

# **TERMS OF REFERENCE FOR CONDUCTING EIA STUDY FOR EASTERN RAJASTHAN CANAL PROJECT, RAJASTHAN**

## **1. GENERAL**

The Environmental Impact Assessment of the proposed 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 and Climate Change (MoEF&CC), Government of India (GoI) has issued a notification called EIA Notification 2006 on September, 14, 2006 and its subsequent amendments. The project requires Environmental Clearance from Ministry of Environment, Forest and 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
- Area within 10 km of various project appurtenances including i.e. canal network, submergence area, etc.
- Gross Command Area
- Catchment area intercepted at the various dam/barrage sites.

## **2. DATA COLLECTION/GENERATION**

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

### **A. 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.

### **B. 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).

### **C. Hydrology of the basin**

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

## **D. Biological Resources**

### **I. 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-Weaver Index) 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.
- Rare, endangered and threatened species
- Presence of endemic 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.

### **II. Fauna**

- Inventorisation of terrestrial wildlife and present status along with Schedule of the species
- Endemic, threatened and endangered species
- Butterflies, if any found in the area.

### **III. Aquatic Ecology**

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

### **IV. 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 up to 10 km d/s from the dam/barrage sites and the impact of untreated and waste water in to the river shall be assessed.

## **E. Conservation areas and status of threatened/endangered taxa**

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

## **F. Remote Sensing & GIS studies**

- Delineation of critically degraded areas in the catchment area intercepted at various barrage/dam sites on the basis of Silt Yield Index as per the methodology of AISLUS
- Land use and land cover mapping
- Drainage pattern/map
- Soil map
- Slope maps

### **Socio-economic aspects**

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

### **Other Details**

- Irrigation planning for the project.
- Soil classification of the command area
- Land Irrigability Classification of the Command Area
- Various sampling locations shall be shown on a map.

## **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 (PM<sub>10</sub>), SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>2.5</sub>
- Noise Environment
- Traffic density in the project area

### **Construction Methodology and Schedule including the tunnel driving operations, machinery and charge density, etc.**

## **6. PRIMARY DATA COLLECTION**

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

**Table-1: Details of primary data generation**

<b>Description</b>	<b>No. of locations</b>	<b>Frequency of Sampling</b>
<b>AIR</b> Ambient air quality monitoring (24 hourly samples), twice a week for 2 weeks at six major construction sites <b>Parameters :</b> PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>2</sub>	20	Three seasons (summer, post- monsoon and winter)
<b>River Water</b> Samples to be collected from various representative locations on river in and around water abstraction sites <b>Parameters :</b> 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,	21	Three seasons (summer, monsoon and winter)

Description	No. of locations	Frequency of Sampling
Total Coliform		
<b>GROUND WATER</b> Samples to be collected from various representative locations in the command area  <b>Parameters :</b> Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Chlorides, Sulphates, Fluorides, Phosphates, Calcium, Magnesium, Sodium, Potassium, Iron, DO, BOD, COD	41 (@ one sample per 5000 ha)	Three seasons (summer, monsoon and winter)
<b>SOIL</b> Sampling in the command area <b>Parameters :</b> pH, N,P,K, organic matter, soil texture, Electrical Conductivity, Total pesticides	41 (@ one sample per 5000 ha)	Three seasons (summer, monsoon and winter)
<b>NOISE</b> Hourly readings taken for 24 hours (Leq.)	20	Three seasons (summer, monsoon and winter)
<b>Terrestrial Ecology</b> <b>Parameters:</b> 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	20	Three seasons (summer, monsoon and winter)
<b>Aquatic Ecology</b> Parameters: Density, diversity and abundance of various phytoplanktons and zooplanktons species, primary productivity	20	Three seasons (summer, monsoon and winter)

**Note:** Soil and Water sampling be so selected that the Head, Middle and Tail reaches of canal network is covered.

## 7. PREDICTION OF IMPACTS

### 7.1 Project construction phase

#### Land Environment

- Pollution due to large scale quarrying activities
- Degradation of land during construction activities, i.e. as a result of disposal of construction waste.
- Generation of muck and other construction wastes
- Pollution due to increased soil erosion from the construction sites.
- Impacts due to disposal of solid waste from labour camps.

#### Water Environment

- Pollution due to disposal of untreated sewage from the labour colonies.
- Pollution due to disposal of runoff from construction sites.
- Impacts due to discharge of effluent from the crusher.

### Ecology

- Increase in turbidity during construction phase with corresponding reduction in photosynthetic activity and primary productivity.
- Impacts on terrestrial ecology due to increased human interferences due to congregation of labour population during construction phase

### Air Environment

- Impacts on ambient air quality as a result of construction activities, e.g. operation of various construction equipments, increased vehicular traffic etc.
- Impacts due to fugitive emissions.
- Impacts on ambient air quality due to source of construction power to be identified at the time of construction.

### Noise Environment

- Increase in noise levels as a result of operation of various construction equipment.
- Impacts due to increased vehicular traffic.

### Socio-Economic Environment

- Improvement in the employment scenario as a result of absorption of locals in the construction activities.
- Traffic congestion and traffic safety aspects due to increased traffic movement.
- Increased stress on existing infrastructure facilities due to congregation of labour population.
- Incidence of water-borne diseases in construction staff colony

## **7.2 Project Operation Phase**

### Land Environment

- Impacts on land use pattern due to increase in cropping intensity
- Increased irrigation intensity in the command area
- Impacts on soil quality due to increased and continued use of agro-chemicals.
- Increased potential for waterlogging and soil salinization in the command area.
- Impacts due to acquisition of land for various project appurtenances including ownership status

### Water Environment

- Water availability for various scenarios shall be studied using simulation studies.
- Impacts on reservoir water quality.
- Disposal of effluents containing agro-chemicals including pesticides from surface and sub-surface drainage system.
- Impacts due to disposal of drainage runoff.

### Ecology

- Impacts on the bio-diversity as a result of introduction of irrigation in the command area.

- Impacts due to acquisition of forest land and impacts on flora and fauna
- Impacts on ecologically sensitive sites like national park, wildlife sanctuary, etc. if 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
- Increased potential for farm and tank fisheries in the command area.

### **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, canal and drainage network in the command area.
- Improvement in employment potential as a result of increase in irrigation intensity.
- Improvement in quality of life as a result of higher agricultural production and improvement in income levels.
- Impacts on livestock
- Increased incidence of vector-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.

## **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 the 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.
- 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.
- Command area development plan including On-farm development works
- Measures to control water logging in Command area including conjunctive use of ground
- Management of water-borne and vector-borne diseases
- Control of Aquatic Weeds

## **9. RESETTLEMENT AND REHABILITATION PLAN**

The project envisages acquisition of 67,615 ha of land for various project appurtenances. The private land to be acquired is 29,422.5 ha. The breakup is given as below:

• Reservoir Submergence	:	17344.5 ha
• Water Conductor System	:	11988 ha
• Colonies	:	90 ha
• <b>Total</b>	:	<b>29422.5 ha</b>

The private land and government land require to acquire 29422.5 ha and 29111.1 ha respectively. 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 Rehabilitation Plan shall be formulated as per the norms of the 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 intercepted at various dams/barrages sites 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.
- Land use 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 Water Shed 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. LOCAL AREA DEVELOPMENT PLAN**

As a part of the CEIA study, 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

## **12. 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.

**13. ENVIRONMENTAL FLOWS**

Norms for release of Environmental Flows, i.e., 30% in monsoon season, 20% in lean season and 25% in non-monsoon & non lean season to be followed corresponding to 75% dependable year.

**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