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**CATCHMENT AREA TREATMENT PLAN
FOR
LOWER NANTI
(10.00 MW)**

DISTRICT SHIMLA, HIMACHAL PRADESH



PROJECT PERIOD: 2012-13 TO 2022-23

TOTAL CAT PLAN COST Rs. 1,69,10,500/-

PROMOTER:- M/S SURYA KANTA HYDRO ENERGIES (P) LTD

**DIVISIONAL FOREST OFFICER
FOREST DIVISION RAMPUR**

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Preface

The CAT plan for Lower Nanti HEP has been prepared on the basis of field survey in active association of the officers/staff of the Forest Department and keeping in view the general requirement of the catchment area to stabilize the area and to reduce the silt load. The areas to be treated have been selected as advised by them. However, detailed site specific planning/micro planning is required before actual execution of the works in consultation with local people/committees to ensure mutually agreed type of work and its scheduling.

Moreover, Master Catchment Area Treatment Plan of Satluj River is under preparation by the H.P. Forest Department with the help of experts/consultant. The prescription of CAT plans of this area will have to be necessarily revised to fit in the prescription of the Master CAT Plan.

For the sit specific planning/ micro planning, a provision of Rs 8.45 lac has been kept.

Changes in this CAT Plan (inter component or across the plan) can be made with approval of PCCF, H.P. Within over all ceiling of the amount, for which this CAT Plan has been prepared.

Total Catchment area is 23.25 km². The area proposed for treatment is 345 ha, which comes to 19.6% of the total catchment area.

The total outlay of the CAT Plan is Rs 1.69 crore

UNDERTAKING

The estimated project cost of Lower Nanti HEP is Rs 67 crore. The CATP LAN for this project has been prepared for Rs 1.69 crore (2.5 % of the project cost)

We, M/S Surya Kanta Hydro Energies Private Ltd undertake that if project cost is revised, CAT Plan out lay will be revised proportionately and we further undertake to pay the differential amount based on the revised Project cost/CAT Plan outlay.

Surya Kanta Hydro Energies (P) Ltd

M/s SURYAKANTA HYDRO ENERGIES (P) LTD
P. M. S. S. S. S.
Authorized Signatory
Authorized Signatory

CHAPTER-I**General Description of the Tract****1. INTRODUCTION :**

Himachal Pradesh is endowed with about 21000 MW of exploitable hydro potential, excluding about 750 MW in small/mini/micro Hydel potential, in its five river basins. It also provides excellent opportunities for power generation to bridge the gap between demand and supply of power in the State. The electric power being a vital and essential infrastructure has a significant role to play in economic development and upliftment of people. Himachal Pradesh has five river basins, which provide an ample scope for development of Hydro power potential. Out of these five basins, Sutlej basin has the highest potential of about 9,227 MW of electricity. Govt. of Himachal Pradesh has entrusted the task of implementation of self-identified Lower Nanti hydro Electric project to **M/S. Surya Kanta Hydro Energies Private Ltd.** in the private sector on Build, Own, Operate and Maintain (BOOM) basis.

The Lower Nanti Hydro Electric Project is a run of river scheme on Nanti Khad, a tributary of Sutlej River in Distt. Shimla (H.P.) It is a perennial snow fed / glacier fed Nullah which emanates at an elevation of $\pm 4600\text{m}$ and flows mostly in south westerly to westerly direction before it joins Sutlej river at an El. $\pm 1150\text{m}$. The total catchment up to proposed diversion site is 57.94 Sq. Km . The gradient of khad is very steep in the entire length. The catchments area above weir site comprises dense forests and some parts are under permanent snow.

The proposed Lower Nanti Small Hydro Electric Project (10 MW) is located on the right bank of Nanti Khad near Lower Nanti

village, a tributary of Sutlej river. The project envisages the construction of trench weir across Nanti khad, a water conductor system comprising of

conveyance channel, desilting tank, Power channel/Head race tunnel, surface forebay tank, surface pen stock and a surface power house having 10 MW installed capacity on the right bank of Nanti khad at El. 2045m. Power house shall have two generating units of 5000 KW each along with auxiliary facilities such as cooling water / potable water supply system, fire fighting system, compressed air supply, oil system, ventilation and air conditioning system.

Power house is located near village Rungcha at a distance of about 30 km from Jeori, which is situated on NH-22 at a distance of 150 km from Shimla (H.P.)

Hamessing of the vast potential of Hydroelectric Projects in the Sutlej catchments has already been started at a good pace. But the locality factors in general are not very conducive for such fast development. The hills are generally steep and covered with pine forests.

The life of a hydro electric project primarily depends on the rate of soil erosion in the catchments area of the project, its transportation and deposition in the reservoir. Soil erosion occurs due to number of abiotic and biotic factors like, topography of the catchments, soil characteristics, meteorological conditions such as precipitation and its intensity in the form of rainfall and snow fall and its types. It is therefore imperative to control one or more of the most crucial contributes of the factors triggering soil erosion, which will enhance the life of a reservoir. Being environment friendly source of energy, Govt. of India / Govt. of Himachal Pradesh has encouraged participation of private sector in a big way, with renewed set of incentives for its exploitation.

Keeping in view the number of hydroelectric projects coming up in Shimla district and the condition of the catchments & hydel potential it is imperative to invest in these projects to preserve and improve the catchments area.

1.1 Name and location:

The Project is situated near village Lower Nanti on Nanti Khad, a right bank tributary of Sutlej river and joins the latter near Jeori, which is at a distance of 150 km from Shimla. It is a perennial snow fed/glacier fed Nullah which emanates at an Elevation of \pm 4600m and flows mostly in south-westerly to westerly direction before it joins Sutlej river at an El of \pm 1150m. The scheme is located between latitude $31^{\circ}-31'-21''$ N and longitude $78^{\circ}-01'-07''$ E.

1.2 Topography and Drainage:

The terrain of the catchments area is mainly mountainous which can be described as moderate to steep and covered with pine forests. The hill slopes are covered with boulders and mostly not suitable for cultivation. Rock outcrops and exposures are frequently encountered on both the banks. The whole area drains into Nanti khad and ultimately drains into river Sutlej. Topo sheet 53E/10 and 53E/14 covers the project area as well as catchments area of the project.

1.3 Geology and Rock:

The geological formation in the catchments area is as follows:

- i) Pre Cambrian – schist, gneiss, granite, quartzite.
- ii) Late Pre-Cambrian Himanta System – Phylites, quartzite, conglomerates, shale and slate.

The stratum of the area is rocky supported with sporadic natural vegetation. However, in the lower portion of the project area there is a possibility of soil erosion which can be checked by vegetative measures.

1.4 Climate &Rainfall:

The year may be divided into four seasons determined by the broad climate conditions prevailing in the region. The seasons are the winter season from December to March, the summer or pre-monsoon season from April to June, the monsoon season from July to September and the post-monsoon season from October to November.

In the winter season the higher regions of the Himalayas receive precipitation as snow while moderate rainfall occurs in the foothills and adjoining plains. The climate of the project area is generally temperate, it is warm in summer, humid during monsoon and cold in the winter. The precipitation is mostly in the form of snow during winter months which can be described as moderate temperate to heavy depending on the altitude.

1.5 Temperature:

There is no temperature recording station inside the catchments area, however, the temperature recorded in the nearby station at Rampur (El 940m) town varies from 0°C to 35°C. The lowest and highest temperature is 0°C and 35°C respectively. The lowest temperature is recorded in the area in the month of December and January. Highest temperature is recorded in the month of June.

1.6 Water Supply:

Nanti Khad is a perennial tributary of Sutlej River. Water in the stream is free from any kind of pollution during winter. However, it is muddy and contaminated during monsoon.

1.7 Socio-Economic Profile

Introduction

There are 2 Gram Panchayats namely Phancha and Jaghori having 5 villages in an around the project area with a human population of 1396 Nos. The animal population is 5404 Nos. Cow, Ox, goat and Sheep are kept by the local people for ploughing and milk, meat purpose & the society of the project area comprises mostly of poor people and their main vocation is agriculture, horticulture, animal rearing etc. Horticultural activity is not encouraging due to non-accessibility of motorable road despite the fact that area is considered to be most suited for horticulture crops. The livestock and livelihood of the people depends upon rich natural resources of the area.

The Lower Nanti HEP project is being constructed in Nanti Khad Catchment. This is tributary of Satluj basin. The proposed project falls in Rampur Community Block. Random sampling survey has been conducted to study a socio – Economy of the catchment area. The Secondary & Primary Data collected during the field investigation revealed that the catchment area have general slope ranging from 20% to 85%. The farmers invariably practice mixed farming comprising of horticulture, agriculture, vegetable cultivation and animal husbandry. About less than 5% population of the catchment area has assured irrigation. Farming, therefore, is mostly rain fed. The manures, both chemical as well as organic are applied in insufficient quantities mainly due to lack of purchasing power of the farmers, non-availability of sufficient quantity of organic manure and insufficient soil moisture during the crop growth period.

occur during the monsoon season, therefore, efforts to conserve the as much as water is essential. This can be achieved by making liberal use of organic manure & practicing organic farming. This will improve the physical property of the soil thereby improving the water holding capacity of the soil which will result in more retention of rain water. Which, in turn will lead to reduction in run off losses and there by silt load in the Nanti Khad.

It was also noticed during the field survey that the farmer are growing the field crops on sloppy land and cultivation is being done in some places across the contours having slope more than 35 to 40 degree. In order to conserve the rain water in situ, the such lands need to be terraced. In the catchment area it is proposed that the farmers should resort to conservation type of farming instead of soil depleting farming process.

The livestock population in the catchment is invariably very high which has put unbearable pressure on the land holding, pasture land and forest land.

The availability of fodder both green as well as dry is less than 50% which leads to pressure on grazing on forest land. The farmers while meeting the need of fodder from the adjoining forest resort to, indiscriminate lopping and felling of trees which has resulted in reduction of forest cover. Over grazing also leads to soil erosion in the tract it is therefore suggested to resort stall feeding. The excessive population of livestock in the catchment area has led to under feeding, malnutrition and insufficient health care of animals. It has resulted into infertility in cattle and farmers abandoned such animals which are causing the stray cattle menace. It is therefore suggested that Gosadans is required to be established. The information collected during the course of field survey is given as under

1.8 Land Use Pattern:

No specific land use survey has been carried out in the catchments area. However, the land use pattern of the catchments area is summarized in Table-1.

Table -1

S.No.	Category	Total Area in Sqr. Km.
1	DPF/UPF Land	15.50
2	Agricultural Land	2.25
3	Rocky/Barren Land	3.75
4	Pasture Land	1.75
5	Area under permanent snow	Nil
	Total	23.25

Source: - The data for land use pattern procured from Revenue Department.

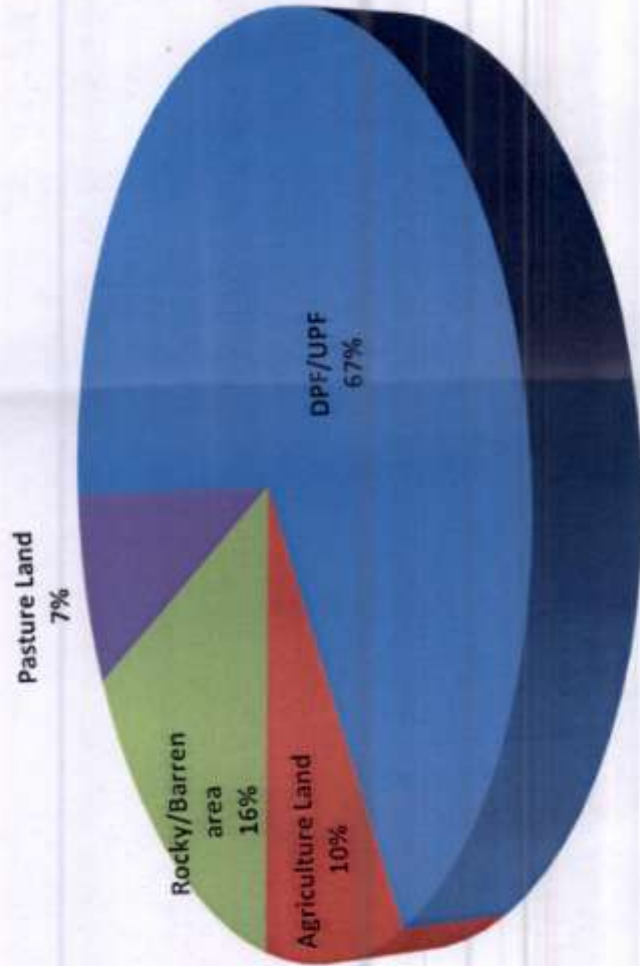
1.9 Demographic Profile of the Catchments

The human population of the catchments area is as under:

District	Tehsil	Name of Panchayat	Name of Village	Human Population		Total
				General	SC	
Shimla	Rampur	Phancha	Phancha	231	106	337
			Nanti	391	15	406
			Kandari	107	11	118
		Jaghori	Tikkar	60	-	60
			Jaghori	367	108	475
		Total		1156	240	1396

Source: The data for Demographic profile of the Catchment procured from Revenue Department .

Land Use-Lower Nainti



Live stock population of the catchments

The live stock population of the catchments is as under:-

Panchayat	Village	Cattle Population						
		Cow	Ox	Sheep	Goat	Horse	Donkey	Total
Phancha	Phancha	140	80	664	336	-	-	1220
	Nanti	143	67	840	469	15	10	1544
	Kandari	32	14	210	122	5	-	382
Jaghori	Tikkar	56	20	403	289	5	-	773
	Jaghori	316	126	590	430	14	9	1485
Total		687	307	2707	1646	39	19	5404

Source: The data for Live Stock Population of the Catchment procured from Revenue Department .

1.10 Flora

The forest of Kail (Pinuswallachana), Deodar (Cedrusdeodara), Fir (Picea smythiana), Spruce (Abiespindrow), Kosh (Alnusnitida), Akhrot (Juglansregia), Chil (Pinusroxburghii), Shagal (PyrusPashia), Ban (Quercus incana)), Kharsu (Quercus semecarpifolia) with mixed broad leaved patches provide vegetational diversity. The broad leaved species mainly include Oaks, Walnut, Horse chestnut, Maples, Bird cherry, Wild popular and Pyrus species.

Forest Types

According to the classification done by Champion and Seth, the following forest types are found within the catchments area as follows:

1.10.1 Sub-Group 9/c Himalayan Sub-tropical pine forests:-

This type of forest occurs between 1000m to 2000m elevation, overlapping the tropical dry mixed deciduous forest at

lower elevations giving way to temperate forest above. The principal species is *Pinus roxburghii* (Chil) which occurs remarkably in pure and gregarious form and constitutes stable sub climax due to biotic factors. The crop is generally irregular and mature trees are few and widely scattered. *Pinus wallichiana* (Kail) makes its appearance in the upper reaches. Higher up and under a more regular canopy bush growth is lesser in extent and here *Desmodium* species,

Berberis species, *Myrsine africana*, *Indigofer apulchella* are found with *Plectranthus lespedeza* and other species of *Compositae* family as the common herbs such as *Frageriavesica* etc.

1.10.2 Group 12-Himalayan Moist Temperate Forests:

This type extends in the wet zone tract between the Chil pine forests below and the alpine formation higher up. The altitude range of this type is generally between 1550 to 3300m, these limits varying distinctly according to the aspect, configuration of the ground and the drainage. The chief characteristic of this type is the extensive development of the coniferous forests with relatively little admixture with broad leaved species. The number of dominant species is small, the species being dependent mainly on altitude and aspect for their distribution.

1.10.3 Sub-group 12/C 1 a Ban Oak Forest (*Quercus incana*):-

The Ban oak is the common low level oak of the moist zone and is the major specie over considerable area which varies from 1500 to 2100m. It thus, overlaps the altitudinal zones of all the lower coniferous and is the common companion of the blue pine, deodar, and spruce. The chief associates are *Rhododendron*

arboretum, *Lyonia ovalifolia* with some *Machilus odoratissima*, *Litseaumbrosa*, *Cedrela serrate*, *Carpinus viminea* etc., in damp ravines. There is generally good deal of shrubby undergrowth chiefly of *Berberis lyceum*, *Indigofera gerardiana*, *Sarcococcasalgana*, *Daphane*, *Prinsepiauntillis*, *Lonicera*, *Viburnum* species and *Rubus* species etc.

