



CHAPTER 6

RECOMMENDATIONS

6.1 Introduction

Based on existing terrestrial biodiversity study conducted for Rampur Hydro-Electric Project following recommendations is made for successful implementation of suggested mitigation measures during construction & operation phase of the project as well as to protect & enhance the terrestrial biodiversity. The recommendations are made to Project Implementation Unit (SJVNL) with reference to Institutional Strengthening, recommendations for vegetative measures & recommendations, which are to be forwarded to the State Forest Department for their consideration while implementing various plans for the protection of terrestrial biodiversity. The issue-wise details are discussed below:

6.2 Institutional Strengthening

Following measures are recommended for Institutional Strengthening in terms of appointment of Environment Officer, Training Programme for Environmental Awareness and suggested Training Institutes. The details are discussed below.

6.2.1 Appointment of Environment Officer

At present there is only one environment engineer looking after the environmental aspects of the project. It is recommended that an additional post of Environment Officer is to be created at corporate level to tackle various environmental issues. The Environmental Officer deployed should be familiar with the National Environmental Legislation and would have experience in monitoring of similar projects. Briefly, his main responsibilities will include:

- Review of specifications during project preparation to ensure their adequacy and suitability with respect to the recommendations of the Management Plan,
- Collection and dissemination of relevant environmental information indicating amendments to environmental protection acts issued by various agencies including the World Bank etc
- Liaise with NGOs, community groups, Government Departments, etc. on environmental issues
- Monitor the environmental aspects of projects, during construction phase to ensure that the environmental requirements and the mitigation measures proposed in the Management Plan are implemented,
- Undertake compliance monitoring to provide periodic checks,
- Undertake environmental training activities
- In the long term, the Environment Officer should liaise with various safety issues related to the project



- Co-ordination with State Forest Department for effective implementation of recommended of Compensatory Afforestation Plan and Catchment Area Treatment Plan with reference to:
 - (i) Inspection of Forest nurseries from where saplings are to be brought for plantation
 - (ii) Supervision & monitoring of various plantation programmes
 - (iii) Effective Implementation of recommended species for compensatory afforestation
 - (iv) Regular inspection/monitoring/evaluation of plantation during maintenance period
 - (v) Effective Implementation of recommended Wildlife Management Plan
 - (vi) Effective implementation of Eco-development Plan recommended by forest department
 - (vii) Co-ordination with Forest Department & local people of Project Influence Area for Conservation of Forest & Wildlife through Public Awareness Programs
- Successful implementation of Muck area re-development plan.
- Successful implementation of Quarry area re-development plan
- Effective implementation of proposed avenue plantation along proposed roads in project area
- Monitoring & supervision of landscaping work expected to be carried out in and surrounding project area

6.2.2 Suggested Environmental Awareness & Training Programs

Whilst there is increased awareness of environmental issues, appreciation towards handling them is limited. It is important to develop sensitivity to appreciate natural flora and fauna. For implementation of biodiversity training of SJVNL officials is essential required which should start top to bottom. It is essential that senior officials should grasp completely the features of biodiversity management.

For management of biodiversity it is required to develop ability to communicate and work with community and understanding the socio-political dynamics prevalent in the village community. The training required are:

- In the immediate short term, training will be required for SJVNL staff on environmental awareness
- The network of training Institutions in India and the World Bank's Economic Development Institute, Environment and Natural Resources Division and the Himachal Pradesh State Pollution Control Board (HPPCB) carry out regular training and contacts in this regard needs to be developed
- In the long term, following the setting up of the Environmental Unit, the need for additional and specialized training has to be examined and appropriate training has to be undertaken

During construction phase training/awareness program should be organized by the PIU for PIU staff, and the contractor twice a year. During operational phase



one workshop/awareness program should be organized at district level each year for the first 3 years. The suggested training modules are given in **Table 6.1**.

Table: 6.1
Proposed Training Modules

Sl. No	Target Group	Subject (s)	Method
1.	PIU staff, Environmental Specialists,	Environmental Awareness Environmental Regulations, Hydro-power Related provisions of various acts, EIA notifications, process and methodology for Biodiversity Conservation	Lectures
2.	Managers (Env) at PIU, Environmental Specialists Contractor Staff	Implementation of Biodiversity Management Plan Planning, Design and execution of mitigation and enhancement measures, monitoring and evaluation of environmental conditions during construction and operation.	Workshops and Lectures
3.	Environmental Specialist Contractor's Staff	Environmentally Sound Construction Practices Clean Construction Technology, Waste minimization and management in construction processes, storage and maintenance of equipments/ materials, Control of soil erosion, Transplantation and compensatory plantation including maintenance, Borrow Area and Construction Camp Management.	Seminars and Lectures

