

**Chapter 3****BIODIVERSITY CONSERVATION AND
MANAGEMENT PLAN****3.0 Introduction**

The Bursar Project envisages construction of 265 m high Concrete Gravity Dam (from river bed level) across river Marusudar, near village Pakal ($33^{\circ} 30' 38''$ N & $75^{\circ} 47' 06''$ E). The proposed dam will store a total volume of 726.30 Mcum of water corresponding to FRL of 2134m and will create a reservoir of approximately 22.8 km length spreading up to village Yourdu (Area= 1442.71ha) located at the confluence of Warwan river and Rin nallah. 6.75 km long Horseshoe shaped Head Race Tunnel will take water from the reservoir to 680MW (4 x 170 MW) surface Power House at Lopara. The water from Power House would be discharged back into the Marusudar along its right bank through proposed Tail Race Channel. One 120 MW (3 x 36 MW + 12 MW) Dam Toe Power House at Pakal is also envisaged for the Project. About 1779.33 ha of land would be required for the Project, out of which 1149 ha is the forest land (including underground forest area). Out of the 1779.33ha, a total of 1442.71 ha of land is coming under proposed reservoir submergence.

The likely potential negative impacts associated with the construction of Bursar project are due to road construction, blasting, quarrying and dumping of excavated material, construction of colonies, submergence, and infrastructural development etc. All these activities may affect the microclimate and ecosystem of the area. Therefore, there is a need for the conservation of biodiversity considering that the project is very much close to Kishtwar High Altitude National Park. The Biodiversity Conservation Plan has been formulated to maximize the positive environmental impacts and minimize the adverse impacts of the Project construction on the flora and fauna of the Project area and the catchment. Biodiversity conservation and management plan has been proposed with the following aims and the objectives:-

- Conservation and management of habitats and microhabitats used by potentially important species.



- Mitigation of biotic and abiotic pressures and adverse impacts on the habitats
- Special efforts for in situ or ex situ conservation of critical/ important plant & animal species, if any, affected by the project
- To provide incentives for training and public education to increase awareness with respect to biodiversity by eco-developmental / awareness programmes.

3.1 Biodiversity Around Project Area

The Bursar project falls within a distance of 10 km from the boundaries of Kishtwar High Altitude National Park (KHANP). Tree species reported from the area are *Abies pindrow* and *Pinus wallichiana* mixed with *Cedrus deodara*, *Pinus griffithii*, *Aesculus indica*, *Juglans regia*, *Populus ciliata*, *Criglus cornula*, *Padus cornula*, *Fraxinus cornula* and *Taxus wallichiana*. Understorey is represented by small trees and shrubs. Besides, other plant species of horticultural importance like apple (*Malus pumila*), pear (*Pyrus communis*), walnut (*Juglans regia*), apricot (*Prunus armeniaca*), sweet cherry (*P. avium*), sour cherry (*P. cerasus*), plum (*P. domestica*) and peach (*P. persica*) are also reported from the area. It is understood that no RET species is being affected due to construction of project, however, some species endemic to the NW Himalayas such as *Berberis lyceum*, *Colchicum luteum*, *Primula glomerata*, *Salvia moorcroftiana*, *Viburnum cotinifolium*, etc., which are found here as well, are likely to get affected. However, as these species are not restricted to the project area only and occur in the other parts of the NW Himalayas, the effect of project related activities on these species will be minimal.

Commonly observed in the study area are domestic animals such as Cattle, Sheep, Horses, Domestic Fowl, Street Dogs, Cats etc. Occasional visits of Black Bear (*Selenarctos thibatanus*), Jackal (*Canis aureus*), Wolf (*Canis Lupus*), Kashmir Leopard (*Panthera pardus*) etc. have been reported. Besides, sighting of *Herpestes nyula* (Common Mongoose), *Martes sibirica* (Himalayan Weasel), *Mus musculus* (Field Mice), *Ratus ratus* (House Rats) and voles are also witnessed in the human and cattle trespassing areas. Six endangered mammal species, viz., *Cervus hanglu*, *Moschus cupreus*, *Lynx lynx isabellinus*, *Ursus arctos isabellinus*, *Selenarctos thibetanus laniger*



and *Hemitragus jemlahicus* and vulnerable species *Panthera pardus millardi* and *Capricornis sumatraensis* are reported from KHANP area. However, most of these species are reported at high altitude and are seldom known to come to project area. During baseline survey, a number of butterflies and moth species were found around the project area. As butterflies prefer habitats with more flowering species and moist regions, increase in the humidity in and around the reservoir and development of green belt will further enhance the butterfly diversity and density. The biodiversity management plan, described below, shall be implemented in coordination with Department of Forests and Wildlife Protection Department, J&K Government.

