

PROPOSED TERMS OF REFERENCE FOR CONDUCTING CEIA STUDY FOR BOKANG BAILING HEP (200MW)

1. GENERAL

The Environmental Impact Assessment of the proposed Bokang Bailing Hydro-electric project shall examine the project's potential negative and positive environmental impacts and shall recommend measures required to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance of the scheme.

The Ministry of Environment, Forest & Climate Change (MoEF&CC), Government of India (GoI) has issued a notification called EIA Notification 2006 on September, 14, 2006. The project requires Environmental Clearance from Ministry of Environment, Forest & Climate Change (MoEF&CC). An EIA study is a pre-requisite for obtaining Environmental Clearance. The Study Area for the EIA study shall comprise of the following:

- Submergence area of dam
- Area within 10 km of various project appurtenances including i.e. submergence area, etc.
- Catchment area in intercepted at the site of dam

EIA Study will be carried out with an objective to :

- Establish and Assess Baseline Environmental-Social ground truth within 10 km. radius and catchment of the project area.
- Identify and Evaluate Environmental-Social Impacts of Proposed project.
- Prepare Environmental Monitoring & Management Plan
- Identification of the project affected people and prepare rehabilitation and resettlement plan, and

2. DATA COLLECTION/GENERATION

The details of baseline data/ information that would be collected are as follows:

1. Geological and Geophysical Aspects

- Geography & physiography of the project area
- Design discharge & its RI (Recurrence interval)
- Regional Geology and structure of the catchment
- Seismicity, tectonics and history of past earthquakes in the area
- Critical review of the geological features around the project area
- Impact of project on geological environment
- Justification for location & execution of the project in relation to structural components.
- Detailed geological mapping of the proposed project site including relevant details as available in the DPR

Seismo-tectonics

Study of Design Earthquake Parameters

A site specific study of earth quake parameters shall be conducted. The results of the site specific earth quake design parameters will be sent for approval of the

NCSDP (National Committee of Seismic Design Parameters, Central Water Commission, New Delhi.

2. Hydrology of the basin

- Hydro-meteorology, drainage systems
- Water availability for the project and the aquatic fauna
- Design discharge and its recurrence interval

3. Biological Resources

Flora

- Forests and forest types
- Water body inundating forest area
- Vegetation profile, no. of species in the project area, etc.
- Community Structure through Vegetation mapping
- Species Diversity Index (Shanon-Weiner) of the biodiversity in the project area as well as plant fossil & phytoplankton
- Documentation of economically important plants, medicinal as well as timber, fuel wood etc.
- Endemic, endangered and threatened species
- Impact of impoundment and construction activities on the vegetation
- Location of any Biosphere Reserve, National Park or Sanctuary in the vicinity of the project , if any
- Cropping and Horticulture pattern and practices in the study area.

Fauna

- Inventorisation of terrestrial wildlife including reptiles, herpetofauna, butterflies and amphibians, alongwith their present status in the project area
- Zoogeographic distribution/affinities, Endemic, threatened and endangered species.
- Avifauna - Status, Resident/Migratory/Passage migrants, Impact of project on threatened/endangered taxa, if any
- RET faunal species are to be classified as per IUCN Red Data list or as per different schedule of Indian Wilde Life Protection Act, 1972.
- Effect on fish migration and habitat degradation due to project.
- Existence of National Park, Sanctuary, Biosphere, Reserve Forest etc. in the study area if any, would be detailed

Aquatic Ecology

- Aqua-fauna like macro-invertebrates, zooplankton, phytoplanktons, benthos, water dependent avifauna etc and Assessment of biotic resources – primary productivity.
- Conservation Status

Fish and Fisheries

- Migratory fish species, if any and their breeding grounds
- Impact of barrage building on fish migration and habitat degradation
- Overall ecological impact upto 10 km d/s from the dam site and the impact of untreated and waste water in to the river shall be assessed.
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Conservation areas and status of threatened/endangered taxa

- Biotic Pressures
- Management plan for conservation areas and threatened/endangered taxa

Remote Sensing & GIS studies and various maps

- Delineation of critically degraded areas in the catchment area intercepted at the dam site upto the upstream project on the basis of Silt Yield Index as per the methodology of AISLUS
- Land use and land cover mapping
- Drainage pattern/map
- Sampling location map for all the parameters at least in 1:50,000 scale; along with FCC a pie diagram to show proportions of different land use/land cover patterns in the project area

Socio-economic aspects

- Land details
- Demographic profile
- Economic structure
- Development profile
- Agricultural practices
- Infrastructure facilities: education, health and hygiene, communication network, etc.
- Impact on socio-cultural aspects due to the proposed project.

