during the construction and operational phase of the grinding plant include dust, noise and vibrations, physical hazards, chemical hazards and other industrial hygiene issues.

5.4.6 Negative impacts on local flora

Implementation of the proposed installation of SSCIL will not have a direct negative impact on a few local vegetation at the proposed site. This is because the vegetation on site that will have to be cleared to pave way for the grinding plant and other associated components. The result impact of vegetation clearance will include the following:

- Overall reduction of flora in the area and overall loss and/or reduction of ecological and economic services derived from the lost vegetation to the environment
- Reduced scenic and aesthetic value.

5.4.7 Negative impacts on local fauna

5.4.7.1 Mammals and Herpetofauna

Based on the knowledge on hazards, ecological hazards in terrestrial ecosystem can be coined to be any biological, chemical, mechanical, environmental or physical agent that is likely to cause harm to other organisms and damage to habitats and ecological processes in the environment in the absence of their control. Potential risks that would likely occur when project is implemented.

Ecological risk/impact assessment focused on the sensitive issues within the project footprint. The total area of the project footprint and the potential new project area. Fauna diversity and population at the project site is low or absent. However, the raw materials such as limestone, gypsum which are being supplied by third parties will have negative impacts, these will be mitigated at those sites and will not directly relate to the grinding plant site.

5.4.7.2 Negative Impacts on Avifauna

The implementation of the proposed project will lead to negative impacts to avifauna in the area. The project has the potential to affect the avifauna of the project area from the associated activities. This is mainly through ecological disturbance leading to displacement or exclusion of birds. For some of the species, there will be complete annihilation of their habitats. This is because the project activities are likely to cause site-specific negative impacts on the biophysical environment of the project area which will affect avifauna in various ways including pressure and/or loss of habitat and essential resources for food and nesting for birds. The following are the potential impacts on avifauna at the proposed site

- The impacts of direct habitat loss due to annihilation of the species habitats.
- The impacts of habitat modification due to changes in land management.
- The impacts of indirect habitat loss due to the displacement of birds as a result of construction, and maintenance activities,

As a wintering/feeding ground for some of the migrants, it is also possible that the species will have to find alternative sites. The effects of the proposed project on birds are highly variable and will depend on a wide range of factors including:

- Specification of the development – how expanse and level of the transformation,
- Topography of the surrounding land,
- Habitats affected
- Number and species of birds present.
- Land uses within the surrounding matrix and availability of alternative sites for these species

5.4.7.3 Habitat Modification from associated project activities

Implementation of the proposed project may result in modification of habitats for avifauna at the proposed project site and its environs. Vegetation clearance to pave way for project implementation will destroy bird feeding grounds, bird nesting ground and complete interfere with the daily routine of the birds. The results of habitat modification to local avifauna will include:

- Disruption on breeding patterns which will results on diminished bird population;
- Migration and relocation of the affected bird species from the area which will affect the local food chain;
- Loss of ecological services associated with birds such as pollination;
- Destruction of migration route for migrant bird species;
- Destruction of foraging grounds of local resident species.

5.5 Cumulative Impact

The cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out are assessed. Cumulative environmental effects of the Project are identified in consideration of other past, present or reasonably foreseeable future projects or activities that have been or will be carried out, for all phases of the Project (*i.e.*, Construction, Operation, and Decommissioning, Reclamation and Closure). A screening of potential interactions is completed to determine if an assessment of cumulative environmental effects is required (*i.e.*, there is potential for substantive interaction) for that specific Project related environmental effect that overlaps with those of other projects or activities that have been or will be carried out. The residual cumulative environmental effects of the Project in combination with other projects or activities that have been or will be carried out are then evaluated, including the contribution of the Project to those cumulative environmental effects (as applicable).

The predicted cement dust emission and noise pollution generated from VRM were assessed in isolation. There is no other industries near the proposed project hence the cumulative impact of dust and noise emissions will not present and no cumulative on the proposed SSCIL cement plant. The background values recorded in the project area and found the value will not increase.

SECTION-6: PREDICTION AND EVALUATION OF IMPACTS AND MITIGATION

6.1 General Considerations

A scooping exercise has been undertaken in section 6.2 to identify the impacts, which are likely to be occurred in the different phases of the project. The next steps, in ESIA process, are prediction, evaluation and mitigation /enhancement measures of impacts. Prediction means to estimate the extent of changes qualitatively and to quantify them as per as practicable. Evaluation means to determine whether all impacts are significant enough to warrant mitigation. In the Checklists of section 5.2 evaluation of the all impacts are done using criteria words 'none', 'minor', 'moderate' and 'major' and short comments are also provided to justify the criteria given to. In the following sections, greater detail prediction and evaluation are done for those impacts, which are considered to have major SEIs. These potential impacts are discussed in relation to relevant regulations and standards of the country. To maintain logical sequence of the ESIA process, the possible mitigation / enhancing measures for SEIs are also discussed concurrently. At the end of each sub section, status of residual impact is also mentioned. It may be noted here that the discussions are limited only to the operational (post construction) impacts because the construction period of the plant is over.

6.2 Impacts on Physical-Chemical Environment

6.2.1 Impact due to liquid discharge

Impact Origin

Fortunately, cement industries do not discharge any contaminated liquid waste, which can deteriorate the water quality of the area. 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.

Mitigation Measures

The domestic liquid waste generated from the cement plant will be treated through septic tank attached with soak pit.

6.2.2 Noise and vibration impacts

Impact Origin

Noise abatement measures will be taken as required avoiding adverse noise impact on the neighborhood villages. Noise will generate during construction and operation stages of the plant.

6.2.3 Noise Modelling

The Noise model for the proposed cement plant at Shikalbaha, Chattogram has been carried out as per Industrial Noise ISO 9613.1/2 at 1/3 octave. The Period definitions considered for the model are Day: 6 AM to 9PM and Night: 9PM to 6 AM.

The noise sources considered for the model are:

- Vertical Rolling Mill (VRM) – reduction assumed as enclosed roof considering it as default design

Other parameters considered are:

- Ground attenuation factor - 0
- Temp:318.15k
- Pressure: 101.33 Kpa
- Air humidity: 80%

Noise Model: The noise prediction modeling of the project has been carried out using iNoise application based on calculations of ISO 9613 method.

From the specification of VRM to be used the noise level measures according to Standard ISO 9613 at a frequency of 60Hz the sound power to the frequency is 85dB.

It is recommended that the noise level be kept below the standards set by the DOE by sophisticated acoustic measures. The noise will be dispersed to the surrounding atmosphere to certain extent.

6.3 Noise modeling calculation

The L_{dn} noise contour map is given as Map 6.1. It can be interpreted from the output that the noise emission from the rolling mill (located on the lower south) is contained due to the indoor placement of the machine. The noise levels are less than 37 dB(A) in the southern side of the plant and the levels are receding in an inverse proportion to the distance. Regarding the Rotary kiln noise emission, the levels in the 200m vicinity of the machine are in the range of 40-50 dB(A). This can be attributed to the reason that the machines placement is left open to air but has been isolated from the rest of the working area. Usage of proper attenuation measures like wood or brick wall to the height of 3m and above shall dissipate the noise energy levels above the standard height of anthropogenic activity.

For proposed cement industries, the noise is generated is moderate vertical rolling mill. To mitigate it construction of an acoustic boundary, wall the following mitigation measures need to be undertaken. The boundary wall is constructed with bricks up to 5 meters and additionally 2.5 meters with especial sound absorbing material. Plant trees at boundary wall and inside the industries green area in order to absorb and protect the noise from ball mill.
The above mitigation measures will ensure that the sound level at the nearest settlement is within the Bangladesh Standard level.

$L_{A,} = 10\log_{10} (^{10LA/10})$ dBA, Where: LA = Sound Source 1 (i.e. VRM of cement mill). The model presents a 'worst-case scenario' as it does not take into account factors which would reduce noise propagation, such as:

- Uneven topography
- Large obstructions in the propagation path, e.g. barriers etc
- Refraction of noise, e.g. due to atmospheric effects such as temperature inversion
- Wind speed or direction effects

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

The mathematical formula for the noise model is shown below:

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

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

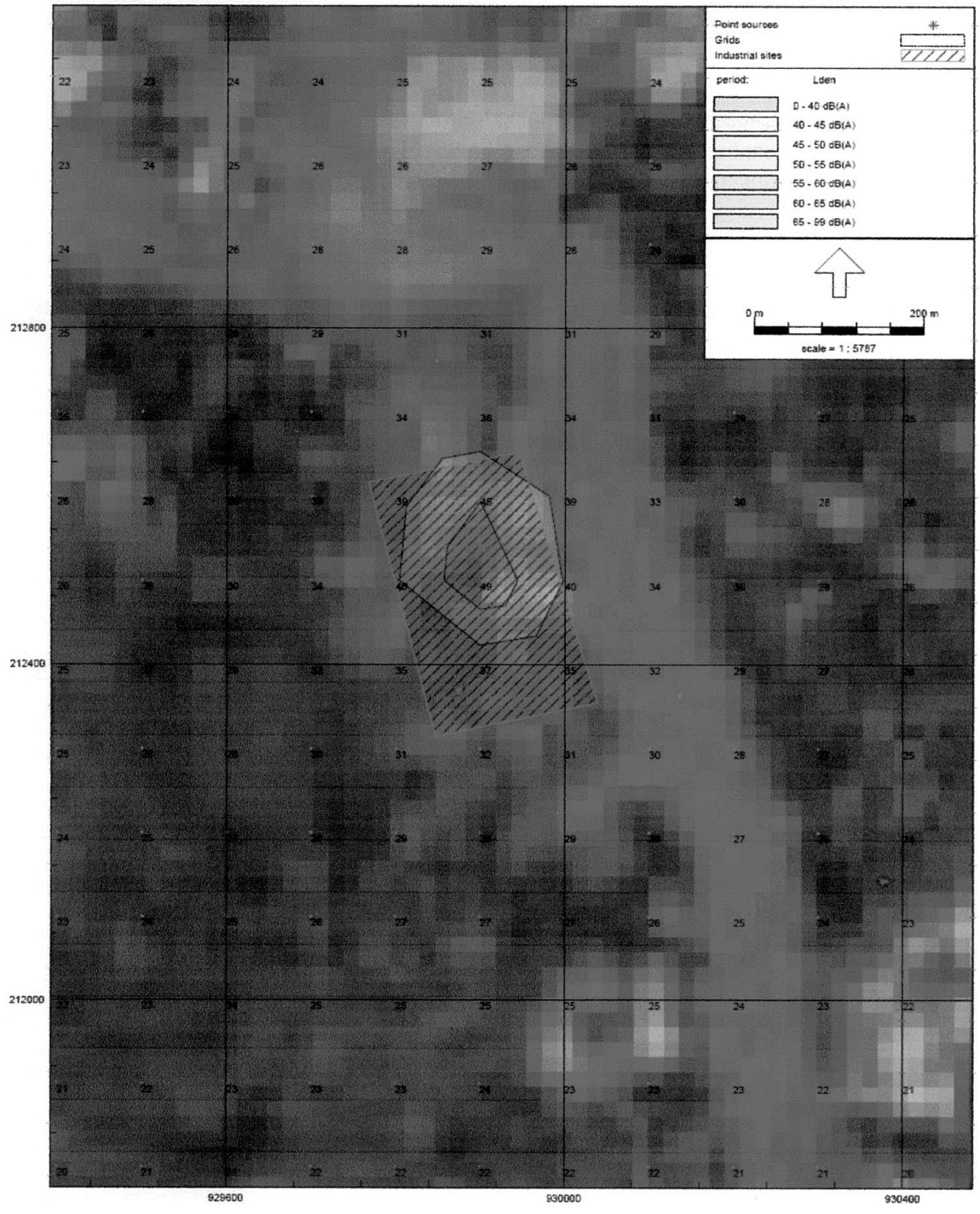
Where: r is the distance from source to receiver;

a is the absorption due to the atmosphere (dB/m), which is most commonly used as 0.005dB/m;

L_W the sound power level of the VRM room; and

Lp the output sound power level of the VRM room at different radius away from the source.

The results of noise level prediction simulation at increasing radius is shown in Map 6.1.



Map 6.1 The Noise contour map of Ldn for proposed cement plant at Shikalbaha, Chiittagong noise concentration around 200m of the plant site

6.3.1 Noise Modeling Results

Table 6.1: At 85 dB noise input, the predicted noise output is as follows

Sl. No	Radius (m)	1	50	100	150	200
1	Predicted value (baseline +$\log_{10}$ of model value	85	49.0	42.0	36.0	33.0

The relationship between the adjacent area and noise level are presented in the above Table. However, there are few homesteads at the west side of the project within the 100m radius of the proposed project where the noise contribution from the project would be around 33 dBA. The ambient noise standard of IFC and Bangladesh Government is mentioned in the following Table 6.6.

Table 6.2: Standards of noise level

Sl. No	Standard	Zone	Day time dBA	Night time dBA
1	World Bank EHS Guideline 2007	Residential, institutional, educational	55	45
		Industrial, commercial	70	70
2	Bangladesh ECR, 1997	Mixed area	60	50
		Commercial	70	60
		Industrial	75	70

Mitigation Measures

Proper acoustic facilities and use of silencer have to be incorporated to reduce adverse impact. According to the entrepreneur, the noise level at distance of 30 m from grinding mill will not exceed 60dB(A). This will ensure that noise level to the nearest receptor will not exceed Bangladesh standard noise. However, the working personnel inside the plant will be experienced higher noise level. Hence use of ear plug for the employee should be confirmed. High noise within the plant itself will cause inconvenience and certain health impacts, related to hearing impairment and other occupational health problems of the workers. It should be mentioned here that certain amount of noise will also be generated from the traffic which will be engaged in handling materials to and from the plant, though comparatively negligible, both during construction and operation of the plant.

6.3.2 Dust Emission

Impact origin

Cement manufacturing plants have been guilty of damaging agricultural productivity in wide areas around the plant due to uncontrolled release of cement dust. This dust can, to a certain extent, cause harm to all types of nearby operations, including commercial, recreational, and forests, ranging from nuisance to significant damage levels.

In the present cause, however, the plant considered providing filter facilities at crucial emissions points. In the project major dust emission points are envisaged to be –

(a) Clinker, Gypsum, Fly ash and Slag storage section
(b) Clinker grinding section
(c) Cement storage section
(d) Cement packing section

Mitigation Measures

The project should possess a dust control system by employing modern pulse-jet type bag filter dust collectors at those points. The jet pulse bag filters have continuous cleaning process of filters media and are therefore have high precipitation efficiency. As per the specifications, dust emission from any point will not exceed the total dust emission to the atmosphere from our major sources-clinker gypsum, fly ash, slag and coal storage, cement mill, cement silo and packing section-amounts to be 2.88 kg/hr. Actually, some more dust will also be escaped during clinker unloading, conveyor system, finished product storage and therefore, all together total amount to be considered about 5.0 kg/hr. The project authority will take necessary steps in their dedusting systems to comply the Bangladesh standard in respect to dust emission rate. The detail of dust cover system is shown in Annex 5. SSCIL will use ECO-Hopper at Jetty for keeping the dust emission at minimum level. Details of ECO - Hopper is attached below in Figure 6.1.

Clinker Unloading

Two flush mounted bag filters with fan mounted on trolley frames and to be mechanically connected to the mobile hoppers is being installed for de-dusting of the belt conveyor at the materials loading point after each hopper. At the head pulley effective split type individually spring controlled scraper blades arranged in two rows is installed for effective scraping of the belt surface and the scraped dust is collected within the discharge hood. Venting connection is provided from the discharge hood and skirt of the loading point of successive conveyor to a bag filter for effective dust control of transfer points. Thus, for jetty a total number of four bag filters with fans are installed (2 for the ECO hoppers and 2 at the transfer points).

Clinker Storage

The openings provided on the top of silo are completely sealed. At each of the discharge point suitable steel frames are built up where pendulum flap valves are installed. These pendulum flap valves are normally closed and they open only when the tripper discharges clinker on them. Each silo is provided with a bag filter on top of the silo. The bag filter, which is connected to any one of the silos, is operated whenever material is loaded into the silo.

At the bottom of the silo the loading points on belt conveyor have skin board rubber and top cover. After each loading point a flush mounted type bag filter is installed. Due to restricted headroom available between top of skirt and silo bottom, bag filters with cartridge bags insert able from the side and the fan mounted on one side of the bag filter. Thus, in two silos, 2 bag filters are installed on the top of clinker silos and 2 bag filters at the bottom of the clinker silos.

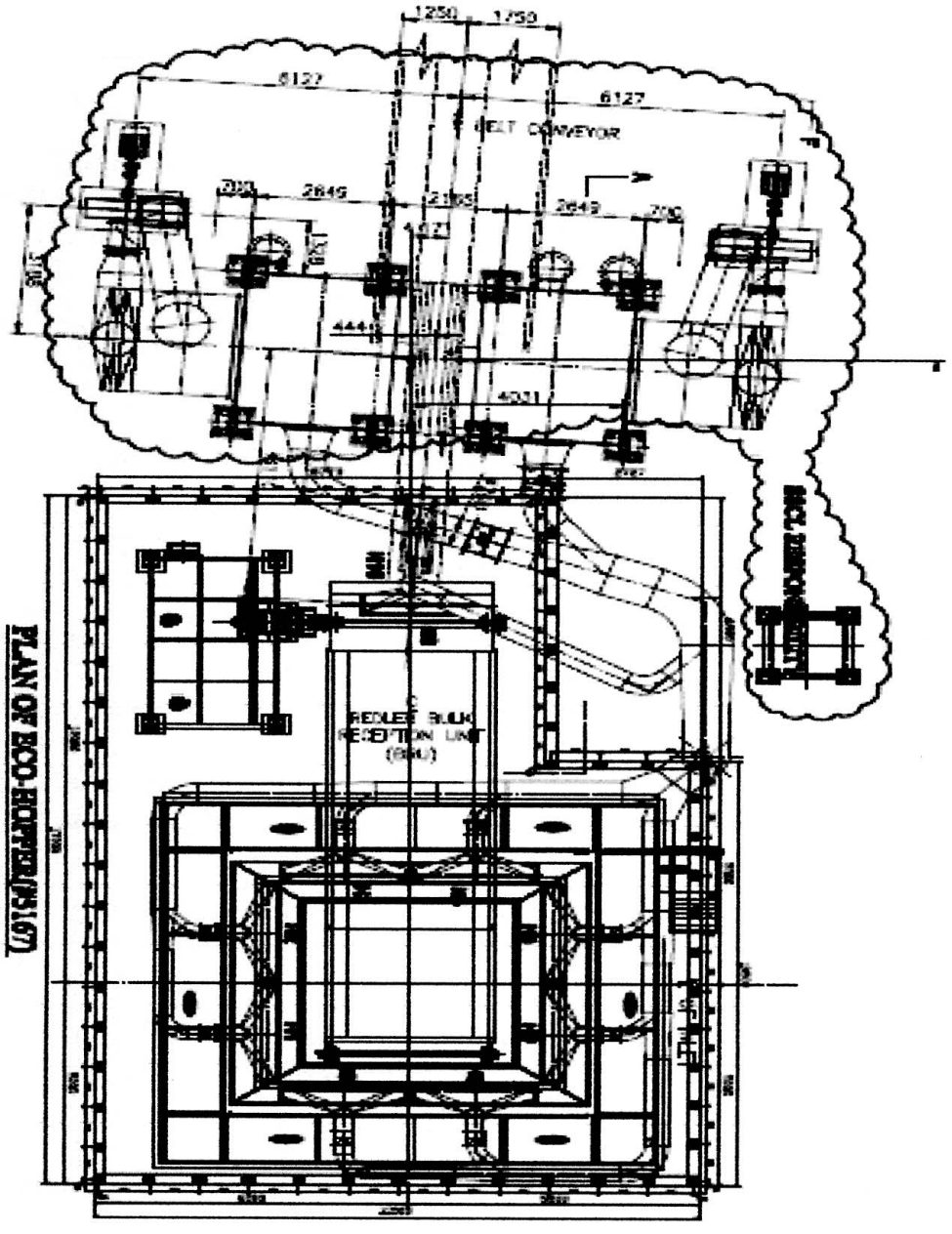


Figure 6.1 Details of ECO – Hopper

Clinker handling (Conveyor Belt to Grinding Mill and VRM)

The proponent has installed bag filters on the top of charging hopper and made proper skirt board and sealing arrangement at the transfer point.

Cement Storage

The air pumped into the silo along with the cement must be exhausted through bag filter for effective pollution control and to conserve the valuable cement dust. There is one bag filter, connected to the silo. The silo bag filter is sized in such way that it is suitable for venting the conveying air from either unit of the mill. Whenever the conveying is on and the cement is discharged into a silo, the bag filter connected to that silo is made operative.

Other Dust Emission Sections

The bag filters are found to be in operation at other dust emission sections, like grinding mill, packing section, gypsum, fly ash, slag and clinker loading hoppers etc.

6.3.3 Hauling Operation

Hauling Operations involving unloading of imported clinker from the river to plant Site and transport of finished cement from plant to port or elsewhere could lead to significant dust escape if careful precautions are not adopted. The crucial points of dust escape in these operations are during loading of finished cement from bagging plant and during unloading of clinker for storage in clinker shade. The loading operation of finished cement will be even more critical if loosely woven bags are used for cement dispatch as proposed by the plant proponents.

6.3.4 Pollution from Solid Waste

Impact Origin

A variety of solid wastes including dirt, fine dirt will be produced in the plant, which will be disposed of through sales (grinding media, unusable bags, etc.) and filling (dirt, frozen cement, etc.).

Mitigation Measures

The cement grinding processes should be designed and operated to prevent, or minimize, the quantities of wastes generated and hazards associated with the wastes generated in accordance with the following strategy:

- Substituting raw materials or inputs with less hazardous or toxic materials, or with those where processing generates lower waste volumes;
- Applying manufacturing process that convert materials efficiently, providing higher product output yields, including modification of design of the production process, operating conditions, and process controls;

Instituting good housekeeping and operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off specification, contaminated, damaged, or excess to plant needs.

Careful attention in disposing used grinding media, frozen cement and also the solid wastes will be required. An appropriate land filling system should also be established for disposal of certain solid wastes, of the "sanitary landfill" type, which does not pose hazards to ground water pollution. There are low-lying areas surrounding the site where these wastes can be disposed of safely. 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. All waste will be properly managed and disposed of off-site.

6.3.5 Sanitary Wastewater management

Sanitary wastewater includes effluents from domestic sewage, food service, and laundry facilities serving site employees. Recommended sanitary wastewater management strategies include:

- Segregation of wastewater streams to ensure compatibility with selected treatment option (e.g. sewerage system which only accepts domestic sewage);
- Segregation and pretreatment of oil and grease containing effluents (e.g. use of a grease trap) prior to discharge into the environment;
- Treatment to meet DoE standards for sanitary wastewater discharges;
- Sewage from the industrial facility is to be discharged to either a septic system, or where land is used as part of the treatment system, treatment to meet Environmental Management and Coordination (Water Quality) Regulations, 1997, standards for sanitary wastewater discharges;
- Sludge from sanitary wastewater treatment systems should be disposed in compliance with Environmental Management and Coordination (Water Quality) Regulations, 1997.

6.3.6 Storm water management

Storm water includes any surface runoff and flows resulting from precipitation, drainage or other sources. Typically storm water runoff contains suspended sediments, metals, petroleum hydrocarbons, Polycyclic Aromatic Hydrocarbons (PAHs), coliform, etc. Rapid runoff, even of uncontaminated storm water, also degrades the quality of the receiving water by eroding stream beds and banks. In order to reduce the need for storm water treatment, the following principles should be applied:

- Storm water should be separated from the sanitary wastewater;
- Surface runoff from potential sources of contamination should be prevented;
- Runoff from areas without potential sources of contamination should be minimized (e.g. by minimizing the area of impermeable surfaces) and the peak discharge rate should be reduced (e.g. by using vegetated swales and retention ponds);

- Where storm water treatment is deemed necessary to protect the quality of receiving water bodies, priority should be given to managing and treating the first flush of storm water runoff where the majority of potential contaminants tend to be present;
- When water quality criteria allow, storm water should be managed as a resource, either for groundwater recharge or for meeting water needs at the facility;
- Oil water separators and grease traps should be installed and maintained as appropriate at refueling facilities, workshops, parking areas, fuel storage and containment areas;

6.3.7 Rain water drainage and water logging management

Due to implementation of the cement industries the existing drainage system which passes by a small canal through the industries to the river will be closed. Existing canal is not capable to carry the total rainwater during heavy rain. As a result, the area become water logged. The authority will construct closed drain along with road and inside the boundary wall of the industries. The drain will extend 1 km toward the south of the industries and connect to the Murari canal for quick discharge of rain water of the whole water-logged area.

6.4 Impact on Socio-Economic Environment

6.4.1 Impact on Employment and Family Finance

The project envisages providing permanent employment of about a total of 200 personnel during its operation phase. This would obviously help to present unemployment burden of the country to a greater extent. This will definitely provide an opportunity to improve every one's basic living standard. Apart from this direct benefit, there would other indirect beneficial impacts on national economy through foreign.

Benefit Enhancement Measures

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 shall employ local people wherever possible and to give preference to employment of the land less and jobless people. This will ensure the real benefit for the poorest of the poor.

6.4.2 Impact on Health and Safety

Impact Origin

As there might be hazards to the plant workers, employees and technical personnel, provisions need to be made by the project for protecting occupational health, including protection of workers from hazards/fires/spillage etc. as well as protection of workers' health and assurance of safe drinking water supply and sanitation. The workers who work inside the factory face occupational health hazard due to different operation processes.

Mitigating Measures

Safe and good occupational health status of the employees and workers is important for not only the persons working in the plant, but also for the better plant operation and maintenance. Protective clothing and accessories should be provided to the workers, who would be subjected to exposure to hazardous substances and situation. Regular medical check-up is to be done to ensure the soundness of health of the employees and workers. Pollution control measures are to be duly adopted as necessary, including noise and odor control, so that there would not be any negative occupational health impact. Insurance for all employees should be taken out. A senior Medical officer with sufficient background and experience in occupational health problems should coordinate this issue and would be responsible for drawing up and implementing a detailed and regular program for ensuring health safety for all the workers in the industrial unit.

6.4.3 Other Safety Provision

Beyond the above measures, the project would also have full provision for the fire fighting and first aid medical services. The proponent also will construct an underground water reservoir for firefighting and a high lift pump including hose pipe which can be operated from all sights will be installed there. Fire extinguisher and sand bucket will be provided in every corner of the project area. The project has provision in its recurring annual expenditure for purchasing safety items such as aprons, hand gloves, ear protector, mask, eye protector etc. They will be arranged firefighting drill four times in a year and extra stair will be used in the outside wall for emergency evacuation. Emergency exit door will be available.

6.5 Hydrology

From the flood forecasting and waring center station at upper stream of Halda River at Shamitirhat union of Fatikchhari Upazila in Chattogram district water level is 2.50m PWD, Highest Water Level (HWL) is 12.54m PWD, Danger Level (DL) is 9.50mPWD

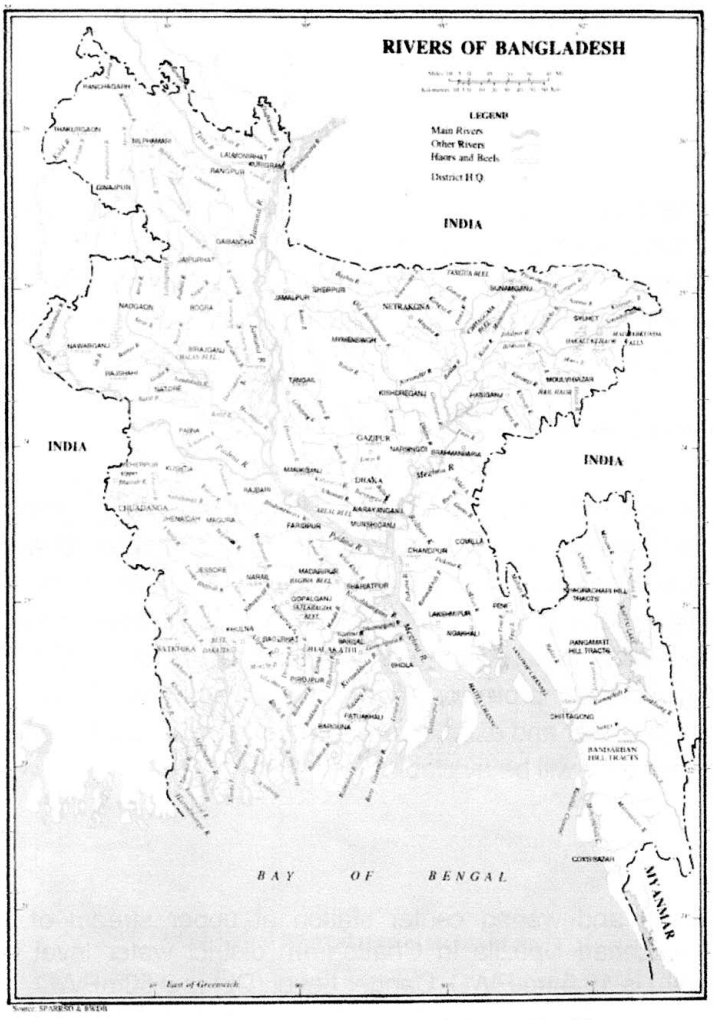
Surface Water

The following are the important rivers which flow beside the towns of the project. The rivers become full to the brim in the monsoon but all of them become detached from the main rivers. The rivers in the lean period get the seepage flow of the area. However, the river is a tidal one show semi-diurnal variation.

Ground Water

Bangladesh lies over a subsiding basin of tectonic origin with a great thickness of sedimentary strata. This is an unconsolidated alluvial deposit of Recent to sub-Recent age overlying the marine sediments. The recent delta and alluvial plains of the Ganges, the Brahmaputra and the Meghna constitute the upper formation. The near surface quaternary alluvium has good aquifer characteristics (transmission and storage coefficients). The groundwater storage reservoir has three divisions: an upper clay and silt layer, a middle composite aquifer (fine to very fine sand) and a main aquifer consisting of medium to coarse sand. In the south-east region, the

composite and extensive clay deposits separate main aquifers. River system of Bangladesh shown in Figure 6.2



Source: Banglapedia [accessed 22 Apr, 2019]
Figure 6.2 River System of Bangladesh.

6.6 Soil Erosion Investigation

ESIA study team visited the study area on 14th January 2019 to investigate the Murari canal condition near the proposed industries. During the reconnaissance field visit it was found that there is no soil erosion at the river bank both upstream and downstream.

6.7 Geotechnical Investigation

The soils at the proposed industries site were deposited as layered sediments a few million years ago. The area then experienced uplift, which caused folding of the layers into long broad ridges running generally in a north-south direction. The folds caused in tilting, to varying degrees, of the original sediments were consolidated, probably under the weight of other overlying sediments which have since eroded. The soils at the site do not fall conveniently into

standard classification nomenclature. The project authority studied in detail of geotechnical investigation of the project area.

6.7.1 Impacts on Air Quality

Impact Origin

In the manufacturing process, the cement industries involve in grinding of clinker to produce fine cement dust. From a plant like Shun Shing Cement Industries Ltd. (SSCIL) there may be a significant emission of cement dust. A part of the fine dust finally escapes to the air through different section of the plant and pollutes the atmosphere. The pollution of atmosphere by particulate matters may have the following effects (Shine, 1973) –

- Reduce visibility
- General dustiness of the area
- Retards the growth of the vegetation
- Nuisance to the inhabitants
- Health hazards to the workers and inhabitants.

