# Environmental Assessment Report

Environmental Management Plan
Project Number: 41627-04
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# IND: Himachal Pradesh Clean Energy Development Investment Program – Sainj Subproject (Tranche 3)

Prepared by WAPCOS Limited

## ENVIRONMENTAL MANAGEMENT PLAN REPORT
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# ABBREVIATIONS AND ACRONYMS

| | | |
|---|---|---|
| AISLUS | - | All India Soil and Land Use Survey |
| CAT | - | Catchment Area Treatment |
| CPCB | - | Central Pollution Control Board |
| DEM | - | Digital Elevation Model |
| DTM | - | Digital Terrain Model |
| DPR | - | Detailed Project Report |
| EC | - | Electrical conductivity |
| EIA | - | Environmental Impact Assessment |
| EMP | - | Environmental Management Plan |
| GIS | - | Geological Information System |
| GHNP | - | Great Himalayan National Park |
| GOI | - | Government of India |
| HEP | - | Hydroelectric Project |
| HPSEB | - | Himanchal Pradesh State Electricity Board |
| MOEF | - | Ministry of Environment and Forests |
| M&E | - | Monitoring and Evaluation |
| NEERI | - | National Environmental Research Institute |
| NOC | - | No Objection Certificate |
| NOx | - | Nitrogen Oxides |
| NPRR | - | National Policy for Resettlement & Rehabilitation |
| NPV | - | Net Productivity value |
| PAP | - | Project Affected People |
| PAF | - | Project Affected Families |
| PHC | - | Primary Health Centre |
| R&R | - | Resettlement & Rehabilitation |
| RPM | - | Respirable Particulate Matter |
| SPCB | - | State Pollution Control Board |
| SPM | - | Suspended Particulate Matter |
| $SO_2$ | - | Sulphur dioxide |
| STP | - | Sewage Treatment Plant |
| SYI | - | Silt Yield Index |
| SVCC | - | Sainj Valley Conservation Cell |
| VAM | - | Vesicular Arbuscular Mycorrizae |
| WAPCOS | - | Water and Power Consultancy Services (I) Limited |

# CHAPTER-1

# COMPENSATORY AFFORESTATION AND BIODIVERSITY CONSERVATION PLAN

## 1.1 INTRODUCTION

Conservation is the sustainable use of natural resources, and is achieved through implementation of various measures that minimize the adverse impacts likely to accrue as a result of any developmental activity or any other form of human interferences. In the present project threats may arise as a result of construction of barrage and associated activities of proposed Sainj hydroelectric project. The likely disruptive activities include road construction, blasting, excavation for tunnels, quarrying, dumping of excavated material and human population pressure on land and biological resources. In view of the foreseen disturbance and degradation of natural ecosystems, a compensatory afforestation plan and biodiversity conservation and management plan has been proposed for Sainj hydroelectric project.

## 1.2 COMPENSATORY AFFORESTATION

The Forest Department of Himachal Pradesh is responsible for conservation and Management of forests in the state. The project site is located in the vicinity of the Great Himalayan National Park (GHNP). The Director GHNP is responsible for the management of the forests and forest area in the study area. The objective of the compensatory afforestation is to make up for the loss of forest land proposed to be utilized for construction of the proposed Sainj hydroelectric project.

### 1.2.1 Impacts on Forest

The forest land required for the proposed Sainj hydroelectric project is 47.993 ha. The forest in the project area is under stress due to multiple reasons. The human

settlement, agriculture activities, grazing in the forest contribute to degradation of forest. Due to construction of barrage, the clearing of vegetation, movement of vehicles for transportation of construction material, widening of road, stocking of construction materials, erection of temporary labour sheds and excavation disturb vegetation and forest area.

During reservoir filling a reservoir is created leading to loss of vegetal cover. The species density and diversity in the proposed submergence area is not significant. However, some tree and other vegetation will be cleared from the proposed submergence area. In addition, forest land is to be acquired for other project appurtenances as well.

### 1.2.2 Afforestation

The Indian Forest Conservation Act (1980) stipulates:

- If non-forest land is not available, compensatory afforestation are to be established on degraded forest lands, which must be twice the forest area affected or lost, and
- If non- forest land is available, compensatory forest are to be raised over an area equivalent to the forest area affected or lost.

The total forest loss including submergence area and other project appurtenance is about 47.993 ha. It is proposed to afforest double the amount of forestland being acquired for the project. Thus, a total of 47.993 (x 2) 96.00 ha of land needs to be afforested. The afforestation work is to be done by the Forest Department

The total expenditure required for afforestation of 96.00 ha of area will be **Rs. 8.70 million**. The details of scheme for compensatory afforestation as given by Forest Department is given in Annexure-IA. In addition to above the project proponent will pay an amount of Rs. 40.55 million to the Forest Department as NPV. As far as cost

of trees is concerned, an amount of Rs. 34.36 million shall be paid to the Forest Department(Refer Annexure-IB), by the project proponents.

The Director GHNP is responsible for conservation of Forest and improvement of habitat for wildlife in the project area. Compensatory afforestation is proposed to be undertaken on degraded forest land identified by Director GHNP. The scheme would be implemented as per integrated Afforestation Programme prepared by Director GHNP. This includes activities like soil conservation works fencing protection awareness, monitoring and evaluation along with the maintenance for 7 years.

## 1.3 BIODIVERSITY CONSERVATION

### 1.3.1 CONSERVATION OF FLORA

#### a. Conservation priorities

Deforestation, over-grazing and indiscriminate over-exploitation of forests have led to degradation at various locations in the study as well as the catchment areas. During construction phase, congregation of large labour force is likely to lead to significant stress on the existing forests and vegetation. In order to mitigate adverse impacts due to project activities and degradation due to congregation of labour population during construction phase. The project authorities in addition to the monitoring of illegal activities, tree felling, will initiate positive steps for conservation of the species at risk. Attention will be given to the habitat protection and strict watch would be maintained to prevent degradation of species under threat and wildlife habitats.

#### b) Conservation for rare and endangered floral species

Some of the plant species which are rare and endangered in nature in terms of their small population sizes, will be specially selected for conservation/preservation. These species are *Betula alnoides, Desmodium gangaticum, Sorbus accuparia,*

*Bistorta macrophylla, Polygonatum verticillatum,* etc. will be taken up for *in situ* and *ex situ* conservation. The *in situ* measures will include rehabilitation of these species in the similar habitats around the area. In case it is known that the population sizes are extremely small in some cases efforts would be made to augment the natural population through artificial multiplication and regeneration.

**c) Conservation measures**

**In situ Conservation Measures**

The in situ conservation measures for the *Betula alnoides* species will be given highest priority. The taxa will be identified and relocated in the similar habitats. Their niche requirements would be analyzed so that their relocation takes place smoothly and they are able to propagate naturally. The areas for in situ relocation will be in the vicinity of their natural habitats. The relocation sites will be selected in a manner so that these taxa are not exposed to any biotic or abiotic threat or pressure. The different taxa would be segregated based on their reproductive propogules. As majority of these species are herbaceous perennials with rhizome/rootstock/corm/bulb as the reproductive propgules, sufficient care will be taken to relocate them initially in nurseries for proper establishment and finally these will be transferred to the selected sites for natural propagation.

The nurseries of about 1 acre area will be located at an appropriate site in the broad-leaf forests and the relocation habitats will be selected among the forests in the area. This exercise will be accomplished by the, State Forest Department. HPSEB will provide the necessary funding support a provision of Rs.3.0 million has been in the project cost for. Since the naturalness of habitats has to be maintained in all respects, no artificial means will be employed to assist these taxa in their relocation.

**Ex-situ Conservation Measures**

Ex-situ conservation measures will be pursued for threatened species which have low reproductive potential and efficiency. The taxa with low individual numbers will-be selected and ex-situ conservation measures like seed collection, in vitro seed germination and nursery establishment will be carried out.

Plant tissue culture will be tried for mass multiplication of such taxa for which protocols are already developed. Some of the species that need such conservation programmes are: *Desmodium gangaticum (*Safed kathi*), Delphinium denudatum (*Nirbishi*),* and *Polygonatum verticillatum (*Salam misri*).*

In vitro pant regeneration of medicinally important plant species have been achieved by using different explants or through organogenesis and cell suspension cultures. Protocols for the in vitro micro propagation of *Polygonatum verticillalum* (Jayanti Sengupta *et al.,* 1987) have been developed successfully. The use of in vitro techniques not only helps in the conservation of this threatened species but also potentially increases the production of medicinally important compound for which the particular plant species is being exploited.

It is proposed that Institutions such as Y.S. Parmar University, Himachal Pradesh, Department of Botany, Punjab University. Chandigarh, NBPGR, New Delhi Himalayan Forest Research Institute of ICFRE at Shimla and G.B. Pant Institute of Himalayan Environment and Development, Regional Centre, Mohal (Kullu) shall be involved for the development of protocols for the in vitro micro propagation and the subsequent re-introduction of these species in their natural habitats. The necessary funding support for setting up the laboratory and offices, chemicals and equipment, hardening facility and green houses/chick houses, etc. and maintenance for 5 years would be provided by HPSEB. A provision of Rs.5.0 million has been considered for

this purpose. The Tissue Culture Centre can be taken over by the host institute after a period of five years.

### 1.3.2 CONSERVATION OF FAUNA

#### a. Conservation Priorities

**Mammals**

The mammals like Goral, Kakar, Bharal and Ibex found in upper reaches of Sainj valley frequently descend down to 1,300 m on grassy slopes or rocky lands between the forests. The visits are made either in mornings or evenings for feeding. These animals, therefore, expose themselves to risks of being shot down or caught and poached. More importantly, most of these animals breed in the winter months starting October. They also descend down during this period particularly after snowfall. The young ones are born in the months of April to June. The mammals like Himalayan thar and Himalayan musk deer also found on grassy and precipitous slopes, on the other hand are quite shy and are very fast runners. Even then they are killed by the poachers. Amongst the large mammals, Brown bear which inhabits upper reaches of Sainj valley descends down in autumn for mating and its young ones are born in February-March. Snow leopard seldom comes down from 3,500m.

**Avi-fauna**

Among the birds Chakor, Hill partridge and pheasants - Kalij, Cheer, Koklas, Monal and Western Tragopan all are known to descend down to lower altitudes during winter months. Their nesting season starts from April extending up to June. Cheer and Monal are found mainly in Jiwa valleys while Western Tragopan is found mostly in GHNP. The highly expensive edible mushroom, *Morchella* spp., locally known as 'Gucchhi' grows in the same habitats as that of pheasants. Gucchhi extraction coincides with the breeding season of Pheasants who are forced to leave nests

because of frequent visits of people in their nesting areas. It has reported to lead to decline in breeding success of pheasants (Kumar *et al.,* 1999 ). Removal of litter and trampling while mushroom collection have also been found to have negative impact on invertebrate population thriving on ground which are primary source of food for growing pheasant chicks.

**b. Management Strategies**

Keeping in view the sudden influx of labour population in the 'wildlife rich areas, the following actions are suggested for the conservation of fauna in the region.

i) The project authorities would ensure that strict vigil is kept especially during the breeding season of animals i.e. from October- December and when young ones are born/nesting season, i.e. from March-June. Activities like blasting or heavy machine operations producing noise levels more than 80-100 dB(A) will be restricted during this period. Heavy penalties would be imposed for violation of this conduct by contractors/labourers, etc. during this period. These aspects shall be included in the Tender Document for the Contractor involved in construction works.

ii) Information dissemination emphasizing the need of conservation and legal consequences on violation of Forest and Wildlife (Protection) Acts will be prioritised and publicised. Awareness would also be imparted to the labourers engaged in construction activities for exerting great restraint especially during critical months of breeding and nesting of animals and birds.

iii) The signboards/Notice boards highlighting penalties for violation of rules, will be put nearby habitation areas of labourers. The importance of conservation of wildlife would also be emphasised.

iv) Education and awareness campaigns including screening of audio-visual films would be conducted stressing on the harmful and negative consequences of collection and removal of herbs and 'Gucchhi' in early stages of their growth.

v) No firearms would be allowed in the sainj valley and the visitors will be made to deposit any firearms with the forest check posts before entering these areas.

Some of the Schedule-I animals reported from the catchment area include Snow leopard, Common leopard, Wolf, Leopard cat, Himalayan black bear, Himalayan brown bear, Bharal, Himalayan ibex, Himalayan tahr, Serow and Musk deer. Maximum efforts would be made to avoid degradation and damage to the habitat and migration routes of these animals. Though majority of the habitats of these animal species are away from the project sites, but some animals do stray into the areas where project works will be carried out. The project authorities would take the following steps in order to ensure habitat protection and protection to animal and bird species like Monal and Western Tragopan around the project sites.

- There will be strict monitoring of laborers and associated workers for any activity related to endangering the life or habitat of wild animals and birds.
- Strict restrictions will be imposed on the workers at project sites to ensure that they do not harvest any produce from the natural forests and cause any danger or harm to the animals and birds in wild.
- Minimum levels of noise during construction activities will be maintained and no activity will be carried out at night since where the project site is in the close vicinity of natural animal/bird habitats.
- The fuel wood to the laborers will be provided from plantations meant for the purpose and/or the provision has been made for the supply of the free subsidized kerosene/LPG from the depots being set up for this purpose to avoid forest degradation and animal habitats.
- The interference of human population would be kept to the minimum and it would be ensured that the contractors do not set up laborer colonies in the vicinity of forests and wilderness areas.
- The project authorities will be bound by the rules and regulations of the

Wildlife Protection Acts or any such agency of the State, which may exist or will be promulgated from time to time for the preservation of habitats and protection of wild animals.

## 1.4 SAINJ VALLEY CONSERVATION CELL

It is recommended that a Sainj Valley Conservation Cell (SVCC) be created under the aegis of Director, Great Himalayan National Park (GHNP). The funding support for this would be provided by the project authorities for a period of 5 years. The action plan for this Cell is as follows:

i) A Sainj Valley Conservation Cell (SVCC) will be set up by the State Government upon the recommendation of Ministry of Environment & Forests, Government of India under the direct and over all administrative control of the Chief Wildlife Warden, Himachal Pradesh.

ii) The SVCC would be governed by a Board under the Chairmanship of the Chief Wildlife Warden/Director (GHNP) and shall include two members each from State Forest Department, two renowned Ecologists/Conservationists, two representatives of local NGOs and one Central Government representative of Ministry of Environment & Forests.

iii) The SVCC shall be housed in the office of the Chief Wildlife Warden and would have a minimum staff of 15 personnel namely Assistant Conservator of Forests (1), Wildlife Rangers (3), Forest Guards (8), Head Clerks (1), Drivers (1), Peons (1).

### 1.4.1 Activities to be undertaken by SVCC

i) The main job of this Cell would be to look after the conservation areas in the vicinity of Project Areas, monitor and enforce regulatory provisions and ensure that the natural ecosystem structure and functions are not changed or subjected to any threat.

ii) The proposed Cell will endeavor to conduct works related to documentation of the existing biological diversity in the project area and publish check lists of flora and fauna. However, this effort would be supplemented by detailed surveys on flora and fauna that are proposed to

be conducted by the competent institutions/agencies.

iii) Surveillance : The Cell through its staff will ensure that the land use frozen at the beginning is not changed and no anthropogenic activities from private or public agencies are carried out within the boundaries of the protected area.

iv) Fire Protection : The forests of the Sainj and adjoining catchments are at times subjected to forest fires. Special attention, therefore needs to be paid to the prevention of forests fires as well as the protection of forests during forest fires.

v) Local Participation: The inhabitants of the area would be encouraged to adopt conservation oriented practices and economic activities. This would ensure habitat protection and continuity as well as rule out loss of wildlife species. These practices will also help in preventing disruption, disturbance and fragmentation of the wildlife habitats.

vi) Enforcement of Anti-poaching Laws : Necessary provisions for law enforcement will need to be put in place to empower these field personnel within the existing framework of the Himachal Pradesh State Forest Department.

vii) The penalty to the violator/s carrying out any illegal operations in this area shall be dealt under existing laws of the Forest Conservation Act, Wildlife Protection Act and other laws which may exist or may come in force from time to time to prevent damage/disturbance to these natural ecosystems.

viii) Monitoring : A monitoring committee will be set up which will monitor and ensure the implementation of conservation measures. The monitoring committee would include all the members of governing board of SVCC and will also have a representative of Project authority. The Cell would monitor the conservation measures like the control of poaching, regulation of biotic activities, prevention of domestic cattle straying into Protected Areas, Conservation awareness, research and monitoring and alternate income generating activities like cultivation of medicinal plants and `Guchhi' collection from pristine forest areas.

A provision of **Rs.25.65 million** has been earmarked for setting up the Sainj Valley Conservation Cell. The details of cost for setting up of Cell is given in Table-1.1.

**TABLE-1.1**
**Details of cost for setting up of SVCC**

| S. No. | Particular | Amount (Rs. million) |
|---|---|---|
| **A.** | **Capital Expenditure** | |
| i) | Office/Building | 1.50 |
| ii) | Equipment (Forest equipment, guns, wireless sets for communication, laboratory equipment, computers, etc. | 2.00 |
| iii) | Furniture and furnishings | 0.50 |
| iv) | Vehicles (1) | 0.50 |
| | **Total (A)** | **5.50** |
| **B.** | **Recurring Expenditure (for one year)** | |
| 1. | Salaries & Wages | |
| i) | Assistant Conservator (1) @ Rs.25,000/- per month = 1 x 12 x 25,000 | 0.3 |
| ii) | Wildlife Rangers (3) @ Rs.15,000/- per month = 3 x 12 x 15000 | 0.5 |
| iii) | Guards (8) @ Rs.10,000/- per month = 8 x 12 x 10,000 | 0.96 |
| iv) | Head Clerks (1) @ Rs.5,000/- per month = 1 x 12 x 10,000 | 0.12 |
| v) | Drivers (1) Rs.5,000/- per month = 1 x 12 x 5,000 | 0.06 |
| vi) | Peons (1) Rs.5,000/- per month = 1 x 12 x 5,000 | 0.06 |
| 2. | Contingent expenditure L.S. @ Rs.1.00 lakhs per year | 0.10 |
| 3. | Running and Maintenance of vehicles L.S. @ Rs.1.00 lakhs per year | 0.10 |
| 4. | Miscellaneous expenses L.S. @ Rs.1.00 lakhs per year | 0.10 |
| 5. | Surveys and studies | 1.0 |
| | Sub Total | 3.30 |
| | **Total Running Expenditure for 5 years including 10% escalation (B)** | **20.15** |
| | **Grand Total (A + B)** | **25.65** |

## 1.5 ENVIRONMENTAL AWARENESS FOR CONSERVATION

The project authorities will provide assistance and funding support to the existing State Government agencies, like Forest Department, Great Himalayan National Park in popularizing environmental conservation among the local inhabitants as well as outsiders. The packages will be in the form of incentives to the locals as well as educational awareness

Since the valley attracts lot of tourist traffic during summer seasons, necessary information campaign will be organized with the help of Forest and Wildlife Agencies. Some of the steps that will be initiated includes publication of an Eco-tourists Guide, pamphlets and other dissemination packages for local school children, adults and tourists. These materials will contain Dos and Don'ts as well as penalties in case of violations. These kits in the form of Audio-Visual kits, books, posters and other environmental awareness material will be distributed free of cost to the schools and NGOs for conducting various campaigns under the environment awareness programmes. Furthermore the local NGOs and educational institutions located in the towns of Kullu and Manali would also conduct environment awareness workshops, seminars, field trips from time to time highlighting the importance of conserving the natural resources in their area. Similarly orientation programmes would also be conducted for not only the officers working on the project but also for the workers and labourers engaged in various construction activities. The project authorities will also bring out a monthly publication in local language which would list out the progress on various conservation programmes being undertaken in the project area and also announce in advance the schedule of various activities and seminars to be conducted for different strata of groups. The funding for all the above mentioned activities would be provided by the project authorities. An amount of Rs.1.0 million

has been earmarked for this purpose in addition to the fund of Rs.1.0 million allotted for the preparation and publication of relevant material for various conservation programmes. Hence, a total of **Rs.2.0 million** have been set aside for conducting various environment awareness programmes.

### 1.6 ANTI-POACHING MEASURES

During construction phase in and around the main construction areas, i.e. the barrage site, powerhouse site, etc. where construction workers congregate, some disturbance to the wildlife population may occur. Therefore, marginal impacts may be on wild life due to various construction activities.In view of this it is recommended that 2 check posts be developed in the major construction area i.e. one near intake and one near power house along the boundary of labour camps to prevent anti-poaching activities in the GHNP. Each check post shall have 3 guards to ensure that poaching does not take place in the area. The guards will be supervised by a range officer. It is also recommended that the staff manning these check posts have adequate communication equipment and other facilities. Apart from inter-linking of check posts, communication link needs to be extended to Divisional Forest Office and the local police station also. The cost involved on this account has already been included in the cost for development of SVCC.

### 1.7 BUDGET

A total provision of **Rs.35.65 million** has been earmarked for biodiversity conservation. The details are given in Table-1.2.

**TABLE-1.2**

**Budget for implementation of biodiversity conservation plan**

| Item | Cost (Rs. million) |
|---|---|
| Setting up of Sainj Valley Conservation Cell (SVCC) | 25.65 |
| Ex-situ Conservation Measures | 3.0 |
| In-situ Conservation Measures | 5.0 |
| Awareness programme for conservation | 2.0 |
| **Total** | **35.65** |

A total provision of **Rs. 119.257 million** has been earmarked for implementation of various measures related to compensatory afforestation and bio-diversity conservation plan. The details are given in Table-1.3.

**TABLE-1.3**

**Budget for implementation of compensatory afforestation and Bio-diversity Conservation plan**

| Item | Cost (Rs. million) |
|---|---|
| Compensatory afforestation | 8.693 |
| NPV | 40.554 |
| Cost of trees | 34.36 |
| Bio-diversity Conservation Plan | 35.65 |
| **Total** | **119.257** |

# CHAPTER-2

# CATCHMENT AREA TREATMENT PLAN

## 2.1 PROJECT DESCRIPTION

The Sainj hydroelectric project has been contemplated as run off the river scheme which envisages construction of barrage across river Sainj near village Niharani, located on the right bank of the river. The power house is proposed with two units of 50 MW each to be located near confluence of Jiwa Nallah and river Sainj, which is about 300 m upstream of the proposed power house of the Parbati Stage-II Hydro-electric Project. The energy generation of 399.57 GWh at 90% dependable year and 436.90 GWh at 50% mean year is envisaged as a result of commissioning of the project.

The salient features of project are briefly described as below:

- 24.5 m high Diversion gated barrage at an elevation of ±1733m, downstream of village Niharni on river Sainj. The FRL and MDDL is proposed at an elevation of ±1752 m and ±1738.50 m respectively, to attain a live storage of ± 38.41 ham to meet up diurnal peaking requirement during lean months.

- Two underground disilting tanks (145mx15mx7.5m) to exclude all silt particles down to 0.2 mm Size.

- A Head Race Tunnel (HRT) on the right bank of river Sainj, of about ±6.3 km long with 3.76 m diameter designed to carry a discharge of 28.70 cumec.

- Two intermediate adits 320 m and 430 m long and 4 m D-shaped proposed at RD 930 m and 4750 m respectively to facilitate construction of HRT.

- An underground restricted orifice surge shaft at the end of HRT - adit to top elevation ±1766.5 m and another adit at Bottom Elevation +1672.37m is proposed to facilitate the construction of surge shaft

- An underground pressure shaft of ±2.75 m diameter, 550 in long to carry discharge into power house.

- An underground power house to be located on right bank of river Sainj near confluence of Jiwa Nallah and Sainj river, which will have two units of 50 MW each to provided total installed capacity of 100MW.

- A tail race tunnel (TRT) of 400 m long and 4.8 m D-shaped, will constructed for discharging the water back into river Sainj.

- Infrastructure works like construction of approach roads, bridge, colony office complex, school and hospital.
- Energy generation of 399.57 GWh and 436.90 GWh at 90% and 50% dependable years are envisaged as a result of commissioning of the project.

The total land requirement for the project is 56.763 ha. The project is proposed to be completed in about 4.5 years.

## 2.2 NEED FOR CATCHMENT AREA TREATMENT

It is a well-established fact that reservoirs formed by dams on rivers are subjected to sedimentation. The process of sedimentation embodies the sequential processes 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 sediment 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 braiding of river reach. The removal of top fertile soil from catchment adversely affects the agricultural production. Thus, a well-designed Catchment Area Treatment (CAT) Plan is essential to ameliorate the above-mentioned adverse process of soil erosion.

Soil erosion may be defined as the detachment and transportation of soil. Water is the major agent responsible for this erosion. In many locations, winds, glaciers, etc. also cause soil erosion. In a hilly catchment area as in the present case erosion due to water is a common phenomenon and the same has been studied as a part of the Catchment Area Treatment (CAT) Plan.

The Catchment Area Treatment (CAT) plan highlights the management techniques for to control erosion in the catchment area of a water resource project. The life span of a reservoir is greatly reduced due to erosion in the catchment area. Adequate preventive

measures are thus needed for the treatment of catchment for its stabilization against future erosion. The total catchment intercepted at barrage site is 39730 ha. The catchment area considered for treatment under the present project is 13234 ha which comes under very high and high erosion category. The sub-watershed in the catchment area considered for the present study is given in Figure-2.1.

The catchment area treatment involves:

- Understanding of the erosion characteristics of the terrain and,
- Suggesting remedial measures to reduce the erosion rate.

In the present study **`Silt Yield Index' (SYI)**, method has been used. In this method, the terrain is subdivided into various watersheds and the erodibility is determined on relative basis. SYI provides a comparative erodibility criteria of catchment (low, moderate, high, etc.) and do not provide the absolute silt yield. SYI method is widely used mainly because of the fact that it is easy to use and has lesser data requirement. Moreover, it can be applied to larger areas like sub-watersheds, etc.

A detailed database on natural resources, terrain conditions, soil type of the catchment area, socio-economic status, etc. is a pre-requisite to prepare treatment plan keeping in view the concept of sustainable development. Various thematic maps have been used in preparation of the CAT plan. Due to the spatial variability of site parameters such as soils, topography, land use and rainfall, not all areas contribute equally to the erosion problem. Several techniques like manual overlay of spatially index-mapped data have been used to estimate soil erosion in complex landscapes.

Geographic Information System (GIS) is a computerized resource data base system, which is referenced to some geographic coordinate system. In the present study, real coordinate system has been used. The GIS is a tool to store, analyze and display various spatial data. In addition, GIS because of its special hardware and software characteristics, has a capacity to perform numerous functions and operations on the

various spatial data layers residing in the database. GIS provides the capability to analyze large amounts of data in relation to a set of established criteria.

In order to ensure that latest and accurate data is used for the analysis, satellite data has been used for deriving land use data and ground truth studies too have been conducted. The various steps covered in the study are as follows:

- Data acquisition
- Data preparation
- Output presentation

The above mentioned steps are briefly described in the following paragraphs.

### 2.2.1 Data Acquisition

The requirement of the study was first defined and the outputs expected were noted. The various data layers of the catchment area used for the study are as follows:

- Slope Map
- Soil Map
- Land use Classification Map
- Current Management Practices
- Catchment Area Map.

### 2.2.2 Data Preparation

The data available from various sources was collected. The ground maps, contour information, etc. were scanned, digitized and registered as per the requirement. Data was prepared depending on the level of accuracy required and any corrections required were made. All the layers were geo-referenced and brought to a common scale (real coordinates), so that overlay could be performed. A computer programme was used to estimate the soil loss. The formats of outputs from each layer were firmed up to match the formats of inputs in the program. The grid size to be used was also decided to match the level of accuracy required, the data availability and the software and time limitations. The format of output was finalized. Ground truthing and data collection was also included in the procedure.

For the present study IRS P6-LISS III digital satellite data was used for interpretation and classification. The classified land use map of the catchment area considered for the study is shown as Figure- 2.2. The landuse pattern of the catchment area is summarized in Table-2.1.

**TABLE-2.1**

**Landuse pattern of the catchment area**

| S. No. | Category | Area (ha) |
|---|---|---|
| 1. | Dense vegetation | 7121 (17.92) |
| 2. | Open vegetation | 3162 (7.96) |
| 3. | Scrub | 3000 (7.55) |
| 4. | Agriculture | 1204 (3.03) |
| 5. | Barren lands | 3397 (8.55) |
| 6. | Water bodies | 4773 (12.01) |
| 7. | Snow cover | 17004 (42.80) |
| 8. | Settlements | 69 (0.17) |
| | **Total** | **39730 (100.00)** |

**Note:** Figure in brackets indicate percentage

Digitized contours from top sheets were used for preparation of Digital Elevation Model (DEM) of the catchment area and to prepare a slope map. The first step in generation of slope map is to create surface using the elevation values stored in the form of contours or points. After marking the catchment area, all the contours on the top sheet were digitised (100 m interval). The output of the digitisation procedure was the contours as well as points contours in form of x, y & z points. (x, y location and their elevation). All this information was in real world coordinates (latitude, longitude and height in meters above sea level).

A Digital Terrain Model (DTM) of the area was then prepared, which was used to derive a slope map. The slope was divided in classes of slope percentages. The slope map is enclosed as Figure - 3. Various layers thus prepared were used for Modeling. Software was prepared to calculate the soil loss using input from all the layers.

### 2.2.3 Output Presentation

The result of the modeling was interpreted in pictorial form to identify the areas with high soil erosion rates. The primary and secondary data collected as a part of the field studies were used as an input for the model.

## 2.3 ESTIMATION OF SOIL LOSS USING SILT YIELD INDEX (SYI) METHOD

The Silt Yield Index Model (SYI), considering sedimentation as product of erosivity, erodibility and areal extent was conceptualized in the All India Soil and Land Use Survey (AISLUS) as early as 1969 and has been in operational use since then to meet the requirements of prioritization of smaller hydrologic units. The erosivity determinants are the climatic factors and soil and land attributes that have direct or reciprocal bearing on the unit of the detached soil material. The relationship can be expressed as:

**Soil erosivity = f** (Climate, physiography, slope, soil parameters, land use/land cover, soil management)

**Silt Yield Index**

The Silt Yield Index (SYI) is defined as the Yield per unit area and SYI value for hydrologic unit is obtained by taking the weighted arithmetic mean over the entire area of the hydrologic unit by using suitable empirical equation.

**Prioritization of Watersheds/Sub watersheds**

The prioritization of smaller hydrologic units within the vast catchments is based on the Silt Yield Indices (SYI) of the smaller units. The boundary values or range of SYI values for different priority categories are arrived at by studying the frequency distribution of SYI values and locating the suitable breaking points. The watersheds/ sub-watersheds are subsequently rated into various categories corresponding to their respective SYI values.

The application of SYI model for prioritization of sub watersheds in the catchment areas involves the evaluation of:

a) Climatic factors comprising total precipitation, its frequency and intensity,
b) Geomorphic factors comprising land forms, physiography, slope and drainage characteristics,
c) Surface cover factors governing the flow hydraulics and
d) Management factors.

The data on climatic factors can be obtained for different locations in the catchment area from the meteorological stations whereas the field investigations are required for estimating the other attributes.

The various steps involved in the application of model are:

- Preparation of a framework of sub-watersheds through systematic delineation
- Rapid reconnaissance surveys on 1:50,000 scale leading to the generation of a map indicating erosion-intensity mapping units.
- Assignment of weightage values to various mapping units based on relative silt-yield potential.
- Computing Silt Yield Index for individual watersheds/sub watersheds.
- Grading of watersheds/sub watersheds into very high, high medium, low and very low priority categories.

The area of each of the mapping units is computed and silt yield indices of individual sub watersheds are calculated using the following equation:

**a. Silt Yield Index**

$$SYI = \frac{\Sigma (Ai \times Wi) \times 100}{Aw}; \quad \text{where } i = 1 \text{ to } n$$

where
Ai = Area of ith unit (EIMU)
Wi = Weightage value of ith mapping unit

n = No. of mapping units
Aw = Total area of sub-watershed.

The SYI values for classification of various categories of erosion intensity rates are given in Table-2.2.

**TABLE- 2.2**

**Criteria for erosion intensity rate**

| Priority categories | SYI Values |
|---|---|
| Very high | > 1300 |
| High | 1200-1299 |
| Medium | 1100-1199 |
| Low | 1000-1099 |
| Very Low | <1000 |

## 2.4 WATERSHED MANAGEMENT – AVAILABLE TECHNIQUES

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

- increase infiltration into soil
- control excessive runoff
- manage & utilize runoff for useful purpose.

Following Engineering and Biological measures have been suggested for the catchment area treatment.

### 1. Engineering measures

- Step drain
- Contour bunding
- Check dams

### 2. Biological measures

- Afforestation /Plantation

- Replenishment afforestation / Gap plantation
- Fuel Wood and fodder development
- Pasture development
- Social forestry
- Development of nurseries

The description of various catchment area treatment measures recommended as a part of CAT Plan of the proposed Sainj hydroelectric project is given in the following paragraphs:

**i) Step Drain :** Step drain are recommended in the steep streams where soil erosion is high. The stepped drain can be concrete drain (2-3 ft. steps) or steps can be developed with sausage wall or combination of sausage walls and dry walls. The steps in the drain help in reducing the current of water which reduces the soil erosion.

**ii) Contour Bunding :** Contour bunding is a widely used soil conservation measure on agriculture land. It consists of constructing narrow trapezoidal embankments on contour to impound the runoff water behind them, so that impounded water is absorbed gradually into the soil profile for crop use.

**iii) Check dam :** The check dam will be provided with stone masonry and G.I. crate walls in the nalah where less vegetative cover and erosion is high.

**iv) Afforestation :** A well stocked forest plays a very important role in control of soil erosion. Thus, it is proposed to increase the vegetal cover in the area. For this purpose, barren areas, devoid of tree growth have been recommended to be brought under afforestation. As a part of the CAT Plan, two types of afforestation programmes have been recommended which are described in the following paragraphs:

**a) Afforestation of Degraded Areas :** As a part of the scheme, barren areas devoid of tree cover will be taken up for plantation. The tree species recommended for plantation include Deodar, Kail, Ban Oak, Ceder, Poplar, etc. About 1500 plants per hectare shall be planted.