1.10.4 Sub-group 12/C 1 b MohruOak Forest (*Quercusdilata*):-

These forests occur in small patches above the ban forests between 2100 to 2500m and are definitely of more mesophytic type than the ban oak which displaces it on dry ridges and hot Southern aspects. There is great admixture of secondary species in the top storey consisting mainly of deciduous trees such as *Cedrelaserrata*, *Acer pictum*, *Rhussemialata*, *Aesculusindica*, *Prunuscomata*, *Pyruspashia* and *Juglansregia* etc.

1.10.5 Sub-group 12 DSI / I c Moist Deodar forest (*Cedrusdeodara*):

This type of forest is found between 1800 m to 2400 m but may be found a little lower down in depressions or Nullahs and cooler aspects and higher up on the hot southern aspects and sunny ridges with better drainage. The under growth consists of *Viburnum foetens* and *Indigoferapulchella*, *Rosa Spp.*, etc.

1.10.6 12 DSI / I d Western mixed coniferous forests:

This type of forest is commonly called as mixed conifer and it includes pure Spruce, Spruce and silver Fir types and mixed Deodar, Kail and Spruce forests. These forests are found above the pure Deodar forests mixed with low level blue pine and deodar forests at altitudes of about 2400 m to 3000m or more. High level blue pine is found both in and above it and the fir- oak mixture above it. These forests are commercially important. In the moist

areas, mixture of coniferous trees often of very fine growth, such as spruce, deodar, blue pine and silver fir with a varying amount of evergreen and deciduous broad leaved undergrowth like *Aesculusindica*, *Juglansregia*, *Coryluscolumna* and *Prunuscornata* etc. are found.

1.10.7 12 DSI / I e Moist temperate deciduous forest:

The coldest aspects and all re-entrants and ravine bottoms of spruce belt between 2100m to 3000m are entirely occupied by a rich mixture of broad leaved species to the exclusion of coniferous species except scattered spruce and very occasional deodar.

The oaks are only occasional members of this type. The common trees are *Acer pictum*, *A. caesium*, *Pyruspashia*, *Lyoniaovalifolia*, *Rhododendron arboretum*, *Rhuscotinus*, *R. punjabensis*, *Celtis australis*, *Aesculus indica*, *Birdcherry*, *Populus ciliata* etc. The shrubby growth consists of *Skimmialaureola*, *Cotoneastor bacillaris*, *Viburnum foetens* etc. Herb growth is poorly developed except in few rather specialized types of canopy e.g. a dense growth of *Chaerophylusreflexum* under a pure stand of *Pyruspashia*, *Galium* species, *Rubia* species, *Salvia* species *Voila* species, *Adiantum* fern under a pure stand of *Horsechestnut* and under very dense growth *Corylus* and *Pyrus* stands a herb growth of *Viola* species and *Ainlina* species instead of shrubs.

1.10.8 Sub-group 12 DSI / I f Low level blue pine forest:

The blue pine is a very important commercial timber species. It is second to only deodar in its commercial value. It is found interspersed with deodar in the tract. The blue pine has two altitudinal zones which are well defined although the species is quite common on intermediate grounds between these two habitats. The low level form, depending on a moderately good

monsoon rainfall and northern aspect is well developed. The high level type is dependent on a heavy and long lying winter snow fall and is confined to upper forest limits in the inner hills.

This species has established itself over large areas in the catchments.

1.10.9 Sub-group 12/C 2 Upper west Himalyan temperate forests:

(i) 12/C 2 a Kharsu oak forests (*Quercus semicarpifolia*):

These forests are found between the elevations of 2400m to 3400m. These forests generally regenerate easily as compared to other varieties of Oak. This is a commercially important species used for various commercial purposes. It finds good expression on the Southern aspects at the top of ridges in a belt of pure forests and its presence end abruptly at the edge of alpine pastures, the other second storey being *Betula utilis*, *B. alnoides* and *Taxus baccata*. This mixture advances towards the higher regions rather than the pure Kharsu. The herbaceous cover of this type of forests is usually coarse and consists of mainly *A. naphalis* species, *Frageriavesca*, *Primula denticulate*, *Caultheria trichophylla*, *Saxifraga ligulata* etc.

(ii) 12/C WestHimalyan upper oak/ fir forests:

This type of forest is found between 2500m to 3400m elevation especially on the Northern aspects and sheltered sites. The forests are covered with snow for several months in the winters. *Abies pindrow* and *A. spectabilis* (the low and high level Silver fir) together form a high level forest belt throughout the wet zone with the same distribution as the spruce.

Kharsu oak, forms a belt of pure forest on the southern aspects in the main and side valleys in the wet zone between 2500m to 3400m to the complete exclusion of silver fir, the dense oak forest stopping abruptly at the edge of the alpine grass lands. On the exposures in the catchments area, this oak occurs as scattered trees or in large pure groups amongst the open silver fir stands, other trees of second storey being species of *Betula*, *Taxus baccata* etc. This mixture goes uphill much higher into the alpine pastures than pure kharsu does.

1.10.10 12/C 1/ DS 2 Himalyan temperate Secondary scrubetc.

This type is found mostly between 2400m to 3600m elevation or more in Mohru, Kharsu and Fir forests and is the result of heavy grazing, lopping and fires, which have thinned out the forests to a varying degree, destroyed all the under growth except for the patches of inedible species and reduced the shrubby ground cover to a grass land. The thicket consists of an open park like land with scattered usually mature mis-shaped and after moribund trees standing over a grassy turf full of flowers in spring. The common trees at such places are of Birdcherry, Acer and Kharsu. These thickets are heavily grazed year after year by flock of sheep and goats, brought to these places by migratory graziers.

Due to thick humus deposits and high weed growth, the regeneration of fir and other broad leaved is not coming up at all and the ground is being replaced by grassy turf. Examples of this may be seen in all over the wet zone less rarely in dry and arid tracts in the catchments area.

1.10.11 Group 14 Sub- alpine Forest:

Sub group 14/C 1 West Himalyan sub- alpine birch/ fir forests (*Betula/ Abies*):

This forest type is found in the elevation range of 3000m to 3400m. It comprises of mainly Undemarcated Protected Forests and upper fringes of DPFs. The principal species in this type are Kharsu oak mixed with scattered fir and Maple and occasional *Betula utilis* along upper limits. Amongst under growth, *Viburnum foetens*, *Rosaserelia*, *Cotoneaster acuminata* are commonly found. Medicinal herbs like *Aconitum heterophyllum* (Patis) ,*Gentiana kuroo* (Karu) etc. occur in this type. Large flocks of sheep and goats graze in this area during summer months.

1.10.12 Group 15 Moist alpine scrub:

This type is found between elevations of 3300m to 3900m. It consists of evergreen scrubby growth, usually up to 1m high forming a dense cover over big patches broken by grass. Outlying patches of alpine forests, the colonies of the larger *Rhododendron campanulatum* some times occur in this zone. The shrub species are *Salix elegans*, *Lonicera parviflora*, *Polygonum vacciniifolium*. Herbs are *Aconitum heterophyllum* (Dhoop) and *Gentiana Karoo* (Karu).

1.10.13 15/C 1 Birch/ Rhododendron Scrub forests:

This forms the upper limit of alpine forest and occurs as patches of varied size in these sheltered sites and usually on the Northern and Western aspects. The *Rhododendrons* with its various species occur as a dense mat in which *Betula utilis*, *Salix elegans* etc. occur in varying proportions. The whole mass of vegetation is well adapted to stand heavy snow fall. The common shrubs are *Salix elegans*, *Cotoneaster microphylla*, *Lonicera parviflora* & herbs are *Potentilla* species, *Primula denticulata*,

Broadly, the vegetation types of the State can be divided into tropical, sub-tropical, temperate and alpine vegetation and the vegetation of stony desert. *The Hon'ble Supreme Court of India in CWP No. 202/95 dated 28.03.2008 in T.N. Godavarman Thirumulpad versus Union of India & Others* held that 16 major forest types have been classified by Champion and Seth further grouped into 6 ecological classes depending upon their ecological functions as follows:-

- Eco-Class I Consisting of Tropical Wet Evergreen Forests, Tropical Semi Evergreen Forests and Tropical Moist Deciduous Forests.
- Eco-Class II Consisting of Littoral and Swamp Forests.
- Eco-Class III Consisting of Tropical Thorn Forests and Tropical Dry Evergreen Forests.
- Eco-Class IV Consisting of Tropical Thorn Forests and Tropical Dry Evergreen Forests.
- Eco-Class V Consisting of Sub-Tropical Broad Leaved Hill Forests, Sub-Tropical Pine Forests and Sub Tropical Dry Evergreen Forests.
- Eco Class VI Consisting of Montane West Temperate Forests, Himalayan Moist Temperate Forests, Himalayan Dry Temperate Forests, Sub Alpine Forest, Moist Alpine Scrub and Dry Alpine Scrub.

Keeping in view the above classification of forests the only eco-class V & VI falls in the catchments area.

1.11 Fauna found in the catchment area are:

a. Mammals

Herbivores	Carnivores
Musk Deer	Snow leopard

Himalayan Thar	Leopard
Goral	Himalayan Black Bear
Serow	Himalayan Brown Bear
Bharal etc.	Jungle Cat

b. Pheasants:

Western Tragopan
Himalayan Monal
Cheer Pheasant
Kaleej

1.12 Scope of the Study:

The main objective of the present study is to plan measures for checking soil erosion thus, to decrease the silt load in the river channels and the catchment area of the proposed Lower Nanti Hydel Project on Nanti Khad, a tributary of Sutlej river. Catchments area treatment (CAT) plan is an important document, which portrays the ecological health of the catchments area, suggests various soil conservation measures and watershed management programmes required to arrest soil erosion. This is crucial for improving the soil and habitat conditions of free drainage area and to rejuvenate the degraded ecosystems in the catchments. The scope of this study is not only to address all those factors which are directly responsible for soil erosion in the catchments but also to address areas of concern that are indirectly responsible for soil erosion. These issues include fuel and fodder requirements of the local people in the project area. We have suggested a number of indirect and direct methods for the treatment of catchments to arrest soil erosion. The direct measures include engineering and biological method, while the indirect methods include gradual

reduction of dependency of local people on natural resources for their daily needs.

1.13 Rights of the people

i) **Grazing:**

In almost all the forests, rights for grazing exist for each demarcated and un-demarcated forest. The field studies conducted indicate that 70% requirements of the fodder are met from the forest area. The settlement provides for free grazing to all animals of the right holders in their own chaks and no ceiling has been fixed on the number of cattle that might graze. The graziers availing summer grazing facilities in the alpine pastures are not allowed to graze their animals outside chaks unless allowed as a special concession or through the payment of certain grazing fee. A large number of cattle graze in these forests leading to great damage to the vegetation as well as to the plantations. The right of grazing also comes in the way of taking up more closure for raising plants of different species as the consent of local people is to be obtained before the plantation work is to be undertaken and require closure notification under the Indian Forest Act, 1927.

ii) **Collection of fuel wood:**

People have the right to collect dry and fallen wood for their domestic use as per Forest Settlement Report. In the catchments area, people entirely depend upon fuel wood for their day to day use. Annual consumption of fuelwood per house hold has been assessed to be 6.5 tones during the field survey. Mainly this requirement is fulfilled by Kunish,

ban, jamun, etc. species found near the river banks and Nullah.

iii) **Timber:**

People have the right to get timber at nominal rates for construction/ repair/ maintenance of their houses. The Concessional rates were fixed at the time of forest settlement. No limit on the nos. of tree to be sanctioned was placed. However, no TDs rights have been used by the right holders these days due to ban on any kind of felling of trees imposed by the Hon'ble H.P. High Court.

iv) **Cutting of Grass and lopping of trees:**

People have right to cut grass and lop trees for fodder purpose. Cutting of grass is being done as of present in the forests without paying any fees to the Department of Forests.

v) **Minor Forest Produce:**

The local people have rights to collect medicinal plants, herbs, roots, shrubs and other forest produce for bonafide domestic use and for sale to the traders as enshrined in the Bushahr Sulej valley Forest Settlement Report, 1921 by H.M. Glover. The system of issuance of export permit has been made easier by delegating power to the Pradhan of Gram Panchayat concerned.

1.14 General Condition and Density:

The composition and density of crop is very good in the upper part of the catchments of the project area. However, in the

lower portion of the project area, the composition and condition of the forest is not good due to a lot of pressure of the right holders. The status of regeneration of Fir/ Spruce is deficient whereas the condition/ regeneration of Kail and Deodar is encouraging.

1.15 Plan Period (Project period):

The CAT plan has been formulated for a period spread over eleven years. The norm of Forest Department for the year 2011-12 has been applied.

1.16 Cost of the Plan:

The total outlay envisaged for the implementation of this CAT Plan is Rs1.69 crore including contingencies, Monitoring & Evaluation, Payment for Environmental Services (PES), etc. The total cost of the CAT Plan would be deposited by the Use Agency in one go. With increase in Project cost, outlay of CAT plan will be revised accordingly & review will be done every two years as per latest guideline issued by the H.P State Forest department. Which contains that with increase in project cost outlay of CAT Plan will be revised Proportionality and a review will be done every two years this provision to offset cost escalation has been incorporated in the CAT Plan.

CHAPTER-II

PROBLEM ANALYSIS AND OBJECTIVES

The geology of the catchments area is not subjected to major land slides or high soil erosion intensity in the upper portion, but the lower portion is susceptible to soil erosion.

2.1 Soil Erosion:

Soil erosion may be defined as the detachment and transportation of soil. Water is the major agent responsible for this erosion. In many locations, winds, glaciers, etc. also cause soil erosion. In the catchments area of a hilly area like that being considered for the proposed project, water erosion is a common phenomenon and the same has been studied as a part of the catchments area treatment (CAT) Plan. The problem has aggravated in last few years and the silt level in all the rivers and streams have gone up to alarming level in Himachal. This is causing great problems in the power generation and lowering the efficiency of turbines in various hydroelectric projects in the State.

2.1.1 Soil Erosion Leads to:

- ↓ Loss in production potential.
- ↓ Reduction in infiltration rates.
- ↓ Reduction in water holding capacity.
- ↓ Loss of nutrients.
- ↓ Increase in tillage operation costs.
- ↓ Reduced transport and storage capacity and
- ↓ Reduction in water availability.

2.1.2 Methodology for the Study of soil erosion:

Main aim of study involves:

- To study erosion characteristics of the terrain.
- To evolve a proper plan to minimize the rate of erosion through Bio- Engineering Mythology & Civil Works.

A comprehensive database on terrain conditions, different type of soil of the catchments, natural resources and socio-economic status etc. is essential to evolve a treatment plan. In high hills variability of site parameters such as topography, soils, land use, climate and rainfall matters. Not all areas contribute equally to the erosion problem; several techniques like manual overlay of spatially index-mapped data have been used to estimate soil erosion in complex topography.

In order to ensure that latest and accurate data is taken for the analysis satellite data has been used for data and ground realities have also been taken into account.

2.1.3 Study of the Problem:

The different data layers of the catchments area used for the study are as under:

- Land use classification map
- Management practices
- Catchments area map
- Soil map
- Slope map
-

2.1.4 Data collection and compilation:

Ground maps and contour information were collected and analysed.

2.1.5 Estimation of Soil loss:

Soil loss can be estimated using Silt Yield Index (SYI) method. The application of SYI method for prioritization of sub water sheds in catchments areas involves the evaluation of:

- Geomorphic factors comprising slope and drainage characteristics; landforms and physiography.
- Surface cover factors governing the flow hydraulics.
- Climatic factors comprising total precipitation its frequency and intensity and
- Management factors

The area of each of the mapping units is arrived at and Silt Yield Index of individual sub-water sheds and computed using following equation: -

a) Silt Yield Index

$$SYI = \frac{\sum(A_i \times W_i) \times 100}{A_w}$$

Where i = 1 to n

A_i = Area of ith (EIMU)

W_i = Weightage value of ith unit

n = Number of mapping units

A_w = Total area of sub-water and

The SYI values for classification of various categories of erosion intensity rates are given in Table below:

Sr. No.	Category	SYI values
1.	Very high	>1300
2.	High	1200-1299
3.	Medium	1100-1199

4.	Low	1000-1099
5.	Very Low	<1000

2.2 Water Shed Management.

Watershed management is the optimal use of soil and water resources within a given geographical area so as to enable sustainable production. It implies changes in land use, vegetative cover, and other structural and non-structural action that are taken in a watershed to achieve specific watershed management objectives. The overall objectives of watershed management programmes are to:

- ↓ Increase infiltration into soil;
- ↓ Control excessive runoff;
- ↓ Manage and utilize runoff for useful purpose

The watershed management measures have been classified under the following categories:

- (a) Biological measures
- (b) Bio-Engineering Measures

a. Biological Measures

The various measures covered in this category are: -

- Normal afforestation
- Enrichment planting.
- Energy plantation
- Nursery Development

b. Soil and water conservation measures

- Stabilization of land slides/slips with engineering works and planting bio engineering species.
- Nullah stabilization with engineering works and planting bio engineering species.

