GOVERNMENT OF ARUNACHAL PRADESH
DEPARTMENT OF ENVIRONMENT, FORESTS & CLIMATE CHANGE
ITANAGAR

No.FOR.657/Cons/2016/ 4634-37 Itanagar, dated. The **02nd December'2025**

To

The Deputy Director General of Forests (Central),
Sub Office, Guwahati (under Regional Office, Shillong)
4th Floor, Housefed Building, Rukminigaon
Guwahati- 781022

Sub: **Proposal for diversion of 6.005 ha of forest land for construction of Denzi Small Hydro Electric Project (10 MW) by M/s Buru Energy Private Limited in West Kameng District of Arunachal Pradesh- Reg.**

Ref: Your letter F. No. 3-AN C/168/2023/GHY/679-80 Dated 24.12.2024

Sir,

With reference to the above letter on the subject, this is to submit and enclose herewith the following information:

1	The approved Catchment Area Treatment Plan (CAT) as proposed area involves a submergence area of 1.00 ha.	The approved CAT Plan is **enclosed as Annexure-I.**
2.	The Chief Secretary certificate for non-availability of the non-forest land of the identified CA site in case CA site is identified in degraded forest land or else, the CA shall be identified in non-forest land as the user agency is a private agency.	The CA site identified in Shergaon VFR for 12 ha. may be considered.

In view of the above details submitted, it is requested to kindly issue necessary formal approval for the diversion of 6.005 ha of forest land for the construction of the above HEP under Section-2 of the Van (Sanrakshan Evam Samvardhan) Adhiniyam,1980.

Enclosed: as stated above

Yours faithfully,

24/12/25

(P. Subramaniam)
PCCF & HoFF

Copy to:

1. The Director, Buru Energy Pvt. Ltd., C/o-Bamang Tago, Yara Tabang Complex, ESS Sector, Near Govt. High School, District-Papum Pare, Itanagar-791111, Arunachal Pradesh, e-mail: buruenergypvtltd2022@gmail.com, Mb.No.7005799319 for information and necessary action.
2. The Chief Conservator of Forests, WAC, Banderdewa for information.
3. The Divisional Forest Officer, Shergaon Forest Division for information.

(P. Subramaniam)
PCCF & HoFF

DENGZI SMALL HYDRO ELECTRICPOWERPROJECT
(2X5MW)

CATCHMENTAREA TREATMENTPLAN

SubmittedBy:

Buru Energy Private Limited
Yara-Tabang Complex, ESS Sector
Itanagar-791111, Arunachal Pradesh

Divisional Forest Officer
Nergaon Forest Division
Arunachal Pradesh

As per the minutes of meeting dated 30th June '2025, the CAT plan for Dengzi HEP in West Kameng District is approved.

CCF & HoFF
Govt. of Arunachal Pradesh
Itanagar

INDEX PLAN – CATCHMENTAREATREATMENTPLAN FOR DENGZI HEP (2X5MW)

1 CATCHMENTAREATREATMENTPLAN

1.1 INTRODUCTION

The study of erosion and sediment yield from catchment is of utmost importance as the deposition of sediment in reservoir reduces its capacity, thus affecting the water available 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 from catchment adversely affects the agricultural production and silt laden water affect the turbine blades thereby affect the hydro power production. Another important factor that adds to the sediment load is due to grazing of animals. A large number of cattle, sheep, and goats graze the pastures continuously for about six months in a mountainous region.

The lack of proper vegetal cover is a factor, which causes degradation and thereby results in severe run off/soil erosion, resulting in premature siltation of the reservoir. Thus, a well-designed Catchment Area Treatment (CAT) Plan is essential to ameliorate the above including process of soil erosion. The catchment area treatment involves the understanding of the erosion characteristics of the terrain and identifying/ suggesting remedial measures to reduce the erosion rate. For this reason, the catchment area responsible for directly draining rivers, streams, tributaries, etc. are treated and the cost is included in the project cost.

The 235 sq.km area free draining catchment of "Dengzi HEP" consists of two watersheds.

CAT plans for the free draining catchment area of the proposed project have been prepared for areas with moderately soil erosion intensity, which targets toward overall improvement in the environmental conditions of the region. All the activities are aimed at treating the degraded and potential areas with severe soil erosion. The plan provides benefits due to biological and engineering measures and its utility in maintaining the ecosystem health. The plan with objectives addresses issues such as prevention of gully erosion, enhancing the forest cover for increasing soil holding capacity; and arresting total sediment flow in the reservoir and flowing waters.

Although the proposed project is not expected to have any significant negative impacts on the environment, measures to minimize the entry of silt in to its weir location and enhance its life as well as for conservation of the ecosystem, are described in the following paragraphs.

1.2 OBJECTIVES

The main aim of the CAT is to rejuvenate various potential and degraded ecosystems in the catchment area. The action plan has been prepared for this purpose with the following objectives;

- To facilitate the hydrological functioning of the catchment and to augment the quality of water of the river and its tributaries
- Conservation of soil cover and to arrest the soil erosion, floods and siltation of the river and its tributaries and consequent reduction of siltation in the reservoir of the project
- Demarcation of the priority of sub watersheds of treatment on the basis of soil erosion intensity in the catchment area
- Rehabilitation of degraded forest through afforestation
- Mitigation of landslide landslip and rock falls
- Soil conservation through biological and engineering measures to reduce sediment load in river and tributaries, thus improving the quality of water
- Ecosystem conservation resulting from increased vegetative cover and water retaining properties of soil
- Employment generation through community participation and conservation

1.3 CATCHMENT SCENARIO AND DRAINAGE

The The proposed Denzi SHP is located on Nargum river (also known as Dhansiri river in Assam) which is a right bank tributary of River Brahmaputra. The river originates from middle Himalayas at an elevation of about 3800 m and flows in southern direction also referred as Ama R, Bhairabkund N and Dhansiri River in the toposheet at the lower reaches, joins River Brahmaputra in Assam state.It has a length of 15 km before the weir site of Dengzi HEP. It is joined by the tributaries Yangphu, and Domkaranag on left bank and shakharjankha at right bank. The river flows in EW direction traverse about 23 km to weir site of Dengzi SHP near Dengzi village, Kalakthang.

