

ENVIRONMENTAL MONITORING OF PAYRA 1320 MW ULTRA SUPER  
CRITICAL COAL BASED THERMAL POWER PLANT

QUARTERLY MONITORING REPORT

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CHINA ENERGY ENGINEERING GROUP  
NORTHEAST NO.1 ELECTRIC POWER CONSTRUCTION CO. LTD.  
(NEPC)

SUBMITTED BY:



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### Abbreviations and Acronyms

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ADB	Asian Development Bank
AQ	Air Quality
BBS	Bangladesh Bureau of Statistics
BCPCL	Bangladesh-China Power Company (Pvt.) Limited
BIWTA	Bangladesh Inland Water Transport Authority
BMD	Bangladesh Meteorological Department
BOD	Biological Oxygen Demand
BPDB	Bangladesh Power Development Board
BWDB	Bangladesh Water Development Board
CEGIS	Center for Environmental and Geographic Information Services
COD	Chemical Oxygen Demand
DGPS	Differential Global Positioning System
DO	Dissolve Oxygen
DoE	Department of Environment
DPHE	Department of Public Health Engineering
DSS	Dust Suppression System
DTW	Deep Tube Well
EC	Electric Conductivity
ECA	Environment Conservation Act / Ecological Critical Area
ECC	Environmental Clearance Certificate
ECR	Environment Conservation Rules
EMP	Environmental Management Plan
KV	Kilo Volt
KWh	Kilo Watt hour
MoA	Ministry of Agriculture
MoC	Ministry of Communication
MoCAT	Ministry of Civil Aviation and Tourism
MoEF	Ministry of Environment and Forestry
MoFL	Ministry of Fisheries and Livestock
MoPEMR	Ministry of Power, Energy and Mineral Resources
MoWR	Ministry of Water Resources

MoU	Memorandum of Understanding
MPA	Mongla Port Authority
MW	Mega Watt
NEMAP	National Environmental Management Action Plan
NEP	National Environmental Policy
NO <sub>x</sub>	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

## Chapter1

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### 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 make 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 million-kilowatt hour (MkWh) net energy (10,804 MkWh in public sector and 12,399 MkWh in 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 million-kilowatt hour (MkWh) and in FY 2011-12, 35,199 million-kilowatt 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 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, 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 new Payra 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 **(Source: adopted from LGED district map)**

Figure 1-1and (**Source: *adopted from LGED upazila map***)

Figure 1-2. The Payra 1320 MW power plant is a joint venture of North-West Power Generation Company Limited (NWPGL) 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.

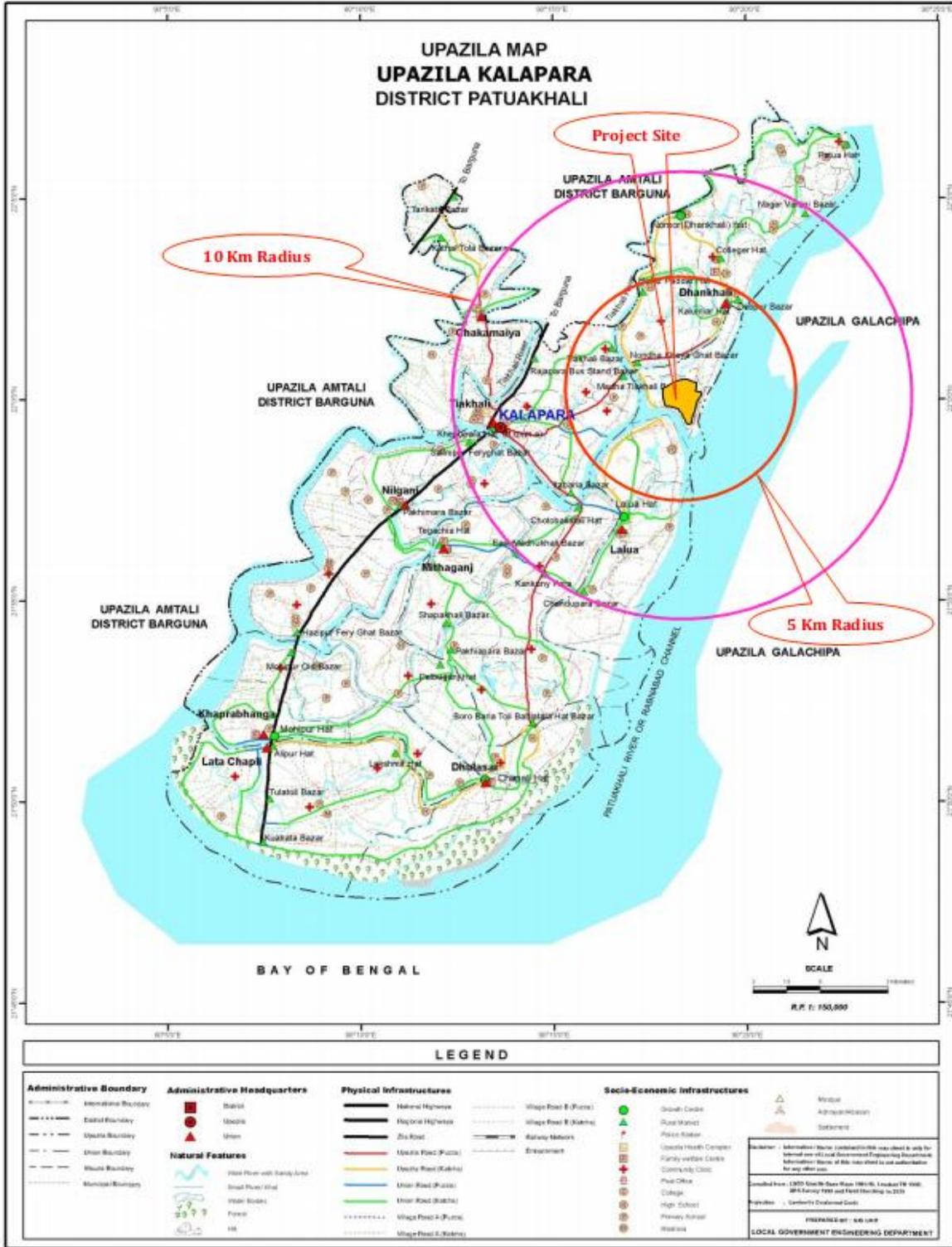
Proper location /siting, its process and waste abatement and control are very important for an industry to be environmentally sound. In tackling environmental problems of the country, various environmental legislations have been made time to time in Bangladesh. Here, like in some other countries environmental 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 corner stone 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 monthly environmental monitoring resultsof 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 1300MW 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 to the local people and improve transportation system in the project area, which will ultimately play an important role in poverty reduction and develop 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 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 payrapower 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 Bangladesh	a. The Public Procurement Regulations, 2003 and Revisions thereafter

Issue	Bangladeshi Legislation or Regulation
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 & 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 done up to 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 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
<b>Agricultural Policy, 1999</b>			
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 variety. 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
<b>Environment Policy 1992</b>			
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
Environment	Section 3.2.4 Industry; Encourage	Bangladesh-China Power Company (Pvt.)	MoEF, MoFL, DoE