However, the nature and the extent of the effects depend on the concentration of particulate, length of exposure and the presence of other atmospheric contaminants (BRTC, 1991).

Dry cement dust of low concentration is known to have little damaging effect on plants. But, in presence of moisture, cement dust is notorious for damaging agricultural productivity in wide areas around the plant. It also imparts damages by interfering with photosynthesis activity and inhibits growth of plant tissue (Rau & Wooten, 1989). Cement also may deteriorate the water quality of the water bodies.

As mentioned earlier the plant site is surrounded by industrial installations at the north, south and east, and the Murari canal at the west side. It is therefore, important to take sufficient control measures in the cement plant in order to minimize cement dust emission level into atmosphere and to reduce the ill effects of dust on the neighboring operations. To evaluate the impact due to cement dust emission, it is necessary to calculate the ground level concentration of SPM at different distances from the plant. The ground level concentration of SPM at different downwind distances as a result of emission of cement dust from different sections of the plant are presented in the following section.

Prediction of ground level concentration

Gaussian dispersion models suggested by Cooper and Alley (*1986*) is used for determination of

$$C_{x,o} = \frac{Q}{\pi u \sigma_z \sigma_y} e^{-\frac{1}{2}\left(\frac{H}{\sigma_z}\right)^2}$$

ground level concentrations along various downwind distances from different sources. The form of dispersion model as simplified for concentrations along only the plume center line is used-

Where, C = pollutant concentration, mg/m^3

Q = pollutant emission rate, mg/sec

U = mean wind speed, m/s

δ_y = horizontal spread parameter evaluated in terms of downwind distance, x, m
δ_z = vertical spread parameter evaluated in terms of downwind distance x, m
H = effective stack height, m
x = downwind distance along plume mean centerline from point source, m
y = Cross wind distance from the centerline of the plume, m

The following basic assumptions were considered in applying the above model-

(a) Continuous emission from a source.
(b) Constant rate of emission for a period equal to or greater than travel times to the downwind position under consideration, so that diffusion in the direction of transport may be neglected.
(c) Steady state wind conditions with mean wind representative of whole diffusion layer.
(d) The particulate matter is less than 20 μm diameter which will remain in air for long periods of time.
(e) The plume has a Gaussian concentration distribution in both horizontal and vertical directions.

Major dust emission sources, emission rates as mentioned by the suppliers and the height of the emission sources in SSCIL are shown in Table -6.1

The plume concentration standard deviations (δ_y & δ_z) depend on the atmospheric stability. Atmospheric stability is a measure of the turbulence of the air, particularly of the vertical motions present. For dispersion, modeling purposes, stability is classified by Pasqual Stability categories, A to F. A is the unstable extreme, representing very convective conditions with large vertical motion, and consequently mixing is suppressed. Stability D refers to neutral conditions, where mechanically generated turbulence is caused by surface winds. Unstable conditions (stabilities A and B) are generally associated with high solar radiation, low surface wind speeds; vertical turbulence arises as a result of surface heating and convection. At the other extreme, stable conditions (stabilities E and F) generally occur at night time and are characterized by a clear skies and low surface wind speeds, as the ground cools under these conditions, the air overlying it also cools and stable stratified layers are formed. In the present study a more conservative value of 1.0 m/s is used. Atmospheric stability is also conservatively considered to be of slightly unstable condition (class- C stability).

Based on the above conditions, Ground Level Concentration (GLC) at various downwind distances i.e. at 100 m, 200 m, 500 m 1000 m to 20000 m are calculated for 100% and 75% operational efficiencies of the filters and are presented in Table-6.2 to Table-6.3.

From Table-6.2, it can be seen that at the design efficiency of the dust collectors, the concentration levels at various distances are within the allowable limit of DOE (Table-6.4) for area categories A to C land use. However, cumulative concentration from different sources in a given area may result in significant negative impact on air quality even when emissions from the individual unit are within the specified limits.

It is worthy to be mentioned here that, due to higher height of the different emission sources, the SMP concentration at low distance (at 200 m or less) the calculated SPM level from the

emission sources (as listed in Table 6.1) are very insignificant. However, there are some sources like different transfer points at conveyor belt at very low level (height not exceeding 4.0 m and not considered in modeling for GLC calculation), which will emit some dust and due to low height, dust from these sources will not spread outside the factory premises. However, this will be of concern for the workers who will work within the plant as they will be exposed to high concentration of dust. Since the concentration level within the plant site will be relatively high, the project entrepreneur must take sufficient precautionary measures.

The US national air quality standards suggest a maximum 24-hour concentration of particulate matters as primary pollutant to be 260 $\mu g/m^3$ which should not exceed more than once a year. The Indian standard suggests values of 500 $\mu g/m^3$ for industrial areas and 200 $\mu g/m^3$ for residential areas (Rao & Rao, 1989).

Table 6.3 Sources, rates and heights of cement dust emission

Sl. No	Source points	Emission rates(mg/sec)	Height(m)
1	Clinker silo	358.33	43.00
2	Grinding Mill	600.00	39.50
3	Cement silo 1	108.33	43.50
4	Cement silo 2	108.33	37.00
5	Cement packing section	317.67	21.00

Table 6.4 SPM concentrations at various downwind distances at design efficiency

Sl. No	Sources	Concentration, $\mu g/m^3$			
		x=100 m	x=200 m	x=500 m	x=1000 m
1	Clinker storage	0.00	0.16	4.89	21.67
2	Grinding Mill	0.00	1.72	78.18	38.38
3	Cement Silo	0.00	2.42	16.51	7.34
4	Cement packing	1.50	35.67	62.68	22.56
	Cumulative	1.50	39.97	162.26	89.95

Table 6.5 SPM concentrations at various downwind distances at 75% efficiency

Sl. No	Sources	Concentration, $\mu g/m^3$			
		x=100 m	x=200 m	x=500 m	x=1000 m
1	Clinker storage	0.05	0.21	6.52	28.89
2	Grinding Mill	0.06	2.30	104.24	51.17
3	Cement Silo	0.08	3.27	22.01	9.78
4	Cement packing	2.00	47.56	83.57	30.08
	Cumulative	2.19	53.34	216.34	119.92

Table 6.6 Concentration levels at various Parameters within allowable limit of DOE

Sl. No	DoE (Bangladesh) Standard for Industrial Zone as per ECR 1997 in Bangladesh.	Ambient Air Pollution Concentration in micro gram/cubic meter				
1		$PM_{2.5}$	PM_{10}	CO	SO_2	NO_2
		65	150	35	120	100

Mitigation Measures

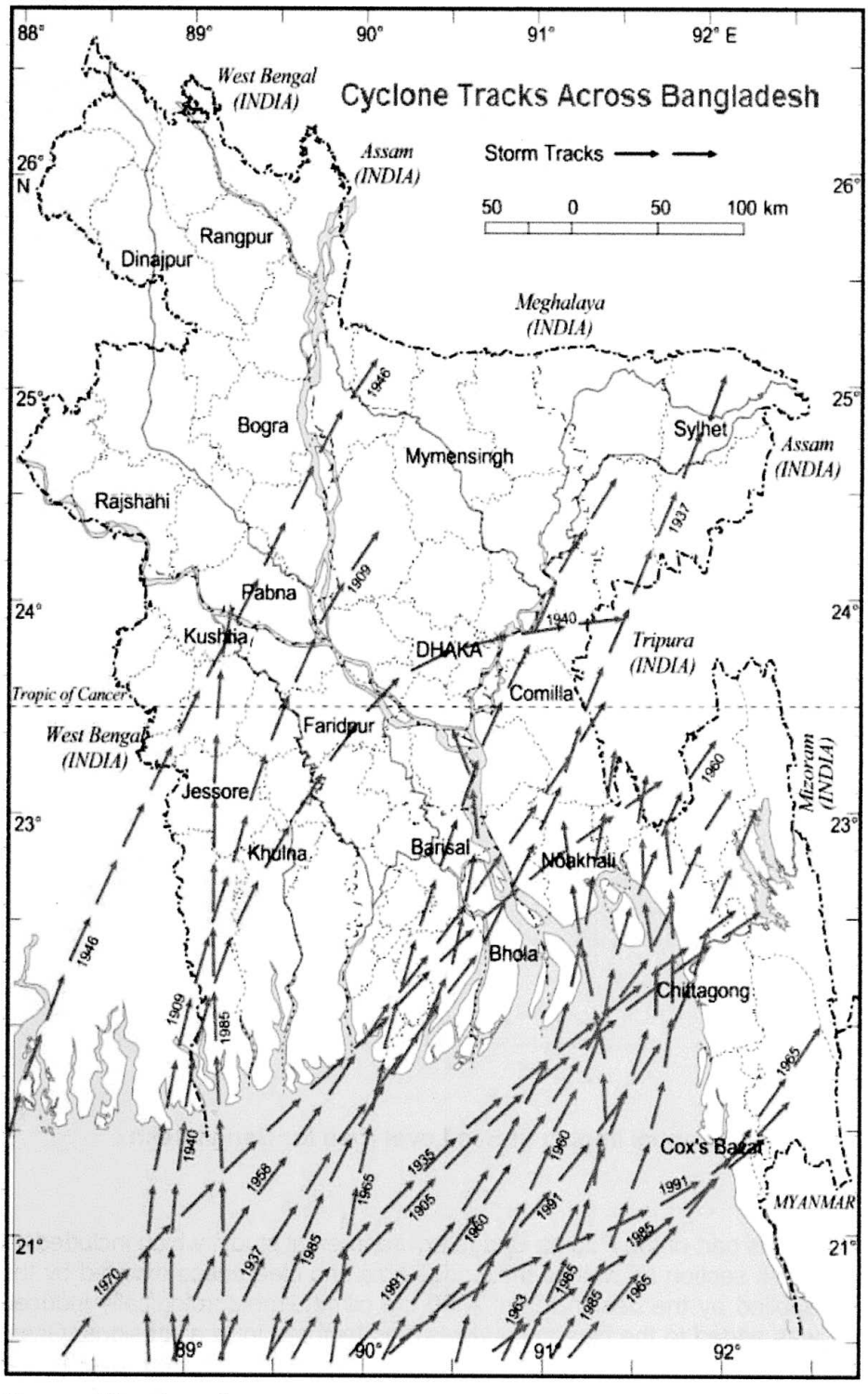
It is therefore; important to take sufficient control measures in the cement plant in order to minimize cement dust escape level into atmosphere and to reduce the ill effects of dust on the neighboring operations. The conveyor belt from the unloading jetty to the clinker silo should be provide with shade and at the clinker silo there should be bag filter with pulse jet system. Bag filter should also be provided like grinding section, cement silo and other points where there is a scope of air pollution. To evaluate the impact due to cement dust escape, it is necessary to calculate the ground level concentration of SPM at different distances around the plant. The workers of the plant, who would be exposed to high concentration of dust within the factory, would be of concern. Since the concentration level within the plant site will be relatively the project entrepreneur must take high sufficient precautionary measures.

The US national air quality standards suggest a maximum 24-hour concentration of particulate matters as primary pollutant to be 260 µg / m^3 which should not exceed more than once a year. The Indian standard suggests values of 500 µg / m^3 for residential areas (Rao & Rao, 1989).

6.8 Cyclones and Storm Surges

Due to its vulnerable geographic location, Bangladesh suffers from frequent and devastating tropical cyclones and tidal surges. The funnel-shaped northern portion of the Bay of Bengal causes tidal bores when cyclones make landfall, and thousands of people living in the coastal areas are affected. Of the last 18 severe cyclones in Bangladesh that occurred between 1905 and 1991, as many as seven hit Chattogram City and vicinity, causing severe damage.

Based on these statistics, the Project corridor is in the coastal belt 10–20 km away from the Bay of Bengal, and directly in line with the cyclone tracks and associated tidal surges. To address this, SSCIL will adopt required measures in designing and construction of the station and other buildings to be able to withstand such weather events (Figure 6.3)

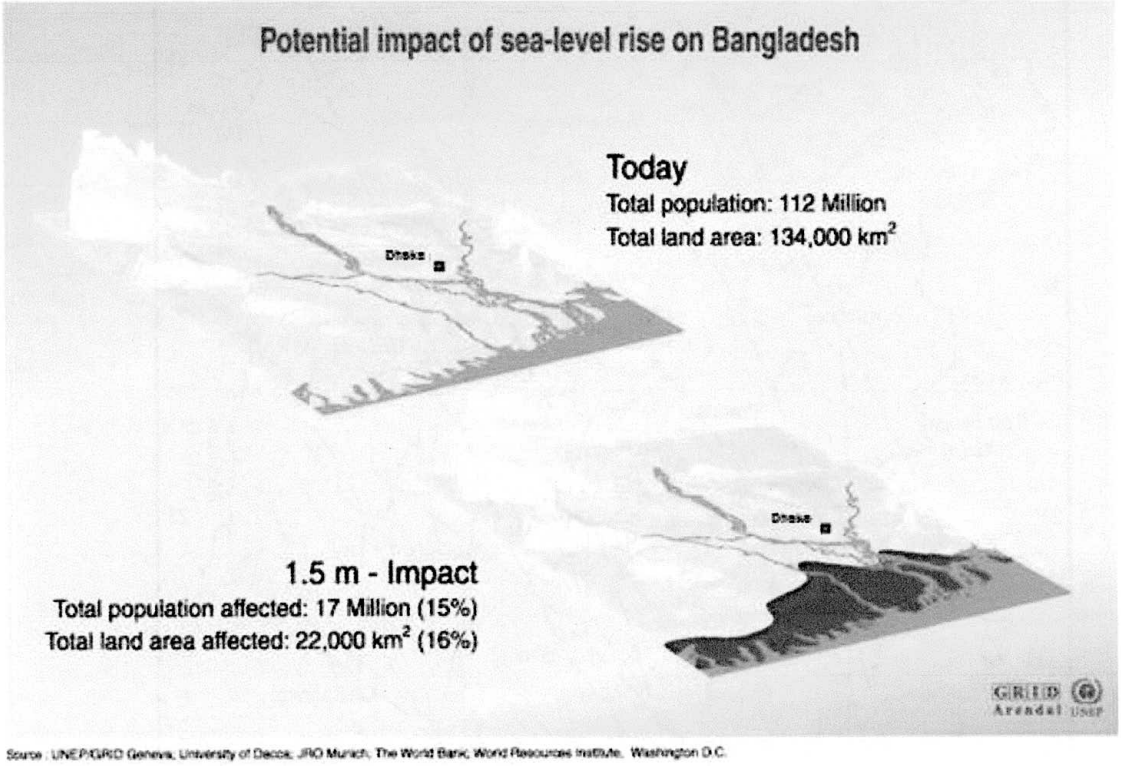


Source: Banglapedia

Figure 6.3 Cyclones Tracking over Bangladesh, 1902–1990

6.9 Climate Change

Since about 1900, the average near-surface temperature of the planet has increased by 0.75°C. Bangladesh is significantly vulnerable to the impact of climate change. Due to climate change, sea level is rising resulting in the ingress of salinity (Figure 6.4). The coastal area from Chattogram to its surrounding area has a higher probability of being affected by climate change, especially the loss of land due to sea level rise coupled with the advance of the sea into the freshwater areas as the ocean pushes further into the river systems. SSCIL has considered the issue of sea level rising and is designing all facilities with this in mind.



Source : UNEP/GRID Geneva, University of Dacca, IRO Munich, The World Bank, World Resources Institute, Washington D.C.

Source CEGIS 2008

Figure 6.4 Graphic of Potential Impact of Sea Level Rise for Bangladesh

Findings generated as part of the Padma Bridge environmental study, which included an extensive climate risk section as well as the Bridge size and clearances dictated by the GoB were fully applied by the design team. A 30 cm climate/meteorologically induced water level rise was added to the clearance levels, this factored in to all designs. Given the location of the bridges from the coast and rise in elevation from sea level to the crossing structures, the original recommendation for the Padma Bridge of a 47 cm adjustment for climate change was adjusted to a 30 cm climate/meteorologically induced water level rise. Figure 11, taken from the Padma Climate Impact Report graphically depicts the approximate reach of three climate-induced water level increases in coastal rivers. Extrapolating these isolines to the SE coastline contributed to the decision to use a 30 cm adjustment (which was amply accommodate by the 1 m freeboard above HFL bridge designs

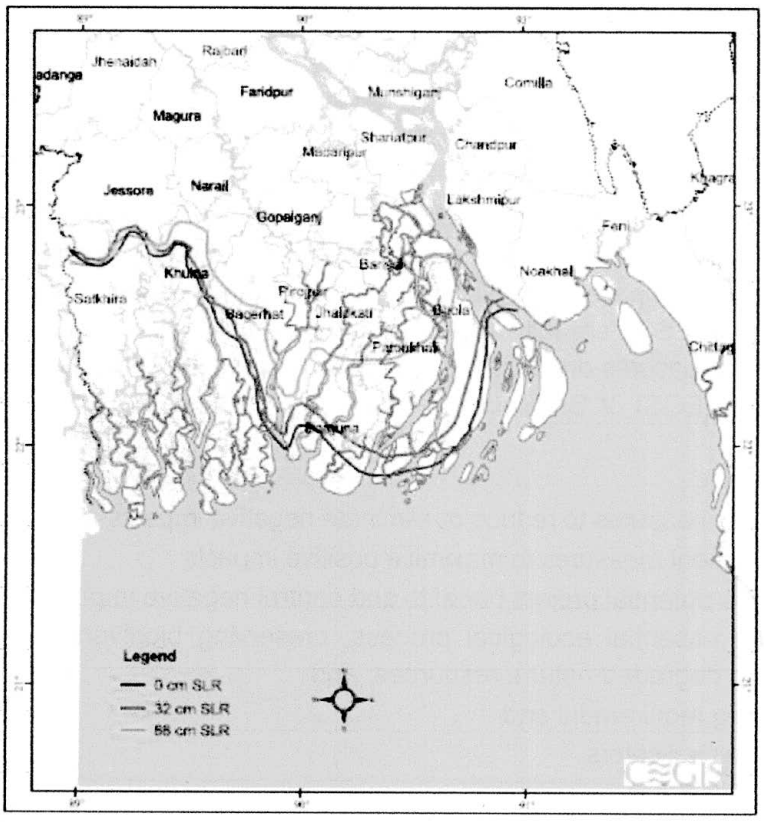


Figure 6. 5 Potential Impact of Sea Level Rise on Bangladesh (Ainun Nishat, 2008, and CEGIS 2008)

6.10 Cumulative Impact

Mitigation of Cumulative Environmental Effects

As with Project environmental effects, mitigation measures that would reduce the cumulative environmental effects are described, with an emphasis on those measures that would help to minimize the interaction of the Project-related environmental effect with similar environmental effects from other projects, activities, and actions. Three types of mitigation measures are generally considered, as applicable:

- measures that can be implemented solely by the Proponent;
- measures that can be implemented by the Proponent in cooperation with other project proponents, government, Aboriginal organizations, the public, and/or other stakeholders; and
- Measures that can be implemented independently by other project proponents, government, the public, and/or other stakeholders.

There is no industries around the proposed cement industries and hence there is air and noise pollution generate. The predicted dust emission and noise pollution were assessed in isolation and also the cumulative impact of dust and noise emissions from the proposed SSCIL cement plants and from the background values recorded in the project area and found is within DoE standard value.

SECTION-7: ENVIRONEMNTAL MANAGEMENT PLAN/ MITIGATION MEASURE

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. Unless the mitigation and benefit enhancement measures, identified in IEE or ESIA, are fully implemented, the prime function of IEE or ESIA cannot be achieved. 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
- Maximize potential project benefits and control negative impacts;
- Maintain essential ecological process, preserving biodiversity and where possible restoring degraded natural resources; and
- Monitoring requirement and
- Monitoring indicators

The EMP will be managed through a number of tasks and activities and site-specific management plans. One purpose of the EMP is to record the procedure and methodology for management of mitigation identified for each negative impacts of the proposed project. The management will clearly delineate the responsibility of various participants and stakeholders involved in planning, implementation and operation of the project.

7.2 Inclusion of Relevant Components of EMP In Contract Documents

The EIAs to be prepared for proposed project should include a section on special environmental clauses to be incorporated in the Tender Document under General/Particular Specification. These clauses are aimed at ensuring that the Contractor carries out his responsibility of implementing the environment management plan (EMP), monitoring plan as well as other environmental and safety measures. Such clauses may specify, for example, penalties for non-compliance as well as incentives to promote strong compliance. The various contractors must be made accountable to implement the plans and mitigation measures which pertain to them through contract documents and/or other agreements of the obligations and importance of the environmental and social components of the project.

7.3 Environmental Codes of Practice

The environmental codes of practice (ECoPs) are generic, non-site-specific guidelines. The ECoPs consist of environmental management guidelines and practices to be followed by the contractors for sustainable management of all environmental issues. The contractor will be required to follow them and also use them to prepare site-specific management plans (discussed later in the Section). The ECoPs are listed below and attached in Annex 6.

- ECoP 1: Waste Management
- ECoP 2: Fuels and Hazardous Substances Management
- ECoP 3: Water Resources Management
- ECoP 4: Drainage Management
- ECoP 5: Soil Quality Management
- ECoP 6: Erosion and Sediment Control
- ECoP 7: Top Soil Management
- ECoP 8: Topography and Landscaping
- ECoP 9: Borrow Areas Management
- ECoP 10: Air Quality Management
- ECoP 11: Noise and Vibration Management
- ECoP 12: Protection of Flora
- ECoP 13: Protection of Fauna
- ECoP 14: Protection of Fisheries
- ECoP 15: Road Transport and Road Traffic Management
- ECoP 16: Construction Camp Management
- ECoP 17: Cultural and Religious Issues
- ECoP 18: Workers Health and Safety

7.4 Mitigations and Compliance Monitoring Plans

The mitigation and compliance monitoring plans are the key element of EMP to be prepared on the basis of impact assessment described in Chapter 5. The Plans describe the potentially negative impacts of proposed project activity, lists mitigation and control measures to address the negative impacts, and assigns responsibilities for implementation and monitoring of these measures. Mitigation and Compliance Monitoring Plan-Pre-Construction Table 7.1, Construction Phase 7.2 and Operation phase shown in Table 7.3.

7.5 Construction Stage Site Specific Management Plans

Pollution Prevention Plan will be prepared and implemented by the contractors on the basis of the DoE Guidelines (2007) that will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Waste Disposal and Effluent Management Plan will be prepared and implemented by the Contractor on the basis of the EMP, DoE Guidelines, which will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Storm Water Drainage: Storm water will be discharge through internal drainage system. A spill basin should be constructed to remove the dirt, grit, silt and other material from storm water before discharge to the canal or river.

Drinking Water Supply and Sanitation Plan: Separate water supply and sanitation provisions will be needed for the temporary facilities including offices, labor camps and workshops so that

it does not shortages and/or contamination of drinking water sources. The plan will be submitted to the CSC for their review and approval before contractor mobilization.

Occupational Health and Safety (OHS) Plan will be prepared and implemented by each contractor on the basis of the DoE Guidelines, and other relevant standards. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Borrow Area Management Plan will be prepared and implemented by each contractor on the basis of the DOE Guidelines and other relevant standards. The Plan will be submitted to the CSC for their review and approval before contractor mobilization

Traffic Management Plan will be prepared by each contractor after discussion with SSCIL and authorities responsible for roads and traffic. The Plan will be submitted to the CSC for their review and approval before contractor mobilization. The Plan will identify the routes to be used by the contractors, procedures for the safety of the local community particularly pedestrians, and monitoring mechanism to avoid traffic congestion.

Construction Camp Management Plan will be prepared by each contractor. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The Plan will be submitted to the CSC for their review and approval before camp establishment.

Fuel and Hazardous Substances Management Plan will be prepared by each contractor in accordance with the standard operating procedures, relevant guidelines, and where applicable, material safety data sheets (MSDS). The Plan will include the procedures for handling the oils and chemical spills. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

An Emergency Preparedness Plan will be prepared by each contractor after assessing potential risks and hazards that could be encountered during construction. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Table 7.1 Mitigation and Compliance Monitoring Plan – Pre-Construction Phase

Sl. No	Environmental and sustainability issue	Issues/Impacts/Impact sources	Mitigation Measures/Action Plan	*Responsibility* Execution	*Monitoring*
1	Cement Industry construction and land use planning	Issues with existing Cement Industry Unregulated development around the industry These above issues are also relevant to the proposed Cement Industry sites when designing the project facilities	Design and provide adequate facilities in the Cement Industry designs. As a part of the engineering designs, a long-term master plan will be developed for planning of SSCIL facilities with adequate buffer areas around the SSCIL facilities. In addition, the project will support creation and/or updating of land use plans around the project areas during project implementation, to help address challenges related to unregulated but anticipated development around the SSCIL facilities that falls outside the scope of the SSCIL jurisdiction and immediate buffer zone.	Consultant and SSCIL	SSCIL
2	Hydrology	SSCIL is located near the kornophull river. This SSCIL may be not subjected to floods and also from the bend erosion of the river.	Design of SSCIL will consider flood fore casting and if necessary, will construct	Consultant	SSCIL

		SSCIL are located in existing facilities.	embankments (or filling the lands above flood levels) for protection of SSCIL from flooding Bank protection measures to control the erosion of the rainwater drain		
3	Noise	Noise from SSCIL equipment.	Design Plantation development around the boundary walls of the SSCIL areas	Consultant	SSCIL
4	Environmental assessment of proposed SSCIL	The current environmental assessment is based on framework approach; however, detailed environmental assessment of each SSCIL needs to be carried out.	Hiring of consultants and carry out ESIA studies for all SSCIL in compliance with DoE requirements Submission of ESIA documents for DOE clearance.	Consultants	SSCIL

Table 7.2 Mitigation and Compliance Monitoring Plan – Construction Phase

Sl. No	Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures	*Responsibility*	
				Execution	*Monitoring*
1	Dust (Fugitive and Cement dust Land development	• Dust pollution • Create nuisance • Road damage • Nutrient loss due to top soil remove • Reduced visibility	• Fill the land in dry season • If transported by truck, then cover the soil by tent of the truck during transportation • Spray of water is suggested in the road and construction sites • As per capacity of road use the	Contractor	CSC, PIU

			below capacity of truck load • Replace the top soil as nutrient content on the same land • Paving of the Project Site and roads; • Workers to use dust/nose masks; • Sufficient ventilation at workplace; • Ensure de-dusting system (bag filters) is always efficient; • Workers to use appropriate PPE; • Strict enforcement on PPE use; • Spilled Cement to be recovered • Covering conveyors • Use of covered trucks to deliver materials • High standard design for mill		

2	Air Quality	Emissions from construction related traffic and machinery. Dust from works, other machinery, concrete mixing, and traffic from trucks and vehicles.	Implement measures in ECoP 10 Air Quality Management. Dust generation will be restricted as much as possible and water sprinkling carried out as appropriate, especially where earthmoving, and excavation are carried out. Emissions from construction equipment and traffic will comply with World Bank EHS guidelines and will be monitored.	Contractor	CSC, PIU
3	Surface Water and Sediment Quality	Waste water from construction camps, offices and warehouses. Spillage of fuels, oils, and other chemicals, and waste effluents from workshops and washing bays. Erosion from construction works	Implement measures in ECoPs 3, 4 and 6	Contractor	CSC, PIU
4	Soil and groundwater quality	Pollution from construction activities and storage facilities.	Implement ECoP 5: Soil Quality Management For effluents to be discharged from workshops, camps, and offices, treatment arrangements such as retention ponds and septic tanks will be	Contractor	CSC, PIU

			incorporated in the facility designs.		
5	Noise	During construction on the land, noise levels produced by vehicles, machinery, concrete mixing, and other construction activities will exceed the applicable standards and may cause nuisance to local community Noise induces hearing loss Poor concentration at workplace Reduced productivity	• Develop and implement an effective noise control and hearing • Conservation programme; • Carry out periodic noise measurements; • Fit noisy machines with noise reduction devices; • Provide suitable hearing protection to all workers exposed to noise levels above 85dB(A); • Post notices and signs in noisy areas; • Carry out audiometric test by a designated medical practitioner to all workers exposed to noise levels above 85dB(A); • Educate all workers on importance of marking correct use of PPE provided. Limit the noisy construction activities to daylight hours • Maintain the equipment and vehicles as per manufacturer guidelines	Contractor	CSC, PIU
6	Health and Safety:	Workers health and safety hazards	Implement ECoP 18: Workers	Contractor	CSC, PIU

		associated with construction activities Community health and safety hazards at the construction sites, including exposure to sexually transmitted diseases such as HIV/AIDS	Health and Safety, ECoP 16: Construction Camp Management Require all contractors to specify a code of conduct for expectations of worker behavior at site and with local communities Separation of people from vehicles and making vehicle passageways one-way, to the extent practical Traffic management Require personal protective equipment (PPE), as well as required health and safety awareness orientation and training, for all workers. To ensure the works contract incorporate minimum health and safety provisions and is being monitor by SSCIL with the support from CSC during construction.		
7	Child labor	Risk of contractors or subcontractors hiring child labor in the construction activities.	National laws on child labor will be strictly followed. No child labor will be hired by the contractors or subcontractors	Contractor	CSC, PIU

			in any of the project activities.		