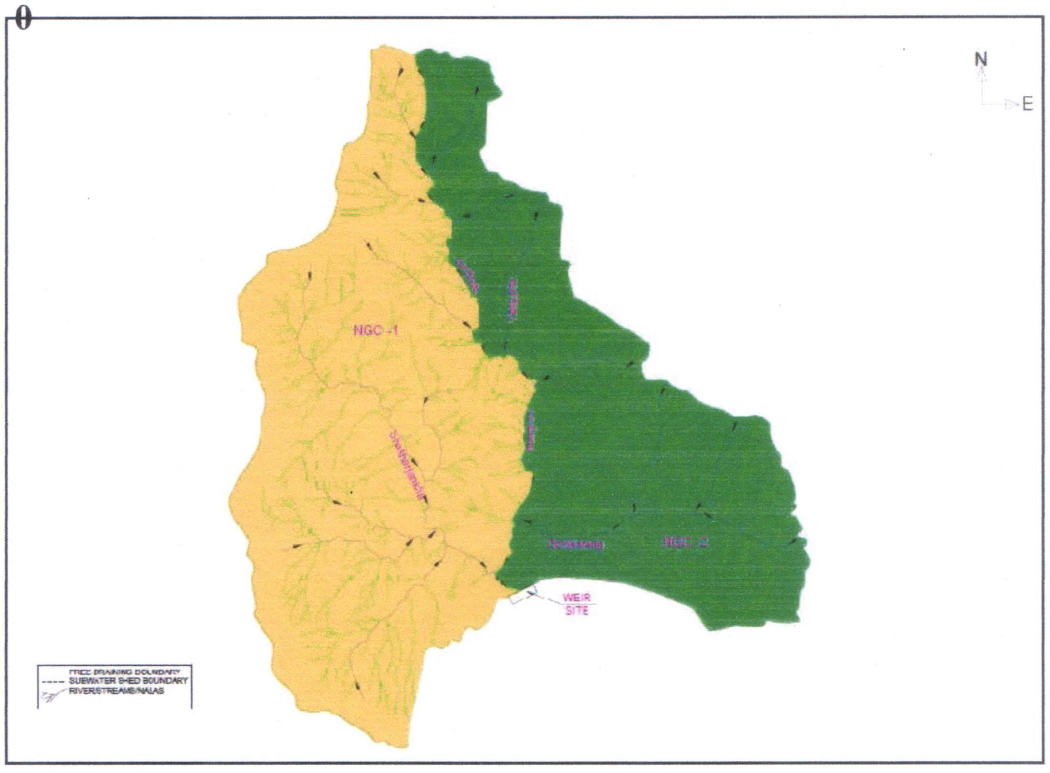
The entire catchment is rained, hence carries large amount of water during monsoon season.

Being the run off the river project the area of the free-draining catchment of the Dengzi HEP. 235sqkm, and covered with perennial streams on both the banks of Nargum river.

1.3.1 DELINEATION OF WATER SHED SAND SUB-WATERSHEDSOF FREE DRAINING CATCHMENT

1.3.1.1 For the demarcation of sub-watersheds, hierarchical delineation system developed by AIS & LUS (AIS&LUS Technical Bulletin 9) was followed. The

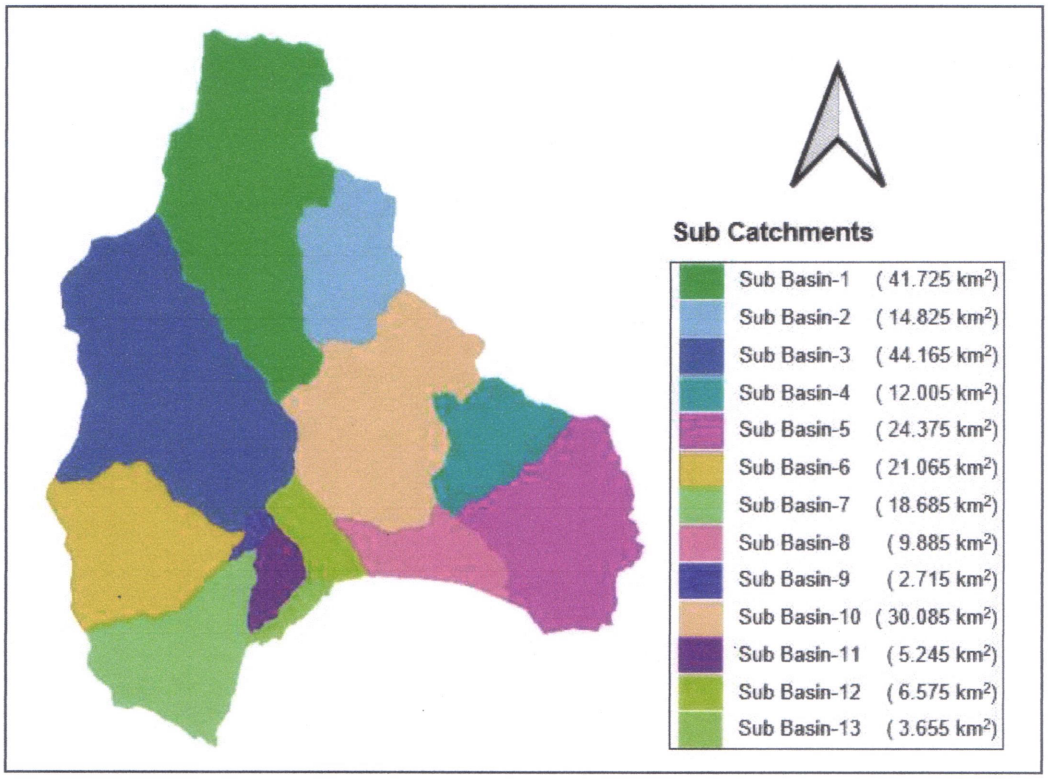
codification system as given in Watershed Atlas of India (AIS&LUS) was followed for Nargum River watershed on 1:50,000 Survey of India top sheets. Sub-catchment of West Kameng catchment (3A2B3) as per the AISLUS, watershed Atlas of India. Therefore, for the preparationof CAT plan, part of West Kameng. 58,59 3A2B3 comprising the free draining catchment area has been delineated two sub-watersheds in the free-draining catchment area as per the codification system as given in Watershed Atlas of India (AIS&LUS) on 1:50,000 Survey of India toposheets of the project area.



