

CHAPTER 4

BIODIVERSITY CONSERVATION AND MANAGEMENT PLAN

Extensive floral and faunal survey carried out in the project area, has enabled to identify the rare and endangered species likely to be affected by the project. In the following paragraphs the mitigation measures are suggested for translocation and relocation of the species. General measures are also suggested for conservation plan of flora and fauna.

4.1. CONSERVATION PLAN FOR ENDANGERED SPECIES OF PLANTS

In EIA reports, following plants are mentioned under the category of endangered species which require measures for conservation:

<i>Albizia arunachalensis</i>	Endemic
<i>Angiopteris evecta</i>	Habitat loss & destruction
<i>Coptis teeta</i>	Endemic & over exploited (Vulnerable – as per BSI's Red Data Book of Indian Plants)
<i>Cyathia spinulosa</i>	Habitat loss & destruction
<i>Entada pursaatha</i>	Habitat destruction, narrow distribution
<i>Gynocardia odorata</i>	Rare and habitat destruction
<i>Podophyllum hexandrum</i>	Rare
<i>Rhododendron edgeworthi</i>	Rare
<i>Taxus wallichiana</i>	Over exploited

The magnificent flora of the Dibang catchment has a special place even among the outstanding floristic composition of the North East, mainly because it is still one of the least disturbed and perhaps the least explored botanically.

The peculiar topography, the area and the location of the dam on a comparatively narrow gorge, perhaps makes the creation of a comparatively long reservoir submerging more than usual, large forest area obligatory in this

case. However, the redeeming feature is that the type of forest affected is, by no means unique to this area alone but occurs in other area of the vast catchment. Moreover the percentage of forest-covered land in this catchment is higher than the accepted norm and the provision of compensatory afforestation should adequately take care of the possibility of upsetting the ecological balance. However, it is suggested that while clearing the forest area to be submerged, the Forest Department should take adequate care to translocate the rare species of plants particularly orchids, tree ferns and medicinal herbs and shrubs to other adjoining forest areas as far as feasible and the Project Authority should fully co-operate in this job. These should also ensure that their men and machineries create the least disturbance in the neighbouring forest areas.

Ex situ conservation is one of the conservation methods, which involves the conservation of components of biological diversity outside their natural habitats (CBD, 1992).

Some formal methods of *ex situ* conservation are listed in Table 17. Among these methods, the storage of seeds in **seed banks** has some advantages for preserving species, but can only be used for species with seeds capable of remaining viable after long-term storage (known as 'orthodox' seeds). The typical technique used for seed storage is to lower the moisture content of the seeds to 2–6 per cent or less, and reduce the temperature to around 0° Celsius or lower. Collections in seed banks should occasionally be tested for their viability. Periodically, the seeds in seed banks should be germinated and the plants allowed to grow and produce more seeds, which are then stored as replacements for the originals. In comparison to some other common methods of *ex situ* conservation, the advantages of seed storage include low cost, less risk of disease and more efficient use of space or land. Seed storage can be 50 to 500 times cheaper per collection than field gene banks or *in vitro* storage (Epperson *et al.*, 1997). However, there are numerous species, including many tropical forest and temperate trees, whose seeds cannot be stored in seed banks because they lose viability if their moisture contents are reduced to the required level ('recalcitrant' seeds).

Field gene banks can be used for conserving varieties of plants for which seedbanks are unsuitable. They are mainly used for major crop plants, such as banana (*Musa*), mango (*Mangifera*) and yam (*Dioscorea*). **Botanical gardens** and arboreta differ from seedbanks and field genebanks in that their collections usually consist of small numbers of many species, rather than many specimens of a few species. **In vitro storage** refers to the maintenance of cells or tissues in sterile growth media in dishes or flasks.

Ex situ plant collections serve various roles in conservation and development, including:

- refuges of last resort against extinction;
- sources of plants to reinstate or reinforce wild populations;
- habitat restoration;
- sources of germplasm for the selection or breeding of useful plant varieties;
- production of plant products;
- convenient collections for research; and
- public edification – for example, through displays in botanic gardens.

Table 4.1 : Techniques of *ex situ* conservation

Techniques	Definition
Seed storage	Collection of seed samples at one location and their transfer to a genebank for storage. The samples are usually dried to a suitable low moisture content and then kept at sub-zero temperatures.
Field genebank	The collecting of seed or living material from one location and its transfer and planting at a second site. Large numbers of accessions of a few species are usually conserved.
Botanic garden / arboretum	The collecting of seed or living material from one location and its transfer and maintenance at a second location as living plant collections of species in a garden or for tree species in an arboretum. Small numbers of accessions of a large number of species are usually conserved.
<i>In vitro</i> storage	The collection and maintenance of explants (tissue samples) in a sterile, pathogen-free environment.
DNA / pollen	The collecting of DNA or pollen and storage in appropriate, usually storage refrigerated, conditions.

