

VOL-IV-C

ANNEXURE-III

GOVERNMENT OF ODISHA
WATER RESOURCES
DEPARTMENT

CAT Plan Report

FOREST CLEARANCE OF HIDSING
MEDIUM IRRIGATION PROJECT



o/c o/c

**Angul Investigation Division,
Angul
District, Angul (ODISHA)**



Catchment Area Treatment Plan

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1 CATCHMENT AREA TREATMENT PLAN

1.1 Introduction

The study of erosion and sediment yield from a catchment area is of paramount importance due to its direct impact on reservoir capacity. Accumulated sediment in reservoirs significantly reduces their water storage capacity, ultimately affecting their intended purposes. Additionally, sediment deposition from catchment erosion onto streambeds and banks can lead to river braiding, further exacerbating the issue. The loss of topsoil from the catchment area also has detrimental effects on agricultural productivity. Another noteworthy contributor to sediment load and soil degradation is the extensive grazing pressure from cattle, sheep, and goats, which continuously graze mountainous pastures for approximately six months.

The absence of adequate vegetative cover plays a pivotal role in degradation, resulting in excessive runoff, soil erosion, and, subsequently, premature siltation of the reservoir. Hence, the development of a well-structured Catchment Area Treatment (CAT) Plan is imperative to mitigate these adverse effects of soil erosion. This plan involves a comprehensive assessment of terrain erosion characteristics and the proposal of remedial measures to reduce erosion rates and soil losses. Consequently, the treatment of catchment areas, including directly draining rivers, streams, tributaries, etc., is incorporated into the project's budget to address these concerns effectively.

A fundamental prerequisite for successful watershed management is the collection of multifaceted data, encompassing geology, geomorphology, topography, soil composition, land use/land cover, climate patterns, hydrology, drainage patterns, and more. The Action Plan for Catchment Area Treatment is formulated based on this comprehensive data, sourced from various published references and firsthand observations in these watersheds.

Catchment Area Treatment (CAT) plans have been meticulously devised for the naturally draining catchment areas within the proposed project's vicinity, with a specific focus on regions characterized by high soil erosion rates. These CAT Plans are designed to enhance the overall environmental conditions of the region. All activities are geared towards addressing areas with significant degradation and a high potential for soil erosion. The plan incorporates both biological and engineering measures, contributing to the preservation of ecosystem health. The objectives of the plan include preventing gully erosion, increasing forest cover to enhance soil retention capacity, and effectively halting the flow of sediment into the reservoir and water bodies.

Chapter-9 (Irrigation and Hydro-Electric Projects, including Catchment Area Treatment (CAT) Plan) of the Handbook deals with the requirement and necessary guidelines for the preparation of Catchment Treatment Plan for the irrigation projects. As per guideline 9.2,

“

9.2. Catchment Area Treatment (CAT) plans: A proposal for diversion of forest land for Irrigation/Hydro-electric projects shall invariably be accompanied by detailed CAT plan except in respect of small hydel projects (maximum up to 10 MW capacity), which are either canal head or run-of the river projects and do not involve impounding of water/submergence of forest land.



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The CAT Plan is an important and essential plan for enhancing and maintaining the ecological health of the catchment area of the proposed irrigation/hydroelectric project through **site-specific biological and engineering measures for conservation of soil & moisture**

and management of water regime. Among other provisions, the measures should focus on **arresting soil erosion, improving effective drainage in the area, and rejuvenation of the degraded eco system in the catchment**. Following general principals should be kept in view while formulating CAT plans.

- i. **In the dense forest areas** major concentration should be on soil & water conservation including water harvesting for which various water harvesting structures like check dams, gully plugging, gabion dams, contour trenches and vegetative structures should be made.
- ii. **In the open forest areas** besides taking up soil & water conservation measures, plantation of local indigenous tree and shrub species, including rare/medicinal plants, should be done. In higher altitudes plantation of Chir pine should be avoided.
- iii. The CAT plan should include **a component of fodder development** on the civil soyam forest or on revenue/private lands in order to meet the requirement of fodder/small timber/fire wood for the local population with a view to reduce pressure on the forests.
- iv. The CAT Plan should have a socio-economic component including supply of CNG connections to the project affected families to be implemented through Joint Forest Management Committees (the nomenclature may vary among the States/UTs).
- v. The infrastructure component like construction of buildings, vehicles, salaries of staff etc. may be provided based on a careful analysis of the need for the same with detailed justification and should constitute a very small percentage (say up to 5%) of the total cost of the CAT plan.
- vi. CAT plan shall be approved by the Principal CCF & HoFF or any other officer authorized by him for the purpose.
- vii. Regular monitoring is essential for effective implementation of the CAT Plan. The Chief Project Officer of the User Agency must be associated in implementation as well as monitoring of the progress of CAT plan. For this, a committee with following composition may be constituted at State level for quarterly review of progress of implementation of various CAT plans and take immediate steps to ensure the same:
 1. PCCF & HoFF– Chairman
 2. Secretary (Agriculture) or his representative – Member
 3. Secretary (Animal Husbandry) or his representative – Member
 4. Project Officer-User Agency – Member
 5. Concerned Conservator of Forests – Member
 6. Nodal Officer (FC) o/o PCCF -Member Secretary

”

1.1.1 Project Details

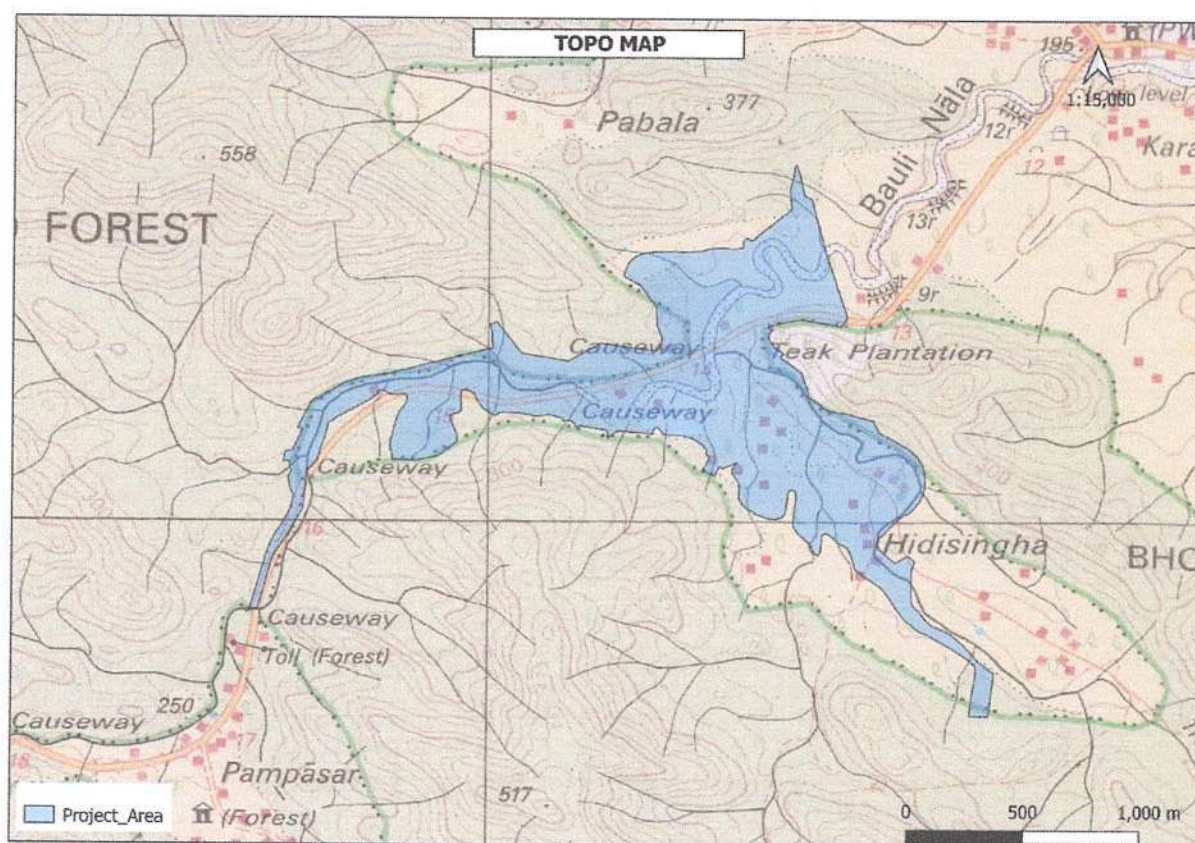
Short narrative of the proposal and Project/Scheme for which the Forest Land is requested:



CATCHMENT AREA TREATMENT

This proposal is for diversion of 87.520 Ha. of Forest land out of 437.330 Ha of total land required for Construction of Hidsing Irrigation Project including alternate road due to submergence of (Angul – Tikarapada Road) S.H 23. The Private Non-forest land 287.579 Ha + Govt. Non-forest land 62.231 Ha + forest land 87.52 Ha (Reserve forest 38.619 Ha + Revenue forest land 7.276 Ha + DLC forest land 19.55 Ha + Private forest land 22.075 Ha) = Total 437.330 Ha of land involved for Construction of Hidsing Irrigation Project including alternate road proposed to be done across the river BauliNallah near Village Karadising in Brahmani Basin of Anugul Forest Division & Anugul District, by the Department of Water Resources, Govt. of Odisha. The BauliNallah is a major tributary of Lingaranallah joining near Ramkasinga. LingaraNallah in turn joins the river Brahmani on its right bank near village Meramundali. The BauliNallah originates from hill ranges of Balanga in Angul Block of Angul District and traverses in the north-east direction. The Project includes a water reservoir with a homogeneous earth dam and a Central Spillway & 2 main (Right & Left) canals with Distributaries, Minors & sub minors & outlets from the main Canal & an alternate road (due to Submergence of Anugul - Tikarapada road S.H 23) has been provided. This project has been technically approved by the Central Water Commission; Govt. of India vide their letter no. M & A/AP-1/2012/13-15 dated- 04.01.2013 (Annexure-I).

The project is located in Angul block of Angul district near village Karadasing at Latitude 20° - 43' - 00" N and Longitude 84° - 58' - 30" E vide Toposheet No. 73H/2, 73D/14. An Index map showing location of the project is enclosed. The dam site, which is near village Karadasing is 25 Kms from Angul, the district head-quarters, Angul. The National Highway - 55 connecting Sambalpur and capital city of the state, Bhubaneswar. The nearest railway station of East coast Railway is Angul 30 Kms from proposed dam site. The dam site is 180 Kms from the state capital and nearest airport, Bhubaneswar.



1.1.2 SALIENT FEATURES OF HIDSING IRRIGATION PROJECT

A. GENERAL

i.	State	:	Odisha
ii.	District	:	Angul
iii.	Sub-Division	:	Angul
iv.	Village	:	Karadasing
v.	River	:	BauliNallah

B. LOCATION

i.	Latitude	:	20° – 43' – 00"
ii.	Longitude	:	84° – 58' – 30"
iii.	Topo Sheet	:	73H/2, 73D/14
iv.	Nearest Railway Station	:	Angul
v.	Nearest Air Port	:	Bhubaneswar
vi.	Distance from State Capital	:	180Km. to Project Site

C. HYDROLOGY

i.	Catchment Area	:	72.30 Sq. Km.
ii.	Rainfall		

a) Maximum annual rainfall : 2693.40mm.

**CATCHMENT AREA TREATMENT**

b) Minimum annual rainfall	:	769.00mm.
c) 75% dependable year rain	:	1138.90mm.
d) Net 75% dependable yield	:	1726.30Ham.
e) Design Flood discharge	:	778.00 Cumecs.

D. RESERVOIR

i. Gross storage at FRL	:	1765.58 Ham.
ii. Dead storage capacity	:	245.30 Ham.
iii. Live storage capacity	:	1520.28 Ham.
iv. Full Reservoir Level	:	RL 228.00m.
v. Dead storage level	:	RL 214.00m.
vi. Top Bank Level	:	RL 231.00m.
vii. Submerged area at FRL/MWL	:	324.95Ha.
viii. Number of villages submerged	:	2 Nos.
ix. Length of NH to be submerged	:	NIL
x. Length of S.H. to be submerged	:	3.65KM.
xi. Forest area to be submerged	:	74.357 Ha.

E. SUBMERGENCE

i. Number of villages affected	:	3 Nos.
Number of villages fully affected	:	2 Nos. of village namely Hidsing & Dimiripal.
Number of villages partly affected	:	1 No. Karadasing
ii. Number of families affected	:	161 Nos.

F. DAM

i. Type	:	Homogeneous Earth Dam
ii. Length of Earth Dam	:	933m.
iii. Maximum height	:	32.50m.
iv. Top width	:	6.00m.

G. SPILLWAY

i. Location and type	:	Central Spillway and Ogee Crest
ii. Length of Spillway	:	36m.
iii. Crest Level of Spillway	:	RL 220.00m.
iv. Size of Gate	:	10m x 8m.
v. Numbers of bays	:	3 Nos.

**H. DISTRIBUTION SYSTEM**

i.	G.C.A.	:	3943 Ha.
ii.	C.C.A.	:	2958 Ha.
iii.	Percentage of CCA & GCA	:	75%
iv.	Intensity of Irrigation during Khariff	:	80%
v.	Intensity of Irrigation during Rabi	:	25%
vi.	Area to be irrigated during Khariff	:	2366 Ha.
vii.	Area to be irrigated during Rabi	:	740 Ha.
viii.	Annual Irrigation	:	3106 Ha.
ix.	Annual intensity of Irrigation	:	105%
x.	Utilization factor	:	77.52%
xi.	Length Main Canal on Right side	:	8.460Km.
xii.	Length Main Canal on Left side	:	17.700Km.
xiii.	Number of villages to be benefitted	:	29 Nos.

I. COST

i.	Cost of Head Works	:	Rs. 16583.89 Lakhs
ii.	Cost of Distribution system	:	Rs. 7965.37 Lakhs
iii.	Total Cost of the Project	:	Rs. 24549.26 Lakhs
iv.	Cost per hector of annual irrigation	:	Rs. 7.90 Lakhs
v.	B.C. ratio (10% rate of interest rate)	:	Rs. 1.53

1.2 Objectives

Integrated watershed management plans are comprehensive strategies designed to sustainably manage and develop the resources within a watershed. These plans aim to address various environmental, social, and economic objectives. Here are detailed pointwise objectives typically included in an integrated watershed management plan:

1 Water Resource Management:

- Improve water quality through pollution prevention and control measures.
- Enhance groundwater recharge and maintain base flow in rivers and streams.

2 Soil Conservation and Land Management:

- Mitigation of landslide, landslip and rockfalls.
- Soil conservation through biological and engineering measures to reduce sediment load in river and tributaries, incidentally improving the quality of water.
- Implement erosion control measures to reduce soil erosion and sedimentation.
- Promote soil conservation practices to maintain soil fertility and structure.



- Prevent land degradation and ensure the sustainable use of land resources.
- 3 Biodiversity and Habitat Protection:
- Preserve and restore natural habitats and biodiversity within the watershed.
 - Promote the conservation of endangered species and ecosystems.
 - Establish and maintain buffer zones and green corridors for wildlife.
- 4 Riparian Zone Protection:
- Protect and restore riparian zones along water bodies to maintain water quality.
 - Establish vegetative cover to stabilize stream banks and reduce erosion.
 - Ecosystem conservation resulting from increased vegetal cover and water retaining properties of soil.
 - Enhance wildlife habitat and promote aquatic biodiversity in riparian areas.
- 5 Afforestation and Reforestation:
- Rehabilitation of degraded forest areas through afforestation and facilitating natural regeneration of plants.
 - Implement tree planting programs to increase forest cover and combat deforestation.
 - Restore degraded forest ecosystems and promote sustainable forestry practices.
 - Enhance carbon sequestration and mitigate the effects of climate change.
- 6 Agricultural Sustainability:
- To meet the fuel and fodder requirements of local people.
 - Promote sustainable agricultural practices that minimize the use of harmful chemicals.
 - Improve crop and livestock management to increase productivity and reduce runoff.
 - Support small-scale farmers through training and capacity-building programs.
- 7 Community Engagement and Livelihood Improvement:
- Involve local communities in watershed management planning and decision-making.
 - Enhance livelihoods through income-generating activities, such as eco-tourism or agroforestry.
 - Promotion of non-conventional energy device to reduce pressure on forest.
 - Strengthen social cohesion and community resilience.
- 8 Infrastructure Development:
- Construct and maintain water harvesting structures, check dams, and irrigation systems.



- Develop sustainable sanitation facilities to reduce water pollution.
- Build and maintain roads and trails for improved access and mobility.

9 Education and Awareness:

- Raise awareness about the importance of watershed management among stakeholders.
- Provide training and educational programs on sustainable resource management.
- Foster a sense of ownership and responsibility among the community.

