Environmental Monitoring of Payra 1320 MW Ultra Super Critical Coal Based Thermal Power Plant Project

Quarterly Monitoring Report

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Submitted by

Bangladesh-China Power Company (Pvt.) Limited (BCPCL)

Prepared by

China Energy Engineering Group

Northeast No.1 Electric Power Construction Co. Ltd. (NEPC)

Technical Support by

EQMS Consulting Limited

website: www.eqmsbd.com

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Abbreviations and Acronyms

ADB	Asian Development Bank
AQ	Air Quality
BCPCL	Bangladesh-China Power Company (Pvt.) Limited
BMD	Bangladesh Meteorological Department
BOD	Biological Oxygen Demand
BPDB	Bangladesh Power Development Board
BWDB	Bangladesh Water Development Board
DO	Dissolve Oxygen
DoE	Department of Environment
DPHE	Department of Public Health Engineering
EC	Electric Conductivity
ECA	Environment Conservation Act /Ecological Critical Area
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EMP	Environmental Management Plan
NEMAP	National Environmental Management Action Plan
NEP	National Environmental Policy
NOx	Oxides of Nitrogen
NWPGCL	North-West Power Generation Company Limited
PPA	Payra Port Authority
PPM	Parts Per Million
SOx	Oxides of Sulfur
SPM	Suspended Particulate Matter
STW	Shallow Tube-Well
TDS	Total Dissolved Solid

Chapter 1

1. Introduction

1.1 Study Background

Planned and appropriate use of power is one of the pre-conditions for economic development of Bangladesh. There is a huge demand for electricity in our day-to-day life as well as in various sectors of the economy. The total power produced in the country is not enough to ensure adequate access to electricity. As of now, only 62 percent of the total population has access to electricity. Per capita electricity generation is only 321 kwh (BPDB, 2014), which is very low compared to that of other developing countries. In order to improve this situation, the Government has given the highest priority to power sector development and is committed to making electricity available to all by 2021. Several programmes have already been taken up to implement short, medium and long term plans for the balanced development of power sector to scale up electricity generation. FY 2013-14 (Till January 2014), a total of 23,204 millionkilowatt hour (MkWh) net energy (10,804 MkWh in the public sector and 12,399 MkWh in the private sector including (IPP, SIPP, Rental, and REB) was generated. Of the total generation, the public-sector power plants generated 46.56 percent while private sector generated 53.44 percent. The share of gas, hydro, coal, and oil based energy generation was 74.71 percent, 1.77 percent, 2.48 percent and 17.61percent respectively. On the other hand, in FY 2012-13, 38,213 millionkilowatt hour (MkWh) and in FY 2011-12, 35,199 millionkilowatt hour (MkWh) net energy were generated i.e. net energy generation growth in FY 2012-13 was 8.13 percent more than the FY 2011-12.

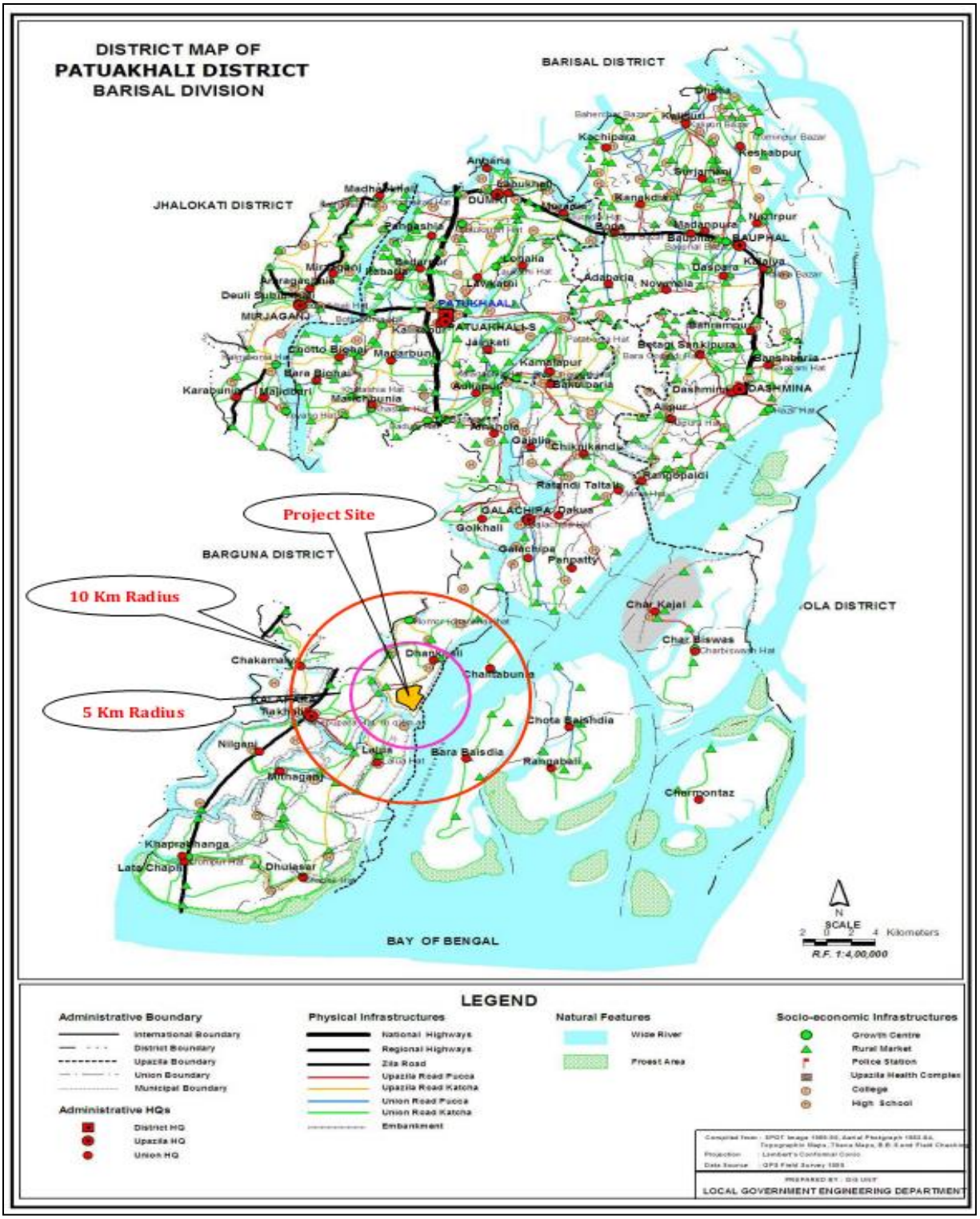
To meet up this, the Government of Bangladesh has formulated a Power System Master Plan (2010). Taking consideration of high dependency on natural gas (77% of power generation comes from natural gas based units), Power System Master Plan (PSMP 2010) recommends diversification of fuel used for electricity generation because present primary energy i.e. natural gas supply will decrease after 2017 and opt coal as a prime energy for electricity generation. The Master plan targets composition of the power supply as of 2030 is set at 50% for domestic and imported coal, 25% for domestic and imported (in the form of LNG) natural gas and 25% for other sources such oil, nuclear power, and renewable energy. The coal based generation is the least cost option in consideration to present economy.

In Bangladesh, the natural gas reserve is depleting and recent gas demands are increasing in other sectors. Hence Government of Bangladesh has decided to install new coal based power plants for future power generation expansion. With the objective of fuel diversification for sustainable power generation and reliable electricity supply, North-West Power Generation Company Limited (an Enterprise of Bangladesh Power Development Board) is installing newPayra 1320 MW Ultra Super Critical Coal Based Thermal Power Plant (hereinafter referred as Payra1320 MW power plant) in Patuakhali district covering areas of Dhankhali Union under Kalapara Upazila. The project location has been shown in the **Figure 1-1** and **Figure 1-2** The

Payra 1320 MW power plant is a joint venture of North-West Power Generation Company Limited (NWPGCL) and CMC, China. The Payra1320 MW power plant will to some extent meet up electricity demand for the country which will improve the system reliably and reduce load shedding.

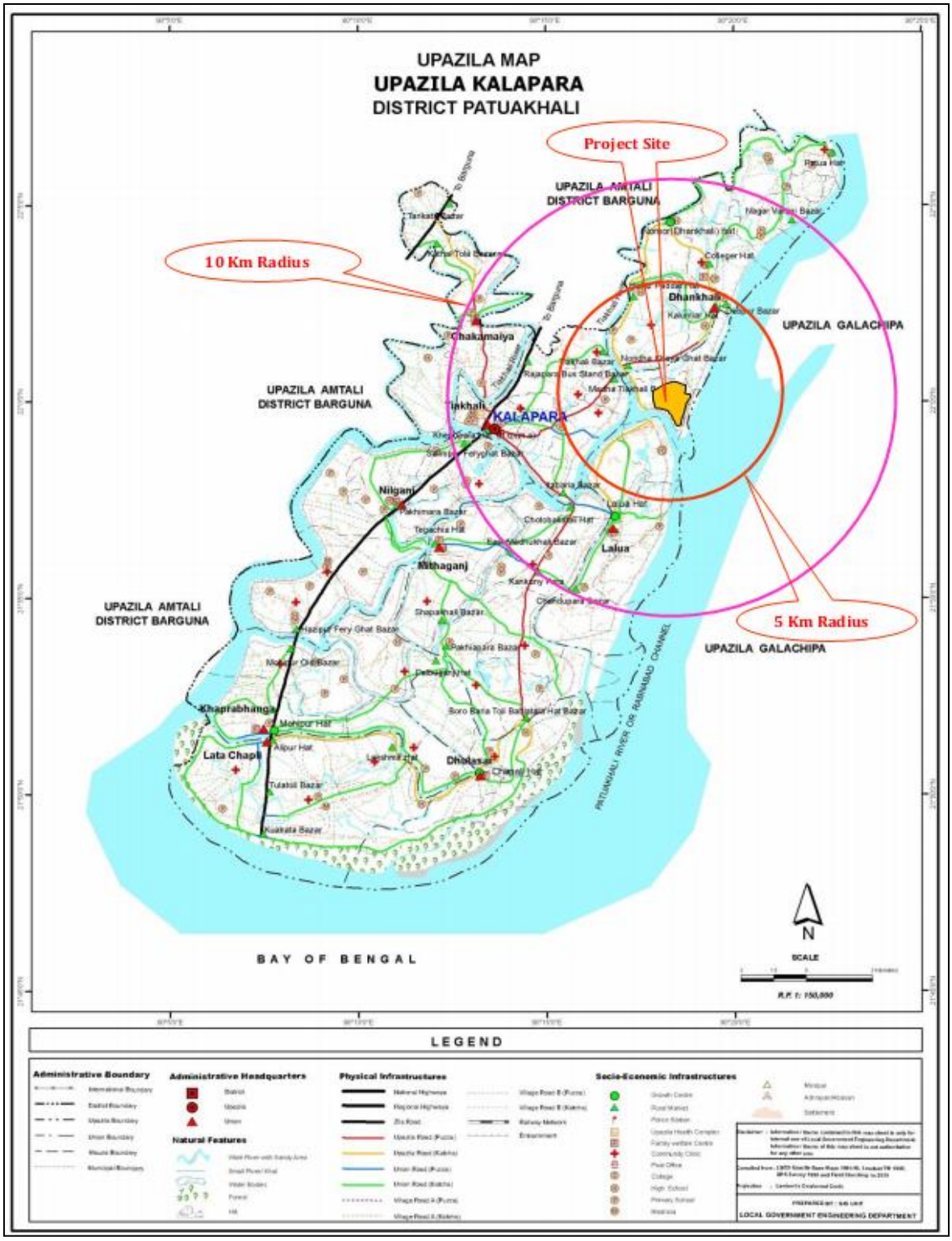
Proper location /siting, its process, and waste abatement and control are very important for an industry to be environmentally sound. In tackling environmental problems of the country, various environmental legislations have been made time to time in Bangladesh. Here, like in some other countries environmental issues are handled by various sectoral legislations. Policies, strategies adopted on environment conservation and on sectoral issues – all have given conservation, protection, and preservation of the environment a paramount importance. Sustainable development is therefore the cornerstone of the policies and procedures regarding Industrial or any other development activities in Bangladesh. As such this current project need to comply with all the relevant national legislation in general and in particular to the Environment Conservation Act, 1995 (ECA, '95) and Environment Conservation Rules, 1997 (ECR, '97). The environmental legislation encompasses laws relating to the protection of environmental health, the control of pollution, and conservation of wildlife and natural resources.

According to approved EIA Report by Department of Environment (DoE), current report presents the quarterly environmental monitoring results of the Payra 1320 MW Ultra Super Critical Coal Based Thermal Power Plant.



(Source: adopted from LGED district map)

Figure 1-1: Project Site at Kalapara Upazila in Patuakhali District



(Source: adopted from LGED upazila map)

Figure 1-2: Power plant Site beside the Rabnabadh Channel, Kalapara Upazila

1.2 Importance of the project

The Payra 1320 MW power plant will add 1300 MW electricity to our national grid that will improve our present electricity generation significantly and as well as trigger our national economic development. Besides, industrial development will be initiated after implementation. Additionally, it will create employment opportunity for the local people and improve the transportation system in the project area, which will ultimately play an important role in poverty reduction and develop the social safety net condition. Moreover, this coal based power plant will thereby play an important role in fuel diversification in electricity generation and reduce pressure on natural gas reserve.

1.3 Objective of Monitoring

- to characterize and monitor the environmental quality at the project site
- to obtain an environmental database which can be used to identify any short and long term environmental impacts of the Project
- to verify the environmental impacts predicted in the EIA study
- to monitor the performance and effectiveness of proposed environmental management plan and practiced mitigation measures
- to identify environmental compliance of the project with regulatory requirements, Government standards and policies
- to provide suggestion and additional measures to achieve proposed Environmental Management Plan.