2.3. PRESSURE ON FOREST RESOURCES

The current problems being faced in forest conservation arises directly from the natural resource dependence of the people inhabiting in forested region. These dependencies are becoming immense because the eco-system is going down from the abuse and over use of natural resources. Man is responsible for degrading the forest eco-system. As his number increased and culture and technology advanced, he modified the natural eco-system into an artificial one. As a result, many species of flora and fauna have become endangered. It is said that if the present course of environmental degradation is continued, then it will destroy the capability of our natural environment to support a civilized human society. The depletion of our Wild Life and also the hardships being faced by people dependent on natural resources is due to:-

- (a) Reduction of Biological diversity in forest Eco-System.
- (b) Increasing biotic pressure.
- (c) Increasing demand of forest resources as per Forest Settlement Report, 1921.
- (d) Illicit felling and poaching
- (e) Encroachment on forest land.
- (f) Forest fires.
- (g) Cultural transition
- (h) Collection of minor forest produces.

2.4 Grazing:

Live stock practices in the tract are rather primitive. Incidence of grazing in the high lying alpine pastures as well as in the low lying pasture lands is very high and fodder resources are fast decreasing. Almost all the forests are burdened with the rights of local people to graze their cattle, without any ceiling on the number of cattle which may be allowed to be grazed under the provision of Forest Settlement Report, 1921. This open access to

forests for grazing leads to great damage to vegetation, soil as well as to plantations etc.

2.5 Management of Wild Life in outside the Protected Area.

The scientific Wild Life management is based on the biological characteristic of a species. Other considerations such as economic, political, social, humanitarian and sentimental are equally important. Since the exact numbers of various animals found in the tract are not known the fundamental need is to carry out a detailed survey and population census of species in the area. The causes for the depletion of fauna can be described as under:-

- i) Poaching, hunting, trapping and killing of Wild animals by local inhabitants.
- ii) Biotic interference by man and his cattle especially near habitations. Depletion in the food of herbivorous animals because of lopping of fodder trees by the graziers and local people.
- iii) Natural calamities like drought, storms, heavy snow fall and forest fires etc.
- iv) Continuous predation has also caused the depletion of animals. This affects both herbivores and carnivores in the Catchments area.

2.6 Man- Wildlife Conflict

Man-Wild Life conflict is a result of gradual degradation of natural resources and the most sufferers are poor, marginalized communities living in an around the Forests of the Catchments area. The problems of animal damage whether it is crop depredation, live stock depredation and human casualties is not as alarming as it is prevalent in other parts of the States or elsewhere

in the country. The problem of livestock predation and killing by Leopard and Black Bear is gradually escalating and to some extent appropriate compensation is needed and also environmental

Awareness programmes for migratory glaziers thus need to be created. Concentrated efforts, education, awareness, research monitoring, policy, law and governance; habitat restoration and development of essentially needed infrastructure to tackle complex issues pertaining to the man animal conflict are required to be implemented on a priority basis.

2.7 Inadequate Scientific Information:

Inventory of the flora and fauna of the catchments is yet to be prepared. The status of important habitat types and that of the threatened flora and fauna is not known. No information is available in this regard about the carrying capacity of the forests and alpine meadows in and around the Catchments area. Therefore, in the absence of reliable primary data on various aspects only general type of strategy and approach can be made as management and improvement of the catchments area by carrying out detailed survey of the catchments area. Thus a well designed catchments area treatment plan (CAT) plan is essential to ameliorate the abovementioned adverse process of depletion of biological diversity. An endeavor has been made in the present Plan to address the problem to some extent.

2.8 Harmful Practices by the Local People.

The trees near habitations are lopped ruthlessly for the fuel wood and fodder. The forest is experiencing tremendous pressure of human and livestock. The animals roam freely in the forest area trampling and grazing the forest. These result in to increased rate

of soil erosion and degradation of forest manifolds. These factors have led to following problems to the forests:

- i) Excessive soil loss and increase in runoffs.
- ii) Man and Wild Life conflict
- iii) Fuelwood and fodder are becoming scarce.
- iv) Unscientific collection of NTPF which is harmful to the Biodiversity of Catchments area.
- v) Excessive grazing.

2.9 Buildings:

The existing buildings are in dilapidated conditions. Provision for repair of I.Hut, FRH, B.O. Qtr and FG Hut has been kept under Forest Infra Structures development in the CAT Plan.

2.10 Lack of Trained Staff in Wild Life Management:

There is a lack of professional knowledge/skills of management especially habitat improvement of Wild Animals, procedure for monitoring and evaluation in different events, vegetation changes overtime and its relationship to changes in prey base species, collection of evidences and biological material, symptoms of important diseases, preventive measures and treatment assessment, techniques and methodologies and bio-diversity impacts etc. The staff is, therefore, left with no option but to undertake the protection job and implementation of various works in the traditional ways. The training in wild life management to the front line staff outside the Protected Area Network is essential.

2.11 Lack of concern about conservation by the local people:

As the local population in majority is backward it is apparent that the people have little or no knowledge about the environmental

conservation. The local people of the area do not seem to show any concern for the conservation of bio-diversity available in the

area. There is no local voluntary organization willing to make conservation as a primary issue. Off late the government has realized that the effective implementation of various biodiversity conservation and environmental related programmes cannot be achieved without awareness and concerns of the local people. So, there is a need to initiate a dialogue with local people on the conservation of natural resources by formation of VFDS etc. at the village/Panchayat level for conservation of bio- diversity.

2.12 Limited Employment and Income generation Activities:

The area was bereft of any road link till very recently, has been dependant only upon the subsistence economy. Most of the agriculture has been for internal consumption and no cash crops are grown in the Catchments area. The only cash crop has been the M.F.P. collection from the forests and sale to traders for supplementing their income under the provisions of the Settlement Report. Formation of society in each Panchayat of the catchments area for collection and sale of the NTFPs will certainly add in supplementing the income of the local people in an organized manner.

2.13 Lack of Appropriate Infrastructure Support:

The area is facing lack of basic minimum infrastructure support in the field of housing, I/Hut, FRH, Office equipment i.e. Computer, PDA, Compass, Camping equipment, field equipment and vehicle etc. In the absence of this infrastructural support, the information flow is very slow and irregular.

2.14 Monitoring and Evaluation:

Monitoring is an important and integral component for effective conservation and management as it provides a ways to track the status of various components of works and their effect over a period of time. The regular feed back through monitoring and evaluation allows better understanding, midway corrections and adoption of appropriate strategies. A provision for in house and third party monitoring has been kept, which, preferably, will be done in 6th year.

CHAPTER-III

WILDLIFE MANAGEMENT IN OUTSIDE THE PROTECTED AREA

3.1 Introduction

The State of Himachal Pradesh is as it embodiment of heaven on earth, replete as it is with lush green forests, high snow covered peaks, beautiful valleys, gushing streams and unpolluted rivers and waters, which is probably why it is the abode of Gods and Goddesses. The mountainous terrain of Himalayas Ranges from 300 meters to 7000 mtrs and support a variety of forests such as Sal, Pines, Rhododendrons, Oaks, Birch, Deodar, Kail, Fir and Spruce. These forests are home to variety of wild flora and fauna, occupying different habitats and ecological niches. Himachal has 12.6% of its geographical area of 55,673 Sqm. Under the protected area network, an extremely high figure when compared to the national average of hardly 4.5%. As a result, there has been an increase in the number of wild flora and fauna not only within the protected areas but more so outside the protected area network.

Himachal Pradesh is rich in various faunal elements with reports of more than 107 species of mammals, 447 species of birds, 17 species of amphibian and 104 species of fishes. There are carnivore species like leopard (*Panthera pardus*), leopard cat (*Prionailurus benghalensis*), jungle cat (*Felis chaus*), Asiatic Black Bear (*Ursus thibetanus*) and Brown Bear (*Ursus arctos*) in the State. The State of Himachal Pradesh also forms home for seven pheasant species out of the 17 found in the country (48 pheasant species found across the world). These seven species are Western tragopan (*Tragopan malenocephalus*) Himalayan monal (*Lophophorus impeyanus*), Koklas (*Pucrasia macrolopha*), White Crested Kalij (*Lophura leucomelanos*), Cheer (*Catreus wallichii*) and Red Jungle Fowl (*Gallus gallus*). The Western tragopan is State bird of Himachal Pradesh and

during 1993-94 Sarahan pheasantry witnessed first ever breeding of Western Tragopan in captivity in the World.

Biodiversity conservation is on the national agenda which came into force on December, 29, 1993 for nation/States which are signatory to the conservation of Biodiversity. It is well known that the conservation of Biodiversity involves conservation of ecosystem, species, land races and population including conservation of genes. Biodiversity conservation is essential not only for ecological and environmental rejuvenation but also for a sustainable development of forests. These forests regulate the water balance in the lands around and influence the climate to considerable extent. Apart from their ecological functions, they serve as valuable gene pools.

The current problems being placed in wild life conservation arises directly from the natural resources dependence of the people in habetating forested regions, impoverished population and Hydro-electric project in Sutlej basin. These dependencies are becoming intense because of Eco-System of Sutlej valley is declining at a very fast rate due to over use of natural resources. Therefore need for conservation preservation and management of biological diversity arises because of threats of natural terrestrial and due to various anthropogenic activities and also there are regular conflicts between humans and wild life in the region. These conflicts may further increase as a result of project activities unless proper management practices are not followed. The likely project activities include road construction, blasting, excavation for tunnels quarrying, dumping of excavated materials and human population pressure on land and biological resources. Looking into all these aspects a wildlife management plan has been prepared for the conservation and protection of biodiversity of the region.

3.2 Improvement and development of wild life:

The improvement and development of wild life in the region various activities have been suggested in the plan. This will be achieved by way of

plantation of trees, fodder species, fire protection measures, prevention of soil erosion and removal of exotic invasive plant species. Some patches of land may be developed exclusively as "green islands" in the project catchment area.

These areas should be out of bound for any human intervention both for local people and domestic animals under the provision of Indian Forest Act, 1927 and these areas should be developed as habitats or corridors for the wild life of the region. The following tasks are suggested.

- Publicity for awareness through Kala Jatha (NukarNatak).
- Fruit bearing and bamboo plantation.
- Anti-poaching measures
- Sign and slogan boards
- Reward/Incentives to informers
- Vaccination of domestic cattle
- Field equipment and medicine for management of wild life—
Purchase of capture cage, traps, immobilizing gun, darts, drug, ,
GPS, Compass, Handy Cam, Altimeter, binoculars, sleeping bags
tents water bottles, pedometer etc.

3.3 Mitigation of Human Wildlife conflict

- (i) Engagement of anti-poachers.
- (ii) Compensation against wild life damages.

3.4 Management of Biodiversity

During the construction period, a large numbers of labourers and anticipated to come in the areas, which will exert additional pressure on the biotic resources of the catchment. Also, the noise and pollution levels will increase as a result of construction activities. To avoid and minimize

the negative impacts during the construction period, project authorities are advised to prepare strict guidelines as follows.

- (i) Strict monitoring of labourers and associated workers for any activity related to endangering the life or habitat of wild animals and birds.
- (ii) Strict restrictions will be imposed on the workers at project sites to ensure that they do not harvest any produce from the natural forests and cause any danger or harm to the animals and birds in the wild.
- (iii) Minimum levels of noise during construction activities will be maintained and no activity will be carried out at night at a project site in the close vicinity of animals/ bird habitats especially in the vicinity of dense forests.
- (iv) The fuel wood to the labourers will be provided from plantations meant for the purpose and/ore the provision be made for the supply of the free/ subsidized kerosene/LPG from the depots being set up for this purpose to avoid forest degradation and the loss of animal habitats.
- (v) The interference of human population will be kept to a minimum and it would be ensured that the contractors do not set up labourer colonies in forests and wilderness areas.
- (vi) A mix of incentives for the protection of wildlife and their habitats and strict regulatory framework will be put in place to implement the conservation effort.
- (vii) The project authorities will be bound by the rules and regulations of the Wildlife Protection Acts or any such regulation of the State, which may exist or will be promulgated from time to time for the preservation of habitats and protection of wild animals/biodiversity.
- (viii) It will be ensured that the noise levels in no case go above 80-100 db in the project area. One of the measures that are proposed to

be adopted is that the blasting is to be restricted during nights, early mornings and late afternoons, which are the feeding times of most of the fauna. Blasting will be resorted to only if extremely necessary. For this strict blasting regime, i.e. controlled blasting under constant and strict surveillance is to be followed. Some of the suggested methodologies for reduction and mitigation of noise so as to cause as little disturbance to the animals as possible are given below:

- (a) Only well maintained/new equipment that produces lesser noise would be used at the work sites.
- (b) The best way to control the noise is at source. Certain equipment that needs to be placed permanently at one place like generators, etc. would be housed in some enclosed structures to cut off the noise.
- (c) The heavy equipment like rotating or impacting machines will be based on anti-vibration mountings.
- (d) Wherever combustion engines are required they will be fitted with silencers.
- (e) The traffic (trucks, etc.) used for the project works will be managed to produce a smooth flow instead of a noise producing stop and start flow. Necessary training/orientation should be provided to the traffic operators/drivers. Sounding of loud horns, etc. in the forest areas will be banned.
- (f) The project authorities will monitor the noise at critical sites from time to time.

CHAPTER-IV

JOINT FOREST MANAGEMENT (JFM)

Introduction

4.1 The State of Himachal Pradesh has traditionally been sensitive to the need of involving local people in the conservation and management of the forest resources. This is evident from the Forest Settlements carried out as early as the 19th Century when people were provided rights in the forests in lieu of their responsibilities and duties to the forests. The Co-operative Societies of Kangra District are another testimony to this resolve. The participatory approaches received a new impetus in the State with the launch of Social Forestry Umbrella project in mid 1980s as also with the adoption of the National Forest Policy 1988 which brought the people to the centre stage & the constitutional devolution of power to the PRIs through the 73rd amendment. This brought about a paradigm shift in the objectives and management practices for forestry in the State through participatory management modes.

Responding to these new developments, the Government of Himachal Pradesh has approved the new Forest Sector Policy in 2005. The Forest Sector Policy evolved through a dynamic and consultative process where an extensive evidence gathering process has been followed through primary and secondary sources through a range of stake holders consultations including the Forest Department, other line departments i.e. Horticulture, Agriculture, Animal Husbandry, Rural Development, research institutions, local communities, representatives of Panchayati Raj Institutions, Non Governmental Organisations, Community based Organisations as well as people's representatives. The new H.P. Forest Sector Policy, 2005 is remarkably different from the earlier State Forest

Policy 1980 as it is in response to the emerging needs and aspirations of the people of the State. The new policy has a unique mountain area focus where livelihoods and decentralization through Panchayati Raj Institutions in management of forests resources form the bedrock on which the policy stands.

4.2 Date of issue of Govt. Orders on JFM and its Modification

GOI resolution	1990
HP introduced JFM	1992
Date of issuance of 1 st JFM orders/ rules	12.05.1993
Date of amendment/ new orders/ rules	23.08.2001

4.3 JFM AT A GLANCE IN HP

No. of JFM Committees 1749 covering an area of about 4246 Sq. Km
 Gender representation in JFM Committees:
 Women 51.3%;
 Men 48.7%

4.4 JFM and Lower Nanti Small HEP CAT Plan:

The works specified in the CAT Plan except Engineering/Technical works will preferably be executed based on the model of JFM. The various activities planned are in consonance with the JFM. Provisions have been kept for plantations in the degraded forest land, and Bio species plantation. Besides this a major thrust of the CAT Plan is on Income Generation Activities (IGA), so that people get their livelihood without entering in to the forests. VFDS will be formed for this specific purpose besides this the active Mahila Mandals and Yuvak Mandals and Local NGOs will be approached to carry out the various works of the CAT Plan. Considering the immense potential and genuine need for women's participation in JFM programme, also the women folk will be involved in the above activities. At least 30% of the plantation works

in the CAT Plan and income generation activities should be carried out through JFMC during the plan period.