Table 7.3 Mitigation and Compliance Monitoring Plan – Operation Phase

Sl. No	Environmental and sustainability issue	Issues/Impacts/impact sources	Mitigation Measures	*Responsibility*	
				Execution	***Monitoring***
1	Air Quality	Dust from the access roads Vehicle emission Fuel storage facilities and transfer may also release volatile organic compounds (VOC).	Regularly sweeping yards and handling areas Keep the vehicle in a safe distance Use modern and latest engine	E&S Cell	SSCIL
2	Release of Sulphur gases SOx, NOx, CO_2 and CO	• Pollution of upper atmosphere that result in the formation of smog, Acid rain effect on plant, wildlife and property; • Respiratory illness, alterations in the lungs' defences and aggravation of existing cardiovascular disease • Formation of acid rain, weak carbonic acid; • Major source of greenhouse gas; • Causes climate change related issues (Global Warming); CO contributes to the formation of smog, ground-level ozone, which can trigger serious respiratory problems; Greenhouse gas hence contribution to global warming; • Formation of acid rain potentially	• Use fuels with low Sulphur content in coal for hot gas generation • Maintenance and servicing of vehicles and machine/equipment. • Switching off engines when not in use (avoid idling mode) • Planting trees onsite and offsite • Maintenance and servicing of vehicles and machine/equipment. • Switching off engines when not in use (avoid idling mode) • Maintenance and servicing of vehicles and machine/equipment; • Switch off engines within the site when not in use(avoid idling mode)	E&S Cell	SSCIL

		damaging to plants, animals and property; • Harmful health effects by reducing oxygen delivery to the body's organs (like the heart and brain) and tissues; • Central Nervous System Effects			
3	Surface Water Quality	Rain water discharge from building top may create flooding.	Rain water discharge from building top and stored in underground storage.	SSCIL maintenance manager.	SSCIL
4	Noise	Major Noise sources is SSCIL equipment.	Consideration should also be given in the planning stage for developing vegetation and walls around the transmission equipment and reduce noise levels.	E&S Cell	SSCIL
5	Occupational health and safety	Physical hazards associated with RF radiation and use of associated machinery and vehicles. Work with fuels may present a risk of exposure to volatile organic compounds (VOC) via inhalation or skin contact during normal use or in the case of spills. Exposure to dust from handling of dry cargo (depending on type of cargo handled, e.g. cement, grain, and coal) and from roads. Noise from cargo handling, including vehicular traffic, and loading/ unloading.	Constructing the surface of SSCIL areas to be: of adequate strength to support the heaviest expected loads; level, or with only a slight slope; cracks, depressions, unnecessary curbs, or other raised objects; continuous; and skid resistant Materials handling operations should follow a simple, linear layout to reduce the need for multiple transfer points. Development of Safety System. This safety system should include procedures to regulate the safe movement of trucks within the SSCIL	Terminal Operator	SSCIL with support from CSC

			facilities, protect the general public from dangers arising from traffic, and prevent events that may result in injury to workers, the public, or the environment. The Safety Management System should include comprehensive emergency preparedness and response plans that provide a coordinated response based on the port and community resources required to manage the nature and severity of the emergency event.		
			To ensure the minimum occupational health and safety provisions and is being monitor by SSCIL.		
6	Community health and safety	Risk of accidents with activities associated with traffic, Visual concerns from SSCIL operations are uncontrolled dumping, debris, derelict warehouses and broken machinery	Separation of people from vehicles and making vehicle passageways one-way, to the extent practical To minimize impacts on visual concerns of the community and improve the cleanliness of SSCIL facilities, it is required to implement regular clean up and maintenance	SSCIL Operator	SSCIL
7	Odor	Odor from diesel exhaust emitted by land-based equipment and	Diesel Engines" and "Liquid Bulk Storage and Transfer (Loading/Unloading")	SSCIL Operator	SSCIL

		vessels;	for BMPs); Adopt a policy requiring SSCIL employees to report odors they detect to SSCIL operator		
8	Trash	Trash from tenant activities "deposited" outside SSCIL property by visitors, service providers, employees, others;	• Conduct a reduce/recycle/reuse (waste minimization) study to identify sources of current waste streams and alternatives to disposal; include a perimeter (and beyond) survey of trash to identify its origins; • Place marked trash containers at locations convenient to visitors, truck operators and employees; • Cover and berm trash collection areas and containers (e.g., roll-offs, barrels) to avoid dispersion by wind and storm water;	SSCIL Operator, E&S Cell	SSCIL
9	Light	• Light from equipment, vessel operation and parking lots, work areas, buildings.	• Conduct light distribution study, including locations outside the perimeter of SSCIL property; • Incorporate energy efficiency lighting to reduce/eliminate unnecessary lighting and change fixtures to more cost-efficient ones; • If study results or complaints warrant, replace overhead (pole) lighting fixtures with "sharp-cutoff" or "down-shoot" fixtures that focus illumination on the ground;	SSCIL Operator	SSCIL

10	Traffic congestion	*Traffic congestion from vehicle queuing, security checks, service deliveries, etc*	• *Direct vehicle traffic to queue on SSCIL owned property for truck stand,* • *Survey the employees' interest in carpooling, to reduce congestion and vehicle emissions;* • *Cooperate with local officials in preparing plans to alleviate congestion in the SSCIL area;* • *Ensure that signage, traffic controls and pavement markings on streets/roads near the project and at its entrances conform to state and federal requirements.*	SSCIL Operator	SSCIL

7.6 Monitoring Program

As one of the key elements of the EMP, a two-tier monitoring program has been proposed comprising compliance monitoring and effects monitoring. The main purpose of this monitoring program is to ensure that the various tasks detailed in the EMP particularly the mitigation measures are implemented in an effective manner, and also to evaluate program impacts on the key environment and social parameters. Various types of EMP monitoring are discussed below.

7.6.1 Compliance Monitoring

The purpose of the compliance monitoring is to ensure that the contractor implements the mitigation measures given in the EMP are effectively and timely implemented. This monitoring will generally be carried out by the CSC with the help of checklists prepared on the basis of the mitigation measures given in Chapter 5.

7.6.2 Effects Monitoring

Effects monitoring is a very important aspect of environmental management to safeguard the protection of environment. The effects monitoring plan proposed for the proposed projects is presented in Table 7.4 which will be revisited and revised during EIA studies. The monitoring will comprise surveillance to check whether the contractor is meeting the provisions of the contract during construction and operation of the project including the responsible agencies for implementation and supervision.

Table 7.4 Effects Monitoring Plan

Sl. No	Parameter / Activity	Location	Means of Monitoring	Compliance indicator/ threshold limits	Frequency	Responsible Agency	
						Implementation	Supervision
	During Construction						
1	Hydrocarbon and chemical storage	Construction camps and yards	Visual Inspection of storage facilities	No leakages from the containers in the storage	Monthly	Contractor	CSC
2	Traffic Safety	Access Roads	Visual inspection to see whether proper traffic signs are placed and flag-men for traffic management are engaged	Smooth flowing of traffic; and placement of traffic signs and flag-men	Monthly	Contractor	CSC
3	Dust	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (e.g., spraying of waters) are in place.	No dust generation from the construction activities	Daily	Contractor	CSC
		Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	No dust generation from the material storage sites	Monthly	Contractor	CSC
4	Air quality (PM, CO_2, SOx, NOx)	Near the SSCIL	24 hours continuous monitoring with the help of appropriate instruments and analzyers	Compliance with the DOE standards	Quarterly during the construction phase	Contractor	CSC

5	Water Pollution	During Construction	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH_4N Oil and Grease. Sampling point is outlet of drain.	Compliance with the DOE standards	Quarterly during the construction phase	Contractor	CSC
6	Noise	Construction sites	Noise measurement using noise meter; Ensure work restriction between 21-06 close to the residential areas	Compliance with DOE standards	Monthly	Contractor	CSC
7	Water quality (For all drinking water parameters including arsenic, iron and coliforms)	Locations of tube-well installation installed SSCIL	Depth of tube well should be more than 30m. Test water for arsenic and iron before installing of casing. If the quality is found not suitable further deepening will be done.	Compliance with DOE drinking water standards	During drilling of wells	Contractor through a nationally recognized laboratory	CSC
		Water wells to be used by contractors for drinking	Laboratory analysis of all drinking water parameters specified in national standards	Compliance with DOE drinking water standards	After development of wells	Contractor trough a nationally recognized laboratory	CSC

8	Waste Management	Construction camps and construction sites	Visual inspection that solid waste collection facilities are in place and waste is disposed at designated site	Facilities are clean and waste collection and disposal facilities are in place	Monthly	Contractor	CSC
9	Drinking water and sanitation	Camps, offices	Ensure the construction workers are provided with safe water and sanitation facilities in the site	Availability of safe drinking water and sanitation facilities	Monthly	Contractor	CSC
10	Cultural and archaeological Sites	At all work sties	Visual observation for finding any change	Indication of any changes	Daily	Contractor	CSC, SSCIL
11	Restoration of Work Sites	All Work Sites	Visual Inspection	The facilities are clean with no waste at the works sties	After completion of all works	Contractor	CSC, M&E Consultant, SSCIL
12	Safety of workers Monitoring and reporting accidents	At work sites	Usage of Personal Protective equipment and implementation of contractor OHS plan	All workers should use necessary PPEs	Monthly	Contractor	CSC, SSCIL
13	Grievances	In the project area	Number of grievances registered and addressed	Minutes of grievance redress meetings	Monthly	PIU	CSC, SSCIL
14	Reporting on Environmental Monitoring	During Construction	All parameters	To meet the compliance requirement	Quarterly	PIU	SSCIL
	During Operation and Maintenance						

15	Dust	At SSCIL facilities & access roads	Visual inspection	No visible dust	Weekly	EHS Officer of respective SSCIL	SSCIL
16	Traffic safety	At SSCIL facilities and access roads	Visual inspection	NO traffic congestion	Weekly	EHS Officer of SSCIL	SSCIL
17	Cleanliness	At SSCIL	Visual Inspection	Facilities are clean with no garbage	Weekly	EHS Officer of respective SSCIL	SSCIL
18	Solid waste collection	At SSCIL	Visual inspection that waste collection facilities are in use	Waste collection and disposal facilities are in place	Weekly	EHS Officer of respective SSCIL	SSCIL
19	Workers and community health & Safety	At SSCIL	Visual inspection on health and safety issues	Use of necessary PPEs by workers	Monthly	EHS Officer of respective SSCIL	SSCIL
20	Accidents	At SSCIL	Visual assessment and Interviews with involved people	Accident reports	As and when happened	EHS Officer of respective SSCIL	SSCIL
21	Drinking water and sanitation facilities	At SSCIL	Visual inspection and interviews	Availability of safe drinking water & sanitation facilities	Monthly	EHS Officer of respective SSCIL	SSCIL
22	Air quality (PM, CO_2, SOx, NOx)	Near the SSCIL	24 hours continuous monitoring with help of appropriate instruments and analyzers	Compliance with the DOE standards	Quarterly	EHS Officer of respective SSCIL	SSCIL

23	Water Pollution	During Operation	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH_4N Oil and Grease	Compliance with the DOE standards. As per Annex 4.	Quarterly	EHS Officer of respective SSCIL	SSCIL
24	Noise	During Operation	Noise measurement using noise meter; Ensure work restriction between 21-06 close to the residential areas	Compliance with DOE standards	Monthly	EHS Officer of respective SSCIL	SSCIL
25	Waste Management	Operation of the port	Visual inspection that solid waste collection facilities are in place and waste is disposed at designated site	Facilities are clean & waste collection & disposal facilities are in place	Monthly	EHS Officer of respective SSCIL	SSCIL

7.7 Performance Indicators

For evaluating the performance of the environmental management and monitoring plan, performance indicators are identified for efficient and timely implementation of measures/actions proposed in EMP. The indicators are defined both for implementation phase and for operation phase. CSC will be responsible for compiling the information on these indicators and report to SSCIL.

To measure the overall environmental performance of the project, a list of performance indicators is given below; however, a detailed list of indicators will be prepared by EIA studies

- Number of inspections carried out by CSC per month
- Number of non-compliances observed by CSC or E&S.
- Availability of environmental specialists in E&S.
- Availability of environmental specialists in CSC.
- Availability of environmental specialists with contractors.
- Timely reporting of documents (as defined in EMP and monitoring plan)
- Number of trainings imparted to stakeholders/other capacity building initiatives

- Timely disbursement of compensation/ timely resettlement of project affected people
- Timely implementation of resettlement schedule.
- Number of grievances received.
- Number of grievances resolved.
- Number of constructions related accidents.

7.8 Grievance Redress Mechanism

A project level Grievance Redress Mechanism (GRM) need to be established based on its institutional mechanism. A three tier grievance redress committees (GRC) need to be established for this Project. The tier 1 GRM consists of the SSCIL In-charge, a representative from the local government, and a representative from the affected communities. When dealing with the complaints on environmental issues, the committee will take advise of the environmental specialists of the CSC and E&S Cell. The second tier of GRM consists of the Project Director, the GRM Officer of the SSCIL and a representative of district government. The third tier of GRM consists of the Secretary of Ministry of Information. The grievance management system will be communicated to the local and affected communities. A toll-free number will also be setup to receive the grievances.

7.9 Capacity Building

Capacity building for effective implementation of the environmental and social safeguard requirements is a key element of the ESMP. Capacity building for environmental and social safeguard management will need to be carried out at all tiers of the project, including SSCIL, E&S Cell, CSC, and contractors. At the construction site, CSC will take the lead in implementing the capacity building plan, though the contractors will also be responsible to conduct trainings for their own staff and workers. The various aspects that are covered under the capacity building will include general environmental and social awareness, key environmental and social sensitivities of the area, and key environmental and social impacts of the project, ESMP requirements, OHS aspects, and waste disposal. Table 7.5 provides a summary of various aspects of the environmental and social trainings to be conducted at the construction site. E&S Cell may revise the plan during the project implementation as required. During the O&M phase of the project, these trainings will continue to be conducted by SSCIL staff for all relevant O&M personnel and community.

Table 7.5 Environmental and Social Trainings

Sl. No.	Description of Item	Unit/ List of Acronym	Quantity	Unite Rate (BDT)	Item Total (BDT)
01	During excavated earth/soil carrying for low land filling for dust management by water sprayer	LS	1	100,000	100,000
02	Low land filling management	LS	1	100,000	100,000

03	Maintenance and protection of traffic including construction of diversion road, warning signs, posting of signboard detaining project activities	LS	1	50000	50,000
04	Campsite solid waste disposal facilities	Nos.	1	50,000	50,000
05	Tree plantation and green area development plan	Nos.	500	250	125,000
06	Water quality protection measures: soil erosion at the construction site, wastewater discharge and prevention of spillages, leakages of polluting materials, etc. to be satisfaction of the engineer.	LS	1	100,000	100,000
07	Stripping topsoil from borrowed agricultural lands, stockpiling and replacing the same to rehabilitate the land to the entire satisfaction of the owner and the engineer.	LS	1	50,000	50,000
08	Rehabilitation of ancillary sites including stockpile sites, brick crushing sites, borrow areas, work force camps/ site office, etc and turfing to the entire satisfaction of Engineer.	LS	1	50,000	50,000
09	Orientation to the technical personnel/ construction worker associated with the SSCIL about the key issues of EMP & Environmental Monitoring	LS	1	100,000	100,000
10	Capacity building of SSCIL staff for general and cumulative impact mitigation	LS	1	150,000	150,000
A	**Total In Word (BDT)-Eight Lac Seventy-Five Thousand Only**				**875,000**

7.10 Documentation

The E&S Cell with assistance from CSC and contractors will produce the following environmental reporting documentation:

Environmental Monitoring Reports: The environmental monitoring reports will include environmental mitigation measures undertaken, environmental monitoring activities undertaken, details of monitoring data collected, analysis of monitoring results particularly the non-compliances, recommended mitigation and corrective measures, environmental training conducted, and environmental regulatory violations observed. The environmental monitoring reports will be submitted quarterly during the construction period and annually for three years after completion of construction.

Project Completion Environmental Monitoring Report: One year after completion of construction, the E&S Cell will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental impacts from the project.

For the SSCIL will be identified and designed during implementation, ESIA will be submitted by the SSCIL for DoE review and clearance. No RAP is required since the industries will set un on the proposed industries own vacant land.

7.11 EMP Implementation Cost

The mitigation measures that are needed to be the part of the design of SSCIL and include in the construction cost. The cost of establishing E&S Cell in the PMU and environmental staff of the CSC consultants will need to be included the overall Project's ESMF. Detailed cost estimates for environmental mitigation is given in Table 7.6 and costs for monitoring during construction are given in Table 7.7. Environmental Monitoring Cost during O&M Phase for SSCIL in Table 7.8.

Total costs of ESMP implementation for SSCIL will be BDT 2,005,000.

Table 7.6 Environmental Mitigation Cost for SSCIL

Sl. No.	Description of Item	Unit/ List of Acronym	Quantity	Unite Rate (BDT)	Item Total (BDT)
01	During excavated earth/soil carrying for low land filling for dust management by water sprayer	LS	1	100,000	100,000
02	Low land filling management	LS	1	100,000	100,000
03	Maintenance and protection of traffic including construction of diversion road, warning signs, posting of signboard detaining project activities	LS	1	50000	50,000
04	Campsite solid waste disposal facilities	Nos.	1	50,000	50,000
05	Tree plantation and green area development plan	Nos.	500	250	125,000
06	Water quality protection measures: soil erosion at the construction site, wastewater discharge and prevention of spillages, leakages of polluting materials, etc. to be satisfaction of the engineer.	LS	1	100,000	100,000
07	Stripping topsoil from borrowed agricultural lands, stockpiling and replacing the same to rehabilitate the land to the entire satisfaction of the owner and the engineer.	LS	1	50,000	50,000
08	Rehabilitation of ancillary sites including stockpile sites, brick crushing sites, borrow areas, work force camps/ site office, etc and	LS	1	50,000	50,000

	turfing to the entire satisfaction of Engineer.				
09	Orientation to the technical personnel/ construction worker associated with the SSCIL about the key issues of EMP & Environmental Monitoring	LS	1	100,000	100,000
10	Capacity building of SSCIL staff for general and cumulative impact mitigation	LS	1	150,000	150,000
A	**Total in Word (BDT)-Eight Lac Seventy-Five Thousand Only**				**875,000**

Table 7.7 Environmental Monitoring Costs during Construction of SSCIL

Sl. No	Component	Stage	Item	Unit Cost (BDT)	Quantity (Yearly)	Total Costs (BDT)
1	Awareness, Warning signs, labels and signals Accident	During Construction	Ensuring that HSMP works right on the track	–	–	100,000
2	Campsite waste disposal facilities	During Construction	Avoid disease	50,000	1	50,000
3	First aid box, PPE	During Construction	Avoid accident	10,000	1	10,000
4	Air Pollution	During Construction	Measurement of SPM, PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO.	75,000	2	150,000
5	Water Pollution	During Construction	Measurement of pH, EC, Turbidity, DO, Coli form, BOD, NH_4N Oil and Grease	25,000	2	50,000
6	Waste	During Construction	Collection, transportation and dumping of waste at authorized dumping sites. Minimization of volume and recycling.	50,000	1	50,000
7	Noise	During Construction	Periodical maintenance of construction vehicles and installation of sound insulation	10,000	2	20,000

			cover			
8	Drinking Water supply and sanitation	During Construction	Arsenic free water/ Treatment and test cost	50,000	1	50,000
9	Reporting on Environmental Monitoring	During Construction	Quarterly Monitoring Report	100,000	1	100,000
	B	**Total in Word (BDT)-Five Lac Eighty thousand only**				**580,000**

Table 7.8 Environmental Monitoring Costs during O&M Phase of Restoration for SSCIL

Sl. No	Component	Stage	Item	Unit Cost (BDT)	Quantity (Yearly)	Total Costs (BDT)
1	Road side drain Cleaning	During operation	Avoid clogging of drain	50,000	01	50,000
2	Air Quality Monitoring	During operation	SPM, PM_{10}, $PM_{2.5}$, NO_X, SO_2, CO	75,000	04	300,000
3	Water Quality Monitoring	During operation	pH, EC, Turbidity, DO, BOD, COD, NH_4N, Phosphate.	25,000	04	100,000
4	Reporting on Environmental Monitoring	During Operation	Semi-annual Monitoring Report	100,000	01	100,000
	C	**Total in Word (BDT)-Five Lac and Fifty Thousand Only**				**550,000**
	Grand Total (A+B+C): Twenty Lac Five Thousand Only					**2,005,000**

7.12 Responsibility of The Contractor

The Contractor shall carry out the project related activities as specified in contract agreement. SSCIL shall ensure that contractors take due responsibility to mitigate those negative impacts. Environmental awareness creation, particularly about the direct construction impacts and for the health, pollution and safety issues will be Contractor's responsibility. Consultants' supervisory roles will be in conformity to relevant Clauses incorporated in construction contracts and national legislation. Clauses that may be incorporated with tender documents are:

- The Contractor shall take all steps to protect environment and avoid causing damages of water bodies, and public nuisances of all types during implementation operations;
- Contractor shall comply with the existing statutes and regulations concerning the execution of works as per requirements of DoE and donor's environmental guidelines;
- Contractor shall be responsible for familiarizing himself with the legislation relating to environmental protection that is relevant to his activities. Reference to rational environmental quality guidelines should be made;
- Contractor shall spray water twice a day in order to suppress the dust.

- Contractor shall be responsible for bearing the costs of cleaning up any environmental pollution resulting from his activities if methods for doing that are available and effective;
- Precautionary signboards /danger signals/ propitiatory billboards shall be placed in appropriate places to notify people about the possible dangers;
- Contractor in case of surface water pollution from his activities shall take adequate prevention measures not to pollute water and in case pollution of surface water occurred he shall be liable to revert the original quality of water particularly so where surface water has potential use. Cost both for tests and purification shall be borne by Contractor;
- Where water abstraction from boreholes dug by the Contractor results in adverse effects on groundwater that at the time of commencement of contract was being used by local people Contractor under the situation shall ensure supply of equivalent quantity of safe water to the users;
- Contractor shall at all times maintain the camp and construction sites under his control in clean and tidy conditions and shall provide appropriate and adequate facilities for temporary dumping all types of wastes before disposed properly;
- Remove equipment, surplus material, rubbish and temporary works and leave the site in a clean condition to the satisfaction of the company's representatives after completion of construction activities;
- Be responsible to pay compensation upon the appropriate monetary evaluation applicable to the local market if any damage is incurred to agricultural land or surrounding homesteads outside of the requisitioned land;
- Contractor shall be responsible for safe transportation and disposal of all types wastes generated out of his activities in a manner so that no environmental pollution or hazard to health is caused to the workers and local people. In case any third party is employed to dispose of wastes, Contractor shall even in such case be considered as if he has discharged the responsibilities himself under this Clause until the wastes leave the site under his control. He remains legally bound to exercise due diligence to ascertain that the proposed transport and disposal mechanism do not cause pollution or public health hazards;
- Contractor shall not allow waste oil, lubricant or other petroleum derivatives to be used as dust suppressants and shall take all reasonable precautions to prevent accidental spillage of petroleum products, contact of such materials with soil or water course through discharge, run-off and seepage;
- Contractor shall be responsible for provision of adequate sanitary facilities to the construction workers (including those employed under subcontract) at construction sites, office and camp sites. He shall not knowingly allow discharge of any untreated sanitary waste to the ground or surface water. Before mobilization of construction workforce, Contractor shall provide details of sanitary and drainage arrangements to the Engineering Representative (ER) for approval. The detail should include maintenance and operation plans and sufficient other information to allow the ER to assess whether or not the proposed facilities are adequate;
- All vehicles and plant operated by the Contractor (including subcontractor) shall be maintained according to manufacturers' specification and their original manual, particularly regarding control of noise and/or smoke emission. The ER shall reserve

the right to ask the Contractor for replacement or rectification of any vehicle or plant within 48 hours that he believes emits excessive noise and/or smoke by serving a notice in writing;

- Contractor shall make every reasonable effort to reduce noise pollution caused by construction activities including relocation of crusher and ancillary plant at new site where the distance between these plants and residential sites is safer for attenuation of noise in the existing residential areas;
- Contractor shall take all reasonable measures to minimize dust-blowing from sites under his control by spraying water on stockpile, bare soil, haul road, un-surfaced traffic route and any other source of dust when conditions require dust suppression. If the ER considers dust suppression measures adopted by Contractor ineffective, Contractor shall in that case take further measure to minimize dust blowing at construction site as per his direction.
- In case any traffic disruption is caused due to construction activities of the Contractor (or subcontractors), Contractor shall in that case be responsible to provide alternative road access to for operational use by vehicles. The facilities provided shall be such that neither of the parties are disturbed by the arrangement;
- In case of any road damage by Contractor (or subcontractor), the Contractor shall notify the ER of it and shall repair the road to its original condition at his own cost;
- In case of any damage caused to agriculture or to the surrounding homesteads outside the RoW either permanently or temporarily by the Contractor or Subcontractor's activities, Contractor shall in such case remain responsible to pay monetary compensation for the damage appropriate to the local market value;
- The Contractor on completion of the Contract shall remove the equipment, surplus materials, and rubbish and temporary structures of all types and shall leave sites in clean condition to the satisfaction of local people and the ER.

7.13 Mitigation/Benefit Enhancement Measures

For effective and environment friendly operation of an industries, 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 industries 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 and often may need modification or up-gradation because of changes in the plant operation or factual pollution load/environmental problems detected afterwards. The plant authority may also need fleshing out the suggested outline of the EMP laid down in this report.

All beneficial and adverse impacts which may likely to occur at different phases of the project is identified 5.0. In section 6.0 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-7.9.

Table 7.9 Recommended mitigation/enhancement measures

Sl. No	Potential Impact	Mitigation/Enhancement Measures	Responsibility
Project Location			
1	Topography/ Landscape	It is no problem. Nevertheless, make good engineering design of the building considering the surrounding beauty. Also plant some permanent trees and flowering plants in the plant compound to beautify the area ecologically. Adequate drainage system should be constructed to ease the natural drainage system of the area. Shore protection wall of river and also during construction works should be proper	Contractor and SSCIL
2	Inadequacy of buffer zone	80% of the total land will be covered by various types of tree will be planted. Plantation of trees should be done at all possible open space and road side of the plant premises.	SSCIL authority
Construction Phase			
3	Landscape losses due to cutting and filling	A proper soil protection will be taken during caution and filling work.	Contractor and SSCIL
4	Shore protection wall and its stability	Proper measurement should be taken for shore protection Modern technology will be provided for construction of building. Shore stability should be maintained accordingly to the design specification	Contractor and SSCIL
5	Air Pollution	Wet the Project site regularly if construction work is done in dry season.	SSCIL authority
6	Noise Pollution	Ensure skilled operation of construction machinery to reduce the noise level. Make working schedule in a manner considering no disturbance of officials and local people.	Contractor and SSCIL
7	Traffic Congestion	Unload construction materials at project site between 11.00 p.m. to 6.00 a.m. Do not keep construction materials on the road.	Contractor

8	Sanitation Diseases Hazard	Create awareness amongst workers about the relation between sanitation facilities and health hazards. Facilitate good accommodation, pure drinking water and sanitary latrine for workers. Remove causes of Dengue and malaria fever at the project site like stagnant water.	Contractor and SSCIL
9	Accidents	Appoint "Safety Officer" to ensure a high level of precaution during construction works. Keep First-Aid Box handy & keep transport standby to shift victim, in case any major accident occurs.	SSCIL authority
Operation Phase			
10	Impact on Air Quality from dust	• Set up a dust control system by employing modern pulse-jet bag type dust collectors • Set up zero emission dust system	SSCIL authority
11	Noise/vibration hazard	* Proper acoustic design should be made. * Provide sufficient buffer strip.	SSCIL authority
12	Discharge of Wastewater	• A septic tank attached with soak pit has to be installed to treat the domestic effluent which will be able to meet the national effluent quality standards.	SSCIL authority
13	Shore failure	• Shore failure should be maintained accordingly to the pre-set monitoring system	SSCIL authority
14	Flooding	• Properly drain out the excess rain or flood water to the river	SSCIL authority
15	Solid Waste Production	• Collection of solid waste properly. • Dispose all solid waste in proper place in proper way • Solid waste should be treated by composting	Contractor and SSCIL
16	Traffic Congestion	• Avoid carrying of materials in peak hour of road traffic. • Keep basement and open space for parking cars. • Appoint 02 persons to control in and out traffic flow.	SSCIL authority
17	Air Pollution	• Provide proper stack height • Use ozone friendly gases in	SSCIL authority

		air-conditioning system to save the stratospheric ozone.	
18	Occupational Health	• Provide apron, mask, hand gloves to the workshop and laboratory working peoples as per requirement. • Ensure periodic medical checkup of the employees of the plant. * Provide well-planed sanitary facilities. * Supply good quality drinking water to the workers.	SSCIL authority
19	Worker safety	* Set up warning signs, signals and provide helmets for workers in accordance with relevant accident prevention and work safety procedure. * Restrict access to plan site. * Provide regular health inspection among workers. * Promote health education campaign among workers.	
20	Disaster Management	Follow suggestions given in Chapter 8.0	Contractor and SSCIL
21	Impact on Employment and Family Finance	* Employ local people wherever possible.	

7.14 Monitoring During Operation Phase

7.14.1 Overview of Impacts and Mitigation Measures

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

- Air quality management
- Acoustic and vibration impacts
- Socio-economic impacts

7.14.2 Dust Emission Management

As mentioned earlier that cement manufacturing plants have been guilty of damaging agricultural productivity in wide areas around the plant due to uncontrolled release of cement dust. This dust can, to a certain extent, cause harm to all types of nearby operations, including commercial, recreational, and forests, ranging from nuisance to significant damage levels.

In the present cause, however, the plant considered providing filter facilities at crucial emissions points. In the project major dust emission points are envisaged to be –

(e) Clinker, Fly ash, Slag/Gypsum/limestone and coal storage section

(f) Clinker grinding section
(g) Cement storage section
(h) Cement packing section

The project should possess a dust control system by employing pulse- jet bag type dust collectors at those points. The jet pulse bag filters have continuous cleaning process of filters media and are therefore have high precipitation efficiency. As per the specifications, dust emission from any point will not exceed the total dust emission to the atmosphere from our major sources- clinker storage, cement mill, cement silo and packing section-amounts to be 2.88 kg/hr. Actually, some more dust will also be escaped during clinker unloading, conveyor system, finished product storage and therefore, all together total amount to be considered about 5.0 kg/ hr. The project authority will take necessary steps in their dedusting systems to comply the Bangladesh standard in respect to dust emission rate.

Clinker Unloading

Two flush mounted bag filters with fan mounted on trolley frames and to be mechanically connected to the mobile hoppers is being installed for de-dusting of the belt conveyor at the materials loading point after each hopper. At the head pulley effective split type individually spring controlled scraper blades arranged in two rows is installed for effective scraping of the belt surface and the scraped dust is collected within the discharge hood. Venting connection is provided from the discharge hood and skirt of the loading point of successive conveyor to a bag filter for effective dust control of transfer points. Thus, for jetty a total number of four bag filters with fans are installed (2 for the mobile hoppers and 2 at the transfer points).

Clinker Storage

The openings provided on the top of silo are completely sealed. At each of the discharge point suitable steel frames are built up where pendulum flap valves are installed. These pendulum flap valves are normally closed and they open only when the tripper discharges clinker on them. Each silo is provided with a bag filter on top of the silo. The bag filter, which is connected to any one of the silos, is operated whenever material is loaded into the silo.

At the bottom of the silo the loading points on belt conveyor have skin board rubber and top cover. After each loading point a flush mounted type bag filter is installed. Due to restricted headroom available between top of skirt and silo bottom, bag filters with cartridge bags insert able from the side and the fan mounted on one side of the bag filter. Thus, in two silos, 2 bag filters are installed on the top of clinker silos and 2 bag filters at the bottom of the clinker silos.

Clinker handling (Conveyor Belt to Grinding Mill)

The proponent has installed a bag filter on the top of charging hopper and made proper skirt board and sealing arrangement at the transfer point.

Cement Storage

The air pumped into the silo along with the cement must be exhausted through bag filter for effective pollution control and to conserve the valuable cement dust. There is one bag filter, connected to the silo. The silo bag filter is sized in such way that it is suitable for venting the conveying air from either unit of the mill. Whenever the conveying is on and the cement is discharged into a silo, the bag filter connected to that silo is made operative.

Other Dust Emission Sections

The bag filters are found to be in operation at other dust emission sections, like grinding mill, packing section gypsum and clinker loading hoppers etc.

7.14.3 Measures for Reduction of Hauling Operation

Unloading of clinker from the vessel to the clinker storage through a conveyor belt and from storage, clinker will be transported to the grinding mill using a bucket elevator. Conveyor belts system will also be used for dispatching of manufactured cement from storage to barges. The clinker storage will be covered by a roof so that there will be no emission of dust to the atmosphere. The neighboring properties therefore, should not suffer any major damages from such activities.

7.14.4 Solid Wastes Management

Recycling will be adopted wherever possible and only small quantities will require disposal to landfill. 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.

7.14.5 Aqueous Management

Ground water will be used for all purposes and the impact of any abstraction on local water bodies would be minimal.

7.14.6 Domestic Sewage Management

All domestic sewage along with occasional floor and machine wash will be treated through septic tank attached with soak pit.

7.14.7 Noise and Vibration Level Management

The clinker grinding section will be housed in such a manner that the buffering action of surrounding walls will reduce the noise outside the plant. It is expected that at 30m from grinding mill the noise level will not exceed 60 dB (A). 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.

7.14.8 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 an available. Hence, the green belt can be created in a short time.

