



Forest Conservation Act 1980
PROPOSAL SUBMITTED TO
THE PRINCIPAL CHIEF CONSERVATOR OF FOREST (HOFF)
GOVERNMENT OF TAMILNADU
PANAGAL BUILDING, SAIDAPET, CHENNAI – 600 015

FOR
DIVERSION OF FOREST LAND

*Proposal Under Section 2 of
Forest (Conservation) Act 1980*

For
**FORMATION OF A TANG ACROSS JUNGLE STREAM
NEAR KANAKKAMPALAYAM VILLAGE IN GOBI TALUK
OF ERODE DISTRICT**

CATCHMENT AREA TREATMENT PLAN

SUBMITTED BY
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CATCHMENT AREA TREATMENT PLAN
FOR KANAKKAMPALAYAM SCHEME

FORMATION OF A TANK ACROSS JUNGLE STREAM IN KANAKKAMPALAYAM VILLAGE IN GOBI TALUK OF ERODE DISTRICT.

1. CATCHMENT AREA TREATMENT PLAN

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.

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 measure 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 20.30 Sq.Km areas free draining catchment consists of four watersheds. The pre-requisite for a watershed management is the collection of multipronged data like geology, drainage pattern, etc. The multi-pronged data generated from various published sources and actual data collected from these watersheds on the above-mentioned parameters are the basis of the action plan for catchment area treatment.

CAT plans for the free draining catchment area of the proposed projected has been prepared for areas with moderately soil erosion intensity, which targets towards 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 measure 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, measure to minimize the entry of silt in to its reservoir 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 projects.
- 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 engineer measure 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 Kanakkampalayam Tank scheme is proposed across the jungle stream which takes its origin near Madapatti hill village in the midst of Gudialathur reserve forest land (Sathyamangalam Tigre Reserve) and flows in the Southern direction for about 13.60 KM and finally joins with the Bhavani River. The proposed site is situated at Latitude 11 0 33' 31" and Longitude 77 0 26' 21" in the Forest area near Kanakkampalayam village boundary

of Gobi Taluk in Erode District. The proposed tank is situated near Kanakkampalayam village of Gobi taluk and just at about 5 Km off the Sathy - Athani - Bhavani road. The site is connected by Road upto Bhagavathi Amman Kovil from Gobichettipalayam. The scheme comes in Bhavani Sub basin of Cauvery Basin.

- Formation of a Tank of 0.814 MM3 (28.75Mcft) with an annual storage of 1.221 MM3 (43.12Mcft) in 1½ fillings.
- Excavation of Right side canal for a length of 3.14 Km to benefit a dry extent of 350 Acres or 141.63 Hec.

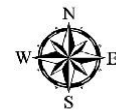
1. Excavation of Left side canal for a length of 2.15 Km to benefit a dry extent of 150 Acres or 60.70 Hec.
2. In addition to direct irrigation, 1800 acres of cultivable land will indirectly be benefitted through recharging the wells in Kanakkampalayam, Perumugai and Kondayampalayam villages. A total of 492 openwells and borewells will be benefitted by implementation of the scheme.

1.3.1 DELINEATION OF WATERSHEDS AND SUB – WATERSHEDS OF FREE DRAINING CATCHMENT

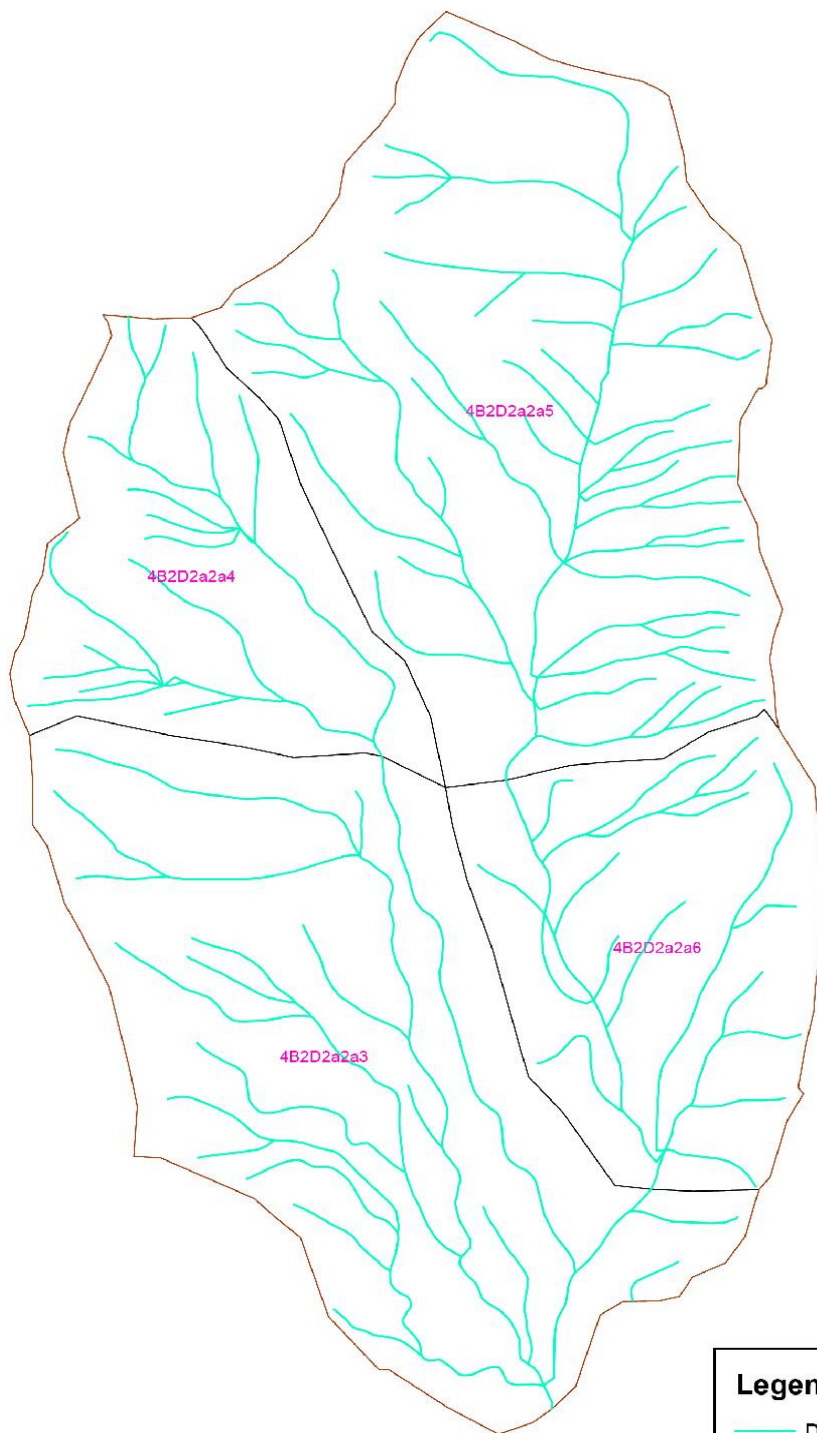
For the demarcation of micro-watersheds, the survey of India toposheets was. Therefore, for the preparation of CAT plan, comprising the free draining catchment area has been delineated as 4 micro – watersheds in the free draining catchment. Further, the micro – watersheds are namely 4B2D2a2a3, 4B2D2a2a4, 4B2D2a2a5, 4B2D2a2a6, The area of each micro – watershed is given in the Table below.