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
Policy 1992	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.	Limited should use economically viable and environmental friendly technology Provide analysis of alternatives in the EIA report	
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
Environment Policy 1992	Section 3.4.5 Energy and Fuel Conserve country's fossil fuel reserves and	Bangladesh-China Power Company (Pvt.) Limited should: Consider the provision for long term aspects	MoPEMR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
	renewable sources of energy		
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 programme in all relevant development activities	Bangladesh-China Power Company (Pvt.) Limited should: Carry out afforestation in and around the project site	MoEF, FD
Environment Policy 1992	Section 3.7.3 Forest; Stop shrinkage and depletion of forest land and forest resources	Bangladesh-China Power Company (Pvt.) Limited should: Take appropriate measures minimize the deforestation around the site	MOEF, FD
Environment Policy 1992	Section 3.7.5 Forest Conserve wildlife and biodiversity	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
		to prevent loss of the biodiversity and undertake compensatory measures in case of inevitable damage if any	
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 the 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
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	Bangladesh-China Power Company (Pvt.) Limited should: Need to consider this provision while importing and transporting	MoEF, MoC, Roads and Highway Department, Port Authority,

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
	environment	the coals	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
<b>Energy Policy 1996</b>			
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 1996	Section 1.9 Environmental Conservation issues 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.	Bangladesh-China Power Company (Pvt.) Limited Should: Need to consider this Provision during their project cycle.	MoPEMR
Energy Policy	Section 7.3 Technology Assessment,	Bangladesh-China Power Company (Pvt.)	MoPEMR

<b>Title and Scope</b>	<b>Relevant Provisions to the Project Activities</b>	<b>Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)</b>	<b>Requirement of BCPCL</b>
1996	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	Limited should: Consider these (Mentioned) factors while selecting the technologies.	
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 fuel wood	Bangladesh-China Power Company (Pvt.) Limited should: Use materials other than fuel wood	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
<b>Land Use Policy 1994</b>			
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
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	Section 2 (i) Objective; Prevent river bank	Bangladesh-China Power Company (Pvt.)	MoFL and MoWR

<b>Title and Scope</b>	<b>Relevant Provisions to the Project Activities</b>	<b>Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)</b>	<b>Requirement of BCPCL</b>
Policy 2010	erosion	Limited should: Prevent activities that may cause river bank erosion	
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
<b>The Forest Policy 1994</b>			
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) on 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 reforestation of forests cleared during the project activity	MoEF, FD
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
<b>The Tourism Policy 1992</b>			

<b>Title and Scope</b>	<b>Relevant Provisions to the Project Activities</b>	<b>Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)</b>	<b>Requirement of BCPCL</b>
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
<b>The Fisheries Policy 1998</b>			
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 1998	9.10.2 Control activities which may have adverse effect on the fish resources	Bangladesh-China Power Company (Pvt.) Limited must: Control the activities which may have adverse impact on the fish resources	MoFL, Fisheries 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
<b>The Water Policy 1999</b>			
Water Policy 1999	Section 4.8 Water and Industry; a) Zoning regulation will be established for location of	Bangladesh-China Power Company (Pvt.) Limited must: Follow the zoning regulation	MoFL, MoWR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
	new industries in consideration of fresh and safe water availability and effluent discharge possibilities.	of the Government	
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 them.	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, heels, khals, tanks, etc. affected by man-made Intervention or other causes.	Bangladesh-China Power Company (Pvt.) Limited should: Consider this provision while implementing the project	MoWR
Water Policy 1999	i) 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
<b>The Industrial Policy 1999</b>			
Industrial Policy 1999	Objective (p); To take appropriate measures for preventing	Bangladesh-China Power Company (Pvt.) Limited need to consider the provision	DoE, MoPEMR

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
		during implementation of the project activities	
<b>The Housing Policy 1999</b>			
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/programme	Bangladesh-China Power Company (Pvt.) Limited should: Adopt the principle during land acquisition	MoHPW Bangladesh-China Power Company (Pvt.) Limited
<b>Biodiversity Strategy and Action Plan (BSAP)</b>			
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: <ul style="list-style-type: none"> <li>• Create an inventory of all the species of flora and fauna in the area.</li> <li>• Conduct EIA and SIA reports.</li> </ul>	MoEF/ DoE
BSAP	Strategy 3: Restore ecosystems and rehabilitate endangered species	Bangladesh-China Power Company (Pvt.) Limited should: <ul style="list-style-type: none"> <li>• Construct ETP to restrict amount of pollution</li> </ul>	MoEF/ DoE

Title and Scope	Relevant Provisions to the Project Activities	Obligations of Bangladesh-China Power Company (Pvt.) Limited (BCPCL)	Requirement of BCPCL
BSAP	Strategy 10: Ensure wise use of wetland resources environment pollution and maintaining the ecological balance	<ul style="list-style-type: none"> <li>• Create buffer zones in and around the project site</li> <li>• Carry on afforestation and reforestation activities on abandoned site</li> </ul> Bangladesh-China Power Company (Pvt.) Limited should: Consider the provision while implementing the project.	MoWR/ MoEF

## **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 has 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.

	<b>Legislation</b>	<b>Enforcing agency</b>
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 Act 1993	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

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### 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 MWpower 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 **Error! Reference source not found.** and the geographic location of the Payra 1320 MW site has been shown in **Error! Reference source not found.**

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, wild life sanctuary, buildings of archaeological importance etc.