**b) Replenishment Afforestation/ Gap plantation:** Many of the forest areas which have been depleted due to excessive pressure of local population for timber, fuelwood and fodder. The natural regeneration is absent as a result of increased human interferences. For such forest areas, it is proposed to increase the stocking by artificial regeneration. About 600 to 800 trees per ha are proposed to be planted as a part of this measure.

**v) Fuel wood and Fodder Development :** The dependence of local population on forest resources to meet fuel wood and fodder requirements leads to cutting of trees and clearance or grazing of pastures. This leads to increased soil erosion. Thus, as a landuse management strategy it is proposed to develop area under social forestry, fuelwood and fodder development to reduce the pressure on existing forest resources.

**vi) Pasture development :** Barren lands with slopes greater than 40% have been recommended to be treated by developing pastures over them. Fodder development has been recommended in vicinity to the villages within the catchment. This will reduce the pressure on pasture land being developed as a part of the catchment area treatment plan.

**vii) Social forestry :** The plantation under social forestry is recommended to control the tree felling near the settlement area.

**viii) Development of nursery :** Development of nursery is done to provide saplings for various plantation works. Nurseries have been recommended as a part

of the CAT Plan in various sub-watersheds covered as a part of the CAT Plan. The size of the nursery can be 1 to 1.5 ha and about 10,000 saplings can be planted in the nursery.

The basis of site selection for different biological and engineering treatment measures under CAT are given in Table -2.3.

**TABLE- 2.3**

**Basis for selection of catchment area treatment measures**

| Treatment measure | Basis for selection |
|---|---|
| Social forestry, fuel wood and fodder grass development | Near settlements to control tree felling |
| Contour Bunding | Control of soil erosion from agricultural fields. |
| Pasture Development | Open canopy, barren land, degraded surface |
| Afforestation | Open canopy, degraded surface, high soil erosion, gentle to moderate slope |
| Step drain | To check soil erosion in small streams, steps with concrete base are prepared in sloppy area where silt erosion in the stream and bank erosion is high due to turbidity of current. |
| Check dam | Stone masonry with cement mortar in 1:6 with concrete base 1:4:8 and G.I. crate walls on steep slopes, sliding surfaces, where less vegetative cover and silt erosion is high |
| Nursery | Centrally located points for better supervision of proposed afforestation, minimize cost of transportation of seedling and ensure better survival. |

## 2.5 CATCHMENT AREA TREATMENT MEASURES

The total directly draining catchment area is 39,730 ha. The erosion category of various watershed in the catchment area as per a SYI index are given in Tables- 2.4 and 2.5. The details are shown in Figure-2.4.

**TABLE- 2.4**
**Erosion intensity categorization as per SYI classification**

| Watershed number | Area (ha) | SYI values | Category |
|---|---|---|---|
| W1 | 1377 | 1216 | High |
| W2 | 1285 | 1335 | Very High |
| W3 | 1228 | 1217 | High |
| W4 | 1693 | 1295 | High |
| W5 | 753 | 1253 | High |
| W6 | 912 | 1246 | High |
| W7 | 852 | 1264 | High |
| W8 | 793 | 1050 | Medium |
| W9 | 1325 | 1285 | High |
| W10 | 1414 | 1159 | Medium |
| W11 | 1885 | 1155 | Medium |
| W12 | 1255 | 1046 | Medium |
| W13 | 1307 | 1208 | High |
| W14 | 1330 | 1032 | Low |
| W15 | 986 | 1030 | Low |
| W16 | 1759 | 1126 | Medium |
| W17 | 1247 | 1212 | High |
| W18 | 1255 | 1240 | High |
| W19 | 1242 | 1088 | Low |
| W20 | 1139 | 1033 | Low |
| W21 | 687 | 947 | Very Low |
| W22 | 1758 | 969 | Very Low |
| W23 | 1247 | 1003 | Low |
| W24 | 827 | 1191 | Medium |
| W25 | 707 | 1000 | Low |
| W26 | 1146 | 932 | Very Low |
| W27 | 712 | 1064 | Medium |
| W28 | 2015 | 1126 | Medium |
| W29 | 1375 | 933 | Very Low |
| W30 | 1747 | 1005 | Low |
| W31 | 1697 | 973 | Very Low |
| W32 | 775 | 967 | Very Low |
| **Total** | **39730** | | |

**TABLE- 2.5**
**Area under various erosion categories**

| S. No. | Category | Area (ha) |
|---|---|---|
| 1. | Very Low | 7438 (18.7) |
| 2. | Low | 12207 (30.7) |
| 3. | Medium | 6851 (17.2) |
| 4. | High | 11949 (30.2) |
| 5. | Very High | 1285 (3.2) |
| | **Total** | **39730(100.00)** |

**Note:** Figure in brackets indicate percentage

The objective of the SYI method is to prioritize sub-watershed in a catchment area for treatment. The area under very high and high erosion categories is to be treated at the project proponent cost. Hence, CAT plan has been suggested for very high and high erosion category, as a part of the present EIA study, the expenses of which have to be borne by project proponents. The area under very high and high erosion categories is 13,234 ha, which is about 33.4% of the total catchment area intercepted at the barrage site.

## 2.6 TREATMENT MEASURES

As a part of catchment area treatment plan, various biological as well as engineering treatment measures have been recommended. The details of the biological and engineering treatment measures recommended as a part of CAT plan are given in Tables- 2.6 and 2.7 respectively.

**TABLE-2.6**

**Details of biological treatment measures recommended as a part of CAT plan**

| S. No. | Treatment measures | Watershed No. | Area (ha) |
|---|---|---|---|
| 1. | Afforestation (1500 trees/ha) | W1 | 25 |
| | | W2 | 18 |
| | | W3 | 20 |
| | | W5 | 17 |
| | | W6 | 21 |
| | **Total** | | **101** |
| 2. | Replenishment Afforestation/ Gap Plantation (800 tree/ha) | W1 | 65 |
| | | W2 | 40 |
| | | W3 | 30 |
| | | W5 | 35 |
| | | W6 | 25 |
| | **Total** | | **195** |
| 3. | Pastures Development | W1 | 20 |
| | | W2 | 20 |
| | | W3 | 20 |
| | | W5 | 20 |

| S. No. | Treatment measures | Watershed No. | Area (ha) |
|---|---|---|---|
| | | W6 | 20 |
| | | W7 | 20 |
| | | W9 | 20 |
| | | W13 | 10 |
| | **Total** | | **150** |
| 4. | Fuel wood and Fodder development | W1 | 20 |
| | | W2 | 20 |
| | | W3 | 20 |
| | | W13 | 20 |
| | **Total** | | **80** |
| 5. | Social forestry | W1 | 20 |
| | | W2 | 20 |
| | | W3 | 20 |
| | | W13 | 20 |
| | **Total** | | **80** |

**TABLE- 2.7**
**Details of Engineering measures recommended as a part of CAT plan**

| S.No. | Treatment measures | Watershed No. | Quantity |
|---|---|---|---|
| 1. | Contour bunding | W1 | 104 |
| | | W2 | 81 |
| | | W3 | 63 |
| | | W5 | 58 |
| | | W6 | 95 |
| | **Total** | | **401 ha** |
| 2. | Stepped drains | W1 | 2 |
| | | W2 | 1 |
| | | W3 | 1 |
| | | W5 | 1 |
| | | W6 | 1 |
| | | W9 | 1 |
| | **Total** | | **7 (105 Rmt)** |
| 3. | Check Dam | W1 | 3 |
| | | W2 | 2 |
| | | W3 | 1 |
| | | W5 | 1 |
| | | W6 | 2 |
| | | W9 | 2 |
| | | W17 | 2 |
| | | W18 | 2 |
| | **Total** | | **15** |

## 2.7 WILDLIFE IMPROVEMENT AND DEVELOPMENT

The catchment area is part of Great Himalayan National Park (GHNP) and the Sainj Wildlife sanctuary (SWLS) is about 2.5 km from the proposed barrage. The wildlife in the area is exposed to a lot of biotic interferences. The excessive cattle population also leads to significant pressure on vegetal cover. This results in disturbance of ecology and environment.The plant communities are representative of temperate and alpine regions. The forest area consists of extensive stands of Oak *(Quercus semecarpifolia)*, coniferous forests of Blue Pine *(Pinus wallichiana),*- West Himalayan Silver Fir *(Abies pindrow),* west Himalayan Spruce *(Picea smithiana)* and Himalayan Cedar *(Cedrus deodara).* The broad-leaf forests contain *Aesculus indica, Rhododendron arboreum, Quercus leucotrichophora, Q.floribunda* at the lower altitude and pure patches of Birch *(Betula utillis)* at higher altitudes, Yew *(Taxus baccata)* is an important medicinal tree of the under storey. A rich variety of shrubs and patches of Ringal bamboo *(Arundinaria spathiflora)* are found as a dense under storey. The shrubs of *(Rhododendron campanulatum)* in the sub-alpine zone. Other shrubs that are found at an elevation above 3,700 m, are *Juniperus communis.* J. *pseudosabina, Lonicera, Berberis, Cotoneaster, Vibemum,* Rosa occur extensively above 3700 m. There are number of clearings in the forest areas which are locally known as 'thach'. These are grazing and camping ground for the migratory livestock including cattle, sheep and goats. The alpine flora occurring above 4,000 meters is characterized by species rich meadows with medicinal and economical values. They include *Aconitum violaceum, Salvia moorcraftiana, Viola serpens, Jurinea macrocephala, Rheum emodi, Berginia ciliata, Picrorhiza kurroo, Saussurea graminifolia* etc.

The catchment area is the part of Great Himalayan National Park (GHNP), supports an

extremely diverse wildlife population. It harbours one of the few known viable population of 'Western Tragopan' alongwith more than 300 species of birds and over 30 species of mammals.

The mammals reported in the catchment area include Serow *(Capricomis sumatraensis)*, Himalayan Tahr. Goral *(Nemorhaedus goral)*, BlueSheep (*Pseudols nayaur*), Himalayan Black Bear *(Selenarctos thibetanus),* Himalayan Brown Bear *(Ursus- arctos),* Himalayan Red Fox *(Vulpes vulpes)* and Musk Deer *(Moschus moschiferus).* The Red Data Book, has listed Musk Deer as a vulnerable species. The GHNP has .recorded 183 bird species including 132 passerines and 51 non-passerines, Galliforms in GHNP constitute a very important and spectacular component of bio-diversity, The GHNP is one of two National Parks in the World with a population of endangered Western Tragopan *(Tragopan melanocephalus).* Another endangered pheasant, Cheer (*Catreus wallichii)* is present on the steep, south-facing grassy slopes. Monal *(Lophphorus impegenus)*, and Koklas *(Pucrasia macrolopha)* are abundant in the temperate forest zone. Kaleej *(Lophura leucomelana)* occurs in small numbers below an elevation of 2,000 m. The sightings of Snow Partridge *(Lerwa lerwa)*, Hill Partridge, *Arborophilatorqueola* and Himalayan Snow cock *(Tetragallus himalayana)* are few.

The communities of the project area generally occupy forest fringe region, they have lived in isolation but in harmony with the nature. They draw their sustenance largely from the forests for their day to day consumption and their livelihood. The needs of the people who live in the harmony with the forests also has to be considered. At the same time, it is essential that there is no adverse on the wildlife habitat and the delicate equilibrium between the two is maintained in future also. The need of the protection and promotion of the existing species of wildlife and education of people

about the harmonious coexistence with wildlife should be given proper importance in managing the forests.

### 2.7.1 Objective of wildlife management

The objectives of wildlife management are:

i) To maintain plant and animal bio-diversity in nature by establishing the viable, healthy and Productive population of wild life for conserving genetic resources.

ii) To identify the problems of wildlife in the area, this in turn will help formulating the guidelines for their development and improvement.

iii) To ensure collection of scientific data for the maintenance and development of viable population of flora and fauna for scientific, aesthetic and economic purposes.

iv) To manage the habitat of fauna by provided special food and ideal habitat.

### 2.7.2 Activities for wildlife improvement and development

The following activities are proposed to be carried out for wildlife improvement and development in the catchment area of Sainj hydroelectric project. Since the catchment area of the proposed project is the part of Great Himalayan National Park (GHNP), therefore the detailed action plan may be prepared by GHNP, who is responsible for the formulation and implementation of various conservation measures in the GHNP.

**A. Wildlife Improvement**

i) Survey and documentation of flora & fauna in the catchment area of Sainj hydroelectric project

ii) Incentive to local communities for fire prevention

iii) Incentive to local communities for protection of Wildlife.

iv) Incentive to community to regulate local and migratory gazers in Sainj WLS.

**B. Wildlife Development**

**a. Intensive Management of Wildlife**

i. Habitat Improvement in Sainj WLS

ii. Wildlife Census .

iii. Capacity building of staff and community
iv. Support for communication-mobile connectivity
v. Establishment of nursery with an area of 1 ha infrastructure for distribution of plants in public
vi. Maintenance of plants in nursery
vii. Soil and moisture conservation
viii. Monitoring, evaluation and impact assessment study

**b. Eco-Development Activities**

i) Support for vermi compost development.
ii) Support for introduction of LPG for poor house holds around project area and Sainj WLS
iii) Socio-economic survey around project area and in Sainj WLS

**c. Ex-situ support for Himalayan Thar Breeding**

**A. WILDLIFE IMPROVEMENT**

**i) Survey and documentation of Flora and Fauna in the catchment**

The existing boundary of the forest covering in the CAT Plan including Sainj WLS will be maintained with pillar. So that the areas are not encroached upon by the local inhabitants near their cultivations and at the same time the forests are also protected. Beside this survey for flora and fauna will also be carried out and recorded. An outlay of Rs.6.0 lakh has been kept for this purpose.

**ii) Incentive to local communities for fire prevention**

The local community of the plan area will be provided with incentives in order to prevent the area from fire and outlay of Rs. 2.0 lakh has been kept for this purpose.

**iii) Incentive to local communities for protection of Wildlife**

Reward / incentive to the informers are required for proper protection of the forest area against poaching and illicit felling. It is proposed to strengthen the Wildlife efforts of forest guard in controlling offences by associating the locals. They can be

rewarded and incentives be given by the forest department. It is necessary to make people aware about the biological, ecological hardship with the bio-diversity of the forest area is facing. Therefore, the people should be encouraged by providing them reward / incentive for giving information about the offender/culprits. It is also ensured that informer's name should not be disclosed publically or otherwise people will not dare to come forward on this issue. A provision of Rs.2.5 lakh has kept for this purpose.

**iv) Incentive to community to regulate local and migratory gazers in Sainj Wildlife Sanctuary**

Incentive will be provided to 1he local inhabitant to regulate the local and migratory gazers in the wildlife sanctuary areas in order to protect the area from complete depletion of the palatable grasses. Therefore an amount of Rs 2.5 lakh is proposed to meet this purpose during the plan period

**B. DEVELOPMENT MEASURES**

**a. Intensive Management of Wildlife**

**i) Habitat Improvement in Sainj Wildlife Sanctuary**

Since all wildlife in nature live in complex web of linkage with other organisms, the proper evaluation of habitat of each species followed by its proper management is very essential. The plant life provides a congenial habitat to wildlife. Thus, it is proposed to improve the wildlife habitat by undertaking planting and other works.

For this purpose bushy, shrubby and thick forests are to be maintained and no grass should be removed from the habitat of the wild life. In degraded forest areas, suitable species i.e. fodder and fruit bearing species will be carried out as per site location, the bank area in the forests especially in high reaches along ridge should be maintained as pasture land by sowing suitable local grasses for the benefit of wild animal. Besides this water pond/ hole should be constructed wherever these are

required. An outlay for Rs. 5.0 lakh has been proposed to be incurred during the plan period.

**ii) Wildlife Census**

It is proposed to carry out wildlife census every alternative year in key areas to assess the trends in population of growth of various species. The findings of the survey will help in assessment of various management measures and need for improvements, if any. An amount of Rs.10.0 lakh has been earmarked for this purpose.

**iii) Capacity building of staff and community**

The implementing staff and communities will be imparted with training and exposure visit in order to build their capacity for effective management and improvement of wildlife and wildlife sanctuary. An outlay of Rs. 3.0 lakh is proposed to be earmarked for this purpose.

**iv) Support for communication**

Mobile connectivity will be provided to the staff to have communication for effective protection of Flora and Fauna. An amount of Rs. 1.0 lakh is proposed to be earmarked for this purpose.

**v) Establishment of nursery with infrastructure**

An ideal nursery will be established with its infrastructure to provide healthy seedlings for distribution of plants in public. Rs. 5.0 lakh has been earmarked to establish this nursery.

**vi) Maintenance of plant in nursery**

The nursery will be maintained so as to provide sufficient planting stock in perpetuity for public distribution. An amount of Rs. 5.0 lakh has been kept for maintenance of nursery.

**vii) Soil and moisture conservation**

The tract is prone to soil erosion and in order to check and protect the area from further erosion, a provision for soil and moisture conservation interventions has been proposed. For this purpose an amount of Rs. 5.0 lakh has been earmarked.

**viii) Monitoring, evaluation and impact assessment study**

A study will be carried out for impact assessment, monitoring & evaluation and for this purpose an amount of Rs. 4.0 lakh has been earmarked.

**b. Eco-development activities**

**i) Support for vermi compost development**

Vermi composting is one of the alternative sources of income generation which is easy to adopt, home based and can bring fast income returns to the local people in an eco friendly manner. Forest department and horticulturist in Kullu district will be a potential buyer of all such compost for its vast network of Forest Nurseries. Woman organization of the area can adopt these activities as a part time without compromising with their day to day work. An outlay of Rs. 1.0 lakh has been kept under income generation activities.

**ii) Support for introduction of LPG for poor house holds**

In order to release pressure on existing forests to meet the demand of fuel in and around Sainj WLS a provision for introduction/ supply of LPG to the poor house holds has been made. An outlay of Rs. 1.0 lakh has been kept under this component

**iii) Socio-economic survey**

A survey will be conducted around Sainj Wildlife sanctuary to assess and study the socio-economic conditions. Funds to the tune of Rs. 1.0 lakh have been earmarked for conducting the socio-economic survey.

**c. Ex-situ support for Himalayan Thar breeding of GHNP**

The catchment area is the part of habitat of rare and important Himalayan Fauna. A provision has been made in the CAT Plan for its management including Ex-Situ Development/conservation. The habitat of these rare and important Himalayan Fauna species is in fact degrading causing their population to dwindle at a very fast pace. Therefore, in order to develop/manage the fauna found in the area, provision has been kept for development / management of wildlife to supplement in situ conservation with Ex-Situ conservation. The emphasis will be to conserve the gene pool of the endangered species so that they can breed in captivity, after which they can be released in the natural habitat of the area. A five year Ex-Situ conservation breeding project management plan will be prepared separately under the supervision of Central Zone Authority (CZA) of India under Wildlife Protection Act (1972). The proposed work will be executed on the basis of approved conservation captive breeding plan by the CZA New Delhi. The necessary infrastructure will be developed for Ex-Situ conservation breeding project as per approved plan and necessary provision will be made for human resource development by providing training to the staff in captive breeding and reintroduction programme. A total outlay of Rs.40.0 lakh has been proposed for this purpose.

### 2.7.3 BUDGET

A total provision of Rs.94.0 lakh has been estimated for implementation of various measures for Wildlife improvement and development. The details are given in Table-2.8.

**TABLE-2.8**
**Details of cost required for wildlife improvement and development**

| S. No. | Activity | Cost (Rs. Lakh) |
|---|---|---|
| 1. | Survey of flora and fauna in the catchment area | 6.0 |
| 2. | Incentives to local communities for fire prevention | 2.5 |
| 3. | Incentives to local communities for wildlife protection | 2.0 |
| 4. | Incentives to community to regulate local and migratory grazers in Sainj Wildlife Sanctuary | 2.5 |
| 5. | Habitat improvement in Sainj Wildlife Sanctuary | 5.0 |
| 6. | Wildlife Census | 10.0 |
| 7. | Capacity Building of staff and community | 3.0 |
| 8. | Support for communication | 1.0 |
| 9. | Establishment of nursery with infrastructure | 5.0 |
| 10. | Maintenance of nursery | 5.0 |
| 11. | Soil and moisture conservation | 5.0 |
| 12. | Monitoring, evaluation & impact assessment study | 4.0 |
| 13. | Support for vermin-compost development | 1.0 |
| 14. | Support for introduction of LPG for poor household | 1.0 |
| 15. | Socio-economic survey | 1.0 |
| 16. | Ex-situ support for Himalayan Thar breeding/conservation of GHNP | 40.0 |
| | **Total** | **94.0** |

## 2.8 Joint Forest Management Process

Joint Forest Management (JFM) is a concept of developing partnerships between fringe forest user groups and the Forest Department (FD) on the basis of mutual trust and jointly defined roles and responsibilities with regard to forest protection and development. In JFM, the local communities and the Forest Department manage the resource and share the cost equally. Joint management of forest lands is sharing of responsibilities, control, decision making authority and products over forest lands between Govt. and local user groups. The primary purpose of JFM is to create conditions at the local level, which enable improvements in forest conditions and productivity. A second goal is to support a more equitable distribution of forests products than is currently the case in most areas. It is a movement towards a more democratic management of natural resources founded on the principle of equity,

transparency and social justice, which aims to build collective community action deeply rooted in many rural communities. Joint forest management activities play an important role in the Catchment Area Treatment. Therefore, as a part of the JFM activities proposed for the Sainj H.E. Project, local communities will be motivated to identify themselves with the development and protection of the forests from which they derive benefits.

### 2.8.1 Objectives of Joint Forest Management (JFM)

The objective of the JFM is to review and study the technology and suitable silvicultural practices for increasing the productivity of degraded forests through participation of local communities. The communities are required to organize forest protection committees, village forest committees, village forest conservation and development societies, etc. Each of these bodies has an executive committee that manages its day-to-day affairs.

### 2.8.2 Policy Framework:

National forest policy 1988, envisages people's involvement in the development and protection of forests. Following the adoption of 1988 policy by the Govt. of India, several state governments including H.P. have decided to adopt the Joint Forest Management (JFM) approach with suitable modifications. Forest Protection Committees of West Bengal, Hill Resource Management Societies of Haryana, and village Forest Committees of Karnataka are few examples. In H.P. J.F.M. has been initiated in pursuance of Govt. Order No. Forest (C) 3-4/80- V dated 12 5.93. Implementation of JFM works shall be carried out as per the provisions of the Integrated Resource Management Plan (Micro Plan) and annual plan or operations finalised accordingly. Legal provisions, as amended from time to time, should be

included in the JFM strategies. The strategies for implementation are discussed as under.

### 2.8.3 Strategies for implementation:

**Primacy of people:**

Involvement of people is the foremost aspect in JFM. Joint management must be consciously based on people, their needs, their analysis of issues and their decisions. It also implies an explicit faith that people, whatever the condition *of* poverty and oppression, can progress, and transform their environment without the help *of* donation by external agencies.

In essence, JFM demands that local people move from being objects to becoming subjects of developmental process. It must be based on bottom up approach "On!y through this approach can any people oriented progrramme attain any meaningful and lasting success. Thus, there is a need to bring in a change not only in their behavior but in attitude as well. The community awareness *of* the necessity and effectiveness *of* participation in their own development will ensure that progress shall continue even after the formalised programme ends. Till now, there is hardly any' example where people's participation has continued in a real sense even after the expiry of a particular programme / project. The programme's next purpose is to nurture the enthusiasm and capabilities *of* the user groups in order that they may attain self sufficiency. The group members will be encouraged to identify and utilise whatever resources, however meagre are available to them. Outside inputs shall be limited to the role *or* stimulants. Only assisting the groups in more effectively managing the own assets by using their knowledge. In no way shall the local community become dependent upon the programme itself for financial and bureaucratic survival. This will not only bridge the gap between officials and people

but also result in increased faith and confidence of people in Govt.

**Involvement of NGO' s**

Undoubtedly NGOs have to play a significant role in creating awareness amongst people. NGOs should be involved particularly in documentation, training and community level organising and facilitation. High people, high sounding NGOs may be of limited use in HP, context as local NGOs like Mahila Mandals, Yuvak Mandals and awakened individuals are more conversant with local customs, traditions and needs of the people and such institutions are working effectively throughout Himachal Pradesh.

**Training:**

JFM. envisages frequent interaction with people on part of the staff of Forest Department. Training of staff is thus crucial for the success of JFM. programme. It requires extensive training and reorientation of the staff of Forest Department to function effectively in an extensive role and provide support to village management. Attitudinal changes are very important so that the forest offtcials do not view JFM. in total isolation nor consider it to be another Govt. 'Scheme'. lt should not be viewed as an entry point activity and plantation! soil conservation activity only. The qualitative factors: whether the VFDC has clearly perceived its role in effectively and judiciously reducing the consumption tends to get lost. How to train officials so that critical evaluation of these qualitative factors becomes an integral part of this programme is the basic issue.

Till recently, forest officials have been depending on physical, resource and position. Use of physical power by way of policing and imposing authority, resource power by giving plethora of benefits in form of timber, fodder, MFP etc., (worth about Rs. 700 crore annually in Himachal Pradesh) and imposing ones own wisdom by virtue of

one's position/status has not resulted in establishing a strong link with the local people. It is, therefore imperative now to concentrate on the last two powers i.e. expert power and personal power. Expert power is the power that is vested in someone because of his acknowledged expertise and personal power resides in the person and in his personality, sometimes called charisma, sometimes personality. These two powers in an official would be developed through trainings; not only in professional activities but also in extension, communication, leadership qualities etc. so that he is able to motivate people.

An appropriate training programme would contain three components (1) Seminars to introduce field staff to concepts, goals, tools and the roles they are expected tpo play in JFM programmes. (2) Field practice in JFM and (3) Extended field visits to successful JFM projects. It will be quite pertinent to mention here that attitudinal changes are required not only at the level of field functionaries but also should include the highest management and planning level including the public representatives.

### 2.8.4 Activities In Joint Forest Management (JFM)

Major activities undertaken as part of joint forest management (JFM) in the catchment area of sainj H.E. Project, includes the following:

- Institutional
- Productivity
- Marketing
- Profit sharing

**Institutional Arrangements**

The primary objective of the JFM programme includes the rehabilitation of degraded forestlands, village resource development, micro watershed to improve the socio-

economic status of forest-dependant communities in order to reduce pressure on forests with peoples' organisations e.g. Village Forest Committees –(VFC). Hence, a VFC needs to be constituted for the implementation of JFM.

**Productivity**

In order to reduce pressure on forests and to provide incentives to communities for economic returns to sustain forest protection and management NTFPs like grasses, bamboo, fruits are being planted in blocks, forest blanks and along trenches, homesteads and agriculture bunds. Fuel wood is the most important commodity that people access from forest areas. Use of fuel-efficient devices like stoves and Biogas plants otherwise plantations through their agro-forestry and other plantation programmes can be implemented as a part of in JFM to reduce the pressure on the forest. Non-wood forest products (NWFPs) have a key role in JFM efforts. With the increasing awareness of their economic potential and growing concerns for the sustainability of the resources and the distribution of the benefits derived from them, various state governments have taken over control of a number of NWFPs. Some of the explicit objectives for state monopoly of NWFP trade are:

- to prevent unscrupulous intermediaries and their agents from exploiting NWFP collectors:
- to ensure fair wages to collectors:
- to enhance revenue for the state:
- to ensure quality;
- to maximize the collection of produce

**Marketing**

There are three types of products available to communities in JFM areas

(i) immediate products like NTFPs, grass, fuelwood available almost immediately or after a time period depending upon the state of degradation of the forest that is being managed jointly,

(ii) intermediate products from operations like thinning, other cultural operations, and
(iii) final products like timber from fellings. In majority of the States, however, JFM is still in the initial stages, and hence marketing has not emerged as an important issue for consideration.

The share of forest products to communities varies as per provisions in the various State orders for JFM. However, from the experience of different states it is evident that the VFC share is rather minimal in case of high revenue earning NTFPs. However, State agencies such as FD and FDCs do have a major role in the marketing of timber and fuelwood. Community involvement in NTFP management needs to be ensured in (i) technology for collection, preservation and regeneration; (ii) scientific harvesting and handling; and (iii) planned extraction and management based on an NTFP database. Among the important strategies that need to be adopted in JFM.

**Benefit sharing**

Forest-user communities, dependent on forests for fuelwood, fodder, small timber and NTFPs, have accessed forest products under different rights regimes. Under the JFM programme, residents of forest-fringe villages will be provided access to forest produce to meet their basic needs of fodder, fuel wood and NTFP. In lie of this, people are protecting and managing the forests with the FD. Social fencing is to be practised for forest protection by VFC's. Regular voluntary patrolling by villagers. The FD is therefore benefiting from reduced workload for forest protection and also reduced expenditure on protection measures. VFCs will be entitled to a share in the timber harvest in varying proportions

### 2.8.5 Budget

A provision of Rs. 20.0 lakh has been earmarked for implementation of awareness programs among locals, training of locals and forest officials, etc.

## 2.9 SILT OBSERVATORIES

It is recommended that in areas categorized under very high erosion categories, major streams and river Sainj be monitored. The monitoring shall cover silt content being carried in the river water. A provision of Rs. 40.0 lakh has been earmarked for this purpose.

## 2.10 COST ESTIMATE FOR ENGINEERING AND BIOLOGICAL TREATMENT MEASURES, WILDLIFE IMPROVEMENT AND DEVELOPMENT, JOINT FOREST MANAGEMENT (JFM) AND SILT OBSERVATORIES

The per ha cost for afforestation in degraded forest land and their maintenance and replenishment afforestaion/ gap plantation development is given in Table- 2.9 & 2.10 respectively.