Watershed Name	Micro – watershed Name	Area (Ha)
4B2D2a2	4B2D2a2a3	517.64
	4B2D2a2a4	498.68
	4B2D2a2a5	412.45
	4B2D2a2a6	601.23
Total		2030.00

DRAINAGE MAP OF THE CATCHMENT AREA OF KANAKKAMPALAYAM TANK SCHEME



1:30,000



Legend

-  Drainages
-  Catchment Area
-  Micro Watershed Boundary

1.4 TOPOGRAPHY

This jungle stream takes its origin near Madapatti hill village which is about 11 Km from the Kanakkampalayam village in the midst of Gudiyalathur reserve forest and flows Southern direction for about 13.50 Km and falls into Bhavani river. The flow is available during both South West and North East monsoons.

There is no existing work across the stream either upstream or downstream of the proposed tank site. The stream at the proposed site has got a free catchment area of 20.30 Sq.KM or 7.93 sq.miles. The yield available at tank site is 2.012 MM3 or 71.05 Mcft.

1.5 SOIL CLASS AND SOIL DEPTH

In present Kanakkampalayam scheme study, it was used for preparing soil – based thematic maps and also to collect other tributes such as soil type and soil depth of the region (catchment area). In the proposed project, a catchment area treatment plan is being prepared, which considers various attributes related to soil, such as soil depth, texture, drainage, PH of the soil etc., some of the parameters are extremely important to reduce the erosion intensity and developing a susceptible erosion model in a particular region and accordingly to plan various treatment measures and to protect it from soil erosion.

Soil class and soil depth in the catchment were delineated from the soil map. This source has identified single soil series in the catchment area. It covers an entire area of the free-draining catchment as well as in soil depth class. The soil unit has deep soil on moderately steeply sloping having loamy surface with severe erosion hazard and moderate stoniness associated with moderately shallow excessively drained, sandy skeletal soil (Figures).

1.6 LANDUSE

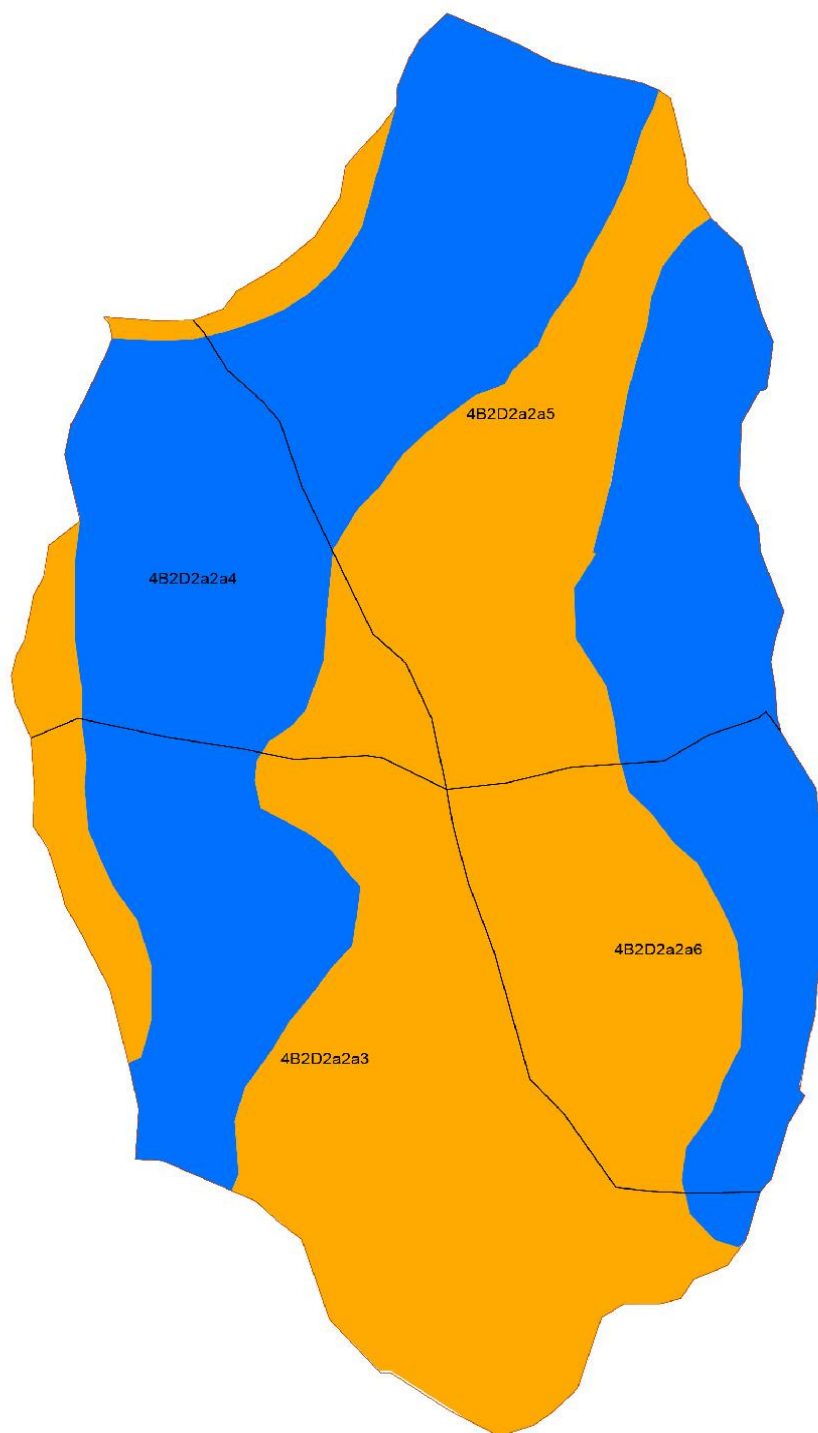
1.6.1 LAND USE / LAND COVER

A Land cover thematic map depicts the land composition, using land cover classification technique which is one of the most common applications of remote sensing. Kanakkampalayam Scheme drainage area depicts a land cover, predominantly with dense forest and open forest, followed by barren land.