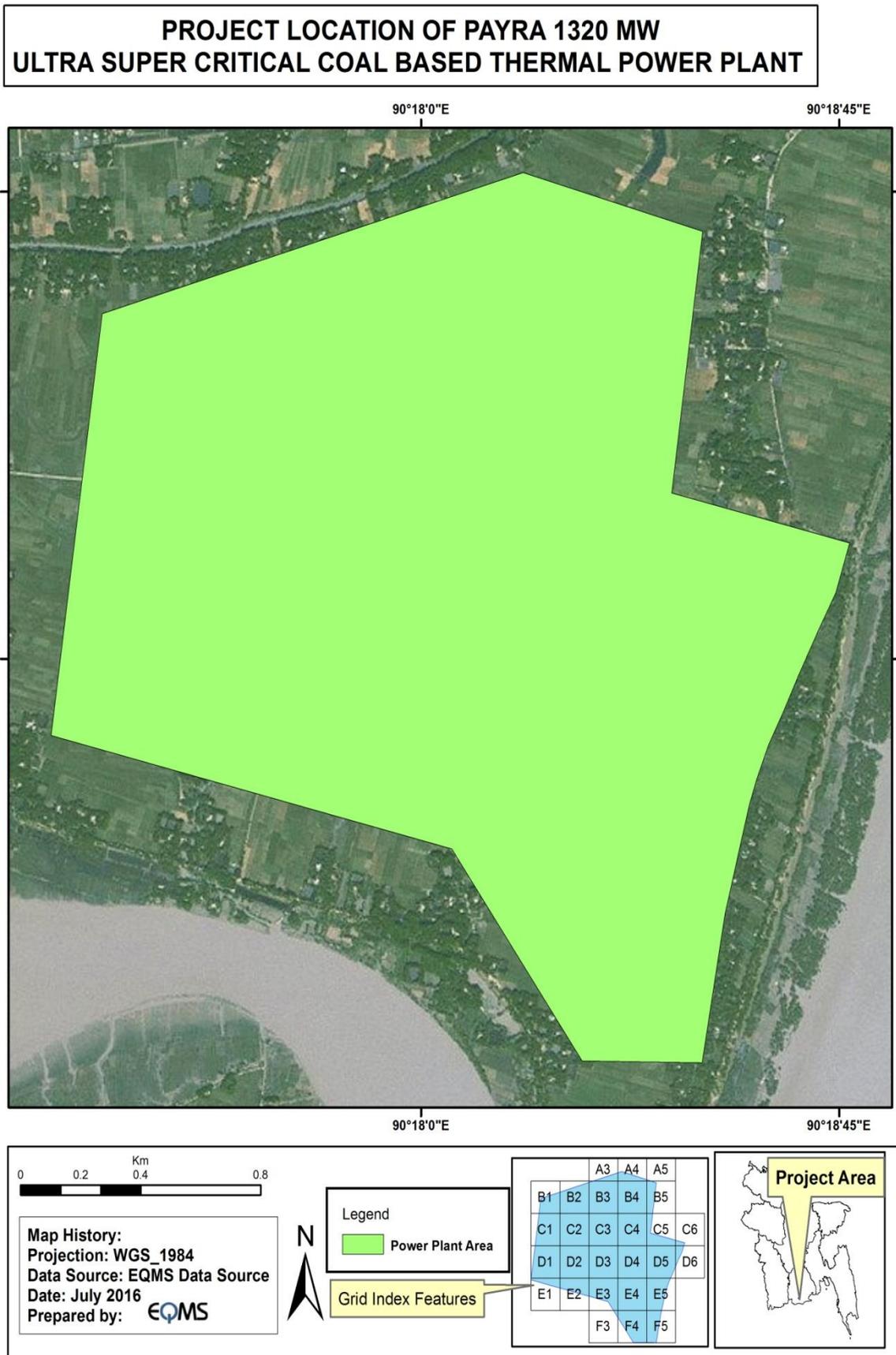


Figure 3-1: Project Location Map

### 3.2 Environmental quality monitoring

According to the approval of Environmental Impact Assessment (EIA) report Memo No: DoE/Clearance/5310/2014/485 on 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 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<sub>10</sub> and PM<sub>2.5</sub>), Sulphur Dioxide (SO<sub>2</sub>), Oxides of Nitrogen (NO<sub>x</sub>), 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 PM<sub>10</sub> and PM<sub>2.5</sub> sampler) has been used to collect the air sample. The particulate and gaseous samples collected during the monitoring have been analysed 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 <sub>10</sub>	Gravimetric method
3.	PM <sub>2.5</sub>	Gravimetric method
4.	SO <sub>2</sub>	Colorimetric method at 560nm using spectrophotometer (West-Gaeke method)
5.	NO <sub>x</sub>	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 has 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"N 90°18'3.29"E	Village and Rural Setting
2.	Londa Kheya Ghat	AQ2	22° 0'40.67"N 90°16'43.35"E	Village and Rural Setting

Sl.	Sampling Station	Station Code	Geographic Location	Location 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"N 90°16'32.70"E	Village and Rural Setting
5.	Lalua village	AQ5	21°58'26.19"N 90°18'0.26"E	Village and Rural Setting
6.	Nishanbari village	AQ6	22° 0'27.59"N 90°18'36.73"E	Village and Rural Setting

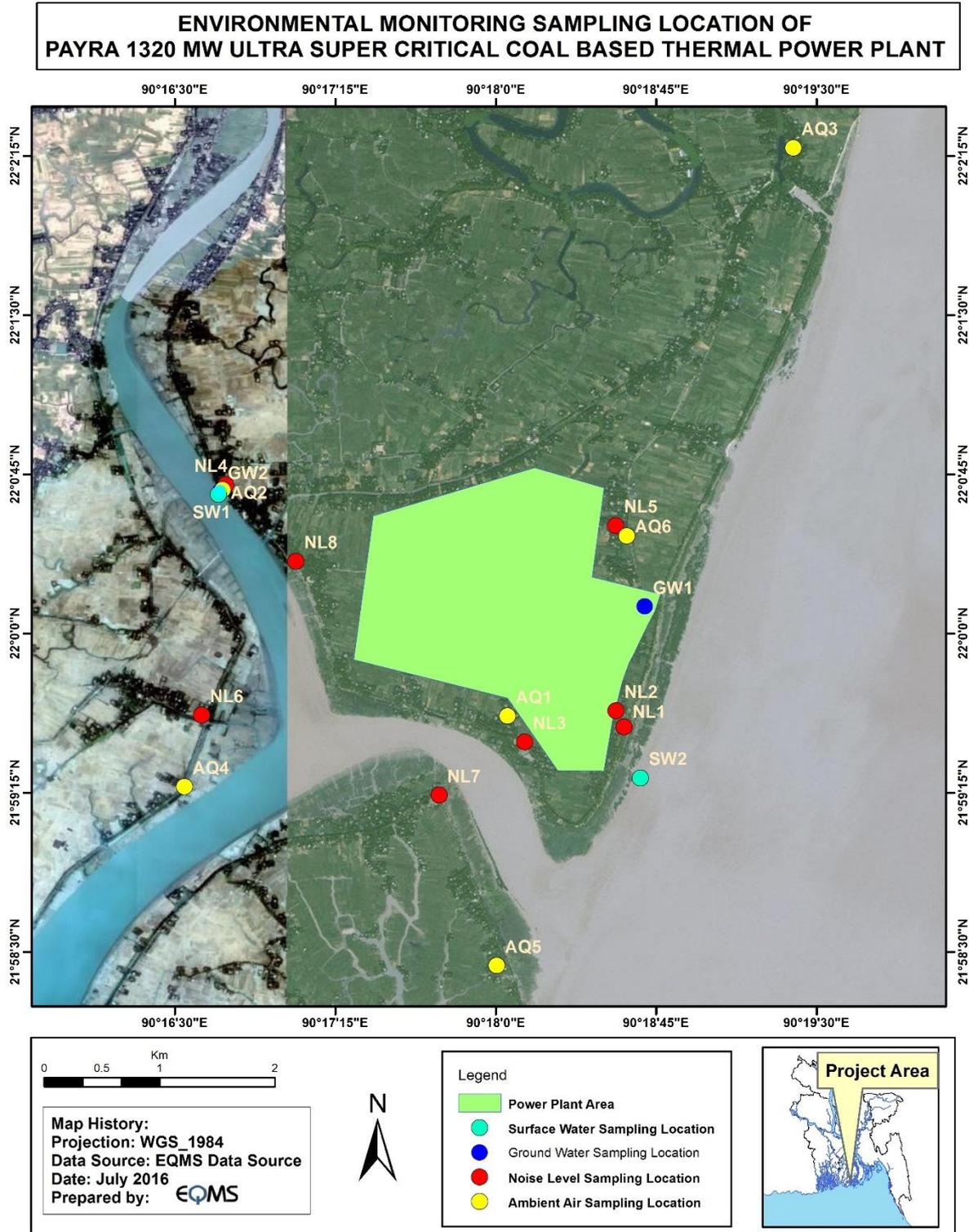


Figure 3-2: Location Map of Samplaning Points

### 3.3.2 Noise Level Monitoring

Ambient noise levels have been monitored on monthly basis during the construction phase. Noise data logger (REED Sound Level Meter SE-322, Korea) 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 have 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: Sensitive Noise 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 Channal 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"N90°16'42.21"E	Andharmanik River
2.	Rabnabadh Channel (adjacent to the project area)	Surface water	SW2	21°59'19.24"N90°18'40.55"E	Rabnabadh Channel
3.	Project site	Ground water	GW1	22° 0'7.74"N90°18'41.78"E	Tubewell
4.	Londa Kheya Ghat	Ground water	GW2	22° 0'40.18"N90°16'42.61"E	Tubewell