10 Monitoring and Evaluation:

- Establish a robust monitoring and evaluation system to assess the effectiveness of interventions.
- Continuously collect data on key indicators to track changes in the watershed.
- Adjust management strategies based on monitoring results.

Integrated watershed management plans play a crucial role in promoting sustainability, resilience, and the long-term well-being of communities and ecosystems within a watershed. These objectives are typically tailored to the specific needs and characteristics of each watershed, taking into account its unique environmental, social, and economic conditions and are based on soil erosion intensity in the catchment area.

1.3 Methodologies

The CAT Plan would cover the following aspects

1. Identification of directly / free draining catchment to be done basing on remote sensing and validation through field survey.
2. Erosion levels the watershed and prioritization of water sheds will be done by appropriate methods.
3. As per the requirement of Ministry of Environment & Forests and Climate Change (MoEF & CC), Government of India, the SMC treatment measures will be proposed for the area falling under very dense forest cover while intensive treatment measures including afforestation and rehabilitation of degraded lands will be suggested in severe erosion categories. Both Engineering as well as biological treatment measures will be proposed in the CAT plan.
4. The CAT Plan also includes a socio-economic component including supply of CNG connections to the project affected families to be implemented through Van Surakhya Samities (VSSs).
5. The infrastructure component like construction of buildings, vehicles, salaries of staff etc. may be provided based on a careful analysis of the need for the same with detailed justification and should constitute a very small percentage (say up to 5%) of the total cost of the CAT plan.
6. The cost of the administrative set up and mitigate measures will include recommendation from State Forest Department for all forest land and from the Soil Conservation Department for non-forest land.



1.4 Scope of the Work

The detailed Scope of work for development of CAT plan for Hidsing (Medium Irrigation) Project is as under:

1.4.1 Data Collection:

- Survey of India (SOI) Topo Sheets.
- Project Map / Catchment Area Map from concerned Project Authorities.
- Satellite imagery acquisition (Liss-IV) from Open-Source platforms.
- Soil map from All India Soil and Land Use Survey and other open sources.

1.4.2 Data Generation:

- Drainage & Hydrology from Digital Elevation Model (DEM).
- Contour from Digital Elevation Model (DEM).
- Land Use: The land used classification and coverage in the Project Catchment Area.
- Physiography / Soil: Project area will have a variety of soils, mainly dependent on the lithology, topography, altitude, climate and vegetation cover. This shall be derived from map prepared by All India Soil and Land Use Surveys and other available data.
- Micro Watershed generation from DEM, Toposheet and Bhuvan data.
- Data Elevation Model (DEM): Derived contours from topographical maps will be used for preparation of DEM of the free draining catchment area and to prepare a slope-oriented map.
- Slope: Generation of Slope from SOI Topo sheets.

1.4.3 Data Analysis / Modeling:

- Google Earth Engine (GEE) has been used to analyze the various Data related to Land Use, Soil, Slope values, Soil erosion, rainfall and runoff etc.
- Watershed prioritization based on the Soil loss data
- Plan for Watershed Management:
 - Treatment measures / options.
 - Sub watershed wise afforestation plan.

1.4.4 THEMATIC MAP GENERATION:

As mentioned in the methodology, various thematic layers like catchment, watershed, drainage, contour, slope, land use, soil were prepared in Geographic Information System (GIS) platform. For seamless integration of different thematic layers and interactive spatial analysis, the themes were generated in a real-world coordinate system, i.e. UTM(Universal Transverse Mercator). This projection system is used in the recent publication Open Series Map (OSM) of SOI and is also suggested in National Map Policy. Datum used for the projection is WGS 1984 and Zone is UTM 45North.

1.4.5 CATCHMENT AND WATERSHED MAP:

The catchment boundary of Hidsing barrage was delineated from Cartosat DEM image file using SAGA watershed algorithm in GIS software. It was further confirmed with the SOI Topo sheets No. F45T02 & F45S14 looking at the contours and drainage. It was decided to



CATCHMENT AREA TREATMENT

prepare the CAT plan at Micro Watershed level instead of Watershed level due to small catchment area of 74 sq km. The micro watersheds are prepared using the information available in Watershed Atlas of India and website and Land Use Survey of India (SLUSI) and the micro watershed boundary collected from Watershed Mission of Odisha.

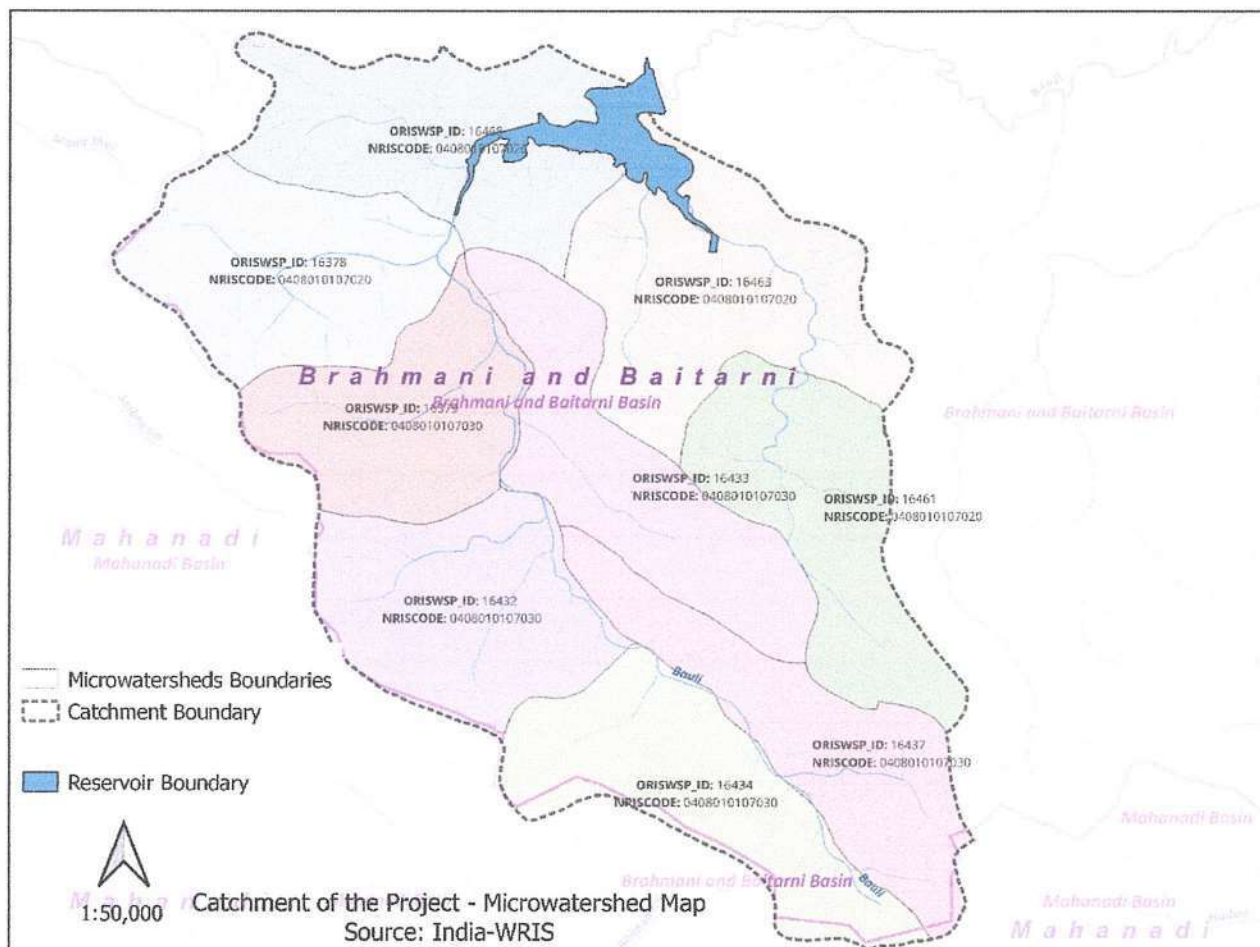


Figure 1: The Catchment Area Map of Hidsing Barrage Project

1.4.6 SLOPE MAP:

The Slope was prepared using the derived contours from SOI Topo sheet. These contours were used for preparation of Digital Elevation Model (DEM) of the catchment area before preparation of the slope map. A surface was created using the elevation values stored in the form of contours or points. After marking the catchment area, all the contours on the topographical maps were derived.

A Digital Terrain Model (DTM) of the area was then prepared, which was used to derive aslope map.

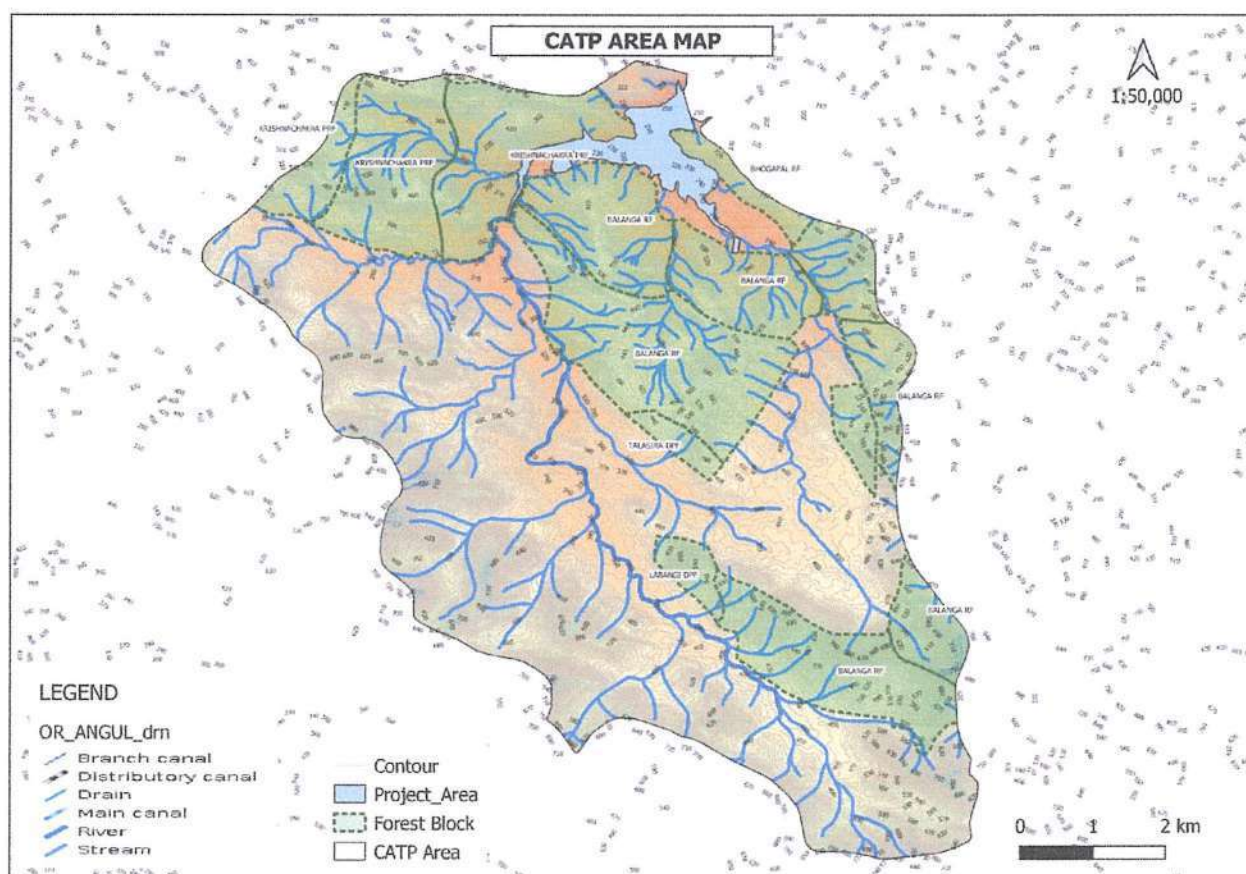


Figure 2: Map showing Contours in the Catchment Area

The slope was divided in classes of slope percentages.

The slope of a watershed plays an important role in controlling the soil and water retention thereby affecting the land-use capability. The percentage of the slope in a watershed determines the soil erosion susceptibility and forms the basis for classifying different of the watershed into suitable classes for formulating effective soil erosion conservation measures. Broadly, the following slope classes and ranges (Table 1.3) as per norms of All India Soil & Land Use Survey were adopted to classify the slopes for the present study.

Table 1.3: Slope Ranges showing the intensity of catchment area

Sr. No	Slope Range (Degrees)	Description
1	0-2	Very Gentle Slope
2	2-5	Gentle Slope
3	5-10	Moderate Slope
4	10-18	Moderately Steep Slope

The Slope map of the free draining catchment is presented in **Figure 3**.

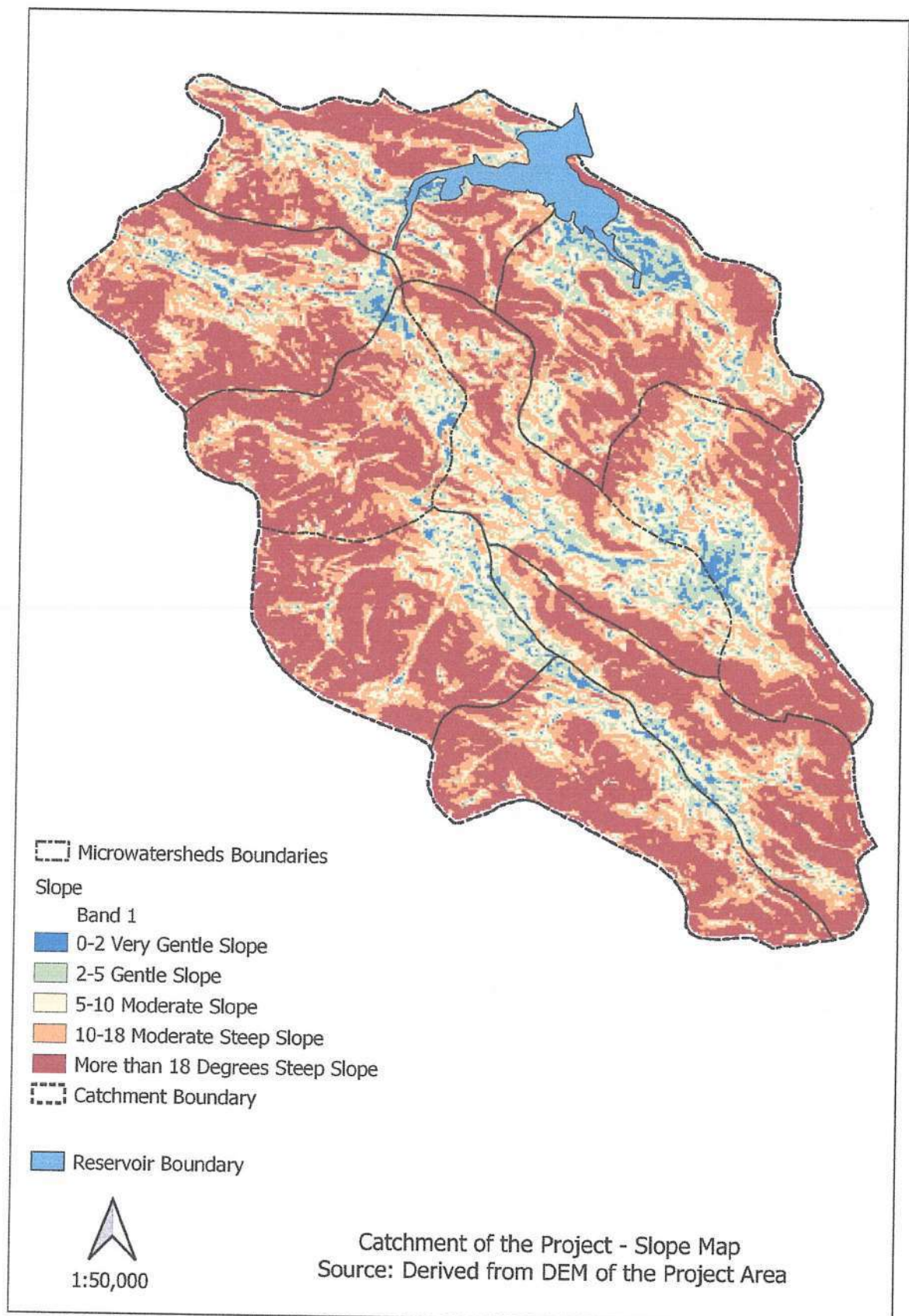


Figure 3: Slope Map of the catchment Area

1.4.7 Land Use/ Land Cover Map:



1.6 Topography

The catchment is largely hilly terrain and has undulated topography and tracts of agriculture land and dry deciduous forest.

The elevation map along with drainage map of the catchment is shown in **Figure1.3**.