SOIL DEPTH MAP OF THE CATCHMENT AREA OF KANAKKAMPALAYAM TANK SCHEME



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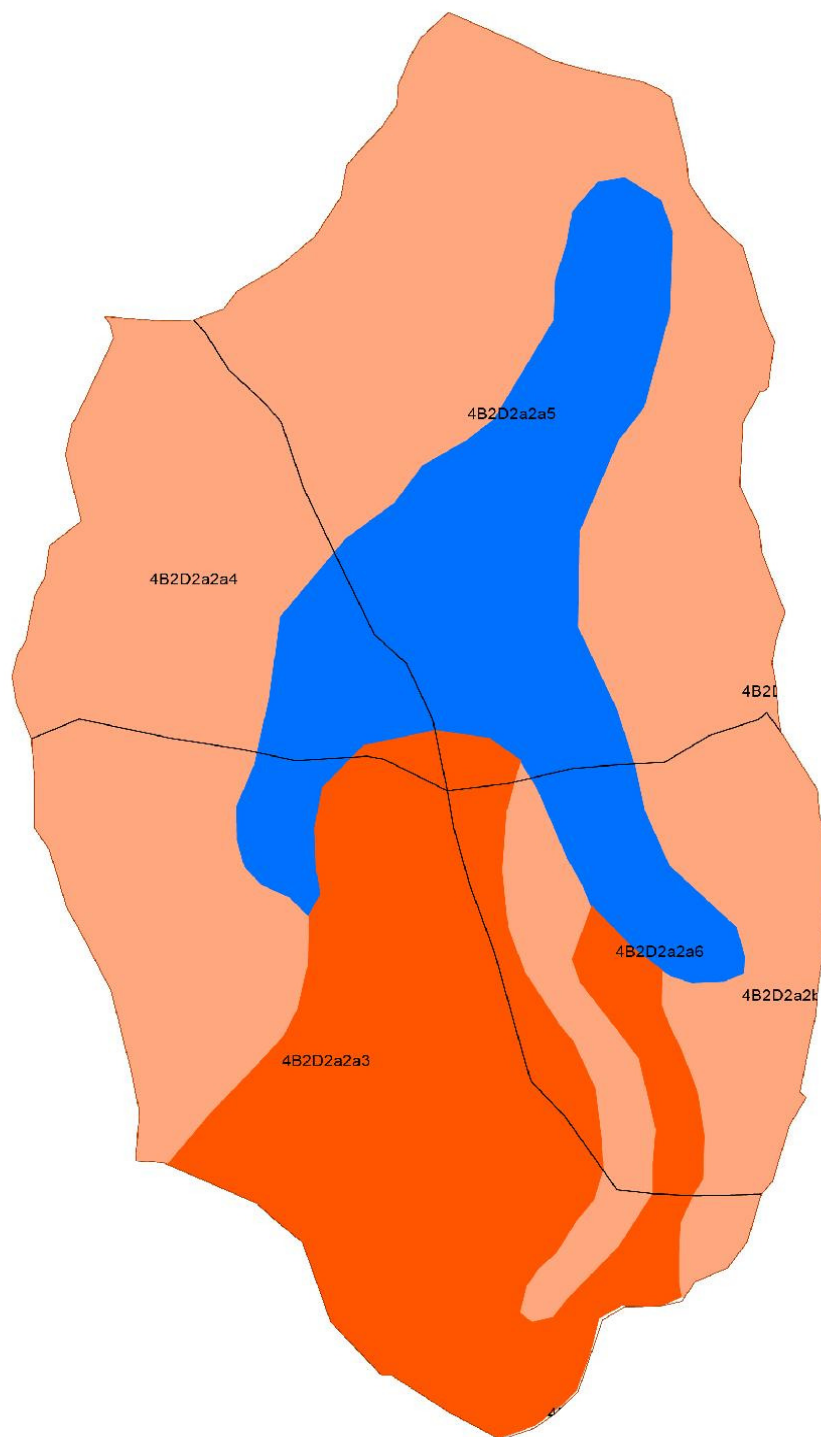


- Legend**
- Catchment Area
 - Micro Watershed Boundary
 - 8.1 - 10.0 (Medium)
 - 10.1 - 20.0 (Medium Deep)

SOIL TEXTURE MAP OF THE CATCHMENT AREA OF KANAKKAMPALAYAM TANK SCHEME



1:30,000



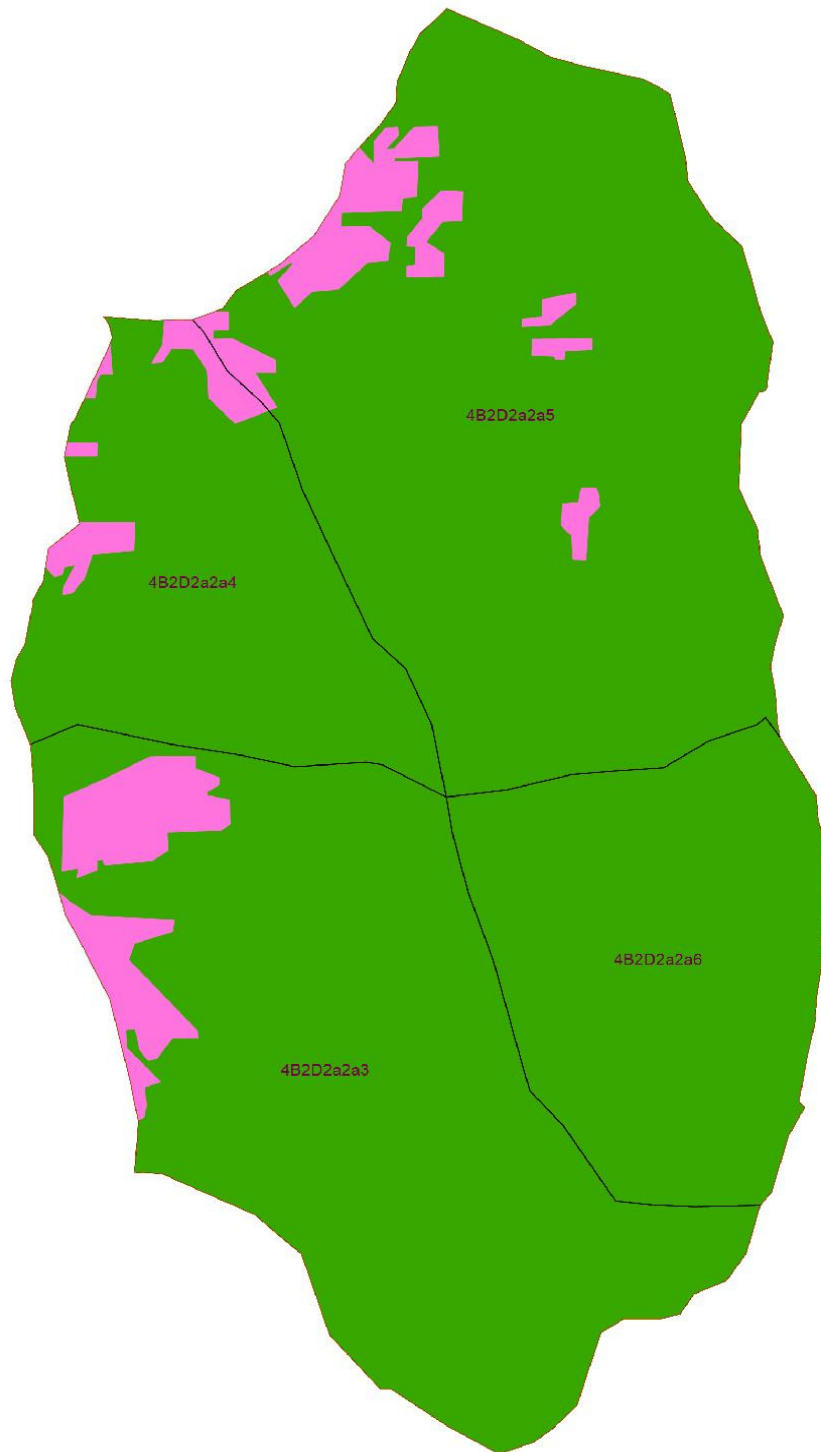
Legend

- Catchment Area
- Micro Watershed Boundary
- Clay
- Sandy Clay Loam
- Sandy Loam

