Catchment Area Treatment (CAT) Plan
TANKUL SHP (12MW)
U.J.V.N. LTD.

Photo 1 : Locating Weir Site

Photo 4 : Proposed location for Surge Tank & Penstock

Photo 6 : Proposed Power House Site on the Right Bank of Mahakali

Plan Duration	**: 7 Yrs.**
Estimated Outlay	**: 236.94 Lakhs**
Executing Agency	**: Pithoragarh Forest Division**
Nodal Agency	**: Pithoragarh Forest Division**
Tehsil	**: Dharchula**
District	**: Pithoragarh**
Total Catchment Area	**: 5243 ha.**

DEPARTMENT OF FORESTS
UTTARAKHAND

INDEX

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

No_HH	No. of Households
TOT_P	Total Population
TOT_M	Total Males
TOT_F	Total Females
P_06	Population in age group (0-6) yrs.
M_06	Males in age group (0-6) yrs.
F_06	Females in age group (0-6) yrs.
P_SC	Total Population of Scheduled Castes
M_SC	Male Population of Scheduled Castes
F_SC	Female Population of Scheduled Castes
P_ST	Total Population of Scheduled Tribes
M_ST	Male Population of Scheduled Tribes
F_ST	Female Population of Scheduled Tribes
P_LIT	Population of Literates
M_LIT	Male Literates
F_LIT	Female Literates
P_ILL	Population of Illiterates
M_ILL	Male Iliterates
F_ILL	Female Iliterates
TOT_WORK_P	Total Population of Workers
TOT_WORK_M	Total Male Workers
TOT_WORK_F	Total Female Workers
MAINWORK_P	Total Main Workers
MAINWORK_M	Male Main Workers
MAINWORK_F	Female Main Workers
MAIN_CL_P	Total Main Cultivators
MAIN_CL_M	Male Main Cultivators
MAIN_CL_F	Female Main Ciltivators
MAIN_AL_P	Total Main Agricultural Laboures
MAIN_AL_M	Male Main Agricultural Laboures
MAIN_AL_F	Female Main Agricultural Laboures
MAIN_HH_P	Total Main Household Industry workers
MAIN_HH_M	Male Main Household Industry workers
MAIN_HH_F	Female Main Household Industry workers
MAIN_OT_P	Total Main Other Workers
MAIN_OT_M	Male Main Other Workers
MAIN_OT_F	Female Main Other Workers
MARGWORK_P	Total Marginal Workers
MARGWORK_M	Male Marginal Workers
MARGWORK_F	Female Marginal Workers
MARG_CL_P	Total Marginal Cultivators
MARG_CL_M	Male Marginal Cultivators
MARG_CL_F	Female Marginal Ciltivators
MARG_AL_P	Total Marginal Agricultural Laboures
MARG_AL_M	Male Marginal Agricultural Laboures

MARG_AL_F	Female Marginal Agricultural Laboures
MARG_HH_P	Total Marginal Household Industry workers
MARG_HH_M	Male Marginal Household Industry workers
MARG_HH_F	FemaleMarginal Household Industry workers
MARG_OT_P	Total Marginal Other Workers
MARG_OT_M	Male Marginal Other Workers
MARG_OT_F	Female MarginalOther Workers
MARGWORK_3_6_P	Total Marginal Workers worked 3 to 6 months
MARGWORK_3_6_M	Male Marginal Workers worked 3 to 6 months
MARGWORK_3_6_F	Female Marginal Workers worked 3 to 6 months
MARG_CL_3_6_P	Total Marginal Cultivators worked 3 to 6 months
MARG_CL_3_6_M	Male Marginal Cultivators worked 3 to 6 months
MARG_CL_3_6_F	Female Marginal Ciltivators worked 3 to 6 months
MARG_AL_3_6_P	Total Marginal Agricultural Laboures worked 3 to 6 months
MARG_AL_3_6_M	Male Marginal Agricultural Laboures worked 3 to 6 months
MARG_AL_3_6_F	Female Marginal Agricultural Laboures worked 3 to 6 months
MARG_HH_3_6_P	Total Marginal Household Industry workers worked 3 to 6 months
MARG_HH_3_6_M	Male Marginal Household Industry workers worked 3 to 6 months
MARG_HH_3_6_F	FemaleMarginal Household Industry workers worked 3 to 6 months
MARG_OT_3_6_P	Total Marginal Other Workers worked 3 to 6 months
MARG_OT_3_6_M	Male Marginal Other Workers worked 3 to 6 months
MARG_OT_3_6_F	Female MarginalOther Workers worked 3 to 6 months
MARGWORK_0_3_P	Total Marginal Workers worked 0 to 3 months
MARGWORK_0_3_M	Male Marginal Workers worked 0 to 3 months
MARGWORK_0_3_F	Female Marginal Workers worked 0 to 3 months
MARG_CL_0_3_P	Total Marginal Cultivators worked 0 to 3 months
MARG_CL_0_3_M	Male Marginal Cultivators worked 0 to 3 months
MARG_CL_0_3_F	Female Marginal Ciltivators worked 0 to 3 months
MARG_AL_0_3_P	Total Marginal Agricultural Laboures worked 0 to 3 months
MARG_AL_0_3_M	Male Marginal Agricultural Laboures worked 0 to 3 months
MARG_AL_0_3_F	Female Marginal Agricultural Laboures worked 0 to 3 months
MARG_HH_0_3_P	Total Marginal Household Industry workers worked 0 to 3 months
MARG_HH_0_3_M	Male Marginal Household Industry workers worked 0 to 3 months
MARG_HH_0_3_F	FemaleMarginal Household Industry workers worked 3 to 6 months
MARG_OT_0_3_P	Total Marginal Other Workers worked 0 to 3 months
MARG_OT_0_3_M	Male Marginal Other Workers worked 0 to 3 months
MARG_OT_0_3_F	Female MarginalOther Workers worked 0 to 3 months
NON_WORK_P	Total Non Worker Population
NON_WORK_M	Male Non Workers
NON_WORK_F	Female Non Workers

LIST OF ANNEXURES

ANNEXURE NO	SUBJECT OF ANNEXURE
1	ASSESSMENT OF CUMULATIVE IMPACTS OF HYDRO ELECTRIC PORJECT ON SURING GAD BASIN, UTTARAKHAND- BY WATER RESOURCES DEVELOPMENT AND MANAGEMENT ROOKEE
2	LETTER TO U.J.V.N. LTD. FOR EXECUTION OF 12.00 MW TANKUL HYDRO POWER PROJECT
3	UNIT COST PLINTH AREA OF BUILDING
4	UNIT COST NATURAL REGENERATION
5	UNIT COST PASTURE DEVELOPMENT
6	UNIT COST BAMBOO PLANTATION
7	UNIT COST CRATE WIRE CHECK DAM
8	UNIT COST RR DRY CHECK DAMS
9	UNIT COST WATER PERCOLATION TANK AND GULLY PLUGGING
10	UNIT COST SPUR CONSTUCTION
11	LIST OF CSR ACTIVITIES

ABBREVIATIONS

ACF	Assistant Conservator of Forest
BOD	Board of Directors
CA	Chartered Accountant
CAMPA	Compensatory Afforestation Fund Management And Planning Authority
CF	Conservator of Forests
CIATP	Catchment and Impact Area Treatment Plan
CO	Campa Office
CWLW	Chief Wildlife Warden
DFO	Divisional Forest Officer
DPR	Detailed Project Report
EDC	Eco-development Committee
FDA	Forest Deposit Account
FSI	Forest Survey of India
GP	Gram Panchayat
HYV	High Yielding Variety
IJRSG	International General of Remote Sensing and Geo-science
IGA	Income Generation Activity
VLC	Village Level Committee
ME	Market Expert
MIS	Management Information System
MNRE	Ministry of New And Renewable Energy
MW	Mega Watt
MWS	Micro Watershed
NGO	Non Government Organization
NRM	Natural Resource Manageme
OWP	Overall Work Plan
PC	Project co-ordinator
PCCF	Principal Chief Conservator of Forests
PIB	Public Investment Board
PIMC	Project Implementation Monitoring Committee
PIU	Project Implementation Unit
PMC	Project Management Cell
PMU	Project Management Unit
TE	Technical Expert
VIC	Village in-Charge
VP	Village Panchayat
WII	Wildlife Institute of India
WP	Working Plan

PREFACE

The small hydro-Electric Scheme Tankul (12.0 M.W.) is proposed to be constructed on runoff the river scheme for power generation on Simkhola Gad, a tributary of river Kali. The Simkhola Gad joins the Kali river near Mangti village. U.J.V.N Ltd. Was selected for execution of 12.0 M.W. Tankul Hydro-power Project Tehsil Dharchula district Pithoragarh, Uttarakhand.

The proposed Hydro Electric power Projects in respect of which land transfer proposal for forest land diversion case is to be made in **10.236 ha.** of which Pithoragarh District of Uttarakhand State and conversion of **10.236 ha.** of land comprising, Civil Soyam- **9.397 ha.,** Van Panchayat **(Nil),** R.F. **(Nil),** Private land **0.839 ha.** required for construction of different components of project.

The prime objective of this CAT plan is the eco-restoration of the project area and participation of the local people for their livelihood support system. Efforts have been made to incorporate all the key factors which are important part of modern system of catchment and impact area treatment plan.

The main aim of CAT plan is to control the quantity of silt in the Catchment area along with soil water conservation and eco-restoration so that to concept of construction of small hydro power project can be realized. The main aim of CAT plan is to control the quantity of silt in the Catchment area along with soil water conservation and eco-restoration so that to concept of construction of small hydro power project can be realized.

The study area spreads over 2 SWS and 6 MWS Namely Nandarma MWS and Suwa MWS of Dhauli Nadi SWS, 3 MWS, 4 MWS, Jiunti Gad MWS,and Sirkha MWS of Kutti SWS. These sub watershed and micro watersheds falls within 10 km area.Out of above, his project are covers only 3MWS spredad over 3 villages only namely Bung Bung, Tankul and Hamlet Mangti of village Pangla.

The catchment area is locacted 10 km radius consists of 17 revenue villages. Proposed HEP Project area has only 03 revenue villages. The Catchment area falls entirely under Pithoragarh Forest Division. The total Catchment area is **27204 ha.** comprises **17295 ha.(64%)** of forests **1671ha. (6%)** of agriculture land and the rest **2804 ha. (10%)** is blank, riverbed area **4288 ha. (16%)**, snow area **1009 ha. (4%)** and rocky area **137 ha. (0%).**

As the CAT works will be taken in only 3 MWS village Bung Bung, Tankul and Hamlet Mangti of village Pangla. The total workable area in these 3 MWS is **3049.25 ha.** and total non workable area **2193.75 ha.** The actulal total HEP Catchment area is **5243 ha.** comprises **3405 ha.(65%)** of forests **176 ha. (3%)** of agriculture land and the rest **1662 ha. (32%)** is blank, river bed area **0 ha. (0%)**, snow area **0 ha. (0%)** and rocky area **0 ha. (0%)**

The project period is 7 years. The total project cost as on Govt. approval letter No. 338/UJVNL/CS/07/BM-78 dt. 21.04.2016 is 11842.76 Lakhs as on approved date. The total CAT Plan cost is **Rs. 236.94 lakhs**. As per guideline P.O/50/13-2 (2) dated Dehradun 02 August, 2014 the CAT plan cost @ 2% of total project cost is 236.94 Lakhs but the total project cost is bourd to escalate in 3 years, hence the CAT plan cost will be revise as per MoU between UA & Pithoragarh Forest Division under taking from Uttarakhand is annexed in the document.

The Tankul small hydroelectric power project (12 Megawatt) is proposed for Construction of Diversion weir on perennial Simkhola gad, tributary of Kali river, near Village Bungbung. The water diverted through on Power Channel / pipe and Surge tank are located close to village Tankul.

hence the name of the project. The proposed power station is located at Tok Mangti, near the village Pangla, on the right bank of river Kali, tehsil Dharchula, district Pithoragarh, Uttrakhand. The proposed Power station is located Tok Mangti near village Pangla on the right bank of river Kali at an elevation of 1525 m asl. The proposed diversion weir site is located near the village Bungbung at an altitude of 2200 m asl. Thus the project harnesses a head of approximately 671.6 mt. The water conductor system consist of on intake chamber, power duct, desilting tank settling tank, power pipe (3500mt. Long) surge tank, penstock pipe (S). The power plant comprises of four (04) nos Pelton turbines coupled to 3000 KW synchronous generators with associated protection and control equipments. The discharge through the turbines flows into the tail race channel, finally discharging into the river Kali over its known highest flood level of 1521 mt. above mean sea level (m asl).

The CAT plan primarily aims at overall improvement of the whole ecology of the hydro electric power project region so that the its life can be enhanced considerably. It would provide benefits of implementation of proposed biological and engeeniring measures and shall help in maintaining the overall health of ecosystem.

Upstream of Tankul power project site N $30^0$01'47.36" E $80^0$42'21.534" and it has been mutually agreed that the villages lying down stream upto N $30^0$01'58" E $00^0$42'32" be also brought within the CAT Plan Scope for uplifting the livelihood standard of these people, so that their dependence on forest resources can be redeemed. So the inclusion of downstream villages within CAT Plan perview will certainly ensure their active participation for biodiversity conservation issues under main project. The altitudinal variation of the project area lies between 4620 m asl at Waziking Ki Dhar on the eastern fringe to 1525 m amsl. The highest peak on the Western border on the catchment has an elevation of 4310 m amsl. It comprises of 2 sub watersheds and 6 micro watersheds within 10 km radius of HEP D.weir site only one 3 MWS falls in the project area. Construction of hydroelectric power project involves large scale disturbances in geological and environmental conditions of the area around the project. These disturbances need to be addressed and cared of by treating the area for soil, water and moisture conservation techniques. A sizable population is bound to be affected directly or indirectly, so there is an urgent need to treat the catchment and impact area of the hydro power project in order to stabilize the eco-fragile sensitive zone.

Therefore, the prime and important environmental consideration of this eco-sensitive catchment and impact area as well as concern of local residents for eco-restoration of the catchment and impact area required to be implemented on perspective basis so that the proposed components could match with ground level ecological and environmental needs of the area. Based on the grounds of the consultations and deliberations at various levels with public representatives, District Administration, Geologist, Scientists and experts from various reputed institutes, this plan has been formulated and suggested various treatment measures.

The CAT plan highlights the provisions for afforestation, pasture development, fire protection and SMC works as main forestry activities while the construction and maintenance of huts/stores, maintenance of old staff quarters/minor civil works, community utility activities such as maintenance of village foot paths/bridle paths/drinking water facilities, Construction and renovation of village water tanks and minor irrigation distribution channels, use of Biogas & LPG, technology transfer have been preferred while finalizing the proposals.

A small area of agriculture land of stake holders is lying either utilized or underutilized in the project area. So, in order to check soil erosion and to control decreasing pattern of land holdings, the special provisions for treating the stake holder's land through vegetative and SMC works have been provided. Furthermore, efforts have been made to involve local community extensively in plan preparation, implementation, evaluation & monitoring & auditing.

The data showing the demographic profile reflects the socio-economic backwardness of the area that is why the area has officially been declared as Backward Area. Keeping this theme of backwardness in mind the livelihood support activities have been planned.

As the area is fragile and prone to erosion so the SMC works have been incorporated.

3 x 4 MW Tankul SHP is run of the river project on Simkhola Gad a tributary of river Kali. In run of the river projects no storage of water is done, only discharge is diverted. As the project is small hydro project the civil structures to be constructed are of smaller size. Thus, no ecological damage is done to the surrounding areas. Further, during construction all necessary measures shall be taken like scientific cutting of slopes, construction of breast & retaining walls to avoid any damage to the environment and work shall be carried out as per the guidelines laid down by the forest department and periodic monitoring by concernec Range Officer during the construction phase.

CSR activities shall be co-related with the activities listed in the CSR policy and UJVNL to avoid duplicities of the works/activities.

The sincere thanks are due to the various institutions such as FRI, FSI, IGNFA, WII & Uttarakhand Watershed Management Directorate for their kind support and help rendered by them from time to time. The heartfelt gratitude is acknowledged to PCCF (Projects), Uttarakhand, Nodal officer and CCF (Kumaon).

Hope, this plan will serve its purpose from all aspects.

Dated:-

(Dr. Vinay Bhargava)
Divisional Forest Officer,
Pithoragarh Forest Division
Pithoragarh

वन संरक्षक
उत्तरी कुमाऊँ वृत्त, उत्तराखण्ड
अल्मोड़ा

मुख्य वन संरक्षक, कुमाऊँ,
उत्तराखण्ड, नैनीताल

अपर प्रमुख वन संरक्षक
परियोजनायें, उत्तराखण्ड
देहरादून

अनुमोदित
29/08/19

प्रमुख वन संरक्षक
उत्तराखण्ड, देहरादून

CATCHMENT AREA TREATMENT PLAN (CAT PLAN) FOR TANKUL HYDRO POWER PROJECT

PROJECT AT A GLANCE

S. No	PARTICULARS	
	About The SHP	
1	Name of SHP	TANKUL SMALL HYDRO POWER PROJECT
2	Developing Agency	U.J.V.N. Ltd.
3	Generation Capacity	12.0 M.W.
4	Type of SHP	Run of the River
5	Total SHP Cost	11842.76 Lakhs As on Govt. approval letter No-338/UJVNL/CS/07/BM-78 dt. 21.04.2016 (Page No.-11)
6	**Location**	Near village Bungbung ,Diversion weir site Near village Tankul (Power channel/ Pipe),Surge Tank. Near village Pangla (Tok Mangti) Power House Site
6.1	State	Uttarakhand
6.2	District	Pithoragarh
6.3	Tehsil	Dharchula
6.4	Gram Panchayat	Village Bungbung, Village Tankul, Village Pangla (Tok Mangti)
6.5	Aproach & accessibility to project	Pithoragarh-Dharchula (96 km.) and Dharchula to Mangti (40 km.)
6.6	Longitude-Latitude	Diversion weir- N 30°01'58.579" E 80°42'24.55" N 30°01'58.541" E 80°42'24.210" Power house- N 29°59'42.569" E 80°42'47.52.301"
6.7	Altitude	1,525m Power House site- 2,200 M Diversion weir site
6.8	Name of the Gad/River/ Hydrological unit	Simkhola gad, tributary of River Kali
7	Total forest land involved for diversion (ha)	Project area 10.236 ha. Civil forest land- 9.397 ha. Private land- 0.839 ha.
About Catchment		
8	Name of Catchment	Simkhola Gad, tributary of Kali River
9	Name (s) of Watersheds	Kali River
10	Name (s) of Sub Watersheds (02)	Kutti SWS & Dhauli SWS
11	Name (s) of Micro Watershed (06)	1.Nandarma Nadi MWS 2. Suwa MWS 3. 3 MWS, 4. 4 MWS 5. Jiunti Gad MWS 6. Sirkha Gad MWS, (only One 3 MWS Falls in project area).
12	Geographical area of the catchment	5243 ha.

13	Names of Drain Lines(03)	Suwagad, Sirkhagad and Juntigad
14	Socio-economics of affected areas	Gram Bungbung, Gram Tankul, Gram Pangla (Mangti)
15	Name of villages, Panchayats involved	Bungbung, Tankul, Pangla (Mangti)
16	Population	Total- 1789. Bungbung- 516 (H.H.-110) Tankul- 332 (H.H.-63) Pangla (Mangti)-941 (H.H.-173)
17	**Production system**	
17.1	Major Crops	Wheat, Paddy, Maize, Mandua, Jou, Rajma, Millets
18	**Animal husbandry**	
18.1	Number of families involved in animal husbandry	346 families
18.2	Livestock	3005 (Buffalo- 34, Cow/bullock- 1290, Goats- 961 Sheep-672, Horse/Mule- 48)
	About Implementation Agency (s)	
19	Name of the Nodal Division involved	Pithoragarh Forest Division, Pithoragarh
20	Name of Nodal Forest Circle	North Kumaon Circle, Almora
	About the Catchment Area Treatment Plan	
21	Affected area due to SHP	Simkhola nala (Diagram Annexure Fig. II & III Page No. 19, 20)
22	Total treatable under CAT Plan (ha.)	3049.25 ha. (Agriculture- 146.75 ha. R.F.- 674 ha. Other than R.F. 1395.25 ha. Reserved blank 0 ha. Other than Reserved blank- 833.25 ha.) Page No. 47, 49, 98
23	Reserve Forest Area under CAT Plan (ha.)	886 ha. Page No. 49
24	Civil Forest /Soyam under CAT Plan (ha.)	3405 ha. Page No. 49
25	Arable area under CAT Plan	2519 ha. Page No. 49
26	Drain Line Treatment under CAT Plan	174.7 Km = 262.05 ha. **Proposed Drain line Treatment Under CAT Plan** Proposed Drain Line length = 50 km Proposed Drain Line area = 75 ha. Page No. 77

27	No-workable area (Snow, Lake, riverbed, rock etc.)	2193.75 ha. (Total Catchment area – Total treatable area) 5243 - 3049.25 = 2193.75 ha.
28	Snow line elevation (mts)	Nil
29	Area for compensatory Afforestation with details	18.749 ha Annexure-
30	Total Project Cost for Catchment Area Treatment	**236.94 Lakh** (2% of project cost as on letter No- 338/UJVNL/CS/07/BM-78 dt. 21.04.2016 subject to revision (Page No.-11)
31	Proposed activities and expected outcomes	
31.1	NRM/Forestry/Soil & Moisture conservation	i. Forestry inputs will enhance the availability of minor timber, fodder and fire wood supporting the forest based daily requirements local community. ii. Yearly measurements of siltation iii. Increased awareness among community. iv. Gradual increase in area under vegetation and forest cover. v. Enhancement in community participation vi. Decrease in soil loss through soil conservation activities. vii. Decrease in land sliding, subsidence, gullies, forest fire.
31.2	Livelihood	Enhancement in the livelihood opportunities to community.
31.3	Production System	Enhancement of agriculture and horticulture activities in the project area.
31.4	Micro-enterprises	
32	List of quantifiable performance indicators	i. Decrease in siltation – chemical lab testing at periodic proposal ii. Studying the vegetation map for every year. Finding out the rise or decrease density of vegetation. iii. Soil and moisture study Report submitted at Page No-139 iv. Rejuvenation of dying and drying water bodies v. Rise or decrease in milk production vi. Rise or decrease in number of cattle population vii. Enhancement in livelihood opportunities. viii. Increase in availability of solar/alternate energy devices. ix. Study & identification of slip sensible and erosion prone places x. Decrease man-animal conflicts xi. Increase in water discharge of the various springs, sub-streams of the MWS

33	Proposed Physical and Financial provisions under Reserve Forest and civil areas	Described in Chapter-3
34	Selection of catchmer area Considering a project area of 10km radius for area selecti	Considering a Project area of 10 Km radius for area selection.

LOCATION MAP OF ALL POWER HOUSES OF SHP SITUATED IN DISTRICT PITHORAGARH

INDIA

UTTARAKHAND

DISTRICT- PITHORAGRH

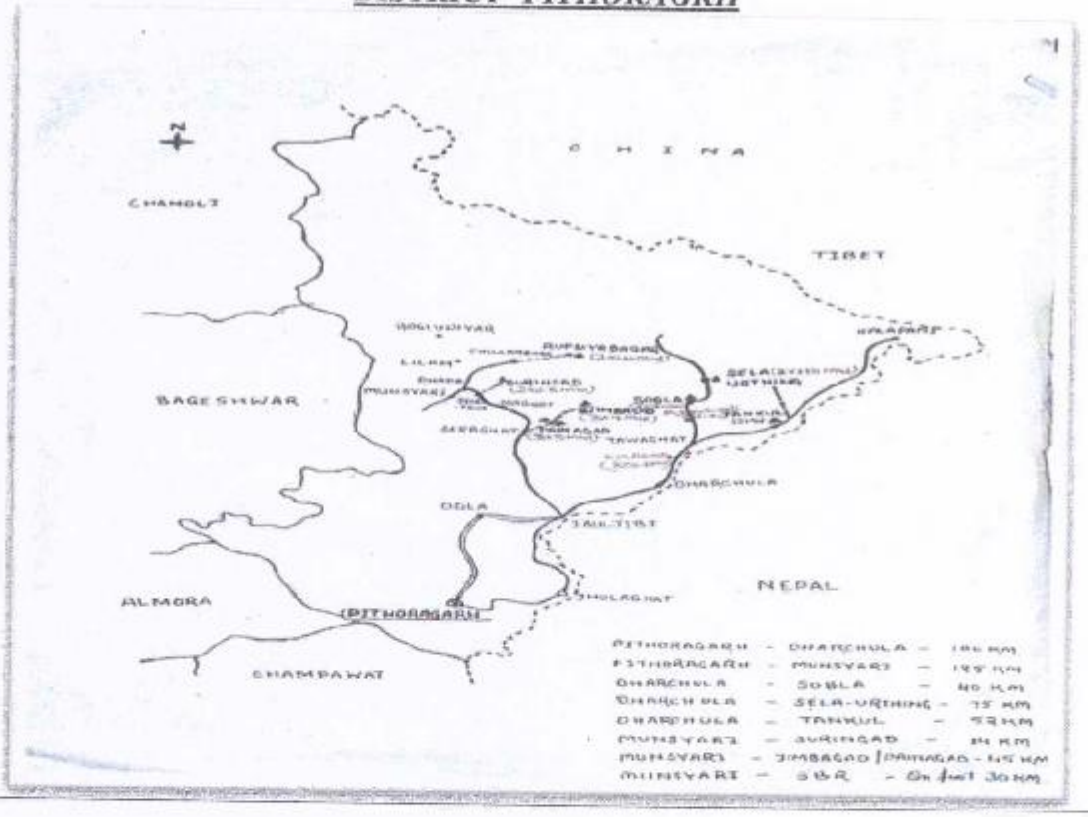


Fig-I

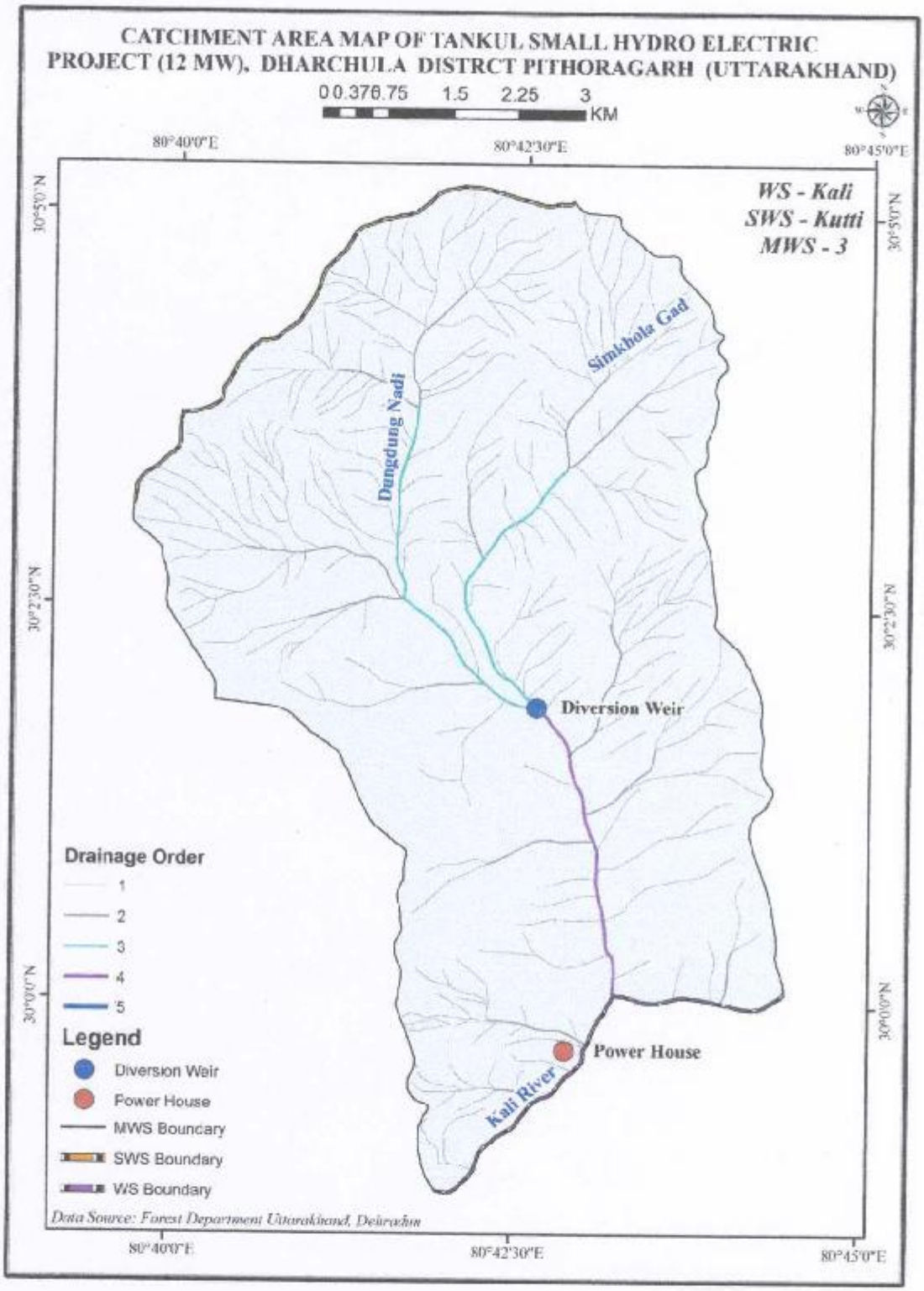

CATCHMENT AREA MAP OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW), DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 0.375 0.75 1.5 2.25 3 KM
80°40'0"E
80°42'30"E
80°45'0"E
30°5'0"N
30°2'30"N
30°0'0"N
WS - Kali
SWS - Kutti
MWS - 3
Simkhola Gad
Dungdung Nadi
Diversion Weir
Power House
Kali River
Drainage Order
1
2
3
4
5
Legend
Diversion Weir
Power House
MWS Bouncary
SWS Boundary
WS Boundary
Data Source: Forest Department Uttarakhand, Dehradun

Fig-II

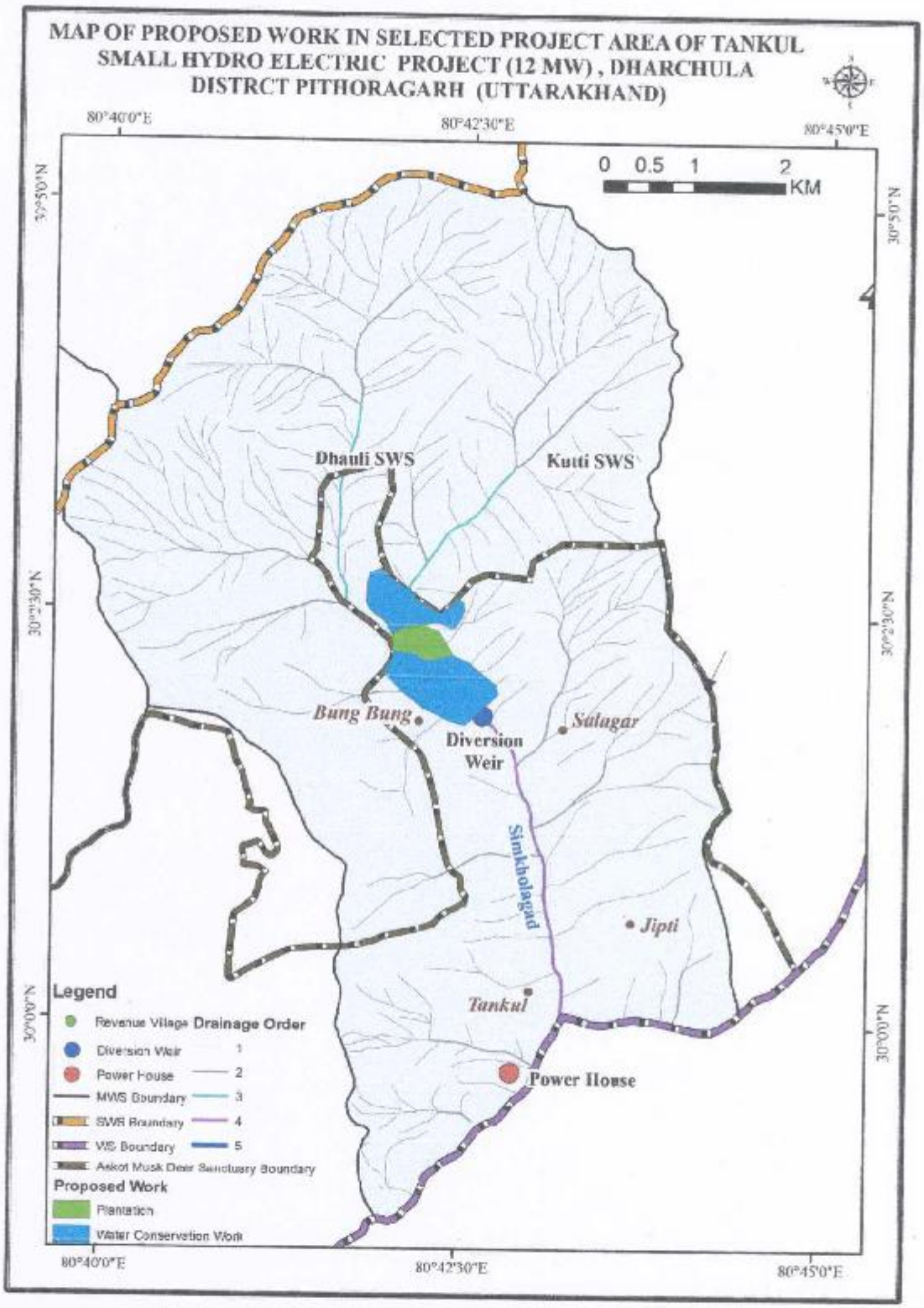

MAP OF PROPOSED WORK IN SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
80°40'0"E
80°42'30"E
80°45'0"E
30°35'0"N
30°32'30"N
30°30'0"N
0 0.5 1 2 KM
Dhauli SWS
Kutti SWS
Bung Bung
Diversion Weir
Salagar
Sinkholagad
Jipti
Tankul
Power House
Legend
Revenue Village
Diversion Weir
Power House
MWS Boundary
SWR Boundary
WS Boundary
Askot Musk Deer Sanctuary Boundary
Drainage Order
1
2
3
4
5
Proposed Work
Plantation
Water Conservation Work

Fig-III

Chapter-1

INTRODUCTION:-

1.1 TANKUL HYDRO-ELECTRIC POWER PROJECT: AN OVERVIEW

U.J.V.N. Ltd. was selected for execution of 12.00 MW Tankul Hydro Power Project. The Tankul small hydroelectric power project (12 Megawatt) is proposed for Constructing of Diversion weir on perennial Simkhola gad, tributary of river kali. Near Village Bungbung. The Water diverted through on Power Channel / pipe and Surge tank are located close to village Tankul, hence the name of the project. The proposed power station is located Tok Mangti, near the village Pangla, on the right bank of river Kali, tehsil Dharchula, district Pithoragarh, Uttrakhand. U.J.V.N. Ltd. was selected for execution of 12.00 MW Tankul Hydro Power Project implementation agreement signed with **State Government Uttarakhand vide letter No.- 338 /UJVNL/CS/07/BM-78 Dated - 21-04-2016.**

The total Buffer zone area 10 Km redius of proposed Tankul small Hydro-electric Power Project is around **27204 ha,** which separates over 1 WS and 6 MWS namely Nandarma Nadi MWS, Suwa MWS, 3 MWS, 4 MWS, Jiunti Gad MWS, Sirkha MWS. Project are covers only 3 MWS spredad over 3 villages only namely Bung Bung, Tankul and Hamlet Mangti of village Pangla The actul total Catchment area is **5243 ha.**

The project area is close to the Musk deer Sancturary and surounded by it from three sides. The areal distance of diversion weir site is 1 km from power house site and 2 km respectively from the nearer point of Musk deer Sanctuary.