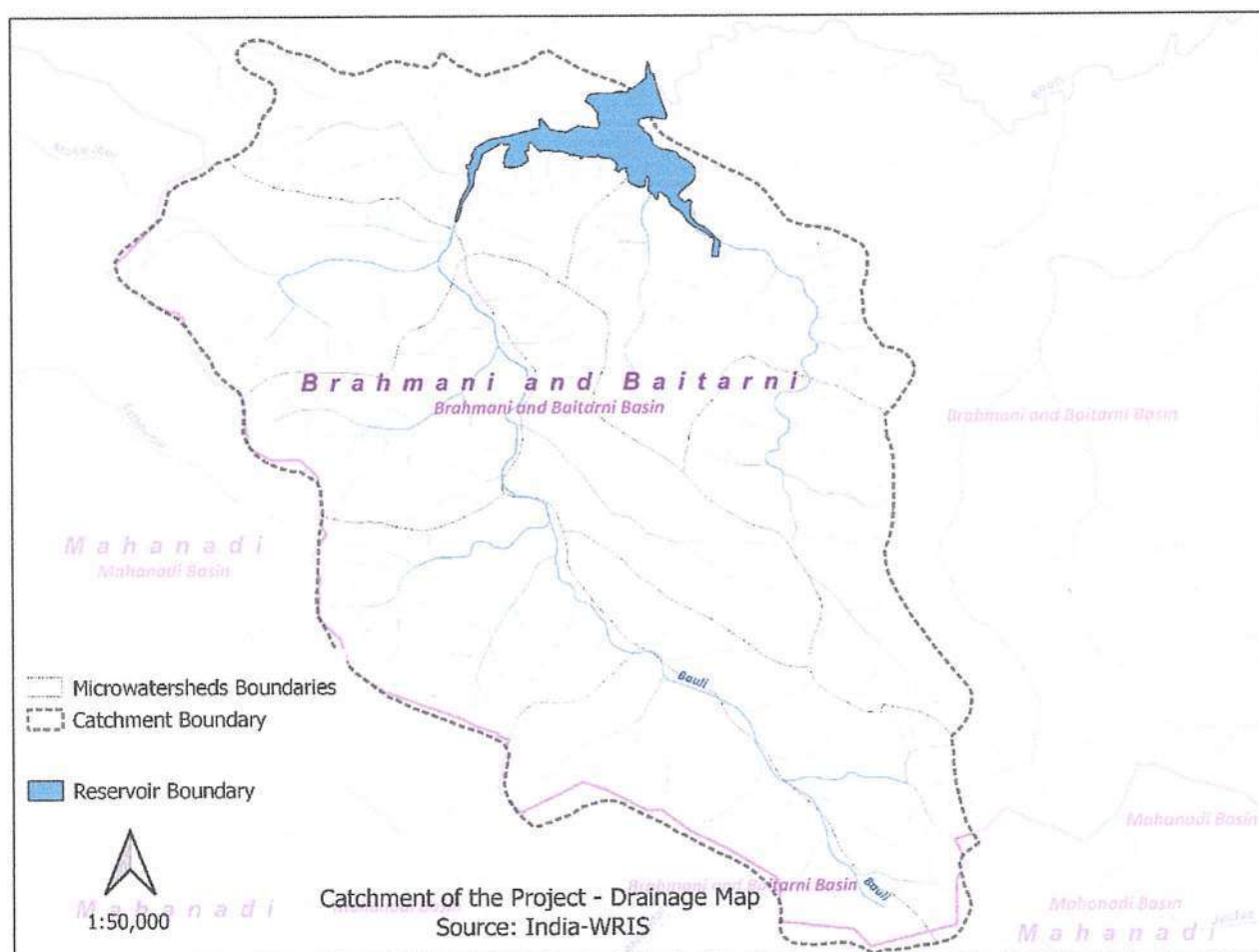


Figure 1.3: Drainage map of the catchment.

1.7 Soil

Slightly deep well drained, clayey soils on gently sloping interveinal plateau with moderate erosion.



Based on satellite data, topo-sheets and other secondary data, a land-use map has been prepared and verified in detail during ground surveys i.e., crosschecked with ground truths. The Land use/Land-cover map of the catchment area is presented in **Figure 1.5** and its details are presented in **Table 1.2**.

1.7.2 Land use Categories and Erosion

The erosion acts differently in different land-use types. It is important to understand the nature of erosion in a land-use class to further plan for treatment.

1.7.2.1 Agricultural Land

Around 3.21sq km area of the catchment constituting 4% of the total catchment comes under this category. Plain to Well-planned and developed terraces were seen at some places. In general, at places the sheet and rill type of soil erosion predominates with few gullies in early stage of its development. Very few or no measures are taken to conserve soil and tendency exists to interrupt the natural drainage due to faulty agricultural practices. Runoff often exceeds the safe velocity on long slope lengths. It is suggested to repair and better design the agricultural terraces, contour trenches, ponds etc. which follows the faulty agricultural practices.

Temporary and semi-permanent soil conservation structures like brushing dams, wiring woven and gabion check dams etc. shall be made for effective adaptive management.

1.7.2.2 Settlement

Under settlement category about 0.18sq km area of catchment constituting less than 1% of the total catchment is present.

1.7.2.3 Open Forest Land

Under open forest category, about 8.01 sq km, constituting 11% of the total catchment, is present. Forest crown density ranges from 0-40% or on average 20% crown density can be assumed present in the area. Soils have relatively good water holding capacity, humus, nutrient content and moderate to slight erosion rates on steeper slopes. Therefore, rill erosion predominates which in due course leads to scrub land formation with gullies. Afforestation and drainage treatments are suggested so as to increase the crown density by 20% in whole of the area to reduce erosion.

1.7.2.4 Dense Forest

Dense forest covers about 48 sq. km area constituting 64% of the catchment with the forest crown density above 40%. Soils are very good in water holding capacity, humus and nutrients with no erosion but due to steeper slopes, some area requires soil conservation measures.

1.7.2.5 River / Waterbody

Around 1.19sq km area constituting 2% of the catchment area is classified under water bodies. The category needs no treatment except that the unstable bank shall be provided stream bank stabilization through protection measures whenever required.

Table 1.2. Land use Details in the Catchment

S. No.	Land use category	Area (sq km)	Area (%)
1	Dense Forest/Vegetation	48	64%
2	Open Forest/Vegetation	8.01	11%
3	Tree Clad Area	5.43	7%
4	Tree Clad Area (Open)	4.66	6%
5	Crop Land-Kharif Crop	3.21	4%
6	River/Stream	1.19	2%
7	Land With Scrub	1.18	2%
8	Groves/Orchard/S. Trees	0.69	1%
9	Mango/Jack Fruit/ Other Fruit Bearing Orchards	0.52	1%
10	Forest Plantation	0.45	1%
11	Grazing Land (Gochar)	0.28	0%
12	Village Settlement	0.18	0%
13	Vacant Land Inside/Periphery of Villages	0.16	0%
14	Metalled /Earth Road	0.14	0%
15	Dense Scrub	0.07	0%
16	Other Misc	0.27	0%
	Grand Total	74.44	100%

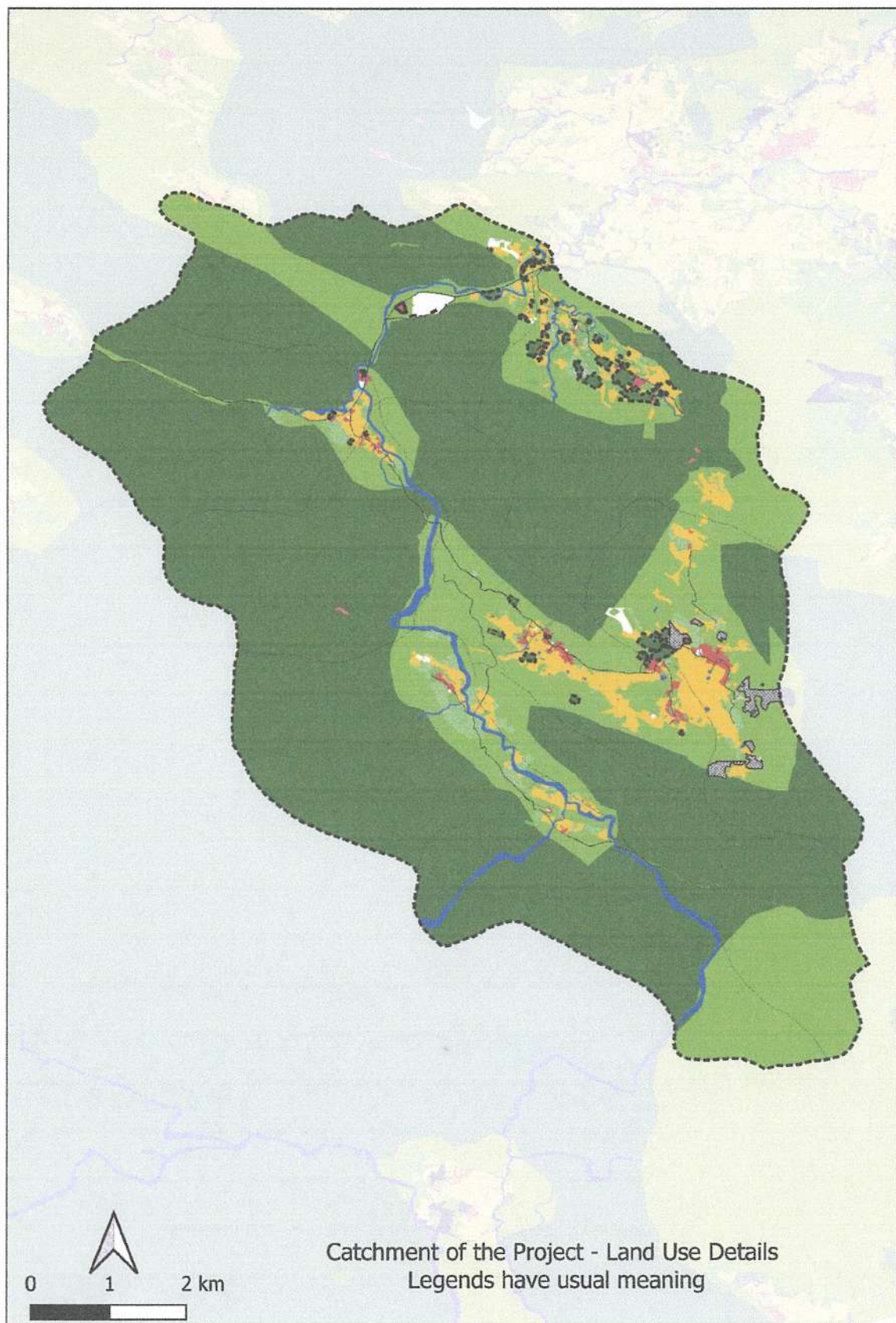


Figure 4.5: Land Use Plan of the Catchment Area



Superimposing topography, slope, soil and land use data/maps, a tentative estimation of erosion prone areas and landslides area in the catchment were made. The vulnerable and problematic areas were identified in different physiographic zones.

These data sets were used for preparation of the thematic maps, calculation of sediment yield index and Erosion Intensity Units.

1.7.1 Soil Loss Using RUSLE Method

Curve Number Method as discussed in Identification of Soil Erosion Prone Areas of Madhya Pradesh using USLE/ RUSLE by Ashwini Suryawanshi, Anupam Kumar Nema, Rahul Kumar Jaiswal, Sukant Jain and Saswat Kumar Kar" published in Journal of Agricultural Engineering, Vol. 58 (2) has been used for the calculation of Soil Loss data in different micro watersheds in the Catchment.

To develop the SCS CN model using cloud data and the GEE server, different sources of data availability were examined. The methodology was finalized with the help of a flowchart to use dynamic LULC (MCD12Q1.006 MODIS Land Cover), rainfall (Climate Hazards Group InfraRed Precipitation (CHIRPS) with Station Data), Global Soil data (OpenLandMap), and other data for SCS CN model.

Sl. No.	Data	Data resolution	Source of data
1.	Total rainfall amount	CHIRPS-2.0 (Resolution 0.05°)	Climate Hazards Group Infrared Precipitation with Station (www.legacy.chg.ucsb.edu/data/chirps/index.html)
2.	Soil type	DSMW at scale 1:5 million.	Digital Soil Map of the World, FAO (www.fao.org)
3.	Land use	MODIS (Moderate Resolution Imaging Spectroradiometer) image format with (30 m resolution)	National Aeronautics and Space Administration's (NASA), (http://www.usgs.gov)
4.	NDVI	eMODIS image (250m resolution)	National Aeronautics and Space Administration's (NASA), (http://www.usgs.gov)
5.	LS and Slope	DEM (30m resolution)	Shuttle Radar Terrain Mapper (SRTM), (http://www.usgs.gov)

The USLE and RUSLE models can be expressed by the following equation:

$$A = R * K * L * S * C * P \quad \dots (1)$$

Where,

A = Computed soil loss caused by sheet and rill erosion, $t \cdot ha^{-1} \cdot yr^{-1}$,

R = Rainfall erosivity factor, $MJ \cdot mm \cdot ha^{-1} \cdot h^{-1} \cdot yr^{-1}$,

K = Soil erodibility factor, $t \cdot ha \cdot h \cdot ha^{-1} \cdot MJ^{-1} \cdot mm^{-1}$,

L = Slope length factor, dimensionless,

S = Slope steepness factor, dimensionless,

C = Cover and management factor, dimensionless, and

P = Support practice factor, dimensionless.

The conceptual framework of soil erosion approximation by USLE/RUSLE model are depicted in Fig. 2, and the

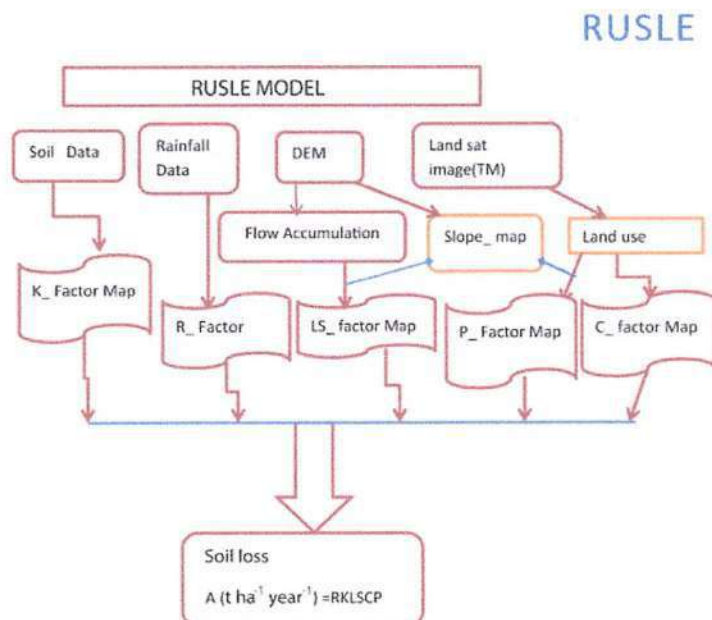


Image Source: <https://www.sciencedirect.com/science/article/pii/S2095633915301076>

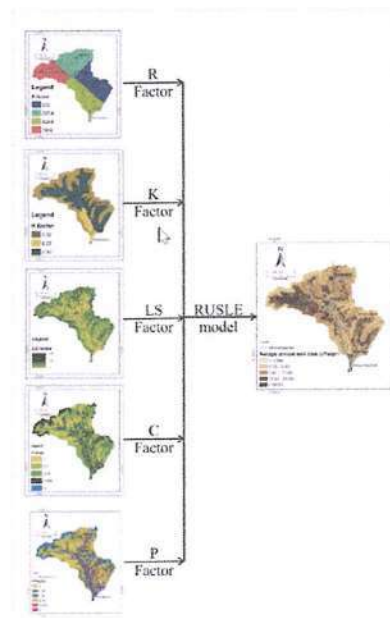


Image Source: <http://www.gathacognition.com/article/gca41>

Summary of the Analysis

On analysis, it has been found that out of 74.67 Sq km area in the catchment, 15 sq km area is having very steep slope of more than 25 degree. And hence, it is not advisable to suggest SMC interventions there. However, such area needs to be protected from any kind of soil disturbance caused by excessive grazing or logging activities for livelihood activities.

The Soil Loss Map of the free draining catchment has been generated based on RUSLE analysis data and is presented in **Figure 1.7** and the statistics are presented in **Table 1.8**.

