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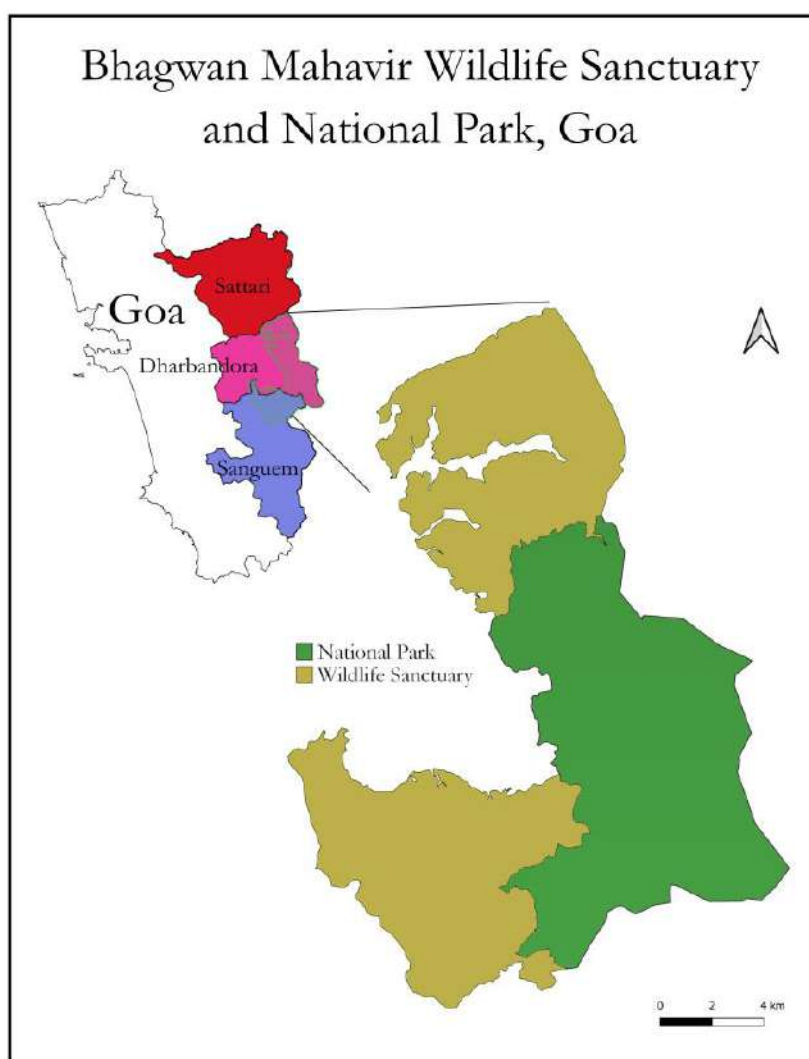
CHAPTER 1

INTRODUCTION TO BHAGWAN MAHAVIR WILDLIFE SANCTUARY AND NATIONAL PARK

1.1 NAME, LOCATION, CONSTITUTION AND EXTENT OF AREA

1.1.1 NAME AND LOCATION

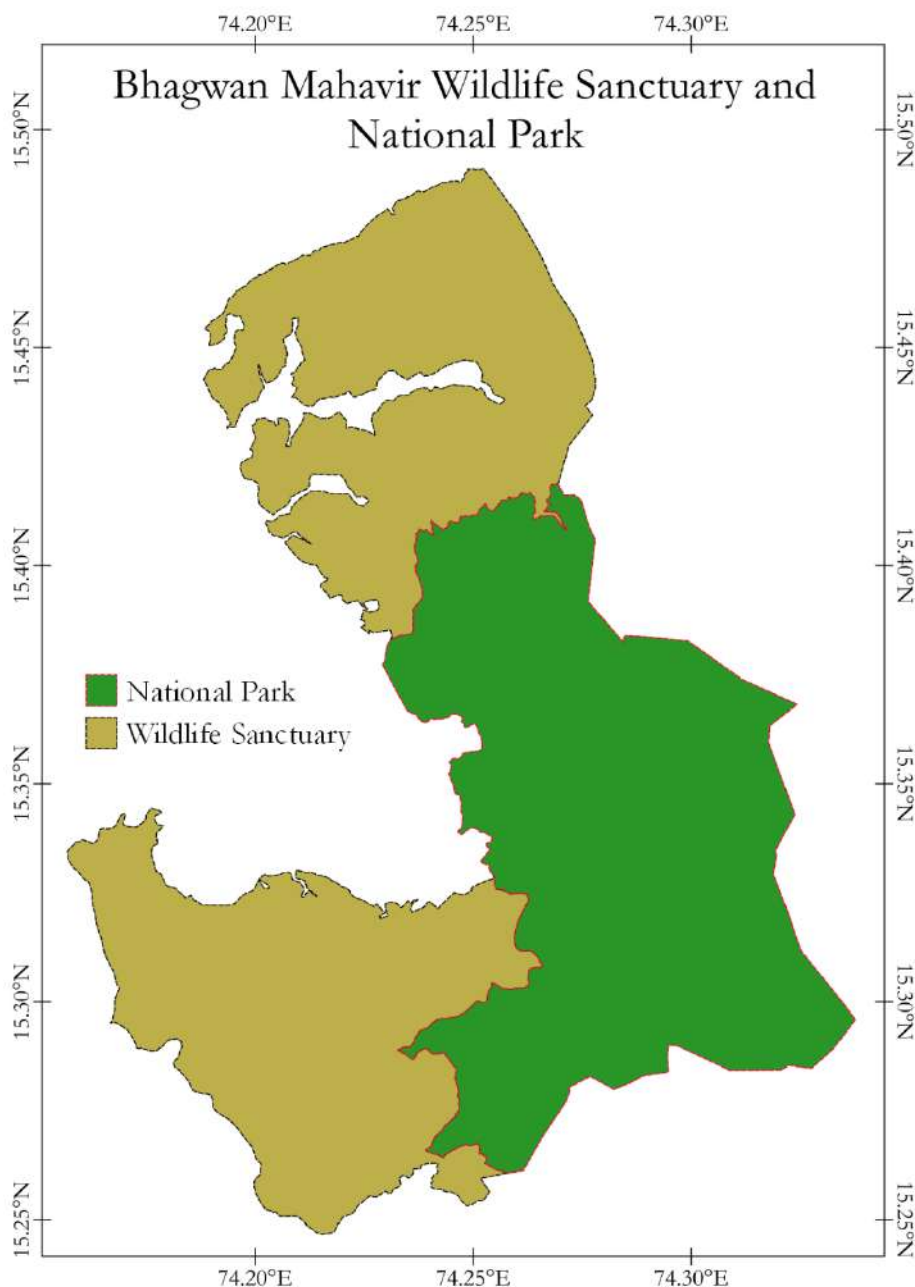
Bhagwan Mahavir Wildlife Sanctuary and National Park is located majorly in Dharbandora taluka with its southern end jutting into Sanguem taluka in the state of Goa. The wildlife Sanctuary and National Park lies within the Latitudinal extent of 15.49°N to 15.24°N and Longitudinal extent of 74.15°E to 74.34°E.



Map 1.1 Location of Bhagwan Mahavir Wildlife Sanctuary and National Park

1.1.2 CONSTITUTION AND EXTENT OF AREA

Bhagwan Mahavir Wildlife Sanctuary and National Park is spread over an area of 240 km². The Wildlife Sanctuary itself, is spread across an area of 133 km² while the National Park occupies an area of 107 km².



Map 1.2 Extent of Area – Bhagwan Mahavir Wildlife Sanctuary and National Park

1.1.3 NOTIFICATION

The Union Territories of Goa, Daman, and Diu in exercise of the powers conferred by the Wild Animals and Wild Birds Protection Act, 1965 (Act 21 of 1965) and under section 18 of the said Act, delimited the area comprising of the Reserve Forest of Collem Range, as a Game Sanctuary vide notification DF-894-FOR-67 dated 28th December 1967. On 13th April 1978, vide notification No. 8-3-77-FOR, all areas falling within the Mahavir Wild Life Sanctuary, comprising an area of 107 km² and villages of Nandron - Mollem, Caranzol, Sonauli; part of Oxel and Boma were notified as National Park. Further, on 27th September 1982, in exercise of powers conferred by section 18 of the Wild Life (Protection) Act 1972 (Central Act 53 of 1972), the Game Sanctuary was declared to be a sanctuary vide notification 8-12-82-FOR. On 14th March 1984 the notification 8-12-82-FOR was amended where in The Wild Life Sanctuary which was popularly known as “Mollem Wild Life Sanctuary” was named as “Bhagwan Mahavir Wildlife Sanctuary” and the amended notification 8-12-82-FOR was called as the “Principal Notification”. Further vide notification 6-12-82-FOR dated 6th September 1985, areas from six villages were excluded from the limits of the Bhagwan Mahavir Wildlife Sanctuary.

1.2 APPROACH AND ACCESS

The Bhagwan Mahavir Wildlife Sanctuary and National Park is situated at the eastern boundary of Goa and shares its eastern border with the Kali Tiger Reserve of Karnataka. The Wildlife Sanctuary and National Park is well connected with road and rail (Map 1.3).

1.2.1 BY ROAD

The Bhagwan Mahavir Wildlife Sanctuary and National Park is connected to the city of Panaji, the capital of Goa, by the National Highway NH748 (Panjim to Belagavi) which incidentally passes along the boundary between the Wildlife Sanctuary and National Park to the north. Margao, another important city of Goa is also connected to the Bhagwan Mahavir

Wildlife Sanctuary and National Park partly by NH748.

- Panaji – Ponda – Dharbandora – Mollem: 58km
- Margao – Borim – Usgao Tisk – Dharbandora – Mollem: 45km

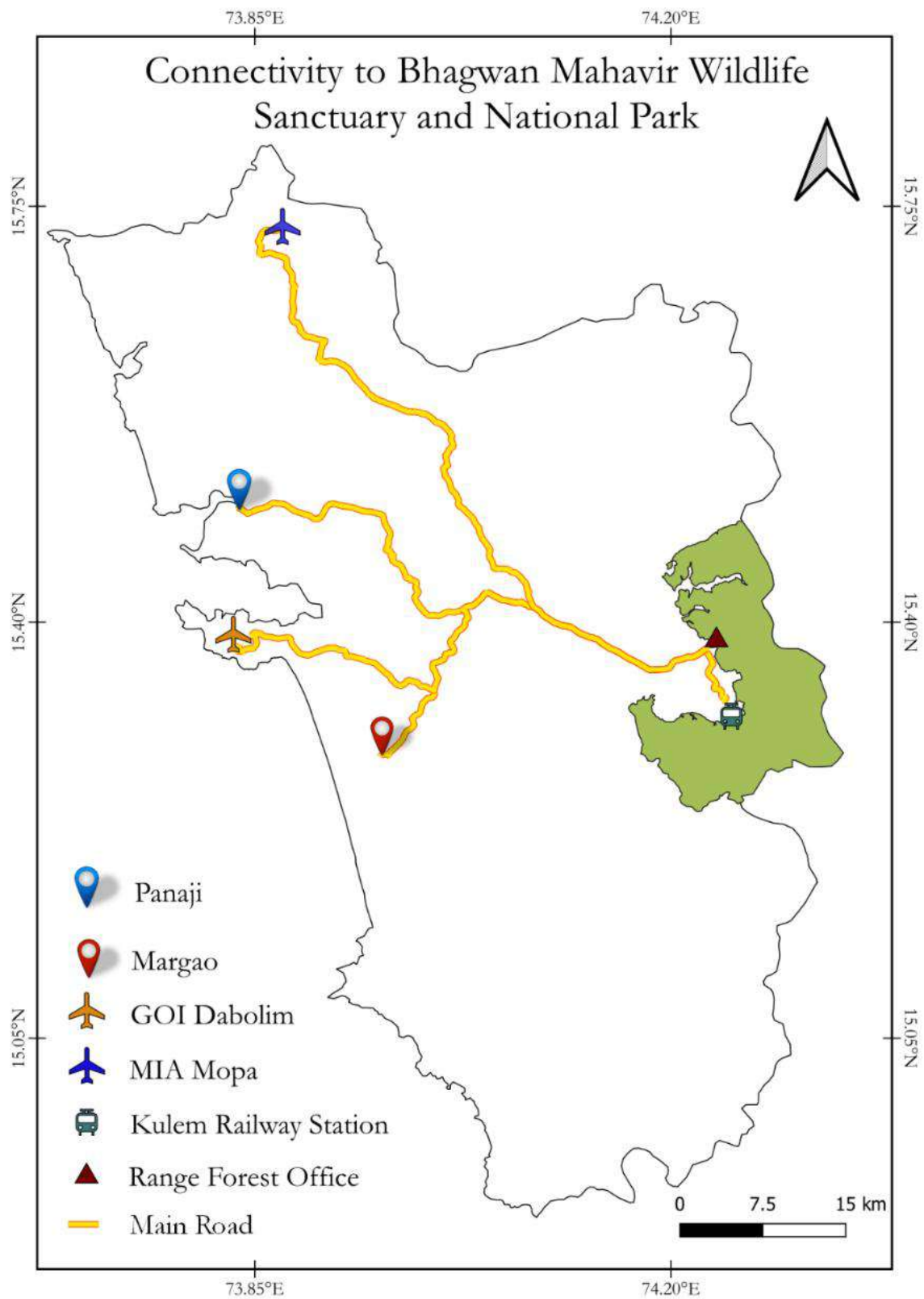
1.2.2 BY RAILWAY

The closest railway station to the Wildlife Sanctuary and National Park is Kulem/ Collem Railway Station at 7 Km. This railway line is part of the Hospet–Tinaighat–Castlerock–Kulem–Madgaon–Vasco line, with a total length of 345km, of which 26km passes through the Wildlife Sanctuary and National Park.

- From Vasco to Kulem Daily Passenger
- Any train from Vasco da Gama Outbound through Castlerock–Kulem–Madgaon–Vasco line. Eg. Vasco – Howrah; Vasco – Yeshwantpur and Vasco – Chennai.
- After alighting at Kulem railway station inbound or outbound, taxi/ local bus services can be availed from the railway station to the Range Forest Office which is connected by MDR33 (Kulem to Dharbandora).

1.2.3 BY AIR

The Goa International Airport, Dabolim is 59km from the Wildlife Sanctuary and National Park. It is connected by NH566 and NH748. After alighting at the airport, taxi services may be availed of to directly reach Bhagwan Mahavir Wildlife Sanctuary and National Park. Bus services may also be availed of from Vasco da Gama Kadamba Transport Corporation Bus Stand to Ponda or Margao and from there to the Wildlife Sanctuary and National Park. The Manohar International Airport, Mopa is 73km from the Wildlife Sanctuary and National Park. After alighting at the airport, taxi services may be availed of to directly reach Bhagwan Mahavir Wildlife Sanctuary and National Park. Bus services may be availed of from the airport terminal to Panaji Kadamba Transport Corporation Bus Stand and from there to the Wildlife Sanctuary and National Park.



Map 1.3. Connectivity Map to Bhagwan Mahavir Wildlife Sanctuary and National Park

1.3 STATEMENT OF SIGNIFICANCE

Bhagwan Mahavir Wildlife Sanctuary and National Park is part of the global Biodiversity hotspot – the Western Ghats, and its conservation significance is of paramount importance. The region of Bhagwan Mahavir Wildlife Sanctuary and National Park exhibits a high degree of endemism and provides habitat for rare and endangered species. Bhagwan Mahavir Wildlife Sanctuary and National Park is a major watershed area for three main rivers including the Mandovi, which supplies water to most of Goa's population, providing water for irrigation and protects coastal areas by emptying its water into the Arabian Sea. The high mountains of the Western Ghats are natural barriers to stop movement of water-laden clouds thereby receiving heavy rainfall in the region. The Wildlife Sanctuary is also identified as an Important Bird and Biodiversity Area (IBA) - IN-GA-01 and fits under IBA Criteria: A1 (Threatened species), A2 (Endemic Bird Area 123: Western Ghats), A3 (Biome-10: Indian Peninsula Tropical Moist Forest) that lies partly in the Western Ghats.

1.3.1 VALUES OF THE PROTECTED AREA

Ecosystem functions are the biophysical foundation of the services an ecosystem delivers. A variety of empirically established links between ecosystem services and biodiversity have been reported. Efficiently managed protected areas are vital tools for safeguarding biodiversity, hence protecting ecosystem functions. The Bhagwan Mahavir Wildlife Sanctuary and National Park is characterized by significant biodiversity values, socio economic & cultural values, catchment values, human ecological values, aesthetic values, and scientific values. Notes on the significance of these are discussed below:

1.3.1.1 BIODIVERSITY VALUE

Biodiversity of Bhagwan Mahavir Wildlife Sanctuary and National Park includes more than 700 plant species, 219 butterfly species, 80 odonates, 75 ants, over 30 fish species, about 52 species of Herpetofauna, 286 species of birds, and more than 60 mammal species (Punjabi, et al. 2021). The protected area has a high degree of endemism and is crucial for implementation of habitat and species-specific conservation measures. A detailed outline of the biodiversity elements of the protected area is provided in Chapter 2, section 2.3.2.

1.3.1.2 SOCIO-ECONOMIC AND CULTURAL VALUES

1. The notification and management of Bhagwan Mahavir Wildlife Sanctuary and National Park go back to the year 1967 as outlined in section 1.1.3. Being one of the oldest managed forests in Goa, people have been culturally connected with this area for water, forest produce, religious beliefs, and traditions. This has given rise to establishment of historical Sacred Groves, which are patches of pristine forest areas dedicated to local deities or forest spirits. The sacred groves of Goa are vital for the conservation of the region's rich biodiversity, as they harbour several rare species of flora and fauna, including numerous medicinal plants. Most of these groves are located near water bodies, springs, or streams, playing a crucial role in preventing soil erosion and conserving water. The groves are associated with unique ecosystems and are considered essential for the protection of the state's flora and fauna.
2. Eco-Tourism including Waterfall Tourism has been a very sought-after activity by tourists, especially during the monsoons and rest of the year. The Bhagwan Mahavir Wildlife Sanctuary and National Park have proven to be of high socio-economic value since they include the world famous Dudhsagar waterfall, Tambdi Surla Temple, Talde Waterfall etc., which are popular tourist attractions generating revenue every year.

3. There are seven temples and one church in the Bhagwan Mahavir Wildlife Sanctuary and National Park. Of these, the 12th Century Mahadev Temple at Tambdi Surla is a crucial and indispensable site of cultural importance in the State of Goa.

Wild animal and plant species found in the area are highly valued by the locals as is evident in their influence on the culture and belief systems of the surrounding local communities near the Bhagwan Mahavir Wildlife Sanctuary and National Park. Several cultural rituals of these communities reflect the spiritual, symbolic and ceremonial importance of wild animals and plants and are central to the religious practices, mythology, and folklore of these communities.

1.3.1.3 CATCHMENT VALUES

1. The Bhagwan Mahavir Wildlife Sanctuary and National Park is an important watershed region in South Goa district, with two major rivers (Dudhsagar and Ragada) originating from this region.
2. The Opa water treatment plant, which supplies drinking water to a large area of the North Goa district, is dependent on water from the Dudhsagar River (Khandepar River) which is also supplemented by the Kalem River.
3. The Ragada River is an important tributary for the Mandovi River and upon meeting the Khandepar River at Usgao, is known as the Mandovi River further downstream.

1.3.1.4 AESTHETIC VALUES

1. Bhagwan Mahavir Wildlife Sanctuary and National Park has rich faunal and floral biodiversity, which serves as a basis for wildlife tourism.
2. The presence of three important waterfalls adds value to the entire hinterland tourism experience.
3. Landscaping, development of botanical and formal gardens add value to the formal setup of the Range Forest Office or Round Offices, where tourists visit.

1.3.1.5 SCIENTIFIC VALUES

1. Being an important zone within the Western Ghats, the Bhagwan Mahavir Wildlife Sanctuary and National Park holds very high value for science and anthropological curiosity.
2. Several species of plants and animals that are still undescribed need to be studied.
3. The Bhagwan Mahavir Wildlife Sanctuary and National Park may harbour several species of plants and fungi, which may potentially be new to science and have unique biochemical properties that could even help in the betterment of human wellbeing.

1.3.2 IMPORTANT FLORA AND FAUNA SPECIES

1.3.2.1 FOREST TYPES OF BHAGWAN MAHAVIR WILDLIFE SANCTUARY & NATIONAL PARK.

The forests of Bhagwan Mahavir Wildlife Sanctuary and National Park are typical of the Western Ghats (Southern Maharashtra and Karnataka). There is diversity in the forests due to the variation in altitude, aspect, soil characteristics, slope etc. As per Champion and Seth (1968) Classification of Forest types of India, the forests of Bhagwan Mahavir Wildlife Sanctuary and National Park fall into the following types:-

(I) Plateau vegetation confined especially to the low altitude

- a. Open scrub jungle (5.E7)
- b. Moist mixed deciduous forests [3B/C2]
- c. Secondary moist mixed deciduous forests [3B/C2/2SI]
- d. Sub-tropical Hill forests [8A/C2]

(II) Semi-evergreen and evergreen forest.

- a. Semi-evergreen forests [2A/C2]
- b. Lateritic Semi-evergreen forests [2 E4]
- c. Evergreen forests [1A/C4]

West Coast Tropical Evergreen Forest: This type of vegetation occurs along nallahs, streams and where soil is deep as residual patches. The species of this type are *Hopea wightiana*, *Holigarna arnottiana*, *Mangifera indica*, *Garcinia spp.*, *Cinnamomum zeylanicum*, *Persea macrantha* etc.

West Coast Semi-Evergreen Forest: This type of vegetation occurs between the Wet Evergreen and Moist deciduous forest. The main species are *Calophyllum inophyllum*, *Calophyllum tomentosum*, *Alstonia scholaris*, *Garcinia indica*, *Lagerstroemia lanecolata*, *Artocarpus hirsuta*, *Saraca indica*, *Pongamia pinnata* etc.

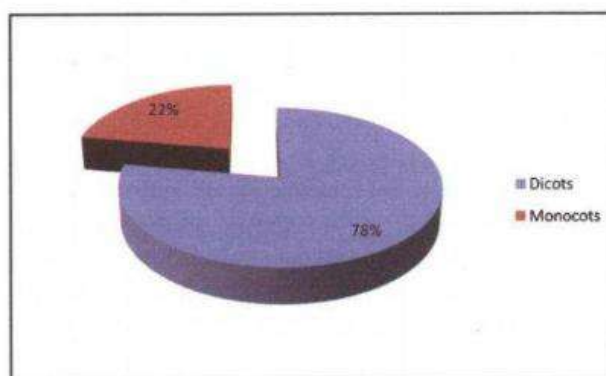
Southern Moist Mixed Deciduous Forest: The main species of this type are *Terminalia crenulata*, *Terminalia paniculata*, *Terminalia bellerica*, *Schleichera oleosa*, *Careya arborea*, *Adina cordifolia*, *Dillenia pentagyna*, *Mallotus philippenensis*, *Macaranga peltata* etc.

Southern Secondary Moist Mixed Deciduous Forest: This type is characterised by absence of large trees. The main species are *Macaranga peltata* *Xylia xylocarpa* *Terminalia crenulata*, *Careya arborea*, *Dillenia pentagyna*, *Adina cordifolia*, *Carrissa caranda* etc The Bhagwan Mahavir Wildlife Sanctuary and National Park has a record of more than 700 plant species (Datar & Lakshminarasimhan 2013). Of these, 127 species are endemic, making about 18% of the total flora (Datar & Lakshminarasimhan 2013). The Bhagwan Mahavir Wildlife Sanctuary and National Park is also a hotspot for fungal diversity in the Western Ghats. Nearly 1,200 fungal species are known from Goa, of which at least 500 mushroom species have been identified and many are yet to be described (Punjabi et al. 2020). Further, a total of 18 lichen species are recorded from Bhagwan Mahavir Wildlife Sanctuary and National Park (Punjabi et al. 2020). The Bhagwan Mahavir Wildlife Sanctuary and National Park supports three distinct forested habitats: evergreen forest, moist deciduous forest, and old-growth monoculture plantations (Datar and Lakshminarasimhan 2013).

Sl. nos.	Name of the family	Number of Genera
1	Leguminosae	38
2	Poaceae	32
3	Rubiaceae	25
4	Orchidaceae	24
5	Apocynaceae	22
6	Euphorbiaceae	22
7	Asteraceae	21
8	Acanthaceae	18
9	Lamiaceae	14
10	Cyperaceae	12

Floristic Spectrum

Dicot : Monocot Ratio



Ten dominant families of Flowering Plants are recorded in Bhagwan Mahavir National Park (Based on the number of Genera (Datar and Lakshminarasimhan (2013))

1.3.2.2 FAUNA

Mammals

1. Leopard (*Panthera pardus*) (Konkani: Bibto Wagh) (IUCN: Vulnerable) is a widespread predator found in various ecosystems, including forests, subtropical and tropical regions, savannas, grasslands, deserts, and rocky and mountainous regions. Leopards play a crucial role in maintaining the health of their ecosystems by controlling the population of herbivores and removing unhealthy animals. Their diet consists of smaller species of herbivores such as chital, langur, and wild boar. They are also known for their ability to adapt to various habitats, which contributes to their success as a predator. Melanistic individuals of the common leopard referred to as 'Black Panthers'

have been reportedly sighted in the Bhagwan Mahavir Wildlife Sanctuary and National Park.

2. Gaur (*Bos gaurus*) (Konkani: Gavo Redo) (IUCN: Vulnerable), the State animal of Goa, also known as the Indian Bison, is a large specimen of the bovine species found in the forests of India, Southeast Asia, and the Malay Peninsula. They live in small herds of up to 40 individuals and graze on a variety of plants, including grasses, shoots, and fruits. Gaurs are known for their preference of large, relatively undisturbed forest tracts and hilly terrain below an altitude of 1,500 to 1,800 meters, with an abundance of water and forage. They are primarily diurnal, but in some areas, they have become largely nocturnal due to human disturbance. The Gaur's feeding ecology involves grazing and browsing on a wide variety of plants, with a preference for the upper portions of plants such as leaf blades, stems, seeds, and flowers of grass species. The Gaur's habitat preference and feeding habits play a crucial role in shaping the ecosystems they inhabit.
3. Dhole (*Cuon alpinus*) (Konkani: Dev Kolo) (IUCN: Endangered), also known as the Asiatic wild dog, is a highly social and forest-dwelling canid found in closed forests across Asia, but who are primarily restricted to protected areas. It is the only social canid that lives in a pack without rigid dominance hierarchies, typically consisting of about 12 individuals, but groups of over 40 have also been known. The dhole is a diurnal pack hunter that preys on large and medium-sized ungulates, and its feeding ecology varies across different habitats, with evidence of vegetation matter in its diet. The dhole's habitat preference and dietary habits are influenced by factors such as prey availability, co-predator densities, and human disturbance. However, the dhole faces threats such as habitat loss, fragmentation, and human persecution, leading to a decline in its population. Conservation efforts are crucial to ensure the survival of this endangered species.

4. Sloth Bear (*Melursus ursinus*) (Konkani: Ashwal) (IUCN: Vulnerable), also known as the Indian bear, is native to the Indian subcontinent. These bears are forest-dwelling animals that inhabit tropical or subtropical regions of India and Sri Lanka, with habitats including dry and wet tropical forests, grasslands, hilly plateaus, and scrublands. Sloth bears are primarily omnivorous, feeding on fruits, insects, and honey, but they may also consume flesh when necessary. They are known for their slow-moving habits and have a keen sense of smell, which helps them locate food sources. Adult sloth bears stand about 75 cm tall at the shoulder, weigh between 91 and 113 kg, and are about 1.5 meters long. They are typically solitary animals, with females raising their cubs for two to three years. There are many other lesser-known mammals in the protected area (Annexure VI)
5. Tigers (*Panthera tigris*) (Konkani: Wagh)

Though tigers are reported occasionally in Bhagwan Mahavir WLS & NP, there is no scientific proof that the PA has got any resident population of tigers. The habitat and prey base also fall deficient in supporting the tiger. In all probabilities, sighted individuals are migratory in nature which strays from adjacent Tiger Reserves of Karnataka.

Birds

As of date, 255 species of birds have been recorded from Bhagwan Mahavir Wildlife Sanctuary and National Park. Some species that are endemic, rare, and of conservation priority as listed below.

Sr. No	Order	Family	English Name	Scientific Name	IUCN Category	WPA Schedule
1	Columbiformes	Columbidae	Nilgiri Wood Pigeon	<i>Columba elphinstonii</i>	Vulnerable	Schedule-I
2	Columbiformes	Columbidae	Grey-fronted Green Pigeon	<i>Treron affinis</i>	Least Concern	Schedule-II
3	Columbiformes	Columbidae	Malabar Imperial Pigeon	<i>Ducula cuprea</i>	Least Concern	Schedule-II
4	Bucerotiformes	Bucerotidae	Malabar Grey Hornbill	<i>Ocyrceros griseus</i>	Vulnerable	Schedule-I

5	Piciformes	Megalaimidae	Malabar Barbet	<i>Psilopogon malabaricus</i>	Least Concern	Schedule-II
6	Psittaciformes	Psittaculidae	Malabar Parakeet	<i>Psittacula columboides</i>	Least Concern	Schedule-II
7	Passeriformes	Vangidae	Malabar Woodshrike	<i>Tephrodornis sylvicola</i>	Least Concern	Schedule-II
8	Passeriformes	Corvidae	White-bellied Treepie	<i>Dendrocitta leucogastra</i>	Least Concern	Schedule-II
9	Passeriformes	Pycnonotidae	Grey-headed Bulbul	<i>Brachypodius priocephalus</i>	Near Threatened	Schedule-II
10	Passeriformes	Pycnonotidae	Flame-throated Bulbul	<i>Rubigula gularis</i>	Least Concern	Schedule-II
11	Passeriformes	Leiothrichidae	Rufous Babbler	<i>Argya subrufa</i>	Least Concern	Schedule-II
12	Passeriformes	Leiothrichidae	Wayanad Laughingthrush	<i>Pterorhinus delesserti</i>	Least Concern	Schedule-II
13	Passeriformes	Muscicapidae	White-bellied Blue Flycatcher	<i>Cyornis pallidipes</i>	Least Concern	Schedule-II
14	Passeriformes	Dicaeidae	Nilgiri Flowerpecker	<i>Dicaeum concolor</i>	Least Concern	Schedule-II
15	Passeriformes	Nectariniidae	Crimson-backed Sunbird	<i>Leptocoma minima</i>	Least Concern	Schedule-II

Herpetofauna

The reptilian diversity of Bhagwan Mahavir Wildlife Sanctuary and National Park is represented by 52 species from Crocodylidae, testudines (freshwater turtles & tortoises), and squamates which includes Sauria (Lizards) and Ophidia (Snakes). Amongst the diversity of reptiles, the Indian Rock Python *molurus*, Indian Monitor Lizard *Varanus bengalensis*, and King Cobra *Ophiophagus hannah* are some species in the Schedule I and II of WPA, 1972. Other endemics such as the Malabar Pit Viper *Trimeresurus malabaricus* and the Large-Scaled Shieldtail *Uropeltis macrolepis* are also reported from the region. Bhagwan Mahavir Wildlife Sanctuary and National Park together contain at least 36 amphibian species. Castlerock is the type locality of *Nyctibatrachus petraeus* (Das & Kunte 2005) and *Raorchestes bombayensis* (Annandale 1919). Biju et al. (2014) described a new species of dancing frog, of which one species *Micrixalus uttaraghati* is found in the streams between Castlerock-Kulem railway lines.

Insects

Bhagwan Mahavir Wildlife Sanctuary and National Park support 219 butterfly species and 80 species of odonates (Appendix X), of which 14 species of butterflies and 18 species of odonates are endemic to the Western Ghats. Two odonate species *Idionyx gomantakensis* (Subramanian et al. 2013) and *Cyclogomphus flavoannulatus* (Rangnekar et al. 2019) have been described from within and immediate outskirts of Bhagwan Mahavir Wildlife Sanctuary and National Park. A few notable butterfly species found in Bhagwan Mahavir Wildlife Sanctuary and National Park are Danaid Eggfly *Hypolimnas misippus*, Common Mime *Papilio clytia*, Common Pierrot *Castalius rosimon*, Blue Nawab *Polyura schreiberi*, Kanara Oakblue *Arhopala alea*, Orchid Tit *Hypolycaena othona*, Short-banded Sailor *Neptis columella*, and Crimson. A sizable population of Malabar Tree Nymph (*Idea Malabarica*) is found in the protected areas.

Rose *Pachliopta hector* is protected under Schedule I of the Wildlife (Protection) Act, 1972. Two endemic butterfly species found here are the Malabar Rose *Pachliopta pandiyana* and the Southern Birdwing *Troides minos*. A 2011 report on moth diversity from the northern Western Ghats reports at least 418 moth species out of which 116 species were unidentified, and potentially new to science (Shubhalaxmi et al. 2011). A total of 75 ant species are recorded from the WLS of which seven are endemic (Baidya 2022). Six scorpion species, 16 spider species, and one species each of Whip Scorpion and Whip Spider have been recorded from Bhagwan Mahavir Wildlife Sanctuary and National Park (Bastawade & Borkar 2008).

CHAPTER 2

BACKGROUND INFORMATION AND ATTRIBUTES

2.1 BOUNDARIES

2.1.1 LEGAL BOUNDARIES

The Bhagwan Mahavir Wildlife Sanctuary and National Park is spread over an area of 240 km². The wildlife sanctuary is spread across an area of 133 km² while the national park encompasses an area of 107 km².

Bhagwan Mahavir National Park

In the Government notification No. 8-3-77-FOR, dated 13 April 1978, the boundaries of the national park were delineated as below:

All the areas falling within the Mahavir Wildlife Sanctuary and comprising of an area of 107km² and of the villages of Nandran- Mollem, Caranzol, Sonauli; part of Oxel and Boma bounded on the north by National Highway 4-A leading to Belgaum, on the south and east by interstate boundary between Goa and Karnataka; and on the west by pole numbers 766 to 1150 and from 1 to 90 and then along the Collem - Mollem road. Furthermore, the boundary runs along the National Highway from Mollem towards Belgaum.

Bhagwan Mahavir Wildlife Sanctuary

Government Notification no. 8-12-82-FOR dated 27-9-1982, published in the Official Gazette Series I, No. 26, dated 27-9-1982 (hereinafter called the principal notification) was amended to append the schedule to the principal notification, where the boundaries (in clockwise direction) for the wildlife sanctuary is notified as follows:

Starting from a point, which is the intersection of Sanguem-Satari Taluka boundary and Malpona Bolcornem-Molem road.

North: Along the taluka boundary between Satari and Sanguem up to the interstate boundary between the district of Goa and Karnataka State.

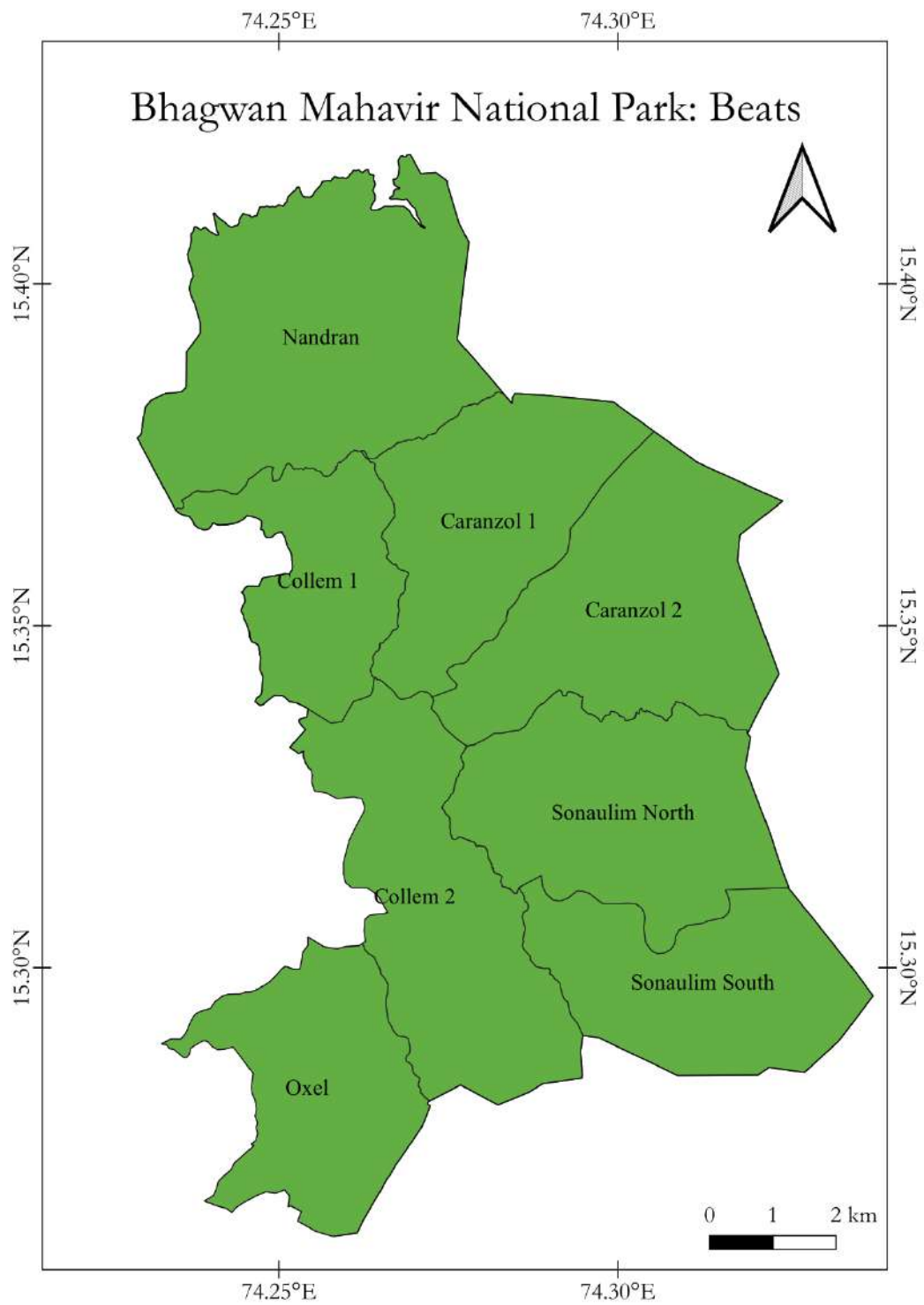
East: Thence along the interstate boundary of district of Goa and Karnataka State up to its intersection with the southern boundary of the Patiem Village.

South: Thence along the southern boundary of Patiem village up to its intersection with the road leading from Tudou to Dhada of Sangod village through Dudal, Calem and Carmonem.

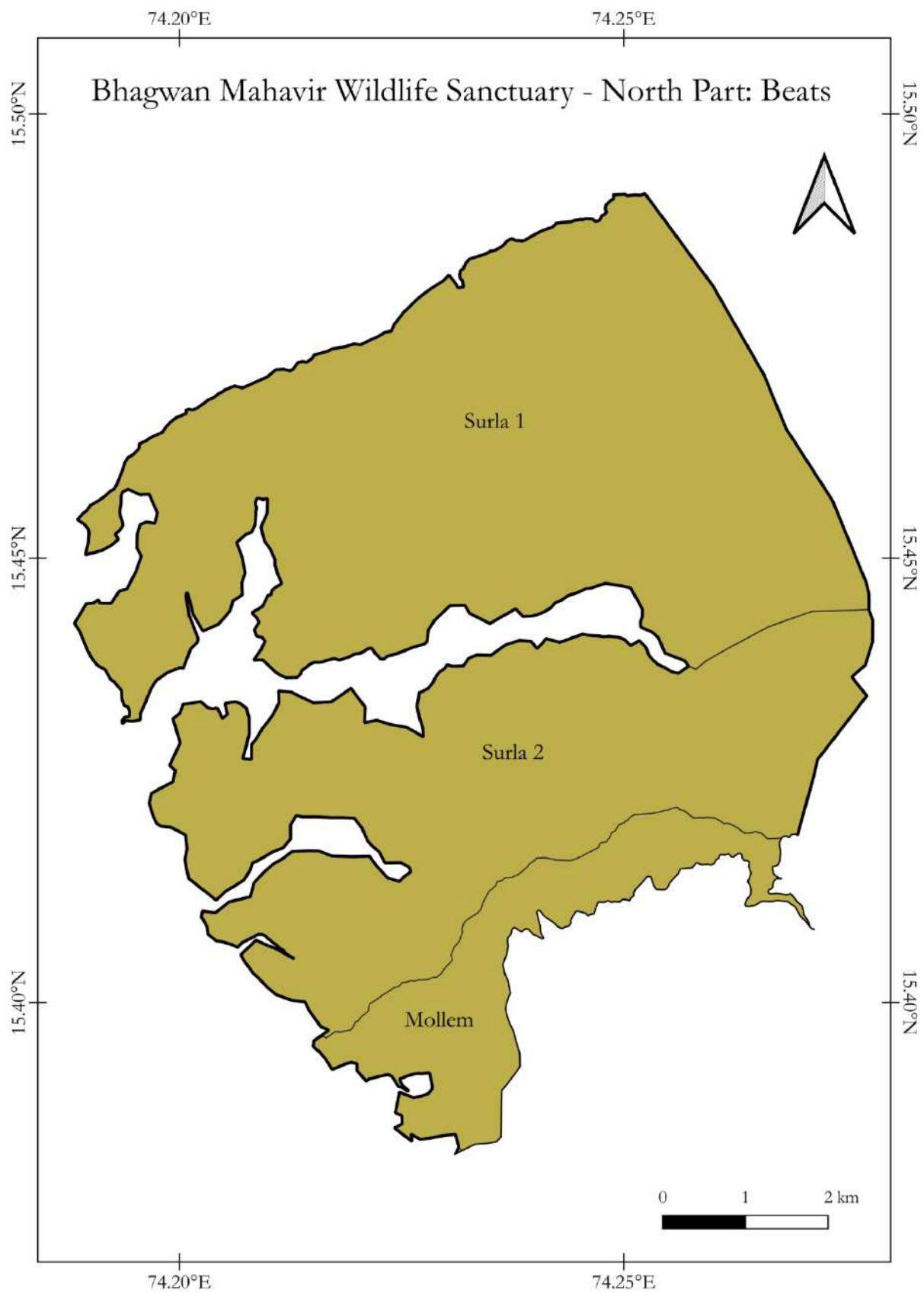
West: Thence along the road leading from Tudou to Dhada of Sangod through the villages Dudal, Calem and Carmonem up to the river Candepar (Dudhsagar). Further along upstream of the same river up to its intersection (Bridge) with the road leading from Colem to Molem. Further along the road leading from Colem to Malpona through Molem up to the starting point of the northern boundary.

2.1.2 INTERNAL BOUNDARIES

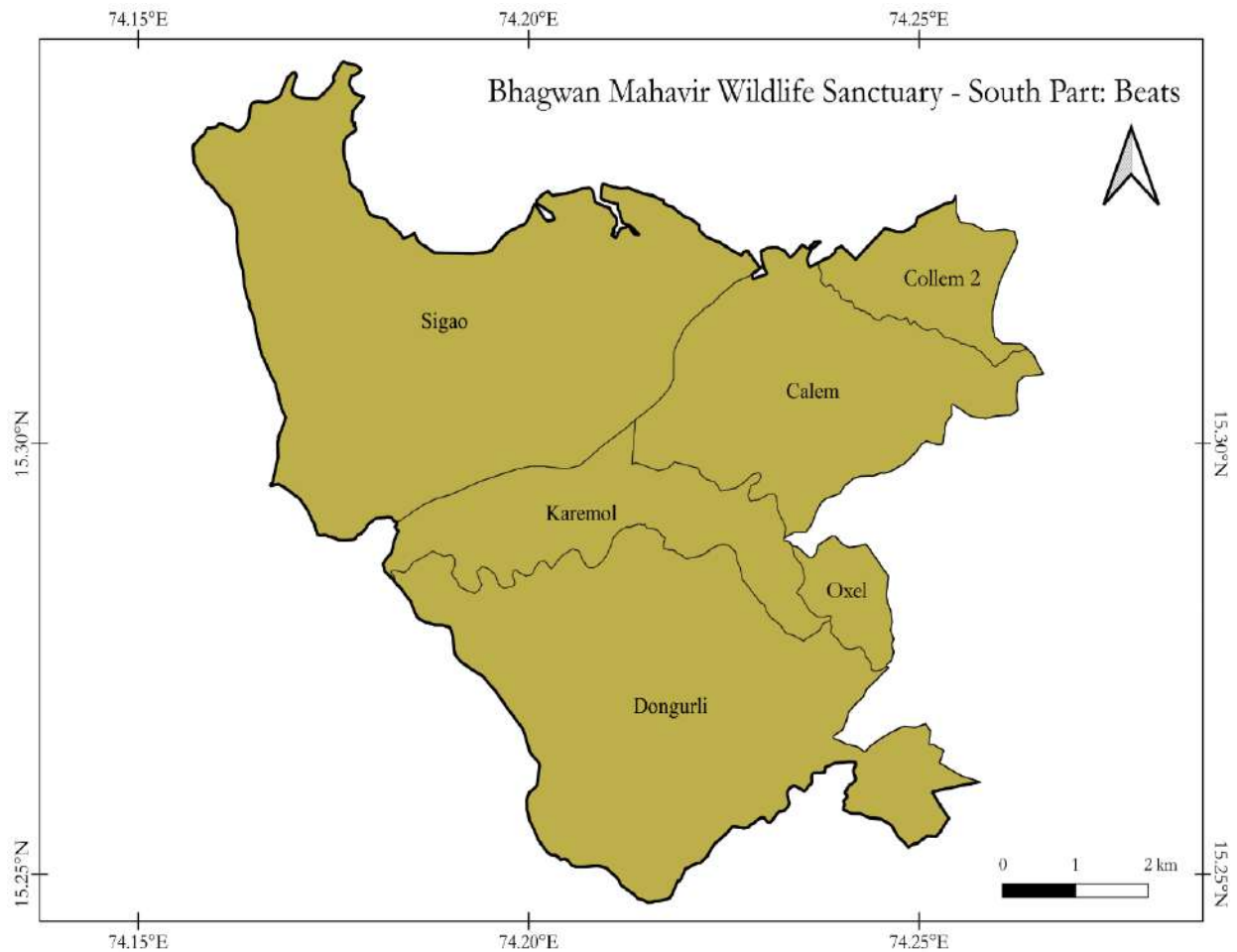
Bhagwan Mahavir Wildlife Sanctuary and National Park is divided into 15 (Fifteen) beats, of which seven are in the Wildlife Sanctuary and 8 (Eight) are in the National Park. The Boundaries are delineated based on physical features like streams, ridge lines or roads (Map 2.2a-c).



Map 2.2a Internal Beat Boundaries of Bhagwan Mahavir National Park



Map 2.2b Internal Beat Boundaries of Bhagwan Mahavir WLS- North Part



Map 2.2c Internal Beat Boundaries of – Bhagwan Mahavir WLS- South Part

2.2 GEOLOGY, ROCK, AND SOIL

The lithology of various geological formations in Bhagwan Mahavir Wildlife Sanctuary and National Park is given below.

2.2.1 GEOLOGY AND ROCKS

Bhagwan Mahavir Wildlife Sanctuary and National Park geologically falls partly within the Barcem and Ponda group, which aggregates different geo-formations (Map 2.3).

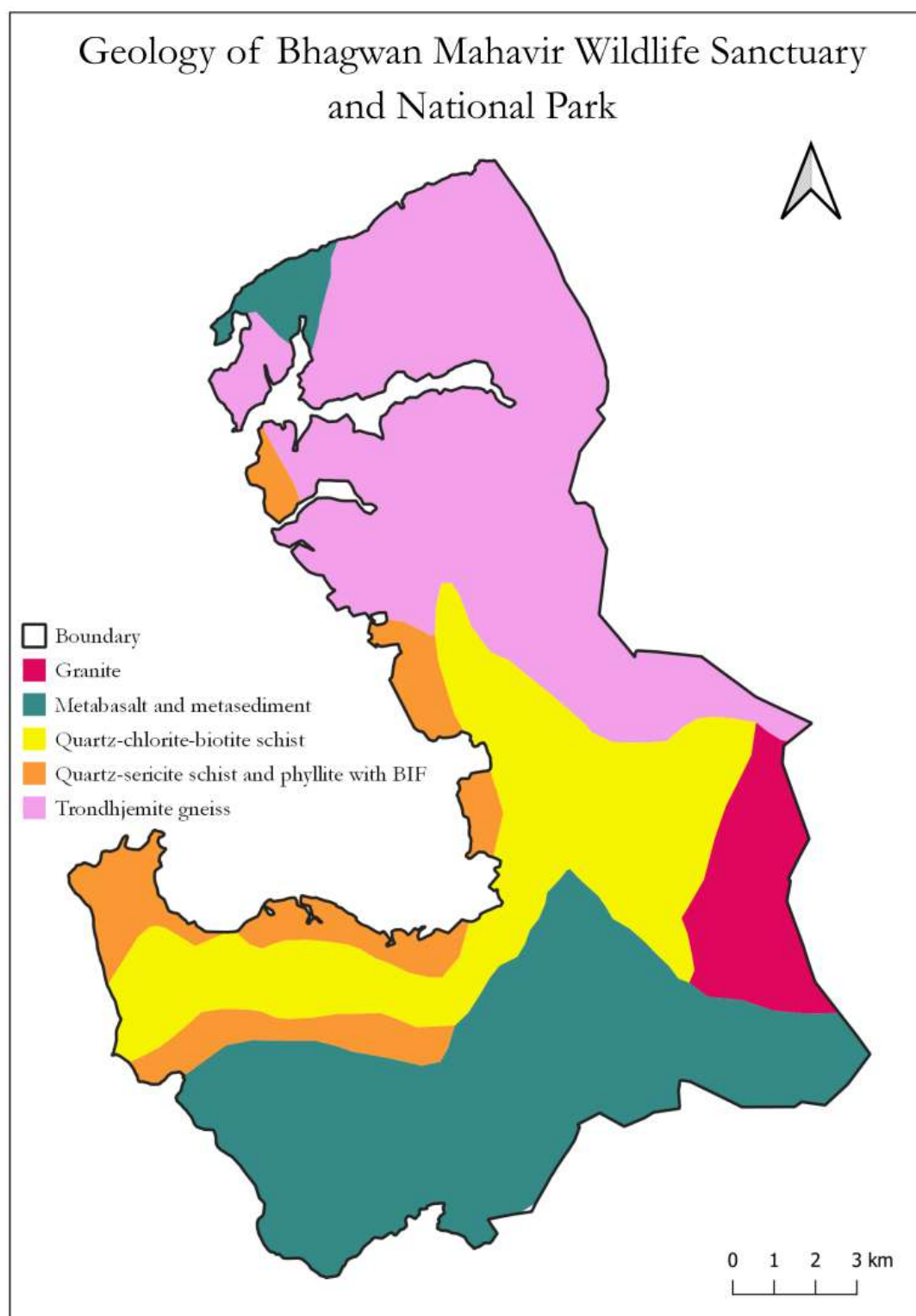
1. The Barcem group in the sanctuary is represented by non-vesicular metabasalts and metasediments consisting of quartzites, quartz-sericite-schists, quartz-chlorite-schists and minor phyllites.

2. The Ponda group is broadly characterised by quartz-chlorite biotite schist and quartz-sericite schist confined to the southwestern part of the protected area, whereas the major portion of the north has trondhjemite gneiss.
3. The south-eastern parts of the higher elevation mountains are granite in nature, a feature seen only in two areas of the state.

Quartz-Chlorite-Sericite-schist: these are pale grey, fine-grained schistose rocks. At places, it shows intercalations of quartzite and Quartz-Chlorite-schist they are composed of quartz, sericite, chlorite, and biotite with a small amount of epidote, zoisite and ilmenite. The predominant minerals are quartz and sericite.

Phyllite: These are hard, compact fine-grained grey rocks when fresh. When altered, it is usually soft and friable and shows a variety of shades of red depending on the degree of alteration.

The above information is based on secondary literature by Dessai (2011) and clipped for relevance to Bhagwan Mahavir Wildlife Sanctuary and National Park.



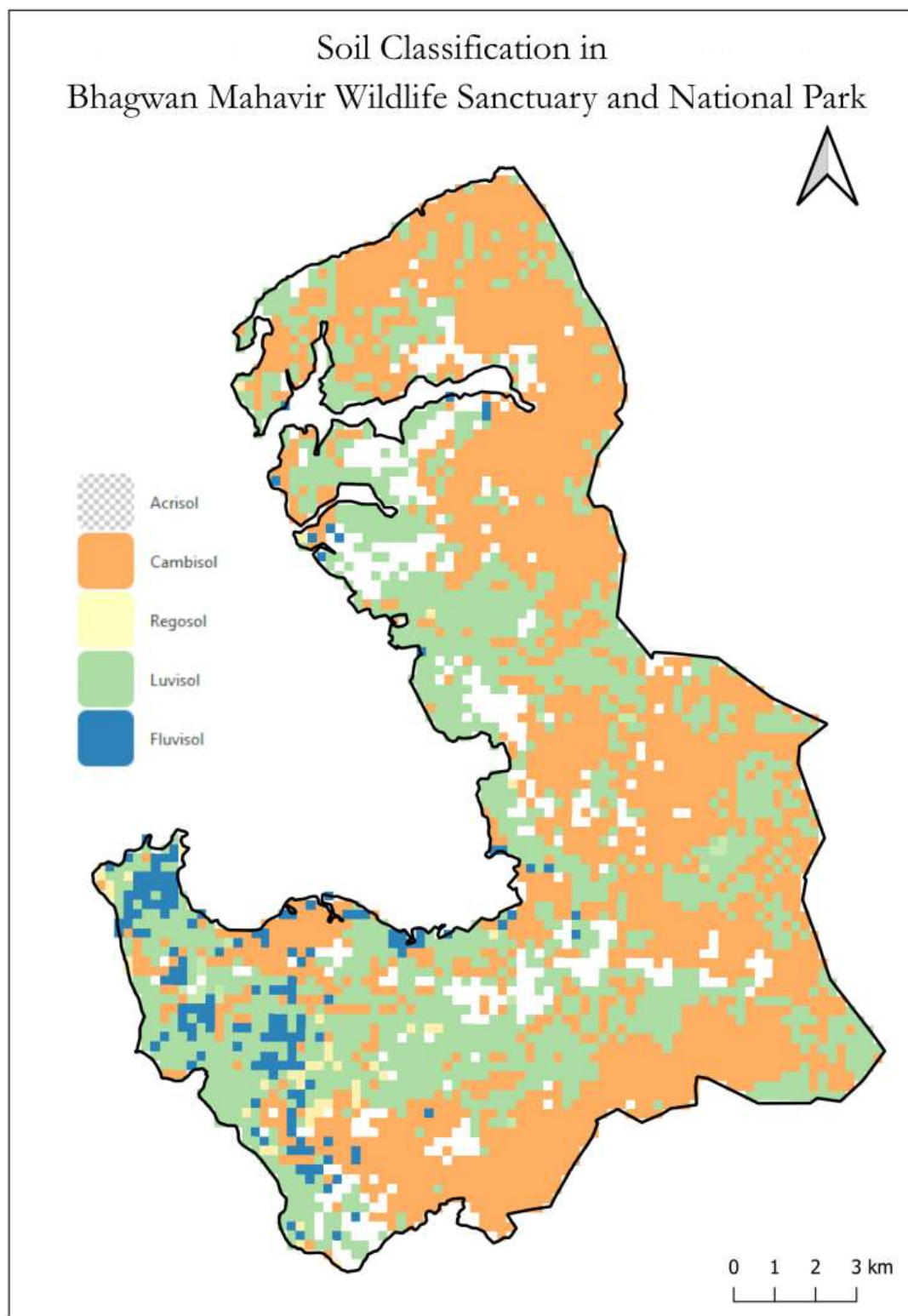
Map 2.3 Lithostratigraphic classification of Bhagwan Mahavir Wildlife Sanctuary and National Park - Data assessed and clipped from Dessai (2011).

2.2.2 SOIL

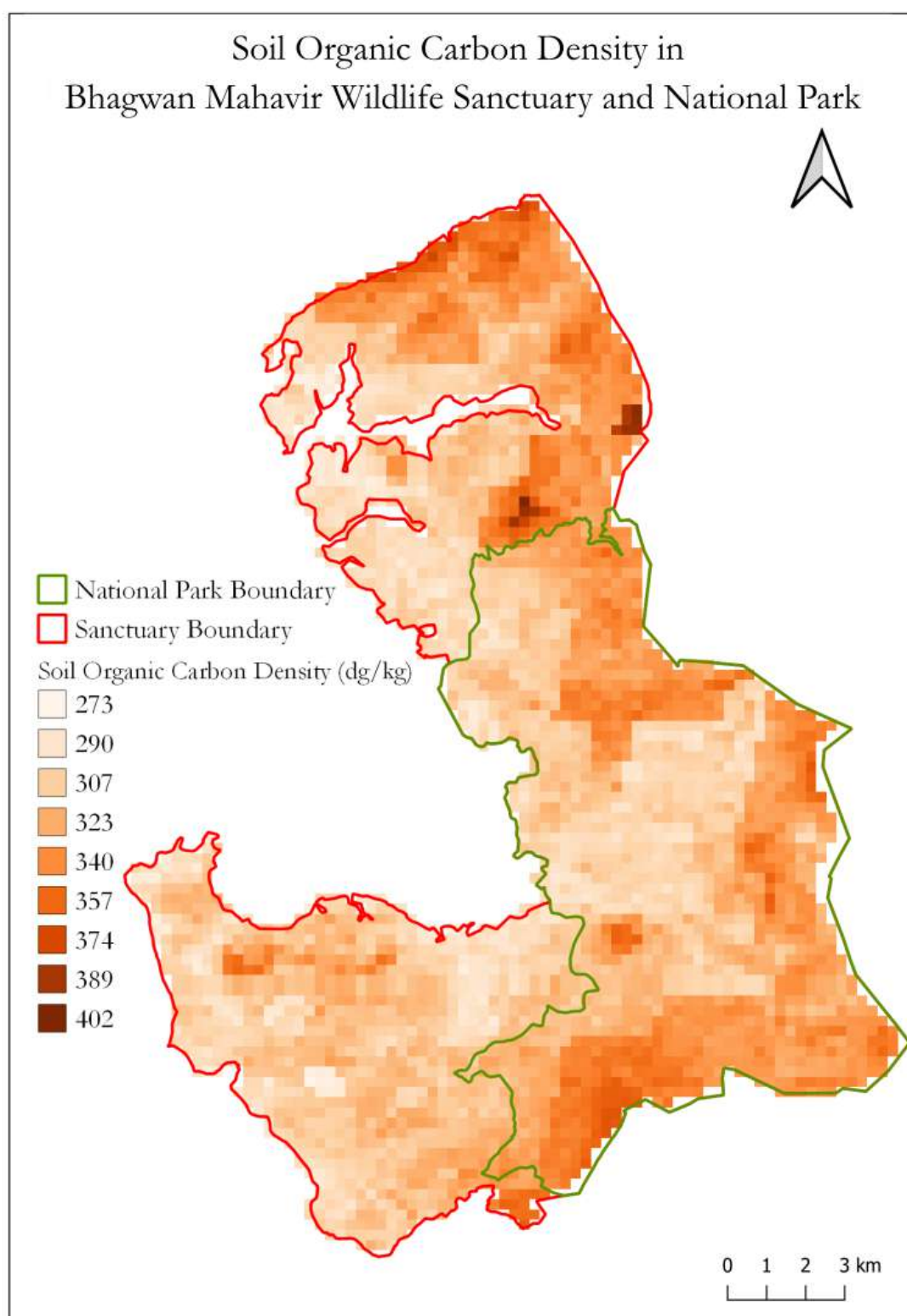
The soil type in Bhagwan Mahavir Wildlife Sanctuary and National Park is predominantly of Cambisols class followed by Luvisols class (Map 2.4). The average soil organic carbon content in the sanctuary is 340 dg/kg peaking to 402 dg/kg at areas near Tambdi Surla (Map 2.5) while Nitrogen content varies between 155 to 500 cg/kg (Map 2.6). Soil pH is variable across the protected area with more neutral soils towards the southwestern end (Map 2.7) with high clay content 364 g/kg in in the Tambdi Surla region of Bhagwan Mahavir Wildlife Sanctuary and National Park (Map 2.8). All soil related data has been acquired from The World Soil Information Service.

The soils in Bhagwan Mahavir Wildlife Sanctuary and National Park can alternatively be classified as:

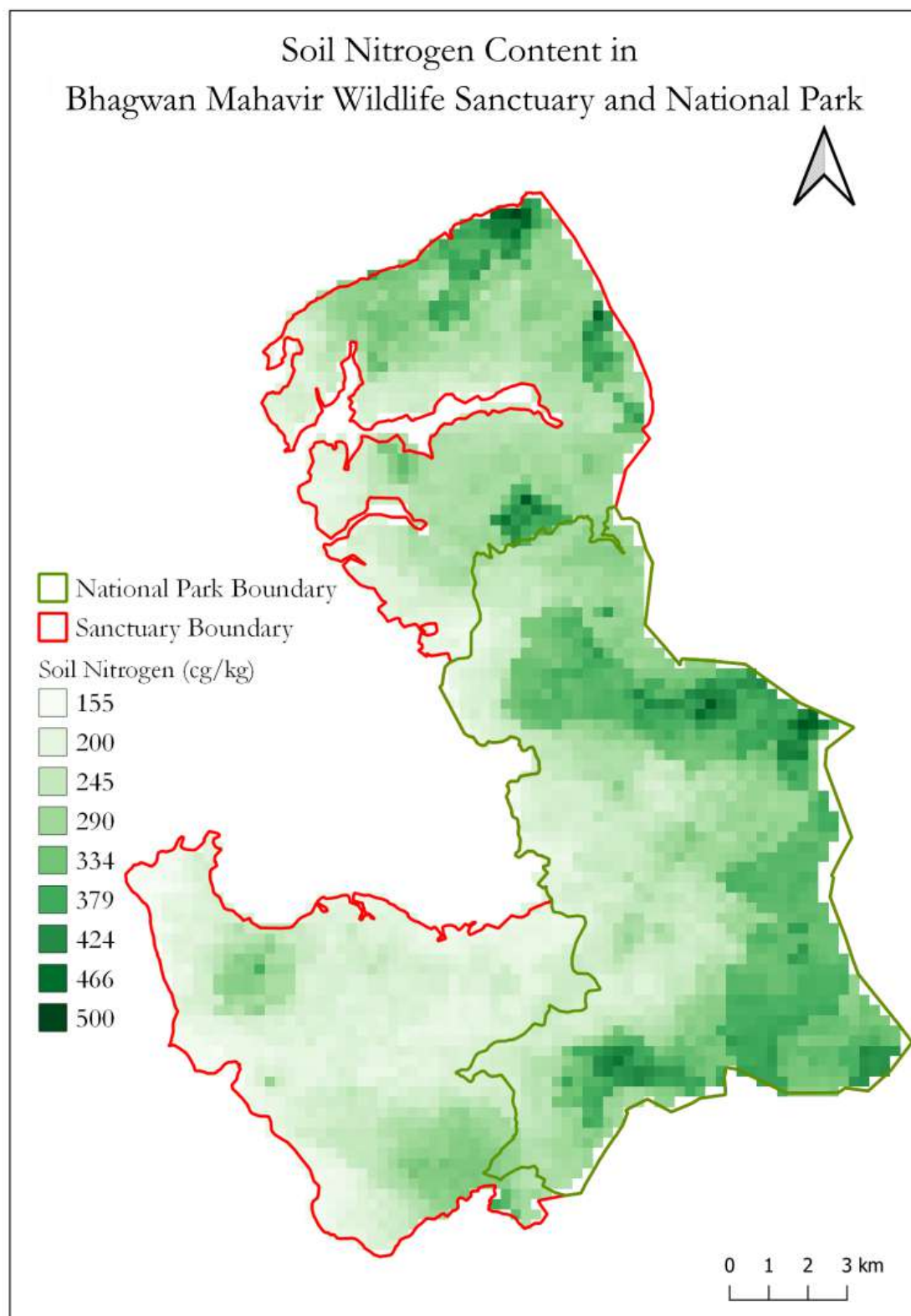
1. Netorlim Series: Consists of dark reddish-brown to dark brown laterite soils derived from pink phyllitic rocks under humid tropical climate, having grass and dense vegetation of moist vegetation type.
2. Darbandora Series: Consists of yellowish brown to strong brown soils developed on high hill ranges at altitudes ranging from 400 to 600 M.S.L. and derived from metabasalts and quartzites under humid tropical climate and dense forest vegetation.
3. Zaimolo Series: Consists of brown to dark brown or yellowish-brown laterite sods of colluvial origin, found on nearly level to gently sloping lands, having developed under humid tropical climate.
4. Rivona Series: Consists of yellowish brown to dark colluvial soils originating from laterite outwash under humid tropical climate.
5. Uguem Series: Consists of grey to dark grey or light brownish grey soils derived from coarse textured granite and gneissic granite rocks under humid tropical.



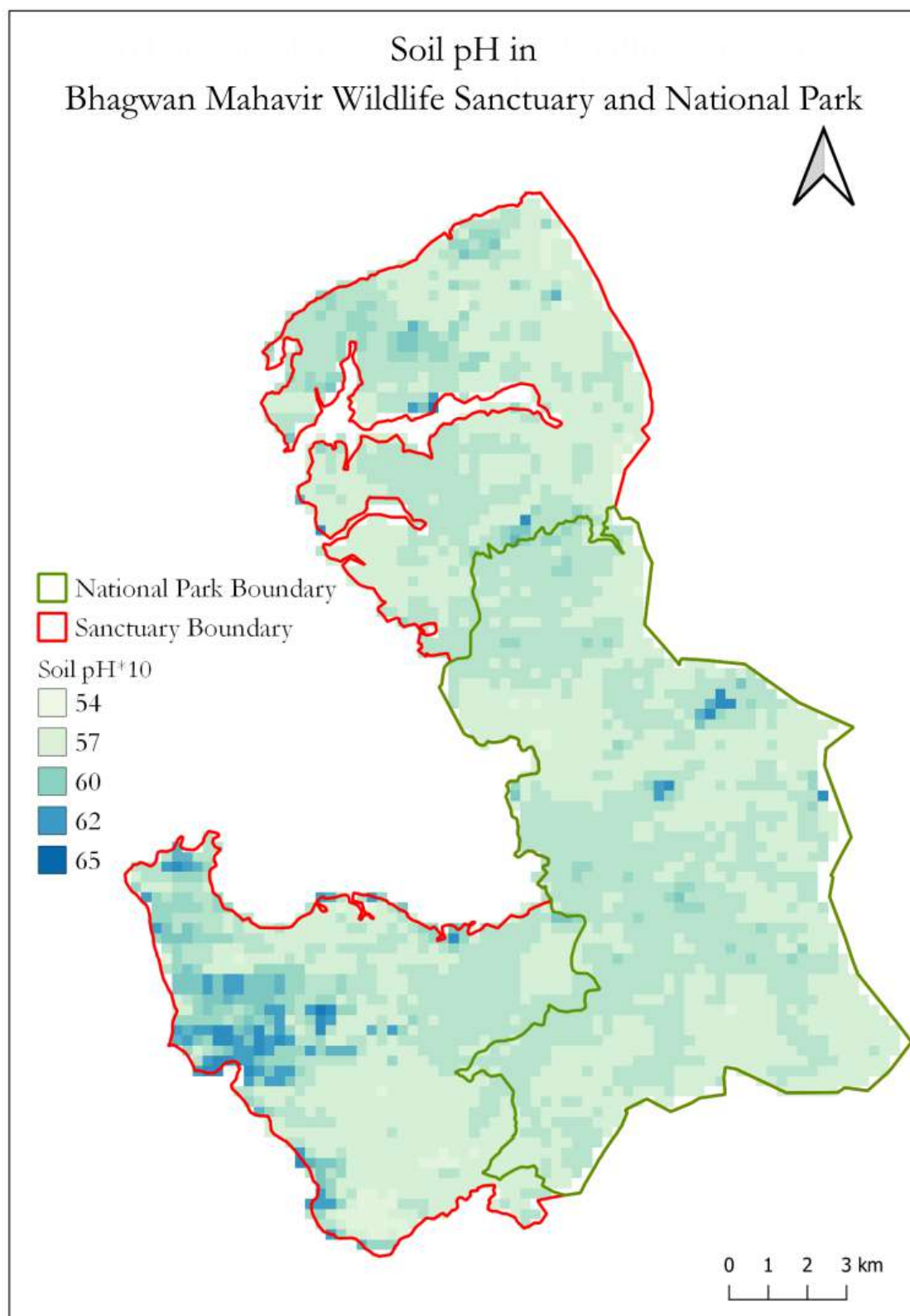
Map 2.4 Soil type in Bhagwan Mahavir Wildlife Sanctuary and National Park



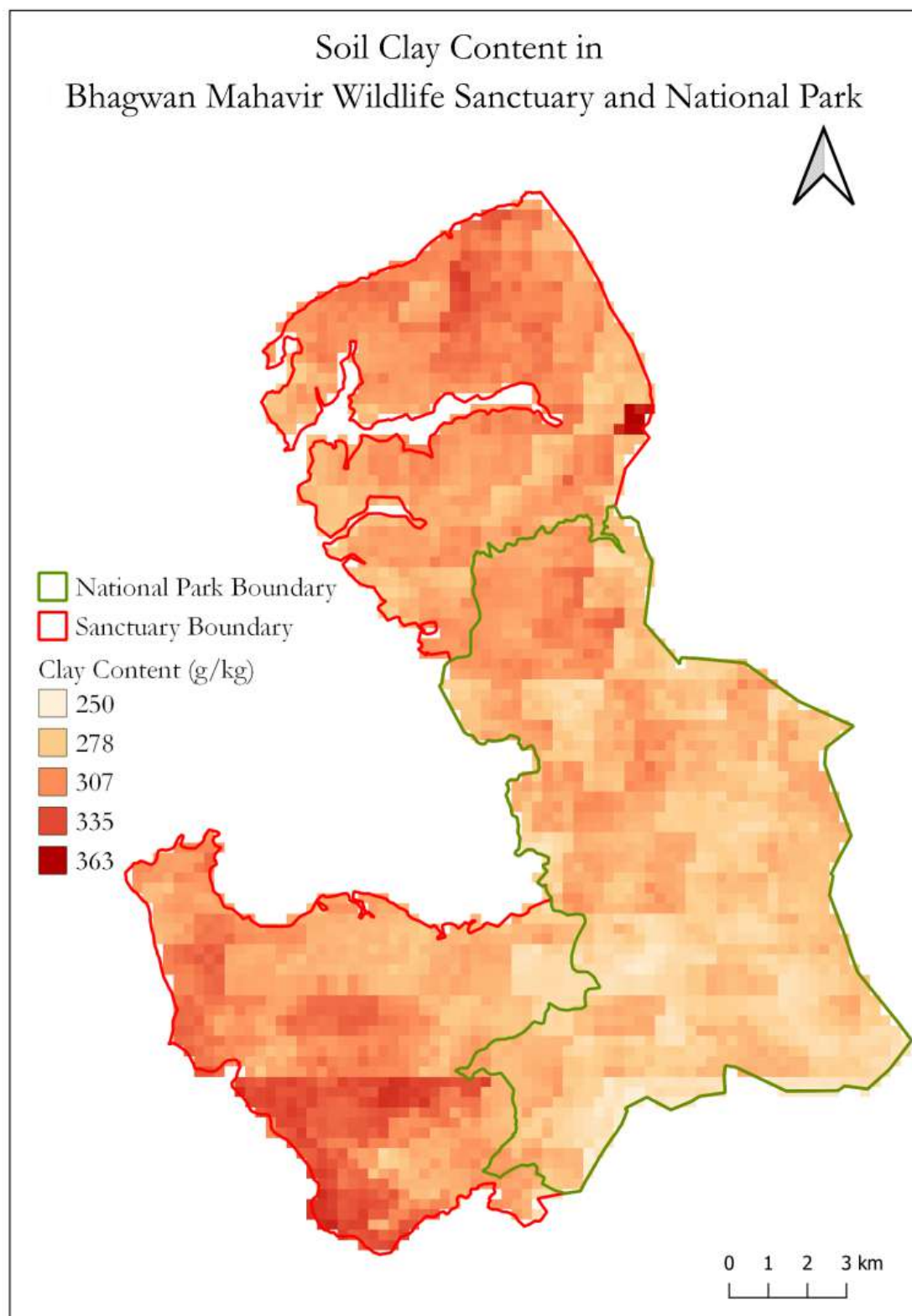
**Map 2.5 Soil Organic Matter in Bhagwan Mahavir Wildlife Sanctuary and National
Park**



Map 2.6 Soil Nitrogen Content in Bhagwan Mahavir Wildlife Sanctuary and National Park



Map 2.7 Soil pH Content in Bhagwan Mahavir Wildlife Sanctuary and National Park

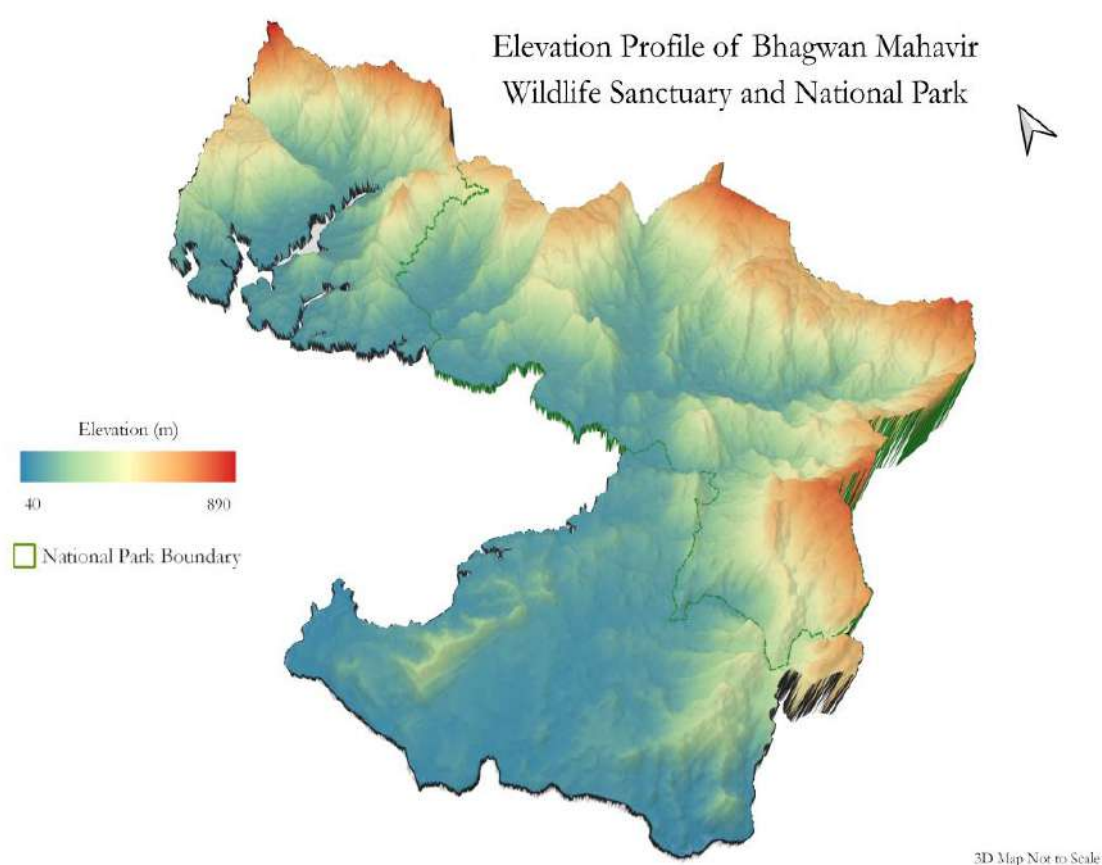


Map 2.8 Soil Clay Content in Bhagwan Mahavir Wildlife Sanctuary and National Park

2.3 TERRAIN

2.3.1 PHYSIOGRAPHIC INFORMATION

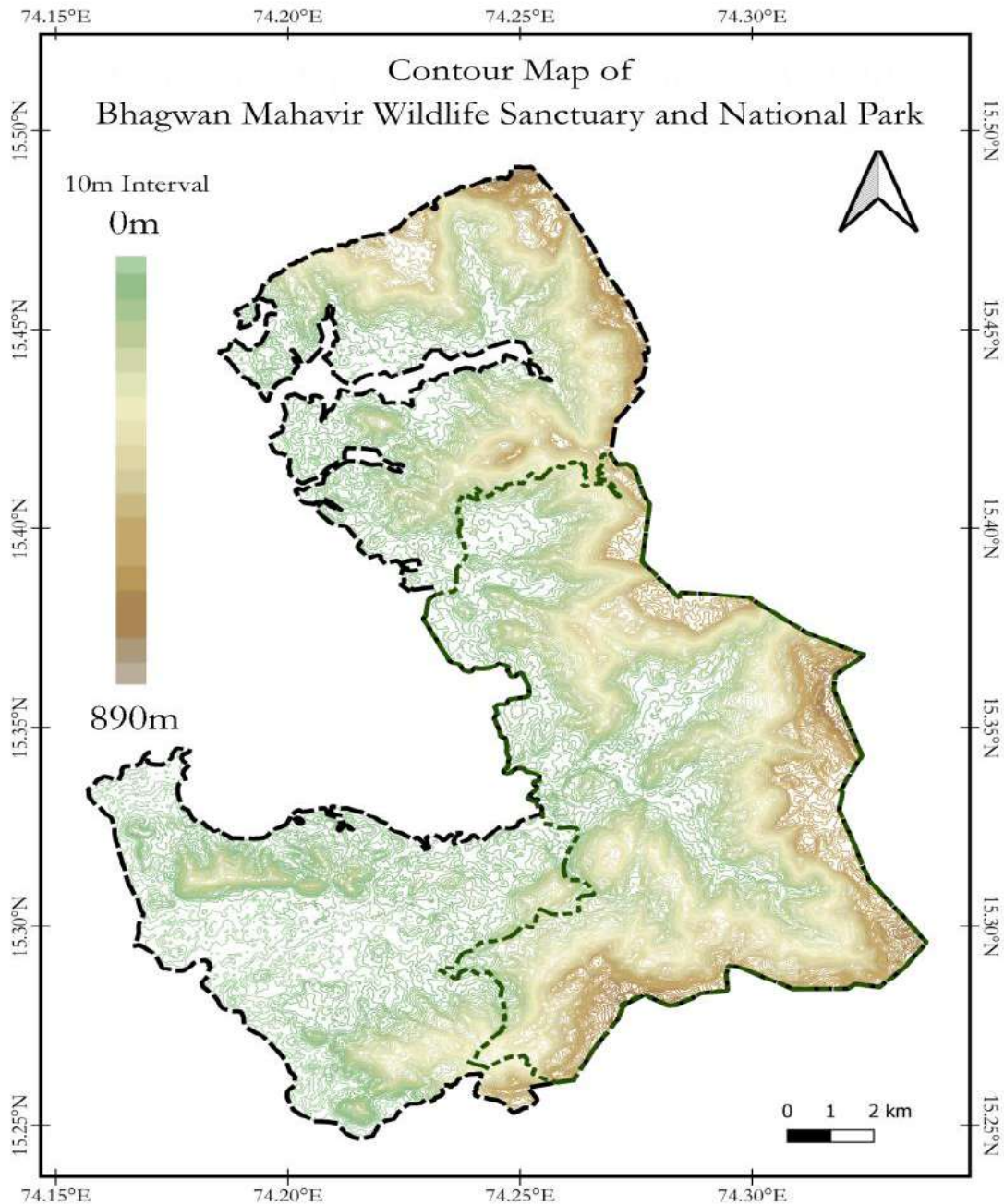
Bhagwan Mahavir Wildlife Sanctuary and National Park is structured as an inverted “C” surrounded by hillocks of varied heights/ altitude, interspersed by deep gorges and steep valleys. The physiographic area of Bhagwan Mahavir Wildlife Sanctuary and National Park has a gradient of slope from the West to the East. Highest altitude recorded is 890 m above mean sea level and is towards the north of Bhagwan Mahavir Wildlife Sanctuary and National Park.



Map 2.9 3-Dimensional Physiographic Profile of Bhagwan Mahavir Wildlife Sanctuary and National Park

2.3.2 CONTOUR MAP OF BHAGWAN MAHAVIR WILDLIFE SANCTUARY AND NATIONAL PARK

Contour maps for the Bhagwan Mahavir Wildlife Sanctuary and National Park are prepared using void filled Shuttle Radar Topography Mission digital elevation model successfully collected radar data over 80% of the Earth's land surface between 60° north and 56° south latitude at a resolution of 1-arc second.



Map 2.10 Contour Map of Bhagwan Mahavir Wildlife Sanctuary and National Park

2.4 CLIMATE

Goa is classified and falls within the monsoon climatic zone as per the Köppen climate classification. The State's annual average precipitation is between 3500 to 4000 mm. Mean annual temperature varies from 33°C maximum and 22°C minimum.

2.4.1 PRECIPITATION PATTERN AND DISTRIBUTION OVER 40 YEARS

The Bhagwan Mahavir Wildlife Sanctuary and National Park receives an annual mean rainfall of 2504.46mm with a deviation of 478.81mm (averaged over 40 years data sourced from CHIRPS-2.0). The quantum of rainfall that the sanctuary has received over the last four decades has varied, with the year 1986 receiving the least rainfall at 1552.34 mm while the year 2019 receiving the maximum rainfall at 3694.27 mm (Fig. 2.1).

