GOVERNMENT OF SIKKIM

Project Concept Note for Funding by JBIC for Sustainable Forest Management

INTRODUCTION

Sikkim is a vertical strip of very rugged, mountainous state, having a geographical area of 7096 sq. km. The Chola ridge towards the East, the Singalila ridge towards the west and the mighty Himalayan axis at the north bound it. These ranges enclose Sikkim in a titanic horseshoe, which traps the moisture-laden winds from the Bay of Bengal, causing heavy precipitation. This land is drained by the mighty Taste, which flows north south. The most astonishing aspect of this region is the enormous altitudinal gradient ranging from 300 masl to 8585 masl. This creates a range of climatic zones, right from the tropics to the tundra. This in turn fosters a bewildering diversity of flora and fauna. The land area under different utilization categories is 7096 sq. km. Detailed break up is as follows:

Table 1: Landuse Classification of Sikkim

S. No.	Class	Reserve forest	Revenue block	Total	% of Total
1	Snow	1018.23	5.41	**1023.64**	**14.43**
2	Alpine barren	815.80	2.35	**818.15**	**11.53**
3	Mixed open forest	433.37	333.38	**766.75**	**10.81**
4	Alpine scrub	611.44	27.72	**639.16**	**9.01**
5	Crop land	0.00	604.85	**604.85**	**8.52**
6	Mixed dense forest	464.46	138.88	**603.34**	**8.50**
7	Alpine pastures	431.32	0.00	**431.32**	**6.08**
8	Mixed degraded forest	194.56	235.06	**429.62**	**6.05**
9	Dense conifer forest	351.94	16.14	**368.08**	**5.19**
10	Open conifer forest	340.63	21.55	**362.18**	**5.10**
11	Glaciers	208.23	0.00	**208.23**	**2.93**
12	Degraded conifer forest	156.89	16.30	**173.19**	**2.44**
13	Fallow/Scrub in Revenue Blocks	0.00	155.69	**155.69**	**2.19**
14	Oak-Rhododendron forest	100.34	26.24	**126.58**	**1.78**
15	Scrubs in reserve forest	101.87	0.00	**101.87**	**1.44**
16	Forest blanks	90.56	0.00	**90.56**	**1.28**
17	Rivers/major streams	31.81	32.50	**64.31**	**0.91**

18	Dry river beds	31.49	9.10	**40.59**	**0.57**
19	Lakes	32.30	0.70	**33.00**	**0.47**
20	Sal open forest	15.93	1.54	**17.47**	**0.25**
21	Miscellaneous	6.93	6.30	**13.23**	**0.19**
22	Land slide areas	5.37	5.16	**10.53**	**0.15**
23	Sal dense forest	5.30	0.77	**6.07**	**0.09**
24	Sal degraded forest	3.32	0.71	**4.03**	**0.06**
25	Built-up area	0.30	3.24	**3.54**	**0.05**
	TOTAL	**5452.39**	**1643.59**	**7095.98**	**100.00**

NATURAL RESOURCES

The state is gifted with abundant natural resources. The resources can be grouped into Biotic or Abiotic, both of which can be renewable and non renewable. Biotic resources include agricultural crops, fodder and forests. The entire Himalayan region is endowed with natural flora and fauna, and is a paradise for nature lovers, conservationists, botanists, zoologists and environmentalists. There are about 4500 species of flowering plants, 362 species of ferns and its allies, 11 species of oaks, 9 species of tree ferns, 30 species of Primulas and 20 species of bamboos. Many medicinal plants are found in low and high altitude areas. Important resources of the state are Human and Livestock resources, Hydroelectric potential, Tourism, Agriculture, Horticulture etc. add to Sikkim's natural resources. Large cardamom production is very high in the state. Tourism development deserves consideration to add to the economy of the region. Forestry is the major land use in the State and nearly 84% of the total geographical area of the State is under the administrative control of the forest department. The forest cover of the State is 3129 sq. km., which is 45% of the total geographical area. This figure is one of the largest in the country. There is one high altitude National park (cum Biosphere Reserve) and six wildlife sanctuaries, which together constitute over 30% of the total geographical area of the state. Covering just 0.2% of the geographical area, Sikkim shows tremendous biological diversity.