6.2.3 Suggested Training Institutes

There are several agencies and training institutes in India which organize training in the above areas. Some of the institutes are:

- Confederation of Indian Industry (CII)
- World Bank's Economic Development Institute of Environment
- State Pollution Control Board (SPCB)/Central Pollution Control Board (CPCB)
- Universities and Non-Government Organizations



- Forest Research Institute (FRI)
- National Botanical Research Institute (NBRI),
- Botanical Survey of India
- Zoological Survey of India
- National Environmental Engineering Research Institute (NEERI) etc

6.3 Vegetative Recommendations

The proposed Muck/Quarry Area Redevelopment Plan, Avenue Plantation and Landscaping will be carried out by SJVNL in and surrounding project Area. The vegetative measures are recommended based on extensive field survey of the project area. The details of vegetative recommendation for various abovementioned activities are discussed below:

6.3.1 Recommendations for Muck/Quarry Area Redevelopment Plan

The review of Muck/Quarry Area redevelopment plan revealed that ornamental trees and grass are recommended for redevelopment. In order to hence speedy resilience of eco system following species of native, every green fast growing gregarious shrubs are recommended for the abovementioned areas.

Table: 6.2
Recommended shrub species for Redevelopment Plan

S. No.	Scientific Name	Common Name
1	<i>Adhatoda vasica</i>	Vasica
2	<i>Calotropis gigantean</i>	Aak
3	<i>Colebrookea oppositifolia</i>	Bambher
4	<i>Debregeasia hypoleuca</i>	Sihanru
5	<i>Dodonea viscosa</i>	Mehandi
6	<i>Rumex hastatus</i>	Bhilmora
7	<i>Racinus cummunis</i>	Arendi

Following thorny and succulent shrubs are recommended for hedges and boundaries of propose Muck/Quarry redevelopment areas owing to their protective, non-palatable and medicinal value to local people.

Table: 6.3
Recommendations of species for Hedges & Boundaries

S. No.	Scientific Name	Common Name
1	<i>Agave americana</i>	Rambans
2	<i>Aloe vera</i>	Aloe
3	<i>Euphorbia royleana</i>	Shuru
4	<i>Opuntia monacantha</i>	Nagphani
5	<i>Carisa spinarium</i>	Karonda
6	<i>Zizyphus nummularia</i>	Ber
7	<i>Rumex hastatus</i>	Bhomali



6.3.2 Recommendation for Avenue Plantations

The ornamental value of trees are due to their beautiful colors of flowers and are helpful to increase aesthetic nature of avenues in proposed project roads and in colonies. Based on intensive survey of sites following flowering plants are recommended for avenue plantation along proposed road to be constructed. The details of ornamental plants are given below

Table 6.4
Recommended Species of Ornamental Plants for Avenue Plantation

S. No.	Scientific Name	Common Name	Color of Flower	Flowering Season
1	<i>Albizzia lebbek</i>	Siris	Yellowish white	June to Sept.
2	<i>Bombax ceiba</i>	Semul	Orange/ Red	Mar. to May
3	<i>Callistemon lantecolatus</i>	Bottle Brush	Red	Jan to Mar.
4	<i>Cassia fistula</i>	Amaltas	Yellow	Apr. to May
5	<i>Erythrina indica</i>		Scarlet Red	Feb. to Mar.
6	<i>Bauhinia verigata</i>	Kachnar	Purple	Feb. to Mar.
7	<i>Melia azaderach</i>	Baken	White	Mar. to May
8	<i>Millingtonia hortensis</i>	Akash Neem	White	Apr. to Jun.
9	<i>Tecoma stans</i>	Ticoma	Yellow	Mar. to Apr.
10	<i>Thevetia peruviana</i>	Pila kaner	Yellow/ white/ Red	Jul. to Oct.
11	<i>Nerium indicum</i>	Kaner	White/Pink/Red	Jan. to Dec.
12	<i>Mallotus philippinensis</i>	Kamala	Red	Feb. to May.