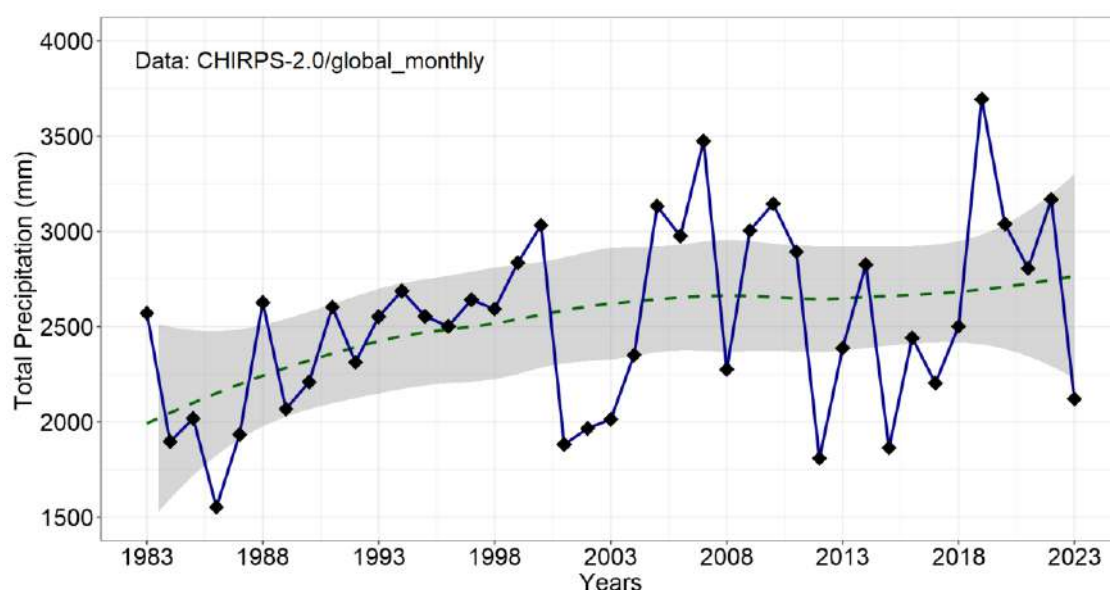


Fig. 1.1. Total yearly precipitation at Bhagwan Mahavir Wildlife Sanctuary and National Park. (Green-dashed line is a LOESS model line passing through maximum number of data points and is not a regression line.)

The amount of annual rainfall received has gradually risen over the period of 30 years with recent years being wetter than before. The bulk of the annual rainfall is received in the months of June, July, and August coinciding with the monsoon season (Fig. 2.2) and hence the year is effectively divided as the wet monsoon season (Jun-Aug), followed by post-monsoon (Sep-Nov), winter (Dec-Feb) and the dry pre-monsoon season (Mar-May).

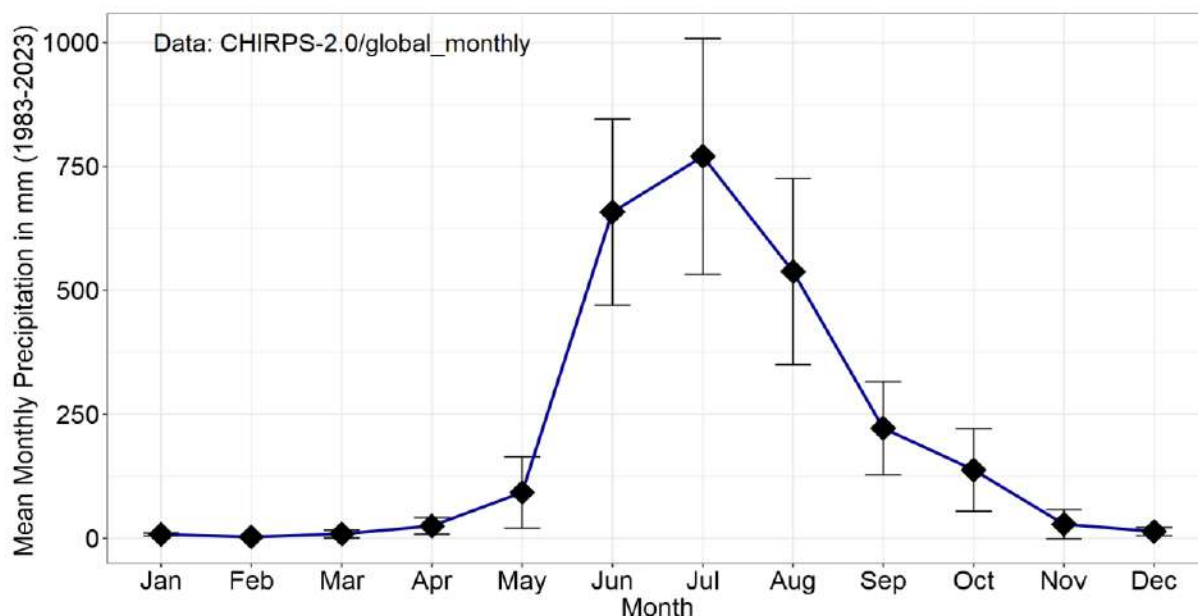


Fig. 1.2. Mean monthly precipitation at Bhagwan Mahavir Wildlife Sanctuary and National Park.

2.4.2 TEMPERATURE PATTERNS OVER 60 YEARS

Mean annual temperature within Bhagwan Mahavir Wildlife Sanctuary and National Park has varied in the last 70 years, with a mean temperature of 25.14°C and a deviation over 70 years to a tune of 2.35°C. The month of April in 1998 saw the highest mean monthly temperature of 31.53°C, whereas the month of September in 1954 saw the lowest mean monthly temperature of 21.43°C.

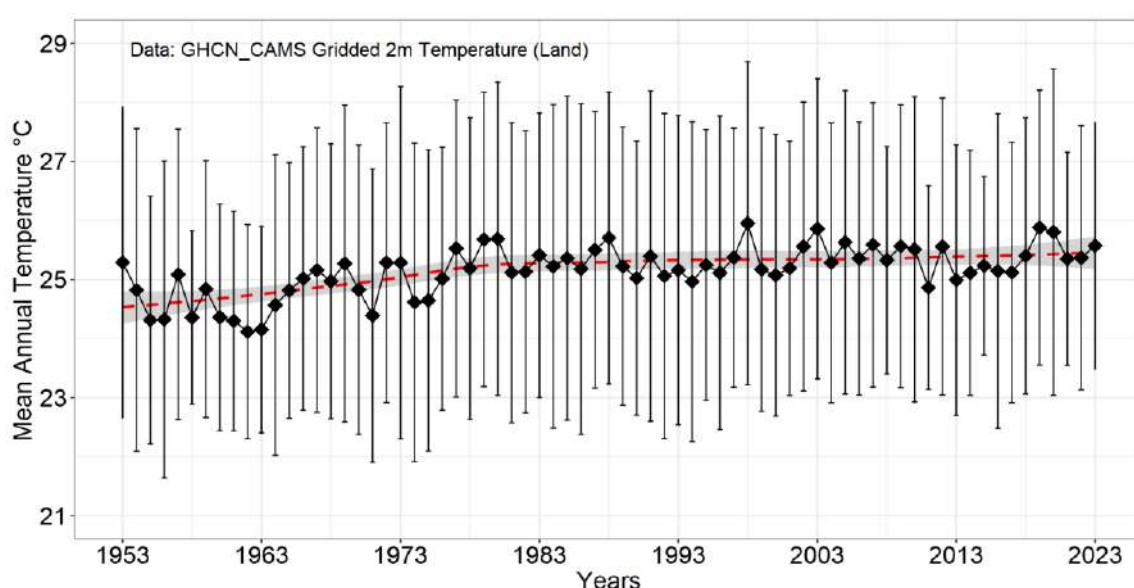
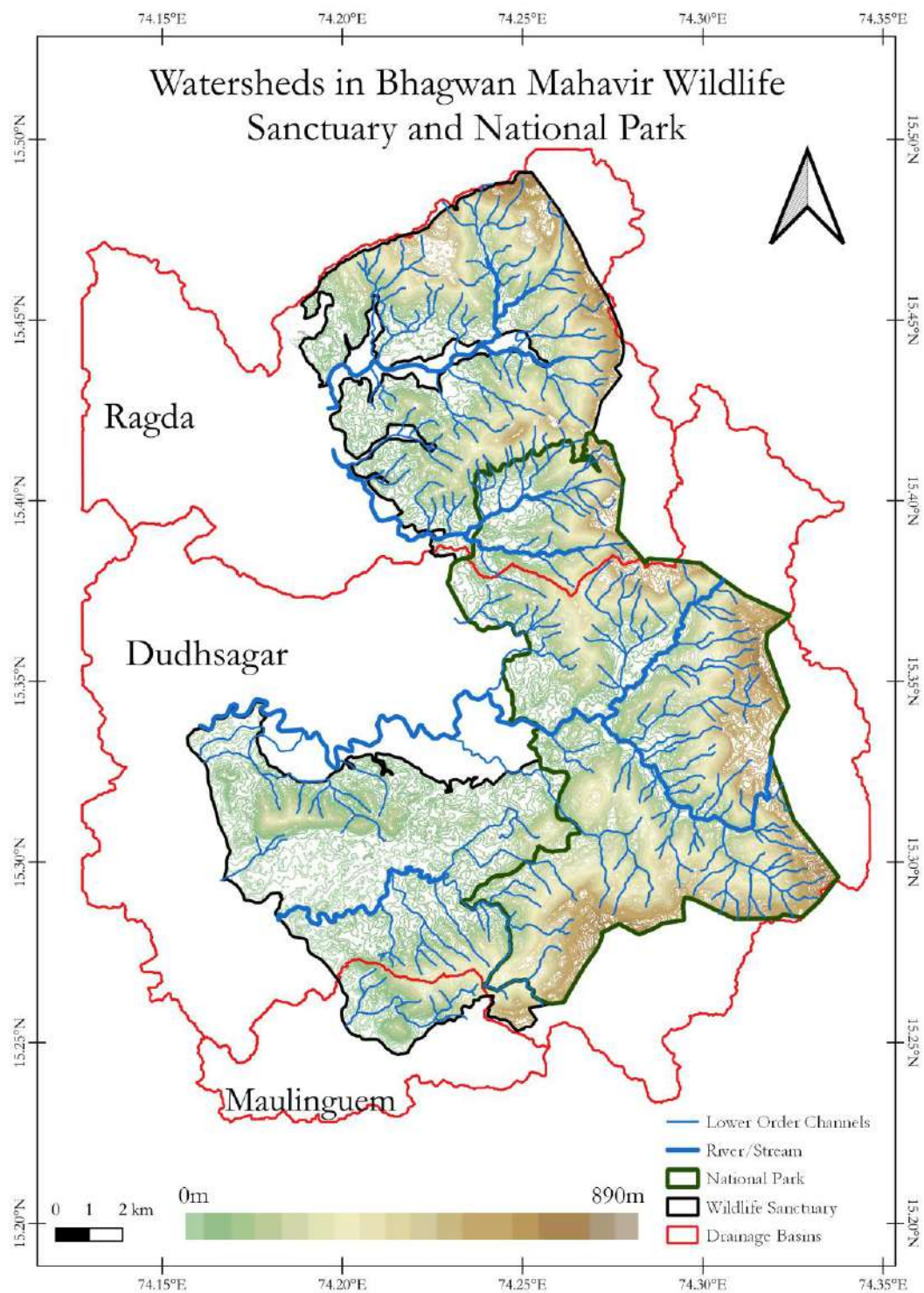


Fig. 1.3. Mean annual temperature at Bhagwan Mahavir Wildlife Sanctuary and National Park (Data sourced from Global Historical Climatology Network's Climate Anomaly Monitoring System).

2.5 HYDROLOGY

The 240km² area of Bhagwan Mahavir Wildlife Sanctuary and Mahavir National Park is an important watershed region in the south Goa district, with two major rivers arising from this region. The Opa water treatment plant, which supplies drinking water to a large area of the North Goa district, is dependent on water from the Dudhsagar river (Khandepar river) which is also supplemented by the Kalem River, while the Ragada river is an important tributary for the Mhadayi river and upon meeting the Khandepar river at Usgao is further downstream known as the Mandovi river. Bhagwan Mahavir Wildlife

Sanctuary and National Park is divided into three major watershed zones (Map 2.11) each feeding three major rivers. The Maulinguem watershed feeds the Ugem river in south of Goa, which ultimately flows as the Zuari river. Dudhsagar watershed gives rise to several streams that feed the perinnial Dudhsagar/ Khandepar river, while the Ragada watershed feeds the Ragada river.



Map 2.11 Watershed basins and stream network in Bhagwan Mahavir Wildlife Sanctuary and National Park

CHAPTER 3

HISTORY OF MANAGEMENT AND PRESENT PRACTICES

3.1 GENERAL

3.1.1 ESTABLISHMENT OF BHAGWAN MAHAVIR WILDLIFE SANCTUARY AND NATIONAL PARK

Bhagwan Mahavir Wildlife Sanctuary and National Park is located majorly in the Dharbandora taluka with its southern end jutting into the Sanguem taluka in the state of Goa. The Wildlife Sanctuary and National Park lies within the latitudinal extent of 15.49°N to 15.24°N and longitudinal extent of 74.15°E to 74.34°E.

The Bhagwan Mahavir Wildlife Sanctuary and National Park is spread over an area of 240 km². The Wildlife Sanctuary is spread across an area of 133 km² while the National Park encompasses an area of 107 km².

3.1.2 PAST MANAGEMENT

This is the first approved Management Plan for the Bhagwan Mahavir Wildlife Sanctuary and National Park for a 10-year period from 2024-2025 to 2033-2034. The past management was based on the approved working plans and principles of wildlife management and ecological needs. The Dy. Conservator of Forest (Wildlife) was one post before it was bifurcated into North and South Goa. The one post of Range Forest Officer (RFO), is the Executive Officer to implement management measures as per the approved working plan and central and state budget specified protection and management interventions of both Protected Areas. The eco-tourism activities are being undertaken based on the carrying capacity studies conducted under the chairmanships of DCF South and DCF Wildlife. There are two carrying capacity studies done and are available with the DCF Wildlife North and RFO Mollem office. CAMPA related activities have been undertaken in the Protected Areas based on the approved APO of respective years. The major emphasis of the CAMPA has been on the Wildlife and Habitat improvement, training and capacity building, soil

and moisture conservation etc. Various activities related to the forest protection, habitat management and soil and moisture conservations have been undertaken both under centrally and state sponsored projects/programmes.

3.2 TIMBER OPERATIONS INCLUDING BAMBOO AND FIREWOOD HARVEST

In the Bhagwan Mahavir Wildlife Sanctuary and National Park, there are no timber operations at present. As a policy decision, endemic and fruit bearing plants are planted in the Sanctuary and National Park enabling the animals to feed on natural sources of food found within geographical areas. Trees that are fallen due to age or uprooted due to natural phenomena like torrential rains are kept in-situ to degrade naturally. There is no dependence on this Wildlife Sanctuary and National Park for timber and fuel wood.

3.2.1 SILVICULTURAL SYSTEMS AND TENDING OPERATIONS

Silvicultural systems are not being practiced in the Bhagwan Mahavir Wildlife Sanctuary and National Park. At the Bhagwan Mahavir Wildlife Sanctuary and National Park, the focus is on managing forest vegetation through prescriptions to fulfil various objectives such as sustaining wildlife habitat, maintaining hydrological processes, restoring ecosystems, and conserving biodiversity. Accordingly, enrichment plantations are taken up annually.

3.2.2 EVEN-AGED SYSTEMS AND UNEVEN-AGED SYSTEMS

In a plantation, if approximately 80% of the individual trees are of the same age, then the plantation is called as Even-Aged and if age group variations are greater than 20%, the plantation is said to be Uneven-Aged. In Bhagwan Mahavir Wildlife Sanctuary and National Park, the plots of planted trees within a beat are Even Aged with little variations as they have all been planted at the same time within a plot. However, within the plantation natural events have created a matrix of Even-aged and Uneven-aged.

3.2.3 BAMBOO WORKING

There are no cultivated Bamboo plantations in the PA, but the natural clumps exist.

3.2.4 FIREWOOD HARVEST AND COLLECTION

No such activity is carried out in the Bhagwan Mahavir Wildlife Sanctuary and National Park. However, local communities residing within the protected area sometimes remove deadwood for fuel purpose. Attempts are being made by the government to persuade the residents to opt for non-conventional fuel options and reduce the dependence on deadwood.

3.3 NON-WOOD FOREST PRODUCE (NWFP) COLLECTION

Currently, no such commercial scale activity is carried out in Bhagwan Mahavir Wildlife Sanctuary and National Park. However, a collection of NWFP is generally done by the forest dwelling and forest dependent communities who use them at a subsistence level. Some of the NWFP of Bhagwan Mahavir Wildlife Sanctuary and National Park are Termite-hill Mushrooms *Termitomyces* sp, Taro *Colocasia esculenta*, Tankala *Senna tora*, Air Potato *Dioscorea bulbifera* and Cocum *Garcinia indica* to name a few.

3.4 LEASES

A Tourist complex is situated in the Bhagwan Mahavir National Park in Survey No. 35 of Mollem village admeasuring an area of 123,000 Sq. mtrs owned by the Forest Department. The said land formed part of Mollem Wildlife Sanctuary when it was notified in 1967. Subsequently, the area was carved out of the Wildlife Sanctuary and notified as Mollem National Park in 1978. The tourist complex was established by the Department of Tourism to promote Eco-tourism activity in the WLPA during the early 80's. The facilities consisted of a Restaurant, Manager's office cum dormitory and a few cottages, the Tourism Department was finding it difficult to run the facility departmentally and a contractor's agency was called upon to run the complex.

In the year 1997 the complex was handed over by the Tourism Department to Goa Tourism Development Corporation (GTDC), The Corporation was renting the complex to private agencies on an annual basis until the year 2000. As the returns were not satisfactory, there were moves at the Government level to explore the possibility of handing over the complex to the Forest Department, but the plan did not materialise. The rental contract was renewed for another 7 years by GTDC in the year 2001. (From 06/12/2001 to 05/12/2008) to M/s Dudhsagar Resort, through a contract signed between the GTDC and the partners of M/s Dudhsagar Resorts. Presently the Dudhsagar resort is non-functional.

3.5. FOREST PROTECTION

The Bhagwan Mahavir National Park and Wildlife Sanctuary are important biodiversity hotspots. The area is so far, being managed through the approved annual work plans. This is the first approved management plan, hence not much data is available on any past management plans. However, there has been considerable work undertaken through various central and state budgets. All the entries and exit points are appropriately manned and patrolling stations have been established at crucial points for holding better protection of the Protected Areas. Trekkers are deployed for protection duty at each beat level to assist Forest Guards. Anti-Poaching Stations are provided with adequate staff.

3.6.1 LEGAL STATUS

The Union Territories of Goa, Daman and Diu in exercise of the powers conferred by the Wild Animals and Wild Birds Protection Act, 1965 (Act 21 of 1965) and under section 18 of the said Act, delimited the area comprising of the Reserve Forest of Collem Range, as a Game Sanctuary vide notification DF-894-FOR-67 dated 28th December 1967. On 13th April 1978, vide notification No. 8-3-77-FOR, all areas falling within Mahavir Wild Life Sanctuary, comprising an area of 107

km² and villages of Nandron.- Mollem, Caranzol, Sonauli; part of Oxel and Boma were notified as National Park. Further, on 27th September 1982, in exercise of powers conferred by section 18 of the Wild Life (Protection) Act 1972 (Central Act 53 of 1972), the Game Sanctuary was declared to be a sanctuary vide notification 8-12-82-FOR. On 14th March 1984 the notification 8-12-82-FOR was amended where in The Wild Life Sanctuary which was popularly known as “Molem Wildlife Sanctuary” was named as “Bhagwan Mahavir Wildlife Sanctuary” and the amended notification 8-12-82-FOR was called as the “principal Notification”. Further vide notification 6-12-82-FOR dated 6th September 1985, areas from six villages (as mentioned in the notification) were excluded from the limits of the Bhagwan Mahavir Wildlife Sanctuary.

3.6.2 HUNTING, POACHING AND OTHER ILLEGAL ACTIVITIES

No hunting and poaching activities have been recorded from the Bhagwan Mahavir Wildlife Sanctuary and National Park for the past five years. The wildlife sanctuary and national park has no reported cases of illegal cutting of trees. Naturally, fallen/dead trees are kept in-situ to degrade naturally to act as natural habitat for flora & fauna.

3.6.3 LIVESTOCK GRAZING

There is a base level of grazing pressures on forest plantations and young natural regenerations in the vicinity of the villages and settlements within and around Bhagwan Mahavir Wildlife Sanctuary and National Park. However, grazing activity is restricted only to these peripheral regions.

3.6.4 FOREST FIRE

Forest fire is one of the serious problems faced in this protected area particularly during the dry season (February to April / May) which leads to destruction of these fragile habitats and causes enormous damage to the ecosystem. There is no natural forest fire reported. However,

minor forest ground fires have been reported which are accidental or unintentional. Accidental fires result from carelessness on the part of smokers, picnickers or travellers in the sanctuary. Sometimes forest fires are unintentionally set by the local people.

There are few areas prone to fire incidents. The fire incidences reported in past decades within the protected area is shown in Map 3.1 The forest areas adjoining the roads and habitations are highly sensitive for fire incidences. Tracing Fire lines are effective in such habitats for preventing spread of fires.

3.6.4.1 FIRE REPORTING SYSTEM

In the past, manpower was deployed to trace the fire. Few people were stationed at the highest point of the Sanctuary. A vehicle with a water pump/ water tank and 4 staff were stationed at the Valpoi station who could readily act as soon as they received information regarding forest fires. With advancement in technology from the last few years, the department is using FSI generated satellite based SMS alerts of fire incidences in real time for quick response to attend fire occurrences.

The Range officers should maintain the details, such as the nature of damage, loss if any, affected locality etc. that can be submitted to the higher authorities. The strategies can be well planned with such past data to protect incidental fires.

3.6.4.2 PREPAREDNESS OF THE STATE IN COMBATING FOREST FIRE

The Forest Department has taken a multipronged approach to the management of forests fires in the State to prevent and control forest fires at a policy level, inter-ministerial (GOI) level, inter-department level and at the level of the local communities. A State Action Plan on Forest Fires is in place, which defines roles and responsibilities of each authority within Department and among the various departments during a forest fire situation. After careful assessment of fire risks based on the FSI reports / alerts and past experience, a comprehensive forest fire prevention and

management plan is prepared every year which *inter alia* includes the following forest fire prevention measures:

3.6.4.3 ENGAGEMENT OF FIRE WATCHERS:

To monitor and contain forest fires during the fire season, firewatchers are engaged between December to May across the state. Local youth are deployed for this purpose by imparting basic training along with other staff. They are placed at strategic places to monitor incidences of fire and to inform forest frontline workers of that respective area in real-time basis, so as to control / douse fires in the shortest feasible time.

3.6.4.4 CREATION OF FIRE LINE:

Fire lines are created across risky / identified areas by making a buffer by removing dry combustible material in a width of a minimum of 2 mtrs across the forest floors to break the continuity of fire creeping along the forest floor.

3.6.4.5 CONTROL BURNING:

Dry biomass on the forest floor is a medium for forest fires to spread. In order to prevent fire, control-burning activities are taken up at pre-identified places in the forest, along either side of roads and linear ways by gathering and burning dry leaf litters and dry biomass.

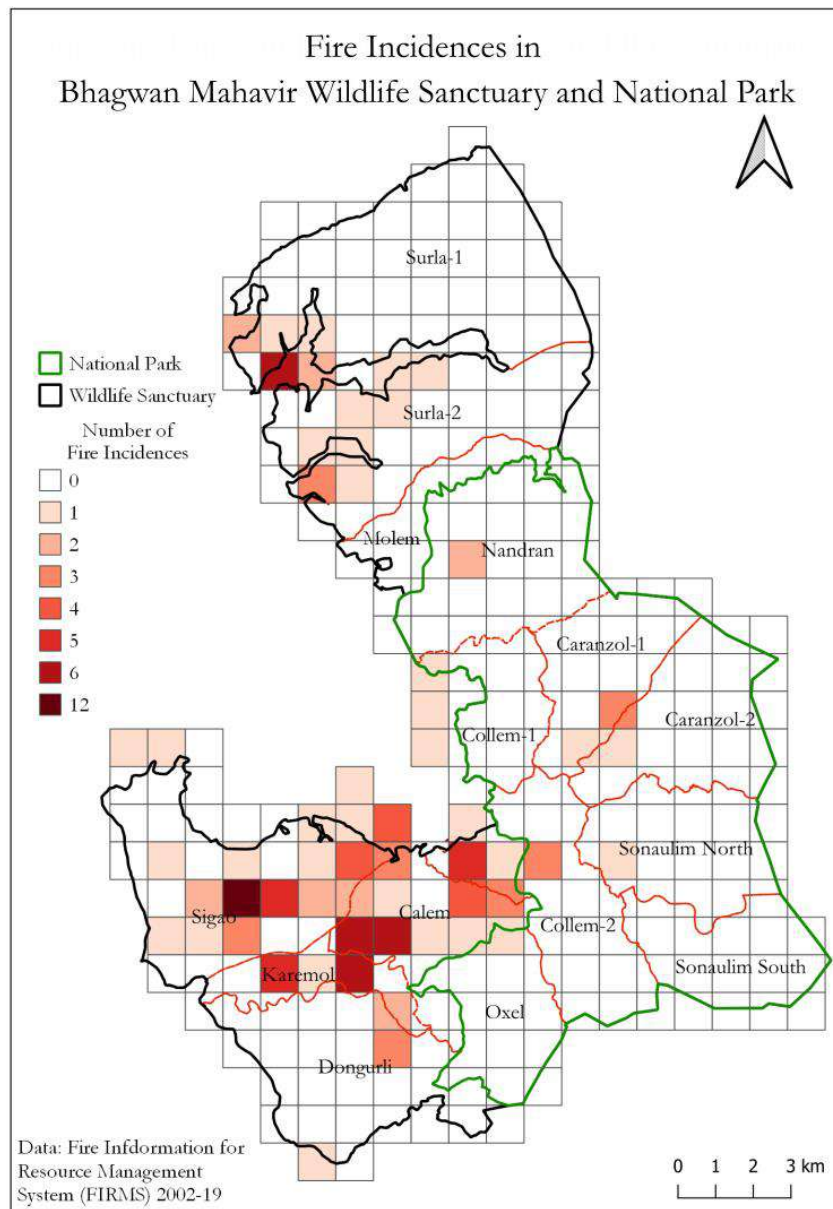
3.6.4.6 INFRASTRUCTURE:

As stated above, considering the fire risk involved, assessment of firefighting equipment is carried out and the required number of such equipment and tools are included in the annual plan. All the field divisions are equipped with firefighting tools and machinery like mechanized air blowers, mist blowers, rakes, firefighting aprons and other field infrastructure like protection camps and watch towers. Specially designed water tankers, mounted on a Bolero Vehicle, are well suited for undulating forest terrain are helpful in dousing the forest fires.

**Table No.1 Details of forest fire incidences reported in Bhagwan Mahavir National Park and
Wildlife Sanctuaries**

Sr. No	Location	Date	Area	GPS Location	Sy. No
1	Anmod Ghat, Mollem	05/03/2023	10 Ha	N15°24'45.5 E074°14'44.2 N15°24'41.8 E074°14'51.7 N15°24'34.8 E074°14'31.8 N15°24'39.7 E074°14'24.5	56,57,59
2	Surla – II beat , Mollem round	10/03/2023	04 Ha	N15°26'18.6 E074°14'55.1 N15°26'13.9 E074°14'55.9 N15°26'11.5 E074°14'49.6 N15°26'15.6 E074°14'45	73/14
3	Surla – I beat , Mollem round	10/03/2023	05 Ha	N15°26'52.1 E074°14'57.1 N15°26'53.2 E074°26'53.2 N15°26'44.9 E074°14'56.8 N15°26'47.0 E074°15'06.	73/14
4	Shigao beat, Kalay	06/03/2023	20Ha	N15°18'52 E074°12'06 N15°18'58 E074°11'59 N15°19'5 E074°11'36 N15°18'56 E074°11'37	113/1
5	Mauliguem beat, Kalay round	05/03/2023	02 Ha	N15°16'03.599 E074°12'37.829 N15°16'05.160 E074°12'37.829	18
6	Karemol beat, Kalay round	09/03/2023	30 Ha	N15°18'37.5 E074°13'05.5 N15°18'36.6 E074°13'10.6	77

				N15 ⁰ 18'36.3 E074 ⁰ 13'15.3 N15 ⁰ 18'34.4 E074 ⁰ 13'25.9 N15 ⁰ 18'45.5 E074 ⁰ 13'32.6 N15 ⁰ 18'50.2 E074 ⁰ 13'27.3 N15 ⁰ 18'50.0 E074 ⁰ 13'15.1	
7	Maida, Collem – II beat, Collem round	12/03/2023	3.50 Ha	N15 ⁰ 19'01.2 E074 ⁰ 15'18.4 N15 ⁰ 19'03.4 E074 ⁰ 15'27.7 N15 ⁰ 18'55.8 E074 ⁰ 15'21.2 N15 ⁰ 18'56.9 E074 ⁰ 15'29.9	70
9	Sonaulim, Dudhsagar, Sonaulim beat, Caranzol Round	29/03/2023	1.50Ha	N15 ⁰ 19'3 E074 ⁰ 18'43 N15 ⁰ 19'8 E074 ⁰ 18'43 N15 ⁰ 19'13 E074 ⁰ 18'43 N15 ⁰ 19'5 E074 ⁰ 18'40	15



Map 3.1 Fire Incidences in Bhagwan Mahavir Wildlife Sanctuary and National Park (2002-2019)

Majority of the fire incidences have been reported from Sigao, Karemoli, Calem and Surla – 1 beat. These beats have human settlements and roads passing through them. Most of the fires are accidental in nature. From the fire incidence map, it is observed that most of the incidents have happened in the periphery of the Bhagwan Mahavir Wildlife Sanctuary and National Park and in beats with heavy human settlements. This points towards the importance of investing more on awareness and capacity building of the local communities there with respect to the hazards of forest

fires. The beat guards and fire watchers of the Sigao, Karemol, Calem and Surla – 1 must be particularly alert and capable responding to wildfire outbreaks in short time periods to avert damage due to fire. Analysis of the fire incidence map shows the effectiveness of fire prevention and management protocols with negligible incidents in the core zone of the Bhagwan Mahavir Wildlife Sanctuary and National Park. Management strategies like creation and maintenance of fire lines, pruning, brushing and removal of dry branches may greatly reduce the fire vulnerability. Extensive planning to control and manage forest fires has been undertaken in the Bhagwan Mahavir Wildlife Sanctuary and National Park over the past nine years, and the details of those are presented below.

3.6.5 INSECT ATTACKS AND PATHOLOGICAL PROBLEMS

No major insect attacks or pathological problems have been reported from the Bhagwan Mahavir Wildlife Sanctuary and National Park in the last five years.

3.6.6 WILDLIFE HEALTH

Health of animals in the Bhagwan Mahavir Wildlife Sanctuary and National Park is constantly monitored by beat guards and trekkers. In case of a sick animal that is observed or animals that are rescued in the vicinity of the wildlife sanctuary and national park, they are taken to the veterinary hospital and rescue center at Bondla Zoological Park, where the services of a Veterinary Officer are available to attend to the health issues of the animals. In the recent five years, there has been no recorded incidence of major health issues or communicable diseases of animals at the sanctuary. However, some areas in the Madei Wildlife Sanctuary have experienced seasonal outbreaks of viral pathogens like Kyasanur Forest Disease (KFD), which is a tick-borne viral hemorrhagic fever that afflicts the Langurs and Humans. Bhagwan Mahavir Wildlife Sanctuary and National Park however has had no known outbreaks of KFD in the past five years.

3.6.7 INTER-AGENCY PROGRAMMES AND RELATED ISSUES

The Wildlife Division (North Goa) collaborates with various research and educational institutes and NGOs in conducting various conservation related activities in the Protected Areas. Institutions of national importance such as WII, IISc and Goa University also have done considerable amount of work and their research publications too are of conservation value. CEE, WWF, AERO and various colleges too have contributed in the conservation efforts through research, education and extension activities.

The Goa Forest Department has an effective inter-departmental coordination in case of emergencies with Police, Fire, Revenue etc.

3.7 ECO- TOURISM

Bhagwan Mahavir Wildlife Sanctuary and National Park is famous within the circles of wildlife tourists and photography enthusiasts due to frequent sightings of Leopard, Gaur, Sambar, and Spotted Deer among other mammals. Though most wildlife enthusiasts visit the Wildlife Sanctuary and National Park for its rich avifauna, the park is well known throughout the country for the Dudhsagar Waterfalls. The volunteers from the surrounding villages have been trained in eco-tourism and ethics. The villagers are earning livelihoods by conducting such activities.

3.7.1 EXISTING ACCOMMODATION FACILITIES

At the range forest office complex in Mollem, there is a dormitory facility that caters to 10 people at full capacity. The Aranyak Camp Site is a unique ecotourism complex within the wildlife sanctuary, where 8 tents are pitched on a concrete hard surface catering to 24 people at full capacity.

Table No.2: Decadal occupancy (number of guests) of Dormitory and Aranyak campsite.

Sr.No	Year	Dormitory	Aranyak Campsite
1	2012-13	109	243
2	2013-14	129	200
3	2014-15	53	250
4	2015-16	22	198
5	2016-17	23	200
6	2017-18	51	220
7	2018-19	168	139
8	2019-20	17	240
9	2020-21	27	146
10	2021-22	14	50
11	2022-23	20	68

3.7.2 NATURE TRAILS

Three nature trails have been identified and marked in the Bhagwan Mahavir Wildlife Sanctuary and National Park. However, there are numerous nature trails existing for the purpose of eco-tourism activities existing in protected areas. Two trails originate near the Range Forest Office, Mollem while a Canopy Walkway is marked at Aranyak Camp Site.

Table No. 3: List of Nature Trails in Bhagwan Mahavir Wildlife Sanctuary and National Park

Trail	Name	Distance
1	Terminalia Trail	2.9km
2	Mhadamalli Trail	1.0km
3	Canopy Walkway	1.7km
4	Bolkarnem to TambdiSurla waterfall	2.9km
5	Nandran Nature Trail	4.0km
6	Dolbag to Waterfall	4.0km
7	Aranyak Campsite to Devils Canyon	2.0 km

Table No. 4: Footfall of tourists and revenue over ten years at Dudhsagar waterfalls

Year	Footfall	Revenue Generated (INR)
2013-14	2,10,829	60,24,385.00
2014-15	1,79,914	46,40,420.00
2015-16	2,49,346	56,89,805.00
2016-17	3,02,523	68,26,830.00
2017-18	2,97,122	1,49,95,115.00
2018-19	3,14,065	1,52,85,940.00
2019-20	2,96,330	1,42,77,830.00
2020-21	1,61,478	1,36,48,810.00
2021-22	2,02,464	1,91,47,359.00
2022-23	2,24,067	1,95,73,370.00
Total	24,38,138.00	12,01,09,864.00

3.7.3 DUDHSAGAR WATERFALL

Dudhsagar waterfall is open for visit from October to the end of May and remains closed during the monsoon season. The current practice followed is to allow registered taxi operators to ferry visitors from Collem (Kulem) village to the waterfalls covering 12 km. Each vehicle is allowed to carry seven adults per trip. The available records indicate that on an average around 96 daily trips were permitted in the year 2000 while the limit has gone up to 270 in 2024. Similarly, the number of registered vehicles permitted to operate in the circuit has seen an increase from 98 in 2000 to 431 in 2024.

Table No.5: Revenue and visitor details from trekking activities in Dudhsagar Circuit.

Year		Revenue Generated from vehicle entry collection (INR)
2013-14	13180	412315
2014-15	16702	565495
2015-16	NIL	NIL
2016-17	NIL	NIL
2017-18	3965	2,34,980
2018-19	6571	3,29,380
2019-20	10,192	5,08,090
2020-21	--	COVID
2021-22	10,000	11,90,320
2022-23	26000	26,28,480
Total	86610	5869060

3.7.4 NATURE EDUCATION CENTER

A Nature Interpretation/Education Centre at the Bhagwan Mahavir Wildlife Sanctuary and National Park is in the Range Forest Office Complex at Mollem. It facilitates information, education and sensitization of the tourists and visitors through Audio-Visual and interactive exhibits about nature and wildlife. At the entrance of the Protected Area, a Nature Information Centre has been set up to orient the visitors before they enter the forest. The education center needs more upgradation with additional interactive audio-video resources along with descriptive murals and displays to make it more purposeful and resourceful.

3.8 RESEARCH, MONITORING AND TRAINING

3.8.1 RESEARCH AND MONITORING

Bhagwan Mahavir Wildlife Sanctuary and National Park has been a choice location for researchers from India's top research and educational institutions. Scientists from Indian Institute of Science, Zoological Survey of India, Botanical Survey of India, and National Centre for Biological Sciences have carried out research on a varied range of subjects, while researchers from Goa University have also contributed immensely to research within this protected area.

Local NGO's have attempted to initiate long-term bird monitoring exercises within the Bhagwan Mahavir Wildlife Sanctuary and National Park in the past. However, the range staff do majority of the monitoring regularly. They monitor wildlife and habitat through direct sightings, movement, camera traps, conflicts, fire incidents, and other habitat related parameters.

3.8.2 TRAINING

Bhagwan Mahavir Wildlife Sanctuary and National Park regularly organizes training sessions for its staff on various aspects of wildlife management and deputes staff until the rank of Deputy Range Forest officer to the training college (School) at Valpoi. The senior Officers of the RFO rank attend refresher courses periodically in Wildlife Institute of India, Dehradun, and Central Academy for State Forest Service in Coimbatore. Further, capacity building camps and workshops are planned and organized regularly as per the requirement to adapt to new technological integration.

3.9 WILDLIFE CONSERVATION STRATEGIES AND EVALUATION

Within the annual work plan of Bhagwan Mahavir Wildlife Sanctuary and National Park, conservation objectives and strategies for the conservation of biodiversity are well represented. Strategies are adopted for habitat management, enrichment of flora, and creating conducive environment for fauna. The department in addition to state funds, receives various centrally sponsored funding through the Ministry of Environment, Forests and Climate Change.

3.9.1 EXISTING HABITAT MANAGEMENT PRACTICES

3.9.1.1 EXISTING ENRICHMENT PROGRAMMES

Plantation of fruit bearing species are carried out at 1000 seedlings per hectare area in plots varying from 1 ha size to 5 ha area. Plantation have been carried out at Mollem, Collem and Nandran. Grass plots have been maintained at Nandran and Caranzol each of size 2 ha. Availability of water for maintaining grass plots during late summer is a limiting factor. It is recommended that water availability to the two-grass plot must be made.

Table No: 6.1 Afforestation and plantation activities taken up in Bhagwan Mahavir Wildlife Sanctuary and National Park.

Year	Name of Work	Area (Ha)
2010-11	Fruit bearing plantation at Caranzol-I Beat of Caranzol Round	3
	Work of bamboo plantation at Surla-I Beat of Mollem Round	1
2011-12	Fruit bearing plantation at Surla-I Beat of Mollem Round	3
	Fruit bearing plantation at Nandran Beat of Mollem Round	3
	Fruit bearing plantation at Maida of Collem Round	2
2012-13	Plantation of fruit bearing at Bottar of Surla-I Beat of Mollem Round	
2013-14	Fruit bearing plantation at Khaskond of Mollem Round	2.5
	Fruit bearing plantation at Collem-I Beat of Collem Round	2.5
2016-17	Canes and Bamboo Plantation at Surla-I Beat of Mollem Round	3
2017-18	Raising of new canes and Bamboo plantation at Karemol of Surla-II Beat of Mollem Round	3
2018-2019	Raising of bamboo plantation at Nandran Beat of Mollem Round	1
	Fruit bearing Plantation at Bottar in Surla-I Beat of Mollem Round	5
	Raising of bamboo plantation at Nandran Beat of Mollem Round	1
2019-2020	Plantation of fruit bearing trees at surla-I beat of mollem round	4
	Plantation of fruit bearing trees at Kalay beat of Kalay round	2
	Plantation of fruit bearing trees at Kalay beat of Kalay round	4
	Plantation of fruit bearing trees at Aranyak campsite of Collem round	4
	Plantation of fruit bearing trees at Caranzol-I Beat of Caranzol round	4
2021-22	Plantation of fruit bearing trees at Mollem	2.5
	Plantation of fruit bearing trees at collem	2.5
2022-23	Fruit bearing plantation at Shigao Beat Kalay Round	5
	Fruit bearing plantation at nandran beat Mollem Round	5
Total		63

Table No.6.2 Grass plot development activities taken up in Bhagwan Mahavir Wildlife Sanctuary and National Park.

Year	Work Conducted	Area (Ha)
2013-14	Development & restoration of grass plot at Nandranmol	1
	Development & restoration of grass plot at Nandran	2
2014-15	Development & restoration of grass plot at Nandranmol	1
	Development & restoration of grass plot at Nandran	2
2017-18	Development & restoration of grass plot at Nandranmol	0.5
	Development & restoration of grass plot near vasant bandara at Nandran beat	0.5
	Development & restoration of grass plot at Dongurlim in Kalay Round	1
	Development & restoration of grass plot at Nandran Beat Mollem Round	1
	Development & restoration of grass plot near vasant bandara at Nandran beat	1
	Development & restoration of grass plot at Dongurlim in Kalay Round	1
2018-19	Development and restoration of grass plot at nandranmol of mollem round	1
	Development and restoration of grass plot at nandran of mollem round	1
2019-20	Development and restoration of grass plot at nandranmol of mollem round	1.5
	Development and restoration of grass plot at Collem round	1
	Development and restoration of grass plot at nandran of mollem round	1
	Development & restoration of grass plot at Dongurlim beat of Kalay Round	1
	Development & restoration of grass plot at Dongurlim beat of Kalay Round	1
2020-21	Development & restoration of grass plot at Aranyak campsite	1
	Development & restoration of grass plot at Dongurlim beat of Kalay Round	1
	Development & restoration of grass plot at Dolbag of caranzol Round	
	Development & restoration of grass plot at Nandranmol of Mollem Round	1.5
	Development & restoration of grass plot at Nandran of Mollem Round	1
2021-22	Development and restoration of grass plot at Nandran Beat of Mollem Round	1
	Development and restoration of grass plot at Nandranmol Beat of Mollem Round	1.5
	Development and restoration of grass plot at Caranzol Round	0.5
	Development and restoration of grass plot at Collem Round	1
	Development and restoration of grass plot at Dongurlim Beat of Kalay Round	1
	Development and restoration of grass plot at Dongurlim Beat of Kalay Round	1
2022-23	Development & restoration of grass plot at Dongurlim Beat	1
	Development & restoration of grass plot at Nandran Beat	1
	Development & restoration of grass plot at nandranmol Nandran Beat	1.5
	Development & restoration of grass plot at Dongurlim Beat	1

3.9.1.2 FOREST PROTECTION

For protection and regular monitoring, a series of check gates, patrolling stations and watch towers have been established. There are eight patrolling stations, ten check post gates and nine watchtowers (Table 7.1 – 7.3). Except few minor incidences of poaching cases, no major incidences have been reported from the Protected Area.

Table 7.1. List of Patrolling Stations in Bhagwan Mahavir Wildlife Sanctuary and National Park.

S.No	Site of Patrolling Station	Geo Location
1	Anmod	(74.266 E 15.417 N)
2	Aranyak	(74.254 E 15.341 N)
3	Bolkernem	(74.195 E 15.431 N)
4	Caranzol – Dolbag	(74.242 E 15.334 N)
5	Collem	(74.184 E 15.291 N)
6	Kalay	(74.228 E 15.377 N)
7	Mollem	(74.241 E 15.388 N)
8	Nandran	(74.236 E 15.389 N)

Table 7.2. List of Check Post Gates in Bhagwan Mahavir Wildlife Sanctuary and National Park

S.No	Site	Geo Location
1	Aranyak	(74.254 E 15.341 N)
2	Bhagwan Mahavir Dwar	(74.236 E 15.389 N)
3	Bolkernem	(74.195 E 15.432 N)
4	Collem	(74.248 E 15.339 N)
5	Dongurlim	(74.208 E 15.287 N)
6	Kaskond	(74.237 E 15.395 N)
7	Madhalwada	(74.196 E 15.420 N)
8	Maida	(74.247 E 15.329 N)
9	Mollem	(74.216 E 15.384 N)
10	Nandran	(74.238 E 15.393 N)

Table 7.3. List of Watchtowers in Bhagwan Mahavir Wildlife Sanctuary and National Park

S.No	Site	Geo Location
1	Nandran	(74.244 E 15.390 N)
2	Awademol	(74.245 E 15.400 N)
3	Sunset Point	(74.268 E 15.396 N)
4	Dudhsagar	(74.312 E 15.309 N)

5	Dolbag	(74.267 E 15.345 N)
6	Aranyak	(74.253 E 15.342 N)
7	Bolkarnem	(74.196 E 15.438 N)
8	Kaskond	(74.213 E 15.404 N)
9	Kegdi	(74.258 E 15.355 N)

3.9.1.3 WATER RECHARGE AND SOIL MOISTURE CONSERVATION

Recharge and rejuvenation activities for natural water bodies have been undertaken through construction of check dams, restoration of natural water bodies within the Bhagwan Mahavir Wildlife Sanctuary and National Park, digging of trenches and sink pits. Trenches and sink pits have been established along the contours, at cross sections to the elevation gradient. These efforts have been taken up to ensure that sufficient ground water is available for the natural water bodies and artificially created water holes, especially during summer. To conserve water and promote percolation into ground aquifers, a series of check dams have been constructed at suitable locations within the massive stream network in Bhagwan Mahavir Wildlife Sanctuary and National Park. Check dams have a length of 20-25 meters and height 3-4 meters. Currently four check dam series have been constructed within Bhagwan Mahavir Wildlife Sanctuary and National Park using local natural material and basalt boulders.

Table No.8: List of Check dams in Bhagwan Mahavir Wildlife Sanctuary and National Park

Work Conducted	Year
Construction of dry-stone loose boulder check dam at Nandran Beat of Mollem Round 03 nos	2014-15
Construction of dry-stone loose boulder check dam at Nandran Beat of Mollem Round khaskond 02 nos	
Construction of dry-stone loose boulder check dam at Nandran Beat of Mollem Round 02 nos	
Construction of dry-stone loose boulder check dam at Nandran Beat of Mollem Round 02 nos	2018-19
Construction of dry-stone loose boulder check dam at Surla-I Beat of Mollem Round 02 nos	

Construction of dry-stone loose boulder check dam at Collem-I Beat of Collem Round 02 nos	
Construction of dry-stone loose boulder check dam at Caranzol-I Beat of Caranzol Round 02 nos	
Construction of dry-stone loose boulder check dam at Dongurlim Beat of Kalay Round 02 nos	
Construction of dry-stone loose boulder check dam at Pokermol Beat of Kalay Round 02 nos	
Construction of dry-stone loose boulder check dam at Shigao Beat of Kalay Round 02 nos	
Construction of dry-stone loose boulder check dam at Dongurlim Beat of Kalay Round 02 nos	
Construction of dry-stone loose boulder check dam at Collem-II Beat of Collem Round 02 nos	
Construction of dry-stone loose boulder check dam at Collem Round 04 nos	2019-20
Construction of dry-stone loose boulder check dam at Caranzol Round 04 nos	
Construction of dry-stone loose boulder check dam at Nandran Beat of Mollem 04 nos	
Construction of dry-stone loose boulder check dam at Dongurlim Beat Kalay Round 04 nos	
Construction of dry-stone loose boulder check dam at Shigao Beat Kalay Round 04 nos	
Construction of dry-stone loose boulder check dam is NIL	2020-21
Construction of dry-stone loose boulder check dam NIL	2021-22
Construction of dry-stone loose boulder check dam NIL	2022-23

3.9.1.4 REJUVENATION OF NATURAL WATER BODIES

Bhagwan Mahavir Wildlife Sanctuary and National Park is located within the monsoon climatic zone based on the Koppen Classification. This leads to the area receiving a high quantum of rainfall, in a very short duration of four months. This is complimented by the undulating topography causing excessive run off. Hence, during summers, there is a shortage of water. To mitigate this, a revival of natural waterbodies is regularly carried out through desilting activities and clearing of all streams leading to such waterbodies.

Table No.9 List of water augmentation activity taken up in Bhagwan Mahavir Wildlife Sanctuary and National Park.

Works Conducted	Year
De-silting of waterhole at Nandran Beat Mollem Round	2014-15
De-silting of waterhole at Caranzol Round	2018-19
De-silting of waterhole at Anmod nandran	
De-silting of waterhole at Khaskond mollem	
De-silting of waterhole at Nandran kekdi	
De-silting of waterhole at Karemol kalay round	
De-silting of waterhole at Dongurlim kalay round	
De-silting of waterhole at Dongurlim beat of kalay round 7x6	2019-20
De-silting of waterhole at Dongurlim beat of kalay round 6x6	
De-silting of waterhole at Shigao beat of kalay round 6x6	
De-silting of waterhole at Karemol beat of kalay round	
De-silting of waterhole at Oxel beat of kalay round	
De-silting of waterhole at Mollem, Kalay, Caranzol and Kalay	2020-21
Work of desilting & maintenance of natural waterholes at Bhoma beat of Kalay round	2021-22
Work of desilting & maintenance of natural waterholes at Karemol beat of Kalay round	
Work of desilting & maintenance of natural waterholes at Dongurlim beat of Kalay round	
Work of desilting & maintenance of natural waterholes at Surla-II Beat of Mollem round	
Work of desilting & maintenance of natural waterholes at collem-I Beat of collem round	
Work of desilting & maintenance of natural waterholes at Shigao beat of kalay round	
Desilting & maintenance of Waterhole at Oxel Beat	2022-23
Desilting & maintenance of Waterhole at Caranzol-I Beat	
Desilting & maintenance of Waterhole at Nandran Beat	
Desilting & maintenance of Waterhole at Collem-I Beat	
Desilting & maintenance of Waterhole at Khaskond Mollem Beat	
Desilting & maintenance of Waterhole at Surla-II Beat	
Maintenance of forest boundary by clearance at Dongurlim Beat	
Desilting & maintenance of Waterhole at Surla-I Beat	
Desilting & maintenance of Waterhole at Bhoma Beat	
Desilting & maintenance of Waterhole at Dongurlim Beat	
Desilting & maintenance of Waterhole at Shigao Beat	

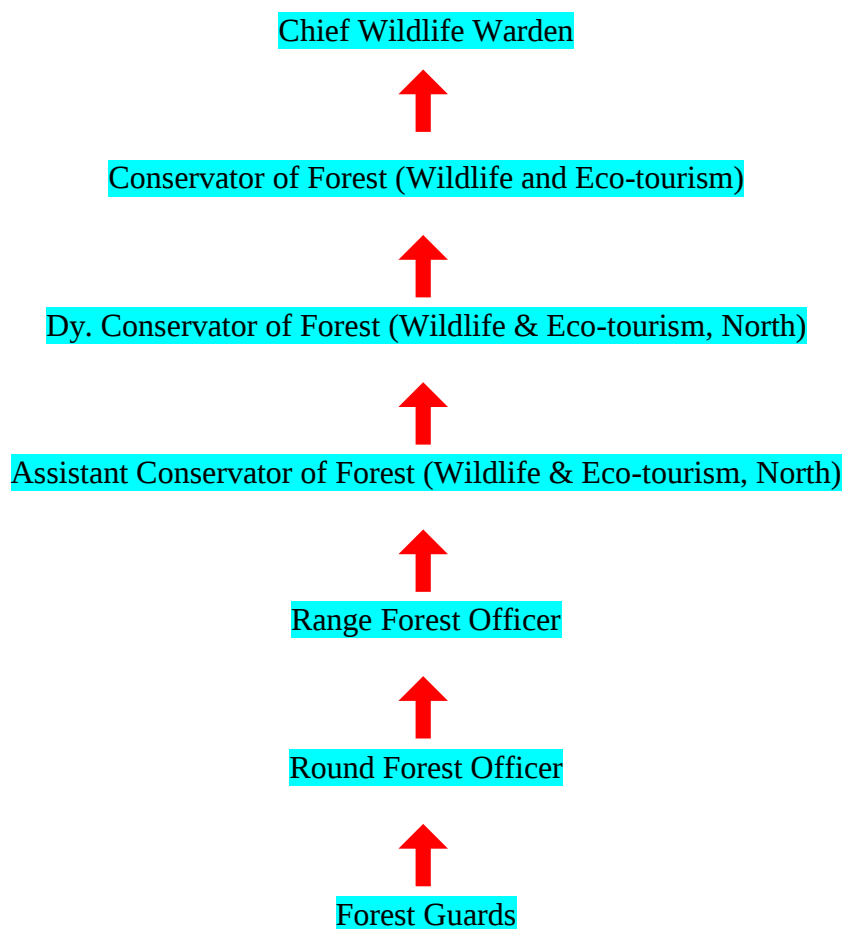
3.9.2 EXISTING NUTRITIONAL REQUIREMENT PRACTICES (FOOD AND WATER)

As a strategy to improve the quality of available food and fodder plants within the Bhagwan Mahavir Wildlife Sanctuary and National Park, fruit bearing trees have been planted as part of the enrichment plantation programme. To ensure that animals avoid straying outside the protected area boundaries, natural and artificial water ponds have been constructed. To enhance bone and muscle growth of ungulates, artificial salt licks are also deployed at specific sites to provide essential elements.

3.10 ADMINISTRATIVE SETUP

The Protected Area is under the overall administrative control of CWLW, Goa. CF (WL&ET) is at the supervisory level. The Wildlife Division (North) is headed by the Deputy Conservator of Forests, who looks after the overall management of this Protected Areas. The Range Forest Officer, Mollem is in-charge of the management of Bhagwan Mahavir National Park and Wildlife Sanctuary. There are three Rounds i.e. Mollem, Collem and Kalay supervised by Round Forester under whom the Forest Guards, manage 15 beats in the National Park and Wildlife Sanctuary.

Fig. 3.1. Administrative setup of Bhagwan Mahavir Wildlife Sanctuary and National Park



3.10.1. STAFF

Bhagwan Mahavir Wildlife Sanctuary and National Park has a total of 89 staff under the leadership of the Range Forest Officer. All personnel are assigned specific duties based on the cadre.

Table 10. Details of Existing staff strength at Bhagwan Mahavir Wildlife Sanctuary and National Park.

Sr. No	Cadre	Present man power Strength deployed	Remarks
01	Range Forest Officer	01	
02	Dy. Range Forest Officer	01	
03	Round forester	06	
04	Forest guards	13	
05	Regular laborers	06	
06	Temporary status labor	22	Seasonal works.
07	Daily Wage Laboures (DWL)	40	

3.10.2 EXISTING INFRASTRUCTURE

The Range Office complex is in Nandran beat at the main entrance of Bhagwan Mahavir Wildlife Sanctuary and National Park and houses the Range Office, nature education centre, parking shed, patrolling station, staff quarters and a dormitory for visitors to stay. The Range Office, houses the administrative block with office and a mini library. Besides this, there are eight patrolling stations.

3.10.3 EXISTING AMENITIES FOR THE STAFF

For accommodation of staff, quarters are constructed in the Range Forest office complex at Mollem. These includes two units for RFO and Dy. RFO and four units for forest guards. All quarters need renovation works. Clean and hygienic drinking water is made available to the staff at the official premises, however the water tank storing water for supply in the range forest office complex needs to be renovated.

3.10.4 MOBILITY

For execution of wildlife protection works, various categories of vehicles depending on their utilities that have been made available. These include truck, camper, pickup truck, and two-wheelers for patrolling.

Table No.11. Details of vehicles in Bhagwan Mahavir Wildlife Sanctuary and National Park

Sr. No	Vehicle Type 4 wheelers	Year of Purchase	Vehicle No.
1	TATA SFC 709 Truck	2007	GA-01-G-2021
2	Mahindra Bolero Camper	2009	GA-07-G-0062
3	Mahindra Bolero Pickup tanker	2022	GA-07-G-1964
4	Mahindra Bolero Camper 4x4	2020	GA-07-G-1729
5	Mahindra Bolero	2022	GA-07-G-1984

Sr. No	Vehicle Type 2 wheelers	Year of Purchase	Vehicle no.
1	Hero Honda Splendor	2016	GA-07-G-0030
2	Hero Honda Passion	2010	GA-07-G-0275
3	Hero Honda Passion	2010	GA-07-G-0276
4	Hero Splendor	2014	GA-07-G-1071
5	Honda SP 125	2020	GA-07-G-1755
6	Honda SP 125	2020	GA-07-G-1756
7	Honda SP 125	2020	GA-07-G-1757

Terrain of the Protected Areas being undulated and in view of torrential rains during the monsoon season it is suggested to engage 4*4 vehicles.

3.11 COMMUNICATION

Bhagwan Mahavir Wildlife Sanctuary and National Park has moderate to poor cellular Network connectivity. There is a need to enhance the connectivity for effective protection of the area especially if the administrative system needs to be digitalized for management and monitoring of its activities.

The Department has covered many areas of PA under wireless network system and efforts are further on to enhance and to cover entire PA for better effective & efficient communication network system.

3.11.1 PATROLLING ROUTES

Regular patrolling is being done by the forest staff and other officials for which six strategically suitable jeepable tracks and many footpaths are being maintained.

3.11.2 WIRELESS NETWORK

Table No. 12 Details of wireless equipment in Bhagwan Mahavir Wildlife Sanctuary and National Park.

Details of wireless sets in Mollem Wildlife Range		
Mobile handsets (with Charger- Tray)	Mobile Stations (with microphones)	Base Stations (with microphones)
20 Nos.	02 Nos. in vehicle	06 Nos at Range office, Aranyak Campsite, Maida Patrolling station, Bolkarnem Patrolling station, Nandran Patrolling Station and Kalay patrolling station.

3.12 SUMMARY OF THREATS TO WILDLIFE

The possible threats to wildlife observed at Bhagwan Mahavir Wildlife Sanctuary and National Park are collisions of fauna with vehicles on NH 748, collision of fauna with railways on the Kulem – Castlerock stretch passing through the National Park, collision of arboreal fauna with 220kV high tension wire, invasive species, human-wildlife encounters, forest fires, and potential encroachments.

3.12.1 VEHICLE MOVEMENT ON NH 748 & THREAT TO WILDLIFE

The NH 748 stretch from Mollem check post in Goa to Anmod check post in Karnataka passes through the Bhagwan Mahavir Wildlife Sanctuary and National Park. This highway is one of the most important roads connecting Goa to Karnataka. As a result, there is heavy traffic on this road irrespective of the time of the year. Since there is no check on the speed despite speed limit warnings and signs along the highway, several animals, especially slow-moving animals that attempt to cross the road collide with these fast-moving vehicles and most of the times succumb to injuries received.

3.12.2 ISSUES CONCERNING RAILWAY LINES

The railway line from Kulem railway station to Castlerock station, passes through the Bhagwan Mahavir Wildlife Sanctuary and National Park. While there is a speed limit that is applied to trains that ply on this route, there have been cases of animals colliding with railway engines.

3.12.3 COLLISION OF ARBOREAL FAUNA WITH 220kV HIGH TENSION WIRE

The 220kv high tension power transmission line passes through the Bhagwan Mahavir Wildlife Sanctuary and National Park almost along the NH 748. Since there are no mitigation structures in place along the transmission line path, it possesses a threat to all arboreal fauna in the vicinity.

3.12.4 INVASIVE SPECIES

The Bhagwan Mahavir Wildlife Sanctuary and National Park has several areas with disrupted canopy cover, especially along the NH 748, the railway line and the 220kv high tension power transmission line. This has given a conducive atmosphere for invasive plant species like *Chromolaena odorata*, these plants are known to outcompete native flora and are detrimental to wildlife. Recent studies have also documented large populations of the most invasive and disruptive ant to ecosystems – *Anoplolepis gracilepis*. Periodical weeding of invasive species has been carried out by the department in the past and details of the weeding process has been listed for the past decade.

Table No.13: Details of Invasive Species Weeding Works Conducted in Last 10 Years

Sr. No.	Name of the work	Area	Year
1.	Eradication of eupatorium and converting into compost by burying at Caranzol Beat	10 Ha	2013-14
2.	Eradication of eupatorium and converting into compost by burying at Mollem Beat	10 Ha	2014-15
3.	Eradication of eupatorium and converting into compost by burying at Collem-II Beat	10 Ha	
4.	Eradication of eupatorium and converting into compost by burying at Nandran Beat	10 Ha	
5.	Eradication of eupatorium and converting into compost by burying at Surla-II Beat	10 Ha	
6.	Eradication of eupatorium and converting into compost by burying at Surla-I Beat (Bottar)	10 Ha	
7.	Eradication of eupatorium and converting into compost by burying at Caranzol Beat	10 Ha	
8.	Eradication of eupatorium and converting into compost by burying at nandran of mollem round	05 Ha	2015-16
9.	Eradication of eupatorium and converting into compost by burying at Surla-II Beat of mollem round	05 Ha	
10.	Eradication of eupatorium and converting into compost by burying at mollem Beat of mollem round	05 Ha	
11.	Eradication of eupatorium and converting into compost by burying at sonauli north Beat of	05 Ha	

	caranzol round		
12.	Eradication of eupatorium and converting into compost by burying at nandran of mollem round	10 Ha	2017-2018
13.	Eradication of eupatorium and converting into compost by burying at nandran of mollem round	10 Ha	
14.	Eradication of eupatorium and converting into compost by burying at Khaskond of mollem round	10 Ha	
15.	Eradication of eupatorium and converting into compost by burying at Khaskond beat of Mollem Round	10 Ha	
16.	Eradication of eupatorium and converting into compost by burying at Nandran Mollem round	10 Ha	
17.	Eradication of eupatorium and converting into compost by burying at Nandran Mollem round	10 Ha	
18.	Eradication of eupatorium and converting into compost by burying at Surla-I Mollem round	05 Ha	
19.	Eradication of eupatorium and converting into compost by burying at Surla-I Mollem round	10 Ha	
20.	Eradication of eupatorium and converting into compost by burying at Surla-II Mollem round	10 Ha	
21.	Eradication of eupatorium and converting into compost by burying at Shigao of Kalay round	05 Ha	
22.	Eradication of eupatorium and converting into compost by burying at Collem round	05 Ha	
23.	Eradication of eupatorium and converting into compost by burying at Collem round	10 Ha	
24.	Eradication of eupatorium and converting into compost by burying at Caranzol round	10 Ha	
25.	Eradication of eupatorium and converting into compost by burying at Kalay round	08 Ha	2018-2019
26.	Eradication of eupatorium and converting into compost by burying at mollem round	05 Ha	
27.	Eradication of eupatorium and converting into compost by burying at Collem round	04 Ha	
28.	Eradication of eupatorium and converting into compost by burying at Sonaulim of Caranzol round	10 Ha	
29.	Eradication of eupatorium and converting into compost by burying at Dongurlim kalay round	08ha	2019-2020
30.	Eradication of eupatorium and converting into compost by burying at kalay round	02 ha	
31.	Eradication of eupatorium and converting into compost by burying at Dongurlim kalay round	03 ha	

32.	Eradication of eupatorium and converting into compost by burying at Sonaulim of Caranzol round	05 Ha	2020-2021
33.	Eradication of eupatorium and converting into compost by burying at mollem round	05 Ha	
34.	Eradication of eupatorium and converting into compost by burying at Collem round	1.50 Ha	
35.	Eradication of eupatorium & converting into compost by burying at Collem Round-CSS	10 Ha	
36.	Eradication of eupatorium & converting into compost by burying at Kalay Round-CSS	10 Ha	
37.	Eradication of eupatorium & converting into compost by burying at Caranzol Round	10Ha	
38.	Eradication of eupatorium & converting into compost by burying at Mollem Round-CSS	10 Ha	
39.	Eradication of eupatorium & converting into compost by burying at Mollem Round-	20 Ha	2021-2022
40.	Work of eradication of eupatorium and converting them into compost by burying in 10 Ha in Collem-II Beat of Collem Round	10 ha	
41.	Work of eradication of eupatorium and converting them into compost by burying in 10 Ha of Caranzol Round	10 ha	
42.	Work of eradication of eupatorium and converting them into compost by burying in 10 Ha of Kalay Round	10 ha	
43.	Work of eradication of eupatorium and converting them into compost by burying in 10 Ha of Kalay Round	10 ha	
44.	Work of eradication of eupatorium and converting them into compost by burying in 10 Ha of Mollem Round	10 ha	
45.	Eradication of Eupatorium & converting into compost by Burying at nandran beat Mollem Round	10 Ha	2022-2023
46.	Eradication of Eupatorium & converting into compost by Burying at shigao beat Kalay Round	03 Ha	
47.	Eradication of Eupatorium & converting into compost by Burying at caranzol-01 beat Caranzol Round	10 Ha	
48.	Eradication of Eupatorium & converting into compost by Burying at dongurlim beat Kalay Round	10 Ha	
49.	Eradication of Eupatorium & converting into compost by Burying at collem-II beat Collem Round	10 Ha	

3.12.5 HUMAN WILDLIFE CONFLICT

Species such as Leopard (*Panthera pardus*), Gaur (*Bos gaurus*), and Wild Boar (*Sus scrofa*) often venture outside Bhagwan Mahavir Wildlife Sanctuary and National Park and are encountered by humans in the villages fringing the protected area. Leopards sometimes prey on smaller livestock and domestic dogs, while other fauna that cause conflict are predominantly herbivores, and generally cause economic losses by crop raiding. However, the probability of threat to life increases if these animals are accidentally encountered at close quarters and the animals feel threatened. To address injuries due to wildlife encounters or economic losses incurred by local communities due to loss of their livestock and agricultural produce, (as per Gazette Notification 7-5-2005/FOR/104, OFFICIAL GAZETTE - GOVT. OF GOA SERIES I No. 25, 29th April, 2020 (Refer **Annexure VIII**); for the purpose of assessment of the loss/damage caused to the livestock/other property such as house, huts, livestock sheds etc.,) a damage assessment committee verifies such claims and assess the damages caused by the Wild Animals to initiate compensation. Occasionally, due to non-availability of food especially during the summer season, the wildlife stray into the private fields and plantation areas. The department periodically conducts awareness activities on the animal behaviours among the locals and general public.

3.12.6 THREAT DUE TO ENCROACHMENT

The boundaries of Bhagwan Mahavir Wildlife Sanctuary and National Park have not been demarcated clearly in many parts. This exercise is especially important on the outskirts of the protected area since in these regions there can be no regulation of activities. The region of Kalem, Sigao, Colem, Cormonem, Bolkornem and Tambdi Surla are vulnerable to encroachments.

CHAPTER 4

THE PROTECTED AREA AND THE INTERFACE LANDUSE SITUATION

Bhagwan Mahavir Wildlife Sanctuary and National Park is comprised of fifteen revenue villages (Partially in a sanctuary area). Of these, human settlements are situated in Sigao, Karemol, Dongurli, Sonaulim North, Calem, Collem 1 and Nandran beat. The Eco-sensitive Zone is subjected to human induced perturbations due to topography, and diversity of ecosystems. Beyond the western boundary, the landscape is characterized by dense human settlements, plantations mainly cashew and areca, and agricultural fields.

4.1 THE EXISTING SITUATION OF THREATS IN THE ZONE OF INFLUENCE

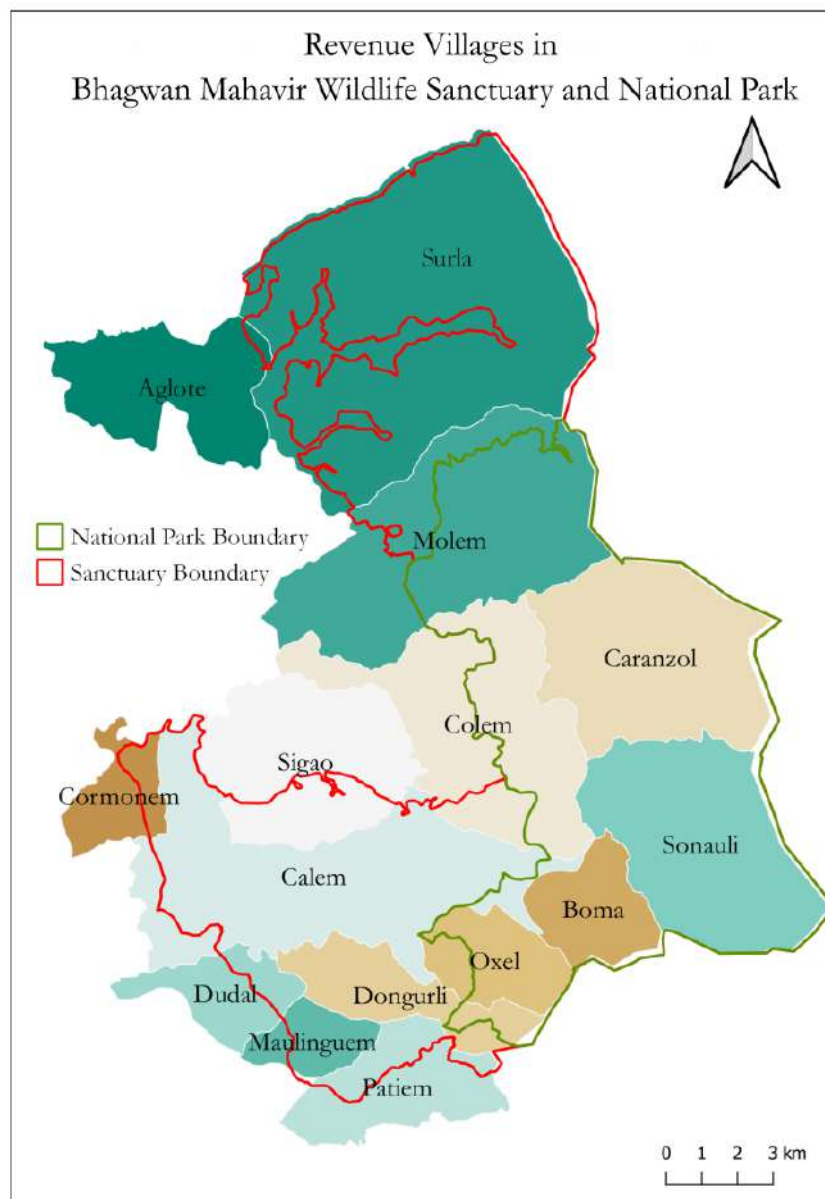
There are 15 revenue villages that are partly or completely within Bhagwan Mahavir Wildlife Sanctuary and National Park.

Table No.14 Existing distribution of Revenue villages in Protected Areas.

Protected Areas	Villages completely within PA	Villages partially in PA
National Park	Caranzol, Boma and Sonaulim	Mollem, Collem, Calem, Oxel and Dongurli
Wildlife Sanctuary: North Part	Surla	Aglote and Mollem
Wildlife Sanctuary: South Part	NA	Sigao, Cormonem, Calem, Dudal, Dongurli (part in NP), Oxel (Part in NP), Maulinguem and Patiem

4.1.1 SETTLEMENT ZONES

The settlement of rights in the Bhagwan Mahavir Wildlife Sanctuary is yet to be finalized and final notification to be issued. Once the final notification is issued, internal beat boundaries will be redrawn to match administrative and management needs of the protected area. Human settlements within Bhagwan Mahavir Wildlife Sanctuary and National Park are situated in Sigao, Karemol, Dongurli, Sonaulim North, Calem, Collem 1 and Nandran beat.



Map 4.1. Revenue village distribution in and around Bhagwan Mahavir Wildlife Sanctuary and National Park.

4.2 DEVELOPMENT PROGRAMMES AND CONSERVATION ISSUES

Management of PA warrants judicious balance between conservation and development. The zone of influence poses various challenges for management interventions.

4.2.1 DEVELOPMENT PROGRAMMES

Human settlements in Sonaulim North and Collem 1 beat do not have permanent access routes, while the settlements in Sigao, Karemol, Calem and Dongurli have tarred roads passing through the protected area boundary. Since these routes forms traditional access of the communities to their land, it becomes difficult to strictly enforce the law. Since the communities living within the protected area must conform to The Wildlife Protection Act, 1972, it curbs certain kinds of development in terms of civic amenities such as roads, water supply, electricity etc. It is desirable that the rights settlements process within Bhagwan Mahavir Wildlife Sanctuary and National Park ought to be completed at the earliest consequently feasible and appropriate action for voluntary resettlement & rehabilitation of the eligible human habitations may be taken with the approval of the Government.

Meanwhile, the efforts of the Department to rehabilitate & resettle the human habitation within PA area is to be hastened. Settlement of people from the Nandran area has been carried out successfully.

4.2.2 CONSERVATION ISSUES & CHALLENGES

Currently, the major impediment in implementation of wildlife conservation activities in Bhagwan Mahavir Wildlife Sanctuary and National Park, is the need to increase the level of trust with local populace living in close vicinity of the protected area, including in the eco-sensitive zone. This is being addressed by the following measures:

A) Prioritising seasonal employment of fire watchers, intelligence gatherers for wildlife crime deterrence and daily Wage labour under different Government schemes from the members of the communities living near the protected area to make them feel connected with the department.

B) Training youth from local communities to impart soft skills to work as wildlife guides, trekking guides and tribal artisans.

C) Communicate conservation issues the local communities through Gramsabhas, workshops and outreach programs in local schools.

Other than these issues, various conservation activities are being undertaken for the protection of biodiversity, control of soil erosion and water recharge. The conservation efforts that have been taken up in the past, needs to be continuous, having clear achievable goals and vision. The management plan prescribed in the subsequent chapters, defines the objectives and methods of implementation to achieve the objectives.

Beat Specific information:

1. Surla 1

Surla-1 Beat is majorly located within Surla village's administrative boundary with a little protrusion into Aglote village at the western end and has an area of 35.20km². It shares its borders with Surla-2 beat. The western side of the beat is flanked by the village of Aglote, Madei Wildlife Sanctuary in the north, and Karnataka in the east (Fig. 1). Elevation in this beat, ranges from 59.67m to 887.31m with the higher slopes towards the northern side (Fig. 2). Of the total area, 97.48% is under tree cover, while the rest 2.51 % comprises of open plateaus, and agricultural fields (Table.15.1; Fig. 3). The beat falls under the Ragda watershed zone. The Tambdi Surla stream and several other streams arises from this beat which further joins the Ragda River (Fig. 4). The Bolkernem patrolling station is located along with a check gate at the western end of the beat. A tarred road goes through the beat at several locations towards the Tambdi Surla Mahadev Temple, while there are several smaller diversions along the road leading to smaller hamlets. The locally important Talde waterfall is in this beat and

is accessed from the Talde village.

Table No.15.1: Percentage habitat coverage by area in Surla-1 Beat

Habitat	Percentage Area
Wet Evergreen Forest	64.80
Moist Deciduous Forest	22.12
Semi Evergreen Forest	10.55
Plateau/Grassland	1.8
Agriculture Fields (Active/Fallow)	0.7
Fresh Water	0.01

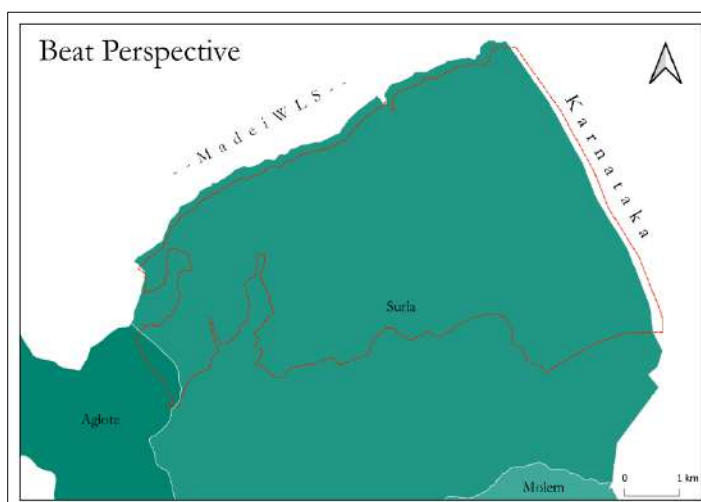


Fig. 1

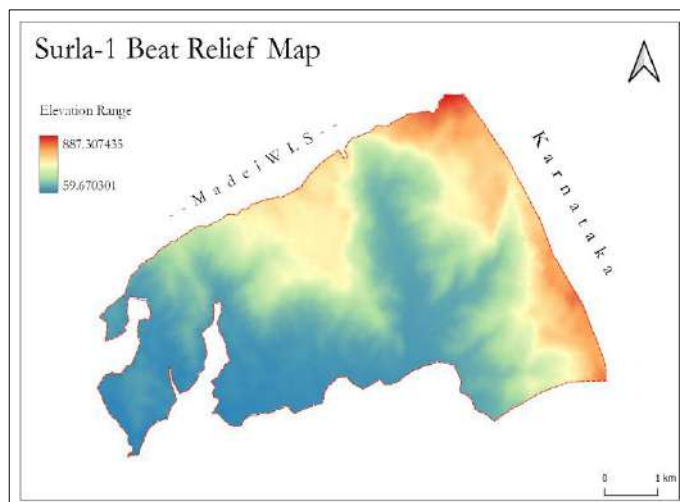


Fig. 2

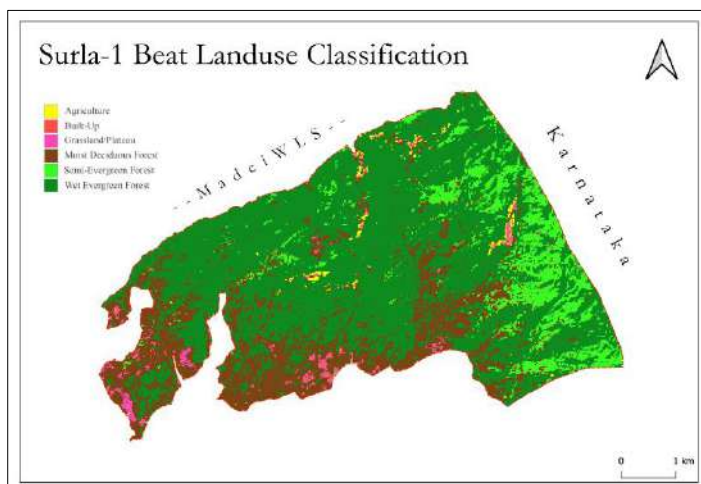


Fig. 3

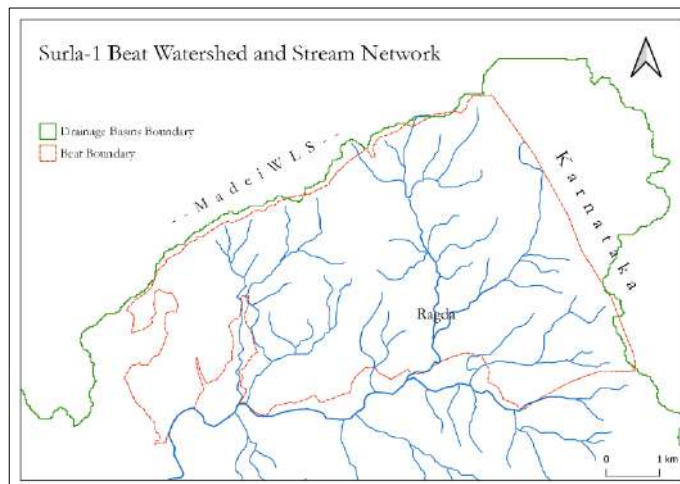


Fig. 4

2. Surla 2

Surla-2 Beat is located within Surla village's administrative boundary and has an area of 23.33 km² (Fig. 5). It shares its borders with Surla-21 and Molem beats. Elevation in this beat, ranges from 58.99 m to 739.30 m with the higher slopes towards the eastern side of the beat (Fig. 6). Of the total area, 98.53% is under tree cover, while the rest 1.46 % comprises of open plateaus and grassy slopes (Table.15.2; Fig. 7). The beat falls majorly under Ragada watershed. Several important primary and secondary streams arise from this beat which further joins the Ragada River (Fig. 8). This beat has two check dams built for water conservation and two waterholes for storing drinking water for animals.

Table No.15.2: Percentage habitat coverage by area in Surla-2 Beat.