DETAIL OF SIMKHOLAGAD CATCHMENT

Table: 1.1

Sl. No.	CATCHMENT	WS NAME	SWS	MWS
1	Kali	Kali	Dhauli	Nandarma Nadi
2	Kali	Kali	Dhauli	Suwa
3	Kali	Kali	Kutti	3
4	Kali	Kali	Kutti	4
5	Kali	Kali	Kutti	Jiuntigad
6	Kali	Kali	Kutti	Sirkha

LIST OF MWS OF 3 AND KALI WATERSHED IN PROJECT AREA

Table 1.2

Sl. No.	CATCHMENT	WS	SWS	MWS
1	Kali	Kali	Kutti	3

1.1.1 LOCATION & APPROACH:

The Tankul small hydroelectric power project (12 Megawatt) is proposed for Constructing of Diversion weir on perennial Simkhola gad,tributary river Kali, Near Village Bungbung. The Water diverted through on Power Channel / pipe and Surge tank are located close to village Tankul, hence the name of the project. The proposed power station is located Tok Mangti, near the village Pangla, on the right bank of river Kali, tehsil Dharchula, district Pithoragarh, Uttrakhand. The proposed Power station is located Tok Mangti near village Pangla on the right bank of river Kali at an elevation of 1525 masl. The proposed diversion weir site is located near the village Bungbung at an altitude of 2200 masl. Thus, the Project harnesses a head of approximately 671.6 mts. The water conductor system consists of on intake chamber, power duct, desilting tank, power pipe (3500 mts long), surge tank, penistock pipe (s). The power plant comprises of four (04) numbers of pelton turbines coupled to 3000 K.w. synchronous generators with associated protection and control equipments. The discharge through the turbines flows into the tail race channel finally discharging into the river Kali over its known highest flood level of 1521 mts above mean sea level (msl).

The project site is accessible from Tankpur (nearest rail head on meter gauge) via Pithoragarh-Dharchula-Tawaghat on the National High Way NH-125, the road distance being about 273 kms. The distance of Pithoragarh from nearest rail head on broad gauge station, Haldwani, is 210 kms. From Haldwani to the power station site, the distance is approximately 343 kms. The distance of the power station is 2 Kms from the ITBP connecting priority road. Thus it is proposed to construct 4 kms of project road for transport of construction materials from the nearest available road head.

The geographical coordinates of the scheme are:

Diversion weir-
N 30^{0}01'48.579" E 80^{0}42'24.55"
N 30^{0}01'58.541" E 80^{0}42'24.210"

Power house-
N 29^{0}59'42.569" E 80^{0}42'47.52.301"

The elevation of the above power station are as below:

Pond level of diversion weir (trench weir)	: El 2202.00 m msl
Steady State level in the surge tank	: El 2192.82 m msl
Static level in the surge tank	: El 2198.71 m msl
Highest flood level in the river near Power house site (on Kali River)	: El 1521.00 m msl
Bottom level of Power Station raft	: El 1525.00 m msl
Centre line of the Runner at PH	: El 1530.4 m msl

1.2 NEED FOR CATCHMENT PLAN:

It is a well establishment fact that reservoirs formed by Dams on rivers are subjected to sedimentation. The process of sedimentation embodies the sequential process of erosion, entrainment, transportation, deposition and compaction of sediment.

The study of erosion and sediment yield from Catchments is of utmost importance as the deposition of sediments in reservoir reduces its capacity, and thus affecting the water availability for the designated use. The eroded sediment from Catchment when deposited on streambeds and banks causes breading of river reach. The removal of top fertile soil from Catchment adversely affects the agriculture production. Thus a well designed Catchment area treatment Plan (CAT) is essential to ameliorate the above mentioned adverse process of soil erosion. The Catchment area treatment Plan (CAT Plan) of any Catchment involves understanding of the erosion characteristics of the terrain and suggesting remedial measures to reduce the erosion rate.

Keeping this in mind the Cat Plan of Tankul Small HEP for **Rs. 236.94 Lakhs** is being proposed for the treatment of Catchment area supposed to be affected due to construction of proposed Dam.

Chapter-2
ABOUT THE CATCHMENT

2.1 CATCHMENT DETAILS:

2.1.1 The Project Area:

Uttarakhand consists of three major physiographic units, viz. Siwalik or outer Himalayas, Himanchal or lesser Himalaya in Himadri or Greater Himalayas. The Simkhola Gad is a tributary of Kali river which in turn is a tributary of river Ganga. The Simkhola Gad flows through the Dharchula block of Pithoragarh district of the Uttarakhand State.

Simkhola Gad originates in the Rungling Reserve Forest with Wazikang Ki Dhar on the eastern fringe (highest elevation 4620 m amsl). The highest peak on the western border of the Catchment has an elevation of 4310 m amsl. The total length of Simkhola Gad from its origin up to its confluence with Kali river is 11.43 kms.

During this traverse the river descends from an elevation of about 4300 m to 2200.00 m msl- the bed level at the diversion site. The power station is located at an elevation of 1525m msl. The approximate length of the stream from its origin up to diversion weir site is 7.38 km.

The river generally flows in a South and South-easterly direction as it flow from an elevation of about 4300 mts. The basin of the river is endowed with dense mixed jungle mainly banj. The river is snow and rain-fed and thus the discharge is generally from snow melt and rains and regeneration water.

The Buffer zone area 10 km redious of Tankul SHP is around **27204 ha** which spreads over 2 SWS Kutti and Dhauli and 6 MWS namely Nandarma Nadi MWS, Suwa MWS, 3 MWS, 4 MWS, Jiunti Gad MWS, Sirkha MWS of Kali river Catchment. It falls under Pithoragarh Forest Division. The total Buffer zone area 10 km redious is **27204 ha** that comprises **17295 ha (64%)** forests, **1671ha (6%)** agriculture land and the rest **2804 ha (30%)** is blank.

Project are covers only 3 MWS spredad over 3 villages only namely Bung Bung, Tankul and Hamlet Mangti of village Pangla. The actul total Catchment area is **5243 ha. Comprises 3405 ha.(65%)** of forests **176 ha. (3%)** of agriculture land and the rest **1662 ha. (32%)** is blank.

The overall crop density of the Project area is very poor. The terrain is rocky combined with sharp slopes and is highly susceptible to erosion consists of 17 revenue villages falls under Pithoragarh Forest Division. Project are covers only 3 MWS spredad over 3 villages only namely Bung Bung,Tankul and Hamlet Mangti of village Pangla.

Tankul SHP capacity 12 MW is located at distance of approximately 7.38 km of upstream to diversion weir. Some area will be covered under the CAT Plans of these power house, therefore an area of 10 kms radius from diversion weir and power house is being considered as Project area.

The major activities will be carried out in the MWS 3, water from where directly comes into Simkhola Gad before diversion. The remaining Project area will mainly be focused for socio-economic empowerment related activities of the community. There are 3 MWS, Jiunti Gad MWS, Sirkha MWS of Kutti SWS fall within the proposed Project area out of which there are only one MWS namely 3 falls in the Catchment area. Nandarma MWS and Suwa MWS of Dhauli SWS fall on the other side of the ridge and their water do not fall into the dam reservoir therefore need not to

be included for Catchment Treatment Plan proposes. Similarly water of 4 MWS, Jiunti Gad MWS and Sirkha MWS of Kutti SWS is falling 6 kms beyond the boundary of Project area.

In addition, there are some seasonal Gadheras/streams such as Dungdung Nadi of Simkhola Gad MWS of Kali river watershed falling within the Project area.

LOCATION MAP OF ALL POWER HOUSES OF SHP SITUATED IN DISTRICT PITHORAGARH

INDIA

UTTARAKHAND

Distric-Pithoragarh

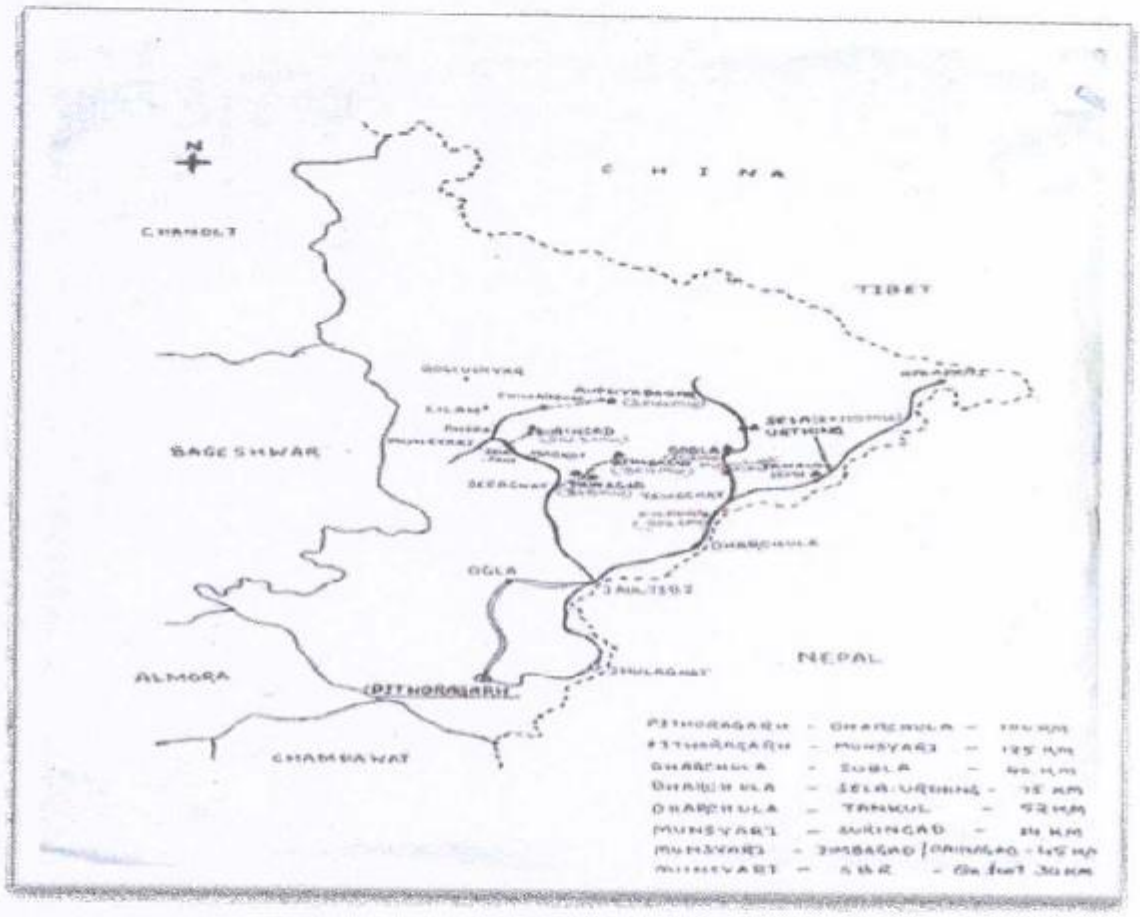


Fig-2.1

As per Policy Guidilines, 2% of the Project cost of the SHEP is to be provided for the catchment area treatment plan (CAT Plan) to enhance the lifecycle of the Project. On the basis of funds available and several other factors mentioned below, One MWS namely 3 MWS have been prioritized for CAT Plan activities. Total 17 villages in 10 K.M. Area buffer zone only 03 villages

in Project area in Pithoragarh Division have been prioritized for CAT Plan activities falling in Project area.

The major activities will be carried out in the MWS 3, Water from where directly comes into Simkhola Gad before diversion. The remaining Project area will mainly be focused for socio-economic empowerment related activities of the community. There are 3 MWS,Jiunti Gad MWS, Sirkha MWS,of Kutti SWS,Fall with in the Proposed Project area out of witch there are only one MWS namely 3 falls in the project area. Nandarma MWS and Suwa MWS of Dhauli SWS fall on the other side of the ridge and their water do not fall into the dam reservoir therefore need not to be included for Catchment Treatment Plan Proposes. Similarly water of 4MWS, jiunti gad MWS and Sirkha MWS,of kutti SWS,is falling 6 kms beyond the boundary of Project area In addition, there are some seasonal Gadheras/ streams such as Dungdung Nadi of simkhola Gad MWS of kali rever watershed falling within the Project area.

Figure – 2.2 - Google Earth Map Tankul SHP

The details of different revenue villages falling in respective micro watersheds is as follows:

List of revenue village in proposed area:-

Table 2.1

Total 17 villages falls within the 10 Km Buffer zone area-

Sl.No.	NAME	VILLAGE_AREA_KM	LONGITUDE	LATITUDE	CATCHMENT	WS_NAME	SWS	MWS
1	Punla Bhataka	70.20	80° 39' 49.268" E	29° 58' 11.824" N	Kali	Kali	Kutti	Sirkha
2	Chhalmachhilason	75.84	80° 40' 38.018" E	29° 58' 5.637" N	Kali	Kali	Kutti	Sirkha
3	Tyongi Pangu	106.04	80° 37' 47.555" E	29° 59' 13.245" N	Kali	Kali	Kutti	Jiuntigad
4	Tanta Gaon Roto	110.20	80° 38' 29.358" E	29° 58' 17.056" N	Kali	Kali	Kutti	Sirkha
5	Rung	116.02	80° 40' 18.114" E	29° 59' 31.584" N	Kali	Kali	Kutti	Sirkha
6	Salagar	117.56	80° 43' 11.726" E	30° 1' 48.282" N	Kali	Kali	Kutti	3
7	Mangti (Pangla)	126.04	80° 41' 20.132" E	29° 58' 46.848" N	Kali	Kali	Kutti	3
8	Suwa	131.68	80° 35' 58.238" E	30° 1' 58.001" N	Kali	Kali	Dhauli	Suwa
9	Dhar Pangu	132.04	80° 37' 8.664" E	29° 59' 3.393" N	Kali	Kali	Kutti	Jiuntigad
10	Jipti	158.96	80° 43' 41.655" E	30° 0' 37.886" N	Kali	Kali	Kutti	3
11	Takul	163.68	80° 42' 59.420" E	30° 0' 12.197" N	Kali	Kali	Kutti	3
12	Himkhola	170.10	80° 37' 57.227" E	30° 0' 26.659" N	Kali	Kali	Kutti	Jiuntigad
13	Geemafi (Jaykot)	194.76	80° 39' 5.797" E	29° 58' 16.670" N	Kali	Kali	Kutti	Sirkha
14	Bung Bung	213.04	80° 42' 15.456" E	30° 1' 54.308" N	Kali	Kali	Kutti	3
15	Sirdang	288.88	80° 39' 48.750" E	29° 59' 26.772" N	Kali	Kali	Kutti	Sirkha
16	Sirkha	292.80	80° 39' 28.560" E	29° 59' 48.366" N	Kali	Kali	Kutti	Sirkha
17	Sosa	325.40	80° 38' 26.558" E	29° 58' 55.688" N	Kali	Kali	Kutti	Sirkha

Total 3 villages falls in the Catchment area-

Sl.No.	NAME	VILLAGE_AREA_KM	LONGITUDE	LATITUDE	CATCHMENT	WS_NAME	SWS	MWS
	Bung Bung	213.04	80° 42' 15.456" E	30° 1' 54.308" N	Kali	Kali	Kutti	3
	Takul	163.68	80° 42' 59.420" E	30° 0' 12.197" N	Kali	Kali	Kutti	3
	Mangti (Pangla)	126.04	80° 41' 20.132" E	29° 58' 46.848" N	Kali	Kali	Kutti	3

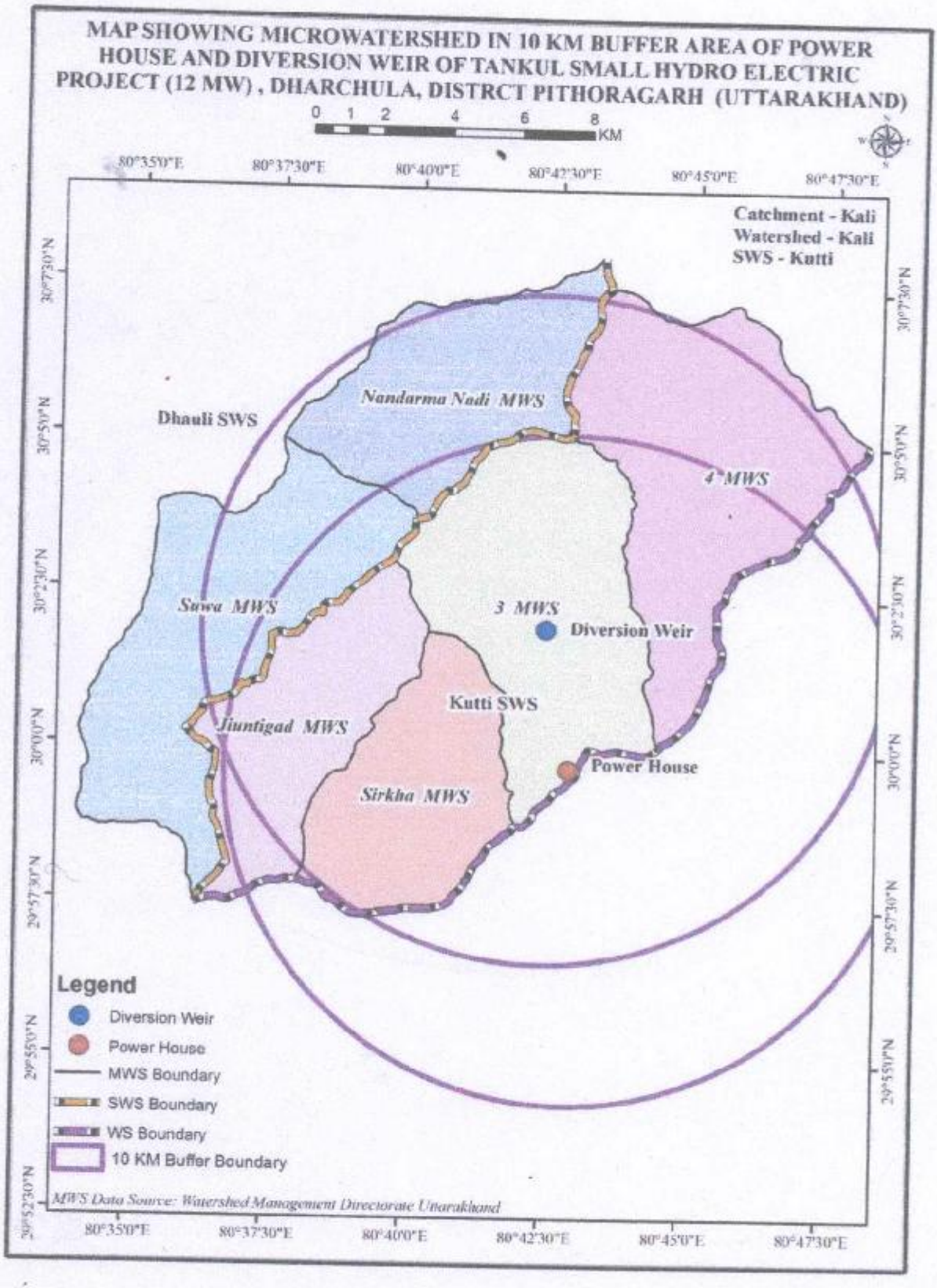

MAP SHOWING MICROWATERSHED IN 10 KM BUFFER AREA OF POWER HOUSE AND DIVERSION WEIR OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA, DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
Catchment - Kali
Watershed - Kali
SWS - Kutti
Dhauli SWS
Nandarma Nadi MWS
4 MWS
Suwa MWS
3 MWS
Diversion Weir
Kutti SWS
Jiuntigad MWS
Power House
Sirkha MWS
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
10 KM Buffer Boundary
MWS Data Source: Watershed Management Directorate Uttarakhand
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N

Fig 2.3

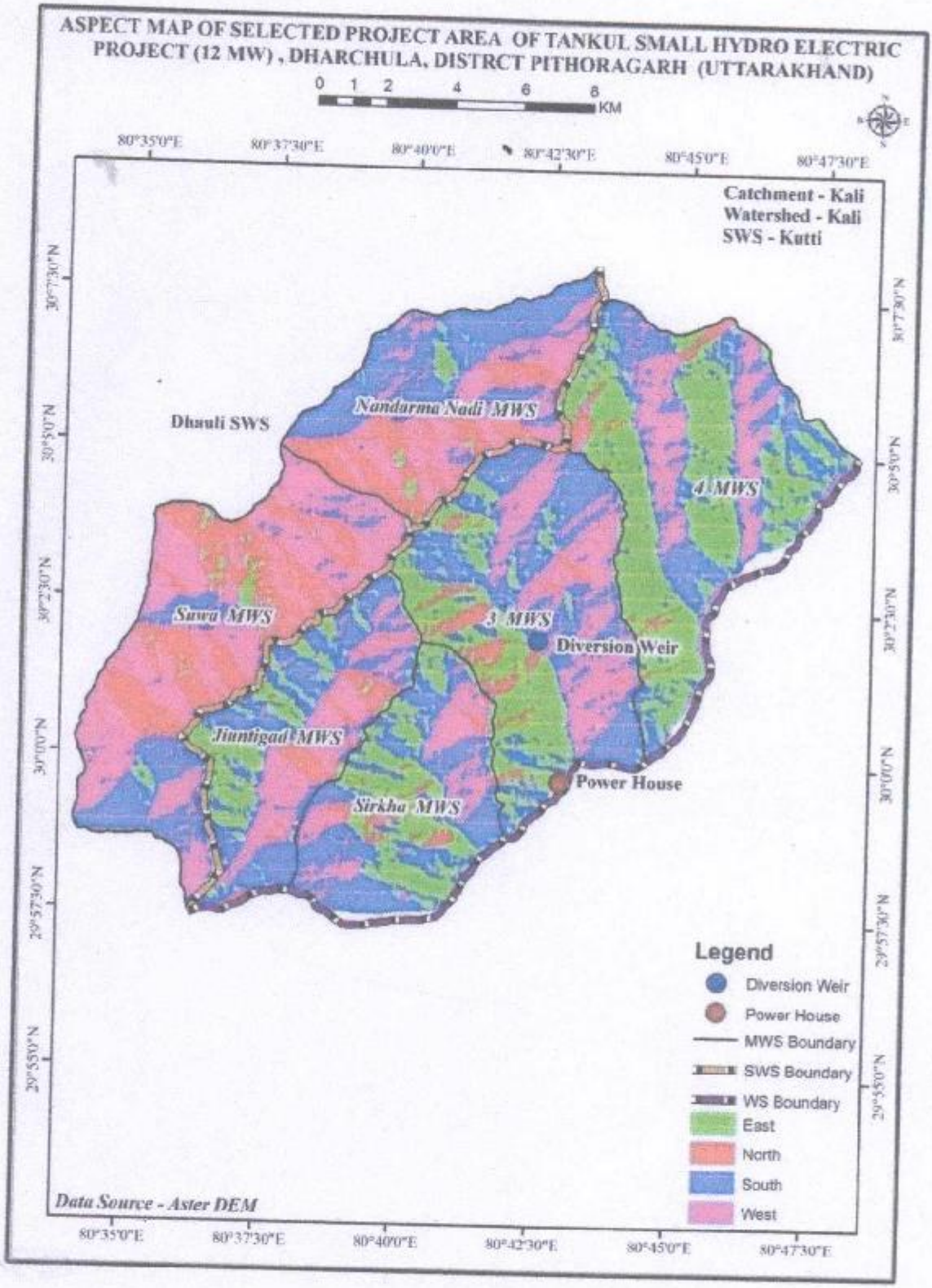

ASPECT MAP OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA, DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
Catchment - Kali
Watershed - Kali
SWS - Kutti
Dhauli SWS
Nandarma Nadi MWS
4 MWS
Suwa MWS
3 MWS
Diversion Weir
Jhuntigad MWS
Power House
Sirkha MWS
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
East
North
South
West
Data Source - Aster DEM

Fig 2.4

Aspect wise details of Project area (All area are in hectare)

Table 2.2

SWS	MWS	NORTH	EAST	SOUTH	WEST	Total
Dhauli	Nandarma Nadi	782	207	1410	1140	**3539**
Dhauli	Suwa	1440	265	845	2363	**4913**
Kutti	3	489	1570	1845	1339	**5243**
Kutti	4	296	2905	1434	1156	**5791**
Kutti	Jiuntigad	457	1075	1685	1145	**4362**
Kutti	Sirkha	269	1106	1366	614	**3356**
		3734	**7128**	**8584**	7758	**27204 ha**
		Northern & Eastern aspect – 10862 ha.		**Southern & Western aspect =16342 ha**		

Note:-
The Southern & Western slopes are having greater vegetation as compared to Northern & Eastern slopes. Here in the Project area the total area of Northern & Eastern aspect is lesser (10862 ha) as compared to the total area of Southern & Western aspect (16342ha.).

Aspect wise details 3 MWS in Catchment Area (Area in Hec.)
Table 2.2.1

SWS	MWS	NORTH	EAST	SOUTH	WEST	TOTAL
Kutti	**3**	**489**	**1570**	**1845**	**1339**	**5243**
		489	**1570**	**1845**	**1339**	**5243**
		Northern and Eastern aspects = 2059 ha		**Southern and Western aspects = 3184 ha**		**5243 ha**

Note:- The Southern & Western slopes are having greater vegetation as compared to Northern & Eastern slopes. Here in the Project area the total area of Northern & Eastern aspect in lesser (2059 ha) as compared to the total area of Southern & Western aspect (3184ha).

Altitude wise area all microwatersheds in Buffer zone Area 10 km redious

Table 2.3

Sl. No.	Name of S.W.S.	Name of M.W.S.	Cultivation						Within Reserved Forests					
			<1000 m	1000-2000m	2000-3200m	3200-4000m	>4000	Total	<1000 m	1000-2000m	2000-3200m	3200-4000m	>4000	Total
1	Dhauli	Nandarman	0	39	0	0	0	**39**	0	0	420	0	0	**420**
2	Dhauli	Suya	0	69	0	0	0	**69**	0	61	2900	0		**2961**
3	Kutti	3	0	37	139	0	0	176	0	0	789	97	0	**886**
4	Kutti	4	0	0	0	0	0	**0**	0	0	0	0	0	**0**
5	Kutti	Sirkha	299	225	419	0	0	**943**	0	2050	0	0	0	**2050**
6	Kutti	Jiuntigad	119	325	0	0	0	**444**	0	0	1982	0	0	**1982**
		Total	**418**	**695**	**558**	**0**	**0**	**1671**	**0**	**2111**	**6091**	**97**	**0**	**8299**

Other Than Reserved Forests						Blank Within Reserved Forest						
<1000m	1000-2000m	2000-3200m	3200-4000m	>4000	Total	Total forest	<1000 m	1000-2000m	2000-3200m	3200-4000m	>4000	Total
0	0	255	0	0	**255**	675	0	0	0	0	0	**0**
0	295	125	0	0	**420**	3381	0	0	0	0	0	**0**
0	474	1741	304	0	**2519**	3405	0	0	0	0	0	**0**
0	226	1667	1145	1008	**4046**	4046	0	0	0	0	0	**0**
0	325	1025	0	0	**1350**	3400	0	0	0	0	0	**0**
0	75	331	0	0	**406**	2388	0	0	0	0	0	**0**
0	**1395**	**5144**	**1449**	**1008**	**8996**	**17295**	**0**	**0**	**0**	**0**	**0**	**0**

Blank Outside Reserved Forest						Total blank area	Riverbed	Rocky	Snow bound	Grand total
1000	1000m-2000m	2000-3200m	3200-4000m	>4000	Total					
0	0	0	0	0	**0**	**0**	0	2688	137	**3539**
0	0	213	0	0	**213**	**213**	0	1250	0	**4913**
0	131	185	995	351	**1662**	**1662**	0	0	**0**	**5243**
0	114	43	249	330	**736**	**736**	0	0	**1009**	**5791**
0	0	19	0	0	**19**	**19**	0	0	0	**4362**
0	0	174	0	0	174	**174**	350	0	0	**3356**
0	**245**	**634**	**1244**	**681**	**2804**	**2804**	**350**	**3938**	**1146**	**27204**

Note:-

- The total land under cultivation is **1671 ha.** The altitude wise area under cultivation is maximum between 100 to 2000 m. **(695 ha.)** and lesser below 1000 m **(418 ha.)to enhance the rural livelihood the cash crops like ginger, Gagali (arbi), chilly, pea, pulses like Rajma, Palthi Maduva, Potato etc. will be promoted. Horticultural spices like citrus verities including lemon, malta, santara, Guava, Aakharot, Pulam, Peach, Khumani etc.**

- The total Forest land is **17295 ha.** out of which within Reserved Forest **2111 ha.** lies between 1000 to 2000 m and **0 ha.** below 1000 m other than Reserve Forest **1395 ha.** lies between 1000 to 2000 m and only **0 ha.** lies below 1000 m.
  The total blank area is **2804 ha.** out of which Reserve Forest is only **0 ha.** lying between 1000 to 2000 m outside the Reserve Forest the maximum area lies between 1000 to 2000 m **(245 ha.)** and around **0 ha.** lies below 1000 m. Around **634 ha.** of blank area lies between 2000 to 3200 m. Tropical species like **Banj, Aharot, Kafal, Burans, Semal etc.** will be promoted as per the site specific below 1000 m for the blank area within and outside the Reserve Forest.

Altitude wise area 3 microwatershed in Catchment Area
Table 2.3.1

Sl. No.	Name of S.W.S.	Name of M.W.S.	Cultivation						Within Reserved Forests					
			<1000m	1000-2000m	2000-3200m	3200-4000m	>4000	Total	<1000m	1000-2000m	2000-3200m	3200-4000m	>4000	Total
	Kutti	3	0	37	139	0	0	176	0	0	789	97	0	886
		Total	**0**	**37**	**139**	**0**	**0**	**176**	**0**	**0**	**789**	**97**	**0**	**886**

Other Than Reserved Forests						Blank Within Reserved Forest						
<1000 m	1000-2000m	2000-3200m	3200-4000m	>4000	Total	Total forest	<1000m	1000-2000m	2000-3200m	3200-4000m	>4000	Total
0	474	1741	304	0	2519	3405	0	0	0	0	0	0
0	**474**	**1741**	**304**	**0**	**2519**	**3405**	**0**	**0**	**0**	**0**	**0**	**0**

Blank Outside Reserved Forest						Total blank area	Riverbed	Rocky	Snow bound	Grand total
1000	1000m-2000m	2000-3200m	3200-4000m	>4000	Total					
0	131	185	995	351	1662	1662	0	0	0	5243
0	**131**	**185**	**995**	**351**	**1662**	**1662**	**0**	**0**	**0**	**5243**

Note:-

- The total land under cultivation is **176 ha.** The altitude wise area under cultivation is maximum between 100 to 2000 m. **(37 ha.)** and lesser below 1000 m **(0 ha.)to enhance the rural livelihood the cash crops like ginger, Gagali (arbi), chilly, pea, pulses like Rajma, Palthi Maduva, Potato etc. will be promoted. Horticultural spices like citrus verities including lemon, malta, santara, Guava, Aakharot, Pulam, Peach, Khumani etc.**
- The total Forest land is **3405 ha.** out of which within Reserved Forest **886 ha.** lies between 1000 to 2000 m and **0 ha.** below 1000 m other than Reserve Forest **474 ha.** lies between 1000 to 2000 m and only **0 ha.** lies below 1000 m.
  The total blank area is **1662 ha.** out of which Reserve Forest is only **0 ha.** lying between 1000 to 2000 m outside the Reserve Forest the maximum area lies between 1000 to 2000 m **(131 ha.)** and around **0 ha.** lies below 1000 m. Around **185 ha.** of blank area lies between 2000 to 3200 m. Tropical species like **Banj, Aharot, Kafal, Burans, Semal etc.** will be promoted as per the site specific below 1000 m for the blank area within and outside the Reserve Forest.

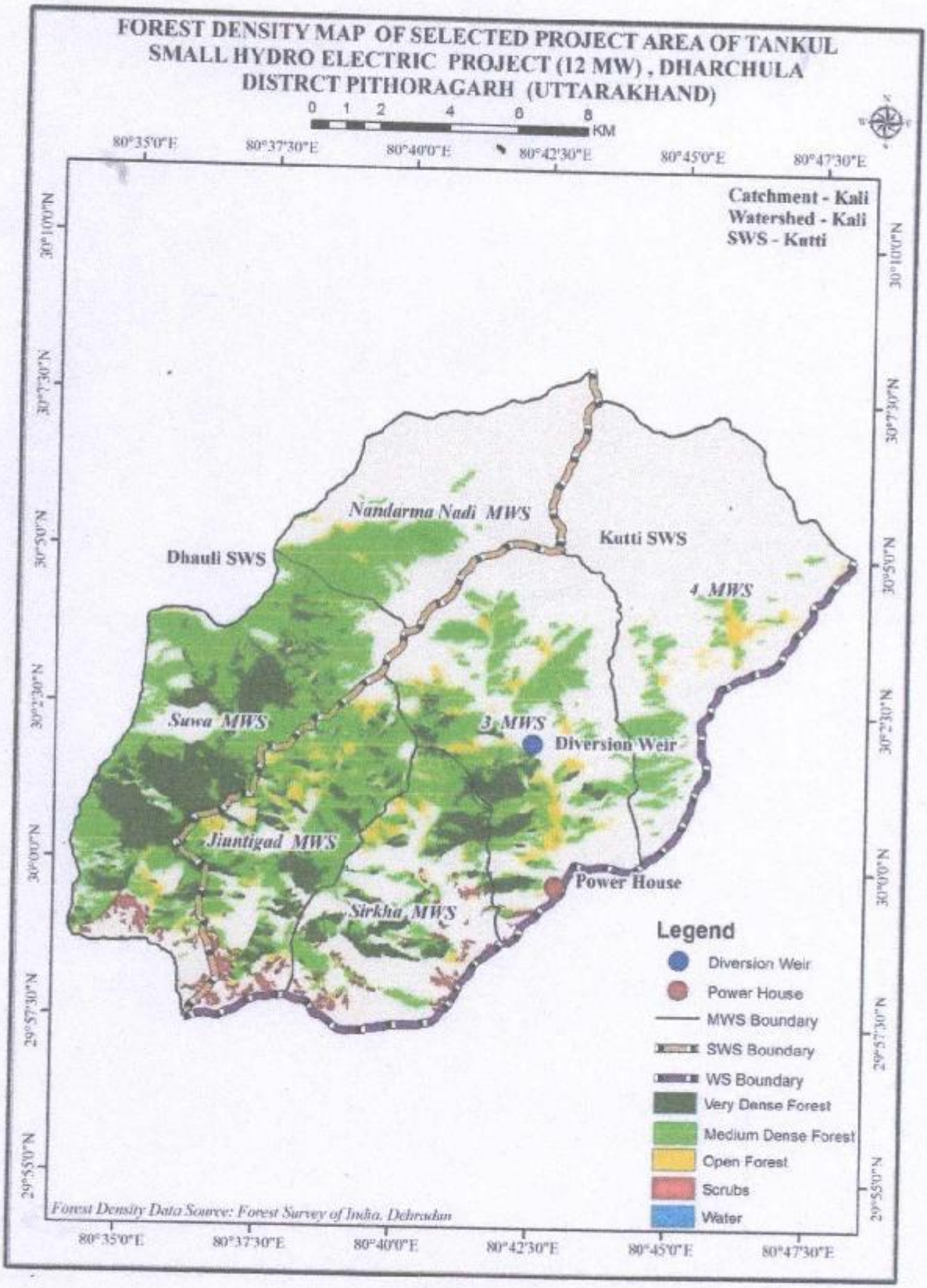

FOREST DENSITY MAP OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
Catchment - Kali
Watershed - Kali
SWS - Kutti
Nandarma Nadi MWS
Kutti SWS
Dhauli SWS
4 MWS
Suwa MWS
3 MWS
Diversion Weir
Jiuntigad MWS
Power House
Sirkha MWS
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Very Dense Forest
Medium Dense Forest
Open Forest
Scrubs
Water
Forest Density Data Source: Forest Survey of India, Dehradun
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°10'0"N
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N

Fig 2.5

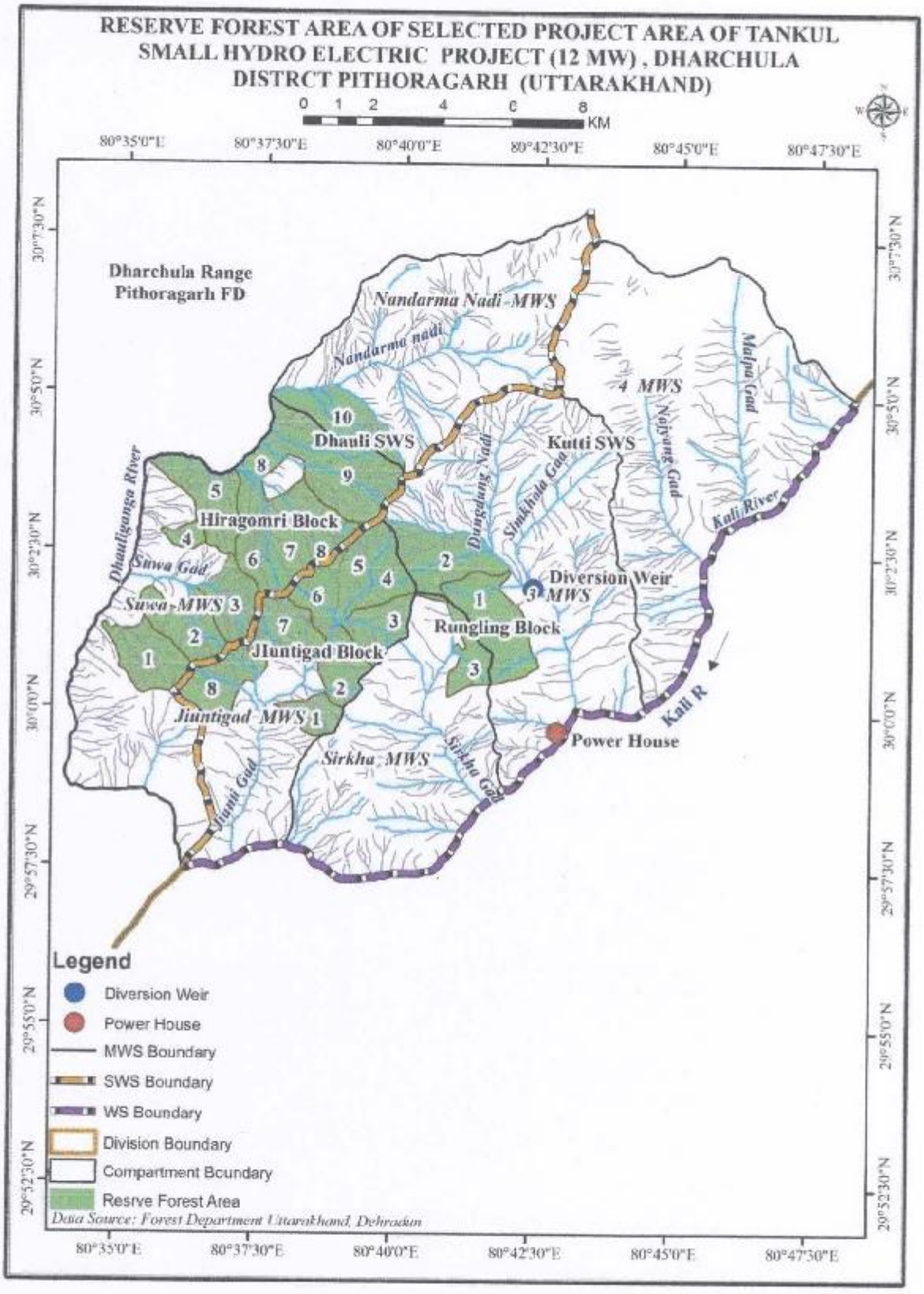

RESERVE FOREST AREA OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N
Dharchula Range
Pithoragarh FD
Nandarma Nadi -MWS
Nandarma nadi
Malpa Gad
4 MWS
Nelyung Gad
Kutti SWS
Dhauli SWS
10
9
8
5
Dhauliganga River
Hiragomri Block
4
6
7
8
5
2
Dungedung Nadi
Simkhola Gad
Kali River
Suwa Gad
Diversion Weir
3 MWS
Suwa -MWS 3
6
4
1
Rungling Block
2
7
3
Jhuntigad Block
1
3
8
2
Jhuntigad MWS 1
Kali R
Power House
Sirkha MWS
Sirkha Gad
Jhanti Gad
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Division Boundary
Compartment Boundary
Resrve Forest Area
Data Source: Forest Department Uttarakhand, Dehradun

Fig 2.6

2.1.2 The Flora:

The altitude, aspect, rainfall and accordingly the vegetation in the catchment area varies from place to place. The major forest types found in the area are shown in table below.