7.14.9 Energy Efficient (EE) measures for SSCIL

The following EE measures have been suggested for SSCIL:

1. Unnecessary lights, fans and cooling equipment will be remain shut off when and where applicable during operation;
2. An EE audit should be done every year to ensure the optimum use energy & raw materials;
3. Energy efficient motor pump, vacuum cleaner, air conditioners, refrigerator etc. should be use
4. Solar panel should be used as renewable energy source to reduce the load on generators
5. Energy saving lamps should be installed where necessary.
6. Various types of trees should be planted for prevent climate change, balance the temperature, protect soil erosion and increase carbon sink etc.

7.15 Monitoring Requirement

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

To check on whether mitigation and benefit enhancement measures are actually being adopted and are providing effective in practice

- To provide a means whereby impacts which were subject to uncertainty at the time of preparation of ESIA, or which were unforeseen, can be identified, and steps to be taken to adopt appropriate control measures.
- To provide information on the actual nature and extent of key impacts and the effectiveness of the mitigation measures which, through a feedback mechanism, can be taken into account in the planning and execution of similar projects in future.

There are two basic forms of monitoring:

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

In the case of industrial projects in general, monitoring is done by physical measurement of some selected parameters like air, water, noise etc. It should be mentioned here that the monitoring program should be such so that it can ensure compliance with national environmental standards. The importance of this monitoring program is also for ensuring that the 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 should be further mentioned that, the best type of self-monitoring should be some auto-monitoring device to be set up at major emission sources after the filters/ dedusters, which will automatically trip in case of excess dust emission that the set limit, conforming acceptability by the design and by the Department of Environment (DOE).

7.16 Monitoring Indicators

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.

A list of parameters to be tested, sample number and sampling frequency are given in Table - 7.10. Here it may be mentioned that parameters are selected according to the requirement of DoE as indicated in the EQS for concerned industries.

Table 7.10 Monitoring parameters

Sl. No	Environmental component	Parameters	Location	Sampling No.
1	Air	SPM, $PM_{2.5}$, PM_{10}, SO_x, NOx, CO	Middle point and west and south side of the plant	03
2	Noise	Noise Level five places	Around Factory site	05
3	Drinking water	pH, TDS, BOD_5, COD	Deep tube well in the plant	01
4	Surface water	pH, TDS, BOD_5, COD, DO, TSS	River water (Shitalakshya)	01

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. to Shun Shing Cement Industries Ltd. should develop a working relationship with the Department of Environment (DoE) by undertaking a joint monitoring program to monitor above parameters or they may exchange data and information or submit periodic report on self-monitoring to the DoE or as the situation may require.

7.17 Environmental Monitoring Cell and Costing Of EMP

An environmental monitoring cell equip with require equipment should set up during operation of the plant.

Costing of ESMP

An annual budget should be arranged for management of environment. The annul costing of ESMP is Tk. 20.5 lac.

7.18 Buffer Zone

In order to protect the environment and the adjunct public from nuisance arising from the plant operations, including noise & pollutant, a buffer strip of trees/plants is desirable & should be provide for the project.

Trees, plants & shrubs improve the general quality of environment. They purify the air absorbing the gases especially Carbon dioxide, reduce noise level, provide shelter to the nature's habitats, prevent the erosion of soil, maintain the ecological balance & improve the scenic beauty.

In view of this a buffer zone/green belt all around the plant should be created. Carefully selected trees should be planted preferably in rows. This will improve the aesthetics/absorb certain amount of harmful dust & also reduce noise emission to the surroundings. This would even be commercially viable by producing timber or fruits.

7.19 Environmental Aesthetics

With a view to mitigate the adverse environmental effect on surroundings and to provide an environmental cover from emissions, green belts are developed in and around the mill. The plantation and green belt development in an industrial area not only serves as foreground and background landscape features resulting in harmonizing and amalgamating the physical structures of a cement mill with the surrounding environment but also acts as a pollutant sink. Plantation also contributes towards environmental improvement, by:

- Acting as a "pollution sink" and preventing the particulate and other Atmospheric pollutants from spreading to the nearby areas
- Providing vegetative cover
- Increasing the aesthetics of the surroundings, and
- Providing resting, feeding and breeding site for fauna.

Extensive plantation has been done under green belt development for the proposed plant. Green belt has been developed and well maintained along the internal roads and mill area. The mill has made elaborate arrangement in developing green belt inside the mill. Flowering trees are planted as avenue trees on local roads involving local population to create awareness among the public.

7.20 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. The new and improved rail communication will facilitate the local people and industries to quickly and efficiently transport their products. This will also facilitate

the school children and local people to reach their school and desired places very easily, safely and quickly and accelerate local development. Road communication system will also enhance the national development by connecting all regions of the country and facilitating cheaper, safer and quick transport facilities to the entire population of the country as well as to and from neighboring countries.

With the implementation of the projects land prices in the area will be increased, as this area will enjoy three transport facilities including rail, road, and river being located nearer to the port city of Chattogram. It is anticipated that this area will become an important potential industrial zone of the country.

7.21 Environmental Health & Safety (EHS), Occupational Health & Safety and Hazard Mitigation Plan During Operation Phase

7.21.1 Environmental Health and Safety

The most significant environmental health and safety impacts occur during the operational phase of cement manufacturing projects and primarily include the following:

- Energy use
- Greenhouse gases (GHGs)
- Air emissions
- Wastewater
- Solid wastes

Energy use

Cement manufacturing is energy-intensive industries. The following sections provide sector-specific energy-efficiency guidance for thermal and electrical energy use.

Cement kiln

cement kiln technology selection, additional thermal energy efficiencies can be realized through optimization techniques for the kiln, including high-capacity utilization, optimized length/diameter ratio, optimized kiln design in regard to the fuel type utilized, optimized kiln firing systems, maintenance of uniform and stable operating conditions, optimization of process controls, provision of tertiary air ducts (for precalciner), maintaining near-stoichiometric but oxidizing kiln conditions, use of mineralizers, reduction of air-in leakage, and maintenance of kiln refractory specifications

Greenhouse Gases
Coal as fuel will be use in the cement industry for generation of hot gases. However, the lower cost of coal has resulted in increased use of this fuel type. Coal generate higher emissions of GHGs than fuel oil and natural gas (for example, approximately 65 percent higher unit emissions than with gas). In addition, high sulfur content in the fuel (characteristic of coal) may create problems, including sulfur buildup on rings in the kiln.

GHG emissions associated with the cement manufacturing project and associated thermal power generation should be quantified annually in accordance with internationally recognized methodologies and good practices.

Recommendations for the management of GHG emissions are provided in the General EHS Guidelines. In addition to the energy efficiency measures discussed in preceding sections of this Guideline, sector-specific techniques for CO_2 emission minimization in cement manufacturing include the following:[1]

- Production of blended cements (in which clinker is partially substituted with fly ash, blast furnace slag, ground limestone) or new cementitious materials which are less energy and GHG-intensive than clinker per unit of final product, resulting in significant reduction in fuel consumption and subsequent CO_2 emissions.

Air Emissions

Point source air emissions in cement manufacturing are generated by the operation of kiln systems, clinker coolers, and mills, and by the handling and storage of intermediate and final materials and products. Non-point source emissions of dust can also arise.

Particulate Matter

Particulate matter (PM) emissions are a potentially significant impact arising from cement manufacturing. The main sources of PM emissions and their respective recommended prevention and control methods are summarized in the following paragraphs.

For PM emissions associated with the operation of kiln systems and clinker coolers, including clinker and limestone burning,

The following pollution prevention and control techniques, in addition to proper smoothing of kiln operations,[2] are recommended:

- Capturing kiln and clinker cooler dusts using filters and recycling the recovered particulates into the kiln feed and into the clinker, respectively.
- Using fabric filter systems[3] as the preferred control option, with electrostatic precipitators (ESPs) as an alternative option[4] to collect and control fine particulate emissions (PM_{10} and $PM_{2.5}$) in kiln exhaust gas and bypass gas dust, and exhaust air from coolers.

[1] Carbon capture and storage or reuse technologies in the cement industry should be considered as their technical and commercial viability are more clearly demonstrated in the future. Further information is available in IEAGHG (2013).

[2] Smoothing of kiln operations refers to maintaining the kiln in consistently optimum operating conditions.

[3] Fabric filters are also referred to as "bag" filters or "baghouse" filters. This document uses the term fabric filter.

[4] Although ESPs are reliable under normal operating conditions, there are risks of explosion when carbon monoxide concentrations in the kiln exhaust exceed 0.5 percent. To prevent these risks, operators should ensure appropriate and continuous management and control of the firing processes, including continuous monitoring of CO levels, particularly during kiln startup, in order to switch off electricity automatically when necessary. ESPs should also be properly dimensioned to absorb large kiln upset situations during which high quantities of hot, unburnt clinker are forced through the cooler exhaust gases.

Solid Wastes

Sources of solid waste in cement manufacturing include clinker production waste, mainly composed of spoil rocks, which are separated at the quarry or removed from the raw materials during the raw meal preparation, as well as off-specification clinker wastes. Another potential waste stream involves the kiln dust removed from the bypass flow and the stack, if it is not recycled in the process or in the final product. Limited waste is generated from plant maintenance (for example, used oil and scrap metal, kiln refractory materials that may contain heavy metals). Other waste materials may include alkali, chloride, or fluoride contained in dust buildup from the kiln.

7.21.2 Occupational Health and Safety

The most significant occupational health and safety impacts occur during the operational phase of cement manufacturing projects and primarily include the following:

- Dust,
- Heat,
- Noise and vibrations,
- Physical hazards,
- Radiation, and
- Chemical hazards and other industrial hygiene issues.

Dust

Exposure to fine particulates is associated with work in most of the dust-generating stages of cement manufacturing, but most notably from quarry operation (EHS Guidelines for Construction Materials Extraction), raw material handling, and clinker or cement grinding. In particular, exposure to the respirable fraction of active (crystalline) silica dust (SiO_2), when present in the raw materials and products (e.g., cement dust), is a relevant potential hazard in the cement manufacturing sector. Methods to prevent and control exposure to dust include the following:

Control of dust through implementation of good housekeeping and maintenance, including use of mobile vacuum cleaning systems to prevent dust buildup on paved areas.

- Use of air conditioned, closed cabins.
- Use of closed conveyors/elevators with emission controls at transfer points for fugitive dust emissions.
- Use of dust extraction and recycling systems to remove dust from work areas, especially in grinding mills.
- Use of air ventilation (suction) in cement-bagging areas.
- Use of personal protective equipment, as appropriate (e.g., masks, respirators) to address residual exposures following adoption of the above-noted processes and engineering controls.

Heat

The principal exposures to heat in this sector occur during operation and maintenance of kilns or other hot equipment, and through exothermic reactions in the lime-hydrating process. Recommended prevention and control techniques include the following:

Shielding surfaces where workers' proximity and close contact with hot equipment is expected, and using personal protective equipment as needed (e.g., insulated gloves, shoes).
Making available and using, as needed, air- or oxygen-supplied respirators.

Noise and Vibrations

Noise pollution is related to several cement phases, including raw material extraction (as discussed in the EHS Guidelines for Construction Materials Extraction); grinding and storage; raw material, intermediate, and final product handling and transportation; and operation of exhaust fans. The General EHS Guidelines provide levels for recommended noise abatement measures and ambient noise levels.

Crushing/grinding operations, mills, chutes and hoppers, exhaust fans, and blowers are the main sources of noise and vibrations in cement plants. Control of noise emissions may include the use of silencers for fans, room enclosures for mill operators, noise barriers, and, if noise cannot be reduced to acceptable levels, personal hearing protection.

Physical Hazards

Injuries during cement manufacturing operations are typically related to slips, trips, and falls; contact with falling or moving objects; and lifting and overexertion. Other injuries may occur due to contact with, or capture in, moving machinery (for example, dump trucks, front loaders, forklifts, bagging machines). Activities related to maintenance of equipment, including crushers, mills, mill separators, fans, coolers, and belt conveyors, represent a significant source of exposure to physical hazards.

Radiation

An X-ray station is sometimes used to continuously monitor the raw material mix on the belt conveyor feeding the raw mill. Operators of this equipment should be protected through ionizing radiation protection measures as in the General EHS Guidelines.

Chemical Hazards and Other Industrial Hygiene Issues

Chromium may contribute to allergic contact dermatitis among workers handling cement. Prevention and control of this potential hazard includes a reduction in the proportion of soluble chromium in cement mixes and the use of proper personal protective equipment to prevent dermal contact, as per in the General EHS Guidelines.

Calcium oxide (CaO), or "quicklime" reacts with water, producing calcium hydroxide ($Ca(OH)_2$) "hydrated lime," a highly corrosive caustic solution. Accidental contact of sufficient duration of quicklime or hydrated lime powders with moist skin, eyes, or mucous membranes will cause caustic tissue burns. This is a powerfully explosive exothermic reaction which generates lime-laden steam and hot water splashing, both of which are highly hazardous due to their high temperature and caustic properties. Areas in which these compounds are handled as powders should be covered and enclosed, if possible, to avoid generation of a dust hazard. Areas where lime is slaked should be similarly enclosed. Facilities for immediate washing of the affected body surface should be available, including eyewash facilities where quicklime is handled. Personal protective equipment (such as use of safety goggles, gloves, protective clothing, and boot covers) should be provided in the lime-hydrating process, and appropriate safety procedures adopted. A

Community Health and Safety

Community health and safety impacts during the construction, operation, and decommissioning of cement manufacturing facilities are common to those of most industrial facilities and are discussed in the General EHS Guidelines.

7.22 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 they are 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 programme contributes to employee morale and pride because employees participate in identifying safety needs and developing safe work procedures.

Employees, contractors and subcontractors who knowing violate safety rules may face disciplinary action, dismissal or legal action. 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 programme. 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 and other on company work sites 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 reissue the policy.

Safety Responsibilities

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

Management Communication

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

Inspections

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

Personnel Protective Equipment (PPE)

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

Safety Rules

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

Standard 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

works tasks have been accounted for. Procedures and codes of practice have to be developed for hazardous work. To determine compliance with safety and hazard issues while performing a task by a worker, efforts should be made to ensure the following:

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

Emergency Procedures

Emergency procedures will identify who does what and when in the event of an emergency. Responsibility for who is in charge of the co-ordination of emergency actions shall be identified. The procedures shall be easily referenced, concise and understandable. All employees shall be aware of the content and location of the procedures. The content lists associated with the procedures will be current. The procedures will be updated and tested on a regular basis. The training record and level of training gained by an employee shall be verified so as to ensure his first aid training. Subcontractor employees will also be trained in first aid. The required emergency safety equipment must be made available and easily accessible to workers. A logbook will be maintained to record all injuries. A plan must include of procedures, postings, training, testing and drills. Procedure details would include safe areas, search and rescue, first aid provisions, medical transportation, notification of next to kin, etc. the following are the important events that need emergency procedures.

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

Beyond the above measures, the project would also have full provision for the fire fighting and first aid medical services. The proponent also will construct an underground water reservoir for firefighting and a high lift pump including hose pipe which can be operated from all sights will be installed there. Fire extinguisher and sand bucket will be provided in every corner of the project area. The project has provision in its recurring annual expenditure for purchasing safety items such as aprons, hand gloves, ear protector, mask, eye protector etc. They will be arranged firefighting drill four times in a year and extra stair will be used in the outside wall for emergency evacuation. Emergency exit door will be available.

7.23 Decommissioning Phase

It is necessary to outline some basic mitigation measures that will be required once all operational activities of the proposed expansion project have ceased. The following will be necessary during this phase of the project:

- Appropriate vegetation and crops re-planted on open spaces (landscaping).
- All solid waste to be collected and disposed of DoE appropriately by licensed garbage handlers.
- All efforts should be made to ensure that all excavated sites are restored to as near as possible to the state in which they were before the project was undertaken.

The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project.

Table 7.11 De-commissioning Phase EMP for the Proposed

Sl. No	Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Tk.)
1	Demolition waste management				
	Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	Once-off	2,000,000
		All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	Once-off	
		All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	Once-off	
		Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	Once-off	
		Donate reusable demolition waste to charitable organizations, individuals and institutions	Project	Once-off	
2	Rehabilitation of project site				
	Site degradation	Implement an appropriate re-vegetation programme to restore the site to its original status	Project Manager & Contractor	Once-off	500,000
		Consider use of indigenous plant species in re-vegetation	Project Manager	Once-off	
		Trees should be planted at suitable locations so as to interrupt slight lines (Screen planting), between the adjacent area and the development.	Project Manager	Once-off	

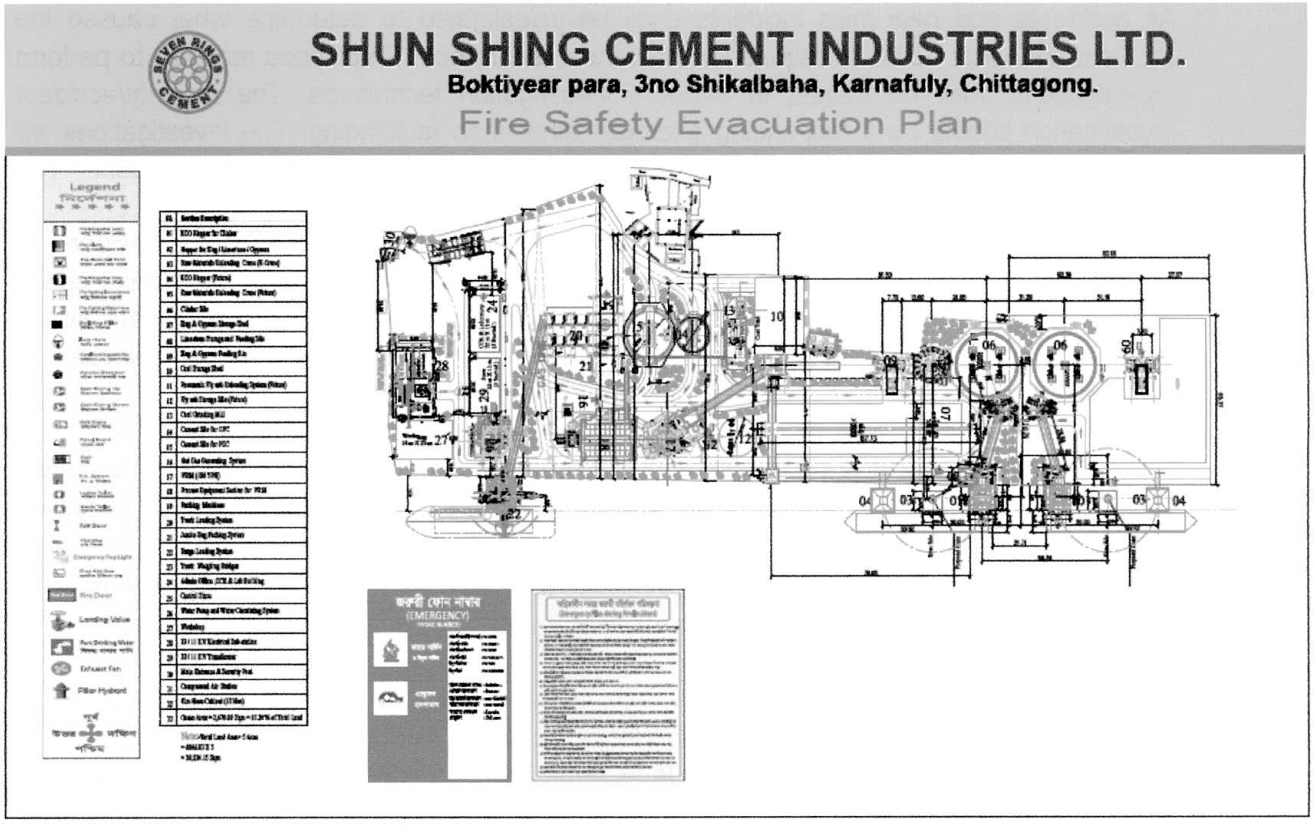


Figure 7.1 Emergency evacuation plan of the project

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.

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.

Protective Equipment

The main reason for protecting workers is to eliminate or reduce the possibility of injury. The Occupational Health and Safety Act (OHSA) 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". Other jurisdictions have similar requirements.

There are some people who resist wearing protective clothing or devices, and will only wear protective equipment when forced to do so. This is not the right attitude to take for the worker's own safety. The consequences of an accident to his quality of life can be major. He can also lose his life. Personal protective equipment provides the worker with a measure of protection, but for it to be really effective; it must be accompanied by the right attitude towards during his job the right way. The wearing of personal protective equipment does not guarantee that he won't get injured. However, when coupled with a good safety attitude it will reduce the likelihood and severity of accidents.

Body Parts That Require Protection

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

The following eight areas or parts of the body require protection:

- Head
- Arms
- Eyes
- Torso

- 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.

Occupational Exposure Limits

(Without hearing protection)

Sl. No	Sound level	Maximum Permitted (dBA) Duration (hours per day)
1	85	8
2	90	4
3	95	2
4	100	1
5	105	2
6	110	1/4
7	115	1/8

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. Safety Hazard Prevention-Control Mitigation Measures shown in Table 7.11.

Table 7.12 Safety Hazard Prevention-Control Mitigation Measures

Sl. No	Event	Prevention, Control and Mitigation Measures
1	General Instruction of Workers	1. Personal and continuous visual supervision of the worker who is not competent to perform the job. 2. Workers to be conversant on the codes and standards of safety 3. Workers must be confident that they have adequate training on handling or unsafe hazards material.
2	Maintenance of Equipment	1. 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. 2.Will perform the function foe which it is intended or was designed 3. Is of adequate strength for that purpose. 4. Is free from potential defects.

Sl. No	Event	Prevention, Control and Mitigation Measures
3	Traffic Hazard	1. 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. 2. 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. 3. 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.
4	Illumination	1. Ensure that illumination at a work site is sufficient to enable work to be done safely. 2. 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
5	House keeping	1. Ensure that each work site is clean and free from stepping and tripping hazards 2. Waste and other debris or material do not accumulate around equipment, endangering workers
6	Falling Hazards	1. 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
7	Overhead power Lines	1. Ensure that no worker approaches and that no equipment is operated, and no worker shall approach or operate equipment, within 7 meters of an overhead power line.
8	Sanitary facilities & drinking water	1. Ensure that an adequate supply of drinking fluids is available at the work site. 2. Ensure that work site is provided with toilet facilities in accordance with the requirement of general health protection guidelines.
9	Working proper clothing	1. 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: . wears close-fitting clothing . confines or cuts short his head and facial hair . avoids wearing jewelry or other similar items
10	Head protection	1. Ensure that during the work process adequate alternative means of protecting the workers head is in place.
11	Eye protection	1. Where there is a danger of injury to or irritation of a worker's eyes, his employer shall ensure that the worker

Sl. No	Event	Prevention, Control and Mitigation Measures
		wears property fitting eye protective equipment.
12	Foot protection	1. 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.
13	Respiratory protective equipment	1. Where the worker is exposed to hazards gases, gums, vapors, or particulates appropriate respiratory protective equipment to be supplied.
14	Transportation of water	1. 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. 2. 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.
15	Cranes and similar hoists	1. Ensure that a crane is equipped with an effective warning device. 2. Is readily accessible to the operator 3. When design or operation of crane is such that the crane may fall or flip backwards because of the return movement of the boom, the crane, must be fitted with positive boom stops in accordance with the manufacture's specification a boom stops limit device to prevent the boom from being drawn back beyond a pre-determined safe boom angle.
16	Testing & commissioning	1. Mobilize test rigs at site 2. Ensure that the test equipment is in good condition 3. Ensure other equipment and facility conforms to the approved specification of test. 4. Public notice to be served before testing.

7.22 DECOMMISSIONING PHASE

It is necessary to outline some basic mitigation measures that will be required once all operational activities of the proposed project have ceased. The following will be necessary during this phase of the project:

- Appropriate vegetation and crops re-planted on open spaces (landscaping).
- All solid waste to be collected and disposed of DoE appropriately by licensed garbage handlers.
- All efforts should be made to ensure that all excavated sites are restored to as near as possible to the state in which they were before the project was undertaken.

The necessary objectives, mitigation measures, allocation of responsibilities, time frames and costs pertaining to prevention, minimization and monitoring of all potential impacts associated with the decommissioning and closure phase of the project are outlined in Table 7.12 below.

Table 7.13 Decommissioning Phase EMP for the Proposed

Sl. No	Expected Negative Impacts	Recommended Mitigation Measures	Responsible Party	Time Frame	Cost (Tk.)
1	Demolition waste management				
	Demolition waste	Use of an integrated solid waste management system i.e. through a hierarchy of options: 1. Source reduction 2. Recycling 3. Composting and reuse 4. Combustion 5. Sanitary land filling.	Project Manager & Contractor	Once-off	2,000,000
		All buildings, machinery, equipment, structures and partitions that will not be used for other purposes must be removed and recycled/reused as far as possible	Project Manager & Contractor	Once-off	
		All foundations must be removed and recycled, reused or disposed of at a licensed disposal site	Project Manager & Contractor	Once-off	
		Where recycling/reuse of the machinery, equipment, implements, structures, partitions and other demolition waste is not possible, the materials should be taken to a licensed waste disposal site	Project Manager & Contractor	Once-off	
		Donate reusable demolition waste to charitable organizations, individuals and institutions	Project	Once-off	
2	Rehabilitation of project site				
	Site degradation	Implement an appropriate re-vegetation programme to restore the site to its original status	Project Manager & Contractor	Once-off	500,000
		Consider use of indigenous plant species in re-vegetation	Project Manager	Once-off	
		Trees should be planted at suitable locations so as to interrupt slight lines (Screen planting), between the adjacent area and the development.	Project Manager	Once-off	

SECTION-8: DISASTER MANAGEMENT PLAN

A disaster is a catastrophic situation in which, suddenly, people are plunged into helplessness and suffering and, as a result, need protection, clothing, shelter, medical and social care and other necessities of life. Disasters can be divided into two main groups. In the first, are disasters resulting from natural phenomena like earthquakes, volcanic eruptions, storm surges, cyclones, tropical storms, floods, avalanches, landslides, forest fires. The second group includes disastrous events occasioned by man, or by man's impact upon the environment. Examples are armed conflict, industrial accidents, radiation accidents, factory fires, explosions and escape of toxic gases or chemical substances, river pollution, mining or other structural collapses, air, sea, rail and road transport accidents and can reach catastrophic dimensions in terms of human loss. The company having fire license from the fire services and Civil defense department and is shown in Annex 7.

There can be no set criteria for assessing the gravity of a disaster in the abstract, since this depends to a large extent on the physical, economic and social environment in which it occurs. What would be considered a major disaster in a developing country, ill-equipped to cope with the problems involved may not mean more than a temporary emergency elsewhere however, all disasters bring in their wake similar consequences that call for immediate action, whether at the local, national or international level, for the rescue and relief of the victims. This includes the search for the dead and injured, medical and social care, removal of the debris, the provision of temporary shelter for the homeless, food, clothing and medical supplies, and the rapid re-establishment of essential services.

Objectives of Disaster Management Plan [DMP]

The Disaster Management Plan (DMP) is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in the same order of priorities. For effective implementation of the DMP, it should be widely circulated and personnel training through rehearsals/drills should be organized. The DMP should reflect the probable consequential severities of the undesired event due to deteriorating conditions or through 'Knock on' effects. Further, the management should be able to demonstrate that its assessment of the consequences uses good supporting evidence and is based on currently available and reliable information, incident data from internal and external sources and, if necessary, the reports of external, independent, agencies.

To tackle the consequences of a major emergency inside the factory or immediate vicinity of the factory, a DMP has to be formulated and this planned emergency document is called "Disaster Management Plan". The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following:

- Effect the rescue and medical treatment of causalities
- Safeguard other people
- Minimize damage to property and the environment
- Initially contain and ultimately bring the incident under control

- Identify any dead
- Provide for the needs of relatives
- Provide authoritative information to the news media
- Secure the safe rehabilitation of affected area
- Preserve relevant records and equipment for the subsequent inquiry into the cause and circumstances of the emergency.

In effect, it is to optimize operational efficiency to rescue rehabilitation and render medical help and to restore normalcy.

Disaster Management Plan (DMP) During Operation of the Plant

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
- When septic tank does not work properly, liquid waste will over flow and will pollute the surroundings.

So, appropriate management plane should have to take 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 plane 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 firefighting 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.

SECTION-9: STAKEHOLDERS CONSULTATION

9.1 Introduction

Stakeholders 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 purpose of Stakeholders consultation meetings was to invite comments and detailed suggestions on any environmental issues considered relevant by the people living in the area of the Project corridor. The Stakeholders consultation program is an essential part of the environmental assessment process and has been undertaken both formally and informally throughout the study to ensure that the knowledge, experience and views of stakeholders and the general public are taken into account during the EIA work.

The company arranged a public meeting at the beginning of the project site. The meeting was attended by several honorable persons who include local people, local community leaders (members & chairman) and other interested persons from different corners.

9.2 Approach and Methodology of Stakeholders consultation

The approach undertaken for information disclosure and consultation involved the following key processes.

- Mapping and Identification of key stakeholders such as primary (direct project influence) and secondary (indirect project influence) stakeholders;
- Undertaking expert consultation, interviews and Stakeholders consultation meeting with the respective stakeholders
- Assessing the influence and impact of the project on these stakeholder's groups;
- Summarizing of key findings and observations from the consultation;
- Preparing a future stakeholder engagement strategy consultation plan for a more detailed assessment at a microscopic level taking into account the various project lifecycle phases and their implications on the stakeholders.

9.3 Stakeholder Assessment

A stakeholder is defined as "a person, group, or organization that has direct or indirect stake in a project/organization because it can affect or be affected by the Project or its Proponent's actions, objectives, and policies". Stakeholders vary in terms of degree of interest, influence and control they have over the Project or the proponent. In the present study, all the stakeholders have been primarily categorized into two categories that have been identified as:

- Primary Stakeholders: include people, groups, institutions that either have a direct influence on the project or are directly impacted (positively or adversely) by the project and its activities; and
- Apart from categorization, the stakeholders have also been classified in accordance with the level of influence the have over the project as well as their priority to the project proponent in term of importance.
- The influence and priority have both been primarily rates as:
- High Influence/Priority: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority for project proponent to engage that stakeholder.
- Moderate Influence/Priority: This implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level for project proponent to engage the stakeholder who are neither highly critical nor are insignificant in terms of influence.
- Low Influence/Priority: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority for project proponent to engage that stakeholder.

9.4 Information Disclosure and Consultation

Number of consultations was conducted during study. The stakeholders consulted include local people, community in the vicinity of project area, local elected representatives and other external stakeholders such as relevant government officials. The details of consultations held with issues raised or discussed and suggestions provided by the respective stakeholders are presented in Table 9.1 of this section.

A combination of mixed methods of information disclosure and consultation process was adopted. The method selected for consultation was basically designed keeping in mind the profile of the stakeholders, type of information desired and level of engagement required. In each consultation session the consultant introduced themselves, introduced the project and the purpose of engagement with the respective stakeholder. A questionnaire was developed for undertaking household survey and KII through semi-structured questionnaire and is showed in Annex 8. The consultant shared and presented the project brief and impact during pre-construction, construction, operation and de-commissioning period with the respondent during large Stakeholders consultation meeting at 3 no Shikalbaha Union Parisha Bhaban. A leaflet in Bengali was distributed before and during Stakeholders consultation meeting and made discussion and is presented in Annex 9. The consultant and representative of project proponent answered the question of the public. The attendance sheet of the consultation meeting is shown in Annex 10 and Annex 11.

9.5 General Findings of the Meetings and Survey

In general, the local people's response to Shun Shing Cement Industries Ltd. (SSCIL) is positive. Most of the people who live close the plant site has 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 to Shun Shing Cement Industries Ltd. (SSCIL) 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 to Shun Shing Cement Industries Ltd. (SSCIL). 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. Also, some people will participate indirectly in various economic activities and support systems associated with to Shun Shing Cement Industries Ltd. (SSCIL).