At least 50% members of the JFM general body should be women. For the general body meeting, the presence of at least 50% women members should be a prerequisite for holding the general body meeting. Local people and committees should be engaged for the CAT Plan works such as plantation and maintenance etc. instead of hiring the labourer. All maintenance work will be done through JFMCs. The wages will be met out from the provision incorporated in the norms.

CHAPTER-V

OBJECTIVE AND PROJECT PROPOSAL

5.1 Project Objectives:

- To initiate measure to rehabilitate the degraded areas through afforestation of native species and assisting of natural regeneration.
- To carry out soil conservation measure in the Lower Nanti Catchments to ensure longevity of Lower Nanti Hydel Project.
- To increase the potential/production of the bio-mass in the area and to ensure longevity of Lower Nanti Hydel Project.
- To provide employment to the local people by engaging them in project activities such as afforestation, fire, anti poaching, rural infrastructure and other works except soil conservation works.
- To built the capacity of the Field Frontline staff in Wildlife management skills by providing training in India to meet the challenges of 21st century.
- To strengthen the extension and follow up activities of the forestry development activities, publicity, motivation and extension programme to be given the desired attention.
- Initiation of research activities to use and protect natural resources in a scientific way.

In the present plan thrust has been given for sustainable development of the catchments area as well as to protect and conserve the local environment with the active involvement of local people. In the CAT plan equal emphasis has been given to the economic needs of the local people, greening of the region and strengthening the local wildlife management and integrate these activities with a view to finally avoid soil erosion and decrease the silt

load in Nanti Khad and Sutlej river. Various mechanical and biological measures have been suggested to treat the catchments area to meet the objectives of the CAT plan.

5.2 Project Period:

The project period would be for 11 years.

5.3 Plan Components:

The CAT Plan has been designed keeping in view the new guidelines issued by Government of HP and ecological as well as social conditions prevailing in both the project as well as catchments area. The treatment measures emphasize on conservation of catchments through afforestation in blank/ degraded areas, and bio engineering works in soil eroded areas, river bank and Nallahs. It also envisages an active participation of local community as it will provide them employment to add to their economy. Apart from this, management as per the needs of the wildlife along with habitat improvement, anti poaching, fire control coupled with bio engineering works will be undertaken in the catchments area. The CAT Plan for Nanti HEP has been designed in view of the latest guide lines and the important activities in this regard to be undertaken during the project period are as under:

- a) A map in the scale of 1:15000 scale of the catchment showing the contour lines at 3600mtrs, 3000mtrs, 2700mtrs, 2400mtr, 2100,mtrs, 1800mtrs, & 900mtrs, depicting the administrative and forest boundaries, beats block, range , Road network, drainage of the catchment etc has been prepared.
- b) A map showing the forest infrastructure present like buildings, nurseries, plantations & soil & water conservation works for existing and proposed works has been prepared.

- c) The prescriptions of the CAT Plan have been made based on the analyses of the current situation of the catchment after extensive field reconnaissance.
- d) The size of the CAT Plan is based on the actual extent of the work to be done in the catchment which is almost 2.5% of the total project cost.

5.4 Biological Measures—Improvement of tree covers.

- (a) Nursery development.
- i. New Nursery development.
 - ii. Maintenance of existing nurseries
- (b) Afforestation.
- (c) Enrichment plantation.
- (d) Energy plantation.

5.5 Soil Conservation Works- Engineering and Bio-Engineering measures:

- ↓ Stabilization of land slides/slips by the way of Bio-engineering and civil works.
- ↓ Stabilization of Nullahs by the way of Bio-engineering and civil works.

5.6 Payment of Environmental Services (PES) (Explain under Para No 56.1)

5.7 Research, Training, studies and Capacity Build up
(Explain under Para No 57.1)

5.8 Forest Infrastructure Development, Operational Support & Forest Protection

- ↓ Maintenance of existing buildings
- ↓ Maintenance of existing bridle and inspection paths.

(a) Energy saving devices on Cost Sharing

- ↓ Distribution of LPG Cylinders.
- ↓ Distribution of Solar lights

➔ Distribution of induction heaters/cookers

- (b) Construction and repair of existing boundary pillars
- (c) Sign and slogan boards
- (d) Reward/Incentive to informers

5.9 Management of Wildlife in outside the protected area

(a) Improvement & Development of Wil Life

- Publicity for awareness through Kala Jatha (NukarNatak).
- Fruit bearing and bamboo plantation.
- Anti-poaching measures
- Sign and slogan boards
- Reward/Incentives to informers
- Vaccination of domestic cattle
- Field equipment and medicine for management of wild life—
Purchase of capture cage, traps, immobilizing gun, darts, drug, ,
GPS, Compass, Handy Cam, Altimeter, binoculars, sleeping bags
tents water bottles, pedometer etc.

- 5.10 Monitoring and Evaluation (Explain under Para No 5.10.1)
- 5.11 Site specific/Micro Planning (Explain under Para No 5.11.2)
- 5.12 Contingencies. (Explain under Para No 5.12.1)

A brief description of each component is as under:

5.4.1. Biological Measures—Improvement of tree covers.

(a) Nursery development.

To raise successful plantation it is necessary to have good & adequate planting stock. It is proposed to establish/Maintain nursery at Pashgaun & Jaghori. The nursery shall be raised in the 1st year of the project period and will be further maintained till the requirement of plants.

S. No	Name of nursery	Name of Beat	Geo reference	Amount
1	Extension of Nursery at Pashgaon and Jaghori	Phancha/Jaghori	31° 32' 50" / 77° 41' 40"	4,00,000
2	Maintenance of existing nursery at Jaghori and Pashgaon	Phancha/Jaghori	31° 34' 03" / 77° 44' 46"	3,00,000
Total				7,00,000

In Jaghori Nursery Fir, Spruce and Taxus will also be raised.

(b) Afforestation.

Since there is no scope for the normal plantation activities therefore only Enrichment Plantation will be under taken. The aim of this CAT Plan is to conserve in-situ flora and fauna along with the full range of eco-system. Under this scheme blank areas devoid of tree growth, and degraded forests areas is proposed to be planted, for which the choice of species will be mainly governed by the site/location.

(c) Enrichment plantation.

There are some forests in the catchments area where in patch density of crop is poor and devoid of overhead shade where planting could be done. In such areas planting of 800 seedlings per hectare is expected to result in full density forests. Extent to such

areas is estimated to be 25 ha. Thus, it is imperative that such forest areas are planted by artificial means to increase their stocking to the required level. The detail of the areas identified is as under:-

S. N.	Name of Area	Name of Beat	Geo reference	Area - ha
1	UF Phancha	Phancha	31° 35' 58" / 77° 44' 28"	5
2	C-208 Phancha Kanda	Phancha	31° 36' 34" / 77° 43' 59"	5
3	UF 14 Karai	Jaghori		5
4	C-199 Karai	Jaghori		10
	Total			25

The cost norms on the basis of prevailing schedule rates applicable in Rampur Circle for raising Deodar, Fir has been applied.

Per Ha Cost Norms for Enrichment Plantation (800 plants of Deodar/Fir Species per ha) Works has been calculated on the Prevailing Schedule of rates applicable in Rampur forest Circle.

Per Hac. Cost Model for Enrichment Planting Deodar/Fir							
S. No	Particulars	Qty	Unit	Rate	unit	Non Tribal	Tribal
1	Survey and demarcation of plantation and area I/C marking of seditions, path preparation of map.	1	Hac	75.05	Hac	75.05	83.81
2	Cutting and preparation of wooden posts 1.8 mtr and 8 to 10 CM dia I/C debarking and fashioning the top 15 cm in conical shape	60	Nos	949.90	Per %	569.94	712.43
3	Carriage of fence posts upto 2 mtr long and 8 to 10 cm dia over distance 0.5 KM	60	Nos	499.95	per % per KM	149.99	187.48

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4	Charing and coaltering of the ends of the posts 45cm bottom and 15 cm conical taring	60	Nos	204.90	per % per no.	122.94	153.68
5	Preparation and digging of holes 20-30 cm dia& 45 cm deep	60	Nos	665.10	per %	399.06	498.83
6	Fixing of wooden posts I/C strutting	60	Nos	510.45	per %	306.27	382.84
7	Carriage of barbed wire bundles up hill over an overage distance of 1 km	0.9	qtls	125.10	per qtl per Km.	112.59	140.74
8	Stretching and fixing of barbed wire with U-stapple in each strand	540	Rmt	3.45	per Rmt	1863.00	2328.75
9	Interlacing of thorny bushes with barbed wire obtained from planting side	160	Rmt	3.00	per Rmt	480.00	600.00
10	Preparation of inspection path 60 cm wide	150	Rmt	7.5	Rmt	1125.00	1406.25
11	Layout of pits/patches	1	Hac	124.9	Hac	124.90	156.13
12	Digging of pits (45x45x45) cm	800	No	699.9	Per %	5599.20	6999.00
13	Filling of pits (45x45x45) cm	800	No	200.5	Per %	1604.00	2005.00
14	Carriage of Plants in P/bags from Nursery site over an average distance of 1 Km.	800	No	133.25	Per %/Km	1066.00	1332.50
15	Planting of entire Plants I/C ramming raised in P/bages	800	No	160.05	Per %	1280.40	1600.50
16				Sub Total		14878.34	18597.92
17	Add Increase 9.09%					1352.44	1690.55
18	Nursery Cost of P/bags raised Plants	800	No NT	5.55	Per plant	4440.00	5560.00
19			Tribal	6.95			
20	cost of B wire and other material					4300.00	4300.00
				G.Total		24970.78	30148.47
				Or Say		24900.00	30100.00

B. Maintenance:

Sl. No.	Name of scheme	Component	Rs
B	Maintenance cost		
	First year Maintenance	Maintenance cost	4760
	Second year Maintenance	Maintenance cost	3170
	Third year Maintenance	Maintenance cost	2410
	Fourth year Maintenance	Maintenance cost	1550
	Fifth year Maintenance	Maintenance cost	1550
		Total Maintenance	13440

Sr. No.	Expenditure Detail	Amount
1.	Afforestation cost with coniferous species over 25 ha. @ 24900	622500
2.	Maintenance cost for 5 years	
	1 st year maintenance cost for 25 ha. @ 4760	119000
	2 nd year maintenance cost for 25 ha. @ 3170	79250
	3 rd year maintenance cost for 25 ha. @ 2410	60250
	4 th year maintenance cost for 25 ha. @ 1550	38750
	5 th year maintenance cost for 25 ha. @ 1550	38750
	Total (New + Maintenance)	958500

(d) Energy Plantation:

Around habitations in small patches, Five Strands barbed wire fencing – 3 strand and 2 cross wise; with creosoted wooden fence posts & two layers of live-hedge to reinforce fencing, 5000 tall plants per ha (spacing 2mx 1m) of fuel and fodder value maintenance intervention should be proposed only through direct funding of User Groups. To provide quick availability of fodder and fuel wood, it is necessary to have high density plantation (5,000 plants per ha) near habitation. Total 10 hac area has been identified for this treatment under this component as per detail is given below:-

S. N.	Name of Area	Name of Beat	Geo reference	Area - ha.
1.	UF Chandi	Jaghori	31° 36' 15" / 77° 45' 18"	5.

2.	UF Kandri	Phancha	5.
	Total		10 hac.

The cost estimate for raising of Energy plantation over one hac is as under:

Per Ha Cost Norms for Energy Plantation:

A. Energy Plantation

Sl. No.	Name of scheme	Component	Rs
A	Energy Plantation- 5,000 plants per ha.	Fencing cost	8000
		Planting cost	30000
		Sub-Total Wages	38000
		Material cost	9200
		Cost of plants raised (Rs.3.80/Plant x5000)	19000
		Total	62,200
		Norms per ha	Rs. 66,200

Expenditure Detail	Amount
Energy plantation over 10 ha. @ 66200	6,62,000

5.5.1 Soil Conservation Works-Engineering and Bio-Engineering measures

Soil Conservation and bio engineering measures stabilize or protect eroded soils and reduces further soil erosion. The plant and plant parts (roots, stems) act as the main structural components to reinforce the soil and to provide protection. Soil bio-engineering technique must be a cost-effective solution using locally available material and executable through unskilled or semi-skilled labor. Traditional methods of controlling stream flow and erosion rely on structural practices like rip rap, retaining walls and sheet piles and are often expensive, ineffective or socially unacceptable. Bio-engineering uses live plants alone or in combination with dead or inorganic material, to produce living, functioning systems to prevent erosion, control sediment and provide habitat. Both structural practices and live vegetation are used to provide erosion protection for hill slopes

and stream banks. The techniques outlined in this manual use woody plants that root mostly from dormant plants.

The species selected for bio-engineering should be available locally suitable for that zone. Cuttings and rooted plants are only to be used during the winter months (dormant season) and sodding techniques be used during the (summer season) vegetation season. Various methods are available for hillside and slope stabilization. Methods of seeding are dry-seeding and hydro-seeding. On exposed areas the seed is to be protected with straw in combination with meshes of jute and wire. After seeding, the stabilization can be increased through transplanting of stump sprouting deciduous shrubs or tree species.

With different type of brush layering, loose rock slopes can be stabilized. If the plants are rooted, they are called hedge layer. If they are un-rooted, they are called brush layer. There are numerous different hillside and slope stabilization methods which utilize plants in combination with wood layering, stone and wire combinations, such as planted pole walls, live slope grids, live wooden crib-walls, vegetated stone walls and vegetated gabions.

The budget for soil and water conservation needs to be utilized as under:-

- 50% For Small Engineering works.
- 50% For Bioengineering afforestation works.
 - 50% of the outlay of Bio Engineering for raising nursery plants.
 - 50% of the outlay of Bio Engineering for actual afforestation.

Application depends upon the suitability of soil bioengineering plants and structural techniques. Bio-engineering species can be raised in p-bags and through cuttings (easily sprouting types). Plants raised in nursery need to be acclimatized to the outdoor environment before planting. Seeding and mulching are not appropriate in areas of flooding, high water

flow or rapid changes in water depth, as the mulch and seed will be washed away. Proper seedbed preparation, fertilization and irrigation may be needed to assure seedling survival. Different techniques used are:-

- Grass planting and seeding
- Brush layering, fascines and palisades construction
- Tree and shrub Planting and seeding
- Live vegetative check dams and stone pitching
- Bamboo planting
- Jute netting and mulching

The following criteria will be used for choosing the species:

- Local natural plant species
- Easy availability
- Easy propagation
- High tolerance for refractory soil conditions
- Non palatable or less grazed/browsed by animals
- Bush to medium sized species

AFFORESTATION:

SEEDINGS: For hill and slope stabilization seeding of a grass and herb mixture is done. Deeper, rooted, woody vegetation helps to prevent shallow mass movement. After a first slope stabilization with seeding, some stumps, sprouting deciduous shrubs or trees are transplanted as naked roots, p.bag or root ball plants. Transplanting is to be carried out carefully- the younger a plant is transplanted, the more successful is its root system. Dry-seeding is an easy method where seed (10-25 g/m²) and organic fertilizer (100 g/m²) are scattered by hand. It can be applied on flat slopes with rough surfaces. On less steep slopes with rough surfaces and no erosion problems seeds of tree and shrub species can be broad cast sown. Seeds of trees and shrubs are mixed with sand in a ratio of 1:3 and spread as broadcast, pit or row seeding. On steeper slopes where it is necessary to cover the soil quickly, a cover crop

Seeding is used. Special types of rye (in fall) and barley (in spring) are spread in a mixture of 10 g/m² and covered with soil. On this surface normal seed (10 g/m²) and organic fertilizer (100 g/m²) were spread. On steep slopes which have a smooth surface and mild climate and are also mainly in forests, mostly, hydro-seeding is used. Seed (25 g/m²), organic fertilizer (100 g/m²), mulch (straw 80 g/m²) and an algae product as glue (100 g/m²) are mixed in a special barrel with water and pumped out onto the slopes (2 l/m²). On very steep slopes it is advisable to fasten a jute mesh on the slope because it fixes the hydro-seed.