Chapter 2

2. Legal and Legislative Framework, Regulations and Policy Considerations

2.1 Applicable Policies and Legal Provision

All legal provisions relevant to environmental protection applicable to the planning, construction, operation and coal transportation were identified according to the approved EIA report. **Table 2-1** below summarizes all relevant legal provisions:

Table 2-1: National Legal provisions applicable to the payra power plant for ensuring environmental protection

Issue	Bangladeshi Legislation or Regulation
Governance of Power Generation and Management System	a. Bangladesh Energy Regulatory Commission Act, 2003 b. Power System Master Plan, 2010 **c.** National Energy Policy
Coal Sourcing	a. Bangladesh Coal Policy (Draft) b. Master Plan on Coal Power Development, 2010 **c.** Import and Export Control Act, 1950
Coal Transportation	a. Terrestrial Water and Maritime Zones Act 1974 & Rules 1977 b. The Ferries Act, 1885 c. Ports Act, 1908 d. Bangladesh Merchant Shipping Ordinance 1983 e. The Prevention of the Interference with Aid to Navigable f. Waterways Ordinance, 1962 g. Payra Port Authority Act, 2013
Prevention of pollution, and Protection of Environment	a. Payra Port Authority Act, 2013 b. Ports Act, 1908 c. The Forests Act, 1927 d. Environment Conservation Act, 1995 and the Amendments thereafter e. Environment Conservation Rules, 1997 **f.** The Environment Court Act, 2000
Health and Safety	a. Fatal Accidents Act, 1855 b. Dock Laborers Act, 1934 c. Dangerous Cargoes Act, 1953 d. Imports and Exports (Control) Act, 1950 e. Public Safety Ordinance, 1953 f. The Explosives Act, 1884 **g.** Fire prevention and Extinguish Act, 2003
Procurement in	a. The Public Procurement Regulations, 2003 and Revisions

Issue	Bangladeshi Legislation or Regulation
Bangladesh	thereafter
Transport, Handling and Storage of Dangerous Goods	a. Environment Conservation Act, 1995 (Amendments thereafter) b. Ports Act, 1908 c. Petroleum Act, 1934 d. Dangerous Cargoes Act, 1953

2.2 National Environmental Legal Provisions in Connection with Setup, Operation and Maintenance

The Environment Conservation Act of 1995 is the key legislation in relation to environment protection in Bangladesh. This Act has been promulgated for environment conservation, standards, development, pollution control and abatement. It has repealed the Environment Pollution Control Ordinance of 1977. The Act has been subsequently amended in 2000, 2002, 2007 and latest amendments did up to the year 2010. The main objectives of the Act 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

According to the law before setting up any new project/interventions by the Government/ non-government agencies/public, the proponents are required to obtain respective clearance from the Department of Environment. Under the Environment Conservation Rules 1997, the project promoter must obtain site clearance from the Director General of Department of Environment. An appeal procedure does exist for those promoters who fail to obtain clearance. The Department of Environment executes the Act under the leadership of the Director General.

Under the Environment Conservation Act, 1995 the first set of rules promulgated is the Environment Conservation Rules, 1997. The Rules have provided a categorization of industries/ projects, hence identified types of environmental assessments needed against respective categories of industries/projects. The Environment Conservation Act (Amendment), 2000 provides responsibility for compensation in cases of damage to ecosystems: (1) The

polluter pay principle is included herein, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.

The Bangladesh Environment Conservation Act (Amendment), 2002 elaborates on: (1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like those that 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 Rules are not explicit for various oil and gas exploration interventions. Rather, this is covered under the broader heading of "exploration, extraction and distribution of mineral resources" under the 'Red' category projects.

So far the Rule has been updated three times - February and August 2002 and April 2003.

2.3 Policy Guidance

Under the study, a number of sectoral national policies have been reviewed to identify the guiding principles which are relevant to the coal based thermal power plant installation, operation and maintenance activities. The sectoral policies will include energy, environment, water, forest, transport, import; fisheries etc.

Analysis of the relevant policies is summarized in **Table 2-2**.

Table 2-2: Summary of the Relevant Polices

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Agricultural Policy, 1999			
Agricultural Policy, 1999	Preserve and develop land productivity	Bangladesh-China Power Company (Pvt.) Limited Should: take appropriate measures to prevent loss of land fertility in and around Project site during the project implementation period. If not, then compensate the loss.	Extension Department, Soil Resource Development Institute
Agricultural Policy, 1999	Section 2.1 Objective; Preserve existing biodiversity of different crops	Bangladesh-China Power Company (Pvt.) Limited Should take appropriate measures to prevent loss of any indigenous crop variety of the project site Viz. preserve the indigenous crop verity. If not, then compensate the loss.	MoA, Bangladesh Rice Research Institute (BRRI), BARC
Agricultural Policy, 1999	Section 12.1 Land Use; Appropriate measures will be taken in the light of the Land Use Policy, to stop the trend of shifting agricultural land into to other due to its use for non-agricultural purposes.	Bangladesh-China Power Company (Pvt.) Limited must follow the appropriate land acquisition procedure as per the GOB	MoA, MoFL
Environment Policy 1992			
Environment Policy,1992	Section 3.2.1 Industry; Adoption of corrective measures by polluting industries in phases	Bangladesh-China Power Company (Pvt.) Limited must comply with the Government regulation.	MoEF, MoFL, MoPEMR, DoE and other relevant government agencies

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Environment Policy 1992	Section 3.2.4 Industry; Encourage development of environmentally sound and appropriate technology and initiatives on research and extension in the fields of Industry. Balance such initiatives with the best use of labor and provision of proper Wages.	Bangladesh-China Power Company (Pvt.) Limited should use economically viable and environmental friendly technology Provide analysis of alternatives in the EIA report	MoEF, MoFL, DoE
Environment Policy 1992	Section 3.3.1 Health; Prevent activities, which are harmful to public health in all spheres, including development	Bangladesh-China Power Company (Pvt.) Limited should take all appropriate measures to prevent risky activities that may affect the Public.	MoEF, LGED, DPHE, Local Administration
Environment Policy 1992	Section 3.3.5 Health; Ensure healthy workplace for workers	Bangladesh-China Power Company (Pvt.) Limited should take all appropriate measures to ensure healthy workplace for the workers	DoE, DPHE
Environment Policy 1992	Section 3.4.1 Energy and Fuel Reduce and discourage the use of those fuels which pollute the environment and increase the use of environmentally sound and less harmful fuels	Bangladesh-China Power Company (Pvt.) Limited must use the fuels in their machinery and vehicles that reduce pollution in the environment	MoEF, DoE, MoPEMR, Local Government Institutes
Environment Policy 1992	Section 3.4.2 Energy and Fuel reduce the use of fuel wood, agricultural residues etc. to meet energy need and increase the use of alternative energy sources	Bangladesh-China Power Company (Pvt.) Limited should use materials other than fuel wood and agricultural residue	MoPEMR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Environment Policy 1992	Section 3.4.5 Energy and Fuel Conserve country's fossil fuel reserves and renewable sources of energy	Bangladesh-China Power Company (Pvt.) Limited should: Consider the provision for long term aspects	MoPEMR
Environment Policy 1992	Section 3.4.6 Energy and Fuel; Conduct EIA before implementing the projects for extraction of fuel and mineral resources	Bangladesh-China Power Company (Pvt.) Limited should conduct EIA	MoEF
Environment Policy 1992	Section 3.5.1 Water development; Ensure environmentally sound utilization of all water resources	Bangladesh-China Power Company (Pvt.) Limited should: Ensure conservation of freshwater resources	MoEF
Environment Policy 1992	Section 3.5.5 Water development keep the rivers, canals, ponds, lakes, haors, baors and all other water bodies and water resources free from pollution	Bangladesh-China Power Company (Pvt.) Limited should: Make sure that the nearby water bodies and resources are not polluted due to project activities.	MoEF
Environment Policy 1992	Section 3.6.2 Prevent land erosion, preserve and increase soil fertility, and expand activities for conservation and environmentally sound management of newly accreted land	Bangladesh-China Power Company (Pvt.) Limited should take appropriate measures to prevent land erosion in the project site.	MoEF, MoFL
Environment Policy 1992	Section 3.7.2 Forest; Include tree plantation programmed in all relevant development activities	Bangladesh-China Power Company (Pvt.) Limited should: Carry out afforestation in and around the project site	MoEF, FD
Environment	Section 3.7.3 Forest; Stop shrinkage and	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measures	MOEF, FD

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Policy 1992	depletion of forest land and forest resources	minimize the deforestation around the site	
Environment Policy 1992	Section 3.7.5 Forest Conserve wildlife and biodiversity	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measures to prevent loss of the biodiversity and undertake compensatory measures in case of inevitable damage if any	MoEF, FD
Environment Policy 1992	Section 3.7.6 Forest; Conserve and develop wetlands and protect migratory birds	Bangladesh-China Power Company (Pvt.) Limited must: avoid activities which cause huge damage to wetlands and destroy any fish sanctuary or species habitat of conservation significance	MoEF, MoWR, FD
Environment Policy 1992	Section 3.8.2 Fisheries; Prevent activities that diminish the wetlands natural habits of fish	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measure, so that the nearby fish habitats are not threatened due to project activities, viz. do not discharge untreated waste water into the river	WET, EIA Report
Environment Policy 1992	Section 3.11.2 Transport and Communication; Ensure that vehicles and people using roads, rails, air and inland waterways do not pollute the environment and take steps to protect health of the workers running these transports	Bangladesh-China Power Company (Pvt.) Limited should: Use the vehicles (which are going to be used during the operation of the project) which cause less pollution to the environment. Take necessary measures to protect health of the workers running transports	MoEF, MoC, Roads and Highway Department, Railway Authority, Inland Water Transport Authority

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Environment Policy 1992	Section 3.11.3 Transport and Communication; Control activities in inland ports and dockyards which cause pollution of water and the local environment	Bangladesh-China Power Company (Pvt.) Limited should: Need to consider this provision while importing and transporting the coals	MoEF, MoC, Roads and Highway Department, Port Authority, Inland Water transport Authority
Environment Policy 1992	Section 3.12.1 Integrate environmental consideration into all housing and urbanplanning activities and research	Bangladesh-China Power Company (Pvt.) Limited should: While setting up the proposed location town, consider the integrated environmental aspects	MoEF
Energy Policy 1996			
Energy Policy 1996	Section 1.2 Objective (iv); Ensure sustainable operation of the energy utilities	Bangladesh-China Power Company (Pvt.) Limited should: Ensure that the project activities do not hamper the sustainable of operations of energy utilities in the Proposed location	MoPEMR, Power Development Board, Rural Electrification Board
Energy Policy 1996	Section 1.2 Objective (v); Rational use of total energy sources	Bangladesh-China Power Company (Pvt.) Limited should: Ensure the coal are used rationally	MoPEMR Hydrocarbon Unit
Energy Policy 1996	Section 1.2 Objective (vi); Ensure environmentally sound sustainable energy development program causing minimum damage to the environment	Bangladesh-China Power Company (Pvt.) Limited must: Consider this provision while implementing the project viz. ensure minimum damages caused to the environment	MoPEMR
Energy Policy	Sectio1. 9 Environmental Conservation issues	Bangladesh-China Power Company (Pvt.)	MoPEMR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
1996	will be considered for all type of fuels and in each and every step of fuel cycle; namely, exploration, appraisal, extraction, conversion, transportation and consumption.	Limited Should: Need to consider this Provision during their project cycle.	
Energy Policy 1996	Section 7.3 Technology Assessment, Necessary arrangements are to be made to select appropriate technologies i.e. conversion, efficiency, transferability, adaptability, environmental effects, cost should be considered while selecting technologies	Bangladesh-China Power Company (Pvt.) Limited should: Consider these (Mentioned) factors while selecting the technologies.	MoPEMR
Energy Policy 1996	Promote use of economically viable environment friendly technology is to be promoted	Bangladesh-China Power Company (Pvt.) Limited should: Use economically viable and environmental friendly technology	MoPEMR
Energy Policy 1996	Discourage use of fuelwood	Bangladesh-China Power Company (Pvt.) Limited should: Use materials other than fuelwood	MoPEMR
Energy Policy 1996	Section 1.9 (g) Encourage the use of lead free petrol	Bangladesh-China Power Company (Pvt.) Limited should: Use lead free petrol	MoPEMR
Land Use Policy 1994			
Land Use Policy 2010	Section 2 (e) Objective Ensure the land use in Harmony with the natural environment.	Bangladesh-China Power Company (Pvt.) Limited should: Follow the Government's land use plan	MoFL and DoE

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Land Use Policy 2010	Section 2 (i) Objective; Conserve the natural forest	Bangladesh-China Power Company (Pvt.) Limited must: Compensate for destroying the natural forest, viz. plantation on the other nearby areas, Reforestation and plantation on the annulled forest area.	MoFL, Forest Department
Land Use Policy 2010	Section 2 (i) Objective; Prevent river bank erosion	Bangladesh-China Power Company (Pvt.) Limited should: Prevent activities that may cause river bank erosion	MoFL and MoWR
Land Use Policy 2010	Section 2 (h) Objective; Prevent the land pollution	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measures to prevent/ reduce the land pollution	MoFL and DoE
Land Use Policy 2010	Section 3.4 Land Use; Maintaining a balanced ecosystem	Bangladesh-China Power Company (Pvt.) Limited should: Proper authorization to utilizing the area (project site) from the concerned authority, via, seek authorization from the Forest Department for utilizing the forest land	MoFL, MoWR, Forest Department and others
The Forest Policy 1994			
Forest Policy 1994	Conserve the natural forest (protected, reserved and unclassified state forest)	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measures to mitigate adverse impact (due to project activities) in the forest of the power plantlocation area	MoEF, FD
Forest Policy 1994	Restoration of natural forest to preserve biodiversity and wildlife	Bangladesh-China Power Company (Pvt.) Limited should: Carry out afforestation and	MoEF, FD