Table

Sl. No	Major Forest Type	Vegetation type
1.	9/CIB/DS1 -Himalayan Sub-tropical forest	This type of forest is the most widely distributed, occupying the lower slopes in all river catchments. This type occurs on slopes with varying altitude from about 750 m to 2000 m, giving way to temperate forest at its higher extremities. The main species are- **Top Canopy**- Quecus leucotrichophora (Banj), Rhododendron orboreum (Burans), Pyrus pashia (Mehal), Myrica nagi (Kaphal), White Burans, Hiphopi, Meppal, Pangar, Kail, Surai, Ranga, Akharot, Alnus nepalensis (Kunis), Populus ciliate (Pahari pipal), Cedrus deodara (Deodar), Pinus wallichiana (Chir), Comus capitat (Bhamora), Toona cerraia (Tun), Pinus roxburghii (Sarol), Aegle marmelos (Bael), Lannea cormandelica (Jhanghan), Acacia catechu (Khair), Ougeinia oogeinensis (Sandan), Schleichera oleosa (Gosum), **Shrubs**- Rubus ellipticus (hinsalu), Berberis asiatica (Kilmora), Berberis chitra (Kimgora), Machonia nepalensis (Khoru), Microphylla (Raunshi), Pinsepia utills (Bhek), Rubus lasiocarpur (Kali Anchhi), Rhus punjabensis (Titri), Rumex hastatus (Bhilmora), Viburnum cotinifolium (Bhutnoi), Hypericum ce Berberis vu;garis (Chatrod) Rubus elliptic (Lal Anchchi), Zanthoxylum alatum (Tejbal), Desmodium podocarpum (Salpan), Callicarpa macrophylla (Daia), Rosa moschata (Kungo), Ficus cunia (Jarhphali), Utrea parviflora)' Phoenix humilis (Kajur), Asparagus filicinus (Kaunta), Arundinella, Prinsepia utilis (Bhekal), Debregeasia hypoleuca (Sirav), Deutzia corymbosa falcate (Bhugroi), Euphorbia royleana (Thor), Hypericum patulum (Phiunili), Solanum xanthocarpum, Woodfordia fruticosa (Dhau), Euphorbia royleana, Rhus parviflora (Tungla), Mimosa himalayana (Alay), Jatropha curcas (Safed arand) (Pingniara), Phoebe lanceolata (Bhadeu), Georardiana heterophylla (Dhaul), Spiraea canescens (Chakroi), Indigofera pulchella (Sakina), Artemisia sp. (Phusara), Surbus foliolosa, Salix elegans (Kadvi), Skimmia laureola (Guripata), Sarcococca Saligna (Tiliari), Solanun surrantense, Daphne papyfaces (Satpura), Pyracantha crenulata Myrsina Africana (Banwan **Grasses**- Cymbopogon, martini (Babala), Heter opogon contortus (Kumeria)

Source:- Working Plans of the Division

Note:-No such RET Species all around in project area.

The areal distance of diversion weir site is 1 km from power house site and 2 km respectively from the nearer point of Musk deer Sanctuary.

The CAT plan primarily aims at overall improvemet of the whole ecology of the hydro electric power project region so that the its life can be enhanced considerably. It would provide benefits of implementation of proposed biological and engeenering measures and shall help in maintaining the overall health of ecosystem.

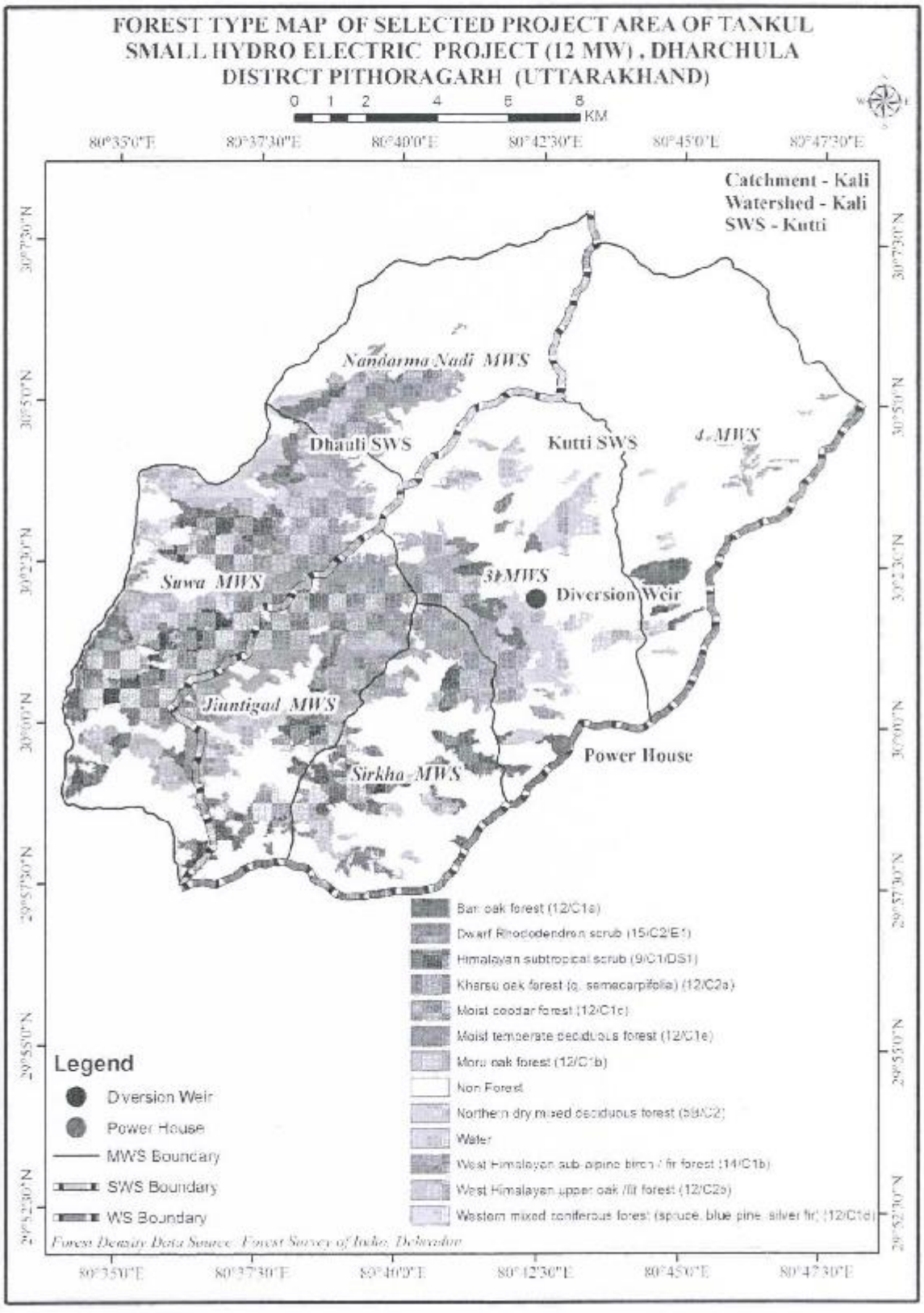

FOREST TYPE MAP OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N
Catchment - Kali
Watershed - Kali
SWS - Kutti
Nandarma Nadi MWS
Dhauli SWS
Kutti SWS
4 MWS
Suwa MWS
3 MWS
Diversion Weir
Jiuntigad MWS
Power House
Sirkha MWS
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Ban oak forest (12/C1a)
Dwarf Rhododendron scrub (15/C2/E1)
Himalayan subtropical scrub (9/C1/DS1)
Khasru oak forest (q. semecarpifolia) (12/C2a)
Moist deodar forest (12/C1c)
Moist temperate deciduous forest (12/C1e)
Moru oak forest (12/C1b)
Non Forest
Northern dry mixed deciduous forest (5B/C2)
Water
West Himalayan sub alpine birch / fir forest (14/C1b)
West Himalayan upper oak /fir forest (12/C2b)
Western mixed coniferous forest (spruce, blue pine, silver fir) (12/C1d)
Forest Density Data Source: Forest Survey of India, Dehradun

Fig 2.7

2.1.3 The Fauna:-

The altitudinal zonation of the Project area varies from side to side and it extends up to a maximum of 2000 m. The main wildlife found in the area is shown in the table below:-

Table A mammals:-

Common Name	Zoological Name
Common Langur	Presbytis entellus
Common leopard	Panthera pardus
Giant flying squirrel	Petaurista sp
Goral	Naemorhaedus goral
Barking deer	Nemorhaedus goral
Spotted deer	Axis axis
Sambhar	Cervus unicolor
Himalayan black bear	Selenarctors thibetanus
Himalayan mouse hare	Ochotana roylei
Jackal	Cauis aures
Jungle Cat	Felis chanus
Wild bore	Susscrofa cristatuis

Table B Birds (Aves):-

Common Name	Zoological Name
Black Francolin	Francolinus francolinus
Brown-capped Pygmy Woodpecker	Dendrocopos nanus
Grey Francolin	Francolinus pondicerianus
Yellow-crowned Woodpecker	Dendrocopos mahrattensis
Coppersmith Barbet	Megalaima haemacephala
European roller	Coracias garrulous
Indian roller	Coracias bengalensis
Asian koel	Eudynamys scolopacea
Alexandrine Prakeet	Psittacula eupatria
Rose-ringed Parakeet	Psittacula krameri
Dark sided Flycatcher	Muscicapa sibirica
Eagle owl	Bubo bubo bonglensis
European kestrel	Paico fimmunculus
Fire breasted flower pecker	Dicacum melanox anthum
Fire tailed surbird	Aethopyga ignicauda
Garthwal pied wood picker	Picordes hennatayansis
Green backed tit	Panus marificolus manticolus
Green saridpipper	Triga ocheopus
Indian Myana	Acidothenes thistis
Indian tree pipit	Anthus
Jungle Nitghter	Caprimalgus indicus
Vulture	Sarcogyps palvus
Cattle egret	Bubulcus ibis

No such RET Species all around in project area. The areal distance of diversion weir siteis 1 km from power house site and 2 km respectively the nearer point of Musk deer Sanctuary.

The CAT plan primarily aims at overall improvemet of the whole ecology of the hydro electric power project region so that the its life can be enhanced considerably. It would provide benefits of implementation of proposed biological and engeeniring measures and shall help in maintaining the overall health of ecosystem.

Source:- Working Plans of the Division

2.2 METEOROLOGY:-

The meteorology data plays a vital role to understand the climatic features of an area. Climatologically, the entire project area falls in Kumaon Himalayas. The metrological data plays vital role to understand the climatic features of an area. The climate varies from sub-tropical in the plains to temperate in higher hills. There are four seasons summer-March to June mid, monsoon- June mid to September, Post monsoon-October to November and Winter- December to February could be identified during the following months

2.2.1 RAIN FALL:-

Summer-	March to June mid
Monsoon-	June mid to September
Post monsoon-	October to November
Winter-	December to February

The climate is subtropical monsoon type with cold winter and hot summer. The winter season is from December to March and summer season normally is from March to June. The area receives about 1500m rainfall in a year on average. About 75% annual rainfall occurs during the monsoon season of mid June to mid September. July being the wettest month. Seasonal rainfall during retreating monsoon occurs between later part of September to November Rainfall during November is the least. About 17% of rainfall occurs during the four winter months. The winter precipitation is in association with the passage of western disturbances and is mostly in the form of snowfall, especially at higher elevations. The precipitation during pre-monsoon months accounts for about 7% the annual precipitation, and is generally associated with thunderstorms.

RAINFALL DATA
Table 2.4
District : PITHORAGARH

Note :

(1) The District Rainfall in millimeters (R/F) shown below are the arithmetic averages of Rainfall of Stations under the District.

(2) % Dep. are the Departures of rainfall from the long period averages of rainfall for the District.

(3) Blank Spaces show non-availability of Data.

YEAR	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEPT		OCT		NOV		DEC	
	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP	R/F	%DEP
2012	82	63	10.1	-82	25.8	-61	96.3	108	42.2	-55	101.4	-66	441	-21	347.3	-36	313	7	14.6	-78	6.7	-46	13.8	-28
2013	87.4	74	159.4	178	18.9	-71	66.6	44	51.3	-45	400.5	34	536.4	-3	343.9	-36	143.3	-51	32	-51	5.5	-56	7.5	-61
2014	42.9	-15	96.1	67	90.6	38	41.9	-9	63.8	-32	128.7	-57	468.7	-16	275.1	-49	142.9	-51	49	-25	0	-100	54	180
2015	76.6	52	91.1	59	145.1	121	75.1	62	69.4	-26	232.1	-23	266.4	-52	265.9	-51	63.2	-78	23.2	-64	0.8	-94	8.9	-54
2016	14.1	-72	32	-44	45.2	-31	13	-72	208	122	235.8	-21	556.2	0	325.8	-40	144.9	-51	39.1	-40	0	-100	8.4	-56

Rainfall (in millimeters)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
2012	82	10.1	25.8	96.3	42.2	101	441	347	313	14.6	6.7	13.8
2013	87	159	18.9	66.6	51.3	401	536	344	143	32	5.5	7.5
2014	43	96.1	90.6	41.9	63.8	129	469	275	143	49	0	54
2015	77	91.1	145	75.1	69.4	232	266	266	63.2	23.2	0.8	8.9
2016	14	32	45.2	13	208	236	556	326	145	39.1	0	8.4

2.2.2 TEMERATURE

The temperature of the project area varies from 2° C in the month of January to 25° C in the month of May / June and during day and night temperature variation is 6 to 8° C.

2.3 SEDIMENTATION:-

In the Simkhola Gad section the sedimentation is noticed in its channel, even though the stream is having sufficient capacity to carry these sediments. Due to change in gradient and volume of water most of the colluvial deposit gets dumped in river bed at lower reaches. Small degree of sedimentation takes place along the channel course where the flow is deflected towards its wide banks.

2.4 WATER QUALITY:-

As per the EIA study of the area the values of most of the water quality parameters were found within the permissible limit of national river water quality standards and BSI. The electric conductivity is from 61-403 us/cm. Some parameters like Mg & Fe are found slightly higher than the limit. So if the water is to be used for drinking purpose then it requires a continuous monitoring and treatment process. The maximum EC level is during rainy season because the rain water carries waste water from various sources. The pH of the water varies from 7.23 to 8.15 on various seasons/ occasions. The pH level of Simkhola Gad indicates neutral to alkaline in nature and was found with the permissible limits (6./5-8 8.5) of surface and drinking water quality standards (i.e. is 2296 and is 10500).

During the winter season, the concentration of the total coliform and faecal coliform and e-coli form all the three seasons was found to be very high when compared to Class A. Surface water quality standards (is 2296). It should be not present in drinking water as per drinking water quality standard is 10500. It is also observed that in the lean season (Dec 2015) and March 2016 the total coliform were very high (5000 MPN/100ml) of is 2296. It further reveals that colliform or faecal contamination is high in lean season due to low discharge of river as the discharge available has no potential to dilute the coliform pollution load.

2.5 HUMIDITY:-

The area is basically in the humid temperature region. The humidity varies between 30% and 85%. Wind remains clam in the early hours of the day, whereas the mean maximum wind velocity goes upto about 25 km/hr with predominant direction as NW and SE. in the rainy season wind direction remains unpredictable with dominant direction being SE. the ambient temperature ranges between – 40C and 270C

2.6 GEOLOGY, ROCK & SOIL:-

2.6.1 GEOLOGY

The project lies well within the Central Himalayas were the rocks belonging to Central Crystalline Group are exposed. The main rock types exposed in and around the project area are Granitic Gneisses, Banded Gneiss, Quartz-Boitite Gneiss and Quartz-Mica Schist. Occurrence of Tourmaline bearing Granites of Tertiary period has also been reported. The regional tectonic discontinuity i.e. Main Central Thrust (MCT) which separates the meta-sedimentary package of Garhwal Group of ricks from the Central Crystalline, lies to the south of the project area. Seismotectonically the project area lies in Zone V which indicates high to very high seismic sensitivity.

Structurally the Uttarakhand Himalaya can be divided into four MW-SE curvilinear tectonic belts, each characterised by its own distinct geological setup bounded by prominent dislocation zones. These tectonic belts from North to South (Misc, Pub 30, GSI, 2012 . pp-13)are:-

The Site.From the point of views of the Geologic structure. Comes under the Primitive Formation of the temal group between the developed stages of the Himalayan Mountain rang.

The autotopic rocks do not notice out coop at the site.In the whole part of the proposed site the Fragments of the neclous nature rocks with coarse grayish soil are visiable in mixed state.

Directorate of Geological and Minerel unit Industries according to Uttarakhand have 30% rocks in the drought zone.

Table:-2.5

Geological Setup of The Project Area

		Jaunsar Area		Uttarkashi- Pithoragarh Area		
Age	**Group**	**Formation**	**Litho logy**	**Group**	**Formation**	**Litho logy**
Metro-proterozoic		Crystalline Granite		Coarse to medium grained, Porphyritic Granite with pocket of Bottles of Biotite and Tourmaline.		
		Garhwal Volcanis		Vesicular, Amygdular and massive Basalt and Dolerite dykes		
	Deoban Formation	Sauli	Carbonaceous Slate, Quartzite, Dolomite with stromatolatic, cherty limes	Garhwal	Berinag Naghthank	Quartzite, Slate, with associated basin meta volcanic
		Bajmara	Stromatolitic limestone and slate		Pithoragarh Shyalana Lameri/ Tejam	Lime stone, dolomite, Phyllite, Shale and cherry Quartzite
		Dharagad	Massive quartzite shale		Rautgara Uttarkashi	Interbedded Quartzite, State with lensiokal limestone, grey green and purple slate with Quartzite
Ndifferntiated Proterozoic	Dudatoli Granite				Agastyamuni	Schistose grit, Sericite phyllite, with basic volcanic
	Ramgarh					Porphyroblastics biotite muscovite granite
	Almora					
	Basic intrusive					Amphibiotile and metanorite

2.6.2 Soil:

Catchment of Simkholagad tributary of river Kali, falls under two soil zones as classified by National Bureau of Soil Survey and Landuse Planning (NBSSLUP). The state has been broadly divided into three physiographic zones considering their elevation, slope and terrain. These zones are central plateau regions (1525 to 2201 m elevation), sub-mountain region (1525 m) and border region. The majority part of river falls in Pithoragarh which again falls in Central Plateau region and sub mountain region. The soil in Central Plateau region of Pithoragarh falls under perhumic thermic sub-eco-region (zones).

Physiography provides useful clues to the understanding of soil types of the area. Runoff is other phenomenon controlled by the physiographic and slopes. The influence of the slope on runoff is modified by the soil properties and vegetation.

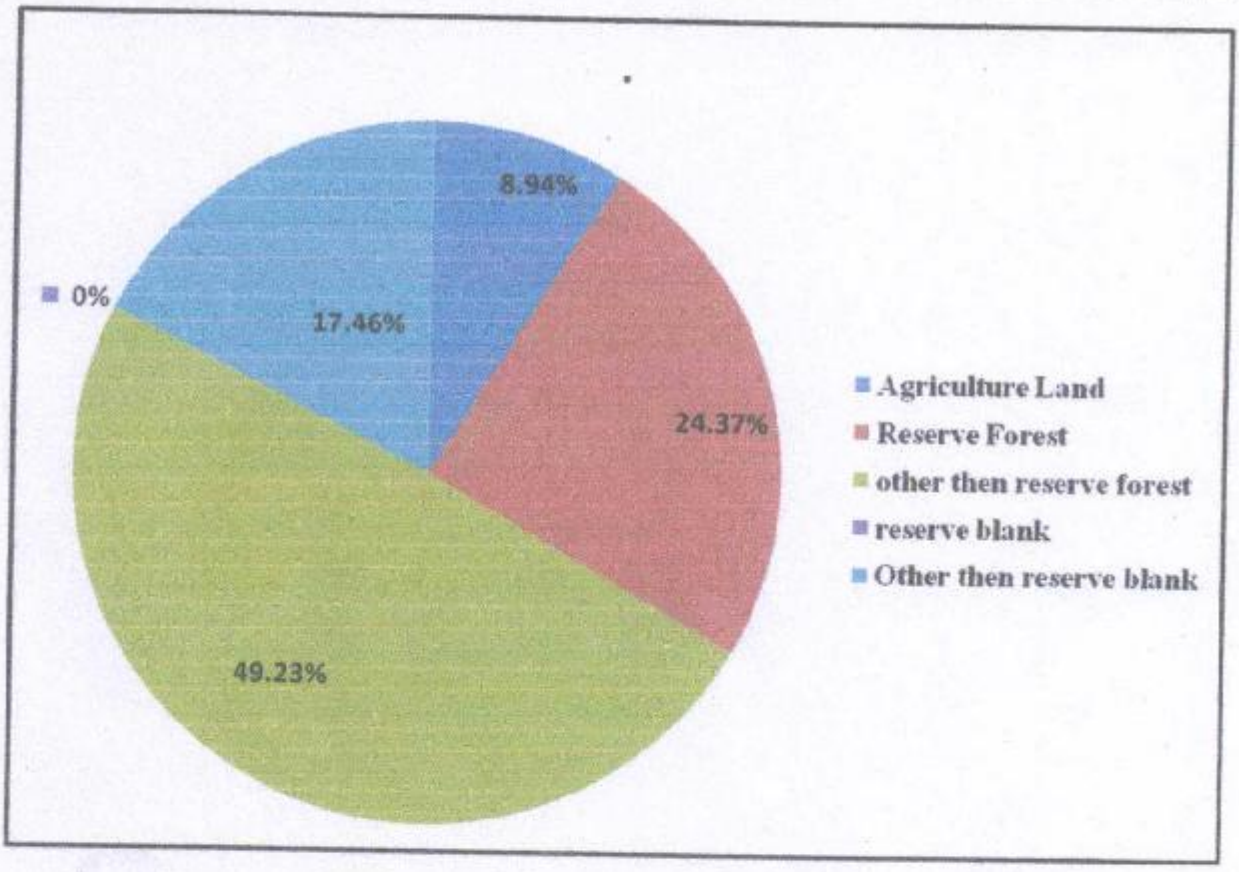
Soil thickness, infiltration and permeability are the main characteristic of the soils that have bearing on run off. Thus, these parameters give quality prediction of the sediment yield from the different parts of the catchment area. These soils are moderately shallow to deep, loamy, skeletal to fine excessively drained and subjected to moderate to severe erosion hazards. The soil is fertile and porous. The general characteristics of these soils are shown in a table.

2.7 Slope:

Slope is a measure of change in the value of the altitude over the distance that can be expressed in degrees or as a percent. In Himalayan region slope predominately governs the land use pattern and it becomes one of the most important factors in land use planning. The slope of a watershed plays an important role in controlling the soil and water retention, thereby affecting land use capability. The percentage of the slope in a watershed determines the soil erosion susceptibility and forms the basis for classifying different segment of the watershed in to suitable capability classes for formulating suitable soil erosion/conservation measures. Keeping in view the physiography and land use/over of the area, the area has been divided in fourclasses.

Slopewise Treatable Area:- In 10 km radius (17 villages)
Table No. 2.6 (A)

S.No.	Agriculture	Reserved forest	Other than reserved forest	Reserved blank	Other than reserved blank	Total treatable area
Treatable area (gradient <33%+ 1/4th of areas having gradient 33 to 50%)	632ha (8.94%)	1723.25ha (24.37%)	3481.50ha (49.23%)	0ha (0%)	1234.75ha (17.46%)	1771.50 ha.



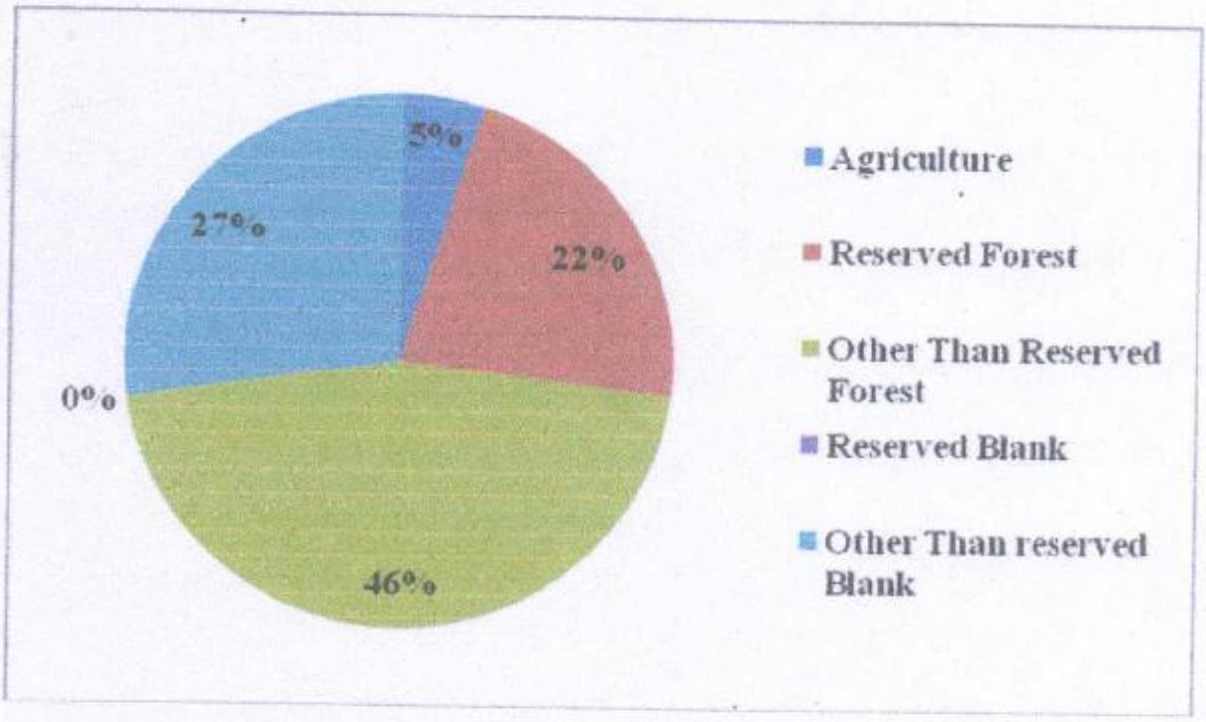
Source of data:- Watershed Management Directorate Uttarakhand

Note: Maximum slope-wise treatable area around 49.23% falls under Other than reserved forest whereas it is minimum (0%) within the reserve blank.

Fig 2.8

Slopewise Treatable Area 3 MWS:-
Table No. 2.6 (B)

S. No.	Agriculture	Reserved forest	Other than reserved forest	Reserved blank	Other than reserved blank	Total area
Treatable area (gradient <33% + 1/4th of areas having gradient 33 to 50%	146.75 (5%)	674 (22%)	1395.25 (46%)	0 (0%)	833.25 (27%)	3049.25 ha.



Source of data:- Watershed Management Directorate Uttarakhand
Note: Maximum slope-wise treatable area around 46% falls under Other than reserved forest whereas it is minimum (0%) within the reserve blank.
Fig 2.8.1

Slope wise treatable area in 10 km radius 17 villages)

Table 2.6

Sl.No.	Name of S.W.S.	M.W.S.No.	Agriculture					Reserved Forest				
			33%	33-50	50-100	100%	Total	33%	33-50	50-100	100%	Total
1	Dhauli	Nandarma Nadi	39	0	0	0	**39**	0	0	362	58	**420**
2	Dhauli	Suwa	0	0	69	0	**69**	0	0	2711	250	**2961**
3	Kutti	3	137	39	0	0	**176**	608	264	14	0	**3381**
4	Kutti	4	0	0	0	0	**0**	0	0	0	0	**0**
5	Kutti	Sirkha	125	493	325	0	**943**	448	600	1002	0	**2050**
6	Kutti	Jiuntigad	120	312	12	0	**444**	0	1805	177	0	**2050**
		Total	421	844	406	0	1671	1056	2669	4266	308	8299
Treatable area (gradient < 33% +1/4 of areas having gradient 33 to 50%			**421+211= 632**					**1056+667.25=1723.25**				

Other than Reserved Forest				Total		Reserved Blank					Other than Reserved Blank					Total Blank	River bed	Rocky	Snow	G. Total
33%	33-50	50-100	100 %	Total	Forest	33%	33 - 50	50-100	100 %	Total	33%	33-50	50-100	100 %	Total					
0	0	225	30	**255**	**675**	0	0	0	0	**0**	0	0	0	0	**0**	**0**	2688	137	0	**3539**
0	0	358	62	**420**	**3381**	0	0	0	0	**0**	0	0	213	0	**213**	**213**	1250	0	0	**4913**
1101	1177	241	0	**2519**	**5900**	0	0	0	0	**0**	639	777	246	0	**1662**	**1662**	0	0	0	**7738**
1419	1834	793	0	**4046**	**4046**	0	0	0	0	**0**	265	347	124	0	**736**	**736**	0	0	1009	**5791**
0	625	725	0	**1350**	**3400**	0	0	0	0	**0**	0	19	0	0	**19**	**19**	0	0	0	**4362**
0	210	177	19	**406**	**2456**	0	0	0	0	**0**	30	60	84	0	**174**	**174**	350	0	0	**3424**
2520	3846	2519	111	8996	19858	0	0	0	0	0	934	1203	667	0	2804	2804	4288	137	1009	29767
2520+961.50=3481.50						**0**					**934+300.75=1234.75**									

Source: Watershed directorate, Uttarakhand

Slope wise treatable area in 3 MWS in Project Area

Table 2.6.1

Sl.No.	Name of S.W.S.	M.W.S.No.	Agriculture					Reserved Forest				
			33%	33-50	50-100	100%	(A1) Total	33%	33-50	50-100	100%	(A2) Total
3	Kutti	3	137	39	0	0	176	608	264	14	0	886
		Total	**137**	**39**	**0**	**0**	176	**608**	**264**	**14**	**0**	886
Treatable area (gradient < 33% +1/4 of areas having gradient 33 to 50%			**137+9.75=146.75**					**608+66=674**				

Other than Reserved Forest					(A2+A3) Total	Reserved Blank					Other than Reserved Blank					Total Blank	Rive rbed	Rocky	Snow	G. Total (A1)+(A2+A3)+(A4+A5)
33%	33-50	50-100	100%	(A3) Total	Forest	33%	33-50	50-100	100%	(A4) Total	33%	33-50	50-100	100%	(A5) Total	(A4+A5)				
1101	1177	241	0	**2519**	**3405**	0	0	0	0	**0**	639	777	246	0	**1662**	**1662**	0	0	0	**5243**
1101	**1177**	**241**	**0**	**2519**	**3405**	**0**	**0**	**0**	**0**	**0**	**639**	**777**	**246**	**0**	**1662**	**1662**	**0**	**0**	**0**	**5243**
1101+294.25–1395.25						**0**					**639+194.25=833.25**									

Source: Watershed directorate, Uttarakhand

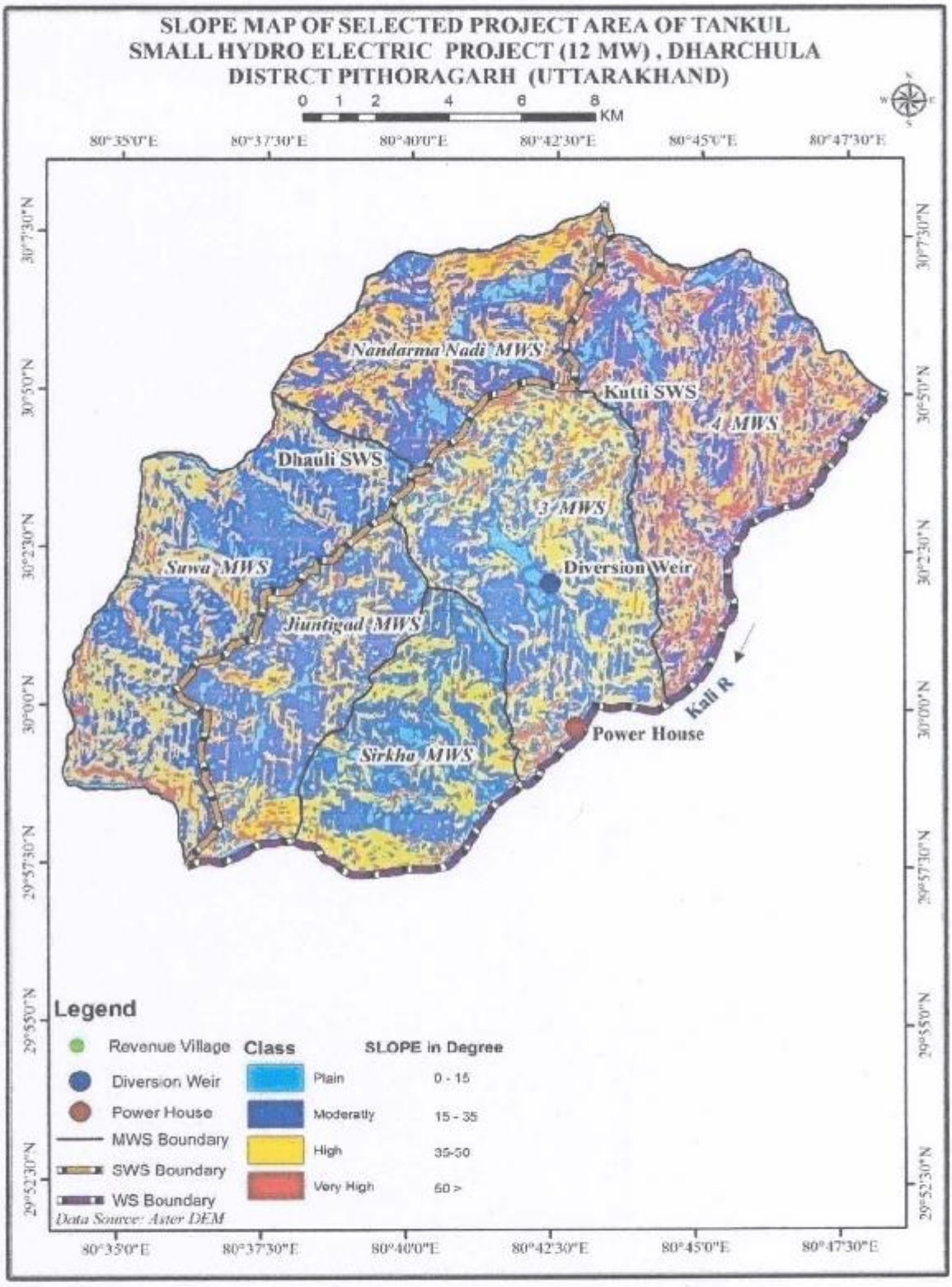

SLOPE MAP OF SELECTED PROJECT AREA OF TANKUL
SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA
DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8
KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N
Nandarma Nadi MWS
Kutti SWS
4 MWS
Dhauli SWS
3 MWS
Suwa MWS
Diversion Weir
Jiuntigad MWS
Kali R
Power House
Sirkha MWS
Legend
Revenue Village
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Data Source: Aster DEM
Class
SLOPE in Degree
Plain
0 - 15
Moderatly
15 - 35
High
35-50
Very High
50 >

Fig 2.9

2.8 Seismology:

Seismological major portion of U.K. falls in zone Vth as per seismic zone map of India, and thus is very susceptible to earthquakes. The tectonic activities as a result of continuous mounting pressure of India Plate on Tibetan plate likely going on in the part of Himalayas. These activities are quite evident by frequently occurring earthquakes in the region on this of intensive study it has been concluded that earthquakes in the area result from strike slip and dip slip movements along serious faults and thrusts.