Habitat	Percentage Area
Wet Evergreen Forest	27.98201
Moist Deciduous Forest	51.78184
Semi Evergreen Forest	18.76891
Plateau/Grassland	1.46
Agriculture Fields (Active/Fallow)	NIL

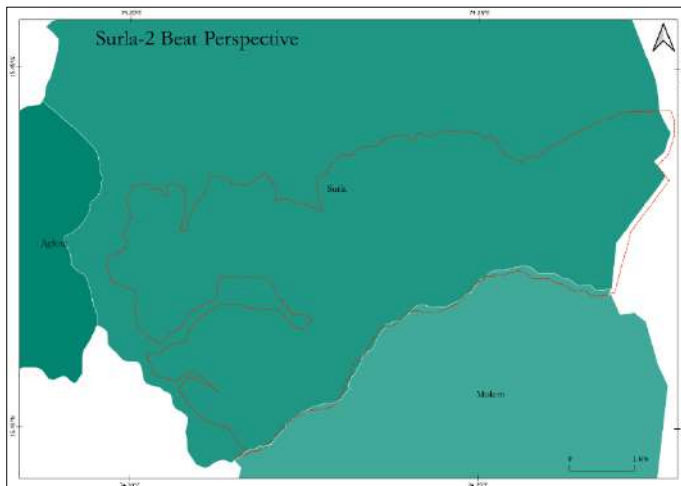


Fig. 5

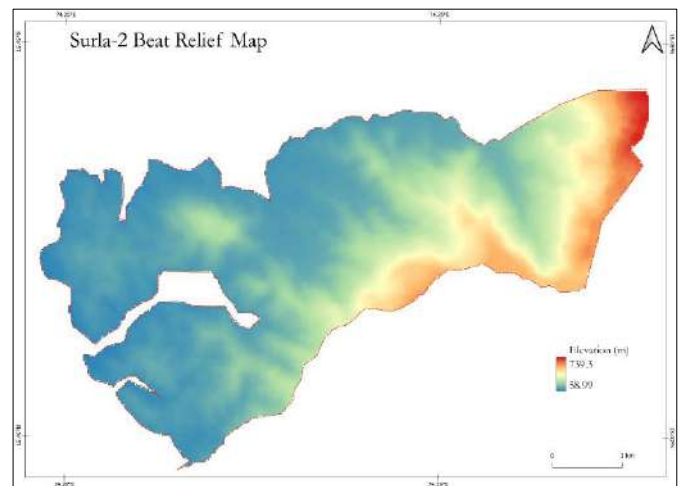


Fig. 6

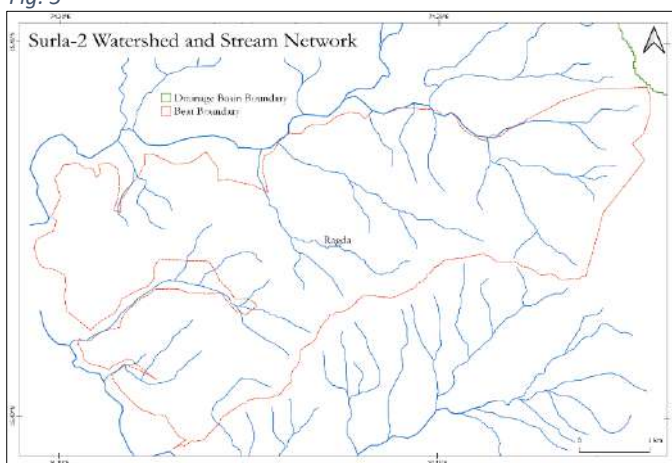


Fig. 7

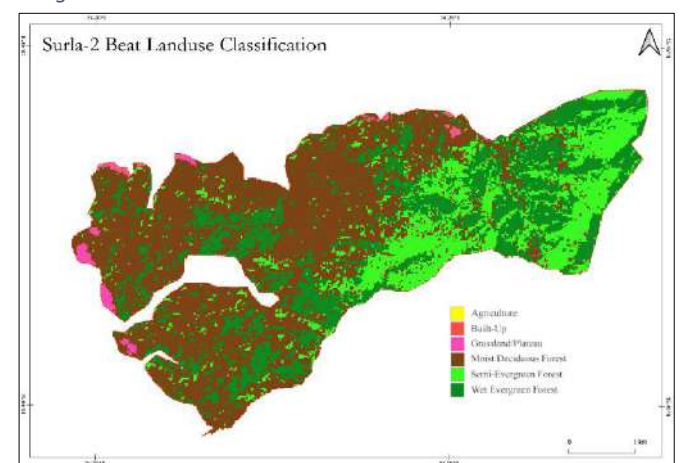


Fig. 8

3. Mollem

Mollem Beat is majorly located within Molem village's administrative boundary and has an area of 6.37km² (Fig. 9). It shares its borders with Nandran and Surla-2 beats. Elevation in this beat, ranges from 66.73m to 607.39m with the higher slopes towards the northern side (Fig. 10). Of the total area, 96.99% is under tree cover, while the rest 3.01 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.3; Fig. 11). The beat falls majorly under the Ragda watershed zone. Several important primary and secondary streams arise from this beat which further joins the Ragda River (Fig. 12). The National Highway 748 from Belgaum in Karnataka to Panaji, Goa's capital city passes through the entire southern boundary of the beat, effectively dividing the Molem and Nandran Beat and runs for 13km. There is a forest check post manned by the territorial division at Molem while the terminal check post at Goa-Karnataka border is managed by the wildlife division. There are three waterholes built for provisioning drinking water for animals in this beat and the trail from

Molem, through Kaskond all the way to Surla-2 beat's northern boundary passes through Molem beat and is manned by another check gate.

Table No.15.3: Percentage habitat coverage by area in Molem Beat.

Habitat	Percentage Area
Wet Evergreen Forest	54.2459
Moist Deciduous Forest	39.08868
Semi Evergreen Forest	3.652796
Plateau/Grassland	3.01
Agriculture Fields (Active/Fallow)	NIL

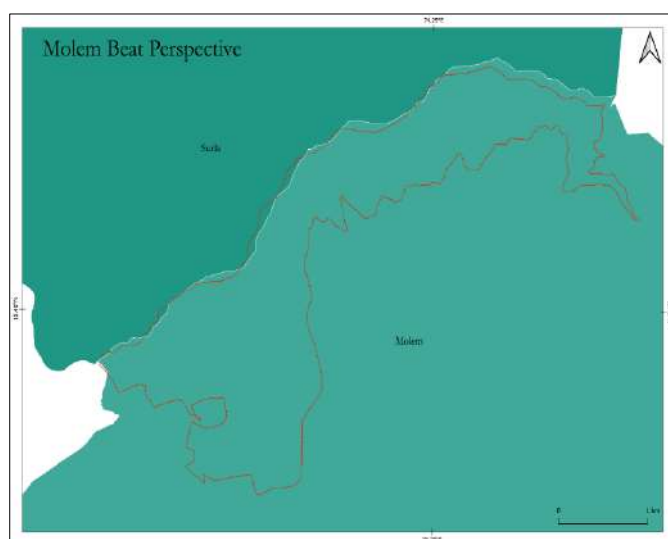


Fig. 9

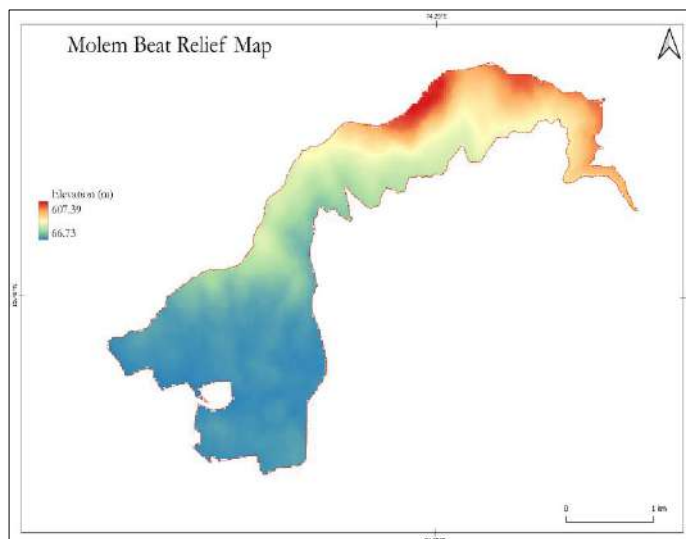


Fig. 10

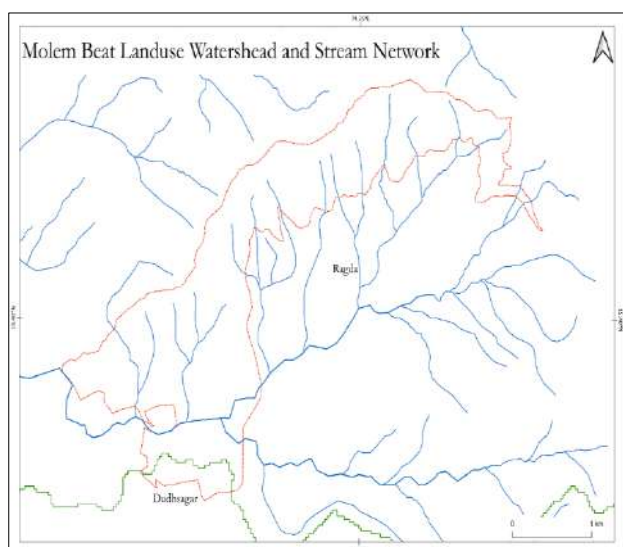


Fig. 11

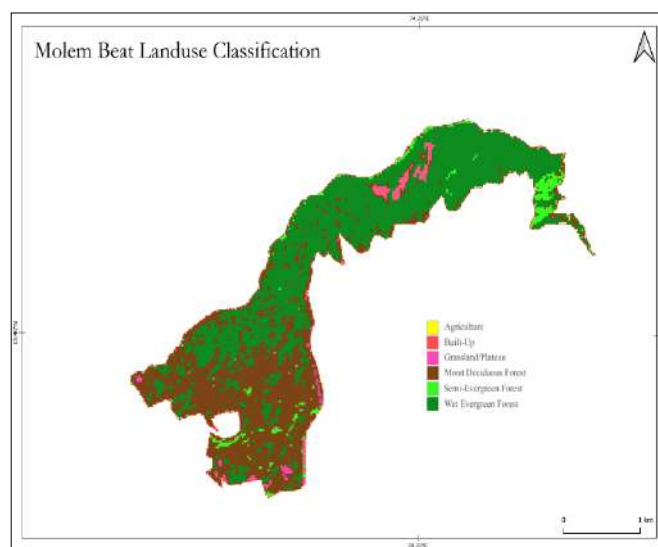


Fig.12

4. Nandran

Nandran Beat is majorly located within Molem village's administrative boundary and has an area of 20.48km² (Fig. 13). It shares its borders with Collem-1, Caranzol-1 and Molem beats. Elevation in this beat, ranges from 73m to 620.33m with the higher slopes towards the eastern side (Fig. 14). Of the total area, 98.96% is under tree cover, while the rest 1.04 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.4; Fig. 15). The beat falls majorly under the Ragda watershed zone, while the south-western end is within the Dudhsagar watershed. Several important primary and secondary streams arise from this beat which further joins the Ragda River (Fig. 16). The National Highway 748 from Belgaum in Karnataka to Panaji, Goa's capital city passes through the entire southern boundary of the beat, effectively dividing the Molem and Nandran Beat and runs for 13km. There are two important nature trails that have been made and maintained in the beat. The Nandran patrolling station is situated 1.8 km from the NH 748. The range forest office and other ecotourism facilities including the dormitory and nature interpretation centre are situated at the south-western end of the beat. The second entrance towards the National park is situated towards the north from the range forest office which leads to the watch tower called the Sunset Point. There are two grass plots which provide fodder grass for several of the important herbivores in the protected area, three watch towers for eco-tourism purpose and a water hole is built for provisioning drinking water for animals in this beat.

Table No.15.4: Percentage habitat coverage by area in Nandran Beat.

Habitat	Percentage Area
Wet Evergreen Forest	42.81
Moist Deciduous Forest	39.61
Semi Evergreen Forest	16.54
Plateau/Grassland	1.04
Agriculture Fields (Active/Fallow)	NIL

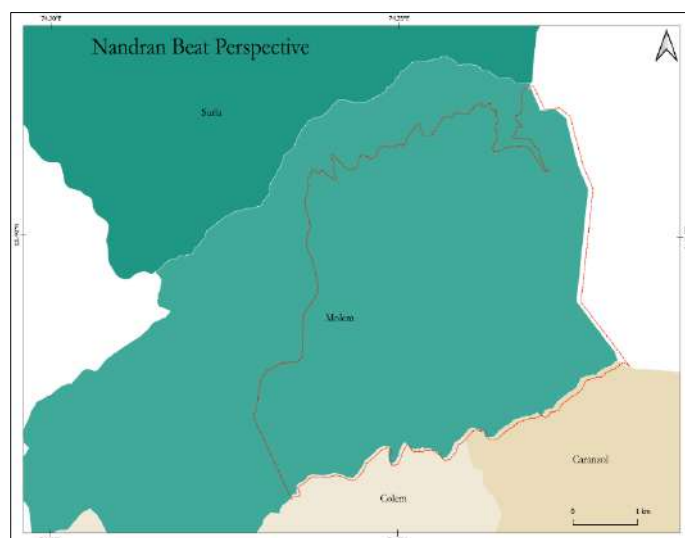


Fig. 13

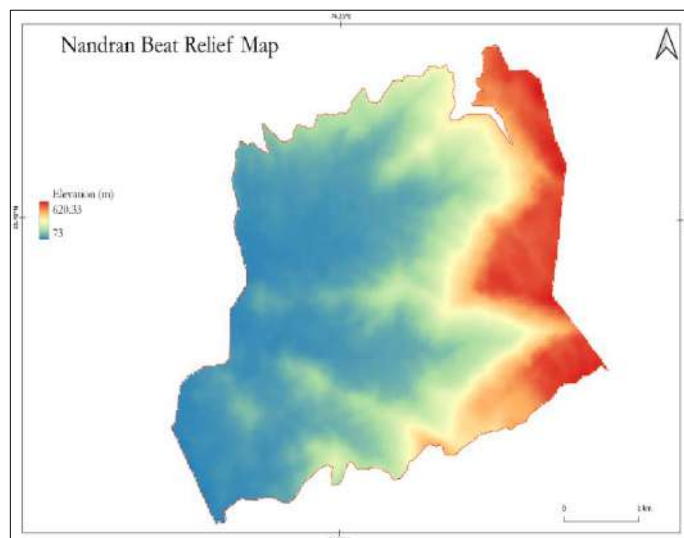


Fig. 14

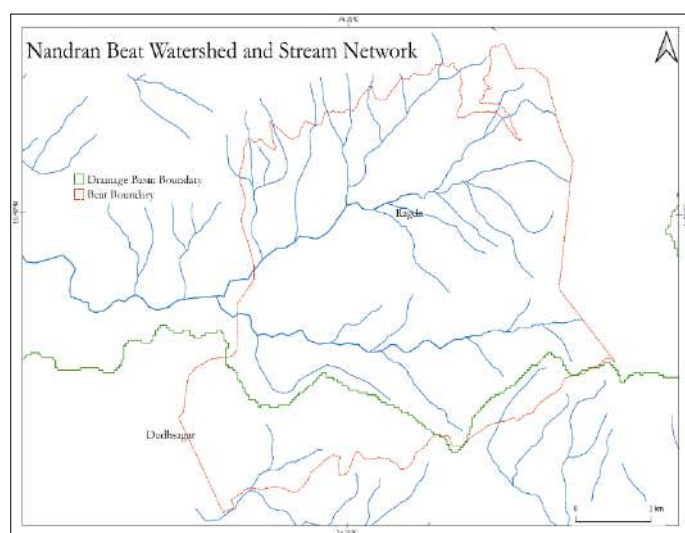


Fig. 15

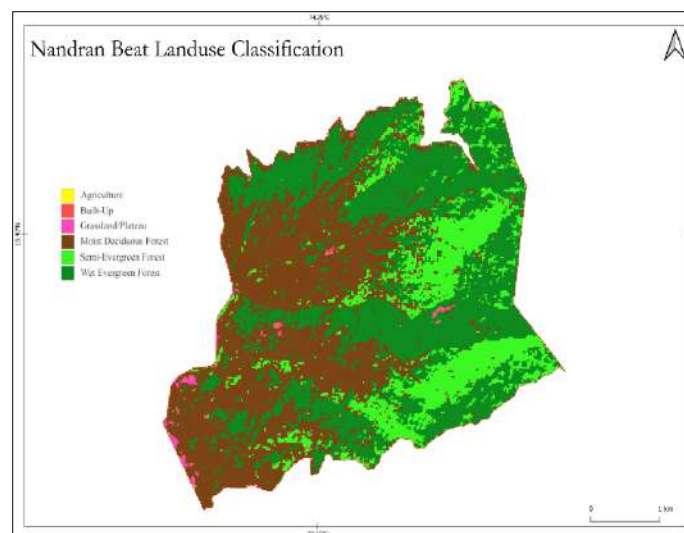


Fig. 16

5. Caranzol 1

Caranzol-1 Beat is majorly located within Caranzol village's administrative boundary with protrusion into Colem village at the southern end and has an area of 12.32km² (Fig. 17). It shares its borders with Caranzol-2, Collem-1, and Collem-2 beats. Elevation in this beat, ranges from 84.24m to 639.40m with the higher slopes towards the northern side (Fig. 18). Of the total area, 95.85% is under tree cover, while the rest 4.15 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.5; Fig. 19). The beat falls under the Dudhsagar watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 20). The jeep track from Collem village to Dudhsagar waterfalls passes through this beat. A 57 ha of privately owned agricultural fields is located within this beat at the south-eastern side. There is a single watchtower for wildlife watching and waterhole within the beat to provide drinking water for animals.

Table No.15.5: Percentage habitat coverage by area in Caranzol-1 Beat.

Habitat	Percentage Area
Wet Evergreen Forest	83.08
Moist Deciduous Forest	8.74
Semi Evergreen Forest	4.03
Plateau/Grassland	1.12
Agriculture Fields (Active/Fallow)	3.04

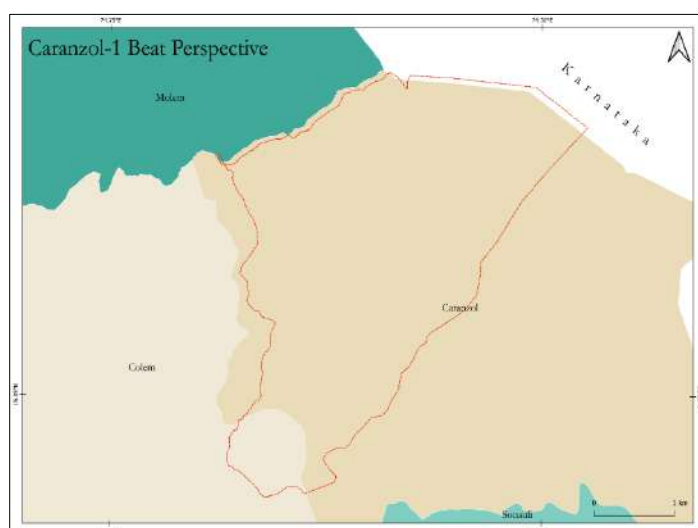


Fig. 17

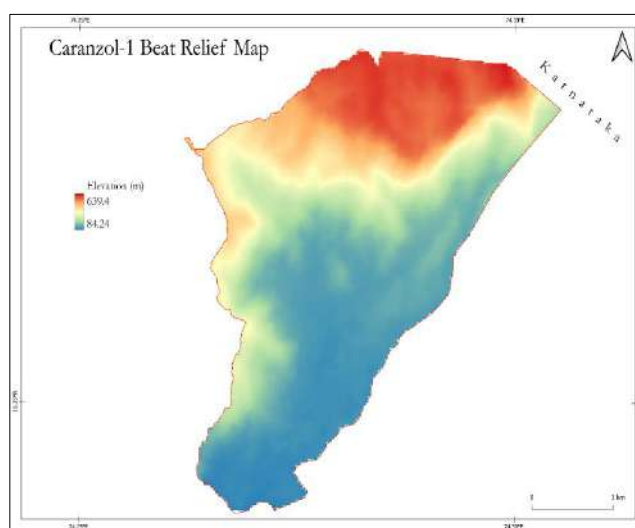


Fig. 18

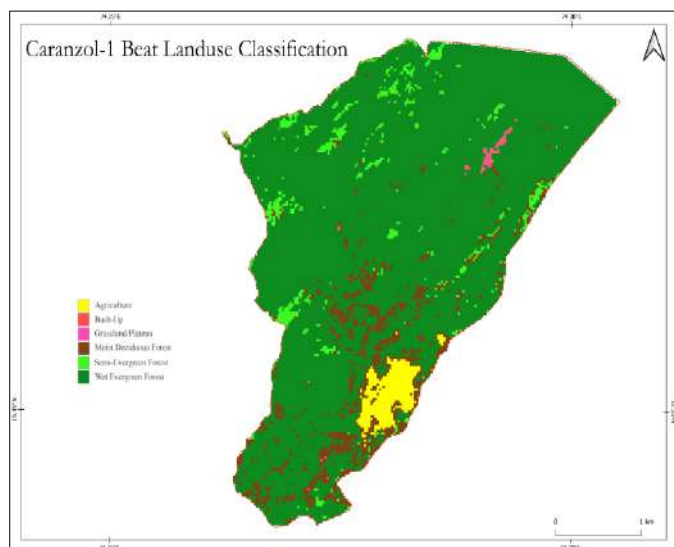


Fig. 19

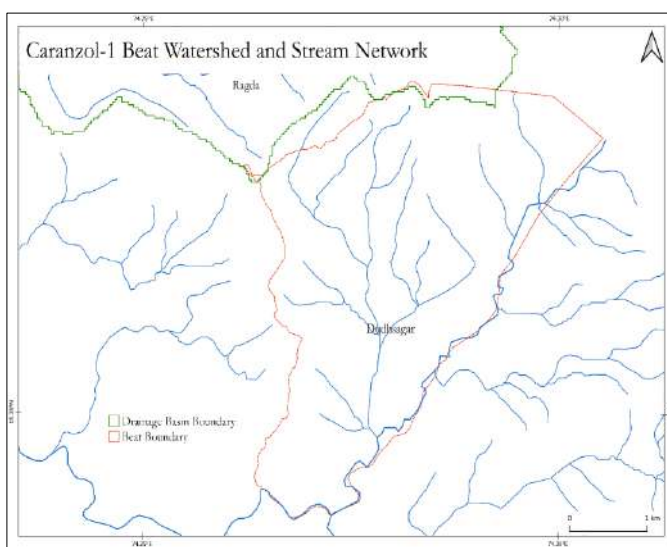


Fig. 20

6. Caranzol 2

Caranzol-2 Beat is majorly located within Caranzol village's administrative boundary and has an area of 16.06km² (Fig. 21). It shares its borders with Caranzol-1, Sonaulim-North, and Collem-2 beats. Elevation in this beat, ranges from 91.97m to 779m with the higher slopes towards the northern side (Fig. 22). Of the total area, 96.34% is under tree cover, while the rest 3.45 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.6; Fig. 23). The beat falls under the Dudhsagar watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 24). The south-western railway's single-line track passes through this beat and the Caranzol railway station is situated in the northern part of this beat.

Table No15.6: Percentage habitat coverage by area in Caranzol-2 Beat.

Habitat	Percentage Area
Wet Evergreen Forest	40.00
Moist Deciduous Forest	16.14
Semi Evergreen Forest	40.19
Plateau/Grassland	3.25
Agriculture Fields (Active/Fallow)	0.20

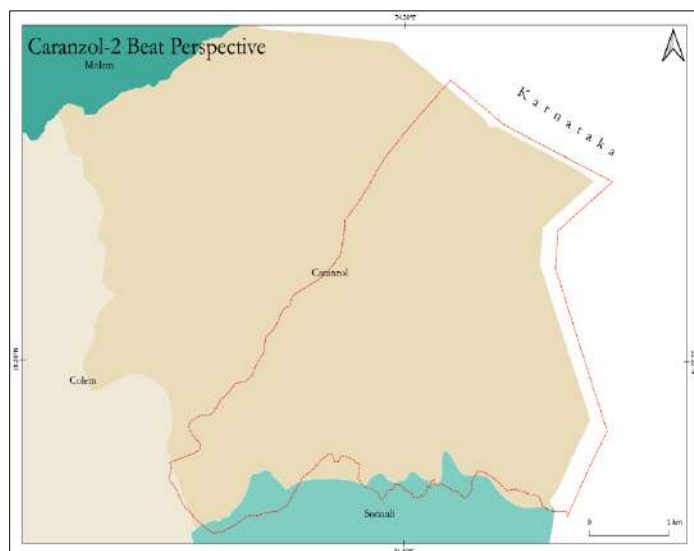


Fig. 21

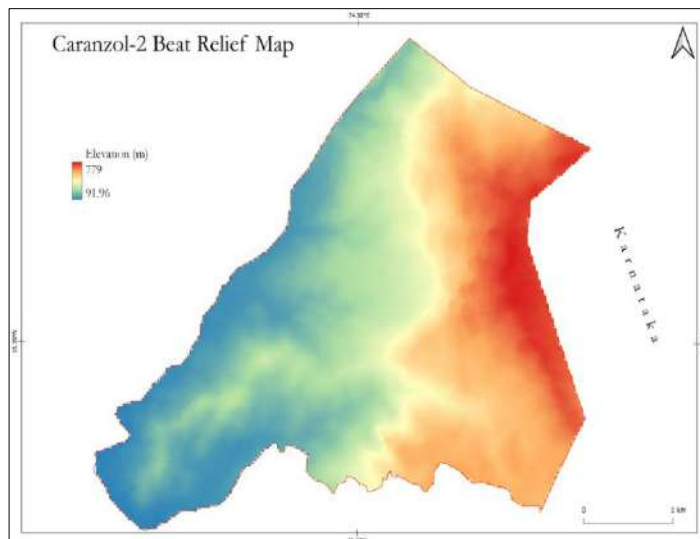


Fig. 22

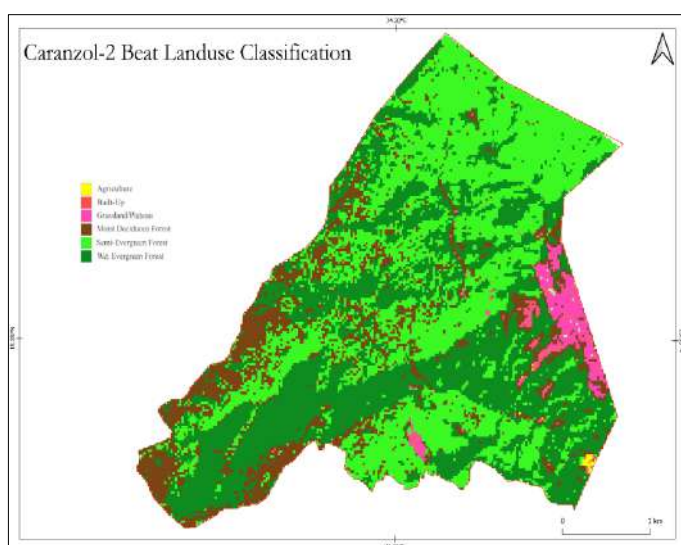


Fig. 23

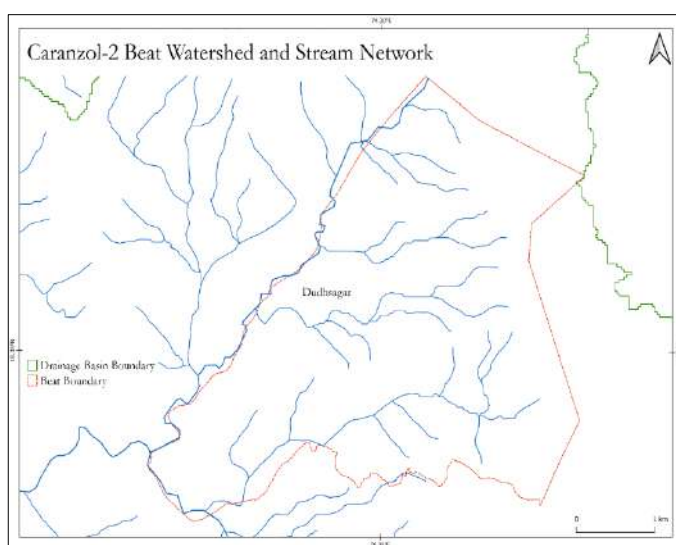


Fig. 24

7. Collem1

Collem-1 Beat is majorly located within Collem village's administrative boundary and has an area of 8.46km² (Fig. 25). It shares its borders with Nandran, Caranzol-1 and Collem-2 beats. Elevation in this beat, ranges from 74m to 480.98m with the higher slopes towards the eastern side (Fig. 26). Of the total area, 97.04% is under tree cover, while the rest 2.96 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.7; Fig. 27). The beat falls under the Dudhsagar watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 28). This beat is an important ecotourism hotspot in the protected area. The Arannyak campsite is situated at the southern end of this beat and is connected to the range office at Mollem through a jeep trail which is also an important nature trail for sighting of several important mammalian and bird species within the area. Along the track there are two watchtowers and a check dam for

water conservation. Besides these, a patrolling station and a check gate is situated at the southern end of the beat where the jeep track from Mollem and connects to the Dudhsagar jeep track. This beat also has a canopy walkway opposite the Arannyak camp site. Another important geological and tourism feature of the beat is the Devil's canyon- which is a unique geological formation caused due to erosion by the Dudhsagar river.

Table No.15.7: Percentage habitat coverage by area in Collem-1 Beat.

Habitat	Percentage Area
Wet Evergreen Forest	48.34
Moist Deciduous Forest	45.87
Semi Evergreen Forest	2.83
Plateau/Grassland	2.93
Agriculture Fields (Active/Fallow)	0.03

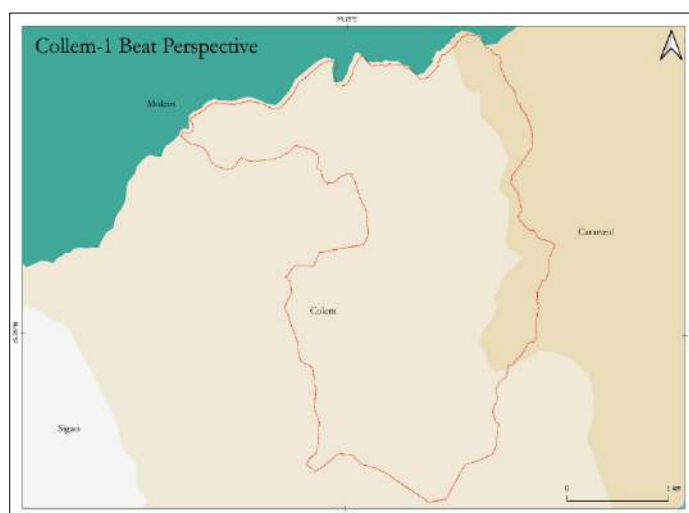


Fig. 25

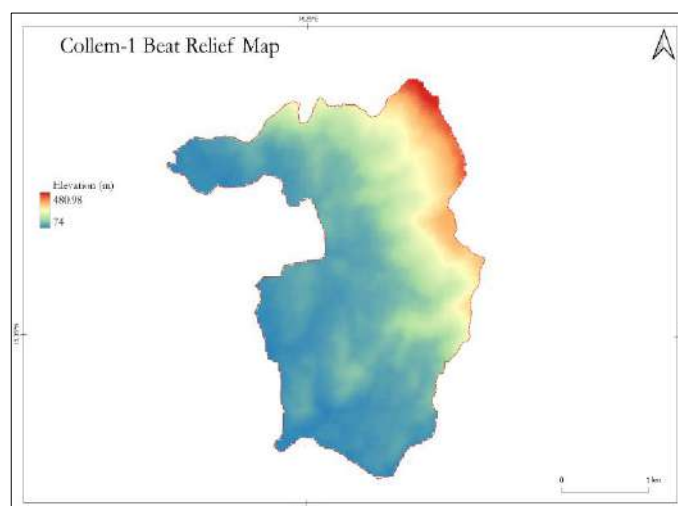


Fig. 26

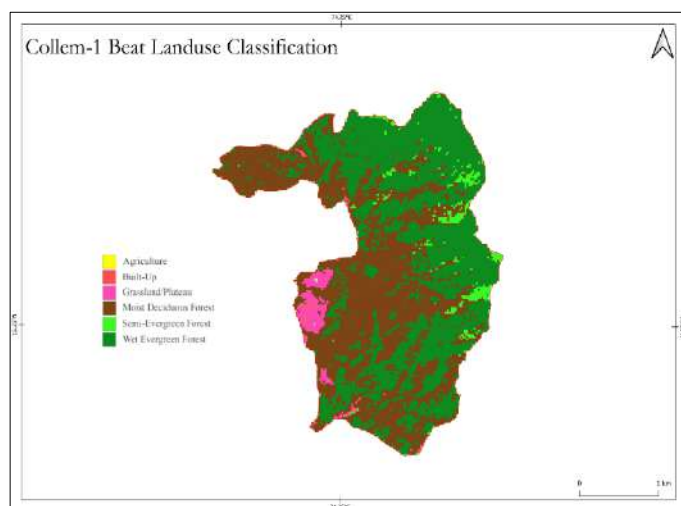


Fig. 27

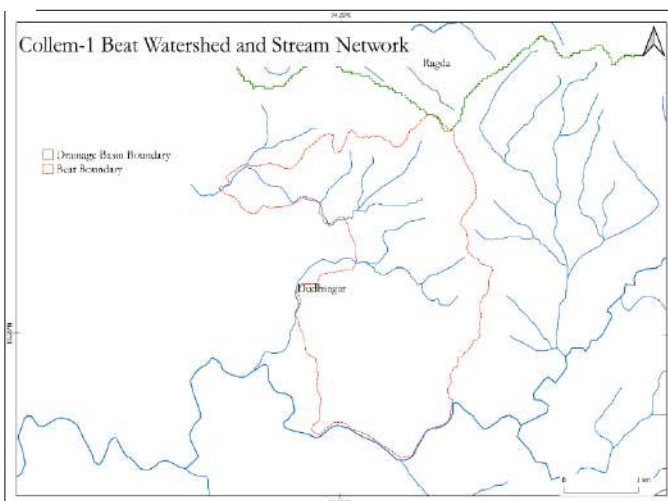


Fig. 28

8. Collem 2

Collem-2 Beat is majorly located within Collem and Boma village's administrative boundary and has an area of 18.58km² (Fig. 29). It shares its borders with Caranzol-1, Caranzol-2, Collem-1, Sonaulim-North and South, Oxel and Calem beats. Elevation in this beat, ranges from 74.83m to 767.45m with the higher slopes towards the southern side (Fig. 30). Of the total area, 96.53% is under tree cover, while the rest 3.46 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.8; Fig. 31). The beat falls under the Dudhsagar watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 32). There are two temples within the beat, one dedicated to Sateri and another to Brahma.

Table No.15.8: Percentage habitat coverage by area in Collem-2 Beat.

Habitat	Percentage Area
Wet Evergreen Forest	34.05
Moist Deciduous Forest	33.38
Semi Evergreen Forest	29.11
Plateau/Grassland	2.91
Agriculture Fields (Active/Fallow)	0.55

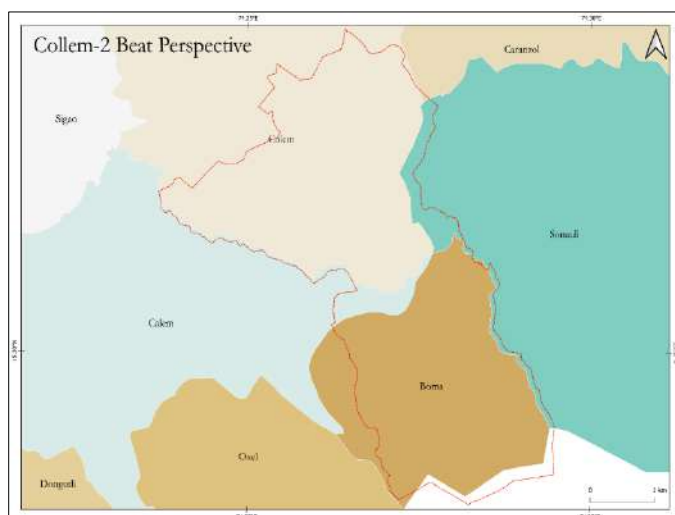


Fig. 29

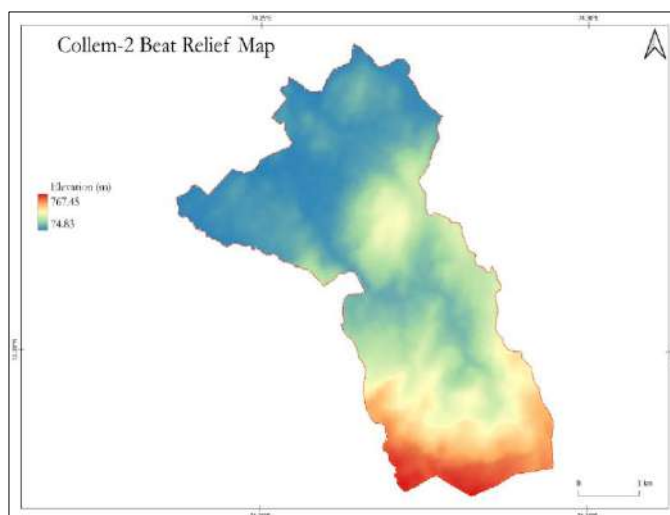


Fig. 30

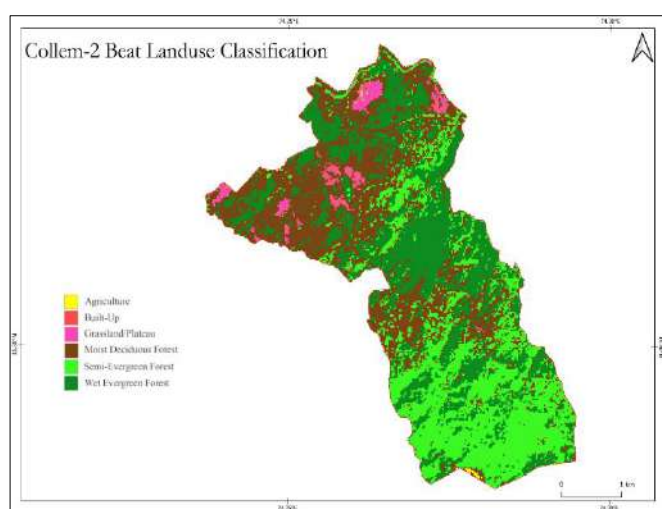


Fig. 31

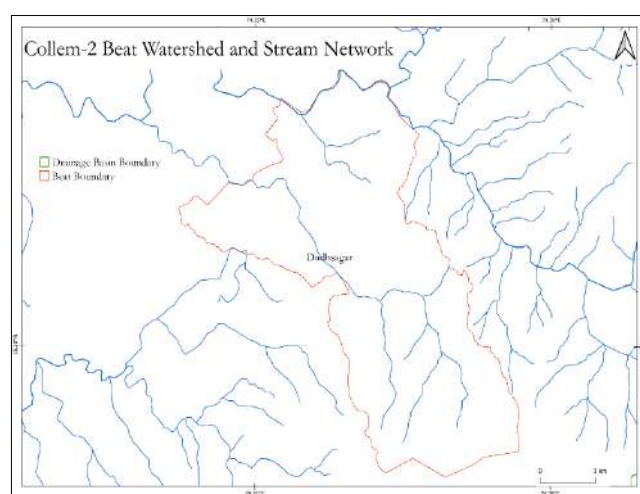


fig.32

9. Sonaulim North

Sonaulim-North Beat is located within Sonaulim village's administrative boundary and has an area of 14.47km² (Fig. 33). It shares its borders with Caranzol-2 Collem-2 and Sonaulim South beats. Elevation in this beat, ranges from 96.37 m to 641.40 m with the higher slopes towards eastern side of the beat (Fig. 34). Of the total area, 96.85% is under tree cover, while the rest 2.99 % comprises of open plateaus and grassy slopes (Table.15.9; Fig. 35). The beat falls majorly under Dudhsagar watershed. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 36). This beat is Goa's most important ecotourism zone as it has the famous Dudhsagar waterfall which is connected to Collem village by a jeep track through which visitors and tourists arrive at the base of this waterfall. There are two temples and a church along the south western railway's railway track which crosses over the Dudhsagar waterfall. There is a watchtower built near the jeep parking lot at the base of the Dudhsagar waterfall.

Table No.15.09: Percentage habitat coverage by area in Sonaulim-North Beat.

Habitat	Percentage Area
Wet Evergreen Forest	45.37
Moist Deciduous Forest	30.22
Semi Evergreen Forest	21.26
Plateau/Grassland	2.99
Agriculture Fields (Active/Fallow)	NIL

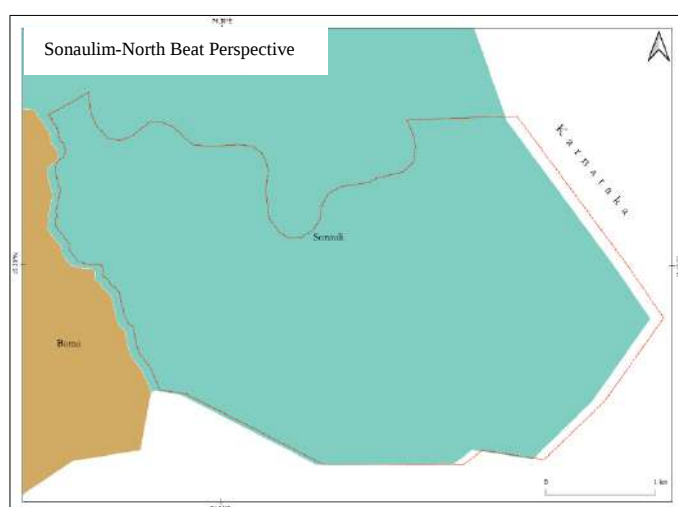


Fig. 33

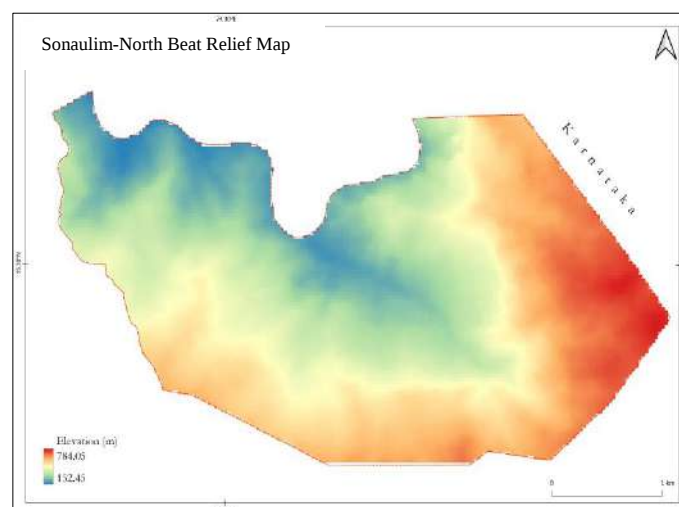


Fig. 34

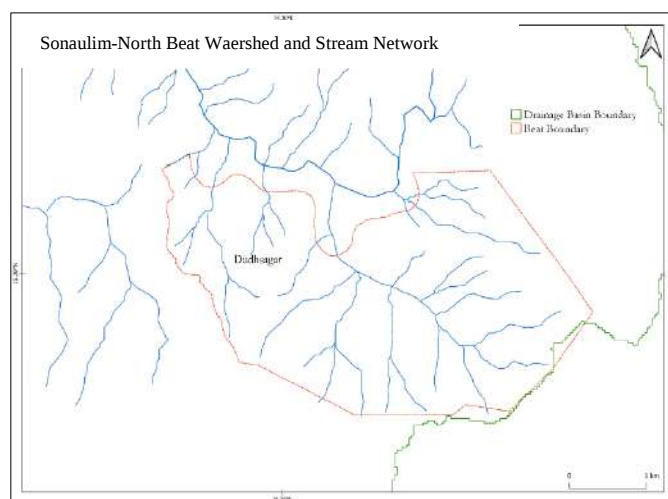


Fig. 35

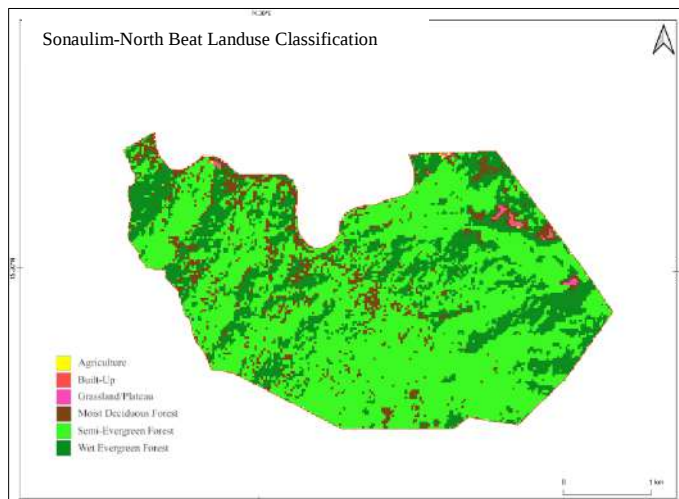


Fig.36

10. Sonaulim South

Sonaulim- South Beat is located within Sonaulim village's administrative boundary and has an area of 12.15 km² (Fig. 37). It shares its borders with Collem-2 and Sonaulim- North beats. Elevation in this beat, ranges from 152 m to 784 m with the higher slopes towards the eastern

side of the beat (Fig. 38). Of the total area, 99.28% is under tree cover, while the rest 0.70 % comprises of open plateaus and grassy slopes (Table.15.10; Fig. 39). The beat falls majorly under Dudhsagar watershed. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 40). This beat is on the eastern most end and the southern-most beat of the protected area and falls within the core of the National Park and hence has no management structures in it. The railway line of south-western railway forms the northern border of the beat.

Table No.15.10 Percentage habitat coverage by area in Sonaulim- South Beat.

Habitat	Percentage Area
Wet Evergreen Forest	26.38191
Moist Deciduous Forest	9.183673
Semi Evergreen Forest	63.72167
Plateau/Grassland	0.7
Agriculture Fields (Active/Fallow)	NIL

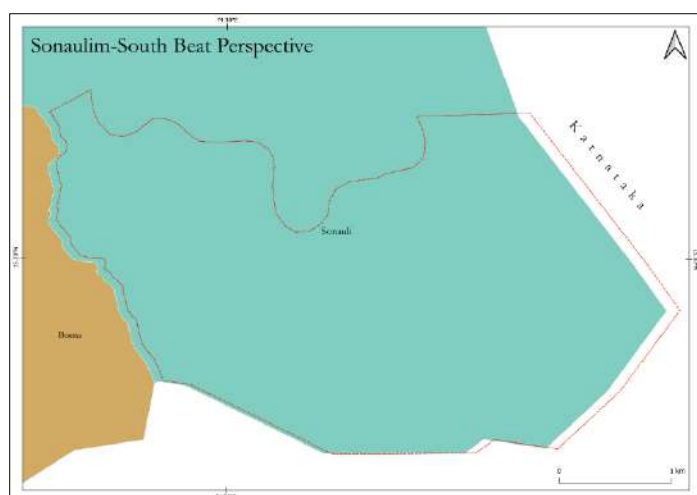


Fig. 37

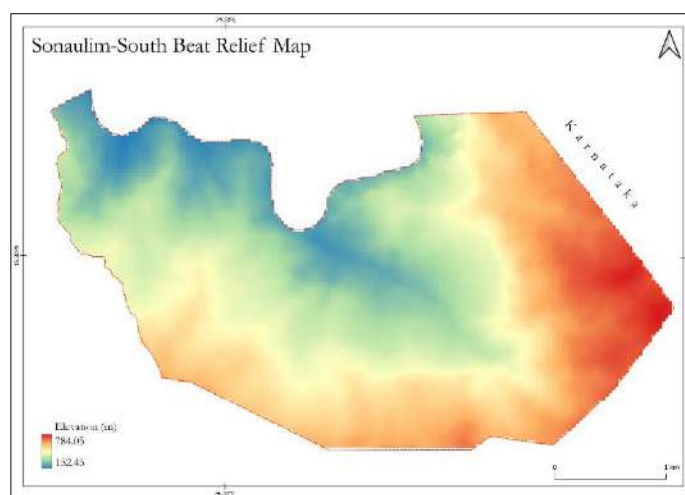


Fig. 38

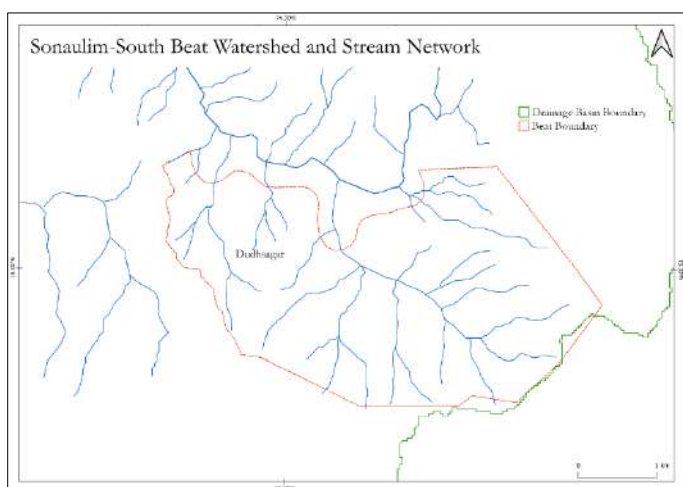


Fig. 39

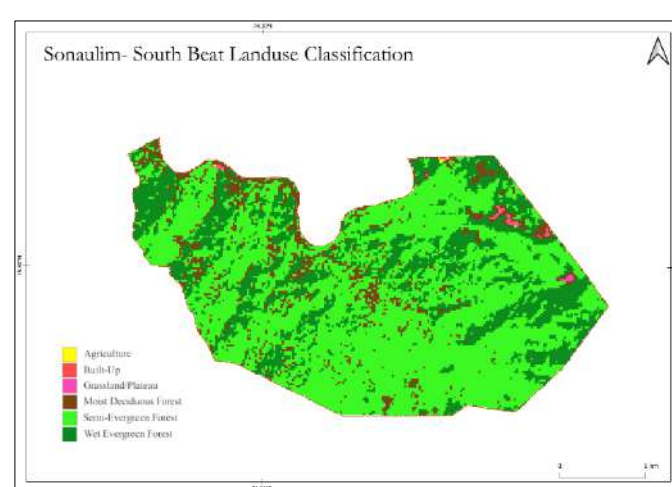


Fig. 40

11. Calem

Calem Beat is majorly located within Calem village's administrative boundary and has an area of 10.53km² (Fig. 41). It shares its borders with Sigao, Karemol, Oxel and Collem-2 beats. Elevation in this beat, ranges from 60.05m to 322m with the higher slopes towards the eastern side (Fig. 42). Of the total area, 93.23% is under tree cover, while the rest 6.78 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.11; Fig. 43). The beat falls under the Dudhsagar watershed zone. The Calem River and several other streams arises from this beat which further joins the Mhadayi River (Fig. 44). The South-western Railway's single-track line passes just above the western border of this beat, passing through it at the northern corner. A tarred road enters the beat at the south-western end into a plantation zone. There are two waterholes constructed within the beat to provision drinking water for animals.

Table 15.11: Percentage habitat coverage by area in Calem Beat.

Habitat	Percentage Area
Wet Evergreen Forest	24.29
Moist Deciduous Forest	65.46
Semi Evergreen Forest	3.48
Plateau/Grassland	6.63
Agriculture Fields (Active/Fallow)	24.29

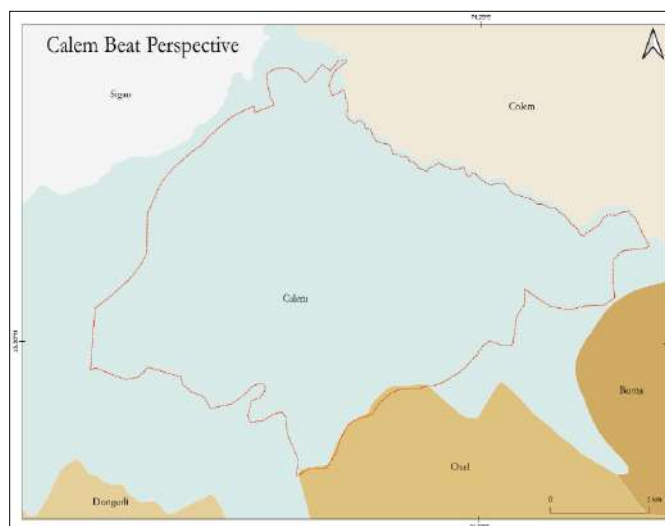


Fig. 41

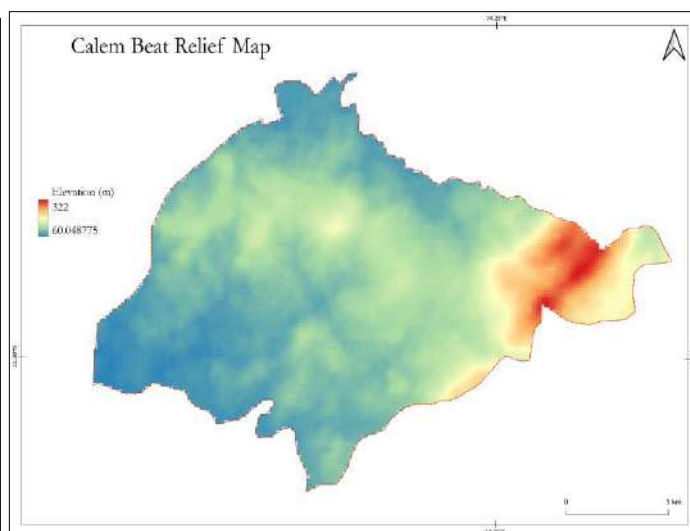


Fig. 42

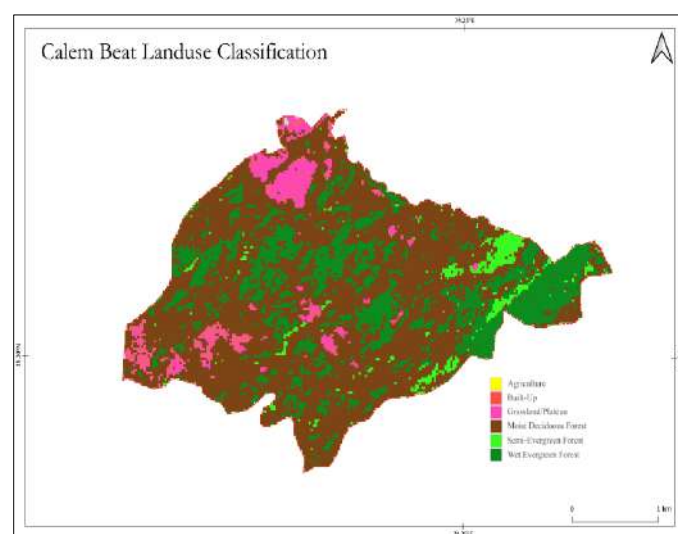


Fig. 43

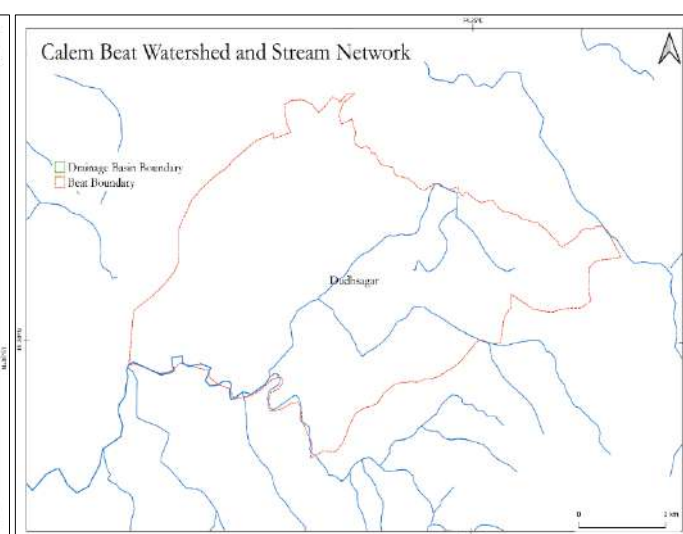


Fig. 44

12. Oxel

Oxel Beat is majorly located within Oxel village's administrative boundary with protrusions into Dongurli, Calem, and Boma and has an area of 12.66km² (Fig. 45). It shares its borders with Dongurli, Karemol, Calem and Collem-2 beats. Elevation in this beat, ranges from 83m to 761.16m with the higher slopes towards the eastern side (Fig. 46). Of the total area, 98.30% is under tree cover, while the rest 1.70 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.12; Fig. 47). The beat falls majorly under Dudhsagar watershed. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 48). Oxel is a very remote beat, constituting the core of the protected area and has no management intervention features in it

Table No.15.12: Percentage habitat coverage by area in Oxel Beat.

Habitat	Percentage Area
Wet Evergreen Forest	30.28
Moist Deciduous Forest	31.09
Semi Evergreen Forest	36.92
Plateau/Grassland	1.70
Agriculture Fields (Active/Fallow)	NIL

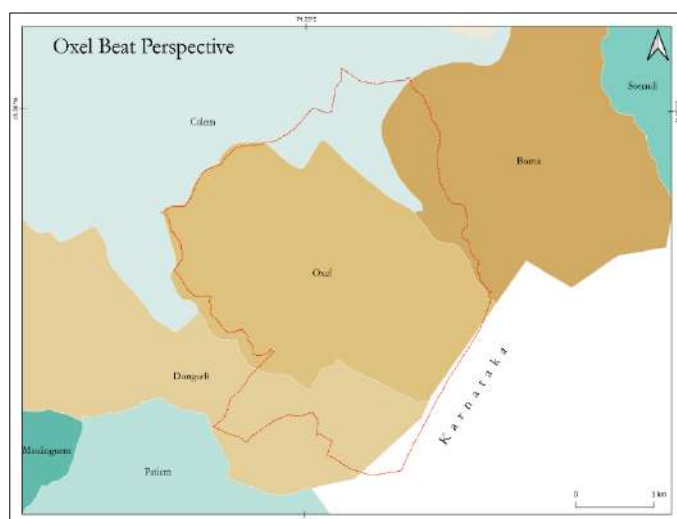


Fig. 45

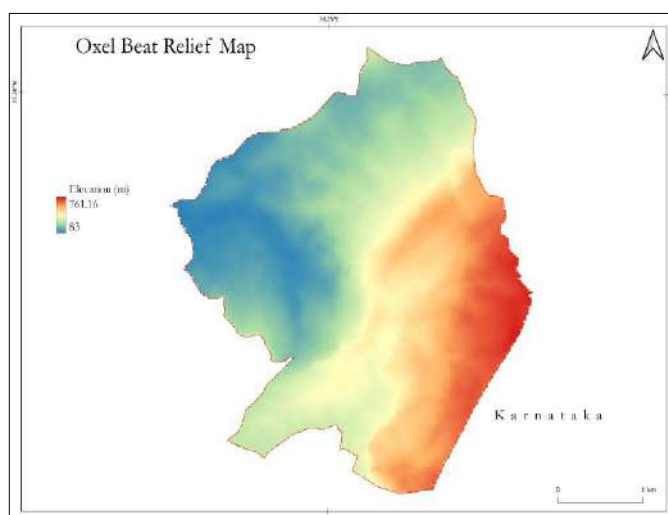


Fig. 46

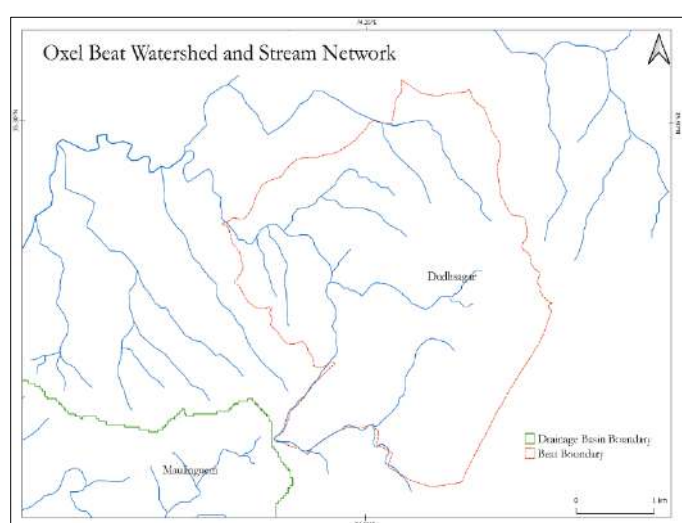


Fig. 47

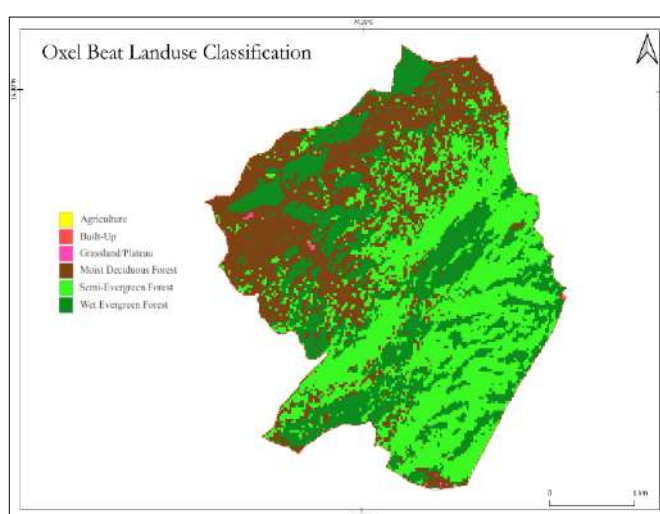


Fig. 48

13. Sigao

Sigao Beat is located within Cormonem, Calem and Sigao village's administrative boundary and has an area of 24.02km² (Fig. 49). It shares its borders with Karemol and Calem beats. Elevation in this beat, ranges from 32.77m to 332m with the higher slopes towards the centre of the beat (Fig. 50). Of the total area, 85.15% is under tree cover, while the rest 14.86 % comprises of open plateaus, grassy slopes, human habitations, and agricultural fields (Table.15.13; Fig. 51). The beat falls majorly under Dudhsagar watershed. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 52). The beat houses the Round office of Calem round and a patrolling station at the southern end while there are two water holes built for storing drinking water. The main road from Kalem to Molem village passes through the western side of the beat, while there are several branching village roads towards the north of the beat. The railway line of south-western railway forms the southern to eastern border of the beat.

Table No.15.13: Percentage habitat coverage by area in Sigao Beat.

Habitat	Percentage Area
Wet Evergreen Forest	25.29
Moist Deciduous Forest	56.50
Semi Evergreen Forest	3.36
Plateau/Grassland	14.47
Agriculture Fields (Active/Fallow)	0.39

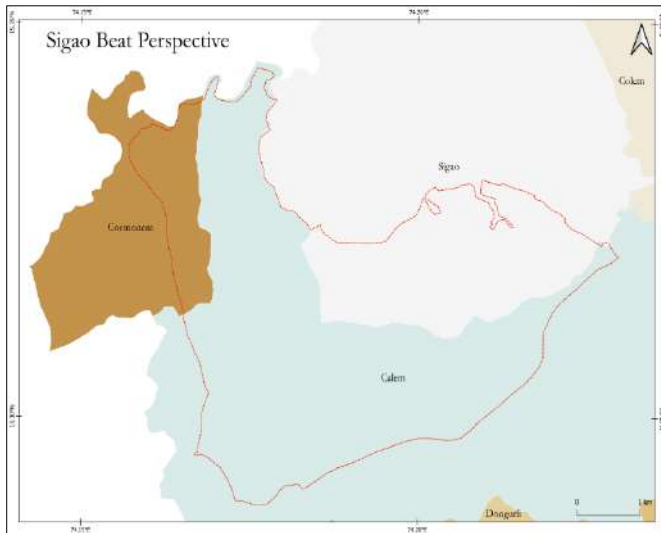


Fig. 49

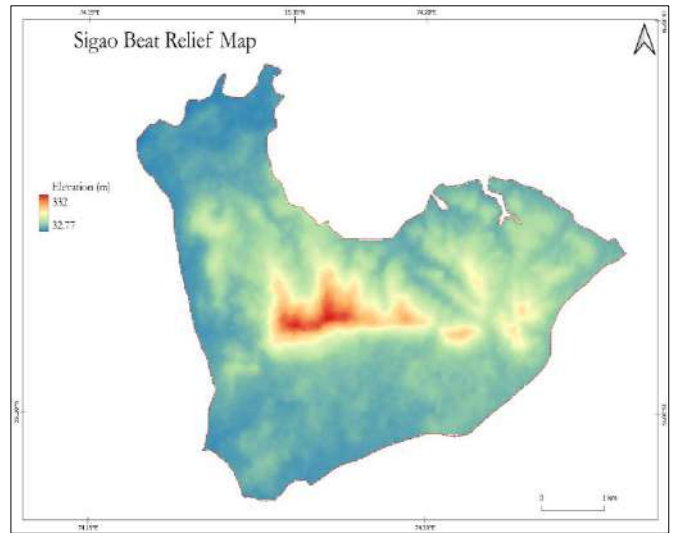


Fig. 50

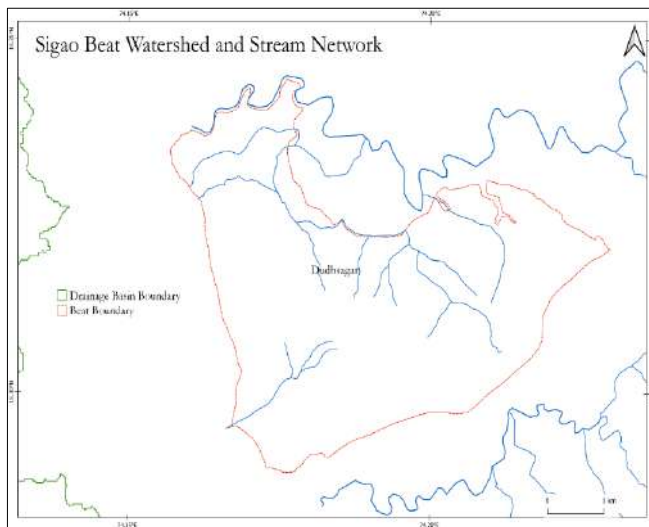


Fig. 51

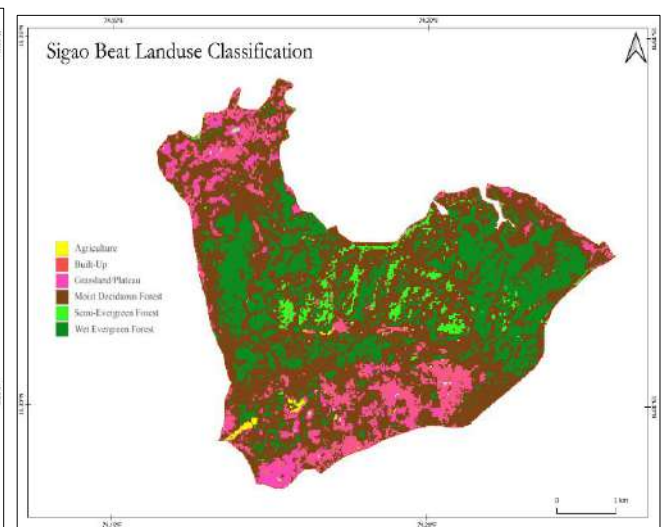


Fig. 52

14. Karemol

Karemol Beat is majorly located within Calem village's administrative boundary and has an area of 6.33km² (Fig. 53). It shares its borders with Dongurli, Oxel, Calem and Sigao beats. Elevation in this beat, ranges from 44.78m to 224m with the higher slopes towards the eastern side (Fig. 54). Of the total area, 79.98% is under tree cover, while the rest 20 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.14; Fig. 55). The beat falls under the Dudhsagar watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar River (Fig. 56). There is a main road bisecting the beat from the west to the east of the beat and the single track of the south-western railway forms the northern border of the beat.

Table No.15.14: Percentage habitat coverage by area in Dongurli Beat.

Habitat	Percentage Area
Wet Evergreen Forest	8.865784
Moist Deciduous Forest	68.34594
Semi Evergreen Forest	2.769376
Plateau/Grassland	19.67
Agriculture Fields (Active/Fallow)	0.33

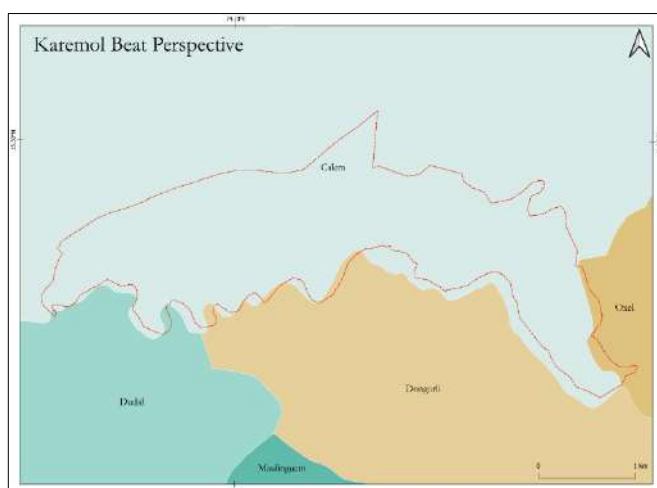


Fig. 53

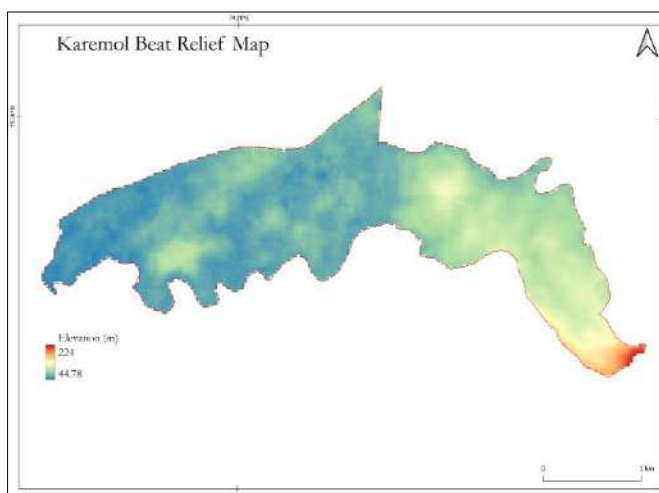


Fig. 54

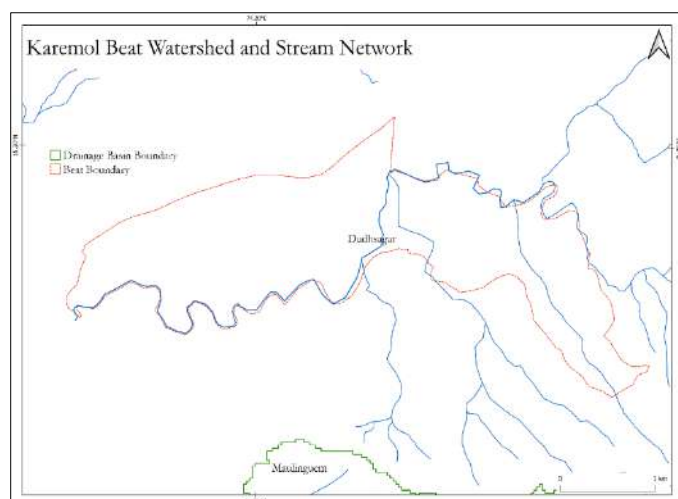


Fig. 55

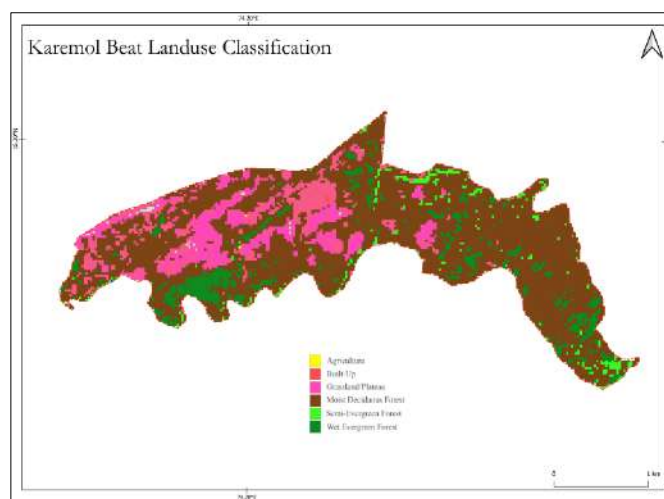


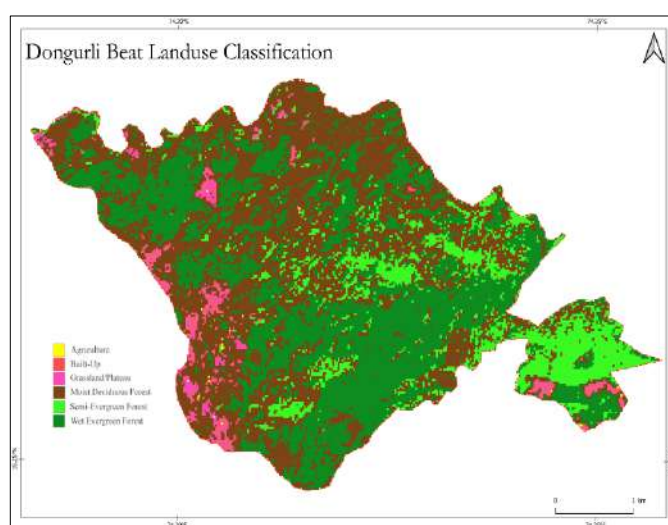
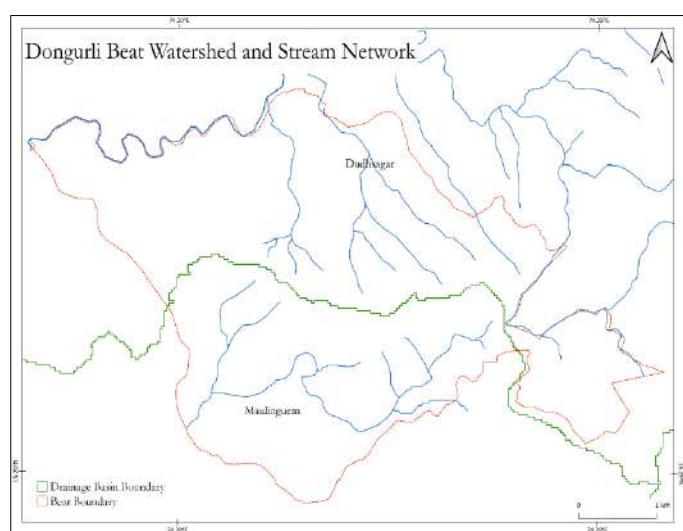
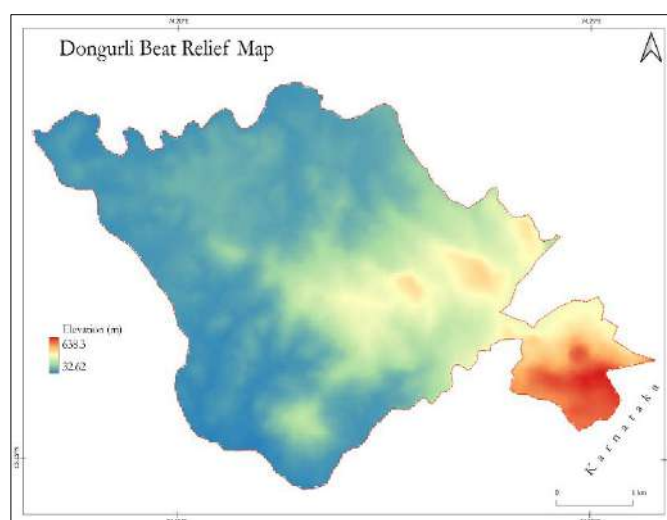
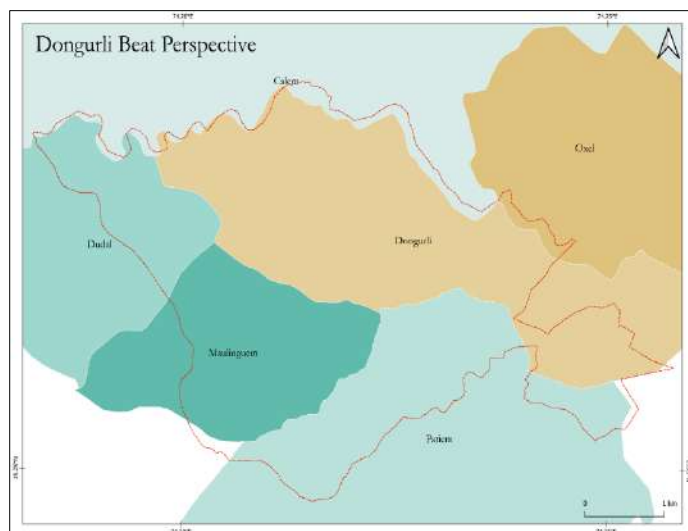
Fig. 56

15. Dongurli

Dongurli Beat is majorly located within Dongurli, Maulinguem, Dudal and Patiem village's administrative boundary and has an area of 19.44km² (Fig. 57). It shares its borders with Karemol and Oxel beats. Elevation in this beat, ranges from 32.62m to 638.32m with the higher slopes towards the eastern side (Fig. 58). Of the total area, 96.23% is under tree cover, while the rest 3.76 % comprises of open plateaus, grassy slopes, and agricultural fields (Table.15.15; Fig. 59). The beat falls under the Dudhsagar and Maulinguem watershed zone. Several important primary and secondary streams arise from this beat which further joins the Dudhsagar and Calem River (Fig. 60). There are two check dams, one grassplot and one waterhole built in this beat

Table No.15.15: Percentage habitat coverage by area in Dongurli Beat.

Habitat	Percentage Area
Wet Evergreen Forest	39.23
Moist Deciduous Forest	44.76
Semi Evergreen Forest	12.23
Plateau/Grassland	3.70
Agriculture Fields (Active/Fallow)	0.06



CHAPTER 5

VISION, OBJECTIVES, ISSUES AND PROBLEMS

5.1 VISION

In – situ protection, conservation and scientific management of Protected Areas with the people's participation.

5.2 OBJECTIVES OF MANAGEMENT

1. Wildlife conservation and protection, with special emphasis to threatened and endemic species.
2. Integrated Development of wildlife habitat including bio-diversity enrichment plantations, aided natural regeneration, soil and moisture conservations works etc
3. To improve the habitat value of the protected area by planning and executing habitat management and habitat improvement activities.
4. To develop and implement strategies for watershed management to ensure uninterrupted water supply for management of wildlife.
5. To improve administration and management of Bhagwan Mahavir Wildlife Sanctuary and National Park, through integration of recent technologies.
6. Improve general and ecotourism infrastructure, communication, and connectivity facilities.
7. To understand issues relating to human-wildlife conflicts and mitigate it through awareness, incentivisation and compensation.
8. Creating awareness and building confidence within the local communities living in and around the protected area for promoting wildlife conservation.
9. Provide for Capacity building of field staff to update and acquire skills to contribute to the overall mandate of the conservation management.

10. To promote research in the protected area and use the findings to improvise and innovate conservation management.

11. Encourage students and general public visitation to Bhagwan Mahavir Wildlife Sanctuary and National Park for instilling within them knowledge and love for wildlife and conservation of nature.

Considering the above objectives, based on existing practices, identified gaps and opportunities, the following plan is proposed. The below outlined strategies need to be considered as a guiding document for management of Bhagwan Mahavir Wildlife Sanctuary and National Park. Detailed modalities of the specific strategies required to be implemented for achieving the above objectives are outlined in Chapter 6.

5.3 PROBLEMS IN ACHIEVING OBJECTIVES AND MITIGATION

1. Wildlife conservation and protection with special emphasis to threatened and endemic species.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Habitat fragmentation and degradation	• Proper management planning and concentrated efforts to review wildlife habitats • Resettlement and rehabilitation package for human population in the Protected Area
2	Ensuring optimal habitat requirements including dietary requirements of targeted faunal groups.	• Habitat improvement strategies must be implemented. • Provisions to be made for plantation of food and fodder plants, maintenance of grass plots, establishment and maintenance of waterholes and salt licks to cater for mineral requirements of target faunal groups.

3	Inadequate data on flora and fauna of the endemic status and global significance in the protected areas	• Conduct periodic estimations of wildlife • Maintain and periodic review an electronic database of all biodiversity data in a centrally located server in the head office of forest department • Developing a protocol for population revival and stabilization of significance species
4	Inadequate resource for the coordinated efforts	• Ensure regular flow of monetary support from both state and centrally sponsored schemes. • Establishment of Trust or Foundation model can be considered for making the protected area monetarily self-sufficient.
5	Ensuring optimal habitat requirements including dietary requirements of targeted faunal groups.	• Habitat improvement strategies must be implemented. • Provisions to be made for plantation of food and fodder plants, maintenance of grass plots, establishment and maintenance of waterholes and salt licks to cater for mineral requirements of target faunal groups.

2. To improve the habitat value of the protected area by planning and executing habitat management and habitat improvement activities.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Habitat improvement	• Biodiversity Enrichment Plantation must be undertaken to ensure that species richness is maintained. • Invasive species like <i>Chromolaena odorata</i> must be actively managed through periodic weeding exercises. • Internal Zonation of Bhagwan Mahavir Wildlife Sanctuary and National Park is required for effective monitoring and execution of conservation works. • Plantation of soil binding and moisture conserving flora needs to be undertaken.