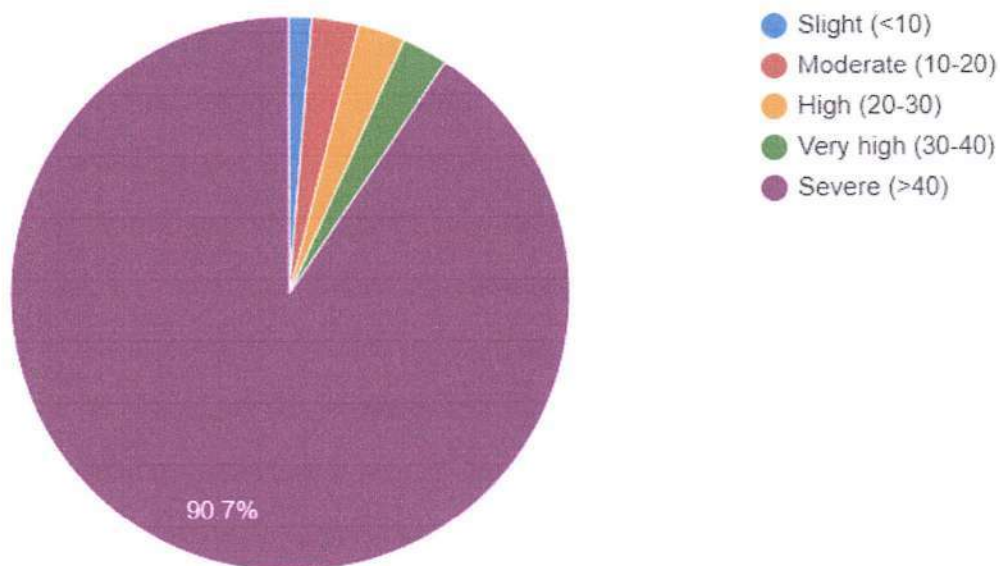
However, when area with slope more than 25 degree is excluded from the study area, it has been found that mean soil loss in tonne per Ha per year is still very high at 358.95 tonnes in comparison to acceptable limit of 40 tonnes. More than 88 percent of the area comes under severe soil loss category.



Table 1.8: Micro-watershed soil loss categories(sq km)

Sr No	Micro watershed	Area in Sq KM	Slight (<10)	Moderate (10-20)	High (20-30)	VERY High (30-40)	Severe (>40)	Mean Soil Loss
1	4H1A7b2b	7.85	0.074	0.162	0.177	0.231	7.203	667.28
2	4H1A7b1a	8.22	0.091	0.220	0.230	0.234	7.446	517.85
3	4H1A7c2a	7.82	0.043	0.140	0.196	0.243	7.200	475.84
4	4H1A7c1b	8.34	0.066	0.178	0.199	0.201	7.695	950.91
5	4H1A7b1b	9.55	0.174	0.307	0.362	0.329	8.380	537.02
6	4H1A7c2b	7.58	0.092	0.152	0.172	0.162	7.000	903.45
7	4H1A7c1c	8.05	0.095	0.203	0.188	0.161	7.406	644.63
8	4H1A7c1a	7.1	0.028	0.068	0.107	0.119	6.782	687.21
9	4H1A7b2a	10.16	0.234	0.441	0.467	0.396	8.620	463.57
	Total	74.67	0.895	1.871	2.098	2.077	67.733	641.51

Soil Loss

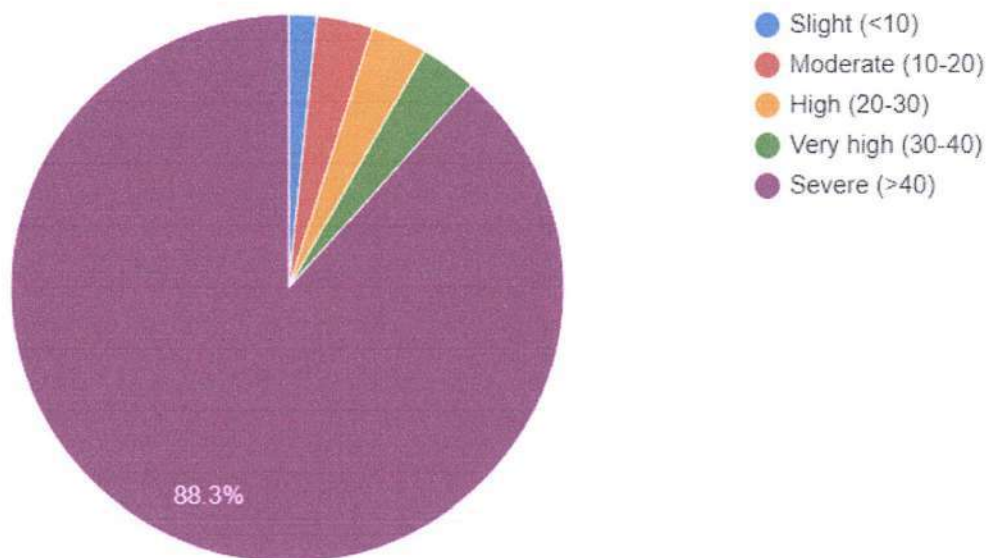


**ANGUL INVESTIGATION DIVISION, ANGUL**

Forest Clearance for Hising Medium Irrigation Project, District Angul, Odisha

CATCHMENT AREA TREATMENT

Sr No	Micro water shed	Area in Sq KM	Slight (<10)	Moderate (10-20)	High (20-30)	VERY High (30- 40)	Severe (>40)	Mean Soil Loss per Ha
1	4H1A7b2b	6.332	0.074	0.162	0.177	0.231	5.688	332.73
2	4H1A7b1a	6.596	0.091	0.220	0.230	0.234	5.821	309.04
3	4H1A7c2a	7.044	0.043	0.140	0.196	0.243	6.422	316.33
4	4H1A7c1b	5.575	0.066	0.178	0.199	0.201	4.931	408.26
5	4H1A7b1b	7.984	0.174	0.307	0.362	0.329	6.811	322.43
6	4H1A7c2b	5.969	0.092	0.152	0.172	0.162	5.392	545.71
7	4H1A7c1c	6.115	0.095	0.203	0.188	0.161	5.469	371.92
8	4H1A7c1a	5.416	0.028	0.068	0.107	0.119	5.093	416.81
9	4H1A7b2a	8.640	0.234	0.441	0.467	0.396	7.103	277.41
	Total	59.670	0.895	1.871	2.098	2.077	52.730	358.95

Soil Loss

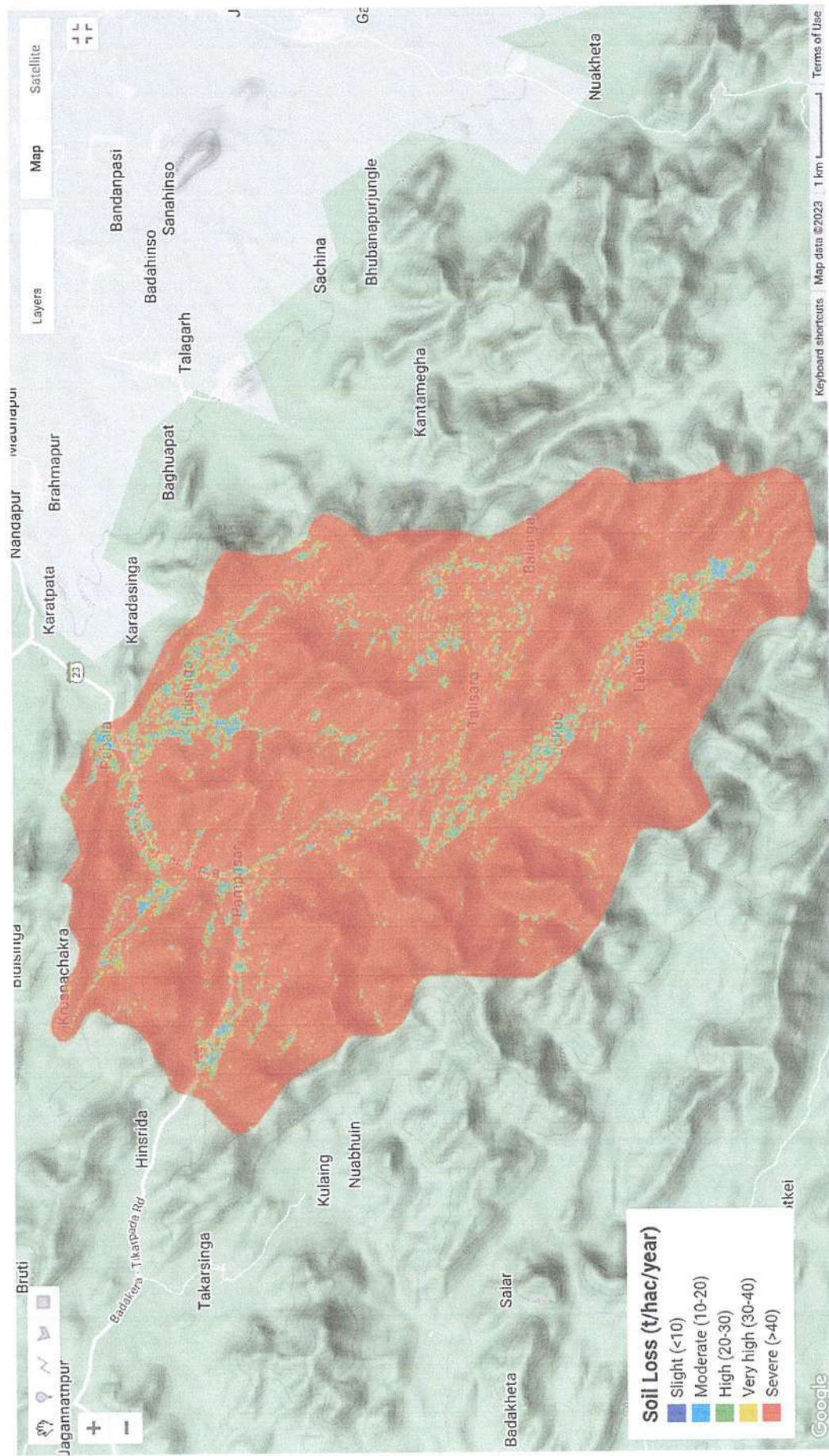


Figure 1.7: Soil Loss Categories for all the catchment area

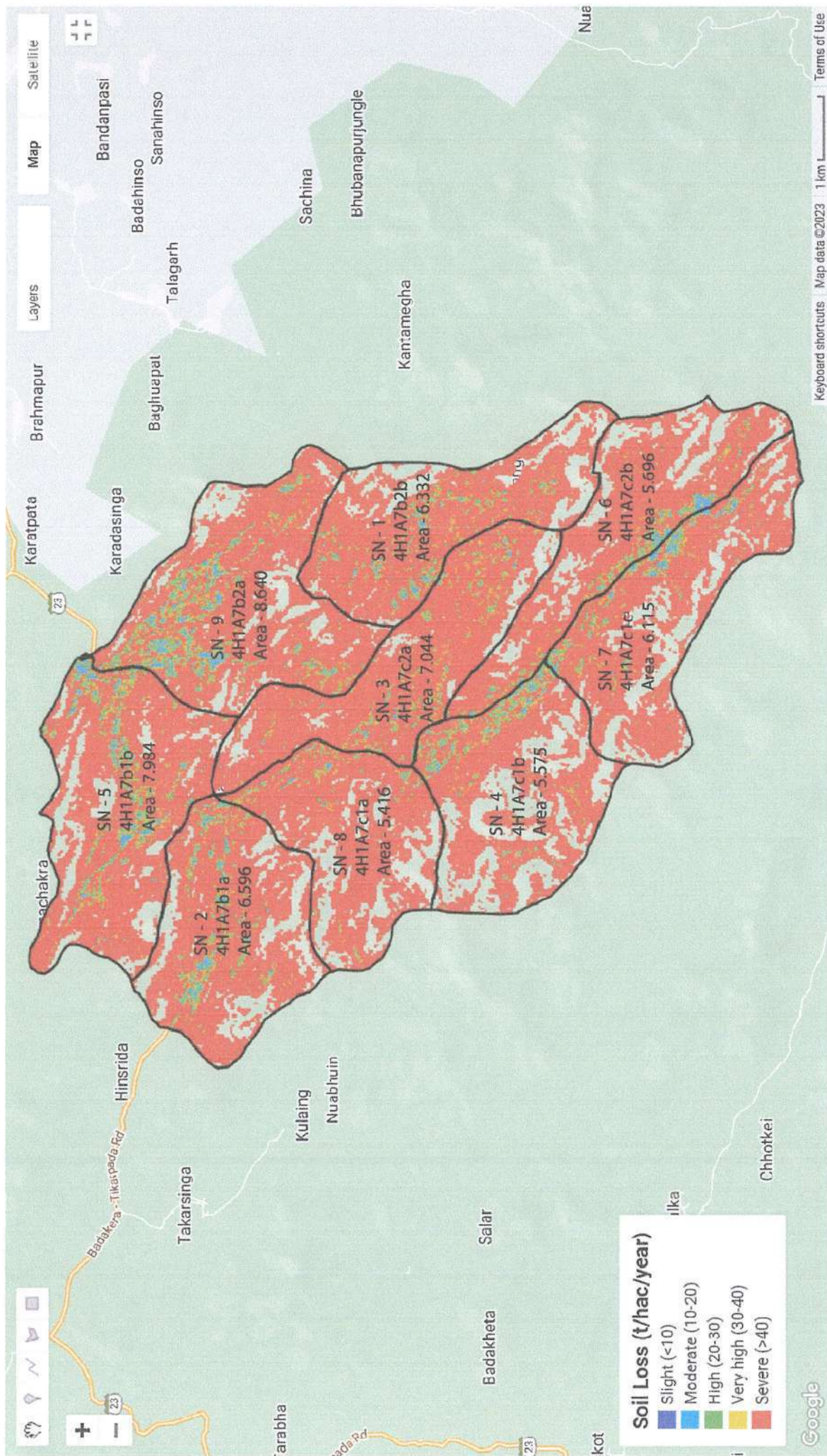
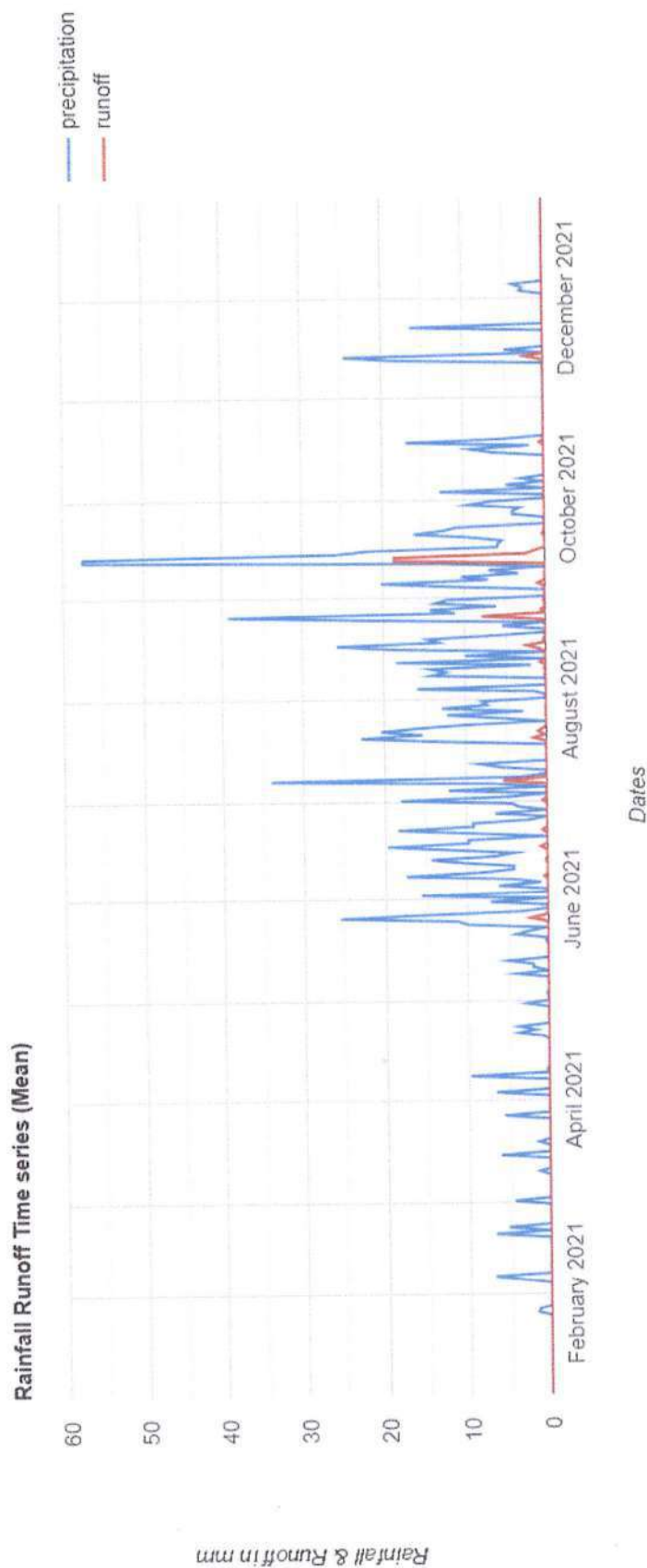