Wild Biodiversity at a glance Approx. Numbers	
Flowering Plants: 4500	Orchids: 500 +
Rhododendrons: 36	Bamboos: 20
Ferns and Ferns allies: 362	Tree Ferns: 9
Primulas: 30	Oaks: 11
Mammals: 144	Birds: 550
Butterflies: 600 +	Fishes: 48
Mountains & Peaks: 28	Glaciers: 21
Lakes and Wetlands: 227	Rivers and Streams: over 104

PROTECTED AREA NETWORK:

National Park

1. Khangchendzonga National Park: North, South, West 1784 sq. km.

Wildlife Sanctuaries

1. Shingba Rhododendron Sanctuary, North Sikkim, 43 sq. km.
2. Barsey Rhododendron Sanctuary West Sikkim, 104 sq. km.
3. Kyongnosla Alpine Sanctuary East Sikkim, 31 sq. km.
4. Fambong Lho Wildlife Sanctuary, East Sikkim, 51.76 sq. km.
5. Maenam Wildlife Sanctuary, South Sikkim, 35.34 sq. km.
6. Pangolakha Wildlife Sanctuary, East Sikkim, 124 sq. km.

Four Eco Regions wise Status of Biodiversity

Sikkim is a land of vast variation in altitude within very short distances ranging from around 300m to 8585m. Elevation plays a prime role in fashioning the ecoregions of the state. This is evident from the presence of Sal forests in the Rangit Valley in the south to the temperate fir forests in the north, beyond which lie the trans-Himalayas and cold desert of the Tibetan plateau. Broadly speaking there are four altitudinal zones of vegetation. They are not clear-cut at their boundaries but merge into one another, often showing considerable local encroachments and recessions above and below the line depending upon physical configuration and exposure of the terrain and the resulting ecological factors.

The Tropical ecoregion extends roughly from the foothills of the outer Himalayas to an altitude of about 1200m. It contains steep sided valleys and gorges with well-drained flanking slopes. Various species of orchids, *Rhapidophora*, wild banana, *Pandanus*, Nettles and giant bamboo are characteristic. The Rangit Valley Sal *Shorea robusta* in this region shows a unique association with the Chir Pine *Pinus roxburghii*. In patches of protected forest it is possible to see the weak Sal being slowly dominated by the Pine. These patches are however relatively poor in bird life. Lowland forests of Sikkim are home to several endangered species of birds like the Rufous-necked Hornbill *Aceros nipalensis,* Great Indian Hornbill *Buceros bicornis homrai* locally called 'Hongraio', Chestnut-breasted Partridge, Black-breasted Parrotbill, Grey-crowned Prinia and Ward's Trogon. Other lowland fauna includes the introduced Peafowl, Python, Geckos, Porcupine, Assamese Macaque and Barking Deer, a host of butterflies and other invertebrates, riverine fish, frogs and toads. Several species of migratory waterbirds use the river systems during transit. Lantana is a major weed in this region. Forest fires are generally reported from this zone and there is an occasional problem of illegal removal of the Sal, Teak trees. New hydroelectric projects have also been taken up in this zone.