		• Monoculture plantations must be phased out gradually and can be converted into grass plots or artificial water conservation zones. These areas can also become experimental plots to perform forest regeneration exercise using principles of secondary succession. • Grass plots need to be established in open areas with soil depths not supporting large growth trees. Local grass species may be planted from seed or slips. • Soil Moisture Conservation related works to be undertaken.
2	Frequent cases of forest fires.	• State Action Plan on Fire to be followed • Initiate mechanisms for maintenance of the fire lines and creation of additional 5 to 10 meter fire lines in zones of maximum fire incidence. • Procure latest firefighting equipment along with mechanised fire extinguishers like 4×4 jeeps with mounted 1500 liter tank. • Construct fire watch towers at strategic locations. • Revamp and improve wireless systems for better network connectivity to facilitate quick communication and response in case of fire incidences. • Ground staff must be trained in using Forest Survey of India's 'Van Agni' portal. • Fire Hazards signages must be installed at strategic locations in areas with high fire incidences. • Awareness drive on fire hazard among the people living within and in proximity of the protected area must be undertaken.
3	Identified of indicator taxa for habitat monitoring, protocol, and format for	• Instead of monitoring all floral and faunal groups for monitoring and assessment of habitat health, specific indicator taxa can be selected, and relevant training can be provided to monitor these groups.

	recording sightings of indicator	• Standard format for data collection of flora and fauna for regular monitoring must be created. This can further be digitised on periodic basis and stored on a central data repository. • Data collection must be spatially prioritised, by geotagging observations and then mapping them on a GIS platform.
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3. To develop and implement strategies for watershed management to ensure uninterrupted water supply for management of wildlife.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Water scarcity in summer due to drying up of waterbodies and ephemeral streams.	• Existing perennial sources water must be desilted and if feasible on case-to-case basis, enhanced. • Artificial waterholes need to be maintained annually and water availability needs to be ensured in the summer months, either by ferrying water to the water holes using water tankers where terrain is feasible, or by laying pipe connections from perennial sources of water. • In areas of high animal movement, larger artificial water bodies can be created with a borewell and pump house, acting as the source of water during the dry summer months.
2	Maintenance, placement, and establishment of check dams.	• Existing check dams must be annually checked for breach and repaired as a part of monsoon preparation activities. • Gully Plugging, Brushwood Dam, Dry stone dam and Gabbions should be given preference over concrete check dams. • The present watershed and stream network mapping is based on SRTM-DEM. These models can be improved

		by conducting on field LIDAR based 3D mapping if possible for planning soil and water conservation (SMC) structures
3	Rainfall and runoff details.	Automated weather monitoring instruments installed should be optimally used in management of water regime in the Protected Areas

4. To improve administration and management of Bhagwan Mahavir Wildlife Sanctuary and National Park, through integration of recent technologies.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Improving digital infrastructure and allied equipment.	• Latest model computers must be provided to administrative staff at Bhagwan Mahavir Wildlife Sanctuary and National Park range office. • Software on these computers must be regularly checked and updated by professionals from the IT department. • Sufficient power backup through UPS and good internet connectivity must be provided. • Latest technology in wildlife monitoring and management to be made available for the Protected Areas
2	Digitalization of records and data.	• All records existing in the range forest office on all matters need to be digitalised and archived on a centrally accessible server, so that it can be accessed with ease, improving administrative efficiency. • Enterprise resource planning (ERP) tools like Systems Applications and Products in Data Processing (SAP) should be used to create a centralised system for data management that enables every division to access and share data for facilitating a better work environment for

		efficient communication, visualisation, planning and accessibility.
3	Technical and digital proficiency of administrative staff to be upgraded through organizing training and capacity building programmes	• Computer and digital technology training must be provided to administrative staff in collaboration with the IT department of Goa Government. Additionally, computer teachers from the department of higher education placed in Multi Faculty College – Dharbandora and Government College – Sanquelim or local NGOs can be roped in for such training programs.

5. Improve general and ecotourism infrastructure, communication, and connectivity facilities.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Maintenance of buildings and staff quarters.	• Built infrastructure must be regularly maintained. • Staff quarters needs to be renovated. • Patrolling stations needs to be renovated and equipped with staff welfare facilities like toilets and water filters.
2	Developing infrastructure for wildlife rescue and medical care.	• Procurement of specialised rescue vehicles, traps, cages, nets, and tranquilizing equipment. • Training of rescue staff in rescue techniques and utilisation of rescue equipment. • Maintaining a digital database of wildlife diseases noted from rescued animals.
3	Augmenting ecotourism infrastructure.	• Aranyak campsite needs a revamp with more site planning and improved infrastructure using eco building materials.

		• Facilities at Dudhsagar needs revamp, with improved toilet and dress-changing facility. • Divyaang friendly access ramps must be created at all ecotourism facilities including toilets. • Online system for booking ecotourism facilities must be initiated. • Nature Education Centre (NEC) needs to be upgraded to include latest biodiversity information from the protected area. The displays need to be made interactive for visiting students. Content creation for NEC can be done in consultation with local researchers or NGOs. • Dormitory at the range forest office campus needs to be renovated and toilet facility at range forest office complex for visitors needs to drastically improve. • Visitor watcher towers, bird hides and bird water baths need to be installed to attract wildlife photographers. • Canopy walkway at Arannyak campsite must be renovated. • Nature trails must be maintained and marked for clarity. Infographic boards may be installed along the nature trail for information. • Existing trails, forest roads, PWD roads, patrolling paths need to be maintained as per the existing rules.
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6. To understand issues relating to human-wildlife conflicts and mitigate it through awareness, incentivisation and compensation.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Degradation of habitats near human settlements	• Appropriate habitat improvement works need to be undertaken to re-stock the forests in such areas. • Priority for daily wage employment for people living in fringe areas and inside the protected area. • Training of people living in fringe areas and inside the protected area on mushroom cultivation and

		apiculture can provide more sustainable source of income and can reduce their dependence on the nearby forested habitat for income. • Creating more cattle proof trenches to dissuade domestic animal movement inside the protected area.
2	Disturbance and collision-based accidents due to movement of vehicles and railway.	• View line along the road to be of at least 15 to 20 meters • Traffic can be regulated at certain times of the day, especially at night. • Patrolling on the national highway to ensure travellers do not break speed limits or stop in between. • Signages to be prominently placed at regular intervals to caution drivers. • Wildlife over and underpass at strategic locations can be built. • Canopy crossing bridges needs to be installed at specific locations. • Regular surveys to monitor status of accidents due to vehicular collisions need to be undertaken. • Appropriate mechanism to regulate rail and other vehicular movement in Protected Areas for reducing casualty to be evolved and implemented.
3	Effective waste management practices in few settlements within Bhagwan Mahavir Wildlife Sanctuary and National Park.	• Awareness activities to be conducted at panchayat, school and college levels on the ill effects of garbage and littering on wildlife and focusing on it as a source of attracting animals outside the forest hence causing human-wildlife conflict. • Need to work in tandem with local village panchayat and Goa Waste Management Corporation for effective disposal of dry and wet waste.

4	Timely settlement of forest rights and wildlife conflict compensation to build trust between community and staff.	• Assessment of damages and disbursement of compensation must be fast tracked. Forest rights claims needs to be disposed in quick manner for safeguarding interest of all parties.
5	Resettlement of human settlements from within Bhagwan Mahavir Wildlife Sanctuary and National Park	• Scheme to ensure adequate compensation and rehabilitation must be planned and offered to facilitate voluntary exit of all settlements from Bhagwan Mahavir Wildlife Sanctuary and National Park.
6	Human-wildlife conflicts responses	• Regular public awareness campaigns by staff in tandem with local NGOs to sensitise the need for wildlife conservation and ways to mitigate conflict. • Local administration including staff at district collector's office, local panchayat and local police station need to be made stakeholders while developing human-wildlife conflict strategies and appropriate training may be provided to them. (challenges faced during the wildlife conflict inter departmental coordination should be further improvised and SOP to deal all such Human wildlife cases should be made available in place in a time bound manner in letter and spirit, joining training /capacity building of all concerned staff may also be planned) • Dedicated training for staff for mob control in case of human-wildlife conflict scenario to be imparted

7. Creating awareness and building confidence within the local communities living in and around the protected area for promoting wildlife conservation.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Effective community participation in management of the protected area. Enhanced involvement of community participation.	• Creation of EDC for livelihood improvement and forest protection for sustainable development. • Mandatorily locals be engaged in seasonal forest works
2	Awareness generation activities	• Organising national events such as wildlife week, Vanmohatsav and bird festival at local scale in panchayat level by involving local NGOs and youths be encouraged • Regular awareness activities on benefits of biodiversity, nature trails etc. • Exhibitions and displays on wildlife conservation in various places on occasion of National and State Functions. • Line department, experts may be involved for knowledge exchange among villagers

8. Provide for Capacity building of field staff to update and acquire skills to contribute to the overall mandate of the conservation management.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Improvisation and enhancement of technology in wildlife management with regular capacity building for staff,	• Training in handling of latest safety equipment, weapons, and their maintenance. Goa Police and defence forces can be approached for providing training on this component. • Training on utilization of latest wireless communication technology and its maintenance. Indian Army's 2 –

		Signal Training Centre can be requested for providing this training. • Training on wildlife monitoring, latest GPS technology and map reading must be provided by competent experts. • Training on basic wildlife forensics, evidence collection storage and interpretation biological materials. National Forensic Sciences University may be approached for providing this training.
2	Legal literacy	• Training on legal aspects of wildlife law enforcement must be regularly conducted to prepare the staff to present the case for logical conclusion.
3	First aid training and capacity building	• Training must be provided on animal health and nutritional requirements, animal behaviour, food habits and habitat requirements. • Basic training in first aid for self and first aid/post-mortem techniques for animals.
4	Ecotourism and Civil Skills	• Basic training in civil construction, and training as 'guides' for execution of ecotourism related activities. Goa Engineering College and Tourism Department can be approached for such training.

9. To promote research in the protected area and use the findings to improvise and innovate conservation management.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Streamlining responsibilities and improving accountability	• It must be made mandatory for researchers to submit a quarterly report for local researchers or expedition-based reports for visiting researchers with strict implementation of deadlines. • Researchers must submit data in easily comprehensible format like checklists, figures, and geotagged data.

		• Researchers must immediately report to the range forest office about important observations, findings or violations observed during their tenure of research.
2	Simplification of research permits	• Clear guidelines and procedures for application of research permits need to be made available on the website of the department. • An online portal for application of permits may be explored.
3	Lack of funding for local institutions.	• Specific small grant funding can be provided by the department to promote local researchers to take up research specific to Protected Areas.
4	Development of publications	• Department must institute publication of a bi-annual magazine that will contain research updates from protected done by in-house, local, and visiting researchers in simple language. • Annual conference on wildlife research can be conducted in parallel with the bird festival of Goa to promote sharing of idea and knowledge.

10. Encourage student and general public visitation to Bhagwan Mahavir Wildlife Sanctuary and National Park for instilling within them knowledge and love for wildlife and conservation of nature.

S.No.	Existing Issues /Problems/Challenges	Mitigative Actions
1	Encouraging students and general public in nature education	• Facility to promote student visitation at range forest office complex must be improved by construction of a hall/ covered space for conducting such activities. • Competitions on wildlife week or other national important festivals must be conducted in the RFO complex upon completion of facility to conduct such events.

		• Toilet facility must be improved. • Nature trails, specific to promoting educational activities for students must be prepared with sufficient signages and on the trail activities. • A staff must be stationed and trained to specifically conduct such educational trail activities at the RFO complex. • Audio-visual short films specific to the protected area must be screened at the nature education centre for students. • Preparation of short educational films about each protected area needs to be commissioned that can be used for educational activities. • Existing dormitory needs renovation, and a new dormitory needs to be constructed on the model present in Bondla Wildlife Sanctuary.
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CHAPTER 6

THE STRATEGIES

A well-defined wildlife management plan for a protected area, shall have comprehensive strategy document aimed at conservation of species and habitats, mitigation of Human Wildlife Conflict, deterring wildlife crime and trade, and creating awareness among the citizens. The below strategies have been envisioned for the optimal management of Bhagwan Mahavir Wildlife Sanctuary and National Park.

6.1 BOUNDARIES

Bhagwan Mahavir Wildlife Sanctuary and National Park is spread over an area of 240 km². The wildlife sanctuary is spread across an area of 133 km² while the National Park encompasses an area of 107 km². The Union Territory of Goa, Daman and Diu enacted the Wild Animals and Wild Birds Protection Act, 1965 (Act 21 of 1965) and under section 18 of the said Act, a Wildlife Sanctuary, viz. Molem Wildlife Sanctuary was notified vide notification no. DF-894-FOR-67 dated 28.12.1967 Subsequently, a National Park admeasuring 107 km² was notified within Mollem Wildlife Sanctuary vide notification no. 8-3-77-FOR dated 13.04.1978 out of the area of the Sanctuary measuring 240 km² vide proclamation by the Forest Settlement Officer dated 02.03.1979 under section 35 of the Wildlife (Protection) Act, 1972.

Internally, Bhagwan Mahavir Wildlife Sanctuary and National Park is divided in to 15 beats, of which seven are in the Wildlife Sanctuary and 8 are in the National Park. Boundaries are delineated based on physical features like streams, ridge lines or roads.

The boundaries are not clearly demarcated on ground at several areas, which gives a scope for dispute, encroachment, and human animal conflict. It is recommended that the boundaries of Bhagwan Mahavir Wildlife Sanctuary and National Park both external and internal must be demarcated with stone/ concrete pillars, rock cairn, and/or rubble wall, with appropriate signage declaring the boundaries. Internally, beats may also be demarcated with

stone/ concrete pillars, rock cairn at regular intervals. In some beats, external boundaries are demarcated by cattle proof trenches (CPT). Such existing demarcation structures need regular maintenance and repairs. Provision of sufficient budget in the annual plan for boundary materials must be done for efficient maintenance. Further, block name, compartment number and number of the pillar should be inscribed on the stone/concrete pillar and records of the same should be maintained in a register maintained at range and division level. It needs to be noted, that several geo-locations of important physical assets, including existing digital boundaries both internal and external from Bhagwan Mahavir Wildlife Sanctuary and National Park, have a significant error margin. Such errors need to be fixed by conducting special D-GPS surveys followed by ground truthing and adopting advanced GIS platforms.

6.2 ZONATION

Zonation is a process of demarcating areas within a protected area, based on purpose and priorities for management. In general, two zones are traditionally demarcated within any protected area viz. a “Protection zone” free of all human use, and a “Conservation” zone having conservation-oriented land use. The management plan for every protected area is then based on the three cardinal principles: a) Elimination of all kinds of exploitation and disturbance from the protection zone, while rationalizing such activities in the conservation zone. b) Limiting the habitat management to repairing the damages inflicted on it by biotic pressure so as to resurrect the habitat in its natural form and c) Researching facts about habitats and wild fauna, while monitoring the changes in flora/fauna owing to management initiatives.

The Conservation zone/multiple use area is a delineated area around a Protection Zone of a National Park or Sanctuary, which facilitates:

- a) Providing Habitat Supplement to the spill over population of wild animals from the protection zone.

- b) Providing socio economic function to local people living in such areas so that their resource dependency on the protected area is reduced.
- c) The habitat conserved in the conservation zone also serves as a corridor for wild animals.

Three zones are recommended for demarcation in Bhagwan Mahavir Wildlife Sanctuary and National Park, viz.

Bhagwan Mahavir National Park and Wildlife Sanctuary

- i. Protection Zone
- ii. Conservation Zone
- iii. Eco-tourism Zone

Protection Zone: An area within the Protected Area earmarked for higher degree of protection considering its vital importance of biological diversity and the landscape.

Conservation Zone: An area earmarked for interventional management of habitat for betterment of wildlife conservation and sustainable utilization of resources and enhancement of livelihoods including eco -tourism without compromising the core objective of Protected Area management.

6.3 ZONE PLANS

Bhagwan Mahavir Wildlife Sanctuary and National Park has been zoned into three areas as discussed. The National Park divides the Wildlife Sanctuary into two regions viz. north and south part. For administrative purposes the zonation is shown at a higher resolution unit wise.

National Park:

Bhagwan Mahavir National Park is spread over an area of 107km². Goa's most important ecotourism area – Dudhsagar waterfall is located within this park. Further, major ecotourism facilities of the park are located towards the western boundary of the park. The National Park shares 10.2 km of its boundaries with non-protected regions along which conservation zone has been identified and demarcated. Ecotourism zones have been demarcated to fulfil provisions of ecotourism activities and infrastructures within the provisions of Wildlife Protection Act 1972.

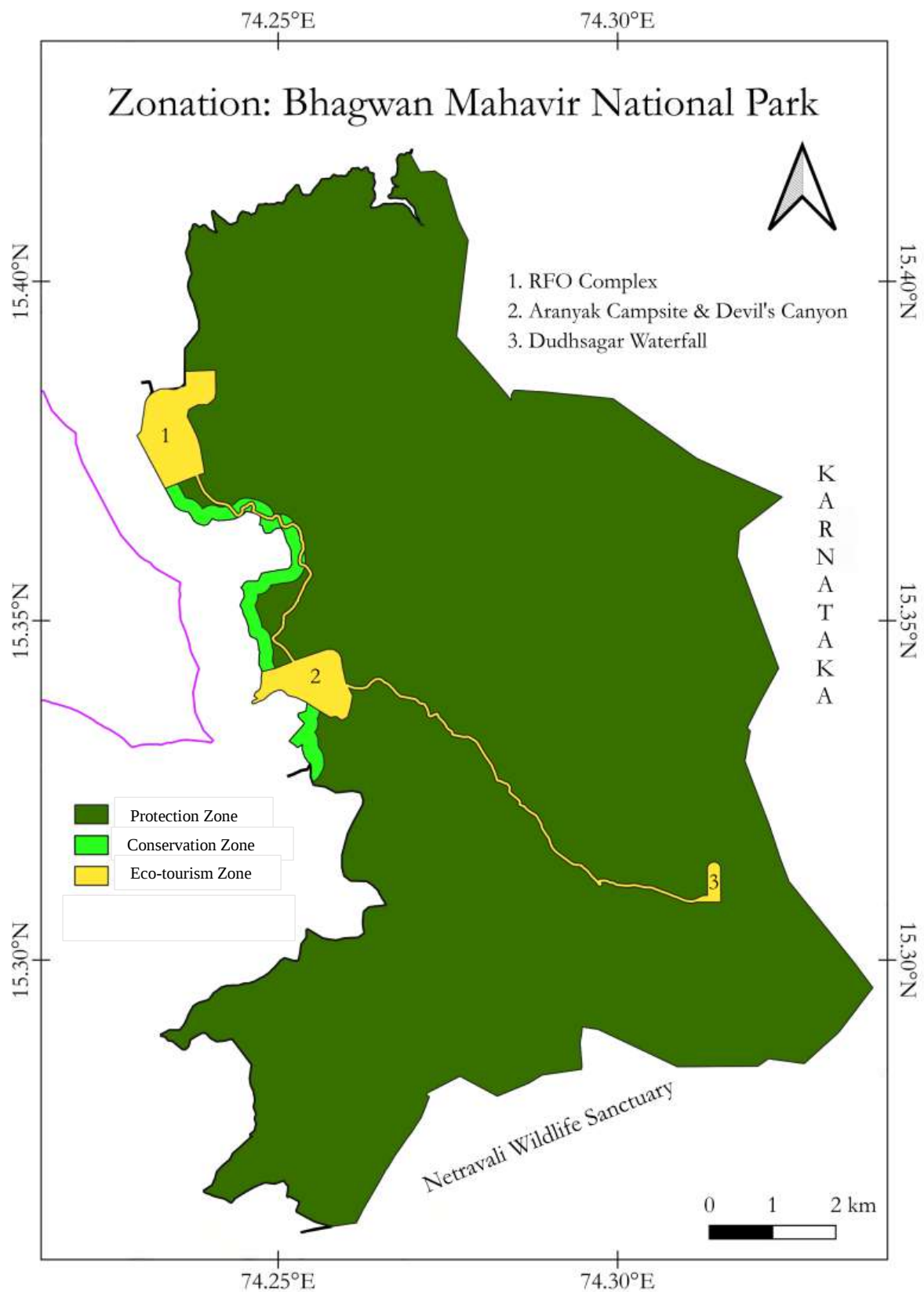
Zones in National Park	Area (Km)	% Coverage
Protection Zone	100.38	93.81
Conservation Zone	3.35	3.13
Ecotourism Zone	3.27	3.06
Total	107	100

Wildlife Sanctuary:

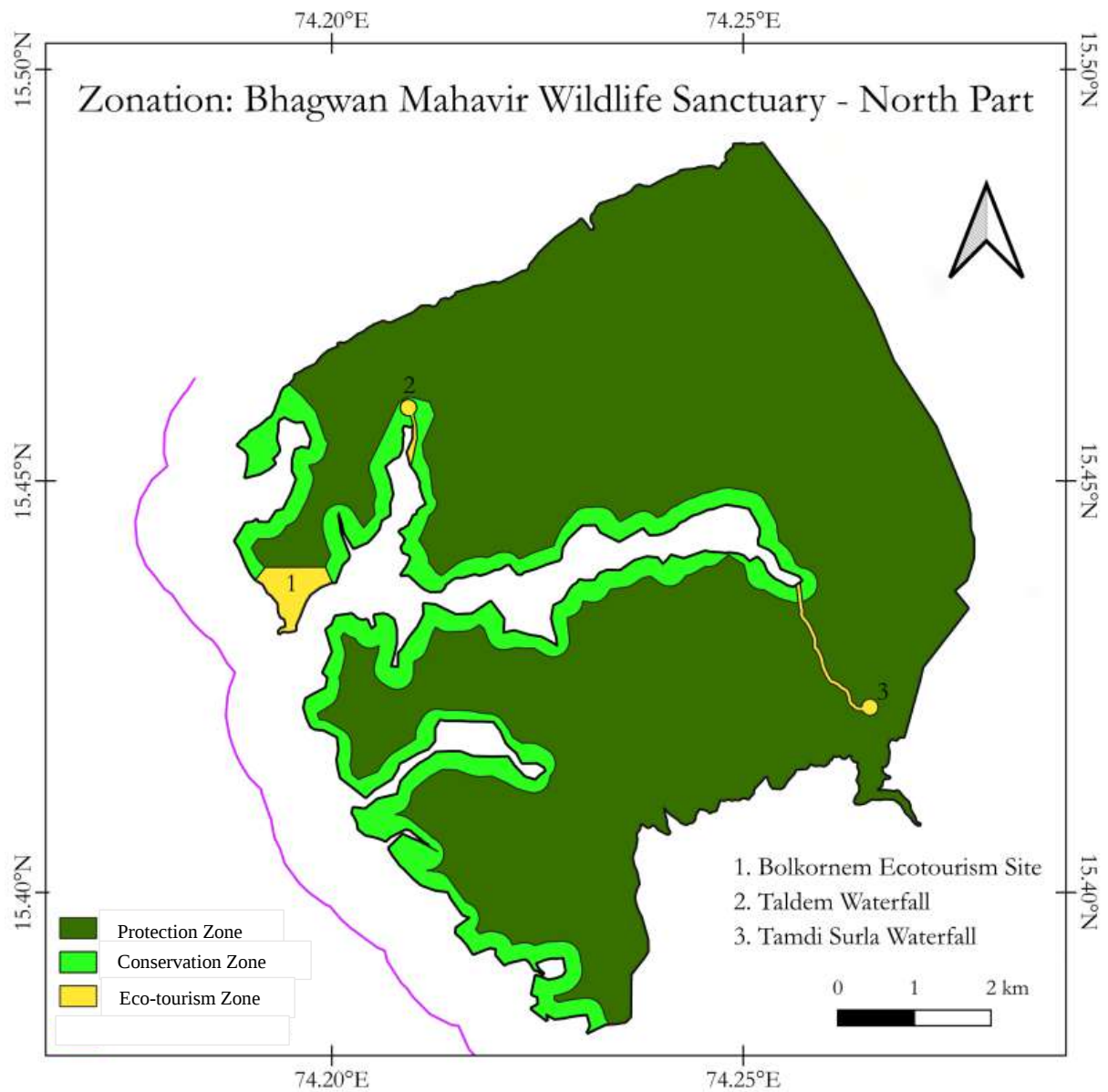
Bhagwan Mahavir Wildlife Sanctuary is spread over 133 km² and is bisected into two regions viz. north and south. The north zone is spread over 66.11 km² while the south zone is spread over 66.89 km². Ecotourism activities have been identified in north zone and encompasses an area of 0.66 km².

Zones in WLS North Part	Area (km²)	% Coverage
Protection Zone	53.22	80.50
Conservation Zone	12.23	18.50
Eco-tourism Zone	0.66	1
Total	66.11	100

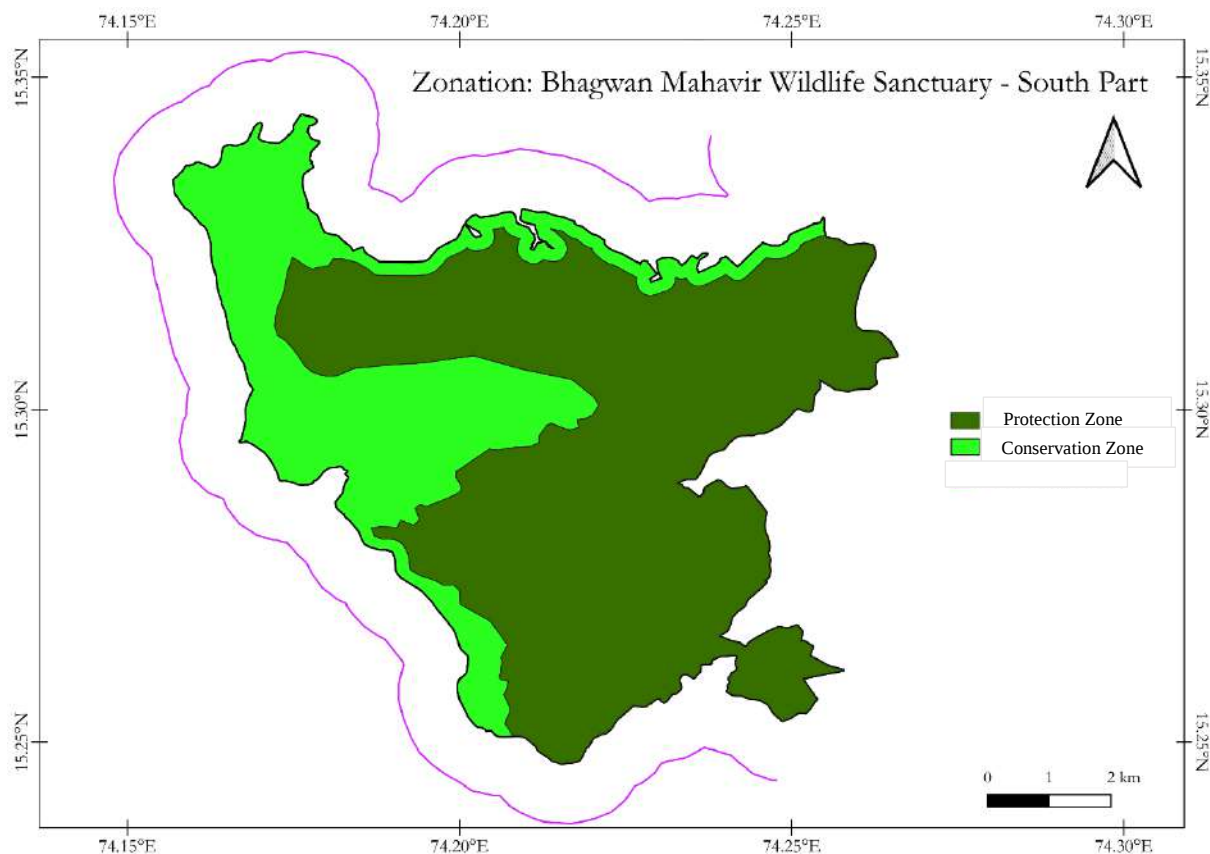
Zones in WLS South Part	Area (km²)	% Coverage
Protection Zone	45.06	67.35
Conservation Zone	21.84	32.65
Eco-tourism Zone	-	0
Total	66.89	100
Grand Total North Portion + South Part	133	



Map No.6.1: Zonation map of Bhagwan Mahavir Wildlife Sanctuary & National Park



Map 6.2: Zonation map of Bhagwan Mahavir Wildlife Sanctuary, North



Map 6.3: Zonation map of Bhagwan Mahavir Wildlife Sanctuary, South

6.3.1 PROTECTION ZONE

Protection zone is a distinct management entity that is also the ‘Sanctum sanctorum’ of a Protected Area. An important objective for setting up a core area is to conserve such areas as centre of ecological reference and ecological processes and to maintain at least a good percentage of the key habitats, elements of conservation importance such as species, communities, and populations under reduced threats (Sawarkar, 2005). The Protection zone has good and undisturbed mix of evergreen, semi-evergreen, moist deciduous forests with good clumps of bamboo forests. In the protection zone, natural ecological process shall be allowed to continue and in this minimal management interventions will be introduced.

6.3.1.1 OBJECTIVES

The following objectives and strategies have been formulated for the Protection zone.

1. To give priority to protection, conservation, and preservation of species in their natural habitat.
2. To allow minimal external influences and undertake required scientific management.

6.3.1.1 STRATEGY RECOMMENDED

1. Protection- Effective protection to the wild animals against poaching, interference by grazing, dangers from fire, and other natural hazards shall be provided. This needs to be achieved through establishment of adequate number of anti-poaching camps, increased patrolling, enhanced communication facilities, and monitoring.
2. Habitat management- Various habitat management practices such as invasive species eradication, desilting, soil and moisture conservation activities, creation, and maintenance of fire lines especially around moist deciduous forests and high elevation grass patches, and invasive weed control must be undertaken, but with extreme caution to cause minimal interference to natural ecological processes.
3. Establishment of manual check posts, antipoaching squads in sensitive areas

6.3.2. CONSERVATION ZONE

Conservation zone can be defined as the zone that acts as a cushion to absorb all the shocks of biotic impacts and does not let them affect the protection zone. For the Sanctuary and National Park, the conservation zone has been identified considering ground situation.

6.3.2.1 OBJECTIVES

The following objectives have been formulated for the conservation zone.

1. To create conducive safe environment and resources for wild animals to thrive.
2. To undertake activities for awareness generation in the local people to sensitize them towards nature, wildlife, and the importance of conserving the sanctuary area.

3. To encourage eco-tourism related activities to generate local employment and a sense of belongingness towards the sanctuary.
4. To undertake eco-development activities to reduce the dependence of people on forest resources and to improve their economic status to garner more local support for the sanctuary.
5. To undertake habitat management and habitat improvement activities, including soil and moisture conservation, enhancing foraging species of plants and to make adequate water availability in important areas.
6. To improve connectivity and communication.

6.3.2.2 STRATEGY RECOMMENDED

1. Creation of grassland/ fodder patches/ waterholes to increase prey population.
 - a. Waterholes at regular intervals needs to be augmented for catering the request of wild animals in lean season.
 - b. Grassland/ fodder patch to be created a maintained at suitable arte for increasing the herbivore population.
2. Reducing biotic pressure –
 - a. Eco-development committees can be created, and pressures in the buffer zone like grazing can be regulated through these committees.
 - b. Support of these committees can also be taken for protection, fire control and other habitat management activities to provide employment to the local people.
 - c. Immunization of livestock in the buffer zone should be carried out on an annual basis.
 - d. The villagers can be provided solar lighting and access to clean drinking water and subsidised fodder etc to reduce their dependence on forest resources.
3. Planning and execution of eco-tourism related activities -

Eco-tourism activities and facilities need to be taken up and upgraded in conservation zone.

The details of the eco-tourism activities have been described in chapter-7 of the plan.

6.3.3. ECOTOURISM ZONE

The ecotourism zone is that part of the sanctuary where regulated tourism is allowed without disturbing the natural integrity of the ecosystem. Unlike protected areas in adjoining Karnataka and Maharashtra, the probabilities of wildlife sighting are low in Bhagwan Mahavir Wildlife Sanctuary and National Park because of the steep terrain leading to less attractive flagship animals and absence of large mammals like Elephants for promoting safari. The protected area however has good densities of Leopards, small carnivores, and other mammalian herbivores. This status caused by geographical conditions, automatically limits the possibility of safaris. However, there is a huge potential for bird tourism. Other than this, the famous Dudhsagar waterfall is present in the protected area and several identified trekking routes which can be highly attractive and challenging to the trekkers and nature lovers are present. Additional tourism facility must be created, and existing facilities must be upgraded with birdwatching and trekking as the core activities. Therefore, the tourism zone is identified in the form of a dendrite pattern of identified trekking routes, access routes to waterfalls and few spots in the periphery of the sanctuary or in the buffer zone of the sanctuary.

Create view lines of at least 25 mtr width from trails and maintain them for better viewing of wildlife on certain approach roads, strategic places, watch towers and canopy walkways and also birding trails for photography.

6.3.3.1 OBJECTIVES

1. To create and refurbish existing eco-tourism facilities as per applicable guidelines issued from time to time.
2. To provide maximum satisfaction to the visitors besides creating nature awareness and conservation.
3. To provide gainful employment opportunities and green job to local communities through eco-tourism activities.

6.3.3.2 STRATEGY RECOMMENDED

1. Providing camping and accommodation facilities:

The Aranyak Campsite has currently four Swiss tents and four single pole tents. The Range Forest Office has one dormitory that can accommodate ten people. Existing structures be refurbished and to upgrade the existing eco-tourism facilities including Aranyak Camp site. As GFDC has been made as nodal agency for conducting eco-tourism activity in forest and wildlife area of Goa, we may augment more facilities by improvising the existing eco-tourism facility.

2. Creation of nature interpretation facilities:

Existing nature interpretation facilities are at Range Forest Office Mollem to be improvised for educating the visitors, who visit the protected area. A nature interpretation centre at Arannyak Campsite be used to the fullest for showcasing fundamental and important aspects of a forest and wildlife for enhancing visitor's experience.

3. Erecting identification boards and signages:

All along trekking paths and nature trails, identification boards should be erected for the important tree species, mammals, birds, reptiles, amphibians etc. Focus can be on endemic and endangered species of the protected area. Signages depicting the map of the sanctuary along with the trekking/ nature trails and dos and don'ts to be followed inside the sanctuary area should be erected at all important points.

4. Conducting nature trips/camps for students:

On wildlife week and other important days of national importance, students must be given day trips to important areas within the protected area, as well as to other recreational facilities available near protected area like the Biodiversity Park. Through this, students will get an exposure of the flora and fauna of Bhagwan Mahavir Wildlife Sanctuary and National Park and will develop empathy towards wildlife.

5. Improved visitor's facility:

All along trekking trails and other areas of importance within the ecotourism zone, facilities like clean drinking water, toilets, resting shades, changing room, canteen, viewpoints and watchtowers must be provided at all eco-tourism sites including at Dudhsagar waterfall circuit.

6. Customized Wildlife Tours-

Department/GFDC by involving naturalist, nature guides, and experts may organise customized wildlife nature camps/tours by engaging local community as per guidelines issued in this regard from time to time.

6.4 THEME PLANS

Theme plans for achieving objectives on conservation of biodiversity, habitat management, improvement of infrastructure and communication and creating awareness on wildlife conservation is discussed in this section. Strategies recommended in the zone plans are explained in detail within the theme plan. These theme plans are applicable to both the wildlife sanctuary and National Park unless specified within this section specifically. Strategies for human animal coexistence with respect to linear structures within the protected area are given separately for the national highway, railway, major district and village roads and electricity line.

The themes covered for achieving objectives under these are:

1. Wildlife Protection
2. Habitat management
3. Fire Protection
4. Soil and water conservation
5. Invasive species control
6. Wildlife Rescue and monitoring
7. Zoonotic disease monitoring

8. Anti-encroachment monitoring
9. Upgrading network and communication system
10. Human-animal coexistence.

6.4.1 THEME PLAN FOR WILDLIFE PROTECTION

6.4.1.1 ANTI-POACHING CAMPS:

It is necessary to maintain adequate number of anti-poaching camps inside the sanctuary at various strategic locations for regular perambulation and immediate action in case of emergencies. Currently there are nine anti-poaching camps in Bhagwan Mahavir Wildlife Sanctuary and National Park, which is much lesser than what is required for effective patrolling against illegal activities. The future locations of these camps need to be determined considering the vulnerability of the places. For improving the condition of existing anti-poaching camps and keeping the morale of the staff high, following measures are suggested:

1. All the existing stations must be regularly maintained as these stations are prone to roof leakage and wall damage due to heavy rainfall.
2. Construction of few more stations in more vulnerable locations.
3. Regular maintenance of the stations and addition of basic facilities such as toilets.
4. Providing basic furniture such as cots, chairs, almirah, utensils, blankets, gum boots, jerkins, raincoats etc to meet up the basic requirements of the staff.
5. Strengthening of anti-poaching camps with equipment such as effective arms, wireless, LPG, cooking facility, solar light, safe drinking water facilities, inverter units etc.

It is recommended that beats bordering human settlements shall have at least two anti-poaching constructed strategically, to increase efficiency of mobilising and cordoning in case of emergencies. Each of these camps must further be enabled with adequate facilities and staff for efficiency in operations.

6.4.1.2 STAFFING:

The existing anti-poaching camps are manned with Forest Guards and trekkers. At present number of forest guards are only 13, with three labours manning Anmod and Sonaulim patrolling station at day and four manning Nandran and kalay at night, totaling seven personals. Hence, of the nine existing camps, only four have active personals which is grossly inadequate. Considerable number of vacancies exist in the Wildlife Sanctuary and National Park as the present staff strength is far below the required strength. Besides the quality of staff is also a critical issue, the strenuous nature of work and various challenges such as living in adverse situations, risk from encounter with wild animals, need to walk on difficult terrain necessitate that the camps are manned with quality staff. It is desirable that the field staff deployed for protection work in the sanctuary must be young, energetic, courageous and Conservation oriented. It is also desirable that field staff are properly trained in handling arms and wildlife management. Following steps are proposed to improve the staffing pattern:

1. Filling up the vacancies of field staffs.
2. Deployment of relatively young staff.
3. Regular training of field staff in collaboration with expert organisation/institutes/Departments for training and capacity building in wildlife management including protection.
4. To reinforce the existing camps with a greater number of temporary staff to provide regular strength in patrolling duty.

6.4.1.3. MOBILITY:

Mobility inside the sanctuary is difficult due to the terrain and thick vegetation. During dry season from November to April mobility is comparatively easier. However, during monsoon season starting from June and lasting till end of September, it becomes difficult to use the existing roads within the sanctuary because of fallen trees, mud slips etc. The existing roads should be maintained on a regular basis after the monsoons and adequate funding needs to be

made available for this activity.

Bhagwan Mahavir Wildlife Sanctuary and National Park, has one truck, four pickup vehicles and seven two-wheelers. This needs to be supplemented with more vehicles, especially two-wheelers & 4x4 wheeler to make patrolling more effective and efficient. Existing vehicles need to be maintained regularly to ensure vehicles do not go out of commission. Of these vehicles, the TATA SFC 709 Truck was purchased in 2007 and has completed 15 years in operation. So, it is under write off. A newer truck needs to be purchased to ensure continued utility of this grade of vehicle

6.4.1.4. PATROLLING:

Regular patrolling of Bhagwan Mahavir Wildlife Sanctuary and National Park is a must for effective protection of valuable flora and fauna in the protected area. At present the Wildlife Sanctuary and National Park staff, patrol the beats at daytime and regularly patrol the area in vehicle during nights. The patrolling staffs are equipped with, wireless and torch lights. They record every observation in course of their patrolling in daily diary and report regularly to the Range head quarter.

Measures necessary for efficient patrolling:

1. All existing patrolling paths should be cleared and maintained regularly to provide safe movement to field staff for patrolling.
2. Providing all basic logistic to field staff such as wireless equipment, flashlight and torches, jungle boots, machete knife, medicines, arms, and ammunition (where required) etc. One pair of uniform and two pairs of jungle boots should be provided to each field staff every year. Other items of uniforms such as raincoat, pull over etc. should be provided to staff every two years.
3. A quality binocular should be provided to each patrolling station to enhance the range of visibility for effective patrolling. Provision of some night vision binoculars in the

Range and Round offices will help in effective patrolling and detection during emergencies.

4. Construction of more watch towers at strategic locations will enhance the efficiency of patrolling staff. A mobile patrolling party organized from the Range and Round can also check and cross check the areas covered by various stations to supervise the patrolling activities.

To ensure effective patrolling, following new patrolling tracks have been identified.

Sr.No	Round	Section	Length (Km)
1	Mollem	Forest Patrolling path from Avedmol to Vasant Bandra Mollem Round	3
2	Kalay	Forest Patrolling path from Karemol to Perini Kalay Round	3.5
3	Collem	Forest Patrolling path from Maida to Shiregal Collem Round	3
4	Kalay	Forest Patrolling path from Dongurlim, Mauliguem, Oxel to Bhoma of Kalay Round	5.5
5	Mollem	Forest Patrolling path from Atli to Mystic Point Mollem Round	2

6.4.1.5. REGISTRATION OF FIREARMS AROUND THE PARK:

In accordance with the provisions of the Wildlife Protection Act, 1972, registration of the gun license holders in the 10 km belt around the sanctuary was done in the year 1999. The list needs to be updated immediately and reviewed annually.

6.4.1.6. FLORA AND FAUNA MONITORING

Forest guards of respective beats are assigned and tasked to maintain a field diary which records their observation in general about the beat. This diary however is qualitative in nature and does not aid in collecting systematic quantitative information. While expecting forest guards to collect extensive floral and faunal information is not advised since it will add to their

existing duties, it is recommended to prepare set of indicator flora and fauna. These indicator species must be chosen in a way such that they represent the status of the beat. Taxa such as mammals, birds, butterflies, odonates, reptiles and amphibians can be selected for this monitoring exercise. In consultation with a forest botanist, a list of indicator tree species can also be created for monitoring. Specific training must be provided to guards for enhancing their identification skills in these target taxa. Recently adopted M-Stripes module by Wildlife North division to be stepped up and used by all staff involved in patrolling duty. However, data sheet format created for monitoring wildlife be made available to the executive staff for manual record entry through M-Stripes app, all observation can be digitally recorded, stored and transmitted.

Data Sheet for Fauna Observations						
Observers name -----						
Start Time -----						
Date						
End Time:						
Forest Division:						
Range -----.						
Beat -----						
Total Kms. Walked -----Km.						
Times Spent in any other activity -----Min.						
S. no	Time	Species	Numbers	Sign type	GPS	Remark

Data Sheet for Flora Observations

Observers name -----

Start Time -----

Date

End Time:

Forest Division:

Range -----.

Beat -----

Total Kms. Walked -----Km.

Times Spent in any other activity -----Min.

S. no	Species	Flowering	Fruiting	Sign of Damage/Disease	GPS	Remark

For robust information of species diversity and population estimates of fauna and densities of floral diversity, dedicated survey efforts should be put in by the department with assistance of research institutions and NGOs who could do such surveys.

6.4.2 THEME PLAN FOR GRASSLAND HABITAT MANAGEMENT

Immediately available land for grassland development is exotic plantation sites like one occupied by Acacia plantation and Cashew plantation of GFDC which are under process of handing over. So these area shall be systematically used and grass species of fodder importance be planted during the plan period. The land identified for grassland development be secured and necessity resources be augmented for proliferation. However, additional grasslands under habitat enrichment scheme can be added to the above proposed list as and when required with the approval of the Chief Wildlife Warden from time to time.

Table No16. List of grass species recorded and preferred in Bhagwan Mahavir Wildlife Sanctuary & National Park.

Sr. No	Animal	Species
1	Gaur	<i>Adina cordifolia</i> , <i>Desmodium triflorum</i> , <i>Strobilanthes callosus</i> , <i>Grewia sp</i> , <i>Helicteres</i> and <i>Vitex negundo</i>
2	Spotted deer	<i>Ficus species</i> , <i>Cordia myxa</i> grasses
3	Hanuman Langur-	<i>Acacia indica</i> , <i>Ficus racemosa</i> , <i>Ficus bengalensis</i> , <i>Diospyros melanoxylon</i> , <i>Ficus religiosa</i> , <i>Madhuca longifolia</i> , <i>Mangifera indica</i> ,, <i>Syzygium cuminii</i> , <i>Tamarindus indica</i> , <i>Aegle marmelos</i> , <i>Holoptelia integrifolia</i> , <i>Lannaea coromandelica</i> , <i>Terminalia arjuna</i> , <i>Ziziphus</i> , <i>Carissa caranda</i> , , <i>Pithecellobium dulce</i> , <i>Albizzia procera</i> , <i>Grewia sp</i> , , <i>Bombax ceiba</i> , <i>Abrus precatorius</i>
4	Bonnet Macaque	Mango, wild figs, tamarind, neem, gulmohar, and pongamia, <i>Caryota urens</i> , <i>Syzygium cumini</i> , <i>Ficus religiosa</i> , <i>Mimosa pudica</i> , <i>Bambusa sp</i> , <i>Ficus sp</i> , <i>Strychnos nux-vomica</i> , <i>Terminalia</i> , <i>Artocarpus heterophyllus</i> , <i>Areca catechu</i> .

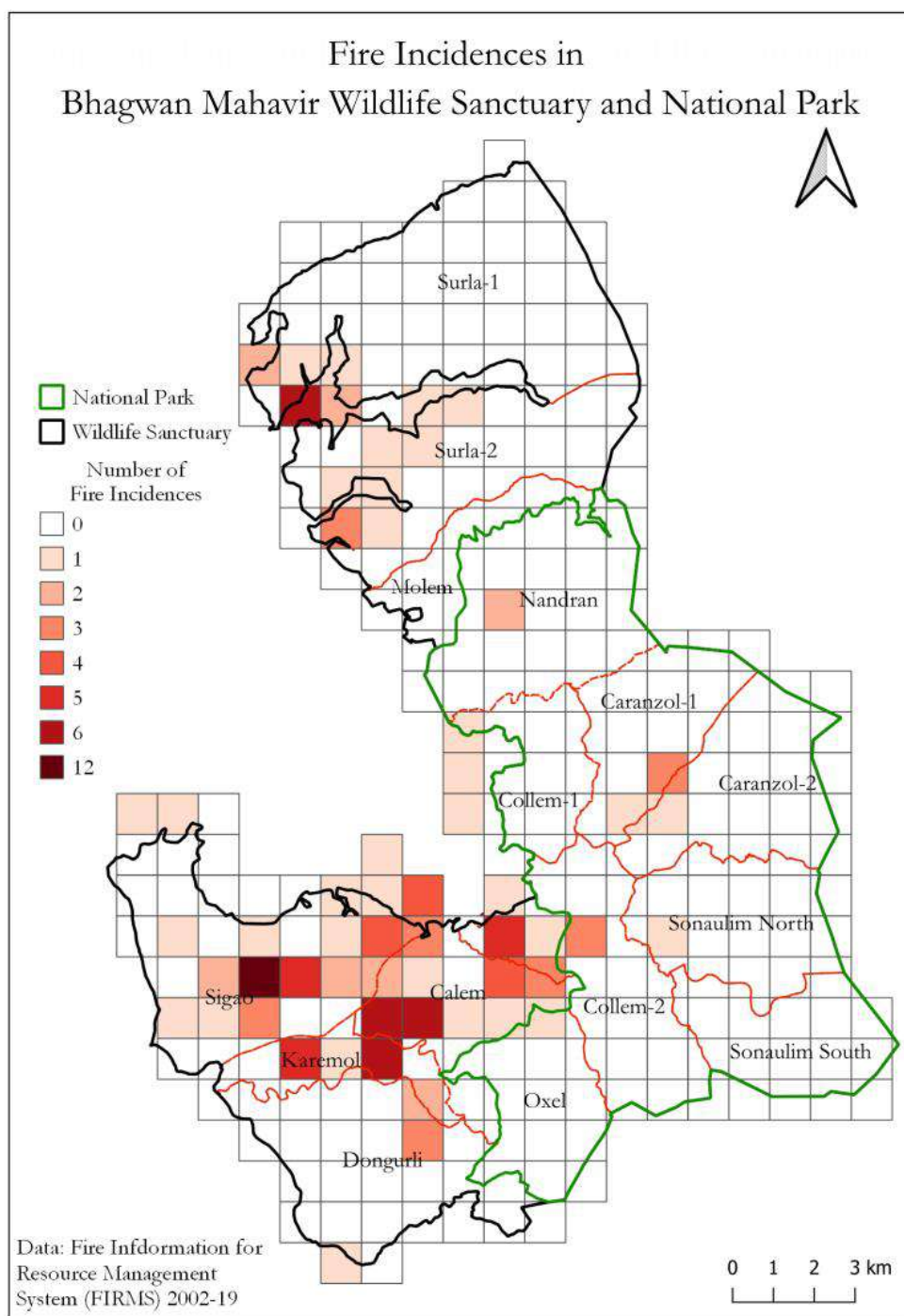
Table No.17 List of grass species recorded and preferred in Bhagwan Mahavir Wildlife Sanctuary & National Park.

S.No.	Species
1	<i>Paspalum canare</i>
2	<i>Heteropogon contortus</i>
3	<i>Ischaemum indicum</i>
4	<i>Oplismenus compositus</i>
5	<i>Psuedechinolaena polystachea</i>
6	<i>Arthraxon lanceolatus</i>
7	<i>Dichanthium annulatum</i>
8	<i>Cynodon dactylon</i>
9	<i>Chrysopogon hackeli</i>
10	<i>Panicum maximum</i>

6.4.3 THEME PLAN FOR FIRE PROTECTION

During the dry period from December to May, there is considerable risk of fire, especially in the southern beats of the Wildlife Sanctuary in Sigao, Karemol, Calem, Dongurlim and the wildlife sanctuary section of Collem 2 beat. High fire incidence rates are also seen in Bolkornem region in Surla 1 beat. There are medium instances of fire in Surla 2 beat. Fire causes considerable damage if it is not controlled in time. Uncontrolled fire has devastating results such as loss of biomass, humus, and food for herbivores. It also results in loss of regeneration of understory vegetation, important insects and insect larvae, ground nesting birds, and fossorial mammals. In the past 17 years, the National Park segment however has had fewer fire incidents. From the distribution of fire incidences, most strategies for mitigating fire incidences must be employed in Bhagwan Mahavir Wildlife Sanctuary – South. Strategies outlined below must be taken up by priority in Sigao, Karemol and Calem.

Map No.6.4 Fire Risk Zone Map of Bhagwan Mahavir Wildlife Sanctuary and National Park



Following strategies are proposed to tackle the problem of fire:

1. Engagement of fire watchers:

For monitoring and containment of forest fire during fire season, fire watchers are engaged between December to May across state, local youth are deployed for this purpose by imparting basic training along with other staff, they are placed at strategic places to monitor incidence of fire and to inform forest frontline line of respective area on real time basis, so as to control / douse fire in shortest feasible time.

2. Creation of fire line:

Fire lines are created across risky / identified areas by making a buffer by removing dry combustible material in a width of minimum 2 mtrs across forest floor to break continuity of fire creeping on forest floor.

3. Control burning:

Dry biomass on forest floor is medium for forest fire spread, so as to prevent fire, control burning activities are taken up at identified places in forest, along either side of roads and linear ways by gathering and burning dry leaf litters and dry biomass, it is one of most effective ways to reduce fuel load in a controlled environment.

4 Infrastructure:

As stated above, considering fire risk involved, assessment of firefighting equipment is carried out and required number of such equipment and tools are included in annual plan. All the field divisions are equipped with firefighting tools and machinery like mechanized air blowers, mist blowers, rakes and firefighting aprons and other field infrastructures like protection camps, watch towers. Specially designed water tankers, mounted on a Bolero Vehicle, are well suited for undulating forest terrain are helpful in dousing the forest fires.

Optimum number of watchtowers be erected in and around sanctuary and National Park are with advanced technical equipment for early detection of forest fire, which shall be monitored centrally by the divisions also facility of alerting staff be in built to reduce response time.

6.4.4 THEME PLAN FOR SOIL AND WATER CONSERVATION

To check for loss of topsoil and leaching of nutrients, soil and moisture conservation activities such as construction of check dams, gully checks, gully plugging etc must be done. Construction of gully checks should be taken up not just to retain the soil but also to improve the water storage capacity, in higher elevation beats and areas with plantation. Problem areas of each beat should be identified and given priority for treatment in the first cycle. In the second cycle, a general treatment of the entire beat area for soil and water conservation measures should be taken up. Gully checks should be constructed with available rubble stone especially in the higher elevation areas and in natural grassland patches at higher elevations. Soil and water conservation measures must be part of routine habitat improvement programme.

Management interventions such as creation of waterholes help wildlife disperse uniformly and avoids aggregation. This will lead to uniform utilisation of the habitat. However, the spacing and placement of waterholes must be done in limited way after assessing the ground situation so that the interventions in the core area are minimal. Waterholes in buffer areas can be carried out to aid and promote eco-tourism. Currently, the probability of sighting large mammals like Leopard and Sloth Bear or herbivores like Gaur and Sambar are sporadic in the protected area. Strategic placements of waterholes and periodical monitoring will help in live sightings of these animals from a safely and strategically placed watchtower or hide. In the lower elevation regions, water in general is not a constraint owing perennial streams, however many beats which are away from such perennial streams and beats which have more high elevation terrain face water shortage in the dry summer months and creation of more waterholes will be very helpful for the wildlife and can also reduce the encounters of wildlife with humans. Some perennial natural springs should be identified based on the stream network map in this report through ground truthing exercise. At the vicinity of such springs, small ponds /check dams must be constructed to ensure storage of water. Based on known wildlife management practices, an average of one pond per 10 km² is said to be sufficient to tide over water shortage

in the Western Ghats bioregion. Such ponds should be de-silted on a cycle of five years as a part of the works in the Wildlife Sanctuary and National Park.

Table No.18 List of proposed waterholes in Bhawan Mahavir Wildlife Sanctuary and National Park

Sr.No	Name	G.P.S. Readings
1	Artificial waterhole in Nandran Beat of Mollem Round (13mx1.5m)	N15°26'50.2 E074°13'04.8
2	Artificial waterhole at Nandranmol in Nandran Beat of Mollem Round (20mx1.3m)	N15°23'53.6 E074°15'05.1
3	Artificial waterhole at Kalay Beat of Kalay Round (20mx1.2m)	N15°18'26.1 E074°11'17.1
4	Artificial waterhole at Collem-I Beat of 5Collem Round (20mx1.0m)	N15°19'30.0 E074°14'04.8
5	Artificial waterhole at Vasant Bandra in Nandran Beat of Mollem Round (20mx1.0m)	N15°13'57.0 E074°15'12
6	artificial waterhole at Caranzol-I Beat of Caranzol Round (20mx1.2m)	N15°21'18.9 E074°15'31.9
7	Artificial waterhole at Khaskond Mollem Beat of Mollem Round (10mx1.5 m)	N15°23'35.9 E074°14'00.9
8	Artificial waterhole at Mollem Beat of Mollem Round (5mx1.5m)	N15°23'55.0 E074°12'58.9
9	Artificial waterhole at Nandran Beat of Mollem Round (5mx1.5m)	N15°23'20 E074°15'00.0
10	Artificial waterhole at Dongurlim Beat of Kalay Round (5mx1.5m)	N15°16'59.6 E074°12'469.1
11	Artificial waterhole at Shigao Beat of Kalay Round (5mx1.5m)	N15°19'12.0 E074°11'54
12	Artificial waterhole at Kalay Beat of Kalay Round (5mx1.5m)	N15°17'62.9 E074°12'34
13	Artificial waterhole at Oxel Beat of Kalay Round (7.5mx1.5m)	N15°17'20.7 E074°13'53.8
14	Artificial waterhole at Surla-I Beat of Mollem Round (7.5mx1.5m)	N15°26'29.4 E074°13'04.9
15	Artificial waterhole at Caranzol-I Beat of Caranzol Round (10mx1.5m)	N15°20'33 E074°16'18.0
16	Artificial waterhole at Collem-I Beat of Collem Round (10mx1.5m)	N15°20'34.0 E074°15'22.0

Additional structures for soil and water conservation can be added to the above proposed list as and when required with the approval of the Chief Wildlife Warden from time to time.

6.4.5 INVASIVE SPECIES MANAGEMENT

Chromolaena odorata and *Strobilanthes sp.* are the major invasive species of Bhagwan Mahavir Wildlife Sanctuary and National Park. In addition to these, old plantations of *Acacia auriculiformis* in isolated patches have led to dispersal and recruitment of new seedlings. Invasive species have the potential to displace native flora species and dominate landscapes. *Chromolaena odorata*, has strongly established itself in the protected area. Because of their ability to establish and spread very fast over vast areas, haphazard and sporadic eradication of these invasives cannot give desired results. Post monsoon, when soil is wet, *Chromolaena odorata*, must be uprooted manually. In case of *Chromolaena odorata* manual uprooting must be done from higher to lower elevations taking into consideration wind directions to arrest dispersal to newer areas. A beat wise survey for spread and distribution of invasive species needs to be conducted for mapping affected areas and beat wise planning for their eradication needs be done. In case of *Strobilanthes sp.*, which is a resilient weed it must be burnt after flowering. Importantly manual uprooting must be done from higher elevations downwards as seed dispersal in new areas would be arrested.

6.4.6 THEME PLAN FOR WILDLIFE RESCUE AND MONITORING

While the boundaries of any protected areas are for administrative purposes, the home ranges of several large mammals are beyond these legal boundaries. This often leads to wildlife straying out of the protected area limits in search of food and water. This then leads to human animal encounters or accidents due to human made infrastructures like well, trenches, sumps etc that can lead to injury or death. Hence a rescue squad should be established for rescue operations that can efficiently capture, treat for injuries, and release such animals. Following strategies are proposed for better wildlife rescue and monitoring:

1. Establishment of a transit rescue centre at range forest office complex at Mollem or any other suitable place in the Wildlife Sanctuary that is easily accessible. This centre should be provided with basic equipment for treatment of injured animals. If longer rehabilitation is required animal may be handed over to Bondla Zoo for treatment and care.
2. The rescue team should be properly trained in animal handling and first aid. They should have a dedicated vehicle and equipment for rescue operations.
3. Cages and enclosures for housing and transferring rescued animals must be of good standards meeting the ethical requirements.
4. A network for quick reporting of animals in distress and response to calls must be established. Contact numbers of rescue centre and rescue personnel should be advertised prominently at all villages surrounding PA. A special media group through WhatsApp/ Instagram be created at sensitive villages for easy and immediate transmission of messages.

6.4.7 THEME PLAN FOR ZOONOTIC DISEASE MONITORING

Many zoonotic diseases often have their origin in livestock. This is an often-overlooked concept. As on date, adequate steps have not been taken up for animal health surveillance. There is a need to initiate proper survey of livestock population in areas around Bhagwan Mahavir Wildlife Sanctuary and National Park to formulate a scheme for immunization of livestock and surveillance especially on Kyasanur Forest Disease (KFD) which is endemic disease of Western Ghats and limited to Madei region of Goa, however, spreading of KFD cannot be ruled out. following strategy needs to be adopted for this purpose:

1. All livestock within 5 km periphery of the protected area must be enumerated through collection of data from Block Development and Veterinary office.

2. Liaison must be maintained with the District Veterinary Officer to carry out regular immunization and of these cattle.
3. Cattle camps should be organized by the District Animal Husbandry and Veterinary Officer to carry out health check-up of cattle and subsequent immunization.
4. Awareness campaign in villages can be organised to impart knowledge on communicable diseases in cattle.
5. SOP/ & protocols for regular survey and surveillance of KFD should be in place
6. Multistakeholder committee department of Health is desirable.

6.4.8 THEME PLAN FOR ANTI ENCROACHMENT MONITORING

Boundaries of Bhagwan Mahavir Wildlife Sanctuary and National Park are yet to be consolidated through final gazette notification, which poses the threat of encroachment. For detecting and initiating action against encroachers, the boundaries of the protected area must be clearly demarcated, on ground and map.

Following strategies are proposed for anti-encroachment monitoring:

1. The process of settlement of rights in the protected area must be completed earliest and accordingly internal and external boundaries may be identified and demarcated on ground as per standard operating procedures.
2. Appropriate use of ICT including GPS may also be encouraged and necessary training and capacity building of forest frontline staff may be carried out from time to time.
3. Encroachments must be immediately removed through appropriate legal process.

6.4.9 THEME PLAN FOR UPGRADING NETWORK AND COMMUNICATION SYSTEM

ROADS/ BRIDGES/ CULVERTS:

Bhagwan Mahavir Wildlife Sanctuary and National Park has a network of forest roads which are mostly restricted to the western side of the protected area. The national highway 748 passes through the northern sector of the wildlife sanctuary while a jeep track runs till Dudhsagar waterfalls. Further access roads are present to go till Caranzol and Sonaulim railway station. Other than these, there are other jeepable tracks within the protected area which are used for ecotourism purpose and for patrolling. Most of these roads within the protected area, except the national highway and a few major district roads are prone to damage during monsoons. These roads are to be repaired annually after the monsoon season to make them jeepable. Besides there are culverts on several of these roads that need to be periodically repaired.

A high band wireless system for communication setup is presently established by and static sets have been provided in the range and round office. However, repeater stations are required to be setup for efficient working of the wireless network. Regular maintenance of the wireless network is a must for efficient working of the system. It is recommended to install repeater stations at

1. Bolkornem Entry Gate
2. Kalay Round Office
3. Dudhsagar Jeep Parking

6.4.10 MAN ANIMAL COEXISTENCE

6.4.10.1 General issues and prescriptions for man animal coexistence

As noted, the boundaries of any protected areas are for administrative purposes, while the home ranges of several large mammals in particular and other animals in general are beyond these legal boundaries. This often leads to wildlife straying out of the protected area limits in search

of food and water, bringing them close to human settlements, and hence increasing the probability of man animal conflict. Several instance of crop raiding by Wild Boar and Gaur have been noted, while damage to plantation produce has also been observed to be caused by Malabar Giant Squirrel, Bonnet Macaque and Malabar Grey Langur. There are also stray instances of cattle being injured by Leopards and Wild Dogs. Such occasional incidences cause considerable hardship to the people affected by these incidents leading to antagonism towards wildlife.

To encourage cordial relationship between the authorities of Bhagwan Mahavir Wildlife Sanctuary and National Park and the villagers living in the fringe areas of the protected area and to garner the active involvement of the people in conservation efforts, the following strategies are suggested:

1. The damage to the crop, domestic animals and properties should be adequately compensated.
2. Injury or death of people due to attack by wild animals should be immediately attended and compensation/ ex-gratia is to be provided as per guidelines in force.
3. Though to be in general discouraged, solar fencing may be taken up in some strategic locations in consultation with the members of eco-development committees that involve representation from local communities. The responsibility of regular maintenance of solar fence should be given to the eco-development committee as the existing staff strength is inadequate for the purpose.

6.4.10.2 Issues and prescriptions for linear infrastructure related human animal conflict

Bhagwan Mahavir Wildlife Sanctuary and National Park presents a unique case of having human interventions that poses threats to wildlife and increases chances of human wildlife encounters. National Highway 748, Castlerock – Kulem Railway track, one Major District Road, a network of village roads, a 220KW high power electricity line and a network of electricity distribution overhead cables, cut across the protected area. The national highway

begins at the Mollem Excise check post all the way till Anmod check post. The road serves as a physical demarcation between the wildlife sanctuary and National Park at the northern end flanked by Mollem beat in the north and Nandran beat in the south. The railway track enters the protected area at the south – western end of the protected area at Kalem railway station. It forms as a physical demarcation between Sigao Calem and Karemol beats. It exits the sanctuary through Calem beat and enters the National Park after Kulem railway station. It passes through Collem 2, Sonaulim – North beat, briefly forms as a physical demarcation between Sonaulim – North and Sonaulim – South beat, turns towards Dudhsagar waterfalls, enters Caranzol 2 beat and exits into Karnataka from therein. The power transmission line is aligned along the national highway and passes through Mollem and Nandran beats. These three linear infrastructures, section the protected area into four parts and increases the probability of human wildlife encounters and presents a major challenge for wildlife management and conservation, since these linear developments have created barriers and breaks in habitat. Further, there is a network of Major District Roads (MDR), Village Roads and electricity distribution overhead cables within the protected area, especially in Bhagwan Mahavir Wildlife Sanctuary – South. Hence, to harmonies wildlife conservation and these existing linear infrastructures, the strategies of the management plan centering around man animal coexistence, must revolve around two principles: i) creating and strengthening the protected area through management actions as recommended above; and ii) mainstreaming wildlife conservation in and around the existing linear infrastructure through management interventions. To provide recommendations and strategies to achieve mainstreaming of wildlife conservation around linear infrastructures in Bhagwan Mahavir Wildlife Sanctuary and National Park, the following issues have been identified.

Expected impact of NH 748, MDR's, VR's and Railway Track:

1. Direct loss of habitat
2. Degradation of habitat quality
3. Noise-induced physiological and behavioural changes
4. Habitat loss and fragmentation
5. Impacts of headlight glare on wildlife
6. Road or rail avoidance
7. Injury and mortality
8. Barrier to movement
9. Disruption of processes that maintain regional wildlife populations
10. Human accidents and economic losses

Expected impacts of 220kW (400kW in future) transmission line and distribution cables

1. Habitat loss and fragmentation
2. Electrocution
3. Collision

Different groups of wildlife are expected to be affected at different scales by linear infrastructure and understanding these relative impacts are critical to formulate mitigation and management strategies.

Challenges for management of wildlife and habitat along linear structures:

National Highway 748: Thirteen kilometers of the ~70.07 km highway passes through Bhagwan Mahavir Wildlife Sanctuary and National Park. The highway forms the northern boundary between the Bhagwan Mahavir Wildlife Sanctuary – North and Bhagwan Mahavir National Park. The highway passes through steep slope gradients at many places, which increases the probability of landslides. Maintenance of the road and emergency situations as in case of landslide is taken up by the district administration through the PWD department. In

such cases ensuring safe animal crossing points become difficult. Lack of staff in the wildlife sanctuary and National Park further reduces the ability to constantly monitor for vehicular stoppage along the road, especially at streams where drivers of heavy vehicles take bath and wash vehicles. Such stoppage also causes in unneeded disposal of vehicular oil and garbage into such streams upstream, causing further wildlife management problems, including the probability of increasing zoonotic disease spread downstream.

Railway through Braganza Ghat: Twenty-six kilometer of the railway line from Castlerock to Kulem, passes through Bhagwan Mahavir Wildlife Sanctuary and National Park, with the majority stretch through the National Park. As per information received from Railways, the Right of Way (RoW) to pass the Railways within the Bhagwan Mahavir National Park & Wildlife Sanctuary the width ranges between 30 to 60 meters on either side of the Railway line. This makes implementation of any interventions for wildlife management difficult in this stretch. In several stretches, there is a steep slope gradient and hill cuts have been stabilised through construction of Gabion retaining wall. During heavy rainfall in the monsoons, many areas are prone to landslides and physical interventions put in place are done without consultation of the forest department, making wildlife management especially ensuring safe animal crossing points difficult, because of ambiguity in land ownership. Despite of speed restriction signages, there have been sporadic cases of railway wildlife collisions along the track.

High Tension Power Line and Electricity Supply Line: A 220 kV powerline passes through the Bhagwan Mahavir Wildlife Sanctuary – North and there are several naked power lines that transmit power to villages along the boundary of the protected area and those inside the Bhagwan Mahavir Wildlife Sanctuary – South. These powerlines cause problems for arboreal wildlife due to electrocution.

Other PWD works: Many other civil works like water pipeline, telephone cable and fiber optic cables pass through the protected area. Most times, a NOC is sought from the range office / division office to carry these works. However, due to lack of staff strength, monitoring of these activities is not possible. This leads to wildlife stranding cases when dug pits are not covered properly, or trenches are not filled sufficiently. Such unplanned activities can also restrict movement of small, bodied animals at micro scale, making wildlife management interventions very difficult.

Taxa	Habitat Loss			Habitat Fragmentation			Disturbance induced behavioural changes			Injury/Mortality			Impediment to movement		
															
Large mammals															
Medium and small mammals															
Arboreal animals/gliders															
Birds															
Reptiles															
Amphibians															
Invertebrates															

High Impact

Moderate Impact

Low/Possible Impact

Fig. No. 6.1: The relative impacts of linear infrastructure development on different animal groups, and the degrees to which these groups are affected.
Adapted from WII 2016 report on Eco-friendly Measures to Mitigate Impacts of Linear Infrastructure on Wildlife

Strategies for mitigating impact on wildlife due to of NH 748, Railway Track, major district roads and village roads are discussed below. It is to be noted that most of NH 748 and Railway Track through Braganza Ghats pass through extremely undulating terrain and hence, prescriptions are given bearing this in consideration. More widely used recommendations can be applied to major district roads and village roads, as they pass through flat terrain.

- Regulatory measures to alter human behaviour
 - a. Speed control (Road and Rail)
 - b. Temporary road closure (if feasible)
 - c. Control on feeding of wild animals along the road/railway track
 - d. Restrictions on stopping/parking of vehicles on highway segments passing through the protected area stretch.
- Engineering prescriptions
 - a. Land bridges: are 30-70 m wide bridges that extends above roads or railway lines. The bridge is typically enhanced with habitat features such as native vegetation, rocks, and logs. These structures allow for natural movement of wild animals as they are less confining, quieter, have ambient natural conditions of rainfall, light and temperature, and can be used by a wide range of fauna. Acceptability to wild animals of land bridges should be achieved by planting and maintaining native vegetation cover in densities similar to the surrounding areas. While designing it should be ensured that the bridges are preferably rectangular or hourglass shaped to provide funnelling effect. For about 50m on either side of the land bridge, chain link fence should be used to make sure animals are further funnelled towards the land bridge.
 - b. Canopy bridges: are rope, pole, rope or wooden ladder or walkway suspended above the road or railway, either from vertical poles or trees, and installed for tree-dwelling species. Canopy bridges should be in areas having important populations of arboreal species like Malabar Giant

Squirrel, Malabar Grey Langur, Malabar Flying Squirrel, Slender Loris etc with a high risk of mortality. The ends of the bridge should always be connected to trees for cover.

c. Viaducts: are useful near valley bottoms to lead roads or railway lines across the valley. Viaducts maintains or elevates the grade of the road or railway, allowing for the passage of fauna below and is the simplest intervention for large mammal movement that can be used especially in mountainous terrains.

d. Box culverts: are built under a linear infrastructure for passage of fauna (including aquatic species) and/or water. Since culverts are usually associated with drainage patterns of the land, it is well suited for crossing of aquatic fauna. However, using ledges or planks above the water level in culverts may encourage many terrestrial species also to use these structures.

e. Pipe culverts: are typically round pipes of small diameter (<1.5 m), made of smooth steel, corrugated metal, or concrete. Though their primary purpose is to drainage of water under roads or railways, many wild animals also use them as passageways, especially small mammals, reptiles, and amphibians. To ensure safety of animals using the pipe culverts while crossing, native vegetation should be established on both sides of the culvert to provide cover.

- Non-engineering prescriptions

a. Habitat management: Vegetation or other habitat features like rocks, fallen timber, are strategically placed, planted, or allowed to regrow so that animals are directed to preferred crossing locations. At such locations, animals can cross the road or railway line without the aid of any structures.

b. Corridor planting: is a method of planting strips of native vegetation on either side of the linear clearing to provide attractive corridors for animal movement.

c. Local traffic management: Devices to reduce noise, speed, or volume of traffic, or convey early warning of risks, are used to manage traffic. They may include noise attenuation walls,

road closures, lighting, and signage. Speed can also be regulated by installing speed breakers at strategic locations, especially in areas known for animal crossings.

- Group specific prescriptions:

1. **Large mammals:** Since the landscape in Goa does not harbour elephants, the prescriptions for management interventions structural or otherwise is based on those for large cats.
 - a. Underpasses – minimum span of 30 m with a height of 5 m and a width of 5-8 m. In core areas, the span needs to be a minimum of 50 m with the same dimensions of height (5 m) and width (5-8 m).
 - b. Overpasses – the minimum passage width of an overpass should be more than 30 m. The overpass should not have a steep incline to the infrastructure that is crossing and slopes over 25 degrees should be avoided.
 - c. Visual Barriers – should be installed along the sides of the infrastructure in such a manner that vehicular or train is not visible from a distance or up close from the animal crossings. Care should be taken that vehicular lights do not escape the visual barrier at night as these visual cues could deter nocturnal species from using the underpass. Visual barriers should be camouflaged and enhanced by planting tall native species of vegetation along the edges of the engineered structure.
 - d. Sound Barriers – Both underpasses and overpasses need to be fortified with sound barriers to prevent any disturbance to wildlife that could potentially use these structures for passage across the infrastructure. More specific details regarding noise barriers are discussed in a later subsection.
 - e. Olfaction and other sensory enhancers – Target animals can be encouraged to use the overpass or underpass by enhancing its acceptability to wildlife through enrichment interventions. These enrichments can be a) use of appropriate substrate like soil, leaf litter, gravel, herbaceous vegetation etc b) attractants like food plants, carrion, pheromones, dung of conspecifics and scats in the case of carnivores like tigers and leopards. Enrichment

techniques need to be undertaken in consultation with wildlife experts, and upon implementation, need to be subjected to rigorous evaluation and testing.

Density of these mitigation strategies to be implemented is crucial to ensure success. A passageway of over 50 m per 1 km length of infrastructure in forested habitats is recommended to ensure that habitat connectivity is maintained, and fragmentation is avoided. Since presence of tiger has been reported from the protected area, at the higher elevations of the road and railway, passageways over 100 m per 1 km length of infrastructure would be recommended in selected regions.

2. **Birds:** The adverse impact of roads and railway associated with traffic on birds can be minimized through their careful design, controlling the disturbance they cause, and reducing the availability of resources that attract birds next to linear infrastructure. The dangers of the existing railway in Bhagwan Mahavir Wildlife Sanctuary and National Park are expected to be minimum, since due to steep gradient, speed of train is limited to 20km/h and hence would pose less chances of bird collisions, however the risk remains for terrestrial birds. Prescriptions for reducing bird hits are as below:

- a. Flight diversion: Birds with rapid and direct flight can be diverted to fly high over the traffic zone by erecting suitable roadside structures like fences, poles, soil berms etc, which can help divert birds away from a roadway. However, careful research and planning is needed before deciding on the most appropriate structure to use since all structures may not be effective for all bird species and may pose a risk of collision for some species.
- b. Managing roadside habitat: to reduce its attractiveness for birds by creating and maintaining vegetation which should be a standard part of the prescription for roadside management within the protected area: a 5 m-wide 'clear zone', with a 3 m-high clearance, devoid of trees and shrubs. This is particularly important to prevent reptiles and rodents to be perceived in that zone and to deter birds of prey who would be foraging for the same. Planting of trees

with non-edible fruits, and species that inhibit undergrowth along the roadside would also be effective in reducing the use of roadside habitat and edges by most birds. However, care must be taken that native tree species are used for such habitat management interventions. To reduce mortality in canopy-dwelling birds, it may be helpful to plant tree species next to roads that tend to grow tall and have dense foliage. Plant flora species that provide food and nesting opportunities for birds should be avoided along roadsides.

- c. Wildlife crossing structures: designed as passageways for other wild animals, can be used by short-flighted birds which cannot cross over roads in a single flight, provided that these structures are sufficiently large and use suitable substrate.
- d. Making roads less attractive to birds: by active waste management and disposal of incidental roadkill to ensure deterring scavenging birds. Lighting along roads may attract insects, which in turn attract birds like owls and nightjars. While major section of the national highway is devoid of light, it must be ensured that appropriate lighting systems for illumination is used at the Dudhsagar temple.

3. **Amphibians and Reptiles:** Road kills of amphibians and reptiles are often a function of species-specific ecological requirements, life-history traits, behaviour, and movement patterns. Herpetofauna (amphibians and reptiles) move between spatially separated breeding and foraging sites, and often need to cross landscapes that are fragmented by roads and railway lines. Their vulnerability is further increased by their relatively slow movement rates and by the fact that many species become immobile in response to approaching vehicles. Seasonal movement of amphibians also makes them particularly susceptible to road mortality. Nocturnal snakes are particularly vulnerable since roads are warmer at night than adjacent habitats and thermoregulatory behaviour of such snakes prolongs their exposure to traffic and increases the likelihood of collisions. Slow moving turtles too have high likelihood of collisions. The following strategies are suggested for management of habitats around linear infrastructures for protection of herpetofauna:

- a. Providing passages to retain habitat connectivity: facilitated by drainage pipes, box culverts and minor bridges which often act as drainage structures associated with road construction but can provide crucial connectivity to maintain the meta-population dynamics if their location corresponds with locations suitable for animal movement. This is important, since entire stretches of areas besides the NH 748 and Railway Track are important habitats for the Amboli Bushfrog, Bombay Bushfrog, at least 3 species of Night Frogs and important species of snakes like Malabar Pit Viper, Hump-nosed Pit Viper, King Cobra, Python amongst others. All these species are very restricted and selective with respect to habitat utilisations and species like King Cobra have large home ranges which make them more vulnerable to habitat fragmentation.
- b. Fencing to guide movement of amphibians: to prevent mortality and deter movement of herpetofauna on to roads by directing them to safe crossing points or passageways. The angle of fencing is an important aspect, and it is to adopt a zig-zag pattern. This will likely direct animals towards passageways at all points of contact, while simultaneously excluding animals. It is also important to check for holes or gaps remaining along the fence, especially at culvert-fencing junctions, as this may reduce the effectiveness of the fencing.

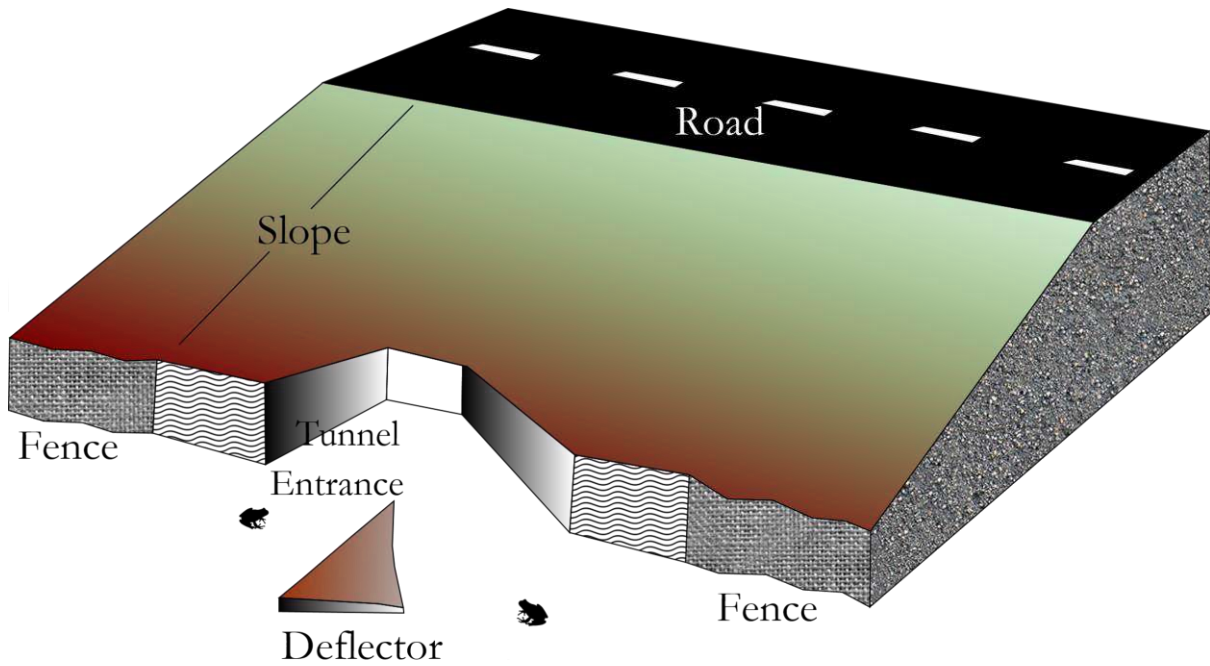


Figure No.6.2 Suggested design for Herpetofauna underpass with deflector and fence.

- c. Prescriptions to reduce use of roads by snakes for thermoregulation: by strategic placement of strips of different surface types that may attract snakes for thermoregulation instead of going to the road. This can be adopted in areas known to have high snake mortality. Such interventions however must be first undertaken as a pilot study and after testing their effectiveness can be scaled up.

4. Signage and Warning Systems: Signs and warning systems for presence of wildlife must be put up along stretches of the national highway and railway line especially in places where animals are known to occur or use local habitat, to caution drivers. These signages can be of five types, viz. Caution Sign, Enhanced Signs, Temporary warning signs, Dynamic message signs and Posters.

Effectiveness Evaluation:

- a. Animal detection systems are best installed at locations that have a history of animal vehicle collisions (AVCs).

- b. The distance between signs and the frequency of these signs should be decided according to the occurrence of AVCs
- c. View line be created at a width of 15 - 20 m along the road.
- d. The size, shape, colour, and material (reflective, non-reflective) of signs should be chosen carefully to make the signs most effective.
- e. Signs that highlight the conservation importance of the site through which the transportation corridor passes, such as World Heritage Site or National Park can help garner support for reducing traffic speed and increased awareness of drivers, thereby helping to protect several threatened species.

At identified sites along the NH 748, caution signs must be installed. These sites can be chosen based on any stretch with more than 200m of non-undulating road where vehicles tend to over speed. Enhanced or dynamic message sign can be installed at Mollem Check post and Anmod Check post. During dry pre-monsoon months, temporary signages can be installed at locations where a greater number of AVC's are recorded. In monsoon season, reflective temporary signs must be installed at locations near water sources along the highway to warn potential amphibian and reptile movements at night.

Along the railway stretch, cautionary signages must be erected

5. Prescription for Noise Attenuation: Noise caused by engines and emission of exhaust, aerodynamic sources, and tyre/road interactions and movement of trains have multiple effects on ecosystems. In such cases, noise barriers must be installed, especially at places where animal movement is high. In such cases in addition to animal crossing structures, noise attenuation barriers will act as a fence to funnel animals towards the crossing. There are two types of noise barrier systems a) ground and b) structure-mounted system.

Type	Construction details	Aesthetics	Drainage, utility, and safety	Cost and maintenance
GROUND MOUNTED SYSTEM				
Noise berm	Constructed from natural earth materials such as soil, stone, rock, rubble, etc. in a natural, unsupported condition.	High appeal and natural	May obstruct natural drainage channels and cause localised flooding. Safe, although occupies more space than a wall-type barrier. Height may be a consideration in significantly reducing the noise levels.	Low costs if raw material is available on site for construction and repairs.
Post and Panel noise wall	Consists of noise barrier panels mounted between foundation supported posts.	Colour and material for the prefabricated structures may be chosen to blend with the surrounding landscape	Side drains are usually provided. May have weight and size limitations	Installation costs are higher than overall maintenance costs. Replacement of barrier elements may be required throughout the life of the noise barrier; availability of replacement parts becomes a critical issue.
Free standing noise wall	Includes barriers which support themselves using 'zig-zag' configuration or compacted soil and a well-drained stone base, a plain cement-concrete levelling pad, or a continuous reinforced concrete footing. Includes three types: precast concrete, planted or 'bin' types, and stone crib.	Wider aesthetic appeal and variability, as can be adapted to suit various soil types and landscapes	Side drains are usually provided.	High installation costs.