**TABLE –2.9**
**Cost Model for Afforestation of Degraded Forest Land (1500 plant/ha)**

| **(A) PLANTATION COST** | | | | |
|---|---|---|---|---|
| **S.No.** | **Particulars of Work** | **Quantity** | **Rate in Rs.** | **Amount in Rs. Area** |
| | **Fencing** | | | |
| 1 | Survey & demarcation of Plantation area | 1 Ha. | 67.33 | 67.33 |
| 2 | Preparation/ purchage of RCC fence posts | 60 Nos. | 200 per post | 12000.00 |
| 3 | Carrige of RCC fence posts upto 2 mt. long over distance 2 km | 60 Nos. | 907.34 per hundred | 544.40 |
| 4 | Preparation/digging of holes 20-30 cm dia & 50 cm. deep | 60 Nos. | 604.51 per hundred | 362.70 |
| 5 | Fixing of Wooden fence posts including strutting | 60 Nos. | 477.34 per hundred | 286.40 |
| 6 | Carriage of Barbed wire over distance 2 Km. | 0.90 Qtl | 54.50 /Qtl/Km | 98.10 |
| 7 | Stretching & fixing of barbed wire in 4 stands. | 720 Rmt | 3.16 per mtr | 2275.20 |

| | | | | |
|---|---|---|---|---|
| 8 | Preparation of inspection path 60 cm width | 250 mtr. | 7.24 per mtr | 1810.00 |
| 9 | Preparation of water retention mounds/treches. | L.S. | | 2000.00 |
| 10 | Interlacing of thorny bushes along the fence. | 180 Rmt | 2.74 per mtr | 493.20 |
| | **Total - Fencing cost** | | | **19937.33** |
| | | | | |
| | | | | |
| | **Planting** | | | |
| 1 | Digging of pits 45x45x45 cm | 600 Nos. | 636.28 per hundred | 3817.68 |
| 2 | Digging of pits 30x30x30 cm | 900 Nos. | 318.22 per hundred | 2863.98 |
| 3 | Filling of pits 45x45x45 cm | 600 Nos. | 182.31 per hundred | 1093.86 |
| 4 | Filling of pits 30x30x30 cm | 900 Nos. | 127.22 per hundred | 1144.98 |
| 5 | Carriage of naked roots plants over distance 2 Km. uphil | 600 Nos. | 23.49 per hundred per Km | 281.88 |
| 6 | Carriage of plants in P/bags over distance 2 Km. uphil | 900 Nos. | 145.39 per hundred | 2617.02 |
| 7 | Planting of entire plant raised in P.bags | 900 Nos. | 145.49 per hundred | 1309.41 |
| 8 | Planting of naked roots plants | 600 Nos. | 122.66 per hundred | 735.96 |
| 9 | Planting of grass tufts/Preparation of strips including sowing in strips 100x30x5 cm for grass sowing along contour | 500 Strips | 613.33 per hundred | 3066.65 |
| | **Total - Planting cost** | | | **16931.42** |
| | | | | |
| | | | | |
| | **Material** | | | |
| 1 | Cost of barbed wire | 0.90 Qtl. | 7000 Per Qtl. | 6300 |
| | | | | |
| | **Nursery cost of plants** | | | |
| 1 | Naked root plants | 600 Nos. | 6 per plant | 3600 |
| 2 | Polythin bags plants | 900 Nos. | 8 per plant | 7200 |
| | **Total - Cost of Plants** | | | **10800** |
| | **Grand Total** | | | **53968.75** |
| | | | **Or Say** | **54000.00** |

**(B) MAINTENANCE COST**

| Sl. No. | Particular of Work | Quantity | Rate in Rs. | Amount in Rs. |
|---|---|---|---|---|
| | **1st year maintenance -30% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 180 Nos. | 318.22 per hundred | 572.79 |
| 2 | Re-digging of pits 30x30x30 cm. | 270 Nos. | 159.07 per hundred | 429.48 |
| 3 | Filling of pits 45x45x45 cms. | 180 Nos. | 182.31 per hundred | 328.15 |
| 4 | Filling of pits 30x30x30 cms. | 270 Nos. | 127.22 per hundred | 343.49 |
| 5 | Planting of P. bag plants. | 270 Nos. | 145.49 per hundred | 392.82 |
| 6 | Planting of naked root plants | 180 Nos. | 122.66 per hundred | 220.78 |
| 7 | Planting of grass tufts/preparation strips I/C sowing in strips 100x35x5 cms for grass sowing | 200 Strips | 613.13 per hundred | 1226.26 |
| 8 | Carriage P. bags plants distance 2 km. Uphil | 270 Nos. | 145.39 per hundred | 392.55 |
| 9 | Carriage of naked roots plants over distance 2 km. Uphil | 180 Nos. | 23.49 per hundred | 42.28 |

| | | | | |
|---|---|---|---|---|
| 10 | Nursery cost of plants | 375 Nos. | 8 & 6 per plant | 3240.00 |
| 11 | Repair of fence | 180 rmt | 1.16/rmt | 208.80 |
| 12 | Repair of inspection path | L.S. | | 700.00 |
| 13 | Moisture conservation works | L.S. | | 1000.00 |
| | **Total** | | | 9097.40 |
| | | | **Or say** | **9100.00** |
| | **2nd year maintenance -20% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 120 Nos. | 318.22 per hundred | 381.86 |
| 2 | Re-digging of pits 30x30x30 cm. | 180 Nos. | 159.07 per hundred | 286.32 |
| 3 | Filling of pits 45x45x45 cms. | 120 Nos. | 182.31 per hundred | 160.43 |
| 4 | Filling of pits 30x30x30 cms. | 180 Nos. | 127.22 per hundred | 167.93 |
| 5 | Planting of P. bag plants. | 192 Nos. | 145.49 per hundred | 279.34 |
| 6 | Planting of naked root plants | 108 Nos. | 122.66 per hundred | 132.47 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 192 Nos. | 145.39 per hundred | 556.8 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 108 Nos. | 23.49 per hundred | 50.74 |
| 9 | Nursery cost of plants | 300 Nos. | 8 & 6 per plant | 2184.00 |
| 10 | Repair of fence | 180 rmt | 1.16/rmt | 208.80 |
| 11 | Repair of inspection path | L.S. | | 500.00 |
| 12 | Moisture conservation works | L.S. | | 800.00 |
| | **Total** | | | 5708.69 |
| | | | **Or say** | **5700.00** |
| | **3rd year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 60 Nos. | 318.22 per hundred | 190.93 |
| 2 | Re-digging of pits 30x30x30 cm. | 90 Nos. | 159.07 per hundred | 143.16 |
| 3 | Filling of pits 45x45x45 cms. | 60 Nos. | 182.31 per hundred | 109.39 |
| 4 | Filling of pits 30x30x30 cms. | 90 Nos. | 127.22 per hundred | 114.5 |
| 5 | Planting of P. bag plants. | 90 Nos. | 145.49 per hundred | 130.94 |
| 6 | Planting of naked root plants | 60 Nos. | 122.66 per hundred | 73.59 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 90 Nos. | 145.39 per hundred | 261.7 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 60 Nos. | 23.49 per hundred | 28.18 |
| 9 | Nursery cost of plants | 150 Nos. | 8 & 6 per plant | 1080.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 400.00 |
| 12 | Moisture conservation works | L.S. | | 800.00 |
| | **Total** | | | 3564.39 |
| | | | **Or say** | **3600.00** |
| | **4th year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 60 Nos. | 318.22 per hundred | 190.93 |
| 2 | Re-digging of pits 30x30x30 cm. | 90 Nos. | 159.07 per hundred | 143.16 |
| 3 | Filling of pits 45x45x45 cms. | 60 Nos. | 182.31 per hundred | 109.39 |
| 4 | Filling of pits 30x30x30 cms. | 90 Nos. | 127.22 per hundred | 114.5 |
| 5 | Planting of P. bag plants. | 90 Nos. | 145.49 per hundred | 130.94 |
| 6 | Planting of naked root plants | 60 Nos. | 122.66 per hundred | 73.59 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 90 Nos. | 145.39 per hundred | 261.7 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 60 Nos. | 23.49 per hundred | 28.18 |

| | | | | |
|---|---|---|---|---|
| 9 | Nursery cost of plants | 150 Nos. | 8 & 6 per plant | 1080.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 300.00 |
| 12 | Moisture conservation works | L.S. | | 700.00 |
| | **Total** | | | 3364.39 |
| | | | **Or say** | **3400.00** |
| | **5th year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 60 Nos. | 318.22 per hundred | 190.93 |
| 2 | Re-digging of pits 30x30x30 cm. | 90 Nos. | 159.07 per hundred | 143.16 |
| 3 | Filling of pits 45x45x45 cms. | 60 Nos. | 182.31 per hundred | 109.39 |
| 4 | Filling of pits 30x30x30 cms. | 90 Nos. | 127.22 per hundred | 114.5 |
| 5 | Planting of P. bag plants. | 90 Nos. | 145.49 per hundred | 130.94 |
| 6 | Planting of naked root plants | 60 Nos. | 122.66 per hundred | 73.59 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 90 Nos. | 145.39 per hundred | 261.7 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 60 Nos. | 23.49 per hundred | 28.18 |
| 9 | Nursery cost of plants | 150 Nos. | 8 & 6 per plant | 1080.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 300.00 |
| 12 | Moisture conservation works | L.S. | | 500.00 |
| | **Total** | | | 3164.39 |
| | | | **Or say** | **3200.00** |
| | **ABSTRACT** | | | |
| 1 | **New Plantation** | - | | 54000.00 |
| 2 | **1st Year Maintenance** | - | | 9100.00 |
| 3 | **2nd Year Maintenance** | - | | 5700.00 |
| 4 | **3rd Year Maintenance** | - | | 3600.00 |
| 5 | **4th Year Maintenance** | - | | 3400.00 |
| 6 | **5th Year Maintenance** | - | | 3200.00 |
| | **GRAND TOTAL** | - | | **79000.00** |

**TABLE – 10**

**Cost Model for Replenishment/ Gap Plantation (800 tree/ha)**

| **(A) PLANTATION COST** | | | | |
|---|---|---|---|---|
| **S.No.** | **Particulars of Work** | **Quantity** | **Rate in Rs.** | **Amount in Rs. Area** |
| | **Fencing** | | | |
| 1 | Survey & demarcation of Plantation area | 1 Ha. | 67.33 | 67.33 |
| 2 | Preparation/ purchage of RCC fence posts | 60 Nos. | 200 per post | 12000.00 |
| 3 | Carrige of RCC fence posts upto 2 mt. long over distance 2 km | 60 Nos. | 907.34 per hundred | 544.40 |
| 4 | Preparation/digging of holes 20-30 cm dia & 50 cm. deep | 60 Nos. | 604.51 per hundred | 362.70 |
| 5 | Fixing of Wooden fence posts including strutting | 60 Nos. | 477.34 per hundred | 286.40 |

| | | | | |
|---|---|---|---|---|
| 6 | Carriage of Barbed wire over distance 2 Km. | 0.90 Qtl | 54.50 /Qtl/Km | 98.10 |
| 7 | Stretching & fixing of barbed wire in 4 stands. | 720 Rmt | 3.16 per mtr | 2275.20 |
| 8 | Preparation of inspection path 60 cm width | 250 mtr. | 7.24 per mtr | 1810.00 |
| 9 | Preparation of water retention mounds/treches. | L.S. | | 2000.00 |
| 10 | Interlacing of thorny bushes along the fence. | 180 Rmt | 2.74 per mtr | 493.20 |
| | **Total - Fencing cost** | | | **19937.33** |
| | | | | |
| | **Planting** | | | |
| 1 | Digging of pits 45x45x45 cm | 300 Nos. | 636.28 per hundred | 1908.84 |
| 2 | Digging of pits 30x30x30 cm | 500 Nos. | 318.22 per hundred | 1591.10 |
| 3 | Filling of pits 45x45x45 cm | 300 Nos. | 182.31 per hundred | 546.93 |
| 4 | Filling of pits 30x30x30 cm | 500 Nos. | 127.22 per hundred | 636.10 |
| 5 | Carriage of naked roots plants over distance 2 Km. uphil | 300 Nos. | 23.49 per hundred per Km | 140.94 |
| 6 | Carriage of plants in P/bags over distance 2 Km. uphil | 500 Nos. | 145.39 per hundred | 1453.90 |
| 7 | Planting of entire plant raised in P.bags | 500 Nos. | 145.49 per hundred | 727.45 |
| 8 | Planting of naked roots plants | 300 Nos. | 122.66 per hundred | 367.98 |
| 9 | Planting of grass tufts/Preparation of strips including sowing in strips 100x30x5 cm for grass sowing along contour | 500 Nos. | 613.33 per hundred | 3066.65 |
| | **Total - Planting cost** | | | **10439.89** |
| | | | | |
| | **Material** | | | |
| 1 | Cost of barbed wire | 0.90 Qtl. | 7000 Per Qtl. | **6300.00** |
| | | | | |
| | **Nursery cost of plants** | | | |
| 1 | Naked root plants | 300 Nos. | 6 per plant | 1800.00 |
| 2 | Polythin bags plants | 500 Nos. | 8 per plant | 4000.00 |
| | **Total - Cost of Plants** | | | **5800.00** |
| | **Grand Total** | | | **42477.22** |
| | | | **Or Say** | **42500.00** |
| **(B) MAINTENANCE COST** | | | | |
| **Sl. No.** | **Particular of Work** | **Quantity** | **Rate in Rs.** | **Amount in Rs.** |
| | **1st year maintenance -30% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 90 Nos. | 318.22 per hundred | 286.39 |
| 2 | Re-digging of pits 30x30x30 cm. | 150 Nos. | 159.07 per hundred | 238.60 |
| 3 | Filling of pits 45x45x45 cms. | 90 Nos. | 182.31 per hundred | 164.07 |
| 4 | Filling of pits 30x30x30 cms. | 150 Nos. | 127.22 per hundred | 190.83 |
| 5 | Planting of P. bag plants. | 150 Nos. | 145.49 per hundred | 218.23 |
| 6 | Planting of naked root plants | 90 Nos. | 122.66 per hundred | 110.39 |
| 7 | Planting of grass tufts/preparation strips I/C sowing in strips 100x35x5 cms for grass sowing | 200 Strips | 613.13 per hundred | 1226.26 |
| 8 | Carriage P. bags plants distance 2 km. Uphil | 150 Nos. | 145.39 per hundred | 218.08 |

| | | | | |
|---|---|---|---|---|
| 9 | Carriage of naked roots plants over distance 2 km. Uphil | 90 Nos. | 23.49 per hundred | 21.14 |
| 10 | Nursery cost of plants | 240 Nos. | 8 & 6 per plant | 1620.00 |
| 11 | Repair of fence | 180 rmt | 1.16/rmt | 208.80 |
| 12 | Repair of inspection path | L.S. | | 700.00 |
| 13 | Moisture conservation works | L.S. | | 1000.00 |
| | **Total** | | | 6202.79 |
| | | | **Or say** | **6200.00** |
| | **2nd year maintenance -20% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 60 Nos. | 318.22 per hundred | 190.93 |
| 2 | Re-digging of pits 30x30x30 cm. | 100 Nos. | 159.07 per hundred | 159.07 |
| 3 | Filling of pits 45x45x45 cms. | 60 Nos. | 182.31 per hundred | 109.386 |
| 4 | Filling of pits 30x30x30 cms. | 100 Nos. | 127.22 per hundred | 127.22 |
| 5 | Planting of P. bag plants. | 192 Nos. | 145.49 per hundred | 279.34 |
| 6 | Planting of naked root plants | 60 Nos. | 122.66 per hundred | 73.60 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 150 Nos. | 145.39 per hundred | 218.08 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 60 Nos. | 23.49 per hundred | 28.19 |
| 9 | Nursery cost of plants | 160 Nos. | 8 & 6 per plant | 1080.00 |
| 10 | Repair of fence | 180 rmt | 1.16/rmt | 208.80 |
| 11 | Repair of inspection path | L.S. | | 500.00 |
| 12 | Moisture conservation works | L.S. | | 800.00 |
| | **Total** | | | 3774.616 |
| | | | **Or say** | **3800.00** |
| | **3rd year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 30 Nos. | 318.22 per hundred | 95.47 |
| 2 | Re-digging of pits 30x30x30 cm. | 50 Nos. | 159.07 per hundred | 79.535 |
| 3 | Filling of pits 45x45x45 cms. | 30 Nos. | 182.31 per hundred | 54.69 |
| 4 | Filling of pits 30x30x30 cms. | 50 Nos. | 127.22 per hundred | 63.61 |
| 5 | Planting of P. bag plants. | 50 Nos. | 145.49 per hundred | 72.74 |
| 6 | Planting of naked root plants | 30 Nos. | 122.66 per hundred | 36.79 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 50 Nos. | 145.39 per hundred | 72.69 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 30 Nos. | 23.49 per hundred | 14.09 |
| 9 | Nursery cost of plants | 80 Nos. | 8 & 6 per plant | 540.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 400.00 |
| 12 | Moisture conservation works | L.S. | | 800.00 |
| | **Total** | | | 2461.615 |
| | | | **Or say** | **2500.00** |
| | **4th year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 30 Nos. | 318.22 per hundred | 95.46 |
| 2 | Re-digging of pits 30x30x30 cm. | 50 Nos. | 159.07 per hundred | 79.535 |
| 3 | Filling of pits 45x45x45 cms. | 30 Nos. | 182.31 per hundred | 54.69 |
| 4 | Filling of pits 30x30x30 cms. | 50 Nos. | 127.22 per hundred | 63.61 |
| 5 | Planting of P. bag plants. | 50 Nos. | 145.49 per hundred | 72.74 |
| 6 | Planting of naked root plants | 30 Nos. | 122.66 per hundred | 36.79 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 50 Nos. | 145.39 per hundred | 72.69 |

| | | | | |
|---|---|---|---|---|
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 30 Nos. | 23.49 per hundred | 14.09 |
| 9 | Nursery cost of plants | 80 Nos. | 8 & 6 per plant | 540.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 300.00 |
| 12 | Moisture conservation works | L.S. | | 700.00 |
| | **Total** | | | 2261.605 |
| | | | **Or say** | **2300.00** |
| | **5th year maintenance -10% mortality** | | | |
| 1 | Re-digging of pits 45x45x45 cm. | 30 Nos. | 318.22 per hundred | 95.46 |
| 2 | Re-digging of pits 30x30x30 cm. | 50 Nos. | 159.07 per hundred | 79.535 |
| 3 | Filling of pits 45x45x45 cms. | 30 Nos. | 182.31 per hundred | 54.69 |
| 4 | Filling of pits 30x30x30 cms. | 50 Nos. | 127.22 per hundred | 63.61 |
| 5 | Planting of P. bag plants. | 50 Nos. | 145.49 per hundred | 72.74 |
| 6 | Planting of naked root plants | 30 Nos. | 122.66 per hundred | 36.79 |
| 7 | Carriage P. bags plants distance 2 km. Uphil | 50 Nos. | 145.39 per hundred | 72.69 |
| 8 | Carriage of naked roots plants over distance 2 km. Uphil | 30 Nos. | 23.49 per hundred | 14.09 |
| 9 | Nursery cost of plants | 80 Nos. | 8 & 6 per plant | 540.00 |
| 10 | Repair of fence | 200 rmt | 1.16/rmt | 232.00 |
| 11 | Repair of inspection path | L.S. | | 300.00 |
| 12 | Moisture conservation works | L.S. | | 700.00 |
| | **Total** | | | 2261.605 |
| | | | **Or say** | **2300.00** |
| | **ABSTRACT** | | | |
| 1 | **New Plantation** | - | | 42500.00 |
| 2 | **1st Year Maintenance** | - | | 6200.00 |
| 3 | **2nd Year Maintenance** | - | | 3800.00 |
| 4 | **3rd Year Maintenance** | - | | 2500.00 |
| 5 | **4th Year Maintenance** | - | | 2300.00 |
| 6 | **5th Year Maintenance** | - | | 2300.00 |
| | **GRAND TOTAL** | - | | **59600.00** |

The details of cost required for implementation of biological treatment measures and engineering treatment measures, wildlife improvement and development, joint forest department and silt observatories are given in Tables – 2.11 & 2.12. The details are given in Figure-2.5.

**TABLE- 2.11**

**Cost estimate for Catchment Area Treatment - Biological Measures**

| S. No. | Item | Rate (Rs.) | Target | |
|---|---|---|---|---|
| | | | Physical | Financial (Rs. lakh) |
| 1. | Afforestation (1500 plants/ha) | 79,000/ha | 101 ha | 79.79 |
| 2. | Replenishment Afforestation/ Gap plantation(800 plants/ha) | 59,600/ha | 195 ha | 116.22 |
| 3 | Pasture Development | 11,800/ha | 150 ha | 17.70 |
| 4. | Fuel wood plantation | 59,600/ha | 40 ha | 23.84 |
| 5. | Fodder (Silvipasture) | 59,600/ha | 40 ha | 23.84 |
| 6. | Social forestry | 59,600/ha | 90 ha | 53.64 |
| 7. | Establishment of New Nurseries | 200,000/no. | 5 | 10.00 |
| | **Total** | | | **325.03** |

**TABLE- 2.12**

**Cost estimate for Catchment Area Treatment - Engineering Measures**

| S. No. | Item | Rate (Rs.) | Unit | Qty (No.) | Target | |
|---|---|---|---|---|---|---|
| | | | | | Physical | Financial (Rs. Lakh) |
| 1. | Contour bunding | 25,000/ha | ha | 401 | 401 | 100.25 |
| 2. | Step drain | 25,000 | Rmt | 7 | 105 | 26.25 |
| 3. | Check dams | 200,000 | No. | 15 | 15 | 30.00 |
| | **Total** | | | | | **156.50** |

**TABLE- 2.13**

**Details of cost required for wildlife improvement and development ,joint forest management & silt observatories**

| S. No. | Activity | Cost (Rs. Lakh) |
|---|---|---|
| 1. | Survey of flora and fauna in the catchment area | 6.0 |
| 2. | Incentives to local communities for fire prevention | 2.5 |
| 3. | Incentives to local communities for wildlife protection | 2.0 |
| 4. | Incentives to community to regulate local and migratory grazers in Sainj Wildlife Sanctuary | 2.5 |
| 5. | Habitat improvement in Sainj Wildlife Sanctuary | 5.0 |
| 6. | Wildlife Census | 10.0 |
| 7. | Capacity Building of staff and community | 3.0 |
| 8. | Support for communication | 1.0 |
| 9. | Establishment of nursery with infrastructure | 5.0 |
| 10. | Maintenance of nursery | 5.0 |
| 11. | Soil and moisture conservation | 5.0 |
| 12. | Monitoring, evaluation & impact assessment study | 4.0 |
| 13. | Support for vermi-compost development | 1.0 |

| | | |
|---|---|---|
| 14. | Support for introduction of LPG for poor household | 1.0 |
| 15. | Socio-economic survey | 1.0 |
| 16. | Ex-situ support for Himalayan Thar breeding/conservation of GHNP | 40.0 |
| 17 | Joint Forest Management, training and awareness | 20.0 |
| 18 | Silt observatories | 40.0 |
| | **Total** | **154.0** |

**Total cost for Biological and Engineering measures, Wildlife improvement & Development, JFM and Establishment of Silt observatories (A) = Rs.635.53 Lakh**

**Departmental Charges @ 17.5 % (B) = Rs.111.22 Lakh**

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**Total Cost of Work (A+B) = Rs.746.75 Lakh**

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## 2.11. PROMOTION OF ECO-TOURISM

The area is known for its scenic beauty and splendour and is frequented by a large number of tourists every year. Keeping in view this the existing path of GHNP will be maintained. Beside this other tourist attraction spots will also be maintained/ developed in the area. An amount of Rs. 7.47 lakh has been kept for this purpose.

## 2.12. ECOLOGICAL TASK FORCE

Ecological Task Forces (ETFs) Scheme was initiated by the Ministry of Defence in1980 with a view to involve ex-servicemen in afforestation and eco-development schemes in remote and difficult areas to undertake restoration of degraded ecosystems through afforestation, soil conservation and water resource management techniques.

The scheme of Eco-Development Forces is based on two objectives of ecological restoration and employment generation for able bodied ex-servicemen. Under this scheme, the establishment and operational expenditure on Eco-Task Force (ETF) Battalion raised by Ministry of Defence (MoD) is reimbursed by Ministry while the input like sapling fencing etc. as also the professional and managerial guidance is

provided by the State Forest Departments {Source- http://envfor.nic.in/naep/sch/etf.pdf (15.07.08) & http://india.gov.in/sectors/ environment/ national_board.php (15.07.08)}. The scheme is in operation for last four Five Year Plans.

At present there are 4 (Four) Eco-Task Force Battalions raised with the Regular and Territorial Army Personnel. These are as follows:

| S. No. | TA Bn. Id No. | Year of Raising | Location |
|---|---|---|---|
| 1. | 127 Inf Bns | 1981 | Shivalik Hills |
| 2. | 128 Inf Bns | 1981 | Rajasthan Canal (Bajju) |
| 3. | 130 Inf Bns | 1988 | State of J&K |
| 4. | 130 Inf Bn | 1994 | Pithoragarh (Uttranchal) |

The progress of the Eco-Task Force (ETF) Battalions is being closely reviewed jointly by Ministry of Defence and Ministry of Environment and Forests. A proposal for establishment of new ETF Battalions in Assam, Jharkhand and Karnataka is also being examined.

The state has already raised an Territorial Army (TA) infantry battalion 133 infantry battalion Dogra Ecological Force in March 2006 in Satluj basin. The Himachal Pradesh government has made a proposal to the Defence Ministry for raising two more Territorial Army battalions of eco-task force for Ravi and Beas catchment areas with a view to preserve the flora and fauna of the state. All CAT Plans of all Hydel projects of the basin are supposed to pool in resources to support the ETF. The reimbursed expenditure by Ministry should be re-invested in the ecological restoration works in the basin. There are number of project in Beas basin of which CAT Plan either under preparation or implementation. Some of these such major projects are given below:-

- Larji Hydro Electric Project
- Parbati stage II & III Hydro Electric Project
- Malana stage II Hydro Electric Project
- Alian dhuhan Hydro Electric Project
- Khauli stage II Hydro Electric Project
- Fozal Hydro Electric Project
- Baragaon Hydro Electric Project
- Lanbaduck Hydro Electric Project
- Uhal stage III Hydro Electric Project
- Neogal Hydro Electric Project
- Khili Bahal Hydro Electric Project
- Sanj Hydro Electric Project 100MW
- Patikari Hydro Electric Project
- Dhaula sidh Hydro Electric Project

There may be other smaller project which may require preparation and implementation of the CAT Plan.

The fragile ecology of the lower Himalayas, especially in Himachal Pradesh, is more prone to flash floods and cloud bursts which cause massive damage to public and private properties and infrastructure as well. People of, Kullu and Mandi districts have suffered heavy losses due to floods in Beas which affected normal life of the people living on banks.

**Budget**

Keeping the above view a provision of Rs 150 lakhs has been made for the same in the CAT Plan of Sainj Hydro Electric Project.

## 2.13 PAYMENT OF ENVIRONMENTAL SERVICES (PES)

It is a new concept as a reward for good conservation behaviour by upstream community leaving in the catchment area of the project. Incidentally there are only three villages in the catchment area of Sainj Hydro Electric Project.

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

- silt load (total, seasonal and average assessment)
- Plantation survival rate in social forestry,
- Freezing land use
- Better Agriculture practices in the catchment area.

A committee would decide the quantum PES to be paid to the upstream considering the above. An amount of Rs. 60.00 Lakh has been earmarked for the same in the catchment area treatment plan of Sainj Hydro Electric Project.

**The mechanism of payment:-**

The payment will be made through Villages Forest Development Society (VFDS) / Panchayat. A Monitoring Committee has been suggested, comprising one member from each i.e. User Agency, Forest Department, Pollution Control Board (PCB) & Environment Department and Agriculture /Horticulture Department under the chairmanship of District Commissioner. The committee will monitor /review the status and progress of the work and determine the quantum of payment of Environmental Services. The year wise allocation of funds made in the CAT Plan is indicative. The committee may decide to release the payment in different ratio for each year with in the overall outlay for the Environmental Services in the CAT Plan of Sainj Hydro Electric Project.

## 2.14 MONITORING

The main objective of the study will be the assessment of impact monitoring and evaluation of the intervention provided in CAT Plan under green India scheme by the Government of India &/ or State Government of Himachal Pradesh. The monitoring will be carried out by independent agency for which a provision of Rs. 28.93 Lakh has been made in the CAT Plan of Sainj Hydro Electric Project. The result will be shared by the User agency.

## 2.15 BUDGET FOR CATCHMENT AREA TREATMENT PLAN

The total budget estimated for implementation of CAT Plan is **Rs. 993.15 Lakh**. The abstract of cost is given in table no. 2.14. The year-wise physical and financial target given in table no. 2.15

**TABLE-2.14**

| Abstract of cost for Catchment Area Treatment Plan for Sainj HEP (100 MW) | | | | | |
|---|---|---|---|---|---|
| **S.N.** | **Activity** | **Unit** | **Rate (in Rupees)** | **Phy** | **Financial (Rs. in Lakh)** |
| **I** | **WORKS** | | | | |
| **A** | **Biological Measures** | | | | |
| 1 | Afforestation | ha | 79000 | 101 | 79.79 |
| 2 | Gap Plantation | ha | 59600 | 195 | 116.22 |
| 3 | Pasture Development | ha | 11800 | 150 | 17.70 |
| 4 | Fuelwood Plantation | ha | 59600 | 40 | 23.84 |
| 5 | Fodder (Silvipasture) | ha | 59600 | 40 | 23.84 |
| 6 | Social Forestry | ha | 59600 | 90 | 53.64 |
| 7 | Establishment of New Nurseries | No. | 200000 | 5 | 10.00 |
| **i** | ***Sub-Total (1) Biological Measures*** | **-** | **-** | ***621*** | ***325.03*** |
| **B** | **Enginerring Measures** | | | | |
| 1 | Contour Bunding | ha | 25000 | 401 | 100.25 |
| 2 | Stepped drain | Rmt | 25000 | 105 | 26.25 |
| 3 | Check dams | No. | 200000 | 15 | 30.00 |
| **iii** | ***Su-total (2) Engineering Measures*** | **-** | **-** | **-** | ***156.50*** |
| **C** | **Wildlife Improvement & Development** | | | - | 94.00 |
| **D** | **JFM, Training, Awareness** | L/S | - | - | 20.00 |
| **E** | **Silt Observatory** | | | - | 40.00 |
| **iii** | ***Sub-Total (3) Works (A to E)*** | | | | ***635.53*** |
| **F** | **Departmental Charges @ 17.5 %** | - | - | - | 111.22 |
| **iv** | ***Total Works (I) Component (4)*** | **-** | **-** | **-** | ***746.75*** |
| **II** | **SERVICES** | | | | |
| **G** | **Eco-Tourism @ 1 % of iv** | - | - | - | 7.47 |
| **H** | **Payment of Environmental Services^** | L/S | - | - | 60.00 |
| **I** | **Eco-task force (Physical 100 ha min.)** | Ha. | - | - | 150.00 |
| **v** | **Total cost of (II) Services** | - | - | - | ***217.47*** |
| **vi** | **Total of Works + Services (I+II)** | | | | ***964.22*** |
| **J** | **Monitoring & Evaluation @ 3 % of iv** | - | - | - | 28.93 |
| | **Grand Total (A-J)** | - | - | - | ***993.14*** |
| | | | | **Rupees in Crores** | **9.931** |

*Rates are inclusive of Maintenance for 5 years*

***Payment of Environmental Services^ =*** *To be paid to communities for conservation behaviour related to silt* load as monitored

**TABLE-2.15**

**Year-wise Physical and Financial Target for Catchment Area Treatment Plan Sainj Hydroelectric Project (100 MW)**

| S.N. | Activity | Financial Outlay for the CAT Plan Period | Unit | Total Phy. Outlay for CAT Plan Period | 0 Yr | | 1 Yr | | 2 Yr | | 3 Yr | | 4 Yr | | 5 Yr | | Total | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Phy | Fin | Phy | Fin | Phy | Fin | Phy | Fin | Phy | Fin | Phy | Fin | Phy | Fin | |
| **I** | **WORKS** | | | | | | | | | | | | | | | | | | |
| **A** | **Biological Measures** | | | | | | | | | | | | | | | | | | |
| 1 | Afforestation | 79.79 | ha | 101 | 11 | 8.69 | 30 | 23.7 | 30 | 23.7 | 30 | 23.7 | 0 | 0 | 0 | 0 | 101 | 79.79 | |
| 2 | Gap Plantation | 116.22 | ha | 195 | 15 | 8.94 | 60 | 35.76 | 60 | 35.76 | 60 | 35.76 | 0 | 0 | 0 | 0 | 195 | 116.22 | |
| 3 | Pasture Development | 17.70 | ha | 150 | 10 | 1.18 | 60 | 7.08 | 60 | 7.08 | 20 | 2.36 | 0 | 0 | 0 | 0 | 150 | 17.7 | Rate of work to be applied in field while executing works shall be as per notified norms excluding maintenance and departmental charges. Maintenance as per norms notified are to be seggregated by Executing Agency |
| 4 | Fuelwood Plantation | 23.84 | ha | 40 | 10 | 5.96 | 10 | 5.96 | 10 | 5.96 | 10 | 5.96 | 0 | 0 | 0 | 0 | 40 | 23.84 | |
| 5 | Fodder (Silvipasture) | 23.84 | ha | 40 | 10 | 5.96 | 10 | 5.96 | 10 | 5.96 | 10 | 5.96 | 0 | 0 | 0 | 0 | 40 | 23.84 | |
| 6 | Social Forestry | 53.64 | ha | 90 | 15 | 8.94 | 25 | 14.9 | 25 | 14.9 | 25 | 14.9 | 0 | 0 | 0 | 0 | 90 | 53.64 | |
| 7 | Establishment of New Nurseries | 10.00 | No. | 5 | 5 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 10 | |
| ***i*** | ***Sub-Total (1) Biological Measures*** | ***325.03*** | ***-*** | ***621*** | ***76*** | ***49.67*** | ***195*** | ***93.36*** | ***195*** | ***93.36*** | ***155*** | ***88.64*** | ***-*** | ***-*** | ***-*** | ***-*** | ***621*** | ***325.03*** | |
| **B** | **Enginerring Measures** | | | | | | | | | | | | | | | | | | |
| 1 | Contour Bunding | 100.25 | ha | 401 | 101 | 25.25 | 100 | 25.00 | 100 | 25.00 | 100 | 25.00 | 0 | 0.00 | 0 | 0.00 | 401 | 100.25 | Rate of work to be applied in field shall be as given in abstract of costs excluding departmental charges |
| 2 | Stepped drain | 26.25 | Rmt | 105 | 15 | 3.75 | 45 | 11.25 | 25 | 6.25 | 20 | 5.00 | 0 | 0.00 | 0 | 0.00 | 105 | 26.25 | |
| 3 | Check dams | 30.00 | No. | 15 | 2 | 4 | 8 | 16.00 | 3 | 6.00 | 2 | 4.00 | 0 | 0.00 | 0 | 0.00 | 15 | 30.00 | |
| ***iii*** | ***Su-total (2) Engineering Measures*** | ***156.50*** | ***-*** | ***-*** | ***-*** | ***33*** | ***-*** | ***52.25*** | ***-*** | ***37.25*** | ***-*** | ***34.00*** | ***-*** | ***0.00*** | ***-*** | ***0.00*** | ***-*** | ***156.50*** | |
| **C** | **Wildlife Improvement & Development** | 94.00 | - | - | - | 32.9 | - | 23.5 | - | 23.5 | - | 14.1 | - | 0 | - | 0 | - | 94.00 | Ref-Table No.8 |