The Sub Tropical ecoregion extends up from about 1800 m to 3000m. The rainfall in this zone is the heaviest and conditions remain humid throughout the year. The crop in the upper storey consists of mainly *Castanopsis hystrix* (Katus), *Machilus* spp. (Kawla), *Rhododendron* spp. (Chimal), *Symplocos spicata* (Kholme), *Symplocos theifolia* (Kharane), *Michelia excelsa* (Rani Champ), *Quercus lamellosa* (Buk), *Quercus lineata* (Phalant), *Leucoseptrum canum* (Ghurpis), *Quercus pachyphylla* (Sungure Katus), etc. The other associates in the upper storey are: *Betula alnoides* (Saur), *Nyssa javanica* (Lekh Chilaune), *Bucklandia populnea* (Pipli), etc. In the underwood, *Engelhardtia spicata* (Mahuwa), *Eurya japonica* (Jhingni), *Rhododendron arboreum* (Guransh), *Viburnum* spp. (Asare), etc. are the main species. In the upper reaches, the upper storey consists of *Quercus lamellosa* (Buk), *Q. lineata* (Phalant), *Machilus* spp. (Kaula). Dense tall evergreen forests with oaks and

Rhododendrons predominate. The undergrowth consists of *Arundinaria maling*, dwarf Rhododendron, ferns, epiphytic mosses and orchids. This area is also rich in birds including the Rusty-bellied and Lesser Shortwings, Kalij and Satyr Tragopan; reptiles like Japalura lizards, Cobra, Krait and Himalayan Pit Viper; Himalayan Bullfrog; butterflies and leeches. Large Cardamom underplanted in forest patches and a tea estate at Temi are dominant features of the landscape as much as the naturalized exotic *Cryptomeria japonica* patches. Most of the human population of Sikkim resides in these two zones in an agricultural setting where terrace farmed rice, ginger, orange, cardamom are commercially grown while guava, banana, squash and marigold are common along with vegetables and herbs in homestead gardens. Forest produce like bamboo shoots, ferns and nettles are also collected during season. Hybrid stall fed livestock is seen around villages.

The Temperate ecoregion extends from 3000m to 4000m with mixed coniferous forests of emlock, Spruce, Pine, Fir and Junipers with shrubby undergrowth of Rhododendron and *Arundinaria*. Red Panda, Common Langur and Himalayan Black Bear, Lesser cats, Goral, Serow, Monal Pheasant, Fire-tailed Sunbird, Blue Magpie and few species of reptiles and amphibians are characteristic. Brown Trout *Salmo trutta fario* has been introduced in high altitude lake and river systems. Wild Seabuckthorn *Hippophae* sp. occurs some of which is collected for medicinal properties and as a dye. Potato and cabbage are grown as cash crops. Subsistence farming of wheat, barley and maize is carried out while beans, peas, some apple, peach and pear are grown on homesteads. Some amount of cattle rearing is practiced with stall fed hybrid milch cows and the rest grazed in forest areas. The Alpine forests and scrub extends upto 4500 m with small crooked trees and large shrubs interspersed with fir and pine. The stunted forest is mainly of rhododendron of many species. Dominant wild fauna includes Musk Deer, Himalayan Tahr, Blue Sheep, Blood Pheasant, Ibisbill and a toad.

The Trans-Himalayan ecoregion extend from 4500 m to 5500m with characteristic cold desert vegetation exclusive restricted to the north of Sikkim. This ecoregion has not yet been included in the protected area network of the state and is perhaps the most threatened as it contains mostly endangered species. Dominant among these are Kiang, Nayan, Tibetan Gazelle, Snow Leopard, Tibetan Wolf, Tibetan Snowcock, Lammergeier, Raven, Golden Eagle and Ruddy Shelduck. The region has a short four-month growing season during which grasses, sedges and medicinal herbs grow abundantly supporting a host of insect fauna as well as the wild and domestic herbivores, larks and finches. There are no permanent settlements. Human population consists of a small number of nomadic Tibetan graziers or ‘Dokpas’ (who herd yak, sheep and pasmina-type goats) and large number of Defence personnel as the area forms the international border with Tibet (China). Closure of the border to trans-humance over the last three decades has led to intense grazing pressure by both the domestic and wild herbivores on the land.

