GOVERNMENT OF ODISHA
DEPARTMENT OF WATER RESOURCES

# CATCHMENT AREA TREATMENT (CAT)

# FOR

# AHEERAJORE BARRAGE PROJECT

# DIST: JHARSUGUDA

Sundargarh
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# 1. Introduction

The Catchment Area Treatment (CAT) targets overall improvement in the environmental conditions of the region. All the activities are aimed at treating the degraded and potential areas of severe soil erosion. The plan provides benefits due to biological and engineering measures, and its utility in maintaining the eco-tourism. It also aims to reduce fuel wood consumption at least during the interregnum till the plantations become utilizable.

The CAT Plan would cover the following aspects:

- Identification of directly / free draining catchment to be done basing on Remote sensing and Validation through field survey
- Erosion levels the watershed and prioritization of water sheds will be done by appropriate methods.
- As per the requirement of Ministry of Environment & Forests and Climate Change (MoEF & CC), Government of India, the treatment measures will be proposed for the area falling under very severe erosion categories. Both Engineering measures as well as Biological treatment measures will be proposed in the CAT plan.
- The cost of the administrative set up and mitigative measures will include recommendation from State Forest Department for all forest lands and from the Soil Conservation Department for non – forest land.

# 2. Need

It is a well-established fact that reservoirs formed by dams on rivers are subjected to sedimentation. The process of sedimentation embodies the sequential processes of erosion, entertainment, transportation, deposition and compaction of sediment. The study of erosion and sediment yield from catchments is of utmost importance as the deposition of sediment in reservoir reduces its capacity, and thus affecting the water availability for the designated use. The eroded sediment from catchment when deposited on streambeds and banks causes braiding of river reach. The removal of top fertile soil form catchment adversely affects the agricultural production. Thus, a well-designed catchment area treatment plan is essential to ameliorate the above –mentioned adverse process of soil erosion.

The CAT plan highlights the management techniques to control erosion in the catchment area of a water resource project. The life span of a reservoir is greatly reduced due to erosion in the catchment area. Adequate preventive measures are thus needed for the treatment of catchment for its stabilization against future erosion.

The catchment area treatment involves understanding of the erosion characteristics of the terrain and suggesting remedial measures to reduce the erosion rate. In the present study silt yield index method has been used. In this process, the terrain is subdivided into various watersheds and the erodibility criteria of catchment (low, moderate, high etc) and do not provide the absolute silt yield. SYI method is widely used because of the fact that it is easy to use and lesser data requirement. Moreover, it can applied to larger areas like sub watersheds etc.

## 3. Salient feature of Aheerajore Barrage Catchments

Aheerajore Nallah originates from the hill range of Garjan RF in Lakhanpur Block in Jharsuguda District. It travels a distance of 22.5 km almost in south direction and finally confluence with Hirakud Reservoir near village Kureimal of Jharsuguda at about 2.50 km downstream of proposed project site. It is ascertained from local enquiry that the flow in the nallah continues till end of the March.

The catchment area at the barrage site is 133Catchment. 40 $km^2$. It is fan shaped and is surrounded by steep hills and covered with degraded forest growth.