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
		reforestation of forests cleared during the project activity	
Forest Policy 1994	Without proper authorization, forest land Cannot be used for non-forest purpose.	Bangladesh-China Power Company (Pvt.) Limited should: Seek for permission from the Forest Department for using the forest area for non-forest purpose	MoEF, FD
The Tourism Policy 1992			
Tourism Policy 1992	Section 5 (3): Development, preservation and maintenance of tourism resources of the country	Bangladesh-China Power Company (Pvt.) Limited need: To look into the matter so that any tourism resource nearby the powerplant are not affected due to the project activities	MoCAT
Tourism Policy 1992	Section 7: Restoration and maintenance of archaeological and historical sites	Bangladesh-China Power Company (Pvt.) Limited must: Not destroy any archaeological and historical sites of the with the power plantlocation of the Power Plant	MoCAT
Tourism Policy 1992	Section 8: Conservation of wildlife	Bangladesh-China Power Company (Pvt.) Limited need to consider this provision	MoEF
The Fisheries Policy 1998			
Fisheries Policy 1998	Section 9.10; Protect natural water bodies and marine biodiversity.	Bangladesh-China Power Company (Pvt.) Limited must: Consider this provision and take appropriate measure to reduce adverse impact on the water bodies	MoFL, Fisheries Department
Fisheries Policy	9.10.2 Control activities which may have	Bangladesh-China Power Company (Pvt.)	MoFL, Fisheries

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
1998	adverse effect on the fish resources	Limited must: Control the activities which may have adverse impact on the fish resources	Department
Fisheries Policy 1998	9.10.6 Implement laws to prevent discharge of untreated waste into water bodies.	Bangladesh-China Power Company (Pvt.) Limited must comply with these laws	MoFL, Fisheries Department
The Water Policy 1999			
Water Policy 1999	Section 4.8 Water and Industry; a) Zoning regulation will be established for location of new industries in consideration of fresh and safe water availability and effluent discharge possibilities.	Bangladesh-China Power Company (Pvt.) Limited must: Follow the zoning regulation of the Government	MoFL, MoWR
Water Policy 1999	b) Effluent disposal will be monitored by relevant Government agencies to prevent water pollution	Bangladesh-China Power Company (Pvt.) Limited must: Allow the monitoring authority to monitor their effluent discharge	MoWR
Water Policy 1999	c) Standards of effluent disposal into common water courses will set by WARPO in consultation with DoE	Bangladesh-China Power Company (Pvt.) Limited need to comply with the polluter pay principle under the national legislation	DoE/MoWR
Water Policy 1999	d) Industrial polluters will be required under law to pay for the cleanup of water body Polluted by then.	Bangladesh-China Power Company (Pvt.) Limited need to comply with the polluter pay principle under the national legislation	DoE/MoWR
Water Policy 1999	Section 4.12 Water and Environment; d) Protect against degradation and resuscitate natural water bodies such as lakes, ponds,	Bangladesh-China Power Company (Pvt.) Limited should: Consider this provision while implementing	MoWR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
	Heels, khals, tanks, etc. affected by man-made Intervention or other causes.	the project	
Water Policy 1999	Enforce the 'polluter pay' principle in the development of regulatory guidelines for all regulatory actions designed to protect public health and the environment	Bangladesh-China Power Company (Pvt.) Limited need to follow the regulatory Guidelines.	DoE
The Industrial Policy 1999			
Industrial Policy 1999	Objective (p); To take appropriate measures for preventing	Bangladesh-China Power Company (Pvt.) Limited need to consider the provision during implementation of the project activities	DoE, MoPEMR
The Housing Policy 1999			
Housing Policy 1999	Section 4.7; Initiate planning to produce more forest products used to build infrastructures and attention be given to environmental management	Bangladesh-China Power Company (Pvt.) Limited should: Carry out afforestation and Reforestation activities to restore degraded lands	MoHPW/MoHFW
Housing Policy 1999	Section 4.9; While implementing any new housing project, need to consider the local building modes, upholding and conservation of the cultural heritage	Bangladesh-China Power Company (Pvt.) Limited should: Consider the provision while implementing the township under the project activities	MoHFW/MoC
Housing Policy 1999	Section 5.1.3 Land; Ensure that the minimum land acquired for any development project/programmed	Bangladesh-China Power Company (Pvt.) Limited should: Adopt the principle during land acquisition	MoHPW Bangladesh-China Power Company (Pvt.) Limited

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Biodiversity Strategy and Action Plan (BSAP)			
BSAP	Strategy 2: Conserve ecosystems, species and genetic pool of the country to ensure that the present and future well-being of the country and its people are secure	Bangladesh-China Power Company (Pvt.) Limited should: • Create an inventory of all the species of flora and fauna in the area. • Conduct EIA and SIA reports.	MoEF/ DoE
BSAP	Strategy 3: Restore ecosystems and rehabilitate endangered species	Bangladesh-China Power Company (Pvt.) Limited should: • Construct ETP to restrict amount of pollution • Create buffer zones in and around the project site • Carry on afforestation and reforestation activities on abandoned site	MoEF/ DoE
BSAP	Strategy 10: Ensure wise use of wetland resources environment pollution and maintaining the ecological balance	Bangladesh-China Power Company (Pvt.) Limited should: Consider the provision while implementing the project.	MoWR/ MoEF

2.4 Law and Policy relevant to Occupational health and safety

A. National Policy Framework

The constitution of Bangladesh adapted on the November 4th 1972 recognizes productivity as a basic need for economic development and covers the right to work and reasonable wages, Medicare and disease and disablement. And thus it is assumed the health and safety of industrial workers have been taken care of.

The Occupational Health and Safety Services in Bangladesh is still in the developmental stage. In Bangladesh, Occupational Health and Safety generally refers mainly to needs of workers of industries or some manufacturing process but does not completely cover all recognized occupations of the country.

In the Fifth Five Year Plan (1997-2002) for the labor and manpower sector the objectives relatable to OSH are:

a. "To ensure fair wages, welfare and social protection of workers under the structural adjustment programs adopted by the government."
b. "To initiate steps to protect children from economic exploitation."

To achieve the objectives of the Fifth Five Year Plan (1997-2002) for the labor and manpower sector the strategies relatable to OSH that were to be pursued are: "Review of existing labor related laws, rules, regulations and directives and adoption of necessary modifications."

a. "Stress on gradual elimination of child labor and protection of children from economic exploitation and hazardous work."

In the labor sector the OSH relatable programs that were to be undertaken under the Fifth Five Year Plan included- Strengthening of Inspectorate of Factories and Establishments in terms of manpower and resources so as to enable them to "enforce various labor laws/rules concerning working hours, working condition, safety, and maternity benefits in different mills, shops and factories, etc."

In the Fifth Five Year Plan (1997-2002) for the health population and family welfare sector some scope for further development in the sector against the background that 'with increased urbanization and industrialization, the number of burn and trauma cases due to traffic and industrial accidents, unsafe use of chemicals, fire, etc., has been increasing every year'. The following needs have been identified:

a. Need to establish hospitals near major highways, traffic blackspots and industrial areas with trauma and burn units to treat burn and trauma cases in time.
b. Promote industrial and occupational health through IEC activities so as to raise awareness of industrial workers and protect them from industrial hazards.

Labor Policy:

- Undertake effective new labor policy on the basis of tripartite negotiation
- Link wages with productivity
- Quick disposal of Industrial dispute
- Stop child labor and provide workers with education, healthcare, and better working facilities

B. LEGISLATIONS RELATING TO OCCUPATIONAL HEALTH AND SAFETY

The Department of Inspection for Factories and Establishments under the Ministry of Labor and Employment administers and enforces 42 labor laws. The following legislations have provisions relating to occupational health, hygiene of workers, occupational diseases, industrial accidents, protection of women and young persons in dangerous occupations, and also cover conditions of work, working hours, welfare facilities, holidays, leave, etc.

Sl#	Legislation	Enforcing agency
1	The Factories Act, 1965 and the Factories Rules 1979	Department of Inspection for Factories and Establishment
2	Dock laborers' Act 1934	Department of Inspection for Factories and Establishment
3	Dock laborers' Regulations 1948	Department of Inspection for Factories and Establishment
4	Tea Plantation Laborers' Ordinance 1962 and the rules thereunder	Department of Inspection for Factories and Establishment
5	The Workmen's Compensation Act 1923 as amended in 1980 and 1983	Department of Inspection for Factories and Establishment
6	The Shops and Establishments Act 1965	Department of Inspection for Factories and Establishment
7	Employment of Children Act 1938	Department of Inspection for Factories and Establishment
8	The Maternity Benefit Tea Estates Act 1950	Department of Inspection for Factories and Establishment
9	The Maternity Benefit Act 1939	Department of Inspection for Factories and Establishment
10	The Maternity Benefit Rules 1953	Department of Inspection for Factories and Establishment
11	The Boilers Act 1923	Chief Inspector of Boilers under Ministry of Industry
12	Nuclear Safety and Radiation Control Act1993	Atomic Energy Commission Bangladesh

C. ILO Convention regarding OSH:

Until now 31 ILO conventions have been ratified by Bangladesh. The ILO convention C 155 and C161 are concerned with the Occupational Safety and Health and the Occupational Health Services respectively. The aim of the policy of the convention C155 is to prevent occupational accidents and injury to health and illnesses by identification and minimizing the causes of hazards in the working environment. The aim of the convention C161 is to establish and maintain a safe and healthy working environment which will facilitate optimal physical and mental health in relation to work. Although these conventions are not yet ratified in Bangladesh but many of the recommendations of these conventions have been practiced to some extent through the implementations of existing various laws and regulations. In the Factory Act 1965 and Factory Rules 1979 and in some other laws and regulations there are various chapters that are relatable to OSH. But by the existing laws and regulations qualitative inspections regarding safety and health in the working is possible but could not be monitored in terms of quantitative standard values and permissible limits.

For ratification of ILO convention No. C 155 and C161 the motivation of all the parties, policy makers, employers and employees is required.

D. IFC's Performance Standard on Labor and Working Condition

IFC's Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of fundamental rights of workers.

The requirements set out in this performance standard have been in part guided by a number of international conventions and instruments, including those of the International Labor Organization (ILO) and the United Nations (UN). Its objectives are following

- To promote the fair treatment, non-discrimination and equal opportunity of workers.
- To establish, maintain and improve the worker-management relationship.
- To promote compliance with national employment and labour laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties and workers in the client's supply chain.
- To promote safe and healthy working conditions and the health of the workers.
- To avoid the use of forced labor.

Chapter 3

3. Methodology

3.1 Project Area

Payra 1320MW power plant is located at Latitude: 22° 59' 58" (N) and Longitude: 90° 17' 58" (E) adjacent to the Kazol River as well as upstream of Rabnabadh Channel at Dhankhali Union, Kalapara Upazila, Patuakhali District of Bangladesh. The site is spread across the Mouza: Modhupara, Char Nisanbaria and Nisanbaria. Plant site is about 8km away from Kalapara Upazila and 39km away from Patuakhali district.

The Payra 1320 MW power plant site stretches about 2.5 km from north to south and 2.3 km. from east to west. This open site is capable of meeting the land-use demand of the Payra 1320 MW (2× 660MW) ultra-supercritical coal-fired power plants, as well as the need for further expansion. The project location with respect to Bangladesh is presented in **Figure 3-1** and the geographic location of the Payra 1320 MW site has been shown in **Figure 3-2**.

The priority economic activities are agriculture, fisheries and plantation. According to different environmental policy and regulations of Bangladesh, plant site is away from any notified eco-sensitive area like Natural Park, wildlife sanctuary, buildings of archaeological importance etc.