Sub-watersheds of Dengzi SHP Catchment Area

Watershed Name	Sub-watershedName	Area(Sqkm)
3A2B3	NGC1	136
	NGC2	99
Total		**235**

1.3.1.2 The catchment has been subdivided into distinct micro-watersheds (micro sheds) allowing focused planning and management. Each micro shed represents a unique hydrological response unit based on topographic ridges and drainage lines.

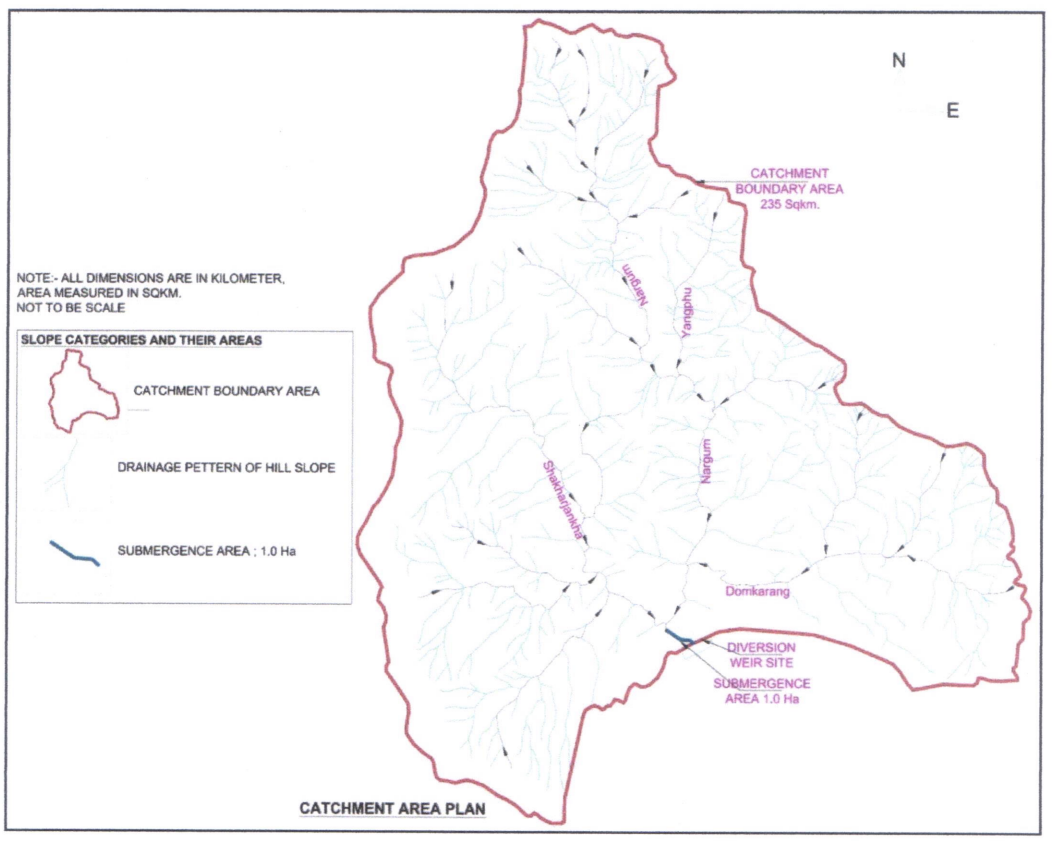


Micro-watersheds of Dengzi SHP Catchment Area

WatershedName	Micro-watershed/ Sub Catchments	Area(Sqkm)
3A2B3	Sub Basin 1	41.725
	Sub Basin 2	14.825
	Sub Basin 3	44.165
	Sub Basin 4	12.005
	Sub Basin 5	24.375
	Sub Basin 6	21.065
	Sub Basin 7	18.685
	Sub Basin 8	9.885
	Sub Basin 9	2.715
	Sub Basin 10	30.085
	Sub Basin 11	5.245
	Sub Basin 12	6.575
	Sub Basin 13	3.655
Total		**235.00**

1.3.2 TOPOGRAPHY

The free draining catchment area lies in greater and less North East Himalayas. At the project site, the river flows in a Valley having mean elevation of 1500 msl. The river bed at weir site is about 42 m wide. The elevation of the study area varies from El. 2375 msl at weir site to El. 950 msl in the free draining catchment area. The Submergence area of the weir would be (217.4 X 46 Sqm) = 1.0 Ha. The topography of the free draining catchment is shown in below.