Direct burial Panel	Involves burying a portion of one end of the panel (either precast concrete or wood) directly into the ground with no other means of foundation support	A unique architectural design is obtained due to the 'tongue and groove' design	Differential settlement may not be even throughout the length of each panel, thus causing tilting and separating of the panels	High installation costs
Cast in place concrete noise walls	Constructed at the project site, includes excavating for the footing, erecting form work, setting reinforcement steel, pouring concrete, surface finishing, and curing.	Less appealing as Surface textures obtained through raking, brushing, or stamping of concrete are not possible	Higher safety standards are achieved	High installation costs
Combination of noise berm and noise wall	Consist of a portion of the barrier height obtained through use of an earth berm with the remainder of the required height achieved by placing a noise wall on top of the berm. The foundation, post, and panel considerations for these wall portions are like those of the original structures.	Limited aesthetic appeal	May obstruct natural drainage channels and cause localised flooding. Safe, although occupies more space than a wall-type barrier. Height may be a consideration in significantly reducing the noise levels.	High installation costs
STRUCTURE MOUNTED SYSTEM				
Structure mounted noise wall	Noise walls used on structures, especially on bridges and retaining walls.	May block the 'view'	Normal safety standards are achieved if maintained properly.	Require additional costs of structural modifications on existing bridges and retaining walls. Overall considerations include maintenance, protection of traffic (both on and beneath bridge),

				accessibility to areas requiring modifications, bridge vibrations due to existing traffic, from construction operations, and potential environmental mitigation measures (e.g., related to painting beams or working over waterways or wetland areas).
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Considering the terrain through which NH 748 and Railway passes through, natural noise berms cannot be used due to inadequate spacing besides the linear structures. In such cases, structure mounted noise walls are most preferable, since they occupy the least space, can be used as a habitat enhancement structure if used as a bio barrier. While making barriers, it is recommended that a barrier covering an angle of 160° subtended from the receiver to the road or railway will ensure that the end diffracted rays are not significant. Cantilevered barriers can be used along sections with turns or steep climbs. Along selected straight stretches, bio barriers can be installed in combination with management techniques for avoiding bird hits.

Species that can be considered for noise attenuation plantations along MDRs and VRs in Bhagwan Mahavir Wildlife Sanctuary are *Adhatoda vasica*, *Adhatoda zeylancia*, *Terminalia arjuna*, *Acacia nelotica*, *Sapindus mukorossi*, *Syzygium cumini*, *Alstonia scholaris*, *Butea monosperma*, *Ficus microcarpa*, and *Pongamia pinnata*.

It is recommended that five trees are planted in a row with alternate rows crisscrossing each other. Maintenance of understory vegetation will also help attenuation. However, care has to be taken to maintain clear view line and fire line to avoid fire incidents especially by putting shallow trenches along the road which will not impede animal crossing.

Strategies for mitigating impact on arboreal wildlife due to power transmission lines are discussed below. It is to be noted that the strategies outlined are to be applied for high tension power lines and general power distribution lines on a case-to-case basis.

1. Power poles must be designed to minimise avian electrocution risk by providing a separation between energized conductors or phases and grounded hardware larger than the wrist-to wrist or head-to-foot distance of a bird.
2. Areas where such separations are not possible, bare parts of poles like phase wire, insulators, jumper wires should be covered by a non-conducting insulated material.
3. In the cases where insulation of distribution lines is not possible, perch deterrent can be placed on the pole to prevent birds from perching on it.
4. Using marker devices to increase visibility of earth wires. Marker devices are available in several colours and are visible to birds from a long distance. Many types of marker devices are available, such as spheres, swinging plates, spiral vibration dampers, strips, flight diverters, bird flappers, ribbons, tapes, flags, and crossed bands

6.4.11 EXOTIC PLANTATION MANAGEMENT

In the past, plantation drives had been undertaken by State Forest Departments across the country. These Forest Plantations are composed of trees with commercial value such as *Acacia* sp., Teak (*Tectona grandis*), Eucalyptus (*Eucalyptus* sp). Along with commercial value, these were also aimed at increasing the green cover to meet afforestation targets.

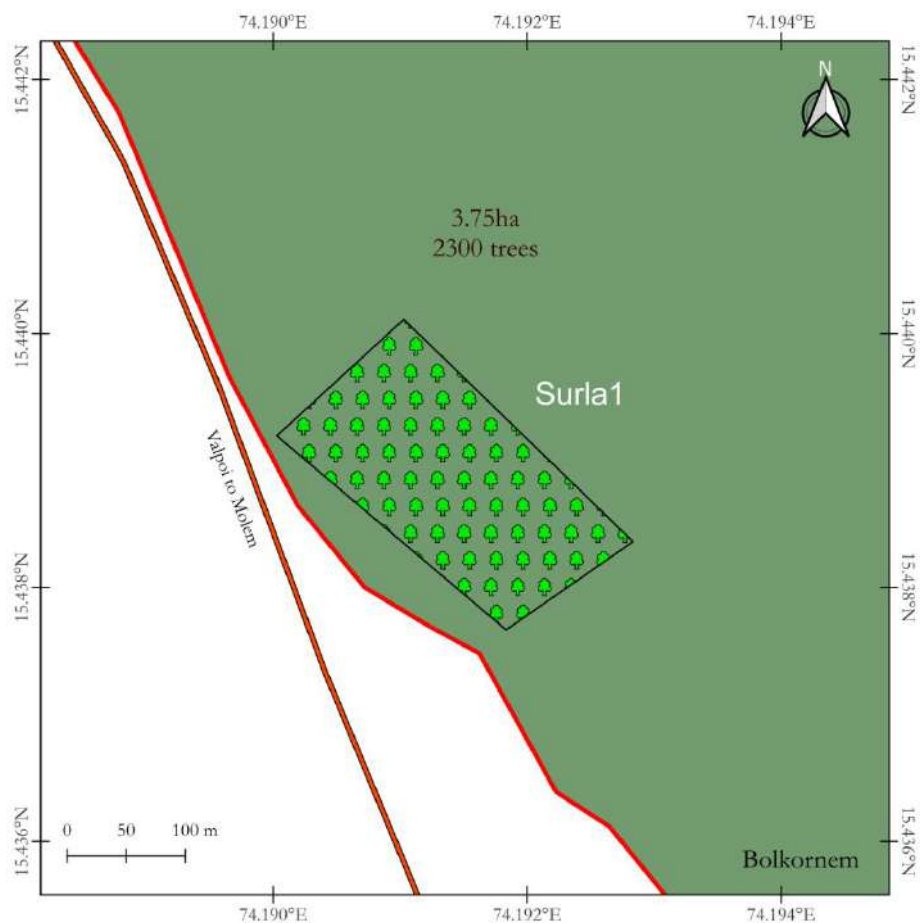
Bhagwan Mahavir Wildlife Sanctuary and National Park has *Acacia* stands in four rounds admeasuring a total area of 76.10ha. Since the area for plantation is less efforts should be made to converting the plantation area into ecologically valuable, by planting intercropping and mixed cropping of grass and wild fruit bearing trees respectively.

Table No. 19 Details of exotic plantations in Bhagwan Mahavir Wildlife Sanctuary and National Park.

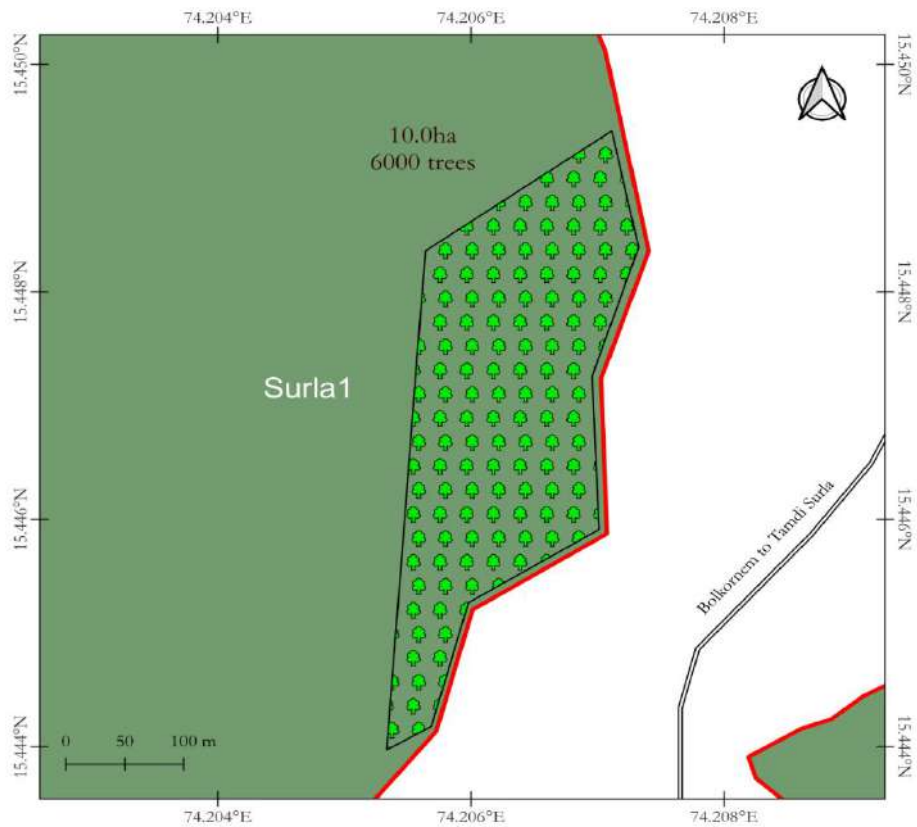
S. No	Place	Plantation	Beat	GPS Reading	Area
1	Collem round (Campsite)	Acacia	Collem-I	N15°20'34.6 E074°15'12.1	2 ha
				N15°20'13.6 E074°15'12.8	
				N15°20'35.8 E074°15'20.1	
				N15°20'33.1 E074°15'19.5	
2	Caranzol round Dolbhag (1no.plot)	Acacia	Caranzol	N15°20'33.4 E074°16'08.9	10 ha
				N15°20'28.6 E074°16'12.0	
				N15°20'29.1 E074°16'28.3	
				N15°20'40.3 E074°16'19.5	
3 a)	Mollem round	Acacia	Nandran	N15°22'41.7 E074°13'53.2	10 ha
				N15°22'30.2 E074°14'06.7	
				N15°22'27.3 E074°14'00.4	
				N15°22'36.6 E074°13'46.0	
b)		Acacia	Surla-II	N15°26'05.7 E074°13'09.8	5 ha
				N15°26'07.0 E074°13'11.9	
				N15°26'08.6 E074°13'14.0	
				N15°26'09.5 E074°13'16.0	
c)		Acacia	Surla-I (plot 01)	N15°26'15.6 E074°11'30.6	3.75 ha
				N15°26'21.1 E074°11'24.1	
				N15°26'18.1 E074°11'34.2	
				N15°26'24.4 E074°11'27.7	
d)		Acacia	Surla-I (plot 02)	N15°26'29.4 E074°13'04.9	2.25 ha

				N15°28'19.4 E074°10'17.5	
				N15°26'35.0 E074°13'08.6	
				N15°26'52.2 E074°12'09.7	
e)		Acacia	Surla-I (plot 03)	N15°26'38.3 E074°12'19.2	10 ha
				N15°26'42.6 E074°12'22.3	
				N15°26'57.9 E074°12'25.6	
				N15°26'54.1 E074°12'20.3	
f)		Acacia	Surla-I (plot 04)	N15°26'50.8 E074°12'06.3	6 ha
				N15°25'43.8 E074°11'59.5	
				N15°26'57.4 E074°12'09.3	
				N15°27'00.9 E074°12'05.1	
g)		Acacia	Surla-I (plot 05)	N15°26'55.8 E074°12'01.6	3 ha
				N15°27'58.4 E074°12'04.9	
				N15°27'03.9 E074°12'04.1	
				N15°27'01.3 E074°11'59.8	
4 a)	Kalay round	Acacia	Dongurlim	N15°17'03.4 E074°12'55.7-62	4.6 ha
				N15°17'03.3 E074°13'01.7-6.9	
				N15°17'05.1 E074°13'06.4-7.1	
				N15°17'07.7 E074°13'07.4-76	
				N15°15'07.9 E074°13'05.2-10.1	
				N15°17'06.1 E074°12'57.6-5.4	
b)		Acacia	Pokermol (1 st plantation)	N15°18'26.4 E074°11'56.0	11.2 ha

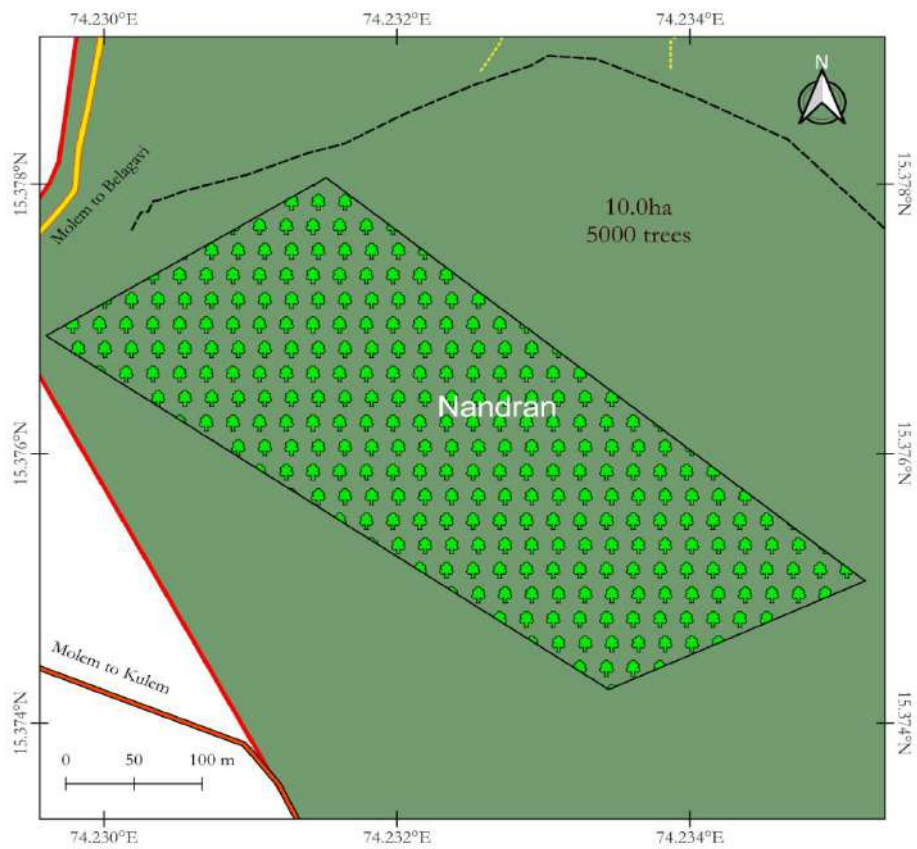
				N15°18'23.0 E074°11'59.6	
				N15°18'17.1 E074°12'24.7	
				N15°18'18.5 E074°12'25.8	



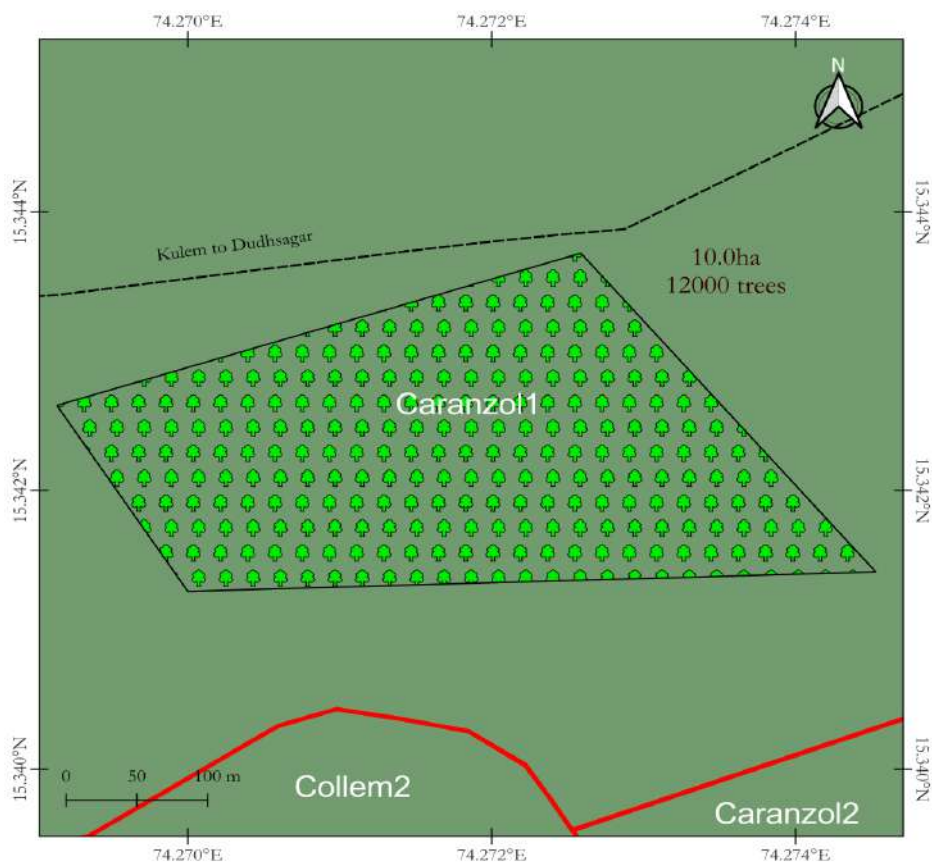
Map No.6.5 Acacia plantation site No.1 at Surla – I beat



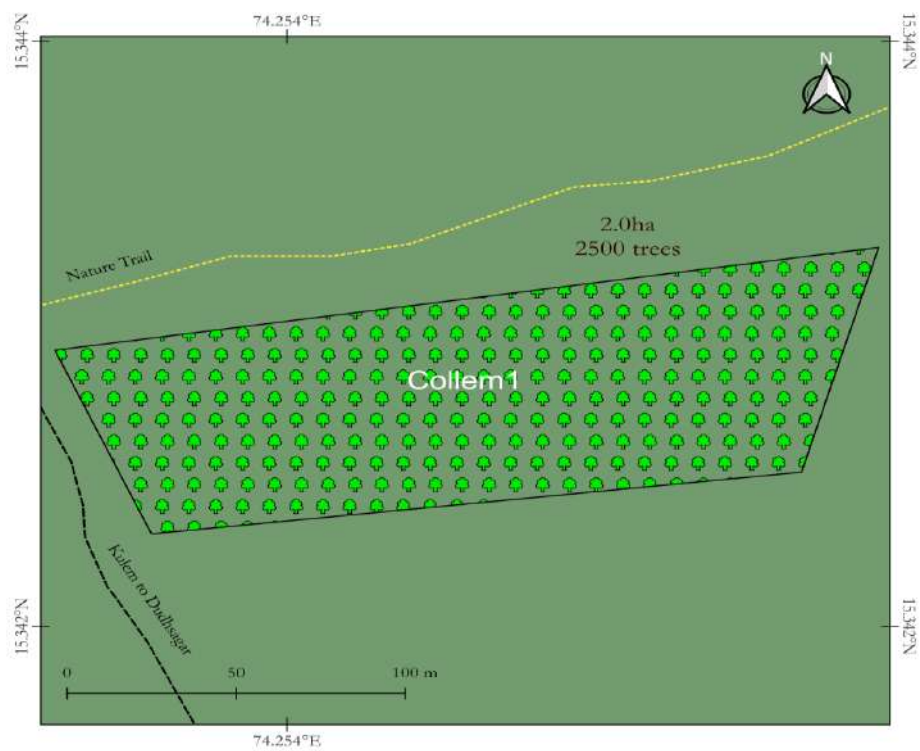
Map No.6.5 Acacia plantation site no.2 at Surla – I beat



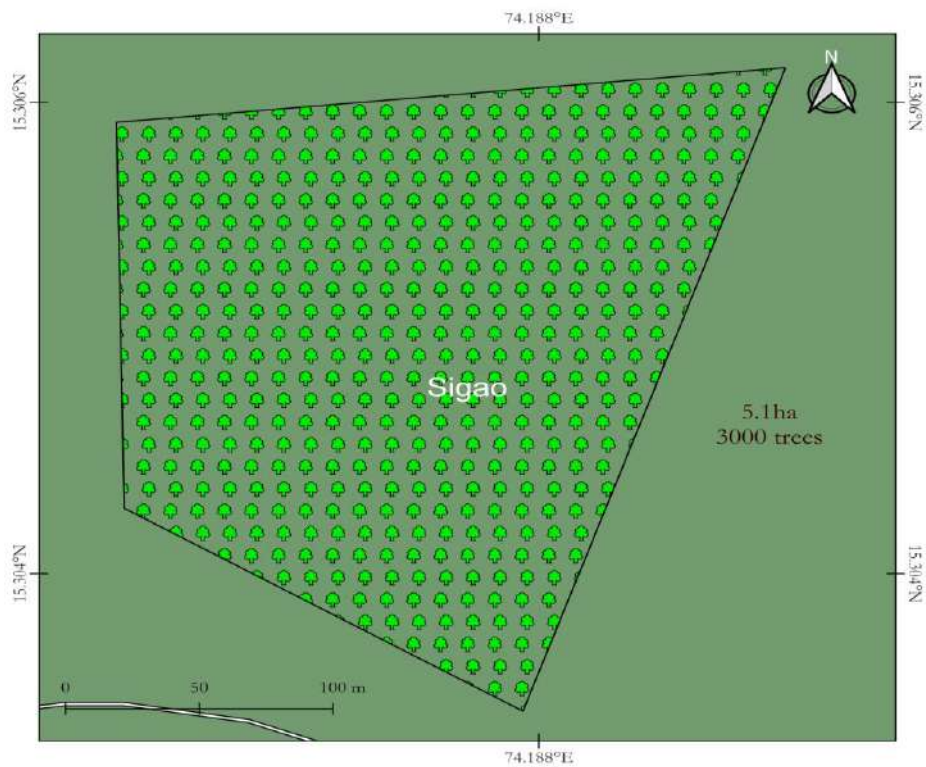
Map No.6.6 Acacia plantation site no.3 at Nandran beat



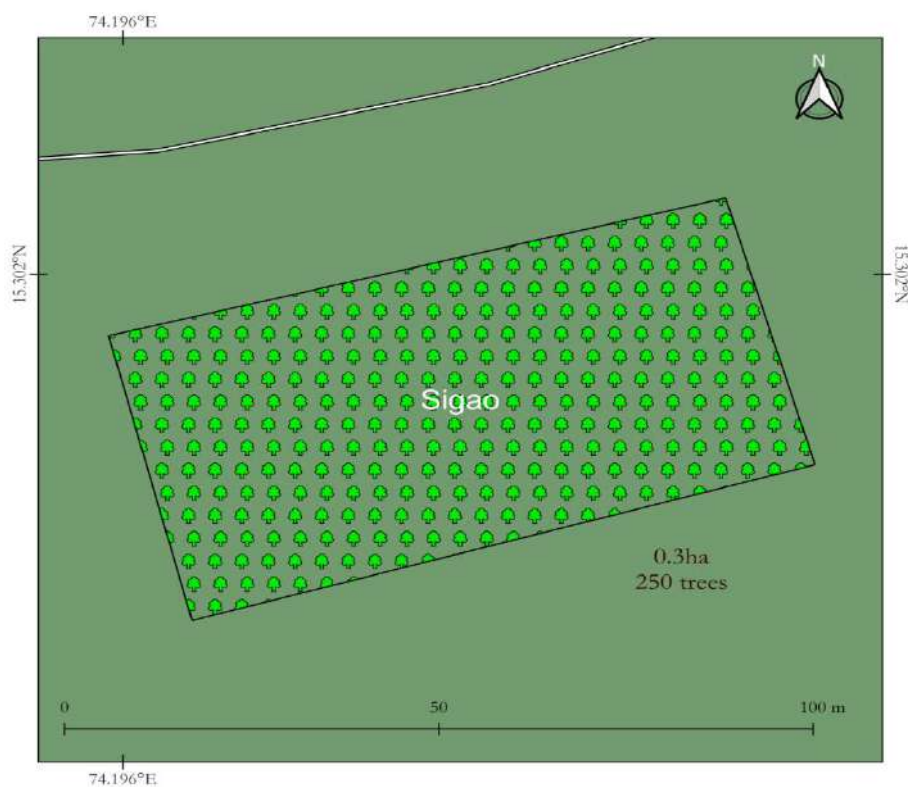
Map No.6.7 Acacia plantation site no.4 at Caranzol – I beat



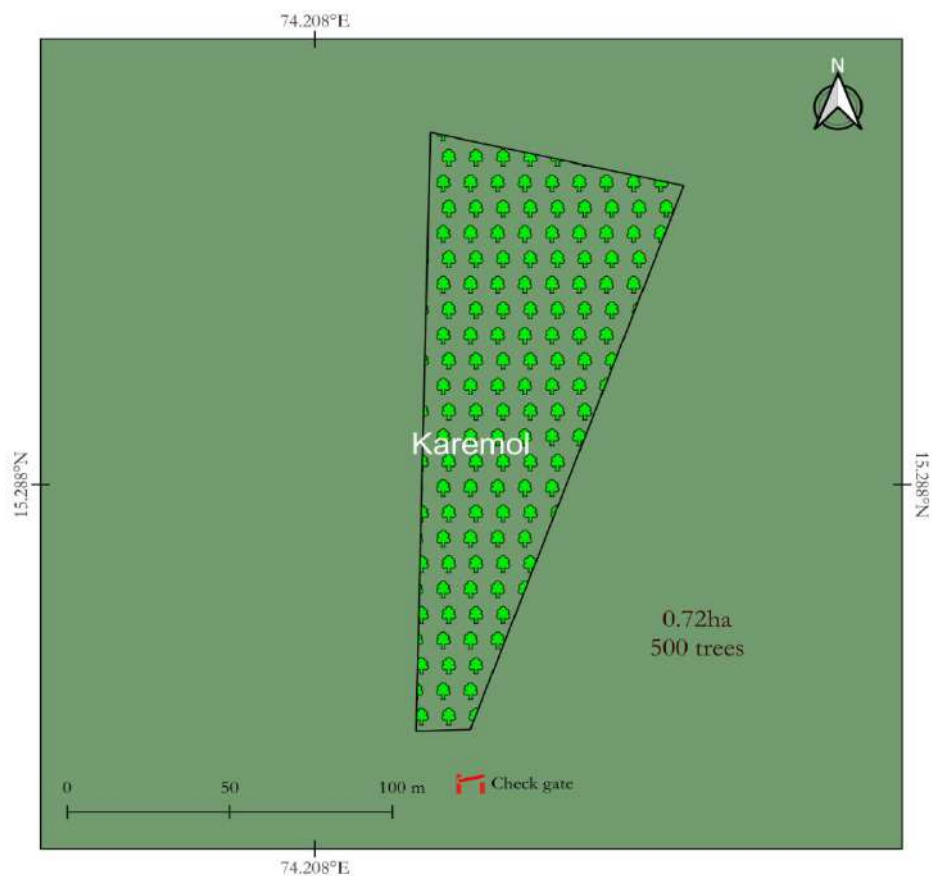
Map No.6.8 Acacia plantation site no.5 at Collem – I beat



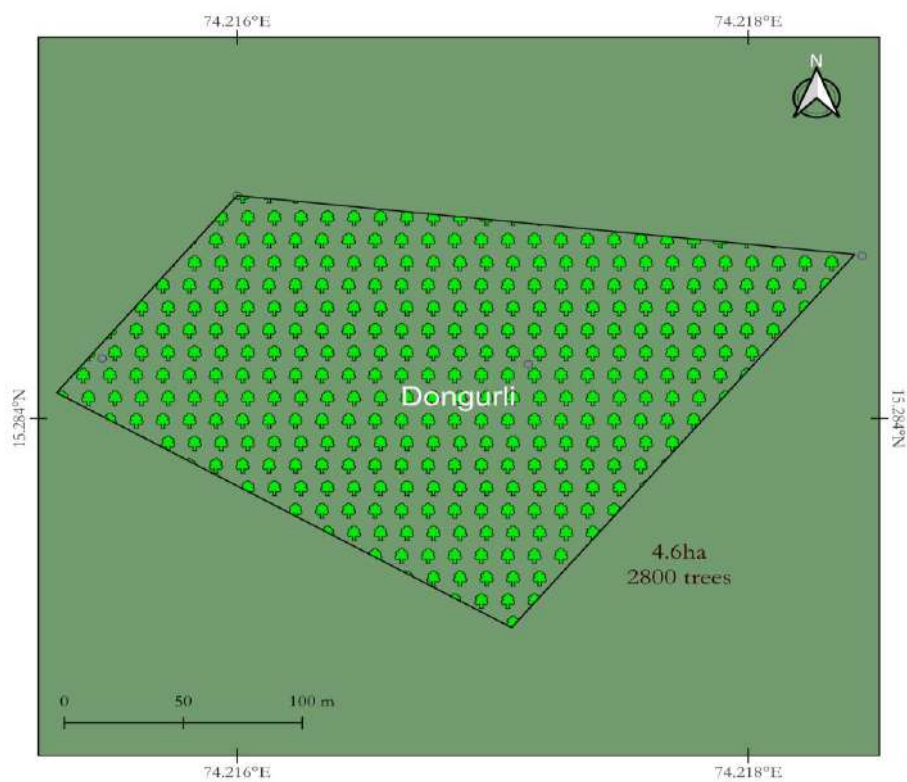
Map No.6.9 Acacia plantation site no.6 at Sigao beat



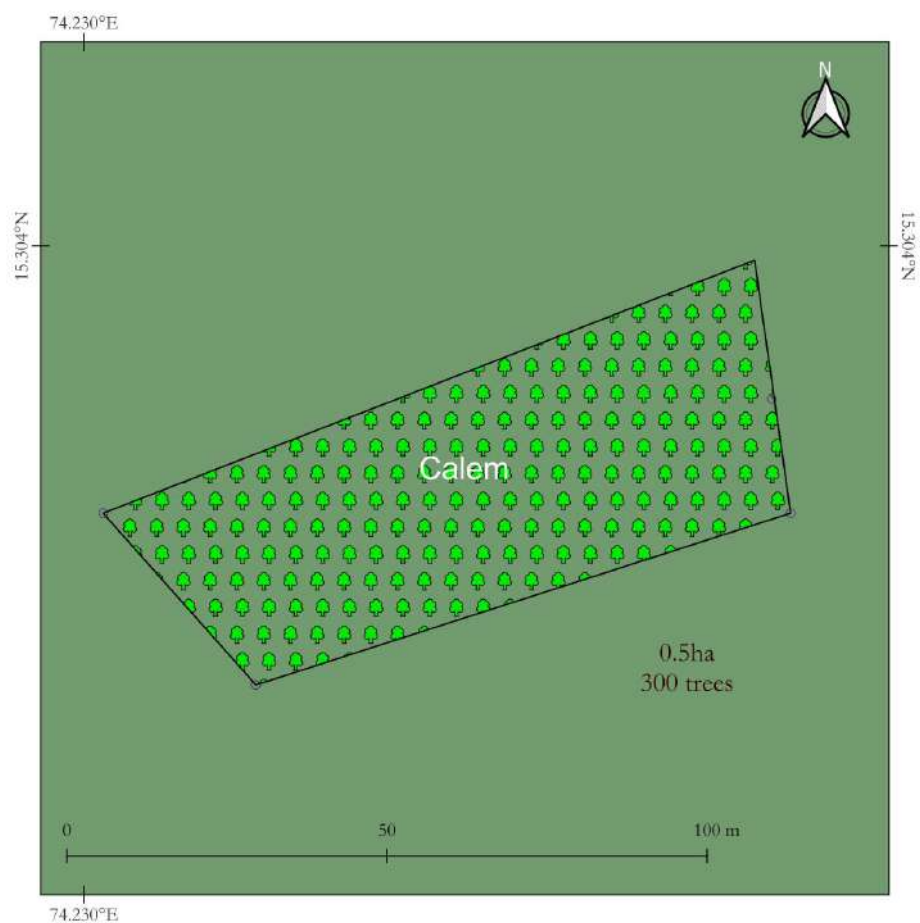
Map No.6.10 Acacia plantation site no.7 at Shigao beat



Map No.6.11 Acacia plantation site no.8 at Karemol beat



Map No.6.12 Acacia plantation site no.9 at Dongurli beat



Map No.6.13 Acacia plantation site no.10 at Calem beat

CHAPTER 7

ECOTOURISM, INTERPRETATION AND CONSERVATION EDUCATION

7.1 GENERAL

Bhagwan Mahavir Wildlife Sanctuary and National Park has high potential for wildlife tourism owing to a matrix of different habitats that support rich biodiversity. The protected area is internationally famous for housing Dudhsagar waterfalls. Locally, the protected area attracts several tourists to other such waterfalls like Tambdi Surla and Talde. Approach to all the three waterfalls can be done by foot forms a good trekking route. The protected area also attracts several devotees to the historically important Mahadev temple at Tambdi Surla, which is just outside the boundary of Surla 1 beat. Besides this, the proximity of Bhagwan Mahavir Wildlife Sanctuary and National Park to the adjacent state of Karnataka and its ecological continuum with the Kali Tiger reserves raises its importance as a conservation and soft-recreation landscape. The existing ecotourism infrastructure however needs upgradation for enhancing ecotourism, while conserving its biodiversity at the same time. In this chapter, a comprehensive plan for developing this protected area for ecotourism purpose is outlined based on the guidelines for sustainable ecotourism in forest and wildlife areas '2021' by the Ministry of Environment, Forest and Climate Change.

7.2 OBJECTIVES

1. Facilitate and promote low impact nature tourism which ensures ecological integrity of the ecotourism sites and its environment.
2. Identifying, developing, and promoting well managed, locally run ecotourism activities/destinations that will create livelihood opportunities and equitable sharing of benefits with the local communities.
3. Setting up of ecotourism infrastructure with eco-friendly materials that conform to global sustainability standards while following all applicable Act/ Rules / Guidelines.

4. Capacity building of all stakeholders to develop hospitality services of global standards to improve the quality of visitor experience.
5. Promote biodiversity, traditional ecological knowledge, and heritage values of Goa's wilderness.
6. Developing a monitoring and evaluation mechanism for assessing the impact of ecotourism activities on wildlife, local stakeholders, and visitors' satisfaction.

7.3 GUIDING PRINCIPLES FOR ECOTOURISM IN BHAGWAN MAHAVIR WILDLIFE SANCTUARY AND NATIONAL PARK

Based on the prescribed guidelines within sustainable ecotourism in forest and wildlife areas, the following guiding principles are important for promoting sustainable ecotourism in Bhagwan Mahavir Wildlife Sanctuary and National Park.

7.3.1 ECOTOURISM PLANNING

To promote ecotourism activities in Bhagwan Mahavir Wildlife Sanctuary and National Park, a science-based approach must be adopted for demarcating ecotourism zones, ecotourism site development, community participation and more importantly mobilising the resources. Two studies on carrying capacity have been conducted in the past on Dudhsagar Waterfall circuit and suitable recommendations have been prescribed therein. However, a fresh comprehensive study on carrying capacity of National Park and Wildlife Sanctuary is desirable which may include Dudhsagar circuit, Talde-waterfall circuit, Tambdi Surla-waterfall circuit, and Aranyak Campsite circuit. This study must calculate (a) Ecological Carrying Capacity (Physical, Real, Effective Permissible), (b) Social Carrying Capacity, (c) Facility Carrying Capacity, (d) Economic Carrying Capacity and (e) Visitors' Experience Based Carrying Capacity. As mandated, reputed institutes like WII, IISc or any equivalent should be involved to determine the carrying-capacity of eco-tourism sites by considering the wide diversity of environmental, physical, social, and economic criteria of development and management of eco-tourism

sites as well as institutional capacities of their managers. A detailed ecotourism plan needs to be developed considering all aspects to control plastic pollution, waste management, noise pollution, sewage treatment and disposal, etc.

7.3.2 ECO-TOURISM ZONATION

Ecotourism zonation ideally necessitates assessment of management requirements of the target wildlife, their habitat, their behavioural and ecological characteristics etc. Accordingly, four ecotourism zones have been identified and demarcated for Bhagwan Mahavir Wildlife Sanctuary and National Park. Tracks and roads leading up to the respective ecotourism sites have been demarcated with 25 m width to enable ecotourism activities within the extant rules and guidelines. An area, with a radius of 100 m, around the identified ecotourism site have also been demarcated for facilitating sustainable ecotourism activities. This ecotourism zonation exercise has been done to ensure ecological integrity of respective sites, including breeding areas of wildlife. The proposed zonation also accommodates safeguards to eligible people provided in the Forest Rights Act, 2006.

Eco-tourism zone has been sub-divided into

1. Trek Zone
2. Trail Zone
3. Eco-tourism Area Development Zone

Ecotourism Zones in Bhagwan Mahavir Wildlife Sanctuary Northern Side (part)

1 Trek Zones		
Site	Beat	Distance (km)
Tambdi Surla Waterfall Trek	Surla 1 and 2	2.1
Talde Waterfall Trek	Surla 1	1

2. Trail Zones		
Site	Beat	Distance (km)
Dudhsagar Jeep Trail	Collem 1,2, Sonaulim-North	12
RFO Complex to Aranyak Jeep Trail	Nandran, Collem 1	7
Terminalia Nature Trail	Nandran	2.8
Madhamali Nature Trail	Nandran	1.1
Aranyak Nature Trail	Collem 1	1.7
3. Ecotourism Area Development Zones		
Site	Beat	Area (ha)
RFO Ecotourism Complex	Nandran	142
Aranyak Campsite and Devil's Canyon	Collem 1 & 2	100.9
Dudhsagar Waterfall	Sonaulim North	14
Bolkornem	Surla 1	43.70

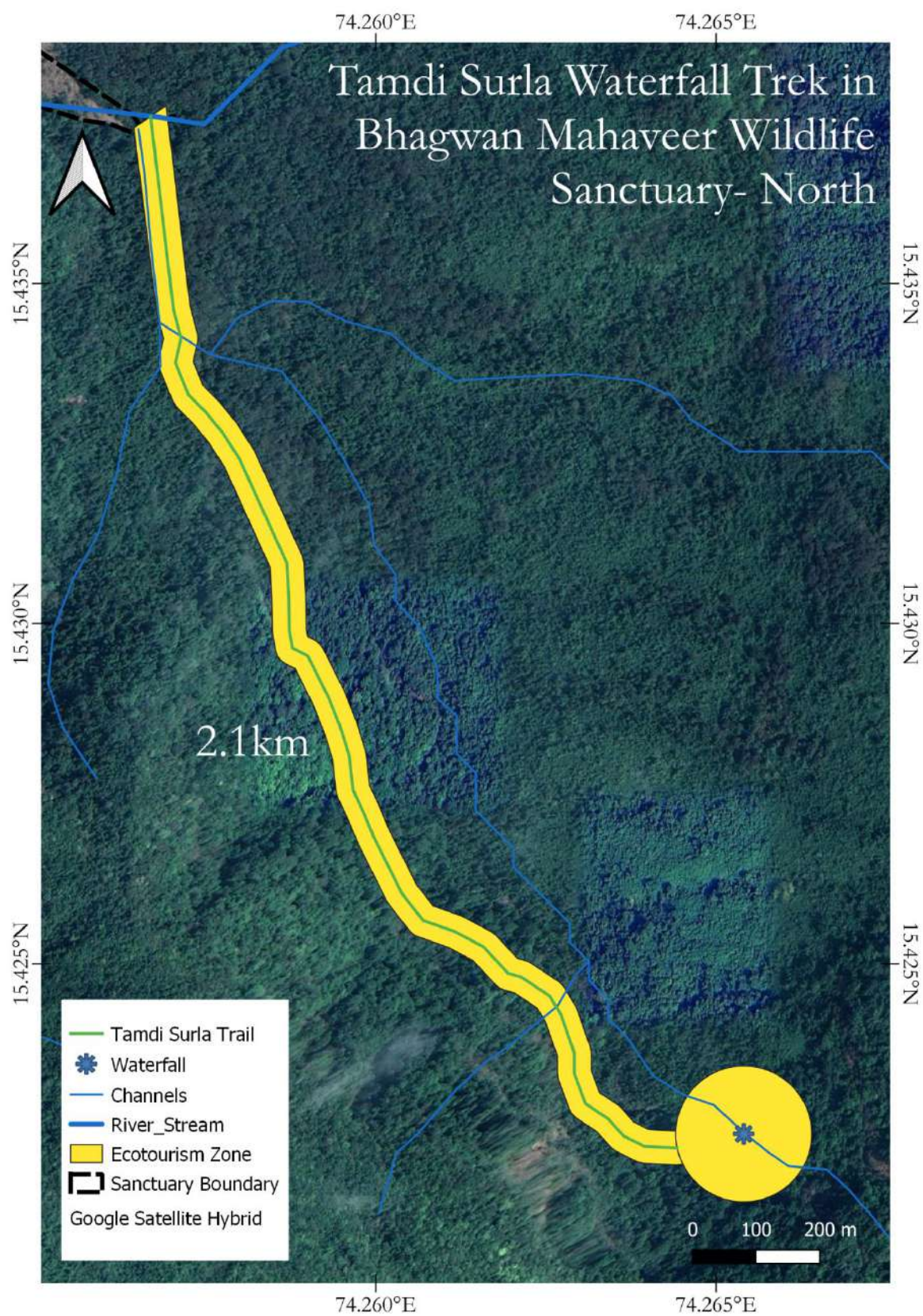
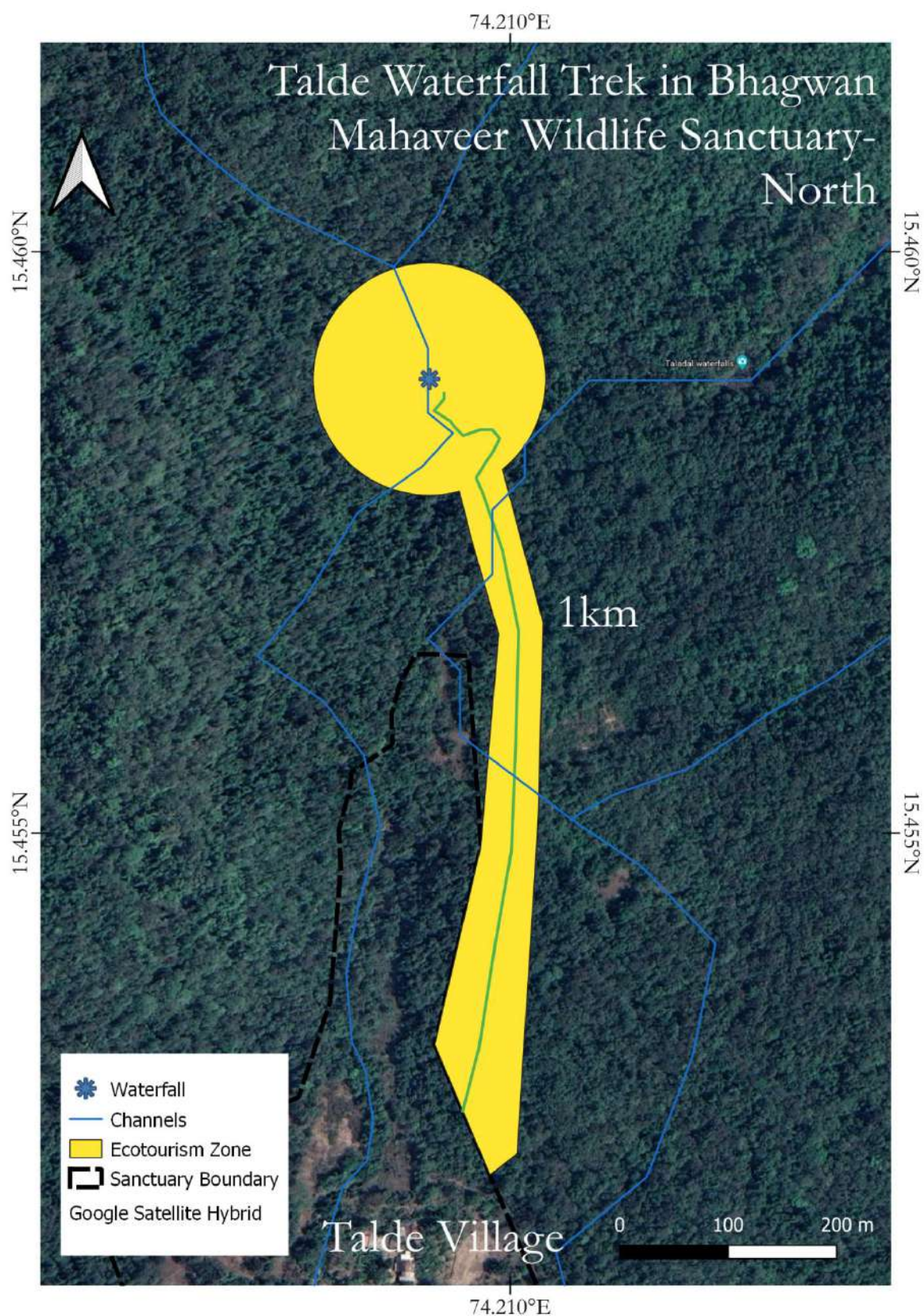
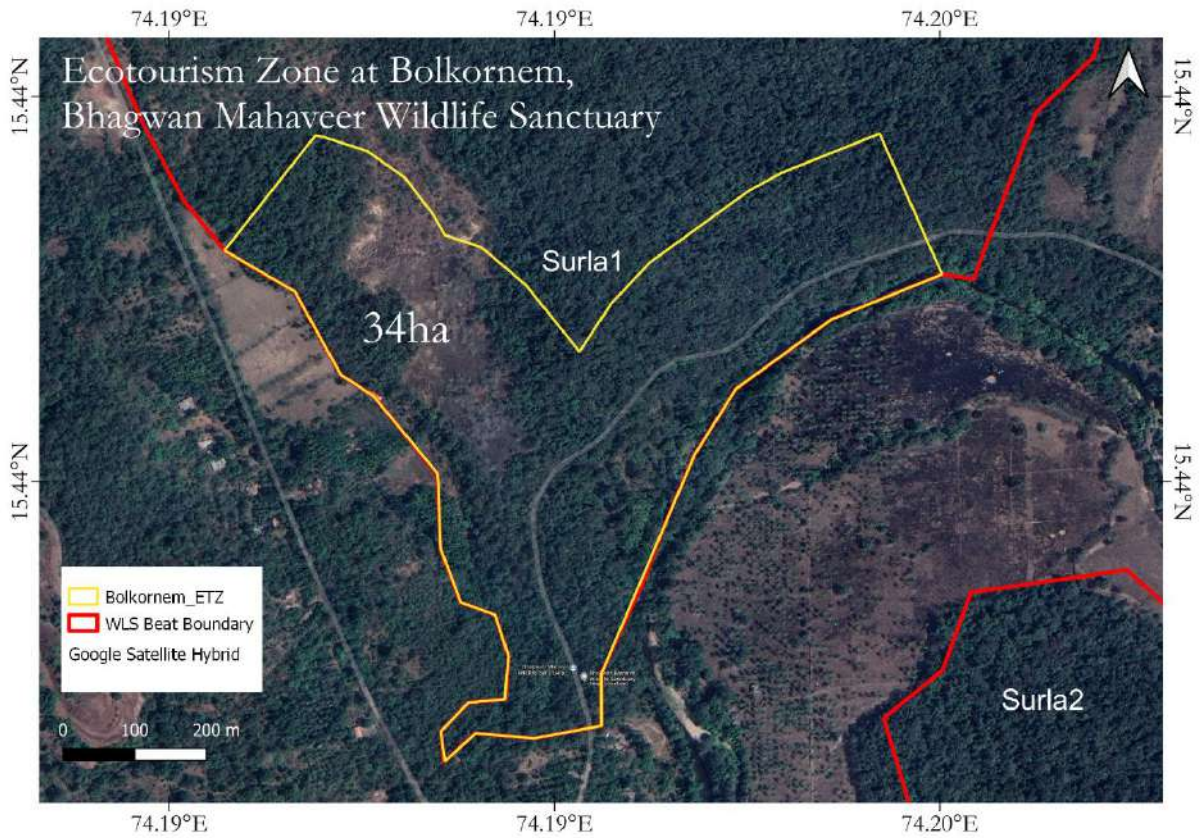


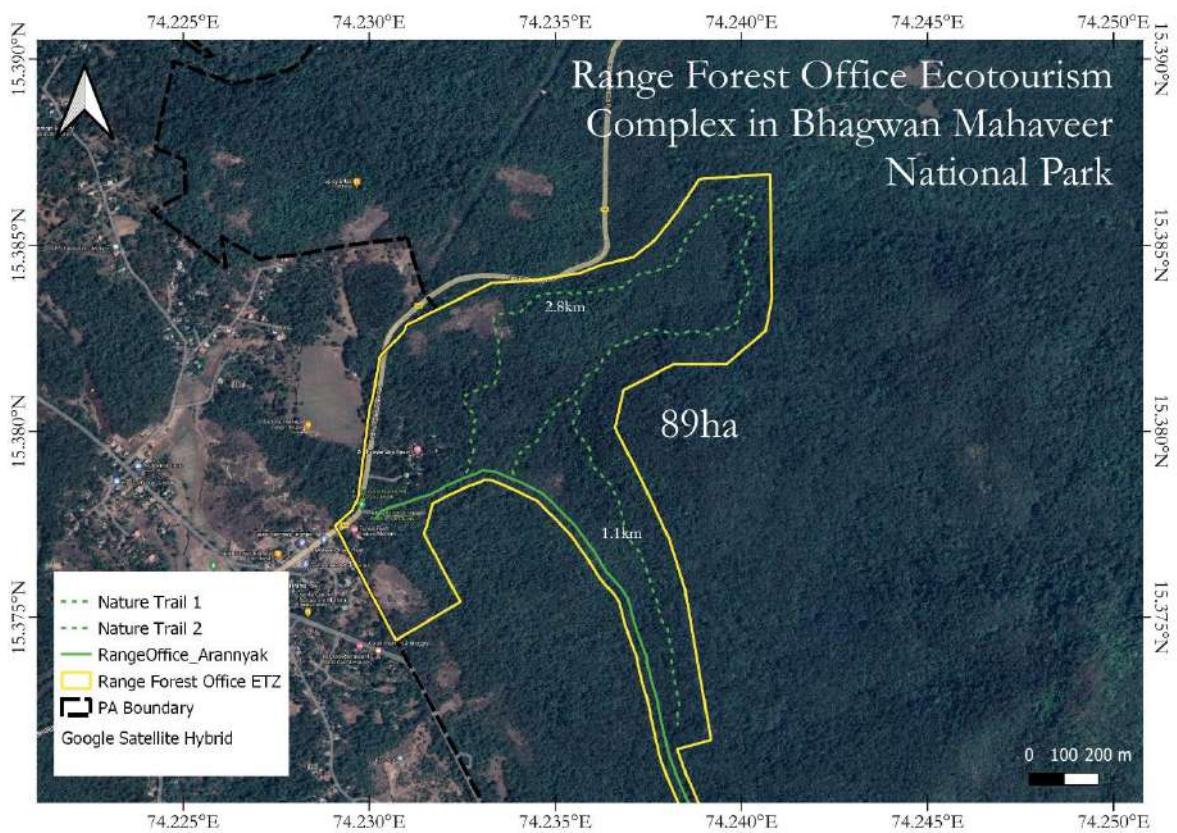
Table No. 7.1 Tambdi Surla waterfall trek rout (Trek Zone)



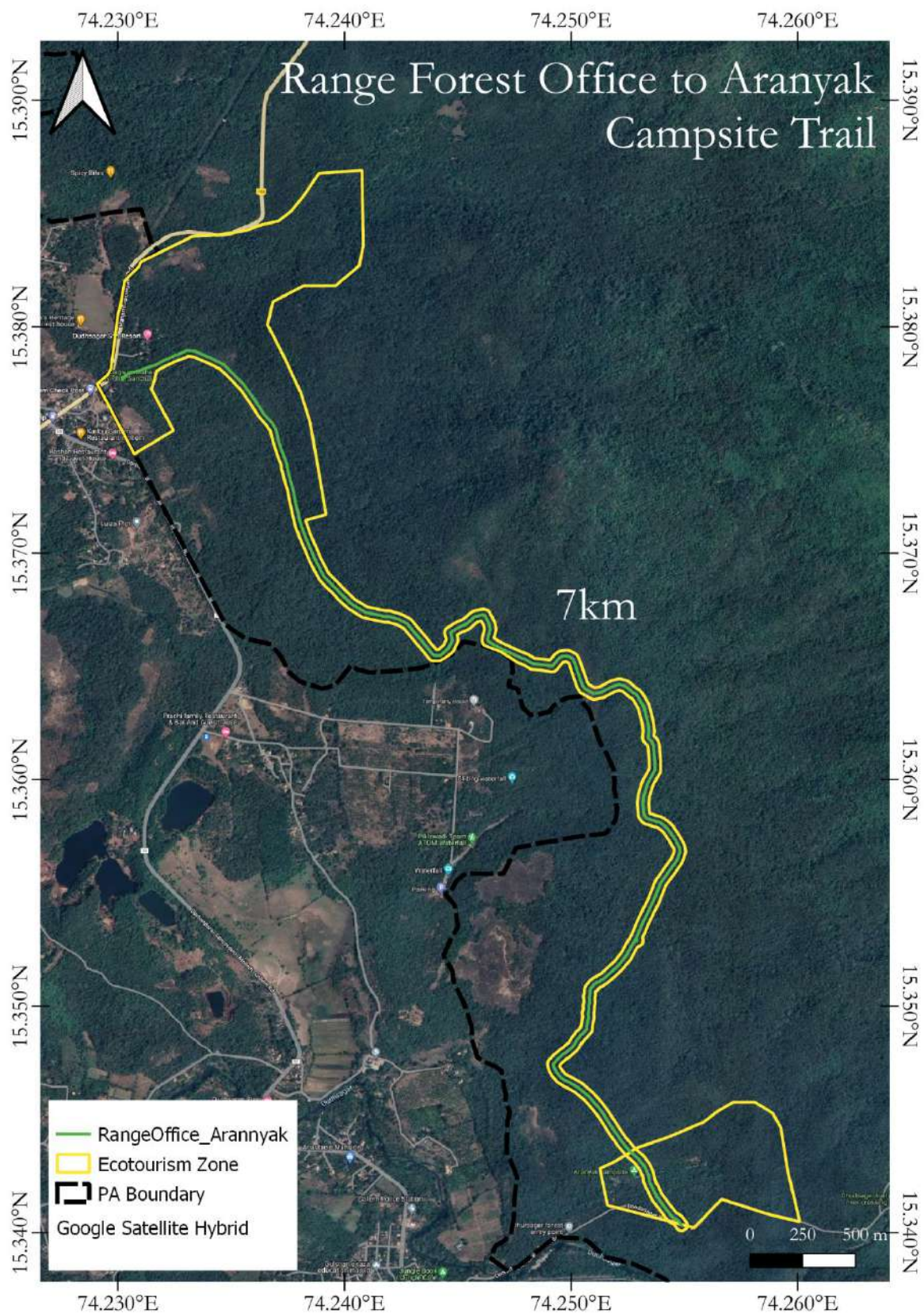
Talde Waterfall Trek (Treck Zone)



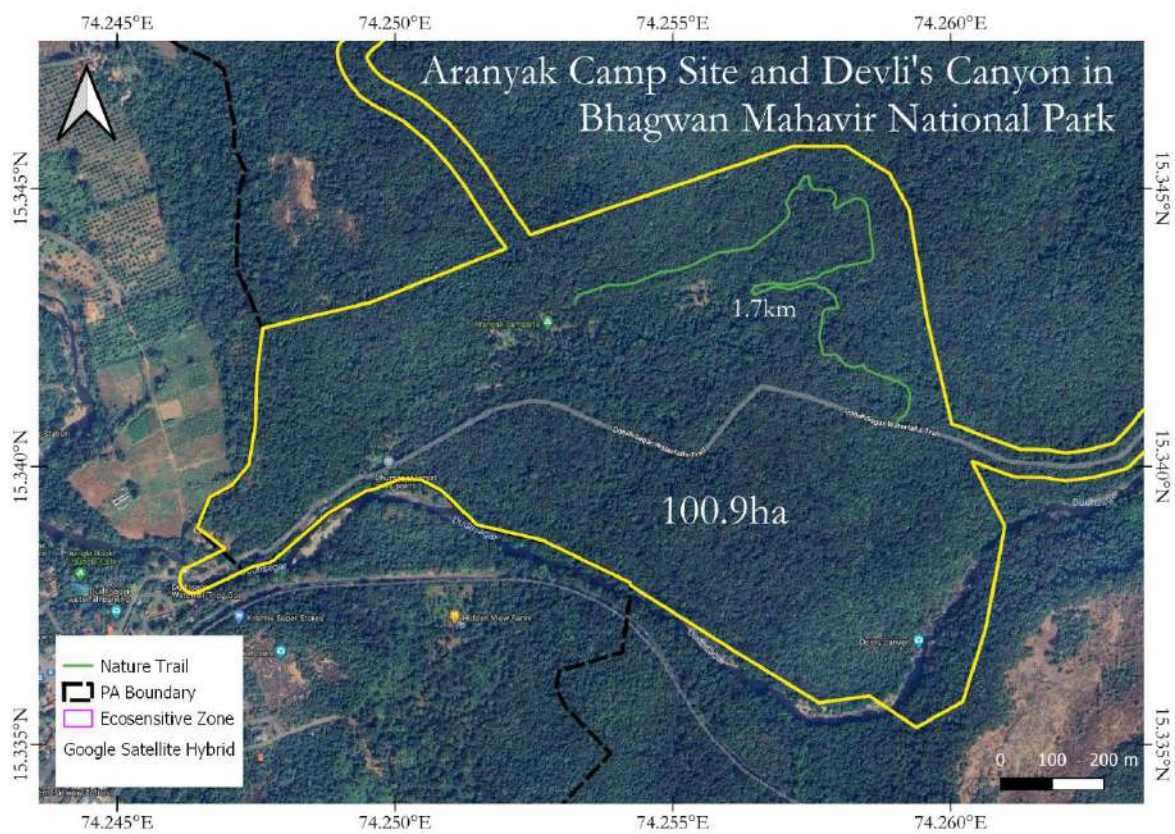
Bolkornem (Eco-tourism Area Development Zone)



RFO Eco-tourism complex (Eco-tourism Area Development Zone)



RFO complex to Aranyak Jeep Trail (Trek Zone)



Aranyak Campsite and Devils Canyon (Eco-tourism Area Development Zone)



Dudhsagar Waterfall (Eco-tourism Area Development Zone)

7.3.4 ECO-TOURISM SITE DEVELOPMENT

Ecotourism sites in Bhagwan Mahavir Wildlife Sanctuary and National Park shall be developed only in ecotourism zone and in an eco-friendly manner. While developing support infrastructure for ecotourism natural profile and ecological integrity of the ecotourism sites including its biodiversity needs to be maintained. Any ecotourism facility on forest lands shall be subject to the provisions of the Forest (Conservation) Act 1980. No permanent structure shall be made /constructed to create ecotourism facility/infrastructure. However, temporary structures/facility made predominantly of ecofriendly material of local origin may be allowed in Protected Area or on forest land. Homestays managed by local communities on non-forest land in and around PA may be promoted. For this, a database of all such operators in the vicinity of Bhagwan Mahavir Wildlife Sanctuary and National Park must be created on priority by the department and provided to GFDC or GTDC. A set of standardized criteria based on site specificity, for adoption of best practices in eco-tourism including sustainable ecological management of the site, customer satisfaction, harmony with local culture and design, ecofriendly construction material used, employment types and environmental education facilities needs to be framed while conducting the carrying capacity study as mentioned in section 7.3.1. Further, safety measures, especially for managing fire, flood, landslide etc, needs to be factored into the ecotourism site development plan and adequate system needs to be in place for efficiently managing such disasters.

7.3.5. INTER-SECTORAL SYNERGY

The Forest Department should strive for developing ecotourism sites across the state and forge necessary coordination with other sectors, like Goa Tourism Department, Goa Forest Development Corporation, Goa Tourism Development Corporation and other relevant stakeholders to ensure possible synergies. Existing regulations should be mainstreamed wherever possible, and processes and procedures should be simplified while taking into consideration the objectives of relevant sectoral policies.

7.3.6. PROMOTING ECO-TOURISM ENTREPRENEURSHIP

Concerted action are required for expanding entrepreneurial opportunities for stakeholders engaged in ecotourism with due priority to the members of local communities and those whose livelihoods have been impacted adversely because of absence of opportunity of forest product extraction from PAs. The focus should be on structural changes, boosting skills and competencies of stakeholders at all levels and overall increasing livelihoods standards by the department. Start-ups must be supported through training, coaching, financial support, and other benefits dovetailing various government programmes.

7.4. ECOTOURISM FACILITIES & ACTIVITIES

All ecotourism activities shall conform to the laws of the land, including the Forest (Conservation) Act, 1980, Environment (Protection) Act, 1986 and Wildlife (Protection) Act, 1972. Ecotourism facilities should be developed in demarcated eco-tourism zone only. However, with the approval of Chief Wildlife Warden and upon assessment of management requirements of forest, wildlife, their habitat, and ecological sensitivity of the particular area outside eco-tourism zone.

7.4.1. SUGGESTED ECOTOURISM ACTIVITIES

- a) Trekking to Dudhsagar and Tambdi Surla
- b) Bird watching trails at identified sites
- c) Nature trail facilities along Range Office – Mollem, Vasant Bandara, Bolkornem and Arannyak Campsite.
- d) Overnight Camping zones at Aranyak Camp site.
- e) Eco lodges and log cabins at Aranyak Campsite (or) Eco-sensitive zones areas around the Protected Areas.
- f) Monsoon herping facilities at Range Office – Mollem.
- g) Camping exclusive for the students and teachers

- h) Promoting research scholars to undertake PhD and masters dissertations
- i) Promoting locals self-help groups to undertake eco-tourism activities in the designated areas and throughout the buffer zones and Eco-sensitive Zone

7.5. STRATEGIES FOR DEVELOPMENT OF ECOTOURISM FACILITIES

7.5.1. UPGRADATION AND DEVELOPMENT OF ECOTOURISM INFRASTRUCTURE

The existing ecotourism infrastructure have been established in three areas, a) Range Forest Office Complex – Mollem, b) Arannyak Campsite, and c) Dudhsagar circuit. Facilities at these three circuits should be renovated and upgraded to accommodate larger number of tourists in boarding and lodging facilities, especially at Aranyak Campsite and Dudhsagar waterfall area. These existing locations are having facilities and amenities; therefore their upgradation will prove cost effective.

The Aranyak Camp currently houses tented accommodation a canteen facility and play area. But, most of these need upgradation following national/ global ecotourism standards. Some specific suggestions are as below:

1. **Visitor Reception:** Currently, there is no visitor reception area anywhere in the Aranyak Campsite of Bhagwan Mahavir Wildlife Sanctuary and National Park, this is very much required to facilitate interaction with official and be apprised on the dos and don'ts of the protected area. There is an urgent requirement of a Reception Office built with interiors to match with the local environment and culture. Images and/ or fiberglass models of the flagship species of this PA should be exhibited in gallery of the reception area. All critical information on the protected area pertinent cautionary advice, statutory warnings should be prominently displayed here in English, Hindi, Konkani, and Marathi. Suitable brochures highlighting details of PA facilities, available timings of visit, connectivity etc and important MoEFCC eco-tourism should be prepared for use of tourists.

2. **Enhancing Visitor Facilities at Dudhsagar, Talde and Tambdi Surla Waterfalls:**

Currently, access to Dudhsagar waterfalls is through two modes (a) a jeep ride of 12 km from Collem Check post to the parking area of the waterfalls and (b) through a trekking route. Trained nature guides from the local community be deployed to guide the visitors. The access route from the Jeep Parking area to the falls should redone/improved to ensure safety and security of the tourists, especially senior citizens. Sufficient handholds and railings should be provided to ease the access to waterfalls. Forest trackers should be deployed along the trail to the waterfall area to ensure that tourists do not feed wild animals and litter the area. In case of violation, stringent enforcement must be ensured. Facilities for changing rooms and toilets should be created/upgraded at suitable sites near the waterfalls to improve sanitation and privacy. Signages & Information boards should be placed all along the trail with relevant information on biodiversity and rules to be followed in the protected area. At present, there are minimal or no facilities available at Talde and Tambdi Surla Waterfalls. Most visitors visit these waterfalls unassisted. Adequate suitable facilities should in line with recommendations for Dudhsagar.

3. **Access route to Waterfalls:** Currently, access routes to all waterfalls, except Dudhsagar, are only trekking routes. The existing jeep trail of 12 km to Dudhsagar. Because of its unique geological conditions becomes very dusty in the dry, winter and pre-monsoon period. In the post-monsoon period and slushy and slippery, posing hazard to visitors in the postmonsoon seasons. The recommendations in the carrying capacity report on Dudhsagar must be implemented on priority. The major concern in the Dudhsagar circuit is suspended particulate matter. Heavier particles above 1 μm diameter size, tend to settle while finer and lighter particles remain airborne for days together and travel for kilometres through wind currents. To arrest this, greenbelt plantation may be carried out using the guidelines of Central Pollution

Control Board – 2000. The jeep trail to the Dudhsagar falls shall be maintained properly during the year to ensure better experience to the visiting tourists.

4. **Nature trails:** Wildlife enthusiasts should be allowed to enter designated nature trails in PA to experience probable sighting of wildlife. These trails must be curated for the best experiences, and visitors must be provided with nature guide facility. Along these nature trails, small size information boards with pictures of wildlife may be established without compromising the aesthetic value of the forest. Separate brochures on trails should be prepared highlighting the checklists of expected animals/plant species.
5. **Wildlife/ bird watching/ herping photographic trail facilities:** Watch towers, machans, hides near waterholes and bird hides will improve visitor's experience. Binoculars can be provided on a rental basis to people who are willing to avail of these facilities. In the monsoons, Bhagwan Mahavir Wildlife Sanctuary and National Park is a perfect area for herping tours. Specially curated herping trails should be operated within the Range Forest Office Complex to improve visitor's experience. Special nature guides can be roped in from the local community to conduct these trails.
6. **Boarding and lodging facility for Visitors:** Currently, there are no dedicated boarding and lodging facility for visitors except the dormitory at Range Forest Office Complex – Mollem, and Arannyak Campsite. The dormitory accommodation facility should be improved suitably. The occupancy is of only 10PAX which is grossly less than the demand. The existing dormitory capacity should be expanded with sufficient plinth height, to deter entry of reptiles. Electrical fixtures in the dormitory should be refurbished, and pleasant interiors done for better quality. Washrooms and bathrooms should have appropriate user-friendly sanitary ware and dedicated maintenance personnel should be placed.

7. **Establishment of a state-of-the-art Butterfly Garden Canopy Walkway and souvenir shop:** A butterfly garden, in line with that established at Cotigao Wildlife Sanctuary can be established in the Range Forest Office Complex – Mollem. Suitable host plants with labelled name plates with botanical and common names and the species they serve for, should be maintained. There should be a dedicated facility for sale of souvenir of Bhagwan Mahavir Wildlife Sanctuary and National Park at Mollem complex.
8. **A canopy walkway** of worldclass standard be established by utilising the existing trees to enhance visitor experience.
9. **Transport facility:** Currently, private vehicles driven by the visitors, or their drivers are allowed to ply from the Range Forest Office – Mollem, to Arannyak Camp Site. The department could make provision for a few 4-wheel drive jeep (Open top electric SUV to allow tourists to explore wildlife in the forest. Forest safaris could be conducted at fixed timings slots, from 06:30 am 08:30, 10 am to 12, 2:30 to 04:30 pm and 05:30 to 06:00 pm depending upon the season. Night Safaris could also be introduced on trial basis, post monsoons as a special package at premium. In fact, the PA can offer a package inclusive of stay and night safari as an added attraction. Separate information/publicity material will have to be generated for the purpose.
10. **Promotion and marketing:** All the facilities provided in Bhagwan Mahavir Wildlife Sanctuary and National Park must be widely publicised and brought to the notice of prospective domestic and foreign tourists. There should be inter-departmental synergy and partnership with Goa Tourism Department, Goa Forest Development Corporation and Goa Tourism Development Corporation. To aid these processes the department should design smart brochure and other publicity materials to attract visitors. Effective publicity through hoardings at airport, railway stations and bus-stands, billboards, print, electronic and social media portals will surely help in attracting visitors. International tourism marts of the state Govt. could also promote this added attraction after being operational.

11. Exigency and miscellaneous expenditure that cannot be foreseen while executing ecotourism activities may be provided in annual budget to ensure fixing bottlenecks for execution of work.

7.6. PLANNING AND EXECUTION

The proposed activities in section 7.5, should adhere to all the provisions of Wildlife Protect Act 1972 and ethics of sustainability. Planning should involve identifying ecotourism resources, executioners, and managers. The local community should have assured gains from this venture. The staff of Bhagwan Mahavir Wildlife Sanctuary and National Park should be sensitized to the nitty-gritties of ecotourism, and they should be able to work as facilitators of ecotourism ventures along with locals. This shall require training, soft skills, reasonable familiarity with the forest and its wildlife at the entry point activity for EDC members, SHGs and departmental staff. During the execution of the plans as mentioned in section 7.5, efforts should be taken to minimize use of resources by recycling and reusing. Construction architecture must be eco-friendly, integrating all facets of natural elements.

7.7 INFRASTRUCTURE DEVELOPMENT

Establishment of eco- tourism infrastructure to be done in line with eco-tourism guidelines issued by MoEFCC from time to time.

Homestays: While this is outside the explicit purview of the department, special incentives may be provided for communities living in the buffer zones of the protected areas to promote establishment of homestay facilities by creating inter departmental synergy especially between Tourism Department and Goa Tourism Development Corporation.

Parking Lot: possibility of developing dedicated parking space for vehicles at Tambdi Surla should be explored without tree felling.

Resting Shades and washrooms: Resting shades and washrooms needs to be placed at strategic locations along all the existing and proposed tracks, for facilitating visiting tourists

Special efforts need to be made to promote eco-tourism by creating eco-tourism infrastructure and by ensuring livelihoods of local people which will ensure sustainability.

7.8 MONITORING AND EVALUATION

Monitoring of all infrastructure and evaluation of performance is an important component of ecotourism management. The following parameters shall be monitored for evaluation of ecotourism activities in Bhagwan Mahavir Wildlife Sanctuary and National Park.

S.No.	Parameter	Purpose	Type of Data
1	Protected Area Use	Data on visitor use and mode of arrival at the protected area entry point	Quantitative
2	Site Use	Data on sites visited within the protected area, seasonal patterns of use, length of stay, frequency of visits, and activities done by the visitor in the protected area.	Quantitative
3	Visitor Profile	Data on demographic and socioeconomic attributes of visitors, reasons for visiting, attitude towards wildlife, motivation, preferences expectations, and information needs	Qualitative and Quantitative
4	Visitor Satisfaction	Experience in terms of satisfaction, dissatisfaction	Qualitative and Quantitative
5	Impact of Visitors	Data on habitat quality, animal sightings and behavioural changes	Qualitative and Quantitative

Monitoring and review exercise would allow park manager to evolve with gap fill strategy and managing visitor expectation with spatial scale of eco-tourism zone.

CHAPTER 8

ECO-DEVELOPMENT

8.1 GENERAL

The idea of eco-development revolves around developing activities to ensure support from the local communities in achieving management objectives of a protected area. It focuses on creating a harmonious relationship between the protected area management and the local communities.

8.2 OBJECTIVES

1. Creating awareness for promoting wildlife conservation and confidence building measures in the fringe areas.
2. Community participation and engagement in eco-development, ecotourism, and wildlife conservation activities.
3. To improve the socio-economic conditions of the people living in the fringe areas of Bhagwan Mahavir Wildlife Sanctuary and National Park.

8.3 SPECIFIC ISSUES

1. Resettlement of communities from within Bhagwan Mahavir Wildlife Sanctuary and National Park: A pragmatic and purely voluntary resettlement scheme that assures adequate compensation and rehabilitation may be formulated in accordance with Resettlement and Rehabilitation policy of the Government in vogue with approval of State Government. Any villager residing within the Wildlife Sanctuary, who voluntarily decides to get resettled outside the sanctuary limits, may avail the benefits of the scheme, to get resettled. Such resettlement shall be done only after obtaining prior approval of the State Government.
2. Lack of participatory conservation activities involving locals: can be addressed by inviting members of villages surrounding the protected area including those from the Eco-Sensitive Zone to form a Monitoring Committee. The committee can then help the forest officials with

information exchange and sharing of traditional knowledge, that are critical to management of wildlife such as animal movements, conflicts, incidents of straying, accidents involving wildlife, poaching, and hunting, extraction of wood etc. The committee should meet monthly with the Round Forester to review their information.

3. Capacity Building through Education: through focused programs on coexistence between Humans and Wildlife. Local schools and colleges must be regularly involved in all kinds of forestry and wildlife celebrations.
4. Fire Monitoring and Control: can be streamlined through participation from local communities.

8.4 BROAD STRATEGIES

Participation of local communities from fringe areas of the protected areas including eco sensitive zones can be ensured through programmes that address their socio-economic enhancement. Below is an overview of plans for involvement of community in conducting awareness activities, ecotourism activities.

8.4.1 COMMUNITY INVOLVEMENT AND ENGAGEMENT IN ECO – DEVELOPMENT

1. Create participatory micro-planning for eco-development and providing implementation support for eco-development.
2. Formulation of eco-development committees and self-help groups in the villages revolving around traditional knowledge systems and ecotourism.
3. Training of the local communities on various aspects of ecotourism, nature guides and incentivising start-ups on home stay in eco-sensitive zone only.

8.4.2 AWARENESS AND EDUCATION ACTIVITIES FOR PROMOTING WILDLIFE CONSERVATION AND CONFIDENCE BUILDING

1. Encourage village eco-development program which specify measurable actions that can be taken up by villagers to strengthen wildlife conservation and management.
2. Conduct programmes and nature camps to increase awareness.
3. Involvement of community for restoration of degraded habitats outside protected areas.
4. Periodic competitions and programmes for educational institutions around the protected area.
5. Celebration of all important forest and wildlife days with the local communities and in educational institutions.

8.5 VILLAGE LEVEL SITE SPECIFIC STRATEGIES

Participatory micro-planning and implementation process: Micro-planning should be drawn up in consultation with the villagers and the local self-help groups. Micro-plan should accommodate all issues such as guidelines, investment criteria, training programme, schedule, and commitment etc. to ensure achieving the set objectives.

Methodology to be adopted for Eco development: should follow the eco-development guidelines issued by the Government of India. The methodology to be adopted is as below:

- A) Refer to the Management Plan and other existing materials.
- B) Refer to Socio-economic and Resource Surveys & documents.
- C) Identification of Impact Zone.
- D) Prioritization and Selection of target villages.
- E) Agreement with the village for reconstitution or new formation of EDC
- F) Preliminary analysis for Micro plan.

- G) Conduct Participatory Rural Appraisal with local community and discuss about the Preliminary Plan.
- H) Preparation of Eco-development Micro plans.
- I) Submission and Approval of Micro plans.

8.5.1 PREPARATION OF MICRO PLAN FOR ECO-DEVELOPMENT

- A) Collect general information of the village from available document:
 - a. Village socio economic profile (demography, education, land holdings, livestock, RoFR, scheme conducted/operational, etc.).
 - b. Understanding existing organizations and micro plan. EDC formed before, General body, executive committee, other existing organizations.
- B) Participatory Rural Appraisal (village meetings with key informants)
 - a. Village Transect Map: will give a bird's eye view of topography of village, Helps understanding special distribution of different types of natural resources and also help in building initial rapport with villagers.
 - b. Historical Timeline: Helps in understanding change in resource use pattern by the villagers with the time. It also helps in understanding prevailing condition/ status of resource.
 - c. Village Social Map: It helps in gathering data related to Socio economic profile of that village along with demographical features.
 - d. Village Resource Map: Helps in understanding special distribution of Natural resource, their condition/status and Strength (stock), Weakness (causes of degradation) and Opportunity (possible scope) to improve the same.
 - e. Seasonal Calendar: Helps to understand seasonal occupancy and lean period.
 - f. Venn diagram: Helps in understanding Institution/s near or inside villages and dependency of villagers on them.

- g. Participatory Wealth Ranking: Helps in understanding different economical strata prevailing in the village and Identifying Poorest of the Poor families.

8.5.2. PROPOSED ACTIVITIES

All activities proposed have a timeline of five years initially.

Entry point activities: In consultation with EDC priority work of village should be taken up as entry point activity.

The current practices being followed in order to involve the locals of Mollem, Collem & Sounaulim to facilitate eco-tourism activities with adequate numbers of jeeps based on carrying capacity studies registered with the Forest Department and controlling its operation both towards protection and enhancing livelihood opportunities for locals.

This practice is in force since last two decades

Habitat Improvement: Following activities can be undertaken for livelihood development and protected area management: Fruit tree planting, Grass land development, Eradication of invasive weeds, Gully plugs, Fire line making, Boundary marking with pillars.

Livelihood Development: Through development of suitable model, SHG formations with earmarking of revolving funds upto INR 1,00,000/- per SHG, may be considered for capacity development and cluster formation, through seasonal employment, as labour and fire watchers, ecotourism and nature guides and local handicraft supply etc.

Planning Village Meetings:

Meeting 1	
Objectives	1) introduction of EDC concept to villagers, 2) understanding of existing interaction between sanctuary and village, 3) Forest mapping with villagers to identify zones used by villagers with landmarks and making agreement to form/reform EDC.
Participants	RFO, BDO, Village Sarpanch, Panch Members and Villagers
Length	3 – 4 hours
Meeting 2	
Objective	Participatory Rural Appraisal: 1) Village Transect Map, 2) Historical Timeline, 3) Village Social Map, 4) Village Resource Map, 5) Seasonal Calendar, 6) Venn Diagram and 7) Participatory Wealth Ranking
Participants	RFO, BDO, Village Sarpanch, Panch Members and Villagers
Length	3 – 4 hours
Meeting 3	
Objective	Making Micro plan Village Development Plan (Community Development Plan, Forest Development, Agroforestry, Income Generation Activities, Livelihood Intervention, Human Resources Development/ Capacity Building Plan). Forest Resource Development plan.

	Annual Action Plan.
Participants	RFO, BDO, Village Sarpanch, Panch Members and Villagers
Length	3 – 4 hours

8.6. MONITORING AND EVALUATION

All the eco-developmental programmes should have an in-built monitoring and evaluation mechanism, to ascertain the progress in right direction and keep the ongoing activities in right track through timely corrective measures. Monitoring team should comprise of PA personnel, representatives of EDC and NGOs. Monitoring formats should be prepared regularly and submitted for regular checking. The progress of the activities should be evaluated based on set indicators of successes.

Activities planned in the micro plan can be effectively monitored by involving of FD and EDC following the scheme as mentioned below:

Major Indicators	Activity	Frequency	Means of Verification	Responsibility	
				FD	EDC

Micro plan is a dynamic document which may be changed as per requirement. Therefore, each micro plan should be revised in 3rd year of project for corrections and modifications. Moreover, progress of each year should also be recorded in the micro plan, which would also facilitate monitoring of project activities under other schemes through convergence.

CHAPTER 9

RESEARCH, MONITORING AND TRAINING

9.1 RESEARCH AND MONITORING

To conserve the rich biodiversity of Bhagwan Mahavir Wildlife Sanctuary and National Park, recommendations in the national wildlife action plan must be implemented. To take the objective of conservation of biodiversity forward, the managers of the protected area must be equipped with all scientific data on exact status of the resources, ongoing ecological processes, nature of threats and opportunities, etc., which will help in proper decision making and adopting effective strategies to deal with various management challenges. For strengthening management, research and monitoring are integral parts. It is desirable to have a well-organized research base which would help the protected area managers in the following areas:

- A) Improvement of benchmark knowledge.
- B) Effective decision making.
- C) Enhance integrity of sanctuary eco-system.
- D) Reducing overall management cost.
- E) Finding solutions to threats.
- F) Enhance public awareness and people's participation in conservation

9.1.1 OVERVIEW OF RESEARCH AND MONITORING ACTIVITIES

9.1.1.1 Research

Rigorous research by various individuals and institutions have been carried out in Bhagwan Mahavir Wildlife Sanctuary and National Park especially by Zoological Survey of India, Botanical Survey of India, Wildlife Institute of India, Indian Institute of Science, National Centre for Biological Sciences, Goa University, amongst others. Most data arising from these studies have been published in several peer reviewed research papers, nationally and internationally. However, research especially targeting forestry

and lesser wildlife needs to be enhanced considerably. The focus of research undertaken should be with the major objective of enabling assessment of the physical and biological resources, planning for conservation of these resources, and monitoring the health of the habitat. There is a need to conduct a preliminary resource study to know the biodiversity, particularly, among the insects, invertebrates, reptiles, and amphibians. Research study on the socioeconomic aspects of fringe area for formulating an effective eco-development plan. A base line data on socio-economic status of the fringe area and on the threats to the sanctuary shall be undertaken by managers of Bhagwan Mahavir Wildlife Sanctuary and National Park through, Goa State Forest Research & Training Institute, Valpoi by engaging Research Associate, Senior Research Fellow, Junior Research Fellow, etc.

9.1.1.2 Monitoring

There has to be a study on the prey base and population estimation of other larger mammals and systematic monitoring of vegetation of the sanctuary area as well. There is an urgent need to study and monitor the inter species relationship, their impact on habitat, ecological problems, status of habitat and other related aspects. The population of the major species within the protected area have a direct bearing on the above-mentioned parameter. Therefore, it is imperative that periodic estimation of all major species should be undertaken on a regular basis.