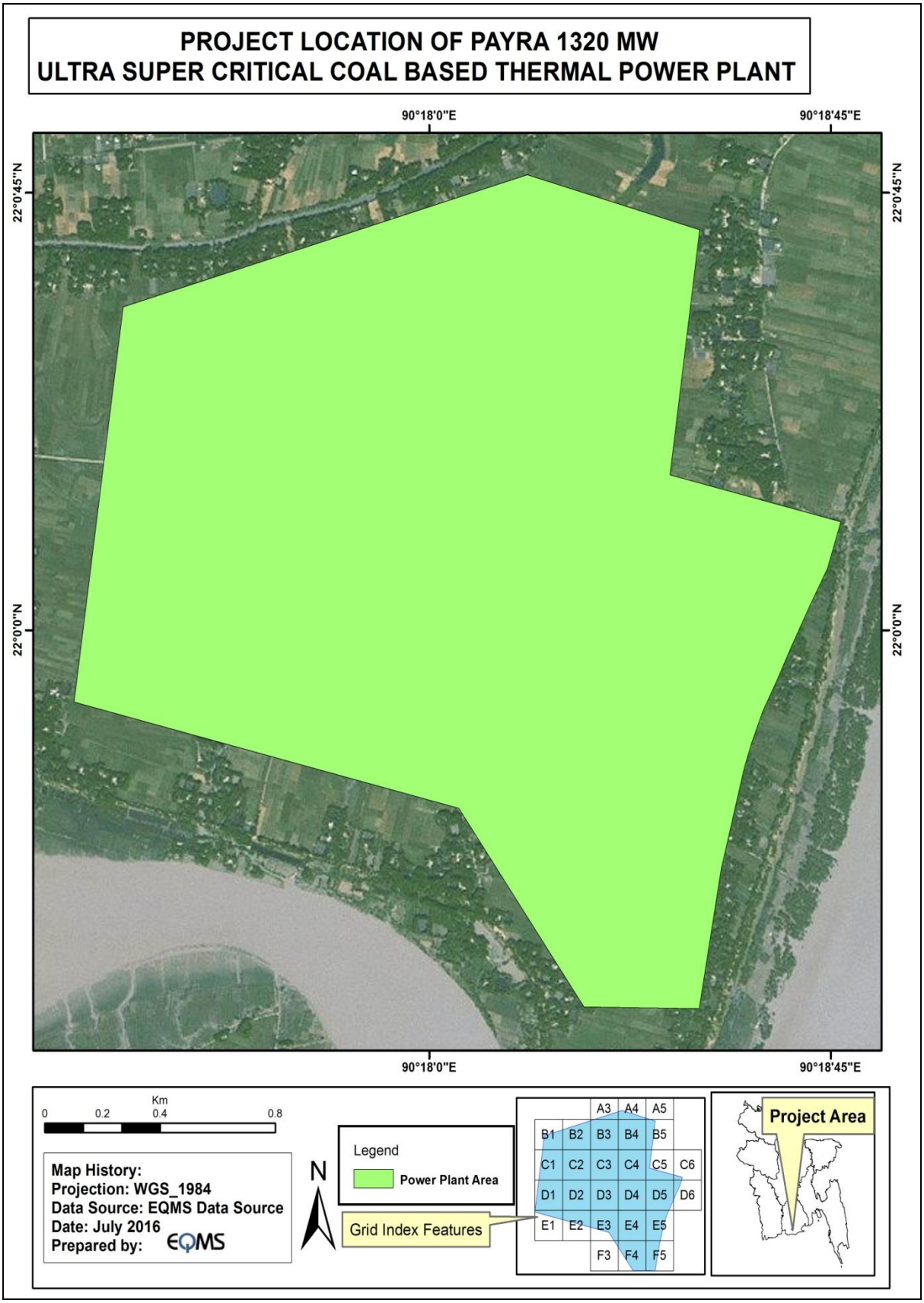


Figure 3-1: Project Location Map

3.2 Environmental quality monitoring

According to the approval of Environmental Impact Assessment (EIA) report Memo No: DoE/Clearance/5310/2014/485on 08 October 2016, a number of physical environmental parameters required to monitor during the construction period of the Payra 1320 MW power plant. Among them, air quality has been measured quarterly and noise level and water quality have been measured on a monthly basis.

3.3 Methods of Environmental Monitoring

3.3.1 Air Quality Monitoring

The ambient air quality monitoring sampling locations have been adopted from the approved EIA report of payra 1320 MW power plant. The existing ambient air quality of the study area was monitored during the construction period of the power plant. The ambient status of major air pollutants viz. Particulate Matter (SPM, PM_{10} and $PM_{2.5}$), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_x), and Carbon Monoxide (CO) have been assessed by monitoring air quality at six locations. All the parameters were monitored on 24-hourly basis during the study period.

Respirable Dust Sampler (Model-Lata Envirotech APM 250 combined PM10 and PM2.5 sampler) has been used to collect the air sample. The particulate and gaseous samples collected during the monitoring have been analyzed as per the procedures specified in **Table 3-1**.

Table 3-1: Methodology for Analysis of Ambient Air Quality

Sl.	Parameter	Analysis procedure
1.	SPM	Gravimetric method
2.	PM_{10}	Gravimetric method
3.	$PM_{2.5}$	Gravimetric method
4.	SO_2	Colorimetric method at 560nm using spectrophotometer (West-Gaeke method)
5.	NO_x	Colorimetric method at 540 nm using spectrophotometer (Jacob and Hochheiser method)
6.	CO	Digital CO meter

The geographical locations and setting of the ambient air quality monitoring locations have been listed in **Table 3-2** presented in **Figure 3-2**.

Table 3-2: Ambient Air Quality Sampling Locations

Sl.	Sampling Station	Station Code	Geographic Location	Location Setting
1.	Project site (Nishanbari)	AQ1	21°59'36.71"N90°18'3.29"E	Village and Rural Setting

Sl.	Sampling Station	Station Code	Geographic Location	Location Setting
2.	Londa Kheya Ghat	AQ2	22° 0'40.67"N90°16'43.35"E	Village and Rural Setting
3.	Dhankhali Union Complex	AQ3	22° 2'17.32"N 90°19'23.42"E	Village and Rural Setting
4.	Tiakhali village	AQ4	21°59'16.74"N90°16'32.70"E	Village and Rural Setting
5.	Lalua village	AQ5	21°58'26.19"N90°18'0.26"E	Village and Rural Setting
6.	Nishanbari village	AQ6	22° 0'27.59"N90°18'36.73"E	Village and Rural Setting

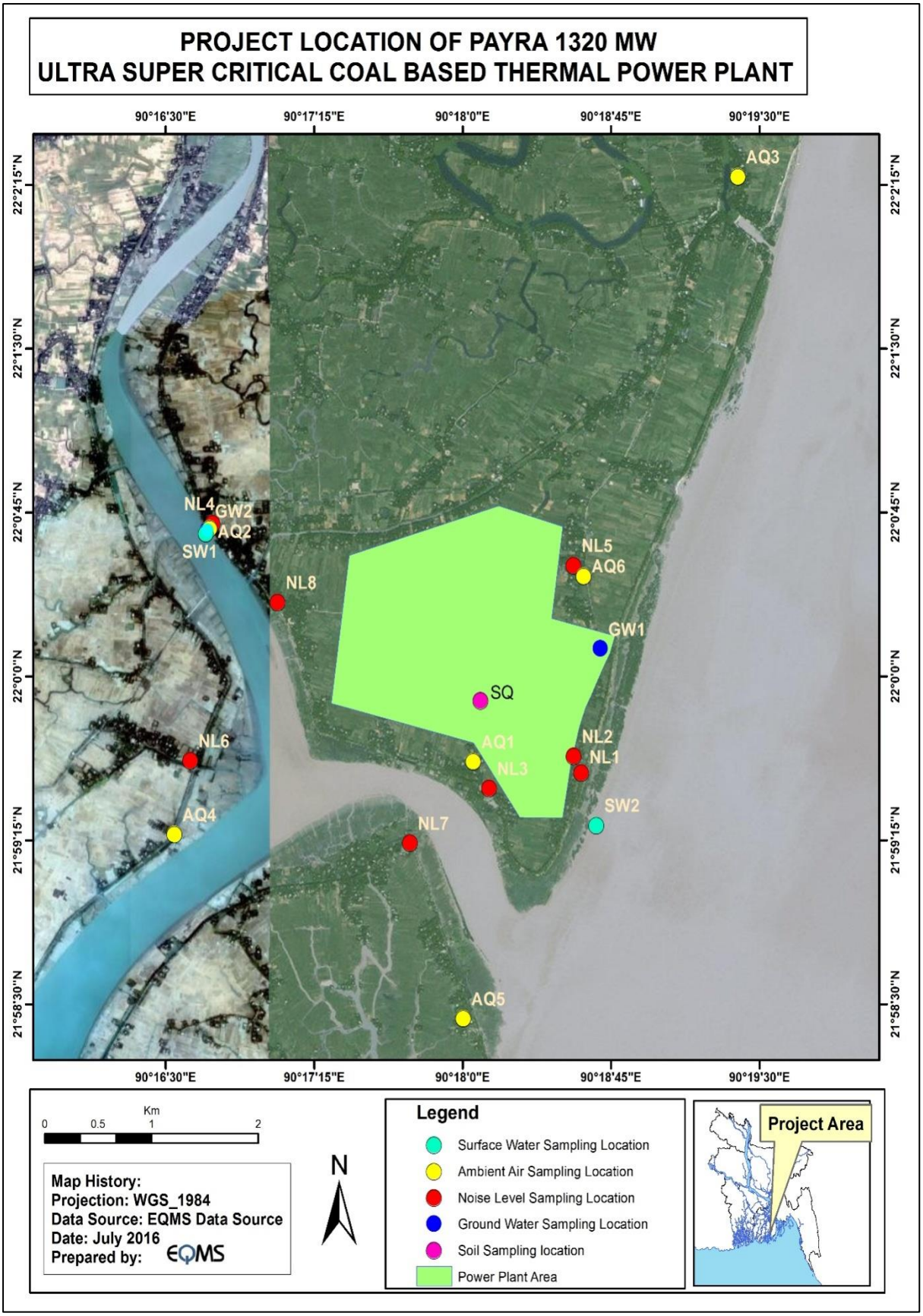


Figure 3-2: Location Map of Sampling Points

3.3.2 Noise Level Monitoring

Ambient noise levels have been monitored on a monthly basis during the construction phase. Noise data logger (Digital Sound Level Meter GM-1357, BENETECH) has been used to monitor of ambient noise levels. Eight (8) noise level sampling locations have been selected from the approved EIA report of payra 1320 MW power plant. Detail list of sampling location has been shown in **Table 3-3** and **Figure 3-2**. Noise level was measured for 1 hour at every location on different time.

Table 3-3: Noise level sampling Location

Sl.	Code	Location	Geographic location	Location setting
1.	**NL1**	Char Nishanbari Primary School	21°59'33.66"N90°18'35.96"E	Silent
2.	**NL2**	Char Nishanbari Mosque	21°59'38.18"N90°18'33.69"E	Silent
3.	**NL3**	Rofiqure Mia's House, Nishanbari Village	21°59'29.40"N90°18'8.05"E	Residential
4.	**NL4**	Londa Kheya Ghat	22° 0'42.08"N90°16'44.23"E	Commercial
5.	**NL5**	MonirHossain's House, Nishanbari village	22° 0'30.58"N90°18'33.61"E	Residential
6.	**NL6**	Salam Uddin's House, Tiakhali village	21°59'36.98"N90°16'37.53"E	Residential
7.	**NL7**	Akber Mia's House, Lalua	21°59'14.37"N90°17'44.09"E	Residential
8.	**NL8**	Sabder Ali's House, Madhupara	22° 0'20.47"N90°17'3.90"E	Residential

3.3.3 Water Quality Monitoring

Water sampling and analysis was undertaken to understand the overall baseline water quality characteristics of the surface and groundwater of the study area. Samples were taken from sampled water bodies and different groundwater sources from the study area. Surface water sampling was based on the identification of major surface water bodies such as the Rabnabadh Channel and Andharmanik River adjacent to the project site. Groundwater sampling locations were selected to obtain a representative water sample from various zones within the study area. The samples were collected from existing tube wells (hand-pumps being used by the villagers). A total of 4 samples comprising of Two (2) surface water and two (2) ground water samples were collected. Detail of the sampling location is provided in **Table 3-4** and depicted in **Figure 3-2.**

Table 3-4: Details of Surface and Ground Water Sampling Locations

Sl.	Sampling location	Sampling water	Sampling Code	Geographic location	Type of Source
1.	Londa Kheya Ghat (Andharmanik river adjacent to the project area)	Surface water	SW1	22°0'39.33"N 90°16'42.21"E	Andharmanik River
2.	Rabnabadh Channel (adjacent to the project area)	Surface water	SW2	21°59'19.24"N 90°18'40.55"E	Rabnabadh Channel
3.	Project site	Ground water	GW1	22° 0'7.74"N 90°18'41.78"E	Tubewell
4.	Londa Kheya Ghat	Ground water	GW2	22° 0'40.18"N 90°16'42.61"E	Tubewell

The samples were analyzed for parameters covering bacteriological and physicochemical characteristics which include certain heavy metals and trace elements.

Water samples were collected as grab water sample in a standard sampling bottle and 250 ml sterilized clean PET bottle for complete physiochemical and bacteriological tests respectively.

The samples were analyzed as per standard procedure/method given in Standard Method for Examination of Water and Wastewater Edition 20, published by APHA as well as using on site field test kit. Details of the analysis method and protocol are presented in **Table 3-5**.

Table 3-5: Method for Water Analysis

Sl.	Parameter	Test method (APHA)
1.	Temperature (°C)	Digital thermometer
2.	Total Dissolved Solids (TDS) (mg/l)	Digital TDS meter
3.	EC (µmhos/***cm***)	Digital EC meter
4.	DO (mg/l)	Digital DO meter
5.	pH	Digital pH meter
6.	Salinity (ppt)	Digital Salinity meter
7.	Arsenic (As) (mg/l)	3114.C
8.	Chloride (Cl^-) (mg/l)	4110.B
9.	Conductivity (µmhos/cm)	Conductivity Meter
10.	Fecal Coliform (mg/l)	Lab Analysis
11.	Iron (Fe) (mg/l)	3113.B
12.	Lead (Pb) (mg/l)	3113.B
13.	Oil and Grease (mg/l)	Lab Analysis

Sl.	Parameter	Test method (APHA)
14.	Total Coliform	9222.B
15.	Turbidity	Turbidity Meter

The quality of surface water was compared with the standards for Inland Surface Water, Environment Conservation Rules (ECR), 1997-Schedule 3 whereas the groundwater was compared with the Drinking Water Standard ECR Schedule-3, 1997. The standards have been presented along with the monitoring results of surface and groundwater for comparison.

3.3.4 Soils of the Project Area

3.3.4.1 Sampling Methodology and Locations

The soil sampling strategy was designed to assess the existing soil quality over the study area. One sample was collected from the project area. The detail of the sampling locations is presented in **Table 3-6** and **Figure 3-2**. A composite sampling technique was used for soil sampling from study area.