Bio-engineering Works-

Bio-engineering works shall involve minor soil conservation works, finding of brush wood check dams, patch sowing of grass and legume seed, plantation of bio-engineering species of shrubs, herbs and trees i.e. @1400 shrubs and 500 trees/ha, fencing of the area with live hedge and maintenance for 1 year of shrub species and 2 years for tree species. The cost analysis per ha of bio-engineering works comprising of plantation, seed broadcasting, brush wood check dams, fencing cost and maintenance has been assessed as Rs. 50000 and is given in Table. However, it will vary as per site specific estimates.

bio-engineering works comprising of plantation, seed broadcasting, brush wood check dams, fencing cost and maintenance has been assessed as Rs. 50000 and is given in Table. However, it will vary as per site specific estimates.

Cost Analysis per ha of Bio-Engineering Works.

Bio-Engineering Cost Norms (Per Hectare)

(Live Hedge Fencing)

A) First Year Operations:

Sl No	Detail of works	Quantity	Rate (Rs)	Amount (Rs)
1	Survey and demarcation plantation area, marking of sections, path and preparation of map.	1 Hectare	75/Hecatre	75
2	Preparation of inspection part	200 Rmt	8 per Rmt	1600
3	Live hedge fencing with Agave, Ipomoea, Dodonaea	300 Rmt	10 per Rmt	3000
4	Preparation of gradional trenches/ staggered trenches (1x0.3x0.3m)	700 No./Rmt.	10.00/ Per Rmt	7000
5	Digging of 1400 pits on mounds of trenches (2pits per mound)20x20x20cms	1400 Nos.	100/%	1400
6	Filling of pits 20x20x20 cms	1400 Nos.	60/%	840
7	Planting of 1400 nos. Plants (P Bags) on mounds (2 pits per mound) inclusive of carriage of plants	1400 Nos.	4/ %	5600
8	Preparation of patches of grass/legume sowing (0.3x0.3x0.3m) inclusive of carriage of plants	700 Nos	240/%	1680
9	Sowing of grass/legume seeds in patches	700 Nos	70/%	490
10	Cost of raising plants [P. bags (6"x4")/Root trainings] in the Nursery	1400 Nos	2 per plant	2800
11	Cost of grass/legume seed	10 Kg.	200 per Kg	2000
12	Minor small soil conservation activities as small gully plugging, brushwood check dams etc.	L/S	3000 per ha	3000
	TOTAL			29485 or say Rs. 29500

B] Second Year Operations:

Sl No	Detail of works	Quantity	Rate (Rs)	Amount (Rs)
1	Strengthening/support to live-hedge fence (approx. 30%)	300 Rmt	10 per Rmt	3000
2	Minor small soil conservation activities as small gully plugging, brushwood check dams etc.	L/S	1100/ha	1100
Total				4100

C] Third Year Operations:

Sl No	Detail of works	Quantity	Rate (Rs)	Amount (Rs)
1	Strengthening/support to live-hedge fence (approx. 30%)	50 Rmt	10 per Rmt	500
2	Digging of pits (60x60x60cm)	500 Nos	700/hundred	3500
3	Filling of pits (60x60x60cm)	500 Nos	280/hundred	1400
4	Carriage of plants raised in Polythene Bags (P bags) of size 4''x6'', from nursery to roadside by road including loading & unloading over a distance of say 10 Kms.	500 plants (1 trips)	1200/- per trip	1200
5	Carriage of plants (P bags) from roadside to plantation site by manual labour over a distance of 2 kms. (approximately 20% mortality replacement)	300 plants	160%/km	480
6	Plantation of P. Bags plants	500 Nos	160/hundred	800
7	Cost of raising plants in P. bags	500 Nos	3.50/plant	1750
8	Minor small soil conservation activities as small gully plugging, brushwood check dams etc.	L/S	1000/ha	1000
TOTAL				Rs.10630

D] Forth Year Operations:

Sl No	Detail of works	Quantity	Rate (Rs)	Amount (Rs)
1	Re-digging of pits (60x60x60cm) - 25% mortality	125 Nos	700/Hundred	825
2	Filling of pits (60x60x60cm)	125 Nos	200/hundred	350

3	Carriage of plants raised in Polythene Bags (P bags) of size 4''*6'', from nursery to roadside by road including loading & unloading over a distance of say 10 Kms.	125 Nos	500/ per trip	500
4	Carriage of plants (P bags) from roadside to plantation site by manual labour over a distance of 2 kms.	125 plants	160/%Km	400
5	Plantation of P. Bags plants	125 Nos	160/ hundred	200
6	Cost of raising plants in P. bags	125 Nos	3.50/plant	440
7	Minor small soil conservation activities as small gully plugging, brushwood check dams etc.	L/S	700/ha	700
TOTAL				3415 or say Rs 3400

E] Fifth Year Operations:

SI No	Detail of works	Quantity	Rate (Rs)	Amount (Rs)
1	Re-digging of pits (60x60x60cm) - 15% mortality	75 Nos	700/ Hundred	525
2	Filling of pits (60x60x60cm)	75 Nos	280/ hundred	210
3	Carriage of plants raised in Polythene Bags (P bags) of size 4''*6'', from nursery to roadside by road including loading & unloading over a distance of say 10 Kms.	75 Nos	500/ per trip	500
4	Carriage of plants (P bags) from roadside to plantation site by manual labour over a distance of 2 kms.	75 plants	160/%Km	240
5	Plantation of P. Bags plants	75 Nos	160/ hundred	120
6	Cost of raising plants in P. bags	75 Nos	3.50/plant	263
7	Minor small soil conservation activities as small gully plugging, brushwood check dams etc.	L/S	500/ha	500
TOTAL				2358 or say Rs 2360

ABSTRACT

Sl. No	Abstract	Amount (Rs.)
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A	First Year Operation	29500
B	Second Year Maintenance Operations	4100
C	Third Year Operations, Planting of 500 Plants	10630
D	First Year maintenance of plants planted in 3 rd year	3415
E	Second Year maintenance of plants planted in 3 rd year	2360
	Total cost per ha	50005
		Or say Rs. 50000

a) **Land slides/ slips stabilization:**

Land slides are caused by the down hill movements of weathered rock mass, boulders, soil etc. There are various factors natural and man made, which contribute directly or indirectly in producing land slide. The identified areas as per the CAT Plan are to be stabilized through various control measures which would depend upon the size, extent and location of the slip of the area. However in general the following measure shall be applied depending upon the situation in the site/ field.

- i) Construction of check wall/ protection/retaining wall with crate wire to control land slips and toe cutting with brushwood check dams.
- ii) A mixture of soil conservation work with biological measures is required depending upon the site.

The various land slips/ land slides stabilization proposed for treatment is given below:

S. N.	Name of Area	Area-hac	Name of Beat	Geo reference	Area benefitted-ha
1	Chandi Slip	4	Jaghori	31° 36' 15" / 77° 45' 18"	40

2	Branda Slip	4	Jaghori	31° 35' 54" / 77° 45' 25"	40
3	Piri Slip (Kandri)	3	Phancha	31° 34' 69" / 77° 44' 28"	30
	Total	11			110 ha

The expenditure of land slide and slips stabilization

Name of work	Amount in Rs
Cost of land slip/ stabilization over 11 ha.	20,00,000

The actual size and expenses may vary as per the site condition prevailing and requirement at the time of execution.

b) Nullah Stabilization:

About 10 Nullahs with a length of about 10Kms. are required to be treated depending upon the sites/ location out of the length in the catchments area. The identified areas are given in the CAT Plan shall be stabilized through controlled measures which will depend upon the size, extent and location of the Nullah of the field.

- a) Construction of check dams with gabian wall, protection wall with crate wire to regulate and check/ reduce the speed of flow.
- b) The eroded and effected Nullah will be channelized and protected by the crate wire of check wall and check dams.

- c) Live hedge vegetative spurs along the Nullah shall be put up after one or two years, when the Nullah will be filled by the silt. Local species which are good soil binders like Salix, Alnusnitida, Alianthus, Agave, Nirgal, Kashmal, Bhekhal, Seabuckthorn, Rosa spp., Rubas spp. etc. will be planted.

The details of Nullahs with length in Km are given below:

S. N.	Name of Nullah	Length -Km	Name of Beat	Geo reference	Area bene fitted -ha
1	Garti Gad	1	Phancha	31° 36' 86" / 77° 44' 64"	20
2	Devri Gad	1	Phancha		20
3	Pichki Gad	1	Phancha	31° 34' 04" / 77° 44' 34"	20
4	KandriNullah	1	Phancha	31° 35' 10" / 77° 44' 17"	20
5	PhanchaNullah	1	Phancha	31° 35' 54" / 77° 43' 48"	20
6	DugaNullah	1	Phancha	31° 36' 59" / 77° 44' 34"	20
7	MethaPaniNullah	1	Phancha	31° 35' 32" / 77° 44' 06"	20
8	Nehri Gad	1	Phancha	31° 34' 59" / 77° 44' 16"	20
9	Boldhar	1	Phancha	31° 48' 47" / 77° 42' 09"	20
10	PeriNullah	1	Phancha		20
	Total	10 Km			200

Financial Implications

Name of Work	Amount-Rs
Cost of Nullah stabilization over 10 Kms.	30,20,000

5.6.1 Payment of Environmental Services (PES):

It is a new concept as a reward for good conservation behaviour by upstream community living in the catchments area of the project. The PES

will be based on the result of monitoring of the following aspects and effectiveness of conservation measures between communities.

- Silt load (total, seasonal and average assessment).
- Survival % of plantation.
- Freezing land use.
- Better Agriculture, Horticulture and Animal Husbandry practices in the catchments area.

Procedure for implementing PES is yet to be evolved. However, 15 % of the CAT Plan outlay has been kept for PES.

Following works are suggested under PES:

- Distribution of Fruit plants.
- Value addition facilities for the local raw materials.
- Span for carriage of /commodity/local produce.
- Maintenance/improvement of village paths.
- Maintenance/improvement of baowries.
- Incentivisation for rotational grazing in pastures.
- Eco-tourism activities.
- Income generating activities.

Details and mechanism as well as year wise phasing of these activities has not been prescribed because this will depend on the degree of support provided by the local people in implementation of CAT plan and providing environmental support. As the CAT Plan progresses, these activities may be decided/changed/amended and there after executed.

Catchment specific study will be made to identify proposals and activities to be undertaken under PES and once these activities are approved by the Forest Department, these will be implemented with the amount kept under PES.

5.7.1 Research, studies& Training:

15/20 forest area is unique and rich in Bio-diversity due to diverse physiographic and climatic condition. Whereas the prominent indigenous

woody component includes Deodar, Kail, Fir, Spruce Betulautilis, the grassland are mainly composed of a large variety of grass and herbaceous plants which have immense medicinal values. However, not much is known about the floral diversity, ecological and environmental impact of the area, as no comprehensive work on the subject has been conducted and published as yet. It is utmost important that a base line information about the floral diversity, ecological studies and composition is generated to guide future conservation action. Funds will be allotted to implementing agency, who will determine the study areas with focus on present scenario during the plan period. The implementing agency will contact most appropriate agency, institution to conduct their research activities from the institution like HFRI Shimla, WII, Dehradun and any recognized university in India. Priority will be given to undertake research studies in the following subject:

- (a) Socio-Economic Studies of the villages dependent on the forest resources.
- (b) Environmental impact Assessment of grazing and biotic interference.
- (c) Identification of habitat for pheasants.

A provision of Rs. 8, 45,000 have been made for this component. Year wise and Division wise allocation shown in the schedule is only indicative and funds may be used as per actual requirement of research activities proposal/plan, submitted by the candidate/institution, which is duly approved by the component authority. First preference will be given to the in service candidate who having a knowledge and experiences on forestry and wildlife management and conservation.

5.8.1 Infrastructure Build up & Forest Protection:

a) For the optimum management of Forest resources of the tract, it is essential that the field infrastructure of the Forest Department adequately developed. The forest path/bridle path and buildings in the region are the important lines of communication in these difficult terrains and to keep them in serviceable condition it is highly desirable but due to paucity of funds many existing paths are in a State of neglect. The following building are required to be maintained

- 1) FRH – Phancha - Rs 50000
- 2) Forest Guard Hut Phancha – Rs 250000
- 3) Inspection Hut – Jhagori – Rs 210000

b) Vehicles and operational support.

A provision has been made in the CAT Plan to provide support to the implementing agency in the form of establishment charges, office expenses, vehicle for better implementation of CAT Plan, Computers and equipments etc.

Sr. No.	Description of items	Qty.	Amount-Rs
1	Establishment Cost(Reimbursement of Salary & Contractual amount to Contractual Staff)	L/s	15,00,000
2	Provision of vehicle		6,00,000
3	Office Equipment's (Computer,- 1 Nos along with accessories,GPS – 4Nos		100,000
4.	O.E.	L/S	100,000
5.	Maintenance of Motor Vehicle	L/S	100,000
6.	Amenities to staff & labour	L/S	50,000
	Total		24,500,00

(a) Energy Saving Devices:

In order to reduce the pressure on forest resources in and around the catchments of the project area, it is proposed to provide alternative sources like LPG Cylinders on subsidized rate (50% cost to be borne by the beneficiaries) to poor local people, construction of crematoria along with fuel wood store and

distribution of solar lights etc. in each villages of PhanchaPanchayat. The component wise detail is given below: -

1. Distribution of LPG Cylinders 50 Nos.
2. Distribution of Solar lights 5 Nos.
3. Distribution of Induction heater & Cookers 15 Nos.

(b) Construction/Repair of existing boundary pillars/chak pillars :

For protection of protected areas from encroachments near the cultivations, the existing boundary pillars are to be repaired and new intermediate pillar/chak pillars are to be constructed along the boundary of cultivated land and jurisdiction of the protected forest areas. An outlay for Rs. 30,000 is proposed to be incurred during the plan period.

(c) Sign and Slogan Boards

It is recommended that the sign and slogan boards must be put up at selected sites. All these sign and slogan boards must be in Hindi and English Languages in the form of an appeal to the local people, aware them the importance of Wildlife conservation under the provision of Wildlife (Protection) Act, 1972, Indian Forest Act, 1927 & Forest Conservation Act, 1980 etc. All such development works which are taking place in the project area must be properly displayed at the site of execution e.g. plantation work, nursery, pasture development, soil conservation works etc. Therefore, an amount of Rs. 5000 has been proposed for this purpose during the plan period.

(d) Reward/Incentives to Informers:

Reward/incentive to informers for control of illegal trade/illicit felling of trees is required for proper protection of forest and wildlife. Without help or association of the local people, forest

guards alone are helpless to protect or detect the forest and wildlife offences. It is necessary to make people aware about the biological and ecological hardships which the fauna of the tract is facing. The people should be encouraged by providing them suitable rewards/incentives for giving information about the offender/culprits. An outlay for Rs. 35000 is proposed to be incurred during the plan period.

5.9.1 Management of Wildlife in outside the Protected Area

(a) Improvement and Development of wildlife

The need for conservation, preservation and management of biological diversity arises because of threats to natural terrestrial and aquatic ecosystems due to various anthropogenic activities. The area heavily degraded will be closed with physical barriers and will be planted with bamboo, fruit trees, fruit bearing shrubs or shrubs with fodder values, herbs and grasses depending upon the site to be planted so far as practical. Increase biomass production especially on degraded common lands adjoining to villages by planting grass/B.L. trees. Plantation must use local and indigenous species since exotics species have long term negative impacts on the environment. For the improvement and development of wildlife the following activities shall be carried out during the plan period

- i Fruit bearing and bamboo plantation.
- ii Publicity for awareness through Kala Jatha (NukarNatak).
- iii Anti-poaching measures
- iv Reward/Incentives to informers
- v Vaccination of domestic cattle

- vi Field equipment and medicine for management of wild life, Purchase of capture cage, traps, immobilizing gun, darts, drug, GPS, Compass.