3.2 Mitigation measures suggested

The objective of the plan is to protect the habitat of the biodiversity around the project area. Considering the impact on various species, following activities and developmental works will be undertaken under this plan:

- i) Setting up of a special cell for inventorising flora and fauna and establishing their baseline status by State Govt.
- ii) Habitat improvement programmes
- iii) Establishment of botanical garden along with development of butterfly habitat
- iv) Management measures for protection of forest and wildlife species.
- v) Safeguards during construction phase

3.3 Biodiversity Conservation Cell (BCC)

The project is located near biodiversity rich area, therefore it is proposed that a Biodiversity Conservation Cell (BCC) be created. The nature of regulatory framework and its implementation will be executed by the J&K State Government. The action plan for this Cell shall be as follows:

- (i) A Biodiversity Conservation Cell will be set up by the State Government under the direct administrative control of Chief Wildlife Warden, Jammu & Kashmir.



- (ii) An Advisory Board under the Chairmanship of the Chief Wildlife Warden J&K shall be constituted by the State Government which shall include two members each from J&K Wildlife Protection Department and State Forest Department, one representative of Union Ministry of Environment, Forests and Climate Change, one renowned Ecologist/ Conservationist from Wildlife Institute of India, two experts from the J&K State Universities and two representatives of local NGOs.
- (iii) The Biodiversity Conservation Cell shall work from an office located in the vicinity of the Bursar Project and would have the following staff.
 - a. Research Officers 2 nos. (with M.Sc. in Env. Sciences/ Wildlife/Zoology/Botany)
 - b. Field Assistants 2 nos. (with graduation in biological science)
 - c. Office Attendants 2 nos. (Matriculate)
 - d. Driver for inspection vehicle 1 No.

Activities to be undertaken by Biodiversity Conservation Cell

- (i) The main job of this Cell would be documentation of the existing biological diversity, record of traditional knowledge on the plant species, medicinal plants and their importance, inventorisation of endemic and invasive species in the proposed project/ catchment area and published check lists of flora and fauna including endangered, threatened and vulnerable floral / faunal species. However, this would be supplemented by detailed surveys on flora and fauna that are proposed to be conducted by the reputed institutions/agencies.
- (ii) The special cell will also develop monitoring protocols for selected species/taxa and conduct regular monitoring of the identified species/taxa and share the information to general public and also publish them.
- (iii) Local Participation: Awareness programmes shall be conducted by the Cell for creating awareness amongst the locals and encourage them 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.

For running & maintenance of the Biodiversity Conservation cell, the budget would be provided by Project proponent for a period of 11 years, thereafter the Cell shall be supported by the State Govt. The land required for the office – cum - Laboratory of the BCC and other works would also be provided by the State Government.

Table 3.1 Cost estimate for Biodiversity Conservation cell

S.No.	Particulars	Amount (Rs. in Lakhs)
1	Office –cum-Laboratory Complex, fencing, etc.	50.00
2	Furniture, etc.	15.00
3	Computers, Printers, etc.	10.00
4	Wireless/ V SATs & other Surveying Equipment (Cameras, Binoculars, GPS), etc.	50.00
5	Inspection Vehicle with accessories	25.00
6	Census, enumerative surveys and collection of baseline data over period of 11 years in various seasons.	90.00
7	Production of updated maps on GIS, reports, etc.	15.00
8	Public Hoardings, publication of Brochures and pamphlets, etc.	11.00
9	Salaries & wages for Staff (11 years) Research Officer @Rs 30000/m for first five years and Rs. 40000/m for next 6years Field Assistant @ Rs. 20,000/m for first five and Rs. 25000/m for next six years Office Attendant/Driver @ Rs, 12000/m for first five and Rs. 15,000/m for next six years.	207.60
10	Contingent expenditure @ Rs. 10.00 Lakhs / per year for 11years	110.00
	Total amount	583.60

3.4 Habitat Improvement Programme

The main aim of the plan is to conserve the forest resources and habitat through involvement of locals. The joint efforts would reduce the pressures on the forests by providing the alternate income generation to people around the project. This joint programme will be carried at various levels like awareness programmes, reward



system, awareness about continued survival and importance of wildlife, etc. The participating NGOs and self help groups (SHG) would run awareness, training programmes for the local communities. The main activities to be carried out in Habitat improvement programme would be:

- i) Plantation of fuel and fodder plant species on degraded forest land to improve the habitats and reduce the pressure on natural forests
- ii) Construction of fire lines in the forest rich in biodiversity
- iii) Awareness programmes for the conservation of wildlife through audio-visual aids including printing of booklets/posters/brochers etc.
- iv) Physical removal of invasive species from pristine ecosystem

The project proponent would provide the finances for supporting the activities through NGOs and SHGs for 11 years. Total financial outlay for the Habitat improvement programme would be **Rs.177.00 lakhs**.