5. Collection of data pertaining to water (physico-chemical and biological parameters), air and noise environment and likely impact during construction and post construction periods.

Air Environment

- Baseline Information on ambient air quality in the project area covering aspects like Particulate Matter less than 10 microns (PM10), PM2.5, SO₂, NO₂
- Noise Environment

Construction Methodology and Schedule

6. PRIMARY DATA COLLECTION

The details of primary data to be collected are given in Table-1.

TABLE 1
Details of primary data generation

Description	No. of locations	Frequency of Sampling
Ambient Air Quality Ambient air quality monitoring (24 hourly samples), twice a week for 2 weeks Parameters : PM10, PM2.5, SO ₂ , NO ₂	4	Three seasons (summer, post-monsoon and winter)
Surface and Ground Water Quality Samples to be collected from various	10	Three seasons (summer,

Description	No. of locations	Frequency of Sampling
representative locations on rivers in and around project site and ground water Parameters : Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Alkalinity, Total Hardness, Chlorides, Sulphates, Fluorides, Phosphates, Calcium, Magnesium, Sodium, Potassium, Iron, Chromium, Lead, Cadmium, Mercury, Zinc, DO, BOD, COD, Total Coliform		monsoon and winter)
Soil Sampling in the study area Parameters : pH, N,P,K, organic matter, soil texture, Electrical Conductivity, Water Holding Capacity, Field Capacity, Wilting Point, Calcium, Magnesium, Sodium, Potassium	10	Three seasons (summer, monsoon and winter)
Noise Hourly readings taken for 24 hours (Leq.)	10	Three seasons (summer, monsoon and winter)
Terrestrial Ecology Parameters : Density, Diversity and abundance of various floral species. Estimation of diversity indices Presence of various faunal species as observed during the ecological survey shall also be recorded and studied	6	Three seasons (summer, monsoon and winter)
Aquatic Ecology Parameters: Density, diversity and abundance of various phytoplanktons and zooplanktons, periphytons, macro-invertebrates species, primary productivity, fish species	6	Three seasons (summer, monsoon and winter)

7. PREDICTION OF IMPACTS

7.1 Construction Phase

The following impacts of the project should be assessed

(a) Air

- Changes in ambient levels and ground level concentrations due to total emissions from point, line and area sources
- Effects on soils, material, vegetation, and human health
- Impact of emissions DG sets used for construction power if any, on air environment.

(b) Noise

- Changes in ambient levels due to noise generated from equipment, blasting operations and movement of vehicles
- Effect on fauna and human health
- (c) **Water**
 - Impact of sewage disposal
- (d) **Land**
 - Changes in land quality including effects of waste disposal
- (e) **Biological**
 - Impacts due to increased human interferences
- (f) **Socio-economic Aspects**
 - Impact on the local community including demographic changes
 - Impact on economic status
 - Impact on human health
 - Impact on increased traffic

7.2.2 Operation Phase

Land Environment

- Impact on land use pattern due to increase in cropping intensity.
- Impacts on soil quality due to increased and continued use of agro-chemicals.
- Increased potential for water logging.
- Impacts due to acquisition of land for various project appurtenances including ownership status.

Water Environment

- Changes in land use and drainage pattern
- Riverbank and their stability
- Impact due to submergence
- Impacts on reservoir water quality.
- Changes in quality
- Sedimentation of reservoir
- Impact on fish fauna
- Disposal of effluents containing agro-chemicals including pesticides from surface and sub-surface drainage system.

Ecology

- Deforestation and shrinkage of animal habitat
- Impact on fauna and flora (including aquatic species if any) due to decreased flow of water
- Impact on rare and endangered species, endemic species, and migratory path/route of animals, if any
- Impact on breeding and nesting grounds, if any
- Impact on animal distribution, migration routes (if any), habitat fragmentation and destruction due to dam building activity
- Impacts on the bio-diversity
- Impacts due to acquisition of forest land and impacts on flora and fauna.

- Impacts on ecologically sensitive sites like national park, wildlife sanctuary, etc. of any.
- Impacts on rare, endangered and threatened species.
- Impacts on medicinally important and other economically important species if any.
- Impacts on migratory routes of wildlife.