LAND USE MAP OF THE CATCHMENT AREA OF KANAKKAMPALAYAM TANK SCHEME



1:30,000



Legend

- Catchment Area
- Micro Watershed Boundary
- Forest
- Settlement

Land use and land cover mapping was carried out by standard methods of analysis of remotely sensed data followed by ground truth collection and interpretation of satellite data. For this purpose digital data of was procured from National Remote Sensing Agency (NRSA), Hyderabad. Digital image processing of the satellite data and the analysis of interpreted maps were using ERDAS imagine 8.7. The project area was extracted from the full scenes (Figure) above. The details of the satellite data use in this study are as follows:

1.6.2. IMAGE PROCESSING SCHEME

Land use/ land cover map was prepared with the objective of preparation of environment management plan and an Acton plan for watershed management and a catchment area treatment. Two forest density classes were interpreted for the forest cover mapping. The forests with canopy cover >40% were delineated as dense forests and between 10% and 40% crown density as open forest. Furthermore, degraded forests (with <10% canopy cover) and scrubs were also delineated for the purpose of erosion mapping. The cropland (Cultivation) was also delineated for the calculation of erosion intensity classification. Alpine meadow was also delineated. The non-forest land cover in the form of glaciers, barren land, water bodies (lakes and river), moraines, etc. was also delineated.

Density Class	Forest Type
Dense Forest (Crown Density >40%)	<ul style="list-style-type: none"> • Tropical semi – evergreen • Sub – Tropical wet hill forest • Wet – Temperature broadleaved forest
Open Forest (Crown Density 10 - 40%)	<ul style="list-style-type: none"> • Sub – Tropical pine forest • Temperate dry coniferous forest • secondary moist bamboo bracks
Scrub	<ul style="list-style-type: none"> • Temperature scrub • Alpine scrub / meadow slope grassland
Non - Forest	<ul style="list-style-type: none"> • Agriculture • Barren / rocky - land

The base map, drainage map and land use/ land cover map prepared using the satellite data were digitized on computer for further processing and analysis using combination of ArcGIS 9.0. The sub-watershed boundaries were then overlaid on the drainage map and land use map of the sub-watershed up to barrage site order to extract the drainage by geographic information system (GIS) functionalities and techniques.

Kanakkampalayam free-draining catchment has a good forest cover. About 67% of the free-draining area up to the proposed dam site is covered with dense forest (Figure). Major part of the catchment along the river on the left bank covered an area. Dense forest forms predominant class belongs mainly to tropical forest types. Subsequently, open forest and scrub accounts for mere area coverage of 6.79% and 6.11% of the projects area on the right bank near the river. barren rocks covers an area of the land in the catchment is 6.39% (235.20ha). Other classes, such as moraines and barren classes account for 6.83% and 6.39% of the free draining area respectively. In the free draining area of Kanakkampalayam projects, some patches of cultivation/ settlement and alpine meadows found for only 0.29% of the total catchment area. Water bodies (River) account for 0.74% of the free draining area.

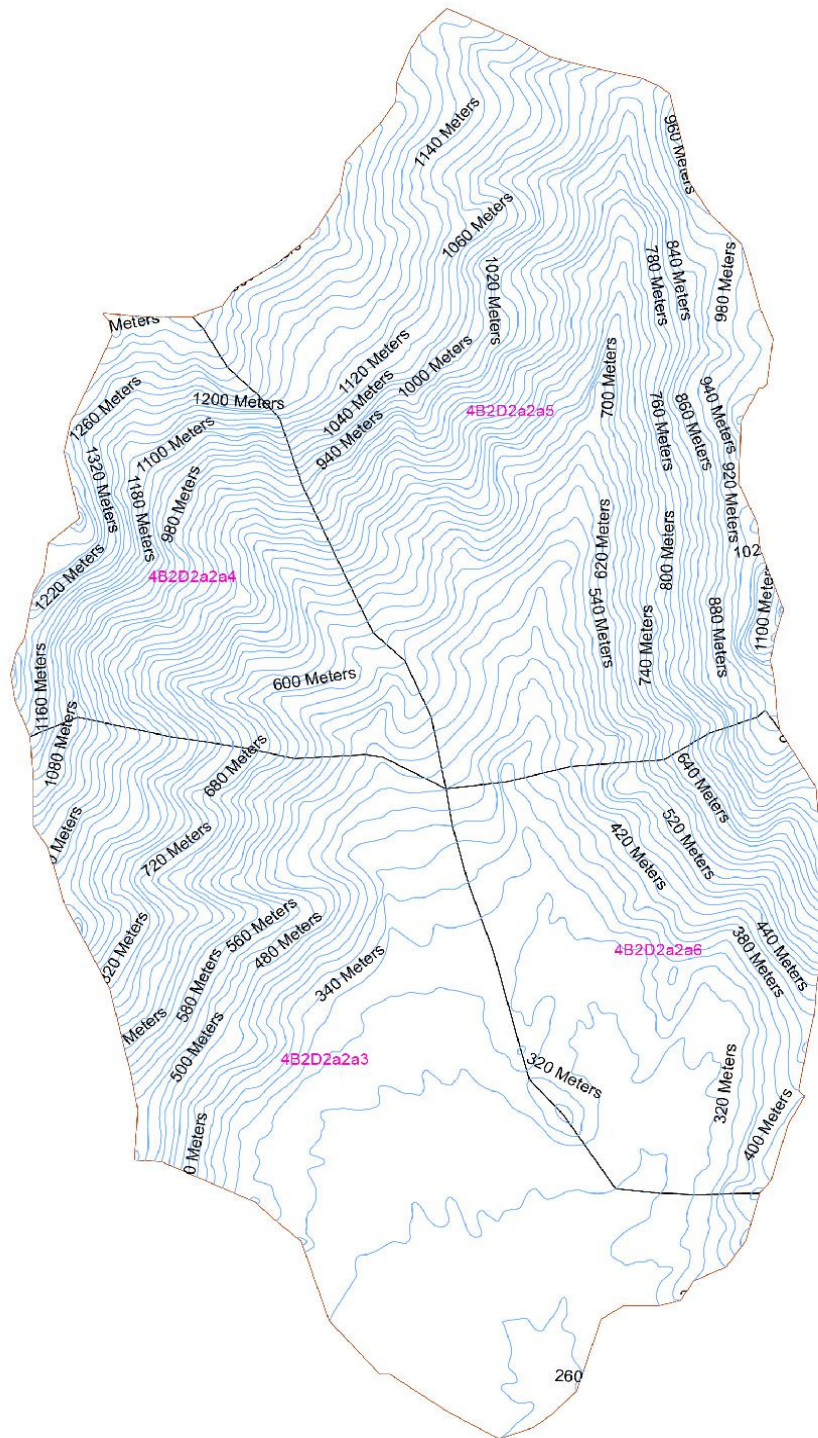
1.6.3. SLOPE

Slope has major influence on the loss of soil and ware from the watershed and thereby influence the land use capability. The slope percentage determines the erosion susceptibility of the soil depending on its nature and class. This helps in classifying various lands suitability classes, which enables us to formulate suitable conservation measure for the prevention of soil erosion. The following slop classes (Table 1-2) and ranges are recommended by All India Soil & Land Use Survey (AIS&LUS).