Table 3-6: Location of Soil Samples

Sl.	Sampling Station	Station Code	Geographic Location
1.	Project site	SQ	21°59'53.47"N90°18'5.51"E

Soil sample was collected from a depth of 45 cm from the top soil surface. The homogenized sample were collected following quartering technique and then packed in polythene plastic jars and sealed. The sealed sample was sent to the laboratory for analysis.

The soil sample was analyzed for physical and chemical characteristics including minerals, heavy metals and trace elements.

Table 3-7: Method for soil quality analysis

Parameters	Methods of Analysis
Sample Code	**SQ**
pH	pH meter
Salinity (dS/m)	IS 14767
Organic Content (%)	ASTM D 2974
Calcium (mg/kg)	Atomic Absorption Spectrometry
Magnesium (mg/kg)	Atomic Absorption Spectrometry
Ammonium-Nitrogen (mg/kg)	EN ISO 11732
Potassium (mg/kg)	Near Infrared Reflectance Spectroscopy (1000-2500 nm)
Phosphorus (mg/kg)	Kjeldahl method
Copper (mg/kg)	Atomic Absorption Spectrometry
Iron (mg/kg)	Atomic Absorption Spectrometry

Parameters	Methods of Analysis
Lead (mg/kg)	Atomic Absorption Spectrometry
Arsenic (mg/kg)	Atomic Absorption Spectrometry
Mercury (mg/kg)	SW-846 method

3.3.5 Occupational health and safety

To study the labor and working conditions of Payra 1320MW Thermal Power Plant Project observational method was used. Monitoring team physically stayed in the construction camp for few days; from 4th October to 7th October, and observed labor and working conditions of the proposed project. During observation, several informal discussions were also conducted with workers of three workers' shed.

For both observation and informal discussion, a checklist with the compliance of "Performance Standards-2 on Labor and Working Conditions" formulated by International Finance Corporation (IFC) was followed.

Chapter 4

4. Result and Discussion

4.1 Air Quality Monitoring Result and Discussion

4.1.1 Ambient Air Quality in the Study Area

The monitored ambient air quality is summarized in **Table 4-1**.

Table 4-1: Ambient Air Quality in the Study Area

Sl.	Sampling location	Ambient air pollution concentration in µg/m³					
		$PM_{2.5}$	PM_{10}	SPM	SO_2	NOx	CO* mg/m³
1.	AQ1	12.39	44.95	72.39	4.64	14.64	<2
2.	AQ2	17.65	66.53	98.04	3.46	13.51	<2
3.	AQ3	15.43	57.62	81.27	2.84	8.68	<2
4.	AQ4	13.92	69.68	92.32	3.29	10.07	<2
5.	AQ5	11.57	64.44	82.67	2.87	9.83	<2
6.	AQ6	14.82	55.82	83.92	3.08	9.47	<2
Duration (hours)		**24**	**24**	**8**	**24**	**24**	**8**
Weather Condition		Sunny					
Bangladesh Standard* (*according to Environmental Conservation Rules' 1997 and subsequent amendment in 2005*)		**65**	**150**	**200**	**365**	**100**	**10**
Method of analysis		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob and Hochheiser	Indicator tube

Source: Air quality analysis done by EQMS Consulting Limited, 2016
Date of sample collection: 4th-7th October, 2016
Note:
** CO concentrations and standards are 8-hourly only.*
*** The Bangladesh National Ambient Air Quality Standards have been taken from the Environmental Conservation Rules, 1997 which was amended on 19th July 2005 vide S.R.O. No. 220-Law/2005.*

4.1.2 Analysis and Discussion of Result

SPM

The 8-hourly SPM concentration in ambient air in the study area was recorded in the range of 72.39 – 98.04 µg/m³. During the monitoring period, the maximum SPM concentration was reported from Londa Kheya Ghat as 98.04µg/m³. SPM concentrations at this location are primarily due to traffic movement. SPM level of all locations was reported below the National Ambient Air Quality Standards of Bangladesh.

PM_{10}

The 24-hourly PM_{10} concentration in ambient air in the study area was recorded in the range of 44.95– 69.68µg/m^3. During the monitoring period, the maximum PM_{10} concentration was reported from Tiakhali village as 69.68µg/m^3. PM10 level at all monitoring locations were reported below the NAAQS.

$PM_{2.5}$

The 24-hourly $PM_{2.5}$ concentrations in ambient air in the study area was recorded in the range of 11.57 – 17.65 µg/m^3. During the monitoring period, the maximum $PM_{2.5}$ concentrationswas reported from Londa kheya Ghat17.65µg/m^3. All the monitoring locations result was within the 24-hourly National Ambient Air Quality Standard (NAAQS) for $PM_{2.5}$ in Bangladesh.

SO_2

The 24-hourly SO_2 concentration was recorded in the range of 2.84 – 4.64 µg/m^3. The concentration of SO_2 is reported low at residential area due to their rural setting. During the monitoring period, the maximum SO_2 concentration is reported at theproject site as 4.64 µg/m^3. SO_2 concentrations at all the monitoring locations were reported well below 365 µg/m^3, which is National Ambient Air Quality Standard (NAAQS) for SO_2 in Bangladesh.

NOx

The 24-hourly NOx concentration was recorded in the range of 9.47 – 14.64 µg/m^3. Concentrations of NOx were reported due to their rural setting, whereas at AQ1, the levels are slightly higher due to the traffic movement and construction activity. During the monitoring period, the maximum NOx concentration is reported at Project site as 14.64 µg/m^3. There are no stipulated standards for 24-hourly NOx concentration in Bangladesh. The annual Bangladesh standard values for NOx are 100 µg/m^3 and present concentrations at all the locations are well below these values.

CO

CO concentrations are reportedly low at all the monitoring locations while comparing with the Bangladesh Standards (10 mg/m^3).

4.2 Noise Level Monitoring Result and Discussion

Summary results Noise level monitoring results shown in **Table 4-2.**

Table 4-2: Noise Level Monitoring Results

Location	Average Noise level [dB(A)]				Applicable Standard * [dB(A)]	
	Leq_{day}	Leq_{night}	L_{max}	L_{min}	Day	Night
NL1	51.7	40.2	60.3	38.5	50	40
NL2	50.8	41.5	58.5	38.5	50	40
NL3	53	42.9	58.7	37.4	55	45

Location	Average Noise level [dB(A)]				Applicable Standard * [dB(A)]	
	Leq_{day}	Leq_{night}	L_{max}	L_{min}	Day	Night
NL4	52.4	46.8	67.4	43.2	70	60
NL5	50.2	42.1	58.1	37.5	55	45
NL6	48.6	40.4	60.1	38.6	55	45
NL7	51.8	42.7	61.2	39.6	55	45
NL8	47.8	40.6	58.5	38.1	55	45

Source: Field Survey by EQMS (4-7th October, 2016)

**Environmental Conservation Rules, 1997 (Schedule 4) (subsequent amendment in 2006)*

Due to an absence of heavy industries, large urban development or other significant noise sources, the background noise level at the project area is low till the date of data collection.

According to Bangladesh Environmental Quality Standard ECR'97 categorizations current project area falls into residential area zone. **Table 4-2**shows that the average noise level at NL1 and NL2 are location are slightly higher than the national standard. The main reason is due to sample collection area resides in front of the school whereas the other locations average day time noise is well within the standard limit of ECR'97. Besides, except NL1 and NL2 average night time noise level of all locations is well within the standard limit of ECR'97 (*subsequent amendment in 2006*).

Comparison of the ambient noise level monitoring among August, September and October 2016 presented in **Figure 4-1**and **Figure 4-2**

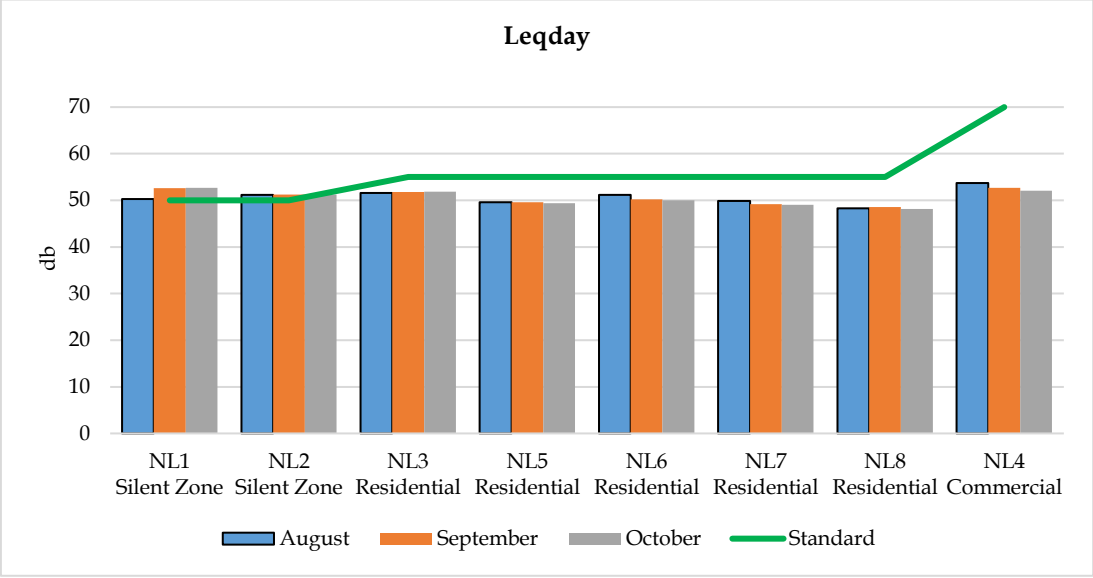


Figure 4-1: Summary of the ambient noise recorded at day time in August, September and October 2016

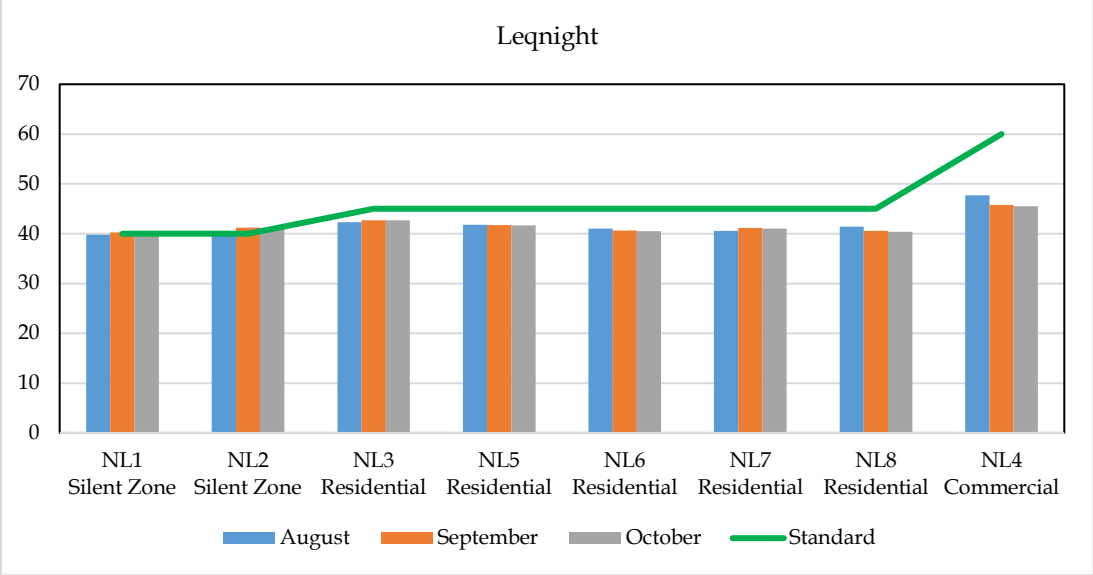


Figure 4-2: Summary of the ambient noise recorded at night time in August, September and October 2016

4.3 Surface Water Monitoring Result and Discussion

The surface water Quality was compared with the Bangladesh ECR standard for best practice based classification criteria. **Table 4-4** shows the analysis results. All the analyzed water quality parameters are within the acceptable limit of Bangladesh water quality standard (ECR, 1997).

Table 4-3: Surface Water Quality Analysis

SL.	Characteristics	Unit	August		September		October	
			SW1	SW2	SW1	SW2	SW1	SW2
1.	EC	µmhos/cm	200	220	280	220	210	180
2.	DO	mg/l	5.5	6.3	7.5	5.6	6.3	6.9
3.	Iron	mg/L	0.59	0.51	0.57	0.54	0.52	0.5
4.	Lead (Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
5.	Oil and Grease	mg/L	<2	<2	<2	<2	<2	<2
6.	pH	-	7.7	7.8	7.75	7.8	7.81	8
7.	Temperature	^{o}C	30.3	32.2	32.2	33.9	31.2	31.8
8.	TDS	mg/l	100	110	140	110	100	209
9.	Turbidity	NTU	17	20	27	32	38	40
10.	Salinity	ppt	100	100	100	100	100	100

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS laboratory, Sampling Date: October 2016-month sampling date 7/10/16 and Result date: 20/10/16)

** Bangladesh Environment Conservation Rules, 1997- Schedule 3 (Standards for inland surface water*

Comparison of the data with the surface water quality standards of the government of Bangladesh reveal the fact that water of the water bodies is suitable for Source of drinking water for supply after conventional treatment, Water usable by fisheries, Industrial process and cooling industries.

4.4 Ground Water Monitoring Result and Discussion

The results of two groundwater samples collected from the tube-wells in project site and Londa Gheya Ghat (**Table 4-4**). Shallow tube-wells (200-400 feet) of the project area contain arsenic contamination. Peoples in this area use surface water for their domestic purposes and use deep tube-wells (900-1000 feet) water for drinking.