From the techniques mentioned in table 4.1, creation of botanic garden is proposed for conservation of endangered plants found in Dibang catchment area. It is proposed to afforest rare and endangered species over an area of 50 ha (as a part of compensatory afforestation) as a measure for *ex-situ* conservation and propagation. The rehabilitation plots are to be atleast the size of 35 ha for trees and 10 ha for shrubs and 5 ha for herbaceous plants.

Many of the threatened plants and the superior germplasm that are going to be affected can be transplanted to safer locations. There are useful technologies that are available for this purpose. Appropriate technologies suiting to the species concerned could be adopted. Some of the vegetative propagation methods like aird layering, grafting, stump planting, cuttings, suckers, stolons, bulbil propagation etc may find application here.

There are many important trees and superior germplasm in the area particularly of timber species and bamboos. We need to create germplasm banks with the materials obtained from it. Though the same species could be found elsewhere, the germ plasm may not be available. The propagation and cultivation of these species may be done in co-ordination with the State Forest Research Institute (SFRI), Itanagar or Regional Forest Research Institute, Jorhat. Similarly NERIST and RRL could take up some aspects of the study and action. The Forest School at Roing Range offices located at Roing and Santipur are key players in rescue and rehabilitation.

In addition, an orchidarium and a fern house are proposed to be developed in the project area, in which important species of orchids and ferns collected from the catchment area will be conserved.

A lump sum amount of Rs. 100 lakhs may be earmarked for propagation of rare & endangered species including R&D activities while Rs. 10 lakhs may be earmarked for development of orchidarium and fern house.

4.2. WILDLIFE CONSERVATION

As already described in EIA report the wildlife (birds and animals, including reptiles) resources of Dibang river catchment is very rich and varied. These species have been described in chapter 4 of EIA report along with their conservation status. A large number of animals like Goral, Takin, Snow-leopard, Hoolock gibbon, Assam Macaque, Mithun, Himalayan Black Bear, Wild Dog, Leopard, Clouded leopard, Leopard cat, Jungle cat, Pangolin etc. are reported to be residents of this catchment. Even tigers may be sighted within the lower reaches. There are a large number of other species of deer, monkeys, antelopes, wild boar and smaller animals like mongoose, civets and squirrels that live in these forests.

No part of Mehao and Dibang Wild Life Sanctuaries will be affected either due to construction activities or due to submergence. It is expected that as the clearing of forest progresses, the wild animal population, including birds, will by natural instinct migrate to neighbouring safer places. However it is important that the adverse impact of the proposed Dibang Multipurpose Project on the faunal resources is kept at the minimum level. There are two ecologically sensitive area viz. Mehao Wildlife sanctuary & Dibang Wildlife sanctuary. These are located about 14 km and 35 km from reservoir periphery respectively. The Project Authority must take certain precaution that the labour force engaged in the construction work or the floating populations of outsiders, who visit the site for business, do not come in conflict with the wildlife population in the working area as well as its neighborhood forests. If possible, carrying firearms in the project area and its vicinity should be banned. Use of explosives and blasting material should be rigidly controlled and kept to the minimum.

During construction and operation phases and to prevent poaching in forest area around the project area, it is recommended that check posts be installed near major construction sites and labour camps. It is proposed to develop 4 check posts, which will have 8 guards and a range officer to prevent the poaching activities. The range officer will supervise the guards of various

check posts. It is also recommended that the staff manning these check posts have adequate communication equipments. It is proposed that 2 jeeps and 5 wireless sets would be purchased.

Apart from inter-linking of check posts, the wireless link needs to be extended to DFO and the local police station also.

It is proposed that provision for revival of the Zoo at Roing and development of a Butterfly Park in the project area may be kept. For the revival of Zoo and development of Butterfly Park, a lump sum amount of Rs. 60 lakhs is proposed to be kept.

4.3. Cost Estimate

Salary of 8 guards @ Rs.5000 per month	: Rs.4.80 lakhs per year
Salaray of one range officer @ Rs. 10,000/month	: Rs.1.20 lakhs per year
Total cost for one year	: Rs. 6.00 lakhs per year
Cost for 8 years (construction period)	: Rs. 48.00 lakhs ... (A)

Cost of construction of check posts and provision of arms & ammunition and communication (Rs. 5 lakh x 4)	: Rs. 20.00 lakhs
Purchase of 2 Jeeps @ Rs.5 lakh/Jeep	: Rs. 10.00 lakhs
Propagation of rare & endangered species including R&D activities	: Rs. 100.00 lakhs
Development of orchidarium & fern house	: Rs. 10.00 lakhs
Revival of zoo and development of Butterfly Park	: Rs. 60.00 lakhs
Total	: Rs. 200.00 lakhs ... (B)

Grand Total (A+B) : Rs. 248.00 lakhs

Note: The jeeps provided to the forest department shall be used for the implementation of various plans (like CAT, compensatory afforestation etc.) also.