(i) Fruit bearing and bamboo plantation:

Since all wildlife in nature live in complex web of linkage with other organism, the proper evaluation of habitat of each species followed by the proper management is very essential. The plant life provides congenial home to wildlife therefore the habitat of wildlife in core zone area is to be improved by supplementing the Bamboo/fruit bearing shrubs or shrubs with fodder values, herbs and also supported by minor soil conservation works. For this purpose bushes, shrubs & herbs forests are to be maintained and no grass should be removed from the home range of the wildlife so that habitat of wildlife could be prescribed & protected. Nirgal Bamboo and fruit bearing shrubs or shrubs with fodder value and grasses will be planted as per site location; the blank area in the forests in high reaches along ridge should be maintained as pasture land by sowing suitable indigenous grasses for the need of wild herbivores which are prey base for the carnivores. The nirgal bamboo/shrubs/herbs in the under storey is very important for conservation of pheasants which are highly endangered species i.e. Western Tragopan and Cheer Pheasants etc. The detail plantation programme has already been given in the component of Biological Measures—Improvement of tree cover in order to achieve the objective and reduce the pressure from the forest area.

(ii) Publicity for awareness through Kala Jatha (NukarNatak)

For the wide publicity of wild life in the Non Protected areas, Publicity through organizing Kala Jatha (NukarNatak) will be organized and provision for the same is kept for this purpose.

(v) Engagement of Anti-Poacher:

The forest area is required to be guarded against poaching throughout the year. In order to curb nefarious activities poachers, anti poaching measures like construction of check post/chowkies and joint patrolling is to be organized by engaging ex-serviceman and local un-employed youth. Local youth are to be trained and engaged them to give assistance to field staff and clues regarding Poaching in a project/ sanctuary area. A forest guard will have two wild life watchers while going on patrolling in the forests. These wild life watchers are to be engaged seasonally and for a short duration so that they will not claim regularization of their services. These wild life watchers will also act as local informers. Therefore, an amount of Rs. 100800 is required to meet this purpose during the plan period.

(vi) Vaccination of domestic cattle:

Due to use of water holes/ponds and grazing by the live stock in the forests and vice versa may lead the wild animals to health hazards. Therefore an effective vaccination programme is recommended for foot and mouth disease in sheep and goats and other cattle adjoining to the Sanctuary areas. The migratory grazier must also be vaccinated before entered to the Sanctuary area. The veterinary department must be associated for this purpose. The staff should be trained in pathological problems and collection of samples. Therefore, an amount of Rs. 85,000 is required to meet this purpose during the plan period.

(vi) Field equipment and medicine for management of wildlife

The rich and unique bio-diversity of catchment area is under tremendous pressures and stress due to ever increasing demographic pressure. Increasing conflicts between Wildlife and local communities is a major factor that leads to antagonism among the people and discourage the forest official to appropriately enforce the existing laws.

The State of Himachal Pradesh has experienced escalation in the human-wildlife conflict in the last one decade. Almost all PAs in the State are surrounded by private land or other man-modified habitats where the presence of several wild animals, particularly predators i.e. Leopard and Black Bear is intolerable. These species increasingly venture into human settlements and cultivated areas in search of food and cause loss of human lives or injuries, livestock predation or extensive damage to the horticulture/agriculture crops and other private properties. The escalation in the human-wild life conflict is an outcome of shrinkage, fragmentation and degradation of habitats. Special field training/workshop on wildlife damage control with emphasis on use and handling of animal repellants, deterrents, snares, traps, capture devices nets and accessories and power fencing etc. need to be organized. Besides above staff should be well equipped with all necessary capture traps and squeeze cages and immobilizing equipments required for capture and handling of problem of Leopard. The equipment will help in capturing of such animals and release them in their natural habitat or zoo under the provision of Wildlife (P) Act, 1972

The field equipment and medicine will be purchased by the project authority and made available to the Division.

- (1) Physical capture cages, traps, immobilizing gun, darts, drugs.

- (2) Animal rescue, translocation/transportation.
- (3) Capture devices net and accessories etc.
- (4) Field measurement-GPS/PDA, altimeter, pedometer, compass, Handy cam, Census equipments.
- (5) Binoculars and spotting scope etc.
- (6) Medicines

Therefore, an amount of Rs. 200000 is required to meet this purpose during the plan period.

(b) Mitigation of Human-Wildlife Conflict

The communities of this project area largely occupied forestry region where for a long period in their history, they have lived in isolation but in harmony with the nature. They draw their sustenance largely from the forests for their day to day consumption and their livelihood. Their life is connected one way or the other with forest and wildlife, right from birth to death. We cannot deny the needs of the society as the local people who live in harmony with the forests; environment and ecologically they cannot be disregarded. Mitigation of Wildlife problems in hilly area is very complicated and therefore there is urgent need for development of livelihood approach that can minimize or reduce the man Wildlife conflict to tolerable level. In order to achieve their objectives and reduce the pressure from forest and maintain ecological balance, the conservation of wild life along with eco-development activities in the adjoining Sanctuary area. The following important mitigative measures are to be undertaken in the regard area as under: -

i. Wildlife compensation against damages:

Wildlife damages on human life and property is a major cause of alienation of local communities from wildlife conservation. Timely payment of compensation against the depredation of wildlife goes a

long way in eliciting local support. There are instances of damage to apple tree/crops, bee keeping farming, agricultural crops etc. whereas we are meeting the compensation for damage to domestic cattle and human loss/injury by wild animals only. Therefore, an amount of Rs. 2,14,200 has been proposed for this purpose during the plan period.

ii. Extension of Sarahan Pheasantry at Gopalpur

The SarahanPheasantry was established during the year 1987-88 comprising total area of Phasantry about 11-12-37 hac. and is located near the Nalati Stadium about half km. from the famous "MAA BHIMAKALI" Temple at Sarahan. It was initially setup as rescue and rehabilitation centre for the Wild Western Himalayan fauna driven from the habitations for food due to snow fall at higher reaches. It was only where the captive breeding of Western red listed Pheasants was added during the year 1990-91 and construction of enclosure was taken up with special attention to pen, hygiene and feed etc. During the year 1993-94 Sarahan Pheasantry witnessed the first ever breeding of Western Tragopan in captivity in the World. It is the only SarahanPheasantry in the World where this rare endangered species kept in captivity at SarahanPheasantry. And now the presents SarahanPheasantry proposed to be established conservation breeding project of Western Tragopan will lead the World in Pheasants re-introduction programme under the guidelines of IUCN besides to standardize techniques for the conservation breeding of red listed pheasant of the western Himalayas. The Sutlej valley has, over the years, come to be recognized as having large scale potential for generation of Hydro Electric Power Project. The Project authorities are under obligation to fund available in lieu of disturbance and maintenance of ecological balance cause during the project activities in the Sutlej catchment. Keeping in view of this facts and

reason the development and management of ex-situ conservation of breeding centre for endangered species will therefore be made during the plan period.

The Hon'ble Chief Minister of Himachal Pradesh has decided in the meeting held on 10.08.2007 that an alternative site for conservation breeding of Western Tragapon at Gopalpur may be setup to avoid any out breaking disease etc. Accordingly the transfer an area of 6.3 hac. from DFO Rampur to DFO Wildlife Sarahan has already been made by the order of Pr. CCF H.P. along with all assets and infrastructure to establish the alternative site of SarahanPheasantry at Gopalpur. The fencing works of alternative sites of SarahanPheasantry had already been commenced and it was decided in the meeting that funds will be met from the CAT Plan of each Hydro Power Project in Suttlej Valley so that the objective of the conservation breeding at alternative site at Gopalpur could be achieved.

Therefore a provision of Rs. 1.25 lac has been made for this purpose during the plan period and funds will be utilized with the approval of the competent authority under the supervision of the CZA New Delhi.

5.10.1 Monitoring and Evaluation:

The regular in house quarterly monitoring will be conducted/ organized during the plan period in addition to third party monitoring. The internal Monitoring Committee would be constituted as below:

1. Conservator of Forests Rampur, Chairman.
2. DFO Wild Life Sarahan, Member.
3. A.C.F. Rampur, Member
4. Representative of PRI, Member
5. Representative of user agency, Member
6. Range Officer Rampur, Member
7. D.F.O. Rampur, Member Secretary

The committee would need to ensure the implementation and monitoring of the catchments area works and review progress from time to time. The implementing agency upon its approval will provide a copy of the approved APO giving details such as list of areas along with the works to be taken up and their costs to each member of the committee. The committee shall strive to make the monitoring process transparent. Meeting of this committee shall be convened at least thrice in a year or as and when required in emergency with due approval from members and higher competent authorities. All non official members shall be entitled to TA/DA as per rates approved and being followed by D.C. Shimla.

Beside this the 3rd party monitoring of the CAT Plan works will also be done. The indicator for monitoring impact of the CAT Plan will include:-

- i) Change in silt load
- ii) Survival of plantations
- iii) The changes in the water discharge in nature springs
- iv) Change in land – use (Private holdings)
- v) Changes in man animal conflicts
- vi) Status & functioning of User group
- vii) Trend of fire incidence in vulnerable areas

All the expenditure incurred on this shall be met from this head of Monitoring and Evaluation. 5% of the cost of CAT Plan has been kept reserved for this purpose. Therefore an outlay for Rs. 8,45,000 is proposed to be incurred under the scheme during the plan period.

5.11.1 Site specific/Micro Planning:

In the proposed CAT Plan, activities of plan are given component wise and area specific. Further site specific Micro Planning will be required at the time of execution of CAT Plan with the consultation of JFMCs. Moreover, if certain new techniques/innovations occur in due course of time, these can be taken up as per requirement of site and particular

Location. Therefore 5% of total CAT Plan outlay amounting to Rs. 8, 45,000 is proposed for this purpose during the plan period.

5.12.1 Contingencies:

5% of the CAT plan has been earmarked as contingency to cover any unforeseen situation/activities.

CHAPTER-VI

ORGANIZATION STRUCTURE AND IMPLEMENTATION

- 6.1 This CAT Plan will be implemented by the H.P. Forest Department through the society meant for the purpose. At the field level the actual implementation will be done by D.F.O. Rampur having territorial jurisdiction over the areas covered under this Plan. The DFO Rampur will be assisted by the regular staff posted under them and may also hire local consultants on short term basis for implementation of the CAT Plan.

In compliance of Hon'ble Supreme Court of India, an agency called "CAMPA" compensatory afforestation fund management and planning authority has been created on the recommendations of the Central Empowered Committee (CEC) for examining the issues pertaining to compensatory afforestation net present value of diverted forest land, other monies recoverable received to be utilized for carrying out the above works.

The Govt. of India, Ministry of Environment and Forests, have notified Governing Body and Executive Body for function of the CAMPA. Mean while a bill has been introduced in the Lok Sabha (Parliament) to lay down the CAMPA (Compensatory afforestation Forest management and Planning Authority) Rules. The monies on account of the CA, NPV and CAT Plan are now to be deposited in the above fund and spent in the manner provided by the MOEF. In compliance to the instructions contained in Ministry of Environment and Forests, Government of India's letter No. 1-58/09-MoS(l/c)-E&F dated 15th July 2009, the Governor of Himachal Pradesh has reconstituted "State Compensatory Afforestation Fund Management and Planning Authority (State CAMPA) vide H.P. Govt.

Notification no FFE-B-F(2)-72/2004-Pt-II intended as an instrument to accelerate activities for Compensatory Afforestation, forest resource management, preservation of natural forests, management of wildlife, infrastructure development in the sector and allied works.

State CAMPA would provide and integrate framework for utilizing multiple sources of funding and activities relating to protection and management of forests and wildlife. Its prime task would be regenerating natural forests and building up the institution engaged in this work. The State Forest Department would be modernized to protect and regenerate the forests and wildlife habitat.

The functions of State CAMPA shall include funding, overseeing and promoting Compensatory afforestation done in lieu of diversion of forest land for non-forestry use under the Forest (Conservation) Act, 1980 and also the execution of Catchment Area Treatment plans. The State CAMPA shall function through a Governing Body, as Steering Committee and an Executive Committee. The Governing Body shall lay down the broad policy framework for the functioning of State level CAMPA and review its working from time to time. The Steering Committee shall monitor the progress of the utilization of funds released by the State CAMPA and approved the Annual Plan of Operation (APO) prepared by the Executive Committee. The State level executive Committee shall take all steps for giving effect to the State CAMPA and overarching objectives and core principles, in accordance with the rules and procedures approved by the Steering Committee and the approved APO. The State level Executive Committee shall supervise the works being implemented in the State out of the funds released from the State CAMPA and be responsible for proper auditing of both receipt and expenditure of funds. An independent system for concurrent monitoring and evaluation of the works

implemented from the State CAMPA funds shall be evolved and implemented to ensure effective and proper utilization of funds.

The works will be executed strictly in accordance with the State CAMPANotification dated 03.08.2009 through the Conservator of Forests-cum-Project Director. The implementation will be at field level by the DFO Rampur having jurisdiction over the area under the plan in Rampur Forest Division.

The works will be carried out as per the annual plan of operations to be prepared on the basis of year wise phasing out of the physical & financial targets. The APOs will be got approved from the State CAMPA through the Pr. CCF as envisaged in the CAMPA Notification.

6.2 Implementation Staff:

The existing staff of Rampur Forest Division will be involved for the implementation of CAT Plan works in addition to their own duties. However, for proper execution of works and utilization of the money for the treatment of the catchments area DFO will be authorized to engage staff on contract basis with the approval of society.

6.3 Cost Escalation:

The present cost projections are based on the prevailing wage rates of the year 2011-12. The cost of the project will escalate as and when wage rates are hiked by the H.P. Government from time to time. To overcome this situation, a provision has been made that with the increase in the cost of the project the outlay of CAT Plan will proportionately be increased. For this every 2 years there will be review.

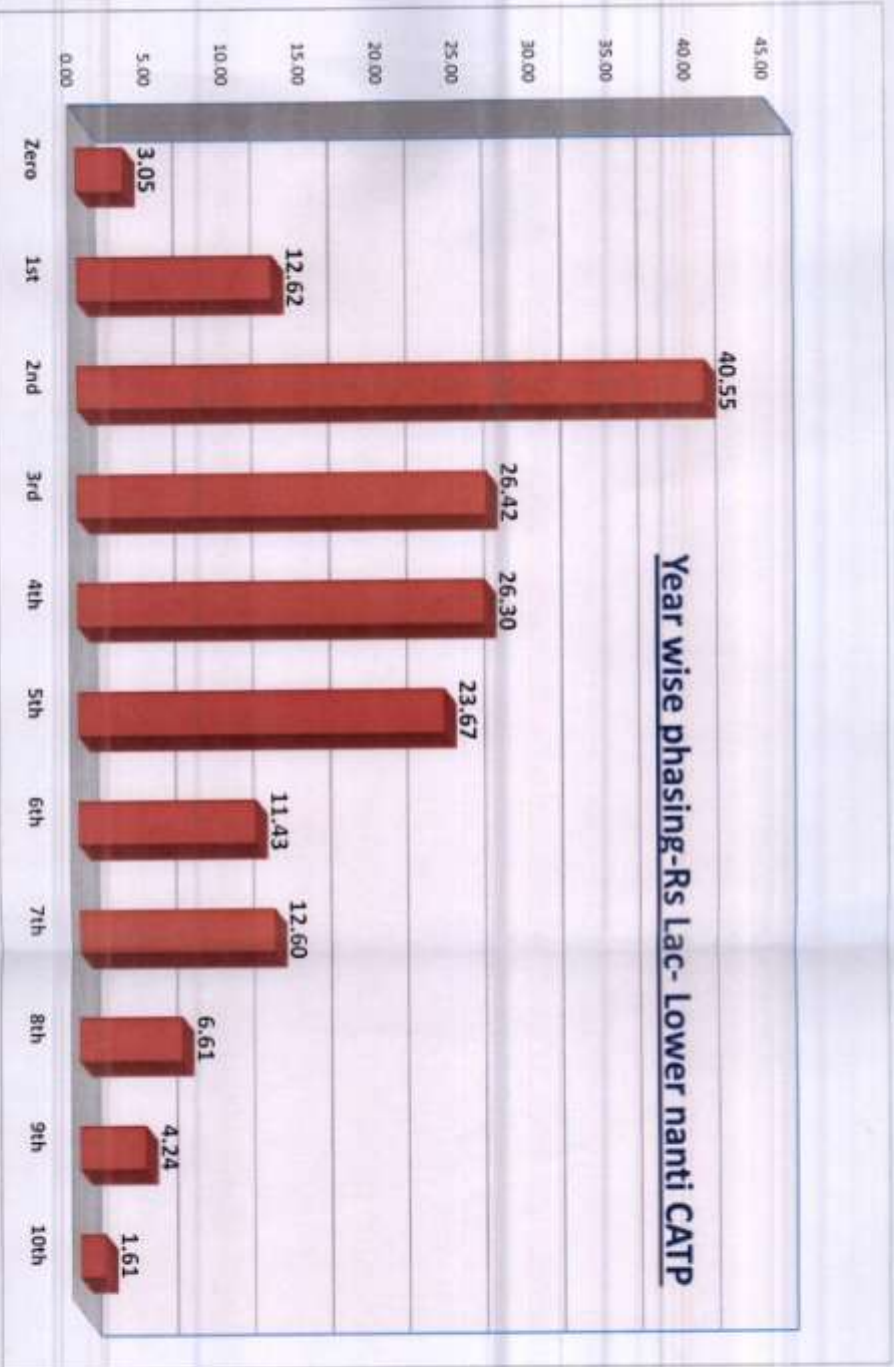
CHAPTER-VII**COST ESTIMATE****7.1 Total Project Cost:**