Catchment area of Dengzi SHP

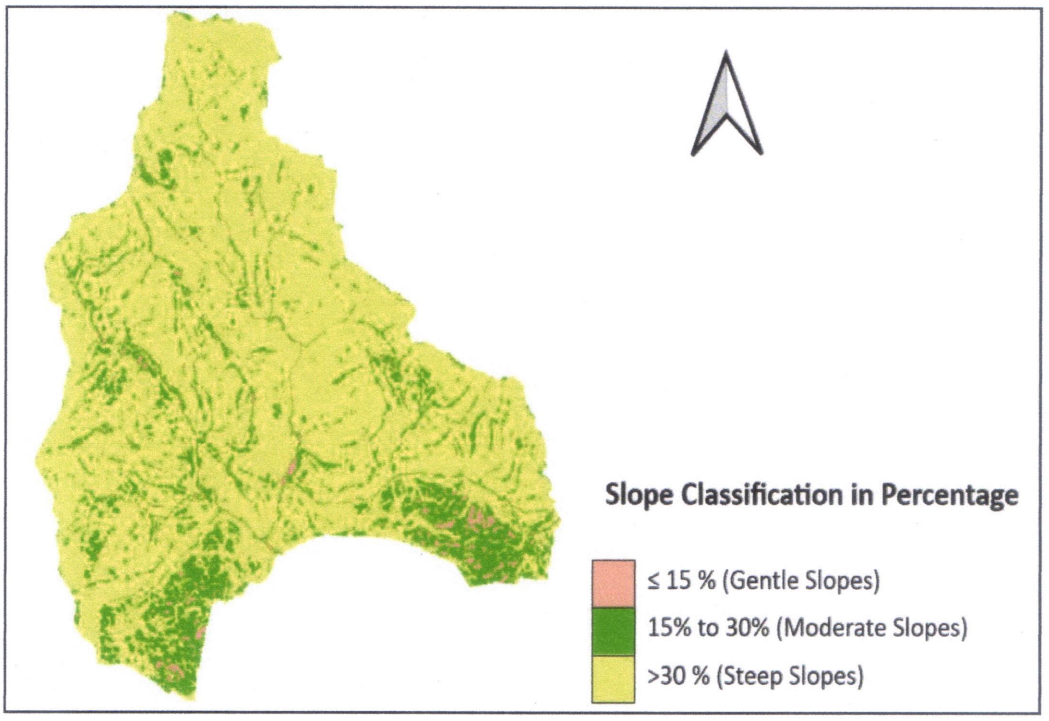
1.3.3SLOPE

Slope has a major influence on the loss of soil and water from the watershed and thereby affects the land use capability. The slope percentage determines the erosion susceptibility of the soil depending on its nature and classification. This helps in classifying various land suitability classes, which in turn enables the formulation of appropriate conservation measures for the prevention of soil erosion. The following slope classes and ranges are recommended by the **All-India Soil & Land Use Survey (AIS&LUS).**

The slope model for the proposed **Dengzi Hydroelectric Project** area was generated from the contours of **Survey of India (SOI)** top sheets at a **1:50,000 scale**, with 40-

meter intervals, using **ArcGIS 9.0**. The slope variation within the catchment has been mapped in degrees or percent rise as follows:

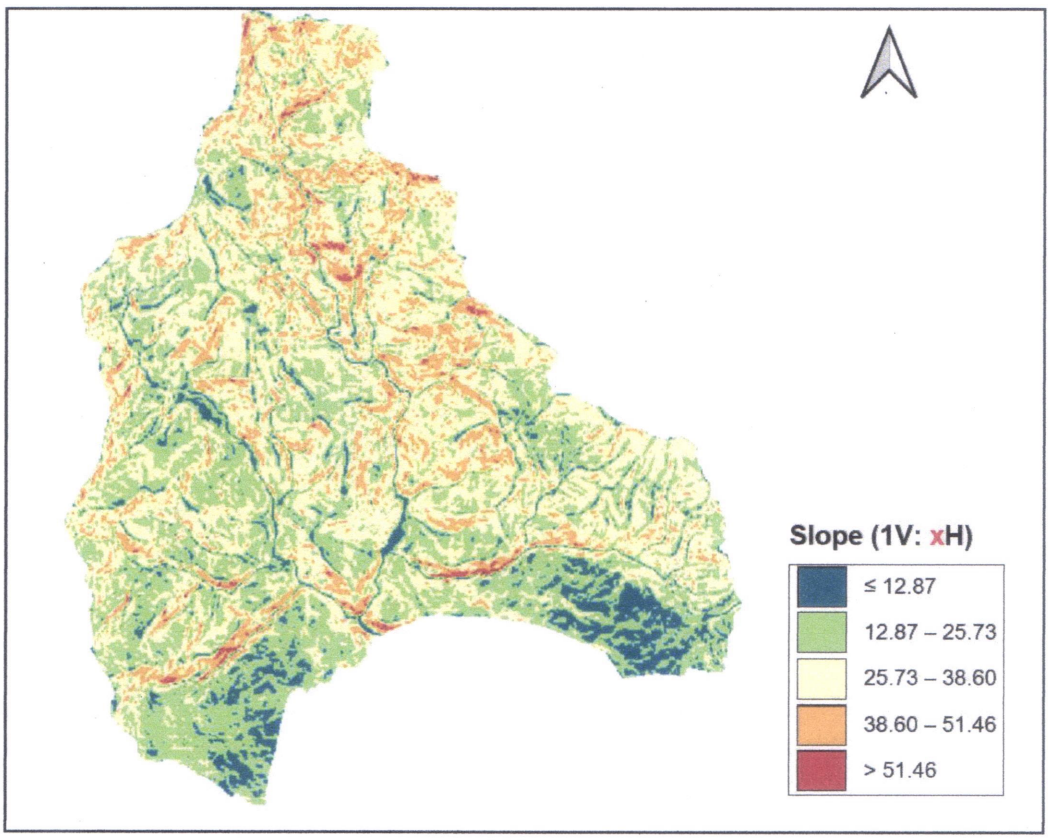
- **Gentle Slopes (<10%)** dominate the valley floors and flat terrain.
- **Moderate Slopes (15%–30%)** are found along foot-hills and low-gradient ridges.
- **Steep Slopes (>30%)** appear along escarpments and hilly regions.