SLOPE MAP OF THE CATCHMENT AREA OF KANAKKAMPALAYAM TANK SCHEME



1:30,000



Legend

- Catchment Area
- Micro Watershed Boundary
- Contours

Table 1 – 2: Slope Range Classification

Slope Class	Slope Range	Description
A	0-5%	Gently Sloping
B	5-8%	Moderately Sloping
C	8-15%	Strongly Sloping
D	15-30%	Moderately Steep
E	30-50%	Steep
F	50-70%	Very Steep
G	Above 70%	Escarpement

The slope model for the proposed Kanakkampalayam Scheme projects area was generated from the contours of Survey of Survey of India (SOI) toposheets at 1:50,000 scale following at 40M interval using ArcGIS 9.0. Analysis through the slope model reveals that Strong Sloping is predominantly distributed in the free draining area with area coverage of 65.23% of total area coverage. Most of the area of the free-draining catchment is ranging from 5-15%. Likewise, Moderately sloping is also predominant class with an area of 22.27% of the free draining area. Subsequently, moderately steep slope covers 20.29% respectively. However, the extreme slope classes i.e., gently sloping and steep are spread in the free draining area these classes have coverage an area of 2.12% and 0.28% of land in free draining area (Table and Figure).

Table 1-3: Slope Class with Area in Hectares

Slope Class	Area(ha)	percentage
Gently Sloping	152.25	7.5
Moderately Sloping	249.08	12.27
Strongly Sloping	410.67	20.23
Moderately Steep	411.89	20.29
Steep	806.11	39.71

1.6.4. CATCHMENT AREA TREATMENT PLAN

It is known that 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 forest land for obvious conservation reasons. Third is scrub or degraded land, which contributes heavily to the silted land 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 forest 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 soil. The fifth is dense forest land, where soil conservation measures are required at few places.

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

Around 4.38% of the total free draining area is found to be under severe erosion. A large area 87.03% of free draining area is classified under moderate erosion whereas slight erosion accounts for 8.59 per cent. Rest of the area falls under the water bodies. No area found under very severe erosion.

1.7A ACTIVITIES CARRIED OVER IN CATCHMENT AREA

In Kanakkampalayam (Vedaparai water spread) scheme, the following activities are carried over in Kanakkampalayam catchment area which are done by T.N.Palayam Range, Sathyamangalam Tiger Reserve Forest.

1 Percolation Ponds:

- Bagavathi Nagar PP N 11.56002 degree E, 77.44325 degree, Elevation 262M
- Ellupuliyar Karadu PP N 11.57143 degree E, 77.44470 degree, Elevation 288M
- Nallakuttai Kodikal PP N 11.56304 degree E, 77.43790 degree, Elevation 294M
- Pavayal Kodikal PP N 11.55968 degree E, 77.43684 degree, Elevation 290M

2 Check dams:

- Pavayal Kodikal CD N 11.56033 degree E, 77.43849 degree
- Pavayal Kodikal CD N 11.56212 degree E, 77.43762 degree
- Pavayal Kodikal CD N 11.56244 degree E, 77.43741 degree
- Pavayal Kodikal CD N 11.56603 degree E, 77.43436 degree
- Palaya Madhayan Kovil Kodikal CD N 11.57074 degree E, 77.43234 degree

3 Check Walls (CW):

- Sannakkaradu Forest Area N 11.56306 degree E, 77.44319 degree, Elevation 271M
- Sannakkaradu Forest Area N 11.56319 degree E, 77.44316 degree, Elevation 270M
- Sannakkaradu Forest Area N 11.56407 degree E, 77.44332 degree, Elevation 266M
- Sannakkaradu Forest Area N 11.56422 degree E, 77.44341 degree, Elevation 270M
- Sannakkaradu Forest Area N 11.56366 degree E, 77.44120 degree, Elevation 273M
- Sannakkaradu Forest Area N 11.56181 degree E, 77.44148 degree, Elevation 268M
- Sannakkaradu Forest Area N 11.56161 degree E, 77.44158 degree, Elevation 265M
- Sannakkaradu Forest Area N 11.56143 degree E, 77.44165 degree, Elevation 265M
- Sannakkaradu Forest Area N 11.56118 degree E, 77.44171 degree, Elevation 263M
- Sannakkaradu Forest Area N 11.56088 degree E, 77.44179 degree, Elevation 264M
- Sannakkaradu Forest Area N 11.56066 degree E, 77.44187 degree, Elevation 261M
- Sannakkaradu Forest Area N 11.56004 degree E, 77.44204 degree, Elevation 261M
- Sannakkaradu Forest Area N 11.55969 degree E, 77.44209 degree, Elevation 261M
- Sannakkaradu Forest Area N 11.55918 degree E, 77.44210 degree, Elevation 257M

4 Elephant Water Trough:

- Elazhupuliyangaradu Elephant Tank N 11.57218 degree E, 77.444384 degree, Elevation 294M

5 Natural Water Hole:

- Nallakka Kuttai N 11.57040 degree E, 77.43554 degree

6 Gully Plugging:

- N 11.56132 degree E, 77.43603 degree
- N 11.56153 degree E, 77.43586 degree
- N 11.56200 degree E, 77.43572 degree
- N 11.56316 degree E, 77.43522 degree
- N 11.56376 degree E, 77.43492 degree
- N 11.56693 degree E, 77.43324 degree
- N 11.56719 degree E, 77.43301 degree
- N 11.56859 degree E, 77.43210 degree
- N 11.56741 degree E, 77.43294 degree
- N 11.56838 degree E, 77.43217 degree

1.7B ACTIVITIES TO BE UNDERTAKEN (TREATMENT MEASURES)

Details of treatment measures viz. engineering measure as well as biological measures to be undertaken are described in the following paragraphs. Watershed-wise details of various activities to be undertaken are provided in **Table**.

Table: Watershed-wise details of various activities

Name of Micro - watershed	Engineering Measures					Biological Measures				
	Gully Control				Bench Terracing	Afforestation	NTFP Regeneration	Assisted Natural Regeneration	Pasture Development	Total Area
	Brushwood Check dams	DRSM check dams	Mulching	Contour Bunding						
	No.	No.	Ha.	Ha.	Ha.	Ha.	Ha.	Ha.	Ha.	Ha.
4B2D2a2a3	3.00	5.00	2.00	2.00	3.00	1.50	1.00	2.00	2.00	28.50
4B2D2a2a4	2.00	3.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	10.00
4B2D2a2a5	3.00	4.00	0.00	1.00	0.00	0.20	0.00	1.00	0.00	15.20
4B2D2a2a6	2.00	3.00	1.00	0.00	1.00	1.00	0.00	0.00	1.00	10.00
Total	10.00	15.00	4.00	3.00	5.00	3.70	1.00	3.00	4.00	63.70

1.7.1 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. Brushwood check dam
- b. DRSM (Dry Rubble Stone Masonry) - Check dams with stones
- c. Contour Bunding
- d. Slope modification by Stepping/Bench Terracing