Project Strategy

Forest decentralization and universalization is underway in Sikkim in a big way with the constitution of more than 900 village based JFMC underway. There is a paradigm shift in devolving powers to the Panchayati Raj Institutions which is the constitutional body at the grassroot level. This throws up a mammoth task of **capacity building and grassroot infrastructural** needs of the local community and forest staff in participatory approaches and forest management. Empowerment of the JFMC is a major thrust area of this project. For this a state level **Integrated Mountain Development Training Institute** is needed to provide training in the fields of forestry, mountain livelihoods, ecotourism etc.

Sikkim is a biodiversity hotspot in the Eastern Himalaya and more than conventional **afforestation** of select species, **species recover programmes** are the need of the day so that the people and wildlife friendly species like oaks, chestnuts, rhododendrons and cane which are also the water reservoirs of the state and can be regenerated with peoples participation using hi-tech tools.

Protection and Conservation of Natural Forests will involve using GIS and GPS demarcation of the boundary by erecting boundary pillars. Creation of grassroot infrastructure for Range and Block office cluster complex.

Biodiversity conservation programmes need to focus on zonation of sensitive habitats for pure wildlife conservation and multiple use zones for community benefit. Ex-situ conservation measures are needed for reintroduction and conservation breeding of rare, endangered and extinct species in the state. Also the households directly impacting on wild biodiversity like hunters, herders etc need to provided sustainable livelihoods.

Community development should focus on livelihood support and not on giving freebies. The **ecotourism, horticulture, animal husbandry and rural energy** are the sectors that have immense potential in the state in income generation for the educated unemployed rather than rural infrastructure works.

Project Duration

8-10 years

Project Contents

I. Afforestation/Regeneration:

Already regular afforestation programmes are underway in the vacant and barren areas available in forest and non forest land through FDA and other schemes. However this project will focus on afforestation using the rare, endangered and useful species of the concerned ecoregions under the following **Endangered Floral Species Recovery Programme.** Afforestation of these endangered and useful species needs to be given a thrust in the state. Afforestation using the rare and endangered as well as less represented species of the concerned ecoregions will be the primary objective under the afforestation programme. **Plants like Oaks, Chestnuts, Rhododendron, Cane which are also the water reservoirs of the region and endangered tree species will be produced in the Specialized Hi – Tech Nurseries.** It is proposed to establish Hi-Tech Nurseries eco-region wise with all modern facilities to cater to the needs of seed collection techniques, treatments and seedling production technologies specifically for species to be identified under species recovery programmes. All the seedlings will be produced from the seeds collected from the natural forests or procured from authenticated sources and the same will be afforestation in the site selected as per the project guidelines. The site will also cover micro watersheds and the afforestation activities will be taken up with the greater participation of the JFMCs. It is proposed by the Government that each of the Panchayat ward will have a JFMC or EDC. The proposal to establish such committees have been already sent to the Government of India for consideration.

II. Protection and Conservation of Natural Forests:

Protection of natural forest is increasingly become a challenge for the forest managers in the current scenario of increasing human population, livestock population and urbanization of smaller tows and villages near by the forests. Protection and conservation will involve enforcement of legal provisions available for protection of forests, creation of awareness among the stake holders and brining in participation in the whole initiative. To achieve all this the following is proposed.

GIS and GPS based Survey and Demarcation of Forest Land:

Limited physical demarcation of the boundary of the forest land is the major impediment in the long term conservation and protection of natural forests in Sikkim. As most of the rich biodiversity is found in these natural forests, demarcation of the forest boundaries will help in efficient protection, conservation and management of natural forest. Hence it is proposed to take up this Herculean task of demarcating the forest boundaries by erecting boundary pillars with the use of modern technologies like GIS and GPS.

Strengthening Range Office Complex

The range office in Sikkim needs lot of improvement in both infrastructural and institutional needs. The range office is the cutting edge institution in the forest protection and management system. Hence infrastructural and institutional requirements need to be

fulfilled to meet the changing face of forestry today. This center can also function as a nature interpretation cum awareness center. This complex shall be also computerized.