9.6 Summary of Special Concerns

9.6.1 Issues

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

- Generation of dust
- Sound pollution
- Water logging
- Drainage Problem
- Water pollution
- Occupational health hazard
- Waste management
- Cutting down of trees
- Socio-economic development of the local people
- Compensation to the project affected people
- Employment for local people
- Contribution to the local development projects
- Damages of roads and culverts in local area due to heavy traffic movement for carrying construction materials and equipment.

9.6.2 Suggested Mitigation Measures

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

- Proper dust collection systems should be installed in the plant; dust pollution will be suppressed by spraying water in regular interval;

- Tree plantation program should be adopted and proper compensation should be provided to the affected person for cutting down of private trees; Authority will develop a green area planting various types of trees and covered by grass to make the site a scenic beauty;
- To reduce noise pollution, proper guidelines should be followed; Sophisticated instrument will be use so that less noise and exhaust gas will produce;
- Proper steps should be adopted for avoiding surface and ground water pollution;
- To reduce occupation health hazard proper steps should be adopted;
- Proper sanitation system should be developed for the workers;'
- Proper waste management system should be developed;
- Project affected people should be compensated properly;
- Where ever possible local people should be given priority for employment in the factory.
- Shun Shing Cement Industries Ltd. (SSCIL) should contribute both in cash and in kind for different development projects like total literacy program, education, development in medical facility, local road etc. in the local area
- All damaged sections of roads and others should be repaired by to Shun Shing Cement Industries Ltd. (SSCIL) after finishing the construction work but before going commercial production.

9.7 Findings of the Stakeholders consultation Meeting

Overall findings of the Stakeholders consultation are summarized in the table below;

Table 9.1 Findings of the Stakeholders consultation Meeting

SL No	Issues discussed	Participants, Opinion, comments and suggestions	Response to Questions/Action Point
1	General perception about the project and the awareness about the proposed project.	Most of the participants are in favor of the project and have been made aware of the proposed project through the various surveys that have taken place. • Creation of employment opportunities; • Creation of business opportunities; • Provision of attachment and internship opportunities; • Availing cement for constructions in the neighborhood; • Provision of revenue to the governments (National and County) through taxes levied on the factory's activities; • Improvement of the infrastructure;	Acceptance of the project
2	Support of local people for the proposed project.	Almost everybody said that they will support the project and advised the consultants to take precautions in the environmental mitigation to avoid the various impacts anticipated during the preconstruction, construction, and operation stages of the project and to ensure protection of the natural water bodies of the areas.	The consultants informed that during the study, the design and layout of all infrastructures have been considered the anticipated adverse impacts. EMP covers

			specific measures to follow during the construction process in protecting natural water bodies
3	What are the negative impacts? (if any)?	Minor problem will be generated during construction of the proposed project due to dust and noise pollution • Dust emissions from the factory and as a result of trucks' movement on the roads; • Noise pollution; • Waste Management issues; • Health and Safety aspects of the project; • Demand for water and sewerage services; • Water and Soil pollution; • Concern of HIV/AIDS prevalence due to the proposed project; • Concern of road congestion due to trucks;	Impact of the project upon the socio-economic life of the people has been assessed
4	Aware of Positive impact this project	Employment, socio-economic development, jobs/employment, land value increase, income increase, lifestyle improve and socio economic improve due this project • Concern that the company will do much more for extension project than present community social responsibility (CSR) is concerned; • Concern that the locals are people are given priority for jobs and business at the factory;	
5	Does the proposed project create any problem of water quality?	People of the project area site were not aware of this problem	Impact of the project upon ambient air, noise quality, water quality has been assessed.
6	Does the proposed project create any problem in traffic congestion?	Proposed project will create minor traffic congestion problem due to transportation of construction materials during construction period and some extent of traffic problem in operation period due to increased traffic	Impact is assessed and mitigation measures have been proposed.
7	Does the proposed project create any problem of air pollution, noise pollution?	The proposed project will generate minor dust and noise pollution during construction period	Impact is assessed and mitigation measures have been proposed
8	If any house needs to displace then how they will survive with their family?	No house needs to be displaced due to the proposed project	Assessed during preparation of draft ESIA report
9	Is there any opportunity of income for local labor?	Labor should be recruited from nearby area. Local people should get priority in employment opportunities	Labor will be employed from the local area.
10	Job Opportunity of local people	Job facility for local people during operation	Preference will be given for the local people.



Photo 9.1 Consultation with the UP Chairman and Local Elites



Photo 9.2 Focus group discussion with Local Body and Elites

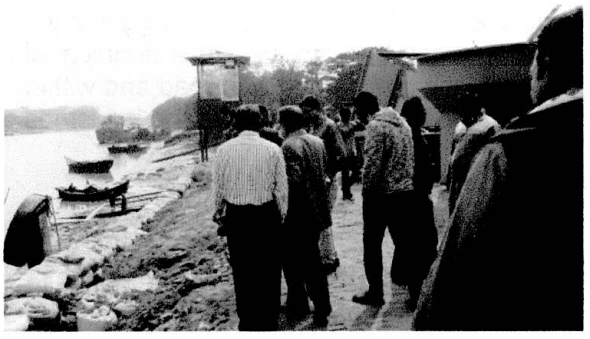




Photo 9.3 Consultation with Head Master of Kalarpul Hazi Md. Omar Ali High School.

9.8 Analysis of the Stakeholders Consultation Findings

9.8.1 Noise and Vibrations

There was general discussion from all the respondents that were engaged during the public stakeholder participation that there will be the possibility of high noise levels and vibrations. According to the respondents, the sources of noise pollution and vibrations are likely to be transport vehicles, construction machinery, and from cement production activities such cement grinding. The respondents suggested that high levels of noise and vibrations are likely to be experienced during the construction and operational phases of the proposed project.

9.8.2 Air Pollution

There was a general concern from the respondents that dust emissions due to project activities is likely to cause air pollution. Even though the company had undertaken an Air quality analysis and emission testing on four factory locations in determination of air pollutants in ambient air using a gas monitor to measure $PM_{2.5}$, PM_{10} and SPM, NO_X, SO_X, CO and Dust using the ambient air quality standards; and that the results indicated that the air quality analysis were within the stipulated National Standards, the proposed project is likely to heighten air pollution due to vehicles and machines that will that will be used during the construction and operational phases of the project.

9.8.3 Drainage System

During field visit it was found that the existing drain is passes through the industries to the river. The participants inform in the meeting that there is drainage problem during monsoon period. Existing canal is not capable to carry the total rainwater during heavy rain. As a result, the area

become water logged. However, they request to industries authority to construct bigger drain with full capacity for whole area. At present rain water passes through the small drain/canal inside the SSCIL area. The authority agreed to construct close drain along with road and within the boundary wall of the industries. The drain will extend 1 km toward the south of the industries and connect to the Murari canal for quick discharge.

9.8.4 River Erosion

The UP chairman and other participants concern that there will be river erosion on the opposite site of the Jetty location. When the jetty will be constructed at the bank of the Murari canal at the industries side normal water channel will be diverted and may create erosion on the opposite side of the river. The jetty design will be done in such a way that the water flow will not be affected or negligible toward the downstream. However, this will verify the authority and will take necessary on it this issue.

9.8.5 Waste Management

Waste management was a concern to some of the respondents. It was intimated that the proposed project would lead to increase in both solid and liquid waste that if not well taken care of would be detrimental to the environment and the human health.

9.8.6 Soil and Water pollution

From the stakeholder interviews, there were concerns that some of the project activities may lead to soil and water pollution. Some of the waste such as waste oil, chemical waste, cement and coal dust may negatively impact on the soil and water. These, however, may not be a problem if the correct measures are put in place as outlined in the EMP.

9.8.7 Other Concerns

Other concerns that were praised by the public include: the concern that the locals are given priority for jobs at the proposed industries; the concern that the company has done much in the Community Social Responsibility (CSR) sector at the proposed project. The company's activities would lead to road congestion due to truck movements.

9.8.8 Positive impacts

The Bangladeshi cement industries has been busy over the last month. Both Vietnam and Iran have marked up the country as a major destination for their exports. Bangladesh Cement Manufacturers Association (BCMA), described 2018 as a good year for the local industries to local media. Cement sales rose to 33Mt and consumption grew by 12% year-on-year.

The country has an integrated production capacity of 8.4Mt/yr from eight plants according to Global Cement Directory data. The main plants are Chhatak Cement and Lafarge Surma Cement. Locally produced clinker accounts for about 20% of the country's needs, with the other 80% imported from abroad. Hence, the action is really with the grinding plants and the country has over 30 of them. A market report by EBL Securities in mid-2017 reckoned that local cement production capacity was 40Mt/yr but that actual production was around 32Mt in the 2016 - 2017 reporting year due to problems with power supplies and so on. Given the focus on grinding it's interesting to note imports of clinker. These rose by 9% year-on-year to a value of US$ 518m in 2017 - 2018, the highest figure since 2014 - 2015.

Implementation of the proposed project 2,880,000 MT/year for SSCIL Cement at Shikalbaha, Chattogram will result in positive impacts. Potential positive impacts likely to result from the proposed project.

9.8.9 Increase in cement production in Bangladesh

The proposed capacity of the project of SSCIL Cement at Shikalbaha seeks to cement grinding capacity is 54,000 MT per year. This if achieved will effectively contribute to significant cement production in Bangladesh.

9.8.10 Increase in Cement Exports

The proposed project at the bank of Murari canal will result in production of cement. This will translate to increased tonnage of sales of cement for export and hence increase in foreign currency in the Country.

9.8.11 Employment and Internship Opportunities

The proposed project of SSCIL Cement will provide opportunities for employment and internship for more people to work in the new industries. It is envisaged that the workforce may increase to cater for the needs.

9.8.12 Support of Local Businesses

Services of local businesses such as transporters will be required to cater for the new factory. This will contribute to growth and development of such businesses. Other businesses may start or be farther developed to cater for the needs of the new factory such businesses likely to grow include housing to cater for the increased workforce, hospitals, schools, shops among others.

9.8.13 Increased Revenue to National and County Government

The proposed project of SSCIL cement will translate to increased tonnage of cement. This will translate to increased tonnage of sales of cement translating to increased profits to the company. Increased profits will translate to increased taxes hence increased revenue to government. The will translate to increased use of raw materials this will result to increased taxes to local Government and the National Government.

SECTION-10: CONCLUSIONS AND RECOMMENDATION

CONCLUSIONS

The proposed cement plant Shun Shing Cement Industries Ltd. (SSCIL) is set up at village-Shikalbaha, Thana and Upazila-Karnafuli, District-Chattogram. The project site will enjoy the well-connected and established infrastructure facilities such as river and road transport, electricity, gas, telecommunication etc.

During construction of the project, the project authority tried to adopt all necessary measures to reduce the environmental impacts. The project proponent has taken site clearance certificate from DOE for the proposed plant, and discussed for the proposed plant due to high demand of the cement in the market.

During the preparation of this report for the development of the proposed project it was observed that the construction, installation and operation and established that most of the negative impacts on the environment are rated low and short term with no significant effect. The positive impact is the creation of employment, economic growth, optimum utilization of the land, etc., hence maximum returns, availing building and construction materials for various individuals/ companies/ developers, improved economy, improved security, and increase in revenue base to the project proponent, tax to local and National Governments.

Noise generated from the VRM will be less through modern machinery and technology. Noise modelling results from iNoise software shows that generated noise is much lees that the ambient noise of surrounding industries.

Dust generated in various sections will be collected through Pulse Jet Type dust collector and it will be within DoE discharge limit. Dust emission will be negligible since the closed Eco-hopper and closed conveyer belt will be used during unloading the raw material from the jetty. Unloading the delivery of the cement will be in a closed system hence there is no scope or minimum level of dust emission. The ground level dust concentration was calculated from source of dust generation and it was found the concentration is within standard of DoE.

The impact due to liquid discharge mainly from domestic liquid waste managed through septic tank attached with soak pit and solid waste generated are collected properly and dispose safely and considering others there are no environmental issues of sensitive nature, which might have any potential of serious ill effects due to the plant in this area. Since it is understood that the project proponent is committed to take necessary steps to address any environmental problems, the selected location of Shun Shing Cement Industries Ltd. (SSCIL) is acceptable for the present project. So, issuance of environmental clearance in favor of Shun Shing Cement Industries Ltd. (SSCIL) may be considered.

The positive impacts are highly rated and will benefit all stakeholders of this project. The project proponent has proposed to adhere to prudent implementation of the environmental management plan and is obtaining all the necessary permits and licenses from the relevant authorities, has qualified and adequate personnel and has proposed adequate safety and health mitigation measures as part of the relevant statutory requirements.

However, although the project is highly regarded in terms of positive impacts, it is anticipated that there will be negative impacts such as those listed in the above table. Since the impacts associated with the industries have been identifies, it is our recommendation that the project be allowed to go on provided the mitigation measures outlined in this ESIA Report are adhered to and the ESMP is implemented.

The location of Shun Shing Cement Industries Ltd. (SSCIL) is environmentally acceptable as has already been mentioned. However, adequate and effective pollution prevention, abatement and control measure, proper and careful operation and maintenance, regular and effective environmental monitoring with adequate staff and budgetary provision, and reporting to DoE should be ensured. It is also expected that DoE will do surveillance monitoring of the project performance. DoE should also continue its encouragement for plants like Shun Shing Cement Industries Ltd. (SSCIL) for initiatives to take care of the factory targeting a better environment.

Since it is understood that the project proponent is committed to take necessary steps to address any environmental and social Management Plan proposed in this report and the statutory requirements. The selected location of Shun Shing Cement Industries Ltd. (SSCIL) is acceptable for the present project. So, issuance of the proposed plant environmental clearance in favor of Shun Shing Cement Industries Ltd. (SSCIL) may be considered

RECOMMENDATION

1. Dust emission during unload the clinker from the jetty to conveyer belt from the existing cement plant need to be improved as closed conveyer belt with eco hopper system in order to save the raw material as well as reduce the pollution and save the environment.

2. Noise generated from the existing cement plant ball mill is exceeded the national standard and is impacted neighborhood at the west side of the plant. The expansion unit of the cement plant noise is within limit. But cumulative noise will increase at the west side of the plant. It is suggested that the following mitigation measure may be reduced the noise level within standard

   - Noise absorbing trees may be planted at the boundary, open space, green area, inside the industry and road side
   - A perforated plastic material can be use at outside of the noise source and above the existing boundary wall specially at the west side
   - A concrete or brick wall may be constructed over the existing wall

SECTION-11: LIST OF REFERENCES

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Annex 1 SSCIL_ESIA TOR_4 April 2018

TERMS OF REFERENCE (TOR) OF ESIA SERVICES

INTRODUCTION AND LEGISLATIVE REQUIREMENTS

Shun Shing Cement Industries Limited (SSCIL) has approached IDCOL for financing of a cement grinding unit with energy efficient Vertical Roller Mill (VRM) technology having capacity of 180 MT per hour at Sikalbaha, Chattogram.

The proposed cement manufacturing plant falls under the "Red Category" as per The Environment Conservation Rules, 1997. And according Safeguard Policy Statement, 2009 of Asian Development bank it is of a B category project. According to Environmental and Social Safeguards Framework (ESSF) of IDCOL it is a High-Risk project. So, SSCIL has initiated to conduct a detail Environmental and Social Impact Assessment (ESIA) for this project by complying with the standards and regulation of DOE as well as guidelines of SPS, 2009 and ESSF, IDCOL. In this regard, SSCIL also expects to comply with the EHS Guidelines of International Finance Corporation (IFC).

So, in summary, the ESIA shall be conducted on the basis of DOE requirement and IFC EHS Guidelines (General and Sector Specific)

OBJECTIVES OF THE ESIA

The objectives of the ESIA are to:

- Assess the present environmental conditions in the project area, including the identification of environmentally sensitive issues.
- Assess the proposed activities to identify their potential impacts, evaluate the impacts, and determine their significance.
- Propose appropriate mitigation and monitoring measures that can be incorporated into the design of the proposed activities to minimize any damaging effects or any lasting negative consequences identified by the assessment pursuant to the most stringent requirements under guidelines of DOE and IFC EHS Guidelines (general and sector specific).
- Prepare an ESIA report that conforms to the requirements of DOE and IFC.



Photographs: SSCIL project site

3. SCOPE OF THE ESIA

The ESIA covers assessment of all sorts of physical, biological, and socioeconomic impacts of the following:

- Construction activities at the proposed site
- Relevant off-site construction activities
- Operation of the cement manufacturing plant including carrying of raw materials and distribution of finished product
- De-commissioning of the plant

4. REFERENCE GUIDELINES AND DOCUMENTS

While conducting the ESIA the consultant has to make sure the compliance of following guidelines and standards:

- All applicable guidelines and standards as are practiced by DOE

- IFC EHS Guidelines (general and sector specific)

5. MAJOR ENVIRONMNTAL ISSUES TO CONSIDER

While conducting Environmental and Social Impacts assessment, the Environmental Consultant has to consider following major environmental issues (but not limited):

i. Air emissions including dust
ii. Exploitation of natural resources and raw materials
iii. Energy consumption and fuels
iv. iv. Wastewater
v. Solid waste generation
vi. Noise
vii. Vibration

6. APPROACH AND METHODOLOGY

a. Principles

The guiding approach of the ESIA will be based on following five principles:

- Completeness: The consultant will provide all facts and figure in a complete manner;
- Consistency: All facts and figures will be presented in a consistent manner;
- Relevancy: There will be no irrelevant discussion or illustration in the ESIA;
- Accuracy: All information and description should be accurate and they are supported with the source of reference (as is possible);
- Transparency: The consultant will prepare the ESIA from a neutral and ethical position, which means that all the issues will be depicted in a transparent manner with due importance and honest judgment.

b. Content

The ESIA report shall contain but not limited to the following contents:

A. Executive Summary
This section will describe the project activities, critical environmental and social issues, significant findings, and recommended actions.

B. Introduction
This section will cover the following aspects:

- Background of the Project;
- Extend of the ESIA study;
- Scope of the ESIA study;
- ESIA methodology in detail;
- Limitation of the study;
- The ESIA Team Composition-basic qualification and competence of Team members in brief with respective contribution in the ESIA;
- Acknowledgement

C. Policy, Legal, and Administrative Framework

This section will cover the following aspects:

- A comprehensive review of the legal and institutional frameworks within which the environmental and social assessment is to be carried out;
- Project relevant international environmental agreements to which the country is a party;
- Project related environmental, occupational and social guidelines, policies, rules and laws as are practiced by DOE and other statutory organizations in Bangladesh.

D. Description of Project

This section will cover the following aspects:

Background and Rationale of the Project

- Rationale for the proposed project;
- Outline of Project objectives.

Project Description

- Description of site location and area with reflection on proximity to nearby communities, designated environmentally sensitive areas and heritage sites[52] ;
- Describe the accessibility to site in detail with approximate length and width of different types of roads and waterways.
- Details of proposed layout plan of the project by clearly demarcating various facilities of the project with required area
- Description of required utilities and source of availability like gas, power etc.
- Description of civil works and electro-mechanical components with detail technical specification.
- Detail activity schedule with mentioning tentative time-period to accomplish each major task[6]

[5] In addition of satellite image, please insert relevant photographs. [2] Please use relevant maps and illustrations.

[6] Preferably in work-break structure (WBS) format

- Approximate work-force/personnel required during construction and operation phases
- Products with capacities for the proposed project

E. Baseline Environmental Condition (by assuming 1 km radius air shed)

This section will cover the following aspects of the project area:

Topography, Geology and Soils

- Brief description of ambient topography, geology and soil;
- Technical information is expected in supporting soil stability[7] and suitability for construction of project facilities.
- Briefly describe contour and drainage pattern of the project area[8]

Land use

- Current land use of the project site
- Description of land use in the project area adjacent to the project area (a 1 km radius airshed)[9]
- Forecasted land use based on the findings from secondary source and stakeholder consultation.

Terrestrial Flora

- List of available tresses, herbs, shrubs at project area[10];
- List of endangered species.
- The photographs of available terrestrial floras are to be inserted with caption in the Annex of ESIA with a mode of eight photographs in one page.

Terrestrial Fauna[11]

- List of endangered species;
- Use of the area by migratory fauna (if applicable);
- List of avian species including birds and so on.
- List of endangered species.
- The photographs of available terrestrial fauna are to be inserted with caption in the Annex of ESIA with a mode of eight photographs in one page.

Aquatic Ecology[12]

[7] Please summarise the major finding of Soil Test Report.

[8] Based on physical observation. No need to go for detail contour survey.

[9] While presenting landuse in the project area, please insert cartographic illustration

[10] Please provide photographs of all types of flora, fauna and aquatic habitat that you have observed in the project area

[11] See footnote 6

[12] See footnote 6

- Fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the project area and any associated wetlands;
- Any rare, threatened or endangered aquatic species;
- The photographs of available aquatic ecology are to be inserted with caption in the Annex of ESIA with a mode of eight photographs in one page.

Meteorological Condition

- Rainfall data of the project area for last ten years (2007-2016) and analysis of trend and its implication to the project;
- Temperature data of the project area for last ten years (2007-2016) and analysis of trend and its implication to the project;
- Humidity data of the project area for last ten years (2007-2016) and analysis of trend and its implication to the project;
- Data of wind speed and direction for last ten years (2007-2016) and analysis of trend and its implication to the project.

Air Quality

- The presence of SOx, NOx, CO, PM 10, PM 2.5 at ambient air and its implication to the project;
- Air quality data is to be collected at least from two points of two corners of the project site.

Noise Quality

- While measuring noise quality, DOE approved technology/widely accepted technology is to be followed.
- There should be hourly monitoring of baseline noise according to the guideline of DOE
- Monitored noise from 2 points located in opposite direction as have been mentioned in the site image at page 2 with location A and B.

Biodiversity[13](Minimum 2 pages)

- Describe the ambient bio-diversity by including 3 issues-(i) composition of biodiversity(ii)structure of biodiversity (iii) and key processes of biodiversity
- Briefly describe the ambient ecosystem service

Surface Water quality

- The analysis of surface quality in terms of the presence of relevant chemical parameters according to the ECR, 1997 including pH, TSS, TDS, BOD, COD, As, Fe and Cl;
- The availability of surface water including major source in the project area (2 km radius air shed);

[13] In case of biodiversity and ecosystem, please consider 1 km radius air shed.

- Implication of availability and quality of surface water to the project area.

Ground Water quality

- The analysis of ground water quality in terms of the presence of relevant chemical parameters according to the ECR, 1997 including pH, TSS, TDS, BOD, COD, As, Fe and Cl;
- Implication of availability and quality ground water to the project area (2 km radius air shed);

Water Stress

- Describe the water stress scenario in the project area based on the available facts and figures from secondary sources and primary observation[14].
- Describe the trend of water table depletion over the last 10-15 years
- Clearly depict the implication of water stress scenario to the project, which means whether the water stress scenario will be deteriorated due to the project.
- Describe whether the potential water stress scenario can affect the sustainability of the project in the long run period.

Seismicity

- Described the seismic vulnerability off the site with supporting facts and updated illustrations

Flood

- Described the vulnerability of the project area based on the flood record for the period 1986-2015.

Tidal surge

- Described the vulnerability of the project area based on the flood record for the period 1986-2015.

Drainage pattern

- An analysis of existing drainage pattern with focus to the movement of rain water and issue of tide-ebb with an air shed of 1 km radius.

Climate Change Impact

- Critically analyse the potential climate change stressor in the project area
- Describe the vulnerability of the project site to climate these climate change stressors in light of various adverse impacts of climate change as are relevant for Bangladesh and regionally important in consideration of the location of project site.

F. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section is expected to discuss in detail about the potential major environmental impacts and their sustainable mitigation measures. Environmental issues for a SSCIL construction and operation primarily include the following:

[14] In case of water stress scenario analysis, there is no need for any technical survey by using any technical devices. It is fully to be based on information of secondary sources and primary observation of ESIA Consultant.

Adverse impacts on topography, geology and soil

- Requirement of the amount total landfilling and technical basis of assumption;
- Impacts of landfilling at adjacent area of project site as well as place from where the filling material is collected;
- Whether there is risk of land erosion or land slide may be resulted in the project area due to construction and operation activities.
- Mitigation measures of emerging adverse impacts.

Adverse impacts on natural drainage

- Whether there is any risk of adversely affecting local natural drainage pattern in the project are which may cause localized flood/water logging;
- Mitigation measures of emerging adverse impacts.

Air pollution

- Scope and sources of emission of dust, particulate matter, SOx, NOx, CO during construction and their proposed mitigation measures;
- Scope and sources of emission of dust, particulate matter, SOx, NOx, CO during operation and their proposed mitigation measures;

General waste reception

- Sources and types of wastes including solid waste, kitchen waste during construction and operation stages;
- Approximate amount of different types of solid waste by relying on available primary and secondary source;
- Waste management measures;

Sanitary waste

- Describe the sources and approximate quantity of sanitary waste during construction and operation phases (with an assumption of required number of workers during construction phase);
- Sanitary waste management measures as are planned both during construction and operation phases

Water consumption

- Requirement of water during construction and operation phases with sources of water; and its impact on availability of surface/ground water in the project area.
- Requirement of water during operation with sources of water and its impact on availability of surface/ground water in the project area.
- In case of determine required water quantity, used reliable reference including international best practices (as available)

Wastewater

- Sources and types of waste water during construction and operation phase[15];

[15] Please try to provide approximate assumption of quantity of waste water

- Waste water management measures;

Hazardous materials and oil management

- Sources and types of hazardous materials that will be used during construction and operation phase;
- Impacts due to spillage and leaks of hazardous materials on surface water, soil and ground water;
- Management measures of hazardous materials and oil spills (as applicable). **Noise**
- List of major noise generating activities/devices during construction with approximate noise level and mitigation measures (if required);
- List of major noise generating activities/devices during operation with approximate noise level and mitigation measures (if required).
- Intense of potential noise impact during operation phase in the manufacturing plant and to the adjacent community. In this regard, application of a basic Noise Model will be highly appreciated to depict potential noise impact to adjacent community.

Biodiversity[16]

- Potential adverse impacts to the biodiversity;
- Mitigation/compensation arrangement;
- Use the IUCN latest Red List on ecological conservation to assess the impact on the local biodiversity as a result of the project. Other relevant international guidelines could be used;

Traffic Safety

- Describe the scope of traffic hazard of community due to the project while carrying construction materials and heavy equipment; and suggest proper traffic safety management measures;
- Describe the potential adverse impact of traffic to the community during operation with potential traffic safety management measures;

Seismic Risk

- Describe the seismic risk management measures.
- Used some valid information from Building Code, which are relevant to make the structure/building more seismic resistant. **Flood Risk**
- Described the flood risk management measures

Tidal Surge Risk

- Describe the tidal surge risk management measures

Drainage pattern

[16] Please discuss bio-diversity in light of the project area specific manner.

- An analysis whether the project will adversely affect the movement of rain water and issue of tide-ebb with an airshed of 1 km radious. And also discuss wither there is any impending risk associated of water logging to adjacent areas.

Climate Change Vulnerability

- Describe the management measures of potential risk of climate change.

G. OCCUPATIONAL HEALTH SAFETY ASSESSMENT

While discussing on occupational health safety impact, it is expected that the environmental Consultant will consider the following issues:

- Described the major potential adverse occupational health impacts and their mitigation measures in consideration of construction
- Described the major potential adverse occupational health impacts of following process/department during operation
- Described the mitigation measures of potential health impacts

H. SOCIAL IMPACT ASSESSMENT WITH STAKEHOLDER CONSULTATION

While assessing social impact assessment, it is required that the ESIA Consultant will (1) analyses the baseline of basic socio-economic aspects (2) Conduct stakeholder consultation/focus group discussion as have been detailed as follows:

Baseline socio-economic condition analysis: In case of baseline socio-economic condition analysis, to collect as much information as you can from project area and respective local government offices. Application of BBS Census 2011 is not a very satisfactory approach as the data are of at least 7 years old. While analyzing baseline condition, to cover following issues of the project area (an air shed of 2km):

- Population and community characteristics (male, female, religion, profession and age group)
- Land acquisition issue if any
- Physical and cultural resources (school, college, madrasha, mosque, temple, church, vocational institute) within 1km of the plant site
- Health and safety facility
- Income structure
- Access to education (literacy rate etc, number of student)
- Access to energy (percentage of electricity facility)
- Communication and transportation facility
- Physical cultural resources

2. **Stakeholder consultation/focus group discussion:** The following Focused Group Discussion (FGD) and consultation are desired:
    1. FGD with Male group
    2. FGD with Female group

3. Consultation with relevant government officials like DOE, Fire Service and Civil Defense and so on.
4. Consultation with NGO officials as are locally available
5. Consultation with local government representatives
6. Large Stakeholders consultation meeting with the all types people (Local people, NGO representatives, government officials and others as are available)

- During FGD, the name, age, occupation, signature and cell phone numbers of respondents have to be recorded as an evidence of authenticity. In case of large Stakeholders consultation, it is highly requested to use a banner written the project name and purpose of FGD. In addition, the photographs of FGD and Stakeholders consultation are highly desired.
  - If there is any significant habitat of Indigenous People within 2 km radius of Project site, they need to be consulted.

I. Disaster Management Plan

This section is expected to cover the following aspects comprehensively:

- Describe the potential sources and causes of fire and explosion with focus to construction and operation phases;
- Describe how fire hazard has been addressed in planning, design, construction and operation of different features of the project;
- Describe the proposed firefighting arrangement;
- Describe how seismic hazard has been addressed in planning, design, construction and operation of different features of the project;
- Discuss the proposed Emergency Response Plan[17].

J. Grievance Redress Mechanism

This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.

K. Conclusion and Recommendation

This section provides the conclusions drawn from the assessment and provides Recommendations

7. COMPLETION OF WORKS

The report may be required to be presented in front of all stockholders and be presented in tele conference to update the progress of the works to all stockholders on regular basis. Necessary revisions, augmentation, deletions, additions are need to be done in order to conform the final report as per requirements of IDCOL, DOE and other stakeholders.

8. DURATION

[17] Please discuss the Emergency Response Plan in a SSCIL project specific manner.

The total duration of the assignment is of **60 calendar days**. By 45 days, the consultant has to submit the draft Report with a brief presentation. Within 5 days IDCOL and SSCIL will share their findings and the consultant will submit the final version within next 10 days.

9. PRESENCE TO HAVE CLEAR UNDERSTANDING

In this ESIA there should be supporting evidence that Team Leader, Environmental Expert, Social Expert, and other relevant team members has physically visit the project **at least twice during this ESIA report preparation phase** in order to acquire adequate understanding about baseline situation.

10. DISCLAIMER AND CLARIFICATION

Based on request of SSCIL, IDCOL has prepared this ToR with an objective to cover major environmental and social issues. While understanding this ToR, if you feel necessity of clarification of any issue, please contact with Mr. Raihan Uddin Ahmed, Environmental Specialist, IDCOL with email **raihan@idcol.org**.