In January 2016, Groundwater samples were collected by EQMS Consulting Limited from shallow tube wells in the project area. The result of the groundwater field samples and the GoB standards for potable water (ECR, 1997) are shown in **Table 4-4**. The concentration levels of pH, As, Fe, Chloride, Fecal Coliform, Conductivity, Lead, DO, TDS and Total Coliform for tube well were found within the acceptable limit set by the DOE, GoB for drinking water. According to the overall water quality data, practically moderate quality and quantity of ground water are available in and around the project site.

Table 4-4: Ground Water Quality Analysis Result

Sl.	Parameters	August		September		October		Bangladesh Standard
		GW1	GW2	GW1	GW2	GW1	GW2	
1.	Arsenic (As) (mg/l)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05 mg/l
2.	Chloride (Cl^-) (mg/l)	151.26	143.39	152.92	154.54	150	151.2	150-600 mg/l
3.	Conductivity (µmhos/*cm*)	215	225	280	220	109	105	-
4.	Fecal Coliform (mg/l)	0	0	0	0	0	0	0 mg/l
5.	Iron (Fe) (mg/l)	0.6	0.57	0.61	0.6	0.6	0.58	0.3-1.0 mg/l
6.	Lead (Pb) (mg/l)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05 mg/l
7.	pH	7.6	7.9	7.89	7.65	7.9	7.8	6.5-8.5
8.	Temperature (°C)	29.1	30.5	29.8	29.9	32	29.1	20-30 °C
9.	Total Coliform (mg/l)	0	0	0	0	0	0	-
10.	Total Dissolved Solids (mg/l)	530	580	270	310	540	520	1000 mg/l

Sl.	Parameters	August		September		October		Bangladesh Standard
		GW1	GW2	GW1	GW2	GW1	GW2	
11.	DO (mg/l)	7.8	7.01	7.06	5.05	5.7	5.2	5 or more

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS Consulting Limited laboratory, Date: October 2016-month sampling date 07/10/16 and analysis date 20/10/16)

All the analyzed sampled water collected from two ground water sources are well within the Bangladesh ECR Standards for drinking water.

4.5 Soil Sample Analysis Results and discussions

The soil sample was analyzed for physical and chemical characteristics including minerals, heavy metals and trace elements.

Table 4-5: Soil Quality Results in the Power Plant Site

Parameters	Soil Quality
Sample Code	SQ
pH	6.9
Salinity (dS/m)	1.5
Organic Content (%)	1.2
Calcium (mg/kg)	5.27
Magnesium (mg/kg)	4.9
Ammonium-Nitrogen (mg/kg)	28.6
Potassium (mg/kg)	0.52
Phosphorus (mg/kg)	3.86
Copper (mg/kg)	2.58
Iron (mg/kg)	48.4
Lead (mg/kg)	13.81
Arsenic (mg/kg)	0.21
Mercury (mg/kg)	BDL

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka, Sampling Date: 07/10/16 and analysis date 22/10/16)

pH level of soil: The pH of the soil samples from the site was found to be neutral as per the standard soil classification.

Organic content in soil: The organic content of soil greatly influences the plant, animal and microorganism populations in that soil. The soil of the SQ1 was found to have an organic content of 1.2%. This indicates a low agricultural value of the soils.

Soil minerals and nutrients: Nitrogen, Phosphorus and Potassium (NPK) are the main nutrients, which defines the soil fertility. Phosphorous was observed to be 3.86. The Potassium content was 0.52.

Metals in soil: Iron, Lead, Arsenic and Mercury were analyzed in the soil samples. All metals were detected in the soil samples. Environmental Conservation Rules (ECR), 1997 has no soil quality standard. Soil qualities were observed to be well below the threshold limit compared with the USEPA standard of heavy metal content in soil.

4.6 Gap Assessment to the Applicable Reference Framework

4.6.1 Applicable Standard

This section reviews the performance of the Project with respect to the Applicable Standards. In terms of IFC performance standard (PS) EQMS review the following PS standards

- PS2: Labor and Working Conditions;

The findings are categorized as per the following definitions:

Table 4-6: IFC PS Alignment Definitions

Rating	Definition
Aligned	Information available indicates that the Project fulfills the requirement and/or is aligned with intended outcome of the requirement.
Partially Aligned	Information available indicates that the Project partially fulfills the requirement and/or is partially aligned with intended outcome of the requirement.
Not Aligned	Information available indicates that the Project does not fulfill the requirement.
Insufficient Information for the assessment	There is insufficient information to make an assessment of the level of alignment.
Not Applicable	The requirements do not apply to the Project at the current time.

The gap assessment with respect to applicable standards primarily focuses on the construction phase environmental and social management and monitoring plan (ESMMP) developed as part of the ESIA study, Project level environmental, health, safety and social policies, procedures and plans as being developed by BCPCL and the EPC contractors as well as their implementation on ground. Furthermore, the aspects related to the operation phase of the Project and linked management plans have been referred in order the operation phase.

Table 4-5: Gap Assessment to the IFC Performance Standards (2012) of the Project

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
1	<u>Types of Workers Accommodation</u> There is a large variety of workers' living facilities. These can be classified in a number of ways. According to IFC's typology of workers' accommodation, in construction camp workers' camp lies in temporary and extractives in nature. Where accommodation services are provided to workers covered by the scope of this Performance Standard, the client will put in place and implement policies on the quality and management of the accommodation	Three EPC contractors' workers camps for accommodation were found in the construction area. These are 1. Sheds for NEPC staffs 2. Sheds for mechanic and engineer of NDE 3. Sub-contractor labor shed under NDE. **NEPC Chinese Employees' Accommodation** The NEPC employees (Chinese) and workers (Chinese) are housed in two separate accommodation sheds; 1. Inside the project boundary. 2. Outside the project boundary. **NDE Employees' Accommodation** Employees of NDE are housed in three separate accommodation camps adjacent to the construction camp. Sheds are known by followings; 1. 1 no shed 2. 2 no shed	**Aligned**	Clear labor construction camp guidelines to be formulated and shared with BCPCL to meet the IFC guideline on worker's accommodation. EPC contractors; NEPC, NDE and others also should take into consideration the observations highlighted in the report.	NEPC Chinese employees' new shed construction has been completed and almost 100 labors are currently living there. No additional accommodation facilities are being constructed right now.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	and provision of basic services. This also includes the applicable requirements of the IFC Guidelines on Worker Accommodation.	3. 3 no shed (Bat-tola) **Subcontractor Labors' Shed Under NDE** Presently, a number of subcontractor workers are working for making block under the NDE. Subcontractor's name is Asaduzzaman. Workers are housed in a separate accommodation camp consisting two living rooms built with GI sheets and bamboo.			
2	<u>General Construction Standards</u> *Building Construction* Quality of material, construction methods, resistance to earthquakes. *General health, safety and security* Requirements on health and safety are often an important part of building	General construction standards followed by the EPC contractors and subcontractors are describing as follows; **NEPC Chinese Employees' Accommodation** 1. Both sheds inside and outside of the project area were built with good materials as well as sheds are resistant to earthquakes. 2. Density is very high in both sheds. (60 workers against 11 rooms and 100 workers	**Partially Aligned**	BCPCL should take immediate initiative as the EPC contractors and the subcontractors must install sufficient fire extinguisher. Client organization should also monitor the facilities of EPC	Minimal improvement has been observed. Fire extinguisher hasn't been installed till now. Client Authority should meet the recommendations by the next quarter.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion. *Fire safety* Requirements on fire safety are common and are likely to apply to housing facilities of any type. This can include provision on fire extinguishers, fire alarms, number and size of staircases and emergency exits, restrictions on the use of certain building materials. *Electricity, plumbing, water and sanitation* National design and	against 13 rooms)At least 8 workers live in a single room. Double deck bunks are available in every room. Ever since no steps have been taken yet to minimize the numbers of double deck bunks. As all rooms are air conditions air volumes and ventilation are not mandatory. Concrete floors are slip resistant. Available security against intrusion was observed during visit. 3. Sufficient fire extinguishers have been found in both sheds. 4. Electricity, plumbing, water and sanitation all are designed compliance with national and IFC standard. **NDE Employees' Accommodation** 5. All sheds; 1, 2 and 3, were		contractors and subcontract labor sheds whether required facilities are provided or not. NEPC and Subcontractor (Asaduzzaman) must try to minimize the density of living rooms. NEPC should minimize the numbers of double deck bunks. NDE and subcontractor (Asaduzzaman) are suggested to install fire extinguishers in every sheds immediately.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment	built with good materials as well as sheds are resistant to earthquakes. 6. Minimal density observed. In shed 1 there are 30 security guards and work assistants against 15 rooms. In shed 2 there are 50 operators, helpers and mechanics against 12 rooms. Lastly in shed 3, there are 11 cook, supervisors, electrician etc. against 4 rooms. Air volumes and ventilation are seen sufficient. Concrete floors are slip resistant. Available security against intrusion was observed during visit. 7. No fire extinguisher was seen. 8. Electricity, plumbing, water and sanitation all are designed compliance with national and IFC standard.			

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
		Subcontractor Labors' Shed Under NDE 1. Vulnerable materials were used. 2. Highly density observed. (45 labors in 2 rooms) 3. No fire extinguisher as well as no electricity, plumbing, water and sanitation were considered within the shed. Sanitation was managed outside the shed.			
3	*General Living Facilities* Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus,	All the sheds are built considering avoiding flooding and other natural hazards. Exception was found in only subcontractor labor shed. As there is no electric supply in subcontractor labor shed, insufficient air and lighting was observed during field visit. Consequently, labors kept the lower part of the wall open. It is not an expected good condition as it may fail to prevent from natural hazards	**Aligned**	Subcontractor (Asaduzzaman) is suggested to ensure minimum clean and safe condition of the labor shed. NDE should monitor the subcontractor labor shed's cleanliness safety	Visible improvement has been observed since last quarter.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. Some requirements need to be followed; 1. Living facilities are located to avoid flooding and other natural hazards. 2. Where possible, living facilities are located within a reasonable distance from the worksite. 3. Transport from the living facilities to worksite is safe and free. 4. The living facilities are built with adequate	and harmful insects. Every Shed was built within less than one km. from the project area. Thus, transportation is not applicable in this case. Cleaning facilities were found regular basis in all workers' shed except subcontractor labors' shed.		conditions.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	materials, kept in good repair and kept clean and free from rubbish and other refuse.				
3.1	*Drainage* The presence of stagnant water is a factor of proliferation of potential disease vectors such as mosquitoes, flies and others, and must be avoided. Client need to consider 1. The building site is adequately drained to avoid the accumulation of stagnant water.	It was found that all sheds are built with proper drainage system. Stagnant water or water logging wasn't seen during field visit.	**Aligned**	BCPCL and EPC contractors should be careful as drainage system is kept in good condition and clean.	Improvement has been confirmed in all sheds.
3.2	*Heating, air conditioning, ventilation*	Air conditioning system was found in NEPC workers shed.	**Partially Aligned**	NDE should take immediate action	Not improved as compared to previous.

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	and light Heating, air conditioning and ventilation should be appropriate for the climatic conditions and provide workers with a comfortable and healthy environment to rest and spend their spare time. Followings are required 1. For facilities located in cold weather zones, the temperature is kept at a level of around 20 degrees Celsius notwithstanding the need for adequate ventilation. 2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.	All the requirements are met by the NEPC. NDE provides sufficient numbers of electric fans in every shed. Moreover, artificial lighting is available in all sheds.24 hours electricity service is not provided. In all sheds under NDE, only electricity is available from 6pm to 11pm. Rarely, workers get electric supply at dawn and afternoon for 1 hour. In the case of ventilation all sheds except subcontract workers' shed were followed the window area against room area. Subcontract workers' shed wasn't built considering the window ratio.		for ensuring 24 hours electricity supply for all workers sheds. Sufficient numbers of fans should be provided to subcontract labor shed. Proper lighting also should be ensured. Subcontractor (Asaduzzaman) should be notified by the NDE to fulfill the requirement.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	3. Both natural and artificial lighting are provided and maintained in living facilities. It is best practice that the window area represents not less than 5% to 10% of the floor area. Emergency lighting is provided.				
3.3	*Water* Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers should always have easy access to a source of clean water. An adequate supply of potable water must be available in the same buildings where	Jar water is provided in all sheds as drinking water. There is a big covered tank in every shed where jar water is poured. Workers collect drinking water as their need. Adequate Tap water and tube-well water are available in every worker's shed for cleaning and other purposes. In subcontract labor's shed workers drink tube-well's water.	**Aligned**	Jar water may not be the permanent solution for pure drinking water. So, BCPCL is suggested to take initiative for ensuring permanent pure drinking water supply. As numbers of workers are increasing, water treatment plant should be initiated	Improved in all cases but should follow the recommendations part.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	bedrooms or dormitories are provided. Drinking water must meet local or WHO drinking water standards and water quality must be monitored regularly. Depending on the local context, it could either be produced by dedicated catchment and treatment facilities or tapped from existing municipal facilities if their capacity and quality are adequate. Following requirements should be considered. 1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending			as soon as possible. BCPCL is suggested to take it into account.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	on climate, weather conditions and accommodation standards, 80 to 180 liters per person per day are available. 2. Drinking water meets national/local or WHO drinking water standards. 3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or contaminated.				
3.4	*Wastewater and solid waste* Wastewater treatment and effluent discharge as well as solid waste treatment and disposal must comply with local or World Bank effluent discharge standards and be	Rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand were not found sheds. Waste bucket or dust bin was found in every labor shed. It is observed that wastewater, food and any other waste materials were	**Partially Aligned**	Proper waste management plan within project area should be employed. Separate containers for different types of waste should be	In previous quarter report, It was suggested to meet recommendations, but no seeming improvement has been observed. Concernedauthority's utmost attention is required regarding that issue.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Depending on the local context, treatment and disposal services can be either provided by dedicated or existing municipal facilities. As follows 1. Wastewater, sewage, food and any other waste materials are adequately discharged, in compliance with local or World Bank standards – whichever is more stringent – and	not adequately discharged. Waste is disposed adjacent open places. Chance of pollution is so high.		installed. BCPCL, EPC contractors and subcontractors should be concerned about disposing waste. Proper planning is required. Client should follow the IFC guidelines and maintain the requirements described in this section.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	without causing any significant impacts on camp residents, the biophysical environment or surrounding communities. 2. Specific containers for rubbish collection are provided and emptied on a regular basis. Standards range from providing an adequate number of rubbish containers to providing leak proof, non-absorbent, rust and corrosion-resistant containers protected from insects and rodents. In addition it is best practice to locate rubbish containers 30 metres from each shelter on				

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to be determined based on temperatures and volumes generated) to avoid unpleasant odours associated with decaying organic materials. 3. Pest extermination, vector control and disinfection are carried out throughout the living facilities in compliance with local requirements and/or good practice. Where warranted, pest and vector monitoring should be performed on a regular basis.				
4	*Room and Dormitory Facilities*	*NEPC Chinese Employees Room and Dormitory Facilities*	**Partially Aligned**	Subcontractor (Asaduzzaman)	More Improvement is required.