Slope Percentage Classification of Dengzi SHP Catchment Area

Slope Classification	Slope Percentage	Area Percentage
Gentle Slopes	≤ 15%	1%
Moderate Slopes	15% to 30%	9%
Steep Slopes	> 30 %	90%

The below image shows the **Slope Map of the Dengzi SHP Catchment Area** in West Kameng, Arunachal Pradesh. It categorizes the terrain into five slope classes, from gentle (≤12.87) to very steep (>51.46), using a color scale. This map helps identify suitable zones for construction and assess areas prone to erosion.



Slope Map of Dengzi SHP Catchment Area

1.3.4LAND USE, FOREST COVER, AND SOIL CHARACTERSTICS

A Land Use/Land Cover (LULC) map was prepared at a 1:50,000 scale using high-resolution satellite imagery with the objective of supporting the Environmental Management Plan (EMP) and the Catchment Area Treatment (CAT) plan for the proposed hydroelectric project. The base map, drainage, and land cover layers were digitized and analyzed using ArcGIS 9.0. These layers were further integrated with sub-watershed boundaries of the Norbung River watershed (up to the barrage site) to facilitate detailed overlay analysis for planning and management.

The LULC classification, based on pixel-based analysis, revealed the following distribution across the catchment: The LULC classification, based on pixel-based analysis, revealed the following distribution across the catchment:

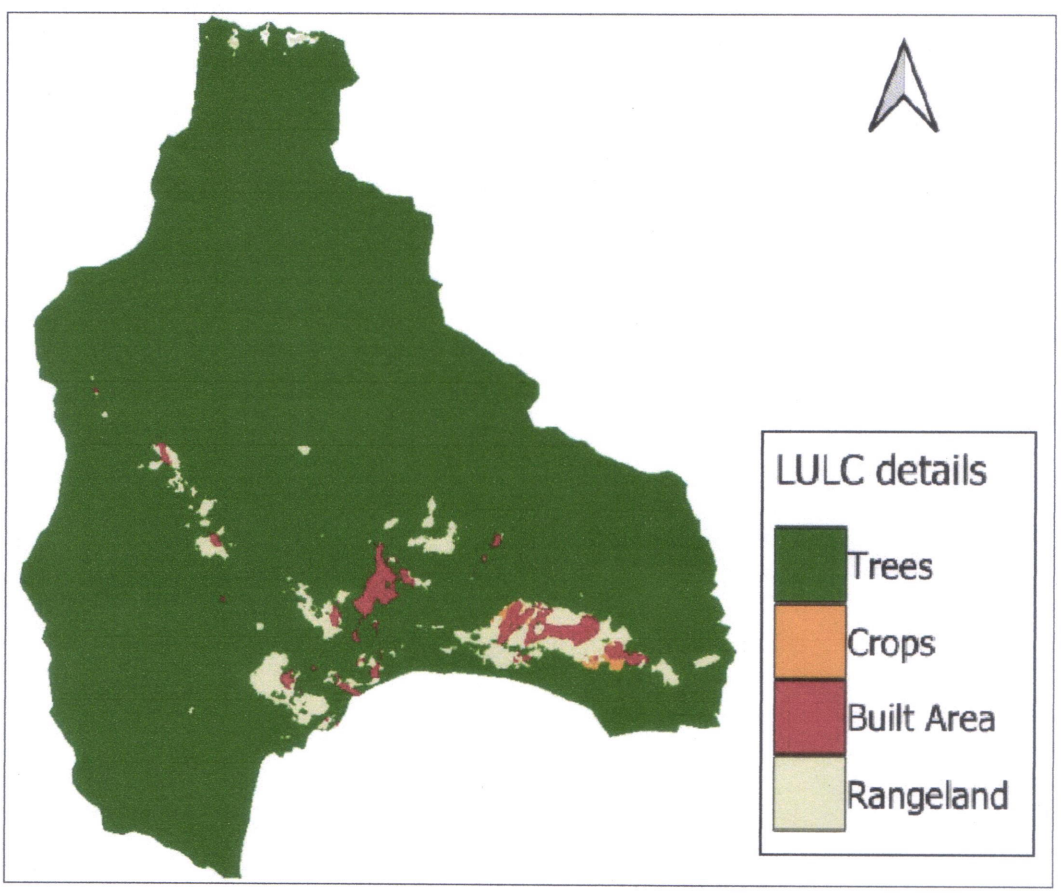
- **Trees**: ~89.4% – Representing dense vegetation, primarily in upper slopes and undisturbed zones, which plays a crucial role in controlling erosion, regulating runoff, and maintaining ecological stability.
- **Crops**: ~ 1% – Concentrated in moderate slope areas and valleys, indicating

significant agricultural activity that requires proper soil and water conservation practices.

- **Built-up Area**: ~2.6% – Scattered human settlements and infrastructure, typically found along accessible terrain and near river corridors.
- **Rangeland**: ~6.0% – Open and sparsely vegetated lands, often used for grazing, more prone to degradation if not managed properly.

Forest Density Classification

Two forest density classes were interpreted for mapping. Forest areas with canopy cover greater than 4.25% were delineated as open forests, mainly located near the riverbed and along erosion-prone areas. These areas are critical for prioritizing bioengineering and vegetative treatment interventions under the CAT plan.