Annex 2 Site Clearance Certificate from DoE of SSCIL_2018

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
চট্টগ্রাম জেলা কার্যালয়
পরিবেশ ভবন, বাকির হোসেন রোড
ওয়েজলেক এলাকা, খুলশী, চট্টগ্রাম -৪২০২
www.doe.gov.bd

অবস্থাননগত ছাড়পত্র

ছাড়পত্র নং: ১৮-০৩১৭৪

পরিবেশগত ব্যবস্থাপনা নিশ্চিতকরণ সাপেক্ষে নিম্নবর্ণিত শর্তে নিম্নবর্ণিত প্রতিষ্ঠান/প্রকল্পের অনুকূলে অবস্থাননগত ছাড়পত্র প্রদান করা হলো :

প্রতিষ্ঠান/প্রকল্পের নাম	: সান সিং সিমেন্ট ইন্ডাস্ট্রিজ লিমিটেড
মালিকের নাম	: মোহাম্মদ আলী খান
মালিকানার ধরন	: ৪৩১২১
প্রতিষ্ঠান/প্রকল্পের ধরন	: সিমেন্ট
প্রতিষ্ঠান/প্রকল্পের শ্রেণী	: Red
প্রতিষ্ঠান/প্রকল্পের ঠিকানা	: নিজবাস (আজবারপাড়া), কর্ণফুলী, চট্টগ্রাম
আবেদনের তারিখ	: ০৮/০৪/২০১৮ খ্রিঃ
মোবাইল ইউনিটের তারিখ	: ০৭/০৪/২০১৮ খ্রিঃ

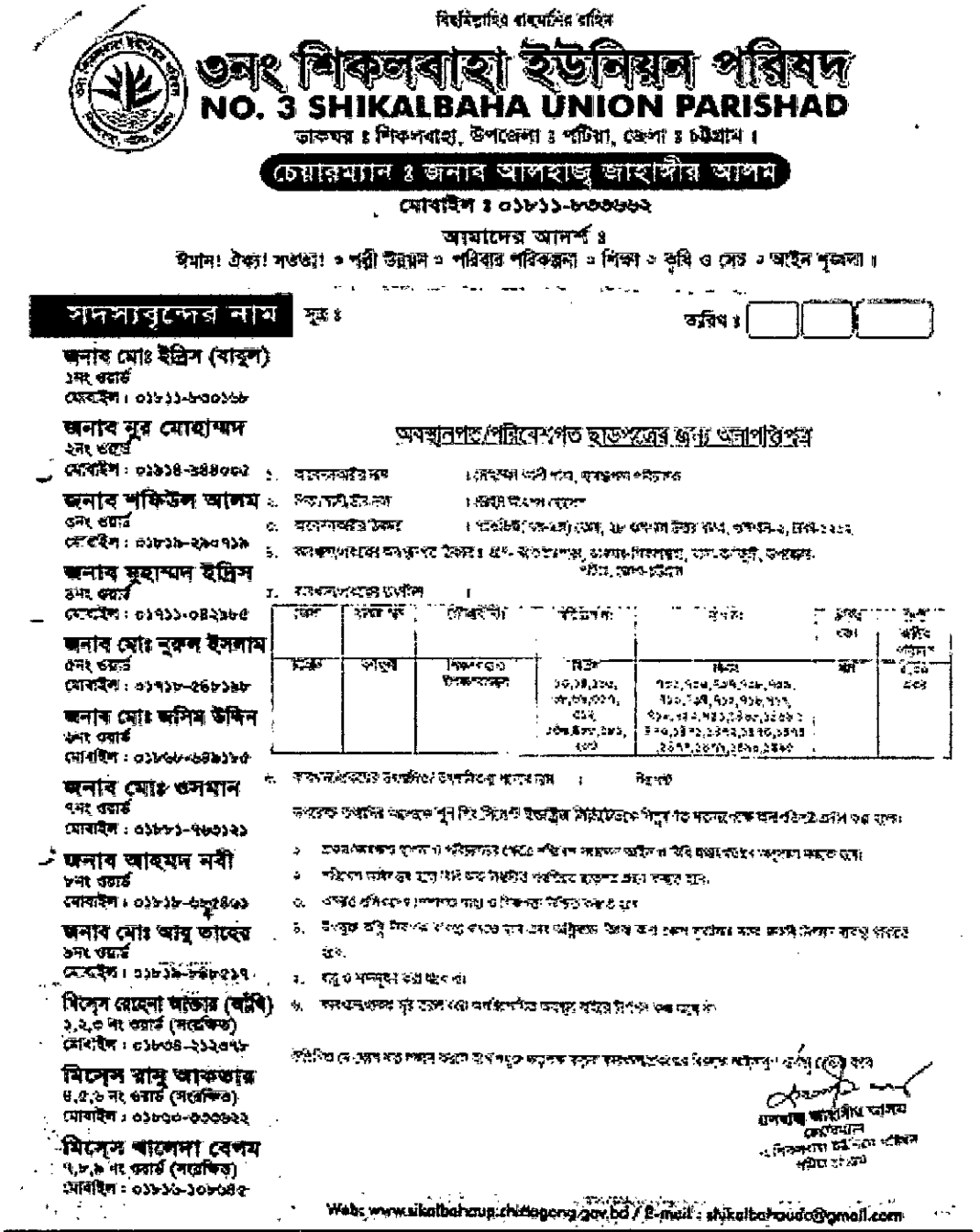
এ ছাড়পত্র সনদের যাবে পুনঃব্যবহার যোগ্য প্রকৃত প্রতিলিপি আবেদনকারী সংরক্ষণ করতে হবে, অন্যথায় ছাড়পত্র বাতিল/অকার্যকর আবেদনের যে কোন ধরনের ক্ষতির জন্য দায়ী থাকবে।

বিস্তারিত এই প্রকল্প বিষয়ক ছাড়পত্রের সাধারণ শর্তাবলী এবং প্রকল্প ভিত্তিক বিশেষ শর্তাবলী সংযুক্ত।

ছাড়পত্রটি যাচাই করতে ভিজিট করুন: http://ecc.doe.gov.bd/certificate_verification

Page 1 of 2

Annex 3 NOC of SSCIL from 3 No Shikalbaha Union Parishad



বিসমিল্লাহির রাহমানির রাহিম

৩নং শিকলবাহা ইউনিয়ন পরিষদ
NO. 3 SHIKALBAHA UNION PARISHAD

ডাকঘর ঃ শিকলবাহা, উপজেলা ঃ পটিয়া, জেলা ঃ চট্টগ্রাম।

চেয়ারম্যান ঃ জনাব আলহাজ্ব জাহাঙ্গীর আলম

মোবাইল ঃ ০১৮১১-৮৩৩৬৬২

আমাদের আদর্শ ঃ

ঈমান! ঐক্য! সততা! ● পল্লী উন্নয়ন ● পরিবার পরিকল্পনা ● শিক্ষা ● কৃষি ও সেচ ● আইন শৃঙ্খলা।

সদস্যবৃন্দের নাম

জনাব মোঃ ইদ্রিস (বাবুল)
১নং ওয়ার্ড
মোবাইল : ০১৮১১-৮৩০১৬৮

জনাব নূর মোহাম্মদ
২নং ওয়ার্ড
মোবাইল : ০১৯১৪-৩৪৪৭০৫

জনাব শফিউল আলম
৩নং ওয়ার্ড
মোবাইল : ০১৮১৯-২৯৩৭১৯

জনাব মুহাম্মদ ইদ্রিস
৪নং ওয়ার্ড
মোবাইল : ০১৭১১-০৪২১৯৫

জনাব মোঃ নুরুল ইসলাম
৫নং ওয়ার্ড
মোবাইল : ০১৭১৮-২৬৮১৯৮

জনাব মোঃ জসিম উদ্দিন
৬নং ওয়ার্ড
মোবাইল : ০১৮৬৮-৬৪৯১৮৫

জনাব মোঃ ওসমান
৭নং ওয়ার্ড
মোবাইল : ০১৮৮১-৭৬৩১২১

জনাব আহমদ নবী
৮নং ওয়ার্ড
মোবাইল : ০১৯১৮-৬৮৫৪৬৯

জনাব মোঃ আবু তাহের
৯নং ওয়ার্ড
মোবাইল : ০১৮১৯-৮৪৮৫১৭

মিসেস রেহেনা আক্তার (মল্লিকা)
১,২,৩ নং ওয়ার্ড (সংরক্ষিত)
মোবাইল : ০১৮৩৪-২১২৩৭৮

মিসেস রানু আকতার
৪,৫,৬ নং ওয়ার্ড (সংরক্ষিত)
মোবাইল : ০১৮৩০-৩৩৩৯২২

মিসেস শাহেদা বেগম
৭,৮,৯ নং ওয়ার্ড (সংরক্ষিত)
মোবাইল : ০১৯১৬-১০৮৬৪৫

স্মারক ঃ তারিখ ঃ

অবস্থানপত্র/পরিবেশগত ছাড়পত্রের জন্য আবেদনপত্র

১. আবেদনকারীর নাম : মেসার্স শেখ শাহ, ব্যবস্থাপনা পরিচালক

২. শিল্প/সার্ভিস/ইউনিট : প্রস্তাবিত সিমেন্ট ফ্যাক্টরী

৩. আবেদনকারীর ঠিকানা : হোল্ডিং নং-৪৩/১৩৮, মৌজা, ১৮ নং ফতেয়া ইউপি ওয়ার্ড, চন্দ্রঘোনা-২, রাঙ্গুনিয়া, চট্টগ্রাম।

৪. কারখানা/প্রকল্পের অবস্থানের বিবরণ ঃ ৫৮৭ ফতেয়াবাদ, চন্দ্রঘোনা-সিকলবাহা, রাঙ্গুনিয়া-পটিয়া, জেলা-চট্টগ্রাম

৫. কারখানা/প্রকল্পের উপাদান ঃ

জমি		শ্রমিক সংখ্যা				
মালিকানা	ভাড়া	নির্মাণকালীন	স্থায়ী	মোট		

৬. কারখানা/প্রকল্পের বর্তমান/প্রস্তাবিত স্থানের নাম : নিজস্ব

আবেদনকৃত তথ্যাদির আলোকে শর্ত সাপেক্ষে ইজতেমায়ী সিমেন্ট ফ্যাক্টরী স্থাপনের অনুমতি/ছাড়পত্র প্রদান করা হলো।

১. প্রস্তাবিত/আবেদনকৃত ভূমির ০১ একরের বেশি জমি ব্যবহার করা যাবে না। যদি প্রয়োজন হয় তা অতিরিক্ত জমি ক্রয় করতে হবে।

২. পরিবেশ সংরক্ষণ বিধি মোতাবেক সকল ধরনের ছাড়পত্র গ্রহণ করতে হবে।

৩. ওয়েস্ট হিট রিকভারি সিস্টেম স্থাপন করে ও সিমেন্ট ফ্যাক্টরি পরিচালনা করতে হবে।

৪. উৎপাদিত বর্জ্য সিমেন্ট ধুলা ও ধোয়া যাতে আশপাশের জমির ক্ষতি না করে সেদিকে লক্ষ্য রাখতে হবে।

৫. ধোয়া ও শব্দদূষণ রোধ করতে হবে।

৬. কারখানা/প্রকল্প স্থাপনের ফলে আশপাশের জনগণের স্বাস্থ্যের উপর কোন প্রভাব পড়লে তার দায়ভার কারখানা কর্তৃপক্ষকে বহন করতে হবে।

উপরোক্ত যে কোন শর্ত লঙ্ঘন করলে ছাড়পত্র/অনুমতি বাতিল করার ক্ষমতা কারখানা/প্রকল্পের বিরুদ্ধে সংরক্ষণ করা হলো।

আলহাজ্ব জাহাঙ্গীর আলম
চেয়ারম্যান
৩নং শিকলবাহা ইউনিয়ন পরিষদ
পটিয়া, চট্টগ্রাম

Web: www.sikalbahaup.chittagong.gov.bd / E-mail : shikalbahaud@gmail.com

Annex 4 DoE Standards

Appendix-3: Environmental Standard According to DoE and WHO

NATIONAL ENVIRONMENT QUALITY STANDARDS

At present, there are environmental standards in operation in Bangladesh also promulgated under the Environment Conservation Rules of 1997. There are standards prescribed for varying water sources, ambient air, noise, odor, industrial effluent and emission discharges, vehicular emissions, etc. The standards, commonly known as Environmental Quality Standards (EQS), are legally binding. The Bangladesh standards for ambient air, noise, odor, sewage, industrial effluent, and emission are furnished here. These are all in an authentic translation from original Bengali, citing the specific source.

Table1 National Standard for Inland Surface Water

Sl. No	Best Practice-Based Classification	pH	BOD (mg/l)	DO (mg/l)	Total Coliform Number/100
1	Source of drinking water for supply only after disinfecting	6.5-8.5	2 or less	6 or above	50 or less
2	Water usable for recreational activity	6.5–8.5	3 or less	5 of more	200 or less
3	Source of drinking water for supply after conventional treatment	6.5–8.5	6 or less	6 or more	5,000 or less
4	Water usable by fisheries	6.5–8.5	6 or less	5 or more	—
5	Water usable by various process and cooling industries	6.5–8.5	10 or less	5 or more	5,000 or less
6	Water usable for irrigation	6.5–8.5	10 or less	5 or more	1,000 or less

Notes: 1. In water used for pisiculture, maximum limit of presence of ammonia as Nitrogen is 1.2 mg/l.
2. Electrical conductivity for irrigation water – 2250 µmhoms/cm (at a temperature of 25°C); sodium less than 26%; boron less than 0.2%.
Source: Department of Environment (DOE)

Table 2 National Standard of Drinking Water

Sl. No	Parameter	Unit	Standards	Sl. No	Parameter	Unit	Standards
1	1. Aluminum	mg/l	0.2	33	Iron	mg/l	0.3 – 1.0

2	Ammonia (NH3)	mg/l	0.5	34	Kjheldal nitrogen (total)	mg/l	1
3	Arsenic	mg/l	0.05	35	Lead	mg/l	0.05
4	Balium	mg/l	0.01	36	Magnesium	mg/l	30 – 35
5	Benzene	mg/l	0.01	37	Manganese	mg/l	0.1
6	BOD5 20°C	mg/l	0.2	38	Mercury	mg/l	0.001
7	Boron	mg/	1.0	39	Nickel	mg/l	0.1
8	Cadmium	mg/l	0.005	40	Nitrate	mg/l	10
9	Calcium	mg/l	75	41	Nitrite	mg/l	<1
10	Chloride	mg/l	150 – 600*	42	Odor	mg/l	Odorless
11	Chlorinated alkanes			43	Oil and grease	mg/l	0.01
12	carbon tetrachloride	mg/l	0.01	44	pH	–	6.5 – 8.5
13	Dichloroethylene	mg/l	0.03	45	Phenolic compounds	mg/l	0.002
14	tetrachloroethylene		0.03	46	Phosphate	mg/l	6
15	trichloroethylene		0.09	47	Phosphorus	mg/l	0
16	pentachlorophenol	mg/l	0.03	48	Potassium	mg/l	12
17	trichlorophenol	mg/l	0.03	49	Radioactive materials (gross alpha activity)	Bq/l	0.01
18	Chlorine (residual)	mg/l	0.2	50	Radioactive materials (gross beta activity)	Bq/l	0.1
19	Chloroform	mg/l	0.09	51	Selenium	mg/l	0.01
20	Chromium (hexavalent)	mg/l	0.05	52	Silver	mg/l	0.02
21	Chromium (total)	mg/l	0.05	53	Sodium	mg/l	200
22	COD	mg/l	0.04	54	Suspended particulate matters	mg/l	10

23	Coliform (fecal)	n/100 ml	0	55	Sulfide	mg/l	0
24	Coliform (total)	n/100 ml	0	56	Sulfate	mg/l	400
25	Color	Haze n unit	15	57	Total dissolved solids	mg/l	1,000
26	Copper	mg/l	1	58	Temperature	°C	20-30
27	Cyanide	Mg/l	0.1	59	Tin	mg/l	2
28	Detergents	mg/l	0.2	60	Turbidity	NTU	1014
29	DO	mg/l	6	61	Zinc	Mg/l	5
30	Fluoride	mg/l	1				
31	pentachlorophenol	mg/l	0.03				
32	Hardness (as CaCO3)	mg/l	200 – 500				

*In coastal area 1000. Reference: Bangladesh Gazette, Addendum, August 28, 1997 Source: Department of Environment (DOE)

Table 2 Bangladesh Standards for Ambient Air Quality Schedule-2, Rule 12, Environment Conservation Rules of 1997 (Micrograms /Cubic Meter)

Sl. No.	Area	Suspended Particulate Matter (SPM)	Sulfur Di oxide (SO 2)	Car bon Mon oxid e (CO)	Oxides of Nitrogen (NOx)
Ka	Industrial and mixed	500	120	5000	100
Kha	Commercial and mixed	400	100	5000	100
Ga	Residential and rural	200	80	2000	80
Gha	Sensitive	100	30	1000	30

Source: Schedule-2, Rule 12, Environment Conservation Rules of 1997 (Page 3123, Bangladesh Gazette, 28 August 1997) (Own authentic translation from original Bengali).

Note: 1. Sensitive area includes national monuments, health resorts, hospitals, archaeological sites, educational institutions and other government designated areas (if any).

Any industrial unit located not in a designated industrial area will not discharge such pollutants, which may contribute to exceed the ambient air quality above in the surrounding areas of category 'Ga' and 'Gha'.

Suspended particulate matters mean airborne particles of diameter of 10 micron or less. Source: Department of Environment (DoE)

Table 3 National Ambient Air Quality Standards published in the Bangladesh Gazette (19 July 2005)

Sl. No	Pollutant	Objective	Averaging Time
1	$PM_{2.5}$	15 µg /m3	Annual (f)
		65 µg /m3	24-hour (h)
2	PM_{10}	50 µg /m3	Annual (b)
		150 µg /m3	24-hours(g)
3	SPM	200 µg /m3	8-hours
4	SO_2	80 µg /m3; (0.03 ppm)	Annual
		365 µg / m3; (0.14 ppm)	24-hour (a)
5	NO_x	100 µg /m3; (0.053 ppm)	Annual
6	CO	10mg/m3; (9 ppm) (a)	8-hours (a)
		40mg/m3; (35 ppm) (a)	1-hour (a)
7	Lead	0.5 µg/m3	Annual (i)
8	Ozone	157 µg /m3; (0.08 ppm)	8-hour (e)
		235 µg /m3; (0.12 ppm)	1-hour(d)

a) Not to be exceeded more than once per year
b) The objective is attained when the annul arithmetic mean is less then or equal to 50µg/m3.
c) The objective is attained when the expected number of days per calendar year with a 24-hour average of 150µg/m3 is equal to or than 1.
d) The objective is attained when the expected number of days per calendar year with the maximum hourly average of 0.12 ppm is equal to or less then 1.
e) 3-year average of annual 4th highest concentration
f) Spatially averaged over designated monitors
g) The from the 99th percentile.
h) The from is the 98th percentile
i) Annual arithmetic average based on lead analysis of TSP samples operated on an every 6th day schedule.

Table 4 Bangladesh Standards for Noise (Amendment in 2006)

Sl. No	Area Category	Standards Values (All Values in dBA)	
		Day	Night
Ka	Silent zone	50	40
Kha	Residential area	55	45
Ga	Mixed area (basically residential and together used for	60	50

	commercial and industrial purposes)		
Gha	Commercial area	70	60
Umma	Industrial area	75	70

Source: Schedule 4, Rule-12, Environment Conservation Rules, 1997. (Page 3127, Bangladesh Gazette, 28 August 1997). Own authentic translation from original Bengali

Note :1. Daytime is reckoned as the time between 6 a.m. and 9 p.m.
Nighttime is reckoned as the time between 9 p.m. and 6 a.m.
Silent zones are areas up to a radius of 100 m around hospitals, educational institutions, or special establishments declared or to be declared as such by the government. Use of vehicular horn, other signals, and loudspeakers is prohibited in silent zones.
Source: Department of Environment (DOE)

Table 5 Bangladesh Standards for Odor

Sl. No	Parameters	Unit	Values
1	Acetaldehyde	PPM	0.5-5
2	Ammonia	PPM	1-5
3	Hydrogen Sulfide	PPM	0.02-0.2
4	Methyl Disulfide	PPM	0.009-0.1
5	Methyl Mercaptan	PPM	0.02-0.2
6	Methyl Sulfide	PPM	0.01-0.2
7	Styrene	PPM	0.4-2.0
8	Trimethylamine	PPM	0.005-0.07

Source: Schedule 8, Rule 12, Environment Conservation Rules, 1997. (Page 3130, Bangladesh Gazette, 28 August
1997). Own authentic translation from original Bengali
Note :1. Regulatory standards at emission/discharge outlets (apply to those outlets which are higher than 5 meters) : Q = 0.108 x He2 cm, Where Q – gas emission rate (Nm3/hour), He – effective height of the outlet (m), Cm – above mentioned standard (ppm)
2. Where there is a range given for a parameter, the lower value will be used for warning and the higher value for initiation of legal procedure or punitive measures. Source: Department of Environment (DOE)

Table 6 Bangladesh Standards for Sewage Discharge

Sl. No	Parameters	Unit	Values
1	BOD	mg/l	40
2	Nitrate	mg/l	250
3	Phosphate	mg/l	35
4	Suspended Solids (SS)	mg/l	100
5	Temperature	°C	30
6	Coliforms	number/100ml	1,000

Source: Schedule- 9, Rule-13, Environment Conservation Rules, 1997. (Page-3131 of Bangladesh Gazette of 28 August 1997) (Own authentic translation from original Bengali)
Note :1. These standards are applicable for discharge into surface and inland water bodies. 2. Chlorination is to be done before final discharge.
Source: Department of Environment (DOE)

Table 7 Bangladesh Standards for Industrial and Project Effluent

Sl. No	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewer to Secondary Treatment Plant	Irrigable Land
1	Ammonical nitrogen (as elementary N)	mg/l	50	75	75
2	Ammonia (as free ammonia)	mg/l	5	5	15
3	Arsenic (as As)	mg/l	0.2	0.05	0.2
4	BOD5 at 20oC	mg/l	50	250	100
5	Boron	mg/l	2	2	2
6	Cadmium (as Cd)	mg/l	0.05	0.5	0.5
7	Chloride	mg/l	600	600	600
8	Chromium (as total Cr)	mg/l	0.5	1.0	1.0
9	COD	mg/l	200	400	400
10	Chromium (as hexavalent Cr)	mg/l	0.1	1.0	1.0
11	Copper (as Cu)	mg/l	0.5	3.0	3.0
12	Dissolved oxygen (DO)	mg/l	4.5-8	4.5-8	4.5-8
13	Electro-conductivity (EC)	µsiemens/cm	1,200	1,200	1,200
14	Total dissolved solids	mg/l	2,100	2,100	2,100
15	Fluoride (as F)	mg/l	2	15	10
16	Sulfide (as S)	mg/l	1	2	2
17	Iron (as Fe)	mg/l	2	2	2
18	Total kjeldahl nitrogen (as N)	mg/l	100	100	100
19	Lead (as Pb)	mg/l	0.1	1	0.1
20	Manganese (as Mn)	mg/l	5	5	5
21	Mercury (as Hg)	mg/l	0.01	0.01	0.01
22	Nickel (as Ni)	mg/l	1.0	2.0	1.0
23	Nitrate (as elementary N)	mg/l	10.0	Not yet set	10
24	Oil and grease	mg/l	10	20	10
25	Phenolic compounds (as C6H5OH)	mg/l	1.0	5	1
26	Dissolved phosphorus (as P)	mg/l	8	8	15
27	Radioactive substance	(to be specified by Bangladesh Atomic Energy Commission)			

28	PH		6-9	6-9	6-9
29	Selenium (as Se)	mg/l	0.05	0.05	0.05
30	Zinc (as Zn)	mg/l	5	10	10
31	Total dissolved solids	mg/	2,100	2,100	2,100
32	Temperature	oC (summer) oC (winter)	40 45	40 45	40 45
33	Suspended solids	mg/l	150	500	200
34	Cyanide	mg/l	0.1	2.0	0.2

Source: Schedule -10, Rule-13, Environment Conservation Rules, 1997 (Page 3132 - 3134 of Bangladesh Gazette of 28 August 1997) (Own authentic translation from original Bengali). Note:
These standards will be applicable for all industries other than those which are specified under "industrial sector specific standards."
These standards will have to be complied with from the moment of trial production in case of industries and from the very beginning in case of projects.
These standards will have to be met at any point of time and any sampling. In case of need for ambient environment condition, these standards may be made stringent.
Inland surface water will include drains, ponds, tanks, water bodies, ditches, canals, rivers, streams, and estuaries.
Public sewer means leading to full-fledged joint treatment facility comprising primary and secondary treatment.
Land for irrigation means organized irrigation of selected crops on adequate land determined on the basis of quantum and characteristics of wastewater.
If any discharge is made into public sewer or on land which does not meet the respective definitions in notes 5 and 6 above, then the inland surface water standards will apply.

Table 8 Bangladesh Standards for Industrial and Project Emissions

Sl. No.	Parameters	Values (in mg/Nm3)
1	Particulates (ka) Power station of capacity of 200 MW or more	 150
	(kha) Power station of capacity of less than 200 MW	350
2	Chlorine	150
3	Hydrochloric acid vapor and mist	350
4	Total fluoride (as F)	25
5	Sulfuric acid mist	50
6	Lead particulates	50
7	Mercury particulates	10
8	Sulfur dioxide (ka) Sulfuric acid production (DCDA* process) (kha) Sulfuric acid production (SCSA* process) (* DCDA: Double conversion, double absorption, SCSA: Single conversion, single absorption) Lowest height of stack for sulfur dioxide dispersion: (ka) Coal based power plant 500 MW or more	kg/ton acid 4 100 275 m

	200 MW – 500 MW Less than 200 MW (kha) Boiler Steam per hour – up to 15 tons Steam per hour – more than 15 tons (Q = SO2 emission in kg/hour)	220m 14(Q)0.3 11m 14(Q)0.3
9	Oxides of nitrogen (ka) Nitric acid production (kha) Gas based power stations 500 MW or more 200 – 500 MW Less than 200 MW (Ga) Metallurgical oven	 3 kg/ton acid 50 ppm 50 ppm 40 ppm 30 ppm 200 ppm
10	Kiln soot and dust (ka) Blast furnace (kha) Brick kiln (Ga) Coke oven (Gha) Lime kiln	Mg/Nm3 500 1000 500 250

Source: Schedule 11, Rule 13, Environment Conservation Rules, 1997 (Page 3135, 3136, Bangladesh Gazette, 28 August 1997) (Own authentic translation from original Bengali)
Source: Department of Environment (DOE)

Table 9 Summary of selected international water quality standard and guideline

Sl. No	WHO Categories	Parameters	Units	Bangladesh	WHO, 1993	EU, 1993	US-EPA
1	Bacteriological quality	Total coliforms Total coliforms	Counts/100 ml Number of samples/months	0	0	0 (i)	5%
		Fecal coliforms	n/100ml	0			
2	Inorganic Chemicals (of health significance)	Arsenic	mg/l	0.05	0.01(p)	0.01(c)	0.05
		Barium	mg/l	0.01	0.7		2
		Boron	mg/l	1	0.5 (p)	1 (c)	
		Cadmium	mg/l	0.005	0.003	0.005(c)	0.005
		Chromium	mg/l	0.05 (hexa) 0.05 (Total)	0.05(p)	0.05 (c)	0.1
		Copper	mg/l	1	2 (p)	2 (c)	1.3 (r:1.0)
		Cyanide	mg/l	0.1	0.07	0.05 (c)	0.2
		Fluoride	mg/l	1	1.5	1.5 (c)	4.0(r: 2.0)
		lead	mg/l	0.05	0.01	0.01 (c)	0.015

		Nickel	mg/l	0.1	0.02	0.02 (c)	
		Nitrate-NO3	mg/l	10	50	50 (c)	10
		Nitrite-NO2	mg/l	<1	3	0.5 (c)	1
		Manganese	mg/l	0.1	0.5 (p)	0.05 (l)	0.05 (r)
		Mercury	mg/l	0.001	0.001	0.001 (c)	0.002
		Selenium	mg/l	0.01	0.01	0.01(c)	0.05
3	Pesticides	Dieldrin	µg/l		0.03	0.03 (c)	
		Atrazine	µg/l		2	0.03 (c)	3
		DDT	µg/l		2	0.1 (c)	
		Gamma-HCH(Lindane)	µg/l		2	0.1 (c)	0.2
		Permethrin	µg/l		20	0.1 (c)	
		Pesticides total	µg/l			0.5 (c)	
4	Disinfectants and disinfectant by-products	Chlorine	mg/l		5		
5	Radioactive constituents	Gross Alpha activity	Bq/litre	0.01	0.1		
		Gross Beta activity	Bq/litre	0.1	1		
		Turbidity	NTU	10	5 (a)		
6	Aesthetic guidelines	Aluminum	mg/l	0.2	0.2 (a)	0.2 (i)	0.05-0.2(r)
		Ammonia - N	mg/l	0.5	1.5 (a)	0.5 (i)	
		Chloride	mg/l	150-600	250 (a)	250 (i)	250 (r)
		Copper	mg/l	1	1		
		Hydrogen sulfide - H2S	mg/l		0.05(a)		
		Iron	mg/l	0.3-1	0.3(a)	0.2 (i)	0.3 (r)
		Manganese	mg/l	0.1	0.1	0.05 (i)	0.05 (r)
		Dissolved Oxygen	mg/l	6		>5 (i)	
		pH		6.5-8.5	<8 (a)	6.9-9.5(i)	6.5-8.5 (r)
		Sodium	mg/l	200	200 (a)	200 (i)	
		Sulfate	mg/l	400	250 (a)	250 (i)	250 (r)
		Sulfides	mg/l	0		0.05(i)	
		Total	mg/l	1000	1000		500

		dissolved solids					(r)
		Electrical conductivity	µS/cm			2500 (i)	
		Zinc	mg/l	5	3 (a)		
		Residual chlorine	mg/l	0.2	0.6-1		
		Ca	mg/l	75			
		Detergent	mg/l	0.2			
		Magnesium	mg/l	30-35			
		Odor	mg/l	Odorless			
		Oil and grease	mg/l	0.1			
		Phenolic compound	mg/l	0.002			
		Colour	Hazen unit	15			
		Phosphate	mg/l	6			
		Phosphorus	mg/l	0			
		Potassium	mg/l	12			
		Temp.	OC	20-30			
		Tin	mg/l	2			
		Silver	mg/l	0.02			
		Suspended particular matter	mg/l	10			
		Hardness as CaCO3	mg/l	200-500			

SUMMARY OF SELECTED INTERNATIONAL WATER QUALITY STANDARD AND GUIDELINE

Selected drinking water quality guideline

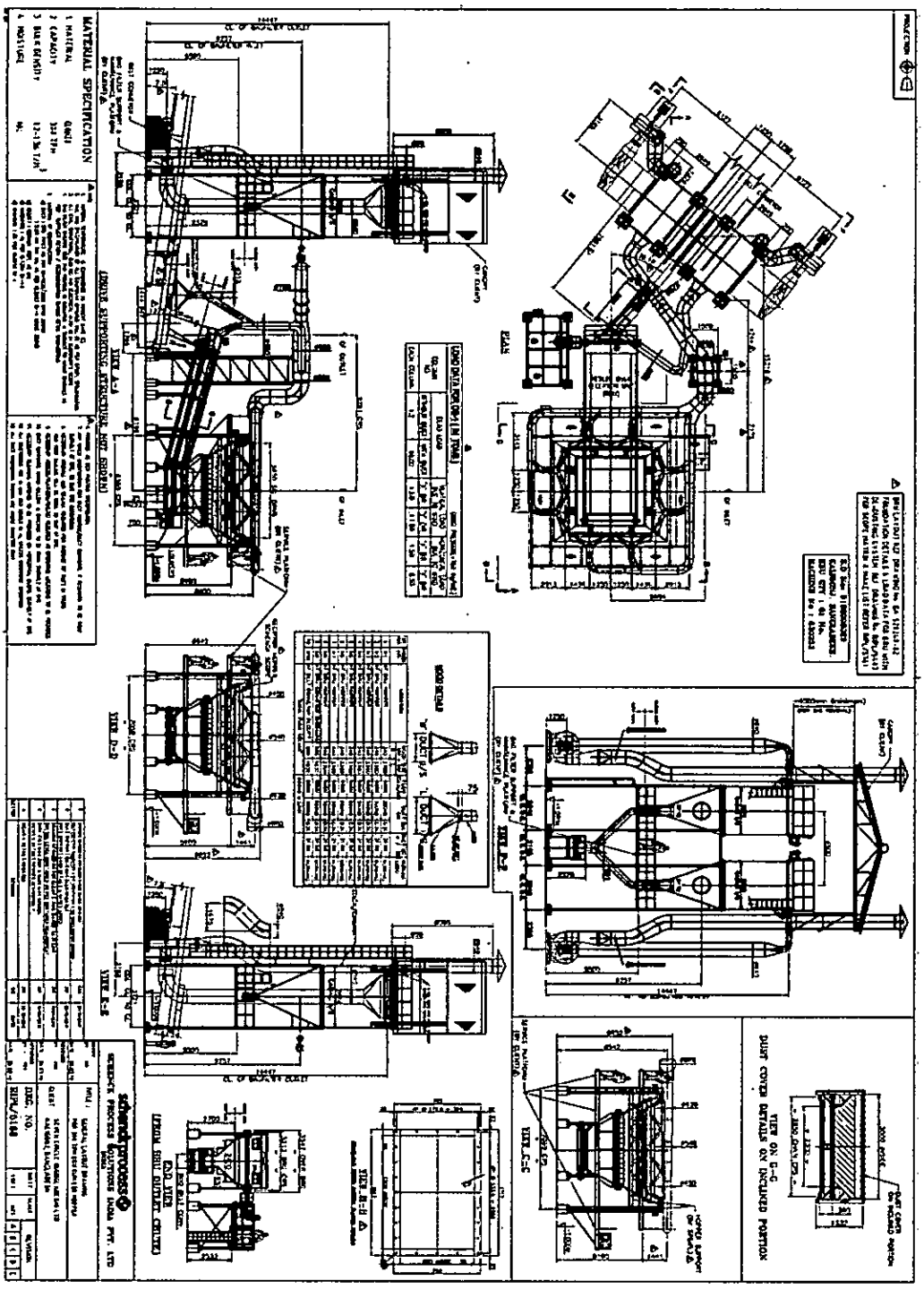
Sources: EU, 1998. Drinking water standards (EU Directive 98/83/EC). (i) Indicator parameter; (c) chemical parameter

US-EPA, 1974. Safe Drinking Water Act (SDWA), plus subsequent amendments. Maximum Contaminant Level (MCL) values (health, enforceable);

(r) Secondary Drinking Water Regulations (aesthetically recommended, but nonenforceable)

WHO, 1993. Guidelines for Drinking Water Quality. Second edition. (p) Provisional guideline value; (a) aesthetic guideline.