The samples were analyzed for parameters covering bacteriological and physico-chemical 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 physio-chemical 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 <sup>-</sup> ) (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
14.	Total Coliform	9222.B

Sl.	Parameter	Test method (APHA)
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 Occupational health and safety

To study the labor and working conditions of Payra Coal Power Plant Project observational method was used. Monitoring team physically stayed in the construction camp for few days; from 16th-22th January 2016, and observed labor and working conditions of the proposed project. During observation three 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 $\mu\text{g}/\text{m}^3$					
		PM <sub>2.5</sub>	PM <sub>10</sub>	SPM	SO <sub>2</sub>	NO <sub>x</sub>	CO* mg/m <sup>3</sup>
1.	AQ1	11.17	49.51	78.4	4.56	8.63	<2
2.	AQ2	18.47	78.11	110.26	5.79	14.18	<2
3.	AQ3	15.31	59.27	89.17	3.13	10.37	<2
4.	AQ4	12.28	67.14	84.59	4.16	9.23	<2
5.	AQ5	10.48	62.12	82.2	3.06	11.1	<2
6.	AQ6	13.15	56.29	75.37	4.18	10.11	<2
<b>Duration (hours)</b>		<b>24</b>	<b>24</b>	<b>8</b>	<b>24</b>	<b>24</b>	<b>8</b>
<b>Weather Condition</b>		Sunny					
<b>Bangladesh Standard*</b> (according to Environmental Conservation Rules' 1997 and subsequent amendment in 2005)		<b>65</b>	<b>150</b>	<b>200</b>	<b>365</b>	<b>100</b>	<b>10</b>
<b>Method of analysis</b>		Gravimetric	Gravimetric	Gravimetric	West-Geake	Jacob and Hochheiser	Indicator tube

Source: Air quality analysis done by EQMS Consulting Limited, 2016

Date of analysis: 16th-22<sup>th</sup> January 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 75.37 - 110.26  $\mu\text{g}/\text{m}^3$ . During the monitoring period, the maximum SPM concentration was reported from Londa Kheya Ghat as 110.26  $\mu\text{g}/\text{m}^3$ . SPM concentrations at this location

are primarily due to traffic movement. SPM level of all locations were reported below the National Ambient Air Quality Standards of Bangladesh.

**PM<sub>10</sub>**

The 24-hourly PM<sub>10</sub> concentration in ambient air in the study area was recorded in the range of 49.51 – 78.11 µg/m<sup>3</sup>. During the monitoring period, the maximum PM<sub>10</sub> concentration was reported from Londa Kheya Ghat as 78.11 µg/m<sup>3</sup>. PM<sub>10</sub> level at all monitoring locations were reported below the NAAQS.

**PM<sub>2.5</sub>**

The 24-hourly PM<sub>2.5</sub> concentration in ambient air in the study area was recorded in the range of 10.48 – 18.47 µg/m<sup>3</sup>. During the monitoring period, the maximum PM<sub>2.5</sub> concentration was reported from Londa Kheya Ghat as 18.47 µg/m<sup>3</sup>. All the monitoring locations result was within the 24-hourly National Ambient Air Quality Standard (NAAQS) for PM<sub>2.5</sub> in Bangladesh.

**SO<sub>2</sub>**

The 24-hourly SO<sub>2</sub> concentration was recorded in the range of 3.06 – 5.79 µg/m<sup>3</sup>. Concentration of SO<sub>2</sub> is reported low at AQ1 due to their rural setting. During the monitoring period, the maximum SO<sub>2</sub> concentration is reported at Londa Kheya Ghat as 5.79 µg/m<sup>3</sup>. SO<sub>2</sub> concentrations at all the monitoring locations were reported well below 365 µg/m<sup>3</sup>, which is National Ambient Air Quality Standard (NAAQS) for SO<sub>2</sub> in Bangladesh.

**NO<sub>x</sub>**

The 24-hourly NO<sub>x</sub> concentration was recorded in the range of 8.63 – 14.18 µg/m<sup>3</sup>. Concentrations of NO<sub>x</sub> were reported low at AQ1 and AQ3 due to their rural setting, whereas at AQ2, the levels are slightly higher due to the traffic movement. During the monitoring period, the maximum NO<sub>x</sub> concentration is reported at Londa Kheya Ghat as 14.18 µg/m<sup>3</sup>. There are no stipulated standards for 24-hourly NO<sub>x</sub> concentration in Bangladesh. The annual Bangladesh standard values for NO<sub>x</sub> are 100 µg/m<sup>3</sup> 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<sup>3</sup>).

**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 <sub>day</sub>	Leq <sub>night</sub>	L <sub>max</sub>	L <sub>min</sub>	Day	Night
NL1	50.5	38.6	59.4	39.1	50	40

Location	Average Noise level [dB(A)]				Applicable Standard * [dB(A)]	
	Leq <sub>day</sub>	Leq <sub>night</sub>	L <sub>max</sub>	L <sub>min</sub>	Day	Night
NL2	53.5	41.5	56.4	38.9	50	40
NL3	52.4	42.6	55.8	40.9	55	45
NL4	57.9	46.8	62.1	43.7	70	60
NL5	53.1	43.4	56.7	39.8	55	45
NL6	54.3	42.1	57.2	38.6	55	45
NL7	50.8	43.2	58.2	38.6	55	45
NL8	52.6	42.8	59.4	37.9	55	45

Source: Field Survey by EQMS (16-22 January, 2016)

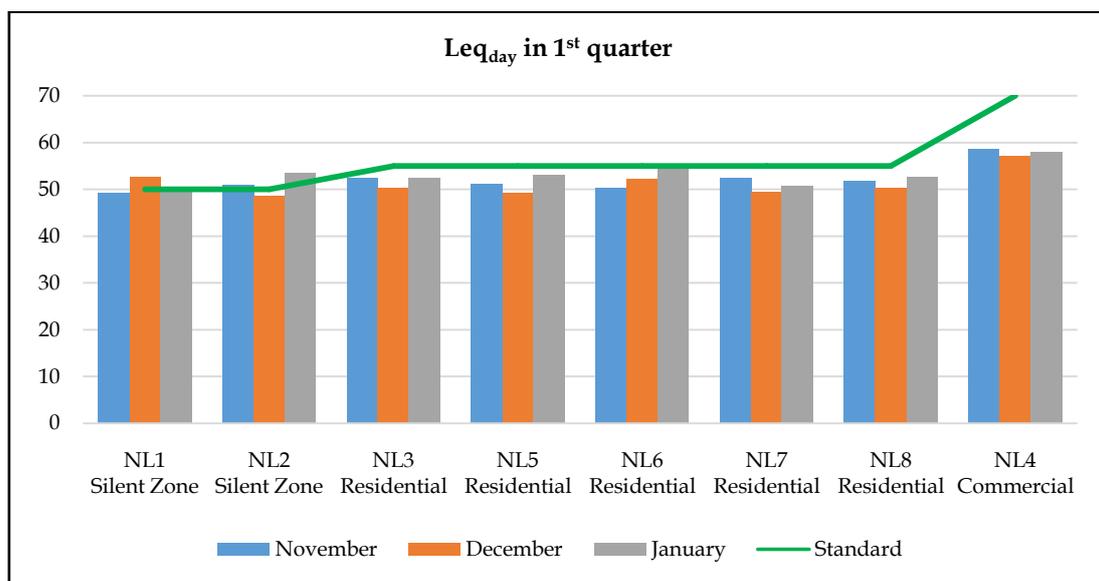
\*Environmental Conservation Rules, 1997 (Schedule 4) (subsequent amendment in 2006)

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 date of data collection.