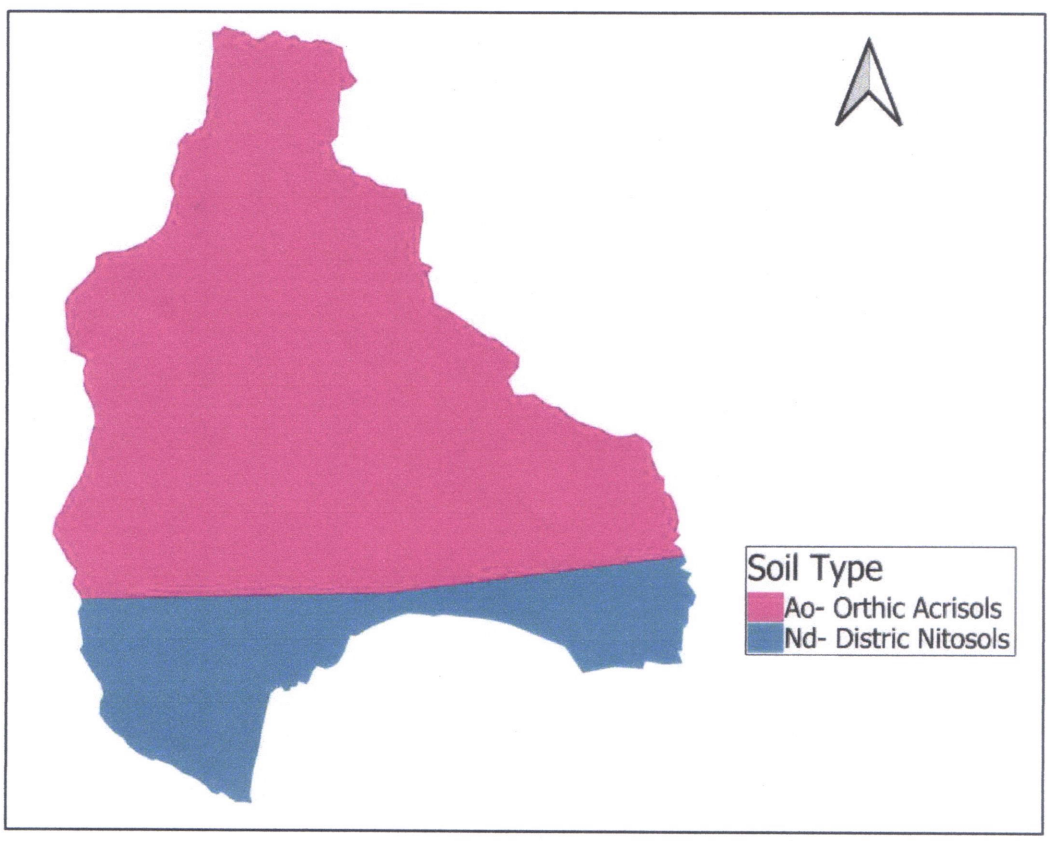


Land Use Land Cover Map

Soil Classification

The catchment exhibits two primary soil types, each influencing land use planning and conservation priorities:

- **Ao – Orthic Acrisols (76.3%)**: Found mostly in the northern and central uplands, these soils are acidic, low in nutrients, and susceptible to erosion. They require careful land management and are suitable for limited agricultural use with soil conservation support.
- **Nd – DistricNitosols (23.7%)**: Located in the southern and lower catchment, these soils are deep, well-drained, and moderately fertile, suitable for diverse cropping systems and agroforestry.



Soil Map of Dengzi SHP Catchment Area

1.4 ACTIVITIES TO BEUNDER TAKEN (TREATMENT MEASURES)

Details of treatment measures viz. engineering measures as well as biological measures to be undertaken are described in the following paragraphs.

1.4.1 ENGINEERING MEASURES

Gully Control: The gully(s) would be treated with the help of engineering/ mechanical as well as vegetative methods. Check dams would be constructed in

some of the areas to promote growth of vegetation that will consequently lead to the stabilization of the slopes/area and prevention of further deepening of gully(s) and erosion. For controlling the gully(s), the erosive velocities are reduced by flattening out the steep gradient of the gully. This is achieved by constructing a series of check which transform the longitudinal gradient into a series of steps with low risers and long flat treads. Different types of check dams would be required for different conditions comprising different materials depending upon the site conditions and the easy availability of material at local level.

The following types are recommended for this area:

a. DRSM (Dry Rubble Stone Masonry) - Check dams with stones
b. Contour Bunding

In addition to the vegetative measures used for stabilization of gullys, temporary or permanent mechanical measures will be used as supplementary measures to prevent the washing away of young plantations by large volume of runoff. The gullys get stabilized over a period of time with the establishment and growth of vegetation cover. With the passage of time mechanical structures weaken and vegetative measures get strengthened.

For engineering measures following types of check dams are suggested.

a. Dry Rubble Stone Masonry (DRSM) checkdams

The site where DRSM check dams are to be constructed is cleared and the sides are sloped 1:1. The bed of gully is excavated for foundation to a uniform depth of 0.45 m to 0.60 m and dry stones are packed from that level. Over the foundation, DRSM super structure of check dam is constructed. The stones are dressed and properly set in with wedges and chips. The width of check dam at the base should be approximately equal to maximum height and successive courses are narrower so the section is roughly a trapezium. It is common to find upstream face of check dams vertical with all slopes on the downstream face but while there is sound engineering reason for this in case of large check dams but it is not of any consequence in small gully control dams. In the center of the dam portion sufficient waterway is allowed to discharge the maximum run off. The dry stone work should go up to 0.30m to 0.60m in the stable portion of the gully side to prevent end-cutting. Sufficient apron is provided topreventscouringofthestructure.Thethicknessoftheapronpackingwouldbeabout 0.45 m and gully sides above the apron have to be protected with packing to a height of at least 0.30 m above the anticipated maximum water level to prevent side scour being formed by the falling water. For gully control measures, 2 DRSM check dams would be constructed. An estimated budget of **8lakhs**.