The project lies well within the Central Himalayas where the rocks belonging to the Central crystalline group are exposed. The main rock type exposed in and around the project area are Granitic Gneisses, Banded Gneiss, quartz-Boitite Gneiss and Quartz-Mica Schist. Occurrence of Tourmaline bearing Granites of Tertiary period has also been reported.

Intensive studies on this have been concluded that earthquakes in the area result from strike -slip and dip-slip movements along various faults and thrusts. Earthquake activities in Uttarakhand has been prolific with loss of the live and as a result of which over many lives have been lost and property worth millions has been destroyed or rendered unusable in the last two hundred years.

The rate of convergence between two major plates (Indian plate and European plate) has a direct bearing on the seismicity in Himalayas. Strain built up and stress release is responsible for recurrence of seismic and geotectonic activities in Garhwal Himalayas. The young Himalayan belt has witnessed large number of great magnitude (M>6) earthquakes in the historical past. The great Assam Earthquake (1987), Kangra (1905), Nepal-Bihar Earthquake and Assam Earthquake (1950) are a few among them. Uttarkashi Earthquake (October 1991) and Chamoli Earthquake (March 1999) are the two strong earthquakes rocked the Garhwal Himalayas in last one decade.

The present area of study lies in the seismically active Himalayan belt zone-V (highly active) which indicates high to very high seismic sensitivity. Tectonic setup of the project reveals that the most important tectonic features.

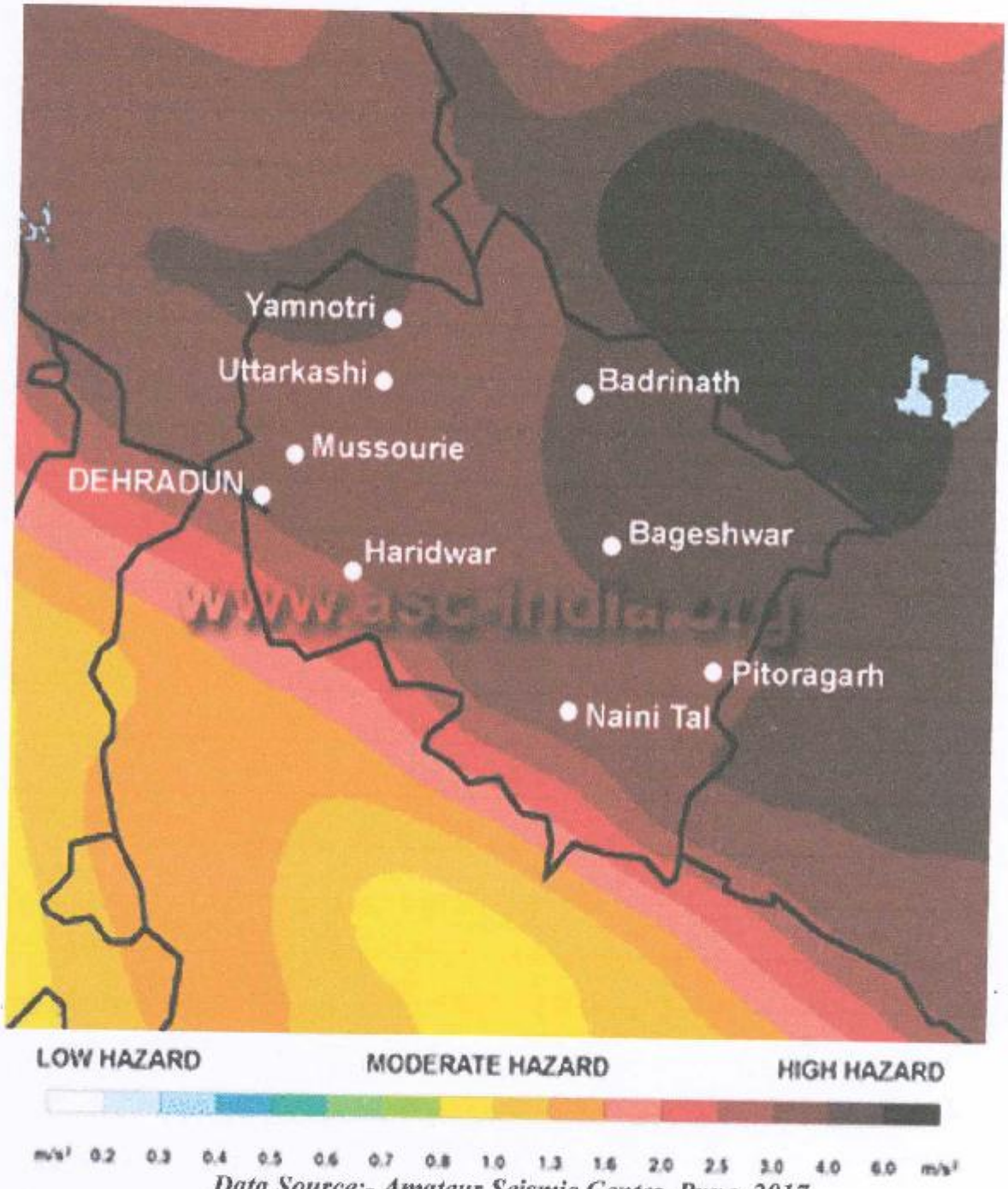
The major earth quakes reported in the area are listed below:-

Table-2.7
LIST OF MAJOR EARTH QUAKES REPRTED IN THE PROJECT

DATE	MAGNITUDE (riechter scale)	AREA OF OCCURENCE	REMARKS
26TH MAY 1816	-	-	Lead to numerous land slides
28th August, 1916	7.5	Dharchula-Kumaon	The earth quake was located in far-Western Nepal, to the North-East of Dharchula. The shock caused severe damage to civil structures in Dharchula
28th December, 1956	6.2	Kapkote-Kumaon	Dozens of houses collapsed in Kapkote
29th July, 1980	6.1	Dharchula-Kumaon	Extensive damage in Dharchula town known as Dharchula lajang earth quakes nost distructive earth quake in Uttarakhand. It took a toll of 768 lives, injured 5000 Persons and damaged all most 46000 houses.
20th October, 1991	6.5	Uttarkashi-Garhwal	Most destructive earth quake in Uttarkashi. 768 persons lost their lives and, about 5000 persons injured and 46000 houses damaged.

In Uttarakhand, a 50 K.M. Wide tract in the vicinity of the surface trace of the MCT, houses of the well known earthquakes of varying intensities. It has witnessed at least 36 events of magnitude>5 recorded in one and a half century in the Garhwal Division alone.

SEISMOLOGICAL MAP OF UTTARAKHAND



Data Source:- Amateur Seismic Center, Pune, 2017

Fig-2.10

Source- Geological Survey of India

Fig-2.11

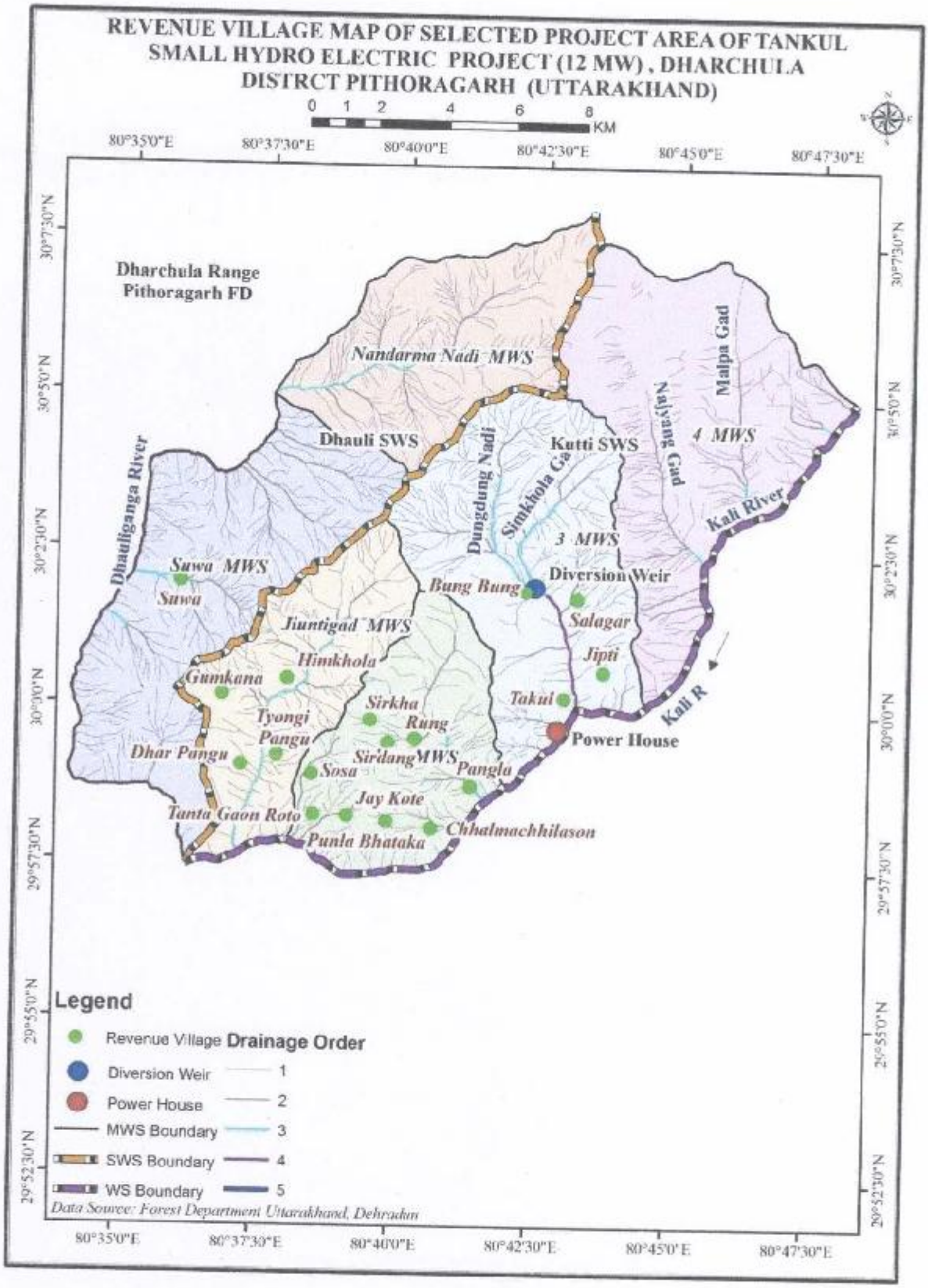

REVENUE VILLAGE MAP OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW), DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8 KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N
Dharchula Range
Pithoragarh FD
Nandarma Nadi MWS
Malpa Gad
Dhauli SWS
Kutti SWS
Dhauliganga River
Dungdung Nadi
Simkhola Ga
Nalyang Gad
4 MWS
Kali River
3 MWS
Suwa MWS
Suwa
Bung Bung
Diversion Weir
Salagar
Jiuntigad MWS
Himkhola
Jipti
Gumkana
Takui
Sirkha
Tyongi
Rung
Pangu
Power House
Kali R
Dhar Pangu
Sirdang MWS
Sosa
Pangla
Jay Kote
Tanta Gaon Roto
Chhalmachhilason
Punla Bhataka
Legend
Revenue Village
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Drainage Order
1
2
3
4
5
Data Source: Forest Department Uttarakhand, Dehradun

Fig 2.12

2.9 - Socio-economic Scenario of the Project Area:

General

2.9.1 About the People:

The People of the proposed area are called by name Bhotiyas (Schedule tribes) depending on geographical region. Majority of the population here is Hindus. **The catchment area** consists of 17 revenue villages.Proposed Project area is only 03 revenue villages. The treatment area falls under Pithoragarh Forest.The SC population is **2008** ST population is **1523** and General population is **3602** Out of the total population of the area **7133.**

Project are covers only 3 MWS spredad over 3 villages only namely Bung Bung, Tankul and Hamlet Mangti of village Pangla.The SC population is **217, ST** population is **100**, and General population is **1472**. out of the total population **1789.**

2.9.2 Occupation:

Agriculture is the main occupation of the population of the residing in the area, while livestock development and horticulture are the other sources of income. The rising unemployment is main concern of the area. Majority population is involved in labour activity. Some households also get part time job in agriculture sector.

The Cat Plan has been formulated for the Catchment area of Tankul Hydroelectric Project having total cost of **236.94 Lakhs**. The Catchment area involves one micro water shed Catchment (Simkhola Gad) consists of mainly civil forest as well as private land lies between 1525 meter to 2200 meter above sea level. The actual treatable area constitutes of 03 revenue villages.

2.9.3 Socio economic profile:

2.9.3.1 Socio economic Status:

The actual treatable area is spread over 3 revenue villages of Pithoragarh division. Upstream of Tankul Hydroelectric Project decline N 30°01'47.36" E 80 ° 42'21.534" and it has been mutually agreed that the villages laying down the stream up to N 30°01'58" E 80 ° 42'32" be brought within the Cat Plan for uplifting the livelihood standard of these people, so that their dependence of the forest resources can be redeemed. So the inclusion of downstream villages within CAT Plan review will certainly ensure their active participation for biodiversity conservation issues under the main Project the altitudinal variation of the Catchment area lies between 4620 m amsl at Wazking kee Dhar on the eastern fringe to 1525 m amsl. The highest peak on the Western boarder of the Catchment has an elevation of 4310 m amsl. It comprises of 2 sub watershed and 6 micro watershed.

Demographic profile of the area, including households are given in the table below:-
Pithoragarh Division
Table 2.8

Total 17 villages falls within the 10 Km Buffer zone area-
Note-Arrange this data MWS wise

CATCHMENT	WS_NAME	SWS	MWS	State	District	Subdistt	Town/Village	Ward	EB	Level	Name	TRU
Kali	Kali	Kutti	3	05	062	00316	049093	0000	000000	VILLAGE	Bung Bung	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049108	0000	000000	VILLAGE	Chhalmachhilason	Rural
Kali	Kali	Kutti	Jiuntigad	05	062	00316	049106	0000	000000	VILLAGE	Dhar Pangu	Rural
Kali	Kali	Kutti	Jiuntigad	05	062	00316	049098	0000	000000	VILLAGE	Himkhola	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049110	0000	000000	VILLAGE	Jaykot	Rural
Kali	Kali	Kutti	3	05	062	00316	049095	0000	000000	VILLAGE	Jipti	Rural
Kali	Kali	Kutti	3	05	062	00316	049103	0000	000000	VILLAGE	Mangti (Pangla)	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049109	0000	000000	VILLAGE	Punla Bhataka	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049102	0000	000000	VILLAGE	Rung	Rural
Kali	Kali	Kutti	3	05	062	00316	049094	0000	000000	VILLAGE	Salagar	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049104	0000	000000	VILLAGE	Sirdang	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049097	0000	000000	VILLAGE	Sirkha	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049105	0000	000000	VILLAGE	Sosa	Rural
Kali	Kali	Dhauli	Suwa	05	062	00316	049118	0000	000000	VILLAGE	Suwa	Rural
Kali	Kali	Kutti	3	05	062	00316	049096	0000	000000	VILLAGE	Tankul	Rural
Kali	Kali	Kutti	Sirkha	05	062	00316	049107	0000	000000	VILLAGE	Tanta Gaon Roto	Rural
Kali	Kali	Kutti	Jiuntigad	05	062	00316	049101	0000	000000	VILLAGE	Jyoti Pangu	Rural
											Total	

Total 3 villages falls in the Catchment area:-

CATCHMENT	WS_NAME	SWS	MWS	State	District	Subdistt	Town/Village	Ward	EB	Level	Name	TRU
Kali	Kali	Kutti	3	05	062	00316	049093	0000	000000	VILLAGE	Bung Bung	Rural
Kali	Kali	Kutti	3	05	062	00316	049103	0000	000000	VILLAGE	Mangti (Pangla)	Rural
Kali	Kali	Kutti	3	05	062	00316	049096	0000	000000	VILLAGE	Tankul	Rural

Total 17 villages falls within the 10 Km Buffer zone area-

Name	No_HH	TOT_P	TOT_M	TOT_F	P_06	M_06	F_06	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT	P_ILL	M_ILL	F_ILL
Bung Bung	110	516	271	245	68	36	32	109	59	50	83	45	38	340	207	133	176	64	112
Chhalmachhilason	79	387	190	197	58	30	28	371	182	189	10	5	5	266	152	114	121	38	83
Dhar Pangu	34	143	67	76	30	11	19	94	42	52	38	19	19	82	47	35	61	20	41
Himkhola	58	273	134	139	44	18	26	99	46	53	79	40	39	162	94	68	111	40	71
Jaykot	169	789	387	402	78	38	40	17	8	9	144	78	66	563	332	231	226	55	171
Jipti	62	357	167	190	51	28	23	36	18	18	48	26	22	247	128	119	110	39	71
Mangti (Pangla)	173	941	458	483	122	64	58	26	16	10	0	0	0	710	389	321	231	69	162
Punle Bhataka	4	20	12	8	3	2	1	20	12	8	0	0	0	14	9	5	6	3	3
Rung	99	389	181	208	65	30	35	206	101	105	175	76	99	302	143	159	87	38	49
Salagar	56	281	143	138	35	19	16	0	0	0	7	3	4	198	115	83	83	28	55
Sirdang	182	812	406	406	135	73	62	539	277	262	157	74	83	567	310	257	245	96	149
Sirkha	103	552	269	283	72	35	37	179	86	93	368	180	188	407	221	186	145	48	97
Sosa	77	309	147	162	32	19	13	54	22	32	185	85	100	204	111	93	105	36	69
Suwa	132	637	309	328	115	56	59	19	7	12	13	4	9	372	218	154	265	91	174
Tankul	63	332	160	172	57	31	26	82	41	41	17	10	7	205	118	87	127	42	85
Tanta Gaun Rojo	36	163	64	99	26	12	14	85	32	53	71	29	42	107	46	61	56	18	38
Tiyongi Pangu	73	232	122	110	24	7	17	72	34	38	128	63	65	182	111	71	50	11	39
Total	**1510**	**7133**	**3487**	**3646**	**1015**	**509**	**506**	**2008**	**983**	**1025**	**1523**	**737**	**786**	**4928**	**2751**	**2177**	**2205**	**736**	**1469**

Total 3 villages falls in the Catchment area:-

Name	No_HH	TOT_P	TOT_M	TOT_F	P_06	M_06	F_06	P_SC	M_SC	F_SC	P_ST	M_ST	F_ST	P_LIT	M_LIT	F_LIT	P_ILL	M_ILL	F_ILL
Bung Bung	110	516	271	245	68	36	32	109	59	50	83	45	38	340	207	133	176	64	112
Tankul	63	332	160	172	57	31	26	82	41	41	17	10	7	205	118	87	127	42	85
Mangti (Pangla)	173	941	458	483	122	64	58	26	16	10	0	0	0	710	389	321	231	69	162
Total	**346**	**1789**	**889**	**900**	**247**	**131**	**116**	**217**	**116**	**101**	**100**	**55**	**45**	**1255**	**714**	**541**	**534**	**175**	**359**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	TOT_WORK_P	TOT_WORK_M	TOT_WORK_F	MAINWORK_P	MAINWORK_M	MAINWORK_F	MAIN_CL_P	MAIN_CL_M	MAIN_CL_F	MAIN_AL_P
Bung Bung	435	231	204	9	5	4	1	0	1	1
Chhaimachhilason	150	74	76	31	17	14	22	11	11	1
Dhar Pangu	65	34	31	63	34	29	33	12	21	4
Himkhola	138	69	69	92	47	45	55	22	33	2
Jaykot	414	201	213	25	17	8	0	0	0	0
Jipti	259	128	131	8	7	1	1	1	0	0
Mangti Pangla	400	198	202	101	90	11	1	1	0	0
Purla Bhataka	7	3	4	0	0	0	0	0	0	0
Rung	196	93	103	124	56	68	101	43	58	1
Salagar	239	122	117	4	2	2	0	0	0	0
Sirdang	466	214	252	26	14	12	2	1	1	2
Sirkha	306	144	162	142	74	68	94	38	56	0
Sosa	146	68	78	129	56	73	109	47	62	6
Suwa	482	231	251	316	146	170	293	133	160	1
Tankul	93	75	18	51	37	14	7	6	1	0
Tanta Gaon Roto	77	31	46	71	31	40	37	12	25	0
Tiyongi Pangu	122	67	55	97	50	47	59	20	39	9
	3995	**1983**	**2012**	**1289**	**683**	**606**	**815**	**347**	**468**	**27**

Total 3 villages falls in the Catchment area:-

Name	TOT_WORK_P	TOT_WORK_M	TOT_WORK_F	MAINWORK_P	MAINWORK_M	MAINWORK_F	MAIN_CL_P	MAIN_CL_M	MAIN_CL_F	MAIN_AL_P
Bung Bung	435	231	204	9	5	4	1	0	1	1
Tankul	93	75	18	51	37	14	7	6	1	0
Mangti Pangla	400	198	202	101	90	11	1	1	0	0
Total	**928**	**504**	**424**	**161**	**132**	**29**	**9**	7	2	**1**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MAIN_AL_M	MAIN_AL_F	MAIN_HH_P	MAIN_HH_M	MAIN_HH_F	MAIN_OT_P	MAIN_OT_M	MAIN_OT_F	MARGWORK_P	MARGWORK_M
Bung Bung	1	0	3	2	1	4	2	2	426	226
Chhalmachhilason	1	0	0	0	0	8	5	3	119	57
Dhar Pangu	4	0	1	0	1	25	18	7	2	0
Himkhola	0	2	8	4	4	27	21	6	46	22
Jaykot	0	0	0	0	0	25	17	8	389	184
Jipti	0	0	1	1	0	6	5	1	251	121
Pangla Mangti	0	0	0	0	0	100	89	11	299	108
Punla Bhataka	0	0	0	0	0	0	0	0	7	3
Rung	0	1	7	2	5	15	11	4	72	37
Salagar	0	0	3	0	0	4	2	2	235	120
Sirdang	1	1	1	0	1	21	12	9	440	200
Sirkha	0	0	0	0	0	48	36	12	164	70
Sosa	2	4	0	0	0	14	7	7	17	12
Suwa	1	0	0	0	0	22	12	10	166	85
Tankul	0	0	0	0	0	44	31	13	42	38
Tantz Gaon Reto	0	0	0	0	0	34	19	15	6	0
Tiyongi Pangu	4	5	0	0	0	29	26	3	25	17
	14	**13**	**21**	**9**	**12**	**426**	**313**	**113**	**2706**	**1300**

Total 3 villages falls in the Catchment area:-

Name	MAIN_AL_M	MAIN_AL_F	MAIN_HH_P	MAIN_HH_M	MAIN_HH_F	MAIN_OT_P	MAIN_OT_M	MAIN_OT_F	MARGWORK_P	MARGWORK_M
Bung Bung	1	0	3	2	1	4	2	2	426	226
Tankul	0	0	0	0	0	44	31	13	42	38
Pangla Mangti	0	0	0	0	0	100	89	11	299	108
Total	**1**	**0**	3	**2**	**1**	**148**	**122**	**26**	767	**372**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARGWORK_F	MARG_CL_P	MARG_CL_M	MARG_CL_F	MARG_AL_P	MARG_AL_M	MARG_AL_F	MARG_HH_P	MARG_HH_M	MARG_HH_F
Bung Bung	200	402	213	189	0	0	0	24	13	11
Chhalmachhilason	62	106	50	56	7	3	4	0	0	0
Dhar Pangu	2	0	0	0	0	0	0	0	0	0
Himkhola	24	29	14	15	0	0	0	9	3	6
Jaykot	205	385	181	204	0	0	0	1	1	0
Jipti	130	249	120	129	0	0	0	0	0	0
Pangla (Mangti)	191	223	35	188	0	0	0	0	0	0
Punla Bhataka	4	7	3	4	0	0	0	0	0	0
Rung	35	63	34	29	2	1	1	1	1	0
Salagar	115	224	115	109	0	0	0	11	5	6
Sirdang	240	175	83	92	25	14	11	194	72	122
Sirkha	94	121	40	81	3	2	1	10	6	4
Sosa	5	6	5	1	1	0	1	0	0	0
Suwa	81	165	84	81	1	1	0	0	0	0
Tankul	4	12	10	2	7	6	1	1	1	0
Tanta Gaon Roto	5	2	0	2	0	0	0	0	0	0
Tiyongi Pangu	8	21	16	5	3	1	2	1	0	1
	1406	**2190**	**1003**	**1187**	**49**	**28**	**21**	**252**	**102**	**150**

Total 3 villages falls in the Catchment area:-

Name	MARGWORK_F	MARG_CL_P	MARG_CL_M	MARG_CL_F	MARG_AL_P	MARG_AL_M	MARG_AL_F	MARG_HH_P	MARG_HH_M	MARG_HH_F
Bung Bung	200	402	213	189	0	0	0	24	13	11
Tankul	4	12	10	2	7	6	1	1	1	0
Pangla (Mangti)	191	223	35	188	0	0	0	0	0	0
Total	**395**	**637**	**258**	**379**	**7**	**6**	**1**	**25**	**14**	**11**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARG_OT_P	MARG_OT_M	MARG_OT_F	MARGWORK_3_6_P	MARGWORK_3_6_M	MARGWORK_3_6_F	MARG_CL_3_6_P	MARG_CL_3_6_M
Bung Bung	0	0	0	408	211	197	384	198
Chhalmachhilason	6	4	2	111	53	58	104	49
Dhar Pangu	2	0	2	2	0	2	0	0
Himkhola	8	5	3	34	18	16	25	13
Jaykot	3	2	1	371	174	197	367	171
Jipti	2	1	1	251	121	130	249	120
Mangti (Pangla)	75	73	3	298	107	191	222	34
Punla Bhataka	0	0	0	7	3	4	7	3
Rung	6	1	5	72	37	35	63	34
Salagar	0	0	0	215	106	109	204	101
Sirdang	46	31	15	197	90	107	155	68
Sirkha	30	22	8	157	67	90	116	39
Sosa	10	7	3	11	9	2	4	4
Suwa	0	0	0	47	23	24	47	23
Tankul	22	21	1	34	30	4	11	9
Tanta Gaon Rolo	4	0	4	6	0	6	2	0
Tiyongi Pargu	0	0	0	20	14	6	18	13
	215	**167**	**48**	**2241**	**1063**	**1178**	**1978**	**879**

Total 3 villages falls in the Catchment area:-

Name	MARG_OT_P	MARG_OT_M	MARG_OT_F	MARGWORK_3_6_P	MARGWORK_3_6_M	MARGWORK_3_6_F	MARG_CL_3_6_P	MARG_CL_3_6_M
Bung Bung	0	0	0	408	211	197	384	198
Tankul	22	21	1	34	30	4	11	9
Mangti (Pangla)	76	73	3	298	107	191	222	34
Total	**98**	**94**	**4**	**740**	**348**	**392**	**617**	**241**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARG_CL_3_6_F	MARG_AL_3_6_P	MARG_AL_3_6_M	MARG_AL_3_6_F	MARG_HH_3_6_P	MARG_HH_3_6_M	MARG_HH_3_6_F	MARG_OT_3_6_P
Burg Bung	186	0	0	0	24	13	11	0
Chhalmachhilason	55	1	0	1	0	0	0	6
Dhar Pangu	0	0	0	0	0	0	0	2
Himkhola	12	0	0	0	5	2	3	4
Jaykot	196	0	0	0	1	1	0	3
Jipti	129	0	0	0	0	0	0	2
Mangti (Pangla)	188	0	0	0	0	0	0	76
Punla Bhataxa	4	0	0	0	0	0	0	0
Rung	29	2	1	1	2	1	0	6
Salagar	103	0	0	0	11	5	6	0
Sirdang	87	5	2	3	16	8	8	21
Sirkha	77	3	2	1	10	6	4	28
Sosa	0	1	0	1	0	0	0	6
Suwa	24	0	0	0	0	0	0	0
Tankul	2	6	5	1	0	0	0	17
Tanta Gaon Roto	2	0	0	0	0	0	0	4
Tiyorgi Pangu	5	1	1	0	1	0	1	0
	1099	**19**	**11**	**8**	**69**	**36**	**33**	**175**

Total 3 villages falls in the Catchment area:-

Name	MARG_CL_3_6_F	MARG_AL_3_6_P	MARG_AL_3_6_M	MARG_AL_3_6_F	MARG_HH_3_6_P	MARG_HH_3_6_M	MARG_HH_3_6_F	MARG_OT_3_6_P
Bung Bung	186	0	0	0	24	13	11	0
Tankal	2	6	5	1	0	0	0	17
Mangti (Pangla)	188	0	0	0	0	0	0	76
Total	**376**	**6**	**5**	**1**	**24**	**13**	**11**	**93**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARG_OT_3_6_M	MARG_OT_3_6_F	MARGWORK_0_3_P	MARGWORK_0_3_M	MARGWORK_0_3_F	MARG_CL_0_3_P	MARG_CL_0_3_M
Bung Bung	0	0	18	15	3	18	15
Chhalmachhilason	4	2	8	4	4	2	1
Dhar Pangu	0	2	0	0	0	0	0
Himkhola	3	1	12	4	8	4	1
Jaykot	2	1	18	10	8	18	10
Jipti	1	1	0	0	0	0	0
Mangti Pangla	73	3	1	1	0	1	1
Punla Bhataka	0	0	0	0	0	0	0
Rung	1	5	0	0	0	0	0
Salagar	0	0	20	14	6	20	14
Sirdang	12	9	243	110	133	20	15
Sikha	20	8	7	3	4	5	1
Sosa	5	1	6	3	3	2	1
Suwa	0	0	119	62	57	118	61
Tankul	16	1	8	8	0	1	1
Tanta Gaon Roto	0	4	0	0	0	0	0
Tiyongi Pangu	0	0	5	3	2	3	3
	137	**38**	**465**	**237**	**228**	**212**	**124**

Total 3 villages falls in the Catchment area:-

Name	MARG_OT_3_6_M	MARG_OT_3_6_F	MARGWORK_0_3_P	MARGWORK_0_3_M	MARGWORK_0_3_F	MARG_CL_0_3_P	MARG_CL_0_3_M
Bung Bung	0	0	18	15	3	18	15
Tankul	16	1	8	8	0	1	1
Mangti Pangla	73	3	1	1	0	1	1
Total	**89**	**4**	**27**	**24**	**3**	**20**	**17**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARG_CL_0_3_F	MARG_AL_0_3_P	MARG_AL_0_3_M	MARG_AL_0_3_F	MARG_HH_0_3_P	MARG_HH_0_3_M	MARG_HH_0_3_F
Bung Bung	3	0	0	0	0	0	0
Chhalmachhilason	1	6	3	3	0	0	0
Dhar Pangu	0	0	0	0	0	0	0
Himkhola	3	0	0	0	4	1	3
Jaykot	8	0	0	0	0	0	0
Jipti	0	0	0	0	0	0	0
Mangti (Pangla)	0	0	0	0	0	0	0
Punla Bhataka	0	0	0	0	0	0	0
Rung	0	0	0	0	0	0	0
Salagar	6	0	0	0	0	0	0
Sirdang	5	20	12	8	178	64	114
Sirkha	4	0	0	0	0	0	0
Sosa	1	0	0	0	0	0	0
Suwa	57	1	1	0	0	0	0
Tankul	0	1	1	0	1	1	0
Tanta Gaon Rato	0	0	0	0	0	0	0
Tiyongi Pangu	0	2	0	2	0	0	0
	88	**30**	**17**	**13**	**183**	**66**	**117**

Total 3 villages falls in the Catchment area:-

Name	MARG_CL_0_3_F	MARG_AL_0_3_P	MARG_AL_0_3_M	MARG_AL_0_3_F	MARG_HH_0_3_P	MARG_HH_0_3_M	MARG_HH_0_3_F
Bung Bung	3	0	0	0	0	0	0
Tankul	0	1	1	0	1	1	0
Mangti (Pangla)	0	0	0	0	0	0	0
Total	**3**	**1**	**1**	**0**	**1**	**1**	**0**

Total 17 villages falls within the 10 Km Buffer zone area-

Name	MARG_OT_0_3_P	MARG_OT_0_3_M	MARG_OT_0_3_F	NON_WORK_P	NON_WORK_M	NON_WORK_F
Burg Bung	0	0	0	81	40	41
Chialmachhilason	0	0	0	237	116	121
Dhar Pangu	0	0	0	78	33	45
Himkhola	4	2	2	135	65	70
Jayket	0	0	0	375	186	189
Jipti	0	0	0	98	39	59
Mangti (Pangla)	0	0	0	541	260	281
Punla Bhataka	0	0	0	13	9	4
Rung	0	0	0	193	88	105
Salagar	0	0	0	42	21	21
Sirdang	25	19	6	346	192	154
Sirkha	2	2	0	246	125	121
Sosa	4	2	2	163	79	84
Suwa	0	0	0	155	78	77
Tankul	5	5	0	239	85	154
Tanta Gaon Roto	0	0	0	86	33	53
Tiyongi Pangu	0	0	0	110	55	55
	40	**30**	**10**	**3138**	**1504**	**1634**

Total 3 villages falls in the Catchment area:-

Name	MARG_OT_0_3_P	MARG_OT_0_3_M	MARG_OT_0_3_F	NON_WORK_P	NON_WORK_M	NON_WORK_F
Bung Bung	0	0	0	81	40	41
Tankul	5	5	0	239	85	154
Mangti (Pangla)	0	0	0	541	260	281
Total	**5**	**5**	**0**	**861**	**385**	**476**

Total 17 villages falls within the 10 Km Buffer zone area-

- Revenue villages – **17 (H.H. 1510)**
- Total population- **7133**
- Male female ratio-910:1000 **(in favour of female-implies that the women may play significant role in village economy, requires capacity building programs in the income generating activities.)**
- Total literacy **4928** Literacy among male is **2751** and female is **2177.** Total illiteracy is **2205** Illiteracy among male is **736** and among female **1469.**
- Total working population is 3995 which is 56% of total population.

(Male-female ratio implies that the women need to be empowered through their active participation in different project activities, requires capacity building training programmes in the income generating activities.)

Total 3 villages falls in the Catchment area:-

- Revenue villages - **03 (H.H- 346)**

- The total population- **1789** ,(Bungbung village-**516** population, H.H. **110**), (Tankul village- **332**population, H.H. **63**), Mangti (Pangla) **941** population. 173-H.H.
- Male female ratio **889:900 (in favour of female-implies that the women may play significant role in village economy, requires capacity building training programs in the income generating activities.)**

- Total literacy **1255** Literacy among male is **714** and female is **541.**

Total working population is **928**, which is **52%** of total population.

(Male-female ratio implies that the women need to be empowered through their active participation in different project activities, requires capacity building training programmes in the income generating activities.)