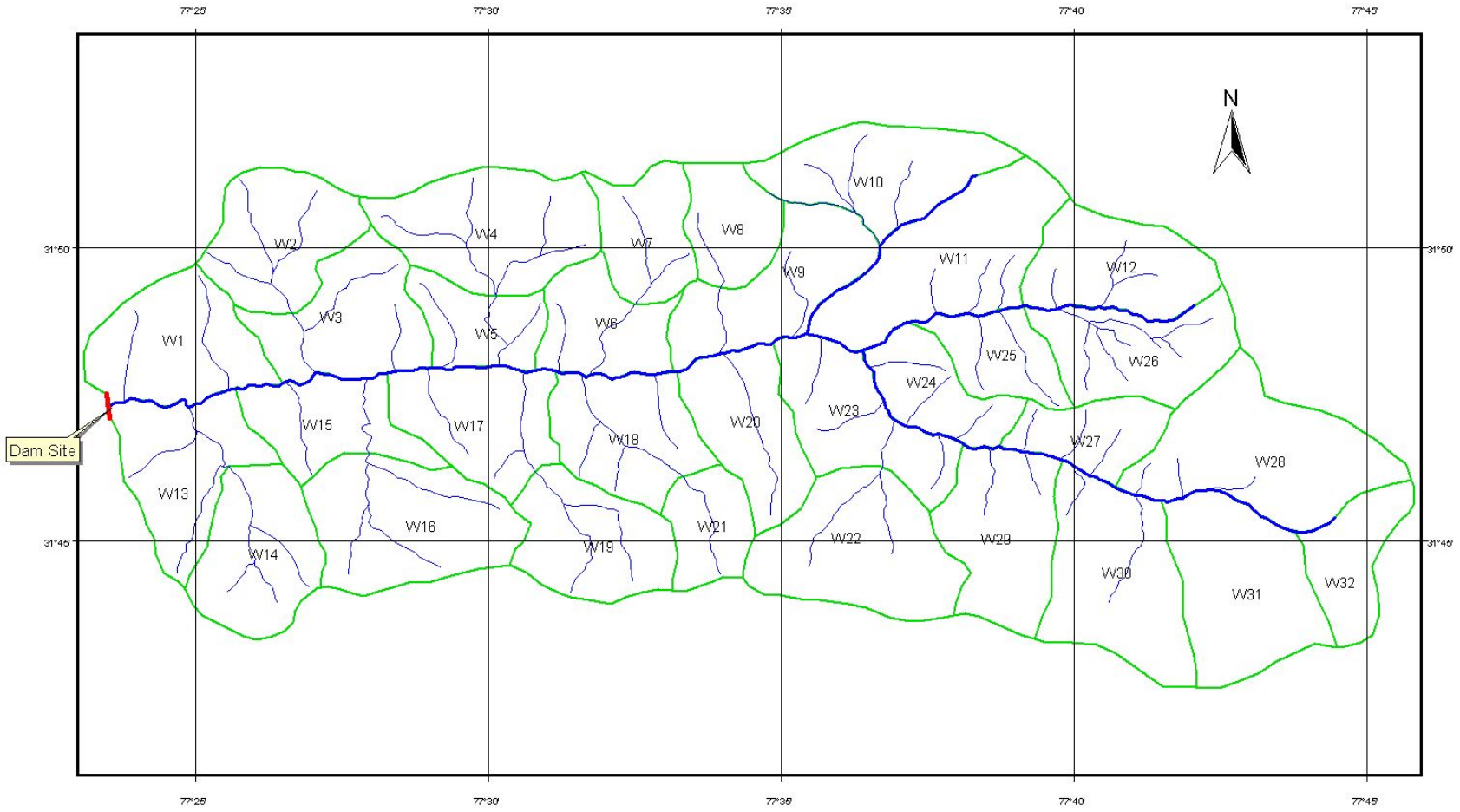
| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **D** | **JFM, Training, Awareness** | 20.00 | L/S | - | - | 7 | - | 5 | - | 5 | - | 3 | - | 0 | - | 0 | - | 20.00 | |
| **E** | **Silt Observatory** | 40.00 | - | - | - | - | - | 40 | - | - | - | - | - | - | - | - | - | 40.00 | |
| ***iii*** | ***Sub-Total (3) Works (A to E)*** | ***635.53*** | ***-*** | ***-*** | ***-*** | ***122.57*** | ***-*** | ***174.11*** | ***-*** | ***159.11*** | ***-*** | ***139.74*** | ***-*** | ***0*** | ***-*** | ***0*** | ***-*** | ***635.53*** | |
| **F** | **Departmental Charges @ 17.5 %** | 111.22 | - | - | - | 21.45 | - | 30.47 | - | 27.84 | - | 24.45 | - | 0.00 | - | 0.00 | - | 111.22 | |
| **iv** | ***Total Works (I) Component (4)*** | 746.75 | **-** | **-** | - | 144.02 | - | 204.58 | - | 186.95 | - | 164.19 | - | 0.00 | - | 0.00 | - | 746.75 | |
| **II** | **SERVICES** | | | | | | | | | | | | | | | | | | |
| **G** | **Eco-Tourism @ 1 % of iv** | 7.47 | - | - | - | - | - | 1.87 | - | 1.87 | - | 1.87 | - | 1.87 | - | - | - | 7.47 | |
| **H** | **Payment of Environmental Services^** | 60.00 | L/S | - | - | - | - | 15.00 | - | 15.00 | - | 15.00 | - | 15.00 | - | - | - | 60.00 | |
| **I** | **Eco-task force** | 150.00 | Ha. | - | - | - | - | 37.50 | - | 37.50 | - | 37.50 | - | 37.50 | - | - | - | 150.00 | Phy. 100 ha min. |
| **v** | **Total cost of (II) Services** | 217.47 | - | - | - | 0.00 | - | 54.37 | - | 54.37 | - | 54.37 | - | 54.37 | - | - | - | 217.47 | |
| **vi** | **Total of Works + Services (I+II)** | 964.22 | | - | - | 144.02 | - | 258.95 | - | 241.32 | - | 218.56 | - | 54.37 | - | 0.00 | - | 964.22 | |
| **J** | **Monitoring & Evaluation @ 3 % of iv** | 28.93 | - | - | - | - | - | - | - | 4.34 | - | 5.79 | - | 8.68 | - | 10.12 | - | 28.93 | |
| **Grand Total (A-J)** | | **993.14** | - | - | - | **144.02** | **-** | **258.95** | **-** | **245.66** | **-** | **224.35** | - | **63.05** | **-** | **10.12** | - | ***993.14*** | |

**Phy = Physical; Fin. = Financial;**

**Financial Amount =** Total is inclusive of Maintenance for 5 years including on Soil & Moisture Conservation Works

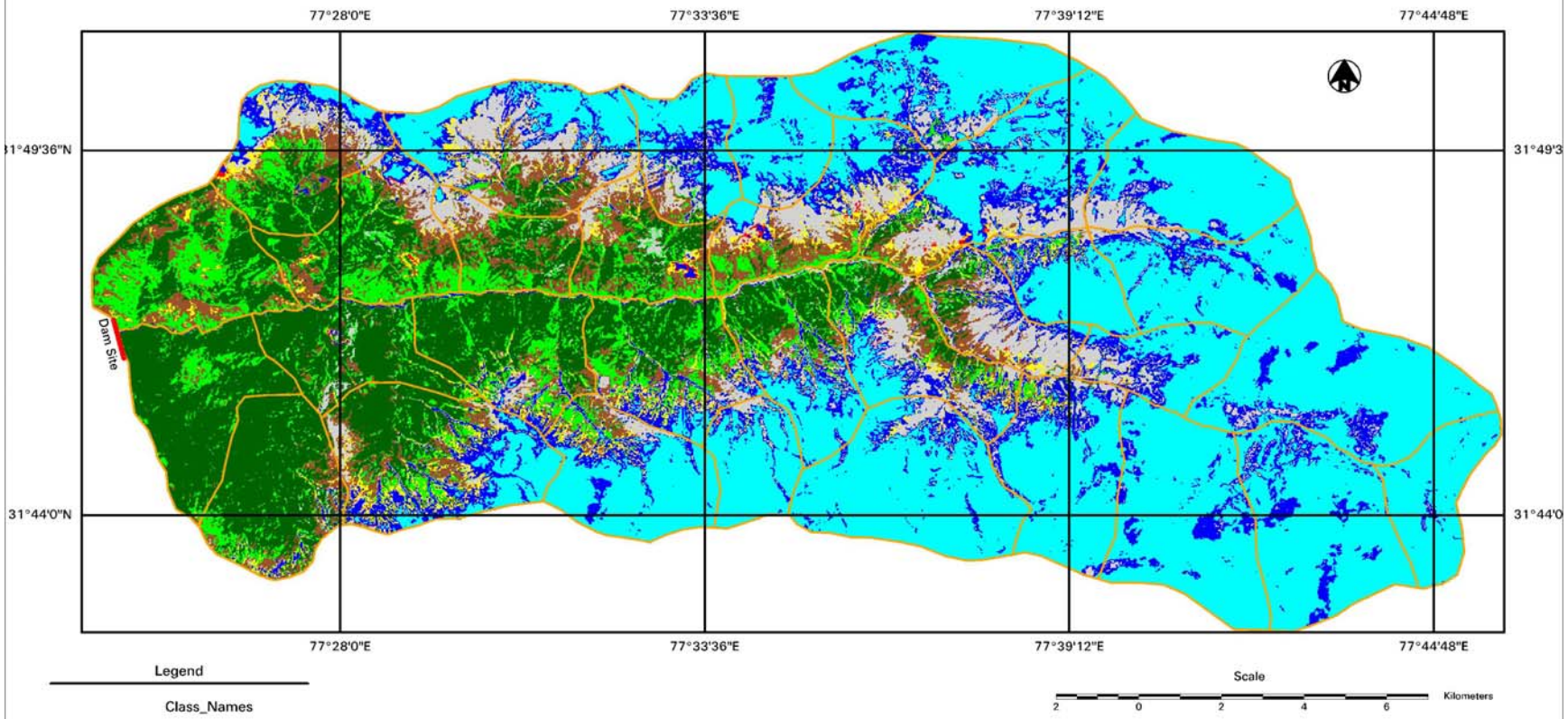
**Rates to be applied each Year =** as per notified norms for executing the works

**This Phasing is mainly for physical works phasing and release of money by the User Agency. Since financial amount each year includes maintenance, the break up to be done by Executing Agency.**



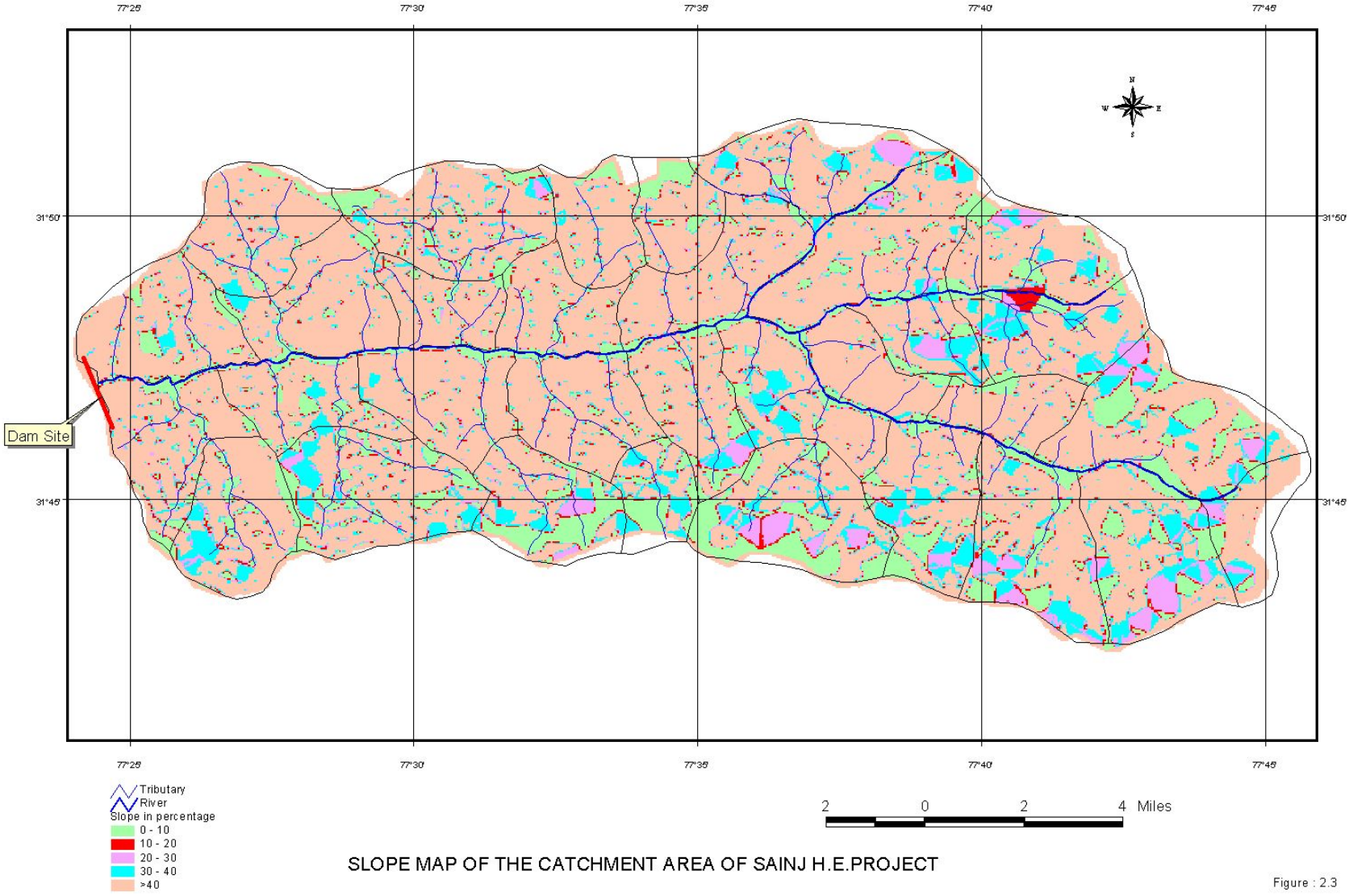

WATERSHED AREA MAP OF SAINJ H.E. PROJECT

Figure : 2.1



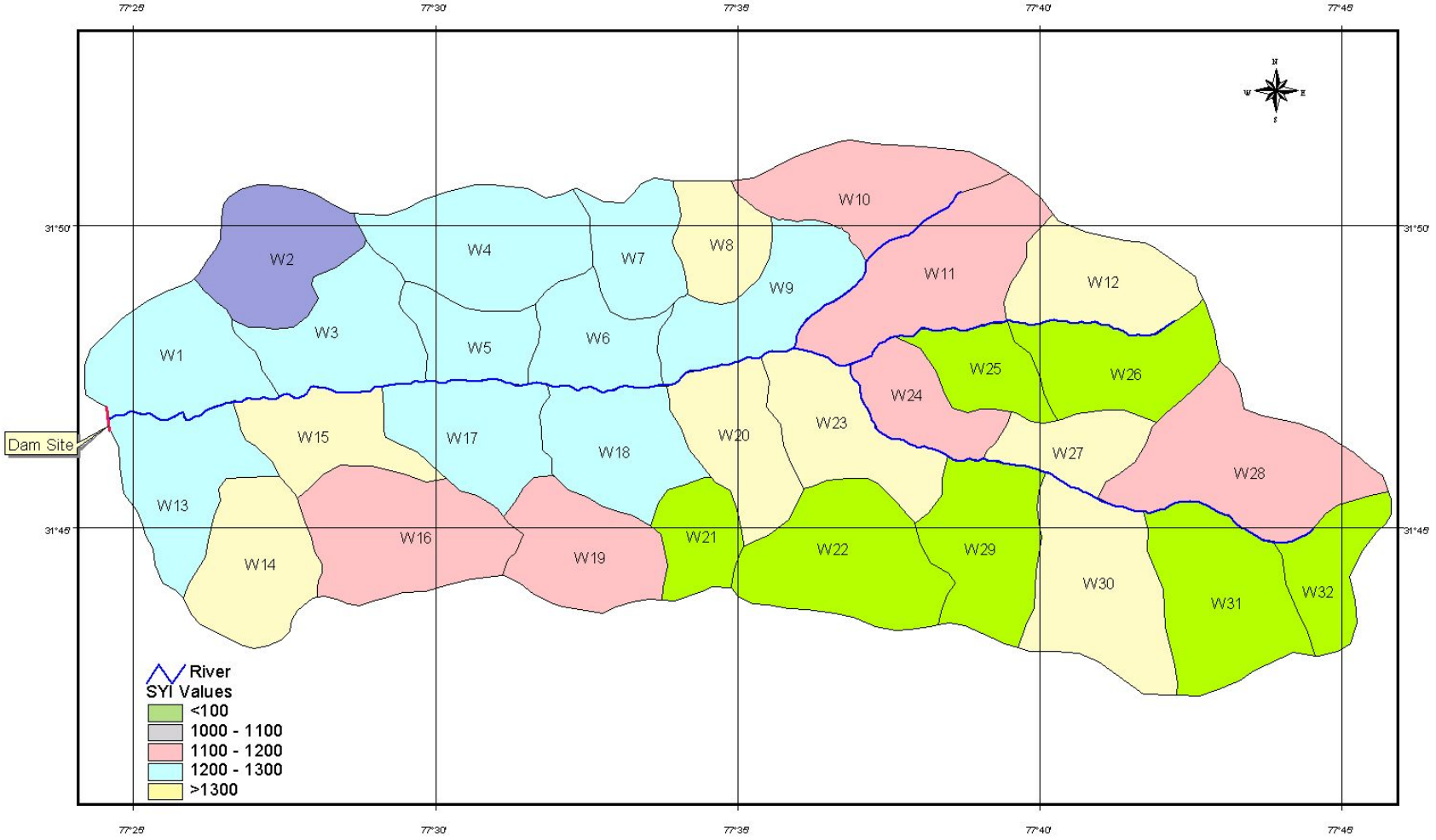

LAND USE CLASSIFICATION OF THE CATCHMENT AREA

Figure : 2.2



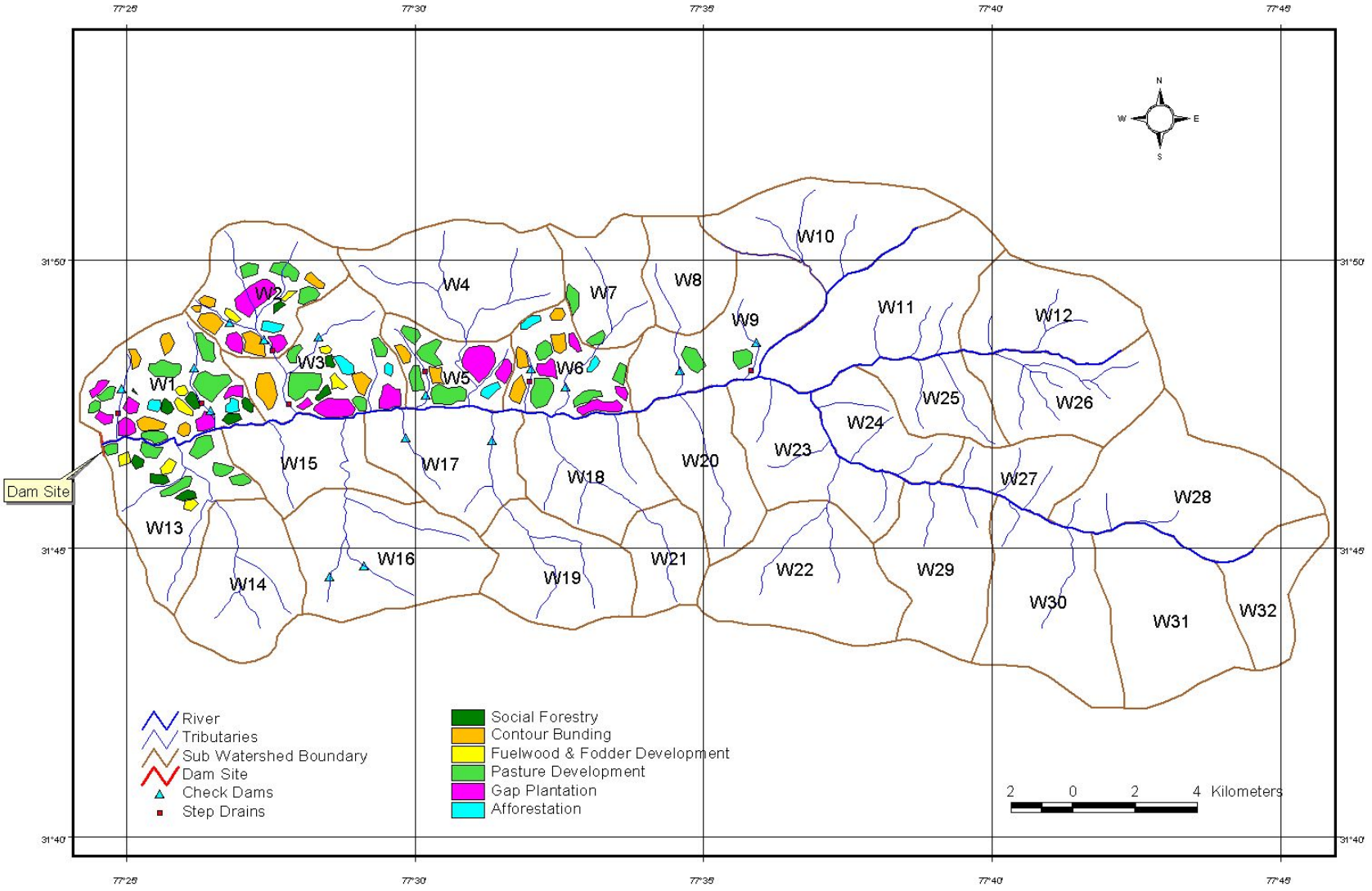

SLOPE MAP OF THE CATCHMENT AREA OF SAINJ H.E.PROJECT

Figure : 2.3




PRIORITISATION OF DIFFERENT WATERSHEDS IN THE CATCHMENT AREA

Figure :2.4




PROPOSED CATCHMENT AREA TREATMENT MEASURES FOR SAINJ H.E.PROJECT

Figure : 2.5

# CHAPTER-3

# FISHERIES MANAGEMENT PLAN

## 3.1 INTRODCUTION

A river valley project may have adverse or beneficial effects on the fish fauna, depending upon the particular situation and the fish fauna inhabiting the concerned river. Similarly it has various impacts on the people, the livelihood of which depends on the fish. The regulation of a river leads the fragmentation of habitat and may have adverse effects on indigenous and migratory fish. On the other hand pondage provides a large volume of water, which is beneficial with respect to fish culture and can play an important role in the upliftment of economic growth.

## 3.2 FISHERIES STATUS

The river Sainj and its tributaries have variety of cold water fishes dominated by trout. The cold water with high oxygen and rich benthic flora and fauna, river offers excellent habitat for breeding of these fishes. The field studies were conducted during the months of April 2007 (summer season), October 2007 (post-monsoon season) and winter season (January 2008). The following three species were observed at various sampling sites during the survey:

- *Schizothorax richardsoni*
- *Salmo trutta fario*
- *Salmo gairdneri gairdneri*

The fish catch composition observed the survey is given in Table 3.1. It is worthwhile to mention that above referred fish species were observed near power house site. However, at dam site only *Schizothorax richardsoni* was only observed.

**TABLE-3.1**

**Fish catch composition observed during the survey**

| Scientific Name | Summer season | Post-monsoon season |
|---|---|---|
| *Schizothorax richardsonii* | 80% | 100% |
| *Salmo trutta fario* | 10% | - |
| *Salmo gairdneri gairdneri* | 10% | - |

The major fish species reported in river Sainj and its tributaries are given in Table-3.2.

**TABLE-3.2**

**Major fishes species reported in river Sainj and its tributaries**

| Scientific Name | Local Name |
|---|---|
| *Schizothorax plagiostromus* | Snow Trout |
| *Schizothorax progastus* | Snow Trout |
| *Schizothorax richardsonii** | Snow Trout |
| *Salmo trutta fario** | Brown trout |
| *Salmo gairdneri gairdneri** | Rain bow trout |
| *Barilius* spp. | - |
| *Nemacheilus* spp. | - |

**Note: *** Fish species were also observed during the fisheries survey as well.

**Fish Migration**

*Schizothorax richardsonii* is the only commercial species observed in river Sainj in the project area. This species in normal course of its life cycle undertakes long journey during winter months to migrate in the lower reaches in warmer waters. With the warming of water in the lower reaches, in summer season the species migrates towards the upstream reaches. During its upstream movement, in the months of May and June, this species breeds in the several side streams.

It was observed during the fisheries survey that all three species namely *Salmo truta fario Salmo gairdneri* and *Schizothorax richardsonii* were observed near the confluence of the Jiwa nallah. The presence of these species near confluence of Jiwa nallah indicates that there is a possibility of migration of these species in Jiwa nallah.

**Spawning and breeding grounds**

There is no specific spawning or breeding ground observed in the study area. However, the presence of fingerling in the catch near confluence of Jiwa Nallah indicate the possibility of breeding in the area near the proposed power house area.

Commercial fishing does not exist in Sainj. However, district Kullu is considered to be an angler's paradise and this sport is getting popular day by day.

Sport fishery is practiced in Sainj river and mainly constitutes brown trout, *(Salmo trutta fario)* and rainbow trout *(Salmo gairdneri).* The game fishing observed in Sainj river mainly near confluence of Jiwa Nallah and Kartaul Khad. The crystal clear water, terrain and climate support good potential for the development of sport fishery in the area. The trout fish, which is most suitable for this area was introduced in the district in 1909 by G.C.L. Hovel and General Orborn. Since then, this variety of fish has spread to larger area in the main river Beas and its tributaries. The Sainj river comes in the former category and has been declared as trout water vide section 3(i) B Himachal Pradesh Fisheries Act 1976 and only sport fishing is allowed i.e. rod and line method only. The license for fishing is issued by the district fishery officer during the open season (i.e. from March to October) every year for the fees of Rs. 10, Rs. 50, and Rs. 350/- for Angling daily, weekly and yearly respectively. Rod and line method can be used with lures such as artificial fly, spinning bait with the limit of 6 trouts of minimum 35 cm size per day.

There are two hatcheries in the region. One of the hatcheries is at Patlikuhal, which was set up as a part of Indo-Norvegion trout farming project and about 60 km from project site. The other hatchery is located at Nagani which is about 45 km from barrage site. About 5,000 to 6,000 fry of brown and rainbow trouts are stocked every year in river Sainj.

The pressure due to anglers in river Sainj and its tributaries so far has been negligible as compared to river Beas. The number of fishing licences issued during the year 2005 to 2007-08 are listed in Table-3.3.

**TABLE-3.3**
**Number of fishing licences issued in the area**

| Year | No. of fishing licences issued |
|---|---|
| 2005-06 | 432 |
| 2006-07 | 401 |
| 2007-08 | 605 |

Commercial fishing does not exist in Sainj. However, district Kullu is considered to be an angler's paradise and this sport is getting popular up day by day. The surface water resources of Kullu district have been divided into two main categories:

- Angling Reserve Water
- Open Water

Sport fisheries is practiced in river Sainj and mainly constitutes brown trout, *(Salmo trutta fario)* and rainbow trout *(Salmo gairdneri).* The crystal clear water, terrain and climate support good potential for the development of sport fishery in the area. The trout fish, which is most suitable for this area was introduced in the district in 1909 by G.C.L. Hovel and General Orborn. Since then, this variety of fish has spread to large area in river Beas and its tributaries. The Sainj river comes in the former category and has been declared as trout water vide section 3(i) B Himachal Pradesh Fisheries Act 1976 and only sport fishing using rod and line method is allowed. The license for fishing is issued by the district fishery officer during the open season (i.e. from March to October) every year with a fee of Rs. 10, Rs. 50, and Rs. *350/-* for angling on daily, weekly and yearly basis respectively. Rod and line method can be used with lures such as artificial fly, spinning bait with the limit of 6 trouts of minimum 35 cm size per day. About 100 number of anglers visit the area every year during fishing

season. It is evident from the available data that the sport fisheries are not very developed in the project area, the reason for which is the poor infrastructural facilities.

## 3.3 IMPACTS ON FISHERIES

### 3.3.1 Construction phase

The construction of the proposed Sainj hydroelectric project would involve large-scale extraction of different types of construction material from the riverbed including boulders, stones, gravel, sand, etc. Extraction of gravel and sand causes considerable damage to fish stocks and other aquatic life by destabilizing the sub-stratum, increasing the turbidity of water, silting of the channel bottom and modifying the flow, which in turn may result in erosion of the river channel. These alterations would have a significant impact on the benthic fauna. The increased turbidity during extraction on dredging process will also increase the turbidity which is likely to last during the time dredging is undertaken. The suspended solids in excess of 100 ppm brought by suspended solids chokes the gills of young fish. Fine solids in concentration greater than 25 mg/l, adversely affects the development of fish eggs and fish. Normally, fish species migrate for the area and return to the site, only after the dredging or extraction activities are ones. This is a phenomenon reported in many projects and is expected in the proposed project as well.

### 3.3.2 Operation phase

Among the aquatic animals, it is the fish life, which would be most affected. The migratory fish species, e.g. snow trouts and brown trouts are likely to be adversely affected due to obstruction created by the proposed barrage. With the completion of barrage, flow in the downstream stretch of the river would be reduced considerably more so during the lean period. Such situation may adversely affect the benthic

community and fish. The most important changes, which can be expected are:

- Reduced flow rate
- Increase in water temperature
- Reduction in availability of stano-thermal aquatic animals
- Increase in population of euro-thermal species.
- Barrier to migration due to construction of barrage.

Unless the desired flow is maintained downstream of the barrage, aquatic ecology in general and fisheries in particular would be affected.

## 3.4 MANAGEMENT MEASURES

### 3.4.1 Release of minimum flow

The requirement of flow in the downstream is directly related to the water temperature. After construction of barrage on Sainj river the water is to be diverted for power generation. The tail race channel will confluence again about 8.5 km downstream of the barrage. However 0.63 cumec is proposed to be released from the barrage. The discharge shall be supplemented by contribution for the Kartol nallah (2.5 km downstream) joining river Sainj on its right bank and other small khads joining the river from the left bank. These small khads include Kotli khad (4 km downstream), Shana khad (6 km downstream) and Nuhara khad (7.5 km downstream) of the barrage. The total discharge of these streams is about 1.4 cumec during lean season. The details of flow contributed by the above referred khads is given in Table-3.4.

**TABLE-3.4**

**Lean season flow from Nala/Khad joining between proposed barrage and confluence of tail race from power house**

| Name of Khad | Flow from Khad (cumec) | Cumulative flow considering lean season releases from barrage |
|---|---|---|
| Minimum release from barrage | 0.63 | 0.63 |
| Kartaul Khad | 0.60 | 1.23 |
| Kotlu Khad | 0.50 | 1.73 |
| Shana Khad | 0.10 | 1.83 |
| Nuhra Khad | 0.20 | 2.03 |

It is clear from Table-3.4, that sufficient releases will be maintained in the river stretch downstream of the barrage site upto the confluence of tail race from power house.

### 3.4.2 Sustenance of Endemic Fisheries

Various measures outlined for sustenance of riverine fisheries are described in the following paragraphs.

**a) Provision of fish ladder**

Snow trout (*Schizothorax richardsonii*) is the endemic species. The barrage on Sainj will be a barrier to the free movement of fish species. Therefore, a provision of fish ladder has been made in the barrage. A minimum flow of 0.63 cumec is to be released in the downstream through fish ladder. The cumulative flow in the downstream will be 2.03 cumec.

**b) Supplementary stocking**

Since, *S. richardsonii* is categorized as vulnerable species amongst the threatened fishes of India, scientific management of the existing stock needs be adopted. The water-spread area in the proposed project is quite small and the proposed project is envisaged as runoff the river scheme, with significant diurnal variations. Hence, reservoir stocking is not recommended in the proposed project.

In order to offset the fishery losses in the stream and development of fishery in the envisaged reservoir a proposal has been made for funding from HPSEB by Directorate of Fisheries, state government of Himachal Pradesh. The activities/development measures proposed shall be as under:

- Construction of trout Angling Lake at Nagini on the bank of river Tirthan.
- Construction of additional fish hatchling rearing infrastructure to make trout seed available for stocking.

**Development of Fishery in Sainj reservoir**

The trout seed produced from the Hamini farm shall be stocked in Sainj reservoir at a rate of 20,000 fingerlings per annum. This shall help in the development of trout fish popu1ation in this reservoir besides upstream potion of the river Sainj.

**Construction of additional rearing space for trout hatchling at Hamini**

The Sainj reservoir and the proposed angling lake shall on a average require 30,000 trout fingerlings for stocking annually. To raise this number of fingerlings having on average weight of 2-3 gm from hatchling of size 20 mm additional rearing space shall be constructed at Hamini fish farm. .

**Development of Angling Tourism**

In order to provide trout angling facilities to the anglers visiting the area, there is a proposal to construct an Angling lake at Nagini, where the department has approximately 2 ha land on the left bank of river Tirthan. The seed for the stocking of this lake shall be arranged from the upcoming trout farm at Hamini in Banjar valley. The tourist anglers from the country and abroad shall have an easy access to trout in this lake and this is likely to help in the development of the Angling Tourism in the area.

### 3.4.3 Budget

The total expenditure estimated by Directorate of Fisheries, state government of Himachal Pradesh for fisheries management plan is Rs. 10 million. The details are given in Table-3.5. The funds shall be made available by project proponents to Directorate of Fisheries, state government of Himachal Pradesh.

**TABLE-3.5**

**Cost estimate for fisheries management plan**

| S. No. | Item | Total Cost (Rs. lacs) |
|---|---|---|
| 1. | Construction of additional rearing space for trout hatchlings at Hamini farm | 16.00 |
| 2. | Construction of angling lake | 75.00 |
| | **Total** | **91.00** |
| 3. | Department Charges (Seed stocking and conservation of fish) @ 10% of the project cost | 9.10 |
| | **Grand Total** | **100.10 or say 100 lacs or Rs. 10 million** |

### 3.4.4 Monitoring Committee

To monitor the implementation of the project and effect mid-way changes in the project components following committee is proposed and is listed in Table-3.6.

**TABLE-3.6**

**List of committee members for monitoring the fisheries management plan**

| S. No. | Officer | Position |
|---|---|---|
| 1. | Secretary (Fisheries) to the Govt. of H.P. | Chairman |
| 2. | Director-cum-Warden of Fisheries, H.P. | Member |
| 3. | General Manager, Sainj Hydro-power project | Member |
| 4. | Deputy Director Fisheries Patlikuhl | Member Secretary |

# CHAPTER-4

# PUBLIC HEALTH DELIVERY SYSTEM

## 4.1 INTRODUCTION

The data on major disease in the study area collected from Primary Health Centre (PHC), District Health officer and village Panchayat office. The primary data also collected by interview of the local people at the time of socio-economic survey. The prevalent disease are acute respiratory infection, diahorea and eye infection. Malaria and typhoid are not reported in the study area. The initial health assessment reveals that there is no specific health hazard in the study area. It was also observed that there are no vector borne disease are prevalent. How in protective strategy are to combat if such disease occur in future. Water pollution problems are not likely as the study area is devoid of industries however, there is a possibility that agriculture runoff could seep the flowing streams.

## 4.2 IMPACTS ON PUBLIC HEALTH

The construction of barrage may involve many diversified activities and require a large number of labors. The change in population density through immigrants/influx may cause new health problems in this region. People may carry different types of contagious diseases if any spread in locality. Influx of human work force may also bring stress on available drinking water sources and sanitary facilities. The additional domestic sewage generated may cause drinking water contamination resulting in spread of enteric diseases if not taken proper precautionary measures.

The proposed project would lead to increase in the water spread area with corresponding increase in shore line. This is expected to increase the incidence of malaria in project area and its surroundings. However, impacts on this account are not expected to be significant.

## 4.3 PUBLIC HEALTH DELIVERY SYSTEM

### 4.3.1 Control of malaria

The increase in water fringe area provides suitable habitats for the growth of vectors of various diseases and they are likely to increase the incidence of water-related diseases. Malaria is the water related major vector-borne disease. Thus, malaria control measures which aim at destroying the habitat and interrupting the life cycle by mechanical or biological or chemical means need to be implemented. Various Primary Health Centres in the nearby villages and Hospital at District Head Quarters can coordinate the anti-malarial operations in association with the project authorities.

The suggested measures are given in following paragraphs:

- The site selected for habitation of workers should not be in the path of natural drainage.
- Adequate drainage system to dispose storm water drainage from the labour colonies should be provided.
- Adequate vaccination and immunization facilities should be provided for workers at the construction site.
- The labour camps and resettlement sites should be at least 2 km away from a main water body or quarry areas.

