



**PREPARATION OF ZONAL MASTER PLAN OF ECO-SENSITIVE
ZONES OF NATIONAL PARKS AND SANCTUARIES
LISTED IN CLUSTER 1 OF MADHYA PARDESH**

**ZONAL MASTER PLAN
BAGDARA WILDLIFE SANCTUARY**

VOLUME 2- ANNEXURE REPORT



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DEFINITION

Eco-Sensitive Zone. Eco-Sensitive Zones (ESZs) are areas notified by the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India around Protected Areas, National Parks and Wildlife Sanctuaries. The purpose of declaring ESZs is to create some kind of “shock absorbers” to the protected areas by regulating and managing the activities around such areas.

Ecologically Sensitive Area. ESA refers to an area around protected areas, National parks and Wildlife sanctuaries which acts as a transition zone from areas of high protection to areas involving less protection. Ecologically Sensitive Areas (ESAs) have been identified and notified by the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India since 1989.

Ecosystem Services. The Millennium Ecosystem Assessment defined Ecosystem Services as “the benefits people derive from ecosystems”.

Environmentally Sensitive Area. Environmentally sensitive areas (ESAs) are landscape elements or places which are vital to the long-term maintenance of biological diversity, soil, water or other natural resources both on the site and in a regional context. They include wildlife habitat areas, steep slopes, wetlands, and prime agricultural lands.

Protected Area. A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. (IUCN Definition 2008)

Core Zone. Core zone formed by undisturbed ecosystems and characteristic of a specific region. It is the area with the greatest protection, it only allows activities that do not interfere in the conservation of the ecosystem and must ensure the protection of biodiversity in the long term.

Buffer Zone. Buffer zones are areas created to enhance the protection of a specific conservation area, often peripheral to it. Within buffer zones, resource use may be legally or customarily restricted, often to a lesser degree than in the adjacent protected area so as to form a transition zone.

National Park. A national park is a park in use for conservation purposes. Often it is a reserve of natural, semi-natural, or developed land that a sovereign state declares or owns.

Wildlife Sanctuary. Wildlife sanctuaries refer to an area which provides protection and favorable living conditions to the wild animals. Wildlife Sanctuary is a natural habitat, owned by the government or private agency that safeguards particular species of birds and animals.

Zonal Master Plan. Zonal Development/Master Plan is a detailed plan for a Zone conceived and prepared within the framework of a Master Plan containing proposals for various land uses, roads and streets, parks and open spaces, community facilities, services and public utilities, etc.

Carrying Capacity. As per the WTO (World Trade Organization) carrying capacity is defined as “The maximum number of people that may visit a tourist destination at the same time, without causing destruction of the physical, economic, socio-cultural environment and an unacceptable decrease in the quality of visitors' satisfaction.”

Keystone Species. A keystone species is a plant or animal that plays a unique and crucial role in the way an ecosystem functions. Without keystone species, the ecosystem would be dramatically different or cease to exist altogether.

ABBREVIATIONS

CBD	Convention on Biological diversity
COP	Conference of parties
ESA	Eco-Sensitive Area
ESZ	Eco-Sensitive Zone
MOEFCC	Ministry of Environment, Forest & Climate Change
MPTB	Madhya Pradesh Tourism Board
NP	National Park
PA	Protected Area
SEPL	Socio- ecological Production Landscape
ULB	Urban Local Body
WLS	Wildlife Sanctuary
ZMP	Zonal Master Plan

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ANNEXURE 1: ESZ NOTIFICATION FOR BAGDARA ECO-SENSITIVE ZONE

[भाग II—खण्ड 3(ii)]

भारत का राजपत्र : असाधारण

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MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 13th September, 2017

S.O. 3028(E).—WHEREAS, a draft notification was published in the Gazette of India, Extraordinary, vide notification of the Government of the India in the Ministry of Environment, Forest and Climate Change number S.O. 1272(E), dated 31st March, 2016, inviting objections and suggestions from all persons likely to be affected thereby within the 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 draft notification were made available to the public on the 31st March, 2016;

AND WHEREAS, no objections and suggestions were received from persons and stakeholders in response to the draft notification;