Creation of Block Office Complex:
In the new proposed JFM structure, Block officers (forester) will be actively associated with the JFMCs/EDCs. Soon 907 village based JFMC/EDC will be formed and these will be provided institutional support by the Block Officer. Creation of the Block Office Complex will bring the forest management closer to the people. This will further improve the efficiency of functioning especially on the issues relating to quick response for forest fire and offence control. Effective forest decentralization to the gross root level is possible only with the creation of this complex with computerization facilities.

III. Biodiversity Programmes

Threat Reduction by providing sustainable livelihoods:
Certain households in the state follow unsustainable livelihoods related to hunting, herding and the like. These few households have maximum knowledge and also maximum impacts on biodiversity. Their biodiversity knowledge can be infact used for conservation and also they can be trained in sustainable livelihoods like ecoguides and ecotourism service providers in trekking tourism etc.

Endangered Faunal Species Recovery Programme
Under the Biodiversity conservation programme, it is proposed to take up Endangered Faunal Recovery Programmes. The programme will aim at *in situ* programmes like designation and conservation initiatives in specific conservation zones and *ex-situ* conservation of including reintroduction and conservation breeding.

Biodiversity Research:
Lack of research inputs for biodiversity conservation is the major constraint in the state due to tough terrain, heavy monsoons and severe winter. One major component would be, scientific status, distribution and population surveys for key flora and fauna.

IV. Training and Extension:

Capacity building and training of all the stake holders involved in forest management, biodiversity conservation, and other issues to be involved in the project is one of the major inputs required for successful implementation of the project. As the coverage of project is whole of the state and most of the forest officials/staff will be involved in the project. Further, the project will aim at greater participation of the local community and will create a sense of ownership, the training and extension needs are very immense. It is proposed to establish a Forest Research and Training Institution under this programme.

Establishment of Integrated Mountain Development Training and Extension Institute

Presently the state of Sikkim does not have any training and extension Institution. It is proposed to have a state-of-the-art training institution to cater to the need this Himalayan task of training all the stake holders to be involved in the project. This institute will focus on building capacity for Forest Decentralization, Capacity Building of Forest Staff, Capacity Building of JFMC/EDC, *Himal Rakshaks* (Honorary Mountain Guardian), NGOs, CBOs, etc. This institution will also conduct a **Certificate course for Ecotourism** in order to systematize the ecotourism in the state of Sikkim. The Institution will also focus on issues like Capacity Building on sustainable mountain livelihoods like horticulture, floriculture, animal husbandry, tourism etc. All the facilities required such as Library, GIS, Tissue culture and the need based in house research programmes is proposed to be established. It is proposed that this institute will have branches in the four districts.

V. Community Development Activities

The Community development activities are proposed in the following livelihood sectors as they are found to be feasible and sustainable in the state of Sikkim.

Ecotourism
Horticulture
Animal Husbandry
Sustainable Energy Sector (Biogas and LPG)

The need of community development is in skill development, value addition in the livelihood sector and not on rural infrastructure. This will result in income generation and growth of self opportunities for the educated unemployed youth.

VI. Infrastructure Development

It is proposed that Infrastructural Gaps in the state of Sikkim for Natural Resource Conservation will be addressed under this component.

Office Buildings/Accommodation/ Computerization:

It is proposed to establish a District Level Complex to provide accommodation and communication facilities to the forest officials/staff. Necessary infrastructure for the programme implementing officers at appropriate location may be established. It is proposed to provide computer facility up to range level.

Communication:

Provision of modern cheaper communication facilities such as Mobile Telephone Connections is proposed to be provided up to JFMC/EDC level.

Transport Facilities:

Provision of vehicles up to range level is proposed. The Block level officers will be provided with motor cycles as transport is the main constraint in any hilly state with limited public transport.