Figure 5: Soil Loss excluding very Steep Slopes >25 degrees from treatment

Rainfall and Runoff Calculations –



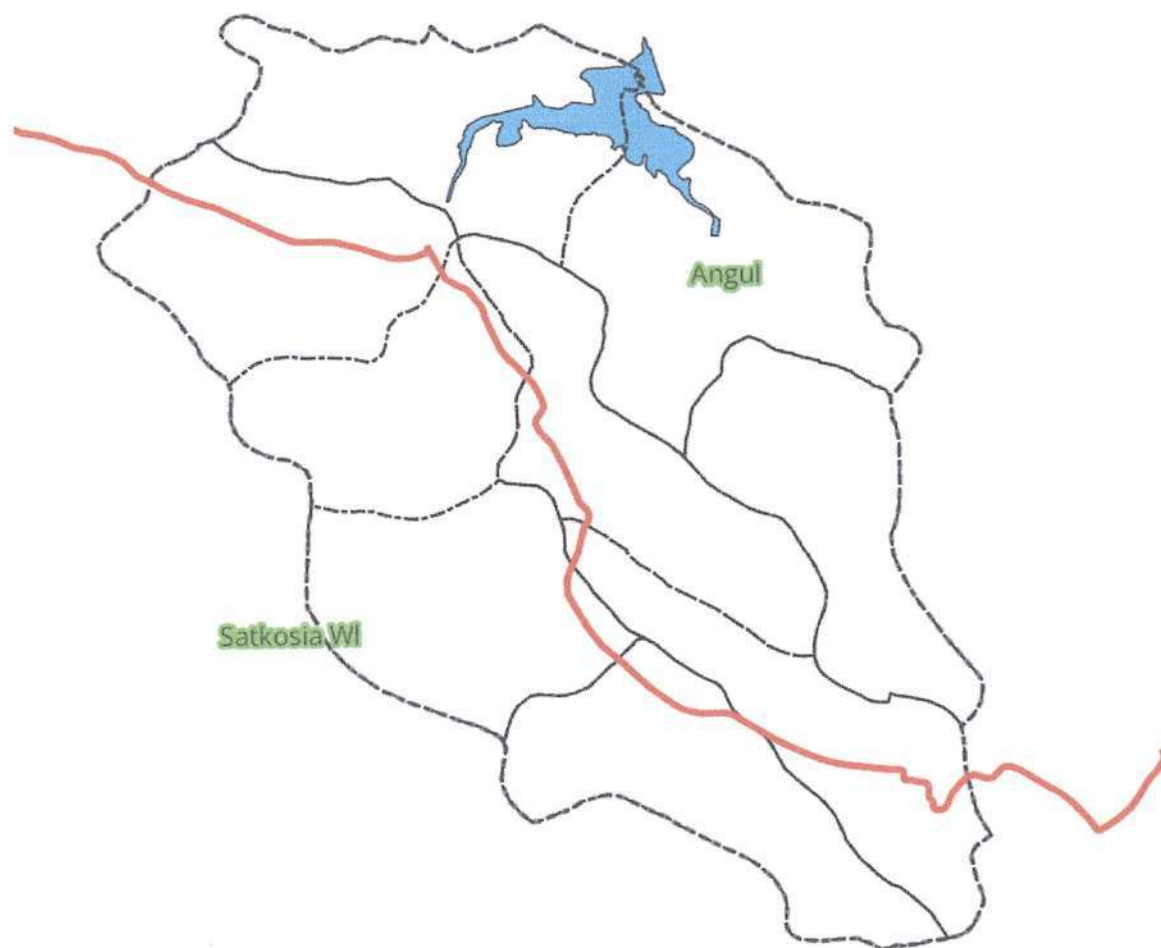
Analysis of the Rainfall and runoff from the catchment area indicates the runoff of about 6%. Runoff is restricted to the period of monsoon season and there, in the days of heavy rainfall, it can go up to 25% of daily rainfall.

S. No.	Micro-watershed	Area in Sq KM	Rainfall in CUM	Runoff in CUM	% runoff
1	4H1A7b2b	7.85	10825958.22	716517.75	6.62%
2	4H1A7b1a	8.22	11294680.64	631153.97	5.59%
3	4H1A7c2a	7.82	10839657.64	677368.03	6.25%
4	4H1A7c1b	8.34	11283182.49	665679.81	5.90%
5	4H1A7b1b	9.55	13852374.47	953593.18	6.88%
6	4H1A7c2b	7.58	10208088.25	498079.89	4.88%
7	4H1A7c1c	8.05	10601287.17	378744.46	3.57%
8	4H1A7c1a	7.1	9502472.339	599624.21	6.31%
9	4H1A7b2a	10.16	14313696.56	995539.1	6.96%
	Total	74.67 Sq KM			

Average Rainfall in mm in the catchment area = 1375.67 mm

Average runoff in mm over the catchment area = 59.54 mm or 5.95% of the total rainfall.

1.8 Catchment Area Treatment Plan



Catchment area is almost bifurcated into two divisions. Satkosia WL and Angul (T) forest Division. There are mainly five categories of Land uses for which a proper treatment plan should be developed. First is the Agricultural Land, as this activity can never be eliminated, because the faulty practice results in heavy loss of fertile soil. Second, being open forestland for obvious conservation reasons. Third is scrub or degraded land, which contributes heavily to the silt load and possibilities exist to bring this area under pastures and other plantation to meet the local demand of fuel and fodder and thus decreasing the biotic pressure on the forests and leading to environment friendly approach of sustainable development. The fourth and most important category is Barren land because with practically no vegetal cover, the area produces huge amount of silt load. The fifth is dense forest land where in a few places soil conservation measures are required. For treatment of catchment area, the areas that require treatment have been delineated from the Composite Erosion Intensity Unit Map. The sum of weightages was reclassified as per the **Table 1.7** below to further subdivide the area as per the erosion intensity classes. The weightages for Land use, Slope & Soil were summed to get the Erosion Intensity Classes.

After exclusion of rocks and inaccessible terrain, only those areas which fall under very severe and severe erosion intensity category would be taken up for conservation treatment measures in very high priority category micro-watersheds, whereas in the rest of micro-watersheds belonging to other priority categories, the area falling under very severe erosion intensity class shall be taken for treatment with biological and engineering measures under the CAT Plan.

Considering the topographic factors, soil type, climate, land-use/land-cover in the catchment area following engineering and biological measures have been proposed to be undertaken with the aim to check the soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run.

1.9 Treatment of Individual Sub-Watershed

There are mainly five categories of land uses for which a proper treatment plan should be developed. First is the agricultural land as this activity can never be eliminated. And, agriculture activities, if faulty, result in heavy loss of fertile soil. Second, is open forest land for conservation reasons. Third is scrub, Gochar or degraded land, which contributes heavily to silt load. Possibilities exist to bring this area under pastures and plantation to meet local demand of fuel and fodder and thus decreasing the biotic pressure on the forests leading to environment friendly approach of sustainable development. The fourth and most important category is treatment of the drainage lines based on their orders to protect them from bank erosion and stream siltation. The fifth is dense forest land where a few places soil conservation measures are required.

Areas falling under very severe and severe erosion intensity category would be taken up for conservation treatment measures after excluding the percentage of area above 25° slope from the area coming under very severe and severe erosion intensity class falling under rocks and inaccessible terrain where no treatment is feasible, the rest of area of very severe and severe categories is to be treated with biological, bio-engineering and engineering measures under CAT Plan.

Considering the topographic factors, soil type, climate, land-use/land-cover in the catchment area following measures have been proposed to be undertaken with aim to check soil erosion, prevent/check siltation of reservoir and to maintain its storage capacity in the long run.

1.9.1 Activities to be Undertaken

1.9.1.1 Concrete bonding in hilly slope of Catchment area of H.I.P

Erosion Control: One of the primary benefits of concrete bonding in hilly terrain is its ability to control erosion. Concrete surfaces can prevent soil erosion caused by rain, runoff, and gravity, helping to maintain the integrity of the landscape and reducing the risk of landslides.

- I. **Stability:** Concrete bonding provides a stable and durable foundation for various structures in hilly areas, such as buildings, retaining walls, and roads. This stability minimizes the risk of structural damage, subsidence, and uneven settling.
- II. **Safety:** Well-bonded concrete surfaces in hilly areas enhance safety for residents, visitors, and property owners. They reduce the risk of accidents and injuries caused by unstable ground or slippery slopes.
- III. **Improved Accessibility:** Concrete bonding allows for the creation of pathways, driveways, and roads in hilly regions. This improves accessibility to properties and makes it easier to navigate steep slopes.

- IV. Aesthetics: Concrete bonding can be used to create visually appealing landscaping features like terraces, patios, and walkways, enhancing the overall aesthetics of hilly properties.
- V. Increased Property Value: Properly executed concrete bonding projects can increase the value of hilly properties by providing usable space, improving curb appeal, and enhancing the property's overall appearance.
- VI. Easier Maintenance: Concrete surfaces in hilly areas generally require less maintenance than natural terrain. They are less prone to erosion, wear, and the need for regular upkeep, which can save time and money.
- VII. Customization: Concrete can be designed in various colors, textures, and patterns to complement the surrounding landscape or meet the property owner's preferences, allowing for a high degree of customization.
- VIII. Support for Retaining Walls: Concrete bonding is often used to construct retaining walls in hilly areas, which can prevent soil erosion, create flat areas for landscaping or buildings, and enhance property functionality.
- IX. Durability: Properly designed and constructed concrete structures in hilly areas can have a long service life, providing stability and utility for many years.
- X. Cost Savings: Although the initial cost of concrete bonding may be higher than alternative methods like soil stabilization or natural landscaping, it often leads to cost savings over time by reducing maintenance and repair expenses.
- XI. Sustainability: Using concrete can contribute to sustainable practices by reducing soil disturbance and the need for extensive grading. It can also be designed with permeable or environmentally friendly options, depending on the project's goals.

The benefits of concrete bonding in hilly areas are contingent on proper planning, design, and execution. Engaging experienced professionals and engineers, conducting site-specific assessments, and adhering to best practices are essential to realize these advantages while mitigating potential challenges.

Work done as per estimate of Water Resource Department is enclosed as (*Annexure-II*)

1.9.1.2 Wire mesh fences can be constructed using various types of wire and materials, including different types of stone, to create aesthetically pleasing and durable boundary fences.

Wire mesh fences can be constructed using various types of wire and materials, including different types of stone, to create aesthetically pleasing and durable boundary fences. Here are some common types of stone wire mesh fences:

- i. **Gabion Wire Mesh Fence:** Gabions are wire mesh containers filled with various types of stone or rock. These cages are stacked to create retaining walls or fences. They provide a natural, rustic appearance and are excellent for erosion control and landscaping in hilly or sloped areas.
- ii. **Rustic Stone Wire Mesh Fence:** This type of fence combines wire mesh with irregularly shaped, uncut stones. The stones are placed within the mesh, giving the fence a rustic, natural appearance. It's often used in gardens or to create a visually appealing boundary.
- iii. **Crushed Stone Wire Mesh Fence:** Crushed stones or gravel can be incorporated into wire mesh fencing. This style offers a more uniform and modern appearance compared to irregularly shaped stones. It's often used in contemporary or industrial settings.
- iv. **Slate Stone Wire Mesh Fence:** Slate stones are flat and can be incorporated into wire mesh fences to create a more refined, modern appearance. Slate stone wire mesh fences are often seen in urban environments and modern landscapes.
- v. **Limestone Stone Wire Mesh Fence:** Limestone is a versatile stone that can be used to create wire mesh fences with a clean and classic appearance. Limestone wire mesh fences are popular in both residential and commercial applications.
- vi. **Granite Stone Wire Mesh Fence:** Granite stones can be used to create sturdy and durable wire mesh fences. These fences have a high-end appearance and are often used to enclose upscale properties or institutions.
- vii. **Sandstone Stone Wire Mesh Fence:** Sandstone is known for its wide range of colors and textures. It can be used to create attractive wire mesh fences with a variety of design possibilities.
- viii. **Marble Stone Wire Mesh Fence:** Marble stones can be used to create elegant and luxurious wire mesh fences. They are often chosen for high-end residential and commercial applications.

When selecting the type of stone for your wire mesh fence, consider the aesthetic you want to achieve, the durability required for the specific application, and the overall budget. Additionally, it's essential to ensure that the wire mesh and stone combination is assembled properly to create a structurally sound and long-lasting fence.

Work done as per estimate is enclosed as (*Annexure-III*)

1.9.1.3 Incentives to VSS for the promotion of Alternate Livelihood Activities around the areas 5 Nos of VSS x 20000 each x for 5year

Incentives provided to VanaSurakhyaSamitis, which are community-based organizations dedicated to forest and environmental conservation in India, can yield several benefits, both for the local communities and the broader environment. Some of these benefits include:

- i. **Increased Participation and Motivation:** Incentives can encourage more community members to actively participate in conservation efforts. This increased participation is crucial for the success of conservation programs, as it mobilizes a broader base of support.
- ii. **Enhanced Conservation Practices:** Incentives can promote the adoption of sustainable and eco-friendly conservation practices. This can include reforestation, afforestation, wildlife protection, and sustainable resource management.
- iii. **Improved Livelihoods:** Many VanaSurakhyaSamiti members are dependent on the forest for their livelihoods. Incentives can provide them with alternative income sources, reducing the pressure on the forest resources. This can include training in sustainable agriculture, animal husbandry, or non-timber forest products collection.
- iv. **Reduced Dependence on Forest Resources:** By providing incentives, VanaSurakhyaSamitis can help reduce the overexploitation of forest resources. This is vital for the long-term sustainability of forests and biodiversity.

- v. **Biodiversity Conservation:** Incentives can support activities that directly benefit biodiversity, such as the protection of critical habitats, endangered species, and the preservation of local flora and fauna.
- vi. **Community Empowerment:** Incentives can empower local communities by giving them a stake in forest conservation. This leads to a sense of ownership and responsibility for the environment, making it more likely that conservation efforts will be successful.
- vii. **Conflict Mitigation:** Incentives can help reduce conflicts between wildlife and humans. Compensation or benefits for crop damage or livestock losses can encourage communities to coexist peacefully with wildlife and report human-wildlife conflicts promptly.
- viii. **Knowledge and Skill Building:** Incentives can fund training and capacity-building programs for VanaSurakhyaSamiti members. This can enhance their knowledge of sustainable forest management, conservation, and ecological restoration.
- ix. **Strengthened Collaborations:** Incentives can encourage partnerships and collaborations between VanaSurakhyaSamitis, government agencies, NGOs, and other stakeholders. This collective effort can lead to more effective conservation initiatives.
- x. **Cultural and Social Benefits:** Incentives can support cultural and social activities within the community, reinforcing the value of traditional ecological knowledge and customs related to nature and conservation.
- xi. **Economic Development:** Incentives can contribute to local economic development by creating jobs and income opportunities related to conservation and sustainable land use.
- xii. **Environmental Benefits:** Ultimately, incentives to VanaSurakhyaSamitis can result in cleaner air, water, and soil, helping to mitigate the impacts of climate change and ensuring a healthier environment for all.

It's important to tailor incentives to the specific needs and goals of each VanaSurakhyaSamiti and to ensure that the incentives are designed in a way that supports long-term sustainability and conservation efforts. Collaboration with local communities and a deep understanding of their needs and aspirations are essential for the success of such programs.

1.9.1.4 Solar Lights (min 30 W)

Supplying solar lights to wildlife areas can offer several benefits for both the environment and the local communities that live in or near these regions. Here are some of the advantages of providing solar lights in wildlife areas:

- i. **Reduced Dependence on Fossil Fuels:** Solar lights do not rely on fossil fuels, reducing greenhouse gas emissions and the carbon footprint in these areas. This is important for mitigating climate change, which can have severe impacts on wildlife and their habitats.
- ii. **Wildlife Protection:** Adequate lighting can help reduce human-wildlife conflicts by making it easier for local residents to see and avoid wildlife at night. This can reduce harm to both humans and animals.
- iii. **Enhanced Safety:** Solar lights improve safety for both wildlife and humans by reducing the risks of accidents and confrontations during the night. This is particularly important in areas where dangerous animals may roam.
- iv. **Community Development:** Providing solar lights can enhance the quality of life for local communities in wildlife areas by extending the hours during which productive activities can take place. This can include education, economic activities, and social gatherings.
- v. **Education and Literacy:** Solar lights enable children and adults to study and learn after dark, which can lead to improved literacy rates and educational outcomes in these communities.
- vi. **Economic Opportunities:** Extended lighting hours can foster economic development by enabling businesses to operate in the evening, expanding income-generating activities, and creating job opportunities.
- vii. **Reduction in Indoor Air Pollution:** Solar lighting can reduce the need for kerosene lamps and other sources of indoor lighting that generate harmful indoor air pollutants. This has significant health benefits for residents.
- viii. **Preservation of Natural Darkness:** By using solar lights designed to minimize light pollution, it's possible to balance the need for lighting with the preservation of natural darkness in wildlife areas. This is essential for the health of nocturnal wildlife and ecosystems.