DIVISION WISE DEMOGRAPHIC PROFILE ACTUAL TREATABLE AREA OF 17 VILLAGES (SUMMARY)

Pithoragarh Division

Table 2.9

No. of House hold	Total Population	Total Male	Total Female	SC Population	ST Population	Literate Population	Male Literate	Female Literate	Illiteracy Population	illiteracy Male	illiteracy Female	Total Working Population
1510	7133	3487	3646	2008	1523	4928	2751	2177	2205	736	1469	3995

SOURCE :UTTARAKHAND CENSUS 2011

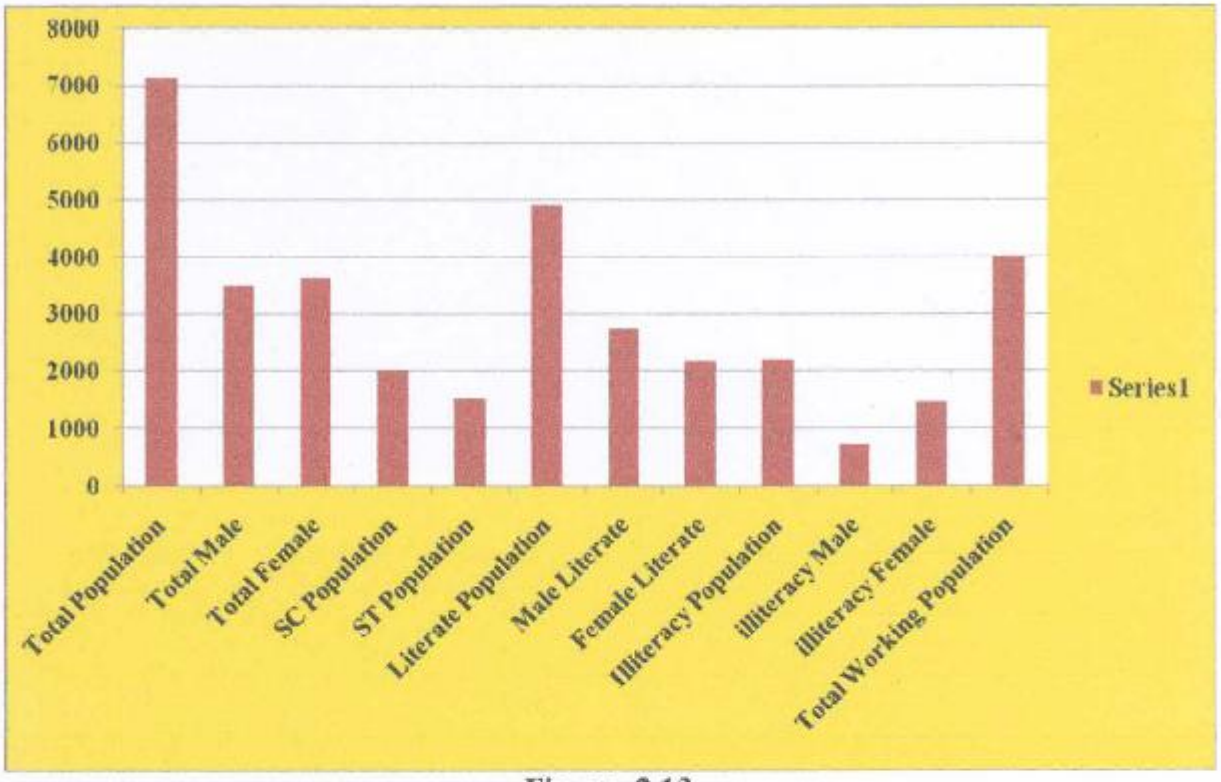


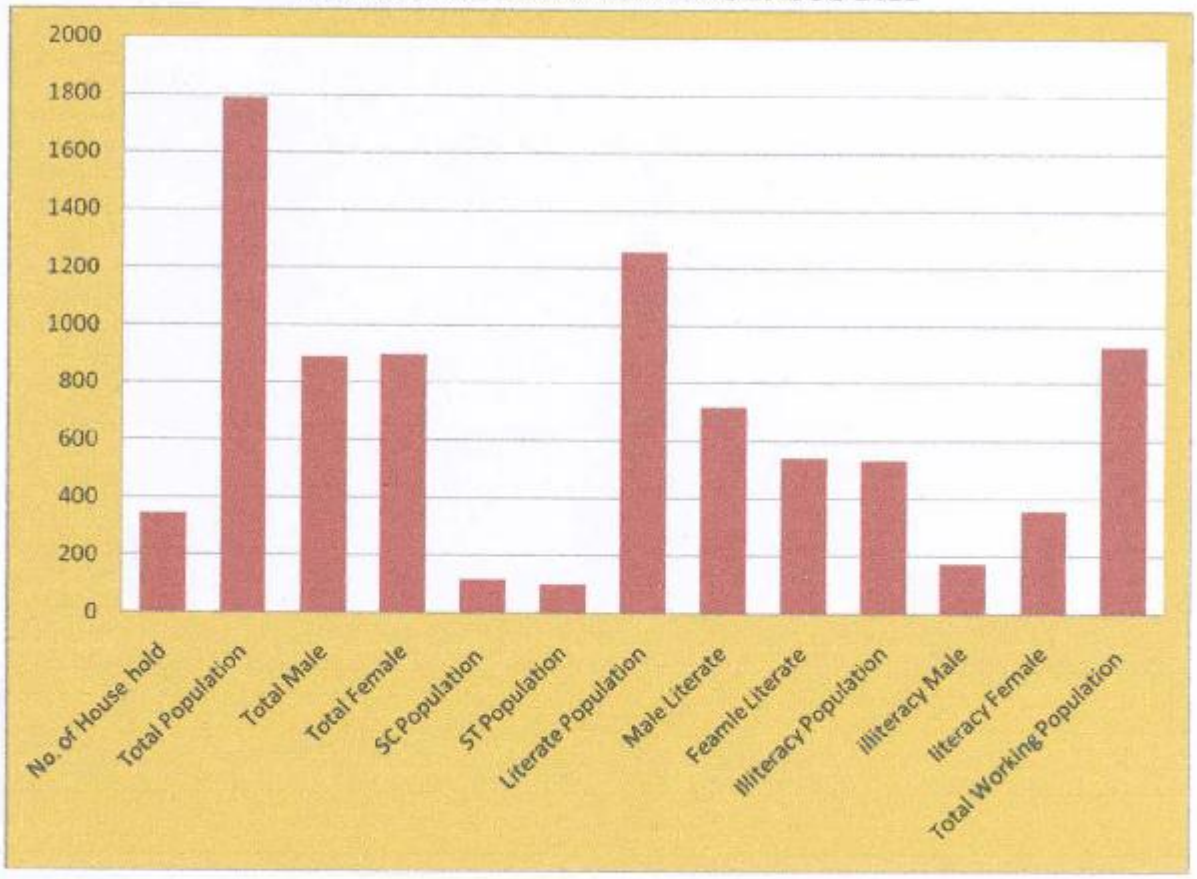
Fig. no. 2.13

Source:- Watershed Management Directorate Uttarakhand

DIVISION WISE DEMOGRAPHIC PROFILE OF ACTUAL TREATABLE AREA
3 VILLAGES (SUMMARY)
Pithoragarh Division
Table 2.10

Village name	No. of House hold	Total Population	Total Male	Total Female	SC Population	ST Population	Literate Population	Male Literate	Female Literate	illiteracy Male	literacy Female	Total Working Population
Bugbung	110	516	271	245	32	50	340	133	133	64	112	435
Tankul	63	332	160	172	26	41	205	87	87	42	85	93
Mangti (Pangla)	173	941	458	483	58	10	710	321	321	69	162	400
Total	346	1789	889	900	116	101	1255	714	541	175	359	928

SOURCE :UTTARAKHAND CENSUS 2011



2.10 Land use in project area

The total Project area of Tankul SHP is **27204 ha.** and the total number of villages falling under this 10 k.m area buffer zone is **17**. The entire area has newly constructed road network, and they lack in important infrastructural facilities such as schools, banks, post office etc. A major portion of the entire area is covered with good forest cover having diversified plant species. Details of land use in the influence zone are presented in table 2.12 below. It may be noticed that a considerable area lie under scrub land and pasture land category, leaving a large scope for bringing the area under some productive use.

The Project area spreads over 2 SWS Kutti and Dhauli and 6 MWS namely Nandanna Nadi MWS, Suwa MWS, 3 MWS, 4 MWS, Jiunti Gad MWS, Sirkha MWS of Kali river Catchment. It includes about the treatment area falls under Pithoragarh Forest Division. **The total Catchment area is 27204 ha.**, comprises **17295 ha. (64%)** of forests, **1671ha. (6%)** of agriculture land and the rest **2804 ha. (10%)** is blank, river bed area **4288 ha (16%),** snow area **1009 (4%)** and rocky area **137 ha (0%)**.The project period is 7 years. The total cat plan cost is **Rs.236.94 lakhs.**

The land use details of these MWS falling in project area are given in the table:-

TABLE:2.11

TOTAL FOREST LAND (ha)	TOTAL AGRICULTURE LAND (ha)	TOTAL BLANK AREA (ha)	TOTAL RIVER BED AREA (ha)	ROCKY AREA (ha)	SNOW AREA (ha)	TOTAL CATCHMENT AREA (ha)
17295 (64%)	1671 (6%)	2804 (10%)	4288 (16%)	137 (0%)	1009 (4%)	27204

The land use details of the catchment area as shown above are also shown in the pie chart below:

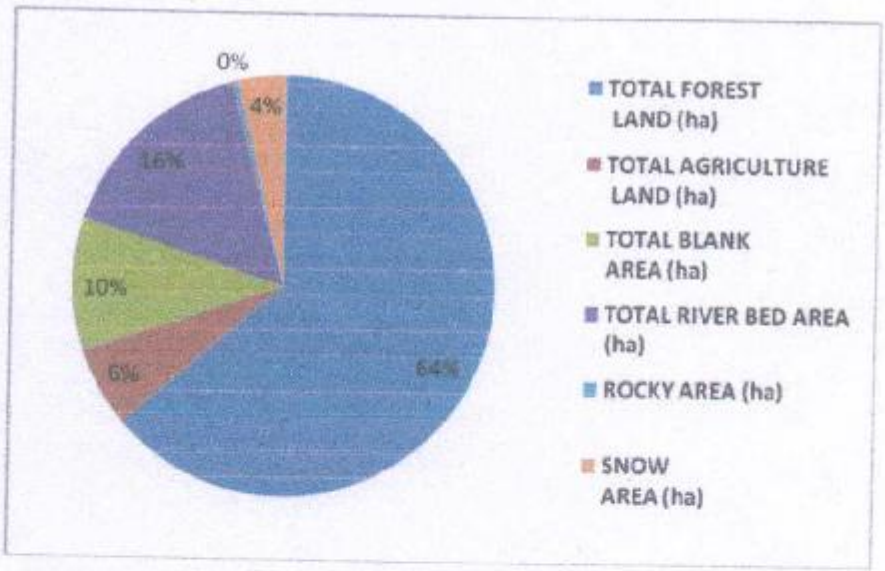


Fig 2.15

Source:- Watershed Management Directorate Uttarakhand

Note:- More than 64% of the influence zone comes under the forest cover. Around 36% of the influence area is treatable. Land use details of the Catchment Area 3 MWS in Project Area.

Land Use Detail 3MWS in Project Area

The atual total Project area of Tankul SHP is **5243 ha.** and the total number of villages falling under this area is 03. The entire area has newly constructed road network, and they lack in important infrastructural facilities such as schools, banks, post office etc. A major portion of the entire area is covered with good forest cover having diversified plant species. Details of land use in the influence zone are presented in table 2.12 below. It may be noticed that a considerable area lie under scrub land and pasture land category, leaving a large scope for bringing the area under some productive use.

The Project area spreads over 2 SWS Kutti and Dhauli and 6 MWS namely Nandarma Nadi MWS, Suwa MWS, 3 MWS, 4 MWS, Jiunti Gad MWS, Sirkha MWS of Kali river Catchment. It includes about the treatment area falls under Pithoragarh Forest Division. **The total Catchment area is 5243 ha.** comprises **3405 ha.(65%)** of forests, **176 ha. (3%)** of agriculture land and the rest **1662 ha. (32%)** is blank, river bed area **0 ha (0%),** snow area **0 (0%)** and rocky area **0 ha (0%).** The project period is 7 years. The total cat plan cost is **Rs.236.94.**

TOTAL FOREST LAND (ha)	TOTAL AGRICULTURE LAND (ha)	TOTAL BLANK AREA (ha)	TOTAL RIVER BED AREA (ha)	ROCKY AREA (ha)	SNOW AREA (ha)	TOTAL CATCHMENT AREA (ha)
3405 (65%)	176 (3%)	1662 (32%)	0 (0%)	0 (0%)	0 (0%)	5243

The land use details of the catchment area as shown above are also shown in the pie chart bellow

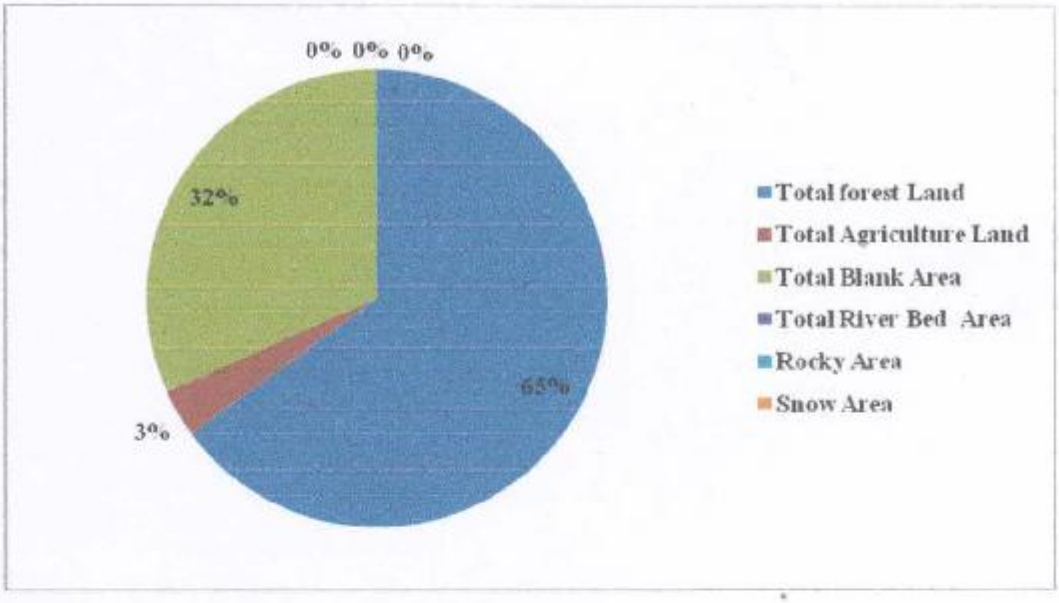


Fig:2.15.1

Source:- Watershed Management Directorate Uttarakhand

Note- More than 65 % of the influence zone comes under the forest cover. Around 35 % of the influence area is treatable.

Agriculture area of 17 villages falling in tankul SHP tehsil Dharchula, Dist.- Pithoragarh

Table:-2.12

S.No.	Division	Agriculture land
1.	Pithoragarh	**1671 ha.**
	Total	**1671 ha.**

DIVISION WISE FOREST DETAILS WITHIN 10 km. BUFFER ZONE AREA

Table:-2.12.1

S.No.	Division	Type	Area in Ha
1.	Pithoragarh	Reserve forest	**8299 ha**
2.	Pithoragarh	Other Land (Panchayati, Civil etc.)	**8996 ha**

Note:- The total buffer zone area, **27204 ha.15746 ha** in other land (Panchayati, Civil etc) and **0ha**. is under reserve Forest area which is only **0%** of the total catchment area.

DENSITY OF VEGITATION IN 10 km. BUFFER ZONE AREA

Table:-2.13

S.L. No	Class Name	Area in ha
1.	Very Dense Forest	3257
2.	Medium Dense Forest	6400
3.	Open Forest	1303
4.	Other Land (Panchayati, Civil etc.)	15746
5.	Scrubs	490
6.	Water	08
	Total	**27204 ha**

Note:- The total Project area is 27204 ha. The total area covered by very dense, medium dense, & open forest vegetation in project area is 50.89%, as per the National & State Forest Policy atleast the 60% of the total geographical area must be under vegetative cover. As shown above in 3 MWS percentage of the area under vegetative cover is less than 60 %. Therefore to fulfill the basic objective of National Forest Policy the workable blank areas of these catchment areas are proposed for afforestation and other vegetative activities.

Microwatershed wise Reserve Forest area

Table:-2.14

Sl. No.	Name of S.W.S.	Name of M.W.S.	Reserve Forest Area
1.	Dhauli	Nandarma Nadi	420
2.	Dhauli	Suwa	2961
3.	Kutti	3	886
4.	Kutti	4	0
5.	Kutti	Jiuntigad	2050
6.	Kutti	Sirkha	1982
	Total		8299 ha

Agriculture area of 3 MWS falling in tankul SHP tehsil Dharchula, Dist.- Pithoragarh

Table:-2.11(A)

S.No.	Division	Agriculture land
1.	Pithoragarh	**176 ha.**
	Total	**176 ha.**

DIVISION WISE FOREST DETAILS WITHIN CATCHEMENT AREA in 3 MWS

Table:-2.12.1(B)

S.No.	Division	Type	Area in Ha
1.	Pithoragarh	Reserve forest	**886 ha**
2.	Pithoragarh	Other Land (Panchayati, Civil etc.)	**2519 ha**

Note:- The total Catchment area, **5243 ha**. **2519 ha** in other land (Panchayati, Civil etc)and **Nil ha**.is under reserve Forest area which is only 0% of the total catchment area.

DENSITY OF VEGITATION IN PROJECT AREA in 3 MWS

Table:-2.13.1

S.L. No	Class Name	Area in ha
1.	Very Dense Forest	436
2.	Medium Dense Forest	1182
3.	Open Forest	375
4.	Other Land (Panchayati, Civil etc.)	19
5.	Scrubs	0
6.	Water	3231
	Total	**5243 ha**

Note:- The total Catchment area is **5243 ha**. The total area covered by very dense, medium dense. & open forest vegetation in project area is 38.01% . as per the National & State Forest Policy atleast the 60% of the total geographical area must be under vegetative cover. As shown above in 3 MWS percentage of the area under vegetative cover is less than 60%. Therefore to fulfill the basic objective of National Forest Policy the workable blank areas of these catchment areas are proposed for afforestation and other vegetative activities.

3 Microwatershed wise Reserve Forest area in Project Area

Table:-2.14.1

Sl. No.	Name of S.W.S.	Name of M.W.S.	Reserve Forest Area
3.	Kutti	3	886
		Total	**886 ha**

ERODIBILITY CLASSWISE TREATABLE AREA:-

Table:-2.15

Erodibility for selected Buffer zone Area Microwatershed wise

DISTRICT	SWS	MWS	Agriculture				Forest				Blank				ROCKY	RIVER BED	SNOW	TOTAL
			E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4				
Pithoragarh	Dhauli	Nandarma Nadi	39	0	0	0	0	0	644	31	0	0	0	0	2688	137	0	3539
Pithoragarh	Dhauli	Suwa	0	0	69	0	0	0	1562	1819	0	0	213	0	1250	0	0	4913
Pithoragarh	Kutti	3	86	90	0	0	428	1474	1503	0	13	73	1517	59	0	0	0	5243
Pithoragarh	Kutti	4	0	0	0	0	0	1274	1523	1249	0	0	304	432	0	0	1009	5791
Pithoragarh	Kutti	Sirkha	131	506	306	0	275	1350	1775	0	0	19	0	0	0	0	0	4362
Pithoragarh	Kutti	Jiuntigad	81	288	75	0	0	782	1606	0	19	112	37	6	350	0	0	3356
			337	**884**	**450**	**0**	**703**	**4880**	**8613**	**3099**	**32**	**204**	**2071**	**497**	**4288**	**137**	**1009**	**27204**

Erodibility class wise treatable area = E2+E3 = 644+1844+4657+3101+3956+2900

DISTRICT	SWS	MWS	E2+E3
Pithoragarh	Dhauli	Nandarma Nadi	644
Pithoragarh	Dhauli	Suwa	1844
Pithoragarh	Kutti	3	4657
Pithoragarh	Kutti	4	3101
Pithoragarh	Kutti	Sirkha	3956
Pithoragarh	Kutti	Jiuntigad	2900
Erodibility Classwise Treatable Area			**17102**

ERODIBILITY CLASSWISE TREATABLE AREA:-

Table:-2.16

Erodibility for selected Catchment Area 3 Microwatershed wise

DISTRICT	SWS	MWS	Agriculture				Forest				Blank				ROCKY	RIVER BED	SNOW	TOTAL
			E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4				
Pithoragarh	Kutti	3	86	90	0	0	428	1474	1503	0	13	73	1517	59	0	0	0	5243
			86	**90**	**0**	**0**	**428**	**1474**	**1503**	**0**	**13**	**73**	**1517**	**59**	**0**	**0**	**0**	5243
Erodibility class wise treatable area = E2+E3 = 90+2977+1590=4657																		

DISTRICT	SWS	MWS	E2+E3
Pithoragarh	Kutti	3	4657
Erodibility Classwise Treatable Area			4657

2.11 Hydrological units

The Land Survey Directorate (LSD), a wing of Uttarakhand Forest Deptt. has, hydrologically, divided Uttarakhand broadly into 8 Catchments, these catchments have further been divided into 26 watersheds, 110 SWS and finally into 1110 MWS. Details of these hydrological units given in the table below:

Table 2.17

Details of Catchment, Watersheds, Sub watersheds and MWS in uttarakhand:

Sl. No	Catchment	Watershed	No. of Sub watersheds	No. of MWS	Total Area (ha.)
1	Alknanda	Alaknanda	7	86	6,69,643
		Lower Alaknanda	5	32	95,475
		Mandakini	5	33	1,68,049
		Pindar	5	56	1,87,800
		Total	22	207	11,20,967
2	Bhagirathi	Bhagirathi	14	120	5,77,523
		Bhilangana	4	39	1,49,660
		Total	18	159	7,27,183
3	Ganga-A	Song	5	56	1,76,597
4	Ganga-B	Hiyunl/mal	6	28	1,00,683
		Nayar	6	59	2,08,612
		Total	12	87	3,09,295
5	Kali	Kali	5	82	5,49,682
		Lower Kali	3	34	1,17,760
		Saryu	8	123	4,45,494
		Total	16	239	11,12,936
6	Kosi	Bhakra	3	9	1,64,746
		Gola	3	20	1,65,988
		Kosi	4	71	2,10,075
		Nandhaur Left	3	17	1,23,618
		Total	13	117	6,64,427
7	Ramganga	Dhela Nadi	1	2	45,393
		Khoh	2	8	48,723
		Ramganga	8	75	3,33,926
		Total	11	85	4,28,042
8	Yamuna	Aglar	2	7	25,698
		Asan	3	18	82,088
		Lower Tons	3	19	45,265
		Tons	4	36	1,67,926
		Yamuna	7	80	2,29,185
		Total	19	160	**5,50,162**
		Grand Total	116	1110	**50,89,610**
				+ Haridwar	**2,33,506**
				Total	**53,20,291**

The Kutti and Dhauli SWS which includes the project area of Tankul SHP falls in Kali water shed of Yamuna Catchment of the State.

2.12 Drainage Pattern:

The Details of stream of different order as found in the identified MWS of catchment area of proposed dam is given the table below. This information is helpful in planning soil conservation activities in the MWS.

Drainage Pattern:

Table 2.18

Particulars	Type of Stream					
	1st order	2nd order	3rd order	4th order	5th order	Total
Length (km)	712.8	83.3	29.2	38.2	14.1	796.1
Nos	994	64	10	3	1	1058

Details of order and length of 1st and 2nd order streams within the proposed actual treatable are (3rd MWS):-

Table:- 2.19

S.No.	Division	No of Streams		Total No of streams	Length of Streams		Total Length of 1st & 2nd order Streams (KM)
		1st Order	2nd order				
1	Pithoragarh	217	14	231	158.20	16.50	174.70

2.13 Availability & Deficiency of fodder and firewood

2.13.1 Occupation:

Agriculture is the main occupation of the population residing in villages, while livestock development and horticulture are the other source of income. The rising unemployment is main concern of the area. Majority population is involved in labour activity. Some households also get part time job in Agriculture sector.

2.13.2 Dependence on Forests:

Majority of the households are dependent on forests for their day to day requirement of not only fuel and fodder but also for timber for domestic use. As animal husbandry is the second main occupation of the population, there is large number of cattle, specially goats and sheep per household. These cattle are left open to graze freely in the adjoining forests and thus causing intensive biotic pressure on forest.

Details of village wise livestock population in the villages of the project area are given in the table below:

Revenue Village-wise Livestock Population (Pithoragarh Forest Division) :
Total 17 villages falls within the 10 Km Buffer zone area-
Table 2.20

S.No	DIVISION	VILLAGE NAME	THE NAME	NO HH	Buffaloes	Cow/ bullock	Goats	Sheep	Horse/ Mule	Total
1	Pithoragarh Forest Division	Tankul	Dharchula	63	06	356	417	309	06	1094
2	Pithoragarh Forest Division	Sirkha	Dharchula	103	0	278	155	315	66	814
3	Pithoragarh Forest Division	Bungbung	Dharchula	110	0	157	315	218	13	703
4	Pithoragarh Forest Division	Rung	Dharchula	99	0	113	36	01	44	194
5	Pithoragarh Forest Division	Sirdang	Dharchula	182	0	544	633	239	75	1491
6	Pithoragarh Forest Division	Jyotipangu	Dharchula	73	0	125	227	97	0	449
7	Pithoragarh Forest Division	Mangti (Pangla)	Dharchula	173	28	777	229	145	29	1208
8	Pithoragarh Forest Division	Sosa	Dharchula	77	0	194	175	448	65	882
9	Pithoragarh Forest Division	Dharpangu	Dharchula	34	0	128	296	257	08	689
10	Pithoragarh Forest Division	Tantagaon Rounto	Dharchula	36	0	81	02	0	0	83
11	Pithoragarh Forest Division	Chhalmachhilanso	Dharchula	79	0	160	137	42	06	345
12	Pithoragarh Forest Division	Punlabhatka	Dharchula	04	0	19	55	10	0	84
13	Pithoragarh Forest Division	Jaykot	Dharchula	169	30	557	152	67	16	822
14	Pithoragarh Forest Division	Jipti	Dharchula	62	0	143	222	1700	82	2147
15	Pithoragarh Forest Division	Himkhola	Dharchula	58	0	165	109	80	22	376
16	Pithoragarh Forest Division	Galagar	Dharchula	56	0	229	363	1075	64	1731
17	Pithoragarh Forest Division	Suwa	Dharchula	132	0	95	71	42	12	220
			Total	**1510**	**64**	**4121**	**3594**	**5045**	**508**	**13332**

Revenue Village-wise Livestock Population (Pithoragarh Forest Division) :
Table 2.20.1

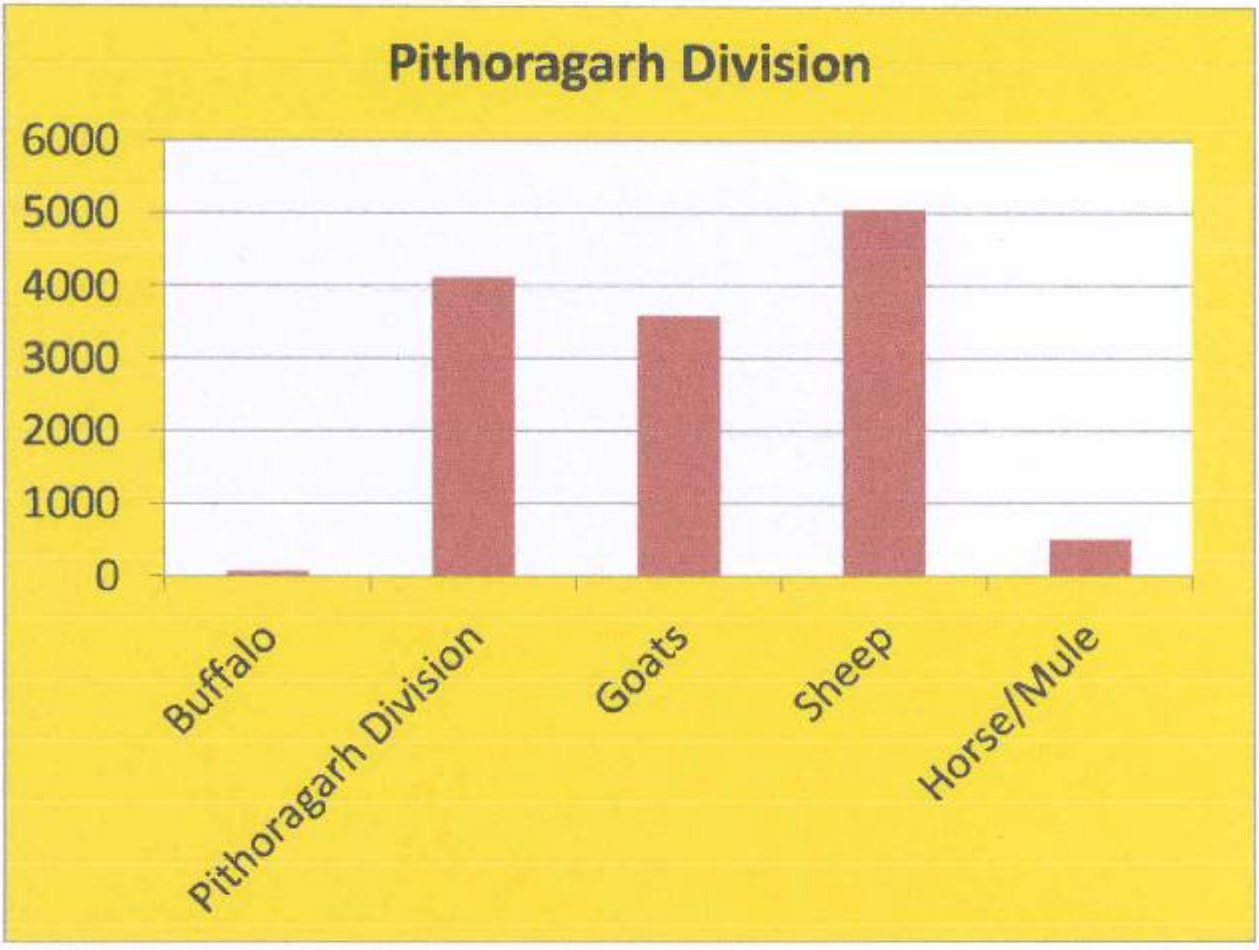
Total 3 villages falls in the Catchment area:-

S.No	DIVISION	VILLAGE NAME	THE NAME	NO HH	Buffaloes	Cow/ bullock	Goats	Sheep	Horse/ Mule	Total
1	Pithoragarh Forest Division	Bungbung	Dharchula	110	0	157	315	218	13	703
2	Pithoragarh Forest Division	Tankul	Dharchula	63	06	356	417	309	06	1094
3	Pithoragarh Forest Division	Mangti (Pangla)	Dharchula	173	28	777	229	145	29	1208
			Total	**346**	**34**	**1290**	**961**	**672**	**48**	**3005**

Livestock Population of 17 Villages at Buffer Zone Area (Pithoragarh Forest Division)

Table:-2.21

Division	Buffalo	Cow/Bullock	Goats	Sheep	Horse/Mule	Total Cattle
Pithoragarh Division	64	4121	3594	5045	508	13332

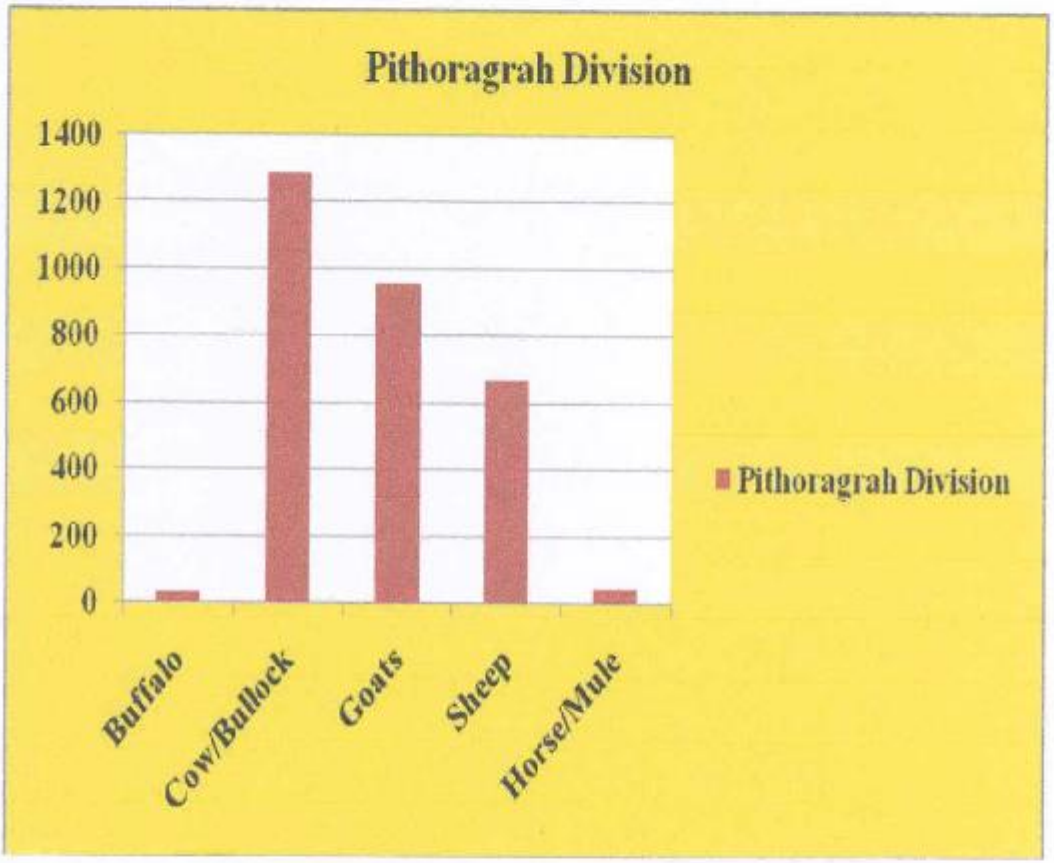


Source:- Livestock census 2014

Livestock Population of 3 Villages at Catchment Area (Pithoragarh Forest Division)

Table:-2.21.1

Division	Buffalo	Cow/Bullock	Goats	Sheep	Horse/Mule	Total Cattle
Pithoragrah Division	34	1290	961	672	48	3005



Source:- Livestock census 2014

2.14 Forest Management & Involvement of Local Community

Civil Forests and Reserve forests are purely managed by State Forest Department. The Panchayati Forests are managed by an elected committee (7 to 9 members) known as Van Panchayat. This committee is headed by an elected person known as **Van Panchayat Sarpanch.** The civil forests which are degraded are under the control of District Administration. There are mainly 3 types of forests in Pithoragarh districts:-

1- Civil Forests
2- Panchayti Forests
3- Reserve Forests

Uttarakhand State has a long history of community forest management since **1930** through community participation. Presently in this State around **12089** Van Panchayats are working and managing the huge forests areas **(34651)** which is around **64.79%** of the total area. **(53583 sq.km)** of the State.

Pithoragarh is one of the districts having highest number of Van Panchayats (1666) and they are managing 90,000 ha. In Pithoragarh district. Almost in every village the Van Panchayat exists. The project area is having 3 revenue villages and cent percent of the villages are having their own Van Panchayats. The execution of the work will be done in civil soyam and private land.

In these villages community has been used fire wood as fuel and very few used Gas-chullha and its use is also very limited. The average weight of the bundle of fire wood carried by women/men is around 18 to 22 kg only. The weekly requirement of wood per family is 3 bundles (Bojhas) a week.

The civil forests which are degraded forests are under the control of district administration.

The availability of fodder and wood in the proposed area is ensured by the following resources:-

1. **Agriculture residues**
2. Reserve Forests:- In Pithoragarh district traditionally community has been following the **MANGA system**. According to this system the local community is empowered with the rights and concessions for using the Reserve Forests. Panchayati Forests as well as the Civil Forests for fodder/grasses. The individual family has the right to protect the area around their habitat for grass/fodder.
3. The local community has the right to collect fire wood from Reserve Forests. Civil Forests.
4. The local community has been benefitted with a facility to collect dry, fallen wood and other fire wood from Panchayati Forests through the Panchayat level communities on subsidised rates or free of cost basis.

2.15 Need of Fodder at village level:-

On the basis of PRA the major vegetation existing in the proposed area are Bhemal, Khadik, Oak, Phalayant, Timla, Khinwa, Pines, Toon, Mango, Mehal, Kachnar, Wallnut etc. Generally they use Bhimal, Khadik, Oak Phalyant, as fodder.