In addition to the vegetative measures used for stabilization of gullies, 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 gullies 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. Brushwood check dams

The main advantage of brushwood check dams is that they are quick and easy to construct and are inexpensive as they are constructed by using readily available materials at the site. In brushwood check dams, small branches preferably of coppice able species are fixed in two parallel rows across the gully or nala and packed with brushwood between the rows of these

vertical stakes. The vertical stakes are tied down with wires or fastened with sticks across the top. The important consideration in erecting brushwood check dams is to pack the brushwood as tightly as possible and to secure it firmly. This type of check dam is generally constructed over small gully or at the starting stretch of gully. In all, 10 brushwood check dams/ vegetative spurs would be constructed to check gully erosion, stream bank protection and slope stabilization works.

b. Dry Rubble Stone Masonry (DRSM) check dams

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 tones 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 centre 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 to prevent scouring of the structure. The thickness of the apron packing would be about 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, 15 DRSM check dams would be constructed.

c. 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 bunding 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 3.96 ha will be used for contour bunding with an estimate budget of **Rs. 0.75 lakhs**.

d. Slope modification by Stepping/ Bench Terracing

Bench terracing is one of the most popular mechanical soil conservation practices adopted by farmers in India and other many countries. It is constructed in the form of step like fields along contours by half cutting and half filling and would result in the conversion of the original slope into leveled fields. Thus, hazards of erosion are eliminated and manure and fertilizers applied are retained in the leveled fields. The sloping fields in the valley need to be bench terraced by cutting and filling with the later supported by retaining stone wall. While making bench terraces, care will be taken not to disturb the top soil by spreading earth from the lower terraces to higher terraces. The vertical intervals between the terraces will not be more than 1.5 m and cutting depth would be kept at 50 cm. The minimum average width of the terrace would be 4 to 5 m to enable the usage of prolong hinge. The shoulder bunds of 30 x 15 cm would also be provided. The excess water from the terraces will be drained off by staggered channels. An area of 9.75 ha will be covered under this plan with an estimated budget of **Rs. 0.38 lakhs**.

1.7.2 BIOLOGICAL MEASURES/PREVENTIVE MEASURES

The Biological Measures/Preventive Measures suggested are:

- A. Afforestation
- B. Assisted Natural Regeneration (ANR)
- C. Non Timber Forest Produce (NTFP) Regeneration
- D. Pasture Development
- E. Nursery development

It is always better to undertake preventive measures than to mitigate the factors that ultimately lead to soil erosion. Such preventive measures will indirectly help to conserve soil in the long run, keeping in view the importance of integrating eco restoration strategy with socio-

economic needs of the local community wherein both ecology and economics are developed. The preventive measures that are suggested for the project area have been discussed below.

A. Afforestation

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, nonfodder/ 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. 1.63 lakhs** (Rs. 1.44 lakhs for creation and Rs. 0.19 lakhs for its maintenance) for 3.70 ha has been provided to cover various areas under afforestation in different sub-watersheds.

B. Assisted Natural Regeneration in Existing Forest

In some of the forest areas, conditions are conducive to natural regeneration provided some sort of assistance is provided. Such areas shall be taken up under this component. The areas shall be closed to exclude biotic interference. Forest floor will be cleared of slash; debris and felling refuse to afford a clean seedbed to the falling seed. At certain places some soil raking may also have to be done to facilitate germination of seeds. Where natural regeneration is found deficient, it will be supplemented by artificial planting. Patch sowing in suitable areas may also be done. Bush cutting & cleaning operations are done depending on necessity. Up to 800 plant or patches per hectare will be planted /sown to hasten the process of regeneration in the area uniformly. An outlay of Rs. 0.36 lakhs including its creation and maintenance has been made to cover 3 ha.

C. Non Timber Forest Produce (NTFP) Regeneration

Sathyamangalam Forest Division have some variety of non-timber forest produce. However, because of over-exploitation of NTFP in the past, there has been depletion of valuable resources.

Therefore, in order to augment natural stock of NTFP in the forests, it is proposed to take up planting of NTFP and establishing nursery. An outlay of **Rs. 0.59 lakhs** has been suggested to cover about 1.00 ha for establishing (Rs. 0.37 lakhs) and its maintenance (Rs.0.22 lakhs) of this facility.

D. Grazing Land/ Pasture Improvement

The livestock owned by the local communities exert significant pressure on the natural habitats. In order to improve the grazing areas/pastures and to make these sustainable, the degraded areas, particularly among community lands will be taken up for treatment under silver-pastoral model. An outlay of **Rs. 1.24 lakhs** has been earmarked for this purpose and it will cover about 4.00 ha of land for development at a cost of Rs.0.80 lakhs and its maintenance will cost Rs.0.44 lakhs.

E. 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. 5.71 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 **Table**.

**Estimate for Raising of Seedlings in 35x50 cm bags by Transplanting
Seedlings Raised in 13x25 cm bags (Advance Nursery Operations) for 1100
Nos (per ha) including casualty replacement**

Sl.No	Qty	Description of works	FSR item no	Rate	Per	Amount
Raising in 13x25 cm bags						
1	200	Preparation of nursery site by clearing and leveling the site for forming standard bed of size 10mx1m @ 20.80 m ² per 1000 for 30x45 cm bags	4.1	1012.53	200 m ²	892
2	2	Cost of seeds @ 2 kg per 1000 Nos	LR	200	kg	400
3	0.25	Formation of germination bed by breaking dods with farm yard manure and earth, forming nursery beds of size 10mx1mx30cm. With side support sowing of seeds, watering for the day and covering with straw including cost of manure @1000 No/bed - 3 m ³ for one bed.	PWD SSR	77.90	m ³	311
4	1	Watering the germination beds twice daily with rose cane - 15 days	4.5.1	343.09	1000	515
5	1	Watering the germination beds twice daily with rose cane - 15 days	4.5.2	171.54	1000	256
6	1100	Cost of polythene bags of size 13x25 cm - 200G	Tender rate	722	1000	794
7	1.1814	Collection and supply of Red Soil, sand and silt for filling in Polythene bags according to the requirement for preparation of Soil mixture - 4/5th of the total volume	MTP ME	1000	m ³	1184
8	0.297	Collection and supply of Farmyard Manure for filling - 1/5th of the total volume	MTP ME	1000	m ³	300