Socio-Economic Environment:

- Acquisition of private lands for construction of various project appurtenances namely construction of road network joining the quarry sites and the construction sites
- Social Impact Assessment of PAFs
- Improvement in employment potential as a result of increase in irrigation intensity.
- Improvement in quality of life as result of higher agricultural production, and improvement in income levels.
- Impacts on livestock.
- Increased incidence of vector- borne diseases.
- Impacts on incidence of water-borne diseases
- Improvement in public health, educational status, etc. as a result of economic development.
- Improvement in the status of livestock as a result of greater water availability and fodder from agricultural residues.
- Impetus to urbanization and industrialization as a result of improved water availability.
- Impact on Holy Places and Tourism

Other Aspects

- Downstream impact on water, land & human environment due to drying up of the river at least 10 km downstream of the dam.
- Positive as well as negative impacts likely to be accrued due to the project are to be listed.
- Positive impacts like benefits from carbon trading.

8. ENVIRONMENTAL MANAGEMENT PLAN

Feasible and cost effective measures to prevent or reduce significant negative impacts to the acceptable levels are to be developed, including the estimate of the impacts and cost of these measures, and of the institutional and training requirements to implement them. When impacts cannot be mitigated, compensation to affected parties shall be considered. The management measures proposed to be suggested for the following aspects:

- Measures to control water pollution due to various effluents to be discharged during construction phase.
- Measures to control air pollution during construction phase.
- Measures to contain noise pollution and mitigate adverse impact on construction staff and habitat in the study area.
- Reclamation of areas disturbed during construction including quarry stabilization

and construction waste disposal sites

- Development of public health management plan
- Maintenance of water quality during project operation phase.
- Compensatory Afforestation Plan in lieu of forest land to be acquired for the project
- Biodiversity conservation plan
- Greenbelt development along periphery of reservoir, colonies, approach road, canals etc.
- Health Delivery system.
- Air Pollution Control.
- Noise Control measures.
- Sustenance and enhancement of fisheries potential.
- Infrastructure development for agriculture.
- Measures to control water logging
- Management of water-borne and vector-borne diseases
- Control of Aquatic Weeds

9. RESETTLEMENT AND REHABILITATION PLAN

The project envisages acquisition of private land for various project appurtenances. The families losing land and, homestead on account of acquisition of land for various project appurtenances shall be identified. The information on other infrastructure facilities and community properties likely to be affected as a result of the project shall also be collected.

A Resettlement & Rehabilitation (R&R) Master Plan highlighting the guidelines of land acquisition and provisions for rehabilitation measures shall be formulated. The Resettlement and Rehabilitations Plan shall be formulated as per the norms of Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

10. CATCHMENT AREA TREATMENT

A Catchment area Treatment Plan for catchment area in India intercepted at diversion site of main dam and reregulating dam will be prepared as a part of the Comprehensive EIA study. The procedure for preparation of CAT plan for each watershed area to be covered is given as below:

- Catchment area Treatment Plan to be prepared using SYI method.
- Delineation of sub-watersheds in the catchment area.
- Landuse pattern using satellite data, slope map using Survey of India toposheets, etc. will be prepared.
- Mapping of critically degraded areas based on Integration of Remote Sensing technique, GIS methodology and Silt Yield Index method and prioritization Watershed treatment
- Preparation of phase wise Catchment Area Treatment (CAT) Plan for sub-watersheds with very high and high erosion intensity.
- Estimation of cost required for implementation of CAT plan.

11. DAM BREAK ANALYSIS STUDY

A dam break analysis shall be conducted to simulate hypothetical failure of dam including preparation of inundation maps. The dam break shall be conducted for scenario considering simultaneous failure of main dam and reregulating dam. The study shall be conducted using HECRAS model. A Disaster Management Plan (DMP) shall be

prepared for dealing with emergency situation. It shall include emergency preparedness plan, surveillance plan, evacuation plan etc including communication system.

12. LOCAL AREA DEVELOPMENT PLAN

As a part of the CEIA, a Local Area Development Plan (LADP) shall be formulated for implementation in study area villages. An amount of 0.5% of the project cost shall be earmarked for implementation of Local Area Development Plan. The Corporate Environmental Responsibility shall also be prepared.

13. ENVIRONMENTAL MONITORING PROGRAMME

The Environmental Impact Assessment is basically an evaluation of future events. It is necessary to continue monitoring certain parameters identified as critical by relevant authorities under an Environmental Monitoring Programme. This would anticipate any environmental problem so as to take effective mitigation measures. An Environmental Monitoring Programme will be formulated for implementation during project construction and operation phases. The cost estimates and equipment necessary for the implementation of various measures suggested as a part of Environmental Monitoring Programme shall also be covered as a part of the EIA Study.

14. COST ESTIMATES

Cost Estimate covering following aspects shall be prepared:

- Cost of implementing Environment Management Plans
- Cost of implementing Environment Monitoring Programme
- Cost of Catchment Area Treatment Plan
- Cost of Rehabilitation & Resettlement Plan
- Cost for Local Area Development Plan
- Cost of all other compensation, mitigation and management measures