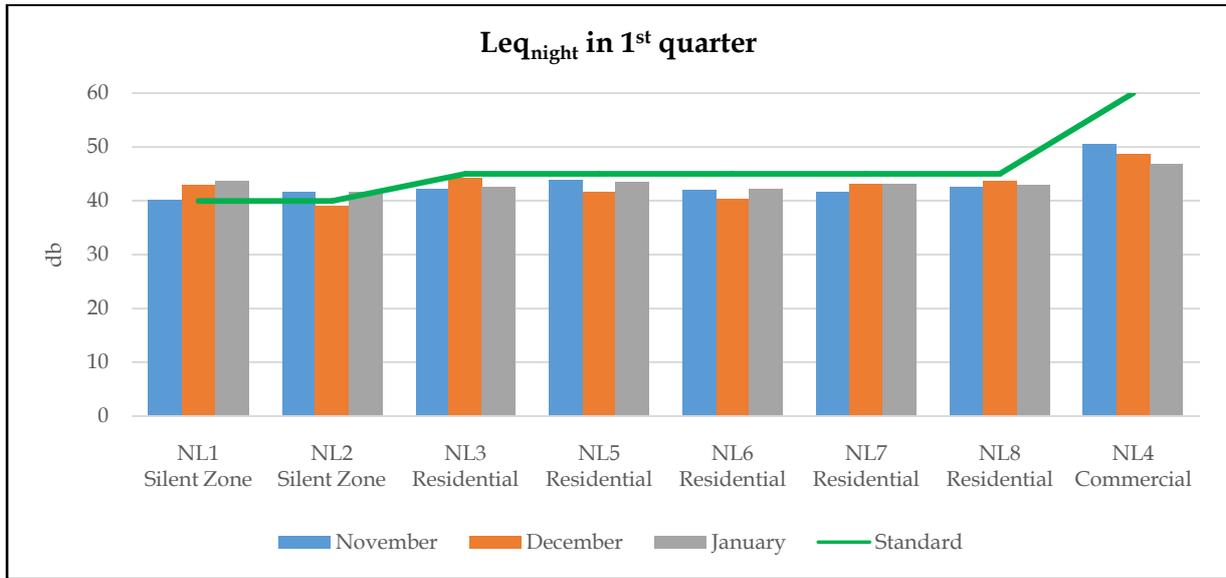
According to Bangladesh Environmental Quality Standard ECR'97 categorizations current project area falls into residential area zone. **Summary results Noise level monitoring results shown in Table 4-2.**

Table 4-2 shows that the average day time 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 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 in 1<sup>st</sup> quarter (November, December 2015 and January 2016) presented in **Figure 4-1** and **Figure 4-2**.



**Figure 4-1: Summary of the ambient noise recorded at day time in November, December 2015 and January 2016**



**Figure 4-2: Summary of the ambient noise recorded at night time in November, December 2015 and January 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 4-3** 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	November		December		January	
			SW1	SW2	SW1	SW2	SW1	SW2
1.	EC	µmhos/cm	81	84	88	90	92	96
2.	DO	mg/l	6.4	7.6	6.8	7.3	6.7	7.6
3.	Iron	mg/L	0.51	0.47	0.55	0.48	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	-	6.8	7.4	6.9	7	6.7	7.3
7.	Temperature	°C	27.3	27.6	22.5	22.3	24.4	23.3
8.	TDS	mg/l	70	75	79	76	78	74
9.	Turbidity	NTU	26	29	16	13	15	14
10.	Salinity	ppt	190	173	200	170	190	175

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS laboratory, Sampling Date: January 2016-month sampling date 21/01/16 and Result date: 23/01/16)

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

Comparison of the data with the surface water quality standards of 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 is available in and around the project site.

**Table 4-4: Ground Water Quality Analysis Result**

Sl.	Parameters	November		December		January		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)	145.39	146.28	151.39	155.46	141.48	139.39	150-600 mg/l
3.	Conductivity (µmhos/cm)	230	240	270	265	270	275	-
4.	Fecal Coliform (mg/l)	0	0	0	0	0	0	0 mg/l
5.	Iron (Fe) (mg/l)	0.58	0.53	0.57	0.55	0.56	0.61	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	7.2	7.4	7.7	7.5	7	6.5-8.5
8.	Temperature (°C)	24.7°C	24.2°C	24.6°C	24.3°C	23.6°C	23.8°C	20-30 °C

Sl.	Parameters	November		December		January		Bangladesh Standard
		GW1	GW2	GW1	GW2	GW1	GW2	
9.	Total Coliform (mg/l)	0	0	0	0	0	0	-
10.	Total Dissolved Solids (mg/l)	355	340	365	425	365	430	1000 mg/l
11.	DO (mg/l)	6.9	7	6.8	7.2	7	6.9	5 or more

(Source: Laboratory Analysis, Department of Soil, water and Environment, University of Dhaka and EQMS Consulting Limited laboratory, Date: January 2016-month sampling date 17/01/16 and analysis date 23/01/16)

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

#### 4.5 GAP ASSESSMENT TO THE APPLICABLE REFERENCE FRAMEWORK

##### 4.5.1 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:

**Figure 4-3: 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 NWPGL and the NEPC contractor 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 3-2: Gap Assessment to the IFC Performance Standards (2012) of the Project

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
1	<p>Types of Workers Accommodation</p> <p>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.</p> <p>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 and provision of basic services. This also includes the applicable requirements of the IFC Guidelines on Worker Accommodation.</p>	<p>Two workers' camps for accommodation were found in the construction area. These are</p> <ol style="list-style-type: none"> <li>1. Shed for mechanic and engineer of NDE</li> <li>2. Sub-contract labor shed.</li> </ol> <p><b>NDE Mechanics and Engineers Accommodation</b></p> <p>NDE mechanics and engineers are housed in a separate accommodation camp adjacent to the construction camp.</p> <p><b>Subcontractor Labor Shed</b></p> <p>Presently, a number of workers are working for making block under the</p>	<b>Aligned</b>	<p>Since it is very beginning phase of the construction, clear labor construction camp guidelines to be formulated and shared with NWPGCL to meet the IFC guideline on worker's accommodation.</p> <p>The guidelines should take into consideration observations highlighted in the report.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
		subcontractor. They are housed in a separate accommodation camp.			
2	<p><u>Standards for Workers' Accommodation</u></p> <p>This section looks at the principles and standards applicable to the location and construction of workers' accommodation, including the transport systems provided, the general living facilities, rooms/dormitories facilities, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities.</p> <p><u>General Construction Standards</u></p> <p><i>Building Construction</i> Quality of material, construction methods, resistance to earthquakes.</p> <p><i>General health, safety and security</i></p>	<p>Following requirements were missing;</p> <ol style="list-style-type: none"> <li>1. No fire safety extinguisher was found in the workers' shed.</li> <li>2. Vulnerable materials were used for constructing subcontractor labors' shed.</li> <li>3. Provisions on occupations density, minimal air volumes, ventilation and quality of the</li> </ol>	<b>Partially Aligned</b>	Initial phase, so proponent NWPGCL, EPC contractors (NEPC and Subcontractors) are recommended to install sufficient fire extinguisher. It is suggested to the client organization to monitor the facilities of labors' shed and make sure all required facilities are provided.	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>Requirements on health and safety are often an important part of building standards and might include provisions on occupation density, minimal air volumes, ventilation, the quality of the flooring (slip-resistant) or security against intrusion.</p> <p><i>Fire safety</i></p> <p>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.</p> <p><i>Electricity, plumbing, water and sanitation</i></p> <p>National design and construction standards often include very detailed provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment</p>	<p>flooring or security against intrusion were not considered before building subcontractor labors' shed.</p> <p>4. Provisions on electricity or plumbing fixtures/fittings, water and sanitation connection/equipment are under construction.</p>			