Table 3.2 Cost estimate for habitat improvement programme

S. No.	Particulars	Amount (in Rs. Lakhs)
1	Plantation	50.00
2	Pasture Development	15.00
3	Horticulture Development	15.00
4	Soil Conservation	50.00
5	Fire Protection	25.00
6	Awareness programme	22.00
	Total	177.00

3.5. Establishment of Botanical Gardens with Butterfly Habitat

In order to conserve endemic/important species in the project area, two botanical gardens of an area of 1 ha of land each is proposed, one near dam site colony and other near powerhouse colony. The proposed botanical gardens would be of special interest to biodiversity conservation, scientific research, education and environmental awareness. It is suggested that while clearing the forest area to be submerged, the Forest Department



should take adequate care to translocate the important species of plants particularly orchids and medicinal herbs and shrubs to the proposed botanical gardens or to adjoining forest areas, whichever feasible. These species should be shifted carefully to the new location under the guidance of Forest officials and taxonomic experts. Important species of orchids and RET plants, if any, shall also be collected from affected project area and conserved at the botanical gardens.

The proposed project area is habitat for more than 40 species of butterflies and moths. Butterfly species belong to family Nymphalidae, Lycaenida and Pieridae. In case of butterflies, it has been observed that in-situ efforts are more successful and better than ex situ efforts. Thus, to conserve butterfly species in the project area, it is proposed that host plants of butterflies, salt licks etc. will be provided in specific area of the botanical gardens as well as in the wild and in the green belt proposed to be developed around the project area.

Table 3.3. Financial allocation for the establishment of botanical gardens with butterfly habitat

S.No.	Particulars	Amount (in Rs. Lakhs)
1	Collection of seeds and plant species	5.00
2	Development of botanical gardens (2 No – 2 ha)	40.00
3	Development of nursery (1No- 1/2 ha)	10.00
4	Procurement and plantation of host species for butterflies	10.00
5	Providing salt licks etc. for butterflies	5.00
6	Maintenance of Gardens + watch and ward (4 nos) for 11 yrs	60.00
7	Maintenance of Nursery for 11 yrs	11.00
8	Water supply system (2 gardens)	5.00
9	Miscellaneous and overhead (LS)	15.00
	Total	161.00

Land for the botanical garden will be provided by the State Government to the project authorities. The staff of the gardens would be under the jurisdiction of Environment monitoring Cell of the Project proponent. Apart from the gardens, project authorities could assign other related work to staff. The provision of budget has been proposed for



11 years, thereafter the gardens will be handed over to the State Govt. for further maintenance. The break-up of the total financial outlay for the repositories including development of nurseries, collection of seeds and plant species, staff etc. is given in Table. 3.3

3.6 Management Measures for Forest Protection and Wildlife Species

For conservation of nearby forests and its animals following measures are being suggested:

- a. **Preservation of animal corridors:** Through the project area there is no corridor for wildlife, however, it may be present in the catchment area. Forest department with the help of wildlife experts would identify such corridors of wildlife. These corridors would be protected on scientific grounds so that man – animal conflict is minimized and wild animals do not enter in the working and settlement areas. Fencing, if necessary, shall be provided at vulnerable places in the project area where the reserved forest or protected forest are near the project component for which an amount of **Rs. 50.00 lakhs** has been kept.
- b. **Establishment of Rescue Centre:** A rescue centre with veterinary facilities would be established near barrage site for stray and injured animals. The controlling of disease shall also be covered under this plan. The animal(s) after treatment will be released in the natural habitat. The budget for rescue centre includes salaries and wages, purchasing of trappings, squeezes, cages, rescue van, food, medicines etc. Necessary land for the development of Rescue Centre will be provided by the state government, through concerned State department. The centre will be established and maintained by Project proponent for a period of 11 years; thereafter it shall be handed over to State Govt. for running and maintenance. The budget provision for centre is **Rs. 150.00 lakhs**.
- c. **Sustainable agricultural practices:** The forests of the catchment are under stress due to grazing and habitation. The inhabitants of the area would be encouraged to adopt sustainable cultivation practices and economic activities. This would ensure habitat continuity, preventing disruption, disturbance and fragmentation of the wildlife habitats. Funds for training through concerned dept of state Govt. shall be provided by the project proponent for a period of 11



years. Total budget under this head would be **Rs. 25.00 Lakhs** only.