Availability of fodder in the 3 Revenue villages

Table 2.22

Types	Jan. to March	April to June	July to September	October to December
Agriculture Residues	No	Yes	Yes	No
Trees	Yes	No	No	Yes
Green fodder	Yes	No	Yes	Yes
Grazing	Yes	Yes	No	Yes

Note: The availability of fodder is minimum during April to June

Table 2.23

Availability of fodder at village level in Catchment area

CATTLE TYPE	Number	Unit	Cattle Unit
Cow/Ox	1290	1	1290
Buffalo	34	1.5	51
Goat	961	0.20	192
Sheep	672	0.20	134
Horse/mule	48	0.60	29
Total	3005	-	1696

Need of fodder in Catchment area = total Cattle unitX2.35 Metric Tonne
= 1696 X2.35 Metric Tonne
– 3985.60 Metric Tonne per annum

In proposed catchment area of Pithoragarh Division the total need of fodder is **3985.60 Metric Tonne per annum.**

The present availability of fodder in the area is 3933.70 metric tonne per annum. Hence the defecit of fodder is 51.90 metric tonne per annum.

2.16- Need of Fire Wood at Village level-

On the basis of PRA the major vegetation existing in the proposed area are Bhemal, Khadik, Oak, Phalayant, Timla, Khinwa, Pines, Toon, Mango, Mehal, Kachnar, Wallnut etc. Generally they use Bhimal, Khadik, Oak Phalyant, as Firewood.

The Villagers do not fetch wood during the rainy season. The Wood collected during the rest of the months is used during rains.

Table-2.24

Month	How many days villagers go for the firewood collection	Weight of onetime carried firewood	Monthly Consumption of firewood (kilogram)
January	20	18	360
February	15	18	270
March	11	18	198
April	11	18	198
May	10	18	180
June	10	18	180
July	-	-	-
August	-	-	-
September	10	18	180
October	15	18	270
November	16	18	288
December	17	18	306
		Total	**2430**

Note:- The annual consumption of firewood per Family is 2430 kg per year. There in the proposed area the total consumption of firewood against 346 families will be 2430 X Total number of families in the project area = 840.78 metric tonne.

The total consumption of firewood is future five years against 346 families will be=2430X Total No of families in the project area X five years.

= 2430X346X5

Metric Tonnes = 4203.90 Metric Tonnes

The average weight of a bundle of firewood is between 17 to 20 kg. During the winters the consumption of firewood is little bit higher and ranges 3 to 4 bundles. Whereas during the others sessions 3 bundles per family are sufficient. In this way per family annual consumption of firewood is 2430 kg per year. Total number of H.H. in the proposed area is 346 and hence the annual consumption of the firewood will be 840.78 The Consumption of wood in the next five years will be **4203.90 Metric Tonnes.**

Traditionally, the fuel wood collected from forest area. Keeping in mind the continued pressures on forest, deteriorating women health etc smoke generated by use of fuel wood. Time consumption in collecting from remote forests and the other risks such as the risk from the violent animals, etc. Emphasis will be on alternate energy resource in place of fule wood and the maximum use of LPG gas

DEMAND AND AVAILABILITY OF FUEL (3 Revenue villages)

Table:-2.25

Types of firewood	No. of families dependent on firewood	No of months of dependence on firewood	Sources (Village) Forests or others)	Demand/ availability
Firewood	346	12	Village, Forest or others	Demand 652.23
Agricultural residues		12	Village	Demand 361.00
LPG	152 (Partially used for few uses only)	12	Village	Demand 165.40
Electric heater	-	-	-	-
Cow dung/Gosha	122	12	Village	Demand 52.00
Kerosene Oil	42	12	Village	Demand 30.60

2.17 ESSENTIAL STEPS TO BE TAKEN FOR MEETING OUT FODDER & FUEL NEED OF THE COMMUNITY

In the proposed catchment the villagers (Particularly the women) have to bring wood and fodder from an average distance of almost 2 to 3 kms. The women get up early in the morning, and leave for jungle at around 7:30 A.M. and come back at around 11:30 A.M. to 12:30 P.M. Locally available grass is used as fodder some times but they have to go to forest for the collection of fuel wood.

Agriculture is base on rain only. The available agriculture residues that could be used as fodder is also minimum. In the surrounding of the villages the green fodder available is in the form of Bhimal, Phalyant, Oak, Timla, Kanol, Kamil, Kumeru etc.

The following steps will be taken to reduce the dependence of villagers on forests for fuel and fodder-

- In the present economic scenario, health status of women and time consumption for collection of wood in hills kumaun, the use of efficient chulhas, solar-energy will be promoted
- Stall/Chari feeding will be encouraged. (Almost 60% practicing).
- Grass protection with community participation will be promoted.
- The total 10km area buffer zone is **27204 ha**, out of this **17295 ha** is forest area which is **63.57%** of the total project area.
- The actual total Catchment area is **5343 ha**, out of this **3405 ha** is forest area. Which is **65%** of the total project area.

The following steps will be taken to reduce the dependence of villagers on forests for fuel and fodder:-

- In the present economic scenario, health status of women and time consumption for fire wood collection in hills of Garhwal, the use of efficient Chulhas, Solar energy will be promoted.
- Stall/Chari feeding will be encouraged.
- Grass protection with community participation will be promoted.
- Planting of grass species like Napier grass into bunds in field boundaries.

Density of Vegetation in 10 km Buffer Zone (17 villages) in Project Area (all areas in hectare)

Table No. 2.26

S. No.	SWS	MWS	Very Dense Forest	Medium Dense Forest	Open Forest	Scrubs	Water	Non Forest	Total
1	Dhauli	Nanarma Nadi	0	684	47	0	0	2808	**3539**
2	Dhauli	Suwa	1552	2017	104	107	8	1125	**4914**
3	Kutti	3	436	1182	375	19	0	3231	**5243**
4	Kutti	4	1	439	181	0	0	5170	**5792**
5	Kutti	Jiunti Gad	622	1252	362	134	0	986	**3356**
6	Kutti	Sirkha	646	826	234	231	0	2426	**4363**
								Total	**27204**

Density of Project Area

Table No. 2.26.1

Density of Vegetation in 3 MWS (03 villages) in Actual Project Area (all areas in hectare)

S. No.	SWS	MWS	Very Dense Forest	Medium Dense Forest	Open Forest	Scrubs	Water	Non Forest	Total
1	Kutti	3	436	1182	375	19	0	3231	**5243**
								Total	**5243**

- Major species are Guriyal, Bheemal, Phalayant, Khinwaa, Oak, Kabad, Timla, Kanol, Burans, Kamil, Kummuru etc. in the project area.
- Rain water harvesting techniques will be introduced to strengthen in irrigation as well as drinking water facilities.

Chapter-3

CATCHMENT AREA TREATMENT PLANING

3.1 THE PROJECT

This project has been conceived as a multi-sectoral project with the objective of treatment of catchment area of Tankul Hydroelectric Power Project to control and mitigate the sedimentation of the proposed dam. A total of 9.379 hectare of Civil Forest Land has been diverted for the proposed dam and this is why this Catchment area treatment Plant being proposed as per the mandatory condition led down in the GOI notification.

Photo 6 : Proposed Power House Site on the Right Bank of Mahakali

Location of Power House
Fig: 3.1

3.2 Project area and duration:-

The buffer zone area includes a total of **27204 hectare** of land spreads over namely 2 SWS Kutti and Dhauli and 6 MWS namely Nandarma Nadi MWS, Suwa MWS, 3 MWS, 4 MWS, Jiunti Gad MWS, Sirkha MWS of Kali river Catchment. Seventeen revenue villages falls total within 10 kms of entire buffer zone area. The total buffer zone area is **27204 ha.** comprises **17295 ha. (64%)** of forests, **1671 ha. (6%)** of agriculture land and the rest **2804 ha. (10%)** is blank, river bed area **4288 ha. (16%)**, snow area **1009 ha. (4%)** and rocky area **137 ha. (0%)**. Out of these only 3 revenue villages falls in the catchment area.The treatment area falls under Pithoragarh Forest Division. The actual Catchment area is **5243 ha.** comprises **3405 ha.(64%)** of forests, **157 ha. (3%)** of agriculture land and the rest **1678 ha. (32%)** is blank, river bed area **0 ha (0%),** snow area **0 (0%)** and rocky area **0 ha (0%)**. The project period is 7 years. Keeping these facts into consideration a 7- year Catchment area treatment (CAT) with a total cost of **Rs. 236.94 Lakhs** has been proposed.

3.3 Project Description:-

Proposed plan will have activities in various sectors that will focus on environmental sustainability of the catchment area along with supporting the population of the area with integrated development of the villages falling in the catchment area of the dam. The interventions proposed will be in line with directions of the State Government for the catchment area treatment and will include forestry, soil conservation, agriculture, horticulture, energy conservation, livestock development and improving income generation opportunities of local population.



Moments with the project area (village-Tankul & village Bung-Bung) community
Fig: 3.2

3.4 Project Objectives:-

The prime objective of this CAT plan is the eco-restoration of the project area and participation of the local people for their livelihood support system. Efforts have been made to incorporate all the key factors which are important part of modern system of catchment and impact area treatment plan.

The main aim of CAT plan is to control the quantity of silt in the Catchment area along with soil water conservation and eco-restoration so that to concept of construction of small hydro power project can be realized. The main aim of CAT plan is to control the quantity of silt in the Catchment area along with soil water conservation and eco-restoration so that to concept of construction of small hydro power project can be realized.

Subsidiary Objectives:-

1. Water conservation, increase infiltration, surface flow/run-off reduction to minimise siltation and flood losses.
2. Facilitate the hydrological functioning of the catchment and to augment the quality of the water of the river and its tributaries.
3. Reverse the degradation process and restore the bio-diversity of eco-impact zone affected by the Tankul SHP.
4. Improving vegetal cover and thus conserving ecosystem resulting from increased and water retaining properties of soil.
5. To improve availabilities of fuel, fodder and timber in the area out side forest.
6. To explore the potential of Eco-tourism in the area.
7. To improve rural livelihood support system and to create additional avenues for socio-economic condition of locals for sustainable development of the area.
8. Encouraging participatory approach, emphasis on upliftment of women/under-privileged and use of Non Conventional Energy Devices.
9. To presave the ecosystem in the project area.

3.5 Methodology:-

Since in the construction of Tankul SHP no storage has been envisaged, and there is no submergence of any homestead and agricultural land. Hence the environmental impact on the flora and fauna of the project area must be considered as the benign. Even there is no displacement of population from the project site. Thus the project has no tangible adverse impact on the environment of the project area. The environmental requirements downstream of the diversion barrage can be met by release of 15% minimum flows during non monsoon period i.e. when there is no spill of the barrage.

The user agency, collected data related to physiography, land use/land cover, lithology, structure, drainage pattern, slope characteristics, landslides/slips etc. and based on these data prepared thematic maps, calculated of sediment yield index and erosion intensity in the catchment areas. These details have been used while preparing this CAT plan.

It has been observed and experienced that the model of **Integrated Approach of Watershed Management is the best model**, so far, for the treatment of any Catchment. This model of treatment targets for the holistic treatment and development of the MWS under consideration and includes the following activities:

i. Forestry management
ii. Drainage Line Treatment works (Soil & Moisture Conservation works)
iii. Agriculture Improvement
iv. Horticulture
v. Eco-Tourism
vi. Animal husbandry
vii. Energy conservation
viii. Water Harvesting & Conservation
ix. Training support
x. Income Generation Activities (IGA) as per PRA micro planning.

3.6 Project Components:

As per the land use details of the area, around 64% is under forest and around 6% under agriculture and 10% is under blank. 0% river bed area 0% rocky area, 0% snow area. 100% of the total forest area (3405 ha) falls under E2 and E3 categories and this is the area where forestry activities have been targeted.

There are number of seasonal local nalas/gads in the projects area which contributes to soil erosion in the area especially during rains. As one of the main objective of this plan is to ameliorate various potential and degraded ecosystems for increasing the life span of the Dam reservoir, the soil and moisture conservation measures involving construction of structures have been proposed. To ensure the effectively of these proposed soil conservation measures it will be mandatory to follow the technical compulsion to follow the top to bottom approach.

The agriculture area of the three villages falling in actual treatable catchement area is 157 ha. With 346 households and 1789 population. This population is heavily dependent on the forests for their day to day requirement of fuel wood and fodder for their livestock which is 3005 in numbers. The present availability of fodder in the area is 3933.70 metric tonne per annum. Hence the defecit of fodder is 51.90 metric tonne per annum.

Though the actual gap between requirement and availability of fuel and fodder will be available after preparation of micro plans, using PRA as a tool, of the villages but it has been observed that there is gap between present supply and demand. One of the objectives of the plan is to reduce this gap, accordingly the activities related to agriculture residuals of which is used both as fodder and fuel, Livestock development, to encourage improved breeding stall feeding and energy

conservation activities like use of solar energy devices, LPG and bio-gas plants etc. have been proposed in the plan.

Around 83% of the land under agriculture fall under E1 and E2 category and land use classification. Technically these lands are suitable for horticulture keeping in this mind distribution and plantation of fruit plant have been proposed under horticulture component of the plan.

Unemployment and lesser opportunities for livelihood and income generation have force the young mass of the area to migrate to near towns and cities. One of the objectives of the plan is also to improve opportunities of livelihood and make the villagers self sufficient, accordingly this plan includes imparting of training for skill up gradation and other income generation activities.

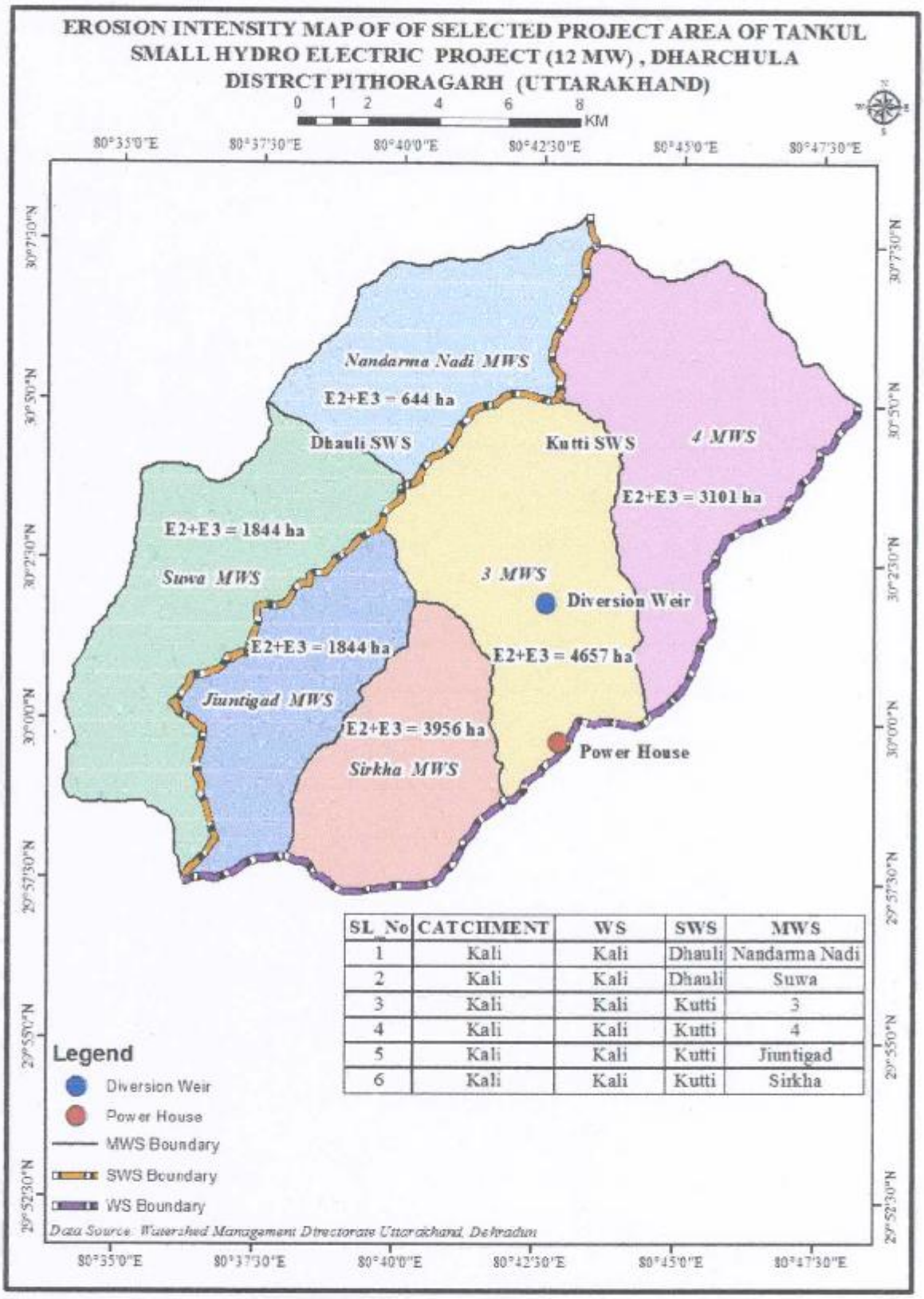

EROSION INTENSITY MAP OF OF SELECTED PROJECT AREA OF TANKUL SMALL HYDRO ELECTRIC PROJECT (12 MW) , DHARCHULA DISTRCT PITHORAGARH (UTTARAKHAND)
0 1 2 4 6 8
KM
80°35'0"E
80°37'30"E
80°40'0"E
80°42'30"E
80°45'0"E
80°47'30"E
30°7'30"N
30°5'0"N
30°2'30"N
30°0'0"N
29°57'30"N
29°55'0"N
29°52'30"N
Nandarma Nadi MWS
E2+E3 = 644 ha
Dhauli SWS
Kutti SWS
4 MWS
E2+E3 = 3101 ha
E2+E3 = 1844 ha
Suwa MWS
3 MWS
Diversion Weir
E2+E3 = 1844 ha
E2+E3 = 4657 ha
Jiuntigad MWS
E2+E3 = 3956 ha
Power House
Sirkha MWS
SL No | CATCHMENT | WS | SWS | MWS
1 | Kali | Kali | Dhauli | Nandarma Nadi
2 | Kali | Kali | Dhauli | Suwa
3 | Kali | Kali | Kutti | 3
4 | Kali | Kali | Kutti | 4
5 | Kali | Kali | Kutti | Jiuntigad
6 | Kali | Kali | Kutti | Sirkha
Legend
Diversion Weir
Power House
MWS Boundary
SWS Boundary
WS Boundary
Data Source: Watershed Management Directorate Uttarakhand, Dehradun

Fig 3.3

3.7. Treatable Area:

(i). Erodibility classwise:- As shown in Table no. 3.1 below, the total treatable area is **7071.50 ha.** Which consists of **632 ha** as cultivable ,**5204.75 ha.** forest & remaining **1234.75 ha** as blank. The treatable area can be determined mainly on the parameters based on Erodability class and Gradient classification.

ERODIBILITY CLASSWISE TREATABLE AREA:-

Table: 3.1

Erodibility for selected Project Area Microwatershed wise

DISTRICT	SWS	MWS	Agriculture				Forest				Blank				ROCKY	RIVER BED	SNOW	TOTAL
			E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4				
Pithoragarh	Dhauli	Nandarma Nadi	39	0	0	0	0	0	644	31	0	0	0	0	2688	137	0	**3539**
Pithoragarh	Dhauli	Suwa	0	0	69	0	0	0	1562	1819	0	0	213	0	1250	0	0	**4913**
Pithoragarh	Kutti	3	86	90	0	0	428	1474	1503	0	13	73	1517	59	0	0	0	**5243**
Pithoragarh	Kutti	4	0	0	0	0	0	1274	1523	1249	0	0	304	432	0	0	1009	**5791**
Pithoragarh	Kutti	Sirkha	131	506	306	0	275	1350	1775	0	0	19	0	0	0	0	0	**4362**
Pithoragarh	Kutti	Jiuntigad	81	288	75	0	0	782	1606	0	19	112	37	6	350	0	0	**3356**
		Total	337	884	450	0	703	4880	8613	3099	32	204	2071	497	4288	137	1009	**27204**
Erodibility class wise treatable area = E2+E3 644+1844+4657+3101+3956+2900=																		**17102**

E2+E3(Erodibility) for selected project area Micro watershed wise (Summary)

ID	*DISTRICT*	SWS	MWS	AGRICULTURE	FOREST	BLANK	E2+E3
1	Pithoragarh	Dhauli	Nandarma Nadi	0	644	0	644
2	Pithoragarh	Dhauli	Suwa	69	1562	213	1844
3	Pithoragarh	Kutti	3	90	2977	1590	4657
4	Pithoragarh	Kutti	4	0	2797	304	3101
5	Pithoragarh	Kuti	Sirkha	812	3125	19	3956
6	Pithoragarh	Kuti	Jiuntigad	363	2388	149	2900
7	**Erodibility Classwise Treatable Area**			1334	13493	2275	17102

ERODIBILITY CLASSWISE TREATABLE AREA:-

Table:-2.12

Erodibility for selected Project Area 3 Microwatershed wise

DISTRICT	SWS	MWS	Agriculture				Forest				Blank				ROCK Y	RIVER BED	SNOW	TOTAL
			E1	E2	E3	E4	E1	E2	E3	E4	E1	E2	E3	E4				
Pithoragarh	Kutti	3	86	90	0	0	428	1474	1503	0	13	73	1517	59	0	0	0	5243
			86	**90**	**0**	**0**	**428**	**1474**	**1503**	**0**	**13**	**73**	**1517**	**59**	**0**	**0**	**0**	**5243**

Erodibility class wise treatable area = E2+E3 = 90+2977+1590=4657

DISTRICT	SWS	MWS	E2+E3
Pithoragarh	Kutti	3	4657
Erodibility Classwise Treatable Area			**4657**

(ii). SLOPEWISE TREATABLE AREA BUFFER ZONE AREA (17 VILLAGES):-The project area may be classified as pr gradient into the following broad classification . The areas having less than 40% gradient suitable for different treatments. Based on this parameter the whole area falling under category less than (‹) 33% and 25% of the areas falling under 33-50% slope category have been taken as treatable areas.

Micro-watershed wise and slope-wise details of areas and treatable areas:-

Table showing MWS wise and slopewise details of areas and treatable areas.

Table:-3.2

Sl.No.	Name of S.W.S.	M.W.S.No.	Agriculture					Reserved Forest				
			33%	33-50	50-100	100%	Total	33%	33-50	50-100	100%	Total
1	Dhauli	Nandarma Nadi	39	0	0	0	**39**	0	0	362	58	**420**
2	Dhauli	Suwa	0	0	69	0	**69**	0	0	2711	250	**2961**
3	Kutti	3	137	39	0	0	**176**	608	264	14	0	**886**
4	Kutti	4	0	0	0	0	**0**	0	0	0	0	**0**
5	Kutti	Sirkha	125	493	325	0	**943**	448	600	1002	0	**2050**
6	Kutti	Jiuntigad	120	312	12	0	**444**	0	1805	177	0	**1982**
			421	844	406	0	**1671**	1056	2669	4266	308	**8299**
Treatable area (gradient ‹ 33%+1/4 of area having gradient 33 to 50%)			**421+211=632**					**1056+667.25=1723.25**				

Other than Reserved Forest					**Total**	**Reserved Blank**					**Other than Reserved Blank**					**Total Blank**	**Riverbed**	**Rocky**	**Snow**	**G. Total**
33%	33-50	50-100	100%	Total	Forest	33%	33-50	50-100	100%	Total	33%	33-50	50-100	100%	Total					
0	0	225	30	**255**	**675**	0	0	0	0	**0**	0	0	0	0	**0**	**0**	2688	137	0	**3539**
0	0	358	62	**420**	**3381**	0	0	0	0	**0**	0	0	213	0	**213**	**213**	1250	0	0	**4913**
1101	1177	241	0	**2519**	**3405**	0	0	0	0	**0**	639	777	246	0	**1662**	**1662**	0	0	0	**5243**
1419	1834	793	0	**4046**	**4046**	0	0	0	0	**0**	265	347	124	0	**736**	**736**	0	0	1009	**5791**
0	625	725	0	**1350**	**3400**	0	0	0	0	**0**	0	19	0	0	**19**	**19**	0	0	0	**4362**
0	210	177	19	**406**	**2388**	0	0	0	0	**0**	30	60	84	0	**174**	**174**	350	0	0	**3356**
2520	3846	2519	111	**8996**	**17295**	0	0	0	0	**0**	934	1203	667	0	**2804**	**2804**	4288	137	1009	**27204**
2520+961.50= 3481.50						**0**					**934+300.75=1234.75**									**7071.50**

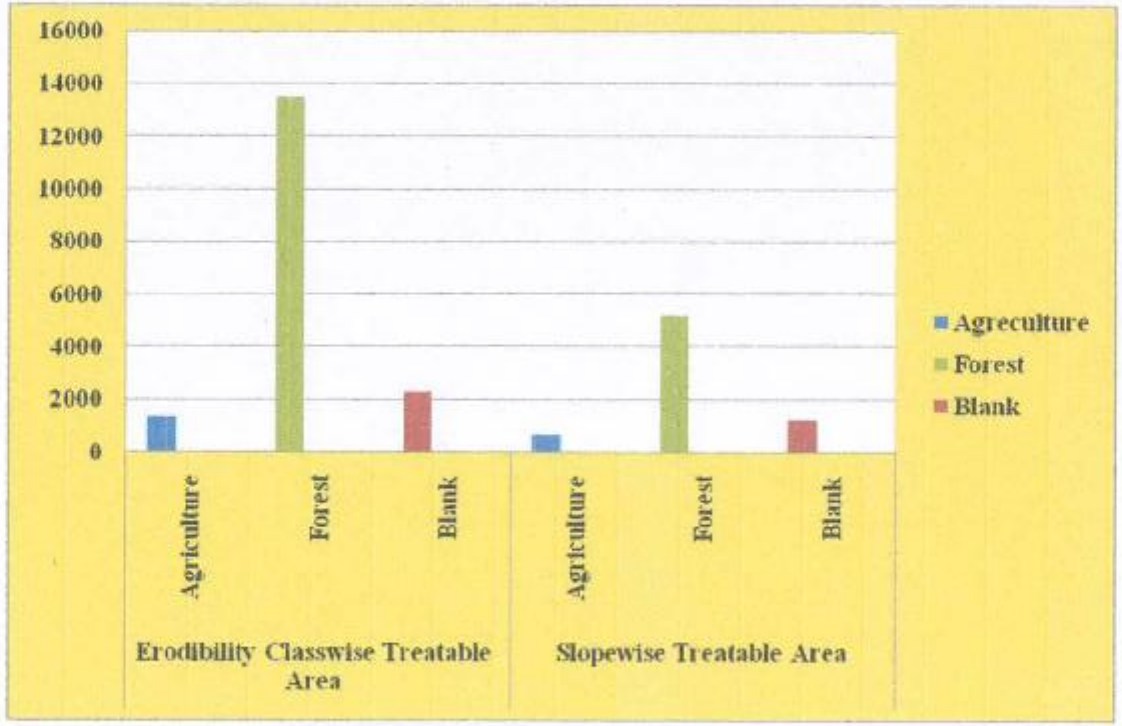
Source : Watershed directorate, Uttarakhand

Source:- Watershed Management Directorate Uttarakhan

Treatable Area (Summary)

Table:-3.4

S.No.	Treatable Area	Agriculture	Forest	Blank	Total
1	Erodibility Classwise Treatable Area	1334	13493	2275	17102 ha
2	Slopewise Treatable Area	632	5204.75	1234.75	7071.50 ha
				Treatable Area	7071.50 ha

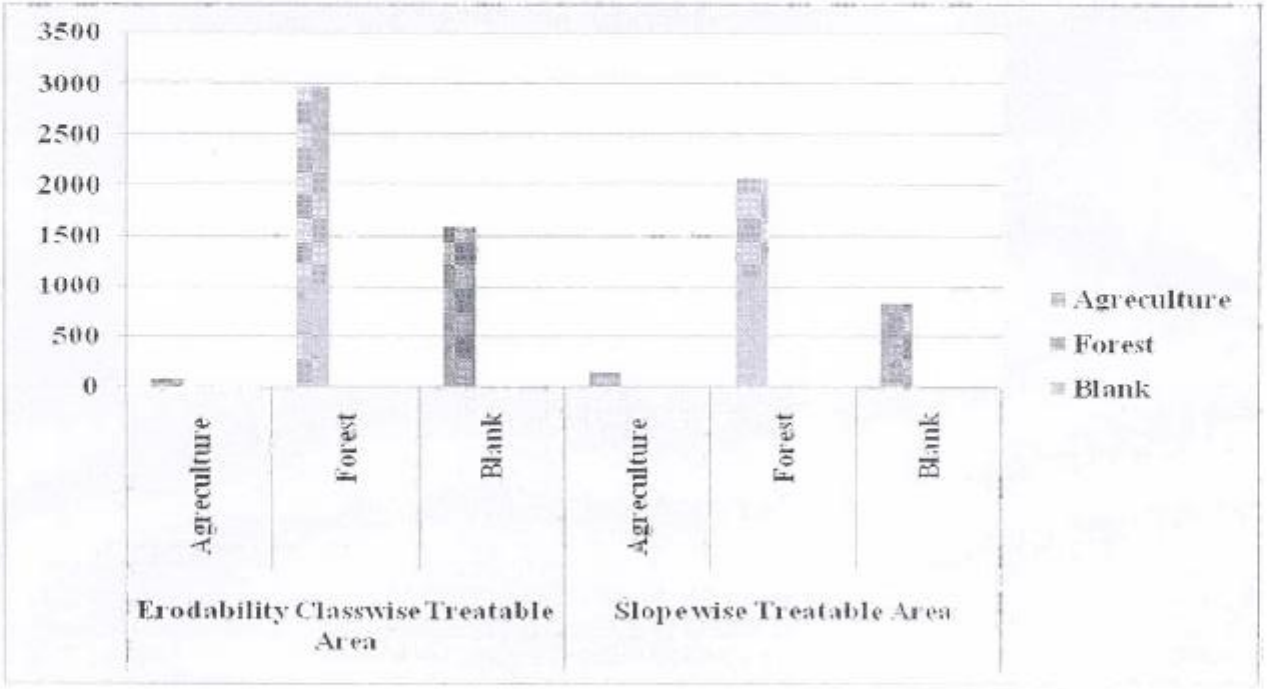


Source:- Watershed Management Directorate Uttarakhand

Treatable Area 3 MWS in Project Area (Summary)

Table:-3.4.1

S.No.	Treatable Area	Agriculture	Forest	Blank	Total
1	Erodibility Classwise Treatable Area	90	2977	1590	4657 ha
2	Slopewise Treatable Area	164.75	2069.25	833.25	3049.25 ha
				Treatable Area	3049.25 ha



Source:- Watershed Management Directorate Uttarakh

3.8 The Proposals:-

3.8.1 Forestry

A actual total of area **6439.5 ha** of forest and blank (**forest = 5204.75+ Blank 1234.75**)is available in the project area for forestry works, slope conditions and soil depth of the area and budget, soil shallow to deep loamy and porous out of **6439.5 ha.** the afforestation work has been proposed in **94.28 ha.** this is a tentative target and can be changed as per the requirement of field after detail micro planning.

Expenditure proposed Rs 71.08 lakhs

The forestry works has been proposed for 3 MWS under subwatershed Kutti. The 3 MWS though comes in the catchment of diversion weir within the selected project area yet the distance of this MWS (Along the stream being far from diversion weir) from diversion weir is more than around 10 Km, therefore according to the availability of funds this MWS has not been selected for foresty activities. This is a tentative proposal and final proposal will be possible after carrying out microplanning of the villages in the area. Plantation of locally useful and indigenous plant species such as locally known as Mehul, Guriyal, Bhimal, Oak, Bithul Timla, Phalyant, horticulture plants such as Citrus and other species etc. have been proposed.

The following plantation models, which will be site specific under forestry activities have been proposed.

Quecus leucotrichophora (Banj), Rhododendron orboreum (Burans), Pyrus pashia (Mehal), Myrica nagi (Kaphal), White Burans, Hiphopi, Meppal, Pangar, Kail, Surai, Ranga, Akharot, Alnus nepalensis (Kunis), Populus ciliate (Pahari pipal), Cedrus deodara (Deodar), Pinus wallichiana (Chir), Comus capitat (Bhamora), Toona cerraia (Tun), Pinus roxburghii (Sarol), Aegle marmelos (Bael), Lannea cormandelica (Jhanghan), Acacia catechu (Khair), Ougeinia oogeinensis (Sandan), Schleichera oleosa (Gosum) etc. will be planted involving local people, especially women.

The areal distance of diversion weir site is 1 km from power house site and 2 km respectively from the nearer point of Musk deer Sanctuary. **The RET** species found in the nearby musk deer sanctuary are Abies pindrow, Acer oblongum, Aconitum balfourii, Acours calamus, Herminium kumaunensis, Ponerorchis renzii, Drosera peltata, Pinguicula alpana, Begonia diocia, Berberis lambertii, Butea pellita, Buxus wallichiana, Chusua renzii etc.

3.8.1.1-:

A. Afforestation-

Critically degraded areas will be taken up for Normal plantation. In this model 1100 plants per hectare will be planted in pits of size 0.30x0.30x0.45 cum at spacing 3mx3m. In addition, tufts of fodder grasses like Napier and Guinnae, will also be planted along contour trenches, of cross section of 0.30mx0.30 m. Indigenous plant species such as locally known as Mehul, Guriyal, Bhaimal, Oak, jamun, Kamil, Kabad, Khinwa, Timla, Phalyant, Kanol etc. will be planted. Toona, Ciliata, Terminalia Chebula, Terminalia Belerica, Zyzygiun, Cuminii, Albizia Procera, Cassia Fistula, Dalbergia Sissoo, Acacia catechu, Kachnar (Bauhinia variegate), Kharik (Celtis

tetrandra), Semla (Bauhinai retusa) and Banj (Quercus species) etc. will be planted involving local people.

Most of land under treatable areas is of poor soil depth. Usually they are not suitable for normal plantation work. Sufficient soil depth and suitable slopes where the result of plantation works may be achieved successfully.

Problem related for forestry and cause of degradation

1. Biotic factor

- Created by human and cattle
- Degradation of forest due to grazing and movement of cattle (The sheep, goats and other cattle dig out the new buds, the future trees and destroy the vegetation cover).

2. Adaphic factors
- The soils of the area are generally sandy and loamy.

3. Climate- The area is basically in the humid temperature region. The humidity varies between 30% and 85%. Wind remains clam in the early hours of the day, whereas the mean maximum wind velocity goes upto about 25 km/hr with predominant direction as NW and SE. in the rainy season wind direction remains unpredictable with dominant direction being SE. the ambient temperature ranges between – 40C and 270C
4. Terrain (Slope condition)- Around 40% of the area Simkhola gad is having a slope more than 35%. The soil moisture conditions will also be weaker. Runoff will be more.

B. Assisted Natural Regeneration works (ANR works)-

It is observed that existing natural forests within the project area have a big biotic pressure. Villagers intensively lop oak leaves for their cattle's, green fodder which caused a sever degradation of oak forests. The ANR development has been proposed for 20 ha. The total cost is **14.78 lakhs.**

Many of them are at the verge of extension hence; a serious and immediate step should be taken to restore these vanishing oak forests. ANR is the only treatment which can re establish these utmost finished oak forests. Under these activities degraded oak forests will be fenced with stone coolie wall. Grazing within fenced area and lopping of oak leaves will be strictly closed for five years. Singling, pruning and other silviculture operation will be carried out. 200 number of oak (Banj) seedling will be planted in blank areas and oak will be dribbled in contour trenches, intensive fire protection measures will be adopted in fenced areas.

C. Pasture Development-

Area adjoining to habitation will be taken up for developing pasture to ensure easy availability of fodder in the villages. The locally existing fodder species proposed are Bhimal, Jamun, Kamil, Kachnar, Kharik etc. The area closed to the habitation mostly and come under civil and soyam forests and they have very poor soil depth, physically they are steep slopy covered with fodder grasses. These grass land play very important role in the economy of local residence as they are the main resource of fodder to their livestock. Due to its poor soil depth success possibility of normal plantation seems very least. Basically they are suitable for pasture development works.

For pasture development activities 500 plants per hectare of fodder spp. Will be planted along with fodder grasses along contour trenches of cross section of 0.30mt.x0.30mt. Grazing have been a leading factor in soil erosion in mountainous regions. A total of 50.96 hectare area has been proposed under this model.

To control soil erosion rotational grazing will be promoted. The grazing land will be protected in rotation by looking two parts for some times and opening one to community use.