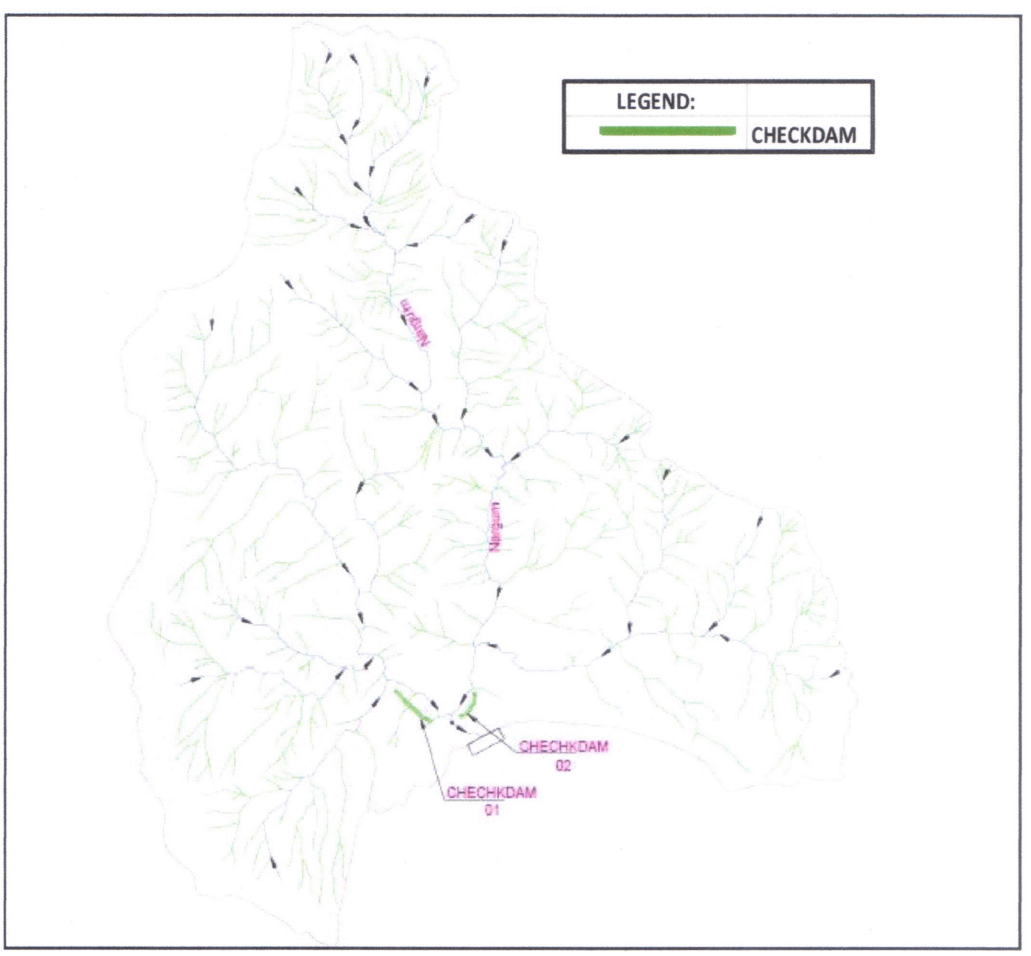
b. Contour Bunding

Contour bunding is one of the simple methods of soil and water conservation. It

plays an important role in soil and water conservation in the field with medium slope. Along bunds trees which fix nitrogen into the soil are planted with grass along the bunds. Contour bonding helps in soil and water conservation. When there is rainfall, contour bund acts as a barrier to the water flow and checks the velocity. This reduces chances of soil erosion. When water starts flowing along the fields, bund becomes obstruction for it. Due to the obstruction, velocity reduces and water percolates behind the bunds. This allows infiltration of water into the soil. A total area of 0.5 ha will be used for contour bunding with an estimate budget of Rs. 2 lakhs.

c. Checkdams

Two check dams will be constructed near the weir in the **Dengzi SHP,** located in **West Kameng district, Arunachal Pradesh**, to regulate water flow, trap sediment, and enhance groundwater recharge. Each dam is built to a height of approximately 1 meter and positioned strategically to controlerosion and maintain a steady flow. These check dams play a crucialrole in improving the overall efficiency and sustainability of the environment and land erosion.



Tentative Location of Check Dams

Check dams	Latitude	Longitude
1	27°05'19.3"N	92°06'26.4"E
2	27°05'14.4"N	92°06'14.2"E

1.4.2 BIOLOGICAL MEASURES/PREVENTIVE MEASURES

The Biological Measures/Preventive Measures suggested are:

A. Afforestation and Barbed wire fence

B. Nursery development

A. Afforestation and barbed wire fence

In the upland region like this project area, the trees and vegetation cover play an important role in the conservation of soil and ecology. Afforestation programmed would be taken up in such forest areas that contain large patches of barren grassy slopes and are generally devoid of trees and are honey-combed by cultivation. The species for plantations would be selected after considering altitude, aspect, biotic pressures, soil depth, moisture, etc. As there is great pressure of cattle grazing, non- fodder/ fuel wood species would also be planted in suitable proportion in between the fodder species. Afforestation measures would be taken up under CAT plan.An outlay of **Rs. 4 lakhs** for 2have been provided to cover various areas under afforestation in different sub-watersheds and in project area. An estimate of **Rs.6Lakhs** for Barbed wire fence