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
3	<p><i>General Living Facilities</i></p> <p>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, 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</p> <ol style="list-style-type: none"> <li>1. Living facilities are located to avoid flooding and other natural hazards.</li> <li>2. Where possible, living facilities are located within a reasonable distance from the worksite.</li> <li>3. Transport from the living facilities to worksite is safe and free.</li> <li>4. The living facilities are built with adequate materials, kept in good</li> </ol>	<p>Sheds are built considering avoiding flooding and other natural hazards.</p> <p>Since all workers' sheds were constructed with in one km, transportation is not provided for workers.</p> <p>Regular cleaning facilities were not observed in all workers' shed during field visit.</p>	<p><b>Partially Aligned</b></p>	<p>Adequate numbers of cleaners should be employed.</p> <p>Attention is required in cleaning activities.</p>	<p>N/A</p>

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	repair and kept clean and free from rubbish and other refuse.				
3.1	<p><i>Drainage</i></p> <p>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</p> <p>1. The building site is adequately drained to avoid the accumulation of stagnant water.</p>	<p>Adequate drainage system wasn't found in all workers' sheds. Though its winter now, but it is assumed that if rainy season comes, stagnant water may cause disease and barrier to move.</p>	<b>Partially Aligned</b>	Proper drainage plan and implementation are required.	N/A
3.2	<p><i>Heating, air conditioning, ventilation and light</i></p> <p>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</p>	<p>Shed construction were running. Still now artificial lighting wasn't available in all sheds.</p> <p>Adequate ventilation was ensured by maintaining window's ratio against room ratio.</p>	<b>Partially Aligned</b>	Proper lighting as well as electric fans should be ensured. NWPGCL should enforce subcontractor to provide all necessary requirements.	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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.</p> <p>2. For facilities located in hot weather zones, adequate ventilation and/or air conditioning systems are provided.</p> <p>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.</p>	<p>But Subcontract workers' shed wasn't built considering the window ratio. Therefore, subcontractor labor's shed was found almost dark at the day light time which may cause disease.</p> <p>Moreover, in subcontractor labor shed there was no electric fan found.</p>			
3.3	<p><i>Water</i></p> <p>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</p>	<p>Inadequate water supply was found in all sheds during the field visit. More water taps and tube-wells are required in every worker's shed.</p>	<b>Aligned</b>	<p>More drinking water facility should be provided.</p> <p>Moreover, proper plan should be taken into account for maintaining water quality yearly such as testing arsenic and hygiene.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>where 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.</p> <ol style="list-style-type: none"> <li>1. Access to an adequate and convenient supply of free potable water is always available to workers. Depending on climate, weather conditions and accommodation standards, 80 to 180 liters per person per day are available.</li> <li>2. Drinking water meets national/local or WHO drinking water standards.</li> <li>3. All tanks used for the storage of drinking water are constructed and covered as to prevent water stored therein from becoming polluted or</li> </ol>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	contaminated.				
3.4	<p><i>Wastewater and solid waste</i> 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 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</p> <p>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 without causing any significant impacts on camp residents, the biophysical environment or surrounding</p>	<p>Very small amount of wastewater, sewage, food and any other waste materials were produced. So, no visible waste management plan implementations were found.</p> <p>Rubbish containers 30 metres from each shelter on a wooden, metal, or concrete stand were not found in all sheds.</p>	<b>Not Aligned</b>	<p>Proper waste management plan within project area should be employed.</p> <p>NWPGCL, EPC contractors (NEPC and Subcontractors) should follow the IFC guidelines and maintain the requirements described in this section.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>communities.</p> <p>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 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.</p> <p>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.</p>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
4	<p><i>Room and Dormitory Facilities</i></p> <p>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 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.</p> <p>1. Rooms/dormitories are kept in good condition. 2. Rooms/dormitories are aired and</p>	<p><i>NDE Mechanics and Engineers' Room Facilities</i></p> <ol style="list-style-type: none"> <li>1. Rooms are kept in good conditions.</li> <li>2. Rooms are built with easily cleanable flooring.</li> <li>3. Sanitary facilities are located within the same buildings.</li> <li>4. Followed standard flooring range (4 to 5.5 sq. metres) and minimum ceiling height (2.10 metres)</li> <li>5. Standard range of room sharing is considered.</li> <li>6. Inadequate furniture.</li> </ol> <p><i>Subcontractor Labour Shed's Room Facilities</i></p>	<b>Partially Aligned</b>	<p>Adequate furniture is required to provide.</p> <p>Subcontractor should be guided by NWPGCL for maintaining standard rooming facilities. NWPGCL may also monitor the progress.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>cleaned at regular intervals.</p> <p>3. Rooms/dormitories are built with easily cleanable flooring material.</p> <p>4. Sanitary facilities are located within the same buildings and provided separately for men and women.</p> <p>5. Density standards are expressed either in terms of minimal 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).</p> <p>6. A minimum ceiling height of 2.10 metres is provided.</p> <p>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.</p> <p>8. All doors and windows should be lockable, and provided with mosquito screens where conditions warrant.</p> <p>9. There should be mobile partitions or curtains to ensure privacy.</p>	<ol style="list-style-type: none"> <li>1. Rooms are not kept in good conditions.</li> <li>2. Easily cleanable flooring wasn't considered.</li> <li>3. Sanitary facilities were built separately. (10 metres away from the shed). Privacy and cleaning requirements were not followed.</li> <li>4. Followed standard flooring range (4 to 5.5 sq. metres) and minimum ceiling height (2.10 metres)</li> <li>5. Standard range of room sharing is not considered. (more than 40 workers live in a 42 square meters room )</li> </ol>			

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>10. Every resident is provided with adequate furniture such as a table, a chair, a mirror and a bedside light.</p> <p>11. Separate sleeping areas are provided for men and women, except in family accommodation.</p>	<p>6. Lockable door and adequate furniture are not provided.</p>			