The details about the plantations proposed under the CAT plan are as under-

Table 3.5

Sl. No.	PROPOSED ACTIVITY	UNIT	UNIT COST (ha.)	PHYSICAL TARGET (ha.)	TOTAL COST (Rs. In Lakhs)
1	Afforestation	Ha	83917	14	11.75
2	A.N.R	Ha	73896	20	14.78
3	Pasture Development	Ha	73896	60.28	44.55
			Total		**71.08**

Note:- List of areas selected for various types of afforestation in tentative which may be change at the time of DPR Preparation. Compensatory afforestation is not a part of CAT plan.

3.8.2.1 Drainage Line Treatment Works (Soil & Moisture Conservation works): 5243 ha, f-3405 ha. Ag-176 ha, barr1662 ha

Soil & water conservation activities play a vital role forest protection. Soil & water conservation activities are essential Increasing population and dependency on forests for different development activities and decreasing vegetation density, drying water springs, and reduction in soil moisture & soil productivity, increasing landslide activities.

The project area **(27204 ha.)** includes **17295 ha** of forests and **1671 ha** of agriculture land. Also as per the detail given in Drainage Pattern a total of **1058** streams, involving a total length of **796.1** Km. have been reported in the catchment area of the proposed SHEP. Of these 1058 streams are of first & second order having a length of 796.1 Km. in the project area. The actual area 3 MWS drainage line total length 174.7 Km of these 231 streams.

The major stream in upstream of diversion weir, proposed for treatment is Simkhola Gad. Technically this is the stream where soil conservation measures could be taken up. In addition soil erosion has also been observed in the villages where agriculture land has been affected. Keeping this in view soil and moisture conservation activities have been proposed for the treatment of area prone to erosion. The soil conservation activities will start from top to bottom.

The major DLT works have been proposed for the 1st and 2nd order streams falling within Simkhola Gad.

Note:- Keeping in view the apparent observations of the relevant treatable areas, conventional/ normal treatment measures are proposed. However where such treatment measures may not be considered adequate, in such cases treatment measures like *Gabbions/ Retaining walls/* Dry Stone Check Dams /Rip-Rap etc. may be considered.

Details of order and length of 1st and 2nd order streams within the proposed actual treatable are (3rd MWS):-

S.No.	Division	No of Streams		Total No of streams	Length of Streams		Total Length of 1st & 2nd order Streams (KM)
		1st Order	2nd order				
1	Pithoragarh	217	14	231	158.20	16.50	174.70

Length of 1st and 2nd order streams within Actual treatable area (Simkhola Gad) = 174.7 Km Km (174700 meter)

Considering, approximately 15 meter width will be proposed for treatment. The treatable area of the 1st & 2nd order stream will be = **174700** meter x 15

= 262.05 ha

On the basis of 1st & 2nd order of streams, physiography, slope conditions (less than 33-35°) soil shallow to deep loamy and porous. Vegetation **and funds available treatable**

Proposed treatable length = 50 km

Considering, that approximately 15 meter width will be treated:

Proposed actual treatable area	= 50 Km x 15m = (50 x 1000) meters x 15 m = 750000 sqmt **=75 ha**
Proposed treatable area	= Area proposed for forestry works + area proposed for DLT works **=94.28+75=169.28 ha.**

Reasons for selecting 50 km length for treatment

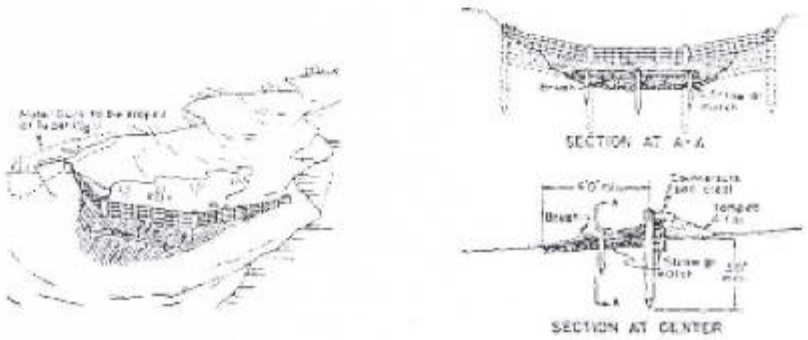
- On the basis of 1st and 2nd order of streams.
- Land use pattern.
- Soil/gradient conditions- The gradient between 0 degree to 20 degree.
- Density of less vegetation.
- Limitation of funds.

3.8.2.2 Treatment of Gullies-

(a) Brush Wood Check Dams

Gullies having depth ranging between 1.2 m to 2.1 meters, brush wood check dams are made by making 2 rows of shrubs and posts. In this method four sufficiently long wooden posts are fixed vertically on the ground across the direction of gully. These posts are inserted 60 cm inside the earth. The brush wood is thereafter spread on the surface of the gully in such a way that the stumps of the bushes are in opposite direction of the flow of water. The brush woods are tied together and are also tied with the wooden posts. The posts should be made of those species which are good coppices. Brush wood check dam with two rows can also be used for the gullies which have depth of 2.1 meters to 3 meters and width of nearly 6

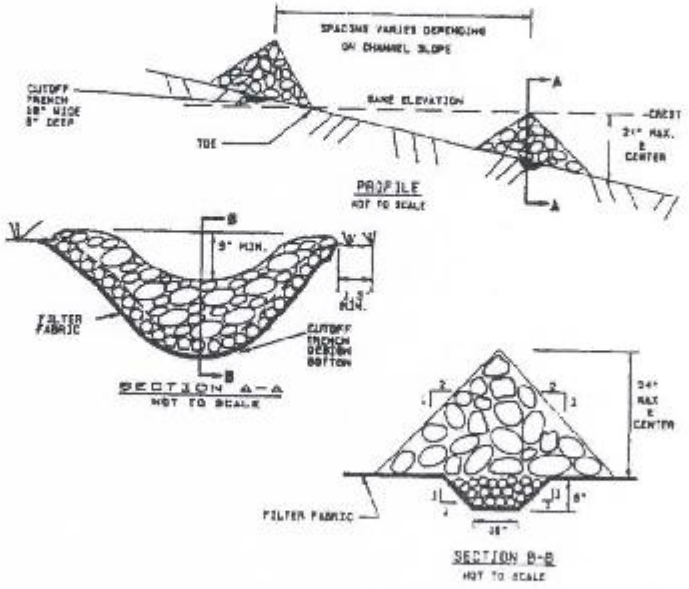
Fig No. 3.4



(b) Dry Check Dams-

Where adequate stones and boulders are available dry check dams are made across the gullies. These are made nearly 0.73 meter deep and 1.25 meters wide (Figure 3.2)

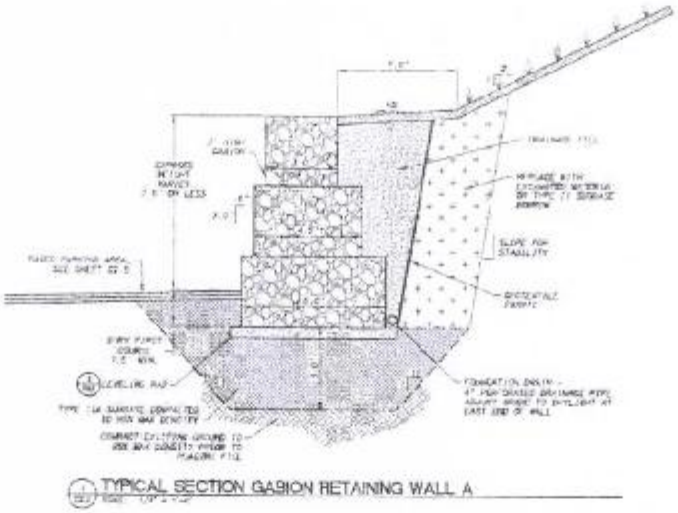
Fig No. 3.5



(c) Gabion Structure/Crate Wire Check Dams-

Gabion structures have multifarious application in erosion control works. Generally these are used for reducing slopes or river and nalas and also for various other purposes as mentioned in other paragraphs of this chapter. Gabion boxes are made of galvanised iron wire preferably with No-8 gauge but not less than 10 gauges. Hexagonal or square triple twisted mesh varying in size between 7.5 cm to 15 cm is commonly used. The wire mesh may be made by labours after short training. One gabion structure is known as gabion unit and bigger structures are made of these gabion units. For construction of these structures in the field first wire mesh is prepared and thereafter if available locally. In case of stones of various sizes being available the larger one should be placed on sides and smaller ones are used for filling in the centers.

Figure 3.6



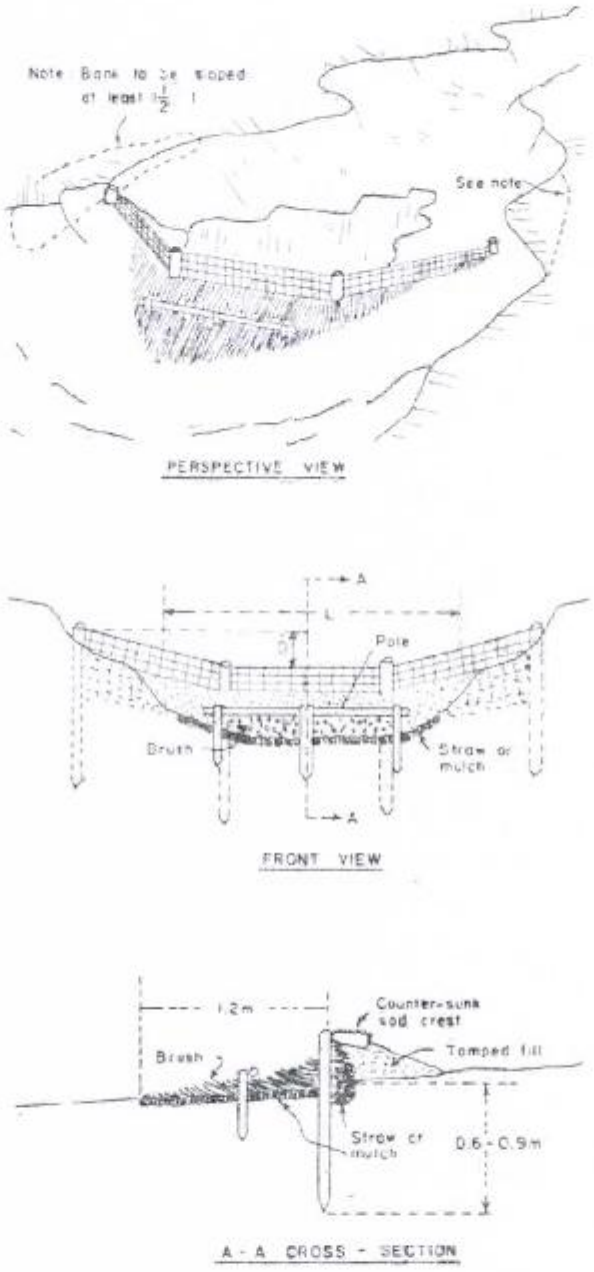


Fig No. 3.6.1

(d) Peerul checkdam

Checkdams constructed from Peerul/pine leaves give an alternate use of pine leaves. Pine leaves are very sensitive to forest fire and their use in the form of checkdams may reduce the possibility of forest fire and enhance soil & moisture conditions. For constructing the peerul checkdams the following items are required.

1- 30-35 kg dry pine leaves for 3 meter long checkdam.

2- Net formed from coconut rope, standard size 10cmx10cm.

For checkdam of 3 meter long and 50 cm diameter, a 3 mx3m sized net is required. According the nature of site the size of net may be changed. Streams of

shrubs or iron may be used as supporting pillars to the peerul checkdams. For making the checkdams from peerul the net is spread and peerul leaves are wrapped with in it in the form of roles. After that this net is tied with rope tightly.

These roles are placed such that no space is left on both the sites and there is no other way for water passes except checkdam. If the role is smaller as compared to the size of Gadhera, then the number of roles may be increased and placed in such a way that the whole Gadhera is covered completely. After that for supporting the roles the supporting sticks or iron hooks (in case of hard rock) may be used. In case of deep Gadheras the roles may be placed one above the other. In small Gadheras series of checkdams may be constructed in such a way that level of lower side of the upper checkdam and upper side of the lower checkdam is samel. There is no need to leave any spill way in this case.

3.8.2.3 Stabilization of Land Slips/Slides

Landslides are common phenomenon in hilly areas and these are basically because of the effect of changes in the earth and also because of the effect of weather on the earth surface. When landslides/landslip takes place a lot of vegetation or public property is destroyed. Landslide areas requires treatment for their rehabilitation and to check accelerated soil erosion in the area.

Following are the main methods used for stabilization of land slide affected areas:

a. Retaining Wall/Breast/Side Wall

Retaining wall is constructed for protecting land and soil on steep slopes. This is made of either dry masonry work or cement masonry work. The wire mesh or gabion blocks are also used depending on the intensity of erosion. The ratio of width and depth of the foundation should be kept as such that it can withstand the weight/pressure of the retaining wall. The breadth of the retaining wall should be 2/3 of the height of the retaining wall. The width of the retaining wall should decrease gradually when ascending towards upper end and it should be nearly 1 meter on the top. Normally width of the base is kept in the multiple of meter so that one meter size gabion blocks can be used for this purpose. The reduction in the width of the retaining wall is such that 1/3 part of measurement of gabion block is reduced. Fig.3.3.

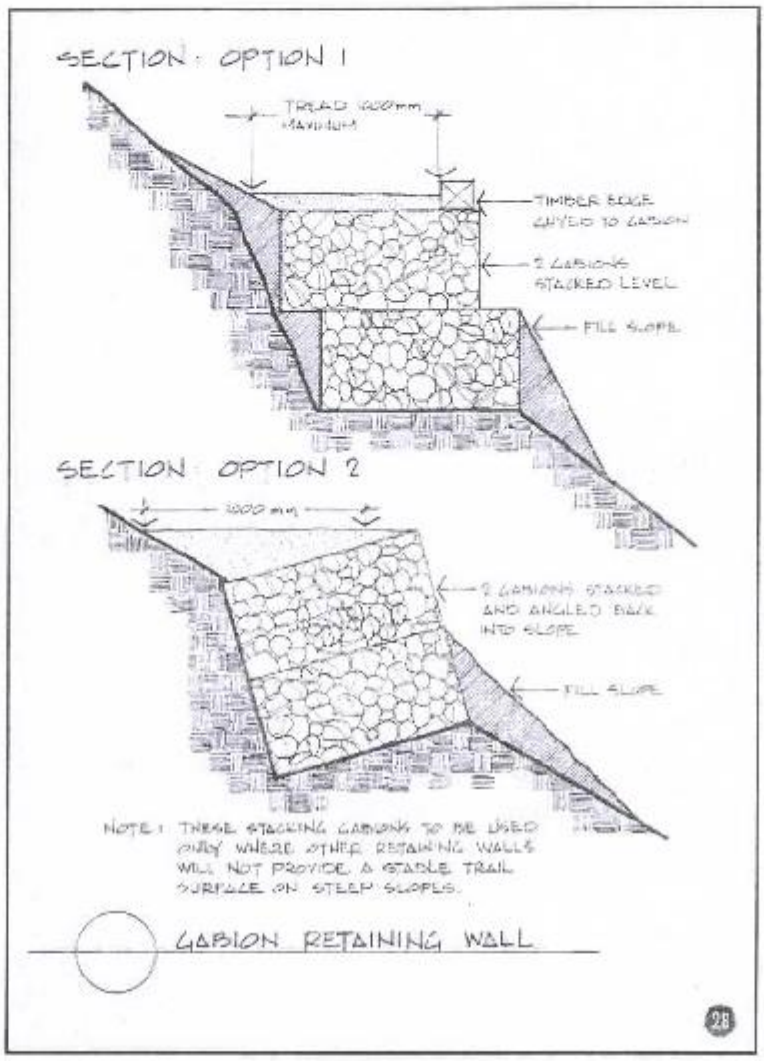


Fig No. 3.7

Use of concrete in constructed of retaining wall in every 6 cm of retaining/breast wall concrete lintel is given and rest of the height is covered by dry masonry work. After every 2 meter gap 100 sqcm size weep holes are made stones are filled between the horizontal wall and the sloping wall.

"T" wall is made with cement concrete at the base of the retaining wall. It should be 60 cm deep and should be in appropriate ratio of the height. A suitable apron should also be made.

b. Vegetative Gully plug, construction of checkdam by pine needles (Peerul)-

To reinforce the protective function of the above soil conservation structures the proposed works will necessarily be strengthened by suitable vegetative measures. The treated area will be supplemented with the plantation of soil binding shrubs and grass species such as *Napier grass, Vitex negundo, lannea grandious, lannea, coromandelica, erthrina, suberosa, ipomoea, cormea etc.*

3.8.2.4 Water Harvesting and Conservation –

Most of the agriculture in the area is rain fed some of which can be put under irrigation if natural water resources are properly utilized. Keeping this in mind following minor **irrigation structures have been proposed under this component-**

i. Water harvesting tank
ii. Irrigation tank
iii. Contour trenching
iv. Repair of Naula/Chal- Khal
v. Repair of irrigation channel
vi. Construction /Strengthening of minor irrigation channels.
Vii Construction/repairing the natural water sources in the form of Bauries, that could be used mainly for drinking. They can hold water for a long time because of almost negligible water evaporation.

Expenditure proposed Rs 63.97Lakh

Table 3.7

Sl. No.	PROPOSED ACTIVITIES	UNIT	UNIT COST (Rs.)	PHYSICAL TARGET (NO)	TOTAL COST (Rs)
1	Construction of Vegetative check dam/ Gully plug,	cum	3300.00	25	82500.00
2	Stone Check dams	Cum	650.00	1511	982150.00
3	Peerul checkdam	No	2490.00	870	2166300.00
4	Construction of RR dry checkdam	Cum	650.00	650	422500.00
5	Construction of gabion structure Crate wire check dams, Retaining wall, breast wall, side wall, defective spurs	Cum	1474.00	700	1031800.00
6	Construction of water conservation tank (kachha) small size	Cum	658.00	250	164500.00
7	Construction of Spur within gabion structure (with filling of hard packed stone)	Cum	1375.00	600	825000.00
8	Digging of contour trenches (3x0.30x0.30) seed sowing of suitable grasses and shrub spp	No	7.33	3000	21990.00
9	Construction of chal-khal	Cum	2335	300	700500.00
			Total Expenditure proposed		**63.97**

3.8.2.5 Wild Life Management:

Habitat improvement is an integral part of wildlife management. This consists of bringing into useful association of those conditions needed by a species to reproduce and survive. Even creation of small openings is of great value and importance. Such openings are essential for herbaceous cover and insect production on which ground-living animals such as pheasants predominately feed during the first few weeks after birth. control of cover is also important. Any change in vegetation can affect many of the animals do not recognize the boundaries and

barriers. It will help in the free movement of the wild animals and further more to reduce the man-animal conflict while they are coming to the nearby village areas.

The CAT Plan area is also quiet sensitive for damage to human life and cattle by leopards. The incidences caused by the leopards so far reported within last few years have been frequent. The Risqué teams will be trained inappropriate institutions. The area is also facing the problem caused by monkeys as they have been causing lot of damage to agriculture crops as well as cause damage to human beings. Plantation of fruit bearing species in the forest fringe areas will reduce the entry of wild animals particularly the monkeys in village areas.

The State Govt. of Uttarakhand/State Forest Deptt. Has launched the operation for catching the notorious monkeys. In the project area such operations will also be executed to catch the notorious monkeys as per the guidelines of deptt and to release them into the distant forest areas. The other scheme will also be executed which are in respect o minimizing the monkey menace as per the directions of deptt. Besides the above the fruit bearing tree saplings such as mango, amla, bair, Jamun, Harrad, Behada etc. will be planted in forest fringe areas so that the sufficient fruit is available to the wild monkeys and birds etc. in near future which ultimately will help in minimizing the man-animal conflicts.

The catchment area comprises of Reserve forest areas and other civil lands which are important for the presence of valuable flora & fauna etc. **The following main faunal species are found in the area-**

Common *Langur (Preshytis entellus), Common leopard (Panthera pardus), Giant flying squirrel (Petaurista sp), Goral (Naemorhaedus goral), Barking deer (Nemorhaedus goral), Spotted deer (Axis axis), Sambhar (Cervus unicolor), Himalayan black bear (Selenarctors thibetanus), Himalayan mouse hare (Ochotana roylei), Jackal (Cauis aures), Jungle Cat (Felis chanus), Wild bore (Susscrofa cristatuis)*

As a good number of motor roads bave been constructed the project area during the last decade, it has created considerable damage to wildlife habitat and is posing a continuous threat for wildlife conservation. As a result incidences of wildlife intrusion and the damage caused have increased. The construction of proposed dam may further aggravate the problem. Keeping above in mind the habitat improvement works and the step helpful for reducing the prevailing trend of man-animal conflicts have been proposed.

Proposed Activities-

1. **Control of invasive weeds and ecological restoration-** This activity will overlap on forest land which is lantana infested at many places. **About 30 ha** of such areas will be undertaken under this activity. The CR Babu method will be applied to control lantana. In the first year uprooting work will be carried out which will be followed by restoration work for successive two years.

2. **Water Springs/Water Holes-** Water is critical for wildlife. Natural water springs are present in the forest but they are not sufficient during the lean periods i.e. midsummer. Artificial water springs/holes may be created or natural spring may be

recharged or reactivated in the forest. They should be maintained every year. It is prescribed that 160 no. Water holes should be created on a priority basis.

Expenditure proposed Rs. 4.74 lakhs

Table 3.8

Sl. No.	PROPOSED ACTIVITIES	UNIT	UNIT COST (Rs)	PHYSICAL TARGET (ha)	TOTAL COST (Rs. In Lakhs)
1	Habitat improvement (Eradication of noxious weeds)	Ha	7530	41	3.09
2	Creation of water holes	No	82500	02	1.65
				Total	**4.74**

Efforts for reducing man animal conflicts:-

The joint groups of 8 to 10 persons of locals plus the local forest guard & watchers etc. will be formed and equipped with risqué equipments to minimize the damage caused to life and property. The groups so formed will be trained by SDRF (State Disaster Relief Force) for basic knowledge of risqué operation.

Fruit bearing tree saplings such as mango, Amla, Bair, Jamun, Harrad, Behada etc. Will be planted in forest fringe areas so that sufficient fruits are available to the wild monkeys and birds etc. In near future which ultimately will help in minimizing the man animal conflicts.

Sufficient measures will be taken in digging of new ponds or water bodies and maintaining the existing ones within forest areas so that sufficient water is available to wild animals and in summer season and the wild animals are not forced to enter the village areas. This will also help in deducing the incidents of man animal interactions and resulting in minimizing the damage caused.

3.8.2.6 Payment of ecosystem services to local communities and institution

Table 3.9

Sl. No	PROPOSED AVTIVITIES	PROPOSED EXPENDITURE (Rs. In Lakhs)
1.	Reward and recognitation to the local communities/institution, biodiversity conservation, fire protection measures bio production system water harvesting etc.	4.74
	Total	**4.74**

3.8.2.7 Provision of Alternate Energy resources/Energy Conservation

The population is largely dependent on forest and forest produce e.g. food, fodder & fuel for their livelihood which ultimately result into deterioration and degradation of forest wealth. So the measures have to be taken in to account which can help reduce the demand of such necessities by providing them other alternative suggested as under:

1) Encouraging use of **Bio-Gas/LPG/Street Solar lights.** For bio-mass saving efficiency improvement and better life style.
2) Encouraging use of individual toilets & Bathrooms-dovetailing with Swajal Yojna & other
3) **Bio bracketing** for income generating.
4) Encouraging use of induction cookers/plates

Table 3.10

Sl. No	PROPOSED ACTIVITIES	PROPOSED EXPENDITURE (IN LAKHS)
1	Alternative Energy Sources	
a	LPG connections to BPL	0.50
b	Solar cooker/solar panel	2.24
c	Solar lantern	2.00
	Total	**4.74**

3.8.3 Agriculture Based Development Activities:_

A total of **176 ha.** Agriculture land is available in the project area. The most of agriculture is rain fed, only small portion is irrigated. The farmers still stick to conventional agriculture practices. Use of total seed is common. All these factors lead to low yield per hectare which is only sufficient for substance barely for 3-4 months, and to fulfil their other day to day requirement the villagers migrate to nearby town and cities. Keeping all these facts into consideration the following measures have been proposed under agriculture components.

Expenditure proposed Rs. 9.47 Lakhs

1- **Field demonstration and Promotion of productive agri-systems-** The main agriculture of crops-wheat and paddy will be exhibited on the field, so that the farmers may be motivated and encouraged for use of improved variety seed and farming techniques.

2- **Repairing of terraces-** The terrain in the catchment area is not suited for good agriculture yield, so the leveling of terracing will be carried out to better the production. The farmers will also be encouraged for scientific mulching practices.

3- **Promotion of use of bio/vermi compost-** The use of chemical fertilizers bring many hazards to public health and organic/biofertilizers are suffer from this view point, simultaneously the productivity is also maintained. Vermi compost is a preferred nutrient sources for organic farming. It is eco-friendly non toxic, consumes low energy input for composting is a recycled biological product, so the bio/vermin compost will be advertised for larger use.

4- **Promotion of use of improved agriculture implements-**the conventional implements take a lot of time and are expensive in energy consumption and also results in low productivity, the use of improved agriculture implements will be encouraged to save the time and energy and increase the productivity.

5- **Establishment of Mahila Nursery-** To involve the local villagers, specially women there is a proposal to establish women nurseries with byback guarantee. Such nurseries will be managed by local Mahila SHG (Self Help Group). The financial support will be extended through CAT Plan and the groups will be properly trained. The technical knowhow and support will also be provided by local forest officers and horticulture experts.

6- **Multiple cropping-** Growing more than one crop of the same pieces of land in one year is called multiple cropping. The system can take various forms including intercropping, relay cropping. Apart from increasing crop production all forms can be beneficial to erosion control because they add an earlier protective cover to the ground compared to mono cropping.

7- **Contour Cultivation and closed planning-** Contour cultivation means filling & planning at right angles to the natural slope of the land. For erosion control, contour cultivation is better than the up and down slope tillage method. Besides this close planting followed by triangle design on the contour will yield better results to control runoff erosion.

8- **Strip cropping-** Is a system where farms crops are planted in relatively narrow strips across the slope of the land and so arranged that the living strips act as erosion resistant crops.

9- **Mulching** – is a cover on the soil that is quite effect for erosion control because it protects at ground level, forming a cover against erosion. It is also protects the soil from extreme temperature. Materials used for mulching can be crop reduces, straw, green leaves and stems, wood chips, old paper as available to farmers.

Table 3.11

Sl. No	PROPOSED ACTIVITIES	PROPOSED EXPENDITURE (IN LAKHS)
1.	Field demonstration and Promotion of productive agri-systems	1.00
2.	Repairing of terraces	2.00
3.	Promotion of use of bio/vermi compost	1.50
4.	Promotion of use of improved agriculture implements	1.85
5.	Establishment of Mahila Nursery	0.62
6.	Multiple cropping	0.50
7.	Contour Cultivation and closed planning	1.00
8.	Strip cropping	0.50
9.	Mulching	0.50
	Total	9.47

3.8.4 Horticulture

As yield from agriculture is not sufficient even for subsistence the villagers are unwilling to continue with agriculture and most of the fields are fallow. This is the area which can be put under horticulture. Also spaces are available in the back yard of the houses where vegetables can be grown to fulfil day to day requirement of the villagers. Keeping this in mind following activities under horticulture component have been proposed.

i. Encouraging use of HYV fruit species.
ii. Encouraging cultivation of medicinal and aromatic plants.
iii. Strengthening of storage capacity building for grading and packaging techniques etc.
iv. Encouraging use of quality seed and planting materials.
v. Encouraging the use of organic manures.
vi. Fruit processing and value addition.

Expenditure Proposed:- 7.11 Lakhs

Table 3.12

Sl. No	PROPOSED ACTIVITIES	PROPOSED EXPENDITURE (IN LAKHS)
1.	Horticulture Development	
a.	Planning of high yield and latest variety horticulture species	1.65
b.	Medicinal Plants Development	1.65
c.	Establishment of cold storage	2.35
d.	Bee-keepings	1.46
	Total	**7.11**

3.8.5 Animal husbandry-

After agriculture animal husbandry is the second important occupation and source of income for the villages. **The animals are of local breed and milk production per cattle is very nominal. The number of the cattle, specially goats and sheep per household is quite large. These animals are left free to graze in the forests. To improve and develop management of livestock in the village following activities have been proposed under** animal husbandry component-

i. **Establishment of NBC/Buffalo (Murra) – goats** – for breed improvement.
ii. **Vaccination** – for health improvement through regular visits of resource persons.
iii. **Chari construction/Nand (troughs)** – for better stall feeding.
iv. **Encouraging use of fodder seeds, (Jai-barseem etc.)-** for better nutrition. This will also reduce the fodder wastage and women labour.
v. Strengthening of **co-operative milk societies** for better marketing. The existing co-operative milk societies will be strengthened and new co-operatives will be initiated in the areas where they don't exceed to give a strong marketing setup to the community.

Expenditure Proposed:- 7.11 Lakhs

Table 3.13

Sl. No	PROPOSED ACTIVITIES	PROPOSED EXPENDITURE (IN LAKHS)
1.	Animal Husbandry Development	
a.	Health care to livestock	1.41
b.	Development of Pasture and fodder in agriculture land	1.88
c.	Stall feeding arrangements	2.82
d.	Breed improvement for livestock	1.00
	Total	**7.11**

3.8.6 Energy Conservation

The population is largely dependent on forest and forest produce e.g. food, fodder & fuel for their livelihood which ultimately result into deterioration and degradation of forest wealth. So the measures have to be taken in to account which can help reduce the demand of such necessities by providing them other alternative suggested as under:

5) Encouraging use of **Bio-Gas/LPG/Street Solar lights.** For bio-mass saving efficiency improvement and better life style.
6) Encouraging use of individual toilets & Bathrooms-dovetailing with Swajal Yojna & other
7) **Bio bracketing** for income generating.
8) Encouraging use of induction cookers/plates

3.8.7 Training for income Generating Activities (IGA)/support for income generation activitis in non-farm sector

As the opportunities of various incomes generating activities are very bleak, so the inhabitant of the project area faced the mounting problem of unemployment and this is also an inducting factor for the migration of youths. Keeping this factor in view a large number of employment generating activities will have to be developed to make the villagers self sufficient. The training for skill up gradation and other income oriented activities have been taken care of in this plan. Following activities are being included this purpose-

1- Capacity building training and exposure visit of VP, SHGs and staff.
2- Process building workshop and catchment awareness programme.

As the opportunities of various income generating activities are very less, so the inhabitant of the project area faces the mounting problem un-employment and this is also an inducting factor for the migration of youths. Keeping this factor in view a large number of employment generating activities will have to be developed to make the villagers self sufficient. The training for skill up gradation

and other income oriented activities have been taken care of in this plan. Following activities are being included for this purpose:-

a. Backyard poultry.
b. Cottage industry.
c. Training and support for local artisans, blacksmith, carpenter (wooden items) and support for handicraft centers.
d. Training and support of small IGA activities.
e. Bio/vermin composting
f. Orchard development

Table No.3.14

Sl. No	PROPOSED AVTIVITIES	PROPOSED EXPENDITURE (Rs. In Lakhs)
1	Capacity building training and exposure visit of vp villagers and staff	7.10
2	Publicity and extension of project and its documentation	2.37
	Sub Total	**9.47**
3	Institution support & Development	2.40
4	Entry point activities	7.07
	Sub Total	**9.47**

3.8.8 Other Interventions-

As has been said in the beginning, multi- sectoral approach has been the central theme in planning and execution of CAT plan proposals as illustrated above, forestry ,SMC ,livelihood support and capacity building /skill up gradation of the stakeholders have been the focus activities. Still few other important areas have been identified which will have major role to play in achieving CAT plan objectives. Appropriate fund provision have been made for these interventions and accordingly activity specific necessary details will be placed in the details project report such areas are under:

- Facilitation for convergence regarding social security schemes (this will be funded by corpus fund)
- Value addition and marketing
- **Minor repairing of community assets**
- Panchayat bhawan /community centre
- Foot/bridle paths
- Village community ponds

3.9 Infrastructure and Communication-

To carry out plan smoothly and successfully, the strengthening of essential infrastructure and communication such as setting up building like field huts/stores, maintenance of old staff quarters/ minor civil works and out sourcing of vehicles is an urgent need. The modern technology can be used as good tool for arriving at better results and healthy operation of the management units. To improvise the effectiveness,

incentives to personnel and structured Monitoring and Evaluation process will make the plan objective meaningful and its results more useful. To meet the purpose the expenditure has been provided which is shown an annexure 8,9 and 10.

Table 3.15

Sl. No.	Component and Activities	Proposed amount in lacs
	Project Management	
	Administration Cost (Project Management Cell)	
	Investment Cost	
1	Equipment and supplies and setting up building like field huts/store	1.11
2	Outsourcing of vehicles (Four & two wheelers)	6.00
	Recurrent Costs	
3	Salaries/service charges of contractual staff (Sector heads), village motivator, senior co-ordinator, Regional co-ordinator and staff on deputation	7.58
4	Project allowance/ honorarium to forest staff	2.25
5	POL of vehicle maintenance, repair and hiring of vehicles	2.25
6	Communication and conveyance allowance to total Project staff & Motivators	2.25
7	Office expenses	2.25
	Sub Total	**23.69**

3. 10 Support For Social Welfare –

As has been said in the beginning, multi- sectoral approach has been the central theme in planning and execution of CAT plan proposals as illustrated above, forestry ,SMC ,livelihood support and capacity building /skill up gradation of the stakeholders have been the focus activities and in these activities women participation will be the first priority. Still few other important areas have been identified which will have major role to play in achieving CAT plan objectives. Support for social welfare, formation of women SHGs and organization of health camps etc.

Table 3.16

Sl. No.	PROPOSED ACTIVITIES	PHYSICAL TARGET No	TOTAL COST (Rs. In Lakhs)
1	Training for related to different income generating activities	24 training	2.37
2	Support for social welfare creation of SHG and organization of health camps	24 camps	2.37
		Total	**4.74**

3.10.1 Documentation of Project Works and Consolidation of Various Works-

Table 3.17

Sl. No.	Consolidation phase	Proposed amount in lacs
1	Execution of withdrawal of Plan	0.71
2	Documentation of project work consolidation and completion	1.66
	Total	**2.37**

3.10.2- Micro-planning-

The detailed project report (DPR) for the treatment of the area will be prepared after preparing micro-plans, using PRA as a tool, for selected entire MWS 3 falling in the Catchment area of the proposed Tankul small SHP.

Table 3.18

Sl. No.	PROPOSED ACTIVITIES	PHYSICAL TARGET No	TOTAL COST (Rs. In Lakhs)
1	Preparation of DPR & Microplans	LS	2.52
2	Research and studies	LS	2.23
	Total		**4.75**

3.10.3 Corpus Fund-

In case of personal benefit to local beneficiaries from agriculture/horticulture/ animal husbandry under CAT plan, provisions of Govt. of India, Common Water Shed Guidelines revised on oct, 2011) contribution of 20% (General category) and 10% (SC/ST category) shall be payable at the time of implementation.

1. User charges and group membership charges etc. also
2. Utilization for the maintenance and project assests.

3.10.4 Executing Agency

The treatment plan targets both the reserve forest and civil and private land in the villages. while mostly plantation and soil conservation activities will be carried out in forest land the other activities targeting village development like Agriculture , Horticulture. Animal Husbandry etc will be implemented in villages involving villagers. While the respective forest divisions will be the executive agency in the forest areas the Gram Panchayats, through respective Villages Level Committees, will implement activities in the villages.

To ensure involvement of villagers in the implementation of the activities formation of local institutions like women/mixed Self Help Groups (SHGs)/User Groups will be encouraged.