9	1100	Preparation of soil mixture by breaking clods. Siveing and mixing of fertile earth (including red soil, silt and sand etc., according to requirements) and farmyard manure at 4:1 ratio heaping at the filling site and filling in polythene bags, arranging bags in beds and pricking out the seedlings (excluding cost of soil mixture and FYM)	4.6.4	1874.43	1000	2062
10	1100	Watering the container seedlings with rose can twice daily - 13x25 cm (15 days)	4.10.4	96.23	1000	1589
11	1100	Watering the container seedlings once daily with rose can - 13x25 cm (30 days)	4.11.4	48.11	1000	1589
12	1100	Watering the container seedlings once in alternate days with rose can - 13x25 cm bags (15 days)	4.11.4	48.11	1000	795
13	1100	Cost of water for watering the container seedlings from private wells 75 days	MTP ME	1.00	1000	82
14	1100	Shifting the container plants weeding, grading and replacement of casualties in the bags (2 time) as per requirements	4.15.4	213.36	1000	470
		Part - II (Bigger size bags (35x50 cm x 600g))				
15	1100	Cost of 35x50cmx600g poly bags	Tender rate	11088	1000	12197
16	10.153	Collection and supply of Red Soil, sand and silt for filling in Polythene bags according to the requirement for preparation of Soil mixture - 4/5th of the total volume (excluding volume of 13x25 cm bags) 35x50 cm poly bags volume = 9.23 m ³ / 1000 Nos	MTP ME	1000	m ³	10153
17	2.541	Collection and supply of Farmyard Manure for filling 35x50 cm bags - 1/5th of the total volume (2.31 m ³ /1000 nos)	MTP ME	1000	m ³	2541

18	1100	Preparation of soil mixture by breaking clods. Sieving and mixing of fertile earth (including red soil, silt and sand etc., according to requirements) and farmyard manure at 4:1 ratio heaping at the filling site and filling in polythene bags, arranging bags in beds and pricking out the seedlings (excluding cost of soil mixture and FYM)	4.6.8	15480.8	1000	17029
19	110	Cost of Vermicasting @ 100 gm/ container seedlings	Research wing rate	15	kg	1650
20	44	Cost of Vam @ 40 gm per seedlings	Research wing rate	25	kg	1100
22	11	Cost of Bio-fertilizers such as Azospirillum at 10 gm / container seedlings	Research wing rate	35	kg	385
22	11	Cost of Phaospobacteria @ 10 gm per container seedlings	Research wing rate	35	kg	385
23	3.9	Labour cost for transplanting seedlings from 13x25 cm to 35x50 cm containers - 3.5 maz / 1000	FSR	418.4	day	1632
24	1100	Cost of Vertical sticks of size 2.5 m ht	MTP ME	8	each	8800
25	550	Cost of Horizontal stick	MTP ME	2	each	1100
26	1100	Tying plants to the vertical stick once in a month - 2 times	MTP ME	0.25	each	275
27	1100	Pruning side branches once in two months - 2 times	MTP ME	2	each	2200
28		Watering the container seedlings with rose can - watering regime as per the NHA M.E approved in PCCF Ref.No. J1/57395/2003, dt 12.12.2003				
a	1100	Twice daily - 60 days	4.10.8	359.82	1000	23748
b	1100	Once daily - 139 days	4.11.8	179.91	1000	27508
29	1100	Shifting the container once in 21 days. First shift after 45 days from the date of transplanting - 6 time	4.15.8	1577.37	1000	10411
30	1100	Cost of water for watering the container seedlings from private wells 199 days	MTP ME	2.00	1000	438

31	175	Land rent for keeping nursery in private land	MTP ME	100	40 m ²	2625
32	27	Nursery protection mazdoor to watch and ward the nursery and for application of manure etc., - I mazdoor - 274 days for 100000	FSR	418.40	maz	11297
33	LS	Contingencies for application of pesticides and panchagavya etc.,	LS			287
		Total				147,000

(Rupees One lakh forty seven thousand only)

Estimate for Maintenance of Seedlings in 35x50 cm bags for 1100 Nos (per ha)

Sl. No	Qty	Description of works	FSR item no	Rate	Per	Amount
1	1100	Tying plants to the vertical stick once in a month - 2 times - 8 Times	MTP ME	0.25	each	2200
2	1100	Pruning side branches once in two months - 2 times		2.00	each	4400
3		Watering the container seedlings with rose can - watering regime as per the NHA I M.E approved in PCCF Ref.No. J1/57395/2003 dt 12.12.2003				
	1100	Once daily - 120 days	4.11.8	179.91	1000	23748
4	1100	Shifting the container once in 21 days. First shift after 45 days from the date of transplanting - 4 time	4.15.8	1577.37	1000	6940
5	1100	Cost of water for watering the container seedlings from private wells 120 days	MTP ME	2.00	1000	264
6	175	Land rent for keeping nursery in private land	MTP ME	86	40 m ²	2625
7	24	Nursery protection mazdoor to watch and ward the nursery and for application of manure etc., - I mazdoor - 240 days for 100000 seedlings	FSR	418.40	maz	10042
8	LS	Provision for application of fungicides&n fertilizers				3500
9	LS	Contingencies for application of pesticides and panchagavya etc.,	LS			281
		Total				54,000

(Rupees Fifty Four thousand only)

Table : Estimated cost for the Nursery Development

Components	Development	Maintenance	Amount(Rs.Lakhs)
Shade house for raising saplings (one time grant)	0.25	0.10	0.35
Raising seedlings	1.47	0.54	2.01
Shade collection procurement grant	0.25	-	0.25
Compost, soil, fertilizer and other materials	0.25	-	0.25
Shade house / chick house for maintaining and storing saplings (nos 2)	0.30	0.10	0.30
Poly bags, pots, trays for raising saplings	0.20	-	0.20
Nursery equipments	0.50	-	0.50
Glass wares and other laboratory wares	0.25	0.10	0.35
Chemicals, pesticides and other growth regulators	0.20	0.05	0.25
Hand held trolleys (Nos. 10)for transporting plant saplings	0.30	0.05	0.35
Mini – truck for transporting plants	0.30	0.10	0.30
Contingency grant for all recurring expenditure	0.20	-	0.20
Personnel / staff	0.20	-	0.20
Total	4.67	1.04	5.71

1.7.3- COST OF OTHER COMPONENTS OF CAT PLAN

Apart from the Forestry works and the drainage line treatment in the catchment area there are other aspects of the CAT plan to be addressed and their cost to be included in the overall plan. The eco-restoration works, livelihood support works, social mobilization, documentation and publication, monitoring and evaluation are some of the integral ingredients which have to be

considered and included while formulating the CAT plans as per suggestions made from time to time by the MOEF.

1.7.3.1 ADMINISTRATIVE SET UP

The CAT plan involves intensive and highly technical operations, which require the expertise of technical personnel. It is therefore, recommended that the existing forest staff of Forest Division will look after all the works to be carried out under the CAT plan including plantation and maintenance as all the areas to be covered under CAT plan fall under the divisions. However, temporary staff may be engaged for this purpose during the project implementation period. Schedule of Rates adopted is inclusive of 10% overhead charges as per indication at 3.1 (page-1) of PWD Schedule of rates.

1.7.3.2 ESTABLISHMENT WORKS RELATED TO AREA DEVELOPMENT

There is urgent need to reduce the dependency of local population on the forest and other natural resources which are under severe pressure. The establishment works related to area development is suggested and should be carried out through Community Welfare Committees (CWC) of local villages in free draining catchment area of Kankampalayam Scheme. This should include the following measures, which would help in rejuvenating the ecosystems and in reducing the soil erosion in the region.