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
4.1	<p><i>Bed Arrangements and Storage Facilities</i></p> <p>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...</p> <p>1. A separate bed for each worker is provided. The practice of “hot-bedding” should be avoided.</p> <p>2. There is a minimum space between beds of 1 metre.</p> <p>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.</p> <p>4. Triple deck bunks are prohibited.</p> <p>5. Each worker is provided with a comfortable mattress, pillow, cover</p>	<p><i>NDE Mechanics and Engineers’ Bed Arrangements and Storage Facilities</i></p> <ol style="list-style-type: none"> <li>1. A separate bed for each worker is provided.</li> <li>2. Minimum space between beds (1 metre) is not maintained all the time.</li> <li>3. Double deck bunk and triple deck bunk were not seen during observation.</li> <li>4. Comfortable mattress, pillow, cover and clean bedding were not provided sufficiently.</li> <li>5. Standard requirement for storage facility was absent. (475-litre big lockers and 1 metre of shelf unit)</li> </ol>	Partially Aligned	<p>NWPGCL, EPC contractors (NEPC and Subcontractors) should follow the requirements of IFC as much as possible considering national and local context.</p> <p>Comfortable mattress, pillow, cover and clean bedding need to be provided.</p> <p>Subcontract labors’ shed need to be monitored periodically whether all requirements are considered.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
5	<p><i>Sanitary and Toilet Facilities</i></p> <p>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, except in family accommodation. Where necessary, specific additional sanitary facilities are provided for women. Required benchmarks are...</p> <p>1. Sanitary and toilet facilities are constructed of materials that are easily cleanable.</p> <p>2. Sanitary and toilet facilities are</p>	<p><i>NDE Mechanics and Engineers'</i></p> <p><i>Sanitary and Toilet Facilities</i></p> <p>1. Sanitary and toilet facilities were being constructed with easily cleanable materials.</p> <p>2. Cleaning was irregular.</p> <p>3. Moderate privacy was observed. Ceiling was absent.</p> <p><i>Subcontractor Labor Shed's</i></p> <p><i>Sanitary and Toilet Facilities</i></p> <p>1. Did not construct with easily cleanable materials.</p> <p>2. Not cleaned frequently and kept in working condition.</p>	<p><b>Partially Aligned</b></p>	<p>Sanitary and toilet facilities are going under construction phase. It is suggested that proper guideline should be followed by the NWPGCL, EPC contractors (NEPC and Subcontractors) providing sanitary and toilet facility</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>cleaned frequently and kept in working condition.</p> <p>3. Sanitary and toilet facilities are designed to provide workers with adequate privacy, including ceiling to floor partitions and lockable doors.</p> <p>4. Sanitary and toilet facilities are not shared between men and women, except in family accommodation.</p>	<p>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.</p>			
<b>5.1</b>	<p><i>Toilet Facilities</i></p> <p>Toilet arrangements are essential to avoid any contamination and prevent the spread of infectious disease. Benchmarks should be followed.</p> <p>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.</p> <p>2. Toilet facilities are conveniently</p>	<p><i>NDE Mechanics and Engineers' Toilet Facilities</i></p> <p>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 not considered providing toilet and urinal facilities. (6 toilets</p>	<b>Partially Aligned</b>	<p>Adequate number of toilets should be provided. NWPGCL, EPC contractors (NEPC and Subcontractors) pay attention regarding the issue. Moreover, adequate handwash basin should be provided also.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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 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.</p>	<p>are provided for more than 40 persons)</p> <ol style="list-style-type: none"> <li>2. Toilet facilities are conveniently located and easily accessible.</li> <li>3. Good ventilation and one handwash basins were not seen.</li> </ol> <p><i>Subcontractor Labour Shed's Toilet Facilities</i></p> <ol style="list-style-type: none"> <li>1. Comparing to the standard range insignificant number of toilets are provided.</li> <li>2. Toilet facilities are conveniently located and easily accessible.</li> <li>3. Sufficient hand wash basins are</li> </ol>			

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
		not provided.			
5.2	<p><i>Shower/Bathrooms and Other Sanitary Facilities</i></p> <p>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 within a reasonable distance from other facilities and from sleeping facilities in particular.</p>	<p><i>NDE Mechanics and Engineers' Shed</i></p> <ol style="list-style-type: none"> <li>Concrete floor</li> <li>One common shower place was found. One tubewell is set up there. Comparing to the standard range it is quite inadequate.</li> <li>Conveniently located.</li> </ol> <p><i>Subcontractor Labors' Shed</i></p> <ol style="list-style-type: none"> <li>Concrete floor</li> <li>They do their shower in an open place. They get</li> </ol>	<p><b>Partially Aligned</b></p>	<p>Following matters are needed to pay attention;</p> <ol style="list-style-type: none"> <li>Separate shower rooms should be provided.</li> <li>Adequate number of shower rooms should be provided.</li> <li>Privacy should be ensured following requirements.</li> <li>Adequate number of handwash basin should be installed.</li> </ol>	<p>N/A</p>

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>Benchmarks</p> <p>1. Shower/bathroom flooring is made of anti-slip hard washable materials.</p> <p>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.</p> <p>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.</p> <p>4. Showers/bathrooms are conveniently located.</p> <p>5. Shower/bathroom facilities are provided with an adequate supply of cold and hot running water.</p>	<p>water by a pipe line. There is no privacy.</p> <p>3. Conveniently located.</p>			
6	<p><i>Canteen, Cooking and Laundry Facilities</i></p> <p>Good standards of hygiene in canteen/dining halls and cooking</p>	<p><i>NDE Mechanics and Engineers' Canteen, Cooking and Laundry Facilities</i></p> <p>1. Canteen and cooking facilities</p>	<b>Partially Aligned</b>	<p>Since canteen construction is still going on, NWPGCL, EPC contractors (NEPC and Subcontractors) are</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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 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.</p> <p>1. Canteen, cooking and laundry facilities are built in adequate and easy to clean materials.</p> <p>2. Canteen, cooking and laundry facilities are kept in a clean and sanitary condition.</p> <p>3. If workers can cook their own</p>	<p>are still now in construction phase.</p> <p><i>Subcontractor Labors Shed's Canteen, Cooking and Laundry Facilities</i></p> <ol style="list-style-type: none"> <li>1. There was no visible canteen. They have their meal in living room.</li> <li>2. Cooking facilities were very poor.</li> <li>3. Unhygienic environment of cooking place.</li> </ol>		<p>recommended to follow all requirements.</p>	

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	meals, kitchen space is provided separate from sleeping areas.				
6.1	<p><i>Laundry Facilities</i></p> <p>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.</p> <p>Benchmarks are...</p> <p>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 are used in contact with dangerous substance (for example, application of pesticide), special laundry facilities (washing machines) should be provided.</p>	No standard requirements were visible in the case of all sheds.	<b>Partially Aligned</b>	Local/ national standard should be followed.	N/A
6.2	<i>Canteen and Cooking Facilities</i>	No visible canteen and cooking facilities were	<b>Partially</b>	It is recommended to follow all the IFC's	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>Canteen and cooking facilities should provide sufficient space for preparing food and eating, as well as conform to hygiene and safety requirements.</p> <p>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 drinking cups and plates to providing special drinking fountains.</p> <p>3. Places for food preparation are designed to permit good food hygiene practices, including protection against contamination between and during food preparation.</p> <p>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</p>	<p>seen. Construction activities were going on for this purpose. Workers managed stove and cooked themselves.</p> <p>Cleaning and storage facilities were also absent.</p>	<p><b>Aligned</b></p>	<p>requirements as much as possible considering the national law.</p> <p>Canteen's space, Hygiene condition, sufficient number of washbasins, kitchen floors, ceiling and wall surfaces are needed to considered.</p> <p>Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment as well as food waste management should also be paid importance.</p>	

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>for hygienic drying.</p> <p>5. Wall surfaces adjacent to cooking areas are made of fire resistant materials. Food preparation tables are also 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.</p> <p>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.</p> <p>7. Wall surfaces adjacent to cooking areas are made of fire resistant materials. Food preparation 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</p>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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.</p> <p>8. Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment are provided.</p> <p>9. Food waste and other refuse are to be adequately deposited in sealable containers and removed from the kitchen frequently to avoid accumulation.</p>				
7	<p><i>Standards for Nutrition and Food Safety</i></p> <p>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</p>	<p>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.</p> <p>Food and meal are selected on the basis of workers choice Foods are</p>	<p><b>Partially Aligned</b></p>	<p>The WHO 5 keys to safer food can be followed emphasizing on workers' health. NWPGCL, EPC contractors (NEPC and Subcontractors) should make management plan and implement as well as monitor it regular basis.</p>	<p>N/A</p>