Annex 5 Dust Cover RIPL-5168 (Rev-K).dwg 26-01-2019-Layout



Annex 6 Environmental Code of Practice

ECoP 1 Waste Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to CSC for approval. Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. Segregate and reuse or recycle all the wastes, wherever practical. Prohibit burning of solid waste Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction process. Provide refuse containers at each worksite. Request suppliers to minimize packaging where practicable. Place a high emphasis on good housekeeping practices. Maintain all construction sites in a clean, tidy and safe condition and provide and maintain appropriate facilities as temporary storage of all wastes before transportation and final disposal.
2	Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall Collect chemical wastes in 200-liter drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. Store, transport and handle all chemicals

			avoiding potential environmental pollution. Store all hazardous wastes appropriately in bounded areas away from water courses. Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. Construct concrete or other impermeable flooring to prevent seepage in case of spills

ECoP 2 Fuels and Hazardous Goods Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these goods may harm the environment or health of construction workers.	The Contractor shall Prepare spill control procedures and submit the plan for CSC approval. Train the relevant construction personnel in handling of fuels and spill control procedures. Store dangerous goods in bounded area on a top of a sealed plastic sheet away from watercourses. Refueling shall occur only within bounded area. Make available MSDS for chemicals and dangerous goods on-site. Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by DoE. Provide absorbent and containment material (e.g., absorbent matting) where hazardous materia are used and stored. Provide protective clothing, safety boots, helmets, masks, gloves, and goggles to the construction personnel which are appropriate to materials in use. Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak Check for leakage regularly to identify potential problems before they occur. Store hazardous materials above flood

			plain level. Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. Put containers and drums in permanent storage areas with an impermeable floor that slopes to a safe collection area in the event of a spill or leak. Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. Avoid the use of material with greater potential for contamination by substituting them with more environment friendly materials. Return the gas cylinders to the supplier. However, if they are not empty prior to their return, they must be labeled with the name of the material they contained or contain, information of the supplier, cylinder serial number, pressure, their last hydrostatic test date, and any additional identification marking that may be considered necessary.

ECoP 3 Water Resources Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall Follow the management guidelines proposed in ECPs 1 and 2. Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
2	Discharge from construction sites	During construction both surface and groundwater quality may be deteriorated due to construction activities in the river, sewerages from construction sites and work camps. The construction works will modify groundcover and	The Contractor shall Install temporary drainage works (channels and bunds) in areas required for sediment control erosion control and around storage areas for construction materials Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site Divert runoff from undisturbed areas around the construction site Stockpile materials away from drainage

		topography changing the surface water drainage patterns of the area including infiltration and storage of storm water. These changes in hydrological regime lead to increased rate of runoff, increase in sediment and contaminant loading, increased flooding, groundwater contamination, and effect habitat of fish and other aquatic biology.	lines Prevent all solid and liquid wastes entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting where possible and transport to an approved waste disposal site or recycling depot Wash out ready-mix concrete agitators and concrete handling equipment at washing facilities off site or into approved bounded areas on site. Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean.
3	Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall Stabilize the cleared areas not used for construction activities with vegetation or appropriate surface water treatments as soon as practicable following earthwork to minimize erosion Ensure that roads used by construction vehicles are swept regularly to remove sediment. Water the material stockpiles, access roads and bare soils on an required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)
4	Construction activities in water bodies	Construction works in the water bodies will increase sediment and contaminant loading, and effect habitat of fish and other aquatic biology.	The Contractor Shall Dewater sites by pumping water to a sediment basin prior to release off site – do not pump directly off site Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables. Use environment friendly and nontoxic slurry during construction of piles to

			discharge into the river. Reduce infiltration of contaminated drainage through storm water management design Do not discharge cement and water curing used for cement concrete directly into water courses and drainage inlets.
5	Drinking water	Groundwater at shallow depths is contaminated with arsenic and hence not suitable for drinking purposes.	The Contractor Shall Pumping of groundwater shall be from deep aquifers of more than 300 m to supply arsenic free water. Safe and sustainable discharges are to be ascertained prior to selection of pumps. Tube wells will be installed with due regard for the surface environment, protection of groundwater from surface contaminants, and protection of aquifer cross contamination All tube wells, test holes, monitoring wells that are no longer in use or needed shall be properly decommissioned
		Depletion and pollution of groundwater resources	Install monitoring wells both upstream and downstream areas near construction yards and construction camps to regularly monitor the water quality and water levels. Protect groundwater supplies of adjacent lands

ECoP 4 Drainage Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Excavation and earth work, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	The Contractor shall Prepare a program for preventing/avoid standing waters, which CSC will verify in advance and confirm during implementation Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there Rehabilitate road drainage structures immediately if damaged by contractors' road transports. Build new drainage lines as appropriate and required for wastewater from

			construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by DoE, before it is being discharged into the recipient water bodies. Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour. Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion Protect natural slopes of drainage channels to ensure adequate storm water drains. Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. Reduce infiltration of contaminated drainage through storm water management design
2	Ponding of water	Health hazards due to mosquito breeding	Do not allow ponding of water especially near the waste storage areas and construction camps Discard all the storage containers that are capable of storing of water, after use or store them in inverted position

ECoP 5 Soil Quality Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Filling of Sites with soil	Soil contamination will occur from filled material	The Contractor shall Fill the land in dry season If transported by truck then Cover the soil by tipple of the truck during transportation Spray of water is suggested in the construction sites Ensure that filled soil used for land filling shall be free of pollutants. Prior to filling, soil quality shall be tested to confirm whether soil is pollution free. Soil shall be properly compacted. Side Slope of Filled

			Land of 1:2 shall be constructed by suitable soils with proper compaction as per design. Slope surface shall be covered by top soils/ cladding materials (0.5m thick) and grass turfing with suitable grass. No sediment laden water in the adjacent lands near the construction sites, and/or wastewater of suspended materials excessive of 200mg/l from soil storage/use area in the adjacent agricultural lands.
2	Storage of hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall Strictly manage the wastes management plans proposed in ECP1 and storage of materials in ECP2 Construct appropriate spill contaminant facilities for all fuel storage areas Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals Train personnel and implement safe work practices for minimizing the risk of spillage Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site Remediate the contaminated land using the most appropriate available method to achieve required commercial/industrial guideline validation results
3	Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

ECoP 6 Erosion and Sediment Control

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Clearing of construction sites	Cleared areas and slopes are susceptible to erosion of top soils, that affects the growth of vegetation which causes ecological imbalance.	Reinstate and protect cleared areas as soon as possible. Mulch to protect batter slopes before planting Cover unused area of disturbed or exposed surfaces immediately with mulch/grass turfings/tree plantations
2	Construction	The impact of soil	The Contractor shall

	activities and material stockpiles	erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullying.	Locate stockpiles away from drainage lines Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds Remove debris from drainage paths and sediment control structures Cover the loose sediments and water them if required Divert natural runoff around construction areas prior to any site disturbance Install protective measures on site prior to construction, for example, sediment traps Control drainage through a site in protected channels or slope drains Install 'cut off drains' on large cut/fill batter slopes to control water runoff speed and hence erosion Observe the performance of drainage structures and erosion controls during rain and modify as required.

ECoP 7 Top Soil Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	The Contractor shall Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. Remove unwanted materials from top soil like grass, roots of trees and similar others. The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bonding of the soil layers, water

			penetration and revegetation
2	Transport	Vehicular movement outside ROW or temporary access roads will affect the soil fertility of the agricultural lands	Limit equipment and vehicular movements to within the approved construction zone Construct temporary access tracks to cross concentrated water flow lines at right angles Plan construction access to make use, if possible, of the final road alignment Use vehicle-cleaning devices, for example, ramps or wash down areas

ECoP 8 Topography and Landscaping

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Land clearing and earth works	Flood plains of the existing Project area will be affected by the construction of various project activities. Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as change the local landscape.	The Contractor shall Ensure the topography of the final surface of all raised lands (construction yards, approach roads, access roads, bridge end facilities, etc.) are conducive to enhance natural draining of rainwater/flood water; Keep the final or finished surface of all the raised lands free from any kind of depression that insists water logging Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography. Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping

ECoP 9 Borrow Areas Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Development and operation of borrow areas	Borrow areas will have impacts on local topography, landscaping and natural drainage.	The Contractor shall Use only approved quarry and borrow sites Not use agriculture areas or ecologically sensitive areas as borrow sites Identify new borrow and quarry areas in consultation with Project Director, if required. Reuse excavated or disposed material available in the project to the maximum extent possible.

			Store top soil for reinstatement and landscaping. Develop surface water collection and drainage systems, anti-erosion measures (berms, revegetation etc.) and retaining walls and gabions where required. Implement mitigation measures in ECoP 3: Water Resources Management, ECoP 6: Erosion and Sediment Control The use of explosive should be used in as less in quantity as possible to reduce noise, vibration and dust. Control dust and air quality deterioration by application of watering and implementing mitigation measures proposed in ECoP 10: Air Quality Management Noise and vibration control by ECoP 11: Noise and Vibration Management.
2	Soil placement at temporary locations prior to shifting or direct placement on the proposed site for filling	Dispersion of sediments and release of high sediment laden runoff from the placement sites.	The Contractor To the extent possible, shall directly place the soil for filling the proposed disposal areas. Prior to filling commencing, the areas being filled will be subdivided into compartments by construction of temporary containment bunds of suitable material.

ECoP 10 Air Quality Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. Operate the vehicles in a fuel-efficient manner Cover haul vehicles carrying dusty materials moving outside the construction site Impose speed limits on all vehicle movement at the worksite to reduce dust emissions Control the movement of construction traffic Water construction materials prior to loading and transport Service all vehicles regularly to minimize emissions Limit the idling time of vehicles not more than 2 minutes

2	Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors Focus special attention on containing the emissions from generators Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites Service all equipment regularly to minimize emissions Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations
3	Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted Minimize the extent and period of exposure of the bare surfaces Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary, to avoid during periods of high wind and if visible dust is blowing off-site Restore disturbed areas as soon as possible by vegetation/grass-turfing Store the cement in silos and minimize the emissions from silos by equipping them with filters. Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations Crushing of rocky and aggregate materials

			shall be wet-crushed, or performed with particle emission control systems

ECoP 11 Noise and Vibration Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. Organize the loading and unloading of trucks, and handling operations for the purpose of minimizing construction noise on the work site
2	Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall Appropriately site all noise generating activities to avoid noise pollution to local residents Use the quietest available plant and equipment Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. Install acoustic enclosures around generators to reduce noise levels. Fit high efficiency mufflers to appropriate construction equipment Avoid the unnecessary use of alarms, horns and sirens
3	Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall Notify adjacent landholders prior any typical noise events outside of daylight hours Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions Employ best available work practices on-site to minimize occupational noise

			levels Install temporary noise control barriers where appropriate Notify affected people if major noisy activities will be undertaken, e.g. pile driving Plan activities on site and deliveries to and from site to minimize impact Monitor and analyze noise and vibration results and adjust construction practices as required. Avoid undertaking the noisiest activities, where possible, when working at night near the residential areas

ECoP 12 Protection of Flora

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Vegetation clearance	Local flora is important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	The Contractor shall Reduce disturbance to surrounding vegetation Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. Get approval from supervision consultant for clearance of vegetation. Make selective and careful pruning of trees where possible to reduce need of tree removal. Control noxious weeds by disposing of at designated dump site or burn on site. Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc. Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and encourages re-growth and protection from weeds. Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. Avoid work within the drip-line of trees to

			prevent damage to the tree roots and compacting the soil. Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest time possible. Ensure excavation works occur progressively and re-vegetation done at the earliest Provide adequate knowledge to the workers regarding nature protection and the need of avoiding trees felling during construction Supply appropriate fuel in the work caps to prevent fuel wood collection

ECoP 13 Protection of Fauna

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction activities	The location of construction activities can result in the loss of wild life habitat and habitat quality.	The Contractor shall Limit the construction works within the designated sites allocated to the contractors check the site for animals trapped in, or in danger from site works and use a qualified person to relocate the animal
2		Impact on migratory birds, its habitat and its active nests	The Contractor shall Not be permitted to destruct active nests or eggs of migratory birds Minimize the tree removal during the bird breeding season. If works must be continued during the bird breeding season, a nest survey will be conducted by a qualified biologist prior to commence of works to identify and located active nests Minimize the release of oil, oil wastes or any other substances harmful to migratory birds or water or any areas frequented by migratory birds.
3	Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding and/or physical destruction and severing of habitat areas	The Contractor shall Restrict the tree removal to the minimum required. Retain tree hollows on site, or relocate hollows, where appropriate Leave dead trees where possible as habitat for fauna Fill the hollow bearing trees in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified

			and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
4	Construction camps	Illegal poaching	Provide adequate knowledge to the workers regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

ECoP 14 Protection of Fisheries

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction activities in River	The main potential impacts to fisheries are hydrocarbon spills and leaks from riverine transport and disposal of wastes into the river	The Contractor shall Ensure the riverine transports, vessels and ships are well maintained and do not have oil leakage to contaminate river water. Contain oil immediately on river in case of accidental spillage from vessels and ships and in this regard, make an emergency oil spill containment plan to be supported with enough equipment, materials and human resources Do not dump wastes, be it hazardous or non-hazardous into the nearby water bodies or in the river
2	Construction activities on the land	The main potential impacts to aquatic flora and fauna River are increased suspended solids from earthworks erosion, sanitary discharge from work camps, and hydrocarbon spills	The Contractor shall follow mitigation measures proposed in ECoP 3: Water Resources Management and EC4: Drainage Management
3		Filling of ponds for site preparation will impact the fishes.	The Contractor shall Inspect any area of a water body containing fish that is temporarily isolated for the presence of fish, and all fish shall be captured and released unharmed in adjacent fish habitat Install and maintain fish screens etc. on any water intake with drawing water from any water body that contain fish

ECoP 15: Road Transport and Road Traffic Management

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	The Contractor shall Prepare and submit a traffic management plan to the CSC for his approval at least 30 days before commencing work on any project component involved in traffic diversion and management. Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs / lights, and road signs. Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Bangladesh Traffic Regulations. Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in Bangla: Location: chainage and village name Duration of construction period Period of proposed detour / alternative route Suggested detour route map Name and contact address/telephone number of the concerned personnel Name and contact address / telephone number of the Contractor Inconvenience is sincerely regretted.
2		Accidents and spillage of fuels and chemicals	Restrict truck deliveries, where practicable, to day time working hours. Restrict the transport of oversize loads. Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize traffic disruptions. Enforce on-site speed limit

ECoP 16 Construction Camp Management

Sl. No	Project Activity/ Impact	Environmental Impacts	Mitigation Measures/ Management Guidelines

	Source		
1	Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall Locate the construction camps at areas which are acceptable from environmental, cultural or social point of view. Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. Submit to the CSC for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters. National laws on child labor will be strictly followed. No child labor will be hired by the contractors or subcontractors in any of the project activities.
2	Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites Adequate housing for all workers Safe and reliable water supply. Water supply from deep tube wells of 300 m depth that meets the national standards Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of toilet facilities required is one toilet for every ten persons. Treatment facilities for sewerage of toilet and domestic wastes Storm water drainage facilities. Both sides of roads are to be provided with shallow v

			drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads with at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. Provide child crèches for women working construction site. The crèche shall have facilities for dormitory, kitchen, indoor and outdoor play area. Schools shall be attached to these crèches so that children are not deprived of education whose mothers are construction workers Provide in-house community/common entertainment facilities. dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible.
3	Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall Ensure proper collection and disposal of solid wastes within the construction camps Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis of waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipments/vehicles needed. Dispose organic wastes in a designated safe place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition of wastes. Cover the bed of the pit with impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination.

			Locate the garbage pit/waste disposal site min 500 m away from the residence so that people are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.
4	Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or another biomass. Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. Conduct awareness campaigns to educate workers on preserving and protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.
5	Health and Hygiene	There will be a potential for diseases to be transmitted including malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall Provide adequate health care facilities within construction sites. Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. Initial health screening of the laborers coming from outside areas Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work Provide HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling

			and testing Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellant sprays during monsoon. Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
6	Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	The Contractor shall Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. Maintain register to keep a track on a head count of persons present in the camp at any given time. Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones. Provide appropriate type of firefighting equipment's suitable for the construction camps Display emergency contact numbers clearly and prominently at strategic places in camps. Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors.
7	Site Restoration	Restoration of the construction camps to original condition requires demolition of construction camps.	The Contractor shall Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed Give prior notice to the laborers before demolishing their camps/units Maintain the noise levels within the national standards during demolition activities Different contractors shall be hired to demolish different structures to promote

			recycling or reuse of demolished material. Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site. Handover the construction camps with all built facilities as it is, agreement between both parties (contactor and land-owner) has been made so. Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner. Not make false promises to the laborers for future employment in O&M of the project.

ECoP 17 Cultural and Religious Issues

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Construction activities near religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. Do not block access to cultural and religious sites, wherever possible Restrict all construction activities within the foot prints of the construction sites. Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites and users make objections. Take special care and use appropriate equipment when working next to a cultural/religious institution. Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the CSC/PMU. Provide separate prayer facilities to the construction workers. Show appropriate behavior with all construction workers especially women and elderly people Allow the workers to participate in praying during construction time Resolve cultural issues in consultation with

			local leaders and supervision consultants Establish a mechanism that allows local people to raise grievances arising from the construction process. Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters

ECoP 18 Worker Health and Safety

Sl. No	Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
1	Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc), (ii) risk factors resulting from human behavior (e.g. STD, HIV etc) and (iii) road accidents from construction traffic.	The Contractor shall Implement suitable safety standards for all workers and site visitors which shall not be less than those laid down on the international standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Bangladesh (e.g. 'The Bangladesh Labor Code, 2006') Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job Appoint an environment, health and safety manager to look after the health and safety of the workers Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works and establishment of construction

			camps so as to maintain effective surveillance over public health, social and security matters To ensure the works contract incorporate minimum health and safety provisions and is being monitor by BLPA with the support from CSC during construction.
		Child and pregnant labor	The Contractor shall not hire children of less than 14 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the Bangladesh Labor Code, 2006
2	Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations shall be easily accessible throughout the place of work Document and report occupational accidents, diseases, and incidents. Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. Provide awareness to the construction drivers to strictly follow the driving rules Provide adequate lighting in the construction area and along the roads
3	Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECoP 17 Construction Camp Management Adequate ventilation facilities Safe and reliable water supply. Water supply from deep tube wells that meets the national standards Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Treatment facilities for sewerage of toilet and domestic wastes Storm water drainage facilities. Recreational and social facilities Safe storage facilities for petroleum and

			other chemicals in accordance with ECoP 2 Solid waste collection and disposal system in accordance with ECP1. Arrangement for trainings Paved internal roads. Security fence at least 2 m height. Sick bay and first aid facilities
4	Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers affect their personal hygiene.	The contractor shall provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities shall be at least 6 m away from storm drain system and surface waters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. Contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
5	Other ECPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECPs to reduce health risks to the construction workers and nearby community ECoP 2: Fuels and Hazardous Goods Management ECoP 4: Drainage Management ECoP 10: Air Quality Management ECoP 11: Noise and Vibration Management ECoP15: Road Transport and Road Traffic Management ECoP 16: River Transport management
6	Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria and transmission of sexually transmitted infections (STI) HIV/AIDS. Train all construction workers in general health and safety matters, and on the specific hazards of their work Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Commence the malaria, HIV/AIDS and STI education campaign before the start of the construction phase and

			complement it with a strong condom marketing, increased access to condoms in the area as well as to voluntary counseling and testing. Implement malaria, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on ongoing and regular basis. This shall be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.

Annex 7 Data sheet of humidity, rainfall and temperature data of the project site

Table: Monthly average humidity data of the project site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	77	67	79	73	77	83	87	87	85	81	75	79
2009	71	67	72	79	79	82	87	86	84	80	74	73
2010	72	63	74	78	80	86	83	85	84	82	77	73
2011	68	67	69	77	80	85	84	87	85	80	74	77
2012	68	62	76	80	80	86	88	86	85	84	77	80
2013	72	64	77	77	85	84	84	86	84	85	78	77
2014	72	69	68	76	79	85	85	87	84	80	72	73
2015	71	68	62	77	77	82	88	84	81	80	75	76
2016	75	72	72	77	78	79	84	82	81	79	76	75
2017	65	65	72	78	77	84	87	84	84	79	75	77
	711	664	721	772	792	836	857	854	837	810	753	760

Source: Bangladesh Meteorological Department (BMD)

Table: Monthly average rainfall data of the project site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	64	7	6	1	244	538	963	757	250	171	31	0
2009	0	2	3	114	373	434	1244	693	281	300	17	0
2010	0	8	40	46	346	747	267	516	116	294	38	19
2011	0	0	35	133	276	481	562	806	762	46	0	0
2012	0	0	30	192	188	1337	788	299	170	636	3	0
2013	0	0	3	58	773	513	405	267	173	369	0	0
2014	0	37	18	43	304	1494	395	692	363	104	0	0
2015	6	0	18	218	92	713	1555	568	331	193	7	12
2016	5	6	77	39	253	201	568	398	323	249	89	0
2017	0	0	102	296	275	845	1008	523	560	123	2	17
	75	60	332	1140	3124	7303	7755	5519	3329	2485	187	48

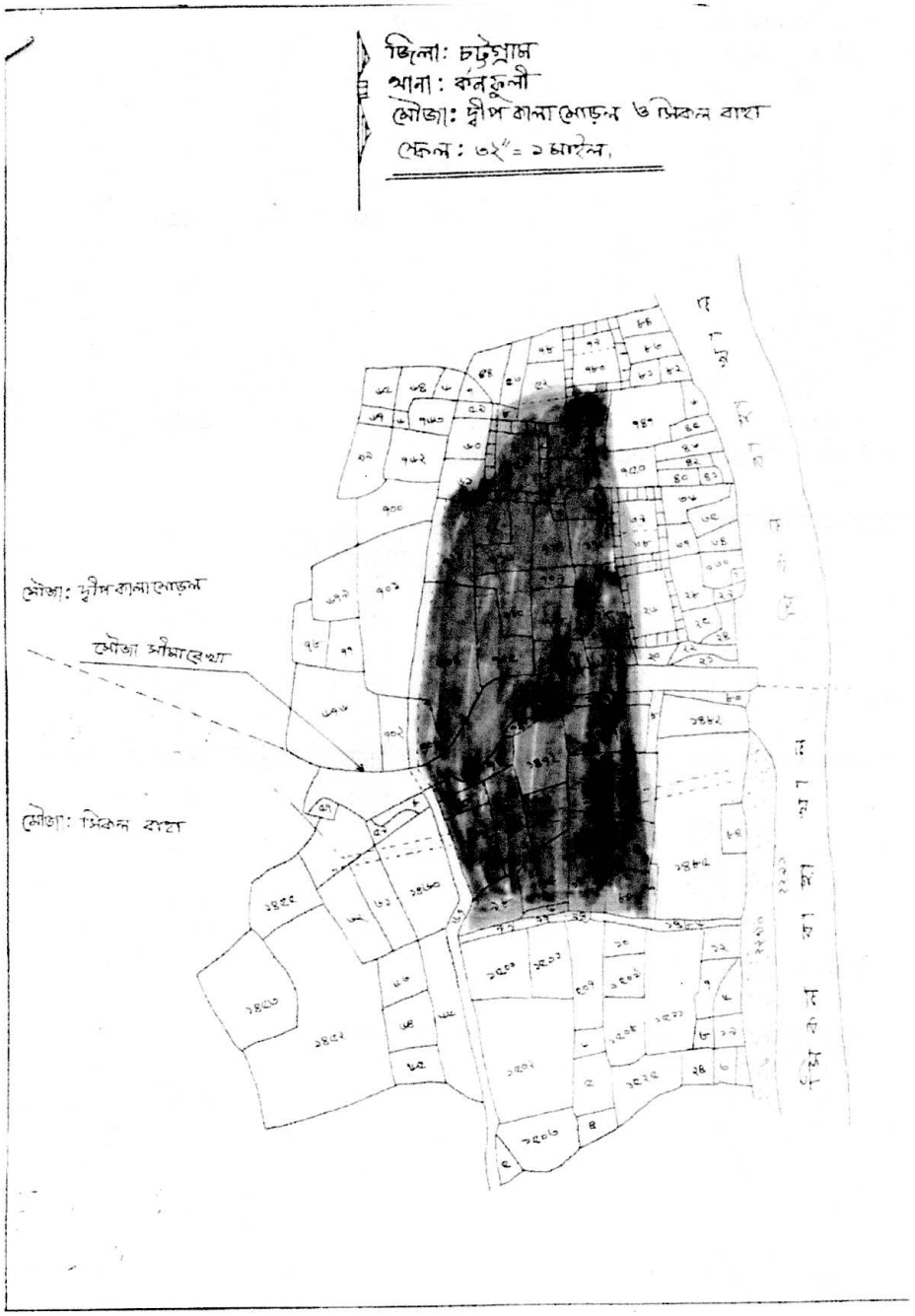
Source: Bangladesh Meteorological Department (BMD)

Table: Monthly average temperature data of the project site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2008	19.9	20.9	25.8	28.4	28.9	28.3	27.3	27.6	28	27.6	24.6	22
2009	20.9	23.2	26.6	28.7	29	28.8	27.8	28	28.3	27.5	25.4	21.1
2010	19.8	23.1	27.2	29.1	29	28.4	28.7	28.5	28.5	28.2	25.6	21.1
2011	19	22.7	25.5	27.6	28.4	28	28.2	27.5	27.7	27.8	24.1	20.6
2012	20.4	22.8	26.2	27.2	29.1	28.2	27.5	28.1	28.3	27.3	24.2	19
2013	18.4	22.9	25.9	28.2	27.2	28.6	28.3	27.9	28.2	26.9	24.2	20.8
2014	19.7	22.2	25.7	29.4	29.5	28.5	28.5	27.9	28.2	27.6	25.2	21.5
2015	20.9	22.7	26.7	28	29.9	28.9	27.8	28.6	29.2	27.6	24.8	21.2
2016	19.7	24.1	27.5	29.5	29.2	29.3	28.3	28.8	29.1	28.4	24.5	22.6
2017	21.1	23.8	25.2	27.7	30.1	28.6	28.1	28.8	28.5	27.9	25.8	22.4
	199.8	228.4	262.3	283.8	290.3	285.6	280.5	281.7	284	276.8	248.4	212.3

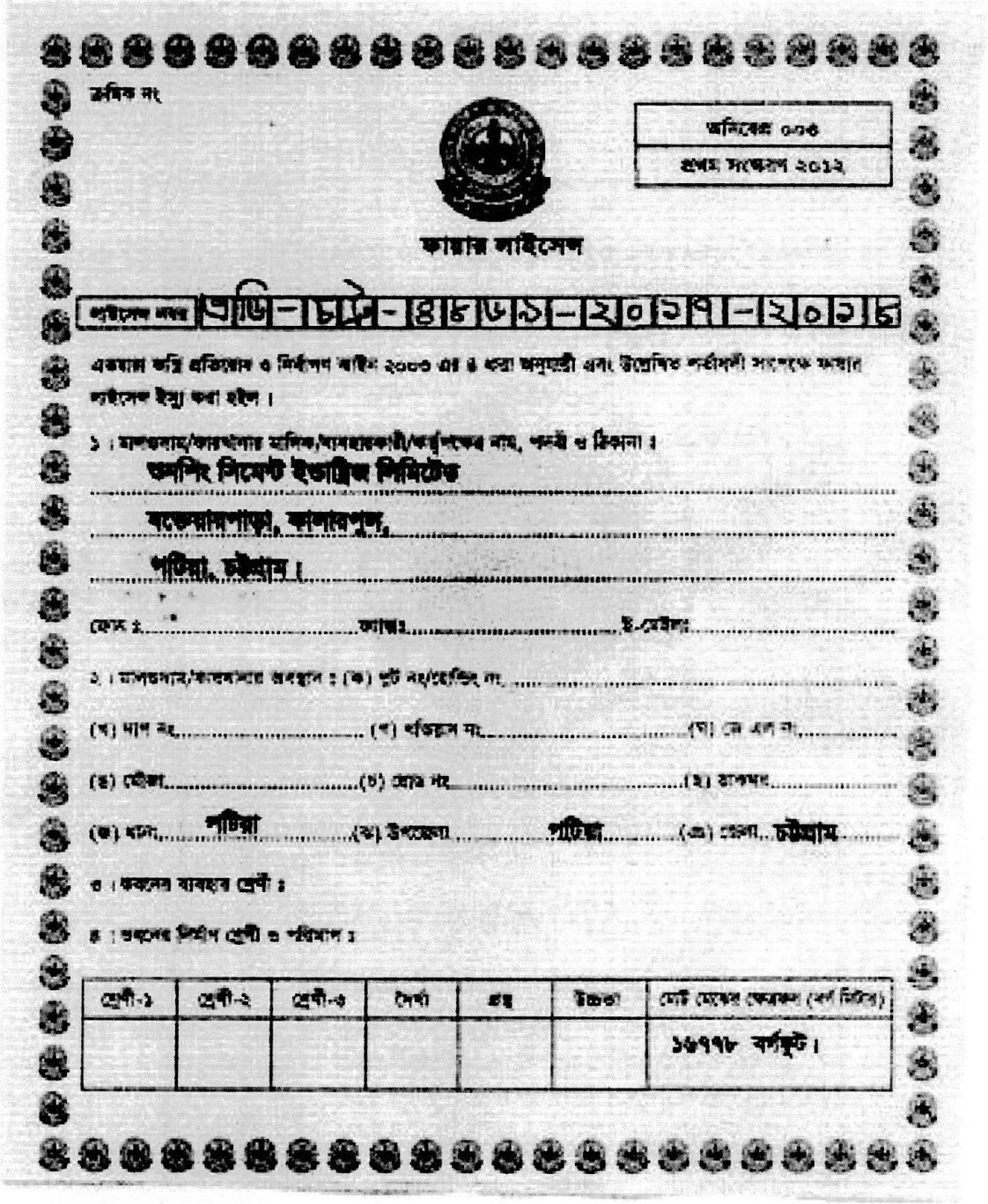
Source: Bangladesh Meteorological Department (BMD)

Annex 8 Mouza Map of the Project Area



Legends:-
GREEN - SHUN SHING CEMENT IND. LTD PROJECT

Annex 9 Fire License



ক্রমিক নং

অনিবেন্ধ ০০৬

প্রথম সংস্করণ ২০১২

ফায়ার লাইসেন্স

লাইসেন্স নম্বর: ৩৬ডি-চট্টগ্রাম-৪৮৫৯-২০১৭-২০১৮

একযায় তদন্ত প্রতিবেদন ও নির্দেশনা মোতাবেক ২০০৩ এর ৪ ধারা অনুযায়ী এবং উল্লেখিত শর্তাবলী সাপেক্ষে ফায়ার লাইসেন্স ইস্যু করা হইল।

১। মালিকানা/কারখানার মালিক/ব্যবস্থাপক/কর্তৃপক্ষের নাম, পদবী ও ঠিকানা:

আশিং সিমেন্ট ইন্ডাষ্ট্রিজ লিমিটেড

বড়েরারপাড়া, কালারপুল,

পটিয়া, চট্টগ্রাম।

ফোন:.....ফ্যাক্স:.....ই-মেইল:.....