- d. **Anti poaching and monitoring:** To prevent poaching, proper vigilance of the forest area near the project area will be done and check posts (2 Nos.) one near dam site and other near powerhouse site shall be established. The penalty to the violator(s) indulging in any illegal operations in this area shall be dealt under existing laws of the J & K Forest Act, and other laws which may exist or may come into force from time to time to prevent damage / disturbance to these natural ecosystems. A site office for this purpose shall be established in the BCC for monitoring all these activities the vehicle provided to BCC can be utilised. Total budget for anti poaching activities would be **Rs. 80.00 lakhs**. It includes cost of check post, watch tower, patrolling paths, vehicle, etc.
- e. **Avifauna Conservation:** A total of 59 species of birds, belonging to 26 families were recorded from project area during the present survey and of them about 11 species belonged to Muscicapidae followed by Corvidae and Accipitridae. None of the species recorded in the primary surveys were threatened as per IUCN records. To conserve bird species in the project area, all efforts will be taken to avoid clear felling in the project area. Further, with plantation under green belt development & landscaping plan, afforestation activities under Catchment Area Treatment plan and compensatory afforestation schemes, will create new habitats for avifauna. Further, after construction of the project, a small reservoir will be created which will form a new habitat for water birds.
- f. **Good Practice:** Project authorities would issue identity cards to all workers under contractors or its own staff. Detailed guidelines regarding the anti poaching measures, involvement in hunting and extraction of forest produces will be issued to workers. No workers will be allowed access to forest areas without permission or/and valid reason. There will be demarcation of all working sites, all activities would occur within the project area.

**Table 3.4. Financial allocation for management measures for forest protection and wildlife species**

S. No.	Particulars	Amount (in Rs. Lakhs)
1	Preservation of animal corridors	50.00
2	Establishment of Rescue Centre	150.00
3	Sustainable agricultural practices	33.00
4	Anti poaching and monitoring	80.00
	Total	313.00

3.7 Safeguards during Construction Phase

During the construction phase, various adverse impacts on the wildlife are anticipated in the surrounding areas of the proposed project in terms of increased noise levels, land vibrations during tunneling and blasting, release of air and water pollutants, etc. To avoid and minimize adverse impacts from these activities project authorities are advised to prepare strict guidelines as follows.

- (i) Strict restrictions shall be imposed on the workers at project sites to ensure that they do not undertake felling of trees from forests near the vicinity of the project or harm any wild animals and birds.
- (ii) Noise abatement measures shall be undertaken at all construction sites.
- (iii) The fuel wood shall be provided to the labourers and/or the provision made for the supply of the free/subsidized kerosene/LPG from the depots.
- (iv) The interference of human population would be kept to a minimum in the adjacent forested areas.
- (v) The project authorities will be bound for the preservation of habitats and protection of wild animals.
- v) Controlled blasting shall be done at project site.
- vi) Researchers of the special cell would monitor the disturbance indicators and the status of flora and fauna in the project area
- vii) No activity should be allowed on part of labourers and associated workers that will endanger the life or habitat of plants, wild animals and birds.



- viii) Strict restrictions will be imposed on the workers at project sites to ensure that they do not harvest any produce (Medicinal Plants especially RET species) from the natural forests and cause any danger or harm to the plants, animals and birds in wild.
- ix) Care may be taken during the construction activities not to disturb the wild animals especially during night due to noise as the project site is in the close vicinity of animal/bird habitats especially in the vicinity of Pakal and Lopara being close to boundary of KHANP.

3.8. Cost Estimates

The proposed cost estimates for the implementation of various activities under the Biodiversity Management Plan are given below. The plan shall be implemented in consultation and through State Wildlife Department. The estimated cost of undertaking various conservation and management works along with maintenance expenses is Rs. 1234.60 lakhs.

Table 3.5. Financial outlay for biodiversity conservation and management of wildlife

S.No.	Particulars	Amount (Rs. In lakhs)
1	Biodiversity Conservation cell	583.60
2	Habitat Improvement Programme	177.00
3	Botanical Gardens with Butterfly Habitat	161.00
4	Management measures for Forest Protection and Wildlife species	313.00
	Total	1234.60