### 4.3.2 Development of medical facilities

A population of about 3,200 is likely to congregate during the construction phase. The labour population will be concentrated at two or three sites. There is no medical facility in the immediate vicinity of the project area. It is recommended that necessary medical facilities be developed at the project site. It is recommended that the dispensary should be developed during project construction phase itself, so that it can serve the labour population migrating in the area as well as the local population.

The details of manpower, infrastructure requirement for this dispensary are given as below.

**Manpower**

Doctor : 1

Qualification : M.B.B.S./ M.D

2 doctors can be employed in the dispensary and will reside in the staff quarters adjacent to the dispensary. The para-medical staff required for assistance to these doctors is given in Table-4.1.

**TABLE-4.1**

**Details of Para-medical staff for Dispensary**

| **Para medical staff** | **Number** |
|---|---|
| Auxiliary Nurse | 2 |
| Male Multipurpose Health worker | 2 |
| Attendants | 2 |
| Driver | 2 |
| **Total** | **10** |

**Infrastructure**

A building shall be constructed to provide basic preventive, promotive and curative services to the labour colony with facilities for maternal and child health services, control of communicable diseases and medical care for minors. The building should have a waiting hall where 30-40 people can sit. The building would have place for the following:

- Two rooms for doctors
- One room for staff
- Two rooms for stores
- One general ward to accommodate 10 beds
- One minor operation theater/ dressing room
- One garbage with space for three vehicle

Residential accommodation is to be provided to the essential staff in the campus.

**Proposed Health Facilities at Construction sites and labour camp**

It is possible that during the construction work, the technical staffs operating different equipment are not only exposed to the physical strain of work but also to the physical effects of the environment in which they are working. The workers and other technical staff may come up with common manifestations such as insect bites, fever, diarrhea, work exhaustion and other diseases. In addition they may invariably come up with injuries caused by accidents at work site. Under all circumstances, workers need immediate medical care.

A first-aid post is to be provided at each of the major construction sites, so that workers are immediately attended to in case of an injury or accident.

This first-aid post will have at least the following facilities:

- First aid box with essential medicines including ORS packets
- First aid appliances-splints and dressing materials
- Stretcher, wheel chair, etc.

**Health Extension Activities**

The health extension activities will have to be carried out in the villages situated in the nearby areas. It is important to inculcate hygienic habits of environmental sanitation specially with respect to water pollution by domestic wastes. There would be possibility of the transmission of communicable diseases due to migration of labour population from other areas at the construction site.

The doctors from the dispensary shall make regular visits to these villages and organize health promotional activities with the active participation of the local village Panchayat, NGOs and available local health functionaries. The health functionaries would undertake the following tasks as a part of health promotional activities:

- Collect water samples to ascertain the portability of water from different sources so as to monitor regular disinfection of drinking water sources.

- Maintain close surveillance on incidence of communicable diseases in these villages.
- Maintain close liaison with the community leaders and health functionaries of different departments, so that they can be mobilized in case of an emergency.

**Cost estimates**

The costs estimated as follows are approximate and indicate the order of expenditure likely to accrue.

**A. Expenditure on salaries**

Dispensary

| **Post** | **Number** | **Monthly** Emoluments (Rs.) | **Annual** Expenditure (Rs.) |
|---|---|---|---|
| Doctors | 1 | 30,000 | 360,000 |
| Nurse | 2 | 10,000 | 240,000 |
| Male Multi-purpose Health Workers | 2 | 10,000 | 240,000 |
| Attendants | 2 | 5,000 | 120,000 |
| Drivers | 2 | 5,000 | 120,000 |
| Total | | | 1,080,000 |

First Aid Posts

| | | | |
|---|---|---|---|
| Health Assistants | 2 | 10,000 | 240,000 |
| Dressers | 2 | 5,000 | 240,000 |
| Total | | | 480,000 |

Total Expenditure (A) = Rs.1,560,000

**B. Expenditure on Material and Supplies**

**Dispensary**
**Non-recurring**

| | | |
|---|---|---|
| i) | 1 Vehicle (Closed Jeep) and | Rs. 1,00,000 |
| ii) | Furniture, etc. | Rs. 50,000 |
| iii) | Hospital equipment | Rs. 5,00,000 |
| iv) | Ambulance 2 No. and their maintenance for five years | Rs.20,00,000 |
| Total | | Rs.35,50,000 |

**Recurring**

| | | |
|---|---|---|
| i) | Drugs and Medicine, | Rs. 300,000/yr |
| ii) | Contingencies | Rs. 50,000/yr |
| iii) | 2 First-Aid Posts at construction sites | Rs. 36,000/yr |
| Total | | Rs. 3,86,000/yr |

**C. Infrastructure**

Dispensary: Considering the number of rooms, staff quarters and open space etc., it is estimated that 5000 sq.feet (i.e. 465 sq.meter) of plot will be required for dispensary, out of which about 4000 sq.feet (375 sq.meter) will be the built-up land which includes staff quarters, etc. The construction cost for RCC structure will be Rs.400/sq.feet excluding land cost. The cost of construction of Dispensary will be Rs.1.6 million. The project proponents can purchase the land from the State Government. An amount of Rs.0.3 million can be earmarked for this purpose.

2 First Aid Posts: These are of temporary nature and will be constructed with asbestos sheets, bamboo, etc. It will cost @ Rs.100,000/First Aid Post. The total cost for constructing First Aid Posts will be of the order of Rs.0.2 million.

The total cost for developing the infrastructure will be (Rs.1.6 + Rs.0.3 + Rs.0.2 million) Rs.2.1 million.

## 4.4 BUDGET

The total expenditure for implementation of various public health measures shall be about Rs.**14.59 million**. The details are given as below:

| | | | |
|---|---|---|---|
| **A.** | **Recurring Expenditure** | | |
| * | Expenditure on salaries | : | Rs. 1080,000/yr |
| * | Expenditure on materials & supplies | : | Rs. 386,000/yr |
| | Sub-Total | | Rs. 14,66,000/yr |
| Total expenditure for 5 years (considering 10% escalation per year period) | (A) | : | Rs. 8.94 million |

| | | | |
|---|---|---|---|
| **B.** | **Non-Recurring Expenditure** | | |
| * | Infrastructure (Construction of Dispensary & 2 First aid posts) | : | Rs. 2.10 million |
| * | Expenditure on materials, supplies and equipment | : | Rs. 3.55 million |
| | Total (B) | | Rs. 5.65 million |
| **Total A + B** | | | **Rs.14.59 million** |

In the DPR, a provision of Rs. 9.4 million has been earmarked for development of health related infrastructure. The details are given in Table-4.2.

**TABLE-4.2**

**Details of provision earmarked for health related infrastructure in DPR**

| S.No. | Item | Cost (Rs. million) |
|---|---|---|
| 1. | Hospital equipment | 3.0 |
| 2. | Medical assistance for 5 years | 4.0 |
| 3. | Ambulance (2 Nos.) | 0.95 |
| 4. | R&M Cost for Ambulance for 5 years | 1.05 |
| 5. | Jeep (1 No.) | 0.40 |
| | **Total** | **9.40** |

Thus, an additional provision of Rs. (14.59-9.40) 5.19 million needs to be earmarked for development of Public Health Delivery System.

# CHAPTER-5

# ENVIRONMENTALMANAGEMENT IN LABOUR CAMPS

## 5.1 INTRODUCTION

The aggregation of large number of works and technical labour in the project area during the construction of phase is likely to put considerable stress on the ecosystem of the area. The labour camps are likely to be concentrated near Kartaul village, near Adit-I, near barrage and near proposed power house sites. The aim of the EMP is to minimize these stresses. It should be made mandatory for the contractor to provide adequate facilities at the labour camp which are described in the following sections.

## 5.2 PROVISION OF HEATING

The contractor can make a block of two large rooms in which about 30-40 workers can stay. Community toilets for each block can be constructed close by. During winter months, a central heating system can also be provided, otherwise, workers will be forced to cut trees to meet the fuel requirements to heat the water required for various uses.

## 5.3 PROVISION OF WATER SUPPLY

The water for drinking purpose is collected from the rivers or streams flowing upstream of the labour camps. The water is stored in tanks and supplied for use. The water quality in general is good and does not require any elaborate treatment. However, it is proposed to disinfect the water prior to distribution. The settlements/ labour camps shall be placed far from the drinking water sources.

## 5.4 SANITATION AND SEWAGE TREATMENT FACILITIES

One community latrine can be provided per 20 persons. The sewage from the community latrines can be treated in oxidation ditch. Each labour camp can be

provided with an Oxidation ditch. The treated effluent from oxidation ditch be disposed off in nearest water body. However, efforts shall be made to ensure, that treated effluent is disposed only in these water bodies, which are not used for meeting domestic water requirements.

The total construction time for the project is 4 years. At peak construction phase, there will be an increase in population by 3,200. It is proposed to construct a construction camp at Ropa. To ensure that the sewage from the labour camp do not pollute the river water, it has been estimated that about 160 community latrines and an oxidation ditch can be constructed for treatment. The total cost required will be Rs.4.4 million (refer Table-5.1).

**TABLE- 5.1**

**Cost Estimate for sanitary facilities for labour camps**

| S. No. | Unit | Rate (Rs./unit) | Number | Total cost (Rs. million) |
|---|---|---|---|---|
| 1. | Community latrines | 20,000 | 160 | 3.20 |
| 2. | Oxidation ditch | | - | 1.20 |
| | **Total** | | | **4.40** |

## 5.5 SOLID WASTE MANAGEMENT FROM LABOUR CAMPS

The labour colony will be located at barrage site, powerhouse and at adit sites. During construction phase, about 800 labour and 200 technical staff is likely to congregate. The increase in population is expected to be of the order of 3,200. The solid waste likely to be generated from labour camps shall be of the order of 1.6 tonnes/day. Adequate facilities for collection, conveyance and disposal of solid waste need to be developed. The solid waste will be disposed at the designated landfill sites.A landfill can be designed in the way as given below, if we start from the bottom, bottom most layer is impervious clay , then second layer is impervious liner (Geomembrane), Third layer is sand, after that well compacted solid waste is to be

put over the sand, then again a layer of clay , finally a layer of soil. Some vegetation can be done at the top most layer. It will give a good aesthetic view of landfill.

Various aspects of solid waste management include:

- Refuse storage
- Collection and Transportation
- Disposal

**a) Refuse storage**

In the proposed project, labour camps are proposed to be located at two or three location. In each of the labour colony, provisions shall be made to separately store the degradable and non-degradable solid waste.

A solid waste collection truck will be commissioned to collect the solid waste. Efforts will be made to separately collect the degradable and non-degradable solid waste. For this purpose workers will be provided with two separate dust bins to segregate the bio-degradable as well as non-biodegradable wastes. A sustained awareness programme will be conducted to educate worker about the segregation of degradable and bio-degradable wastes.

**Disposal**

The degradable portion of the solid waste would be disposed off at the muck disposal sites. The non- degradable portion such as plastic bottles, cans etc. shall be segregated and disposed off at separate sites identified by the district administration. The total cost required for solid waste management is Rs.3.11 million. The details are given in Table-5.2.

**TABLE-5.2**

**Cost estimates for solid waste management**

| S. No. | Item | Cost (Rs. million) |
|---|---|---|
| 1 | One covered truck for conveyance of solid waste to landfill site | 1.00 |
| 2 | Manpower cost for 4 persons @ Rs. 5000/ month for 5 years including 10% escalation/year | 1.46 |
| 3 | Reclamation and stabilization cost | 1.00 |
| 4 | Awareness programme | 0.50 |
| | **Total** | **3.96** |

## 5.6 BUDGET

A total provision of (4.40 + 3.96) **Rs. 8.36 million** has been earmarked for Environmental Management in labour camp.

## 5.7 IMPLEMENTING AGENCY

Various measures recommended in this chapter shall be included in the contract document of the contractor involved in construction activities. The implementation of these measures shall be monitored by the project proponents. However, the site for disposal of treated effluent from Oxidation ditch and solid waste shall be identified with district administration.

# CHAPTER-6

# MUCK MANAGEMENT PLAN

## 6.1 INTRODUCTION

A large quantity of muck is expected to be generated as a result of tunneling operations, construction of roads, etc. Muck generated from excavation of any project component is required to be disposed in a planned manner so that it takes a least possible space and is not hazardous to the environment. The muck disposal sites cause increased sedimentation in the rivers (though insignificant compared to natural sedimentation) and totally spoils the visual aesthetics of the area. It is of prime importance that these sites will have to be rehabilitated as soon as the disposal sites are full.

## 6.2 MUCK GENERATION

The total quantity of muck expected to be generated has been estimated to be of the order of 0.805 $Mm^3$. The component wise detail of muck to be generated are given in Table-6.1. Based on the geological nature of the rocks and engineering properties of the soil, a part of the muck can be used as construction material. However, the balance requires being suitably disposed. Normally, muck is disposed in low-lying areas or depressions. Trees, if any, are cut before muck disposal, however, shrubs, grass or other types of undergrowth in the muck disposal at sites perish. In the proposed project 0.4 $Mm^3$ muck is proposed to be disposed at different sites.

## TABLE-6.1

## Component wise detail of muck to be generated

| S. No. | Name of components where Muck/ Debries is to be produced | Total Qty. of muck to be produced in cum | Less qty @ 35% of the muck to be used on various works | Quantity of muck to be dumped on compaction basis ($m^3$) | Factor for increase in muck quantity due to bulking ($m^3$) | Total Quantity of muck on the basis of increase due to bulking ($m^3$) | Net Quantity of muck to be dumped on the basis of increase due to bulking ($m^3$) | Total capacity of dumping proposed in different dumping sites. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sl. No | Dumping site | Capacity of dumping site ($m^3$) |
| 1 | Diversion Barrage | 100800 | 35280 | 65520 | 1.40 | 91728 | 91728 | 1 | Dumping site No.-1 at Niharni | 116864.00 |
| 2 | Intake structure | 1200 | 420 | 780 | 1.40 | 1092 | 1092 | 2 | Dumping site No.-2 at Kartaul | 163431.00 |
| 3 | Desanding arrangement | 104300 | 36505 | 67795 | 1.40 | 94913 | 94913 | 3 | Dumping site No.-3 at Sambha | 41439.00 |
| 4 | Head Race Tunnel | 136300 | 47705 | 88595 | 1.40 | 124033 | 124033 | 4 | Dumping site No.-4 at Kartah | 231306.00 |
| 5 | Surge Shaft | 20300 | 7105 | 13195 | 1.40 | 18473 | 18473 | 5 | Dumping site No.-5 at Dharmehara | 507035.00 |
| 6 | Pressure Shaft | 14000 | 4900 | 9100 | 1.40 | 12740 | 12740 | 6 | Dumping site No.-6 at Karehala near Surge Shat. | 42323.00 |

| S. No. | Name of components where Muck/ Debries is to be produced | Total Qty. of muck to be produced in cum | Less qty @ 35% of the muck to be used on various works | Quantity of muck to be dumped on compaction basis ($m^3$) | Factor for increase in muck quantity due to bulking ($m^3$) | Total Quantity of muck on the basis of increase due to bulking ($m^3$) | Net Quantity of muck to be dumped on the basis of increase due to bulking ($m^3$) | Total capacity of dumping proposed in different dumping sites. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Sl. No | Dumping site | Capacity of dumping site ($m^3$) |
| 7 | Power House Complex | 84800 | 29680 | 55120 | 1.40 | 77168 | 77168 | 7 | Dumping site No.-7 at Suind near TRT. | 58686.00 |
| 8 | Tail Race Tunnel | 12400 | 4340 | 8060 | 1.40 | 11284 | 11284 | | | |
| 9 | Roads | 331500 | 116025 | 215475 | 1.40 | 301665 | 301665 | | | |
| | **Total** | **805600** | **283960** | **523640** | | **733096** | **733096** | **Total capacity in cum** | | **1161084** |

## 6.3 DISPOSAL OF MUCK AND RECLAMATION 0F MUCK DISPOSAL SITES

As per the existing proposal for the construction of Sainj hydroelectric project about 0.805 $Mm^3$ of muck is to be generated. It is proposed that 0.283 $Mm^3$ of muck shall be utilized for various project works, e.g., production of aggregates, leveling of roads by providing filling in some reaches, development of work sites, construction area facilities, construction of retaining walls along dumping area. Coffer dam and various other protection work. Hence the balance quantity of muck to be disposed off shall be about 0.523 $Mm^3$, which goes up to 0.733 $Mm^3$ after increased in volume due to bulking @ 40% increased. For the disposal of muck, seven (7) muck disposal sites with a total area of about 10.729 ha have been identified. The capacity of these sites, their location and distance from the muck generation area have been described in Table-6.2. The proposed dumping sites shall be enough to cater the generated quantity of muck.

The dumping of muck will be done in the scientific manner by providing appropriate protection walls with deep foundations so that muck will not flow and washed away in the river Masonry work, crate work and check dam will also be provided wherever necessary in order to avoid the chances of soil erosion and to ensure flow of silt, free water. The reclamation plan of these sites has been shown in Figure-6.1. Besides these engineering measures, proper plantation will be done at the dumping sites for reclamation of the dumping areas.

## TABLE-6.2
## Capacity, location and distance of Dumping site from the Muck Generation sites

| S.No. | Name of Component from where muck is to be produced | Qty. of muck is proposed to be dumped | Name of dumping place/site | Capacity of Dumping place/site | Location of dumping place/site vill/police station & nearby road | Slope of dumping area | Distance of dumping place/site from near by river with name of river | Height of retaining wall | Height of dumping proposed beyond retaining wall (ha) | Area (ha) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 1. | **Diversion Barrage** | | | | | | | | | | |
| | | 91728 | D-1 at Niharni | 1,16,864 | D-1 situated of Niharni, right bank of river Sainj P.O. Neuli, Police Station Sainj | 1:15 | 5 mtr from HFL in Horiz. & Vert. of Sainj river | 6.00 mtr | 4.50 | 0.762 | |
| i) | Intake structure | 1092 | | | | | | | | | |
| ii) | HRT 700 mtr | 13781 | | | | | | | | | |
| iii) | Desanding arrangements | 10000 | | | | | | | | | |
| | **Total** | **116601** | | | | | | | | | |
| 2 i) | Desanding Arrangements | 84914 | D-2 & D-3 at Kartaul & Sambha | 163431<br>41439<br>204870 | D-2 & D-3 situated along Kartaul nallah away from Sainj Khad i.e. Sambha about 20 mtr and Kartaul site about 300 m | 1:15 | 5 mtr from HFL in Horiz. & Vert. of Kartaul nallah | 6.00 | 4.50 | 2.044 + 0.592 | |
| ii) | HRT 2400 mtr | 47250 | | | | | | | | | |
| 3. | HRT 3200 mtr. | 63001 | D-5 at Dharmehara beside Dry Nallah | 507035 | D-5 at Dharmehara P.O. & Police Station Sainj near by Sainj Neuli Road | 1:15 | 100 to 450 m away from Sainj river | 6.00 | 4.50 | 4.08 | |
| 4. | Surge Shaft | 18473 | D-6 at Karehala near S/shaft | 42323 | D-6 situated at Village Karenala P.O. Sainj | 1:15 | 500 m away from Sainj river | 6.00 | 4.50 | 0.666 | |
| 5. | Pressure Shaft | 12740 | D-7 at Seuind | 58686 | D-7 situated at Village Seuind right bank of Sainj river P.O. Sainj | 1:15 | 5 mtr from HFL in Horiz. & Vert. of Sainj river | | | 0.74 | |
| 6. i) | Power house | 77168 | D-4 at Kartah | 231306 | D-4 situated at Kartah P.O. and Police station, Sainj | 1:15 | 5 mtr from HFL in Horiz. & Vert. of Sainj river | 6.00 | 4.50 | 1.845 | |
| ii) | Tail Race Tunnel | 11284 | | | | | | | | | |
| | **Total** | **88452** | | | | | | | | | |

| S.No. | Name of Component from where muck is to be produced | Qty. of muck is proposed to be dumped | Name of dumping place/site | Capacity of Dumping place/site | Location of dumping place/site vill/police station & nearby road | Slope of dumping area | Distance of dumping place/site from near by river with name of river | Height of retaining wall | Height of dumping proposed beyond retaining wall (ha) | Area (ha) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| 7 | Roads | 301665 | D-2, D-4, D-5, D-6 & D-7 | 231306 | D-4 situated at Kartah P.O. & Police station, Sainj | 1:15 | | | | | |
| | **Total** | **733096** | | **1161084** | | | | | | **10.729** | |

Muck generally lacks nutrients and therefore, are difficult to re-vegetate. However, if no attempts to vegetate the slopes are made, the muck could slide lower down during rain and may eventually wash off the check dams also. Since, top soils are not available in large quantities in Himalayas, it may not be possible to apply a thin layer of soil over the muck. Bio-fertiliser technique developed by National Environmental Engineering Research Institute (NEERI) can be adopted in the proposed project. NHPC has successfully used this technique in Uri hydroelectric project. Similar approach can be utilized in the proposed project as well. In this process, the unused excavated material is piled and stacked with proper slopes at the designated muck disposal sites. The slopes are broken up by creating benches across them. This is done to provide stability to the slopes and also to provide ample space for planting of trees that would further help in holding and consolidating biotechnological approach. The traditional methods of afforestation of these areas would be supplemented with the use of fungus, i.e. Vesicular Arbuscular Mycorrizae (VAM) and nitrogen fixing bacteria that form partnership with plant roots. These grow on plant roots and provide water and nutrition especially phosphorus to plants at faster rate. The seeding of plants would be inoculated with VAM and nitrogen fixing bacteria before planting. It has been found that plants inoculated with bio-fertilizers grow at faster rate especially in the medium where the soil/rock is devoid of nutrients.

The afforestation with suitable plant species shall be done. About 1000-1200 trees/ha shall be planted. Major species recommended for plantation are listed in Table-6.3.

**TABLE-6.3**

**Species recommended for plantation over muck disposal site**

| Botanical Name | Local Name |
|---|---|
| **Trees** | |
| *Betula alnoides* | Bhoj patra |
| *Populus ciliate* | Popular |
| *Pinus roxburghii* | Chir |
| *Cedrus deodara* | Deodar |
| *Salix acutifolia* | Bhains |
| **Shrubs** | |
| *Artemisia nilgarica* | Kunja |
| *Berbaris aristata* | Kingor |
| *Berberis lyceum* | Kingor |
| *Rosa Moschata* | |

## 6.4 BUDGET

The total expenditure required for stabilization of muck disposal sites has been estimated to be of the order of **Rs.9.75 million**. The details are given in Table-6.4.

**TABLE-6.4**

**Break-up of cost for stabilization of muck disposal sites**

| S. No. | Items | Cost (Rs. million) |
|---|---|---|
| 1 | Construction of check dams along river banks @ Rs. 2.0 million/km for a stretch of 3.0 km. | 6.00 |
| 2 | Preparation of muck disposal site@ Rs. 0.05 million/ha for 10.73 ha | 0.54 |
| 3 | Provision of 15 cm soil layer over an area of 10.73 ha @ Rs. 0.15 million/ha | 1.60 |
| 4 | Development of vegetation over an area of 10.73 ha@ Rs. 150,000/ha | 1.61 |
| | **Total** | **9.75** |

# CHAPTER-7

# RESTORATION AND LANDSCAPING OF CONSTRUCTION SITES

## 7.1 INTRODUCTION

The landscape and restoration plan targets towards overall improvement in the condition of the area. The landscape plan provides benefits to improve beautification and its utility. All the activities are aimed at restoring the areas where scars would be formed. The restoration would prevent soil erosion enhance forest cover and stabilize degraded areas.

## 7.2 QUARRYING OPERATIONS

A project of this magnitude would require significant amount of construction material. The details are given in Table-7.1.

**TABLE-7.1**

**Detail of Construction Material Required**

| Material | Quantity |
|---|---|
| Coarse aggregate | 0.111 $Mm^3$ |
| Fine aggregate | 0.066$Mm^3$ |
| Cement | 63800 ton |
| Structural steel | 1000 ton |
| Reinforced steel | 10400 ton |
| BQ steel | 1190 ton |

The aggregate requirement for concrete is proposed to be met from quarry which has already been acquired for Larji Project and the same shall be utilized for the Sainj project as well. The quarry site is located at Silly Larji and about 30 km from the barrage site. The quarry has an area of 3 ha. A part of the concrete can be met by using the muck generated during excavation of the tunnel, power house and other project appurtenances, by crushing it into the required size. The quantum of muck

utilization as construction material would depend on the engineering properties of the muck and its suitability for construction.

The quarrying operations are semi-mechanized in nature. Normally, in a hilly terrain like Himanchal Pradesh, quarrying is normally done by cutting a face of the hill. A permanent scar is likely to be left, once quarrying activities are over. With the passage of time, the rock from the exposed face of the quarry under the action of wind and other erosion forces, get slowly weathered and after some time, they become a potential source of landslide. Thus it is necessary to implement appropriate slope stabilization measures to prevent the possibility of soil erosion and landslides in the quarry sites.

Similarly, the proposed project would require significant amount of fine material, which can be met either by crushing the aggregates or by excavation from borrow areas. In the proposed project, large quantity of fines shall be required, which would entail excavation from borrow pits. Normally, such sites are left untreated after excavation of the construction material. The pit so created impedes the natural drainage, increases the potential for soil erosion and stores rain water and runoff. These pools of water can serve as habitats for proliferation of mosquitoes, which can lead to increased incidence of vector-borne diseases.

## 7.3 RESTORATION PLAN FOR QUARRY SITE AND BORROW AREA

The following biological and engineering measures are suggested for the restoration of quarry site:

- Garland drains around quarry site to capture the runoff and divert the same to the nearest natural drain.
- Construction of concrete guards check the soil erosion of the area.
- The pit formed after excavation be filled with small rocks, sand and farmyard manure.

- Grass slabs will be placed to stabilized and to check the surface runoff of water and loose soil.

At the present level of investigations a tentative provision of Rs.3.50 million can be earmarked for quarry slope stabilization. The details are given in Table-7.2.

**TABLE-7.2**

**Cost estimate for restoration of quarry site and borrow area**

| S. No. | Activities/purpose | Cost (Rs. million) |
|---|---|---|
| 1. | Filling up the land with soil | 1.00 |
| 2. | Cost of green manure | 0.40 |
| 3. | Cost of sapling (10,000 saplings/ha) @ Rs.5.00 per sapling | 0.05 |
| 4. | Cost of fertilizers and pesticides | 0.40 |
| 5. | Fencing with RCC pillars and barbed wire | 0.30 |
| 6. | Maintenance activities including cleaning of weeds @ Rs.50,000 for 5 years | 0.25 |
| 7. | Digging of pits | 0.10 |
| 8. | Construction of garland drain | 1.0 |
| | **Total** | **3.50** |

## 7.4 LANDSCAPING AND RESTORATION PLAN

### Area for landscaping

The working area of barrage site, power house complex colony area have been selected for beautification of the project area after construction is over.

The reservoir created due to the construction of barrage may be a local point of tourist attraction. This could be used for sport fishing, so there is a need to construction of benches for sitting, development of resting sheds and footpath. The beautification would be carried out by developing flowering beds for plantation ornamental plant and flower garden.

There would be sufficient open space in power house complex and colony area. Forested area in the power house complex would provide aesthetic view and add to natural seismic beauty. The beautification in the colony area would be carried out by development of flowering beds for plantation of ornamental plant, creepers, flower

garden and a small park, construction of benches for sitting, resting sheds, walk way and fountain.

**Species for beautification**

The species identified for beautification of the area are given in Table-7.3.

**TABLE-7.3**

**Species have been identified for beautification the area**

| **Common Name** | **Scientific Name** |
|---|---|
| Bouganvilla | *Bougainvillaea spectabilis* |
| Dikamali | *Gardenia gummifera* |
| Mehndi | *Myrtus communis* |
| Chirpine | *Pinus roxburghii* |
| Deodar | *Cedrus deodara* |
| Poplar | *Populus ciliate* |
| Walnut | *Juglans regia* |
| Kail | *Pinus wallichiana* |
| Sita Ashok | *Saraca indica* |
| Satian | *Alstonia scholoris* |

A provision of **Rs.5.0 million** has been earmarked for landscaping and beautification of the area.

## 7.5 BUDGET

A total provision of (3.50 + 5.00) **Rs. 8.50 million** (has been earmarked for Restoration of quarry and borrow area, reclamation of construction sites landscaping and beautification.

# CHAPTER-8

# ENVIRONMENTAL MANAGEMENT IN ROAD CONSTRUCTION

## 8.1 INTRODUCTION

The project construction would entail significant vehicular movement for transportation of large construction material, heavy construction equipment. Some of the existing roads in the project area, would require widening. The existing road from Suind to Neuli has also been proposed to be widened. New access roads would have to be constructed. Approach roads 5/7 m wide of total length 19.50 km will be constructed to connect different sites of the project. The details of proposed road to be constructed are given in Table-8.1.

**TABLE-8.1**

**Details of roads proposed to be constructed**

| Description | Length (km) |
|---|---|
| 5/7 m wide road from Neuli to Barrage | 4.0 |
| 5/7 m wide road to decending basin and intake | 0.5 |
| 5/7 m wide road from Sambha to deflushing tunnel & HRT adit-I at Kartaul nallah | 2.0 |
| 5/7 m wide road from Suind to bottom of surge shaft | 7.0 |
| 5/7 m wide road from bottom of the surge shaft to top of surge shaft | 2.5 |
| 7/10 m wide road from Suind to MAT and tail race | 1.5 |
| 5/7 m wide road from quarry sites, dumping areas & colony etc. | 2.0 |
| Widening of existing road from Suind to Neuli (from 2.75/5m to 5/7m) | 8.0 |
| **Total** | **19.5** |

## 8.2 IMPACTS DUE TO CONSTRUCTION OF ROADS

The construction of roads can lead to the following impacts:

- The topography of the project area has steep to precipitatuous slope, which descends rapidly into narrow valleys. The conditions can give rise to erosion hazards due to net downhill movement of soil aggregates.

- Removal of trees on slopes and re-working of the slopes in the immediate vicinity of roads can encourage landslides, erosion gullies, etc. With the removal of vegetal cover, erosive action of water gets pronounced and accelerates the process of soil erosion and formation of deep gullies. Consequently, the hill faces are bared of soil vegetative cover and enormous quantities of soil and rock can move down the rivers, and in some cases, the road itself may get washed out.
- Construction of new roads increases the accessibility of a hitherto undisturbed areas resulting in greater human interferences and subsequent adverse impacts on the ecosystem.
- Increased air pollution during construction phase.

**8.3 MANAGEMENT MEASURES**

The approach roads will have to be constructed as a part of the access to the construction site. In a hilly environment, construction of roads sometime disturbs the scenic beauty of the area. In addition, landslides are often triggered due to road construction because of the loosening of rocks by water trickling from various streams. A total length of 19.5 km of new roads needs to be constructed as a part of the proposed project.

Steeply sloping banks are liable to landslides, which can largely be controlled by provision of suitable drainage. The basic principle is to intercept and divert as much water as possible, before it arrives at a point, where it becomes a nuisance. The other erosion hazard is that of surface erosion of the bank, which is best controlled by vegetation. However, in a steeply sloping terrain, difficulty lies in growing vegetation on steeply sloping banks. Engineering solutions such as surface drainage, sub-surface drainage, toe protection and rock bolting can be used.

Landslides can be stabilized by several methods-engineering or bioengineering measures alone or a combination of these. The cost required for implementation of various measures has already been incorporated in the overall budget earmarked for construction of roads.

In hilly terrain, road construction often generates significant quantity of wastes (muck) due to the stripping of the rocks to make way for the roads. The stripped muck is generally cleared by dumping the material along the slopes. These dumped material finally flow down to the valleys and ultimately finds its way to the river. However, it is recommended to adopt a more systematic approach. The stripped material should be collected and dumped in the designated muck disposal area, which will have retaining wall to prevent the muck to flow down into the river. After disposal operation is complete at the dumpsite, the dump yard should be contoured and vegetated.

The various aspects to be considered while making the project roads are briefly described in the following paragraphs.

**Construction**

- Area for clearing and grubbing shall be kept minimum subject to the technical requirements of the road. The clearing area shall be properly demarcated to save desirable trees and shrubs and to keep tree cutting to the minimum.
- Where erosion is likely to be a problem, clearing and grubbing operations shall be so scheduled and performed that grading operations and permanent erosion control of features can follow immediately thereafter, if the project conditions permit; otherwise temporary erosion control measures shall be provided between successive construction stages. Under no circumstances, however, should very

large surface area of erodible earth material be exposed at any one time by clearing and grubbing.

- The method of balanced cut and fill formation shall be adopted to avoid large difference in cut and fill quantities.
- The cut slopes shall be suitably protected by breast walls, provision of flat stable slopes, construction of catch water and intercepting drains, treatment of slopes and unstable areas above and underneath the road, etc.
- Where rock blasting is involved, controlled blasting techniques shall be adopted to avoid over-shattering of hill faces.
- Excavated material should not be thrown haphazardly but dumped duly dressed up in a suitable form at appropriate places where it cannot get easily washed away by rain, and such spoil deposits may be duly trapped or provided with some vegetative cover.

**Drainage**

- Drainage of the water from hill slopes and road surface is very important. All artificial drains shall be linked with the existing natural drainage system.
- Surface drains shall have gentle slopes. Where falls in levels are to be negotiated, check dams with silting basins shall be constructed and that soil is not eroded and carried away by high velocity flows.
- Location and alignment of culverts should also be so chosen as to avoid severe erosion at outlets and siltation at inlets.

**Grassing and Planting**

- Tree felling for road construction/works should be kept bare minimum and strict control must be exercised in consultation with the Forest Department. Equivalent amount of new trees should be planted as integral part of the project within the

available land and if necessary, separate additional land may be acquired for this purpose.

- Depending on the availability of land and other resources, afforestation of roadside land should be carried out to a sufficient distance on either side of the road.

## 8.4 BUDGET

An amount of **Rs. 8.84 million** has been earmarked for implementation of measures to mitigate adverse impacts due to construction of roads. The details are given in Table-8.2.