২। মালামাল/কারখানার অবস্থান: (ক) প্লট নং/হোল্ডিং নং.....

(খ) দাগ নং.....(গ) খতিয়ান নং.....(ঘ) জে এল নং.....

(ঙ) মৌজা.....(চ) ওয়ার্ড নং.....(ছ) ডাকঘর.....

(জ) থানা: পটিয়া (ঝ) উপজেলা: পটিয়া (ঞ) জেলা: চট্টগ্রাম

৩। কারখানার ব্যবহার শ্রেণী:

৪। কারখানার নির্মাণ শ্রেণী ও পরিমাণ:

শ্রেণী-১	শ্রেণী-২	শ্রেণী-৩	দৈর্ঘ্য	প্রস্থ	উচ্চতা	মোট মেঝের ক্ষেত্রফল (বর্গ মিটার)
						১৬৭৭৮ বর্গফুট।

২ । খাদ্য বস্তুর নাম ও মজুদ পরিমাণ ঃ **প্যাকিং বস্তা।**

৩ । ব্যবসার ধরন ঃ **সিমেন্ট মজুদ ও সরবরাহ।**

৭ । অগ্নি ঝুঁকির মাত্রা ঃ (ক) হালকা-১ (খ) হালকা-২ (গ) হালকা-৩ (ঘ) সাধারণ-১ (ঙ) সাধারণ-২ (চ) সাধারণ-৩ (ছ) অতিমাত্র

৮ । অগ্নি ঝুঁকির শ্রেণীবিন্যাস (মোট ফ্লোর এরিয়ার অনুপাত হিসাবে) ঃ A.....% B.....% C.....%
D.....% K.....%

৯ । **মাসুল ও মেয়াদ ঃ- ১০০০/- টাকা মাত্রে ০১/০৭/২০১৭ হইতে ৩০/০৬/১৮ পর্যন্ত।**

উপ-পরিচালক/সহকারী পরিচালক/ডিপো ব্যবস্থাপক
ফায়ার সার্ভিস ও সিভিল ডিফেন্স

(সুনীতি কুমার কুণ্ডু)
সহকারী পরিচালক
ফায়ার সার্ভিস ও সিভিল ডিফেন্স
চট্টগ্রাম।

লাইসেন্সের শর্তাবলী

(১) প্রতি বছর ৩০ জুনের মধ্যে এই লাইসেন্সের অনুকূলে মাসুলের টাকা অগ্রিম লাইসেন্স ফি হিসাবে পরিশোধ করিতে হইবে।

(২) এই লাইসেন্স হস্তান্তরযোগ্য নহে এবং কেবলমাত্র তফসিল-১ এ উল্লেখিত অবস্থানের জন্যই প্রযোজ্য হইবে।

(৩) লাইসেন্সের শর্তাবলী যথাযথভাবে পালিত হইতেছে কিনা তাহা যাচাই করার জন্য অগ্নি অধিদপ্তরের কর্মকর্তা যে কোন কার্য দিবসে প্রবেশ বা কারখানা পরিদর্শন করিতে পারিবেন এবং পরিদর্শনকালে সংশ্লিষ্ট কর্তৃপক্ষ উপযুক্ত কারণে লাইসেন্সটি প্রদর্শন করিতে বাধ্য থাকিবেন।

(৪) সার্বিক অগ্নি নিরাপত্তা ব্যবস্থা বাংলাদেশ ন্যাশনাল বিল্ডিং কোড ও অগ্নি প্রতিরোধ ও নির্বাপণ আইন ২০০৩ এবং সংশ্লিষ্ট বিধির ভিত্তিতে নিশ্চিত করিতে হইবে।

(৫) অগ্নি প্রতিরোধ ও নির্বাপণ আইন ২০০৩ মোতাবেক লাইসেন্সের শর্ত ভঙ্গ করিলে শাস্তিযোগ্য অপরাধ হিসাবে গণ্য হইবে।

***** প্রতিষ্ঠানটির সেফটি প্লান তৈরী ও তদানুযায়ী ব্যবস্থা গ্রহণ সাপেক্ষে অত্র দপ্তরকে অবহিত করতে হবে।**

Annex 10 Questionnaire for Household Survey and KII

Shun Shing Cement Industries Limited (SSCIL)
Sikalbaha, Chattogram
Questionnaires Survey for Environmental and Socio-Economic Data Collection
Conducted by Enviro Consultants Ltd.
8, Garden Rose, 1st Floor, Monipuripara, Tejgaon, Dhaka-1215, Date: 14.01.2019

1. Name of the respondent :
2. Occupation :
3. Address :

4. Either he is aware of this project (Cement Industries) or not :

5. Either he is aware of negative impact of this project (Cement) or not:
   (if not known explain the what are the negative impacts)

6. Either he is aware of Positive impact this project (Cement) or not:
   (if not known explain the what are the positive impacts like employment, economic dev. etc)

7. Either he is aware of the socio-economic development (like generate new jobs/employment, land value increase, income increase, lifestyle improve and socio economic improve due this project (Cement Industries) or not:

8. Description of the general environment (River, open space, air quality, other industries etc) around the project site

9. Visible air, water and noise quality

10. Land use pattern within and around of that area

11. Livelihood of the area:

12. Infrastructure facilities available like (Road, gas, electricity, water telecommunication etc)

13. Description of the socio-economic condition (Income level, education, culture, professions, major profession of the area) in and around the project site

14. The project proponent shall mitigate all the negative impact due this project:

15. If above mentioned project are implemented here is there any objection:
    If Yes what are the objections

16. What they think about the benefit of the mentioned project if implemented here:

17. What does they think would be the impacts of the proposed project in their household once implemented in their village

Name & Signature of the Respondent
Cell No:

Name & Signature of the Data Collector
Designation

Annex 11 Leaflet of Stakeholders consultation Meeting of SSCIL ESIA Bangla 290119

অভিযোগ প্রতিকার প্রক্রিয়া

(Grievance Redress Mechanism/জিআরএম)

এই প্রকল্পটি নির্মাণকালীন সময়ে সৃষ্ট স্থানীয় জনগনের যে কোনো সমস্যা সমাধানের লক্ষ্যে একটি প্রতিকার ব্যবস্থাপনা কমিটি গড়ে তোলা হবে। এই কমিটির সদস্যরা হবেন- শুন শিং সিমেন্ট ইন্ডাস্ট্রিজ কর্তৃপক্ষ, সংশ্লিষ্ট ইউনিয়ন পরিষদের চেয়ারম্যান/ সদস্য/ মহিলা সদস্য, স্থানীয় এনজিও প্রতিনিধি, পরিবেশ অধিদপ্তরের জেলা পর্যায়ের সদস্য এবং অভিযোগ এলাকার একজন স্থানীয় সদস্য।

নিম্নবর্তিত উপায়ে স্থানীয় জনগনের যেকোনো সমস্যা সমাধানের চেষ্টা করা হবে।

ধাপ ১- অভিযোগকারী সমস্যাটি সরাসরি/টেলিফোনের মাধ্যমে যোগাযোগ করে সমস্যাটি সমাধানের চেষ্টা করবেন। যদি অভিযোগকারীর সমস্যাটি এক সপ্তাহের মধ্যে প্রতিকার না হয় তাহলে দ্বিতীয় ধাপ অবলম্বন করতে পারবেন।

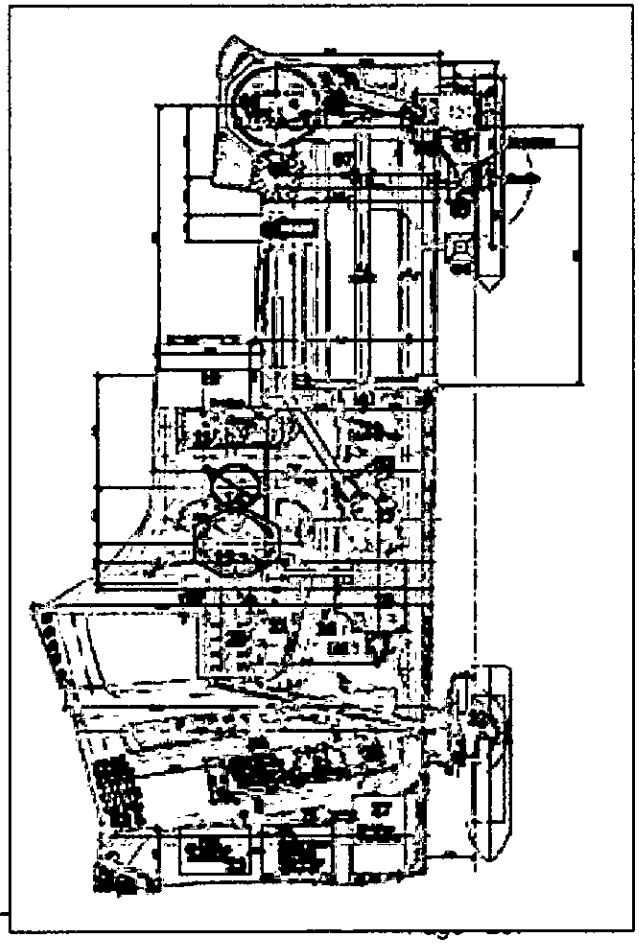
ধাপ ২- অভিযোগকারী উপজেলা পর্যায়ে স্থাপিত জি আর সি কমিটির মাধ্যমে সমস্যাটির সমাধানের চেষ্টা করবেন।

ধাপ ৩- যদি সমস্যাটি দুই সপ্তাহের মধ্যে সমাধান না হয় তাহলে উপজেলা পর্যায়ে স্থাপিত জি আর সি কমিটি একটি আনুষ্ঠানিক শুনানির ব্যবস্থা করবে। এ পর্যায়ে একটি সুনির্দিষ্ট সিদ্ধান্ত গ্রহন করা হবে এবং পাঁচ দিনের মধ্যে তা কার্যকর করা হবে।

ধাপ ৪- ধাপ ৩ এর গৃহীত সিদ্ধান্তটি অভিযোগকারীর মনপুত না হলে অভিযোগকারী আইনি মামলা নিষ্পত্তি পদ্ধতি গ্রহন করতে পারবেন।

অনুসন্ধান, মতামত এবং পরামর্শের জন্য দয়া করে নিম্নলিখিত কার্যালয়ে যোগাযোগ করুণ।

৩ নং শিকলবাহা ইউনিয়ন পরিষদ, বখতিয়ারপাড়া, কর্ণফুলী, চট্টগ্রাম



সেভেন রিংস ব্র্যান্ড সিমেন্ট

Environmental & Social Impact Assessment of Shun Shing Cement Industries

প্রকল্প: প্রতিষ্ঠানের নাম: শুন শিং সিমেন্ট ইন্ডাস্ট্রিজ লিমিটেড

পরিবেশগত ও সামাজিক প্রভাব ও এর ব্যবস্থাপনা
পরিবেশগত ও সামাজিক গণপরামর্শ প্রক্রিয়া
পরামর্শ প্রক্রিয়ায় অংশগ্রহণকারীগণের জন্য সহায়ক তথ্য।

CEMENT INDUSTRIES LTD
SHUN SHING

২৯ শে জানুয়ারী, ২০১৯

প্রকল্পের ভূমিকা

সম্মানিত সূধী,

আপনারা অবগত আছেন যে, ৩ নং শিকলবাহা, বখতিয়ারপাড়া, কর্ণফুলী, চট্টগ্রাম সংলগ্ন একটা বড় সিমেন্ট ইন্ডাস্ট্রিজ তৈরী হতে যাচ্ছে। প্রতিষ্ঠানের পরিকল্পনা অনুযায়ী প্রকল্পটি নির্মিত হলে বাংলাদেশে সিমেন্ট সরবরাহ বাড়বে। শিকলবাহা, এলাকা একটা পরিচ্ছন্ন শহরে রূপান্তরিত হবে। এলাকার জনগণের জীবন মান বৃদ্ধি পাবে। রাস্তা-ঘাট বর্তমানের তুলনায় অনেক উন্নত হবে। নাগরিক সকল সুবিধা বৃদ্ধি পাবে। অর্থনৈতিক কর্মকান্ড বৃদ্ধি পাবে। অধিক লোকের কর্মসংস্থান সৃষ্টি হবে। ব্যবসায়-বাণিজ্য বৃদ্ধি পাবে।

সুপ্রিয় সূধী,

যে কোন উন্নয়ন কাজে জনগণের সহযোগিতা প্রয়োজন। প্রস্তাবিত সিমেন্ট ইন্ডাস্ট্রিজ নির্মাণে জমির উপযুক্ত মূল্য প্রদান, ঘরবাড়ীর উপযুক্ত ক্ষতিপূরণ দিয়ে জমি অধিগ্রহণ হয়েছে। স্থানীয়ভাবে বেকার যুবকদের কর্মসংস্থানের লক্ষ্যে আপনাদের পরামর্শ মোতাবেক প্রশিক্ষণসহ বাস্তব কর্মসূচি গ্রহণ করা হবে।

প্রকল্পের জন্য ভূমি উন্নয়ন, অন্যান্য অংশের নির্মাণ সংক্রান্ত বিরিধ কর্ম সম্পাদন কালে পরিবেশগত সমস্যা পরিহারের লক্ষ্যে ইএসআইএ প্রতিবেদনে একটি পরিবেশগত প্রতিকার এবং পর্যবেক্ষন পরিকল্পনা অন্তর্ভুক্ত থাকবে। প্রল্পের বিষয়ে মতামত দেয়া সহ প্রকল্পের কারণে সম্ভাব্য বিরূপ প্রভাব প্রশমনে কার্যকর পরামর্শ প্রদানে উদ্বুদ্ধ করার লক্ষ্যে এই পরিকল্পনা সংক্রান্ত কার্যক্রম অর্থাৎ পরিবেশ ব্যবস্থাপনা পরিকল্পনা (ই.এম.পি) বর্তমান পরামর্শক সভায় অংশগ্রহনকারীদের মধ্যে বিতরন করা ।

উপরোক্ত মতামত ও পরামর্শ দ্বারা সমৃদ্ধ ইএসআইএ এবং ই.এম.পি প্রতিবেদন এইভাবেই তৈরি হবে এবং ইডকল ও বাংলাদেশ সরকারের কাছে দাখিল করা হবে। পরবর্তি পর্যায়ে ই.এম.পি সহ ইএসআইএ প্রতিবেদন সংশ্লিষ্ট ও সর্বস্তরের জনসাধারনের অবগতির জন্য উন্মুক্ত করা হবে। এছাড়াও পরিপূর্ন ইএসআইএ প্রতিবেদন ইডকল এর ওয়েবসাইটে প্রকাশ করা সহ নিম্নোক্ত কার্য্যালয় গুলোর সহজে দৃশ্যমান স্থানে প্রদর্শিত হবে।

১। আঞ্চলিক কার্যালয় সমূহ□
২। প্রধান কার্যালয়, পরিবেশ অধিদপ্তর, ঢাকা।

প্রকল্প কার্যক্রম এবং প্রধান পরিবেশগত বিষয় সমূহ

প্রকল্পের কার্যক্রম নিরূপ ঃ

১। জমিঅধিগ্রহণ
২। ভূমি উন্নয়ন
৩। রাস্তা নির্মাণ
৪। ড্রেন নির্মাণ
৫। বিভিন্ন স্থাপনা নির্মাণ

প্রকল্পের পরিবেশগত বিসয়সমূহ ঃ

১। গ্যাস ও ধুলাবালি নির্গমন
২। জলাবদ্ধতা
৩। অতিরিক্ত শব্দ ও কম্পন
৪। ভূ-পৃষ্ঠ ও ভূ-গর্ভস্থ পানি দূষণ
৫। পেশাগত স্বাস্থ্যঝুকি
৬। বর্জ্য ব্যবস্থাপনা
৭। গাছ কাটা

প্রধান সামাজিক বিষয়সমূহ ঃ

১। জমি অধিগ্রহণ
২। বিভিন্ন স্থাপনা অপসারণ
৩। সাময়িক ব্যবসায়িক ও অর্থনৈতিক ক্ষতি

প্রকল্পের সুবিধা / প্রতিকার ঃ

১। এলাকার অর্থনৈতিক ও সামাজিক উন্নয়ন
২। জমি, ঘরবাড়ীর উপযুক্ত ক্ষতিপূরণ দেয়া
৩। কর্মসংস্থান
৪। কারিগরী প্রশিক্ষণ
৫। শিক্ষা প্রতিষ্ঠান ও হাসপাতাল
৬। জীবন যাত্রার মান উন্নয়ন
৭। পরিবেশের (গ্যাসও ধুলাবালি নির্গমন শব্দ) উন্নয়ন
৮। পরিবেশ-বান্ধব যাতে অন্তর্ভুক্ত থাকবে সৌরশক্তি, বৃষ্টির পানি সংরক্ষন ব্যবস্থা,সবধরনের সিমেন্ট ইন্ডাস্ট্রিজ উপযোগী যোগাযোগ সুবিধা□

প্রকল্পের সম্ভাব্য পরিবেশগত ও সামাজিক প্রভাব ও প্রতিকার

১) ভূমি উন্নয়ন কার্যক্রমের ফলে প্রকল্পে ধুলাবালি যেন বাতাসে না ছড়ায় সেজন্য প্রকল্প এলাকায় প্রচুর পানি ছিটিয়ে ও বালি ঢেকে ধুলাবালি দমিয়ে রাখা হবে। বছরে দুইবার প্রকল্প এলাকার বাতাস পরীক্ষা করে তার গ্রহনযোগ্যতা যাচাই করা হবে।

2) প্রকল্প এলাকায় গাছ লাগান হবে এবং জনসাধারনের গাছ কাটা গেলে তার ক্ষতিপূরণ দেওয়া হবে।

৩) প্রকল্পের বিভিন্ন কার্যক্রমের ফলে প্রকল্পএলাকায় শব্দ দূষণ হতে পারে। প্রকল্পের এলাকায় বিশেষ করে ধর্মীয়, শিক্ষাপ্রতিষ্ঠান ও হাসপাতালে সরকারের জারিকৃত শব্দের গ্রহণযোগ্য মাত্রার মধ্যে সিমিত রাখতে হবে।

৪) প্রকল্প এলাকার বিভিন্ন কার্যক্রমের ফলে ভূপৃষ্ঠ ও ভূগর্ভস্ত পানি দূষণ রোধে ভূমিকার্যক্রম প্রস্তাবিত নকশা এবং নির্দেশনা অনুযায়ী করা হবে□

৫) এই প্রকল্পটি বাস্তবায়নকালীন পেশাগত স্বাস্থ্য ঝুকির সম্ভাবনা রয়েছে। সেজন্য নির্মান শ্রমিকদের জন্য বিশুধ্য পানি, স্বাস্থ্যসম্মত টয়লেট ও আবাসন ব্যবস্থা গড়ে তোলা হবে। নির্মানকালীন সুরক্ষা সরঞ্জাম ব্যবহার বাধ্যতামুলক করা হবে।

৬) অপ্রতুল বর্জব্যবস্থাপনার কারনে দীর্ঘস্থায়ীভাবে ভূপৃষ্ঠ ও ভূগর্ভস্ত পানি দূষিত হতে পারে। সেজন্য সকল প্রকার নির্মান বর্জপদার্থ নির্ধারিত যায়গায় ফেলতে হবে।

৭) জমি অধিগ্রহণে জমির উপযুক্ত মূল্য প্রদান, ঘরবাড়ীর উপযুক্ত ক্ষতিপূরণ দেয়া হবে। স্থানীয়ভাবে বেকার যুবকদের কর্ম সংস্থানের লক্ষ্যে আপনাদের পরামর্শ মোতাবেক প্রশিক্ষণসহ বাস্তব কর্মসূচি গ্রহণ করা হবে।

৮। সাময়িক ব্যবসায়িক অর্থনৈতিক ক্ষতি প্রশমনে কার্যকর কর্মসূচি গ্রহণ করা হবে।

৯। শিক্ষা প্রতিষ্ঠান / হাসপাতাল সহ একটা পরিচ্ছন্ন শহর গড়ে তোলা হবে।

ATTENDANCE SHEET OF PUBLIC CONSULTATION MEETING

Environmental and Social Impact Assessment (ESIA) Study of

for

Shun Shing Cement Industries Limited (SSCIL), Sikalbaha, Chittagong

Conducted by: Enviro Consultants Ltd. Date: 13.01.2019

SL No	Name	Address	Mobile no.	Profession	Signature
1	KHURSID ALAM	Dip kalaMollol	01856498563		
2	KAKALIL	Dipkola Molpal	01816825369		
3	HASHAM.	Dipkola Mollal	01833524179		
4	[illegible]	[illegible]	01857954857	[illegible]	
5	LUTFOR RAHMAN	SIKALBAHA	01819894214	D/L. CPP	
6	[illegible]	Sikal Baha	01829448827	Business	
7	Nurul Alam	Shikalbaha	01874245637	Business	
8	SHOFI UL ALAM	SHIKALBAHA	01819229719		
9	Badaruddin chy	Shikalbala	01730055592	Service	
10	Mamun	Sikalbaha	01812373269		
11					
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Annex 13 Attendance Sheet of Stakeholders consultation

ATTENDANCE SHEET OF PUBLIC CONSULTATION MEETING
Environmental and Social Impact Assessment (ESIA) Study of
for
Shun Shing Cement Industries Limited (SSCIL), Shikalbaha, Chittagong

Conducted by: Enviro Consultants Ltd. Date: 29.01.2019

SL No	Name	Age	Address	Mobile no.	Profession	Signature
1	Hr ওহাবুদ্দীন আলম		চেয়ারম্যান UP	০৩৪১৪৪৯৬৬৮	ব্যবসা	
2	Bazar Wahiduly		Shikalbaha.	043005559[illegible]		
3						
4	[illegible]		[illegible]	01834-217378	গৃহিনী	
5	বাবু আবকাতর		[illegible]	01860333622	ঐ	
6	[illegible]		[illegible]	[illegible]	কৃষক	
7	Md. Reazul Islam	47yrs	Asst. Manager (Admin)	01701217855	চাকরী	
8	Abdul Kaiyum	52	Secretary U/P	01819-179314	ঐ	
9	Ansar Ullah	44	শিক্ষকতা	01819-108407	ঐ	
10	Alamgir	32	Sk Kalbaha	01810330150	ঐ	
11	মোঃ তোফিক ইসলাম			01899312[illegible]	ব্যবসা	
12	Abdullah Al Mamun		Shun Shing Cement Industries Ltd.	01730323291	চাকরী	
13	Md. Yousuf		[illegible]	01874917627	ছাত্র	
14	মোঃ আরিফ হোসেন		[illegible]	01840283528	ঐ	
15	[illegible]				গৃহিনী	
16	[illegible]		[illegible]	01734135[illegible]	ছাত্র	
17	মোঃ রফিকুর রহমান			01890-309[illegible]	চাকরী(পুঃ)	
18	ARIF				ছাত্র	
19	[illegible]			01816614093	ব্যবসা	
20	[illegible]			01877[illegible]	ব্যবসা	
21	[illegible]		[illegible]	01811[illegible]	ঐ	
22	[illegible]			01871922[illegible]	ঐ	
23	[illegible]			01[illegible]	ব্যবসা	
24	[illegible]			01707032[illegible]	চাকরি	
25	[illegible]		[illegible]	0181-237326	ব্যবসা	

ATTENDANCE SHEET OF PUBLIC CONSULTATION MEETING

Environmental and Social Impact Assessment (ESIA) Study of

for

Shun Shing Cement Industries Limited (SSCIL), Shikalbaha, Chittagong

Conducted by: Enviro Consultants Ltd. Date: 29.01.2019

SL No	Name	Age	Address	Mobile no.	Profession	Signature
1		৫০		01819640517		
2		৪৭		01811296166		
3		৪৮				
4		৪০				
5						
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Annex 14 Test Report

Enviro Consultants Ltd.

8, Garden Rose (1st Floor), Monipuripara,
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EQRL/Ambient Air/1805/2019

Enviro Quality Laboratory

Test Results of Ambient Air Quality Analysis

Name of the Project : Shun Shing Cement Industries Ltd. [SSCIL]
Address of Project : Sikalbaha, Chattogram.

Description of Sample : Samples were collected from Inside of the Project Area.
Sample Collector : Collected by ECL Personnel
Sampling Date : 14th January, 2019
Date of Analysis : 17th – 20th January, 2019
Reporting Date : 24th January, 2019

Description of Analysis

S.N	Parameter	Unit	Location		Duration (hrs)	DoE (Bangladesh) Standard (Schedule – 2)	Method of Analysis
			Middle of the project area	Near office			
01	PM_{10}	$\mu g/m^3$	148.64	122.44	8	150	Gravimetric
02	$PM_{2.5}$	$\mu g/m^3$	66.67	26.25	8	65	Gravimetric
03	SO_2	$\mu g/m^3$	< LOD	< LOD	8	365	West-Geake
04	NO_x	$\mu g/m^3$	26.70	35.60	8	100	Jacob & Hochheiser
05	CO	mg/m^3	0.00	0.00	1	35	Sensor

Note:

- *During monitoring the day was sunny and the weather condition is good.*
- *Regular checkup and calibration of the equipment are done by the manufacturers and ECL personnel to avoid any error*
- *The LOD of SO_2 is 5 $\mu g/m^3$*
- *During monitoring construction work was going on*

Legends:

1	PM_{10}	Particulate Matter of a diameter upto 10 micron
2	$PM_{2.5}$	Particulate Matter of a diameter upto 2.5 micron
3	NO_X	Oxides of Nitrogen
4	SO_2	Sulphur Di-Oxide
5	CO	Carbon Monooxide

Mohammad Saad
(Chemist)

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EQRL/Ground Water/1806/2019

Enviro Quality Laboratory

Test Results of Ground Water Quality Analysis

Name of the Project : Shun Shing Cement Industries Ltd. [SSCIL]
Address of the Project : Sikalbaha, Chattogram.

Description of Sample : Sample was collected from taps inside of project area.
Sample Collector : Collected by ECL Personnel
Sampling Date : 14th January, 2019
Date of Analysis : 17th January – 18th February, 2019
Reporting Date : 25th February, 2019

Description of Analysis

SN	Parameter	Unit	Concentration of Drinking Water	Bangladesh (DoE) Standard for Drinking Water (ECR 1997,Schedule-3-B)
01	pH		7.5	6.5 – 8.5
02	EC	µS/cm	1962	NYS
03	TDS	mg/L	981	1000
04	DO	mg/L	6.8	6
05	COD	mg/L	6.4	4
06	Arsenic	mg/L	0.002	0.05
07	Chloride	mg/L	608	150 – 600
08	Iron	mg/L	< LOD	0.3 - 1.0

Note:
NYS - Not Yet Set
LOD -Lower of Detection Limit (Fe – 0.01 mg/l)

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EQRL/Surface water/1807/2019

Enviro Quality Laboratory

Test Results of Surface Water Quality Analysis

Name of the Project : Shun Shing Cement Industries Ltd. [SSCIL]
Address of the Project : Sikalbaha, Chattogram

Description of Sample : Sample was collected from Murari Khal.
Sample Collector : Collected by ECL Personnel
Sampling Date : 14th January, 2019
Date of Analysis : 17th January – 18th February, 2019
Reporting Date : 25th February, 2019

Description of Analysis

SN	Parameter	Unit	Concentration of Surface Water	Bangladesh (DoE) Standard for Surface Water (ECR 1997,Schedule- 3-A)
01	pH		7.6	6.5 – 8.5
02	Temperature	^{0}C	23^{0}C	NYS
03	DO	mg/L	7.2	≥5
04	BOD_5	mg/L	2.4	≤10
05	COD	mg/L	32	NYS
06	EC	µS/cm	1522	2250
07	TDS	mg/L	761	NYS
08	Chloride	mg/L	438	150 - 600

Note:
NYS - Not Yet Set

Mohammad Saad
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EQRL/Noise Level1808/2019

Enviro Quality Laboratory

Results of Ambient Noise Level Measurement and Analysis

Name of the Project : Shun Shing Cement Industries Ltd. [SSCIL]
Address of the Project : Sikalbaha, Chattogram

Description of Noise Data : Data were collected from the Selected Locations of the Project Area
Data Collector : Collected by ECL Personnel
Data Collection Date : 14th January, 2019
Date of Analysis : 19th January, 2019
Reporting Date : 24th January, 2019

Description of Analysis

SN	Location	Day Time (6 AM-9 PM)	Night Time (9 PM- 6 AM)	DoE (Bangladesh) Noise Standard for Mixed Area (Schedule-1), Leq	
		Results in dBA (Leq)	Results in dBA (Leq)	Day Time (6 AM-9 PM)	Night Time (9 PM- 6 AM)
01	Near Office	65.40	53.52	60	50
02	Middle Point	65.19	57.72	60	50
Method/Instrument				Sound Level Meter Model: SL – 4033SD	

Mohammad Saad
(Chemist)