The aesthetic and environmental value of proposed roads can further be enhance by implementing plantation of same species throughout the stretch and naming road as Bombax Avenue (*Bombax ceiba*); Siris Avenue (*Albizzia lebbek*); Kachnar Road (*Bauhinia verigata*) etc. The roads in proposed staff colonies may be planted with colorful shrubs reaching to the height of 2-3 m such as Tecoma Lane (*Tecoma stans*), Yellow Kaner Lane (*Thevetia peruviana*), Kaner Lane (*Nerium indicum*) etc

6.4 Recommendation to be forwarded to State Forest Department

The Compensatory Afforestation Plan, Catchment Area Treatment Plan & Wild life Management Plan will be implemented by State Forest Department Govt. of Himachal Pradesh through the Conservator of Forests. At the field level the actual implementation will be done by DFO's of Rampur & Ani Forest Division. Based on the review of abovementioned documents and our experience during



extensive field survey of Project Influenced Area, following recommendations are made which can be forwarded by SJVNL to State Forest Department for their consideration while implementing these plans. The recommendations are discussed below.

6.4.1 Recommendation for Compensatory Afforestation Plan

Following species were found to be growing well throughout the forest patches. Being native, easily available as well as high fodder value in respect of crude protein content. Following species are recommended to incorporate as fodder species in proposed compensatory afforestation plan which will be implemented by State Forest Department.

Table: 6.5
Fodder Spices Recommended for Compensatory Afforestation

S. No.	Scientific Name	Common Name	Crude Protein Content (%)
1	<i>Bauhinia variegata</i>	Kachnar	15.18
2	<i>Bombax ceiba</i>	Semul	16.83
3	<i>Cleitis australis</i>	Kharik	13.33
4	<i>Cedrela toona</i>	Tun	10.71
5	<i>Quercus dilata</i>	Moharuoak	13.37
6	<i>Zizyphus nummularia</i>	Ber	11.63
7	<i>Tamarindus indica</i>	Imli	18.80

6.4.2 Recommendation for Implementation of Catchment Area Treatment Plan

The Catchment Area Treatment Plan formulated by State Forest Department covers all issues related to control soil erosion by implementing various schemes. This CAT Plan is designed to address the basic environmental problem of catchment's degradation. An associated approach would be to assist institutional development and strengthening to ensure sustainability of interventions with involvement and participation of the local communities. The details are discussed below:-

(i) Participatory Approach

It is now accepted that no forestry works would be successful in any project, without the involvement of the local population. A participatory approach has to be adopted in this CAT Plan as well.

Participatory approach implies development of/strengthening the capacity of the community for collaborative action, identifying and analysing their problems, setting goals and actively implementing micro-projects. The community takes management decisions and the technocratic outsider acts as a facilitator in the process. This would include the following.



(ii) Community Development

In order to make the participatory approach a success, sufficient attention is paid to Community Development Process. The process aims at building up/strengthening the capacity of the community to plan and undertake participatory development activities. The process starts with Village Selection with simultaneous deployment of staff and selection of NGOs, who are to be involved in project implementation process to assist in Rapid Appraisal (**RA**), community development through Participatory Assessment (**PA**), Participatory Resource Planning (**PRP**), Participatory Monitoring and Evaluation (**PME**), on-the-job training for leadership development and communication skills for villagers and village institutions, gender sensitization and to carry out process evaluation studies.

(ii) Community Capacity Building

Community Capacity Building is an important tool to strengthen the cadre of people involved in a project, and is achieved through PA, formation of village level institutions and micro planning. The objectives of capacity building are: (1) to enhance capabilities of participatory communities in terms of awareness, knowledge and skills; (2) to enable them to perform tasks assigned in a better manner, and (3) to develop visionary leadership for village improvement.

Capacities building through training and on-the-job exposure visits within and outside the state are essential. The contents focus on project ideology, roles and responsibilities and record keeping among others. This will probably make a difference in the near future in terms of village level institutions that are holistically concerned with the quality of environment, natural resource management, upkeep of records, resource mobilisation, increasing area under village woodlots, land fertility, innovation, etc.

(iv) Village Level Institutions

The need for constituting village level institutions is to organise community members through a common platform to address the issues of natural resource management, to build leadership resources at the local level, to create a forum which can ensure accountability and transparency, empowerment of disadvantaged and to create a reservoir of resources, which can maintain community assets created under the project to sustain activities after the project withdraws.

Self-Help Groups (**SHG**) need to be formed in different villages for social mobilization of women. This approach gives an opportunity to women to free themselves from isolation and exploitation. Regular training needs to be conducted to develop and enhance their skills to run these organizations.