**TABLE-8.2**

**Details of expenditure for implementation of measures for management of Impacts due to construction of roads**

| S. No. | Item | Cost (Rs. million) |
|---|---|---|
| 1. | Clearing and grubbing @ Rs.0.05 million/km for 19.5 km | 0.98 |
| 2. | Provision of breast walls, construction of catch water and interceptor drains @ Rs.0.30 million/km for 19.5 km | 5.90 |
| 3. | Provision of drainage system along roads @ Rs.0.05 million/km for 19.7 km | 0.98 |
| 4. | Roadside plantation, Jute matting etc. @ Rs.0.05 million/km for 19.5 km | 0.98 |
| | **Total** | **8.84** |

# CHAPTER-9

# GREENBELT DEVLOPMENT PLAN

## 9.1 INTRODUCTION

The greenbelt development plan aims to overall improvement in the environmental conditions of the region. The plan with a five-fold objective addresses issues such as prevention of land degradation due to activities during construction phase; enhancing the forest cover for increasing the biodiversity of the region; providing aesthetic value to the project area and consequently inviting a proportionate tourist flux; enhancing the ecological equilibrium of the area; and to a large proportion in combating soil erosion. Although the forest loss due to reservoir submergence and other project appurtenances have been compensated as a part of compensatory afforestation. It is proposed to develop greenbelt around the periphery of various project appurtenances, selected stretches along reservoir periphery.

## 9.2 NEED FOR GREENBELT DEVELOPMENT PLAN

The green belt on either side of the reservoir will reduce the sedimentation and ensure protection of the reservoir area from any other human activity that could result in the reservoir catchment damage. The forest stands of conifers and mixed broad leaf on the steep slopes of both the banks will be treated as the natural green belt around that part of the reservoir. On moderately steep slopes tree species will be planted for the creation of green belt which are indigenous, economically important, soil binding in nature and an thrive well under high humidity and flood conditions.

## 9.3 SCHEME FOR GREENBELT DEVELOPMENT

The scheme of plantation around the reservoir is given as follows:

i) The green belt will start from the immediate vicinity of the reservoir rim on both the banks, up to the tail of the reservoir moderately steep slopes are available for plantation.

ii) The width of the green belt will be around 50 m or as physiographic and land features allow. There would be at least 2-3 layers of plantation. The plantation will start along 1755 m contour level and would go up to 1795 m contour level from the barrage axis up to the tail of the river.

iii) The row of tree species nearest the rim will constitute water loving species, preferably *Alnus nitida*, *Salix* spp., *Populus* spp. These species will thrive very well at these altitudes.

iv) Towards higher altitudes of the reservoir the rows around the reservoir may include *Aesculus indica*, *Populus ciliata*, in addition to *Salix* spp.

v) The middle rows of the green belt will comprise species like *Juglans regia*, *Acer pictum, Celtis tetrandra*.

*vi)* The outermost layer of the green belt will constitute of hardly tree species and shrub by mix to withstand any external influences/pressures of grazing, browsing by cattle and sheep, etc. The species best suited for this layer at lower altitudes are *Prunus cornuta, Rhododendron aroboreum, Pinus wallichiana, Abies pindrow* and towards higher reaches the outer layers will comprise *Quercus dilatata*, *Acer caesium, Lyonia ovalifolia, Viburnum cotonifolium, Ulmus wallichiana and Aesculus indica.*

vii) The green belt will be put under a protective regulatory framework to ensure that it is not degraded or disturbed. No ecologically disruptive activity will be allowed in this zone.

## 9.3 BUDGET

The plantations would be carried out on an approximate area of 40 ha. This work would be completed in two years at an estimated cost of **Rs.4.0 million** at the rate of Rs.100,000/- per ha which includes the cost of nursery creation, advance works, actual plantations and maintenance. The plantation for this purpose will be carried out by Forest Department.

# CHAPTER-10

# CONTROLOF AIR POLLTION

## 10.1 IMPACTS ON AIR QUALITY

In a water resources project, air pollution occurs mainly during project construction phase. The major sources of air pollution during construction phase are:

- Fuel combustion in various construction equipment, e.g. crushers, drillers, rock bolters, diesel generating vehicles, etc.
- Fugitive emissions from crusher
- Impacts due to vehicular movement

### a) Pollution due to fuel combustion in various equipment

The operation of various construction equipment requires of combustion of fuel. Normally, diesel is used in such equipment. The major pollutant, which gets emitted as a result of diesel combustion, is $SO_2$. The SPM emissions are minimal due to low ash content. Based on past experience in similar projects, SPM and $SO_2$ are not expected to increase significantly. Thus, in the proposed project, no significant impact on ambient air quality is expected as a result of operation of various construction equipment.

### b) Emissions from various crushers

The operation of the crusher during the construction phase is likely to generate fugitive emissions, which can move even up to 1 km in predominant wind direction. During construction phase, one crusher each is likely to be commissioned at the barrage and powerhouse sites. During crushing operations, fugitive emissions comprising of the suspended particulate will be generated. There could be marginal impacts to settlements close to the sites at which crushers are commissioned. However, based on past experience, adverse impacts on this account are not anticipated. However, during finalizing the project layout, it should be ensured that the labour camps, colonies, etc. are located on the leeward side and outside the impact zone (about 1.5 to 2 km) of the crushers.

**c) Impacts due to vehicular movement**

During construction phase, there will be increased vehicular movement for transportation of various construction materials to the project site. Large quantity of dust is likely to be entrained due to the movement of trucks and other heavy vehicles. However, such ground level emissions do not travel for long distances. Thus, no major adverse impacts are anticipated on this account.

## 10.2 MITIGATION MEASURES

**a) Control of Emissions**

Minor air quality impacts will be caused by emissions from construction vehicles, equipment and DG sets, and emissions from transportation traffic. Frequent truck trips will be required during the construction period for removal of excavated material and delivery of select concrete and other equipment and materials. The following measures are recommended to control air pollution:

- The contractor will be responsible for maintaining properly functioning construction equipment to minimize exhaust.
- Construction equipment and vehicles will be turned off when not used for extended periods of time.
- Unnecessary idling of construction vehicles to be prohibited.
- Effective traffic management to be undertaken to avoid significant delays in and around the project area.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

**b) Air Pollution control due to DG sets**

The Central Pollution Control Board (CPCB) has issued emission limits for generators upto 800 KW. The same are outlined in Table-10.1, and are recommended to be followed.

**TABLE-10.1**

**Emission limits for DG sets prescribed by CPCB**

| Parameter | Emission limits (gm/kwhr) |
|---|---|
| NOx | 9.2 |
| HC | 1.3 |
| CO | 2.5 |
| PM | 0.3 |
| Smoke limit* | 0.7 |

Note : * Light absorption coefficient at full load ($m^{-1}$)

The above standards needs to followed by the contractor operating the DG sets.

**c) Dust Control**

The project authorities will work closely with representatives from the community living in the vicinity of project area to identify areas of concern and to mitigate dust-related impacts effectively (e.g., through direct meetings, utilization of construction management and inspection program, and/or through the complaint response program). To minimize issues related to the generation of dust during the construction phase of the project, the following measures have been identified:

- Identification of construction limits (minimal area required for construction activities).
- When practical, excavated spoils will be removed as the contractor proceeds along the length of the activity.
- When necessary, stockpiling of excavated material will be covered or staged offsite location with muck being delivered as needed during the course of construction.

- Excessive soil on paved areas will be sprayed (wet) and/or swept and unpaved areas will be sprayed and/or mulched. The use of petroleum products or similar products for such activities will be strictly prohibited.
- Contractors will be required to cover stockpiled soils and trucks hauling soil, sand, and other loose materials (or require trucks to maintain at least two feet of freeboard).
- Contractor shall ensure that there is effective traffic management at site. The number of trucks/vehicles to move at various construction sites to be fixed.
- Dust sweeping - The construction area and vicinity (access roads, and working areas) shall be swept with water sweepers on a daily basis or as necessary to ensure there is no visible dust.

## 10.3 IMPLEMENTING AGENCY

Various management measures needs to be implemented for Control of air pollution control need to be included in the Tender Document for the Contractor involved in construction activities. The same shall be monitored on a regular basis by the project proponents.

# CHAPTER-11

# MEASURES FOR NOISE CONTROL

## 11.1 IMPACTS ON NOISE LEVELS

In a water resource projects, the impacts on ambient noise levels are expected only during the project construction phase, due to earth moving machinery, etc. Likewise, noise due to quarrying, blasting, vehicular movement will have some adverse impact on the ambient noise levels in the area.

## 11.2 MITIGATION MEASURES

The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. The construction equipment will be required to use available noise suppression devices and properly maintained mufflers.

- vehicles to be equipped with mufflers recommended by the vehicle manufacturer.
- staging of construction equipment and unnecessary idling of equipment within noise sensitive areas to be avoided whenever possible.
- use of temporary sound fences or barriers to be evaluated.
- notification will be given to residents within 300 feet of major noise generating activities. The notification will describe the noise abatement measures that will be implemented.
- monitoring of noise levels will be conducted during the construction phase of the project. In case of exceeding of pre-determined acceptable noise levels by the machinery will require the contractor(s) to stop work and remedy the situation prior to continuing construction.

The following Noise Standards for DG sets are recommended for the running of DG sets during the construction:

- The maximum permissible sound pressure level for new diesel generator sets with rated capacity upto 1000 KVA shall be 75 dB(A) at 1 m from the enclosure surface.
- Noise from the DG set should be controlled by providing an acoustic enclosure or by treating the enclosure acoustically.
- The Acoustic Enclosure should be made of CRCA sheets of appropriate thickness and structural/ sheet metal base. The walls of the enclosure should be insulated with fire retardant foam so as to comply with the 75 dB(A) at 1m sound levels specified by CPCB, Ministry of Environment & Forests.
- The acoustic enclosure/acoustic treatment of the room should be designed for minimum 25 dB(A) Insertion Loss or for meeting the ambient noise standards, whichever is on the higher side.
- The DG set should also be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).
- Proper efforts to be made to bring down the noise levels due to the DG set, outside its premises, within the ambient noise requirements by proper siting and control measures.
- A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

**Noise due to crushers**

Based on literature review, noise generated by crushers is in the range of 79-80 dB(A) at a distance of 250 ft or 80 m from the crusher. Thus, noise level at a

distance of 2 m from the crusher shall be of the order of 110 dB(A). The exposure to labour operating in such high noise areas shall be restricted upto 30 minutes on a daily basis. Alternatively the workers need to be provided with ear muffs or plugs, so as to attenuate the noise level near the crusher by atleast 15 dB(A). The exposure to noise level in such a scenario is limited upto 4 hours per day.

It is known that continuous exposure to noise levels above 90 dB(A) affects the hearing of the workers/operators and hence has to be avoided. Other physiological and psychological effects have also been reported in literature, but the effect on hearing acuity has been specially stressed. To prevent these effects, it has been recommended by international specialist organizations that the exposure period of affected persons be limited as specified in Table-11.1.

**TABLE-11.1**

**Maximum Exposure Periods specified by OSHA**

| Maximum equivalent continuous noise level dB(A) | Unprotected exposure period per day for 8 hrs/day and 5 days/week |
|---|---|
| 90 | 8 |
| 95 | 4 |
| 100 | 2 |
| 105 | 1 |
| 110 | 1/2 |
| 115 | 1/4 |
| 120 | No exposure permitted at or above this level |

# CHAPTER-12

# WATER POLLUTION CONTROL

## 12.1 CONTROL OF WATER POLLUTION DURING CONSTRUCTION PHASE

During project construction phase, sufficient measures need to be implemented to ameliorate the problem of water pollution from various sources. The sewage generated from various labour camps is proposed to be treated in an oxidation ditch, prior to its disposal. However, efforts shall be made to discharge the treated effluent only in these water bodies, which are not used for meeting domestic water requirements.

The construction activities would require a crusher to crush large lumps of rocks to the requisite size for coarse as well as fine aggregates. The effluent generated from these crushers will have high-suspended solids. The effluent needs to be treated before disposal. Settling tanks of appropriate size for treatment of effluent from various crushers should be provided.

During tunneling work the ground water flows into the tunnel along with construction water, which is used for various works like drilling, shortcreting, etc. The effluent thus generated in the tunnel contains high suspended solids. Normally, water is collected in the side drains and drained off into the nearest water body without treatment. It is recommended to construct a settling tank of adequate size to settle the suspended impurities. It is expected that about 2 to 3 adits shall be required for the tunneling work. Thus, effluents are expected to be generated from 2 to 3 locations. The sludge from the various settling tanks can be collected once in 15 days and disposed at the site designed for disposal of municipal solid wastes from the labour camps. The sludge after drying could also be used as cover material for landfill disposal site. An amount of **Rs.2.0 million** needs to be earmarked for construction of various settling tanks.

## 12.2 CONTROL OF WATER POLLUTION DURING OPERATION PHASE

In the project operation phase, a plant colony with 30 quarters is likely to be set up. It is recommended to provide a suitable Sewage Treatment Plant (STP) to treat the sewage generated from the colony. The cost required for construction of sewage STP in the project colony has already been covered in the budget earmarked for construction of the project colony. Hence, the cost for the same has not been included in the cost estimated for implementation of various measures outlined in the Environmental Management Plan.

# CHAPTER-13

# RESETTLEMENT AND REHABILITATION PLAN

## 13.1 INTRODUCTION

The Resettlement and Rehabilitation Plan for the Project Affected Families of the proposed Sainj hydro-electric project has been prepared in line with the provisions and/or guidelines as given in **Resettlement and Rehabilitation Scheme for the Project Affected Families of Sainj Hydroelectric Project**, which has been prepared by the Himachal Pradesh Power Corporation Limited. This has been prepared by taking into consideration the R&R Policy notified by Government of Himachal Pradesh vide notification No. Rev (PD) F (5) – l/1999 dated 27-04-06, the National Rehabilitation and Resettlement Policy 2007 and the National Hydro Policy 2008.

## 13.2 AFFECTED PROPERTIES, LAND AND FAMILIES

There are 5 village panchayats from where private land and forest land is proposed to be acquired for the proposed Sainj hydro-electric project namely

- Panchayat Gada parli
- Panchayat Shainshar
- Panchayat Deori Dhar
- Panchayat Suchen
- Panchayat Shangar (kothi Shangar).

A total of about 56.763 ha of land proposed to be acquired. Of this, about 8.770 ha is private land (un-irrigated land), while about 47.993 ha is forest land. The overall quantum of land to be acquired for various project appurtenances is given in Table – 13.1.

**TABLE – 13.1**
**Details of land required for acquisition**

| Description | Area (ha) |
|---|---|
| Agricultural land<br>➢ Irrigated land<br>➢ Un-irrigated land | <br>-<br>8.770 |
| Homestead | - |
| Forest Land | 47.993 |
| **Total** | **56.763** |

**Note**: Of the total of 47.993 ha of forest land to be acquired, 41.94 ha is actual forest land, while 6.053 ha is underground forest land

It is observed that about 8.77 ha of private land is proposed to be acquired from 3 revenue Fati, namely, Fati Suchen Kothi Vanogi, Fati Shainshar Kothi Shainshar and Fati Gara Parli Kothi Shainshar. It is observed that about 206 project affected families (PAFs) are likely to lose land (agricultural and/or homestead) in varying proportions. The village-wise details of PAPs in the project affected villages are depicted in Table 13.2.

**TABLE – 13.2**

**Village-wise details of project affected families**

| Village Name | Families losing only land | Families losing only homestead | Families losing both land and homestead | Total |
|---|---|---|---|---|
| Fati Suchen Kothi Vanogi | 1 | 0 | 1 | 2 |
| Fati Shainshar Kothi Shainshar | 75 | 0 | 54 | 129 |
| Fati Gada Parli Kothi Shainshar | 59 | 0 | 16 | 75 |
| **Total** | **135** | **0** | **71** | **206** |

It is also observed from Table-13.2, that a total of 206 PAFs are likely to lose their lands (agricultural/non-agricultural/homestead) in varying proportions. Refer to Annexure–II which has been compiled to depict the khasra wise land to be acquired and balance left with the PAF. Also refer to Annexure–III which depicts the total land and proportion owned, acquired, balance left with PAFs.

Further, it was observed during field studies that many PAFs were losing their homesteads. It was found that many of the homesteads/sheds were either newly constructed or under construction; on the khasras (plots) which are proposed to be acquired (refer Annexure–IV). It was also observed that many of the homestead owners are non-residents of the affected villages and have purchased plots in the project affected villages on which they have constructed homesteads/sheds. Further, there are some homesteads which have been in existence before the project was proposed; on the khasras (plots) which are proposed to be acquired.

## 13.3 PAYMENT OF COMPENSATION

The project affected families losing land and/or homesteads plots will be compensated by the project authority in line and within the provisions of the Land Acquisition Act, 1894. As per Table 13.2 there are 206 PAFs who are likely to lose land in varying proportions. They will be entitled for compensation of their acquired lands within the provisions of the Land Acquisition Act. In addition, PAPs/ PAFs that lose their homesteads will also receive compensation of homesteads being acquired, based on assessment and evaluation (based on age of building, material used for construction, etc.) carried-out by an agency deputed for this purpose. Further other properties, such as fruit bearing and timber trees will be assessed and compensation amount will be due to the respective PAFs. Compensation will also be paid to the various public utility buildings, structures, spaces, etc., which will be given to the concerned departments/ agencies.

## 13.4 RESETTLEMENT AND REHABILITITON PLAN

Over and above the compensation received for acquired properties, the project affected families will be entitled for Resettlement and Rehabilitation benefits, as per

the Resettlement and Rehabilitation Scheme for Project Affected Families of Sainj Hydro Electric Project, prepared by the Himachal Pradesh Power Corporation, taking into consideration the R&R Policy notified by Government of Himachal Pradesh vide notification No. Rev/(PD)F(5)-1/1999 dated 27-04-06, the National Rehabilitation and Resettlement Policy 2007 and the National Hydro Policy 2008.

The objectives of the Resettlement and Rehabilitation Scheme for Project Affected Families of Sainj Hydro Electric Project are to:-

(1). compensate the families affected adversely by construction of the project

(2). improve the quality of life of the people of the area through better infrastructure, sustainable income and better skills and generally contribute to and be a part of the development of the area and the people.

(3). create a good will for the organization and have a good long term relationship.

(4). ensure that rights of individual and society particularly those belonging to the weaker section of the society are adequately protected.

The R&R benefits extended to the PAFs is outlined in Table 13.3. This table reflects the provisions for R&R on the one hand and describes the benefits extended to the PAFs along-with details and costing in its corresponding column.

## TABLE 13.3

### Provisions for R&R under the Sainj R&R Scheme and the actual benefits extended to PAFs.

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| 4. | **Resettlement Grant.** | |
| | The PAF rendered landless on account of acquisition of land shall be eligible for landless grant in the following manner. | In all there are 206 PAFs which are losing their lands in varying proportions. Among these PAFs, 35 are not rendered landless after acquisition. About 35, 118 and 18 PAFs fall within Category-(ii), (iii) and (iv) respectively of this sub-section of the R&R Scheme. Further, there are about 71 PAFs who would be rendered "House Less" after acquisition. |
| (i) | Family whose land before acquisition was more than 5 bighas and is left with one biswa or no agriculture land after acquisition, Rs. 2.50 lac lump sum. | No PAFs falling within this category to be eligible for resettlement grant. |
| (ii) | Family whose land before acquisition was less than five bighas and is left with one biswa or no agriculture land after acquisition, Rs. 1.50 lac lump sum. | There are about 35 PAFs that fall within this category. As per the R&R Plan for Sainj Hydro electric Project, these PAFs would be entitled for a financial assistance of Rs. 1.5 lakhs. Thus, a provision of **Rs. 5.25 million** (Rs. 1.5 lakhs x 35 PAFs x $10^{-1}$) needs to be ear-marked. |
| (iii) | Family whose land holding is left with more than one biswa and less than 2-10-0 bighas of land after | As per our assessment, there are about 118 PAFs whose land holding is left with more than one biswa and less |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | acquisition, Rs. 1.00 lac lump sum. | than 2-10-0 bighas of land after acquisition. These PAFs, as per the policy measures would be entitled for a financial assistance of Rs. 1.00 lakh lump sum. Thus, a provision of **Rs. 11.80 million** (Rs. 1.0 lakh x 18 PAFs x $10^{-1}$) needs to be ear-marked. |
| (iv) | Family whose land holding is left with more than 2-10-0 and less than five bighas of land after acquisition, Rs. 75,000/- lump sum. | There are about 18 PAFs who would be left with more than 2-10-0, but less than five bighas of their land holding after acquisition. These PAFs would have to be paid a financial assistance @ Rs. 75,000/- lump sum. Thus, an amount of **Rs. 1.35 million** (Rs. 75,000 x 18 PAFs X $10^{-1}$) needs to be earmarked. |
| (v) | Family whose cattle shed is acquired in the project area, shall get one time financial assistance of Rs. 10,000/-. In no case the grant shall exceed Rs. 25,000/- per family. | It is observed that all families own and rear cattle. Thus, each displaced family shall be extended financial assistance for acquisition of cattle-shed. Thus, a provision of **Rs. 1.775 million** (Rs. 25000 x 71 PAFs rendered houseless) is being kept for this purpose. |
| 4.2 | Each PAF rendered landless as well as houseless (both) or houseless will be provided an independent house with a built up plinth area of 150 Sqm. Alternatively, PAF can also be offered a plot of size 250 Sqm. which allows construction of built up house of 150 Sqm. plinth area plus construction cost of the house @ | As per our assessment, there are about 171 PAFs being rendered landless. Also there are about 71 PAFs that are being rendered houseless. All these 71 PAFs are included within the PAFs that are rendered landless. Thus in all there are about 71 PAFs being rendered landless and houseless. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | Rs. 4000 per Sqm. (limited to 150 Sqm. plinth area).<br><br>A family which does not opt for house/plot but constructs a house at own cost with a plinth area of 150 Sqm or more shall be paid the construction cost of the house @ of Rs. 5000 per Sqm (upto a plinth area of 150 Sqm maximum). Options from such families will be asked at an appropriate time. In case any of such family constructs house of less than 150 Sqm. Plinth area on his own plot or plot offered by the Project then amount to be given will be worked out on pro-rata basis. | Thus, each PAF rendered landless as well as houseless (both) or houseless will be provided an independent house with a built up plinth area of 150 Sqm. Alternatively, the PAFs could also be allotted a plot of size 250 Sqm which allows construction of house with built-up area of 150 Sqm. plinth area.<br><br>**(A) Area/ Land required for resettlement colony**<br>It is hereby recommended that each PAF is allotted a housing plot of 250 sqm. Thus, an area of about 17750 sqm/ 1.775 ha (250 sqm x 71 PAFs) of land would be required. In addition about 50% of this area (amounting to 0.888 ha) would be required for providing civic amenities and infrastructure facilities in the resettlement colony. **Thus, a total area of about 2.6625 ha (say 2.7 ha) of land would be required for the resettlement site.**<br><br>The land for the resettlement site would have to be identified by the project developer in consultation with the district administration. It would be highly preferred that this land be located very near the present place of residence of the PAFs, so that socio-cultural relations and social harmony amongst the shifted families are not disturbed. The cost of procuring the land for resettlement |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | would be decided by the district administration.<br><br>**(B) House building assistance**<br>In addition to allotting housing plots to the PAFs, it is also recommended that the PAFs be given housing building assistance. A financial assistance for house building @ Rs. 5000 per Sqm (upto a plinth area of 150 Sqm maximum) is being suggested for the PAFs. Thus, an amount of **Rs. 53.25 million** (Rs. 5000/sqm x 150 sqm plith area x 71 PAFs x $10^{-6}$) is being made for providing house building assistance to the PAFs.<br><br>In case any of such family constructs house of less than 150 Sqm Plinth area on his own plot or plot offered by the Project then amount to be given will be worked out on pro-rata basis.<br><br>Families which do not opt for house/plot but constructs a house at own cost with a plinth area of 150 Sqm or more shall be paid the construction cost of the house @ of Rs. 5000 per Sqm. At present the number of such families is not known. |
| 4.3 | Displaced shopkeepers will be given shops in allotment in the market complex of the Project Township wherever | As per our socio-economic survey, it is observed that there are 02 individuals that are engaged in business as |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | the Project constructs such market places. In addition, they will be entitled to one time displacement grant of Rs. 20,000/-. The commercial premises/ shops allotted to such displaced shopkeepers shall be utilized by them or their successors in interest for bonafide use only. In case the project is unable to provide shops, displaced shopkeepers shall get financial assistance of Rs. 2,00,000/- cash. | shopkeepers.<br><br>The project developer would allot these displaced shopkeepers with a shop in the market complex, wherever the Project constructs such market places.<br><br>In addition, they will also be entitled to one time displacement grant of Rs. 20,000/-. Thus, a provision of **Rs. 0.04 million** (Rs. 20,000 x 2 PAPs) is being made for this purpose.<br><br>In case the project developer is unable to provide shops, the displaced shopkeepers shall get a financial assistance of Rs. 2,00,000/- cash. Thus a provision of **Rs. 0.40 million** (200,000 x 2 PAPs) needs to be kept for this purpose. |
| 4.4 | Infrastructure facilities in the Rehabilitation colony will include water supply, sewage, drainage, electricity, streets community centre, green area, park and approach path/roads at the project cost. | In addition to the aforesaid resettlement benefits, the displaced families shall be provided the basic amenities and infrastructure facilities at the resettlement site. The Sainj R&R Scheme only makes mention of certain infrastructure facilities to be provided in the resettlement colony. However, it does not give details/ specifications/ quantities of these facilities. The consultant has prepared the details/ quantities of these civic amenities and |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | infrastructure facilities based on experience and population/ families to be served.<br>1. The new resettlement site would be connected to the main motor-able road by **Water Bound Macadam Approach Road and internal village roads**. The cost for construction of the approach road would be about Rs. 500,000 per km. A provision for a distance of about 5 km is being kept for this purpose. Thus an amount of **Rs. 2.50 million** (lumpsum) can be earmarked for laying WBM approach road and internal village roads at the resettlement site.<br>2. **Power supply** needs to be provided within the resettlement site/ colony to the resettled households. In all there are 71 households that would be resettled in the resettlement colony. Free power supply of about 100 units per month for a period of 10 years from the date of commissioning of the project will be given to each of the resettled PAFs. As per the Sainj R&R Policy, if the electricity consumption by the PAF is less than this, then the difference will be compensated in cash.<br>3. **Piped water supply** for drinking purpose. This could be provided by harnessing the natural sources of water and constructing storage tanks. These community tanks could then be connected with |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | pipeline, community taps. The approximate cost for storage tanks, laying the PVC pipeline for distribution, works out to approximately Rs. 10,000 per household (including cost of PVC pipe, excavation, sluice walks, labour etc.). The water could then be brought to the village through a pipeline. Thus the cost for providing water supply is about **Rs. 2.06 million.**<br>4. **Sanitation facility** needs to be provided at the resettlement site. Although most of the villagers are not in the habit of using lavatory facilities presently, it is felt when these PAFs move to the new relocation sites, they may have to live in compact settlements. It therefore becomes essential to provide lavatory facilities for them. It is suggested to provide about 12 Nos. of community lavatories with septic tanks and absorption trenches at the resettlement site. An amount of **Rs. 0.41 million** can be earmarked for commissioning of sewage treatment facilities. The details are given in Table. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|

**Table**
**Cost estimate for sanitary facilities in the resettlement site**

| S. No. | Works | Unit rate (Rs) | No. | M |
|---|---|---|---|---|
| 1 | Community Lavatories @ 1 per 20 persons | 40,000 | 4 | |
| 2 | Septic tank and absorption trenches including pipeline upto the point of disposal | 250,000 | 1 | |
| **Total** | | | | |

5. **Higher Secondary School with playground**. About 1500 sq.m of land would be required for construction of higher secondary school building (800 $m^2$) with play ground (700 $m^2$). The school building should have at least 20 rooms (size 40$m^2$ including room,