Cost of the various component have been worked out on schedule rate for the year 2011-12 as applicable in Rampur Forest Circle H.P. Forest Department. The detail of expenditure for various components has been shown in the respective chapter. Total project cost for 11 years will be as under:

Year	Amount (Rs. lac)
Zero Year	3.05
Ist Year	12.62
IInd Year	40.55
Third Year	26.42
Fourth Year	26.30
Fifth Year	23.67
Sixth Year	11.43
Seventh Year	12.60
Eighth Year	6.61
Nineth Year	4.24
Tenth Year	1.61
Total Cost of CAT PLAN	169.10

Lower Nanti-Year wise Expenditure break up

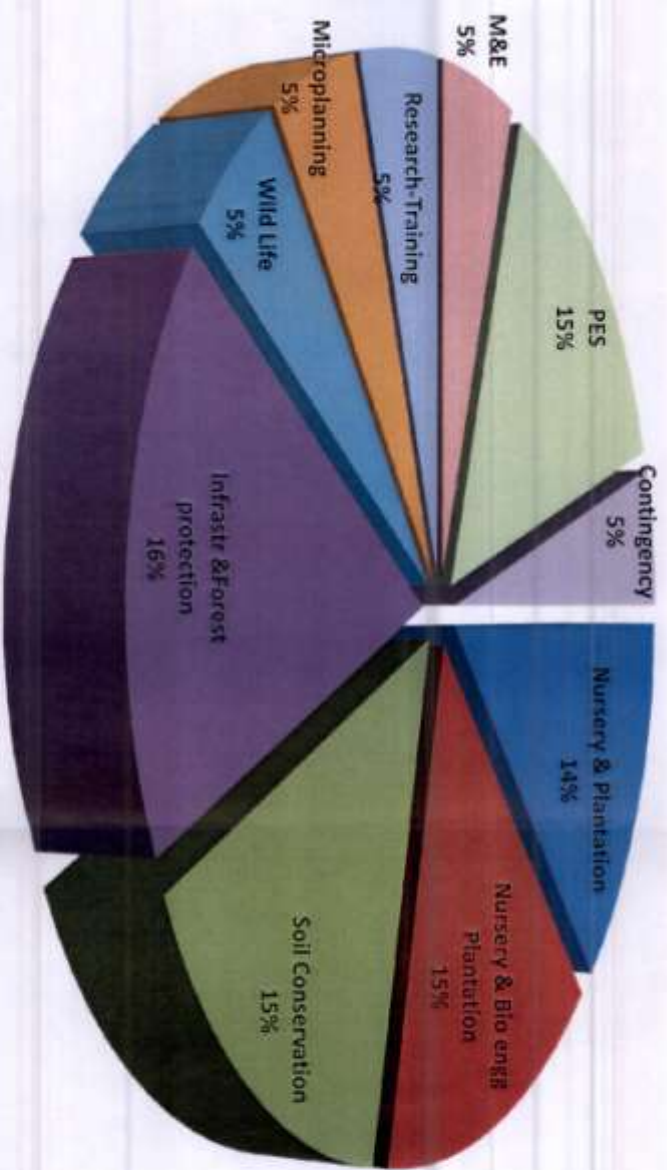
S. No.	Year	Rs-Lac.
1	Zero	3.05
2	1st	12.62
3	2nd	40.55
4	3rd	26.42
5	4th	26.30
6	5th	23.67
7	6th	11.43
8	7th	12.60
9	8th	6.61
10	9th	4.24
11	10th	1.61
	Total	169.10



Lower Nanti-Component wise expenditure

Component	Rs-lac
Nursery & Plantation	23.21
Nursery & Bio engg Plantation	25.1
Soil Conservation	25.1
Infrastr & Forest protection	28.1
Wild Life	8.45
Microplanning	8.45
Research-Training	8.45
M&E	8.45
PES	25.35
Contingency	8.45
Total	169.11

% allocation of activities-Lower Nanti CATP



7.2 Annual Phasing:

Annual phasing of works to be carried out in Lower Nanti HEP CAT Plan has been done for 11 years. The year wise phasing of Financial Outlay of CAT Plan is attached as Annexures.

Detail of work during zero year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs	
1	Bio-logical Measures-			
	(a) Nursery Development			
	(i) Extension of nursery	2	150000	
	(ii) Maintenance of existing Nurseries		0	
	(b) Enrichment planting			
	New		0	
	Maintenance		0	
	(c) Energy plantation			
	New		0	
	Total (1)		2	150000
2	Soil Conservation works-Engineering			
	(i) Stabilization of land slides/Slips	0	0	
	(ii) Stabilization of Nullah	0	0	
Total (2)		0	0	
3	Payment of Eco-Services		0	
4	Forest Infrastructure Development & Forest Protection			
	(i) Maintenance of FRH Phancha	0	0	
	(ii) Maintenance of Fgd. Hut at Phancha	0	0	
	(iii) Maintenance of I. Hut at Jhagori	0	0	
	(iv) Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)	0	0	
	(v) Mobility for Protection-Vehicle	0	0	
	(vi) Office Equipments	0	0	
	(vii) O.E.	0	0	
	(viii) Maintenance of Vehicle	0	0	
	(ix) Amenities to staff & labour	0	0	
	(a) Energy Saving devices	0		
	(i) LPG Cylinders On 50 % cost sharing	0	0	
	(ii) Distribution of Solar lights	0	0	
	(iii) Induction heater/cooker	0	0	
	(b) Construction and repair of existing boundary pillars/chak pillars	0	0	
	(c) Sign & Slogan Boards	0	0	
	(d) Reward/Incentive to informers	0	0	
	Total (4)		0	0

5	Management of Wildlife in outside the Protected Area				
	(a)	Improvement and Development of wildlife		0	
		(i)	Engagement of Anti-Poacher	0	0
		(ii)	Vaccination of domestic cattle	0	0
		(iii)	Publicity for awareness through Kala Jatha (NukarNatak)	0	0
		(iv)	Field equipments and medicine for management of wildlife	0	0
(b)	Mitigation of Human Wildlife Conflict		0		
(c)	Extension of Sarahan Pheasantry at Gopalpur	0	0		
	Total (5)		0	0	
6	Research studies & Training				
7	Monitoring & Evaluation				
8	Site Specific Work Plan			100000	
9	Contingencies		0	55000	
Grand Total			2	305000	

Detail of work during 1st year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs	
1	Bio-logical Measures-			
	(a) Nursery Development			
	(i) Extension of nursery	2	100000	
	(ii) Maintenance of existing Nurseries	2	100000	
	(b) Enrichment planting			
	New		0	
	Maintenance		0	
	(c) Energy plantation			
	New		0	
	Total (1)		4	200000
2	Soil Conservation works-Engineering			
	(i) Stabilization of land slides/Slips		300000	
	(ii) Stabilization of Nullah		250000	
Total (2)		0	550000	
3	Payment of Eco-Services		0	
4	Forest Infrastructure Development & Forest Protection			
	(i) Maintenance of FRH Phancha	1	50000	
	(ii) Maintenance of Fgd. Hut at Phancha		0	
	(iii) Maintenance of I. Hut at Jhagori		0	
	(iv) Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		0	
	(v) Mobility for Protection-Vehicle		0	
	(vi) Office Equipments		0	
	(vii) O.E.		0	
	(viii) Maintenance of Vehicle		0	
	(ix) Amenities to staff & labour		0	
	(a) Energy Saving devices			
	(i) LPG Cylinders On 50 % cost sharing		0	
	(ii) Distribution of Solar lights		0	
	(iii) Induction heater/cooker		0	
	(b) Construction and repair of existing boundary pillars/chak pillars		0	
	(c) Sign & Slogan Boards		0	
	(d) Reward/Incentive to informers		0	
	Total (4)		1	50000

5	Management of Wildlife in outside the Protected Area		
(a)	Improvement and Development of wildlife		
(i)	Engagement of Anti-Poacher		14400
(ii)	Vaccination of domestic cattle	L/s	15000
(iii)	Publicity for awareness through Kala Jatha (NukarNatak)	1	30000
(iv)	Field equipments and medicine for management of wildlife		0
(b)	Mitigation of Human Wildlife Conflict		0
(c)	Extenssion of Sarahan Pheasantry at Gopalpur	L/s	50000
	Total (5)	1	109400
6	Research studies & Training		
7	Monitoring & Evaluation		
8	Site Specific Work Plan		250000
9	Contingencies		102945
	Grand Total	6	1262345

Detail of work during 2nd year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs	
1	Bio-logical Measures-			
	(a)	Nursery Development		
	(i)	Extension of nursery	2	50000
	(ii)	Maintenance of existing Nurseries	2	100000
	(b)	Enrichment planting		
		New		0
		Maintenance		0
	(c)	Energy plantation		
		New		
	Total (1)		4	150000
2	Soil Conservation works-Engineering			
	(i)	Stabilization of land slides/Slips		400000
	(ii)	Stabilization of Nullah		350000
Total (2)		0	750000	
3	Payment of Eco-Services		350000	
4	Forest Infrastructure Development & Forest Protection			
	(i)	Maintenance of FRH Phancha		0
	(ii)	Maintenance of Fgd. Hut at Phancha	1	250000
	(iii)	Maintenance of I. Hut at Jhagoni		0
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		500000
	(v)	Mobility for Protection-Vehicle		600000
	(vi)	Office Equipments		0
	(vii)	O. E.		15000
	(viii)	Maintenance of Vehicle		15000
	(ix)	Amenities to staff & labour		10000
	(a)	Energy Saving devices		
	(i)	LPG Cylinders On 50 % cost sharing		0
	(ii)	Distribution of Solar lights		0
	(iii)	Induction heater/cooker		0
	(b)	Construction and repair of existing boundary pillars/chak pillars		0
	(c)	Sign & Slogan Boards		0
	(d)	Reward/Incentive to informers		0
	Total (4)		1	1390000

5	Management of Wildlife In outside the Protected Area		
(a)	Improvement and Development of wildlife		
(i)	Engagement of Anti-Poacher		14400
(ii)	Vaccination of domestic cattle	L/s	15000
(iii)	Publicity for awareness through Kala Jatha	1	30000
(iv)	Field equipments and medicine for management of wildlife	L/s	100000
(b)	Mitigation of Human Wildlife Conflict		
(c)	Extenssion of Sarahan Pheasantry at Gopalpur	L/s	50000
	Total (5)	1	209400
6	Research studies & Training		845000
7	Monitoring & Evaluation		
8	Site Specific Work Plan		200000
9	Contingencies		160970
	Grand Total	6	4055370

Detail of work during 3rd year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs	
1	Bio-logical Measures-			
	(a) Nursery Development			
	(i)	Extension of nursery	2	25000
	(ii)	Maintenance of existing Nurseries	2	50000
	(b) Enrichment planting			
		New	10	249000
		Maintenance		0
(c) Energy plantation				
	New		0	
Total (1)		14	324000	
2	Soil Conservation works-Engineering			
	(i)	Stabilization of land slides/Slips		500000
	(ii)	Stabilization of Nullah		500000
Total (2)		0	1000000	
3	Payment of Eco-Services		400000	
4	Forest Infrastructure Development & Forest Protection			
	(i)	Maintenance of FRH Phancha		0
	(ii)	Maintenance of Fgd. Hut at Phancha		0
	(iii)	Maintenance of I. Hut at Jhagori	1	210000
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		150000
	(v)	Mobility for Protection-Vehicle		0
	(vi)	Office Equipments -Computer- 1 No along with accessories		50000
	(vii)	O.E.		15000
	(viii)	Maintenance of Vehicle		15000
	(ix)	Amenities to staff & labour		10000
	(a) Energy Saving devices			
	(i)	LPG Cylinders On 50 % cost sharing		0
	(ii)	Distribution of Solar lights		0
	(iii)	Induction heater/cooker		0
	(b)	Construction and repair of existing boundary pillars/chak pillars		10000
	(c)	Sign & Slogan Boards		0
	(d)	Reward/Incentive to informers	L/s	5000
	Total (4)		1	465000

5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
	(i)	Engagement of Anti-Poacher		14400
	(ii)	Vaccination of domestic cattle	L/s	20000
	(iii)	Publicity for awareness through Kala Jatha (NukarNatak)	1	30000
	(iv)	Field equipments and medicine for management of wildlife	L/s	100000
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur	L/s	25000
		Total (5)	1	189400
6	Research studies & Training			
7	Monitoring & Evaluation			150000
8	Site Specific Work Plan			113670
9	Contingencies			
		Grand Total	16	2642070

Detail of work during 4th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs		
1	Bio-logical Measures-				
	(a)	Nursery Development			
		(i)	Extension of nursery	2	25000
	(ii)	Maintenance of existing Nurseries	2	20000	
	(b)	Enrichment planting			
		New		5	124500
		Maintenance			
			1st year maintenance	10	47600
			2nd year maintenance		0
			3rd year maintenance		0
			4th year maintenance		0
		5th year maintenance		0	
	(c)	Energy plantation			
New		5	331000		
Total (1)		24	548100		
2	Soil Conservation works-Engineering				
	(i)	Stabilization of land slides/Slips		550000	
	(ii)	Stabilization of Nullah		600000	
Total (2)		0	1150000		
3	Payment of Eco-Services		450000		
4	Forest Infrastructure Development & Forest Protection				
	(i)	Maintenance of FRH Phancha		0	
	(ii)	Maintenance of Fgd. Hut at Phancha		0	
	(iii)	Maintenance of I. Hut at Jhagori		0	
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		100000	
	(v)	Mobility for Protection-Vehicle		0	
	(vi)	Office Equipments GPS - 4Nos		50000	
	(vii)	O.E.		15000	
	(viii)	Maintenance of Vehicle		15000	
	(ix)	Amenities to staff & labour		8000	
	(a)	Energy Saving devices			
		(i)	LPG Cylinders On 50 % cost sharing		0
		(ii)	Distribution of Solar lights		0
		(iii)	Induction heater/cooker		0
	(b)	Construction and repair of existing boundary pillars/chak pillars		10000	
(c)	Sign & Slogan Boards		2500		
(d)	Reward/Incentive to informers	L/s	5000		

	Total (4)		0	205500
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
	(i)	Engagement of Anti-Poacher		14400
	(ii)	Vaccination of domestic cattle	L/s	20000
	(iii)	Publicity for awareness through Kala Jatha (NukarNatak)	1	30000
	(iv)	Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur	L/s	0
	Total (5)		1	64400
6	Research studies & Training			0
7	Monitoring & Evaluation			0
8	Site Specific Work Plan			100000
9	Contingencies			111925
	Grand Total			2629925