(v) Training

The training activities of the project would be undertaken the following objectives:

- To enhance the technical competence of field level forestry staff in areas like forestry extension, rural communication, participatory assessment, micro planning, participatory monitoring and evaluation and leadership building, in order to enable effective implementation of the project
- Community capacity building at village level with a view to promote participation and self-reliant actions of the community, to manage their village resources in a sustainable manner
- To hasten the process of empowerment of the weaker sections of village communities, particularly women, scheduled castes, landless and other disadvantaged groups, through on-the-job skill training to generate self-employment opportunities

(vi) Information and Communication

There is a range of community forestry information needed within the project as below which needs to be communicated

- Villagers require access to community information systems related to management of Common Property Resources (**CPRs**), farm tree resources, income generating possibilities, resources and markets, various Government schemes for village development, skills needed to manage village level institutions
- Extension staff needs information on different forestry models, community development processes, and communication and media skills
- Project management would require information for decision-making, planning, monitoring and evaluation through establishment of reporting systems and a Management Information System (**MIS**)

(vii) Participatory Monitoring and Evaluation

The main aim is to provide information for better managing community forestry micro-projects and for improving community capabilities for sustainable resource management. The involvement of people in the process enables them to critically examine the programmes in order to achieve the desired results.

6.4.3 Recommendation for Management of Biodiversity of Project Influence Area

Based on extensive field survey of Project Influenced Area & major treats to existing terrestrial biodiversity, following recommendations are made for the conservation of Project Influenced Area. The issues are discussed in details below.



(i) Control of Timber Demand:

Local people have recorded rights of timber for construction purposes at nominal rate. The ratio between this concessional and market rate is 1:4000 to 1:5000. Due to division of families, the number of right holders is multiplying and the forests are depleting. The right to timber for villagers is found to be the major factor affecting forests of the project influence area. Almost half of the yield prescribed annually from the forest goes to T.D. right holders. As whole standing trees are marked to the individual right holder, it gives entry and license to enter the forest and provide a temptation for illicit felling. The timber species of the forest are climax species & play significant role in providing forest cover and habitat for wildlife hence, it should be protected from felling. Following measures are suggested

- Strict ban on felling of timber species of size less than 90 i.e. girth at g.b.h (II B class) timber species
- Reduction in Timber Demand by local right holders
- Increase in zamindari rate/concessional rates to prevailing market rules
- Compulsory plantation/successful survival of timber species then only T.D. should be permitted by forest department to right holder
- Provision of alternate building material to timber such as concrete block made of fly ash or brick for construction of houses/dwellings, Provision of Cement/Asbestos/Plastic/Tin sheets as roof material for poor right holders

(ii) Control of Agriculture/Horticulture activities in forest areas.

- The agriculture/horticulture activities at the cost of forestlands should be discouraged
- Strict control on felling of trees for expansion of agriculture/horticultural lands existing in forest areas
- Control on Land use in forest areas and should be based on land capability classification
- Areas under dense forest cover should not be disturbed for agriculture/horticulture activities

(iii) Control of Forest Fire :

Special fire protection measures needed to be undertaken for control of forest fire such as

- Early detection
- Quick communication
- Early action
- Placement of fire control equipments
- Reduction of fire hazards in forests
- Setting of fire lines and fire breaks
- Create Public awareness about impacts/effects of fire



(iv) Control on Grazing :

In order to protect forest from overgrazing certain punitive actions, as mentioned below, need to be attended to:

- Where grazing is permitted, the animals should be allowed to enter the forests well after the rains have begun so that grasses would have grown sufficiently to withstand grazing and trampling
- The cattle allowed to graze inside the forests should be accompanied by a herdsman to control unwanted grazing
- To reduce the dependency of grazing on forest surrounded by heavy bovine population, stall feeding, balanced animal nutrition, improved cattle varieties application of concentrates etc. should be encouraged
- Fencing around the important forest areas to prevent entry of cattle inside forest should also be tried. Provision of at least 1.5 m high fencing with barbed wire and R.C.C. posts is standard practice. Effective fencing restrict the movement of human beings and thereby illicit removal of forest material
- Cattle proof trenching of size 3 m wide top, 1.5 m wide bottom, and 1.5m deep is dug and dugout earth is heaped on the border of trench so that cattle cannot enter the protected area. On the soil, heaped on the border of trench, thorny species like *Carissa spinarium*, *Zizyphus nummularia*, *Euphorbia royleana*, *Agave americana* etc. should be planted so that it will stabilize the soil and prevent animals to jump and get into forest

(v) Illegal Cutting/Felling of Trees:

In order to prevent economic loss to forest division and degradation of reserve forest from illicit cutting following care should be taken –

- Theft of timber and firewood, if any should be controlled
- Special forest protection force should be established to apprehend the illegal felling
- For unlawful activities in forests, strong actions should be taken and be punished

NGOs should also be involved for creating public awareness against illegal felling of trees