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | common areas, etc), which would include primary section as well. Land for school is to be provided by the Project Authority, in consultation with local government/ administration. Necessary electrical fitting for the bulb/tube-light, Fan are also proposed in each room. The cost of construction of the school is approximately **Rs. 3.00 million** (Rs. 2.40 million + Rs. 0.60 million lump-sum for water supply and electrification). In case a higher secondary school already exists in the vicinity of the project area, this amount may be used to augment the existing infrastructure facilities of the school.<br>6. A **Community hall** is to be constructed at the Resettlement site for which an area of 100 sq.m can be earmarked. The cost of construction shall be about Rs. 3000/$m^2$. Thus the total cost for construction of Community building would be **Rs. 0.30 million**. In case a community center already exists in the vicinity of the project area, this amount may be used to augment the existing infrastructure facilities of the community center.<br>7. A **Panchayat building** is to be constructed at the resettlement site for which an area of 50 sq.m can be earmarked. The cost of construction shall be about Rs. 3000/$m^2$. Thus, the cost of constructing one |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | panchayat building shall be **Rs. 0.15 million**.<br>8. **Place of worship** is to be constructed at the resettlement site. A lump-sum provision of **Rs. 0.50 million** has been earmarked.<br>9. A **Post-office building** is to be constructed in the resettlement site for which an area of 40 sq.m can be earmarked. The cost of construction shall be about Rs. 3000/$m^2$. Thus, the cost of constructing one post office shall be **Rs. 0.12 million**.<br>10. A **fair price shop** is to be constructed in the resettlement site for which an area of 30 sq.m can be earmarked. The cost of construction shall be about Rs. 3000/$m^2$. Thus, the cost of constructing one post office shall be **Rs. 0.09 million**.<br>11. Space for **market** would be required in the resettlement site, for which an area of 200 sq.m can be earmarked. The project authority, in consultation with the District Collector would provide the land required for market purpose.<br>12. Space for **Park and Play-ground** would be required in the resettlement site, for which an area of 1000 sq.m can be earmarked. The project authority, in consultation with the District Collector would provide the land required for Park and Play ground purpose. The cost for leveling and development would be |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | about Rs. 100 / $m^2$. The total cost would be **Rs. 0.10 million**.<br>13. A **Primary Health Center,** with 5 beds is to be constructed in the resettlement site for which an area of 1500 sq.m can be earmarked. The built area of the PHC building, including residential complex (for 1 doctor, 2 nurses, 2 multipurpose health workers and 2 attendants) would be about 600 $m^2$. The cost of construction shall be about Rs. 3000/$m^2$. Thus, the cost of constructing one PHC building, including residential complex shall be Rs.1.80 million. Other infrastructure facilities, such as bed, furniture, equipment, one ambulance, etc., would cost Rs. 1.00 million. Thus the total cost required for establishing a PHC in the resettlement colony would be **Rs. 2.80 million**. This cost has to be borne by the project authority.<br><br>The recurring cost towards salaries of PHC staff and expenses on drugs and medicines and other running cost of the hospital shall be borne by the district administration.<br><br>The facilities suggested as a part of the Resettlement package should be made available not only to the |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | resettled households but also to the remaining villagers (affected families) in the study area and its vicinity. |
| 4.5 | Transportation at the project cost will be provided for physical movement of all the PAFs, and displaced shopkeepers and their house hold goods/ shop goods, as soon as the houses/shop get constructed in the Rehabilitation colony or a sum of Rs. 20,000/- in lump sum shall be paid, for which option will be invited from the affected families/ shopkeepers. | Transportation for physical movement of all the PAFs (including shop keepers) and their household goods/shop goods, would be provided to all families rendered landless and/or houseless families by the project developer, at the project cost, as soon as the houses/shop get constructed in the Rehabilitation colony.<br><br>Alternatively, a sum of Rs. 20,000/- in lump-sum could be paid to each family rendered landless and/or houseless, for which option will be invited from the affected families/ shopkeepers. In this case, an amount of **Rs. 1.42 million** (Rs. 20,000/PAF x 71 PAFs x $10^{-6}$) may be kept for this purpose. |
| 4.6 | Stamp duty and other fees payable for registration shall be borne by the Project Authority. Rehabilitation grant shall be provided by the Project Authorities and placed at the disposal of the Deputy Commissioner, Kullu for disbursement to the eligible PAF's. | Stamp duty and other fees payable for registration of house plot shall be borne by the Project Authority.<br><br>The Rehabilitation grant shall be provided by the Project Authorities and placed at the disposal of the Deputy Commissioner, Kullu for disbursement to the eligible PAF's. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| 4.7 | Transitional/ Subsistence Allowance based on 25x12 days minimum wages to each Project Affected Family will be paid if the family has become houseless and has to shift house or become landless and has to shift livelihood to a different location or change livelihood or has been involuntarily displaced. | As mentioned earlier, there are 71 families being rendered landless and/or houseless. A provision of **Rs. 2.13 million** (25 x 12 days minimum wages x 71 PAFs x Rs. 100 minimum wages x $10^{-6}$) is being kept for providing Transitional/ Subsistence Allowance. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| 4.8 | Whereas it is not possible to provide land in exchange of land acquired but in case some agricultural land is available for distribution, upto 5 bighas land will be given to each PAF by giving priority to landless. This land will be given only to such PAF's who are primarily dependent on agriculture and the livelihood is substantially affected by land acquisition. In no case will land to be given in excess of that acquired. Giving of agricultural land will not be a right and will be only a welfare measure to be given only if possible.<br><br>If it is not possible to give land, a financial assistance at the rate of Rs. 50,000/-per bigha of land acquired will be paid as an additional assistance to the project affected family for purchasing land. This assistance will only be given if the Project Affected Family is able to prove that this will be utilized to purchase land of a value more than the money paid to the Project Affected Family under this clause (Clause-4.8).<br><br>If waste land or degraded land is allotted under this clause, then a land development charge of Rs. 15,000/- per bigha will be paid. The PAF's who are allotted land or these who purchase agricultural land will also get Rs.10,000/- cash for agricultural production. | Emphasis will be laid providing "land for land" to all the PAFs. For this purpose, the project developer in consultation with the district administration will identify agricultural lands, cultivable waste lands, government lands, etc., in the vicinity of the proposed project area to be allotted to the PAFs. Thus, the project developer would have to identify about **855 bigha** (1 bigha = 809.288704 sqm as per "The Himachal Pradesh Land Records Manual" conversion factor in district Kullu) **or 69.19 ha** (171 PAFs x 5 bigha) for allotment to PAFs under "land for land" option.<br><br>As per our experience, it is observed that alternative land (agricultural lands, cultivable waste lands, government lands, etc.) is seldom available for allotment to PAFs. Thus, "Cash in-lieu of Land" will be the most appropriate option. It is further observed that about 8.77 ha of private land would be acquired for the project. Thus, a provision of about **Rs. 5.42 million** (8.77 ha/ 108.37 bigha x 50,000/bigha) needs to be made as additional assistance to PAFs for purchasing land.<br><br>In case alternative land (waste land or degraded land) is allotted to the PAFs under "land for land" option, land development charge of Rs. 15,000/- per bigha will be |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | paid. Thus a provision of **Rs. 1.625 million** (108.37 bigha x Rs. 15,000) needs to be made for land development cost.<br><br>Besides, an amount of **Rs. 2.42 million** (Rs. 10000 x 242 PAFs x $10^{-6}$) needs to be earmarked for providing financial assistance for agricultural production. |
| 4.9 | Each PAF which is displaced and has Cattle will be given Rs.20,000/- for construction of cattle shed. | It is observed that all families own and rear cattle. In all there are about 71 PAFs which would be rendered houseless. Thus, each displaced family shall be extended financial assistance for construction of cattle-shed. Thus, |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | a provision of **Rs. 1.42 million** (Rs. 20,000 x 71 PAFs rendered houseless) is being kept for this purpose. |
| 4.10 | Each PAF who is a artisan, small trader or self employed person and has been displaced shall get a one time financial assistance of Rs.50,000/- for construction of working shed or shop. | It is observed as per our socio-economic survey that there are about 3 individuals who are engaged as artisans and handicraft. An amount of **Rs. 0.10 million** may be earmarked for construction of working shed or shop for such PAPs. |
| 4.11 | The families who have to shift house due to the project will be provided temporary accommodation at project cost for 3 to 6 months depending on their need.<br>**NOTE:** All the above grants shall be in addition to the compensation paid under Land Acquisition Act, 1894. | Will be complied as per Policy guidelines. |
| 5. | **Employment** | |
| 5.1 | One member of each Project Affected Family rendered landless will be provided employment by the Project Authority in the category of skilled/ semiskilled/ unskilled workmen subject to fulfilling the requisite criteria/qualification and as and when any fresh recruitment is done in these categories, it would be ensured that land oustees eligible for employment as mentioned above are given chance first and normal recruitment would be made only if none are eligible & | As mentioned earlier, there are about 171 PAFs that would be rendered landless. Thus, it is suggested to give one person from each PAFs employment under the category of skilled/ semiskilled/ unskilled workmen subject to fulfilling the requisite criteria/qualification and as and when any fresh recruitment is done in these categories.<br><br>It would be ensured that land oustees eligible for |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | willing from amongst them. However, persons who are allotted shops shall not be eligible for benefit of employment and vice versa.<br><br>The following criteria will be adhered to by the Deputy Commissioner concerned for providing of preference while sponsoring the names for employment to the Project Authority.<br><br>i. Affected families whose entire land has been acquired.<br><br>ii. Affected families who have become landless on account of acquisition of land by the project.<br><br>iii. Other affected families.<br><br>Within these categories preference will be given on the basis of quantum of land acquired. Those who lose more land will come first. | employment as mentioned above are given chance first and normal recruitment would be made only if none are eligible & willing from amongst them. However, persons who are allotted shops shall not be eligible for benefit of employment and vice versa. |
| 5.2 | The main PAF who have not been provided employment will be given a special rehabilitation/employment grant equivalent to 1000days of minimum wage for labour per family. | As mentioned in Section 5.1 above, there are 171 PAFs. In case these 171 PAFs have not been provided with employment, a special rehabilitation/ employment grant equivalent to 1000 days of minimum wage for labour per |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | | family will be given.<br><br>Thus as per this provision, an amount of **Rs. 17.10 million** (1000 days minimum wages x 171 PAFs x Rs. 100 minimum wage x $10^{-6}$) needs to be kept for providing employment grant to the PAFs. |
| 5.3 | Annuity Policy will be arranged for each vulnerable PAF (disabled, destitute, orphans, widows, unmarried girls, abandoned women, or persons above fifty years of age; who are not provided or cannot immediately be provided with alternative livelihood and who are not otherwise covered as part of a family) which will provide a pension of Rs. 1000/-PM to the family starting from a date 5 years after the date of implementations of this plan and will continue for 10 years after that date. | As per our socio-economic survey, there are 3 widows, 1 widower, 12 females who are single and more than 18 yrs, 17 females and 30 males who are married and more than 50 yrs of age. In all 63 individuals.<br><br>Annuity Policy could be extended to each of these vulnerable individuals. Thus, as per this R&R scheme, each of these persons can be given a pension of Rs. 1000 per month for a period of 10 years, from the date of implementation of this R&R scheme. Thus, an amount of **Rs. 7.56 million** (Rs. 1000 x 120 month x 63 individuals) can be ear-marked for this purpose. |
| 5.4 | **Secondary Employment** | |
| | There may be families who are not covered under the Project Affected Family, rendered landless/houseless/shop less as given at 5-i, 5-ii, 5-iii and 5.3 above but their land is acquired for the project, | There are about 37 PAFs that would not be rendered landless, albeit their lands would be acquired. These families would also have to be helped in starting some gainful occupation or for getting training. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | they shall have to be helped in starting some gainful occupation for getting training. Therefore, such families who may not be accommodated in direct employment, the Project Authorities will help them in any one of the following manners: | |
| 5.4.1 | Merit scholarship scheme for the wards of Project Affected Families (PAFs) and other residents of project affected zone who may be pursuing vocational or professional course will be introduced by the Project Authorities as per scheme to be drafted by the Project Authority in consultation with Government of Himachal Pradesh. The project authorities will also consider getting some special seats in ITI's for the project affected families and other residents of the project affected zone. Some schemes to provide apprenticeship or on the job training to increase the employability of the residents of the project affected zone will also are started. Merit scholarship scheme for school going students of project affected zone will be started. | It is suggested that all the PAFs be extended this facility. Thus, it is recommended that one ward/ member from each PAF is given this merit scholarship benefit. In addition, about 100 other scholarships may be extended to other families residing in the affected zone. Thus a total of (206 + 100) 306 merit scholarships may be provided. These scholarships could be given for a period of 2 years amounting to about Rs. 500 per month.<br><br>Thus, an amount of **Rs. 3.672 million** (Rs. 500 x 24 months x 306 scholarships/ wards) may be earmarked for this purpose. |
| 5.4.2 | The Project Authorities will also consider award of petty contracts to the cooperatives of eligible families on preferential basis so that some may be engaged in such jobs. Further, the Project Authorities will advise their contractor to engage eligible persons from amongst | There are 02 contractors from among the PAFs as per the socio-economic survey.<br><br>Will be complied as per Sainj R&R Scheme |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | effected families on a preferential basis wherever possible during construction stage. Other employment opportunities like hiring vehicles from PAF's will also be made available. Normally all contracts upto a value of Rs. 5 lakh will be given to PAF's and if PAF's are not available to families living in project affected zone. All vehicles hired by the project will be from PAF's and if not available from PAF's then from residents of Project Affected Zone. The new vehicles hired from PAF's may be hired for 3+1 years. | |
| 5.4.3 | The Project Affected Families (such as rural artisans/small traders and self employed persons) will be assisted to start various suitable self-employment occupations, which include dairy farming, poultry, weaving, bakery, handicraft, cottage industries unit/shops and hiring of vehicle to the corporation. The Project Authority will provide a grant of Rs. 50,000/- per family towards seed capital. The grant will be given once only.<br><br>"Only those families who have not been provided with employment in the Project or have not been allotted any shop will be eligible for this grant"<br><br>Families residing in the project affected area other then | As already mentioned, there are 02 shop keepers and 02 artisans among the PAFs, who could be assisted to start various suitable self-employment occupations.<br><br>Besides, it is also suggested that other individuals who wish to be self-employed could also be extended this facility. Thus, it is recommended that a provision may be created for this one time grant for one member from each of 206 PAFs.<br><br>Thus, a provision of **Rs. 10.30 million** (Rs. 50,000 x 206 individuals x $10^{-6}$) may be kept for this purpose. |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | PAF's can also be considered for this on merit and if they are needy.<br><br>**Explanation:**<br>The Deputy Commissioner, Kullu will certify the effect on source of livelihood in case of rural artisans, small traders and self employed persons for eligibility of the grant. | |
| 5.4.4 | The PAF's and other fishermen having fishing rights in the river will also get fishing rights in the reservoir. | Will be complied as Sainj R&R Scheme |
| 5.4.5 | If any manpower is obtained by the project authorities through outsourcing at any time during construction or running of the project for services like house keeping, gardening, typing, maintenance, computer work, office help etc first opportunity will be given to PAF's as contractors and also as personnel hired by contractor for their jobs. If PAF's are not willing then other residents of project affected zone may be considered. | Will be complied as Sainj R&R Scheme |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| 6. | **R&R Benefits for PAF's belonging to ST & SC.** | |
| 6.1 | In case the families loose access to forest due to the project a special plan will be formulated for development of alternate fuel, fodder and non timber forest produce. | As per Table 13.1 in Chapter – 13 of the EMP report, about 47.993 ha of forest land is also proposed to be acquired. Thus, in view of this, a special plan will need to be formulated for development of alternate fuel, fodder and non timber forest produce. |
| 6.2 | Each PAF of ST followed by SC categories shall be given preference in allotment of land if any land is available for allotment to PAF's. | There are 05 Scheduled Caste PAFs, as per our socio-economic survey. Thus, as per the provisions laid herein, preference has to be given in allotment of land, if any land is available for allotment to PAF's. |
| 6.3 | Each ST family will get an addition one time financial assistance of 500 days minimum wages for labour for loss of customary right's or usage of forest produce. | As per the socio-economic study, there are no Schedule Tribe PAFs. |
| 6.4 | ST. PAF's will be resettled as far as possible in the same schedule area in a compound block so that they can retain their ethnic, linguistic and cultural identity. | Nil |
| 6.5 | The resettlement area prominently inhabited by ST's shall get 1000 Sqm. Land free of lost for community and religious gatherings. | Nil |
| 6.6 | The ST's families resettled out of the district will get 25% higher resettlement grant. | Nil |
| 7. | **Other benefits:-** | |
| 7.1 | Each PAF will be provided 100 units of electricity per | Provision for providing electricity to displaced families in |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | month for a period of 10 years from the date of commissioning of the project. If the consumption of the PAF is less than that then the difference will be compensated in cash. | the resettlement colony, which has been elaborated in section 4.4 of this Table. |
| 7.2 | **Medical fund:**<br>A medical fund will be created for the PAF's. This fund will be need for providing treatment to the member of PAF's in hardship due to illness or in extreme illness or accident cases. Medicines may also be provided to other residents in the area. | Provision for a Primary Health Centre has been made in the section 4.4 of this Table. |
| 7.3 | Free medical treatment will be provided to PAF's at the project medical facility. | Will be complied as per R&R Scheme |
| 7.4 | Medical camps will be organized in various places in the project affected zone from time to time. | Will be complied as per R&R Scheme |
| 7.5 | In order to help the families living in the project affected zone and to improve their skills in their occupation Agriculture, Horticulture and animal husbandry training and awareness camps will be organized by the Project Authorities from time to time. Training camps on other subjects like finance and accounts, how to run small business, alternatives for self employment etc. will also be organized from time to time. | Will be complied as per R&R Scheme |
| 7.6 | If it is felt that the fuel supply of the local residents is | Will be complied as per R&R Scheme |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | effected due to construction of the project, a scheme will be formulated to provide alternative fuel or fuel saving devices to the families whose fuel supply is effected. | |
| 7.7 | Each PAF will be given an identity card which will have names of all the members of PAF. | Will be complied as per R&R Scheme |
| 7.8 | The project authorities will set up one or more Project Information Officer for providing information and guidance to the local people particularly the PAF's. | Will be complied as per R&R Scheme |
| 7.9 | Project authorities will set up a cultural fund for providing grants for organizing local fairs. | Will be complied as per R&R Scheme |
| 8. | Infrastructure Development construction of the project is a major development activity for the area. It will be ensured that the available infrastructure in the area improves with the project. | Will be complied as per R&R Scheme |
| 8.1 | If any available infrastructure is damaged due to the project, it will be restored. This includes water supply, irrigation, roads, paths, schools, places of worship, community building etc. | Will be complied as per R&R Scheme |
| 8.2 | The local people will be allowed use of the infrastructure created primarily for the project like roads, bridges, schools, etc. | Will be complied as per R&R Scheme |
| 8.3 | A fund under the name LADF will be created for development of infrastructure in the project affected area. The project authorities will contribute 1.5% of the project cost towards the funds. This fund will be | Will be complied as per R&R Scheme |

| Actual Section/ Sub-section No. | Provisions for R&R as per the Sainj R&R Scheme | R&R measures adopted for the PAFs |
|---|---|---|
| | administered by a local area development committee in accordance with the orders of the appropriate Government. The 80% of the funds available in LADF will be divided amongst the Panchayats falling within the Project affected area on the basis of a formula giving equal weightage to 3 criteria i.e. | |
| (i) | Number of project affected families. | |
| (ii) | Area acquired. | |
| (iii) | Extent of underground works and disturbance in the area. | |
| | The remaining 20% funds may be used for common works or for works in the project affected zone or for completion of incomplete works. | Will be complied as per R&R Scheme |
| 8.4 | The project authorities will build infrastructure over and above LADF at their own. | Will be complied as per R&R Scheme |

### 13.4.1 Summary of the Resettlement Plan

The resettlement plan for the PAFs will include the following provisions, which have been discussed in Table 13.3:

- Housing Plot
- House building assistance
- Civic amenities and infrastructure facilities
- Transportation
- Stamp duty and other fees
- Transitional/ subsistence allowance
- Assistance for construction of cattle shed
- Financial assistance for construction of working shed or shop
- Provision of temporary accommodation

### 13.4.2 Summary of the Rehabilitation Plan

The rehabilitation plan for the PAFs will include the following provisions, which have been discussed in Table 13.3:

- Landless grant to PAFs rendered landless and/or houseless
- Provision of shops to displaced shopkeepers
- Land for Land option
- Grant for artisans
- Employment opportunities
- Secondary employment opportunities
- Award of petty contracts

### 13.4.3 Other benefits and Area Development Activities

Other Benefits and Area Development Activities for the PAFs will include the following provisions, which have been discussed in Table 13.3:

- Annuity Policy
- Merit scholarships

## 13.5 INSTITUTIONAL/ ADMINISTRATIVE ARRANGEMENT FOR IMPLEMENTATION OF THE R&R MEASURES

### 13.5.1 Appointment of Administrator and Commissioner for Rehabilitation and Resettlement and their powers and functions

Where the appropriate Government is satisfied that there is likely to be involuntary displacement of large number of persons due to acquisition of land for any project or due to any other reason, it may; and where the appropriate Government is satisfied that there is likely to be involuntary displacement of four hundred or more families *en masse* in plain areas, or two hundred or more families *en masse* in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution due to acquisition of land for any project or due to any other reason, it shall, appoint, by notification, by the State Government(s) concerned, in respect of that project, an officer not below the rank of District Collector of the State Government to be appointed as the Administrator for Rehabilitation and Resettlement (R&R).

The Administrator for Rehabilitation and Resettlement shall be assisted by such officers and employees as the appropriate Government may provide. Subject to the superintendence, directions and control of the appropriate Government and Commissioner for Rehabilitation and Resettlement, the Administrator for Rehabilitation and Resettlement shall take all measures for the rehabilitation and resettlement of the affected families. The overall control and superintendence of the formulation, execution and monitoring of the rehabilitation and resettlement plan shall vest in the Administrator for Rehabilitation and Resettlement.

Subject to any general or special order of the appropriate Government, the Administrator for Rehabilitation and Resettlement shall perform the following functions and duties:

(i) minimize displacement of people and to identify non-displacing or least-displacing alternatives in consultation with the requiring body;

(ii) hold consultation with the affected families while preparing a rehabilitation and resettlement scheme or plan;

(iii) ensure that interests of the adversely affected persons of Scheduled Tribes and weaker sections are protected;

(iv) prepare a draft scheme or plan of rehabilitation and resettlement as required under Chapter VI of this policy;

(v) prepare a budget including estimated expenditure of various components of acquisition of land, rehabilitation and resettlement activities or programmes in consultation with representatives of the affected families and the requiring body;

(vi) arrange adequate land, as far as possible, for rehabilitation and resettlement of the affected families;

(vii) allot land and sanction the benefits to the affected families;

(viii) perform such other functions as the appropriate Government may, from time to time, by order in writing, assign.

The administrator for Rehabilitation and Resettlement may, by order in writing, delegate such of the administrative powers conferred and duties imposed on him by or under this policy to any officer not below the rank of *Tehsildar* or equivalent. All officers and staff appointed by the appropriate Government under this policy shall be subordinate to the Administrator for Rehabilitation and Resettlement.

The State Government shall appoint an officer of the rank of Commissioner or of equivalent rank of that Government for rehabilitation and resettlement in respect of such cases to which this policy applies to be called the Commissioner for Rehabilitation and Resettlement. For the purposes of this policy, the Administrator

for Rehabilitation and Resettlement and other officers and employees appointed for the purposes of rehabilitation and resettlement of the affected families shall be subordinate to the Commissioner for Rehabilitation and Resettlement. The Commissioner for Rehabilitation and Resettlement shall be responsible for supervising the formulation of rehabilitation and resettlement plans (R&R) schemes and proper implementation of such plans or schemes.

### 13.5.2 Grievance Redressal Mechanism

For each project which involves involuntary displacement of four hundred or more families *en masse* in plain areas, or two hundred or more families *en masse* in tribal or hilly areas, DDP blocks or areas mentioned in the Schedule V or Schedule VI to the Constitution, the appropriate Government shall constitute a Committee under the chairpersonship of the Administrator for Rehabilitation and Resettlement, where appointed, or some other senior Government official, where the Administrator for Rehabilitation and Resettlement is not appointed, to be called the Rehabilitation and Resettlement Committee, to monitor and review the progress of implementation of the scheme or plan of rehabilitation and resettlement of the affected families, and to carry out post-implementation social audits.

The Rehabilitation and Resettlement Committee constituted as above shall include, apart from officers of the appropriate Government, as one of its members:-

- a representative of women residing in the. affected area;
- a representative each of the Scheduled Castes and Scheduled Tribes residing in the affected area;
- a representative of a voluntary organization;
- a representative of the lead bank;

- Chairperson(s) of the *panchayats* and municipalities located in the affected area, or their nominee(s);
- Members of Parliament and Members of Legislative Assembly of the area included in the affected area;
- the Land Acquisition Officer of the project; and
- a representative of the requiring body.

The procedure regulating the business of the Rehabilitation and Resettlement Committee, its meetings and other matters connected thereto shall be such as may be prescribed by the appropriate Government.

In the project area district, the State Government shall constitute a standing Rehabilitation and Resettlement Committee under the chairpersonship of the District Collector or, as the case may be Deputy Commissioner of the district, to monitor and review the progress of rehabilitation and resettlement of the affected families in the district excluding those covered by the Rehabilitation and Resettlement Committees at the project level.

An Ombudsman shall be appointed by the state Government, for time-bound disposal of the grievances arising out of the matters covered by this policy. Any affected person, if aggrieved, for not being offered the admissible rehabilitation and resettlement benefits as provided under this policy, may move an appropriate petition for redressal of his or her grievances to the Ombudsman concerned.

### 13.5.3 Post-Project Monitoring

Status of availability of alternative homestead for project affected persons, development of infrastructural facilities such as schools, sewer networks, roads, etc. are some of the aspects which could be considered for monitoring and modifications

may be suggested if required. It needs to be appreciated that R&R issues are politically sensitive issues and often need timely attention. For such reasons, it is suggested that the monitoring be conducted by an independent agency not connected with the project. Therefore, an independent Consultant having experience in R&R studies in similar areas, i.e. hilly areas and not connected with the project, can be appointed for monitoring the project. The Consultant will review the rehabilitation and resettlement programme after 2nd, 4th and 6th year from the completion of the R&R activity. A total provision of **Rs. 0.90 million** has been kept in the project estimate for this purpose.

## 13.6 PARTICIPATION OF PAFS

Involvement of affected communities in planning and implementation of rehabilitation programmes according to their felt needs and socio-economic conditions is of vital importance. To obtain co-operation, participation and feedback, PAFs need to be systematically informed and consulted during preparation and implementation of resettlement plan about their options and rights. In the proposed project, co-operation and participation of PAFs in the resettlement process could be ensured through their involvement in each of the following stages.

- **Involvement in preparation of Rehabilitation Master Plan**

  As a part of participatory planning, community meetings should be held on a routine basis to explain about the project and the R&R policy of the project. Direct communication with the PAFs will negate the politicization of the R&R Process. The communication with the PAFs can be through the Village Level Committee.

- **Involvement of PAFs in implementation process**

  The Village Level Committee can be involved in the implementation of

Rehabilitation Plan particularly during the identification of forest land to be allotted to Village Level Committee. They should also be consulted in finding out alternative economic opportunities to supplement their household income. However, some NGO groups can also be associated which can interact directly with the project authorities and the affected population.

## 13.7 BUDGET FOR RESETTLEMENT & REHABILITATION

The budget for different components of the Resettlement and Rehabilitation plan has been worked-out and depicted in Tables 13.4 to 13.8. The budget for the resettlement plan is shown in Table 13.4.

**TABLE 13.4**

**Budget for Resettlement**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| a) | Land for resettlement site = 2.70 ha | ** |
| b) | One time financial assistance for house building assistance | 53.25 |
| c) | Financial assistance for construction of cattle-shed | 1.42 |
| d) | Transportation cost | 1.42 |
| e) | Transitional/ Subsistence allowance | 2.13 |
| **TOTAL** | | **58.22** |

The budget required for providing civic amenities and infrastructure facilities in the resettlement colony has been details and shown in Table 13.5.

**TABLE 13.5**

**Budget required for providing civic amenities and infrastructure facilities**

| S. No. | Civic amenities and Infrastructure facilities | Cost (Rupees Million) |
|---|---|---|
| a) | Water Bound Macadam Approach Road and internal village roads | 2.50 |
| b) | Power supply: Free power supply of about 100 units per month for a period of 10 years from the date of commissioning of the project will be given to each of the resettled PAFs. | 0.00 |
| c) | Piped water supply for drinking purpose | 2.06 |
| d) | Sanitation facility | 0.41 |
| e) | Higher Secondary School with playground | 3.00 |
| f) | A Community hall | 0.30 |
| g) | A Panchayat building | 0.15 |
| h) | Place of worship | 0.50 |
| i) | A Post-office building | 0.12 |
| j) | A fair price shop | 0.09 |
| k) | Space for market (200 sq.m ) | 0.00 |
| l) | Space for Park and Play-ground | 0.10 |
| m) | A Primary Health Center | 2.80 |
| | **Total** | **12.03** |

The budget for the Rehabilitation Plan has been worked-out for two scenarios, viz., Option – I where "land for land" scheme is adopted for the PAFs, and Option – II where "Cash in lieu of Land" has been adopted. The budget required for Rehabilitation Plan in case of **Option – I "land for land"** is adopted for the PAFs is depicted in Table 13.6, while that of Option – II **"cash in-lieu of land"** is adopted for the PAFs.

**TABLE 13.6**

**Budget required for rehabilitation measure under Option – I "land for land"**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| a) | Rehabilitation grant for PAFs rendered landless | 18.400 |
| b) | "Land for land" 855 bigha (69.19 ha)** | 0.00 |
| c) | Financial assistance for Land development cost | 1.625 |
| d) | Financial assistance for agricultural production | 1.420 |
| e) | Cash grant for acquisition of cattle-shed | 1.775 |
| f) | Cash displacement grant for shop keepers | 0.400 |
| g) | Financial assistance for construction of working shed/ shop | 0.100 |
| h) | Special rehabilitation/ employment grant | 17.100 |
| i) | One time assistance to start self-employment | 10.300 |
| **Total** | | **51.120** |

***** Alternative land is to be identified and Cost of land has to be decided and finalized by the District Collector.***

**TABLE 13.7**
**Budget required for rehabilitation measure under Option – II "Cash in lieu of land"**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| a) | Rehabilitation grant for PAFs rendered landless | 18.400 |
| b) | "Cash in lieu of Land" | 5.420 |
| c) | Cash grant for acquisition of cattle-shed | 1.775 |
| d) | Cash displacement grant for shop keepers | 0.400 |
| e) | Financial assistance for construction of working shed/ shop | 0.100 |
| f) | Special rehabilitation/ employment grant | 17.100 |
| g) | One time assistance to start self-employment | 10.300 |
| **Total** | | **53.495** |

Budget for Area Development Activities and other facilities extended to the PAFs is depicted in Table 13.8.

**TABLE 13.8**

**Area Development Activities**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| a) | Annuity Policy for vulnerable groups/ individuals | 7.560 |
| b) | Merit Scholarships | 3.672 |
| **Total** | | **11.232** |

Thus, the total budget for Resettlement and Rehabilitation Plan is show in Table 13.9 and 13.10.

**OPTION – I:** The budget required **in case alternate land is made available** under "land for land" scheme is highlighted in Table 13.9.

**TABLE 13.9**

**Budgetary estimate for implementation of R&R Plan (Option - I)**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| 1 | Resettlement plan | 58.220 |
| 2 | Basic amenities & facilities in the resettlement site | 12.030 |
| 2 | Rehabilitation plan | 51.12 |
| 4 | Area Development Activities | 11.232 |
| 5 | Monitoring and Evaluation set-up | 0.900 |
| **Total** | | **133.502** |

A total budget of **Rs. 133.502 million + 69.194 ha of land (for land for land option) + 2.70 ha land for resettlement colony** would be required under Option – I, wherein "land for land" is made available to the project affected persons/ families in consultation with the District authorities and subject to availability of Government land in the district.

**OPTION – II:** The budget required **in case alternate land is not made available** to the project affected persons/ families are highlighted in Table 13.10.

**TABLE 13.10**

**Budgetary estimate for implementation of R&R Plan (Option - II)**

| S. No. | R&R Components | Cost (Rupees Million) |
|---|---|---|
| 1 | Resettlement plan | 58.220 |
| 2 | Basic amenities & facilities in the resettlement site | 12.030 |
| 2 | Rehabilitation plan | 53.495 |
| 4 | Area Development Activities | 11.232 |
| 5 | Monitoring and Evaluation set-up | 0.900 |
| **Total** | | **135.877 Say 136 million** |

Thus, a total budget of **Rs. 136.0 million + 2.70 ha of land for resettlement colony** would be required under Option – II, wherein "land for land" is not made available to the project affected persons/ families. Thus this cost (136.0 million + 2.70 ha of land for resettlement) is being taken for R&R implementation.

## 13.8 CONCLUSIONS

On the whole, there are about 3 village panchayats that would be affected due to the process of land acquisition. Thus it can be concluded that about 206 PAFs are expected to lose their lands in varying proportion. In addition there are about 71 that are likely to get displaced from their homesteads. It is also observed that most of these 71 PAFs losing land have alternative place of residence, which was confirmed during the survey work. It was also observed that a considerable number of residents from the nearby villages and towns have invested in homestead plots, which have been purchased from these local villagers. It was observed during survey work, many of the house/ sheds had been newly constructed or were under construction.

The Resettlement and Rehabilitation Plan for the Project Affected Families of the proposed Sainj hydro-electric project has been prepared in line with the provisions and/or guidelines as given in the Resettlement and Rehabilitation Scheme for the Project Affected Families of Sainj Hydro Electric Project, which has been prepared by the Himachal Pradesh Power Corporation Limited. This R&R Scheme has been prepared by taking into consideration the R&R Policy notified by Government of Himachal Pradesh, vide Notification No Rev(PD)F(5)-1/1999 dated 27-4-06, the National Rehabilitation and Resettlement Policy 2007 and the National Hydro Policy 2008. The Resettlement and Rehabilitation package and their subsequent costs that have been suggested in line with the aforesaid R&R Scheme and the benefits are over and above the compensation due/received for the loss of properties of and by the PAFs.

# CHAPTER-14

# ENVIRONMENTAL MONITORING PROGRAMME

## 14.1 THE NEED

Environmental monitoring is an essential component for sustainability of any water resources project. It is an integral part of any environmental assessment process. Any water resources development project introduces complex inter-relationships in the project area between people, various natural resources, biota and the many developing forces. Thus, a new environment is created. It is very difficult to predict with complete certainty the exact post-project environmental scenario. Hence, monitoring of critical parameters is essential in the project operation phase. An Environmental Monitoring Programme has been designed with the following objectives :

- Assess the changes in environmental conditions, if any, during construction and operation of the project.
- Monitor the effective implementation of mitigatory measures.
- Warning of any significant deterioration in environmental quality so that additional mitigatory measures may be planned in advance.

## 14.2 AREAS OF CONCERN

From the monitoring point of view, the important parameters are water quality, landuse, ambient air quality, ecology, etc. An attempt is made to establish early warning of indicators of stress on the environment. Suggested monitoring details are outlined in the following sections.

## 14.3 WATER QUALITY

### Construction Phase

It is proposed to monitor the effluent before and after treatment from oxidation ditch. The frequency of monitoring could be once per month. It is assumed that a oxidation

ditches shall be constructed to treat the sewage generated from the labour camp at Ropa. It is proposed to analyse 120 samples/year. The parameters to be monitored include pH, Bio-chemical Oxygen Demand, Total Suspended Solids and Total Dissolved Solids. The cost of analysis of one sample is expected to be Rs.1,500. Thus, total cost for analysis of 120 samples is expected to be Rs. 0.18 million/year. The analysis work can be done by a laboratory recognized by the State Pollution Control Board.

**Operation phase**

The surface water quality of the proposed reservoir and Malana Nallah needs to be monitored thrice a year. The proposed parameters to be monitored are as follows:

pH, Temperature, Electrical Conductivity, Turbidity, Total Dissolved Solids, Calcium, Magnesium, Total Hardness, Chlorides, Sulphates, Nitrates, DO, COD, BOD, Iron, Zinc and Manganese. The sampling sites shall be:

- 1 km upstream of the barrage site.
- Reservoir water.
- 1,5 and 10 km downstream of the confluence of the tail race discharge.

The total cost of analysis will be Rs.0.3 million per year. This analysis shall be done throughout the entire life of the project. The analysis work can be conducted by a reputed external agency recognized by State Pollution Control Board.

During project operation phase, a Sewage Treatment Plant (STP) is proposed to be set up to treat the effluent from the project colony. Once every week, it is envisaged to analyse a sample each before and after treatment from the STP. The parameters to be analysed include pH, Biochemical Oxygen Demand, Chemical Oxygen Demand, Total Suspended Solids and Total Dissolved Solids. The cost of analysis of 104 samples @ Rs.1500 per sample works out to Rs.0.16 million/year. Thus, total cost for analysis in project operation works out to Rs.0.46 million/year.

## 14.4 AIR QUALITY AND METEOROLOGY

### Project Construction Phase

The ambient air quality monitoring during construction phase can be carried out by an external agency, approved by State Pollution Control Board at four stations close to construction sites. Every year monitoring is to be done for the following three seasons:

- Winter
- Summer
- Post-monsoon

The frequency of monitoring could be twice a week for four consecutive weeks at each station for each season. The parameters to be monitored are Respirable Particulate Matter (RPM) and Suspended Particulate Matter (SPM), Sulphur dioxide ($SO_2$) and Nitrogen Oxides (NOx).

Every year, ambient air quality is to be monitored for (4 stations * 2 days/week * 4 weeks x 3 seasons) 96 days. A total cost of Rs. 0.29 million @ Rs. 3000/day can be earmarked for this purpose.

## 14.5 NOISE

### Project Construction Phase

Noise emissions from vehicular movement, operation of various construction equipment may be monitored during construction phase at major construction sites. The frequency of monitoring shall be once every three months. For monitoring of noise generators an Integrating Sound Level Meter will be required.

### Project Operation Phase

No major impact due to noise is observed in operation phase.

## 14.6 SOIL EROSION AND SILTATION

### Project Construction Phase

No monitoring programme is suggested for project construction phase

### Project Operation Phase

Soil erosion rates, slope stability of embankments of barrage, efficacy of soil conservation measures, need to be closely monitored twice a year. The HPSEB staff at the project site can do the study. The study should be undertaken throughout the life of the project so as to design the soil erosion prevention measures and also for the rehabilitation/decommissioning of the project. Following parameters like soil erosion rates, stability of bank embankment would be measured. In addition to above, soil quality at various locations in the catchment area needs to be monitored once every year. The parameters to be monitored are pH, organic matter and texture.

## 14.7 ECOLOGY

### Project Construction Phase

A detailed ecological survey covering forestry, fisheries, wildlife is recommended during entire construction phase. The survey can be conducted once every year for the entire construction period. A provision of Rs.0.5 million/year can be earmarked for this purpose. The various aspects to be covered include:

- Qualitative & Quantitative assessment of flora and fauna.
- Monitoring of restoration of muck disposal area.

### Project Operation Phase

Status of afforestation programmes, changes in migration patterns of the aquatic and terrestrial fauna species should be studied. The study could be undertaken with a frequency of 5 years till the entire design life of the barrage. A provision of Rs.0.5 million per study can be kept for this purpose. Thus the annual expenditure can be

taken as 0.1 million/ year. The monitoring can be conducted by a reputed external agency.

## 14.8 INCIDENCE OF WATER-RELATED DISEASES

**Project Construction Phase**

Identification of water-related diseases, adequacy of local vector control and curative measures, status of public health are some of the parameters which should be closely monitored three times a year with the help of data maintained in the government dispensaries/hospitals.

| | | |
|---|---|---|
| Implementation | : | Public Health Department, & Dispensary constructed for labour camps |
| Cost per annum | : | Rs.0.1 million |

**Project Operation Phase**

Increased prevalence of various vector borne diseases and adequacy of local vector control and curative measures need to be monitored. The monitoring can be done three times in a year.