1. Establishment of a committee for plantation
2. Avenue plantation using fuel wood trees with suitable fencing in the villages
3. Technical and financial support for using alternate energy sources such as non-
Conventional energy (solar heating) to reduce pressure on the forest (tree cutting) for
fuel wood
4. Maintenance of hygiene in the villages
5. Establishment of Training, Awareness programmes, etc. for water conservation and
Harvesting in the villages, Soil conservation measures in village areas, Improvement in
Agricultural and Horticultural practices etc.,

6. Establishing a rural technology support programmes
7. Awareness programmes for conservation of wildlife and natural resources

1.7.3.3 MICRO-PLANNING

An estimated cost of **Rs. 0.88 lakhs** (5% costs of total Engineering and biological measures) has been proposed for micro-planning (**Table**).

1.7.3.4 FOREST INFRASTRUCTURE DEVELOPMENT

The works of the catchment area treatment plan will be executed by the Forest Department, Government of Tamil Nadu. These works will be an added responsibility for the Forest Department that may not have adequate facilities and infrastructure to execute the work as suggested in the plan. Therefore, provision has been made under CAT plan to develop infrastructure of Forest Department in the region and accordingly a budget of **Rs. 29.40 lakhs** has been proposed (**Table**).

Table: Budget for Development of State Forest Department Infrastructure

Components	Establishment	Running Cost	Amount (Rs. Lakhs)
1. Forest Office Establishment (One Office)	15.00	-	15.00
2. Forest Fire Fighting System	1.00	-	1.00
3. Road and Foot Path Development	1.00	-	1.00
4. Office Equipment and Stationery	1.00	-	1.00
5. Office Vehicle	10.00	-	10.00
6. Contingency	1.40	-	1.40
Total			29.40

1.7.3.5 ECO-RESTORATION

There is urgent need to reduce the dependency of local population on the forest and other natural resources which are under severe pressure. The eco-restoration works and other activities related to income generation are suggested and should be carried out through Community Welfare Committees of local villages. These should include the following measures, which would help in rejuvenating the ecosystems and in reducing the soil erosion in the region.

- ☐ Plantation in the degraded patches of community/civil/ forest land.
- ☐ Water conservation and harvesting in the villages.
- Soil conservation measures in village areas.
- ☐ Improvement in agricultural and horticultural practices.
- Rural technology support programmes.
- Awareness programmes for conservation of wildlife and natural resources.
- Promotion of income generating schemes like ecotourism.

The total cost estimate for these activities works out to be **Rs. 2.00** lakhs. The Summary of cost is given in **Table**.

Table: Budget for Eco-restoration

Sub-Components	Amount (Rs. Lakhs)
Plantation of avenue trees in the villages and towns	0.50
Cooking gas supply and energy conservation measures	0.50
Maintenance of hygiene in the villages and towns	0.30
Training, awareness, extension and other activities	0.40
Income generating schemes	0.20
Contingency	0.10
Total	2.00

1.7.3.6 MONITORING AND EVALUATION

Monitoring and evaluation will be developed as a part of the project management. Thus, a process of self-evaluation at specific interval of time will ensure the field worthiness and efficacy of the CAT plan.

Annual work plan for each sub-watershed would be prepared well in advance specifying physical and financial targets, sites, locations and beneficiaries of each component of the project activity. Month-wise work scheme of various items of each component for the financial year would also be prepared in advance and its timely implementation would be ensured. Monthly progress report on all activities would be submitted by the Range Officers to Divisional Forest Officer for its subsequent submission to the project authorities. The monitoring committee appointed for this purpose would also monitor the quality and quantity of works carried out in the area on a regular basis.

Installation of silt recording station upstream of barrage site on Kanakkampalayam is suggested to monitor the silt load and impact on soil conservation measures. A sum of **Rs. 1.37 lakhs** has been provided for monitoring and evaluation (**Table**).

1.7.4 INSTITUTIONAL MECHANISM

1) Role of Project Proponent

The forest department would implement the Catchment Area Treatment plan. A joint inspection group would be formalized which would include officers from State Forest Department and Official from the Environment Cell of the project proponent. The management will have liaison with the forest officials as far as the financial disbursement would evolve employment opportunities. Thus, people's participation should be encouraged and would involve mobilization of manpower for such activities. Experts and professionals competent enough in operating the plan need to be consulted from time to time.

2) 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.

3) Period and schedule of implementation

The execution of CAT plan in Kanakkampalayam Scheme area would require extensive efforts on the part of executing agencies. Keeping in view the local topography and climate, it is being estimated that the entire treatable area would require at least 4 years to complete. However, the maintenance of plantations would continue for one year and accordingly CAT plan has been prepared for five years. All these works would have to start with the pre-construction activities especially the studies in respect of micro-planning for each micro-watershed, which would require further detailed investigations. Based on the micro-watersheds, **Table** gives the year-wise physical details of various engineering and biological treatment measures to be undertaken.

4) Project Monitoring and Reporting Procedures

Meetings would be held every three months to resolve logistic problems in plan implementation. A Joint committee would be formed with the Environment Cell of project proponent and State Forest Department team members to ensure the implementation and monitoring of the CAT works and review the progress from time to time. Quarterly progress reports and completion certificates would be submitted to project proponent, for evaluation and disbursement of finance. In addition, the work done should be published through public awareness campaigns. Visual and print media need to be used to embark on maximum benefit by direct and indirect beneficiaries. Such efforts would resolve conflicts which otherwise are potential sources for project gestation.

1.7.5 COST ESTIMATE OF CAT PLAN

Table : Component - wise cost estimate for Catchment Area Treatment Plan

Sl.No.		Item of Work	Unit	Oty	Rate (Rs.)	Amount (Rs. Lakhs)
A.		ENGINEERING MEASURES				
1		Gully Control				
	a)	Brushwood checkdams	Nos.	10.00	26000	2.60
	b)	DRSM checkdams	Nos.	15.00	33281	4.99
	c)	Mulching	Ha	4.00	4000	0.16
	d)	Contour Bunding	Ha	3.00	25000	0.75
2		Bench terracing	Ha	5.00	7500	0.38
		Sub-Total (1+2)				8.88
		Add 5% for maintenance of structures				0.44
		Sub-Total (A)				9.32
B		BIOLOGICAL MEASURES				
1		Afforestation				
	i)	Creation	Ha	3.70	39000	1.44
	ii)	Maintenance			5000	0.19
2		Assisted natural regeneration in existing forests				
	i)	Creation	Ha	3.00	11760	0.35
	ii)	Maintenance			250	0.01
3		NTFP Regeneration				
	i)	Creation	Ha	1.00	36563	0.37
	ii)	Maintenance			21500	0.22
4		Pasture development				
	i)	Creation	Ha	4.00	20000	0.80
	ii)	Maintenance			11000	0.44
5		Nursery Development				5.71
6		Weir/Barbed fencing				2.00
		Total (B)				11.53
		Total (A+B)				20.85
C.		Micro-planning @5% of (A+B)				1.04
D.		Eco-restoration				2.00
E.		Establishment Cost@7% of (A+B)				1.46
F.		Forest Infrastructure Development				29.40
G.		Contingency @5% of (A+B)				1.04
H.		Monitoring and evaluation				2.00
		GRAND TOTAL (A TO H)				57.79

The total estimated cost of catchment area treatment plan to be spent over a period of five years is **Rs. 57.79** lakhs. The details of cost estimates and physical work schedule as well as phasing of expenditure are given as above in **Tables**. All the costs towards the administration during the implementation work have been included in the cost estimates of CAT.