- ix. **Cost Savings:** Solar lights require minimal operating costs once installed and can lead to long-term cost savings compared to traditional grid-based lighting solutions.
- x. **Community Engagement:** The provision of solar lights can engage local communities in conservation efforts, fostering a sense of ownership and responsibility for their environment and wildlife.
- xi. **Promotion of Sustainable Energy:** Introducing solar lights encourages the use of renewable and sustainable energy sources, setting an example for responsible energy practices in wildlife areas.
- xii. **Wildlife Research and Observation:** Solar lights can support nocturnal wildlife research, enabling scientists to observe and study wildlife behavior during the night.

It's essential to design solar lighting projects in wildlife areas carefully, taking into account the specific needs and concerns of the local community and the potential impacts on the natural environment. Additionally, using energy-efficient and dark-sky-friendly lighting solutions can help mitigate potential adverse effects on wildlife and ecosystems.

1.9.1.5 Other unforeseen Expenditures like computer, printer and etc.

Implementing Agency: -

Divisional Forest Officer, Angul Division and
Divisional Forest Officer, Satkosia Wildlife, Division.

Satkosia Wildlife Division

Para	Activities	Unit Cost	Quantity	Unit	Total Cost of intervention	Calendar of Operation					Remark
						1st Year	2nd Year	3rd year	4th Year	5th year	
1.9.1.1	Concrete bonding at Hilly Slope of Catchment Area	9104	600	Mtr.	5462400	1092480	1092480	1092480	1092480	1092480	enclosed as Annexure-I
1.9.1.2	Wire Mesh Loose Boulder Check Dam (WM LBCD)	5364.28	1200	Cum.	6437136	1287427	1287427	1287427	1287427	1287427	Estimate is enclosed as Annexure-II
1.9.1.3	5% for Preparation of DPR for construction of (WM LBCD)				321857	321857	0	0	0	0	
1.9.1.4	Incentives to VSS for the promotion of Alternate Livelihood Activities around the areas 5 Nos. of VSS x 20000 each x for 5 year	100000	5	Villages	500000	100000	100000	100000	100000	100000	
1.9.1.5	Solar Lights (min 30 V)	50000	12	Numbers	600000	200000	100000	100000	100000	100000	
1.9.1.6	Other unforeseen Expenditure like computer, printer and etc.	100000	5	Years	500000	100000	100000	100000	100000	100000	
					1,35,21,393	3101764	2679907	2679907	2679907	2679907	
					Add. 20% escalation cost Rs.	2764279	2679907	2679907	2679907	2679907	
1.9.1.7	ANR Plantation 500 seedling Per Ha.	157554	30	Ha.	4726620	45,01,530	1,62,25,672				enclosed as Annexure-III
Grand Total					21312292	2,07,27,202					

Rs. 21312292/- (Rupees Two Crore Thirty One Lakhs Two Thousand Two Hundred Ninety Two) Only

Shyam
Assistant Engineer
 Angul Sub-Division.
 Angul

10/10/20
Assistant Engineer
 Angul Sub-Division.
 Angul

10/10/20
Divisional Forest Officer
Satkosia Wildlife Division
Asst. Conservator of Forests
Superintending Engineer
Angul Investigation Division
Angul

ANGUL DIVISION

Para	Activities	Unit Cost	Quantity	Unit	Total Cost of intervention	Calendar of Operation					Remark
						1st Year	2nd Year	3rd year	4th Year	5th year	
1.9.1											
1.9.1.1	Concrete bonding at Hilly Slope of Catchment Area	9104	600	Mtr.	5462400	1092480	1092480	1092480	1092480	1092480	enclosed as Annexure-I
1.9.1.2	Wire Mesh Loose Boulder Check Dam (WM LBCD)	5364.28	1200	Cum.	6437136	1287427	1287427	1287427	1287427	1287427	Estimate is enclosed as Annexure-II
1.9.1.3	5% for Preparation of DPR for construction of (WM LBCD)				321857	321857	0	0	0	0	
1.9.1.4	Incentives to VSS for the promotion of Alternate Livelihood Activities around the areas 5 Nos. of VSS x 20000 each x for 5 year	100000	5	Villages	500000	100000	100000	100000	100000	100000	
1.9.1.5	Solar Lights (min 30 V)	50000	12	Numbers	600000	200000	100000	100000	100000	100000	
1.9.1.6	Other unforeseen Expenditure like computer, printer and etc.	100000	5	Years	500000	100000	100000	100000	100000	100000	
Total					13821393	3101764	2679907	2679907	2679907	2679907	
Add. 20% escalation cost Rs.					2764279						
1.9.1.7	ANR Plantation 500 seedling Per Ha.	157554	30	Ha.	4726620						enclosed as Annexure-III
Grand Total					21312292						

Rs. 21312292/- (Rupees Two Crore Thirty One Lakhs Two Thousand Two Hundred Ninety Two) Only

Bhama

Assistant Engineer
Angul Investigation Sub-Division.
Angul

Asst. Engineer
Angul Investigation Sub-Division.
Angul

Divisional Forest Officer
Angul Division


Superintending Engineer
Angul Investigation Division.
Angul


ABSTRACT


Name of Division	Amount
Angul Division	21312292
Satkosia WL, Division, Angul	21312292
Total Amount	42624584

Rs. 42624584/- (Rupees Four Crore Twenty Six Lakhs Twenty Four Thousand Five Hundred Eighty Four) Only


Asst. Engineer
Angul Investigation Sub-Division.
Angul


Divisional Forest Officer
Satkosia Wildlife Division, Angul
Angul Division


Asst. Executive Engineer
Angul Investigation Sub-Division.
Angul


Divisional Forest Officer
Angul Division.


Superintending Engineer
Angul Investigation Division.
Angul

Recommended


Regional Chief Conservator
of Forests, Angul Circle.

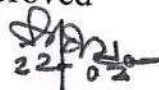
Financial Outlay for **Catchment Area Treatment Plan** for **Hidsing Irrigation Project** including alternate road of Angul District under Angul Forest Division favour of **Executive Engineer, Cuttack Investigation Division, Cuttack**

(Wage Rate @ Rs.352/- per MD)

Sl. No.	Activities	Unit Cost (in Rs.)	Quantity	Total Cost of Intervention (in Rs.)
(A) Engineering Measures:				
1.	Concrete bonding at hilly slope of Catchment Area	9104 per MRT	600 Mtr	54,62,400.00
2.	Wire Mesh Loose Boulder Check Dam (WM LBCD)	5364.28 per Cum	1200 Cum	64,37,136.00
3.	5% for preparation for DPR for construction of WM LBCD	-	-	3,21,857.00
4.	Incentive to VSS for promotion of alternate livelihood activities around the areas 5 nos. of VSS X 20,000 each X 5 years (As proposed by DFO, Angul Forest Division)	1,00,000 per VSS	5 Villages	5,00,000.00
5.	Solar Light (Minimum 30 V) (As proposed by DFO, Angul Forest Division)	50,000 per No.	12 Nos.	6,00,000.00
6.	Other unforeseen expenditure like Computer, Printer etc. (As proposed by DFO, Angul Forest Division)	-	-	2,00,000.00
7.	Add 20% Escalation Cost		Total	1,35,21,393.00
				27,04,279.00
			Sub-Total	1,62,25,672.00
(B) Biological Measures:				
1	Cost of ANR plantation @ 500 plants per ha with 10 years maintenance as per approved one time cost-norm	1,50,051 per ha	30 ha	45,01,530.00
			Grand Total	2,07,27,202.00
				or rounded off to 2,07,27,300.00

(Rupees Two Crore seven lakhs twenty seven thousand and three hundred) only

Approved


22/02

Principal Chief Conservator of Forests
Forest Division & Nodal Officer, EC Act
(Forest Diversion & Nodal Officer EC Act)
O/o the P.C.C.F Odisha, Bhubaneswar


Financial Outlay for **Catchment Area Treatment Plan** for **Hidsing Irrigation Project** including alternate road of Angul District under **Satakosia (WL) Division** in favour of **Executive Engineer, Cuttack Investigation Division, Cuttack**

(Wage Rate @ Rs.352/- per MD)

Sl. No.	Activities	Unit Cost (in Rs.)	Quantity	Total Cost of Intervention (in Rs.)
(A) Engineering Measures:				
1.	Concrete bonding at hilly slope of Catchment Area	9104 per MRT	600 Mtr	54,62,400.00
2.	Wire Mesh Loose Boulder Check Dam (WM LBCD)	5364.28 per Cum	1200 Cum	64,37,136.00
3.	5% for preparation for DPR for construction of WM LBCD	-	-	3,21,857.00
4.	Incentive to VSS for promotion of alternate livelihood activities around the areas 5 nos. of VSS X 20,000 each X 5 years (As proposed by DFO, Satakosia (WL) Division)	1,00,000 per VSS	5 Villages	5,00,000.00
5.	Solar Light (Minimum 30 V) (As proposed by DFO, Satakosia (WL) Division)	50,000 per No.	12 Nos.	6,00,000.00
6.	Other unforeseen expenditure like Computer, Printer etc. (As proposed by DFO, Satakosia (WL) Division)	-	-	2,00,000.00
			Total	1,35,21,393.00
7.	Add 20% Escalation Cost			27,04,279.00
			Sub-Total	1,62,25,672.00
(B) Biological Measures:				
1.	Cost of ANR plantation @ 500 plants per ha with 10 maintenance as per approved one-time cost norm	1,50,051 per ha	30 ha	45,01,530.00
			Grand Total	2,07,27,202.00 or rounded off to 2,07,27,300.00

(Rupees Two Crore seven lakhs twenty seven thousand and three hundred) only

Approved


Principal Chief Conservator of Forests
Forest Diversion & Nodal Officer, FC Act

Principal Chief Conservator of Forests
(Forest Diversion & Nodal Officer FC Act)
O/o. the P.C.C.F Odisha, Bhubaneswar

GOVERNMENT OF ODISHA



**DEPARTMENT OF WATER RESOURCES
ODISHA, BHUBANESWAR**

Name of the work – Estimate for Concrete Bonding at Hilly Slope of
Catchment Area of H.I.P.

Estimated Cost – Rs. 9,104.00 (Per Running Meter)


Superintending Engineer
Angul Investigation Division
Angul.

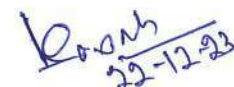
This estimate has been framed by the Superintending Engineer, Angul Investigation Division, Angul for the work: "Concrete Bonding at Hilly Slope of Catchment Area of H.I.P."

REPORT

This estimate amounting to **Rs. 9104.00** (Rupees Nine thousand One Hundred Four) only has been Prepared considering one running meter of the concrete bonding to protect the soil erosion in hilly slope of the catchment area at Hidising Irrigation Project. Detailed stranded drawing has been followed basing on the drawing approved earlier.

The rates provided in this estimate are based on S/R, 2022. with enhanced Royalty & labour rate. The detailed standard specification for Odisha would be followed during the course of execution of above work.


Asst. Engineer
Angul Inv. Sub- Division,
Angul


Asst. Executive Engineer,
Angul Inv. Sub-division,
Angul.


Superintending Engineer,
Angul Investigation Division,
Angul

ESTIMATE FOR CONCRETE BONDING AT HILLY SLOPE OF CATCHMENT AREA OF H.I.P.

1 Earth work in excavation of foundation in stoney earth & gravelled mixed with stone bolders etc.

1 x	1.00	x	1.02	x	1.30	=	1.33	M3	
						Net =	1.33	M3	
						@ Rs.	211.00	/cum.	279.79

2 Supplying, filling foundation and plinth with sand in well watered and rammed including all cost etc.complete

with sand

1 x	1.00	x	1.02	x	0.2	=	0.20	M3	
Back Filling	1 x	1.00	x	0.15	0.80	=	0.12	M3	
	1 x	1.00	x	0.15	0.80	=	0.23	M3	
			2			Net =	0.55	M3	
						@ Rs.	1301.20	/ cum.	716.00

3 C.C. M15 using 20 mm size & Down Graded black hard granite C. B chips. (Ground floor)

Base	1 x	1.00	x	1.02	x	0.30	=	0.31	M3
						Net =	0.31	Cft	
						@ Rs.	6037.90	/ cum.	1,872.00

4 C.C. M20 using 20 mm size & Down Graded black hard granite C. B chips. (Ground floor)

1 x	1.00	x	0.72	+	0.3	x	1.20	=	0.61	M3
								Net =	0.61	M3
								Rs.	6534.05	/ cum.
										3985.77

5 Centering & Shuttering

Back	1 x	1.00	x	1.27		=	1.27	M3	
	1 x	1.00	x	1.02		=	1.20	M3	
	2 x	1.00	x	0.30	+	0.7	x	1.20	=
								1.20	M3
								3.67	Sft
						@ Rs.	234.70	/ Sqm.	861.35

Add GST 18 %

TOTAL 7,714.91
1,388.68
9,103.59
Grand Total 9,103.59
Says. 9,104.00

(Rupees Nine Thousand One Hundred Four) Only

D. Hemu
22/12/2023
Asst. Engineer,
Angul Investigation Sub Division
Angul

K. Rans
22/12/23
Asistant Executive Engineer,
Angul Investigation Sub-Division.
Angul

S. A. S.
22/12/2023
Superintending Engineer,
Angul Investigation Division.
Angul

MATERIALS (LEAD STATEMENT)

Sr No	Descriptions	Unit	Quarry	Lead in km	Rate of lead	Royalty	Total Lead & Royalty	Basic Rate	Total cost
1	Cement	Qntl	Angul	35			60.45	535.86	596.31
2	Sand (Mortar)	Cum	Brahmani (Santhapada)	57	926.31	229.25	1155.56	76.88	1232.44
3	Sand (Filler)	Cum	Brahmani	57	926.31	229.25	1155.56	71.94	1227.50
4	12mm c.b. chips c.b.	Cum	Badalu	73	1073.51	400.50	1474.01	1396.62	2870.63
5	20mm c.b. chips c.b.	Cum	Badalu	73	1073.51	400.50	1474.01	1382.29	2856.30
6	10mm c.b. chips c.b.	Cum	Badalu	73	1073.51	400.50	1474.01	1405.22	2879.23
7	Non sal bullah (80mm dia)	Mtr.						30.81	30.81
8	38mm plank	Cum						58374.79	58374.79
9	Non Sal bullah 120mm dia	Mtr.						41.81	41.81
10	Sal bullah 120mm dia	Mtr.						51.87	51.87
11	Sal Bullah 80mm dia	Mtr.						51.87	51.87
12	Non sal scatting	Cum						58374.79	58374.79
13	Battens	Cum						58374.79	58374.79

Certify that the leads Provided in this lead statement are minimum and currect to the best of my Knowledge.