B. Nursery Development

Proper development of nursery and allied services, like drip irrigation or micro-irrigation, will be crucial for successful execution of CAT plan. It will be important to prepare a stock of plant material for the supply of saplings for afforestation programmed and various other activities. Main nursery may be developed near dam site, proposed colony areas, preferably along the road side for easy accessibility. The nurseries may be developed around colony area because of its proximity to both the upstream and downstream part of the CAT plan area as it lies in the middle of catchment. Besides, this area possesses necessary infrastructure and various raw materials for nursery development can be easily made available. In addition, provision will also be made for two green-houses/chick houses for maintaining plant saplings. The estimated cost for the development of nursery and greenhouses will be around Rs. 9 lakhs. Development of nursery will start from the zero year and will continue for 5 years with its

maintenance. During maintenance, nursery will supply plants wherever required for the replacement. When we are considering the cost of Plant / sapling, these provisions are avoidable. The Estimated Cost for the development of Nursery is given in below table.

Estimated Cost for the Nursery Development

Components	Development	Maintenance	Amount (Rs.Lakhs)
Shed House for raining saplings (one time grant)	1	0.5	1.5
Seeds collection procurement grant	1	-	1
Compost, soil, fertilizer and other materials	2	-	2
Shed House/Chick house for maintaining and Storing saplings (Nos2)	1.5	0.5	2
Polybags, pots, trays for raising saplings	1.5	-	1.5
Nursery equipment	1	-	1

1.5 CAT IMPLEMENTATION

Environmental Officer or Manager (Environment) of project proponent would coordinate with the forest department for the implementation of the proposed Plan. The Environment Officer would evaluate/monitor financial aspects at Site Office. The modalities of financial disbursement every quarter in a year need to be taken care of. The implementing agency shall submit completion certificate in the light of guidelines fixed by CAMPA. The implementation of CAT Plan should have enough flexibility and should be subject to changes as per requirements and periodic gains. A monitoring committee as per the MOEF guidelines should be instituted for the project for administrative guidance and smooth realization of targets.

1.6 PERIOD AND SCHEDULE OF IMPLIMANTATION

Dengzi is a runoff the river project of 10MW and only the water is diverted between weir and power house and further at power house it discharged in Nargum river. The project is not disturbing the catchment water shed natural course of flow other than approx. 100m upstream of Weir site. The execution of CAT plan in Dengzi HEP as desired by Department of Environment of Forest. Keeping in view the local topography and climate, it is being estimated that the

entire treatable area would require at 2 years to complete. However, the maintenance of plantations would continue for one year and accordingly CAT plan has been prepared for three years. All these works would have to start with the pre-construction activities especially the studies in respect of micro-planning for each sub-watershed,

1.7 CATCHEMENT AREA TREATMENT MEASURES

The catchment area of Dengzi project in not affected by Dengzi HEP as it is a runoff the river project and not affecting the course of water in the catchments. The erosion category of various watersheds in the catchment area as per a SYI index is given in Table below.

Watershed Number	Area in Sqkm	SYI Values	Category
NGC1	136	1120.00%	Medium
NGC2	99	1120.00%	Medium
Total 235 Sqkm			

1.8 BASIN STUDY KAMENG BASIN

In July 2017, the Ministry of Environment, Forest and Climate Change (MoEF&CC) conducted a Cumulative Impact Assessment and Carrying Capacity Study for the Kameng Basin in Arunachal Pradesh to evaluate the development of Hydroelectric Projects (HEPs). The study assessed a total of 44 HEPs with a combined capacity of 4898.9 MW, of which 37 projects, totaling 2561.9 MW, were recommended for implementation. The Dengzi HEP is among the projects approved for development under this recommendation.

1.9 CCF SITE VISIT

A site visit conducted by the Chief Conservator of Forests (CCF) and the Forest team has resulted in specific recommendations to enhance the effectiveness of the catchment area treatment measures. It has been recommended that two temporary check dams be constructed, as opposed to one, in order to better control soil erosion and water runoff in critical areas. This recommendation has been incorporated into the proposal, and the cost estimates have been revised accordingly to account for the additional construction.

2.0 COST ESTIMATE OF CAT PLAN

The total estimated cost of catchment area treatment plan to be spent over a period of two years is **Rs. 49.5** Lakhs. The details of cost estimates and physical work schedule as well as phasing of expenditure are given as follows in **Tables below**. All the costs towards the administration during the implementation work have been included in the cost estimates of CAT.

Measure	Year-I		Year-II		Total	
	Physical	Financial	Physical	Financial	Physical	Financial
Gap Plantation	0.5 Ha	2.5 Lakhs	0.5 Ha	1.5 Lakhs	1.00 Ha	4.0 Lakhs
Afforestation	0.5 Ha	2.0 Lakhs	0.5 Ha	2.0 Lakhs	1.00 Ha	4.0 Lakhs
Contour bunding	0.5 Ha	4.5 Lakhs	0.5 Ha	3.5 Lakhs	1.00 Ha	8.0 Lakhs
Check dam	1 Nos	5 Lakh	1 Nos	5 Lakhs	2.00 nos.	10 Lakhs
Nursery development & maintenance	LS	6.0 Lakhs	LS	4.0 Lakhs	LS	10.0 Lakhs
Barbed wire fence	300 Rm	5.5 Lakhs	100 Rm	4.0 Lakhs	400 Rm	9.5 Lakhs
Watch and ward for 2 years	1 nos. Security Guard	2 Lakhs	1 nos. Security Guard	2 Lakhs	1 no. of Security Guard	4.0 Lakhs
Total		27.05 Lakhs		22.0 Lakhs		49.5 Lakhs