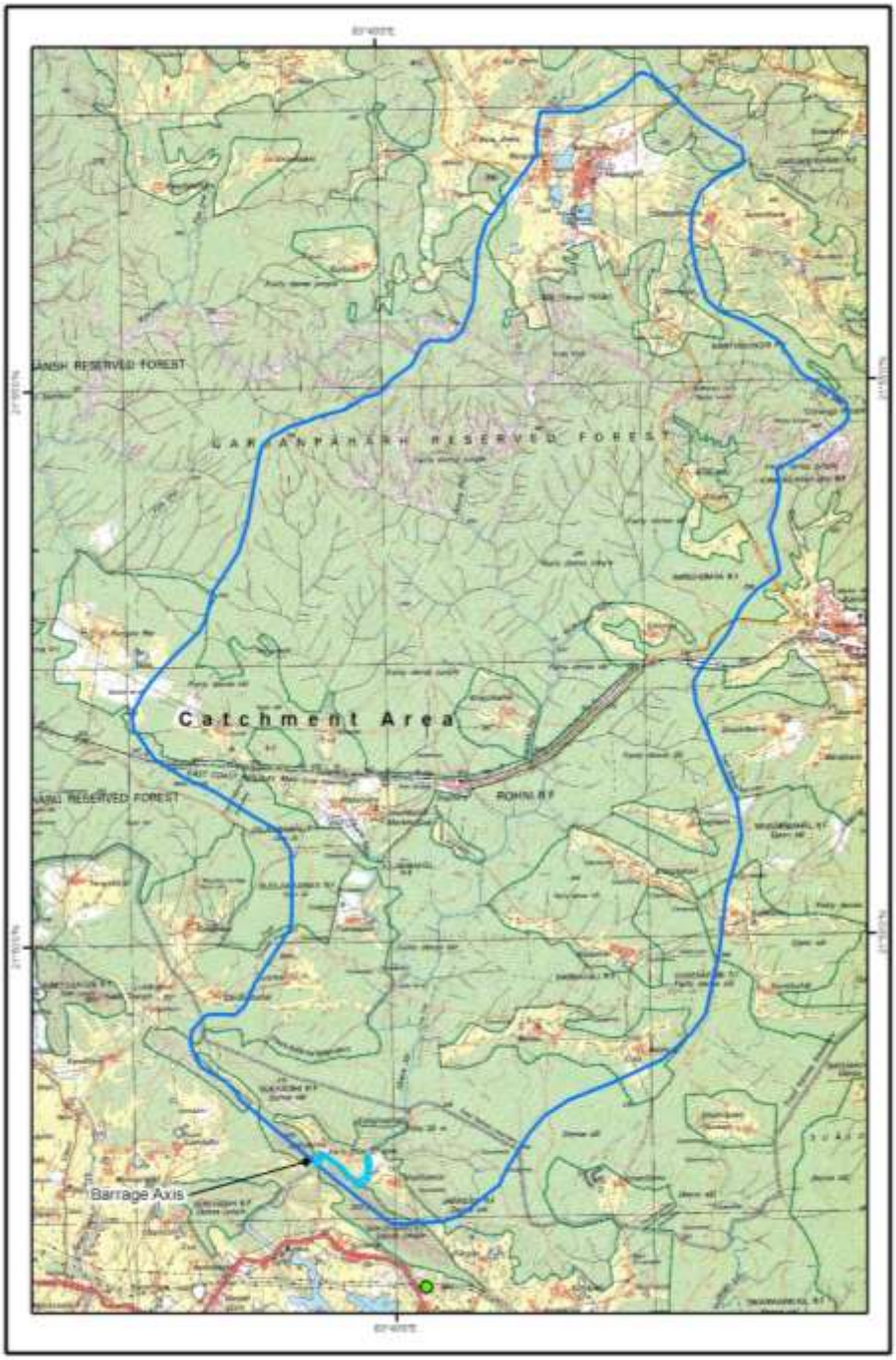


**Fig-1: Catchment Area of Aheerajore Irrigation Project**

# 4. Proposed Methodology

A detailed database on natural resources, terrain conditions, soil type of the catchment area, socio-economic status, etc. is a pre-requisite to prepare CAT plan. Various thematic maps are proposed to be used in preparation of the CAT plan, will be developed in Geographic Information System (GIS) platform.

The proposed methodology for development of CAT plan for Aherajore project is as under:

- Satellite Data acquisition and Thematic Map preparation
- Data Modelling and Mapping of Soil Erosion Range
- Estimation of Soil Loss using Silt Yield Index
- Watershed Prioritization
- Catchment Treatment (CAT) Plan
- Cost Estimate

The various data layers of the catchment area to be used for the study are as follows:

- SoI Topo Sheets
- Land use Classification Map derived from satellite Image
- Soil Map from All India Soil and Land Use Survey
- Slope Map generated from SOI topo map
- Watershed Boundaries

Thematic data integration and erosion index modeling shall be done using relevant map layers in GIS.

Silt Yield Index (SYI) of various watersheds within the free catchment shall be estimated. Watershed management approach shall be taken for optimal use of soil and water resources within the catchment with the broad objective of

- increase infiltration into soil
- control excessive runoff
- manage & utilize runoff for useful purpose

Following Engineering and Biological measures shall be suggested for the catchment area treatment depending upon the requirement and suitability:

a. Engineering measures -
    - Step drain
    - Stone masonry
    - Check dams
b. Biological measures
    - Development of nurseries
    - Plantation/afforestation
    - Pasture development
    - Social forestry

The basis of site selection for different biological and engineering treatment measures under CAT are given in the Table below.

**Basis for selection of catchment area treatment measures**

| Treatment measure | Basis for selection |
|---|---|
| Social forestry, fuel wood and fodder grass development | Near settlements to control tree felling |
| Contour Bunding | Control of soil erosion from agricultural fields |
| Pasture Development | Open canopy, barren land, degraded surface |
| Afforestation | Open canopy, degraded surface, high soil erosion, gentle to moderate slope |
| Step drain | To check soil erosion in small streams, steps with concrete base are prepared in sloppy area where silt erosion in the stream and bank erosion is high due to turbidity of current |
| Nursery | Centrally located points for better supervision of proposed afforestation, minimize cost of transportation of seedling and ensure better survival. |

## 4.1 Catchment Area Treatment (CAT) Plan

CAT Plan as per the slope, land use pattern, soil characteristics has to be suggested based on the prioritization of sub watersheds using SYI method. The CAT plan has to be suggested for Sub-watersheds with very high and high erosion categories as the cost for treatment for such watersheds is to be borne by the project authority. The objective of the SYI method is to prioritize sub-watershed in a catchment area for treatment. Sub-watershed wise proposed treatment measures in these sub watersheds are to be superimposed over SOI toposheets. The treatment measures shall be implemented in a year wise phase and shall be co-terminus with the construction of project.

Few silt observation locations for regular monitoring of silt load coming in tributaries of sub-watersheds falling under high and very high categories have to be suggested. This would ensure monitoring efficacy of implementation various treatments measures suggested as in CAT plan. Monitoring would be undertaken for a period of 10 years including CAT plan implementation period. Cost towards this will be kept in project estimates.

## 4.2 Cost

The cost required for Catchment Area Treatment is proposed to be calculated under the following indicative heads.

### Biological Measure

- Afforestation
- Maintenance of afforestation
- Pasture development
- Nursery development
- Maintenance of Nursery
- Watch and Ward

### Engineering measures

- Contour bunding
- Gully plugging
- Check dams/ WHS

Provision for other expenses like Govt. overhead (including O & M), Establishment cost and Contingency will also be kept over the expenditure on Biological and Engineering measures. Provisions will also kept for other miscellaneous works like

- Provision for forestry research in the area
- Provision for eco-tourism
- Provision for monitoring & evaluation activities
- Provision for forest protection measures
- Provision for eco-services to local communities
- Provision for training for forest staff and sensitization of local communities
- Provision for energy saving devices
- Silt Observation Sites (10 year cost including manpower)