Detail of work during 5th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs		
1	Bio-logical Measures-				
	(a)	Nursery Development			
		(i)	Extension of nursery	2	20000
	(ii)	Maintenance of existing Nurseries	2	10000	
	(b)	Enrichment planting			
		New		10	249000
		Maintenance			
			1st year maintenance	5	23800
			2nd year maintenance	10	31700
			3rd year maintenance		0
			4th year maintenance		0
		5th year maintenance		0	
	(c)	Energy plantation			
		New		5	331000
Total (1)		34	665500		
2	Soil Conservation works-Engineering				
	(i)	Stabilization of land slides/Slips		250000	
	(ii)	Stabilization of Nullah		700000	
Total (2)		0	950000		
3	Payment of Eco-Services		375000		
4	Forest Infrastructure Development & Forest Protection				
	(i)	Maintenance of FRH Phancha		0	
	(ii)	Maintenance of Fgd. Hut at Phancha		0	
	(iii)	Maintenance of I. Hut at Jhagori		0	
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		100000	
	(v)	Mobility for Protection-Vehicle		0	
	(vi)	Office Equipments (Computer- 1 No along with accessories, GPS - 4Nos		0	
	(vii)	O.E.		15000	
	(viii)	Maintenance of Vehicle		15000	
	(ix)	Amenities to staff & labour		7000	
	(a)	Energy Saving devices			
		(i)	LPG Cylinders On 50 % cost sharing	10	20000
		(ii)	Distribution of Solar lights	1	10000
		(iii)	Induction heater/cooker		0
		(b)	Construction and repair of existing boundary pillars/chak pillars		10000
(c)	Sign & Slogan Boards		2500		
(d)	Reward/Incentive to informers		10000		

	Total (4)	11	189500
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5 Management of Wildlife in outside the Protected Area

(a) Improvement and Development of

	Total (4)		11	189500
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
		(i) Engagement of Anti-Poacher		14400
		(ii) Vaccination of domestic cattle	0	0
		(iii) Publicity for awareness through Kala Jatha (NukarNatak)		0
		(iv) Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur		0
	Total (5)		0	14400
6	Research studies & Training			0
7	Monitoring & Evaluation			0
8	Site Specific Work Plan			45000
9	Contingencies			127695
	Grand Total			2367095

Detail of work during 6th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs		
1	Bio-logical Measures-				
	(a)	Nursery Development			
		(i)	Extension of nursery	2	10000
	(ii)	Maintenance of existing Nurseries	2	5000	
	(b)	Enrichment planting			
		New		0	
		Maintenance			
			1st year maintenance	10	47600
			2nd year maintenance	5	15850
			3rd year maintenance	10	24100
			4th year maintenance		0
		5th year maintenance		0	
	(c)	Energy plantation			
		New		0	
Total (1)		29	102550		
2	Soil Conservation works-Engineering				
	(i)	Stabilization of land slides/Slips	0		
	(ii)	Stabilization of Nullah	0		
Total (2)		0	0		
3	Payment of Eco-Services				
4	Forest Infrastructure Development & Forest Protection				
	(i)	Maintenance of FRH Phancha	0		
	(ii)	Maintenance of Fgd. Hut at Phancha	0		
	(iii)	Maintenance of I. Hut at Jhagori	0		
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		50000	
	(v)	Mobility for Protection-Vehicle		0	
	(vi)	Office Equipments (Computer- 1 No along with accessories, GPS - 4Nos		0	
	(vii)	O.E		10000	
	(viii)	Maintenance of Vehicle		10000	
	(ix)	Amenities to staff & labour		5000	
	(a)	Energy Saving devices			
		(i)	LPG Cylinders On 50 % cost sharing	10	20000
		(ii)	Distribution of Solar lights	1	10000
		(iii)	Induction heater/cooker		0
(b)		Construction and repair of existing boundary pillars/chak pillars		0	
(c)		Sign & Slogan Boards		0	
(d)	Reward/Incentive to informers		5000		

	Total (4)		11	110000
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
		(i) Engagement of Anti-Poacher		14400
		(ii) Vaccination of domestic cattle	L/s	15000
		(iii) Publicity for awareness through Kala Jatha		0
		(iv) Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur		0
		Total (5)	0	29400
6	Research studies & Training			
7	Monitoring & Evaluation			845000
8	Site Specific Work Plan			
9	Contingencies			56098
	Grand Total			1143048

Detail of work during 7th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs
1	Bio-logical Measures-		
	(a) Nursery Development		
	(i) Extension of nursery	2	10000
	(ii) Maintenance of existing Nurseries	2	5000
	(b) Enrichment planting		0
	New		
	Maintenance		
	1st year maintenance		
	2nd year maintenance	10	31700
	3rd year maintenance	5	12050
	4th year maintenance	10	15500
	5th year maintenance		0
	(c) Energy plantation		
New			
Total (1)		29	74250
2	Soil Conservation works-Engineering		
	(i) Stabilization of land slides/Slips		400000
	(ii) Stabilization of Nullah		400000
Total (2)		0	400000
3	Payment of Eco-Services		
4	Forest Infrastructure Development & Forest Protection		
	(i) Maintenance of FRH Phancha		0
	(ii) Maintenance of Fgd. Hut at Phancha		0
	(iii) Maintenance of I. Hut at Jhagori		50000
	(iv) Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		0
	(v) Mobility for Protection-Vehicle		0
	(vi) Office Equipments		10000
	(vii) O.E.		10000
	(viii) Maintenance of Vehicle		5000
	(ix) Amenities to staff & labour		
	(a) Energy Saving devices		
	(i) LPG Cylinders On 50 % cost sharing	10	20000
	(ii) Distribution of Solar lights	1	10000
	(iii) Induction heater/cooker	5	10000
(b) Construction and repair of existing boundary pillars/chak pillars		0	
(c) Sign & Slogan Boards		0	
(d) Reward/Incentive to informers		5000	

	Total (4)		16	120000
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
	(i)	Engagement of Anti-Poacher		0
	(ii)	Vaccination of domestic cattle		0
	(iii)	Publicity for awareness through Kaia Jatha (NukarNatak)		0
	(iv)	Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		214200
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur		0
	Total (5)		0	214200
6	Research studies & Training			0
7	Monitoring & Evaluation			0
8	Site Specific Work Plan			0
9	Contingencies			51713
	Grand Total			45
				1260163

Detail of work during 8th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs		
1	Bio-logical Measures-				
	(a)	Nursery Development			
		(i)	Extension of nursery	2	5000
	(ii)	Maintenance of existing Nurseries	2	5000	
	(b)	Enrichment planting			
		New		0	
		Maintenance			
		1st year maintenance		0	
		2nd year maintenance		0	
		3rd year maintenance		10	24100
		4th year maintenance		5	7750
	(c)	Energy plantation			
		New		0	
		Total (1)		29	57350
2	Soil Conservation works-Engineering				
	(i)	Stabilization of land slides/Slips	0		
	(ii)	Stabilization of Nullah	100000		
Total (2)		0	100000		
3	Payment of Eco-Services		350000		
4	Forest Infrastructure Development & Forest Protection				
	(i)	Maintenance of FRH Phancha	0		
	(ii)	Maintenance of Fgd. Hut at Phancha	0		
	(iii)	Maintenance of I. Hut at Jhagori	0		
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)	50000		
	(v)	Mobility for Protection-Vehicle	0		
	(vi)	Office Equipments (Computer- 1 No along with accessories, GPS - 4Nos	0		
	(vii)	O. E.	10000		
	(viii)	Maintenance of Vehicle	10000		
	(ix)	Amenities to staff & labour	5000		
	(a)	Energy Saving devices			
(i)		LPG Cylinders On 50 % cost sharing	10	20000	

	(ii)	Distribution of Solar lights	1	10000
	(iii)	Induction heater/cooker	5	10000
	(b)	Construction and repair of existing boundary pillars/chak pillars		0
	(c)	Sign & Slogan Boards		0
	(d)	Reward/Incentive to informers		5000
	Total (4)		16	120000
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
	(i)	Engagement of Anti-Poacher		0
	(ii)	Vaccination of domestic cattle		0
	(iii)	Publicity for awareness through Kala Jatha (NukarNatak)		0
	(iv)	Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extenssion of Sarahan Pheasantry at Gopalpur		0
	Total (5)		0	0
6	Research studies & Training			0
7	Monitoring & Evaluation			0
8	Site Specific Work Plan			0
9	Contingencies			33618
	Grand Total		45	660968

Detail of work during 9th year

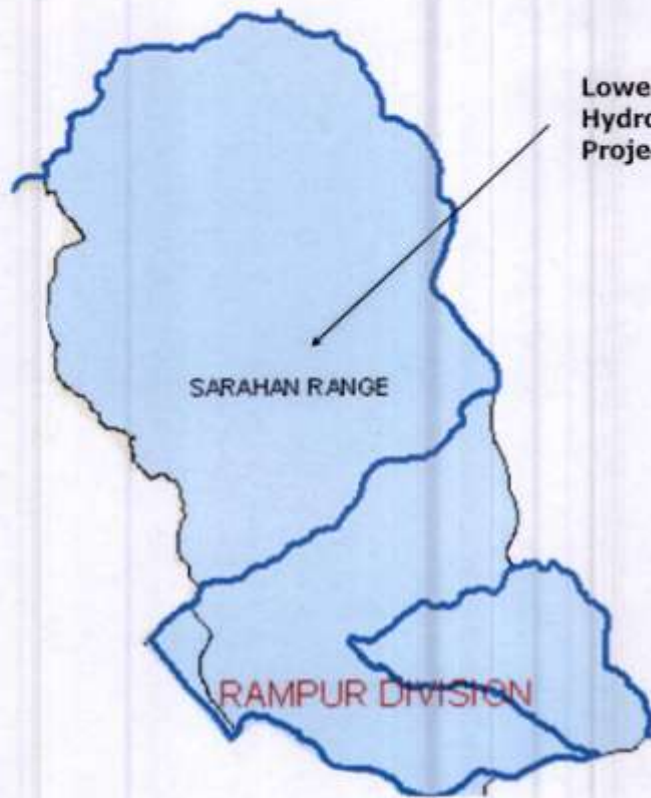
S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs
1	Bio-logical Measures-		
	(a) Nursery Development		
	(i) Extension of nursery	2	3000
	(ii) Maintenance of existing Nurseries	2	5000
	(b) Enrichment planting		
	New		0
	Maintenance		
	1st year maintenance		0
	2nd year maintenance		0
	3rd year maintenance		0
	4th year maintenance	10	15500
	5th year maintenance	5	7750
	(c) Energy plantation		
New		0	
	Total (1)	19	31250
2	Soil Conservation works-Engineering		
	(i) Stabilization of land slides/Slips		0
	(ii) Stabilization of Nullah		60000
	Total (2)	0	60000
3	Payment of Eco-Services		210000
4	Forest Infrastructure Development & Forest Protection		
	(i) Maintenance of FRH Phancha		0
	(ii) Maintenance of Fgd. Hut at Phancha		0
	(iii) Maintenance of I. Hut at Jhagori		0
	(iv) Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)		50000
	(v) Mobility for Protection-Vehicle		0
	(vi) Office Equipments		0
	(vii) O.E.		5000
	(viii) Maintenance of Vehicle		5000
	(ix) Amenities to staff & labour		0
	(a) Energy Saving devices		
	(i) LPG Cylinders On 50 % cost sharing	10	20000
	(ii) Distribution of Solar lights	1	10000

	(iii)	Induction heater/cooker	5	10000
(b)		Construction and repair of existing boundary pillars/chak pillars		0
(c)		Sign & Slogan Boards		0
(d)		Reward/Incentive to informers		0
Total (4)			16	100000
5	Management of Wildlife in outside the Protected Area			
	(a)	Improvement and Development of wildlife		
	(i)	Engagement of Anti-Poacher		0
	(ii)	Vaccination of domestic cattle		0
	(iii)	Publicity for awareness through Kala Jatha (NukarNatak)		0
	(iv)	Field equipments and medicine for management of wildlife		0
	(b)	Mitigation of Human Wildlife Conflict		0
	(c)	Extension of Sarahan Pheasantry at Gopalpur		0
Total (5)			0	0
6	Research studies & Training			0
7	Monitoring & Evaluation			0
8	Site Specific Work Plan			0
9	Contingencies			22623
Grand Total			35	423873

Detail of work during 10th year

S. No.	Name of Component	Phy-ha/ Km/ No	Fin- Rs	
1	Bio-logical Measures-			
	(a)	Nursery Development		
		(i)	Extension of nursery	2
	(ii)	Maintenance of existing Nurseries		
	(b)	Enrichment planting		
		New		0
		Maintenance		0
		1st year maintenance		0
		2nd year maintenance		0
		3rd year maintenance		0
		4th year maintenance		0
	(c)	Energy plantation		
		New		0
		Total (1)		12
			17500	
2	Soil Conservation works-Engineering		0	
	(i)	Stabilization of land slides/Slips	0	
	(ii)	Stabilization of Nullah	60000	
Total (2)			0	
			60000	
3	Payment of Eco-Services		0	
4	Forest Infrastructure Development & Forest Protection			
	(i)	Maintenance of FRH Phancha	0	
	(ii)	Maintenance of Fgd. Hut at Phancha	0	
	(iii)	Maintenance of I. Hut at Jhagori	0	
	(iv)	Establishment Cost (Reimbursement of Salary & Contractual Amount to contractual Staff)	50000	
	(v)	Mobility for Protection-Vehicle	0	
	(vi)	Office Equipments	0	
	(vii)	O.E.	5000	
	(viii)	Maintenance of Vehicle	5000	
	(ix)	Amenities to staff & labour	0	
	(a)	Energy Saving devices		
		(i)	LPG Cylinders On 50 % cost sharing	0
		(ii)	Distribution of Solar lights	0
	(iii)	Induction heater/cooker	0	
(b)	Construction and repair of existing boundary pillars/chak pillars	0		
(c)	Sign & Slogan Boards	0		
(d)	Reward/Incentive to informers	0		
Total (4)			0	
			60000	

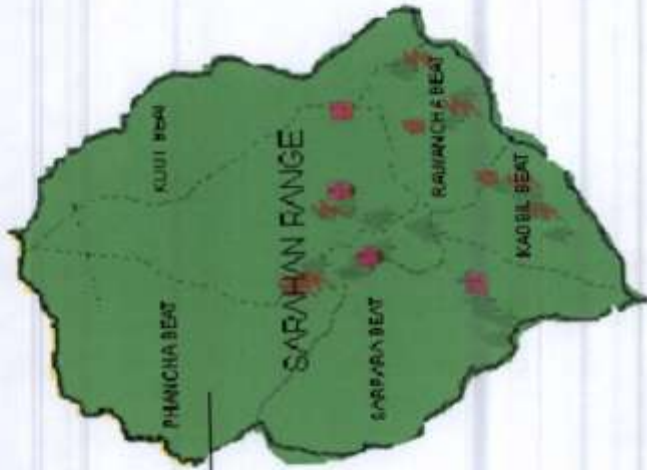
5	Management of Wildlife in outside the Protected Area				
	(a)	Improvement and Development of wildlife			
		(i)	Engagement of Anti-Poacher		14400
		(ii)	Vaccination of domestic cattle		0
		(iii)	Publicity for awareness through Kala Jatha (NukarNatak)		0
(iv)	Field equipments and medicine for management of wildlife		0		
(b)	Mitigation of Human Wildlife Conflict			0	
(c)	Extenssion of Sarahan Pheasantry at Gopalpur			0	
	Total (5)		0	14400	
6	Research studies & Training			0	
7	Monitoring & Evaluation			0	
8	Site Specific Work Plan			0	
9	Contingencies			8745	
	Grand Total		12	160645	



Lower Nanti
Hydro Electric
Project (10.00MW)



ADMINISTRATIVE MAP



**LOWER
NANTI HEP**

INDEX MAP - Sp3d MICROWATERSHED



Legend

- * Villages
- Soil Moisture Conservation NFA
- d Landslides
- Tributaries

LAYER

- Village Road
- Rivulets
- Minor Contours
- Major Contours
- MWs

1:45,000

INDEX MAP - Sp3b MICROWATERSHED



Legend

- | | |
|--|---|
| <ul style="list-style-type: none"> ✕ Forest Guard Hut 🏠 Forest Rest House Ⓛ Land slides 🌱 Nursery 🌳 Plantation 👤 Range HQ 🌿 Soil Moisture Conservation FA 🌿 Soil Moisture Conservation NFA 🏠 Villages | <p>LAYER</p> <ul style="list-style-type: none"> — Tributaries — Village Road — Rivulets — River — Minor Contours — Major Contours □ MWs |
|--|---|

1:45,000