Implementation : Dispensary at the project site
Cost per annum : Rs.0.10 million

Monitoring of aquatic ecology will be essential to achieve sustainable yield of fish. Some of the parameters to be monitored are phytoplanktons, zooplanktons, benthic life and fish composition, etc. The monitoring can be conducted by a reputed external agency, for which an amount of Rs.0.30 million/year can be earmarked.

## 14.9 LANDUSE PATTERN

### Project Operation Phase

During project operation phase, it is proposed to monitor land use pattern once every year. An amount of Rs.0.3 million can be earmarked for this purpose.

## 14.10 SUMMARY OF ENVIRONMENTAL MONITORING PROGRAMME

The details of environmental monitoring programme are given in Tables 14.1 and 14.2 respectively.

**TABLE-14.1**
**Summary of Environmental Monitoring Programme during Project Construction Phase**

| S. No. | Item | Parameters | Frequency | Location |
|---|---|---|---|---|
| 1. | Effluent from septic tanks | pH, BOD, COD, TSS, TDS | Once every month | Before and after treatment from Oxidation ditch |
| 2. | Water-related diseases | Identification of water related diseases, adequacy of local vector control and curative measure, etc. | Three times a year | Labour camps and colonies |
| 3. | Noise | Equivalent noise level ($L_{eq}$) | Once in three months | At major construction sites. |
| 4. | Air quality | SPM, RPM, $SO_2$ and NOx | Once every season | At major construction sites |
| 5. | Meteorological aspects | Wind direction & velocity temperature humidity, rain | Once every season | At one of the ambient air quality sampling sites |

## TABLE-14.2

### Summary of Environmental Monitoring Programme during Project Operation Phase

| S. No. | Items | Parameters | Frequency | Location |
|---|---|---|---|---|
| 1. | Water | pH, Temperature, EC, Turbidity, Total Dissolved Solids, Calcium, Magnesium, Total Hardness, Chlorides, Sulphates, Nitrates, DO. COD, BOD, Iron, Zinc, Manganese | Thrice a year | • 1 km upstream of barrage site<br>• Reservoir area<br>• 1, 5 and 10 km downstream of Tail Race discharge |
| 2. | Effluent from Sewage Treatment Plant (STP) | pH, BOD, COD, TSS, TDS | Once every week | • Before and after treatment from Sewage Treatment Plant (STP) |
| 3. | Erosion & Siltation | Soil erosion rates, stability of bank embankment, etc. | Twice a year | - |
| 4. | Ecology | Status of afforestation programmess of green belt development | Once in 2 years | - |
| 5. | Water-related diseases | Identification of water-related diseases, sites, adequacy of local vector control measures, etc. | Three times a year | • Villages adjacent to project sites |
| 6. | Aquatic ecology | Phytoplanktons, zooplanktons, benthic life, fish composition | Once a year | • 1 km upstream of barrage site<br>• Reservoir area<br>• 1, 5 and 10 km downstream of Tail Race discharge |
| 7. | Landuse | Landuse pattern using satellite data | Once in a year | Catchment area |
| 8. | Soil | pH, EC, texture, organic matter | Once in a year | Catchment area |

# CHAPTER-15

# COST ESTIMATES

## 15.1 COST FOR IMPLEMENTING ENVIRONMENTAL MANAGEMENT PLAN

The total amount to be spent for implementation of Environmental Management Plan (EMP) is **Rs. 417.75 million**. The details are given in Table-15.1.

**TABLE-15.1**

**Cost for Implementing Environmental Management Plan**

| S. No. | Item | Cost (Rs. million) |
|---|---|---|
| 1. | Compensatory Afforestation NPV, Cost of Trees and Bio-diversity conservation | 119.257 |
| 2. | Catchment Area Treatment | 99.315 |
| 3. | Fisheries Management | 10.00 |
| 4. | Public health delivery system | 5.19 |
| 5. | Environmental Management in labour camp | 8.36 |
| 6. | Muck management | 9.75 |
| 7. | Restoration and Landscaping of construction sites | 8.50 |
| 8. | Environmental management in road construction | 8.84 |
| 9. | Greenbelt development | 4.00 |
| 10. | Water pollution control | 2.00 |
| 11. | Resettlement and Rehabilitation Plan (Option-II Cash in lieu of land) | 136.00 |
| 12. | Environmental Monitoring during construction phase | 6.53 |
| | **Total** | **417.742 say Rs. 417.75 million** |

## 15.2 COST FOR IMPLEMENTING ENVIRONMENTAL MONITORING PROGRAMME

The cost required for implementation of the Environmental Monitoring Programme is of the order of Rs.6.53 million @ Rs.1.07 million/ year. A 10% annual price increase may be considered for every year. The construction period for estimation of cost for implementation of Environmental Monitoring programme during construction phase has been taken as 5 years. The details are given in Table-15.2. The cost required for implementation of the Environmental Monitoring Programme at operation phase is of the order of Rs.1.16 million/year. The details are given in Table-15.3.

**TABLE-15.2**

**Cost for Implementing Environmental Monitoring Programme during construction phase**

| S. No | Item | Cost (Rs. million/year) | Total cost 4 years with 10% escalation (Rs. million) |
|---|---|---|---|
| 1 | Water quality | 0.18 | 1.10 |
| 2 | Air quality | 0.29 | 1.77 |
| 3 | Ecology | 0.50 | 3.05 |
| 4 | Incidence of water related Diseases | 0.10 | 0.61 |
| | **Total** | **1.07** | **6.53** |

**TABLE-15.3**

**Cost for Implementing Environmental Monitoring Programme during operation phase**

| S. No | Item | Cost (Rs. million/year) |
|---|---|---|
| 1 | Water quality | 0.46 |
| 2 | Ecology | 0.1 |
| 3 | Incidence of water related diseases | 0.3 |
| 4 | Land use pattern | 0.3 |
| | **Total** | **1.16** |

# CHAPTER-16

## SUMMARY OF IMPACTS AND MANAGEMENT MEASURES

The Summary of impacts, suggested management measures and implementing agency has been given in Table-16.1.

**TABLE-16.1**
**Summary of Impacts, Suggested Management measures and Implementing agency**

| S. No. | Parameters | Impact | Management Measures | Implementing Agency |
|---|---|---|---|---|
| **1.** | **WATER ENVIRONMENT** | | | |
| | **Water Quality** | | | |
| | Construction phase | • Water pollution due to disposal of sewage from labour colonies. | • Provision of community toilets and Oxidation ditch. | • HPSEB and project contractor |
| | | • Deterioration water quality due to effluent from crusher | • Provision of settling tank | • Project contractor |
| | Operation phase | • Deterioration of water quality in the dry stretch of river due to reduced flow during the lean season. | • Minimum flow of 0.63 cumec will be released | • HPSEB |
| | | • Disposal of sewage from project colony. | • Commissioning of Sewage Treatment Plant (STP) | • HPSEB |
| | | • Eutrophication problem | • Eutrophication risks are minimal; hence, specific management measures are not required. | - |
| | **Water Resources** | | | |
| | Operation phase | • River stretch from barrage site to tailrace outfall will have reduced flow | • Minimum flow of 0.63 cumec will be released | • HPSEB |

| S. No. | Parameters | Impact | Management Measures | Implementing Agency |
|---|---|---|---|---|
| | | during lean season. | | |
| **2.** | **AIR ENVIRONMENT** | | | |
| | Construction phase | • Fugitive emissions due to crusher operation at various sites. | • Commissioning of cyclone on crusher. | • Project contractor |
| | | • Increased in SPM level due to vehicular movement during construction | • Provision of water sprinkler to settle SPM | • Project contractor |
| | | • Emission of $SO_2$ due to combustion of fuel in construction equipment | • $SO_2$ not expected to increase significantly | - |
| **3.** | **NOISE ENVIRONMENT** | | | |
| | Construction phase | • Marginal increase in noise levels due to operation of various construction equipment. | • Maintenance of construction equipment<br>• Provision of ear plug/ear muff | - |
| **4.** | **LAND ENVIRONMENT** | | | |
| | Construction Phase | • Erosion due to quarrying operation for coarse and fine aggregate | • Proper mining plan for quarrying operation<br>• Rehabilitation plan for quarry sites after extraction of construction material | • Project Contractor and HPSEB |
| | | • Generation of Muck due to underground work | • Disposal of Muck at designated muck disposal site<br>• Restoration of Muck disposal sites of disposal is over. | • Project Contractor and HPSEB |

| S. No. | Parameters | Impact | Management Measures | Implementing Agency |
|---|---|---|---|---|
| | | • Erosion due to construction of road | • Cut-slope to be protected by breast walls<br>• Provision of catch water and intercepting drain<br>• Plantation of tree along road side. | • Project Contractor and HPSEB |
| | | • Acquisition of about 56.763 ha forest and private land | • Compensatory afforestation in lieu of forest land<br>• Net productivity value and cost of tree to be cut to be given to Forest department.<br>• R&R Plan formulated for families losing land as per the provisions of R&R Policy for Sainj hydroelectric project. | • Director GHNP, HPSEB and Revenue department |
| **5.** | **BIOLOGICAL ENVIRONMENT** | | | |
| | **Terrestrial Flora** | | | |
| | Construction phase | • Cutting of trees for meeting fuel wood requirements by labour. | • Provision of subsidized kerosene and LPG to construction labour and technical staff. | • Project Contractor/ HPSEB |

| S. No. | Parameters | Impact | Management Measures | Implementing Agency |
|---|---|---|---|---|
| | Operation phase | • Acquisition of about 47.993 ha forest land. | • Compensatory afforestation. | • Forest Department |
| | **Terrestrial Fauna** | | | |
| | Construction phase | • Disturbance to wildlife due to operation of various construction equipment | • Surveillance through check post is recommended. | - |
| | | • Disturbance to wildlife due to increased accessibility in the area | • Surveillance through check posts is recommended. | • Director, GHNP |
| | Operation phase | • Disturbance to wildlife in GHNP due to increased accessibility | • Marginal impact anticipated which could be minimized by strict anti-poaching law.<br>• Formulation of Sainj Valley Conservation Cell (SVCC) | • Director, GHNP |
| | **Aquatic Ecology** | | | |
| | Construction phase | • Marginal decrease in aquatic productivity due to increased turbidity and lesser light penetration. | • Marginal impact, hence no specific management measures are suggested. | • Project Contractor |
| | Operation phase | • Obstruction in the path of migratory fishes. | • Provision of fish ladder in the barrage | • Fisheries Department |
| | | • Drying of river stretch downstream of | • Development of hatchery for artificial seed | |

| S. No. | Parameters | Impact | Management Measures | Implementing Agency |
|---|---|---|---|---|
| | | barrage up to tail race outfall. | and production and stocking of reservoir & river stretch.<br>• Release of minimum flow 0.63 cumec | • HPSEB<br>• HPSEB |
| **6.** | **SOCIO-ECONOMIC ENVIRONMENT** | | | |
| | Construction phase<br><br>=Operation phase | • Increase in employment potential.<br>• Acquisition of land<br>• Increased power generation<br>• Greater employment opportunity | -<br>• Formulation of R&R Plan as per the provisions of R&R Policy for Sainj hydroelectric project.<br>-<br>- | • HPSEB<br>-<br>- |

# CHAPTER-17

# PROJECT BENEFITS

## 17.1 NEED FOR THE PROJECT

In the present developing state of country's economy, there is a great requirement of electrical power for both industrial and agricultural use. As per power position, requirement during March-April'03 in the Northern Region was 156,610 MU against the availability of 144,218 MU. Thus, there was a deficit of and 7.9%, for Northern Region. This deficit will continue to increase even after commissioning of various power projects in the Northern Region as indicated in the anticipated power supply position in 2006-07 ($X^{th}$ plan). As per this report, in the year 2006-07, total energy and peak energy demands in the Northern Region were 220,820 MU and 355,540 MU against availability of 181,468 MU and 229,667 MU, respectively. Thus, there was a deficit of 17.80% and 16.5% for total energy and peak energy respectively in the Northern Region. The corresponding deficit figures on all India basis were 12.9% and 12.3% respectively. Thus, energy crisis in Northern Region is quite severe.

With the limited coal resources and difficult oil position all over the world, it is necessary that electricity generation be aimed to achieve the economic balance of 40:60 between the hydro and thermal generation of power, as against the existing 25:75 ratio. Thus it is of utmost importance to commission hydroelectric projects.

## 17.2 PROJECT FEATURES

The salient features of project are briefly described as below:

- 24.5 m high diversion gated barrage at an elevation of $\pm$1733m, downstream of village Niharni on river Sainj.
- The FRL and MDDL is proposed at an elevation of $\pm$1752 m and $\pm$1738.50 m respectively, to attain a live storage of $\pm$ 38.41 ham to meet up diurnal peaking requirement during lean months.

- Two underground disilting tanks (145mx15mx7.5m) to exclude all silt particles down to 0.2 mm Size.

- A Head Race Tunnel (HRT) on the right bank of river Sainj, of about ±6.3 km long with 3.76 m diameter designed to carry a discharge of 28.7 cumec.

- Two intermediate adits 320 m and 430 m long and 4 m D-shaped proposed at RD 930 m and 4750 m respectely to facilitate construction of HRT.

- An underground restricted orifice surge shaft at the end of HRT - adit to top elevation ±1766.5 m and another adit at Bottom Elevation +1672.37m is proposed to facilitate the construction of surge shaft

- An underground pressure shaft of ±2.75 m diameter, 550 in long to carry discharge into power house.

- An underground power house to be located on right bank of river Sainj near confluence of Jiwa Nallah and river Sainj, which will have two units of 50 MW each to provide total installed capacity of 100MW.

- A tail race tunnel (TRT) of 400 m long and 4.8 m D-shaped, will constructed for discharging the water back into river Sainj.

## 17.3 PROJECT BENEFITS

The installed capacity is (2 x 50 MW) 100 MW. The Annual energy generation in 90% dependable year is 399.57 GWhr. Likewise in 50% dependable year, the annual energy generation is 436.90 GWhr.

# CHAPTER-18

## DISCLOSURE OF CONSULTANTS INVOLVED IN THE CEIA STUDY

The CEIA study has been conducted by WAPCOS Ltd., a government of India Undertaking under Ministry of Water Resources. WAPCOS Ltd., has a full-fledged Centre for Environment who has conducted the above referred study. The list of the Experts involved in the CEIA study is given in Table-18.1.

**TABLE-18.1**

**List of Experts involved in the CIEA study**

| S.No. | Name | Designation | Educational Qualification | Experience (Year) |
|---|---|---|---|---|
| 1. | Dr. Aman Sharma | Chief Engineer | BE (Civil Engg.)<br>ME (Environmental Engg.)<br>PhD(Environmental Engineering) | 18 |
| 2. | Dr. A. K. Sharma | Addl. Chief Scientist | B.Sc.<br>M.Sc. (Fisheries)<br>Ph.D (Fisheries) | 18 |
| 3. | Mr. A.S. Leo | Addl. Chief Scientist | B.Sc.<br>M.Sc. (Environmental Sciences) | 21 |
| 4. | Mr. R.V. Ramana | Dy. Chief Engineer | B.E. (Civil Engineering) | 18 |
| 5. | Dr. R. K. Singh | Sr. Scientist (Gr.I) | B.Sc.<br>M.Sc. (Botany)<br>Ph.D (Agr. Botany) | 12 |
| 6. | Mr. S. Selva Kumar | Sr. Scientist (Gr.I) | MA (Geography)<br>MA (Development Planning & Administration) | 12 |
| 7. | Mr. S.M. Dixit | Engineer | BE (Civil)<br>M.Tech. (Environmental Engineering) | 4 |
| 8. | Mrs. Moumita Mondal Ghosh | Engineer | BE (Civil)<br>M.Tech. (Environmental Engineering) | 2 |

# CHAPTER – 19

# PROCEEDINGS OF PUBLIC HEARING

## 19.1 Introduction

As per the EIA notification September 2006, the Himachal Pradesh Power Corporation Limited (HPPCL) had submitted the Draft EIA Report and Executive summary of EIA Report to the Himachal Pradesh State Pollution Control Board (HPSPCB) for conducting the Public Hearing. In this connection HPSPCB published advertisement for public hearing in the follwing newspaperrrs on 16/05/2008

- Hindustan Times
- Tribune
- Danik Bhaskar
- Danik Jagran

The Public Hearing was conducted at village Neuli, Post office Ropa, sub-tehsil Sainj(Banjar), District Kullu on 19/06/08 at 11 Am . The proceedings of the above referred public hearings is briefly described in the following sections.

## 19.2 Proceeding of Public Hearing

The Public Hearing was conducted by HPSPCB in presence of Additional District Magistrate who chaired the Public Hearing Committee and the list of panel members and government officers who were present during the public hearing is given in Table-19.1

**TABLE-19.1**
**List of Panel Members and Govt. Officers in the Public Hearing at village Neuli-Sainj District Kullu**

| S.No. | Name and Designation | Status |
|---|---|---|
| 1 | Sh. Raj Krishan Pruthi<br>Additional Distt. Magistrate | Chairman Public Hearing Committee |
| 2 | Sh. Nazu Ram-Sr. Citizen | Member |

| S.No. | Name and Designation | Status |
|---|---|---|
| | Village-Neuli | |
| 3 | Sh. Tek Ram-Sr. Citizen<br>Village-Neuli | Member |
| 4 | Sh. Tarun Gupta<br>Environmental Engineer<br>Deptt. of Env & ST Shimla | Member |
| 5 | Sh. Vishal Sharma<br>A.E.E.(c) | HPSPCB Kullu |
| 6 | Sh. K.L. Verma<br>Mining Inspector DIC kullu | Member |
| 7 | Sh. A.M. Dutta<br>Sr. Manager | HPPCL |
| 8 | Sh. A.M. Dutta<br>Sr. Manager | HPPCL |
| 9 | Sh. Khushal Thakur<br>Deputy Manager | HPPCL |
| 10 | Sh. Virender Thakur<br>J.E. HPPWD | Member |
| 11 | Sh. Arun Kant Verma<br>Fisheries Officer Larji | Member |
| 12 | Sh. R.N. Bhardwaj | HPPCL |
| 13 | Sh. N.L. Sharma<br>A.O | HPPCL |
| 14 | Sh. Raj Kumar<br>J.E. I&PH Sub Div. Larji | Member |
| 15 | Sh. Gokul Chand Sharma<br>Naib Tehsil Sainj | Member |
| 16 | Smt. Nirmala Devi<br>Pradhan Gram Panchayat Deoridhar | Member |
| 17 | Smt. Lata Devi<br>Pradhan Gram Panchayat Suchehn | Member |
| 18 | Smt. Rama Devi<br>Pradhan Gram Panchayat | Member |
| 19 | Sh. Leeladhar Chouhan<br>Pradhan Gram Panchayat Shongarh | Member |
| 20 | Sh. Budh Ram<br>Pradhan Gram Panchayat Gara Parli | Member |
| 21 | Sh. Chetan Joshi<br>Environmental Engineer HPSPCB Kullu | Convener/Member |

The issues raised during the public Hearing and response of the Project proponent are given in Table-19.2. The proceeding of public hearing is given in Annexure-V.

## TABLE-19.2

### The issues raised during the public Hearing and response of the Project proponent

| S. N. | Statement of issues | Response of Project Proponent |
|---|---|---|
| 1 | Rate of compensation for the land, houses and trees acquired for the Project on the pattern of ADHPL and NTPC (Kol Dam). | That Project authority has made an R&R package following the National Relief and Rehabilitation Policy 2007 and the relief proposed is better than the package envisaged in the central policy.<br>As regards compensation on the pattern of ADHPL (Allain-Dhuhangan Hydro Power Ltd) & NTPC Koldam, it is clarified that HPPCL will pay as per the rates fixed by the LAO (Land Acquisition Officer) and HPPCL does not go in appeal against the rate applied by LAO in the award. |
| 2. | Disturbance allowance | |
| 3. | Permanent job to all displaced and affected families. | As per availability of post and suitability of the persons affected, preference will be given in the appointment. |
| 4 | Free training to youth. | A scholarship scheme would be introduced by the project proponent for the eligible persons from Project Affected Families (PAF). |
| 5 | Extension of Siund-Krahila project road up to Neuli. | It is not possible to make it as a project road but it may be taken up under LADF (Local Area Development Fund). |
| 6. | Land in lieu of land. | Giving land in lieu of land is not possible. However, return of surplus land after construction of project can be considered. No commitment can be given at this stage in this regard. |
| 7 | Return of surplus land after completion of the Project. | |
| 8 | Widening of Sainj-Neuli road, before the start of construction of project. | Widening & metalling of Sainj-Neuli road shall be got executed through HPPWD with the request to complete the work before commencement of construction of the project. |
| 9. | Construction of road on right bank of river Sainj. | Not possible from project cost but can be taken up under the LADF. |
| 10 | Construction of community Centre at Neuli. | The demand for community centre, modern village, dispensaries, school, |

| | | |
|---|---|---|
| 11 | All villages should be adopted and developed as modern villages. | playground and drinking water may be met from LADF. Some of the dumping ground, if found suitable, can be leveled on completion of dumping and left as play ground. Regarding firewood and fodder, project proponent is paying cost of Compensatory Afforestation and Catchment Area Treatment to the Forest Department under which suitable plantations may be raised. |
| 12 | Providing dispensaries, middle school, playground, safe drinking water, fire wood, fodder etc. | |
| 13 | Families left with 5 Bighas of land should be declared landless. | It was intimated that the project affected family in whose case balance agriculture land left after acquisition is less than 5 bighas will be declared as landless. |
| 14 | Free electricity to the affected Villages. | 100 units per month as free power will be given to each project affected family (PAF) as per Government of India, Tariff Resolution dated 31.03.08. |
| 15 | Opening of ITI in the area. | No commitment was made to open ITI in Village Neuli. However, Project Proponent will be give scholarship to eligible persons from PAF for training. |
| 16 | Hindi copy of EIA to the general public of project affected area. | It was clarified that as per rules, the copies have been provided to the local village Pradhans as it is not possible to provide the same to each person. |
| 17 | Employment and suitable job to the locals. | Project authority clarified that one member of each project affected family rendered landless will be provided employment in the category of skilled/semi skilled workman subject to fulfilling the requisite criteria/qualification as and when fresh recruitment is done in these categories and it would be ensured that the persons rendered landless by the project eligible for employment are given chance first. |
| 18 | Land Compensation may be increased from Rs. 50,000/- per bigha to Rs. 10.00 lacs per bigha. | Project affected families rendered landless shall be paid relief of Rs. 50,000/- per bigha which is over and above the compensation awarded by LAO. |
| 19 | Issue of air pollution as dust generated due to vehicles and | Water sprinkling shall be carried out and preference in awarding such work |

| | | |
|---|---|---|
| | various project activities. | shall be given to PAFs. |
| 20 | Loss to houses and other rural structures viz. Gharats water springs by the construction work and blasting. | Shall be suitably compensated after technical study. In this regard, documentation including videography/ photography of the existing houses and water sources shall be carried out before starting the construction work. |
| 21 | Pollution of water from tunnel discharge | Shall be taken care of as per provisions made in EMP. |
| 22 | Maintenance of footpaths. | These works are to be done through LADF. |
| 23 | Tender up to Rs. 50 (fifty) lacs to be awarded to affected public of project area. | Project proponent clarified that amount of such tenders is limited to Rs. 5.0 (five) lacs only. |
| 24 | Monthly meetings with project authorities. | Meetings in this regard are conducted by District Administration as per practice. |
| 25 | Use of development fund provided (By Project Authorities) properly and timely by respective departments for the development of Project affected areas. | The matter is being noted and shall be addressed suitably by the concerned. |
| 26 | Extension of date of Public Hearing. | It was clarified that public hearing meeting has been conducted in line with the relevant procedure and it is not possible to postpone the same. |
| 27 | Same rate of land compensation be applied in the entire Kullu Distt. | It was clarified that the land compensation shall be made as per award of LAO. |
| 28 | Issue of muck disposal in to the river. | Shall be taken care of as per the provision made in the EMP, which has a detailed muck management plan. |
| 29 | Contents of RR should not be proposal only but commitments. | Project authorities clarified that provision made in RR shall be forwarded to Government for final approval and the RR Plan approved finally shall be implemented *in toto*. |
| 30 | Mentioning of un-irrigated land in the proposal for land being acquired whereas most of the land is irrigated. | Project authorities clarified that the payment shall be made as per class of land per revenue record. |
| 31 | Injustice has been made to the people of area by Parbati HEP authorities, hence regular | Project authorities assured that these issues will be suitably attended and development work/activities are to be |

| | | |
|---|---|---|
| | employment to the affected people, provision of suitable roads, water supply schemes, construction of community hall, construction of Surya Narayan temple be made in affected area. | met from the provision under the LADF. |
| 32 | Opening of tenders at Neuli. | Project authorities assured that the copies of tender enquiries will be sent to all Panchyat Pradhans of Project affected area and will also be displayed in the office of Naib Tehsildar, Sainj. Opening the site office of HPPCL and thereby opening small tenders locally in due course was also committed. |
| 33 | Environment Problems. | Project authority intimated that most of the components of the project are underground and there are lesser chances of pollution; however, the environmental concerns have been taken care of in the EMP which will be implemented earnestly. |
| 34 | Award of tenders up to Rs. 5.0 lacs to the affected public of the project area through limited tendering. | Project authority agreed to the proposal. |
| 35 | Compensation of land based on the negotiated rates directly between Government and owner of the land. | Project authority clarified that the rates of compensation shall be as decided by the LAO appointed by the Government. |
| 36 | Provision of public facilities like water supply, roads, health before the construction work of the project. | Public facilities shall be provided/created in a phased manner from LADF. |

## ANNEXURE – I

## SCHEME FOR COMPENSATORY AFFORESTATION

Detail scheme for Compensatory Afforestation to be carried out in lieu of 41.94 ha of forest area to be diverted for Sainj Hydro-electric Project (100 MW) in Kullu District H.P.

**1. Details of degraded forest land/non-forest land**

District : Kullu, Village : Bah, Neuli, Kareihla, Sub-The : Sainj, Teh.: Banjar

Name of Forest Division : GHNP, Shamshi, Range : Jiwanala

Block/Compartment/Survey No. DEUN & Railla Block

Area to be afforested : 83.88 lac.

**2. Description of Area:**

i) Whether the site selected for compensatory/Afforestation is a land bank or not: DPF & UPF (Govt. land).

ii) If the CA site is other than land bank, reasons be given: No

iii) In case of non-forest area identified for CA, then what is the distance of CA site from the adjoining forest boundary: Nil

iv) Soil type: Hilly soil

v) Topography : a. Hilly/undulating/plain – Hilly
b. Slope : Steep/Medium/Gentle : Medium

vi) Whether the area is bearing any root stock of vegetation: No.

**3. Plantation Model:**

Copy of the approved Compensatory Afforestation Scheme/Model showing component wise physical and financial break up to be enclosed.

**Schedule of Plantation Programme:**

Details of year wise break up of requirement of funds is as under:

| Year | Area (ha) | Rate/ha | Total Amount |
|---|---|---|---|
| $0^{th}$ year | 83.88 | - | 35,10,261.34 |
| $1^{st}$ year | 83.88 | 32.00.56 | 2,68,502.4408 |
| $2^{nd}$ year | 83.88 | 2799.43 | 2,34,866.24 |
| $3^{rd}$ year | 83.88 | 2229.435 | 1,87,054.184 |
| $4^{th}$ year | 83.88 | 2000.00 | 1,67,761.6 |
| $5^{th}$ year | 83.88 | 1500.00 | 1,25,821.2 |
| $6^{th}$ year | 83.88 | 1250.00 | 1,04,851.00 |
| $7^{th}$ year | 83.88 | 1250.00 | 1,04,851.00 |
| **Total (1-$7^{th}$ year)** | | | **11,93,707.665** |
| 7.15% increase (increase in wage rate @ 75/day) | | | 85,350.60 |
| **Total** | | | **47,89,319.005** |
| Additional contingencies @ 5% as above | | | 2,39,465.95 |
| **G.Total** | | | **50,28,784.955** |
| Additional Departmental Charges @ 17.50% | | | 8,80,037.37 |
| **Total Cost H/A** | | | **59,08,822.325** |

**Say Rs. 59,08,822.00**

## 4. Technical Details

Technical details of Compensatory Afforestation Scheme are as follows:

a) General details : Mixed Plantation of conifees and Broad leave, naked & P-Bags Plants

b) Spacement : 45 x 45x 45 cm (Broad leaved app.)
30 x 30 x 30 (conifees)

c) Species : Deodar, Rubenia, Ban ock

d) Plantation Methoc: Poly bag raised plantation

e) Soil & moisture conservation works: Contour trenches, mulching @ 25% of initial cost.

f) Protection (Fencing, watchman, people's participation etc.) :
Barbed wire Fencing (4 starched)

g) Proposed Monitoring Mechanism: Through Deptt. & other recommended agencies

h) Any other information : Nil

Sd/-

Divisional Forest Officer

**Detailed Cost**

Compensatory Afforestation Plan for 83.8808 ha Compensatory Plantation in Jeewanal Wildlife Range of GHNP during 2006-07

| S.No. | Particulars | Units | Qty. | Rate/unit | Amount |
|---|---|---|---|---|---|
| 1. | Survey and demarcation of plantation area including preparation of map | ha | 83.8803 | 47.75 | 4005.284325 |
| 2. | Bush cutting in plantation site | | 83.8803 | 556.75 | 46700.35703 |
| 3. | Preparation of inspection path 60 cm wide | Rmt | 20970.08 | 5.1 | 106947.3825 |
| 4. | Cutting and preparation of fence posts 1.80 Mtr longland 8 to 10 cm dia (including) | Nos | 5094 | 6.0445 | 30790.683 |
| 5. | Carriage of fence posts over a lead of 1 km | Nos | 5094 | 3.1815 | 16206.561 |
| 6. | Preparation/digging of holes 20-30 cm dia and 45 cm deep | Nos. | 5094 | 4.2315 | 21555.261 |
| 7. | Fixing of fence posts including strutting | Nos. | 5094 | 3.249 | 16550.406 |
| 8. | Carriage of Barbed wire over average uphill lead of 1 km | Qtl. | 82.9325 | 79.6 | 6601.427 |
| 9. | Stretching and fixing of barbed wire with U-steples (4strand) | Rmt | 60422.25 | 8.8 | 531715.8 |
| 10. | Interlacing of thorny bushes in barbed wire obtained from plantation site | Rmt | 15164.8 | 1.9 | 28813.12 |
| 11. | Layout of Pits | Ha | 83.8803 | 79.6 | 6676.87188 |
| 12. | Digging of pits 45*45*45cm (40% of total) | Nos. | 33528 | 4.454 | 149333.712 |
| 13. | Digging of pits 30*30*30 cms | Nos. | 58764 | 2.2275 | 130896.81 |
| 14. | Filling of pits 45*45*45 cms | Nos | 33528 | 1.273 | 42681.144 |
| 15. | Filling of pits 30*30*30 cms | Nos. | 58764 | 0.891 | 52358.724 |
| 16. | Carriage of nacked root plants over a lead of 2 kms | Nos. | 33528 | 0.165 | 5532.12 |
| 17. | Carriage of plants in P/bages over distance of 2 kms | Nos. | 58764 | 1.017 | 59762.988 |
| 18. | Planting of entire plants raised in P/bags | Nos | 58764 | 1.0185 | 59851.134 |
| 19. | Planting of nacked root plants | Nos | 33528 | 0.858 | 28767.024 |
| 20. | Nursery cost of plants | Nos | 92292 | 5 | 461460 |
| | | | | | **1807206.81** |
| | 7.15% increase (increase in wage rate to @ 75/day) | | | | 129215.86 |
| | **Subtotal (s.No. 1 to 20)** | | | | **1936422.67** |
| 21 | Soil and moisture | Ha | 83.8803 | 25% of | **484105.67** |

| | | | | | |
|---|---|---|---|---|---|
| | conservation works 25% of initial planting cost at S.No. 20) | | | initial planting cost | |
| 22. | Add cost of B/wire including cost of U.nails | Qtl. | 75.492 | 3200 | 242944 |
| 23. | Cost of Fence post (Broad leaved species) | Cum | 152.85 | 5540 | 846789 |
| | **Total (S.No. 1 to 23)** | | | | **3510261.34** |
| 24 | Year wist maintenance cost | | | | |
| i) | 1st year | | 83.88 | 3201 | 268502.4408 |
| ii) | 2nd year | | 83.88 | 2800 | 234866.24 |
| iii) | 3rd year | | 83.88 | 2230 | 187054.184 |
| iv) | 4th year | | 83.88 | 2000 | 167761.6 |
| v) | 5th year | | 83.88 | 1500 | 125821.1 |
| vi) | 6th year | | 83.88 | 1250 | 104851 |
| vii) | 7th year | | 83.88 | 1250 | 104851 |
| | | | | | **1193707.665** |
| | 7.15% increase (increase in wage rate to @ 75/day) | | | | 85350 |
| | **Sub total (i-vii)** | | | | **1279057.665** |
| | **Total (S.No. 1 to 24)** | | | | **4789319.005** |
| | Additional contingencies @ 5% as above | | | | 239465.95 |
| | **Grand Total** | | | | **5028784.955** |
| | Additional departmental charges @ 17.50% | | | | 880037.37 |
| | **Total Cost H/A** | | | | **5908822.325** |
| | | | | **Or say** | **5908822** |
| | Name of Areas to be planted: | | | | |
| | | | | | |
| 1. | Kareihla UPF | 13.88 ha | | | |
| 2. | Riara UPF | 10 ha | | | |
| 3. | Banaugi UPF | 10 ha | | | |
| 4. | Ranaga UPF | 10 ha | | | |
| 5. | Mail UPF | 10 ha | | | |
| 6. | Thnour DPF | 10 ha | | | |
| 7. | Sawankanda DPF | 10 ha | | | |
| 8. | Ratana UPF (Range) | 10ha | | | |
| | | 83.8808 ha | | | |

**Block Officer**

**Range Forest Officer**