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of	During field visit, facilities observed 1. Rooms are kept in good conditions. 2. Rooms are built with easily cleanable flooring. 3. Sanitary facilities are located within the same buildings. 4. Followed standard flooring range (4 to 5.5 sq. metres) and minimum ceiling height (2.10 metres) 5. Standard range of room sharing is not considered. 6 to 8 persons are sharing each room. Double deck bunks are applied for all workers. 6. Lockable door and adequate furniture are provided. *NDE Mechanics and Engineers' Room Facilities* 1. Rooms are kept in good conditions. 2. Rooms are built with easily cleanable flooring. 3. Sanitary facilities are located within the same buildings. 4. Followed standard flooring range		should be guided by NDE for maintaining standard rooming facilities. BCPCL may monitor the rooming facilities periodically.	

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	privacy. Resorting to dormitories should be minimised and single or double rooms are preferred. Dormitories and rooms must be single-sex. Following benchmarks need to be followed. 1. Rooms/dormitories are kept in good condition. 2. Rooms/dormitories are aired and cleaned at regular intervals. 3. Rooms/dormitories are built with easily cleanable flooring material. 4. Sanitary facilities are located within the same buildings and provided separately for men and women. 5. Density standards are expressed either in term of minimal	(4 to 5.5 sq. metres) and minimum ceiling height (2.10 metres) 5. Standard range of room sharing is considered. 4 to 5 workers share single room. 6. Lockable door and adequate furniture are provided. *Subcontractor Labour Shed's Room Facilities* 1. Rooms are not kept in good conditions. 2. Easily cleanable flooring wasn't considered. 3. Sanitary facilities were built separately. (10 metres away from the shed). Privacy and cleaning requirements were not followed. 4. Followed standard flooring range (4 to 5.5 sq. metres) and minimum ceiling height (2.10 metres) 5. Standard range of room sharing is not considered. (more than 30 workers live in a 42 square meters room) 6. Lockable door and adequate			

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	volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic metres (volume) or 4 to 5.5 square metres (surface). 6. A minimum ceiling height of 2.10 metres is provided. 7. In collective rooms, which are minimised, in order to provide workers with some privacy, only a reasonable number of workers are allowed to share the same room. Standards range from 2 to 8 workers. 8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant. 9. There should be mobile partitions or	furniture are not provided.			

Sl#	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	curtains to ensure privacy. 10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light. 11. Separate sleeping areas are provided for men and women, except in family accommodation.				

4.1	*Bed Arrangements and Storage Facilities* The provision of an adequate numbers of beds of an appropriate size is essential to provide workers with decent, safe and hygienic conditions to rest and sleep. Here again, particular attention should be paid to privacy. Consideration should be given to local customs so beds could be replaced by hammocks or sleeping mats for instance. Benchmarks are... 1. A separate bed for each worker is provided. The practice of "hot-bedding" should be avoided. 2. There is a minimum space between beds of	*NEPC Chinese Employees Bed Arrangements and Storage Facilities* During field visit, facilities observed 1. A separate bed for each worker is provided. 2. Minimum space between beds (1 metre) is not maintained all the time. 3. All the beds are double deck bunks. 4. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding. 5. Standard requirement for storage facility was absent. (475-litre big lockers and 1 metre of shelf unit) 6. Separate storage for work boots and other personal protection equipment wasn't visible during field visit. *NDE Mechanics and Engineers' Bed Arrangements and Storage Facilities* 1. A separate bed for each	**Partially Aligned**	NEPC should take necessary steps reducing the numbers of double deck bunks. NEPC, NDE and Subcontractor are suggested to provide storage facilities to all workers. EPC contractors (NDE, NEPC) should follow the requirements as much as possible considering national and local context. Subcontract labor shed need to be monitored periodically whether all requirements are considered.	NDE Should monitor the subcontract labor shed and improvement is required in some specific issues.

1 metre. 3. Double deck bunks are not advisable for fire safety and hygiene reasons, and their use is minimised. Where they are used, there must be enough clear space between the lower and upper bunk of the bed. Standards range from to 0.7 to 1.10 metres. 4. Triple deck bunks are prohibited. 5. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding. 6. Bed linen is washed frequently and applied with repellents and disinfectants where conditions warrant (malaria). 7. Facilities for the storage of personal belongings for workers are provided.	worker is provided. 2. Minimum space between beds (1 metre) is not maintained all the time. 3. Double deck bunk and triple deck bunk were not seen during observation. 4. Each worker is provided with a comfortable mattress, pillow, cover and clean bedding. 5. Standard requirement for storage facility was absent. (475-litre big lockers and 1 metre of shelf unit) 6. Separate storage for work boots and other personal protection equipment wasn't visible during field visit. *Subcontractor Labour Shed's Bed Arrangements and Storage Facilities* 1. A separate bed for each worker is provided. 2. Minimum space between beds (1 metre) is not maintained. 3. Double deck bunk and triple deck bunk were not seen during observation. 4. Worker shade not provided			

	Standards vary from providing an individual cupboard for each worker to providing 475-litre big lockers and 1 metre of shelf unit. 8. Separate storage for work boots and other personal protection equipment, as well as drying/airing areas may need to be provided depending on conditions.	with a comfortable mattress, pillow, cover and clean bedding. 5. There was no storage facility. (475-litre big lockers and 1 metre of shelf unit) 6. There was no separate storage facility for work boots and other personal protection equipment.		

5	*Sanitary and Toilet Facilities* It is essential to allow workers to maintain a good standard of personal hygiene but also to prevent contamination and the spread of diseases which result from inadequate sanitary facilities. Sanitary and toilet facilities will always include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities should be kept in a clean and fully working condition. Facilities should also be constructed of materials that are easily cleanable and ensure privacy. Sanitary and toilet facilities are never shared between male and female residents,	*NEPC Chinese Employees' Sanitary and Toilet Facilities* 1. Sanitary and toilet facilities are constructed with easily cleanable materials. 2. Sanitary and toilet facilities are cleaned frequently and kept in working condition. 3. Adequate privacy 4. Sanitary and toilet facilities are not shared between men and women. One female employee was seen and her sanitary and toilet facility are attached to her living room. *NDE Mechanics and Engineers' Sanitary and Toilet Facilities* 1. Sanitary and toilet facilities are constructed with easily cleanable materials. 2. Cleaned frequently and kept in working condition. 3. Moderate privacy was observed. Ceiling was absent. *Subcontractor Labor Shed's*	**Partially Aligned**	NDE should monitor the subcontractor labors' shed. Subcontract labor shed's toilet facilities are really a matter of concerned issue. Proper monitoring is required for making subcontractor follow the standard requirements. Privacy and ceiling conditions are needed to be improved for all sheds.	Improvement hasn't been observed in the case of subcontract labors' shed. Authority should pay attention.

except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women.Required benchmarks are… 1. Sanitary and toilet facilities are constructed of materials that are easily cleanable. 2. Sanitary and toilet facilities are cleaned frequently and kept in working condition. 3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors. 4. Sanitary and toilet facilities are not shared between men and women, except in family	*Sanitary and Toilet Facilities* 1. Did not construct with easily cleanable materials. 2. Not cleaned frequently and kept in working condition. 3. Permeable privacy. Most of the doors were not working and remained open while field visit conducted. Ceiling was absent too. Condition would be worse in rainy season.			

	accommodation.			
5.1	*Toilet Facilities* Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease. Benchmarks should be followed. 1. An adequate number of toilets are provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons. For urinals, usual standards are 1 unit to 15 persons. 2. Toilet facilities are conveniently located and easily accessible. Standards range from 30 to 60 metres from rooms/dormitories. Toilet rooms shall be located so as to be accessible without any	*NEPC Chinese Employees' Toilet Facilities* 1. Standards range. In one shed there are 4 toilets for 60 workers. In another sheds, 20 toilets for 100 workers. 2. Toilet facilities are conveniently located and easily accessible. 3. Good ventilation and sufficient hand wash basins are provided. In one shed there are 5 basins for 60 workers. In another shed there are 15 basins for 100 workers. *NDE Mechanics and Engineers' Toilet Facilities* 1. Standards range (1 unit to 15 persons to 1 unit per 6 persons and for urinals, usual standards are 1 unit to 15 persons) was considered providing toilet and urinal	**Aligned**		Significantly Improved

individual passing through any sleeping room. In addition, all toilet rooms should be well-lit, have good ventilation or external windows, have sufficient hand wash basins and be conveniently located. Toilets and other sanitary facilities should be ("must be" in cold climates) in the same building as rooms and dormitories.	facilities. (6 toilets are provided for more than 40 persons) 2. Toilet facilities are conveniently located and easily accessible. 3. Good ventilation and onehandwashbasins are provided. *Subcontractor Labour Shed'sToilet Facilities* 1. Comparing to the standard range significant number of toilets are provided. (4 for 45 workers) 2. Toilet facilities are conveniently located and easily accessible. 3. Sufficient hand wash basins are not provided but workers can wash their hands easily from tap water.			

5.2	*Shower/Bathrooms and Other Sanitary Facilities* Showers/bathrooms and other sanitary facilities Hand wash basins and showers should be provided in conjunction with rooms/dormitories. These facilities must be kept in good working condition and cleaned frequently. The flooring for shower facilities should be of hard washable materials, damp-proof and properly drained. Adequate space must be provided for hanging, drying and airing clothes. Suitable light, ventilation and soap should be provided. Lastly, hand washing, shower and other sanitary facilities should be located	*NEPC Chinese Employees' shed* 1. Shower/bathroom flooring is made of concrete. 2. Hand wash facilities including basin and soap were found adequate. 3. Adequate numbers of shower/bathroom facilities are provided. (within the standard limit) 4. Conveniently located. *NDE Mechanics and Engineers' Shed* 5. Concrete floor 6. Hand wash facilities including basin and soap were found inadequate comparing to standards. (One unit was visible during field visit) 7. One common shower place was found. One tube-well is set up there. Moreover 6 shower rooms are also available. Comparing to the standard range itsenough. 8. Conveniently located.	**Partially Aligned**	Subcontractor labors' shed is needed to be improved. Separate showering place should be provided with minimum privacy.	Significant improvement has been observed. Additionally, more improvements are recommended in subcontractor labors shed.

within a reasonable distance from other facilities and from sleeping facilities in particular. Benchmarks 1. Shower/bathroom flooring is made of anti-slip hard washable materials. 2. An adequate number of handwash facilities is provided to workers. Standards range from 1 unit to each 15 persons to 1 unit per 6 workers. Handwash facilities should consist of a tap and a basin, soap and hygienic means of drying hands. 3. An adequate number of shower/bathroom facilities are provided to workers. Standards range from 1 unit to 15 persons to 1 unit per 6 persons.	*Subcontractor Labours' Shed* 1. Hand wash facilities are absent there. 2. They do their shower in an open place. They get water by a pipe line. There is no privacy. 3. Conveniently located.			