Babu
22/12/2023

Asst. Engineer,
Angul Investigation Sub Division
Angul

Ronh
22.12.23

Asistant Executive Engineer,
Angul Investigation Sub-Division.
Angul

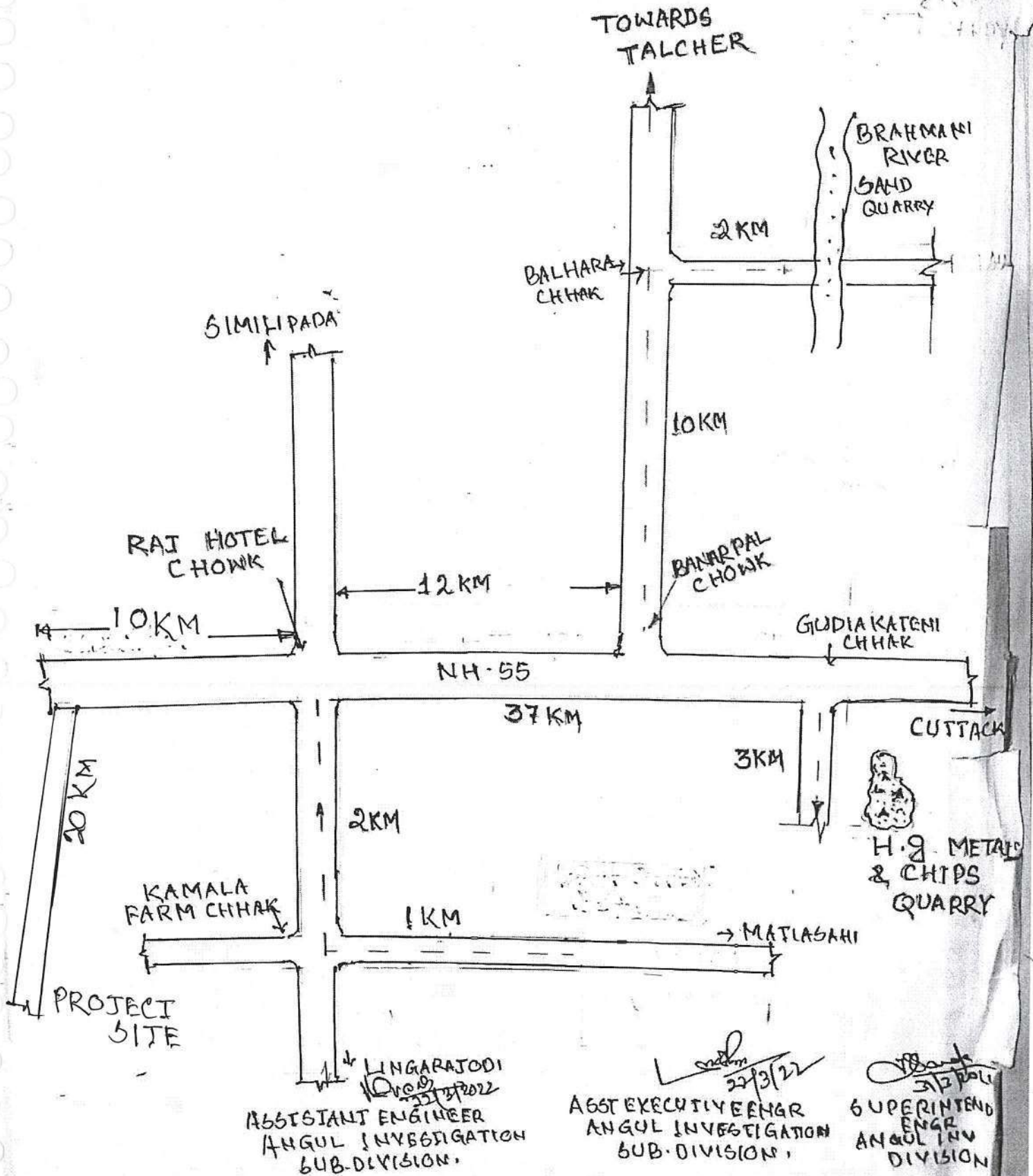
SA
22/12/2023

Superintending Engineer,
Angul Investigation Division.
Angul

ANALYSIS OF RATES						
1	Earth work in excavation of foundation in hard soil including rough dressing and levelling the bed etc. complete.					
Data for 100 Cum						
SI No	Materials	Quantity	Rate	Unit	Amount	
1	Mulia	43	352.00	Each	15136.00	
	Over head Charges	7.5%			1135.20	
	Contractor's Profit	7.5%			1135.20	
					17406.40	138.46
	Add for excavation	20%			3481.28	1.38
					20887.68	139.84
	Add Cess towards laboure welfare		@	1%	208.88	
					21096.56	
					21096.60	Per 100 Cum
					211.00	Per Cum
2	Filling foundation and plinth with sand well watered and rammed.					
Data for 100 Cum						
SI No	Descriptions	Quantity	Rate		Amount	
1	Female Mulia	12.36	352.00	Each	4350.72	
2	Sand	100	71.94	Cum	7194.00	
			Over head Charges	7.5%	865.85	
			Contractor's Profit	7.5%	865.85	
					13276.43	
			Rate per 1 Cum		132.76	
Caraiage of Materials						
1	Sand	1.00	1155.56		1155.56	
					1288.32	
	Add Cess towards laboure welfare		@	1%	12.88	
					1301.20	
					1301.20	Per One Cum
3	C.C. M20 using 20 mm size & Down Graded black hard granite C. B chips.					
Basic Rate (Data for 15 cum.)						
SI No	Descriptions	Quantity	Rate		Amount	For F.F
1	Chips 20mm c.b	8.10	1382.29	Cum	11196.55	
2	Chips 10mm c.b	5.40	1405.22	Cum	7588.19	
3	Sand	6.75	76.88	Cum	518.94	
4	Cement	52.10	535.86	Each	27918.31	
5	Mason (2nd class)	1.50	442.00	Each	663.00	663.00
6	Mate	0.86	392.00	Each	337.12	337.12
7	Mulia	20.00	352.00	Each	7040.00	7040.00
8	Concrete mixture	6.00	229.55	Hour	1377.30	
9	Vibrator	6.00	153.23	Hour	919.38	
			Over head Charges	7.5%	4316.91	603.01
			Contractor's Profit	7.5%	4316.91	603.01
					66192.61	9246.14
	rate per Cum	66192.61 /.		15	4412.84	
Add extra cost of lead & royalty of materials						
1	Chips	0.90	1474.01	Cum	1326.61	
2	Sand	0.45	1155.56	Cum	520.00	
3	Cement	3.473	60.45	Qntl	209.96	
					6469.41	
	Add Cess towards laboure welfare		@	1%	64.69	
					6534.10	
					6534.10	Per One Cum

4	C.C work of M-15 with 20mm down graded hard granite crusher broken chips including cost, conveyance, royalty and other taxes of all materials to the work site, mixing and laying of concrete in position & compacted properly with all leads, lifts, A/R-2006 P-49,								
SI No	Descriptions	Quantity	Rate	Unit	Amount				
1	H.G.C.B 20mm size ch	0.54	1382.29	Cum	746.44				
2	H.G.C.B 10mm size ch	0.36	1405.22	Cum	505.88				
3	Sand for concrete	0.45	76.88	Cum	34.6				
4	Cement	2.8	535.86	Qntl	1500.41				
					2787.33				
Labour									
1-	Mate	0.06	392	Each	23.52				
2-	Mason 2nd Class	0.1	442	Each	44.2				
3-	Mulia	1.33	352	Each	468.16				
					535.88				
Machinery									
1	Concrete mixture	0.4	229.55	Hour	91.82				
2	Vibrator	5.04	153.23	Hour	30.4				
					3445.43				
	Over head Charges			7.50%	258.41				
	Contractor's Profit			7.50%	258.41				
					3962.25				
Carriage & royalty									
1	Chips	0.9	1474.01	Cum	1326.609				
3	Sand	0.45	1155.56	Cum	520.002				
4	Cement	2.8	60.45	Qntl	169.26				
					5978.12				
	Add Cess towards labour welfare @				59.78				
					6037.90				
					6037.90	Per One Cum			
CENTERING & SHUTTERING WORKS									
5	Raft foundation, Column base and Plinth bend								
SI No	Descriptions	Quantity	Rate	Unit	Amount				
	Data for 10 Sqm								
1	25mm thick plank	0.267	58374.79	Cum	15586.07				
	Non sal bullah 80mm dia	12.60	30.81	Mtr.	388.21				
3	Carriage of wood	0.3284	198.30	Cum	65.12				
	For 10 times				16039.40				
	For One time	16039.40		=	1603.94				
		10							
	Labour								
1	S.S. Mulia	0.50	392.00	Each	196	196.00			
2	Carpenter 2nd class	0.50	442.00	Each	221	221.00			
	Over head Charges			7.5%	151.57	31.28			
	Contractor Profit			7.5%	151.57	31.28			
					2324.08	479.55			
	For 1 Sqm.	2324.08		=	232.41				
		10							
	Add Cess towards labour welfare @			1%	2.32				
					234.73				
				Say	234.70	per Sqm			
	<i>Dehe</i>	<i>22/12/2023</i>	<i>10/01/23</i>	<i>22/12/23</i>					
Asst. Engineer,		Asistant Executive Engineer,		Superintending Engineer,					
Angul Investigation Sub Division		Angul Investigation Sub		Angul Investigation Division.					
Angul		Angul		Angul					

QUARRY CHART (NOT TO SCALE)



**GOVT. OF ODISHA
WORKS DEPARTMENT
OFFICE OF THE SUPERINTENDING ENGINEER,**

Calculation sheet of Cement price for Angul (R&B) Division w.e.f 16.08.2023

Sl. No.	Name of Manufacturer in Odisha	Factory price per Bag	Average factory Price per Bag	Order GST @28% col.4/1.28	Deduct cost of empty gunny bag @ 39.5/100	Price Per Bag (in Rs.)	Price Per Qntl. (in Rs.)
1	2	3	4	5	6	7	8
1	ACC	349.00	348	271.875	267.92	267.92	535.86
2	ULTRATECH	355.00					
3	DALMIA	340.00					

The price of cement for Angul(R&B)Division is fixed as Rs. 535.86/ Qntl.

Memo No. 13290 Dt. 16-08-2023

Copy submitted to the Chief Construction Engineer, Dhenkanal (P&B) Circle, Dhenkanal for information and necessary action.

Executive Engineer,
Angul (R&B) Division
16.8

Memo No. 13291 Dt. 16-08-2023

Copy submitted to the Collector & District Magistrate, Angul for information and necessary action.

Executive Engineer,
Angul (R&B) Division
16.8

Memo No. 13292 Dt. 16-08-2023

Copy to all AEs/AEs/JEs/Sr. CAO under this division for information and necessary action.

Executive Engineer,
Angul (R&B) Division
16.8

Executive Engineer,
Angul (R&B) Division
16.8



DISTRICT REVENUE SECTION, ANGUL

ଜିଲ୍ଲାଗଣସ୍ୱତ୍ୱପରିଚାଳନା, ଅନୁଗୋଳ

COLLECTORATE, ANGUL || ଜିଲ୍ଲାପାଳଙ୍କ କାର୍ଯ୍ୟାଳୟ, ଅନୁଗୋଳ

Telephone: 06764-230567(O)/ 23023-1(R)-230689(F) || Website: www.angul.nic.in E-mail: dmr-angul@nic.in

Letter No. 308 / File No. VI-04/2023 Date: 22.05.2023

From

Shri Santosh Kumar Pradhan, OAS,(SAG)
Addl. District Magistrate, (Revenue), Angul.

To

The D.F.O, Angul/ Executive Engineer, R&B Divn. Angul/ R.W Divn. Angul/ Irrigation Division, Angul/ Athmallik / Manjore Irrigation Divn. Athmallik / Executive Engineer N.H. Divn. Dhenkanal/ Pallahara/ Executive Engineer, Camps & Bulding Divn./Heads Works Divn. Samal/ Executive Engineer, Rengali Right Canal Divn. Baghuaboli, Talcher/ Executive Officer, Angul/Talcher Municipality/ Executive Officer, Athmallik NAC /Executive Director, NALCO, Angul/ District Project Co-Ordinator, Angul/ All BDO of Angul District/ Chief General Manager, Jagannath Area/ Kalinga Area, MCL Talcher/ General Manager, Hingula Area/Talcher Area/Lingaraj Area, MCL, Talcher/ General Manager, TSTPP, Kaniha/TTPS, Talcher Thermal/ Secretary, TAMDA, Angul

Sub: -

Realization of additional charge along with EMF & DMF from the work bills of the works and other Engineering Departments in addition to the Royalty of the Minor Minerals used in the Project.

Ref: -

District Office Letter No. 169. Dt. 17.03.2023.

Sir/ Madam,

With reference to district office letter under reference , I am to further clarify that as per letter No.207 / Mines dated 1.2.2016 of DD Mines, Talcher and letter No. 18685 /F&E, dated 5.9.2017 of Govt. in F&E Department , the DMF will be collected 10% of Royalty and EMF is 5 % of the Royalty.

But in the earlier instruction issued vide district office letter No. 169 dated 17.3.2023, where in it was instructed to deduct the DMF & EMF @ 10 % and 5% of the Royalty and adding addl. charges which needs to be dispensed herewith as per Govt. letters cited above.

Besides, the average rate has been calculated at Rs.224 /- per cum for Sand i.e. (Rs.35/- Royalty + Rs.189/- Addl. Charges) , Rs. 381/- per cum for Stone (Rs.130/- Royalty + Rs.251/- Addl. Charges) and Rs. 95/- per cum for Morrum (Rs.35/- Royalty + Rs.60/- Addl. Charges) which includes Royalty and Addl. charges.

You are therefore requested to collect DMF & EMF @ 10 % and 5% of the Royalty only excluding the Addl. Charges from the work bills from the executants accordingly.

This is for information and necessary follow up action.

Yours faithfully

[Signature]
22/5/23

**OFFICE OF THE
LABOUR COMMISSIONER: ODISHA: BHUBANESWAR**

+++

NOTIFICATION

No. 6158 /LC, Bhubaneswar, dated 01-10-2023

Whereas the minimum rate of wages for unskilled, semi skilled, skilled and highly skilled categories of employees in 89 scheduled employments were fixed/ revised by the Government in Notification No. 7312-LL-I(III)-56/18/LESI dated 30.10.2018 of the Labour & ESI Department, Odisha published in the Extraordinary Issue No. 1991 of the Odisha Gazette dated the 30.10.2018 bearing SRO No. 431/2018.

And whereas, the State Minimum Wages Advisory Board have advised to adopt a system of revision of the special allowance called Variable Dearness Allowances @ Rs. 0.90 per point rise in the Consumer Price Index Number for Industrial Workers (Base 2001-100) as admissible and shall be declared at half yearly interval i.e. on 1st April and 1st October from the date of notification of revised wages, starting from 1st April 2019.

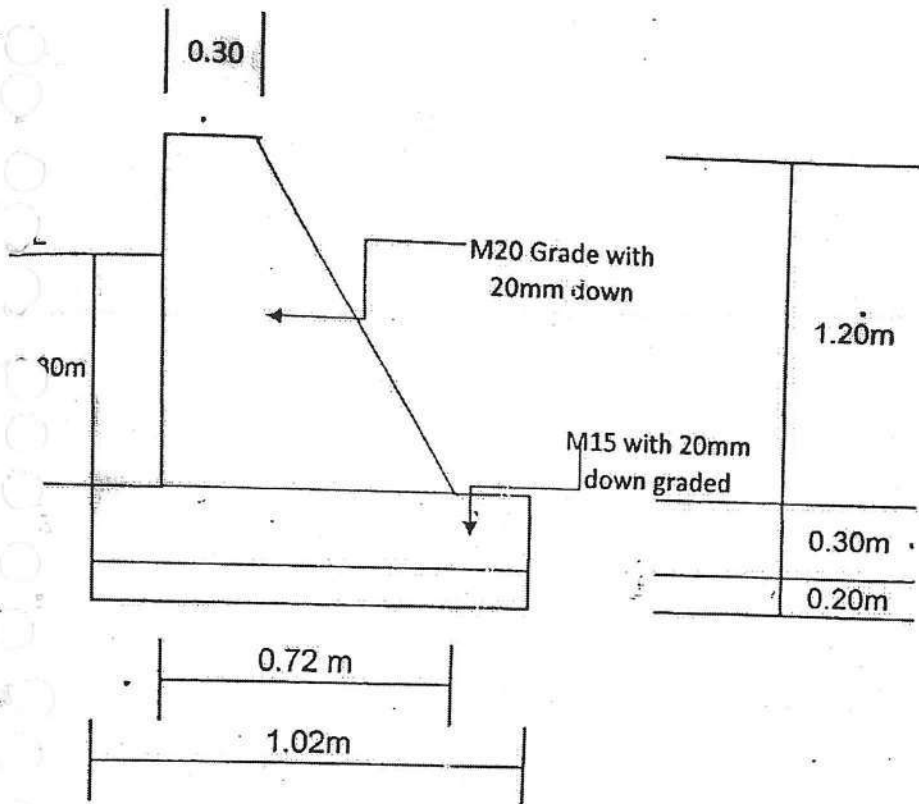
And whereas, the Variable Dearness Allowance for the half year commencing w.e.f. 1st October, 2023 is required to be effected on the basis of the increase in average Consumer Price Index Number for Industrial workers reaching 385.97 from 378.58 as on 30.06.2023 and thereby resulting in an increase of 7.39 points.

Now therefore, I Dr. N. Thirumala Naik, I.A.S., Labour Commissioner, Odisha in exercise of the powers delegated in the aforesaid Notification do hereby notify that the Variable Dearness Allowance (VDA) @ Rs. 7.00 per day (after rounding off) shall be payable to the unskilled, semi-skilled, skilled and highly skilled categories of employees in all 89 scheduled employments (list enclosed in the Schedule) w.e.f. 1st October, 2023 in addition to the minimum rate of wages notified vide the aforesaid Notification of Government in Labour & ESI Department, Odisha and the total VDA notified vide Notification No. 2500/ LC dtd. 05.04.2023. Accordingly, the present rate of minimum wages including VDA per day w.e.f. 1st October, 2023 shall be as under:

Category of Employee	Minimum Wages with VDA per day w.e.f. 01.04.2023	V.D.A. per day w.e.f. 1.10.2023	Minimum Wages with VDA per day w.e.f. 01.10.2023
Unskilled	Rs.345.00	Rs.7.00	Rs.352.00
Semi skilled	Rs.385.00	Rs.7.00	Rs.392.00
Skilled	Rs.435.00	Rs.7.00	Rs.442.00
Highly Skilled	Rs.495.00	Rs.7.00	Rs.502.00

Labour Commissioner, Odisha

NOT TO SCALE
All dimensions are in mtr.