3.10.5 Monitoring & Evaluation:-

Table 3.19

Sl. No.	Component and Activities	Proposed amount in lacs
	Monitoring & Evaluation-Proposed	
1.	Establishment of MIS	0.60
2.	Establishment of GIS & Monitoring	0.60
3.	Evaluation & Monitoring	1.20
4.	Baseline studies/Midterm/ End Term	1.20
5.	Internal & External audit	1.14
	Total	**4.74**

3.10.6 CONTINGENCY:-

Table 3.20

Sl. No	Particulars	Amount in lacs
1	Contingency charges: (2%)	4.75

3.10.7 CAT plan duration, physical & financial outlay:-

The CAT plan period is 7 years, first 4 years will be utilized for management and the rest period is withdrawal phase. Component wise and subcomponent wise financial targets are being shown in the table below:

Proposed cost component wise in % for CAT plan (CAT plan guidelines 2014)

Table No-3.21
Proposed cost component wise in % for CAT plan

Sl. No.	Code No.	Component and Activities	Proposed Target	Proposed amount (in lacs)	Financial % as per CAT Plan guidelines (2014)
1	1	Project Management			**12%**
	1.1	Administration Cost (Project Management Cell)			**10%**
	1.1.1	Investment Cost			
	1.1.1.1	Equipment and supplies and setting up building like field huts/store		3.555	1.5%
	1.1.1.2	Outsourcing of vehicles (Four & two wheelers)		3.555	1.5%
	1.1.2	Recurrent Costs			
	1.1.2.1	Salaries/service charges of contractual staff (Sector heads), village motivator, senior co-ordinator, Regional co-ordinator and staff on deputation		7.58	Total required Rs. 9.83 Lac (As per MoM dt. 07.09.17 remaining will be diverted from 1.1.2.2)
	1.1.2.2	Project allowance/ honorarium to forest staff		2.25	1%
	1.1.2.3	POL of vehicle maintenance, repair and hiring of vehicles		2.25	1%
	1.1.2.4	Communication and conveyance allowance to total Project staff & Motivators		2.25	1%
	1.1.2.5	Office expenses		2.25	1%
		Sub Total		**23.69**	
	1.2	Monitoring and Evaluation-Proposed			

वन संरक्षक
उत्तरी कुमाऊँ वृत्त, उत्तराखण्ड
अल्मोड़ा

मुख्य वन संरक्षक, कुमाऊँ,
उत्तराखण्ड, नैनीताल

	1.2.1	Management Information System(MIS)/GIS		1.20	0.5%
	1.2.2	Concurrent Monitoring & Evaluation		1.20	0.5%
	1.2.3	Study(Baseline/mid-term/end term)		1.20	0.5%
	1.2.4	Control Systems & Financial review-Audit(Internal+ External)		1.14	0.5%
		Sub Total		**4.74**	**2%**
		Total (1)		**28.43**	**12%**
2	2	Preparatory Phase-Proposed			10%
	2.1	Development of institutional system			
	2.1.1	Institutional Development and Support		2.40	1%
	2.1.2	Entry Point Activities (EPA) Minor repairing of community (water tap, Drinking water etc.)		7.07	3%
		Sub Total		**9.47**	**4%**
	2.2	Capacity Building and Publication awareness and extension			
	2.2.1	Capacity building training and exposure visit of vp villagers and staff		7.10	3%
	2.2.2	Publicity and extension of project and its documentation		2.37	1%
		Sub Total		**9.47**	**4%**
	2.3	Preparation of DPR & Micro-plans		2.52	1%
	2.4	Research and study		2.23	1%
		Sub Total		**4.75**	**2%**
		Total(2)		**23.69**	**10%**
3	3	Catchment area treatment phase			75%
	3.1	Catchment area treatment activities			63%
	3.1.1	A forestation works in Reserve Forests			
	3.1.1.1	Afforestation works	14.00 ha	71.08	30%
	3.1.1.2	Assisted Natural Regeneration works	20.00 ha		
	3.1.1.3	Miscellaneous activities-Pasture development	60.28 ha		

मुख्य वन संरक्षक, कुमाऊँ
उत्तराखण्ड, नैनीताल

अधिकारी वन अधिकारी
धियोरागढ़ वन प्रभाग

		Catchment Treatment Work			27%
		***Soil & moisture conservation work**			
	3.1.2	Construction of vegetative CheckDams/ gully plug	25.00 cum	63.97	
	3.1.2.3	Stone Check Dams	1511.00 cum		
	3.1.2.4	Pirul Check Dams	870 N0		
	3.1.2.5	Construction of R.R. Dry Check Dam	650.00 cum		
	3.1.2.6	Construction of Gabion Structure Crate wire checkdam, Retaining walls, Breast wall, Side wall, Defective Spurs	700.00 cum		
	3.1.2.7	Construction of water conservation tanks (Kacha) Small size	250.00 cum		
	3.1.2.8	Construction of spurs with in gabion structure (with filling of hard packed stone)	600.00 cum		
	3.1.2.9	Digging of contour trenches (3.0x0.30x0.30) seed sowing of suitable grasses and shrub species)	3000 No		
	3.1.2.10	Construction of Chal-khal	300.00 cum		
	3.1.3	Payment of eco-system services to the local communities/ institutions, bio-diversity conservation, fire protection measures to adopt bio production system water harvesting etc.	LS	4.74	2%
	3.1.4	Wildlife Management (Mitigation of Man-animal conflict, habitat improvement by eradication of noxious weeds.	46 ha	4.74	2%
		Creation of water holes)	02 No		
	3.1.5	Provision of alternative energy resources (by installation of solar energy panel and supply of solar lantern)	LS	4.74	2%
		Sub Total		**149.27**	**63%**
	3.2	Conservation oriented livelihood activities			

*जल एवं मृदा संरक्षण कार्यों हेतु स्थलों का विवरण संलग्नक (ए) में इंगित किया गया है।

वन संरक्षक
उत्तरी कुमाऊँ वृत्त, उत्तराखण्ड
अल्मोड़ा

मुख्य वन संरक्षक, कुमाऊँ
उत्तराखण्ड, नैनीताल

सभागीय वन अधिकारी
पिथौरागढ़ वन प्रभाग

	3.2.1	Agricultural based development activities		9.47	4%
	3.2.1.1	Development of agro-forestry (plantation of fuel, fodder and domestic use species.			
	3.2.2	**Horticulture**			3%
		Development of horticulture activities (Planting of high yield and latest variety horticultural species creation of infrastructure for storage of food and vegetable and their processing, planting of aromatic and medicinal plants)			
		Distribution of Horticulture Plants	7110	7.11	
	3.2.3	**Animal husbandry**			
	3.2.3.1	Chari construction/Nand (troughs)- for better stall feeding	56	2.84	3%
	3.2.3.2	Vaccination –for health improvement	LS	2.96	
	3.2.3.3	Cattle immunization (Twice in a year through animal husbandry doctor)	400 No	0.81	
	3.2.3.4	Promoting artificial insemination in cattle	5 No	0.50	
	3.2.4	**Support for income generation activities in non farm sector (Nature guide/eco tourism and development of local embroidery)**			
		Training for related to different income generating activities.	21 Training	2.37	1%
	3.2.5	Organization of health camp	21 camps	2.37	1%
		Sub Total		**28.43**	**12%**
		Total (3)		**177.70**	**75%**
4	4	Consolidation phase			
	4.1	Execution of withdrawal of Plan		0.71	0.30%
	4.2	Documentation of project work consolidation and completion		1.66	0.70%
		Total (4)		**2.37**	**1%**
5	5	Contingency Charges		4.75	
		Total (5)		**4.75**	**2%**
		Total (1+2+3+4+5)		**236.94**	**100%**

वन संरक्षक
उत्तरी कुमाऊँ वृत्त, उत्तराखण्ड

मुख्य वन संरक्षक, कुमाऊँ
उत्तराखण्ड, नैनीताल

क्षेत्रीय वन अधिकारी
पिथौरागढ़ वन प्रभाग

The component wise and sub component wise financial allocation is based on the guide lines issued by PCCF, Uttarakhand. The financial estimation for forestry management, drainage line treatment and water harvesting and conservation works are based on current North Kumaon Circle Schedule of Rates. Due consideration has been provided to account for the inflation in subsequent years.

The activity proposed under each measure component of the five components (Project Management, Preparatory Phase , Watershed Work Phase, Livelihood Activities for poorest/ marginal farmers and consolidation phase) are indicative and may slightly differ depending on the site specific condition/requirement as per micro-planning.

The total cost of the proposed CAT Plan is 236.94 Lakhs.

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मुख्य वन संरक्षक, कुमाऊँ
उत्तराखण्ड, नैनीताल

प्रभागीय वन अधिकारी
Divisional Forest Officer
Pithoragarh Forest Division

29/8/19
अपर प्रमुख वन संरक्षक
परियोजनायें, उत्तराखण्ड
देहरादून

29/08/19
प्रमुख वन संरक्षक
उत्तराखण्ड, देहरादून

Catchment Treatment Work 'A'

Soil and moisture conservation work

Sl. No.	Name of work and description	Name of place	Longitude	Latitude
1	Construction of vegetative Check Dams /gully plug	Bunbung Gaon	80°42'12.300"	30°1'36.540"
2	Stone Check Dams	Bunbung Gaon	80°42'15..480"	30°1'30.960"
		Tankul Gaon	80°42'52.920 "	30°0' 12.180 "
		Weir site Simkhola	80°42'22.560"	30°1'58.860"
3	Pirul Check Dams	Bunbung Gaon	80°42'22.860"	30°1'30.480"
		Tankul Gaon	80°42' 52.260"	30°0' 11.340"
		Near Weir site Simkhola	80°42'23.820"	30°1'57.000"
4	Construction of R R Dry Check Dams	Mangti Gaon Nala	80°42'53.580"	29°1'47.040"
		Kunjaso Gaon	80°42' 47.700 "	30°1'17.520 "
		Magti Gaon	80°42'53.160"	29°1'48.180"
		Tankul Gaon	80°42' 48.300 "	30°0'13.140 "
5	Construction of Gabion Structure Crate Wire check dams, Retaining Walls, Breast Walls, Side Walls, Defective Spurs	Tankul Gaon Nala	80°42'44.220 "	30°0'13.560 "
		Tankul Gaon	80°42'45.660 "	30°0' 42.000 "
		Weir site Simkhola	80°42'25.680 "	30°1'52.380"
		Power house site Mangti	80°42'54.160"	29°1'50.120"
6	Construction of water conservation tanks (Kacha) Small Size	Bunbung Gaon	80°42'20.640"	30°1'28.980"
		Tankul Gaon	80°42' 51.180 "	30°0' 09.300"
7	Construction of spurs within gabion structure (with filing of hard packed stone)	Bunbung Gaon	80°42'16.380"	30°1'30.840"
		Tankul Gaon	80°42' 48.660 "	30°0'16.200 "
		Weir site Simkhola	80°42'33.460"	30°1'55.320"
		Manggti Gaon	80°42'54.260"	29°1'49.200"
8	Digging of contour trenches (3.0x0.3x0.3)m seed showing of suitable grasses and shrub spices)	Bunbung Gaon	80°42'19.500"	30°1'30.900"
		Tankul Gaon	80°42'49.020 "	30°0' 15.360 "
		Mangti Gaon	80°42'46.260"	29°1'45.340"
9	Construction of Chal- Khal	Bunbung Gaon	80°42'23.700"	30°1'30.000"
		Tankul Gaon	80°42'49.740 "	30°0' 13.020 "
		Mangti Gaon	80°42'39.450"	29°1'36.320"

J.E (C)

A.E (C)

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मुख्य वन संरक्षक, कुमाऊँ
उत्तराखण्ड, नैनीताल

Slope wise treatable area in 3 MWS in Project Area:-

Table 3.2.1

Sl.No.	Name of S.W.S.	M.W.S.No.	Agriculture					Reserved Forest				
			33%	33-50	50-100	100%	(A1) Total	33%	33-50	50-100	100%	(A2) Total
3	Kutti	3	137	39	0	0	**176**	608	264	14	0	**886**
		Total	**137**	**39**	**0**	**0**	**176**	**608**	**264**	**14**	**0**	**886**
Treatable area (gradient ‹ 33% +1/4 of areas having gradient 33 to 50%			**137+9.75= 146.75**					**608+66=674**				

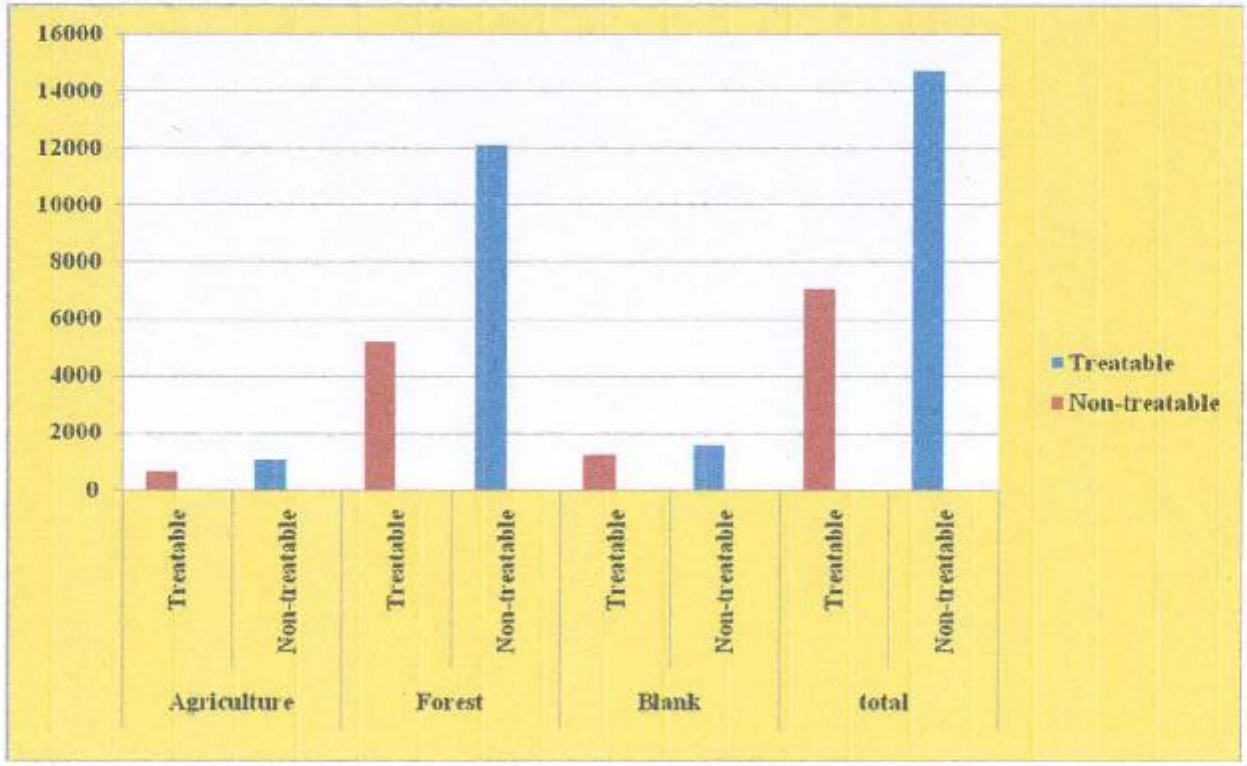
Other than Reserved Forest					(A2+A3) Total Forest	Reserved Blank					Other than Reserved Blank					(A4+A5) Total Blank	River bed	Rock y	Sno w	(A1+ A2+A3+ A4+A5) G. Total
33%	33-50	50-100	100 %	(A3) Total		33 %	33-50	50-100	100 %	(A4) Total	33%	33-50	50-100	100 %	(A5) Total					
1101	1177	241	0	**2519**	**3405**	0	0	0	0	**0**	639	777	246	0	**1662**	**1662**	0	0	0	**5243**
1101	**1177**	**241**	**0**	**2519**	**3405**	**0**	**0**	**0**	**0**	**0**	**639**	**777**	**246**	**0**	**1662**	**1662**	**0**	**0**	**0**	**5243**
1101+294.25=1395.25						**0**					**639+194.25=833.25**									

Source: Watershed directorate, Uttarakhand

Treatable and Non-treatable Area

Table:- 3.3

Agriculture		Forest		Blank		total	
Treatable	Non-treatable	Treatable	Non-treatable	Treatable	Non-treatable	Treatable	Non-treatable
632	1039	5204.75	12090.25	1234.75	1569.25	7071.5	14698.5



3.10.8 Dove-Tailing

In the respective divisions, other forestry and allied programmes of similar nature with the same mandate are being carried out. The funds available in such schemes may be well utilized for the activities in this plan. the probable schemes which can be dove tailed to this CAT Plan are summarized as below:

1. The development scheme of the RF& Civil Soyam Forest.
2. Intensification of forest management scheme
3. 13th finance commission scheme
4. CAMPA
5. Uttrakhand Bamboo& Fiber Development Board aided scheme
6. MNREGA (Mahatama Gandhi National Rural Employment Guarantee Act)

3.10.9 CSR Activities;-

The U.J.V.N.Ltd. will conducted the following activities from their CSR fund for the social welfare of the local community.

1- Health camps
2- Scholarship for poor and brilliant students (10th and 12th)
3- Higher education support for poor and meritorious students.
4- Support for providing additional private teachers in those school lacking appropriate teacher availability.
5- Support for repair and maintenance of local assets (temple, drinking water pipeline, footpath, Dharmshala etc.)

3.10.10 Benefits of CAT plan to community:-

1. Increase in awareness among community regarding watershed development.
2. Availability of fodder near the village.
3. Reduction in women drudgery.
4. Economic empowerment of women through SHGs formation and capacity building for entrepreneurship development.
5. Availability of alternate energy resources.
6. Technical support in animal husbandry and increase diary production and change in number of cattle.
7. Training and technical support on agriculture and income generation activities.
8. Recharge and rejuvenation of drying and dried up springs.
9. Enhancement in irrigation and drinking water availability at village level.
10. Involvement of community in forest management and development of sense of ownership among them.
11. Enhancement of agriculture and horticulture production.

CHAPTER-4
(PROJECT IMPLEMENTATION UNIT AND STAFFING)

4.1 Project Implementation Unit (PIU) and Staffing:

The Tankul small SHP Catchment Area Treatment Plan is an elaborated catchment area treatment plan with multi-dimension integrated activities in which community participatory approach has an important role in planning and execution. The project area i.e. the catchment area falls in to Pithoragarh Forest Division, Pithoragarh. Accordingly the project activities would be implemented over a period of seven years. Three revenue villages will be covered through community participation with a well deigned exist plan/strategy.

Project Implementation Unit will recruit required contractual staff personnel such as Junior project co-ordinator, agriculture/horticulture specialist, livelihood specialist, village motivators for effective implementation of these works and expert attention regarding technical and social imputes. The forestry and anclliary works will be executed by respective field staff.

PIU wise requirement of contractual staff is shown in the table below:-

01 number junior project co-ordinator and 01 number data entry operator for Pithoragarh Forest division have been proposed in Pithoragarh forest division.

Table 4.1

Sl. No.	Office/ Division name	Number of revenue village	Detail of proposed contractual staff for CAT Plan		
			Junior Project co-ordinator operator cum Data entry	Horticulture, agriculture and livestock specialist	Village motivator
1	Pithoragarh Forest Division	3	01	Horticulture, agriculture and livestock specialist will be occasionally hired as per the requirement of project activities	01
	Total	3	01		01

Detail of total estimated expenditure on staff shown in above

Table 4.2

i. Management Cost

Contractual staff	Monthly emolument	Total Number of staff	1st Yr.	2nd Yr.	3rd Yr.	4th Yr.	Sub Total
Village Motivator	3000	01	36000	37800	39690	41674	155164
Junior Project co-ordinator cum Data Entry Operator	12000	01	144000	151200	158760	166698	620658
	Total	**02**	**180000**	**189000**	**198450**	**208372**	**775822**

II- Withdrawal Phase (Contractual Staff only)

Contractual staff	Monthly emolument	Total Number of staff	5th Yr.	6th Yr.	7th yr.	Sub Total
Village Motivator	3000	01	43758	45946	48243	137947
Junior Project co-ordinator cum Entry Operator	12000	01	175033	183785	192974	551792
	Total	**02**	**218791**	**229731**	**241217**	**689739**
	Grand Total		**75822+689739=**			**1465561**

Note:- Rate of management cost as per prevailing rates

The above PMU staff requirement is based on the schedule communicated by PCCF Uttarakhand vide office memorandum Kha-174/13-2(2), dated 13-8-2011 and the financial calculations are based on the monthly emoluments fixed by CCF, Kumaon. An annual increase 5% (3% fixed and 2% performance based in the wage rate has been considered in working out of the expenditure for plan period.

4.2 Project Implementation Unit (PIU):

The responsibility of implementing the project as envisaged in its objective will lie with the concerned Divisional Forest Officer i.e. DFO, Pithoragarh. The nodal PMU i.e. DFO, Pithoragarh will perform the duties of generating/compiling the monthly/quarterly/ annually reports and sending the documents and MIS progress report and other relevant information to CF Kumaon circle (The nodal conservator). In addition, an ACF will monitor the project progress.

The PMU staff will regularly help and advice on technical and social matters to the ACF and DFO in planning and implementation process. DFO will co-ordinate to concern experts/technical institution/line departments such as FRI, WII, FSI, Central Soil and Water Conservation, research and training institution Dehradoon, agriculture, horticulture , animal husbandry, rural development department etc. for support and know how sharing.

The project will also be closely monitored by CCF Kumaon.

The Tankul SHP area lies in Dharchula Range (Pithoragarh Division) . For effective implementation of the project activities range headed by a Range level Forest officer will form a Project implementation Unit (PIU). Each revenue village will have a committee entitled to implement the work proposed in Panchayat area.

To provide institutional and technical support to the project works Junior Project co-ordinator will be engaged as per the requirement. Junior Project co-ordinator (Jr.PC) will closely associate with Village motivator facilitator and will proposed of all the institution/capacity building training, workshops, exposure visits of project staff and community and ensuring the participatory monitoring mode of project execution process.

Junior PC will primarily be responsible for planning, co-ordination and monitoring the execution of village based eco-restoration works and livelihood improvement works and they will also work in close co-ordination with other experts, line departments and agencies for appropriate field level planning, execution, monitoring and dissemination of documents of best practices/achievements.

All proposals and different report will be jointly recommended /signed by Jr.PC and ACF. The village based livelihood improvements works or IGA will be planned and executed with due consultation with respective specialist and will apprise of DFO factual position.

CHAPTER-5

INSTITUTIONAL DEVELOPMENT

The executing agencies for the implementation of CAT plan will be the Forest Department in reserve forest and civil soyam forest land and Van Panchayats in Panchayat land. The important institutions identified for the facilitation and support of catchment area treatment activities will be as under:-

1. Line Departments.
2. Van Panchayats and local CBOS.

For the institutional development the following steps will be taken:-

1. It has already been explained in the preceding chapters. The project area is having 3 Forest Panchayats/committees. Each Forest Panchayat/committees comprises 9 members, meaning thereby almost 60 forest protection guards among the villagers. They will be encouraged for deep involvement in overall protection of forest including the protection of forest from the fire.

2. The Van Panchayats will be strengthened and the forestry works will be done through the local community. In this way they will get an alternate livelihood opportunity also.

The villagers will themselves select the interested locals. The persons engaged will be paid the resqusite honorarium.

The existing institutional development in the project area can be categorized into following three major categories:-

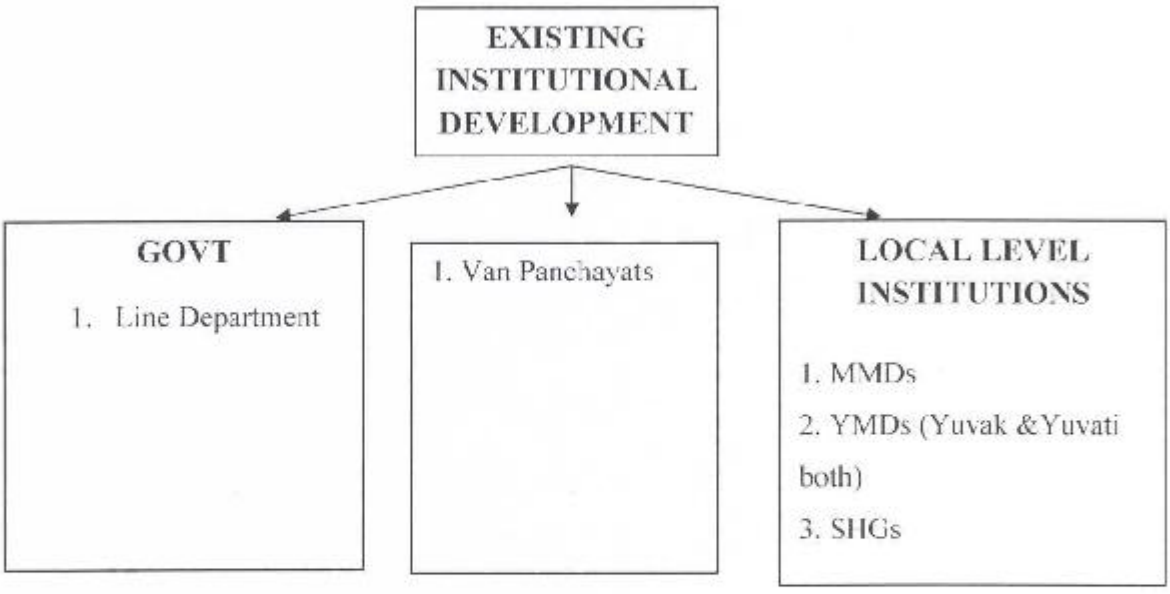


Fig 5.1

CHAPTER-6

CONSOLIDATION PHASE

6.1 Execution of Withdrawal Plan:-

i. The community participation will be encouraged in planning and executing forestry, soil moisture conservation (SMC) and other similar works/activities so that a sense of ownership develops in them and they take the future responsibility of carrying out the project.
ii. Listing of different village level committees will be done and the community assist will be maintained and watched through them.
iii. Village Panchayat/Van Panchayat/beneficiary committees will be trained for common property resource management.
iv. All stakeholders will be apprised/well informed with general direction regarding CAT Plan.
v. The constitute user groups/SHG's will contribute in the execution of withdrawal plan.
vi. Committees formed and given responsibility regarding the management of different assets generated during the project implementation will be motivated for genuine contribution to generate a development/maintenance fund.

6.2 Compilation, Consolidation successful completion and widening up for the execution by beneficiary themselves the project works (Related with Social, institutional, technical and livelihood etc.)

All Project works carried out during the execution of the CAT activities will be complied. Consolidated and wound up a proper forms/manner. Emphasis will be on works related to social, institutional, technical livelihood activities.

6.3 Contingency-

2% of total CAT outlay will be kept as contingency to meet any sort of exigency during the execution of Project activities. A part of the fund may also be utilized for the possible works due to the circumstantial charges in the area.

Chapter-7

DOCUMENTATION & REPORTING

7.1 Project Information Management:

Management information system (MIS) will be developed for regular and close monitoring, preparation of quality document/reports and monitoring the accounts at all levels including village level committee and PIU level.

A proper reporting mechanism will be developed at PIU level and monthly expenditure, accounts. Other relevant reports showing work progress and fund availability will be submitted as per the desired schedule.

7.2 Documentation and Publications:-

Awareness programs for common people will launched and the video recording of the process, procedures and guidelines will be prepared and published printed accordingly.

Project will bring out wide range of publication of good practices and results. The same will be disseminated, the material aimed at awareness and education of the local community and their capacity building for sustainable NRM will be focused.

Experience sharing of various project activities, success stories and processes etc. with different facilitators like NGO's, expert institution, line departments etc. will be ensured on regular basis. Information regarding eco-restoration and livelihood activities such as; forestry, agriculture, horticulture, animal husbandry and organic farming etc will be prepared and disseminated to the community members. The project will prepare annual directory of works and the monitoring reports would be published. Local version of the plan will be prepared as soon as the plan is approved.

Chapter-8

OUT PUTS AND OUT COMES`

All the CAT Plan activities have been proposed with the following out puts and out comes

SL.NO	INPUTS	OUTPUTS	OUTCOMES
1.	Forestry activities	94.28 ha. Plantation	Increase in availability of minor timber, fodder and firewood that will fulfil the forest based daily requirements/needs of local community.
			Gradual increase in area under vegetation and forest cover
			Decrease in landsliding, subsidence, gullies, forest fire.
2.	Soil & Moisture Conservation Activities	Forestry activities will retard the soil erosion by reducing runoff water flow	Reduction in siltation, soil loss and enhanced soil productivity, recharge/rejuvenation of during and dying springs.
3	Enhancement in the livelihood opportunities	Livelihood support from labour works and agriculture technical supports	Increase in average annual income of the community
			Enhancement in the livelihood opportunities and average annual income of the community
			Reduction in migration of people from villages
4	Participatory approach in different project activities	Involvement of community in planning, implementation and sustainability of different project activities.	Development of sense of honour ship among community
			Involvement of community in forest management
			Decrease in soil loss
5	Wildlife Management Activities	Availability of food and water for wild animals and improvement of wild life habitat.	Decrease in incidences of entrance of wild animals in village boundaries.

Chapter-9

PERFORMANCE INDICATORS

1. Decrease in siltation.
2. Increase in forest cover in density of vegetation in project area.
3. Enhancement of agriculture and horticulture productions.
4. Pasture development around or close to village.
5. ENHANCEMENT in socio-economic status of the community in project area.
6. Reduction in forest fire.
7. Increase dairy production and enhancement in number of cattle.
8. Rejuvenation of dying and drying water bodies.
9. Reduction in dependence of community on forests for fuel/change in traditional cooking methods and fuel management. Increase in availability of solar/alternate energy device.
10. Reduction in migration from Project area.

Note: The actual base line data for performance indicator will be collected at the time of micro planning

Chapter-10

MONITORING & EVALUATION

Monitoring is a regular and continuous exercise and provides a base to evaluate any ongoing project and extract its learning. Monitoring is an absolute non-negotiable in any walk of life if the desired goal has to be achieved.

10.1- Need of Monitoring –

- Monitoring helps us in reviewing the progress, identifying the various problems and searching for the possible solutions. It also provides crucial information for guidance and decision making.
- In the organization monitoring of projects ensure that they are moving on the right track towards the objectives that they set out to.
- Monitoring system helps us to identify the factors that they limit or promote the project progress in the desired direction with the desired place. They show the gaps in achievement that need to be covered.

10.2- Monitoring principles

- Input activity monitoring
- Process monitoring
- Output- Outputs monitoring

Regular monitoring of the project at different stages will be ensured at appropriate levels. The different streams of monitoring are as under-

i. **Internal monitoring system-** DFO concerned will hold monthly experience sharing workshops of the project staff on the prefixed date and will review the physical & financial progress, the work quality, the accounts and other relevant reports. Experience sharing will support the innovate approaches in achieving the project targets. Internal monitoring will be conducted regularly by PCCF (Projects) Uttarakhand Dehradun. The PMU will organize co-ordination meeting of community representatives, village motivators and all the concerned staff to monitor the progress and the quality of its implementation in the village. The project co-ordinator will have the main responsibility in organizing such workshops and will ensure the participation of all stakeholders.

ii. **Physical Monitoring-** The physical verification of all the activities will be carried out at certain levels i.e. departmental PIU, PMU. The internal cross checking and the third party- NGO's, expert institutions and line departments etc.- verification will be the internal part of the physical monitoring

iii. **Technical Monitoring-** Base line, mid-term and end-term monitoring will be done and the evaluation report will be prepared and suggestions if any will be accorded.

iv. **Audit-** All accounts and reports will be annually audited through AG, Uttarakhand audit team, department internal audit team and through CAMPA deputed CA and suggestions if any will be accorded.

v. **Monitoring through independent body-** The independent monitoring and evaluation of different activities will be done through an independent body.

vi. **Social audit-** Time to time a social audit will be conducted of different project activities.

Rules and Responsibilities of communities:-

The rules and responsibilities of this committees will be as under:-

1- Create awareness among the local community regarding the programme.
2- To monitor the project activities regularly.
3- Being local residence of the area, give appropriate suggestions according to the physiographic and climatic conditions of the area.
4- Co-ordinate with the local community and implementation of project activities.
5- Project and create a sense of ownership among the local community about the assets generated during the project implementation.
6- To do an initiative to take over the responsibility of project after withdrawal.
7- To generate a fund through local contribution to look after the project activities after project withdrawal.

CAT Plan Monitoring & Evaluation

BASIS OF MONITORING	MONITORING FREQUENCY	ORIENTATION OF THE INDICATOR	MONITORING LEVEL	MONITORING BY	TO BE MONITORED
Immediate response basis	Regular monthly monitoring	Activity oriented	Division level	PIA Team (Including DFOs, Project Coordinator, and members of Van Panchayat)	1. Manpower (required and available/approved). 2. Material availability (required and available/approved). 3. Fund availability (Required and allocated). 4. Targets and achievements on ground with defined project activities under DPR including:- • Assessment of IEC, capacity building and institutional development. • Promotion of participatory approach through trainings & capacity building SHGs/Federation etc. and their smooth functioning. • Promotion of livelihood production system & Microenterprises in a systematic and equitable manner • Overall performance of appraisal of each PIU staff. 5. Assessment of shortcoming 6. Taken corrective measures 7. Participation of all monitoring stakeholders with due endorsement

					8. Financial tracking and utilization. 9. Data collection for silt index on seasonal basis from HEP development agency or other reliable sources. 10. Documentation/Record keeping/Data base management including coordinates for various proposed activities and field visit reports. 11. Communication and reporting.

Note:- For the sustainability and success of CAT Plan activities the complete involvement community and its 100 % participation will be ensured to develop a sense of ownership in them. Social audit of all project activities (Afforestation & SMC works at priority) will be done by the local community after regular intervals (Atleast quarterly). A committee for social audit has been proposed to do the social audit. The membership of this committee may be given to PRI members, Community based organizations etc.

(For official use only)

उत्तराखण्ड शासन

Technical Memorandum No. 89 T.R. (S_2-11)

DETERMINATION OF SILT CONTENT IN WATER SAMPLE

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Tribhuwan Singh
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Roorkee

October, 2018

IRRIGATION RESEARCH INSTITUTE, ROORKEE

DETERMINATION OF SILT CONTENT IN WATER SAMPLE

T.M.No. 89T.R. (S_2-11)

One number water sample was received from Deputy General Manager(E&M-SHP),Cantt Road, Jakhni District-Pithoragarh-262501 (Uttarakhand) by his letter no. 1266/यूएजेवीएनएल/08/नि(परि)/उमप्र(जा)/तांकुल Dated 10/10/2018.The sponsoring authority desired to find out the silt content in water sample.

The water sample was filtered through filter paper. The silt content collected on filter paper, was weighed after drying in oven at 100^0C till constant weight was achieved. The test result of silt content in PPM has been shown in the enclosed table.

This report is only valid for the above one sample supplied by the sponsor in this Chemical Laboratory.

(Kishan Lal)
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Soil Research Unit-2

(Dheer Singh)
Research Officer
Soil Research Unit-2

RRIGATION RESEARCH INSTITUTE **ROORKEE-247667** **(An ISO:9001-2008 Certified Organization)**	TEST REPORT T.M. No. 89T.R. (S_2-11)
	TYPE OF PUBLICATION 'C'
SUPERINTENDING ENGINEER P. K. MALL	Tel : 01332-257507(O) Fax : 01332-262487
TITLE OF THE REPORT DETERMINATION OF SILT CONTENT IN WATER SAMPLE	Month of Issues: October 2018
	No. of Pages : 1
	No. of Tables : 1
PROJECT SPONSORING AUTHORITY DEPUTY GENERAL MANAGER (E&M-SHP) CANTT ROAD, JAKHNI DISTRICT –PITHORAGARH -262501 UTTARAKHAND	No. of Drg. : -
	SPONSOR'S REFERENCE letter No.: 1266/यू0जे0वी0एन0एल0 / 08 / नि0(परि0) / उमप्र0(जा0) / तांकुल Dated- 10.10.2018
	CODE OF ESTIMATE : 5958

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SYNOPSIS

One number water sample was received from Deputy General Manager (E&M-SHP),Cantt Road, Jakhni, District-Pithoragarh-262501 (Uttarakhand) by his letter no. 1266/यू0जे0वी0एन0एल0 / 08 / नि0(परि0) / उमप्र0(जा0) / तांकुल Dated 10/10/2018.The sponsor desired to find out the silt content in water sample. The result of silt content in P.P.M.is given in the enclosed table.

KEY WORDS : SILT CONTENT, PPM, WATER SAMPLE,

SUBJECT : SILT CONTENT IN WATER SAMPLE

PROJECT : PROPOSED 4X3 MEGAWATT TANKUL HYDROELECTRIC PROJECT

Approved by
(P. K. Mall)
Superintending Engineer
Research Circle

Recommended
(Dheer Singh)
Research Officer
Soil Research Unit-2

Submitted
K Lal
(Kishan Lal)
Asstt.Research Officer-1
Soil Research Unit-2

IRRIGATION RESEARCH INSTITUTE, ROORKEE

RESULT OF SILT CONTENT IN WATER SAMPLE RECEIVED FROM DEPUTY GENERAL MANAGER (E&M-SHP), CANTT ROAD, JAKHNI, DISTRICT-PITHORAGARH -262501 (UTTARAKHAND)

T.M.No. 89T.R. (S_2-11)

Sl. No	LAB NO.	NAME OF PROJECT	LOCATION	VOLUME (Lit.)	SILT CONTENT (PPM)
1	2	3	4	6	7
1.	13/1	Proposed 4X3 Megawatt Tankul Hydroelectric Project (CAT PLAN)	Proposed Diversion weir	10	518 mg/l

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