	4. Showers/bathrooms are conveniently located. 5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.				
6	*Canteen, Cooking and Laundry Facilities* Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. Adequate canteen, cooking and laundry facilities and equipment should also be provided. When caterers are contracted to manage kitchens and canteens, special attention should be paid to ensure that contractors take into account and implement the benchmarks below and that adequate	*NEPC Chinese Employees' Canteen, Cooking and Laundry Facilities* 1. Canteen and cooking facilities are built in adequate and easy to clean materials. 2. Found clean and sanitary condition. 3. Laundry facilities were visible. *NDE Mechanics and Engineers' Canteen, Cooking and Laundry Facilities* *1.* Canteen and cooking facilities are built in adequate and easy to clean materials. 2. Moderately clean and sanitary condition found. 3. Laundry facilities were not visible. *Subcontractor Labors Shed*'s *Canteen,*	**Partially Aligned**	Cleanliness should be ensured.	Significantly Improved

reporting and monitoring mechanisms are in place. When workers can individually cook their meals, they should be provided with a space separate from the sleeping areas. Facilities must be kept in a clean and sanitary condition. In addition, canteen, kitchen, cooking and laundry floors, ceilings and walls should be made of easily cleanable materials. 1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials. 2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition. 3. If workers can cook their own meals,	*Cooking and Laundry Facilities* 1. There was no visible canteen. They have their meal in living room. Cooking facilities were very poor. Cooking room is adjacent to living room. 2. Unhygienic environment of cooking room. 3. No laundry facilities.		

	kitchen space is provided separate from sleeping areas.			
6.1	*Laundry Facilities* Providing facilities for workers to wash both work and non-work related clothes is essential for personal hygiene. The alternative is for the employer to provide a free laundry service. Benchmarks are… 1. Adequate facilities for washing and drying clothes are provided. Standards range from providing sinks or tubs with hot and cold water, cleaning soap and drying lines to providing washing machines and dryers. 2. When work clothes	National standard applicable in all sheds. Moreover, NEPC manage international standards for its workers.	**Aligned**	Improved

	are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.				
6.2	*Canteen and Cooking Facilities* Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements. 1. Canteens have a reasonable amount of space per worker. Standards range from 1 square metre to 1.5 square metres. 2. Canteens are adequately furnished. Standards range from providing tables, benches, individual	*NEPC Chinese Employees' Canteen Cooking Facilities.* 1. Adequate space. 2. Tables, benches, individual drinking cups and plates are available. 3. Places for food preparation are designed to permit good food hygiene practices. 4. Sufficient number of washbasins designated for cleaning hands. 5. Wall surfaces adjacent to cooking areas are made of fire resistant materials. 6. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided. 7. Food waste and other refuse are seen to be deposited in	**Partially Aligned**	Subcontractor labors are deprived of all facilities. NDE should monitor that issue. Subcontractor (Asaduzzaman) should meet the requirements.	Improved, but more improvements are required.

drinking cups and plates to providing special drinking fountains. 3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation. 4. Kitchens are provided with facilities to maintain adequate personal hygiene including a sufficient number of washbasins designated for cleaning hands with clean, running water and materials for hygienic drying. 5. Wall surfaces adjacent to cooking areas are made of fire resistant materials. Food preparation tables are also	waste bin and removed from the kitchen frequently to avoid accumulation. *NDE Mechanics and Engineers' Canteen Cooking Facilities.* 1. Adequate space. 2. Tables, benches, individual drinking cups and plates are available. In 2 no shed of NDE, lack of plates and glass observed. Workers living in 2 no shed also validate the observation. 3. Places for food preparation are designed to permit good food hygiene practices. 4. Washbasins for cleaning hands were provided. 5. wall surfaces adjacent to cooking areas are made of fire resistant materials. 6. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided. 7. Food waste and other refuses are not seen to be deposited separately. *Subcontractor Labours Shed's Canteen*			

	equipped with a smooth durable washable surface. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures and all walls and ceilings have a smooth durable washable surface. 6. All kitchen floors, ceiling and wall surfaces adjacent to or above food preparation and cooking areas are built using durable, non-absorbent, easily cleanable, non-toxic materials. 7. Wall surfaces adjacent to cooking areas are made of fire resistant materials. Food preparation	*Cooking Facilities.* 1. No space for canteen. Workers have their meal in their living place. 2. No visible furniture was found. Plates and cup were found. 3. No washbasin 4. Wall surfaces of cooking place aren't fire resistant. 5. No adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided. 6. Food waste and other refuse are seen not to be deposited properly.		

	tables are equipped with a smooth, durable, easily cleanable, non-corrosive surface made of non-toxic materials. Lastly, in order to enable easy cleaning, it is good practice that stoves are not sealed against a wall, benches and fixtures are not built into the floor, and all cupboards and other fixtures have a smooth, durable and washable surface. 8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided. 9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to			

	avoid accumulation.				
7	*Standards for Nutrition and Food Safety* When cooking for a number of workers, hygiene and food safety are absolutely critical. In addition to providing safe food, providing nutritious food is important as it has a very direct impact on workers' productivity and wellbeing. An ILO study demonstrates that good nutrition at work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs. 1. The WHO 5 keys to safer food or an equivalent process is implemented.	Meals are not planned by trained nutritionist. In the case of all sheds separate cooks make meals. Food and meal are selected on the basis of workers choice. All requirements of the WHO 5 keys to safer food are not maintained in all the sheds. Most vulnerable situation found in subcontract labor shed. All requirements of WHO are absent there. Foods are served according to workers' different cultural and religious backgrounds.	**Partially Aligned**	The WHO 5 keys to safer food can be followed emphasizing workers' health. Concerned authority should make management plan and implement as well as monitor it regular basis.	Satisfactory improvement wasn't observed compared to previous quarter.

	2. Food provided to workers contains an appropriate level of nutritional value and takes into account religious/cultural backgrounds; different choices of food are served if workers have different cultural/ religious backgrounds. 3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.				
8	*Medical facilities* Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. The availability or level of medical facilities provided in workers' accommodation is	It is a matter of great concern that no client provided medical facilities were found during the field visit. Moreover, no medical staffs/workers were employed and no first aid kits were found. There are two village doctors' dispensaries adjacent to the project area. Doctors keep medicine and first aid kits if any urgent accident occurs. But their first aid kits are not sufficient comparing to the volume of workers.	**Not Aligned**	First aid facilities along with medical facilities with sufficient health services are immediately required. BCPCL should take it into account and make all EPC contractors to follow the requirements.	No initiatives have been taken compared to previous field visit.

likely to depend on the number of workers living on site, the medical facilities already existing in the neighboring communities and the availability of transport. However, first aid must always be available on site. *First aid facilities* Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones. *Other medical facilities* Depending on the number of workers living on site and the medical services offered in the surrounding communities, it is important to provide workers with	Village doctors' dispensaries don't remain open 24/7, thus in emergency time workers might not get health facility instantly. Both NEPC and NDE have health and safety officer but no monthly incident report is kept.		

additional medical facilities. Special facilities for sick workers and medical services such as dental care, surgery, a dedicated emergency room can, for instance, be provided. 1. A number of fist aid kits adequate to the number of residents are available. 2. First aid kits are adequately stocked. Where possible a 24/7 fist aid service/facility is available. 3. An adequate number of staff/workers are trained to provide first aid. 4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are				

	provided (nurse rooms, dental care, minor surgery).		

	Leisure, Social and Telecommunication Facilities Basic leisure and social facilities are important for workers to rest and also to socialize during their free time. This is particularly true where workers' accommodation is located in remote areas far from any communities. Where workers' accommodation is located in the vicinity of a village or a town, existing leisure or social facilities can be used so long as this does not cause disruption to the access and enjoyment of local community members. But in any case, social spaces should also be provided on site. Exercise and recreational facilities will increase workers welfare and reduce the impact of the presence of workers in the surrounding communities. In	Place for rest and religious observance were found. No visible recreational facilities were found.	**Not Aligned**	Authority may consider managing recreational facilities for workers. Providing TV, Caram board, chess board in every shed may be a good choice. Establishing separate club for workers is also a good suggestion. EPC contractors; NDE and NEPC, are suggested to follow the requirement.	No visible improvement

10	*Health and Safety on Site* The company or body in charge of managing the workers' accommodation should have the prime responsibility for ensuring workers' physical wellbeing and integrity. This involves making sure that the facilities are kept in good condition (ensuring that sanitary standards or fie regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented. 1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully	Workers were found using small scale of PPE during work. In some cases, workers were found not using gloves or boots or helmets, which may occur accident any time. Except NEPC no fire extinguisher practice was observed. Following observation were also noted 1. No designed health and safety management plans including electrical, mechanical, structural and food safety have been implemented. 2. No records are kept on outbreak of any contagious diseases, food poisoning and other important casualties. 3. No trained staffs/workers for providing first aid. 4. No specific fire safety plan is prepared except NEPC. 5. No client provided medical facilities were found. 6. No prepared emergency plans on health and fire safety was observed.	**Partially Aligned**	Proponent BCPCL and EPC contractors; NDE and NEPC, are suggested to meet the requirements. Immediate attentions are required or epidemic may occur in any time. Training on using PPE is also required for workers.	No visible improvement has been observed.

	designed and are implemented. 2. The person in charge of managing the accommodation has a specific duty to report to the health authorities the outbreak of any contagious diseases, food poisoning and other important casualties. 3. An adequate number of staff/workers is trained to provide first aid. 4. A specific fire safety plan is prepared, including training of fire wardens, periodic testing and monitoring of fire safety equipment and periodic drills. 5. Guidance on the detrimental effects of the abuse of alcohol and drugs and other			

potentially harmful substances and the risk and concerns relating to HIV/AIDS and of other health risk related activities is provided to workers. It is best practice to develop a clear policy on this issue. 6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets. 7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers. 8. Emergency plans on health and fire safety are prepared. Depending on the local context, additional emergency plans are			

	prepared as needed to handle specific occurrences (earthquakes, floods, tornadoes).				
11	*Security of Workers' accommodation* Ensuring the security of workers and their property on the accommodation site is of key importance. To this end, a security plan must be carefully designed including appropriate measures to protect workers against theft and attacks. 1. A security plan including clear measures to protect workers against theft and attack is implemented. 2. A security plan including clear policies on the use of force has been carefully	Proponent BCPCL as well as EPC contractors; NDE and NEPC have separate security plan and numbers of guards. As per the plan, security guards were seen doing their duty during field visit. A good numbers of members of Ansar VDP, 22 in numbers, are working currently in the project site. Routinely, 2 Ansars guard each shed.	**Aligned**		Improvement has been found compared to previous report.

	designed and is implemented. 3. Security staff has been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staffs from both genders are recruited. 4. Security staff has a clear mandate and have received clear instruction about their duties and responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers. 5. Security staffs have received adequate training in dealing with domestic violence and the use of force. 6. Security staffs have a good understanding about the importance			

	of respecting workers' rights and the rights of the communities. 7. Body searches are only allowed in specific circumstances and are performed by specially trained security staff using the least-intrusive means possible. Pat down searches on female workers can only be performed by female security staff. 8. Security staff adopt an appropriate conduct towards workers and communities. 9. Workers and members of the surrounding communities have specific means to raise concerns about security arrangement and staff.			
12	*Grievance Mechanism*	There is no formal on-site grievance mechanism for workers.	**Partially aligned**	The Project should establish channels Unchanged condition has been found in

Grievance mechanism for workers where they can raise reasonable workplace concerns. 1. Mechanisms for workers' consultation have been designed and implemented. It is best practice to set up a review committee which includes representatives elected by workers. 2. Processes and mechanisms for workers to articulate their grievances are provided to workers. Such mechanisms are in accordance with PS2/PR2. 3. Workers subjected to disciplinary proceedings arising from behavior in the accommodation should have access to a fair and transparent	Workers in proponent and EPC contractors convey their grievance to their own upper designated workers. During informal meetings with workers, they confirmed that they are quite happy with the existing informal mechanism.		for management and workers to communicate and for the workers to place their concerns as well as suggestions. The grievance process should be made accessible for construction workforce and should enable workforce to raise anonymous complaints. The grievance records should be properly documented, tracked and reviewed for redressal of the Grievances.	comparison to the previous report.

	hearing with the possibility to contest decisions and refer the dispute to independent arbitration or relevant public authorities. 4. In case conflicts between workers themselves or between workers and staff break out, workers have the possibility of easily accessing a fair conflict resolution mechanism. 5. In cases where more serious offences occur, including serious physical or mental abuse, there are mechanisms to ensure full cooperation with the police authority (where adequate).			

Chapter 5

5. Conclusion

The Project is now at the site development stage and various development activities are in progress. The land development activities of the Project area for are ongoing. There are some environmental compliance measures in the environmental management plan that should be at the place during this pre-construction stage. This quarterly environmental monitoring report, some recommendations have been made and it is important to consider these measures to properly implement the proposed Environmental Management Plan.

Annex-A: Environmental monitoring Photographs

Ambient Air sampling at Construction Camp

Ambient Air sampling at Londa Kheya Ghat

Ambient Air sampling at Dhankhali Union Complex

Ambient Air sampling at Tiakhali village

Ambient Air sampling at Lalua village

Ambient Air sampling at Nishanbari village

Noise Level Monitoring at Char Nishanbari Mosque

Noise Level Monitoring at 154 no. Char Nishanbari Primary School

Noise Level Monitoring at Rafique Mia's House, Nishanbari Village

Noise Level Monitoring at Londa Kheya Ghat

Noise Level Monitoring at Akber Mia's House, Lalua

Noise Level Monitoring at Salam Uddin's House, Tiakhali village

Noise Level Monitoring at Monir Hossain's House, Nishanbari village	Noise Level Monitoring at Sabder Ali's House, Madhupara Village
	
Ground Water collection at Project Area	**Ground Water collection at Londa kheya Ghat**
	
Surface Water Collection at Rabnabadh Channel	**Surface Water Collection at Andharmanik River**
	
Soil Sample Collection at Project Site	**Ground Water Collection at Project Site**

Ground water quality testing at field

Ground water quality testing at field

Ground water quality testing at field

Water Collection at Andharmanik River

Surface water quality testing at field

Surface water quality testing at field

Surface water quality testing at field

Annex-B: Health safety monitoring Photographs

Working with PPE

Kitchen Condition

Canteen Condition

Basin

Sanitary conditions

NDE Workers' Shed

Initial meeting with Health and Safety officer of NDE	Waste disposed adjacent places
	
Subcontractor labors working without PPE	**Subcontractor Labor's Shed**
	
Subcontractor Labor's kitchen	**Subcontractor Labor's Toilet Conditions**
	
Subcontractor Labor's Toilets	**Subcontractor labors using brick instead of pillow**

	
Workers under NEPC using PPE	**Meeting with Health and Safety Officer of NEPC**
	
NEPC Workers Shower and Laundry Facilities	**NEPC labors toilets facility**
	
Toilet facility (NEPC)	**Without Safety Boot (NEPC workers)**
	
Bericades for keeping hazardous	**Distinct Point for Smoking**