9.1.2 PRESCRIPTIONS FOR RESEARCH

9.1.2.1 Research Infrastructure and Present Status

Basic facilities, such as placement of Research Officer, accommodation, field equipment, laboratory, museum, vehicle, library, computer, GPS etc. in a centralised location at Goa State Forest Research & Training Institute (GSFRTI) may be considered for conducting research as decided by field manager. The post of Research Officer/ Research Associate should be created/hired at Research & Utilisation Division, who can also cater to the research requirements of all the protected areas in the State. The main thrust will be collection of routine data, compilation, analysing population dynamics and estimation, vegetation monitoring, threats to wildlife and identifying research areas which needs immediate and future attention and study. The research wing should be entrusted with the task of maintaining proper documentation of scientific data.

9.1.2.2 Research Funding

Adequate funds should be provided for executing various works for consolidation of research wing on the following issues:

- 1) Strengthening Research infrastructure.
- 2) Field research and monitoring.
- 3) Meeting research coordination cost.

9.1.2.3 Suggested list of Research thrust areas and Research topics

(a) Ecology (Species and Habitat)

- a. Biodiversity of Bhagwan Mahavir Wildlife Sanctuary and National Park.
- b. Study on Macro invertebrates (Butterflies, Dragonflies, aquatic insects etc.)
- c. Study on herpetofauna

- d. Study on primates.
- e. Ecology of the evergreen forests of the sanctuary.
- f. Ecology and threats to the high elevation grasslands.
- g. Long-term monitoring of birds and butterflies as habitat indicators.
- h. Carbon stock estimation in standing biomass.
- i. Movement ecology of Gaurs with consequent man-gaur conflict.
- j. Study of breeding behaviour of bird species with special emphasis on migratory species.

(b) Wildlife population surveys: Ample scope exists for refinement of the existing wildlife estimation methods with a view to narrow down the uncertainty in the estimate of population for a particular species. A precise estimate of wildlife population along with its spatial and temporal distribution will facilitate its proper management.

(c) Zoonotic Diseases

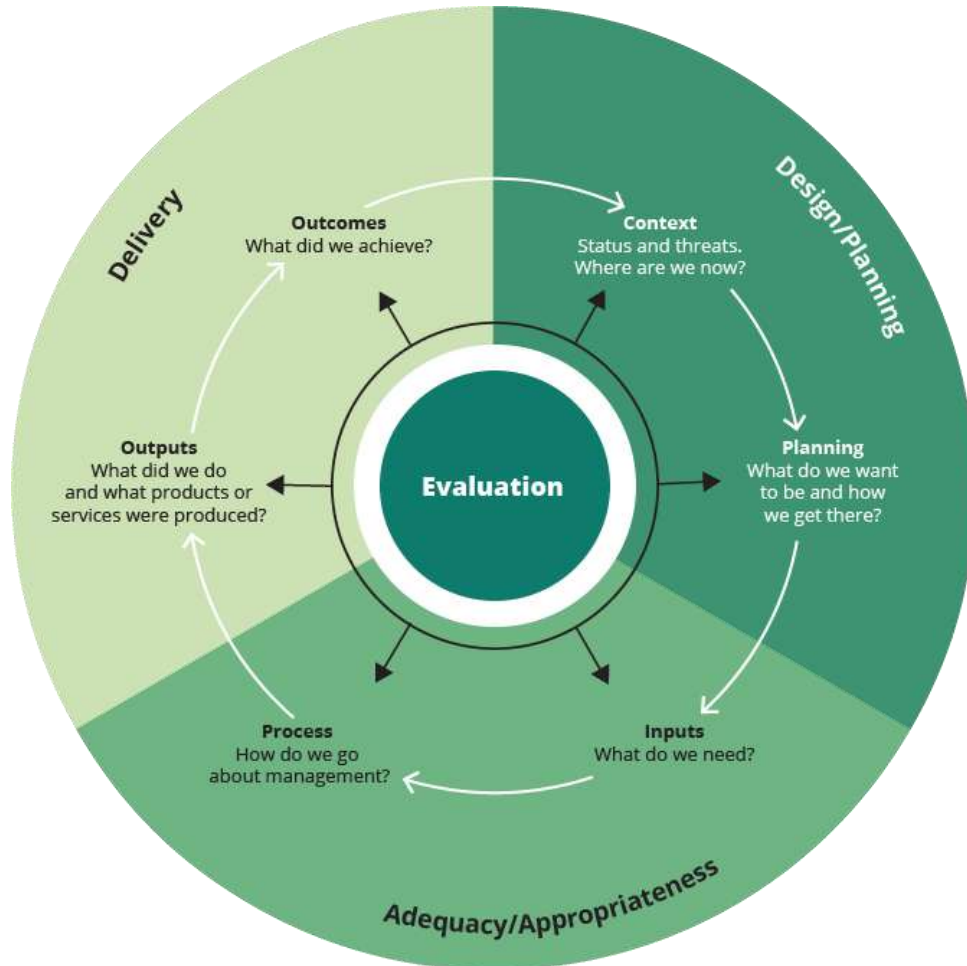
- a. Database on various wildlife diseases of different species.
- b. Study of livestock diseases of importance to wildlife and wildlife diseases of importance to livestock & (Zoonotic diseases).
- c. Compilation of a predator- disease database.

(d) Miscellaneous

- a. Study on the socio-economic conditions of the people in the fringe and eco sensitive zones to formulate an appropriate eco-development plan.
- b. Study on the carrying capacity of the sanctuary as well as appropriate interventions for formulation of eco-tourism plan.
- c. Study of soil carbon: nitrogen ratios

9.1.3 PRESCRIPTION FOR MONITORING

Monitoring should be done as per the Management Effectiveness Evaluation framework which will help to understand the strengths and weaknesses of Bhagwan Mahavir Wildlife Sanctuary and National Park.



The World Commission on Protected Areas Framework sees management as a process or cycle with six distinct stages, or elements:

1. It begins with establishing the context of existing values and threats,
2. Progresses through Planning
3. Allocation of resources (Inputs)
4. As a result of management actions (Process)
5. Eventually produces goods and services (Outputs)
6. That result in impacts or Outcomes.

There are 32 'Headline Indicators' developed under six elements of MEE framework suitable in Indian context for evaluation.

Element of Evaluation	Explanation	Criteria that are Assessed	Focus of Evaluation
Context	Where are we now? Assessment of importance, threats and policy environment	• Significance • Threats • Vulnerability • National context • Partners	Status
Planning	Where do we want to be? Assessment of protected area design and planning	• Protected area legislation and policy • Protected area system design • Reserve design • Management Planning	Appropriateness
Inputs	What do we need? Assessment of resources needed to carry out Management.	• Resourcing of agency • Resourcing of site	Resources
Processes	How do we go about it? Assessment of the way in which management is conducted	• Suitability of management processes	Efficiency and Appropriateness
Outputs	What were the results? Assessment of the implementation of management programmes and actions; delivery of Products and services.	• Results of management actions • Services and products	Effectiveness
Outcomes	What did we achieve? Assessment of the outcomes And the extent to which they achieved objectives.	• Impacts: Effects of management in relation to objectives	Effectiveness and Appropriateness

9.1.3.1 Types of Monitoring

Impact monitoring: Measuring conservation target – checking changes in conservation targets (Find cause, plan target, and check the threats and interventions).

Outcome monitoring: Measuring changes in the level of threats –checking levels of threats.

Monitoring of habitats as well as biodiversity and infrastructure is essential.

Performance monitoring - Measuring the implementation of interventions.

9.1.3.2 Factors to be monitored.

A) Overarching

1. Climate
2. Soil contamination
3. Natural and human-induced disturbances.
4. Phenological observations (long series of phenological observations may be used to detect climate variability and/or climate change)
5. Population size and area occupied.
6. Pests and diseases
7. Invasive species

B) Habitat Monitoring

1. Quantity
2. Area
3. Quality: physical attributes
 - i. Geological (e.g., presence of bare rock or deep peat).
 - ii. Water (e.g., presence of open water or depth of water table).

C) Species Composition

1. Richness and Diversity
2. Indicator Species

3. Presence Absence
4. Frequency
5. Density

D) Ecosystem Structure

1. Inter-habitat (landscape) scale (e.g., fragmentation, habitat mosaics).
2. Intra-habitat scale
 - i. Macro-scale
 1. Horizontal (e.g., plant community mosaics)
 2. Vertical (e.g., ground-, shrub- and tree layer topography)
 - ii. Micro-scale
 1. Horizontal (e.g., patches of short and tall vegetation)
 2. Vertical (e.g., within-layer topography).

E) Ecosystem Dynamics and Functions

1. Succession
2. Reproduction or regeneration
3. Cyclic change and patch dynamics
4. Physical and biochemical (e.g., soil stabilization, carbon sinks)

9.1.4 PRESCRIPTIONS FOR REVIEW

Periodic review of the management practices and infrastructure is essential. All data obtained during monitoring must be maintained and digitalized and subjected to analysis.

a) Annual Monitoring:

Measures to check effectiveness of implantation of the works of management plan, annual review is required to take corrective measures if need be. For this purpose, the following protocol needs to be followed:

- Record keeping of Floral and Faunal data as per the formats to be tabulated and digitized.

- Diary record of observations of field duty guards to be tabulated and digitized.
- Periodic ‘Group discussions’ should be held to collect feedback on various factors monitored and strategies implemented.
- ‘Annual report’ needs to be prepared based on the outcome of various factors monitored. The report should also highlight how objectives of WLS were fulfilled.

b) Three-year review

- a. Review of Impact monitoring: Measuring conservation target – checking changes in conservation targets (Find cause, plan target and check threats and interventions).
- b. Review of Outcome monitoring: Measuring changes in the level of threats –checking levels of threats.

The Parameters for review; Status of management, Protection, Habitat restoration, Diversity indices, Conservation of threatened and indicator species, Adequacy of infrastructure, staff, and financial resources, Socio-economic status of local communities

9.2 TRAINING

Wildlife Management has emerged as a progressive science. The different cadres of wildlife staff are to be imparted with certain level of basic training and education on wildlife management and other related disciplines to entrust them different tasks for efficient management of the sanctuary. Staffs are also to be made physically & technically fit through regular training, it includes handling modern arms, combat, etc. to deal effectively against poachers and smugglers. It is realized that there is inadequacy of training at all levels. Basic skill development will be targeted for field staff. It is proposed to carry out regular training programmes on matter of wildlife protection, conservation, and other related subjects of wildlife management in the field as well as at reputed specialized institutions of the country

9.2.1 TRAINING AREAS

The following training areas have been identified for Forester and Forest Guard cadres. Further, the possibility of tying up with the Police Department, Fire Department and Defense for utilizing the available local expertise should be explored.

- a) Wildlife and Forest laws.
- b) Handling arms and modern combat.
- c) Management of man-animal conflict.
- d) Managing the ranging pattern of animals (including tranquilization).
- e) Nature interpretation.
- f) Population dynamics & wildlife estimation.
- g) Animal health and nutrition.
- h) Participatory Rural Appraisal & Micro-planning.
- i) Ecology and population biology
- j) Rescue of accident affected and animals under distress.
- k) First Aid.
- l) Intelligence gathering.
- m) Basic Wildlife Forensic

Short term training course can be held at Goa Forest Research & Training Institute, Valpoi in which basic skill shall be imparted to the field staff.

9.2.2 ON THE JOB TRAINING

Inadequate frontline staff has always been a limiting factor for sending them on training courses outside the protected area. Therefore, on the job training can be conducted for trainees at GSFRTI.

9.2.3 FORMAL TRAINING COURSES

Mid and senior level officers need to be imparted training in identified subjects and institutes including training of trainers (TOT) who will then further impart training to their subordinate officers. The DCF, (Wildlife and Ecotourism) North Division can select subjects and include them in Annual Plan of operation on priority basis in consultation with Principal of GSFRTI.

CHAPTER 10

ORGANISATION AND ADMINISTRATION

10.1 STRUCTURE AND REPOSIBILITIES

Goa Forest Department functions under the administrative control of Principal Chief Conservator of Forests, who is Head of the Department. The Addl. PCCF who is also the Chief Wildlife Warden is the overall in charge of Wildlife and habitat improvement related activities of the state. There is one Conservator of Forest (Wildlife) to assist Chief Wildlife Warden. The Wildlife and Ecotourism Division (North) is headed by the Deputy Conservator of Forests, who looks after the administration and management of this Protected Areas. The Range Forest Officer, WL, Mollem is in charge of day to day management of Bhagwan Mahavir National Park and Wildlife Sanctuary. There are three Rounds i.e. Mollem, Collem and Kalay. The Round Forester is in-charge of each Round/ section, under whom Forest Guards manages 15 beats in the National Park and Wildlife Sanctuary.

Principal Chief Conservator of Forest : Head of Forest Department



Present Staff Strength:

S.No.	Designation	Number
1	Range Forest Officer	01
2	Dy. Range Forest officer	01
3	Round forester	06
4	Forest guards	13
5	Regular labourers	06
6	Temporary status labour	22
7	Daily Wage Labours (DWL)	40
	DWL above 5 years (16)	
	DWL below 5 years (10)	
	DWL below 1 year (14)	
	Total	89

Staff Responsibilities:

- The Bhagwan Mahavir Wildlife Sanctuary and National Park administration is looked after by a Deputy Conservator of Forests WL and ET North.
- Day to Day Planning, Execution, Directing, Evaluating and Coordinating operations for habitat improvement protection and investigation of forest offence is done by Range officer.
- Round Forester/ Forest beat guards is in charge of patrolling, developmental works, plantation works, etc.

10.2 STAFF AMENITIES

The Bhagwan Mahavir Wildlife Sanctuary and National Park is in the remotest taluka of Goa. Most of the places the staff reside alone, keeping their family away from their places of posting. Staff need to manage two establishments separately. To make effective use of human resources, Government may consider minimum need support for staff. Following proposals are made in this regard.

Housing: -

Proper housing for the staff with basic amenities is required at Mollem, Collem and Kalay with a special consideration of paying HRA and providing accommodation as well. This is required to encourage the staff to stay in their remote headquarters as required in public interest.

Uniforms and Field Equipment: -

Presently staff is getting uniform allowance as per State Government norms. The staff should be well equipped with arms and ammunition and other gears.

Welfare measures:

By virtue of the mandate of the Department, the forest frontline staff carries out various types of works including protection, plantation, construction, wildlife monitoring, soil and moisture conservation works, survey and demarcation, eco -tourism, research and training, extension activities like nature camps, workshops seminars, etc. Further, the work over a period of time has increased manifolds whereas staff strength remained the same. To ensure that the concerned forest staff carries out the assigned duty effectively and efficiently in a professional manner, the Department should ensure that basic amenities like residential quarters, insurance, safety, special allowances are provided to all the staff. Many of the works involve risk; therefore, options for adequate insurance cover may also be worked out preferably as a part of CSR activity or in collaboration with the bank. Regular medical camps may also be organized for the staff.

CHAPTER 11

THE BUDGET

1.1 THE BUDGET

A budget is a financial plan for a defined period, often for one financial year. However, as the validity of this Management Plan is for a decade, financial projections have been made for a span of 10 years under different heads of various components of management. Each of these Major Heads of Expenditure indicates a component of management intervention over a decadal timeline (2024-25 to 2033-34). Any modification in the proposed annual budget can be accepted with due approval of the Chief Wildlife Warden, based specific requirements and if specific need arises.

The year wise budget outlay for Bhagwan Mahavir Wildlife Sanctuary & National Park

Sr. No.	Year	Non-Recurring Budget estimate (in Lakhs)	Recurring Budget estimate (in Lakhs)	Total estimate (in Lakhs)	Remarks
1	1 st Year	280.50	148.00	428.50	Considering past management experiences and fund utilization, the figures arrived at, are projected.
2	2 nd Year	229.00	229.50	458.50	
3	3 rd Year	238.00	217.00	455.00	
4	4 th Year	158.50	230.50	389.00	
5	5 th Year	370.50	240.00	610.50	
6	6 th Year	213.50	266.00	479.50	
7	7 th Year	283.50	281.00	564.50	
8	8 th Year	228.00	299.50	527.50	
9	9 th Year	399.00	316.00	715.00	
10	10 th Year	219.50	332.00	551.50	
	TOTAL	2619.50	2594.30	5213.80	

THE PLAN BUDGET

Sr. No.	Strategy	Action Plan	Cumulative target (for 10 years)	Non-Recurring Year wise targets										Location	Budget Requirement in Lakhs
				2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34		
1	Augmentation of Water	Creation of Artificial water holes	90 nos	10	12	12.5	13	13.5	14	15	15.5	16	17	As and where required within boundaries of protected areas	138.5
		Water recharge works/rain water harvesting	30 nos		10	12	12.5	13	13.5	14	14.5	15	16		120.5
2	Soil and Water Conservation	Creation of Gully plug Check Dams	150 nos		3	3	4	4	5	5	5	5	6		40
		Creation of Loose stone check dams	150 nos		3	3	4	4	5	5	5	5	6		40
		Creation of Gabion Check dams	150 nos		3	3	4	4	5	5	5	5	6		40
3	Restoration of Habitat	Plantation of soil binding and moisture conserving flora	50 Ha		10	10	11	11	12	12	13	13	14		106
		Removal of invasive species & de-weeding	750 Ha	7	8	8.5	9	9.5	10	11	11.5	12	12.5		99

		Restoration of grass cover	50 Ha	5	5	6	6	7	7	8	8	9	9	70
4	Habitat Improvement	Rehabilitation and relocation of villages inside the sanctuary/National Park		200		100		200		100		200		800
		Propagation of specific fruit bearing plants	70 Ha		8	8	8	8	8	8	8	8	8	72
		Enrichment plantation	80 Ha		8	8	8	8	9	9	10	10	10	80
		Nursery propagation – specific plants	200000 nos	3	3	4	4	5	5	6	6	7	7	50
		Bamboo plantations	50 Ha		5	5	6	6	7	7	8	9	9	62
		Increasing grass plots/shrub/herb cover	50 Ha	5	5	6	6	7	7	8	8	9	9	70
		Repair and maintenance of Forest Roads		10	10	11	11	12	12	13	13	14	14	120
5	Forest Protection	Fire extinguishers	09 nos		1	1	1	1	1	1	1	1	1	9
		Vehicle with water tanker	02 nos		15				15					30
		Procurement of 04	03 nos		20			20			20			60

		wheeler Vehicle for patrolling purpose												
		Procurement of two wheeler for patrolling purpose	20 nos		1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	15
		Procurement of GPS for wildlife management purpose			2		2		2		2		2	10
		Procurement of camera traps for monitoring wildlife		1	2	1	2	1	1	2	2	2	2	16
		Waterholes and salt licks		1	1	1	1	1	1	1	1	1	1	10
6	Wildlife Rescue / rehabilitation	Self-protections gears and rescue equipment's for staff			2		2		2		3		3	12
		Procurement of rescue cages			1	1	1	1	1	1	1	1	1	10
		Construction of Shed for housing Rescue cages			15				15					30
		Construction of store room for storing rescue equipment's			10	1	1	1	1.5	1.5	1..5	2	2	21.5
7	Infrastructure Development	Construction of new septic tanks for cottages at ecotourism complex.		3			3			4			5	15

8	Boundary demarcation	Boundary demarcation works			10	12	13	14	15	16	17	18	19	134
9	Mobility	Purchase of new 04 wheeler vehicles	02 nos		15	1	1	1	15	1	1	2	2	39
10	Communication	Purchase of Gadgets for field monitoring (PPS, scope, head torch, Camera traps etc)			1	1	1	2	2	2	3	3	4	19
		VHF communication hand held receivers		2.5	3	3	3.5	3.5	4	4	4.5	5	5.5	38.5
11	Ecotourism	Upgradation of nature trails/ trekking trails/bird walk trails		2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	42.5
		Creation of Information centre resources: pamphlets, brochures, maps.	Cost per year		1	1	1	1	1	1	1	1	1	09
		Creation of Infographic gallery- at nature information centre	Cost per year	15	5	5	5			5	5	5	5	50
		Creation and Erection of Signages as per theme plan	Cost per year	5	5	3	3	3	4	4	3	3	3	36

		Creation of souvenir section in the Information centre	Cost per year	10	5	5	3	3	3	3	4	4	5	45
		Nature Camps												
		New watch tower	3nos		15			15			15			45
12	Eco development	Trainings: for locals (guides, souvenir making, local product packaging)			1	1.5	1.5	1.5	2	2	2	3	3	17.5
		Associations with schools and colleges – for competitions and programmes		01	1	1	1	1.5	1.5	1.5	2	2	2	14.5
		Train local youth as ‘Nature guides’			1	1	1	1	1	1	1	1	1	09
		Total Amount in Lakhs (Non-recurring)		280.50	229.00	238.00	158.50	370.50	213.50	283.50	228.00	399.00	219.50	2619.50
Recurring Expenditure														
1	Augmentation of Water	Desilting works of water bodies	100 nos	5	5	5	5	5	5	5	5	5	5	50
		Maintenance of Water tanks/Sumps	05 nos.		1	1	1	1	1	1	1	1	2	09
		Maintenance of water pipeline supplying water to Staff colony			02	02	02	02	03	03	4	4	4	26
2	Soil and Water Conservation	Maintenance of gully and loose rubble check dams	150 nos	In lakhs	3	3	3	3	4	4	5	5	6	36

		Maintenance of gabion structures	100 nos	In lakhs	3	3	3	3	4	4	5	5	6		36
3	Restoration of Habitat	Labour for general Maintenance of habitat	20 nos	20	21	22	23	24	25	26	27	28	29		245
4	Habitat Improvement	Labour for habitat improvement and Plantation, manual uprooting invasive species	100 Ha	7	8	9	10	11	12	13	14	15	16		92
5	Forest Protection	Maintenance of fire lines	1070 km	8	9.5	11	12.5	14	15.5	17	18.5	19	20	As and where required within boundaries of protected Ares.	145
		Maintenance of road side signages		2.0	3	3	3.5	3.5	4	4.5	5	5.5	6		40
		maintenance of four wheeler used for protection purpose		1.5	1.8	2.2	2.5	3	3.5	3.8	4	4.5	5		31.8
		Deployment of Trekkers for watch ward at check posts.	44 nos	56	57.5	59	60.5	62	63.5	65	67	68	69		627.5
		Deployment of daily wage labourer for fire watcher	30 nos	6	7.5	9	11	12.5	14	15.5	17	18.5	20		131
6	Wildlife Management	Desilting of Natural water holes	60	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6		37.5
		Maintenance of Artificial water holes	50 nos	In lakhs 5	6	7	8	9	10	11	12	13	14		90
		Maintenance of Trap cages			1	1	1	1	1	1	1	1	1		09
		Deployment Personnel	03	10-	11	12	13	14	15	16	17	18	19		145

		for Rescue work													
7	Capacity Building	CB Workshops (Refer list in chapter 9)		1	1	1	1	1	1	1	1	1	1	As and where required within boundaries of protected Areas	10
8	Publicity and Awareness	Sensitization /awareness programmes		1	1	1	1	1	1	1	1	1	1	As and where required within boundaries of protected Areas	10
		Wildlife week													
		Vanamahotsava			0.5	0.5	0.5	0.5	0.5	0.5	1	1	1		06
		Awareness camps			1	1	1	1	1	1	1	1	1		09
		Nature camps	lumsun												
9	Infrastructure maintenance	Maintenance of check posts/gates/patrolling stations			10	1.5	2	2.5	3	3.5	4	4.5	5	As and where required within boundaries of protected areas.	36
		Office Upgradation – IT based as per theme plan on Pg. 141			In lakhs 5	5	5	5	5.5	5.5	6	6.5	7		50.5
		Maintenance of A type Quarter		5	15	1.5	1.5	2.	2.5	3.	3.5	4	4.5		42.5
		Maintenance of C type Quarter		5	5	1.5	1.5	1.5	1.5	2.	2.	2	2		24
		Maintenance of Range Forest office		05	05	1	1	1	1.5	1.5	1.5	2	2		21.5
		Maintenance of Nature Information centre			01	1	1	1	1	1.5	1.5	2	2		12

10	Boundary demarcation	Maintenance of Boundary demarcation works			15	16	17	17.5	18	18.5	19	19.5	20		160.5
11	Mobility	Repair and maintenance of four wheelers			1	1	1	1	1.5	1.5	1.5	1.5	1.5		11.5
		Repair and maintenance of two wheelers			1	1	1	1	1.5	1.5	1.5	1.5	1.5		11.5
12	Ecotourism	Maintenance of nature trails/ trekking trails/bird walk trails		2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	As and where required within boundaries of protected areas.	42.5
		Maintenance of Information centre			1.5	1.5	1.5	2	2.5	2.5	3	3.5	3.5		21.5
		Maintenance of Signages		1	2	2.5	3	3.5	4	4.5	4.5	5	5		35
		View line maintenance	900 km	6	6.5	7	7.5	8	8.5	9	10	10.5	11		84
		Maintenance of Watch towers			2.5	2.5	2.5	2.5	3	3	3	3	3		25
		Maintenance of cottages			1.5	1.5	1.5	1.5	2	2.5	2.5	3	3		19
		Maintenance of Gardens			5	5.5	6	6.5	7	7.5	8	8.5	9		56.25
	Eco development	Trainings: for locals (guides, souvenir making, local product packaging)			1	1	1	1	1	1	1	1	1	As and where required within	09

		Maintenance of gardens												boundaries of protected areas.	56.25
		Associations with schools and colleges			1	1	1	1	1	1	1	1	1		9
	Miscellaneous	Emergency situation/Disaster management fund/ Structural maintenance not listed.			05	0.5	0.5	0.5	1	1	1	1.5	1.5		12.5
		Stationary / Software upgradation/			3	3	3	4	4	4	5	5	5		36
		Servicing of gadgets and equipment			02	02	02	02	2.5	2.5	3	3.5	4		23.5
		Conveyance and hospitality	lump sum		1	1	1	1	1	1	1	1	1		09
	Total Amount in Lakhs (Recurring)			148.00	229.50	217.00	230.50	240.00	266.00	281.00	299.50	316.00	332.00		2594.30

CHAPTER 12

THE SCHEDULE OF OPERATIONS AND MISCELLANEOUS REGULATIONS

12.1 THE SCHEDULE

First plan - 10 years period

12.2 RECORD OF DEVIATIONS AND IMPLEMENTED TARGETS

Any modification in the proposed annual budget can be accepted with due approval of the Chief Wildlife Warden, as per specific requirements and if specific need arises. Special requirements arising due to any natural calamities/disasters may be accommodated with due approval of the Chief Wildlife Warden. There should be periodical review of the Management Plan.

12.3 RECORD OF EMPLOYMENT POTENTIAL

Not Applicable

12.4 CONTROL FORMS

Since this is the first wildlife management plan for Bhagwan Mahavir Wildlife Sanctuary and National Park, the components of the control form only applicable for this plan be entered and maintained.

FORM WM-1**CREATION OF NEW ARTIFICIAL WATERHOLES**

Sr. No	Category	Year	Location	Cost	Performance
1	2	3	4	5	6
1	Excavation				

FORM WM-1.1**MAINTENANCE OF WATERHOLES: NATURAL**

Sr. No.	Category	Perennial or seasonal	Location	Year	Nature of work	Cost	Performance
1	2	3	4	5	6	7	8
1	Natural	Perennial					

FORM WM - 1.2

MAINTENANCE OF WATERHOLES: ARTIFICIAL

Sr. No.	Category	Perennial seasonal	or	Location	Year	Nature of work	Cost	Performance
1	2	3		4	5	6	7	8
1	Artificial	-						-

FORM WM – 2

RESTORATION OF HABITAT: WEED CONTROL, INITIAL OPERATION

Sr. No.	Location and name of site	Year	Extent of area(ha)	Species of weed	Operation	Total cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9
1								
2								

FORM WM - 2.1

RESTORATION OF HABITAT: WEED CONTROL, SUBSEQUENT OPERATIONS

Sr. No.	Location and name of site	Year	Extent of area (ha)	Complete or partial coverage	Species of weed	Operation	Total cost	Cost per ha	Remark
1	2	3	4	5	6	7	8	9	10
1									

FORM WM - 2.2**RESTORATION OF HABITAT: CONTROL OF REGENERATION OF WOODY SPECIES IN GRASSLANDS**

Sr. No.	Location & name of site	Year	Extent of area (ha)	Species controlled	Operation	Total cost	Cost per (ha)	Remarks
1	2	3	4	5	6	7	8	9
1								
2								
3								

FORM WM - 2.3
RESTORATION OF HABITAT: PRESCRIBED BURNING

Sr. No.	Location & name of site	Year	Extent of area (ha)	Area treated (ha)	Period	Total cost	Cost per (ha)	Remarks
1	2	3	4	5	6	7	8	9
1								

FORM WM - 2.4

**RESTORATION OF HABITAT: SOIL CONSERVATION MEASURES - INITIAL OPERATIONS
AND SUBSEQUENT MAINTENANCE**

Check dams

Sr. No.	Location & name of site	Year	Extent of area (ha)	Area treated (ha)	Operations	Total cost	Cost per (ha)	Remarks
1	2	3	4	5	6	7	8	9
1								
2								

FORM WM - 2.5

RESTORATION OF HABITAT: PLANTING, SOWING - INITIAL OPERATION

Sr. No.	Location	Year	Extent of area (ha)	Species	Planting stock	Spacing	Operations	Total cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9	10	11
1										

FORM WM - 2.6

**RESTORATION OF HABITAT: RESPONSE OF PLANTINGS, SOWINGS AND
SUBSEQUENT OPERATIONS**

Sr. No.	Location	Year	Extent of area (ha)	Species	Survival%	Casualty replacement	Operations	Total cost	Cost per ha	Remarks
1	2	3	4	5	6	7	8	9	10	11

FORM WM - 2.7

RESTORATION OF HABITAT: AREA UNDER PROTECTION/CLOSURE

Sr.No.	Location	Year	Extent of area (ha)	Description of site	Regulation protection measures	or Response	Remarks
1	2	3	4	5	6	7	8
1							
2							
3							

FORM WM - 3**ANIMALS: MEASURING TRENDS IN POPULATIONS (YEAR)****Year:**

Sr. No.	Species	Population estimation Methodology	Adult		Sub- adult		Yearlings	Fawns	Cubs	Total	Remark
			Male	Female	Male	Female					
1	2	3	4	5	6	7	8	9	10	11	12
1											

FORM WM - 3.1**ANIMALS: NEW RECORDS****Year:**

Sr. No.	Species	Location	Year	How discovered	Details of number, age, sex	Habitat description	Remarks
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

FORM WM - 3.2**ANIMALS: MORTALITY OTHER THAN THAT ATTRIBUTABLE TO AN OFFENCE****Year:**

Sr. No.	Species	Location	Year	Sex and age	Number	Discovered in what condition	Cause of mortality	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	-

FORM WM - 3.3**ANIMALS: MORTALITY ATTRIBUTED TO POACHING OR AN ACT OF VANDALISM****Year:**

Sr. No.	Species	Location	Cause of mortality				Remarks
			Number	Sex	age	Class	
1	2	3	4				5
-	-	-	-	-	-	-	

FORM WM - 3.4**ANIMALS: PREDATION ON DOMESTIC LIVESTOCK BY WILD CARNIVORES****Year:**

Sr.No.	Range	Month	Category of livestock killed	Location	Numbers	Ex gratia Payment(Rs)	Carnivore involved	No. of cases undecided	Remarks
1	2	3	4	5	6	7	8	9	10
-	-	-	-	-	-	-	-	-	

FORM WM - 3.5**ANIMALS: KILLING OF A HUMAN BY WILDLIFE OR INJURY CAUSED****Year:**

Sr. No	Range	Month	No. of incidents	No. of people killed, age & sex	Location circumstance & species	No. of people injured, age and sex	Location circumstance and species	Ex gratia Payment (Rs)
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM WM - 3.6**ANIMALS: WILDLIFE DAMAGE TO PRIVATE OR PUBLIC PROPERTY****Year:**

Sr. No	Range	Month	The category of property	Extent of damage	Species involved and number	Remark
1	2	3	4	5	6	7
-	-	-	--	-	-	-

FORM WM - 4**PLANTS: NEW RECORDS**

Sr. No	Family	Species	Year	Location	Habitat	Status	Remark
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	-

FORM WM - 4.1**PLANTS: DISEASE AND MORTALITY**

Sr. No.	Species	Location	Year	Particulars of disease morbidity and mortality	Area affected	Remark
1	2	3	4	5	6	7
-	-	-	-	-	-	-

FORM WM - 4.2**PLANTS: ILLEGAL AND LEGAL COLLECTION**

Sr. No.	Year	Species	Location	Details of material	Quantity	Trade particular	Remarks
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	-

FORM WM - 4.3**TIMBER OUT-TURN AND REVENUE****YEAR**

Sr. No.	Range	Timber Species	Volume extracted amt in grade	Volume auctioned amt in grade	Amount (Rs)	Price/cmt/(Rs) grade	Unauctioned Volume cmt in grade
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	-

FORM WM - 4.4**FIREWOOD OUT-TURN AND REVENUE****YEAR AND DEPOT**

Sr. no.	Range	Firewood species	Volume extracted cmt.	Volume auctioned cmt.	Amount (Rs)	Price/ cmt(Rs)	Disposal pattern of firewood in cmt.	
							Local	Other areas
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	-

Note: - No commercial felling of trees as per the law.

FORM WM - 4.5**OUT-TURN OF CHARCOAL AND REVENUE****YEAR AND DEPOT**

Sr.No	Range	Species used	Volume tonnes	Converted charcoal quantity tonnes	Conversion factor	Quantity sold	Total amount per ton (Rs)	Disposal pattern in tonnes	
								Local	Other area
1	2	3	4	5	6	7	8	9	10
-	-	-	-	-	-	-	-	-	-

Note: - No commercial felling of trees as per the law.

FORM WM - 4.6**Extraction of bamboo and disposal****Year**

Sr. No	Range	Species	Quantity extracted by		Disposal, commercial non-by		Revenue realized (Rs)		Undisposed quantity	
			Commercial	Non-commercial	Locally	Other areas	commercial	Non commercial	Commercial	Non-commercial
1	2	3	4	5	6	7	8	9	10	11
-	-	-	-	-	-	-	-	-	-	-

FORM WM - 4.7**DISTRIBUTION OF FOREST PRODUCE UNDER NISTAR AND OTHER CONCESSIONS****INCLUDING FREE GRANT****YEAR**

Sr.No.	Range	Produce	Species	Quantity	village	No. of families	Revenue	Free of change qty.
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM WM - 4.8**NWP COLLECTION: PLANTS AND OTHER PRODUCE****YEAR**

Sr No.	Range	Kind of produce	Species	Quantity	Revenue realised	Free of change quantity	Agency involved	
							Local people	Outsiders
1	2	3	4	5	6	7	8	
-	-	-	-	-	-	-	-	

Note: - Harvesting of plants and other produce is prohibited as per law.**FORM WM - 5****GRAZING OF DOMESTIC LIVESTOCK****YEAR**

Sr. No.	Grazing unit No.	List of villages in the unit	Village- wise listed population of cattle	Capacity of the unit (cattle units) and number of cattle grazing	Total cattle units grazed		Remark
					Legal	Illegal	
1	2	3	4	5	6		7
-	-	-	-	-	-		-

Note: - No record available.

FORM WM - 6**INTER-AGENCY PROGRAMMES: AGENCIES AND SCHEMES (GOVERNMENT)****YEAR**

Sr.No.	Name of agency	Central or state	Number and name of scheme operated	Physical and financial targets		Area & location	Remarks
				Given	Achieved		
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

Note: - No record available.**FORM WM - 6.1****PROGRAMMES OF NGOS****YEAR**

Sr.No	Name of agency	HQ location	Nature of the scheme operated	Physical/financial targets		Area and location	Remarks
				Given	Achieved		
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

Note: - As per the availability of speaker and funds.

FORM WM - 7

CONSTRUCTION*/MAINTENANCE* OF INFRASTRUCTURE: ROADS & BRIDGES (*EXISTING/NEW)

YEAR: 2021-22 to 2030-31

Sr. No.	Category	Range	Surface	Name or number	Length covered (km)	Cross drainage works bridges or culverts with types	Total cost and status
1	2	3	4	5	6	7	8
1							

FORM WM - 7.1**CONSTRUCTION*/MAINTENANCE* OF INFRASTRUCTURE: BUILDINGS (*EXISTING/NEW)****YEAR: 2021-22 to 2030-31**

Sr. No.	Range	Nature of the building	Location	Types of construction	Numbers	Total cost	status
1	2	3	4	5	6	7	8
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							

FORM WM - 7.2

DEVELOPMENT*/MAINTENANCE* OF INFRASTRUCTURE: COMMUNICATION (*EXISTING/NEW)

YEAR 2021-22 to 2030-31

Sr. No.	Range	Type of facility	Location	Numbers	cost	Advantage gained	Remarks
1	2	3	4	5	6	7	8

FORM WM - 7.3

DEVELOPMENT*/MAINTENANCE* OF INFRASTRUCTURE: VEHICLES (*EXISTING/NEW)

YEAR 2021-22

Sr. No.	Kind of vehicle	Number	HQ if any	Intended use	Cost	Remarks
1	2	3	4	5	6	7

FORM WM - 7.4

DEVELOPMENT OF INFRASTRUCTURE: MANPOWER RECRUITMENT*/EXISTING MANPOWER*

YEAR 2021-22 to 2030-31

Sr. No.	Category of post	Number	Status		Scale pay	Intended Deployment/deployed as	Remarks
			Recruited	Vacant			
1	2	3	4	5	6	7	8
1							
2							
3							
4							

FORM WM - 7.5**DEVELOPING INFRASTRUCTURE: CONSTRUCTION OF BOUNDARIES, FENCES, CPTS, EPTS, ENCLOSURES,
ENCLOSURES (*EXISTING/NEW)****YEAR 2021-22 to 2030-31**

Sr. No.	Category of construction	Range	Location	Length(meter)	Numbers	Specification	Remarks
1	2	3	4	5	6	7	8
1							

FORM WM - 7.6**DEVELOPING INFRASTRUCTURE: FIRELINES (*EXISTING/NEW)****YEAR 2021-22 to 2030-31**

Sr. no.	Range	Fire line category and width	Name of points connected	Length (meters)	Cost	Remarks
1	2	3	4	5	6	7
1						
2						

FORM WM - 8

TOURISM YEAR

Total number of visitors all categories: - 1402 nos.

Name of complex: - Arannyak

Total revenue earned: 28040.00 (2019-2020)

Sr. No.	The category of visitors by month & number					Indian			No. day visitors	No. staying overnight And revenue
	Adult			children	Foreigners	Rural	Urban	Revenue		
	Month	Male	Female							
1	2	3	4	5	6	7	8	9	10	11
1										
2										
3										
4										
5										
6										
7										
8										
9										

10										
11										
12										

FORM WM - 8

TOURISM YEAR

Total number of visitors all categories: - 79,331 nos.

Name of complex: - Arannyak Zoo.

Total revenue earned: 46, 12,105/- (2019-2020)

Sr. No.	The category of visitors by month & number					Indian			No. day visitors	No. staying overnight And revenue
	Adult			children	Foreigners	Rural	Urban	Revenue		
	Month	Male	Female							
1	2	3	4	5	6	7	8	9	10	11
1										
2										
3										
4										
5										

6										
7										
8										
9										
10										
11										
12										
	Total									

FORM WM - 8.1

TOURISM: USE OF TOURIST FACILITIES - LODGING

YEAR: 2019-2020

Name of complex: Ecotourism complex Arannyak Camp Site.

Class of accommodation: **Capacity (beds): 02 beds for each room.**

Sr. No.	Month	Month capacity (beds/month)	Occupancy (beds/month)		Total occupancy During the month(beds/month)
			Foreign	Indian	
1	2	3	4	5	6
1					
2					
3					

4					
5					
6					
7					
8					
9					
10					
11					
12					

Note: - The total number of visitors for next few year cannot be defined, however annual increase of 10% may be consider.

FORM WM - 8.2

TOURISM: USE OF TOURIST FACILITIES - FIELD TRIPS

YEAR

Name of complex: - Bondla

Sr. No.	Month	Riding elephant use. Month trip capacity	Utilisation	Revenue (Rs)	Use of PA bus/es. Month trip capacity	Utilisation	Revenue (Rs)	Use of month trip quantum	Guides utilisation	Revenue (Rs)
1	2	3	4	5	6	7	8	9	10	11
-	-	-	-	-	-	-	-	-	-	-

FORM WM - 8.3**ECO-TOURISM - PARTNERS****YEAR**

Sr. No.	Identity of eco-tourism entrepreneur	Infrastructure	Programmes	Investment	Kind and extent of benefits to local people	Benefit to PA & resources
1	2	3	4	5	6	7
-	-	-	-	-	-	

Note: - NIL.

FORM WM - 8.4 (A) & (B)**ECO-TOURISM: VISITOR ASPIRATIONS****YEAR**

Visitor category	No.	Interested in									
Adult Male		Plants	Bird watching	Animal sighting	Photography	Sketching	Scenic place	Cultural /historical sites	Pilgrimage	Trekking	Other
Female											
Children											
Foreigner Male											
Female											
Children											
1	2	3	4	5	6	7	8	9	10	11	12

Note: - No record available.

FORM WM - 9**OUTBREAK OF FIRES****YEAR**

Sr. No.	Range	Location	Extent (ha)	Dates		Reasons	Estimated loss	Remarks
				Detected	controlled			
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

Note: - No record available.**FORM WM - 10****OFFENCE CASES DETECTED****YEAR**

Sr. No.	Range	Category	Numbers	Number of cases decided		Number of cases under process	Number of cases compounded	Remarks
				Successful	Failure			
1	2	3	4	5	6	7	8	9
1			01	01	-	-	01	

FORM WM - 11**INCENTIVES AND REWARDS/AWARDS****YEAR**

Sr. No.	Range	Number of recipients : incentives/reward detecting offences	No. of recipients award outstanding service	Kind of award	Number recipients	Remarks
1	2	3	4	5	6	7
-	-	-	-	-	-	

Note: - No record available.**FORM WM - 12****RESEARCH PROJECTS UNDER IMPLEMENTATION THROUGH PA MANPOWER WITH OR WITHOUT****COLLABORATION WITH OTHER AGENCIES****YEAR**

Sr. No.	Title	Completed	Ongoing	New	Status	Financial outlay (Rs)	Expenditure incurred (Rs)	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

Note: - No record available.

FORM WM - 12.1**RESEARCH PROJECTS UNDER IMPLEMENTATION BY OTHER AGENCIES****YEAR**

Sr. No.	Title	Completed	Ongoing	New	Status	Financial outlay (Rs)	Expenditure incurred (Rs)	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

Note: - No record available.**FORM WM - 13****SURVEY AND INVENTORIES****YEAR**

Sr. No.	Title of survey, inventory activity	Completed	Ongoing	New	By PA	By other agency	Remarks
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

FORM WM - 14**THE MONITORING PROGRAMME****YEAR**

Sr. No.	Title of the programme	Date of initiation	Responsible agency	Technique	Status of collaboration and analysis of data	Remarks
1	2	3	4	5	6	7
-	-	-	-	-	-	

FORM WM - 15**ECO-DEVELOPMENT PROGRAMME: TARGETS AND IMPLEMENTATION****YEAR**

Sr. No.	Nature of the programme	Sector (Central/State) or NGO sponsored	Target set		Achievements		Village (Buffer/enclaved)	Remarks
			Physical	Physical	Physical	Financial		
1	2	3	4	5	6	7	8	9
1								

FORM WM - 16**PROGRESS OF ALL STRATEGIES UNDER THE ZONE AND THEME PLANS****YEAR**

Sr. No.	Zone/Theme	Nature of strategy	Target as per the schedule of operations/APO*		Achievement		Location	Remarks
			Physical	Financial	Physical	Financial		
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM WM - 17**PROGRESS OF LEGAL SETTLEMENTS UNDER THE WILDLIFE (PROTECTION) ACT 1972 IN CONTEXT OF****ATTAINMENT OF THE STATUS OF A WLS/NP****YEAR**

Sr. No.	Nature of settlement/ enquiry & section under the Act	Progress achieved till the commencement of the year under report	Progress achieved during the year	Remarks
1	2	3	4	5
-	-	-	-	-

FORM WM - 18**A SUMMARY OF ALLOTMENT OF FUNDS, REVENUE AND EXPENDITURE****YEAR**

Sr. No.	Plan/non- plan/ any grant	Sector Central/State/other	Allotment received		Expenditure Incurred		Revenue realised	Remarks
			Non- recurrent	Recurrent	Non- recurrent	Recurrent		
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM LS - 1**EXISTING CORRIDORS - CONSERVATION INPUTS REQUIRED**

Sr. No.	Identity of the corridor	Length/ section	Nature Inputs/treatment	Target	Agency/cies identified	Constraints	Anticipated investment
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

FORM LS - 2**EXISTING CORRIDORS - CONSERVATION INPUTS ACCOMPLISHED**

Sr. No.	Identity of the corridor	Length/section addressed	Nature of Inputs/treatment	Agency	Target set	Achievement	Constraints	Investment	Remarks
1	2	3	4	5	6	7	8	9	10
-	-	-	-	-	-	-	-	-	

FORM LS - 3**EXISTING CORRIDORS - MONITORING HABITAT RECOVERY**

Sr. No.	Identity of the corridor	Length/section monitored	Inputs/treatment that had been provided	Monitoring technique/process	Indicators of recovery	Nature of progress	Constraints	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM LS - 4**POTENTIAL CORRIDORS - CONSERVATION INPUTS REQUIRED**

Sr. No.	Identity of the corridor	Length/section	Nature of inputs/treatment	Target	Agency/cies identifies	Constraints	Anticipated investment
1	2	3	4	5	6	7	8
-	-	-	-	-	-	-	

FORM LS - 5**POTENTIAL CORRIDORS - CONSERVATION INPUTS ACCOMPLISHED****YEAR**

Sr. No.	Identity of the corridor	Length/section addressed	Nature of inputs/treatment	Agency	Target set	Achievements	Constraints	Investment	Remarks
1	2	3	4	5	6	7	8	9	10
-	-	-	-	-	-	-	-	-	

FORM LS - 6**POTENTIAL CORRIDORS - MONITORING HABITAT RECOVERY****YEAR**

Sr. No.	Identity of the corridor	Length /section monitored	Inputs/treatment that had been provided	Monitoring technique /process	Indicators of recovery	Nature of progress	Constraints	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

FORM LS - 7**CONNECTING MULTI-AGENCY PROGRAMS IN LANDSCAPE BASED PLANNING****PARTNERS DURING YEAR:**

Sr. No.	District	Sector Central/ State/Other (specify)	Agency & Work area/speciality	Program coverage	Agreed input and mechanism	Financial implications /investment source &
1	2	3	4	5	6	7
-	-	-	-	-	-	

FORM LS - 8

MONITORING EXTENT AND QUALITY OF MULTI-AGENCY PROGRAMS

YEAR

Sr. No.	District	Sector/Central/State/ Other (specify)	Agency	Objectives & targets	Achievement and standard	Constraints	Extent of investment	Remarks
1	2	3	4	5	6	7	8	9
-	-	-	-	-	-	-	-	

12.5 Maintenance of Compartment Histories

NA

12.6 A Pocket Field Guide for Plan Implementation

NA

Annexure I

Plants and Fungi

(Abbreviations used for endemism: WG—Western Ghats | PI—peninsular India | AN—Andaman & Nicobar Islands | IND—India | SWI—southwestern India | NWG— northern Western Ghats | WI—western India | WSI—western and southern India | PCI—peninsular and central India | WPI—western peninsular India | Goa—Goa state. Abbreviations used for Red Listed Species: CR—Critically Endangered | EN— Endangered | VU—Vulnerable)

Species / Family	Local name	Endemism	IUCN
ACANTHACEAE			
<i>Andrographis paniculata</i> (Burm.f.) Wall. ex Nees	Chirayat		
<i>Asystasia dalzelliana</i> Santapau		Endemic WG	
<i>Barleria prattensis</i> Santapau			
<i>Barleria prionitis</i> L.			
<i>Barleria terminalis</i> Nees			
<i>Cynarospermum asperrimum</i> (Nees) Vollesen		Endemic PCI	

Species / Family	Local name	Endemism	IUCN
<i>Dicliptera foetida</i> (Forssk.) Blatt.			
<i>Ecboium ligustrinum</i> (Vahl) Vollesen			
<i>Eranthemum capense</i> L. var. <i>concanensis</i> (T.Anderson ex C. B. Clarke) Santapau		Endemic WG	VU
<i>Eranthemum roseum</i> (Vahl) R.Br.		Endemic WG	
<i>Gymnostachyum glabrum</i> (Dalzell) T.Anderson			
<i>Haplanthodes tentaculatus</i> (L.) R.B.Majumdar			
<i>Hemigraphis latebrosa</i> (B.Heyne ex Roth) Nees			
<i>Hygrophila pinnatifida</i> (Dalzell) Sreem.			
<i>Hygrophila ringens</i> (L.) R.Br. ex Steud.			
<i>Hygrophila schulli</i> (Buch.-Ham.) M.R.Almeida & S.M.Almeida			
<i>Justicia adhatoda</i> L.	Adulsa		
<i>Justicia procumbens</i> L.			
<i>Justicia simplex</i> D.Don			
<i>Justicia wynaadensis</i> (Nees) Heyne ex T.Anderson		Endemic WG	
<i>Lepidagathis cuspidata</i> Nees			
<i>Lepidagathis incurva</i> Buch.-Ham. ex D.Don var. <i>mucronata</i> (Nees) C.B.Clarke ex T.Cooke			
<i>Lepidagathis lutea</i> Dalzell	Koche		
<i>Lepidagathis prostrata</i> Dalzell			
<i>Nelsonia canescens</i> (Lam.) Spreng.			
<i>Phaulopsis imbricata</i> (Forssk.) Sweet			
<i>Pseuderanthemum malabaricum</i> (C.B.Clarke) Gamble			
<i>Rostellularia japonica</i> (Thunb.) Ellis			

Species / Family	Local name	Endemism	IUCN
<i>Rungia parviflora</i> (Retz.) Nees ssp. <i>pectinata</i> (L.) L.H.Cramer			
<i>Strobilanthes callosus</i> Nees	Karaw	Endemic WI	
<i>Strobilanthes ciliata</i> Nees		Endemic WG	EN
<i>Strobilanthes heyneanus</i> Nees	Karaw	Endemic PI	
<i>Strobilanthes integrifolia</i> (Dalzell) Kuntze		Endemic WG	
<i>Strobilanthes ixiocephalus</i> Benth.	Kaarw	Endemic WG	
ALISMATACEAE			
<i>Wiesneria triandra</i> (Dalzell) Micheli			EN
AMARANTHACEAE			
<i>Achyranthes aspera</i> L.			
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.			
<i>Amaranthus spinosus</i> L.			
<i>Celosia argentea</i> L.			
<i>Cyathula prostrata</i> (L.) Blume			
AMARYLLIDACEAE			
<i>Crinum lorifolium</i> Roxb. ex Ker Gawl.			
<i>Crinum viviparum</i> (Lam.) R.Ansari & V.J.Nair			
<i>Pancratium triflorum</i> Roxb.			
ANACARDIACEAE			
<i>Anacardium occidentale</i> L.	Kaju		
<i>Buchanania lanzan</i> Spreng.	Char		
<i>Holigarna arnottiana</i> Hook.f.	Bibba	Endemic WG	

Species / Family	Local name	Endemism	IUCN
<i>Holigarna grahamii</i> (Wight) Kurz		Endemic WG	
<i>Lannea coromandelica</i> (Houtt.) Merr.			
<i>Mangifera indica</i> L.	Amba		
<i>Nothopegia beddomei</i> Gamble		Endemic WG	
<i>Nothopegia castaneifolia</i> (Roth) Ding Hou		Endemic WG	
ANCISTROCLADACEAE			
<i>Ancistrocladus heyneanus</i> Wall. ex J.Graham		Endemic WG	
ANNONACEAE			
<i>Milusa tomentosa</i> (Roxb.) Finet and Gagnep.			
<i>Orophea zeylanica</i> Hook.f. & Thomson			
<i>Polyalthia fragrans</i> (Dalzell) Bedd.		Endemic WG	
<i>Sageraea laurina</i> Dalzell	Sadni	Endemic WG	
<i>Uvaria narnum</i> (Dunal) Blume			
ANTHERICACEAE			
<i>Chlorophytum heynei</i> Rottl. ex Baker			
APIACEAE			
<i>Centella asiatica</i> (L.) Urb.			
<i>Pimpinella wallichiana</i> (Miq. ex Hohen.) Gandhi			
APOCYNACEAE: SUBFAMILY ASCLEPIADOIDEAE			
<i>Asclepias curassavica</i> L.			
<i>Calotropis gigantea</i> (L.) R.Br.			

Species / Family	Local name	Endemism	IUCN
<i>Cynanchum callialata</i> Buch.-Ham. ex Wight			
<i>Dregea volubilis</i> (L. f.) Benth. ex Hook.f.			
<i>Genianthus laurifolius</i> (Roxb.) Hook.f.			
<i>Gymnema sylvestre</i> (Retz.) R.Br. ex Schult.			
<i>Holostemma annulare</i> (Roxb.) K.Schum.			
<i>Hoya wightii</i> Hook.f.		Endemic PI	
<i>Tylophora fasciculata</i> Buch.-Ham. ex Wight & Arn.			
APOCYNACEAE: SUBFAMILY APOCYNODEAE			
<i>Aganosma cymosa</i> (Roxb.) G.Don			
<i>Anodendron paniculatum</i> (Roxb.) A.DC.			
<i>Chonemorpha fragrans</i> (Moon) Alston			
<i>Holarrhena pubescens</i> (Buch.- Ham) Wall. ex G.Don			
<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton			
<i>Parsonsia alboflavescens</i> (Dennst.) Mabb.			
<i>Wrightia arborea</i> (Dennst.) Mabb.			
<i>Wrightia tinctoria</i> (Roxb.) R.Br.			
APOCYNACEAE: RAUVOLFIOIDEAE			
<i>Alstonia scholaris</i> (L.) R.Br.			
<i>Carissa spinarum</i> L.			
<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz			
<i>Tabernaemontana alternifolia</i> L.		Endemic WSI	
APOCYNACEAE: PERIPLOCOIDEAE			
<i>Cryptolepis buchananii</i> R.Br. ex Roem. & Schult.			
<i>Hemidesmus indicus</i> (L.) R.Br.			

Species / Family	Local name	Endemism	IUCN
ARACEAE			
<i>Amorphophallus bulbifer</i> (Roxb.) Blume			
<i>Amorphophallus commutatus</i> (Schott) Engl. var. <i>commutatus</i>		Endemic PI	
<i>Amorphophallus commutatus</i> var. <i>anmodensis</i> Sivad. & Jaleel		Endemic Goa	EN
<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson			
<i>Ariopsis peltata</i> Nimmo			
<i>Arisaema sivasadanii</i> S.R.Yadav, K.S.Patil & Janarth.		Endemic WG	CR
<i>Arisaema tortuosum</i> (Wall.) Schott			
<i>Cryptocoryne retrospiralis</i> (Roxb.) Kunth			
<i>Lagenandra ovata</i> (L.) Thwaites			
<i>Pothos scandens</i> L.			
<i>Theriophonum dalzellii</i> Schott.		EndemicWG	
ARALIACEAE			
<i>Schefflera elliptica</i> (Blume) Harms			
ARECACEAE			
<i>Arenga wightii</i> Griff		Endemic WG	
<i>Calamus pseudotenuis</i> Becc.	Wet		
<i>Calamus thwaitesii</i> Becc.	Wet		
<i>Caryota urens</i> L.	Bherli mad		
ARISTROLOCHIACEAE			
<i>Thottea siliquosa</i> (Lam.) Ding Hou			
ASPARAGACEAE			
<i>Asparagus racemosus</i> Willd.			
ASTERACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Acanthospermum hispidum</i> DC.			
<i>Ageratum conyzoides</i> L.			
<i>Bidens biternata</i> (Lour.) Merr. & Sherff			
<i>Blumea belangeriana</i> DC.		Endemic PI	
<i>Blumea membranacea</i> DC.			
<i>Blumea oxyodonta</i> DC.			
<i>Blumea virens</i> DC.			
<i>Cyathocline purpurea</i> (Buch.-Ham. ex D.Don) Kuntze			
<i>Dichrocephala integrifolia</i> (L.f.) Kuntze			
<i>Eclipta prostrata</i> (L.) L.			
<i>Elephantopus scaber</i> L.			
<i>Emilia sonchifolia</i> (L.) DC.			
<i>Erigeron sublyratus</i> DC.			
<i>Eupatorium odoratum</i> L.			
<i>Gnaphalium polycaulon</i> Pers.			
<i>Grangea maderaspatana</i> (L.) Poir.			
<i>Gynura nitida</i> DC.			
<i>Phyllocephalum phyllolaenum</i> (DC.) Narayana			
<i>Phyllocephalum ritchiei</i> (Hook.f.) Narayana		Endemic PI	
<i>Senecio belgaumensis</i> (Wight) C.B.Clarke			
<i>Senecio gibsonii</i> Hook.f.		Endemic WG	
<i>Spilanthes paniculata</i> Wall. ex DC.			
<i>Synedrella nodiflora</i> (L.) Gaertn.			
<i>Tricholepis glaberrima</i> DC.			
<i>Tridax procumbens</i> L.			
<i>Vernonia cinerea</i> (L.) Less.			
BALSAMINACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Impatiens acaulis</i> Arn.			
<i>Impatiens balsamina</i> L.	Terda		
<i>Impatiens lawii</i> Hook.f. & Thomson			
<i>Impatiens minor</i> (DC.) Bennet		Endemic WG	
<i>Impatiens oppositifolia</i> L.			
<i>Impatiens pulcherrima</i> Dalzell		Endemic WG	
BEGONIACEAE			
<i>Begonia crenata</i> Drynad.			
<i>Begonia trichocarpa</i> Dalzell		Endemic NWG	EN
BIGNONIACEAE			
<i>Heterophragma quadriloculare</i> (Roxb.) K.Schum.	Kuski		
<i>Oroxylum indicum</i> (L.) Benth. ex Kurz			
<i>Pajanelia longifolia</i> (Willd.) K.Schum.	Padwal		
<i>Stereospermum colais</i> (Buch.-Ham. ex Dillw.) Mabb.			
BOMBACACEAE			
<i>Bombax ceiba</i> L.	Sawar		
<i>Bombax insigne</i> Wall.			
BORAGINACEAE			
<i>Coldenia procumbens</i> L.			
<i>Cynoglossum zeylanicum</i> (Vahl ex Hornem.) Thunb.ex Lehm.			
<i>Ehretia canarensis</i> (C.B.Clarke) Gamble			
<i>Paracaryopsis coelestina</i> (Lindl.) R.R.Mill			VU
<i>Rotula aquatica</i> Lour.			
BUDDLEJACEAE			
<i>Buddleja asiatica</i> Lour.			
BURMANNIACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Burmannia pusilla</i> (Wall. ex Miers) Thwaites			
BURSERACEAE			
<i>Canarium strictum</i> Roxb.	Dhup		
CAMPANULACEAE			
<i>Lobelia alsinoides</i> Lam.			
<i>Lobelia nicotianaefolia</i> Roth ex Roem. & Schult.	Rantambaku		
CAPPARACEAE			
<i>Capparis rheedei</i> DC.		Endemic WG	
<i>Cleome viscosa</i> L.			
CARYOPHYLLACEAE			
<i>Polycarpon prostratum</i> (Forssk.) Asch. & Schweinf.			
CELASTRACEAE			
<i>Celastrus paniculata</i> Willd			
<i>Euonymus indicus</i> B. Heyne ex Wall.		Endemic PI & AN	
<i>Hippocratea grahamii</i> Wight			
<i>Hippocratea indica</i> Willd.			
<i>Hippocratea obtusifolia</i> Roxb.			
<i>Lophopetalum wigtianum</i> Arn.			
<i>Maytenus rothiana</i> (Walp.) Lobreau-Callen			
<i>Salacia chinensis</i> L.	Narbundi		
<i>Salacia oblonga</i> Wall ex Wight & Arn.			
CLEOMACEAE			
<i>Crateva magna</i> (Lour.) DC.			
CLUSIACEAE			
<i>Calophyllum calaba</i> L.	Wiray	Endemic WG	

Species / Family	Local name	Endemism	IUCN
<i>Calophyllum polyanthum</i> Wall. ex Choisy			
<i>Garcinia gummi-gutta</i> (L.) N.Robson		Endemic WG	
<i>Garcinia indica</i> (Thouars) Choisy	Bhirand, Kokam, Aamsul	Endemic WG	
<i>Garcinia morella</i> (Gaertn.) Desr.			
<i>Mammea suriga</i> (Buch.-Ham. ex Roxb.) Kosterm.	Surangi		
<i>Mesua ferrea</i> L.	Nag-Chapha		
COLCHICACEAE			
<i>Gloriosa superba</i> L.			
<i>Iphiginea indica</i> (L.) A. Grey ex Kunth			
COMBRETACEAE			
<i>Combretum latifolium</i> Blume			
<i>Getonia floribunda</i> Roxb.	Uski		
<i>Terminalia bellirica</i> (Gaertn.) Roxb.			
<i>Terminalia chebula</i> Retz.			
<i>Terminalia elliptica</i> Willd.	Matti, Madat		
<i>Terminalia paniculata</i> Roth	Kindal	Endemic PI	
COMMELINACEAE			
<i>Commelina benghalensis</i> L.			
<i>Commelina forsskalaei</i> Vahl			
<i>Cyanotis fasciculata</i> (B.Heyne ex Roth) Schult. & Schult.f.			
<i>Cynotis cristata</i> (L.) D.Don			
<i>Floscopa scandens</i> Lour.			
<i>Murdannia dimorpha</i> (Dalzell) G.Brückn.			
<i>Murdannia japonica</i> (Thunb.) Faden			

Species / Family	Local name	Endemism	IUCN
<i>Murdannia semiteres</i> (Dalzell) Santapau			
<i>Murdannia simplex</i> (Vahl) Brenan			
<i>Murdannia spirata</i> (L.) G.Brückn.			
<i>Murdannia versicolor</i> (Dalzell) G.Brückn.			
CONNARACEAE			
<i>Connarus monocarpus</i> L.	Ghagrya		
CONVALLARIACEAE			
<i>Ophiopogon intermedius</i> D.Don			
CONVOLVULACEAE			
<i>Argyreia elliptica</i> (Roth) Choisy			
<i>Argyreia involucrata</i> C.B.Clarke			
<i>Erycibe paniculata</i> Roxb.			
<i>Evolvulus nummularius</i> (L.) L.			
<i>Ipomoea campanulata</i> L.			
<i>Ipomoea nil</i> (L.) Roth			
<i>Ipomoea obscura</i> (L.) Ker Gawl.			
<i>Ipomoea sinensis</i> (Desv.) Choisy			
<i>Ipomoea violacea</i> L.			
<i>Merremia umbellata</i> (L.) Hall f.	Washel		
<i>Merremia vitifolia</i> (Burm.f.) Hall f.			
CORNACEAE			
<i>Mastixia arborea</i> (Wight.) Bedd.			
COSTACEAE			
<i>Costus speciosus</i> (J.J.König) J.E.Sm.			
CRASSULACEAE			
<i>Kalanchoe pinnata</i> (Lam.) Pers.			
CUCURBITACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Coccinia grandis</i> (L.) Voigt	Tendli		
<i>Cucumis melo</i> L.			
<i>Momordica dioica</i> Roxb. ex Willd.			
<i>Mukia maderaspatana</i> (L.) M.Roem.			
<i>Solena amplexicaulis</i> (Lam.) Gandhi			
<i>Trichosanthes cucumerina</i> L.	Kondal, Fagal		
<i>Zanonia indica</i> L.			
CYPERACEAE			
<i>Carex caricina</i> (D.Don) Ghildyal & U.C.Bhattach.var. <i>caricina</i> .			
<i>Carex caricina</i> (D.Don) Ghildyal & U.C.Bhattach.var. <i>glaucina</i> (Boeck.) Ghildyal & U.C.Bhattach.		Endemic PI	
<i>Cyperus haspan</i> L. ssp. <i>haspan</i> .			
<i>Cyperus haspan</i> L. ssp. <i>juncooides</i> (Lam.) Kuk.			
<i>Cyperus iria</i> L.			
<i>Diplacrum caricinum</i> R.Br.			
<i>Eleocharis acutangula</i> (Roxb.) Schult.			
<i>Fimbristylis dichotoma</i> (L.) Vahl			
<i>Fimbristylis lawiana</i> (Boeck.) J.Kern			
<i>Fimbristylis ovata</i> (Burm.f.) J.Kern			
<i>Fimbristylis woodrowii</i> C.B.Clarke		Endemic WPI	
<i>Hypolytrum nemorum</i> (Vahl) Spreng.			
<i>Kyllinga brevifolia</i> Rottb.			
<i>Lipocarpus squarrosa</i> (L.) Goetgh.			
<i>Mariscus compactus</i> (Retz.) Bold.			
<i>Mariscus paniceus</i> (Rottb.) Vahl			

Species / Family	Local name	Endemism	IUCN
<i>Pycneus flavidus</i> (Retz.) T.Koyma			
<i>Pycneus malabaricus</i> C.BClarke			
<i>Pycneus pumilus</i> (L.) Nees			
<i>Pycneus sanguinolentus</i> (Vahl) Nees			
<i>Rhynchospora wightiana</i> (Nees) Steud.			
<i>Scleria terrestris</i> (L.) Fassett			
DATISCACEAE			
<i>Tetrameles nudiflora</i> R. Br.			
DILLENACEAE			
<i>Dillenia pentagyna</i> Roxb.	Karmal		
DIOSCOREACEAE			
<i>Dioscorea bulbifera</i> L.			
<i>Dioscorea hispida</i> Dennst.			
<i>Dioscorea pentaphylla</i> L.			
DIPTEROCARPACEAE			
<i>Hopea ponga</i> (Dennst.) Mabb.		Endemic WG	
DRACAENACEAE			
<i>Dracaena terniflora</i> Roxb.			
DROSERACEAE			
<i>Drosera indica</i> L.			
EBENACEAE			
<i>Diospyros buxifolia</i> (Blume) Hiern			
<i>Diospyros candolleana</i> Wight			
<i>Diospyros crumenata</i> Thwaites			
<i>Diospyros montana</i> Roxb.	Kalakonda		
<i>Diospyros neilgerrensis</i> (Wight) Kosterm.		Endemic PI	
<i>Diospyros oocarpa</i> Thw.			

Species / Family	Local name	Endemism	IUCN
<i>Diospyros paniculata</i> Dalzell		Endemic IND	
<i>Diospyros pruriens</i> Dalzell			
ELAEAGNACEAE			
<i>Elaeagnus conferta</i> Roxb.			
ERIOCAULACEAE			
<i>Eriocaulon dalzellii</i> Koern.		Endemic WG	
<i>Eriocaulon eurypeplon</i> Koern.		Endemic WG	
<i>Eriocaulon heterolepis</i> Steud.		Endemic WI	
<i>Eriocaulon lanceolatum</i> Miq. ex Koern.		Endemic WG	
<i>Eriocaulon robusto-brownianum</i> Ruhland			
<i>Eriocaulon sexangulare</i> L.			
<i>Eriocaulon stellulatum</i> Koern.		Endemic WG	
<i>Eriocaulon xeranthemum</i> Mart.			
<i>Eriocaulon palghatense</i> R.Ansari & N.P.Balakr.		Endemic WG	
EUPHORBIACEAE s.l.			
<i>Actephila excelsa</i> (Dalzell) Mull. Arg.			
<i>Agrostistachys indica</i> Dalzell			
<i>Antidesma acidum</i> Retz.			
<i>Antidesma menasu</i> (Tul.) Mull. Arg.			
<i>Aporosa cardiosperma</i> (Gaertn.) Merr.			
<i>Baliospermum montanum</i> (Willd.) Mull. Arg.			
<i>Blachia</i> <i>andamanica</i> (Kurz) Hook.f. ssp. <i>denudata</i> (Benth.) N.P.Balakr. & Chakrab.		Endemic WG	
<i>Breynia retusa</i> (Dennst.) Alston			
<i>Bridelia retusa</i> (L.) A.Juss.			
<i>Bridelia stipularis</i> Blume			
<i>Croton persimilis</i> Mull. Arg.			

Species / Family	Local name	Endemism	IUCN
<i>Dimorphocalyx glabellus</i> Thwaites var. <i>lawianus</i> (Mull. Arg.) Chakrab. & N.P.Balakr.		Endemic WG	
<i>Drypetes venusta</i> (Wight) Pax & K.Hoffm.			
<i>Euphorbia erythroclada</i> Boiss		Endemic PCI	
<i>Euphorbia hirta</i> L.			
<i>Euphorbia ligularia</i> Roxb.			
<i>Euphorbia notoptera</i> Boiss.		Endemic WG	
<i>Falconeria insignis</i> Royle			
<i>Glochidion hohenackeri</i> (Mull.-Arg.) Bedd.		Endemic NWG	
<i>Glochidion zeylanicum</i> (Gaertn.) A.Juss.			
<i>Homonoia riparia</i> Lour.			
<i>Jatropha curcas</i> L.			
<i>Macaranga peltata</i> (Roxb.) Mull. Arg.	Chanda		
<i>Mallotus ferrugineus</i> (Roxb.) Mull. Arg.			
<i>Mallotus philippensis</i> (Lam.) Mull. Arg.			
<i>Mallotus resinous</i> (Blanco) Merr. var. <i>stenanthus</i> (Mull. Arg.) Susila & N.P.Balakr.		Endemic WG	
<i>Margaritaria indica</i> (Dalzell) Airy Shaw			
<i>Microstachys chamaelea</i> (L.) Mull. Arg.			
<i>Phyllanthus amarus</i> Schumach. & Thonn.			
<i>Phyllanthus emblica</i> L.	Awla		
<i>Phyllanthus juniperinus</i> Mull. Arg.			
<i>Phyllanthus simplex</i> Retz.			
<i>Phyllanthus urinaria</i> L.			
<i>Tragia praetervis</i> Chakrab. & N.P.Balakr.			
FLACOURTIACEAE			
<i>Casearia ovata</i> (Lam.) Willd.			

Species / Family	Local name	Endemism	IUCN
<i>Flacourtia montana</i> J.Graham	Chaper	Endemic WG	
<i>Homalium ceylanicum</i> (Gardn.) Benth.			
<i>Hydnocarpus pentandrus</i> (Buch.-Ham.) Oken	Kastal	Endemic WG	
GENTIANACEAE			
<i>Canscora diffusa</i> (Vahl) R.Br. ex Roem & Schult.			
<i>Canscora perfoliata</i> Lam.		Endemic WG	
<i>Exacum pumilum</i> Griseb.			
<i>Exacum tetragonum</i> Roxb.			
<i>Hoppea fastigiata</i> (Griseb.) C.B.Clarke			
GESNERIACEAE			
<i>Rhynchoglossum notonianum</i> (Wall.) Burt			
<i>Rhynchoglossum obliquum</i> Blumevar. <i>parviflorum</i> C.B.Clarke			
HYCINTHACEAE			
<i>Ledebouria revoluta</i> (L.f.) Jessop			
HYDROCHARITACEAE			
<i>Blyxa aubertii</i> Rich.			
<i>Vallisneria spiralis</i> L.			
HYACINTHACEAE			
<i>Curculigo orchioides</i> Gaertn.			
ICACINACEAE			
<i>Gomphandra tetrandra</i> (Wall.) Sleumer			
<i>Nothapodytes nimmoniana</i> (J. Graham) Mabb.			
<i>Sarcostigma kleinii</i> Wight & Arn.			
LAMIACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Anisomeles indica</i> (L.) Kuntze		Endemic WG	
<i>Callicarpa tomentosa</i> (L.) L.			
<i>Clerodendrum infortunatum</i> L.			
<i>Colebrookea oppositifolia</i> Sm.			
<i>Gmelina arborea</i> Roxb.	Shiwan		
<i>Hyptis capitata</i> Jacq.			
<i>Hyptis suaveolens</i> (L.) Poit.			
<i>Leucas biflora</i> (Vahl) R. Br. ex Sm.			
<i>Leucas ciliata</i> Benth.			
<i>Leucas lavendulifolia</i> Sm.			
<i>Leucas stelligera</i> Wall.			
<i>Platostoma hispidum</i> (L.) A.J.Paton			
<i>Pogostemon paniculatus</i> (Willd.) Benth			
<i>Pogostemon purpurascens</i> Dalzell			
<i>Premna coriacea</i> C.B.Clarke			
<i>Rothea serrata</i> (L.) D.A.Steane & Mabb.			
<i>Scutellaria discolor</i> Colebr.			
<i>Tectona grandis</i> L.f.	Sagon		
<i>Vitex altissima</i> L.f.	Bailado		
<i>Vitex leucoxydon</i> L.f.			
<i>Vitex negundo</i> L.			
LAURACEAE			
<i>Actinodaphne angustifolia</i> (Blume) Nees			
<i>Beilschmiedia dalzellii</i> (Meisn.) Kosterm.	Miryo		
<i>Cinnamomum nitidum</i> (Roxb.) Hook.			
<i>Cinnamomum sulphuratum</i> Nees	Tikki		

Species / Family	Local name	Endemism	IUCN
<i>Cinnamomum verum</i> J.Presl	Tikki		
<i>Cryptocarya lawsonii</i> Gamble		Endemic WG	
<i>Litsea coriacea</i> (Heyne ex Meisn.) Hook.f.		Endemic WG	
<i>Litsea ghatica</i> C.J.Saldanha		Endemic WG	
<i>Persea macrantha</i> (Nees) Kosterm.	Olamb		
LECYTHIDACEAE			
<i>Careya arborea</i> Roxb.	Kumyo		
LEEACEAE			
<i>Leea asiatica</i> (L.) Ridsdale			
<i>Leea indica</i> (Burm.f.) Merr.	Dino		
LEGUMINOSAE: SUBFAMILY CAESALPINIOIDEAE			
<i>Bauhinia malabarica</i> Roxb.			
<i>Bauhinia racemosa</i> Lam.	Apto		
<i>Caesalpinia mimosoides</i> Lam.	Pansi		
<i>Cassia fistula</i> L.	Bayo		
<i>Chamaecrista absus</i> (L.) H.S.Irwin & Barneby			
<i>Moullava spicata</i> (Dalzell) Nicolson	Shamachi Wal	Endemic PI	
<i>Saraca asoca</i> (Roxb.) W.J.de Wilde	Ashok		
<i>Senna hirsuta</i> (L.) H.S.Irwin & Barneby	Taykolo		
<i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby			
<i>Senna tora</i> (L.) Roxb.			
LEGUMINOSAE: SUBFAMILY MIMOSOIDEAE			
<i>Acacia caesia</i> (L.) Willd.			

Species / Family	Local name	Endemism	IUCN
<i>Acacia chundra</i> (Roxb. & Rottl.) Willd.			
<i>Acacia concinna</i> (Willd.) DC.	Shikekai		
<i>Acacia pennata</i> (L.) Willd.			
<i>Acacia torta</i> (Roxb.) Craib.			
<i>Albizia chinensis</i> (Osbeck.) Merr.			
<i>Albizia odoratissima</i> (L.f.) Benth.			
<i>Entada rheedei</i> Spreng.	Garmbi		
<i>Mimosa pudica</i> L.			
<i>Xylia xylocarpa</i> (Roxb.) Taub.	Jambha		
LEGUMINOSAE:PAPILIONOIDEAE			
<i>Abrus pulchellus</i> Wall. ex Thwaites	Gunj		
<i>Aeschynomene indica</i> L.			
<i>Alysicarpus bupleurifolius</i> (L.) DC.			
<i>Alysicarpus glumaceus</i> (Vahl.) DC.			
<i>Butea monosperma</i> (Lam.) Taub.	Palas		
<i>Cajanus lineatus</i> (Wight & Arn.) Maesen			
<i>Crotalaria filipes</i> Benth.		Endemic WG	
<i>Crotalaria lutescens</i> Dalzell		Endemic WG	
<i>Crotalaria pallida</i> Aiton			
<i>Crotalaria prostrata</i> Rottl.			
<i>Crotalaria retusa</i> L.			
<i>Dalbergia horrida</i> (Dennst.) Mabb.		Endemic WG	
<i>Dalbergia latifolia</i> Roxb.	Sisam		
<i>Dalbergia rubiginosa</i> Roxb.		Endemic PI	

Species / Family	Local name	Endemism	IUCN
<i>Dendrolobium triangulare</i> (Retz.) Schindl.			
<i>Derris heyneana</i> (Wight and Arn.) Benth.		Endemic PI	
<i>Desmodium heterocarpon</i> (L.) DC.			
<i>Desmodium laxiflorum</i> DC.			
<i>Desmodium motorium</i> (Houtt.) Merr.			
<i>Desmodium triflorum</i> (L.) DC.			
<i>Erithrina stricta</i> Roxb.	Pangaro		
<i>Flemingia macrophylla</i> (Willd.) Kuntze ex Merr.			
<i>Flemingia strobilifera</i> (L.) R.Br. ex W.T.Aiton			
<i>Flemingia tuberosa</i> Dalzell		Endemic PI	
<i>Geissaspis cristata</i> Wight & Arn.			
<i>Geissaspis tenella</i> Benth.		Endemic PI	
<i>Indigofera dalzelli</i> T.Cooke		Endemic WG	
<i>Indigofera prostrata</i> Willd.		Endemic PI	
<i>Mucuna monosperma</i> DC.			
<i>Paraderris canarensis</i> (Dalzell) Adema			
<i>Pongamia pinnata</i> (L.) Pierre	Karanji		
<i>Sesbania bispinosa</i> (Jacq.) W.Wight			
<i>Smithia bigemina</i> Dalzell			
<i>Smithia conferta</i> J.E.Sm			
<i>Smithia salsuginea</i> Hance		Endemic PI	
<i>Spatholobus parviflorus</i> (Roxb. ex DC.) Kuntze			
<i>Spatholobus purpureus</i> Benth. ex Prain			
<i>Tadehagi triquetrum</i> (L.) H.Ohashi			
<i>Tephrosia candida</i> (Roxb.) DC.			
<i>Tephrosia coccinea</i> Wall.		Endemic PI	

Species / Family	Local name	Endemism	IUCN
<i>Teramnus labialis</i> (L.f.) Spreng.			
<i>Uraria rufescens</i> (DC) Schindl.			
<i>Vigna vexillata</i> (L.) A.Rich.			
LENTIBULARIACEAE			
<i>Utricularia caerulea</i> L.			
<i>Utricularia graminifolia</i> Vahl			
<i>Utricularia lazulina</i> P.Taylor			
<i>Utricularia purpurascens</i> J.Graham			
<i>Utricularia reticulata</i> Sm.			
<i>Utricularia striatula</i> Sm.			
<i>Utricularia uliginosa</i> Vahl.			
LOGANIACEAE			
<i>Strychnos nux-vomica</i> L.	Kajro		
<i>Strychnos minor</i> Dennst.			
LORANTHACEAE			
<i>Dendrophthoe falcata</i> (L.f.) Blume			
<i>Elytranthe capitellata</i> (Wight & Arn.) Engl.			
<i>Scurrula parasitica</i> L.			
<i>Taxillus tomentosus</i> (B.Heyne ex W.Roth) Tiegh.			
<i>Tolypanthus lagenifer</i> (Wight) Tiegh.		EndemicWG	
LYTHRACEAE			
<i>Lagerstroemia microcarpa</i> Wight	Nana		
<i>Lagerstroemia parviflora</i> Roxb.			
<i>Rotala densiflora</i> (Roth ex Roem. & Schult.) Koehne			
<i>Rotala rotundifolia</i> (Buch.-Ham. ex Roxb.) Koehne			
<i>Woodfordia fruticosa</i> (L.) Kurz	Dhayti		

Species / Family	Local name	Endemism	IUCN
MALPIGHIACEAE			
<i>Aspidopterys canarensis</i> Dalzell		Endemic WG	CR
MALVACEAE			
<i>Abelmoschus manihot</i> (L.) Medik.	Ambadi		
<i>Abutilon persicum</i> (Burm.f.) Merr.			
<i>Daceschistia trilobata</i> Wight		Endemic WG	
<i>Hibiscus hirtus</i> L.			
<i>Hibiscus hispidissimus</i> Griff.			
<i>Kydia calycina</i> Roxb.			
<i>Sida acuta</i> Burm.f.			
<i>Sida cordata</i> (Burm.f.) Borss.			
<i>Sida rhombifolia</i> L.	Tupkadi		
<i>Thespesia lampas</i> (Cav.) Dalzell ex Dalzell & A.Gibson			
<i>Urena lobata</i> L.			
MARANTACEAE			
<i>Schumannianthus virgatus</i> (Roxb.) Rolfe			
MELASTOMATACEAE			
<i>Melastoma malabathiricum</i> L.			
<i>Memecylon talbotianum</i> D.Brandis			
<i>Memecylon terminale</i> Dalzell		Endemic PI	
<i>Memecylon umbellatum</i> Burm.f.			
<i>Memecylon wightii</i> Thwaites			
<i>Osbeckia muralis</i> Naud.			
MELIACEAE			
<i>Aglaia eleagnoidea</i> (A.Juss.) Benth.			