C / S OF Toe Wall

Perhemo
22/12/2023
Assistant Engineer
Angul Inv. Sub-Div.
Angul

10 v 023
22-12-23
Asst. Ex. Engineer
Angul Inv. Sub-Div.
Angul

SA
22/12/2023
Superintending Engineer
Angul Investigation Div.
Angul

ANR base Cost Norm for Compensatory Afforestation
@ 500 Plants/ Ha. with 10 year Maintenance
Wage rate @ ₹311/- per Manday

Sl. No.	Items of Work	Preferable Period of Execution	No. of Mandays	Labour Cost (₹)	Material Cost (₹)	Total Cost (₹)
0th Year (Advance work) Pre-Planting Operation						
1	Survey, Demarcation and Pillar posting	Nov/Dec	2	622	0	622
2	Preparation of Treatment Map (Digital Map)	Nov/Dec	1	311	100	411
3	Site preparation	Nov/Dec	2	622	0	622
4	Silvicultural operations including clearance of weed, cutting of climber, high stump cutting, singling of shoots & removal of cut out after drying from the field to blank space	Jan/Feb	15	4665	0	4665
5	Alignment and stacking for digging of pits	Feb/Mar	1	311	0	311
6	Digging of pits (45cm x 45cm x 45cm) in hard & gravelly soil	Feb/Mar	20	6220	0	6220
	Total		41	12751	100	12851
1st Year/Planting Year						
1	Refilling of pits by altering the dug-out soil of the pits, application of organic compounds / CDM/ FYM & mixing the same perfectly	Jun/Jul	4	1244	2500	3744
2	Transportation of 18 months old polythene bag seedlings in hired truck/tractor from the Permanent/Mega nursery to planting site including loading & unloading. (Average lead of 10 Rkm) & stacking the seedlings @ Rs.6/- per seedling. (550 nos.)	Jul/Aug	0	0	3300	3300
3	Watering polythene bag seedlings at stacking site of plantation	Jul/Aug	1	311	0	311
4	Conveyance of polythene bag seedlings on head load from the stacking site to individual dugout pits within the planting site, applying insecticide, fertilizers & planting after scooping the soil with other applied materials & pressing the soil perfectly around the planted seedlings.	Jul/Aug	11	3421	0	3421
5	Cost of Fertilizer & Insecticide	Jul/Aug	0	0	1500	1500
	(a) NPK/Bio-fertilizer @ 50 gms/plant as basal dose = 25kg @ Rs.30/- per kg = Rs.750/-					

Sl. No.	Items of Work	Preferable Period of Execution	No. of Mandays	Labour Cost (₹)	Material Cost (₹)	Total Cost (₹)
	(b) Urea/Vermicompost/Mo Khata/any other fertilizer @ Rs.375/-					
	(c) Insecticide/ Bio-pesticide @ 5 gms/plant = 2.5 kg @ Rs.150/- per kg = Rs.375/-					
6	Casualty Replacement @ 10% (50 nos.)	Jul/Aug	1.5	466.5	0	466.5
7	1st Weeding & Manuring	Aug/Sep	5	1555	0	1555
8	2nd Weeding, Soil working (1mt. diametre around the plants) & Manuring	Oct/Nov	8	2488	0	2488
9	Fire line tracing & inspection path	Feb/Mar	3	933	0	933
10	Watch & Ward including watering as per requirement	Aug-Mar	8	2488	0	2488
	Total		41.5	12906.5	7300	20206.5
2nd Year Maintenance						
1	Transportation of 50 seedlings from Nursery to plantation site including loading, unloading & conveyance by Tractor @Rs.6/- per seedling	Jul	0	0	300	300
2	Casualty replacement	Jul	1.5	466.5	0	466.5
3	Cost of Fertilizer & Insecticide-	Jul/Aug	0	0	1437.5	1437.5
	A) Cost of Insecticide/Bio-pesticide(Themet/Foret)@5gms/plant = 0.25Kg @ Rs.150/- per kg = Rs.37.50					
	B) Urea/NPK/Bio-fertilizer/Vermicompost/Mo Khata/any other fertilizer @Rs.1400/-					
4	Complete Weeding, Manuring & Soil working, (1mt. diametre around the plants)	Sep/Oct	8	2488	0	2488
5	Fire line tracing (2 m. wide fire line over 400 m long) & inspection path	Feb/Mar	3	933	0	933
6	Watch & Ward including watering as per requirement	Apr-Mar	12	3732	0	3732
	Total		24.5	7619.5	1737.5	9357
3rd Year Maintenance						
1	Cost of fertilizer Urea/NPK/Bio-fertilizer/Vermicompost/Mo Khata/any other fertilizer = Rs.1400/-	Jul/Aug	0	0	1400	1400
2	Complete Weeding, Manuring & Soil working, (1mt. diametre around the plants)	Sep/Oct	8	2488	0	2488

Sl. No.	Items of Work	Preferable Period of Execution	No. of Mandays	Labour Cost (₹)	Material Cost (₹)	Total Cost (₹)
3	Fire line tracing(2m. wide fire line) & inspection path	Feb/Mar	3	933	0	933
4	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		23	7153	1400	8553
4th Year Maintenance						
1	Fire line tracing (2m. wide fire line) & inspection path	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665
5th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665
6th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665
7th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665
8th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length) & cultural operation	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665
9th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665

Sl. No.	Items of Work	Preferable Period of Execution	No. of Mandays	Labour Cost (₹)	Material Cost (₹)	Total Cost (₹)
10th Year Maintenance						
1	Fire line tracing (2 m. wide fire line over 400 m length)	Feb/Mar	3	933	0	933
2	Watch & Ward including watering as per requirement	Apr/Mar	12	3732	0	3732
	Total		15	4665	0	4665

Year wise Abstract of Cost Norm (Showing Seedling Cost separately)

Sl. No.	Year	No. of Mandays	Labour Cost ₹311/- per day	Material Cost (₹)	MELD and other contingency 5% of (4+5)	Cost of Seedling @₹50.31 per Seedlings	Total Cost (₹)
1	0th year	41	12751	100	549	0	13400
2	1st year	41.5	12906.5	7300	993.5	27671	48871
3	2nd year	24.5	7619.5	1737.5	443	2516	12316
4	3rd year	23	7153	1400	347	0	8900
5	4th year	15	4665	0	135	0	4800
6	5th year	15	4665	0	135	0	4800
7	6th year	15	4665	0	135	0	4800
8	7th year	15	4665	0	135	0	4800
9	8th year	15	4665	0	135	0	4800
10	9th year	15	4665	0	135	0	4800
11	10th year	15	4665	0	135	0	4800
	Total:	235	73085	10537.5	3277.5	30187	117087

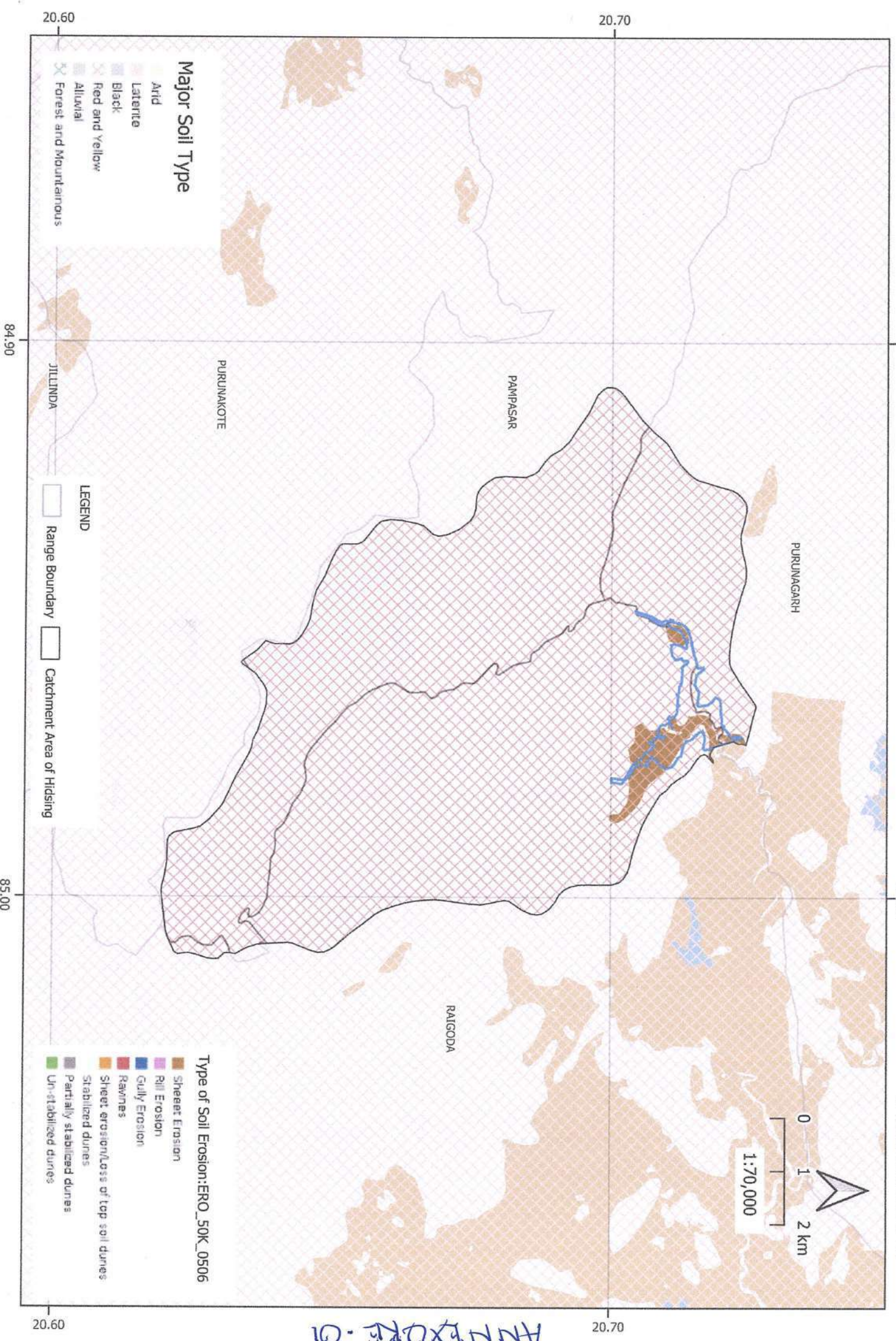
Note:

- Priority must be given to the indigenous local species available nearby to the site of plantation.
- 10 % indigenous fruit bearing trees must be preferred to Plantation.
- Site specific Soil conservation work like LBCD, Gully Plugging, Staggered Trench, Contour Trench, Graded Bund, etc. may be taken up.
- Chain link fencing can be adopted in the CA plantation taken up outside the forest area and Bamboo twigs fencing may be preferred to CA plantations taken up in degraded forest area.
- Watering facilities for procurement of water & watering may be adopted as per the availability of water.
- The Cost Norm of various items can be changed with the approval of the concerned RCCFs keeping the overall cost norm fixed for each Financial Year.

Matrix for ANR Plantation for Compensatory Afforestation @ 500 Seedlings/ Ha. with 10 year maintenance

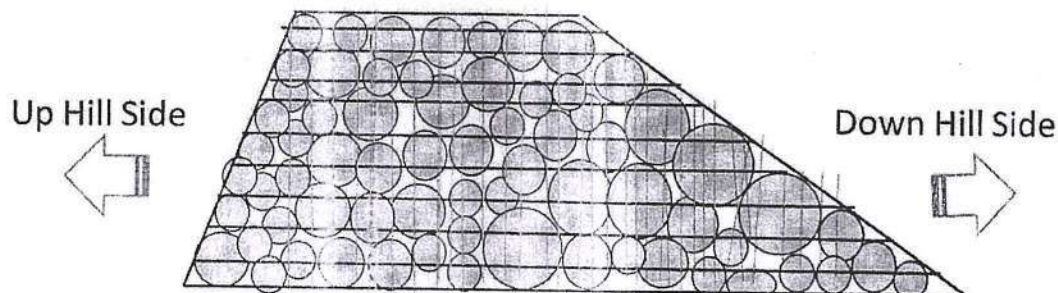
Sl. No.	Comment Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII	XIX	XX	XXI	Total Cost (10Yrs)
	Base Norm	13400	48871	12316	8900	4900	4800	4800	4800	4800	4800	4800											136098
01	2021-22	13400	51315	13577	10303	5834	6126	6432	6754	7092	7446	7819	8210										142904
02	2022-23		14070	53881	14256	10818	6126	6432	6754	7092	7447	7818	8210										150051
03	2023-24			14774	56575	14669	11359	6432	6754	7092	7447	7819	8209	8621									157554
04	2024-25				15513	59404	15717	11927	6754	7052	7447	7819	8210	8619	9052								165433
05	2025-26					16289	62374	16503	12523	7092	7447	7819	8210	8621	9052	9505							173705
06	2026-27						17103	65493	17328	13149	7447	7819	8210	8621	9052	9505	9980						182390
07	2027-28							17958	68768	18194	13806	7819	8210	8621	9052	9505	9980	10479					191510
08	2028-29								18856	72206	19104	14496	8210	8621	9052	9505	9980	10477	11003				201086
09	2029-30									19799	75816	20059	15221	8621	9052	9505	9980	10479	11001	11553			211141
10	2030-31										20789	79607	21062	15982	9052	9505	9980	10479	11003	11551	12131		

Annexure-I



ANNEXURE - 01

3: Design of WLBCD

Design of Wire Mesh Loose Boulder Check Dam (WM LBCD)
Cross Section**Model Estimate of Wire Mesh LBCD**

Providing & making Gabion structure with Mechanically Woven Double Twisted Hexagonal Shaped Wire mesh Gabion Boxes as per IS 16014:2012, MORTH Clause 2500, of required size, Mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc coated, Mesh wire diameter 3.0 mm, mechanically edged/selvages with partitions at every 1m interval and shall have minimum 10 numbers of openings per meter of mesh perpendicular to twist, tying with lacing wire of diameter 2.2mm, supplied @3% by weight of Gabion boxes, filled with boulders with least dimension of 200 mm,

Details of Cost for: 2.00 Cum

SL No.	Description	Unit	Quantity	Rate (In Rs.)	Amount (In Rs.)
MATERIALS:					
1	Crates made of GI Mesh Type 10x12 (D=100 mm with tolerance of $\pm 2\%$) Zinc coated, Mesh wire diameter 3.0 mm) For size 2 m X 1m X 1m. Surface area is 11.00Sqm	Sqm	11	480.00	5280.00
	Stone boulder with least dimension 200 mm	Cum	2	880.00	1760.00
	Total (A)				7040.00
LABOUR:					
	Mate	Day	0.1	392.00	39.2
	Mason Second class	Day	0.5	442.00	221
	Man Mulia	Day	1.5	352.00	528
	Total (B)				788.2
	Total (A+B)				7828.2
	Add OH Charges @ 7.5% on (A+B)				587.115
	Contractor Profit @ 7.5% on (A+B)				587.115
	Total:-				9002.43
	Add LC @ 1%				90.0243
	Total:-				9,092.45

Cost for 2.00 Cum				9,092.45
Cost for 1.00 Cum				4546.23
			(Or)	4,546.00
Cost for 1.00 Cum with 18% GST				5364.28

NOTE: FOR LBCD AND WIREMESH LBCD THE UPHILLSIDE SLOPE IS TAKEN AS 1:1 AND DOWNHILLSIDE SLOPE TAKEN AS 1:3 FOR THE PURPOSE OF VOLUMETRIC CALCULATION. THE LENGTH OF THE STRUCTURE REFERS TO THE CROSSECTION OF THE NAALA AND WIDTH OF THE STRUCTURE REFERS TO THE WIDTH OF THE TOPMOST PORTION OF THE STRUCTURE. HEIGHT REFERS TO THE DISTANCE OF THE TOPMOST POINT OF THE STRUCTURE FROM THE GROUND LEVEL.

N. B: Model Estimate prepared based on Local rate to work out the budget. During work Execution, actual estimate needs to be prepared for approval as per site condition in specific place. If deficit of approved budget may arise due to prevailing market and site-specific condition, the no of structures may be reduced, or budget may be adjusted as per the requirement. Geo-Coordinates of the location may be changed as per the site-specific condition.

12/10/23
13-10-23
Assistant Engineer
Angul Inv. Sub-Division
Angul

13-10-23
Asst. Ex. Engineer,
Angul Inv. Sub-Divn.
Angul.

13/10/2023
Superintending Engineer
Angul Investigation Division
Angul