AND WHEREAS, the Bagdara Wildlife Sanctuary is spread over an area of 478.00 square kilometers and is situated/located in Singrauli district in the State of Madhya Pradesh;

AND WHEREAS, Bagdara Wildlife Sanctuary is one of the finest sanctuaries of India for its unique features, situated on the 'Kaimur hills' located in the Singrauli district of Madhya Pradesh; the Sanctuary is famous for sure sighting of the endangered species Black buck; the Kaimur Wild Life Sanctuary (Utter Pradesh) is located in continuity in north of the Bagdara Sanctuary, so the animals are using the corridor frequently for their movements; the protected forest area is 213.047 kilometers and rest 246.953 kilometers is the revenue area and there is no reserved forest area in the Sanctuary; the northern, eastern and majority western boundary of the Sanctuary is the inter-state boundary of Madhya Pradesh and Utter Pradesh and the southern boundary is Son River which is notified at Son Gharial Sanctuary;

AND WHEREAS, the Bagdara Wildlife Sanctuary represents the floral and faunal attributes of the Sidhi and Singrauli forest landscape and as per Champion and Seth classification has Northern Dry Mixed Deciduous Forest;

AND WHEREAS, 145 species of plants have been documented from the Sanctuary which includes 63 tree species, 23 herbs and shrubs species, 18 climbers and parasites, 21 grasses and bamboo species of aquatic plants;

AND WHEREAS, the Sanctuary harbours panther, wolf, hyena, fox, jackal, chital, sambhar, nilgai, chinkara, black buck, wild bor, sloth bear, various species of reptiles and 90 species of birds;

AND WHEREAS, the important faunal species of the Bagdara Wildlife Sanctuary include fauna of Bagdara Sanctuary Monkey with red mouth(*Semnopithecus species*), Monkey with black mouth(*Presbytis entellus*), Sloth bear(*Melursus ursinus*), Barking deer(*Mutiacus muntjak*), Indian ratel(*Melivora capensis*), Spotted deer(*Axis axis*), Hyena(*Hyaena hyaena*), Common Indian hair(*Lepus nigricolis*), Black Buck(*Antelope cervicapra*), Jackal(*Canis aureus*), Fox(*Vulpes bengalensis*), Wild rat(*Andicots bengalensis*), Indian mongoose(*Herpestes edwardi*), Blue bull(*Boselaphus tragocamelus*), sambar(*Cervus unicolor*), Porcupine(*Hystrix indica*), Wild dog(*Cuon alpinus*), Indian wild boar(*Sus scrofa*), Panther(*Panthera pardus*), India small clawotter(*Ambloayx cinera*), Tiger(*Panthera tigris*);

AND WHEREAS, the Birds found in Bagdara Wildlife Sanctuary with their frequency of occurrence are Babbler common(*Turdoides caudatus*), Babbler Jungle (seven sister) (*Turdoides striatus*), Bee-eater small green(*Merops orientalis*), Bulbul red vented(*Pycnonotus cafer*), Bush chat pied(*Saxicola caprata*), Chat brown rock(*Cercomela fusca*), Cormorant Little(*Phalacrocorax niger*), Crow house(*Corvus splendens*), Crow pheasant (Coucal) (*Centropus sinensis*), Crow jungle(*Orvus acrorhynchos*), Cuckoo pied crests(*Clamastor jacobinus*), Dove ringed(*Streptopelia decaocto*), Dove little brown(*Streptopelia senegalensis*), Dove red turtle(*Streptopelia tranquebar*), Drongo Black (king crow) (*Dicrurus adsimilis*), Duck bramihny (Ruddy sheldrake) (*Tedorna ferrunginea*), Duck comb(*Arkidiornis melanotos*), Eagle crested hawk(*Spizaetus cirrhatius*), Egret cattle(*Bulbulcus ibis*), Egret little(*Egretta garzetta*);

AND WHEREAS, the Reptiles are Chitti(*Python molurus*), Dhaman(*Zamenish mucosus*), Goh(*varanus species*), Green snake(*Lachesis species*), Black snake(*Naja bungarus*), Nag(*Naja naja*), Insects of Economic importance are Deemak(*Isoptera order*), Madhu(*Kymenopterus*), Fishes are Bam(*Mastacembalus armatus*), Channa(*Ambasis nama*), Chainya(*Channa marulius*), Hilsa(*Hilsa hilsa*), Magur(*Clarius betracus*), Singhara(*Mystus seenghala*), Padan(*Wallago species*), Rohu(*Labeo rihita*);