Species / Family	Local name	Endemism	IUCN
<i>Aglaia lawii</i> (Wight) C.J. Saldanha ex Ramamoorthy	Maharsangal		
<i>Chukrasia tabularis</i> A.Juss.		Endemic IND	
<i>Naregamia alata</i> Wight & Arn.	Pitmado	Endemic IND	
<i>Toona ciliata</i> M.Roem.			
<i>Trichlia connaroides</i> (Wigh & Arn.) Benth.			
<i>Turraea villosa</i> A.W.Benn.			
<i>Walsura trifoliata</i> (A.Juss.) Harms			
MENISPERMACEAE			
<i>Anamirta cocculus</i> (L.) Wight & Arn.			
<i>Cocculus hirsutus</i> (L.) Theob.			
<i>Cyclea peltata</i> (Lam.) Hook.f. & Thomson			
<i>Diploclisia glaucescens</i> (Blume) Diels	Ramwel, Ramrukhi		
<i>Stephania elegans</i> Hook. f. & Thomson			
<i>Stephania japonica</i> (Thunb.) Miers			
MOLLUGINACEAE			
<i>Glinus oppositifolius</i> (L.) A.DC.			
MORACEAE			
<i>Artocarpus gomezianus</i> Wall. ex Trecul ssp. <i>zeylanicus</i> Jarrett	Patphanas		
<i>Artocarpus heterophyllus</i> Lam.	Patphanas	Endemic WG	
<i>Artocarpus hirsutus</i> Lam.	Patphanas		
<i>Ficus arnottiana</i> (Miq.) Miq.	Payar		
<i>Ficus benghalensis</i> L.	Wad		
<i>Ficus callosa</i> Willd.			
<i>Ficus drupacea</i> Thunb. var. <i>pubescens</i> (Roth) Corner			
<i>Ficus exasperata</i> Vahl			

Species / Family	Local name	Endemism	IUCN
<i>Ficus heterophylla</i> L.f.			
<i>Ficus hispida</i> L.f.	Karwat		
<i>Ficus microcarpa</i> L.f.	Nandangol		
<i>Ficus nervosa</i> Heyne ex Roth			
<i>Ficus racemosa</i> L.	Rumad		
<i>Ficus tinctoria</i> G.Forst. ssp. <i>parasitica</i> (Koenig ex Willd.) Corner			
<i>Ficus tsjahela</i> Burm.f.	Kel		
MUSACEAE			
<i>Ensete superbum</i> (Roxb.) Cheesman		Endemic WG	
<i>Musa x paradisiaca</i> L.	Keli		
MYRISTICACEAE			
<i>Knema attenuata</i> (Wall. ex Hook.f. & Thomson) Warb.		Endemic WG	
<i>Myristica malabarica</i> Lam.		Endemic WG	
MYRSINACEAE			
<i>Ardisia solanacea</i> Roxb.	Bugadi		
<i>Embelia tsjeriam-cottam</i> (Roem. & Schult.) DC.			
<i>Maesa indica</i> (Roxb.) DC.			
MYRTACEAE			
<i>Eugenia mooniana</i> Wight			
<i>Eugenia roxburghii</i> DC.			
<i>Syzygium caryophyllatum</i> (L.) Alston	Bhirand		
<i>Syzygium cumini</i> (L.) Skeels	Bhirand		
<i>Syzygium hemisphericum</i> (Wight) Alston	Zamlo		
<i>Syzygium laetum</i> (Buch.-Ham.) Gandhi		Endemic SWI	

Species / Family	Local name	Endemism	IUCN
<i>Syzygium salicifolium</i> (Wight) J.Graham		Endemic SWI	
<i>Syzygium zeylanicum</i> (L.) DC.			
OCHNACEAE			
<i>Ochna obtusata</i> DC.			
OLACACEAE			
<i>Olax imbricata</i> Roxb.			
OLEACEAE			
<i>Jasminum coarctatum</i> Roxb.			
<i>Jasminum malabaricum</i> Wight		Endemic PI	
<i>Jasminum multiflorum</i> (Burm.f.) Andr.			
<i>Jasminum ritchiei</i> C.B.Clarke			
<i>Ligustrum perrottetii</i> A.DC.		Endemic WG	
<i>Olea dioica</i> Roxb.			
<i>Schrebera swietenoides</i> Roxb.			
ONAGRACEAE			
<i>Ludwigia hyssopifolia</i> (G.Don) Exell			
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven ssp. <i>octovalvis</i>			
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven ssp. <i>sessiliflora</i> (Micheli) P.H.Raven			
ORCHIDACEAE			
<i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann			
<i>Aerides crispa</i> Lindl.		Endemic WG	
<i>Aerides maculosa</i> Lindl.		Endemic PI	
<i>Aerides ringens</i> (Lindl.) C.E.C.Fisch.			

Species / Family	Local name	Endemism	IUCN
<i>Bulbophyllum neilgherrense</i> Wight	Bendli	Endemic WG	
<i>Cleisostoma tenuifolium</i> (L.) Garay			
<i>Conchidium microchilos</i> (Dalzell) Rauschert		Endemic PI	
<i>Cottonia peduncularis</i> (Lindl.) Rchb.f.			
<i>Cymbidium aloifolium</i> (L.) Sw.			
<i>Dendrobium barbatulum</i> Lindl.		Endemic WG	
<i>Gastrochilus flabelliformis</i> (Blatt. & McCann) C.J.Saldanha		Endemic WG	
<i>Habenaria diphylla</i> (Nimmo) Dalzell			
<i>Habenaria heyneana</i> Lindl.		Endemic PI	
<i>Habenaria longicorniculata</i> J.Graham		Endemic PI	
<i>Habenaria marginata</i> Coleb.			
<i>Habenaria multicaudata</i> Sedgew.		Endemic WG	EN
<i>Habenaria plantaginea</i> Lindl.			
<i>Liparis deflexa</i> Hook.f.			
<i>Liparis nervosa</i> (Thunb.) Lindl.			
<i>Luisia tenuifolia</i> Blume		Endemic WG	
<i>Malaxis versicolor</i> (Lindl.) Abeyw.			
<i>Nervilia aragoana</i> Gaudich.			
<i>Oberonia brachyphylla</i> Blatt. & McCann		Endemic WG	VU
<i>Pecteilis gigantea</i> (J.E.Sm.) Raf.			
<i>Peristylus plantagineus</i> (Lindl.) Lindl.			
<i>Pholidota imbricata</i> Hook.			

Species / Family	Local name	Endemism	IUCN
<i>Porpax jerdoniana</i> (Wight) Rolfe		Endemic WG	
<i>Porpax reticulata</i> Lindl.			
<i>Rhynchostylis retusa</i> (L.) Blume			
<i>Smithsonia viridiflora</i> (Dalzell) C.J.Saldanha			
<i>Tropidia angulosa</i> (Lindl.) Blume			
<i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don			
<i>Vanda testacea</i> (Lindl.) Rchb.			
<i>Zeuxine longilabris</i> (Lindl) Trim			
OROBANCHACEAE			
<i>Aeginetia indica</i> L.			
OXALIDACEAE			
<i>Biophytum sensitivum</i> (L.) DC.			
<i>Oxalis corniculata</i> L.			
PANDANACEAE			
<i>Pandanus odorifer</i> (Forssk.) Kuntze			
PAPAVERACEAE			
<i>Argemone mexicana</i> L.			
PASSIFLORACEAE			
<i>Adenia hondala</i> (Gaertn.) J.Wilde	Salkando		
PEDALIACEAE			
<i>Sesamum orientale</i> L.			
PIPERACEAE			
<i>Peperomia pellucida</i> (L.) Humb.			
<i>Piper argyrophyllum</i> Miq.	Miri		
<i>Piper nigrum</i> L.			
PITTOSPORACEAE			

Species / Family	Local name	Endemism	IUCN
<i>Pittosporum dasycaulon</i> Miq.		Endemic WG	
POACEAE			
<i>Apluda mutica</i> L.			
<i>Arundinella leptochloa</i> (Nees ex Steud.) Hook.f.		Endemic PI	
<i>Arundinella metzii</i> Hochst ex Micq.		Endemic PI	
<i>Arundinella pumila</i> (Hochst. ex A.Rich.) Steud.			
<i>Bambusa bambos</i> (L.) Voss			
<i>Brachiaria ramosa</i> (L.) Stapf			
<i>Capillipedium filiculme</i> (Hook.f.) Stapf		Endemic PI	
<i>Centotheca lappacea</i> (L.) Desv.			
<i>Cynodon dactylon</i> (L.) Pers.			
<i>Cyrtococcum oxyphyllum</i> (Hochst. ex Steud.) Stapf			
<i>Dendrocalamus strictus</i> (Roxb.) Nees			
<i>Dichanthium annulatum</i> (Forssk.) Stapf			
<i>Dimeria stapfiana</i> C.E.Hubb. ex Pilger			
<i>Echinochloa colona</i> (L.) Link			
<i>Eragrostis gangetica</i> (Roxb.) Steud.			
<i>Eragrostis unioides</i> (Retz.) Nees ex Steud.			
<i>Eulalia trispicata</i> (Schult.) Henrard			
<i>Garnotia arborum</i> Stapf. ex T.Cooke		Endemic PI	
<i>Glyphochloa acuminata</i> (Hack.) Clayton		Endemic WG	
<i>Glyphochloa veldkampii</i> M.A.Fonseca & Janarth.		Endemic Goa	CR
<i>Isachne globosa</i> (Thunb.) Kuntze			
<i>Ischaemum barbatum</i> Retz.			

Species / Family	Local name	Endemism	IUCN
<i>Ischaemum dalzellii</i> Stapf. ex Bor			
<i>Ischaemum semisagittatum</i> Roxb.			
<i>Jansenella griffithiana</i> (C.Muell.) Bor			
<i>Ochlandra talboti</i> Brandis			
<i>Oplismenus burmanni</i> (Retz.) P.Beauv.			
<i>Oplismenus compositus</i> (L.) P.Beauv.			
<i>Panicum antidotale</i> Retz.			
<i>Paspalum canarae</i> (Steud.) Veldk.			
<i>Paspalum scrobiculatum</i> L.			
<i>Pennisetum pedicellatum</i> Trin.			
<i>Pennisetum polystachion</i> (L.) Schult.			
<i>Polytrias indica</i> (Houtt.) Veldkamp			
<i>Pseudanthistiria heteroclita</i> (Roxb.) Hook.f.			
<i>Pseudoxytenanthera stocksii</i> (Munro) T.Q.Nguyen			
<i>Sacciolepis indica</i> (L.) A.Chase			
<i>Setaria pumila</i> (Poir.) Roem. & Schult.			
<i>Spodiopogon rhizophorus</i> (Steud.) Pilger			
<i>Themeda triandra</i> Forssk.			
PODOSTEMACEAE			
<i>Dalzellia ceylanica</i> (Gardn.) Wight			
<i>Zeylanidium sessile</i> (Willis) C.D.K.Cook & Rutish.			
POLYGALACEAE			
<i>Polygala elongata</i> Klein ex Willd.		Endemic IND	
<i>Salmonia ciliata</i> (L.) DC.			
POLYGONACEAE			
<i>Persicaria glabra</i> (Willd.) M.Gomez			

Species / Family	Local name	Endemism	IUCN
<i>Persicaria auriculata</i> (Meissn.) S.K.Dixit, B.Datt & G.P.Roy			
<i>Polygonum plebeium</i> R.Br.			
PONTEDERIACEAE			
<i>Monochoria vaginalis</i> (Burm.f.) C.Presl			
PORTULACACEAE			
<i>Portulaca oleracea</i> L.	Gungune		
RANUNCULACEAE			
<i>Clematis gauriana</i> Roxb. ex DC.			
<i>Naravelia zeylanica</i> (L.) DC.			
RHIZOPHORACEAE			
<i>Carallia brachiata</i> (Lour.) Merr.	Phanshi		
RHAMNACEAE			
<i>Gauania microcarpa</i> DC.			
<i>Scutia myrtina</i> (Burm.f.) Kurz.			
<i>Smythea bombaiensis</i> (Dalzell) S.P.Banerjee & P.K.Mukh.		Endemic WG	
<i>Ventilago denticulata</i> Willd.		Endemic IND	
<i>Ziziphus mauritiana</i> Lam.			
<i>Ziziphus oenoplia</i> (L.) Mill.			
<i>Ziziphus rugosa</i> Lam.	Churan		
<i>Ziziphus xylopyra</i> (Retz.) Willd.			
RUBIACEAE			
<i>Argostemma courtallense</i> Arn.		Endemic WG	
<i>Argostemma verticillatum</i> Wall.			
<i>Canthium rheedei</i> DC.			

Species / Family	Local name	Endemism	IUCN
<i>Catunaregam spinosa</i> (Thunb.) Tirveng.	Gela		
<i>Chassalia curviflora</i> (Wall.) Thwaites var. <i>ophioxyloides</i> (Wall.) Deb & B.Krishna			
<i>Discospermum sphaerocarpum</i> Dalzell ex Hook.f.			EN
<i>Haldina cordifolia</i> (Roxb.) Ridsdale	Hedu		
<i>Hedyotis auricularia</i> L.			
<i>Hedyotis corymbosa</i> (L.) Lam.			
<i>Hedyotis herbacea</i> L.			
<i>Hedyotis trinervia</i> (Retz.) Roem. & Schult.			
<i>Hymenodictyon obovatum</i> Wall.		Endemic IND	
<i>Ixora brachiata</i> Roxb.		Endemic IND	
<i>Ixora coccinia</i> L.	Pentkul		
<i>Ixora elongata</i> B.Heyne ex G.Don			
<i>Ixora malabarica</i> (Dennst.) Mabb.			
<i>Ixora nigricans</i> R. Br. Wight & Arn.			
<i>Meyna laxiflora</i> Robyns			
<i>Mitragyna parvifolia</i> (Roxb.) Korth.			
<i>Mussaenda glabrata</i> (Hook.f.) Hutch. ex Gamble	Sharwad	Endemic PI	
<i>Mussaenda laxa</i> (Hook.f.) Hutch. ex Gamble	Sharwad	Endemic WI	
<i>Neanotis rheedei</i> (Wall. ex Wight & Arn.) W.H.Lewis		Endemic WG	
<i>Neanotis subtilis</i> (Miq.) Govaerts		Endemic WG	
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Kadamb		
<i>Neonauclea purpurea</i> (Roxb.) Merr.			

Species / Family	Local name	Endemism	IUCN
<i>Ophiorrhiza rugosa</i> Wall. var. <i>prostrata</i> (D. Don) Deb & D.C.Mondal			
<i>Oxyceros rugulosus</i> (Thw) Tirveng.			
<i>Pavetta crassicaulis</i> Bremek.			
<i>Pavetta indica</i> L. var. <i>tomentosa</i> (Roxb. ex Sm.) Hook.f.			
<i>Psychotria dalzellii</i> Hook.f.	Endi	Endemic WG	
<i>Psydrax umbellata</i> (Wight) Bridson	Tupya		
<i>Rubia cordifolia</i> L.			
<i>Saprosma glomeratum</i> (Gardn.) Bedd.		Endemic PI	
<i>Spermacoce articularis</i> L.			
<i>Spermacoce ocymoides</i> Burm.f.			
<i>Spermacoce pusilla</i> Wall.			
<i>Tamilnadia uliginosa</i> (Retz.) Tirveng. & Sastre			
<i>Wendlandia thyrsoidea</i> (Roth) Steud.		Endemic WG	
RUTACEAE			
<i>Atlantia racemosa</i> Wight	Malkadlimbi		
<i>Atlantia wightii</i> Tanaka		Endemic WG	
<i>Glycosmis pentaphylla</i> (Retz.) DC.	Menaka		
<i>Luvunga eleutherandra</i> Dalzell		Endemic WG	
<i>Milicope lunu-ankenda</i> (Gaertn.) T.G.Hartely			
<i>Murraya koenigii</i> (L.) Spreng.	Karpil		
<i>Murraya paniculata</i> Jack			
<i>Paramigna monophylla</i> Wight			

Species / Family	Local name	Endemism	IUCN
<i>Toddalia asiatica</i> (L.) Lam.			
<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	Tirphal		
SANTALACEAE			
<i>Osyris quadripartita</i> Salzm. ex Decne.			
SAPINDACEAE			
<i>Allophylus cobbe</i> (L.) Raeusch.			
<i>Dimocarpus longan</i> Lour.			
<i>Harpullia arborea</i> (Blanco) Radlk.			
<i>Lepisanthus tetraphylla</i> (Vahl) Radlk.			
<i>Schleichera oleosa</i> (Lour.) Oken	Koshim		
SAPOTACEAE			
<i>Chrysophyllum roxburghii</i> G.Don			
<i>Mimusops elengi</i> L.	Owal		
<i>Palaquium ellipticum</i> (Dalzell) Baill.			
<i>Xantolis tomentosa</i> (Roxb.) Raf.	Kumbal		
SCROPHULARIACEAE			
<i>Angelonia gardneri</i> Hook.			
<i>Centranthera indica</i> (L.) Gamble			
<i>Dopatrium junceum</i> (Roxb.) Buch.-Ham. ex Benth.			
<i>Lindernia antipoda</i> (L.) Alston.			
<i>Lindernia caespitosa</i> (Blume) Panigrahi			
<i>Lindernia ciliata</i> (Colsm.) Pennell			
<i>Lindernia crustacea</i> (L.) F. Muell.			
<i>Lindernia multiflora</i> (Roxb.) Mukerjee			
<i>Lindernia oppositifolia</i> (Retz.) Mukerjee			
<i>Mecardonia procumbens</i> (Mill.) Small			

Species / Family	Local name	Endemism	IUCN
<i>Rhamphicarpa longiflora</i> (Arn.) Benth.		Endemic WG	
<i>Scoparia dulcis</i> L.			
<i>Striga asiatica</i> (L.) Kuntze			
<i>Striga gesnerioides</i> (Willd.) Vatke ex Engl.			
<i>Torenia indica</i> C.J.Saldanha		Endemic WG	
<i>Torenia violacea</i> (Azaolo ex Blanco) Pennell			
SMILACACEAE			
<i>Smilax zeylanica</i> L.			
SOLANACEAE			
<i>Lycianthes laevis</i> (Dunal) Bitter			
<i>Physalis minima</i> L.			
<i>Solanum anguivi</i> Lam.			
STERCULIACEAE			
<i>Helicteres isora</i> L.	Kewan		
<i>Melochia corchorifolia</i> L.			
<i>Pterospermum diversifolium</i> Blume	Mothi Daman		
<i>Sterculia guttata</i> Roxb. ex DC.			
SYMPLOCACEAE			
<i>Symplocos cochinchinensis</i> (Lour.) S. <i>Mooressp. laurina</i> (Retz.) Noot.			
<i>Symplocos racemosa</i> Roxb.			
THYMELAEACEAE			
<i>Gnidia glauca</i> (Fresen.) Gilg.			

Species / Family	Local name	Endemism	IUCN
TILIACEAE			
<i>Corchorus capsularis</i> L.			
<i>Corchorus olitorius</i> L.			
<i>Grewia nervosa</i> (Lour.) Panigrahi	Asoli, Chiwar		
<i>Grewia serrulata</i> DC.	Chopdi		
<i>Grewia tillifolia</i> Vahl	Dhaman		
<i>Triumfetta rhomboidea</i> Jacq.			
ULMACEAE			
<i>Celtis timorensis</i> Spanoghe			
<i>Holoptelea integrifolia</i> (Roxb.) Planch.	Wawal		
<i>Trema orientalis</i> (L.) Blume			
URTICACEAE			
<i>Boehmeria macrophylla</i> Hornem.			
<i>Debregeasia longifolia</i> (Burm.f.) Wedd.			
<i>Laportea interrupta</i> (L.) Chew			
<i>Pilea microphylla</i> (L.) Liebm.			
VERBENACEAE			
<i>Lantana camara</i> L.			
VISCACEAE			
<i>Viscum monoicum</i> Roxb. ex DC.			
VITACEAE			
<i>Ampelocissus indica</i> (L.) Planch.			
<i>Amplelocissus latifolia</i> (Roxb.) Planch.			
<i>Caryatia tenuifolia</i> (Wight and Arn.) Gagnep.			
<i>Caryatia trifolia</i> (L.) Domin			
<i>Cissus elongata</i> Roxb.			

Species / Family	Local name	Endemism	IUCN
<i>Cissus javanica</i> DC.			
<i>Cissus rependa</i> Vahl	Palkonde		
<i>Cyphostemma auriculatum</i> (Roxb.) P.Singh & B.V.Shetty			
<i>Tetrastigma sulcatum</i> (M.A.Lawson) Gamble			
ZINGIBERACEAE			
<i>Alpinia galanga</i> (L.) Willd.			
<i>Curcuma decipiens</i> Dalzell		Endemic PI	
<i>Curcuma zanthorrhiza</i> Roxb.			
<i>Kaempferia scaposa</i> (Nimmo) Benth.		Endemic WG	
<i>Zingiber neesatum</i> (J. Graham) Ramamoorthy		Endemic PI	
<i>Zingiber nimmonii</i> (J. Graham) Dalzell		Endemic PI	
<i>Zingiber zerumbet</i> (L.) Roscoe ex J.E.Sm.			

Annexure II

Insects and Arachnids

Sr. No.	Order	Family	Common name	Scientific name	WPA Schedule
1	Lepidoptera	Papilionidae	Southern Birdwing	<i>Troides minos</i>	
2	Lepidoptera	Papilionidae	Malabar Or Ceylon Rose	<i>Pachliopta pandiyana</i>	
3	Lepidoptera	Papilionidae	Common Rose	<i>Pachliopta aristolochiae</i>	
4	Lepidoptera	Papilionidae	Crimson Rose	<i>Pachliopta hector</i>	I
5	Lepidoptera	Papilionidae	Southern Bluebottle *	<i>Graphium tereon</i>	
6	Lepidoptera	Papilionidae	Common Jay	<i>Graphium doson</i>	
7	Lepidoptera	Papilionidae	Tailed Jay	<i>Graphium agamemnon</i>	
8	Lepidoptera	Papilionidae	Spot Swordtail	<i>Graphium nomius</i>	
9	Lepidoptera	Papilionidae	Five-Bar Swordtail *	<i>Graphium antiphates</i>	
10	Lepidoptera	Papilionidae	Common Mime	<i>Papilio clytia</i>	I
11	Lepidoptera	Papilionidae	Lime	<i>Papilio demoleus</i>	
12	Lepidoptera	Papilionidae	Malabar Raven	<i>Papilio dravidarum</i>	
13	Lepidoptera	Papilionidae	Red Helen	<i>Papilio helenus</i>	
14	Lepidoptera	Papilionidae	Common Mormon	<i>Papilio polytes</i>	
15	Lepidoptera	Papilionidae	Blue Mormon	<i>Papilio polymnestor</i>	
16	Lepidoptera	Papilionidae	Paris Peacock	<i>Papilio paris</i>	
17	Lepidoptera	Papilionidae	Malabar Banded Peacock	<i>Papilio budha</i>	
18	Lepidoptera	Pieridae	Common Emigrant *	<i>Catopsilia pomona</i>	
19	Lepidoptera	Pieridae	Mottled Emigrant	<i>Catopsilia pyranthe</i>	
20	Lepidoptera	Pieridae	Small Grass Yellow	<i>Eurema brigitta</i>	

21	Lepidoptera	Pieridae	Spotless Yellow Grass	<i>Eurema laeta</i>	
22	Lepidoptera	Pieridae	Common Yellow Grass	<i>Eurema hecabe</i>	
23	Lepidoptera	Pieridae	Three-Spot Yellow Grass	<i>Eurema blanda</i>	
24	Lepidoptera	Pieridae	One-Spot Yellow *	<i>Eurema andersonii</i>	II
25	Lepidoptera	Pieridae	Common Jezebel	<i>Delias eucharis</i>	
26	Lepidoptera	Pieridae	Psyche	<i>Leptosia nina</i>	
27	Lepidoptera	Pieridae	Common Gull	<i>Cepora nerissa</i>	
28	Lepidoptera	Pieridae	Lesser Gull	<i>Cepora nadina</i>	II
29	Lepidoptera	Pieridae	Pioneer Or Caper White	<i>Anaphaeis aurota</i>	
30	Lepidoptera	Pieridae	Plain Puffin *	<i>Appias indra</i>	II
31	Lepidoptera	Pieridae	Chocolate Albatross *	<i>Appias lyncida</i>	II
32	Lepidoptera	Pieridae	Common Albatross	<i>Appias albina</i>	II
33	Lepidoptera	Pieridae	Common Wanderer	<i>Pareronia valeria</i>	II
34	Lepidoptera	Pieridae	Dark Wanderer	<i>Pareronia ceylonica</i>	
35	Lepidoptera	Pieridae	Great Orange Tip	<i>Hebomoia glaucippe</i>	
36	Lepidoptera	Nymphalidae	Southern Duffer *	<i>Discophora lepida</i>	II
37	Lepidoptera	Nymphalidae	Common Evening Brown	<i>Melanitis leda</i>	
38	Lepidoptera	Nymphalidae	Great Evening Brown *	<i>Melanitis zitenius</i>	II
39	Lepidoptera	Nymphalidae	Dark Evening Brown	<i>Melanitis phedima</i>	
40	Lepidoptera	Nymphalidae	Common Palmfly	<i>Elymnias hypermenstra</i>	
41	Lepidoptera	Nymphalidae	Bamboo Treebrown *	<i>Lethe europa</i>	

42	Lepidoptera	Nymphalidae	Tamil Treebrown	<i>Lethe drypetis</i>	
43	Lepidoptera	Nymphalidae	Common Treebrown	<i>Lethe rohria</i>	
44	Lepidoptera	Nymphalidae	Common Bushbrown	<i>Mycalesis perseus</i>	
45	Lepidoptera	Nymphalidae	Dark Branded Bushbrown *	<i>Mycalesis mineus</i>	
46	Lepidoptera	Nymphalidae	Gladeye Bushbrown	<i>Mycalesis patnia</i>	
47	Lepidoptera	Nymphalidae	Medus Brown	<i>Orsotrianea medus</i>	
48	Lepidoptera	Nymphalidae	Common Three-ring *	<i>Ypthima asterope</i>	
49	Lepidoptera	Nymphalidae	White Or Ceylon Four-ring *	<i>Ypthima ceylonica</i>	
50	Lepidoptera	Nymphalidae	Common Four-ring	<i>Ypthima huebneri</i>	
51	Lepidoptera	Nymphalidae	Common Five-ring	<i>Ypthima baldus</i>	
52	Lepidoptera	Nymphalidae	Common Nawab *	<i>Polyura athamas</i>	II
53	Lepidoptera	Nymphalidae	Anomalous Nawab *	<i>Polyura agraria</i>	
54	Lepidoptera	Nymphalidae	Blue Nawab *	<i>Polyura schreiberi</i>	I
55	Lepidoptera	Nymphalidae	Tawny Rajah	<i>Charaxes bernardus</i>	II
56	Lepidoptera	Nymphalidae	Black Rajah *	<i>Charaxes solon</i>	II
57	Lepidoptera	Nymphalidae	Tawny Coster	<i>Acraea violae</i>	
58	Lepidoptera	Nymphalidae	Tamil Lacewing	<i>Cethosia nietneri</i>	
59	Lepidoptera	Nymphalidae	Cruiser	<i>Vindula erota</i>	
60	Lepidoptera	Nymphalidae	Rustic	<i>Cupha erymanthis</i>	
61	Lepidoptera	Nymphalidae	Common Leopard	<i>Phalanta phalantha</i>	
62	Lepidoptera	Nymphalidae	Small Leopard	<i>Phalanta alcippe</i>	II
63	Lepidoptera	Nymphalidae	Tamil Yeoman	<i>Cirrochroa thais</i>	
64	Lepidoptera	Nymphalidae	Black Prince *	<i>Rohana parisatis</i>	
65	Lepidoptera	Nymphalidae	Painted Courtesan *	<i>Euripus consimilis</i>	II
66	Lepidoptera	Nymphalidae	Chestnut-Streaked Sailer	<i>Neptis jumbah</i>	

67	Lepidoptera	Nymphalidae	Common Sailer	<i>Neptis hylas</i>	
68	Lepidoptera	Nymphalidae	Clear Sailer *	<i>Neptis nata</i>	II
69	Lepidoptera	Nymphalidae	Shortbanded Sailer *	<i>Neptis columella</i>	I
70	Lepidoptera	Nymphalidae	Yellow Jack Sailer	<i>Neptis viraja</i>	
71	Lepidoptera	Nymphalidae	Common Lascar	<i>Pantoporia hordonia</i>	
72	Lepidoptera	Nymphalidae	Extra Lascar *	<i>Pantoporia sandaka</i>	
73	Lepidoptera	Nymphalidae	Colour Sergeant	<i>Athyma nefte</i>	
74	Lepidoptera	Nymphalidae	Staff Sergeant *	<i>Athyma selenophora</i>	II
75	Lepidoptera	Nymphalidae	Blackvein Sergeant	<i>Athyma ranga</i>	
76	Lepidoptera	Nymphalidae	Common Sergeant	<i>Athyma perius</i>	
77	Lepidoptera	Nymphalidae	Commander	<i>Limenitis procris</i>	
78	Lepidoptera	Nymphalidae	Clipper	<i>Parthenos sylvia</i>	II
79	Lepidoptera	Nymphalidae	Grey Count	<i>Tanaecia lepidea</i>	II
80	Lepidoptera	Nymphalidae	Common Baron	<i>Euthalia aconthea</i>	II
81	Lepidoptera	Nymphalidae	Gaudy Baron	<i>Euthalia lubentina</i>	IV
82	Lepidoptera	Nymphalidae	Redspot Duke *	<i>Dolpha evelina</i>	II
83	Lepidoptera	Nymphalidae	Angled Castor	<i>Ariadne</i>	
84	Lepidoptera	Nymphalidae	Common Castor	<i>Ariadne merione</i>	
85	Lepidoptera	Nymphalidae	Common Map	<i>Cyrestis thyodamas</i>	
86	Lepidoptera	Nymphalidae	Club Beak *	<i>Libythea myrrha</i>	
87	Lepidoptera	Nymphalidae	Yellow Pansy	<i>Junonia hierta</i>	
88	Lepidoptera	Nymphalidae	Lemon Pansy	<i>Junonia lemonias</i>	
89	Lepidoptera	Nymphalidae	Peacock Pansy	<i>Junonia almana</i>	
90	Lepidoptera	Nymphalidae	Grey Pansy	<i>Junonia atlites</i>	
91	Lepidoptera	Nymphalidae	Chocolate Pansy	<i>Junonia iphita</i>	
92	Lepidoptera	Nymphalidae	Painted Lady *	<i>Cynthia cardui</i>	
93	Lepidoptera	Nymphalidae	Great Eggfly	<i>Hypolimnas bolina</i>	

94	Lepidoptera	Nymphalidae	Danaid Eggfly	<i>Hypolimnas misippus</i>	I and II
95	Lepidoptera	Nymphalidae	Autumn leaf (Malabar)	<i>Doleschallia bisaltide malabarica</i>	II
96	Lepidoptera	Nymphalidae	South Indian Blue Oakleaf	<i>Kallima horsfieldi</i>	II
97	Lepidoptera	Nymphalidae	Glassy Tiger	<i>Parantica aglea</i>	II
98	Lepidoptera	Nymphalidae	Blue Tiger	<i>Tirumala limniace</i>	
99	Lepidoptera	Nymphalidae	Dark Blue Tiger *	<i>Tirumala septentrionis</i>	
100	Lepidoptera	Nymphalidae	Plain Tiger	<i>Danaus chrysippus</i>	
101	Lepidoptera	Nymphalidae	Striped Or Common Tiger	<i>Danaus genutia</i>	
102	Lepidoptera	Nymphalidae	Common Indian Crow	<i>Euploea core</i>	
103	Lepidoptera	Nymphalidae	Double-Branded Crow *	<i>Euploea sylvester</i>	
104	Lepidoptera	Nymphalidae	Brown King Crow *	<i>Euploea klugii</i>	
105	Lepidoptera	Nymphalidae	Malabar Tree Nymph	<i>Idea malabarica</i>	
106	Lepidoptera	Riodinidae	Double-Banded Judy *	<i>Abisara albofasciatus</i>	
107	Lepidoptera	Lycaenidae	Apefly *	<i>Spalgis epius</i>	
108	Lepidoptera	Lycaenidae	Common Pierrot	<i>Castalius rosimon</i>	I
109	Lepidoptera	Lycaenidae	Angled Pierrot	<i>Caleta</i>	
110	Lepidoptera	Lycaenidae	Banded Blue Pierrot	<i>Discolampa ethion</i>	
111	Lepidoptera	Lycaenidae	Dark Pierrot	<i>Tarucus ananda</i>	IV
112	Lepidoptera	Lycaenidae	Spotted Pierrot *	<i>Tarucus nara</i>	
113	Lepidoptera	Lycaenidae	Zebra Blue *	<i>Leptotes plinius</i>	
114	Lepidoptera	Lycaenidae	Common Hedge Blue	<i>Acytolepis puspa</i>	I
115	Lepidoptera	Lycaenidae	Plain Hedge Blue *	<i>Celastrina lavendularis</i>	

116	Lepidoptera	Lycaenidae	Quaker	<i>Neopithecops zalmora</i>	
117	Lepidoptera	Lycaenidae	Malayan	<i>Magisba malaya</i>	
118	Lepidoptera	Lycaenidae	Dark Grass Blue	<i>Zizeeria karsandra</i>	
119	Lepidoptera	Lycaenidae	Lesser Grass Blue	<i>Zizina otis</i>	
120	Lepidoptera	Lycaenidae	Tiny Grass Blue	<i>Zizula hylax</i>	
121	Lepidoptera	Lycaenidae	Lime Blue	<i>Chilades laius</i>	II
122	Lepidoptera	Lycaenidae	Plains Cupid	<i>Chilades pandava</i>	
123	Lepidoptera	Lycaenidae	Grass Jewel *	<i>Freyeria trochylus</i>	
124	Lepidoptera	Lycaenidae	Gram Blue	<i>Euchrysops cnejus</i>	II
125	Lepidoptera	Lycaenidae	Forget-Me-Not	<i>Catochrysops strabo</i>	
126	Lepidoptera	Lycaenidae	Pea Blue *	<i>Lampides boeticus</i>	II
127	Lepidoptera	Lycaenidae	Dark Cerulean *	<i>Jamides bochus</i>	
128	Lepidoptera	Lycaenidae	Common Cerulean	<i>Jamides celeno</i>	
129	Lepidoptera	Lycaenidae	Metallic Cerulean *	<i>Jamides alecto</i>	
130	Lepidoptera	Lycaenidae	Large 4-Line Blue *	<i>Nacaduba pactolus</i>	II
131	Lepidoptera	Lycaenidae	Pale 4-Line Blue *	<i>Nacaduba hermus</i>	
132	Lepidoptera	Lycaenidae	Transparent 6-Line Blue *	<i>Nacaduba kurava</i>	
133	Lepidoptera	Lycaenidae	Opaque 6-Line Blue *	<i>Nacaduba beroe</i>	
134	Lepidoptera	Lycaenidae	Common Line Blue *	<i>Prosotas nora</i>	
135	Lepidoptera	Lycaenidae	Tailless Line Blue *	<i>Prosotas dubiosa</i>	
136	Lepidoptera	Lycaenidae	Dingy Line Blue *	<i>Petrolaea dana</i>	
137	Lepidoptera	Lycaenidae	White-Tipped Line Blue *	<i>Prosotas noreia</i>	
138	Lepidoptera	Lycaenidae	Red Pierrot	<i>Talicaa nyseus</i>	
139	Lepidoptera	Lycaenidae	Common Ciliate Blue *	<i>Anthene emolus</i>	

140	Lepidoptera	Lycaenidae	Pointed Ciliate Blue	<i>Anthene lycaenina</i>	
141	Lepidoptera	Lycaenidae	Western Centaur Oakblue *	<i>Arhopala pseudocentaurus</i>	
142	Lepidoptera	Lycaenidae	Large Oakblue	<i>Arhopala amantes</i>	
143	Lepidoptera	Lycaenidae	Rosy Or Kanara Oakblue *	<i>Arhopala alea</i>	I
144	Lepidoptera	Lycaenidae	Aberrant Oakblue *	<i>Arohopala abseus</i>	
145	Lepidoptera	Lycaenidae	Tamil Oakblue	<i>Arhopala bazaloides</i>	
146	Lepidoptera	Lycaenidae	Common Acacia Blue *	<i>Surendra quercetorum</i> <i>Surendra</i>	
147	Lepidoptera	Lycaenidae	Silverstreaked Acacia Blue *	<i>Zinaspa todara</i>	II
148	Lepidoptera	Lycaenidae	Silverstreak Blue	<i>Iraota timoleon</i>	
149	Lepidoptera	Lycaenidae	Leaf Blue	<i>Amblypodia anita</i>	
150	Lepidoptera	Lycaenidae	Common Silverline	<i>Spindasis vulcanus</i>	
151	Lepidoptera	Lycaenidae	Longbanded Silverline *	<i>Spindasis lohita</i>	II
152	Lepidoptera	Lycaenidae	Yamfly *	<i>Loxura atymnus</i>	
153	Lepidoptera	Lycaenidae	Common Imperial	<i>Cheritra freja</i>	
154	Lepidoptera	Lycaenidae	Monkey Puzzle	<i>Rathinda amor</i>	
155	Lepidoptera	Lycaenidae	Redspot *	<i>Zesius chrysomallus</i>	
156	Lepidoptera	Lycaenidae	Silver Royal *	<i>Ancema blanka</i>	
157	Lepidoptera	Lycaenidae	Broadtail Royal *	<i>Creon cleobis</i>	
158	Lepidoptera	Lycaenidae	White Royal *	<i>Pratapa deva</i>	II
159	Lepidoptera	Lycaenidae	Peacock Royal *	<i>Tajuria cippus</i>	II
160	Lepidoptera	Lycaenidae	Orchid Tit *	<i>Hypolycaena othona</i>	I
161	Lepidoptera	Lycaenidae	Fluffy Tit *	<i>Zeltus amasa</i>	
162	Lepidoptera	Lycaenidae	Cornelian *	<i>Deudorix epijarbas</i>	

163	Lepidoptera	Lycaenidae	Common Guava Blue *	<i>Deudorix isocrates</i>	
164	Lepidoptera	Lycaenidae	Large Guava Blue *	<i>Deudorix perse</i>	
165	Lepidoptera	Lycaenidae	Plane *	<i>Bindahara phocides</i>	II
166	Lepidoptera	Lycaenidae	Indian Red Flash *	<i>Rapala iarbus</i>	
167	Lepidoptera	Lycaenidae	Slate Flash	<i>Rapala manea</i>	
168	Lepidoptera	Lycaenidae	Indigo Flash *	<i>Rapala varuna</i>	II
169	Lepidoptera	Lycaenidae	Indian Sunbeam	<i>Curetis thetis</i>	
170	Lepidoptera	Lycaenidae	Shiva Sunbeam *	<i>Curetis siva</i>	
171	Lepidoptera	Lycaenidae	Malabar Flash *	<i>Rapala lankana</i>	
172	Lepidoptera	Lycaenidae	Common Onyx	<i>Horaga onyx</i>	II
173	Lepidoptera	Hesperiidae	Orange-Striped Awl/Orange Awlet *	<i>Burara jaina</i>	
174	Lepidoptera	Hesperiidae	Orangetail Awl/Pale Green Awlet *	<i>Bibasis sena</i>	II
175	Lepidoptera	Hesperiidae	Common Banded Awl *	<i>Hasora chromus</i>	
176	Lepidoptera	Hesperiidae	White Banded Awl *	<i>Hasora taminatus</i>	
177	Lepidoptera	Hesperiidae	Common Awl *	<i>Hasora badra</i>	
178	Lepidoptera	Hesperiidae	Brown Awl	<i>Badamia exclamationis</i>	
179	Lepidoptera	Hesperiidae	Common Spotted Flat	<i>Celaenorrhinus leucocera</i>	
180	Lepidoptera	Hesperiidae	Malabar Spotted Flat *	<i>Celaenorrhinus ambareesa</i>	
181	Lepidoptera	Hesperiidae	Tamil Spotted Flat *	<i>Celaenorrhinus ruficornis</i>	
182	Lepidoptera	Hesperiidae	Common/Ceylon Snow Flat *	<i>Tagiades jepetus</i>	
183	Lepidoptera	Hesperiidae	Water Snow Flat	<i>Tagiades litigiosa</i>	

184	Lepidoptera	Hesperiidae	Fulvous Pied Flat	<i>Psuedocoladenia dan</i>	
185	Lepidoptera	Hesperiidae	Tricolour Flat	<i>Psuedocoladenia indrana</i>	
186	Lepidoptera	Hesperiidae	Common Small Flat	<i>Sarangesa dasahara</i>	
187	Lepidoptera	Hesperiidae	Spotted Small Flat *	<i>Sarangesa purendra</i>	
188	Lepidoptera	Hesperiidae	Angled Flat/Black Angle	<i>Tapena twaitheesi</i>	
189	Lepidoptera	Hesperiidae	Golden Angle	<i>Odontoptilum ransonnetti</i>	
190	Lepidoptera	Hesperiidae	Indian Grizzled/Indian Skipper *	<i>Spialia galba</i>	
191	Lepidoptera	Hesperiidae	Pygmy Grass-/Scrub-Hopper *	<i>Aeromachus pygmaeus</i>	
192	Lepidoptera	Hesperiidae	Bush Hopper *	<i>Ampittia dioscorides</i>	
193	Lepidoptera	Hesperiidae	Indian Ace *	<i>Halpe homolea</i>	II
194	Lepidoptera	Hesperiidae	Madras Ace	<i>Thoressa honorei</i>	IV
195	Lepidoptera	Hesperiidae	Moore's Ace *	<i>Halpe porus</i>	
196	Lepidoptera	Hesperiidae	Chestnut Bob	<i>Lambrix salsala</i>	
197	Lepidoptera	Hesperiidae	Coon	<i>Psolos fuligo</i>	
198	Lepidoptera	Hesperiidae	Common Banded Demon	<i>Notocrypta paralysos</i>	
199	Lepidoptera	Hesperiidae	Restricted Demon	<i>Notocrypta curvifascia</i>	
200	Lepidoptera	Hesperiidae	Grass Demon	<i>Udaspes folus</i>	
201	Lepidoptera	Hesperiidae	Indian Palm Bob *	<i>Suastus gremius</i>	
202	Lepidoptera	Hesperiidae	Tree Flitter *	<i>Hyarotis adrastus</i>	IV
203	Lepidoptera	Hesperiidae	Giant Redeye	<i>Gangara thyrsis</i>	
204	Lepidoptera	Hesperiidae	Common Redeye *	<i>Matapa aria</i>	

205	Lepidoptera	Hesperiidae	Tamil Grass Dart	<i>Taractrocera ceramas</i>	
206	Lepidoptera	Hesperiidae	Pale Palm Dart *	<i>Telicota colon</i>	
207	Lepidoptera	Hesperiidae	Plain Palm Dart *	<i>Cephrenes acalle</i>	
208	Lepidoptera	Hesperiidae	African Straight/Straight Swift *	<i>Parnara naso</i>	
209	Lepidoptera	Hesperiidae	Bevan's Swift *	<i>Borbo bevanii</i>	
210	Lepidoptera	Hesperiidae	Dark Small-Branded Swift *	<i>Pelopidas mathias</i>	
211	Lepidoptera	Hesperiidae	Conjoined Swift *	<i>Pelopidas conjuncta</i>	
212	Lepidoptera	Hesperiidae	Paintbrush Swift *	<i>Baoris farri</i>	IV
213	Lepidoptera	Hesperiidae	Blank Swift *	<i>Caltoris kumara</i>	
214	Lepidoptera	Hesperiidae	Philippine Swift *	<i>Caltoris philippina</i>	II
215	Lepidoptera	Hesperiidae	Maculate Lancer *	<i>Salanoemia sala</i>	
216	Lepidoptera	Hesperiidae	Small Palm Bob *	<i>Suastus minutus</i>	
217	Lepidoptera	Hesperiidae	Wax Dart *	<i>Cupitha purreea</i>	
218	Lepidoptera	Hesperiidae	Common Dartlet	<i>Oriens goloides</i>	

Odonates

Sr. No.	Common name	Scientific name	Family	IUCN status	Western Ghat Endemism
1	Pale Dartlet	<i>Agriocnemis pieris</i>	Coenagrionidae		
2	Pygmy Dartlet	<i>Agriocnemis pygmaea</i>	Coenagrionidae		
3	Splendid Dartlet	<i>Agriocnemis splendissima</i>	Coenagrionidae		
4	Orange-tailed Marsh Dart	<i>Ceriagrion cerinorubellum</i>	Coenagrionidae		

5	Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i>	Coenagrionidae		
6	Rusty Marsh Dart	<i>Ceriagrion olivaceum</i>	Coenagrionidae		
7	Sindhudurg Marsh Dart	<i>Ceriagrion chromothorax</i>	Coenagrionidae		
8	Rusty Marsh Dart	<i>Ceriagrion olivaceum</i>	Coenagrionidae		
9	Golden Dartlet	<i>Ischnura rubilio</i>	Coenagrionidae		
10	Pygmy Bluespot	<i>Mortonagrion varralli</i>	Coenagrionidae		Endemic
11	Yellow-striped Blue Dart	<i>Pseudagrion indicum</i>	Coenagrionidae		Endemic
12	Saffron-faced Blue Dart	<i>Pseudagrion rubriceps</i>	Coenagrionidae		
13	Yellow Bush Dart	<i>Copera marginipes</i>	Platycenemididae		
14	Blue Bush Dart	<i>Copera vittata</i>	Platycenemididae		
15	Pied Reedtail	<i>Protosticta gravelyi</i>	Platystictidae		Endemic
16	Red-spot Reedtail	<i>Protosticta sanguinostigma</i>	Platystictidae	Vulnerable	Endemic
17	Black Bambootail	<i>Prodasineura verticalis</i>	Platycenemididae		
18	Blackwinged Bambootail	<i>Disparoneura quadrimaculata</i>	Platycenemididae		
19	Coorg Bambootail *	<i>Caconeura ramburi</i>	Platycenemididae		
20	Black & yellow bambootail	<i>Elatoneura tetrica</i>	Platycenemididae		Endemic
21	Emerald Spreadwing	<i>Lestes elatus</i>	Lestidae		
22	Stream Glory	<i>Neurobasis chinensis</i>	Calopterygidae		
23	Black-tipped Forest Glory	<i>Vestalis apicalis</i>	Calopterygidae		
24	Clear-winged Forest Glory	<i>Vestalis gracilis</i>	Calopterygidae		

25	River Heliodor	<i>Libellago indica</i>	Chlorocyphidae		Endemic
26	Stream Ruby	<i>Rhinocypha bisignata</i>	Chlorocyphidae		
27	Malabar Torrent Dart	<i>Euphaea fraseri</i>	Euphaeidae		Endemic
28	Black Torrent Dart	<i>Dysphaea ethela</i>	Euphaeidae		Endemic
29	Plain sinuate Clubtail	<i>Burmagomphus laidlawi</i>	Gomphidae		Endemic
30		<i>Cyclogomphus flavoannulatus</i>	Gomphidae		Endemic
31	Kodagu Clubtail	<i>Gomphidia kodaquensis</i>	Gomphidae		Endemic
32	Forest Hooktail	<i>Heliogomphus promelas</i>	Gomphidae	Near Threatened	
33	Wayanad Bowtail	<i>Macrogomphus wynaadicus</i>	Gomphidae		Endemic
34	Common Clubtail	<i>Ictinogomphus rapax</i>	Gomphidae		
35	Giant Clubtail	<i>Megalogomphus hannyngtoni</i>	Gomphidae	Near Threatened	
36	Long-legged Clubtail	<i>Merogomphus longistigma</i>	Gomphidae		Endemic
37	Pigmy Clubtail	<i>Microgomphus souteri</i>	Gomphidae		Endemic
38	Laidlaw's Clubtail	<i>Onychogomphus acinaces</i>	Gomphidae		Endemic
39	Common Hooktail	<i>Paragomphus lineatus</i>	Gomphidae		
40	Blue-tailed Green Darner	<i>Anax guttatus</i>	Aeshnidae		
41	Blue Darner *	<i>Anax immaculifrons</i>	Aeshnidae		
42	Brown Darner	<i>Gynacantha dravida</i>	Aeshnidae		
43	Parakeet Darner	<i>Gynacantha bayadera</i>	Aeshnidae		

44	Common River Hawk	<i>Epophthalmia vittata</i>	Macromidae		
45		<i>Macromia flavicincta</i>	Macromidae		
46		<i>Macromia irata</i>	Macromidae		Endemic
47	Evening Torrent Hawk	<i>Idionyx saffronata</i>	Cordulidae		Endemic
48	Goan Shadowdancer	<i>Idionyx gomantakensis</i>	Cordulidae		Endemic
49	Ditch Jewel	<i>Brachythemis contaminata</i>	Libellulidae		
50	Granite Ghost *	<i>Bradinopyga geminata</i>	Libellulidae		
51	Konkan Rock Dweller *	<i>Bradinopyga konkanensis</i>	Libellulidae		
52	Emerald-banded Skimmer	<i>Cratilla lineata</i>	Libellulidae		
53	Ruddy Marsh Skimmer	<i>Crocothemis servilia</i>	Libellulidae		
54	Ground Skimmer	<i>Diplacodes trivialis</i>	Libellulidae		
55	Amber-winged Glider	<i>Hydrobasileus croceus</i>	Libellulidae		
56	Blue Hawklet	<i>Hylaeothemis indica</i>	Libellulidae		
57	Dark Ground Skimmer	<i>Indothemis carnatica</i>	Libellulidae	Near Threatened	
58	Asian Bloodtail	<i>Lathrecista asiatica</i>	Libellulidae		
59	Fulvous Forest Skimmer	<i>Neurothemis fulvia</i>	Libellulidae		
60	Pale Forest Skimmer	<i>Neurothemis intermedia</i>	Libellulidae		
61	Pied Paddy Skimmer	<i>Neurothemis tullia</i>	Libellulidae		

62	Stellate River Hawk *	<i>Onychothemis testacea</i>	Libellulidae		
63	Cherry Skimmer	<i>Orthetrum chrysis</i>	Libellulidae		
64	Blue Marsh Hawk	<i>Orthetrum glaucum</i>	Libellulidae		
65	Crimson-tailed Marsh Hawk	<i>Orthetrum pruinosum</i>	Libellulidae		
66	Blue-eyed Marsh Hawk	<i>Orthetrum luzonicum</i>	Libellulidae		
67	Green Marsh Hawk	<i>Orthetrum sabina</i>	Libellulidae		
68	Tiny Flufftail *	<i>Palpopleura sexmaculata</i>	Libellulidae		
69	Wandering Glider	<i>Pantala flavescens</i>	Libellulidae		
70	Yellow-tailed Ashy Skimmer	<i>Potamarcha congener</i>	Libellulidae		
71	Common Picturewing	<i>Rhyothemis variegata</i>	Libellulidae		
72	Pigmy Skimmer	<i>Tetrathemis platyptera</i>	Libellulidae		
73	Coral-tailed Cloud-wing *	<i>Tholymis tillarga</i>	Libellulidae		
74	Red Marsh Trotter	<i>Tramea basilaris</i>	Libellulidae		
75	Black Marsh Trotter	<i>Tramea limbata</i>	Libellulidae		
76	Crimson Marsh Glider	<i>Trithemis aurora</i>	Libellulidae		
77	Black Stream Glider	<i>Trithemis festiva</i>	Libellulidae		
78	Long-legged Marsh Glider *	<i>Trithemis pallidinervis</i>	Libellulidae		

79	Iridescent Stream Glider *	<i>Zygonyx iris</i>	Libellulidae		
80	Brown Dusk Hawk	<i>Zyxomma petiolatum</i>	Libellulidae		

Annexure III

Fish

	Species	Western Ghats Endemic	IUCN status
1.	<i>Aplocheilus lineatus</i> (Valenciennes, 1846)		Least Concern
2.	<i>Arothron leopardus</i> (Day, 1878)		Data Deficient
3.	<i>Carinotetraodon travancoricus</i> (Hora & Nair, 1941)	Endemic	Vulnerable
4.	<i>Chanda nama</i> Hamilton, 1822		Least Concern
5.	<i>Channa gachua</i> (Hamilton, 1822)		Least Concern
6.	<i>Channa marulius</i> (Hamilton, 1822)		Least Concern
7.	<i>Channa striata</i> (Bloch, 1793)		Least Concern
8.	<i>Dawkinsia filamentosa</i> (Valenciennes, 1844)	Endemic	Least Concern
9.	<i>Devario spp</i>		
10.	<i>Devario malabaricus</i> (Jerdon, 1849)		Least Concern
11.	<i>Etroplus suratensis</i> (Bloch, 1790)		Least Concern
12.	<i>Garra bicornuta</i> Narayan Rao, 1920	Endemic	Near Threatened
13.	<i>Garra mullya</i> (Sykes, 1839)		Least Concern
14.	<i>Garra stenorhynchus</i> (Jerdon, 1849)		Least Concern
15.	<i>Glossogobius giuris</i> (Hamilton, 1822)		Least Concern
16.	<i>Glossogobius spp.</i>		
17.	<i>Haludaria melanampyx</i> (Day, 1865)	Endemic	Data Deficient
18.	<i>Hypselobarbus curmuca</i> (Hamilton, 1807)	Endemic	Endangered
19.	<i>Hypselobarbus dobsoni</i> (Day, 1876)	Endemic	Data Deficient
20.	<i>Hypselobarbus jerdoni</i> (Day, 1870)	Endemic	Least Concern
21.	<i>Lepidocephalichthys thermalis</i> (Valenciennes 1846)		Least Concern
22.	<i>Mastacembelus armatus</i> (Lacépède, 1800)		Least Concern

23.	<i>Microphis cunocalus</i> (Hamilton, 1822)*		Least Concern
24.	<i>Mystus armatus</i> (Day, 1865)		Least Concern
25.	<i>Mystus cavasius</i> (Hamilton, 1822)		Least Concern
26.	<i>Mystus gulio</i> (Hamilton, 1822)		Least Concern
27.	<i>Mystus keletius</i> (Valenciennes, 1840)	Endemic	Least Concern
28.	<i>Migul</i> spp.		
29.	<i>Osteochilichthys nashii</i> (Day, 1869)	Endemic	Least Concern
30.	<i>Osteochilichthys thomassi</i> (Day, 1877)	Endemic	Least Concern
31.	<i>Parambassis ranga</i> (Hamilton, 1822)		Least Concern
32.	<i>Paracanthocobitis mooreh</i> (Sykes, 1839)	Endemic	
33.	<i>Pangio goaensis</i> (Tilak, 1972)*	Endemic	Least Concern
34.	<i>Pethia narayani</i> (Hora, 1937)	Endemic	Least Concern
35.	<i>Pethia punctata</i> (Day, 1865)	Endemic	Least Concern
36.	<i>Pethia setnai</i> (Chhapgar & Sane, 1992)	Endemic	Vulnerable
37.	<i>Pethia ticto</i> (Hamilton, 1822)		Least Concern
38.	<i>Pseudetroplus maculatus</i> (Bloch, 1795)		Least Concern
39.	<i>Puntius amphibius</i> (Valenciennes, 1842)		Data Deficient
40.	<i>Rasbora daniconius</i> (Hamilton, 1822)		Least Concern
41.	<i>Rasbora labiosa</i> Mukerji, 1935	Endemic	Least Concern
42.	<i>Salmostoma bacaila</i> (Hamilton, 1822)		Least Concern

43.	<i>Salmostoma boopis</i> (Day, 1874)		Least Concern
44.	<i>Salmostoma novacula</i> (Valenciennes, 1840)		Least Concern
45.	<i>Schistura denisoni</i> (Day, 1867)		Least Concern
46.	<i>Schistura</i> spp.		
47.	<i>Sicyopterus griseus</i> (Day, 1877)	Endemic	Least Concern
48.	<i>Tor khudree</i> (Sykes, 1839)	Endemic	Least Concern
49.	<i>Xenentodon cancila</i> (Hamilton, 1822)		Least Concern

Annexure IV Herpetofauna

	Order	Family	Species	Common name	IUCN Red List category	WPA Schedule
1	Testudines	Bataguridae	<i>Melanochelys trijuga</i>	Indian Black Turtle	Near Threatened	
2	Testudines	Trionychidae	<i>Lissemys punctata</i>	Indian Flapshell Turtle	Least Concern	I
3	Squamata	Gekkonidae	<i>Cnemaspis goaensis</i>	Goan Day Gecko	Endangered	
4	Squamata	Gekkonidae	<i>Cyrtodactylus albofasciatus</i>	Boulenger's Indian Gecko	Not Evaluated	
5	Squamata	Gekkonidae	<i>Hemidactylus frenatus</i>	Asian House Geck	Least Concern	
6	Squamata	Gekkonidae	<i>Hemidactylus prashadi</i>	Prashad's Gecko	Least Concern	
7	Squamata	Lacertidae	<i>Ophisops beddomei</i>	Beddome's Snake-eyed Lizard	Least Concern	
8	Squamata	Mabuyidae	<i>Allapalli grass skink</i>	Allapalli Grass Skink	Least Concern	
9	Squamata	Mabuyidae	<i>Eutropis macularia</i>	Bronze Grass Skink	Least Concern	
10	Squamata	Mabuyidae	<i>Eutropis carinata</i>	Common Keeled Skink	Least Concern	
11	Squamata	Lygosomidae	<i>Lygosoma goaensis</i>	Goan Supple Skink	Least Concern	
12	Squamata	Lygosomidae	<i>Lygosoma punctatum</i>	Spotted Supple Skink	Least Concern	
13	Squamata	Varanidae	<i>Varanus bengalensis</i>	Bengal Monitor Lizard	Least Concern	
14	Squamata	Chamaeleonidae	<i>Chamaeleo zeylanicus</i>	Indian Chamaeleon	Least Concern	II

	Order	Family	Species	Common name	IUCN Red List category	WPA schedule
15	Squamata	Agamidae	<i>Calotes rouxii</i>	Roux's Forest Lizard	Least Concern	
16	Squamata	Agamidae	<i>Calotes versicolor</i>	Indian Garden Lizard	Least Concern	
17	Squamata	Agamidae	<i>Draco dussumieri</i>	South Indian Flying Lizard	Least Concern	
18	Squamata	Typhlopidae	<i>Indotyphlops braminus</i>	Brahminy Worm Snake	Least Concern	
19	Squamata	Typhlopidae	<i>Grypotyphlops acutus</i>	Beaked Worm Snake	Least Concern	
20	Squamata	Erycidae	<i>Eryx whitakeri</i>	Whitaker's Boa	Least Concern	
21	Squamata	Uropeltidae	<i>Melanophidium khairei</i>	Khaire's Shieldtail	Least Concern	
22	Squamata	Uropeltidae	<i>Uropeltis beddomii</i>	Beddome's Shieldtail	Least Concern	
23	Squamata	Pythonidae	<i>Python molurus</i>	Rock Python	Near Threatened	I
24	Squamata	Viperidae	<i>Daboia russelii</i>	Russell's Viper	Least Concern	II
25	Squamata	Viperidae	<i>Echis carinatus</i>	Indian Saw-scaled Viper	Not Evaluated	
26	Squamata	Viperidae	<i>Hypnale</i>	Common Hump-nosed Pit Viper	Not Evaluated	
27	Squamata	Viperidae	<i>Trimeresurus gramineus</i>	Bamboo Pit Viper	Least Concern	
28	Squamata	Viperidae	<i>Trimeresurus malabaricus</i>	Malabar Pit Viper	Least Concern	

	Order	Family	Species	Common name	IUCN Red List category	WPA schedule
29	Squamata	Elapidae	<i>Bungarus caeruleus</i>	Common Indian Krait	Not Evaluated	
30	Squamata	Elapidae	<i>Calliophis castoe</i>	Castoe's Coral Snake	Not Evaluated	
31	Squamata	Elapidae	<i>Calliophis melanurus</i>	Slender Coral Snake	Not Evaluated	
32	Squamata	Elapidae	<i>Naja</i>	Spectacled Cobra	Least Concern	II
33	Squamata	Elapidae	<i>Ophiophagus hannah</i>	King Cobra	Vulnerable	II
34	Squamata	Natricidae	<i>Amphiesma stolatum</i>	Striped Keelback	Not Evaluated	
35	Squamata	Natricidae	<i>Atretium schistosum</i>	Olive Keelback Water Snake	Least Concern	
36	Squamata	Natricidae	<i>Hebius beddomei</i>	Beddome's Keelback	Least Concern	
37	Squamata	Natricidae	<i>Macrophistodon plumbicolor</i>	Green Keelback	Not Evaluated	
38	Squamata	Natricidae	<i>Rhabdops aquaticus</i>	Aquatic Forest Snake	Not Evaluated	
39	Squamata	Natricidae	<i>Xenochrophis piscator</i>	Checkered Keelback	Not Evaluated	II
40	Squamata	Colubridae	<i>Ahaetulla nasuta</i>	Common Vine Snake	Not Evaluated	
41	Squamata	Colubridae	<i>Ahaetulla pulverulenta</i>	Brown Vine Snake	Least Concern	
42	Squamata	Colubridae	<i>Boiga beddomei</i>	Beddome's Cat Snake	Data Deficient	

	Order	Family	Species	Common name	IUCN Red List category	WPA schedule
43	Squamata	Colubridae	<i>Boiga forsteni</i>	Forsten's Cat Snake	Least Concern	
44	Squamata	Colubridae	<i>Chrysopelea ornata</i>	Ornate Flying Snake	Not Evaluated	
45	Squamata	Colubridae	<i>Coelognathus helena monticollaris</i>	Montane Trinket Snake	Not Evaluated	
46	Squamata	Colubridae	<i>Dendrelaphis ashoki</i>	Ashok's Bronzeback Snake	Least Concern	
47	Squamata	Colubridae	<i>Dendrelaphis tristis</i>	Common Bronzeback Snake	Not Evaluated	
48	Squamata	Colubridae	<i>Boiga forsteni</i>	Forsten's Cat Snake	Least Concern	
49	Squamata	Colubridae	<i>Lycodon aulicus</i>	Common Wolf Snake	Not Evaluated	
50	Squamata	Colubridae	<i>Oligodon taeniolatus fasciatus</i>	Russell's Kukri Snake	Least Concern	
51	Squamata	Colubridae	<i>Ptyas mucosa</i>	Indian Rat Snake	Not Evaluated	II
52	Crocodylia	Crocodylidae	<i>Crocodylus palustris</i>	Mugger or Marsh Crocodile	Vulnerable	I

	Order	Family	Species	Common name	IUCN Red List category	WPA schedule
1	Anura	Bufo	<i>Duttaphrynus melanostictus</i>	Asian Common Toad	Least Concern	
2	Anura	Bufo	<i>Duttaphrynus stomaticus</i>	Indian Marbled Toad	Least Concern	
3	Anura	Bufo	<i>Pedostibes tuberculosus</i>	Malabar Tree Toad	Endangered	
4	Anura	Dicroglossidae	<i>Euphlyctis cyanophlyctis</i>	Indian Skipper Frog	Least Concern	
5	Anura	Dicroglossidae	<i>Minervarya rufescens</i> *	Malabar Wart Frog	Least Concern	
6	Anura	Dicroglossidae	<i>Minervarya syhadrensis</i> *	Small Cricket Frog	Endangered	
7	Anura	Dicroglossidae	<i>Minervarya gomantaki</i> *			
8	Anura	Dicroglossidae	<i>Minervarya goemchi</i> *			
9	Anura	Dicroglossidae	<i>Minervarya cepfi</i> *			
10	Anura	Dicroglossidae	<i>Minervarya agricola</i> *			
11	Anura	Dicroglossidae	<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	Least Concern	Schedule IV
12	Anura	Dicroglossidae	<i>Sphaerotheca breviceps</i>	Indian Burrowing Frog	Least Concern	

13	Anura	Dicroglossidae	<i>Sphaerotherca dobsonii</i>	Dobson's Burrowing Frog	Least Concern	
14	Anura	Microhylidae	<i>Microhyla ornata</i>	Ornate Narrow-mouthed Frog	Least Concern	
15	Anura	Microhylidae	<i>Microhyla nilphamariensis</i>	Niphamarai Narrow-mouthed Frog	Not Evaluated	
16	Anura	Microhylidae	<i>Uperodon globulosus</i>	Indian Balloon Frog	Least Concern	
17	Anura	Microhylidae	<i>Uperodon mormoratus</i>	Indian Dot Frog	Endangered	
18	Anura	Nyctibatrachidae	<i>Nyctibatrachus danieli</i>	Daniel's Night Frog	Least Concern	
19	Anura	Nyctibatrachidae	<i>Nyctibatrachus petraeus</i>	Castle Rock Night Frog	Least Concern	
20	Anura	Ranixalidae	<i>Indirana chiravasi</i>	Amboli Leaping Frog	Not Evaluated	
21	Anura	Ranixalidae	<i>Indirana salelkari</i>	Leaping Frog	Not Evaluated	
22	Anura	Rhacophoridae	<i>Pseudophilautus amboli</i>	Amboli Bush Frog	Critically Endangered	
23	Anura	Rhacophoridae	<i>Philautus bombayensis</i>	Maharashtra Bush Frog	Vulnerable	

24	Anura	Racophoridae	<i>Polypedates maculatus</i>	Common Indian Tree Frog		
25	Anura	Rhacophoridae	<i>Rhacophorus malabaricus</i>	Malabar Gliding Frog	Least Concern	
26	Anura	Rhacophoridae	<i>Raorchestes bombayensis</i>	Maharashtra Bush Frog		
27	Anura	Ranidae	<i>Hydrophylax malabaricus</i>	Fungoid Frog	Least Concern	
28	Anura	Ranidae	<i>Hydrophylax bahuvistara</i>	Wide-spread Fungoid Frog		
29	Anura	Ranidae	<i>Indosylvirana temporalis</i>	Bronzed Frog	Near Threatened	
30	Anura	Ranidae	<i>Indosylvirana caesari</i>	Maharashtra Golden-backed Frog		
31	Anura	Ranidae	<i>Clinotarsus curtipes</i>	Bicoloured Frog	Near Threatened	
32	Anura	Micrixalidae	<i>Micrixalus uttaraghati</i>	Northern Dancing Frog		
33	Gymnophiona	Ichthyophiidae	<i>Ichthyophis davidi</i>	Chorla Striped Caecilian		
34	Gymnophiona	Ichthyophiidae	<i>Ichthyophis bombayensis</i>	Bombay Caecilian	Least Concern	
35	Gymnophiona	Indotyphlidae	<i>Gegeneophis danieli</i>	Daniel's Ceacilian		
36	Gymnophiona	Indotyphlidae	<i>Gegeneophis mhadeiensis</i>	Mhadei Caecilian		

Annexure V

Birds

IUCN: Evaluation of species as per IUCN Redlist 2020-1 CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened

WPA (1972): Species listed and protected under five different categories (Schedule I to IV, and VI) in accordance to the Wildlife Protection Act of 1972

STATUS: Evaluation of migratory status of a species. R: Resident; M: Migrant; LM: Local Migrant, making short movements out of the political boundaries of Goa; R/M: Resident population supplemented by a migratory population; VG: Vagrant migrants recorded away from their known migratory range; S: Residents of the Indian Subcontinent with no known resident populations in Goa attributed to as stray; UC: Unclear

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	I. Anseriformes					
	1. Anatidae (Ducks, geese, swans)					
1	Lesser Whistling Duck <i>Dendrocygna javanica</i>			4	R	
	II. Galliformes					
	2. Phasianidae (partridges, pheasants, grouse)					
2	Indian Peafowl <i>Pavo cristatus</i>			1	R	
3	Jungle Bush Quail <i>Perdica asiatica</i>			4	R	
4	Grey Junglefowl <i>Gallus sonneratii</i>			2	R	
5	Red Spurfowl <i>Galloperdix spadicea</i>			4	R	
	III. Columbiformes					
	3. Columbidae (pigeons)					

6	Rock Pigeon <i>Columba livia</i>			4	R	
7	Nilgiri Wood Pigeon <i>Columba elphinstonii</i>		VU	4	R	
8	Oriental Turtle Dove <i>Streptopelia orientalis</i>			4	R	
9	(Western) Spotted Dove <i>Streptopelia chinensis suratensis</i>			4	R	
10	Orange-breasted Green Pigeon <i>Treron bicinctus</i>			4	R	
11	Grey-fronted Green Pigeon <i>Treron affinis</i>			4	R	
12	Asian Emerald Dove <i>Chalcophaps indica</i>			4	R	
13	Green Imperial Pigeon <i>Ducula aenea</i>			4	R	
14	Mountain Imperial Pigeon (Nilgiri Imperial Pigeon) <i>Ducula badia cuprea</i>			4	R	
	IV. Caprimulgiformes					
	4. Podargidae (frogmouths)					
15	Sri Lanka Frogmouth <i>Batrachostomus moniliger</i>			1	R	
	5. Caprimulgidae (nightjars)					
16	Jungle Nightjar <i>Caprimulgus indicus</i>			4	R	
17	Jerdon's Nightjar <i>Caprimulgus atripennis</i>			4	R	
18	Indian Nightjar <i>Caprimulgus asiaticus</i>			4	R	X
19	Savanna Nightjar <i>Caprimulgus affinis</i>			4	R	
	6. Hemiprocnidae (Treeswifts)					
20	Crested Treeswift <i>Hemiprocne coronata</i>				R	
	7. Apodidae (swifts)					
21	White-rumped Spinetail <i>Zoonavena sylvatica</i>				R	
22	Brown-backed Needletail <i>Hirundapus giganteus</i>				R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
23	Indian Swiftlet <i>Aerodramus unicolor</i>			1	R	
24	Asian Palm Swift <i>Cypsiurus balasiensis</i>				LM	
25	Alpine Swift <i>Tachymarptis melba</i>				R	
26	Indian House Swift <i>Apus affinis</i>				R	
27	Common Swift <i>Apus apus</i>				M	X
	V. Cuculiformes					
	8. Cuculidae (cuckoos)					
28	Greater Coucal <i>Centropus sinensis</i>			4	R	
29	Blue-faced Malkoha <i>Phaenicophaeus viridirostris</i>			4	R	
30	Pied Cuckoo <i>Clamator jacobinus</i>			4	R/M	
31	Asian Koel <i>Eudynamys scolopaceus</i>			4	R	
32	Banded Bay Cuckoo <i>Cacomantis sonneratii</i>			4	R	
33	Grey-bellied Cuckoo <i>Cacomantis passerinus</i>			4	R	
34	Fork-tailed Drongo Cuckoo <i>Surniculus dicruroides</i>			4	R	
35	Large Hawk Cuckoo <i>Hierococcyx sparveroides</i>			4	M	X
36	Common Hawk Cuckoo <i>Hierococcyx varius</i>			4	R	
37	Indian Cuckoo <i>Cuculus micropterus</i>			4	M	X

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
38	Common Cuckoo <i>Cuculus canorus</i>			4	M	
	VI. Gruiformes					
	9. Rallidae (rails and coots)					
39	Slaty-legged Crake <i>Rallina eurizonoides</i>			4	M	
40	White-breasted Waterhen <i>Amaurornis phoenicurus</i>			4	R	
41	Purple Swamphehen <i>Porphyrio porphyrio</i>			4	R	
	VII. Ciconiiformes					
	10. Ciconiidae (storks)					
42	Lesser Adjutant <i>Leptoptilos javanicus</i>		VU	4	R	
43	Asian Openbill <i>Anastomus oscitans</i>			4	R	
44	Black Stork <i>Ciconia nigra</i>			4	M	X
45	Woolly-necked Stork <i>Ciconia episcopus</i>		VU	4	R	
	11. Ardeidae (herons)					
46	Malayan Night Heron <i>Gorsachius melanolophus</i>			4	R	
47	Striated Heron <i>Butorides striata</i>			4	R	
48	Indian Pond Heron <i>Ardeola grayii</i>			4	R	
49	(Eastern) Cattle Egret <i>Bubulcus ibis coromandus</i>			4	R	
50	Grey Heron <i>Ardea cinerea</i>			4	R/M	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
51	Purple Heron <i>Ardea purpurea</i>			4	R	
52	(Eastern) Great Egret <i>Ardea alba modesta</i>			4	R	
53	Intermediate Egret <i>Ardea intermedia</i>			4	R	
54	Little Egret <i>Egretta garzetta</i>			4	R	
55	Western Reef Egret <i>Egretta gularis</i>			4	R	
	12. Threskiornithidae (ibises)					
56	Black-headed Ibis <i>Threskiornis melanocephalus</i>		NT	4	R/M	
	VIII. Suliformes					
	13. Phalacrocoracidae (cormorants)					
57	Little Cormorant <i>Microcarbo niger</i>			4	R	
58	Indian Cormorant <i>Phalacrocorax fuscicollis</i>			4	R	
	14. Anhingidae (darters)					
59	Oriental Darter <i>Anhinga melanogaster</i>		NT	4	R	
	IX. Charadriiformes					
	15. Recurvirostridae (stilts and avocets)					
60	Black-winged Stilt <i>Himantopus himantopus</i>			4	M	
	16. Charadriidae (plovers & lapwings)					

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
61	Little Ringed Plover <i>Charadrius dubius</i>			4	R	
62	Yellow-wattled Lapwing <i>Vanellus malabaricus</i>			4	R	
63	Red-wattled Lapwing <i>Vanellus indicus</i>			4	R	
	17. Jacanidae (jacanas)					
64	Bronze-winged Jacana <i>Metopidius indicus</i>			4	R	
	18. Scolopacidae (sandpipers)					
65	Common Snipe <i>Gallinago gallinago</i>			4	M	
66	Common Sandpiper <i>Actitis hypoleucos</i>			4	LM	
67	Green Sandpiper <i>Tringa ochropus</i>			4	M	
	19. Turnicidae (buttonquails)					
68	Barred Buttonquail <i>Turnix suscitator</i>			4	R	
	20. Glareolidae (coursers and pratincoles)					
69	Little Pratincole <i>Glareola lactea</i>				M	
	21. Laridae (gulls and terns)					
70	Gull-billed Tern <i>Gelochelidon nilotica</i>			4	R	
71	River Tern <i>Sterna aurantia</i>		NT	4	R	
	22. Accipitridae (kites, hawks and eagles)					

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
72	Black-winged Kite <i>Elanus caeruleus</i>			1	M	
73	Oriental Honey Buzzard <i>Pernis ptilorhynchus</i>			1	R	
74	Egyptian Vulture <i>Neophron percnopterus</i> §		EN	1	S	X
75	Crested Serpent Eagle <i>Spilornis cheela</i>			1	R	
76	Short-toed Snake Eagle <i>Circaetus gallicus</i>			1	S	
77	White-rumped Vulture <i>Gyps bengalensis</i>		CR	1	S	X
78	Indian Vulture <i>Gyps indicus</i>		CR	1	S	X
79	Mountain Hawk Eagle (Legge's Hawk Eagle) <i>Nisaetus nipalensis kelaarti</i>			1	R	X
80	Changeable Hawk Eagle (Crested Hawk Eagle) <i>Nisaetus cirrhatus cirrhatus</i>			1	R	
81	Rufous-bellied Eagle <i>Lophotriorchis kienerii</i>			1	R	
82	Black Eagle <i>Ictinaetus malaiensis</i>			1	R	
83	Bonelli's Eagle <i>Aquila fasciata</i>			1	R	
84	Booted Eagle <i>Hieraetus pennatus</i>			1	M	
85	Western Marsh Harrier <i>Circus aeruginosus</i>			1	M	
86	Crested Goshawk <i>Accipiter trivirgatus</i>			1	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
87	Shikra <i>Accipiter badius</i>			1	R	
88	Besra <i>Accipiter virgatus</i>			1	R	
89	Eurasian Sparrowhawk <i>Accipiter nisus</i>			1	M	
90	White-bellied Sea Eagle <i>Haliaeetus leucogaster</i>			1	R	
91	Grey-headed Fish Eagle <i>Ichthyophaga ichthyaetus</i>		NT	1	M	X
92	Brahminy Kite <i>Haliastur indus</i>			1	R	
93	Black Kite <i>Milvus migrans</i>			1	R/M	
94	White-eyed Buzzard <i>Butastur teesa</i>			1	R	
	22. Tytonidae (barn owls)					
95	Sri Lanka Bay Owl <i>Phodilus assimilis</i>			4	R	X
96	Common Barn Owl <i>Tyto alba</i>			4	R	
	23. Strigidae (owls)					
97	Brown Hawk Owl <i>Ninox scutulata</i>			4	R	
98	Jungle Owlet <i>Glaucidium radiatum</i>			4	R	
99	Spotted Owlet <i>Athene brama</i>			4	R	
100	Oriental Scops Owl <i>Otus sunia</i>			4	R	
101	Indian Scops Owl <i>Otus bakkamoena</i>			4	R	
102	Brown Wood Owl <i>Strix leptogrammica</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
103	Spot-bellied Eagle Owl <i>Bubo nipalensis</i>			4	R	
104	Brown Fish Owl <i>Ketupa zeylonensis</i>			4	R	
	24. Trogonidae (trogons)					
105	Malabar Trogon <i>Harpactes fasciatus</i>			4	R	
	25. Bucerotidae (hornbills)					
106	Great Hornbill <i>Buceros bicornis</i>		NT	1	R	
107	Malabar Pied Hornbill <i>Anthracoceros coronatus</i>		NT	1	R	
108	Malabar Grey Hornbill <i>Ocyrceros griseus</i>	WG		1	R	
109	Indian Grey Hornbill <i>Ocyrceros birostris</i>			1	R	
	26. Upupidae (hoopoes)					
110	Common Hoopoe <i>Upupa epops</i>				R	
	27. Picidae (woodpeckers)					
111	Speckled Piculet <i>Picumnus innominatus</i>			4	R	
112	Heart-spotted Woodpecker <i>Hemicircus canente</i>			4	R	
113	Common Golden-backed Woodpecker <i>Dinopium javanense</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
114	Lesser Golden-backed Woodpecker <i>Dinopium benghalense</i>			4	R	
115	Rufous Woodpecker <i>Micropternus brachyurus</i>			4	R	
116	Lesser Yellow-naped Woodpecker <i>Picus chlorolophus</i>			4	R	
117	White-bellied Woodpecker <i>Dryocopus javensis</i>			4	R	
118	Greater Golden-backed Woodpecker <i>Chrysocolaptes guttacristatus</i>			4	R	
119	White-naped Woodpecker <i>Chrysocolaptes festivus</i>			4	R	
120	Brown-capped Pygmy Woodpecker <i>Dendrocopos nanus</i>			4	R	
121	Yellow-fronted Pied Woodpecker <i>Dendrocopos mahrattensis</i>			4	R	
	28. Megalaimidae (barbets)					
122	Brown-headed Barbet <i>Psilopogon zeylanicus</i>			4	R	
123	White-cheeked Barbet <i>Psilopogon viridis</i>			4	R	
124	Malabar Barbet <i>Psilopogon malabaricus</i>	WG		4	R	
125	Coppersmith Barbet <i>Psilopogon haemacephalus</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	29. Meropidae (bee-eaters)					
126	Blue-bearded Bee-eater <i>Nyctyornis athertoni</i>				R	
127	Green Bee-eater <i>Merops orientalis</i>				R	
128	Chestnut-headed Bee-eater <i>Merops leschenaulti</i>				R	
129	Blue-tailed Bee-eater <i>Merops philippinus</i>				M	
130	Indian Roller <i>Coracias benghalensis</i>			4	LM	
131	European Roller <i>Coracias garrulus</i>			4	M	
	30. Alcedinidae (kingfisher)					
132	Oriental Dwarf Kingfisher <i>Ceyx erithaca</i>			4	R	
133	Blue-eared Kingfisher <i>Alcedo meninting</i>			4	R	
134	Common Kingfisher <i>Alcedo atthis</i>			4	R	
135	Pied Kingfisher <i>Ceryle rudis</i>			4	R	
136	Stork-billed Kingfisher <i>Pelargopsis capensis</i>			4	R	
137	White-throated Kingfisher <i>Halcyon smyrnensis</i>			4	R	
138	Black-capped Kingfisher <i>Halcyon pileata</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	31. Falconidae (falcons and caracaras)					
139	Common Kestrel <i>Falco tinnunculus</i>			4	M	
140	Amur Falcon <i>Falco amurensis</i>			4	M	
141	Eurasian Hobby <i>Falco subbuteo</i>			4	M	
142	Peregrine Falcon <i>Falco peregrinus</i>			1		
	32. Psittaculidae (Old World parrots)					
143	Plum-headed Parakeet <i>Psittacula cyanocephala</i>			4	R	
144	Malabar Parakeet <i>Psittacula columboides</i>	WG		4	R	
145	Rose-ringed Parakeet <i>Psittacula krameri</i>			4	R	
146	Vernal Hanging Parrot <i>Loriculus vernalis</i>			4	R	
	33. Pittidae (pittas)					
147	Indian Pitta <i>Pitta brachyura</i>			4	R	
	34. Campephagidae (minivets and cuckooshrikes)					
148	Small Minivet <i>Pericrocotus cinnamomeus</i>			4	R	
149	Scarlet Minivet (Orange Minivet) <i>Pericrocotus flammeus</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
150	Large (Indian) Cuckooshrike <i>Coracina javensis</i> <i>macei</i>			4	R	
151	Black-winged Cuckooshrike <i>Lalage</i> <i>melaschistos</i>			4	M	X
152	Black-headed Cuckooshrike <i>Lalage</i> <i>melanoptera</i>			4	R	
	35. Oriolidae (orioles, figbirds and allies)					
153	Black-hooded Oriole <i>Oriolus</i> <i>xanthornus</i>			4	R	
154	Indian Golden Oriole <i>Oriolus</i> <i>kundoo</i>			4	LM	
155	Black-naped Oriole <i>Oriolus</i> <i>chinensis</i>			4	M	
	36. Artamidae (woodswallows, Australian magpies and allies)					
156	Ashy Woodswallow <i>Artamus</i> <i>fuscus</i>				R	
	37. Vangidae (vangas and helmet-shrikes)					
157	Bar-winged Flycatcher-shrike <i>Hemipus</i> <i>picatus</i>			4	R	
158	Malabar Woodshrike <i>Tephrodornis</i> <i>sylvicola</i>	WG		4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
159	Common Woodshrike <i>Tephrodornis pondicerianus</i>			4	R	
	38. Aegithinidae (ioras)					
160	Common Iora <i>Aegithina tiphia</i>			4	R	
	39. Dicruridae (drongos)					
161	Black Drongo <i>Dicrurus macrocercus</i>			4	R	
162	Ashy Drongo <i>Dicrurus leucophaeus</i>			4	M	
163	White-bellied Drongo <i>Dicrurus caerulescens</i>			4	R	
164	Bronzed Drongo <i>Dicrurus aeneus</i>			4	R	
165	Hair-crested Drongo <i>Dicrurus hottentottus</i>			4	R	
166	Greater Racket-tailed Drongo <i>Dicrurus paradiseus</i>			4	R	
	40. Rhipiduridae (fantails)					
167	White-spotted Fantail <i>Rhipidura albogularis</i>			4	R	
	41. Laniidae (shrikes)					
168	Brown Shrike <i>Lanius cristatus</i>				M	
169	Isabelline Shrike <i>Lanius isabellinus</i>				M	
170	Long-tailed Shrike <i>Lanius schach</i>				M	
	42. Corvidae (crows and jays)					