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	work leads to gains in productivity and worker morale, prevention of accidents and premature deaths and reductions in health care costs.	served according to workers' different cultural and religious backgrounds.			
	<p>1. The WHO 5 keys to safer food or an equivalent process is implemented.</p> <p>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.</p> <p>3. Food is prepared by cooks. It is also best practice that meals are planned by a trained nutritionist.</p>	Separate cooks prepare foods for separate workers shed.			
8	<p><i>Medical facilities</i></p> <p>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</p>	All requirements were absent.	<b>Not Aligned</b>	<p>Followings are need to be implemented;</p> <ol style="list-style-type: none"> <li>1. Ensure adequate number of first aid kits for all residents</li> <li>2. Stocking</li> </ol>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>facilities provided in workers' accommodation is likely to depend on the number of workers living on site, the medical facilities already existing in the neighbouring communities and the availability of transport. However, first aid must always be available on site.</p> <p><i>First aid facilities</i> Providing adequate first aid training and facilities can save lives and prevent minor injuries becoming major ones.</p> <p><i>Other medical facilities</i> 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 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.</p>			<p>adequate first aid kits for providing 24/7 health safety.</p> <p>3. A number of health staffs or workers are needed to be recruited.</p> <p>4. Other medical facilities should be included.</p>	

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>1. A number of first aid kits adequate to the number of residents are available.</p> <p>2. First aid kits are adequately stocked. Where possible a 24/7 first aid service/facility is available.</p> <p>3. An adequate number of staff/workers are trained to provide first aid.</p> <p>4. Where possible and depending on the medical infrastructures existing in the community, other medical facilities are provided (nurse rooms, dental care, minor surgery).</p>				
9	<p><i>Leisure, Social and Telecommunication Facilities</i></p> <p>Basic leisure and social facilities are important for workers to rest and also to socialise 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,</p>	<p>Place for rest and religious observance were found.</p> <p>No visible recreational facilities were found.</p>	<b>Partially Aligned</b>	<p>NWPGCL and EPC contractors (NEPC and Subcontractors) may consider managing recreational facilities for workers.</p>	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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 addition, it is also important to provide workers with adequate means to communicate with the outside world, especially when workers' accommodation is located in a remote location or where workers live on site without their family or are migrants. Consideration of cultural attitudes is important. Provision of space for religious observance needs to be considered, taking account of the local context and potential conflicts in certain situations.</p> <p>Benchmarks 1. Basic collective social/rest spaces</p>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>are provided to workers. Standards range from providing workers multipurpose halls to providing designated areas for radio, TV, cinema.</p> <p>2. Recreational facilities are provided. Standards range from providing exercise equipment to providing a library, swimming pool, tennis courts, table tennis, educational facilities.</p> <p>3. Workers are provided with dedicated places for religious observance if the context warrants.</p> <p>4. Workers have access to public phones at affordable/ public prices (that is, not inflated).</p> <p>5. Internet facilities can also be provided, particularly where large numbers of expatriates/Third Country Nationals (TCNs) are accommodated.</p>				
10	<p><i>Health and Safety on Site</i></p> <p>The company or body in charge of managing the workers' accommodation should have the</p>	<p>Following observation were noted</p> <p>1. No designed health and safety</p>	Not Aligned	Though project is going through initial stage, proper designed health and safety management plans should be taken	N/A

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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 fire regulations are respected for instance) and that adequate health and safety plans and standards are designed and implemented.</p> <p>1. Health and safety management plans including electrical, mechanical, structural and food safety have been carefully designed and are implemented.</p> <p>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.</p> <p>3. An adequate number of staff/workers is trained to provide first aid.</p> <p>4. A specific fire safety plan is prepared, including training of fire</p>	<p>management plans including electrical, mechanical, structural and food safety have been implemented.</p> <p>2. No records are kept on outbreak of any contagious diseases, food poisoning and other important casualties.</p> <p>3. No trained staffs/workers for providing first aid.</p> <p>4. No specific fire safety plan is prepared.</p> <p>5. No client provided medical facilities found.</p>		and implemented.	

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>wardens, periodic testing and monitoring of fire safety equipment and periodic drills.</p> <p>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.</p> <p>6. Workers have access to adequate preventive measures such as contraception (condoms in particular) and mosquito nets.</p> <p>7. Workers have easy access to medical facilities and medical staff. Where possible, female doctors/nurses should be available for female workers.</p> <p>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,</p>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
		tornadoes).			
11	<p><i>Security of Workers' accommodation</i></p> <p>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.</p> <ol style="list-style-type: none"> <li>1. A security plan including clear measures to protect workers against theft and attack is implemented.</li> <li>2. A security plan including clear policies on the use of force has been carefully designed and is implemented.</li> <li>3. Security staff have been checked to ensure that they have not been implicated in any previous crimes or abuses. Where appropriate, security staff from both genders are recruited.</li> <li>4. Security staff have a clear mandate and have received clear instruction about their duties and</li> </ol>	<p>Security staffs were not seen working in any accommodation area. That's because there may be no clear measures to protect workers against theft and attack.</p>	<p><b>Partially Aligned</b></p>	<p>Proper security plan and sufficient number of security guards should be employed.</p>	<p>N/A</p>

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>responsibilities, in particular their duties not to harass, intimidate, discipline or discriminate against workers.</p> <p>5. Security staffs have received adequate training in dealing with domestic violence and the use of force.</p> <p>6. Security staffs have a good understanding about the importance of respecting workers' rights and the rights of the communities.</p> <p>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.</p> <p>8. Security staff adopt an appropriate conduct towards workers and communities.</p> <p>9. Workers and members of the surrounding communities have specific means to raise concerns</p>				

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	about security arrangement and staff.				
12	<p><i>Grievance Mechanism</i></p> <p>Grievance mechanism for workers where they can raise reasonable workplace concerns.</p> <p>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.</p> <p>2. Processes and mechanisms for workers to articulate their grievances are provided to workers. Such mechanisms are in accordance with PS2/PR2.</p> <p>3. Workers subjected to disciplinary proceedings arising from behaviour in the accommodation should have access to a fair and transparent hearing with the possibility to contest decisions and refer the dispute to independent arbitration or relevant public authorities.</p>	<p>There is no formal on-site grievance mechanism for workers.</p>	<p><b>Partially aligned</b></p>	<p>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.</p>	<p>N/A</p>

S. No	Requirement	Observation/Gap	Level of Compliance	Recommendation	Comparison to Previous Report
	<p>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.</p> <p>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).</p>				

### **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 is ongoing. there are some environmental compliance measures in environmental management plan that should be at place during this pre-construction stage. From the first quarter environmental monitoring of assessment, some recommendations have been made and it is important to consider these measures to properly implement the proposed Environmental Management Plan.

## Annex 1: Environmental Monitorin Photographs



**Ambient Air sampling at Construction Camp**



**Ambient Air sampling at LondaKheyaGhat**



**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 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 MonirHossain's House, Nishanbari village**



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



**Noise Level Monitoring at Akber Mia's House, Lalua**



**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**