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
171	Rufous Treepie <i>Dendrocitta vagabunda</i>			4	R	
172	House Crow <i>Corvus splendens</i>			5	R	
173	Large-billed Crow (Indian Jungle Crow) <i>Corvus macrorhynchos culminatus</i>			4	R	
	43. Monarchidae (monarchs and paradise-flycatchers)					
174	Black-naped Monarch <i>Hypothymis azurea</i>			4	R	
175	Indian Paradise-flycatcher <i>Terpsiphone paradisi</i>			4	LM	
	44. Dicaeidae (flowerpeckers)					
176	Thick-billed Flowerpecker <i>Dicaeum agile</i>			4	R	
177	Pale-billed Flowerpecker <i>Dicaeum erythrorhynchos</i>			4	R	
178	Nilgiri Flowerpecker <i>Dicaeum concolor</i>	WG		4	R	
	45. Nectariniidae (sunbirds)					
179	Little Spiderhunter <i>Arachnothera longirostra</i>			4	R	
180	Purple-rumped Sunbird <i>Leptocoma zeylonica</i>			4	R	
181	Crimson-backed Sunbird <i>Leptocoma minima</i>	WG		4	R	
182	Purple Sunbird <i>Cinnyris asiaticus</i>			4	R	
183	Loten's Sunbird <i>Cinnyris lotenius</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
184	Vigors's Sunbird <i>Aethopyga vigorsii</i>	WG		4	R	
	46. Irenidae (fairy-bluebirds)					
185	Asian Fairy-bluebird <i>Irena puella</i>			4	R	
	47. Chloropseidae (leafbirds)					
186	Golden-fronted Leafbird <i>Chloropsis aurifrons</i>			4	R	
187	Jerdon's Leafbird <i>Chloropsis jerdoni</i>			4	R	
	48. Ploceidae (weavers)					
188	Baya Weaver <i>Ploceus philippinus</i>			4	R	
	49. Estrildidae (waxbills)					
189	Red Munia <i>Amandava amandava</i>			4	R	
190	White-rumped Munia <i>Lonchura striata</i>			4	R	
191	Scaly-breasted Munia <i>Lonchura punctulata</i>			4	R	
192	Black-throated Munia <i>Lonchura kelaarti</i>			4	R	
193	Tricoloured Munia <i>Lonchura malacca</i>			4	R	
	50. Passeridae (sparrows, snowfinches and allies)					
194	House Sparrow <i>Passer domesticus</i>			4	R	
195	Yellow-throated Sparrow <i>Gymnoris xanthocollis</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	51. Motacillidae (wagtails and pipits)					
196	Forest Wagtail <i>Dendronanthus indicus</i>			4	M	
197	Tree Pipit <i>Anthus trivialis</i>			4	M	
198	Olive-backed Pipit <i>Anthus hodgsoni</i>			4	M	X
199	Paddyfield Pipit <i>Anthus rufulus</i>			4	R/M	
200	Tawny Pipit <i>Anthus campestris</i>			4	M	
201	Western Yellow Wagtail <i>Motacilla flava</i>			4		
202	Grey Wagtail <i>Motacilla cinerea</i>			4	M	
203	White-browed Wagtail <i>Motacilla maderaspatensis</i>			4	R/M	
204	White Wagtail <i>Motacilla alba</i>			4	M	
	52. Fringillidae (finches, euphonias and Hawaiian honeycreepers)					
205	Common Rosefinch <i>Erythrura erythrura</i>			4	M	
	53. Emberizidae (Old World buntings)					
206	Red-headed Bunting <i>Emberiza bruniceps</i>			4	M	
207	Black-headed Bunting <i>Emberiza melanocephala</i>			4	M	
208	Grey-necked Bunting <i>Emberiza buchanani</i>			4	M	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	54. Stenostiridae (fairy-flycatcher and crested flycatchers)					
209	Grey-headed Canary- flycatcher <i>Culicicapa ceylonensis</i>			4	M	
	55. Paridae (tits, chickadees)					
210	Black-lored Tit <i>Machlolophus xanthogenys</i>			4	R	
	56. Alaudidae (larks)					
211	Sykes's Short-toed Lark <i>Calandrella dukhunensis</i>			4	M	
212	Malabar Lark <i>Galerida malabarica</i>			4	R	
	57. Cisticolidae (cisticolas)					
213	Zitting Cisticola <i>Cisticola juncidis</i>			4	R	
214	Grey-breasted Prinia <i>Prinia hodgsonii</i>			4	R	
215	Ashy Prinia <i>Prinia socialis</i>			4	R	
216	Plain Prinia <i>Prinia inornata</i>			4	R	
217	Common Tailorbird <i>Orthotomus sutorius</i>			4	R	
	58. Locustellidae (bush warblers)					
218	Grasshopper Warbler <i>Locustella naevia</i>			4	M	
	59. Acrocephalidae (brush, reed and swamp warblers)					
219	Booted Warbler <i>Iduna caligata</i>			4	M	
220	Sykes's Warbler <i>Iduna rama</i>			4	M	X

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
221	Blyth's Reed Warbler <i>Acrocephalus dumetorum</i>			4	M	
222	Paddyfield Warbler <i>Acrocephalus agricola</i>			4	M	
223	Clamorous Reed Warbler <i>Acrocephalus stentoreus</i>			4	R/M	
	60. Hirundinidae (swallows)					
224	Northern House Martin <i>Delichon urbicum</i>				M	X
225	Streak-throated Swallow <i>Petrochelidon fluvicola</i>				M	
226	Red-rumped Swallow <i>Cecropis daurica</i>				R	
227	Wire-tailed Swallow <i>Hirundo smithii</i>				R	
228	Barn Swallow <i>Hirundo rustica</i>				M	
229	Eurasian Crag Martin <i>Ptyonoprogne rupestris</i>				M	
230	Dusky Crag Martin <i>Ptyonoprogne concolor</i>				R	
	61. Pycnonotidae (bulbuls)					
231	Square-tailed Bulbul <i>Hypsipetes ganeesa</i>			4	R	
232	Flame-throated Bulbul <i>Pycnonotus melanicterus gularis</i>	WG		4	R	
233	Red-whiskered Bulbul <i>Pycnonotus jocosus</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
234	Red-vented Bulbul <i>Pycnonotus cafer</i>			4	R	
235	White-browed Bulbul <i>Pycnonotus luteolus</i>			4	R	
236	Grey-headed Bulbul <i>Brachypodius priocephalus</i>	WG	NT	4	R	
237	Yellow-browed Bulbul <i>Acritillas indica</i>			4	R	
	62. Phylloscopidae (Old World leaf warblers)					
238	Yellow-browed Warbler <i>Abrornis inornatus</i>			4	M	X
239	Sulphur-bellied Warbler <i>Phylloscopus griseolus</i>			4	M	
240	Tickell's Leaf Warbler <i>Phylloscopus affinis</i>			4	M	
241	Green Leaf Warbler <i>Seicercus nitidus</i>			4	M	
242	Greenish Leaf Warbler <i>Seicercus trochiloides</i>			4	M	
243	Large-billed Leaf Warbler <i>Seicercus magnirostris</i>			4	M	
244	Western Crowned Leaf Warbler <i>Seicercus occipitalis</i>			4	M	
	63. Sylviidae (Sylvia warblers, parrotbills and allies)					
245	Yellow-eyed Babbler <i>Chrysomma sinense</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	64. Zosteropidae (white-eyes and yuhinas)					
246	Oriental White-eye <i>Zosterops palpebrosus</i>			4	R	
	65. Timaliidae (scimitar babblers and allies)					
247	Indian Scimitar Babbler <i>Pomatorhinus horsfieldii</i>			4	R	
248	Tawny-bellied Babbler <i>Dumetia hyperythra albugularis</i>			4	R	
249	Dark-fronted Babbler <i>Rhopocichla atriceps</i>			4	R	
250	Puff-throated Babbler <i>Pellorneum ruficeps</i>			4	R	
	66. Pellorneidae (smaller babblers)					
251	Quaker Tit Babbler <i>Alcippe poioicephala</i>			4	R	
	67. Leiothrichidae (babblers, laughingthrushes and allies)					
252	Rufous Babbler <i>Argya subrufa</i>	WG		4	R	
253	Jungle (Black-winged) Babbler <i>Turdoides striata somervillei</i>	WG		4	R	
254	Yellow-billed Babbler <i>Turdoides affinis</i>			4	S	X
255	Waynaad Laughingthrush <i>Garrulaxdelesserti</i>	WG		4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	68. Sittidae (nuthatches, spotted creepers and wallcreeper)					
256	Velvet-fronted Nuthatch <i>Sitta frontalis</i>				R	
	69. Sturnidae (starlings)					
257	Rosy Starling <i>Pastor roseus</i>			4	M	
258	Brahminy Starling <i>Sturnia pagodarum</i>			4	R	
259	Chestnut-tailed Starling <i>Sturnia malabarica</i>			4	R	
260	Malabar Starling <i>Sturnia malabarica blythii</i>	WG		4	R	
261	Common Myna <i>Acridotheres tristis</i>			4	R	
262	Jungle Myna <i>Acridotheres fuscus</i>			4	R	
263	Southern Hill Myna <i>Gracula indica</i>			1	R	
	70. Muscicapidae (chats and flycatchers)					
264	Indian Robin <i>Saxicoloides fulicatus</i>			4	R	
265	Oriental Magpie Robin <i>Copsychus saularis</i>			4	R	
266	White-rumped Shama <i>Kittacincla malabarica</i>			4	R	
267	Dark-sided Flycatcher <i>Muscicapa sibirica</i> §			4	VG	X
268	Asian Brown Flycatcher <i>Muscicapa dauurica</i>			4	M	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
269	Brown-breasted Flycatcher <i>Muscicapa muttui</i>			4	M	
270	Rusty-tailed Flycatcher <i>Muscicapa ruficauda</i>			4	M	
271	White-bellied Blue Flycatcher <i>Cyornis pallidipes</i>	WG		4	R	
272	Tickell's Blue Flycatcher <i>Cyornis tickelliae</i>			4	R	
273	Verditer Flycatcher <i>Eumyias thalassinus</i>			4	M	
274	Indian Blue Robin <i>Larvivora brunnea</i>			4	M	
275	Malabar Whistling Thrush <i>Myophonus horsfieldii</i>			4	R	
276	Red-breasted Flycatcher <i>Ficedula parva</i>			4	M	
277	Taiga Flycatcher <i>Ficedula albicilla</i>			4	M	
278	Ultramarine Flycatcher <i>Ficedula superciliaris</i>			4	M	X
279	Black Redstart <i>Phoenicurus ochruros</i>			4	M	X
280	Blue-capped Rock Thrush <i>Monticola cinclorhyncha</i>			4	M	
281	Blue Rock Thrush <i>Monticola solitarius</i>			4	M	
282	Siberian Stonechat <i>Saxicola maurus</i>			4	M	
283	Pied Bushchat <i>Saxicola caprata</i>			4	R	

	Species	Endemism to WG	IUCN	WLPA (1972)	Status	Rarity
	71. Turdidae (thrushes)					
284	Orange-headed Thrush <i>Geokichla citrina</i>			4		
285	Indian Blackbird <i>Turdus simillimus</i>			4	R	
286	Tickell's Thrush <i>Turdus unicolor</i>			4	M	X

Annexure VI

Mammals

	Order	Family	Species	Common name	IUCN Red List Category ^s	WPA schedule ^s
1	Carnivora	Felidae	<i>Panthera tigris</i>	Bengal Tiger	Endangered	I
2	Carnivora	Felidae	<i>Panthera pardus</i>	Common Leopard	Vulnerable	I
3	Carnivora	Felidae	<i>Prionailurus bengalensis</i>	Leopard Cat	Least Concern	I
4	Carnivora	Felidae	<i>Prionailurus rubiginosus</i>	Rusty-spotted Cat	Near Threatened	I
5	Carnivora	Felidae	<i>Felis chaus</i>	Jungle Cat	Least Concern	II
6	Carnivora	Canidae	<i>Cuon alpinus</i>	Dhole	Endangered	II
7	Carnivora	Canidae	<i>Canis aureus</i>	Golden Jackal	Least Concern	II
8	Carnivora	Ursidae	<i>Melursus ursinus</i>	Sloth Bear	Vulnerable	I
9	Carnivora	Herpestidae	<i>Herpestes/ Urva vitticollis</i>	Stripe-necked Mongoose	Least Concern	II
10	Carnivora	Herpestidae	<i>Herpestes/ Urva smithii</i>	Ruddy Mongoose	Least Concern	II
11	Carnivora	Herpestidae	<i>Urva edwardsii</i>	Indian Grey Mongoose	Least Concern	II
12	Carnivora	Mustelidae	<i>Aonyx cinereus</i>	Small-clawed Otter	Vulnerable	I
13	Carnivora	Mustelidae	<i>Lutrogale perspicillata</i>	Smooth-coated Otter	Vulnerable	II
14	Carnivora	Viverridae	<i>Viverricula indica</i>	Small Indian Civet	Least Concern	II

15	Carnivora	Viverridae	<i>Paradoxurus jerdoni</i>	Brown Palm Civet	Least Concern	II
16	Carnivora	Viverridae	<i>Paradoxurus hermaphroditus</i>	Common Palm Civet	Least Concern	II
17	Cetartiodactyla	Bovidae	<i>Bos gaurus</i>	Gaur	Vulnerable	I
18	Cetartiodactyla	Bovidae	<i>Tetracerus quadricornis</i>	Four-horned antelope	Vulnerable	I
19	Cetartiodactyla	Cervidae	<i>Rusa unicolor</i>	Sambar	Vulnerable	III
20	Cetartiodactyla	Cervidae	<i>Axis axis</i>	Chital	Least Concern	III
21	Cetartiodactyla	Cervidae	<i>Muntiacus vaginalis</i>	Northern Red Muntjac	Least Concern	III
22	Cetartiodactyla	Tragulidae	<i>Moschiola indica</i>	Indian Chevrotain/ Mouse deer	Least Concern	I
23	Cetartiodactyla	Suidae	<i>Sus scrofa</i>	Wild Boar	Least Concern	III
24	Pholidota	Manidae	<i>Manis crassicaudata</i>	Indian Pangolin	Endangered	I
25	Primates	Cercopithecidae	<i>Semnopithecus hypoleucos</i>	Black-footed Gray Langur	Vulnerable	II
26	Primates	Cercopithecidae	<i>Macaca radiata</i>	Bonnet Macaque	Least Concern	II
27	Primates	Lorisidae	<i>Loris lydekkerianus</i>	Slender Loris	Least Concern	I
28	Lagomorpha	Leporidae	<i>Lepus nigricollis</i>	Indian Hare	Least Concern	IV
29	Rodentia	Sciuridae	<i>Ratufa indica</i>	Indian Giant Squirrel	Least Concern	II

30	Rodentia	Sciuridae	<i>Petaurista philippensis</i>	Indian Giant Gliding Squirrel	Least Concern	II
31	Rodentia	Sciuridae	<i>Funambulus tristriatus</i>	Western Ghats Striped Squirrel	Least Concern	IV ^a
32	Rodentia	Sciuridae	<i>Funambulus palmarum</i>	Common Palm Squirrel	Least Concern	IV ^a
33	Rodentia	Hystricidae	<i>Hystrix indica</i>	Indian Crested Porcupine	Least Concern	IV
34	Rodentia	Muridae	<i>Tatera indica</i>	Indian Gerbil	Least Concern	V ^b
35	Rodentia	Muridae	<i>Vandeleuria oleracea</i>	Asiatic Long- tailed Climbing Mouse	Least Concern	V ^b
36	Rodentia	Muridae	<i>Mus musculus</i>	House Mouse	Least Concern	V ^b
37	Rodentia	Muridae	<i>Mus booduga</i>	Indian Field Mouse	Least Concern	V ^b
38	Rodentia	Muridae	<i>Mus saxicola</i>	Brown Spiny Mouse	Least Concern	V ^b
39	Rodentia	Muridae	<i>Mus terricolor*</i>	Pygmy Field Mouse	Least Concern	V ^b
40	Rodentia	Muridae	<i>Millardia meltada*</i>	Soft-furred Metad	Least Concern	V ^b
41	Rodentia	Muridae	<i>Madromys blanfordi</i>	White-tailed Wood Rat	Least Concern	V ^b
42	Rodentia	Muridae	<i>Golunda ellioti</i>	Indian Bush-rat	Least Concern	V ^b

43	Rodentia	Muridae	<i>Bandicota indica</i>	Greater Bandicoot Rat	Least Concern	V ^b
44	Rodentia	Muridae	<i>Bandicota bengalensis</i>	Lesser Bandicoot Rat	Least Concern	V ^b
45	Rodentia	Muridae	<i>Rattus rattus</i>	House Rat	Least Concern	V ^b
46	Rodentia	Muridae	<i>Rattus satarae</i> *	Sahyadris Forest Rat	Vulnerable	V ^b
47	Chiroptera	Pteropodidae	<i>Pteropus medius</i>	Indian Flying Fox Bat	Least Concern	V ^b
48	Chiroptera	Pteropodidae	<i>Rousettus leschenaultii</i>	Leschenault's Rousette	Least Concern	V ^b
49	Chiroptera	Pteropodidae	<i>Cynopterus sphinx</i>	Greater Short-nosed Fruit Bat	Least Concern	V ^b
50	Chiroptera	Pteropodidae	<i>Cynopterus brachyotis</i>	Lesser Short-nosed Fruit Bat	Least Concern	V ^b
51	Chiroptera	Pteropodidae	<i>Eonycteris spelaea</i> *	Dawn Bat	Least Concern	V ^b
52	Chiroptera	Molossidae	<i>Tadarida aegyptiaca</i> *	Egyptian Free-tailed Bat	Least Concern	
53	Chiroptera	Molossidae	<i>Chaerephon plicatus</i> *	Wrinkle-lipped Free-tailed Bat	Least Concern	
54	Chiroptera	Molossidae	<i>Otomops wroughtoni</i> *	Wroughton's Free-tailed Bat	Data Deficient	I
55	Chiroptera	Emballonuridae	<i>Taphozous longimanus</i> *	Long-winged Tomb Bat	Least Concern	

56	Chiroptera	Emballonuridae	<i>Taphozous nudiventris</i> *	Naked-rumped Tomb Bat	Least Concern	
57	Chiroptera	Emballonuridae	<i>Taphozous melanopogon</i>	Black-bearded Tomb Bat	Least Concern	
58	Chiroptera	Emballonuridae	<i>Taphozous theobaldi</i> *	Theobald's Bat	Least Concern	
59	Chiroptera	Emballonuridae	<i>Saccolaimus saccolaimus</i> *	Bare-rumped Sheath-tail Bat	Least Concern	
60	Chiroptera	Megadermatidae	<i>Megaderma lyra</i> *	Greater False Vampire Bat	Least Concern	
61	Chiroptera	Megadermatidae	<i>Megaderma spasma</i>	Lesser False Vampire Bat	Least Concern	
62	Chiroptera	Rhinolophidae	<i>Rhinolophus rouxii</i>	Rufous Horseshoe Bat	Least Concern	
63	Chiroptera	Rhinolophidae	<i>Rhinolophus lepidus</i>	Blyth's Horseshoe Bat	Least Concern	
64	Chiroptera	Rhinolophidae	<i>Rhinolophus beddomei</i>	Beddome's Horseshoe Bat	Least Concern	
65	Chiroptera	Hipposideridae	<i>Hipposideros fulvus</i> *	Fulvous Leaf-nosed Bat	Least Concern	
66	Chiroptera	Hipposideridae	<i>Hipposideros speoris</i> *	Schneider's Leaf-nosed Bat	Least Concern	
67	Chiroptera	Hipposideridae	<i>Hipposideros galeritus</i> *	Cantor's Leaf-nosed Bat	Least Concern	

68	Chiroptera	Hipposideridae	<i>Hipposideros lankadiva</i>	Kelaart's Leaf-nosed Bat	Least Concern	
69	Chiroptera	Vespertilionidae	<i>Myotis horsfieldii</i> *	Horsfield's Bat	Least Concern	
70	Chiroptera	Vespertilionidae	<i>Pipistrellus coromandra</i>	Indian Pipistrelle	Least Concern	
71	Chiroptera	Vespertilionidae	<i>Pipistrellus tenuis</i>	Least Pipistrelle	Least Concern	
72	Chiroptera	Vespertilionidae	<i>Pipistrellus ceylonicus</i> *	Kelaart's Pipistrelle	Least Concern	
73	Chiroptera	Vespertilionidae	<i>Scotozous dormeri</i> *	Dormer's Bat	Least Concern	
74	Chiroptera	Vespertilionidae	<i>Scotophilus heathii</i> *	Greater Asiatic Yellow Bat	Least Concern	
75	Chiroptera	Vespertilionidae	<i>Scotophilus kuhlii</i> *	Lesser Asiatic Yellow Bat	Least Concern	
76	Chiroptera	Vespertilionidae	<i>Hesperoptenus tickelli</i> *	Tickell's Bat	Least Concern	
77	Chiroptera	Vespertilionidae	<i>Kerivoula picta</i>	Painted Bat	Near Threatened	
78	Chiroptera	Vespertilionidae	<i>Tylonycteris pachypus</i> *	Lesser Bamboo Bat	Least Concern	
79	Chiroptera	Miniopteridae	<i>Miniopterus schreibersii</i> ssp. <i>fuliginosus</i>	Schreiber's Long- fingered Bat	Near Threatened	
80	Eulipotyphla	Soricidae	<i>Suncus murinus</i>	House Shrew	Least Concern	
81	Scandentia	Tupaiaidae	<i>Anathana ellioti</i>	Madras Tree Shrew	Least Concern	

Annexure VII

Ants

	Species
	AMBLYOPONINAE
1	<i>Mystrium</i> sp.
2	<i>Stigmatomma</i> sp.
	DOLICHODERINAE
3	<i>Tapinoma indicum</i> Forel, 1895
4	<i>Tapinoma melanocephalum</i> (Fabricius, 1793)
5	<i>Technomyrmex albipes</i> (Smith, 1861)
	DORYLINAE
6	<i>Aenictus ceylonicus</i> (Mayr, 1866)
7	<i>Dorylus orientalis</i> Westwood, 1835
8	<i>Ooceraea biro</i> Forel, 1907
9	<i>Parasyscia aitkenii</i> Forel, 1900
10	<i>Parasyscia indica</i> Brown, 1975 (E)
	FORMICINAE
11	<i>Anoplolepis gracilipes</i> (Smith, 1857) (I)
12	<i>Camponotus angusticollis</i> (Jerdon, 1851)
13	<i>Camponotus compressus</i> (Fabricius, 1787)
14	<i>Camponotus irritans</i> (Smith, 1857)
15	<i>Camponotus parius</i> Emery, 1889
16	<i>Camponotus radiates</i> Forel, 1892 (E)
17	<i>Camponotus sericeus</i> (Fabricius, 1798)
18	<i>Lepisiota capensis</i> (Mayr, 1862)
19	<i>Lepisiota opaca</i> (Forel, 1892)
20	<i>Oecophylla smaragdina</i> (Fabricius, 1775)
21	<i>Paratrechina longicornis</i> (Latreille, 1802) (I)
22	<i>Polyrhachis exercita</i> (Walker, 1859)

23	<i>Polyrhachis illaudata</i> Walker, 1859
24	<i>Polyrhachis lacteipennis</i> Smith, 1858
25	<i>Polyrhachis rastellata</i> (Latreille, 1802)
26	<i>Polyrhachis scissa</i> (Roger, 1862)
27	<i>Polyrhachis tibialis</i> Smith, 1858
	MYRMICINAE
28	<i>Aphaenogaster beccarii</i> Emery, 1887
29	<i>Carebara affinis</i> (Jerdon, 1851)
30	<i>Carebara diversa</i> (Jerdon, 1851)
31	<i>Cataulacus latus</i> Forel, 1891
32	<i>Cataulacus taprobanae</i> Smith, 1853
33	<i>Crematogaster dalyi</i> Forel, 1902
34	<i>Crematogaster rogenhoferi</i> Mayr, 1879
35	<i>Crematogaster rothneyi</i> Mayr, 1879
36	<i>Crematogaster subnuda</i> Mayr, 1879
37	<i>Lophomyrmex quadrispinosus</i> (Jerdon, 1851)
38	<i>Meranoplus bellii</i> Forel, 1902
39	<i>Meranoplus bicolor</i> (Guerin-Meneville, 1844)
40	<i>Monomorium atomum</i> Forel, 1902
41	<i>Monomorium dichroum</i> Forel, 1902
42	<i>Monomorium indicum</i> Forel, 1902
43	<i>Monomorium pharaonis</i> (Linnaeus, 1758) (I)
44	<i>Myrmicaria brunnea</i> Saunders, 1842
45	<i>Pheidole grayi</i> Forel, 1902 (E)
46	<i>Pheidole sharpi</i> Forel, 1902
47	<i>Solenopsis geminata</i> (Fabricius, 1804) (I)
48	<i>Strumigenys hostilis</i> Bolton, 2000 (E)
49	<i>Strumigenys peraucta</i> Bolton, 2000 (E)

50	<i>Tetramorium mixtum</i> Forel, 1902
51	<i>Tetramorium rugigaster</i> Bolton, 1977 (E)
52	<i>Tetramorium simillimum</i> (Smith, 1851) (I)
53	<i>Tetramorium wroughtonii</i> (Forel, 1902)
54	<i>Trichomyrmex destructor</i> (Jerdon, 1851) (I)
55	<i>Trichomyrmex wroughtoni</i> Forel, 1902
	PONERINAE
56	<i>Anochetus graeffei</i> Mayr, 1870
57	<i>Anochetus</i> (cf) <i>pupulatus</i> Brown, 1978
58	<i>Bothroponera henryi</i> Donisthorpe, 1942 (E)
59	<i>Bothroponera sulcata</i> (Mayr, 1867)
60	<i>Bothroponera tesseronoda</i> (Emery, 1877)
61	<i>Brachyponera luteipes</i> (Mayr, 1862)
62	<i>Diacamma indicum</i> Santschi, 1920
63	<i>Diacamma ceylonense</i> Emery, 1897
64	<i>Diacamma rugosum</i> (Le Guillou, 1842)
65	<i>Harpegnathos saltator</i> Jerdon, 1851
66	<i>Leptogenys diminuta</i> (Smith, 1857)
67	<i>Leptogenys chinensis</i> (Mayr, 1870)
68	<i>Leptogenys processionalis</i> (Jerdon, 1851)
69	<i>Odontomachus simillimus</i> Smith, 1858
70	<i>Parvaponera darwinii</i> (Forel, 1893)
71	<i>Platythyrea parallela</i> (Smith, 1859)
72	<i>Pseudoneoponera rufipes</i> (Jerdon, 1851)
	PSEUDOMYRMECINAE
73	<i>Tetraponera allaborans</i> (Walker, 1859)
74	<i>Tetraponera nigra</i> (Jerdon, 1851)
75	<i>Tetraponera rufonigra</i> (Jerdon, 1851)

Annexure VIII

Compensation Notification

Date 08/05/2020
Infor
RFS/AM
ACF/ZM.



Government of Goa,
Forest Department
Secretariat, Porvorim – 403 521

Tel Nos: (0832) 2419443/2419792/2419697

E-mail: usforest-sect.goa@nic.in

F.No.7-5-2005/FOR/104

Dated:-24/04/2020

Read:-Notification No. 7-5-2005/FOR/310 dated 14-08-2012.

NOTIFICATION

In supersession of Notification No. 7-5-2005/FOR/310 dated 14-08-2012, the Government of Goa is pleased to revise the “**Scheme for grant of compensation on account of loss of human life, permanent disability or injury and/or damage to cattle or property caused by Wild Animals**” herein after called “**Compensation for damage by wild animals**” in order to simplify the procedure for determination and timely disbursement of appropriate compensation to the affected person(s). The term ‘Wild Animal’ will be as defined in the Wild Life (Protection) Act, (Central Act 53 of 1972).

2. The compensation for damage by wild animals for causing death/ injury to human and loss to cattle/damage to property will be determined and paid based on the terms and conditions and the rates as mentioned below.

Table- I

The rate of compensation on account of loss of human life or permanent disability or injury caused by wild animals

S. No.	Injury/ loss to human life	Compensation
1.	Ex-gratia payment for death / injury to human life	
(a)	Death	Rs.10,00,000/-
(b)	permanent disability (viz. loss of limb, eye, etc.)	Rs.5,00,000/-
(c)	Injury other than permanent disability	Rs.1,00,000/-, or the entire cost of treatment whichever is less

Contd...2/-

Table- II

The rate of compensation for loss of cattle or damage to property caused by wild animals

	Loss of cattle/ property	Maximum Compensation*
2.	Death of cattle	
(a)	Calf	Rs. 10,000/-
(b)	Local cow / buffalo / bullock	Rs. 25,000/-
(c)	Jersey Cow	Rs. 50,000/-
(d)	Pig / Sheep / Goat	Rs. 5,000/-
3.	Injury to cattle	Rs.15,000/-, or as per actual assessment, whichever is less
4.	Damage to House/ other property	Rs. 25,000/- or actual assessment, whichever is less

Note: * The amount of actual compensation to be paid should take into account factors listed at para 4 (vi) below and in no case should exceed the maximum amount notified in the table-II of the notification.

3. In respect of any other item not mentioned above, the DCF concerned shall decide the amount on merit after examining the case submitted by the RFO.

4. The procedure for assessment of amount of loss / damage and grant of compensation-

- (i) The Compensation for attack on human being by wild animal will be admissible to bonafide residents of the area/ authorized visitors only if the incident has taken place inside any of the Wildlife Sanctuaries or National Parks. For attack outside Wildlife Sanctuary / National Park, the compensation shall be available to any person. However, in case of attack on cattle, the compensation shall be available even if the cattle was killed/ attacked inside Wildlife Sanctuary/National Park.
- (ii) The cases of compensation shall be dealt by concerned Park Manager/ Deputy Conservator of Forests (DCF) (Wildlife & Eco-tourism) and the Range Forest Officer (RFO) (Wildlife) in case the incident has taken place within Wildlife Sanctuary / National Park or within Eco-Sensitive Zone of that particular Wildlife Sanctuary/National Park. For cases occurring beyond Eco Sensitive Zone, concerned DCF (Territorial) and the RFO (Territorial) shall deal the case.

Contd...3/-



- (iii) The investigation in the incidence of attack by wild animal shall be initiated as early as possible by concerned RFO on receipt of the information. For the purpose of assessment of the loss/damage caused to the livestock/other property such as house, huts, livestock sheds etc., the applicant should report the claim to the nearest RFO of the Wildlife Division/ Territorial Division, as the case may be, within 3 days of the incident. The RFO shall forward the same immediately to the DCF alongwith his/her report and Damage Assessment Report from Veterinary Officer (in case of cattle etc.) / Assistant Engineer, PWD (in case of house and other property).
- (iv) In cases of loss of human life, concerned DCF shall investigate the case and arrange to obtain the post mortem report from the Authorized Medical Officer and on satisfying on genuineness of the claim shall arrange to pay the compensation to affected person(s) within maximum 3 working days after receipt of post-mortem report. The compensation for loss of human life shall be granted in the following order of preference to:
 - (a) Wife or husband, as the case may be.
 - (b) Sons, unmarried or divorced daughters (equal share).
 - (c) Daughters (equal share).
 - (d) Grand children being children of sons or daughters (equal share).
 - (e) Father or mother.
 - (f) In case of any dispute as per the succession certificate issued by the competent authority.
- (v) In case of death of cattle suspected to be caused by wild animals, the owner of the cattle shall submit the claim to the RFO alongwith the post-mortem report from the concerned Government Veterinary Officer within 3 days. The concerned nearest Veterinary Officer shall visit the site within 48 hours of the receipt of complaint and furnish certificate to the owner mentioning loss in Rupees taking various parameters mentioned at (vi) below.
- (vi) The maximum amount of compensation to the owner/owners of the cattle due to the attack by wild animal has been given in Table-II. For determining the actual compensation payable in case of death or injury of cattle caused by wild animals, RFO shall record his finding that the death of the live-stock / cattle was entirely due to the attack by wild animal and not due to any other reason. The RFO shall record following information/ details in the report: —
 - a) Age of the animal.
 - b) Milk yield of the animal in case of female.
 - c) Maintenance cost of the animal by the owner.
 - d) Quantity of the animal dropping.

Contd...4/-

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- e) Health of the animal or its disease status.
- f) Life history and productive capacity of the animal etc.

****Cattle include cow (including cross-bred cow), bullock, buffalo, calf, pig, goat, sheep, etc.**

- (vii) In cases of loss or injury of cattle/ damage to property, concerned DCF shall investigate the case and on satisfying on genuineness of the claim, shall arrange to pay the compensation to affected person(s) within maximum 3 working days after receipt of post-mortem report.

5. The expenditure shall be debitable under the appropriate Scheme/Head of Account of the Forest Department and arranged to be paid by the DCF/ Divisional Head.

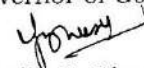
6. To ensure immediate disbursement of compensation, an interest-bearing account dedicated for **"Wildlife Compensation Fund"** shall be opened under Goa Forest Development Corporation with initial corpus of Rs. 25 lakh. For this purpose, the Government shall provide fund from the appropriate budget- head of Forest Department or otherwise, which shall be recouped from time to time. This Wildlife Compensation Fund may also receive donation from corporate houses/societies.

7. After receipt of recommendations and sanction from concerned DCF, the Goa Forest Development Corporation shall affect the payment immediately in not more than 2 days from the **'Wildlife Compensation Fund'** to the affected party as recommended by DCF concerned.

8. DCF shall report all cases of loss/ damage by wild animals and payment of compensation to the Chief Wildlife Warden within three days of payment of compensation. The cases where time limits are exceeded due to any unforeseen circumstance, the same should be brought to the notice of the Chief Wildlife Warden.

This order issues with the concurrence of the Finance Department vide its U. O. No. 1400070882 dated 20-04-2020.

By order and in the name of the
Governor of Goa


(Shaila G. Bhosle)

Under Secretary (Forests)

To,

- 1. The Director (Printing & Stationery), Government Printing Press, Panaji with request to publish the notification in the next issue of Government Gazette.

Contd...5/-

Copy to:-

1. The Principal Chief Conservator of Forests, Forest Department, Goa Van Bhawan, Old IPHB Complex, Altinho, Panaji-Goa.
2. All Heads of Departments/Officers.
3. The Conservator of Forests (Wildlife & Eco-tourism/ Conservation)
4. The Collector North Goa, Panaji.
5. The Collector, South Goa, Margao.
6. The Director of Agriculture, Panaji.
7. The Director of Animal Husbandry and Veterinary Services, Panaji.
8. The Director of Health Services, Panaji.
9. All Departments in the Secretariat.
10. The Director of Accounts, Panaji.
11. All Deputy Conservators of Forests. (Wildlife & Eco-tourism) (West)
12. The Joint Director of Accounts, Margao-Goa.
13. The Resident Audit Officer, Panaji.
14. P.S. to Chief Minister/Forest Minister, Secretariat, Porvorim.
15. P.S. to all Ministers, Secretariat, Porvorim.
16. P.A. to all Secretaries, Secretariat, Porvorim.
17. The Sr. Dy. Accountant General (Audit), Porvorim.
18. Guard file.
19. O/c.

Annexure IX

Eco-sensitive Zone Notification of Bhagwan Mahavir Wildlife Sanctuary & National Park

रजिस्ट्री सं० डी० एल०-33004/99

REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (ii)

PART II—Section 3—Sub-section (ii)

प्राधिकार से प्रकाशित

PUBLISHED BY AUTHORITY

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NEW DELHI, FRIDAY, JANUARY 23, 2015/MAGHA 3, 1936

पर्यावरण वन और जलवायु परिवर्तन मंत्रालय

अधिसूचना

नई दिल्ली, 23 जनवरी, 2015

का.आ. 221(अ).—भगवान महावीर वन्य जीव अभयारण्य और राष्ट्रीय उद्यान, गोवा राज्य के उत्तरी गोवा जिले में 15° 29'30.47" उत्तर और 15° 15'9.29" उत्तर अक्षांश तथा 74° 20'10.01 पूर्व और 74° 29'26.27" पूर्व देशांतर के बीच स्थित है और 240 वर्ग किलोमीटर के क्षेत्र में विस्तृत है, जो जैव विविधता से समृद्ध वेस्टर्न घाट का आवश्यक भाग है।

और, मूल संरक्षित क्षेत्र के 240 वर्ग किलोमीटर क्षेत्र में से, 107 वर्ग किलोमीटर का क्षेत्र काट कर और अभयारण्य को दो भागों में विभाजित कर राष्ट्रीय उद्यान के रूप में संरक्षित है।

और, अभयारण्य में वन्य जीवों की संकटापन्न प्रजातियां जैसे भारतीय गवल, तेंदुआ, चूहा हरिण, काला तेंदुआ, तवांग, जंगली कुत्ते, भालू आदि निवास करते हैं;

और, इस संरक्षित क्षेत्र के वन वर्षा को आकृष्ट करते हैं और भूमिगत जलदायी स्तरों में जल को संचित करने में सहायता करते हैं और नदियों और धाराओं के विरुद्ध मृदा क्षरण को कम करके उनमें सिल्ट के भराव को रोकते हैं और बहुवार्षिक या अर्द्धवार्षिक या मौसमी प्रकृति की जल धाराओं का पूरा बंधा हुआ नेटवर्क चलता है जो जुआरी नदी, मांडवी नदी और उसकी नहरों को भरता है;

अतः, यह आवश्यक है कि भगवान महावीर वन्य जीव अभयारण्य के चारों ओर के संरक्षित क्षेत्र को पारिस्थितिक और पर्यावरण के दृष्टिकोण से एक पारिस्थितिक संवेदी क्षेत्र के रूप में संरक्षित और संधारित किया जाए;

और पर्यावरण (संरक्षण) अधिनियम, 1986 के नियम 5 के उपनियम (3) के अधीन यथा अपेक्षित एक प्रारूप अधिसूचना पर्यावरण (संरक्षण) अधिनियम, 1986(1986 का 29) की धारा 3 की उपधारा (2) के खंड (v) और खंड (xiv) और उपधारा (3) के साथ पठित उपधारा (1) के अधीन प्रदत्त शक्तियों का प्रयोग करते हुए भारत के तत्कालीन पर्यावरण और वन मंत्रालय की संख्यांक का.आ. 635 (अ) तारीख 3 मार्च, 2014 की अधिसूचना द्वारा भारत के राजपत्र, असाधारण, में उन सभी व्यक्तियों की जानकारी के लिए प्रकाशित की गई थी जिनके उससे प्रभावित होने की संभावना है और उसके द्वारा उस तारीख से सात दिन की अवधि के भीतर आक्षेप और सुझाव मांगे गए थे जिस तारीख को उक्त अधिसूचना को अंतर्विष्ट करने वाले राजपत्र की प्रतियां जनता को उपलब्ध कराई गई थीं;

323 GI/2015

(1)

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE
NOTIFICATION

New Delhi, the 23rd January, 2015

S.O. 221(E).—Whereas, the Bhagwan Mahaveer Wildlife Sanctuary and National Park, Goa lying between latitudes 15° 29' 30.47" N and 15° 15' 9.29" N and longitudes 74° 20' 10.01" E and 74° 29' 26.27" E in the North Goa District of Goa State and extending over an area of 240 square kilometres, is an essential part of the Western Ghats, which is rich in biodiversity;

And whereas, out of the 240 square kilometres of original Bhagwan Mahaveer Wildlife Sanctuary, an area of 107 square kilometres was carved out and constituted as a National Park thereby dividing the Sanctuary into two parts;

And whereas, the endangered species of wildlife like Indian bison, panther, mouse deer, black panther, slender loris, wild dog, sloth bear, etc inhabits the Protected Areas;

And whereas, the forest of these Protected Areas intercepts rainfall and helps recharge ground water aquifer and protects rivers and streams against siltation by minimising soil erosion and has a well knit network of streams spreading throughout which are perennial or semi perennial or seasonal in nature, feeding Zuari river, Mandovi river and its canals;

And whereas, it is necessary to conserve and protect the area around the Bhagwan Mahaveer Wildlife Sanctuary and National Park as Eco-sensitive Zone from ecological and environmental point of view;

And whereas, a draft notification under sub-section (1) read with clause (v) and clause (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) was published in the Gazette of India, Extraordinary, *vide* notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 635(E), dated the 3rd March, 2014, as required under sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, inviting objections and suggestions from all persons likely to be affected thereby within a period of sixty days from date on which copies of the Gazette containing the said notification were made available to the public;

And whereas, copies of the Gazette containing the said notification were made available to the public on the 3rd March, 2014 along with the corrigendum issued *vide* notification number S.O. 831(E), dated 19th March, 2014;

And whereas, all objections and suggestions received in response the draft notification have been duly considered by the Central Government;

Now, therefore, in exercise of the powers conferred by sub-section (1), clause (v) and clause (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies an area to an extent of one kilometre of land or the water body, whichever is nearer to the boundary of the Bhagwan Mahaveer Wildlife Sanctuary and National Park in the State of Goa, as the Eco-sensitive Zone, details of which are as under, namely:—

1. Extent and Boundaries of Eco-sensitive Zone.—(1) The extent of Eco-sensitive Zone shall be one kilometre of land or the water body whichever is nearer to the boundary of the Bhagwan Mahaveer Wildlife Sanctuary and National Park in the State of Goa.

(2) The Eco-sensitive Zone is bounded on the North by the boundary of Madei Wildlife Sanctuary, on the South by the boundary of Netravali Wildlife Sanctuary, on the East by the boundary of Bhagwan Mahaveer Wildlife Sanctuary and National Park and on the West by areas of the villages of Dharbandora Taluka, Sattari Taluka and Sanguem Taluka; the Dudhsagar river, originating from the Bhagwan Mahaveer National Park passes through the Eco-sensitive Zone towards West along the Eco-sensitive Zone boundary and Bhagwan Mahavir Sanctuary boundary.

(3) The map of Eco-sensitive Zone boundary is appended to this notification as **Annexure I**. List of latitudes and longitudes of prominent points on the boundary of the ESZ is appended to this notification as **Annexure II**.

(4) The list of sixteen villages falling partially within Eco-sensitive Zone boundary is given at **Annexure III**.

(5) The list of villages given in Annexure III shall be further revisited and confirmed by the State Government while preparing the Zonal Master Plan.

✓ 2. **Zonal Master Plan for the Eco-sensitive Zone.**— (1) The State Government shall for the purpose of effective management of the Eco-sensitive Zone, prepare a Zonal Master Plan, within a period of two years from the date of publication of this notification in the Official Gazette, for consideration and approval of the Ministry of Environment, Forests, and Climate Change, Government of India in consultation with local people and with the involvement of all concerned State Departments, such as Environment, Forest and Wildlife, Agriculture, Revenue, Urban and Housing Development, Tourism, Rural Development, Irrigation and Flood Control, Mining and Public Works Department for integrating the ecological and environmental considerations into the said plan.

(2) The Zonal Master Plan shall provide for restoration of degraded areas, conservation of existing water bodies, management of catchment areas, watershed management, ground water management, soil and moisture conservation, needs of local community and such other aspects of ecology and environment that need attention.

(3) The Zonal Master Plan shall demarcate all the existing and proposed urban settlements, village settlements, types and kinds of forest, agriculture areas, horticultural areas, man-made heritage sites, natural heritage sites, mining leases in operation, lakes and other water bodies.

(4) The Zonal Master Plan thus prepared specific to this Eco-sensitive Zone shall be integrated into the regional plan for the State of Goa.

(5) The Zonal Master Plan shall contain the measures as may be specified by the Central Government or the State Government, for regulation of activities specified under column (2) of the table specified in paragraph 4.

(6) The Zonal Master Plan so prepared shall be co-terminus with the regional development plan.

(7) The Zonal Master Plan shall be a reference document for the State Level Eco-sensitive Zone Monitoring Committee (hereinafter referred to as the SESZMC), as referred to in para 5, for carrying out its functions of monitoring under the provisions of this notification.

3. **Measures to be taken by State Government.**—The State Governments shall take the following measures for giving effect to the provisions of this notification, namely:—

(1) Forests, horticulture areas, agricultural areas, parks and open spaces earmarked for recreational purposes in the Eco-sensitive Zone shall not be used or converted into areas for commercial or industrial related development activities:

Provided that the conversion of agricultural lands within the Eco-sensitive Zone may be permitted on the recommendation of the SESZMC, and with the prior approval of the State Government, to meet the residential needs of the local residents, and for the activities listed at item numbers 24, 26, 28 and 31 in column (2) of the Table in paragraph 4, namely:—

- (i) Small scale industries not causing pollution,
- (ii) Rainwater harvesting, and
- (iii) Cottage industries including village industries,
- (iv) Ecofriendly cottages for temporary occupation of tourists such as tents, wooden houses, etc. for Eco-friendly tourism activities:

Provided further that no change in use of land from tribal usage to non-tribal usage shall be permitted without the prior approval of the State Government and without compliance of the provisions of the law for the time being in force, including the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 (2 of 2007):

Provided also that any error appearing in the land records within the Eco-sensitive Zone shall be corrected by the State Government, after obtaining the views of SESZMC, only once in each case and the correction of said error shall be intimated to the Central Government in the Ministry of Environment, Forest and Climate Change:

Provided also that the above correction of error shall not include change of land use in any case except as provided under this sub-paragraph.

(2) The catchment areas of all natural springs shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan and the strict guidelines shall be drawn up by the State Government to prohibit development activities at or near these areas.

(3) The activity relating to tourism within the Eco-sensitive Zone which shall form part of the Zonal Master Plan shall be as under, namely:-

- (a) all new tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be in accordance with the guidelines issued by the Central Government in the Ministry of Environment, Forests and Climate Change and by the National Tiger Conservation Authority, with emphasis on eco-tourism, eco-education and eco-development and based on carrying capacity study of the Eco-sensitive Zone;
- (b) New construction of any kind shall not be allowed within the Eco-sensitive Zone except for eco-friendly accommodation like tents, wooden houses or thatched roofs for temporary occupation of tourists and for eco-friendly tourism activities;
- (c) Till the Zonal Master Plan is approved, development for tourism and expansion of existing tourism activities shall be permitted by the concerned regulatory authorities based on the actual site specific scrutiny and recommendation of the SESZMC.
- (4) All sites of valuable natural heritage in the Eco-sensitive Zone such as the gene pool reserve areas, rock formations, waterfalls, springs, gorges, groves, caves, points, walks, rides, cliffs, etc. shall be identified and preserved and proper plan shall be drawn up for their protection and conservation, within six months from the date of publication of this notification and such plan shall form part of the Zonal Master Plan.
- (5) Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic, and cultural significance shall be identified in the Eco-sensitive Zone and plans for their conservation shall be prepared within six months from the date of publication of this notification and incorporated in the Zonal Master Plan.
- (6) The Environment Department of the State Government shall draw up guidelines and regulations for the control of noise pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981).
- (7) The Environment Department of the State Government shall draw up guidelines and regulations for the control of air pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981).
- (8) The discharge of treated effluent in Eco-sensitive Zone shall be in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974).
- (9) Disposal of solid wastes shall be as under:-
 - (i) The solid waste disposal in Eco-sensitive Zone shall be carried out as per the provisions of the Municipal Solid Waste (Management and Handling) Rules, 2000 published by the Government of India in the erstwhile Ministry of Environment and Forests *vide* notification number S.O. 908(E), dated the 25th September, 2000;
 - (ii) the local authorities shall draw up plans for the segregation of solid wastes into biodegradable and non-biodegradable components;
 - (iii) The biodegradable material shall be recycled preferably through composting or vermiculture;
 - (iv) the inorganic material shall be disposed of in an environmentally acceptable manner.
- (10) The bio-medical waste disposal in the Eco-sensitive Zone shall be carried out as per the provisions of the Bio-Medical Waste (Management and Handling) Rules, 1998 published by the Government of India in the erstwhile Ministry of Environment and Forests *vide* Notification number S.O. 630(E), dated the 20th July, 1998.
- (11) The vehicular movement of traffic shall be regulated in a habitat friendly manner and specific provisions in this regard shall be incorporated in the Zonal Master Plan and till such time as the Zonal master plan is prepared and approved by the Ministry of Environment, Forests and Climate Change, SESZMC shall monitor compliance of vehicular movement as per the rules and regulations in force.

4. List of activities prohibited or to be regulated within the Eco-sensitive Zone.-All activities in the Eco-sensitive Zone shall be governed by the provisions of the Environment (Protection) Act, 1986 (29 of 1986) and be regulated in the manner specified in the Table below, namely:—

TABLE

S.No.	Activity	Remarks
(1)	(2)	(3)
Prohibited Activities		
1.	Commercial Mining, stone quarrying and crushing units.	(a) All new and existing mining (minor and major minerals), stone quarrying and crushing units are prohibited with immediate effect: Provided that the existing mines may be phased out within a period of ten years subject to the Supreme Court modifying its interim order dated 4.8.2006 in I.A. 1000 in Writ Petition 202 of 1995 (T.N. Godavarman Vs. Union of India) and its order in Writ Petition 435 of 2012 in the matter of Goa Foundation Vs Union of India: Provided further that the State Government shall ensure a proper and rigorous mine closure plan for rehabilitation and ecological restoration of the mined out area which shall be completed as early as possible as per Indian Bureau of Mines norms.
2.	Setting up of saw mills.	Prohibited with immediate effect.
3.	Setting up of industries causing water or air or soil or noise pollution.	Prohibited with immediate effect.
4.	Commercial establishment of hotels and resorts.	New commercial establishment such as hotels and resorts shall be prohibited within the Eco-sensitive Zone with immediate effect.
5.	Commercial use of firewood.	Prohibited with immediate effect.
6.	Establishment of new major hydroelectric projects.	Setting up of new hydro-electric power plants (dams, tunnelling, and construction of reservoir) and expansion of existing plants in the Eco-sensitive Zone is prohibited with immediate effect, except the micro hydel power projects (Up to 100KW) or the mini hydel power projects (from 101 to 2000KW), which would serve the energy needs of the local communities, subject to the consent of the concerned Gram Sabha and all other requisite clearances.
7.	Use or production of any hazardous substances.	Prohibited with immediate effect
8.	Discharge of untreated effluents and solid waste in natural water bodies or land area.	Prohibited with immediate effect.
9.	New wood based industry.	Establishment of new wood based industry shall be prohibited within the limits of Eco-sensitive Zone with immediate effect.
10.	Construction activities	No new construction of any kind shall be prohibited within the Eco-sensitive Zone with immediate effect, except for the domestic needs of local residents including the activities listed at item numbers 26, 28 and 31 and in the case of activities listed at item number 24, the construction activity shall be regulated and kept at the minimum.
11.	Use of plastic carry bags	Prohibited with immediate effect.
12.	Brick kilns	Prohibited with immediate effect.
Regulated Activities		
13.	Felling of trees.	(a) There shall be no felling of trees on the forest or Government or revenue or private lands without prior permission of the competent authority in the State Government. (b) The felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Act and the rules made thereunder.
14.	Commercial water resources including ground water harvesting.	(a) The extraction of surface water and ground water shall be allowed only for <i>bona fide</i> agricultural use and domestic consumption of the occupier of the land (b) extraction of surface water and ground water for industrial or commercial

		use including the amount that can be extracted, shall require prior written permission from the concerned Regulatory Authority. (c) No sale of surface water or ground water shall be permitted. (d) Steps shall be taken to prevent contamination or pollution of water from any source including agriculture.
15.	Erection of electrical cables and telecommunication towers.	Promote underground cabling.
16.	Fencing of existing premises of hotels and lodges.	
17.	Widening and strengthening of existing roads and construction of new roads.	Shall be done with proper Environment Impact Assessment and mitigation measures, as applicable.
18.	Movement of vehicular traffic at night.	For commercial purpose.
19.	Introduction of exotic species.	
20.	Undertaking activities related to tourism like over-flying the National Park area by hot-air balloons, etc.	
21.	Protection of hill slopes and river banks.	
22.	Discharge of treated effluents in natural water bodies or land area.	Recycling of treated effluent shall be encouraged and for disposal of sludge or solid wastes, the existing regulations shall be followed.
23.	Commercial Sign boards and hoardings.	
24.	Small scale industries not causing pollution.	Non polluting, non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous goods from the Eco-sensitive Zone, and which do not cause any adverse impact on environment.
25.	Collection of Forest produce or Non-Timber Forest Produce (NTFP).	
26.	Eco-tourism activities including eco tourist lodges, restaurant and recreational facilities including sap, swimming pool, gymnasium in temporary structures made of cloth or wood or particle board such as tents etc.	As per tourism master plan
Promoted Activities		
27.	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries.	
28.	Rain water harvesting.	Shall be actively promoted.
29.	Organic farming.	Shall be actively promoted.
30.	Adoption of green technology for all activities.	Shall be actively promoted.
31.	Cottage industries including village artisans, etc.	

5. State Level Eco-sensitive Zone Monitoring Committee.- (1) The Central Government in the Ministry of Environment, Forest and Climate Change, for effective monitoring of all notified Eco-sensitive Zones around the National Parks and Wildlife Sanctuaries in the state of Goa, hereby constitutes a Committee

called the State Level Eco-sensitive Zone Monitoring Committee (SESZMC) for the State of Goa comprising of the following members, namely:-

- (i) Chief Secretary, Government of Goa- Chairman;
- (ii) Representative of the Ministry of Environment, Forests and Climate Change –Member;
- (iii) Member Secretary, State Pollution Control Board-Member;
- (iv) One representative of Non-governmental Organizations working in the field of environment, nominated by the Government of Goa (for a term of one year)– Member;
- (v) One representative of community based organization nominated by the State Government (for a term of one year)– Member;
- (vi) Principal Secretaries of the Government of Goa from Departments of Forest, Environment, Rural Development, Agriculture, Urban Development and Housing, Mining and Ports and Transport, Revenue– Members;
- (vii) One expert in Ecology from reputed Institution or University of the State of Goa nominated by the State Government (for a term of one year) - Member;
- (viii) Chief Conservator of Forests (WL) and Chief Wildlife Warden, Government of Goa– Member Secretary.

(2) The function of the SESZMC shall be as under:

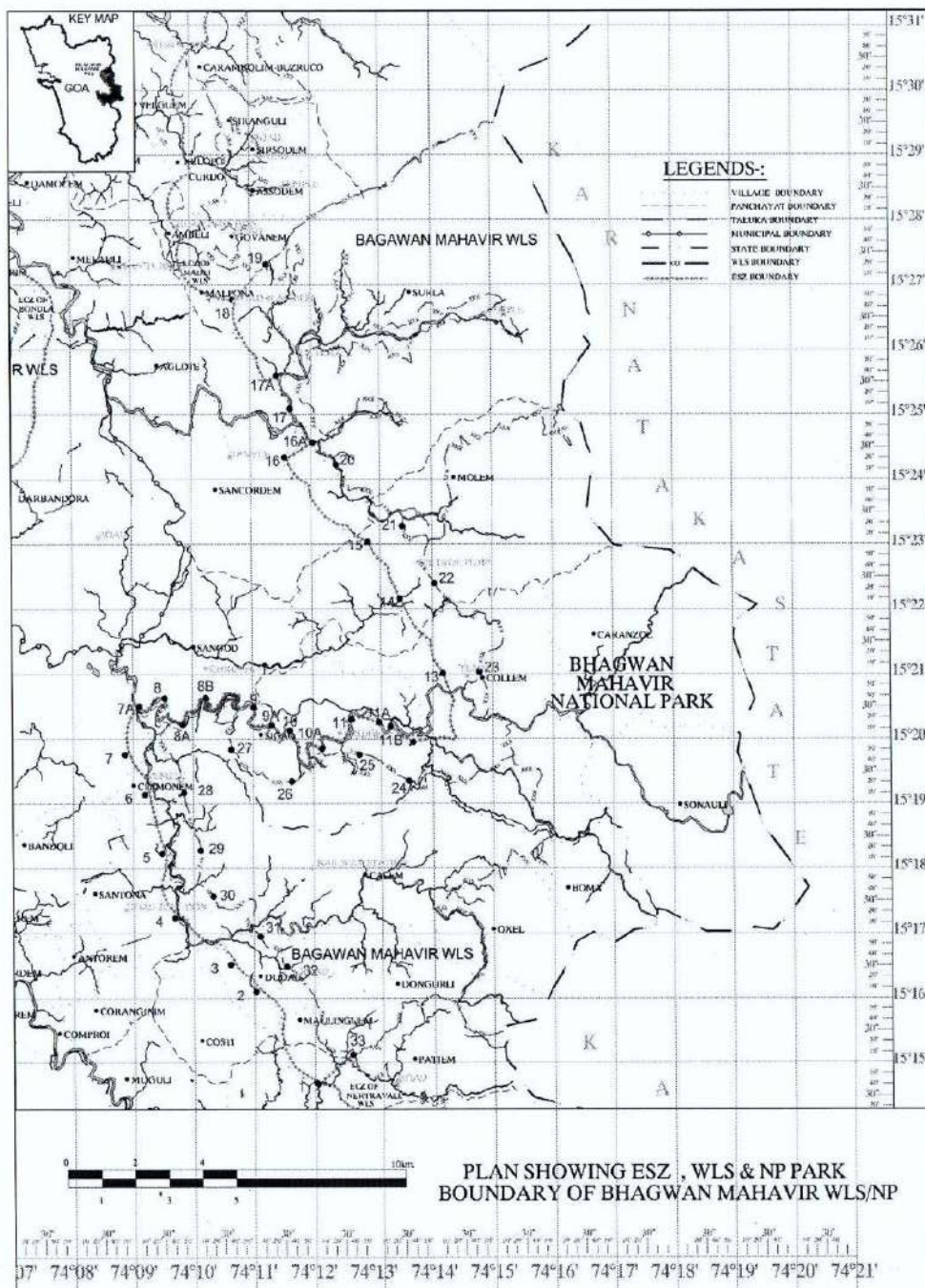
- (a) The SESZMC shall monitor the compliance of the provisions of Notifications declaring Eco-sensitive Zones around National Park and Wildlife Sanctuaries in the State of Goa including this notification.
 - (b) All activities that are covered under the Schedule to the notification of the Government of India in the Ministry of Environment and Forests number S.O. 1533(E), dated the 14th September, 2006, and are falling within such Eco-sensitive Zones as are notified by the Central Government by issuing notification in the Gazette of India in respect of the National Parks and Wildlife Sanctuaries in the State of Goa, except for the prohibited activities specified in the Table under paragraph 4 thereof, shall be scrutinised by the SESZMC based on the actual site-specific conditions and refer the same to the Central Government in the Ministry of Environment, Forest and Climate Change for prior environmental clearances under the provisions of the said notification.
 - (c) The activities that are not covered under the Schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 1533(E), dated the 14th September, 2006 but are falling within such Eco-sensitive Zones as are notified by the Central Government by issuing notification in the Gazette of India in respect of the National Parks and Wildlife Sanctuaries in the State of Goa, except for the prohibited activities specified in the Table under paragraph 4 thereof, shall be scrutinized by the SESZMC based on the actual site-specific conditions and refer the same to the concerned regulatory authorities.
 - (d) The Member Secretary of the SESZMC or the concerned Collector or the concerned park in-charge shall be competent to file complaint under section 19 of the Environment (Protection) Act, 1986 against any person who contravenes the provisions of this notification.
 - (e) The SESZMC may invite representatives or experts from concerned Departments, Industry Associations or concerned stakeholders to assist it in its deliberations depending on the requirements on issue to issue basis.
 - (f) The SESZMC shall submit the annual action taken report of its activities as on 31st March of every year by 30th June of that year to the Central Government in the Ministry of Environment, Forests and Climate Change as per pro forma given in **Annexure IV**.
 - (g) The Central Government in the Ministry of Environment, Forests and Climate Change may give such directions, as it may deem fit, to the SESZMC for effective discharge of its functions.
6. The provisions of this notification shall be subject to the orders passed by the Hon'ble Supreme Court of India or the High Court or National Green Tribunal (NGT) as the case may be, in respect of matters covered under this notification.

[F. No. 25/34/2013-ESZ-RE]

Dr. G. V. SUBRAHMANYAM, Scientist 'G'

Annexure I

**Map of Bhagwan Mahaveer Wildlife Sanctuary & National Park Eco-sensitive Zone showing
Latitudes-Longitudes**



Annexure II

CO-ORDINATES OF PROMINENT POINTS			
S. No.	Description	Latitude	Longitude
1	PLANTATION	15°14'32.12"N	74°11'55.78"E
2	ROAD	15°15'58.19"N	74°10'58.55"E
3	ROAD	15°16'23.40"N	74°10'33.37"E
4	RAILWAY ROAD	15°17'5.93"N	74°9'38.10"E
5	ROAD	15°18'5.77"N	74°9'25.42"E
6	ROAD	15°19'0.17"N	74°9'8.32"E
7	ROAD	15°19'37.55"N	74°8'48.79"E
7A	RIVER	15°20'27.07"N	74°9'5.03"E
8	RIVER	15°20'49.63"N	74°9'40.75"E
8A	RIVER	15°20'12.15"N	74°9'48.20"E
8B	RIVER	15°20'36.59"N	74°10'13.28"E
9	RIVER	15°20'41.92"N	74°11'7.41"E
9A	RIVER	15°20'11.85"N	74°11'19.26"E
10	RIVER	15°20'7.80"N	74°11'48.41"E
10A	RIVER	15°19'50.54"N	74°12'9.19"E
11	RIVER	15°20'10.67"N	74°12'34.26"E
11A	RIVER	15°20'12.43"N	74°13'6.80"E
11B	RIVER	15°20'12.11"N	74°13'15.51"E
12	ROAD	15°19'47.29"N	74°13'31.47"E
13	ROAD	15°20'51.63"N	74°14'1.11"E
14	ROAD	15°21'58.72"N	74°13'19.14"E
15	PADDY CORNER	15°22'52.60"N	74°12'47.45"E
16	PADDY CORNER	15°23'53.72"N	74°11'35.05"E
16A	RIVER	15°24'34.13"N	74°12'1.38"E
17	RIVER	15°25'5.24"N	74°11'36.97"E
17A	RIVER	15°25'37.06"N	74°11'27.73"E
18	MADEI-BHAWGAN ESZ	15°26'51.80"N	74°10'12.72"E
19	MADEI-BHAWGAN WLS	15°27'15.04"N	74°11'16.98"E
20	WLS BOUNDARY	15°24'7.47"N	74°12'31.77"E
21	WLS BOUNDARY	15°23'9.15"N	74°13'27.37"E
22	WLS BOUNDARY	15°22'11.43"N	74°13'59.18"E
23	WLS BOUNDARY	15°21'1.53"N	74°14'42.51"E
24	WLS BOUNDARY	15°19'21.93"N	74°13'28.54"E
25	WLS BOUNDARY	15°19'48.95"N	74°12'41.04"E
26	WLS BOUNDARY	15°19'31.54"N	74°11'58.74"E
27	WLS BOUNDARY	15°19'57.69"N	74°10'50.58"E
28	WLS BOUNDARY	15°19'8.06"N	74°9'50.22"E
29	WLS BOUNDARY	15°18'20.49"N	74°9'57.43"E
30	WLS BOUNDARY	15°17'29.83"N	74°10'19.74"E
31	WLS BOUNDARY	15°16'54.18"N	74°11'5.25"E
32	WLS BOUNDARY	15°16'24.77"N	74°11'35.11"E
33	BHAGWAN-NETRAVALI WLS	15°15'10.83"N	74°12'33.08"E

Annexure III

List of villages falling within the Bhagwan Mahaveer Wildlife Sanctuary and National Park Eco-sensitive Zone

List of Villages partially within the ESZ Boundary

S. No.	Village Name
1	Aglote
2	Sancordem
3	Mollem
4	Suria

5	Collem
6	Sigao
7	Codli
8	Cormonem
9	Santona
10	Calem
11	Dudal
12	Maulinguem
13	Uguem
14	Melauli
15	Govanem
16	Patiem

Annexure IV**Proforma of Action Taken Report: - State Level Eco-sensitive Zone Monitoring Committee.-**

1. Number and date of Meetings
2. Minutes of the meetings: Mention main noteworthy points. Attached Minutes of the meeting on separate Annexure.
3. Status of preparation of Zonal master Plan including Tourism master Plan (Eco-sensitive Zone wise)
4. Summary of cases dealt for rectification of error apparent on face of land record. (Eco-sensitive Zone wise).
Details may be attached as Annexure
5. Summary of cases scrutinized for activities covered under Environment Impact Assessment Notification, 2006 (Eco-sensitive Zone wise).
Details may be attached as separate Annexure.
6. Summary of case scrutinized for activities not covered under Environment Impact Assessment Notification, 2006 (Eco-sensitive Zone wise).
Details may be attached as separate Annexure.
7. Summary of complaints lodged under Section 19 of Environment (Protection) Act, 1986. (Eco-sensitive Zone wise).
8. Any other matter of importance.

Annexure X

Gazette Notification of Bhagwan Mahavir National Park

REGD. GOA - 5

Panaji, 20th April, 1978 (Chaitra 30, 1900)

SERIES II No. 3

OFFICIAL GAZETTE

GOVERNMENT OF GOA, DAMAN AND DIU

GOVERNMENT OF GOA, DAMAN AND DIU

Department of Personnel and Administrative Reforms

Notification

No. 3-16-76-Div. I (Part file)

In exercise of the powers conferred on him by Rule 25(3) of the Goa, Daman and Diu Civil Service Rules, 1967, the Administrator of Goa, Daman and Diu is pleased to appoint the following officers to the Grade II posts of the Goa, Daman and Diu Civil Service in the scale of Rs. 650-30-740-35-810-EB-35-890-40-1000-EB-40-1200 from the date of their taking charge of the respective posts as indicated below, and post them against the vacancies indicated against their names until further orders. The appointments are on ad-hoc basis.

Sr. No.	Name of the officer	Present designation	Appointed as	Date from which the appointment will take effect
1	2	3	4	5
1.	Shri S. M. Naik.	Superintendent	Management Analyst vice Shri M. N. Bhartiya, M. A. transferred.	with immediate effect.
2.	Shri R. N. A. de Monte Furtado.	Superintendent	Addl. Dy. Collector, Goa North Division.	with immediate effect.
3.	Shri Mathews O. B. V. de Jesus Mascarenhas.	Superintendent	Planning Officer Rural Industries Project, vice Shri H. P. Furtado.	29-4-1978 (A. N.)

2. S/Shri Arnaldo Souza, Addl. Dy. Collector, North Goa Division and H. P. Furtado, Planning Officer, Rural Industries Project, Directorate of Industries & Mines stand retired on superannuation with effect from 30-4-1978 (A. N.). Shri L. H. Dias, Addl. Dy. Collector, shall hand over the charge of the post of Addl. Dy. Collector, held by Shri Arnaldo Souza, to Shri Furtado.

By order and in the name of the Administrator of Goa, Daman and Diu.

V. J. Moneses, Under Secretary (Personnel).

Panaji, 17th April, 1978.

Notification

No. 12-4-77-Div.I

The Government of Goa, Daman and Diu is pleased to set up the Vigilance Division in the Department of Personnel

and Administrative Reforms. The said Division shall perform the following function:—

- To organise and coordinate Vigilance work in all Government Offices/establishments and Semi Government organisations;
- To aid and advise the Departments on disciplinary matters;
- To impart training and guidance to various functionaries in the field of Vigilance;
- To maintain contact with Central Bureau of Investigation and Central Vigilance Commission;
- To identify and collect information about corrupt practices, sensitive spots etc.; and to exercise surveillance thereon;
- To conduct investigation in respect of cases involving moral turpitude, disproportionate assets and corrupt practices and cases of doubtful integrity of Government employees as well as those working in autonomous bodies under the jurisdiction of the Government;
- To conduct enquiries into public complaints, institution of regular enquiries and prosecution;
- Suggest blacklisting of firms having dubious dealings;
- Any other work relating to Vigilance.

2. The following posts in the anti-corruption Bureau at present under the control of Inspector General of Police shall stand transferred to the aforesaid Vigilance Division:—

- Police Inspector 1 post
- Police Sub-Inspector 2 posts
- Head Constable 2 posts
- Police Constable 1 post

3. Besides the post indicated in para (2) above, the following posts have been created/operated/re-designated for the aforesaid Vigilance Division:—

- Deputy Director (Vigilance) 1 post
- Vigilance Officer 1 post
- Superintendent 1 post
- Assistant 1 post
- Junior Stenographer 1 post

4. The aforesaid Vigilance Division shall function under the control of Chief Secretary as Chief Vigilance Officer.

5. This comes into force with immediate effect.

By order and in the name of the Administrator of Goa, Daman and Diu.

Chaman Lal, Joint Secretary.

Panaji, 15th April, 1978.

Forest and Agriculture Department

Notification

No. 8-3-77-FOR

Whereas it appears to the Administrator of Goa, Daman and Diu that the areas specified in the Schedule hereto are needed to be constituted as a National Park for the purposes of protecting, propagating and developing wild life therein or its environment;

Now, therefore, in exercise of the powers conferred by Section 35 of the Wild Life Protection Act, 1972, (Central Act 53 of 1972) the Administrator of Goa, Daman and Diu hereby notifies his intention to constitute the areas specified in the Schedule hereto as a National Park for the purposes of the said Act and further directs that the Collector of Goa shall enquire into and determine the existence, nature and extent of any rights alleged to exist in favour of any person in or over the land comprised within the limits of the said areas and deal with the same as provided in sections 19 to 25 of the said Act.

SCHEDULE

All that areas falling within the Mahavir Wild Life Sanctuary and comprising of an area of 107 sq. kms. and of the villages of Nandron, Mollem, Caranzol, Sonauli; part of Oxel and Boma bounded on the north by National Highway 4-A leading to Belgaum, on the south and east by Interstate boundary between Goa and Karnataka; and on the west by pole numbers 766 to 1150 and from 1 to 90 and then along the Collem—Mollem road. Further the boundary runs along the National Highway from Mollem towards Belgaum.

By order and in the name of the Administrator of Goa, Daman and Diu.

M. K. Bhandare, Under Secretary (Forest and Agriculture).
Panaji, 13th April, 1978;

Local Administration and Welfare Department

Order

No. 4-3/Coop/Deput/(JM)/76/RDD/3998

Read: Govt. Order No. 4-3/Coop/Deput/(JM)/76/RDD dt. 28-2-1978.

Sanction of the Govt. is, hereby, accorded to the extension of deputation term of Shri John Mascarenhas, Extension Officer (V.P.-cum-Coop.) Canacona, as Managing Director to Canacona Taluka Farmers Service Coop. Society Ltd., Canacona for a further period of one year with effect from 12-3-1978 to 11-3-1979, under the terms and conditions already specified in the Govt. order cited above.

By order and in the name of the Administrator of Goa, Daman and Diu.

E. N. Rodrigues, Under Secretary (Revenue).

Panaji, 5th April, 1978.

Revenue Department

Office of the Collector and D.C.A.

Order

No. CAB/Temple/92/602

The Special Committee appointed on 3-5-1968 as published in the Government Gazette No. 8, Series II dated 23-5-1968,

is hereby dissolved for not having submitted the draft bye-laws even much after lapse of the maximum period stipulated for the purpose.

2. Under Art. 18 of the Devasthan Regulation (Regulamento do Mazanias) the following persons are hereby appointed to form the Special Committee to frame the draft bye-laws of the Devasthan of "Shri Ganapati Rawalnath" of Dargalin, Pernem Taluka.

Effective Members:

President: — Shri Ravindra Purshotam Punalecar, Tivim-Bardez.

Treasurer: — Shri Laxman Balkrishna Halbe, Dargali-Pernem.

Attorney: — Shri Avinash P. Punalecar, Tivim-Bardez.

Secretary: — Shri Kashiram Gopal Punalecar, Corgao-Bardez.

Substitute Members:

President: — Shri Narayan Vithal Punalecar, Tivim-Bardez.

Treasurer: — Shri Dattaram Vithal Punalecar, Tivim-Bardez.

Attorney: — Shri Suresh Baburao Punalecar, Satarda-Sawantawadi.

Secretary: — Shri Gangaram Balkrishna Punalecar, Res, Sawantawadi.

3. The Committee is required to submit its report to the Government within a period of six months from the date of publication of this order in the Official Gazette. The procedure laid down under Art. 17 and 18 of the Devasthan Regulation as amended by the Legislative Diploma No. 1899 dated 29-5-1969, and also the Government directions contained in the Revenue Department's letter No. RD/END/116-71/II, dated 27-7-1971 should be followed while framing the bye-laws.

Narendra Prasad, Collector and DCA.

Panaji, 30th March, 1978.

Industries and Labour Department

Order

No. IRM/CON(15)/77/IT-15/78

Whereas the Lieutenant Governor of Goa, Daman and Diu is of the opinion that an industrial dispute exists between the employers in relation to the management of M/s. Sociedade de Fomento Industrial Pvt. Ltd., Margao, Post Box No. 31 and their workman Shri Vaman Pednekar, House No. 35, Sarvodom, Navelim, Salcete, represented by the Goa General Offices and Establishments Staff Association, Post Box No. 99, Margao, in respect of the matters specified in the Schedule hereto annexed (hereinafter referred to as the "said dispute");

And whereas the Lieutenant Governor of Goa, Daman and Diu considers it expedient to refer the said dispute for adjudication;

Now, therefore, in exercise of the powers conferred by clause (d) of sub-section (1) of section 10 of the Industrial Disputes Act, 1947 (Central Act 14 of 1947), the Lieutenant Governor of Goa, Daman and Diu hereby refers the said dispute for adjudication to the Industrial Tribunal, Goa, Daman and Diu, Dona Paula, Goa, constituted under section 7-A of the said Act.

SCHEDULE

"Whether the action of the management of M/s. Sociedade de Fomento Industrial Pvt. Ltd., Post Box No. 31, Margao (Goa) in terminating the services of Shri Vaman Pednekar, Driver with effect from 18-11-1976 is legal and justified?

If not, to what relief the workman is entitled to?"

By order and in the name of the Lieutenant Governor of Goa, Daman and Diu.

G. M. Sardesai, Under Secretary, Industries and Labour.

Panaji, 5th April, 1978.

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Annexure XI

Gazette Notification of Bhagwan Mahavir Wildlife Sanctuary

REGD. GOA-5

Panaji, 5th April, 1984 (Chaitra 16, 1906)

SERIES I No. 1

OFFICIAL GAZETTE



GOVERNMENT OF GOA, DAMAN AND DIU

GOVERNMENT OF GOA, DAMAN AND DIU

Department of Personnel and Administrative Reforms

Notification

1/56/76-PER (Part)

In exercise of the powers conferred by the proviso to Article 309 of the Constitution read with the Government of India, Ministry of External Affairs Notification No. F. 7(11)62-Goa dated 25th July, 1963, the Lieutenant Governor of Goa, Daman and Diu hereby makes the following amendment to all the existing Recruitment Rules governing recruitment to Group 'C' and Group 'D' posts in the Union Territory of Goa, Daman and Diu, namely:—

In the Schedule appended to all the existing Recruitment Rules for the various group 'C' and group 'D' posts under this Administration in the entry under column 6, for the words "Relaxable upto 5 years for Government Servants" wherever they occur, the following words shall be substituted, namely:—

"Relaxable for Government Servants".

By order and in the name of the Lieutenant Governor of Goa, Daman and Diu.

N. P. Gaunekar, Under Secretary (Personnel).

Panaji, 12th March, 1984.

Forest and Agriculture Department

Notification

8-12-82-For

The Wild Life Sanctuary which is popularly known as "Molem Wild Life Sanctuary" and constituted by Government Notification No. 8-12-82-FOR, dated 27-9-82, published in the Official Gazette, No. 26, Series I, dated 27-9-1982 is hereby named as "Bhagwan Mahavir Wild Life Sanctuary".

By order and in the name of the Administrator of Goa, Daman and Diu.

S. M. Naik, Under Secretary to the Government of Goa, Daman and Diu.

Panaji, 14th March, 1984.

Notification

8-12-82-FOR

In exercise of the powers conferred by Section 18 of the Wild Life (Protection) Act, 1972 (Central Act 53 of 1972), the Administrator of Goa, Daman and Diu hereby amends the Government Notification no. 8-12-82-For dated 27-9-1982, published in the Official Gazette Series I, No. 26, dated 27-9-1982 (hereinafter called the "principal Notification") as follows, namely:—

For the Schedule appended to the principal Notification, the following Schedule shall be substituted, namely:—

SCHEDULE

The areas of Sanguem taluka falling partially or wholly within the village limits of Aglote, Boma, Calem, Caranzol, Colem, Carmonem, Dongurlim, Dudal, Maulinguem, Molem, Ozel, Patiem, Surla, Sancordem, Sigao and Sonaulim and delimited by the boundaries mentioned below:

Boundaries in the clockwise directions:

Starting from a point, which is the intersection of Sanguem-Satari Taluka boundary and Malpona Bolcornem-Molem road.

North: Along the taluka boundary between Satari and Sanguem upto the interstate boundary between the district of Goa and Karnataka State.

East: Thence along the interstate boundary of district of Goa and Karnataka State upto its intersection with the southern boundary of the Patiem Village.

South: Thence along the southern boundary of Patiem village upto its intersection with the road leading from Tudou to Data of Sangod village through Dudal, Calem and Carmonem.

West: Thence along the road leading from Tudou to Data of Sangod through the villages Dudal, Calem and Carmonem upto the river Candepar (Dudhsagar). Further along upstream of the same river upto its intersection (Bridge) with the road leading from

Colem to Molem. Further along the road leading from Coleman to Malpona through Molem upto the starting point of the northern boundary.

By order and in the name of the Administrator of Goa, Daman and Diu.

S. M. Naik, Under Secretary to the Government of Goa, Daman and Diu.

Panaji, 14th March, 1984.

Corrigendum

8-12-82-FOR

In the Government Notification No. 8-12-82-FOR dated 27-9-1982, published in the Official Gazette, Series I, No. 26, dated 27-9-1982, for the figures "20-12-1967" occurring in the recital thereof, read "28-12-1967".

By order and in the name of the Administrator of Goa, Daman and Diu.

S. M. Naik, Under Secretary to the Government of Goa, Daman and Diu.

Panaji, 14th March, 1984.

Local Administration and Welfare Department

Notification

5-56-81/LAWD (Marketing)

Whereas the Government vide Notification No. 5-56-81/LAWD (MARKETING), dated 14th February, 1984, published in the Official Gazette Series I, No. 47, dated 23rd February, 1984 and also local daily newspapers dated 17-2-1984 inviting objections or suggestions from the members of the public on the declaration of the intention of the Administrator of Goa, Daman and Diu for regulating the marketing of "Cattle" in the District of Goa as a market area;

And whereas no objections or suggestions were received on the said declaration within the prescribed period.

Now, therefore, in exercise of the powers conferred by sub-section (1) of section 4 of the Maharashtra Agricultural Produce Marketing (Regulation) Act, 1963 as extended to the Union territory of Goa, Daman and Diu, the Administrator of Goa, Daman and Diu hereby declares that the marketing of 'Cattle' shall be regulated under the said Act in the District of Goa, as market area.

By order and in the name of the Administrator of Goa, Daman and Diu.

A. V. Pimenta, Under Secretary (LAWD).

Panaji, 23rd March, 1984.

Industries and Labour Department

Notification

1/629/78-ILD

Whereas the draft of certain rules which the Government of Goa, Daman and Diu proposed to make in exercise of the powers conferred by section 6 read with sections 33, 39, 46 and 47 of the Indian Ports Act, 1908 (Central Act 15 of 1908), was published as required by sub-section (2) of section 6 of the said Act, at pages 341 to 359 of the Official Gazette, Series I, No. 38, dated the 16th December, 1982 under the Industries and Labour Department Notification No. 1/629/78-ILD, dated the 1st December, 1982 inviting suggestions and objections from all persons likely to be affected thereby within thirty days from the date of publication of the said Notification in the Official Gazette;

And whereas the said Gazette was made available to the public on the 16th December, 1982;

And whereas no suggestions or objections have been received from the public to the said draft by the Government.

Now, therefore, in exercise of the powers conferred by section 6 read with sections 33, 35, 46 and 47 of the Indian Ports Act, 1908 (Central Act 15 of 1908), the Lieutenant Governor of Goa, Daman and Diu hereby makes the following rules, namely:—

CHAPTER I

Preliminary

1. **Short title and commencement.**—(1) These rules may be called the Goa, Daman and Diu Ports, Rules, 1983.

(2) They shall come into force at once.

2. **Definitions.**—In these rules, unless the subject or context otherwise requires,—

(a) "Act" means the Indian Ports Act, 1908 (Central Act 15 of 1908);

(b) "Craft" means any vessel, power driven or otherwise, plying, exclusively or partly, within the limits of a port;

(c) "Crew" means the assemblage of all persons which constitutes the crew of a craft;

(d) "Fair weather season" means the period commencing on the 16th day of September and ending on the 20th day of May next following;

(e) "Foul weather season" means the period commencing on the 21st day of May and ending on the 15th day of September next following;

(f) "Government" means the Government of Goa, Daman and Diu;

(g) "Licensed Craft" means any craft to which a licence is granted under the rules;

(h) "Owner" in relation to a craft includes part owner, charterer, consignee, agent or mortgagee in possession thereof;