AND WHEREAS, the important floral species of the Bagdara Wildlife Sanctuary Flora of Bagdara Sanctuary Glossary of local, standardised, botanical name of plants are, Marorphali (*Helicteres isora*), Aam (mango) (*Mangifera indica*), Amaltas(*Cassia fistula*), Amarbel(*Cuscuta reflexa*), Khatua(*Antidesmas diandrum*), Amara(*Spondias pinnata*), Amla(*Bauhinia malabarica*), Adhu kamini(*Murraya panicullata*), Aonla(*Embliba officinalis*), Babul(*Acacia Arabica*), Bahera(*Terminalia belerica*), Baibarang(*Embliba tajariamcottam*), Bamboo(*Dendrocalamus*

Bagdara Eco-Sensitive Zone

strictus), Safed siris(*Albizia procera*), Bansuli(*Grewia rothii*), Bargad(*Ficus bengalensis*), Bahva-Danda(*Arundo donax*), Bel(*Aegle marmelos*), Ber(*Zizyphus jujube*), Bhilwa(*Semicarpus anacardium*), Neel(*Indigofera tinctoria*), Bhirra(*Chloroxylon swietenia*), Bija(*Pterocarpus marsupium*), Tarota(*Cassia tora*), Achar(*Buchanania lanzan*);

AND WHEREAS, it is necessary to conserve and protect the area, the extent and boundaries of which are specified in paragraph 1 of this notification, around the Bagdara Wildlife Sanctuary as Eco-sensitive Zone from ecological and environmental point of view and to prohibit industries or class of industries and their operations and processes in the said Eco-sensitive Zone.

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-section (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies the area to an extent of one kilometer from the Western boundary of the Bagdara Wildlife Sanctuary, in the State of Madhya Pradesh as the Bagdara Wildlife Sanctuary Eco-sensitive Zone (hereinafter referred to 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 is one kilometer from the Western boundary of the Bagdara Wildlife Sanctuary and the area of Eco-sensitive Zone is 12.886 square kilometers.

(2) The Northern and Eastern boundary of the Bagdara Wildlife Sanctuary overlaps with the inter-State boundary between Madhya Pradesh and Uttar Pradesh and the Son Gharial Wildlife Sanctuary forms the Southern boundary of the Bagdara Wildlife Sanctuary.

(3) The map of Eco-sensitive Zone along with latitudes and longitudes is appended as Annexure I.

(4) The coordinates of one village viz., Baghor which falls within the Eco-sensitive Zone is appended as Annexure II.

2. **Zonal Master Plan for Eco-sensitive Zone.**—(1) The State Government shall, for the purpose of the Eco-sensitive Zone prepare, a Zonal Master Plan, within a period of two years from the date of publication of their notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification for approval of Competent Authority in the State Government.

(2) The Zonal Master Plan for the Eco-sensitive Zone shall be prepared by the State Government in such manner as is specified in this notification and also in consonance with the relevant Central and State laws and the guidelines issued by the Central Government, if any.

(3) The Zonal Master Plan shall be prepared in consultation with the following State Departments, for integrating the ecological and environmental considerations into the said plan:—

- (i) Environment;
- (ii) Forest and Wildlife;
- (iii) Agriculture and Horticulture;
- (iv) Revenue;
- (v) Urban Development;
- (vi) Tourism including eco-tourism;
- (vii) Rural Development;
- (viii) Irrigation and Flood Control;
- (ix) Municipal and Urban Development;
- (x) Panchayati Raj;
- (xi) Public Works Department.

(4) The Zonal Master Plan shall not impose any restriction on the approved existing land use, infrastructure and activities, unless so specified in this notification and the Zonal Master Plan shall factor in improvement of all infrastructure and activities to be more efficient and eco-friendly.

(5) The Zonal Master Plan shall provide for restoration of denuded and degraded areas, conservation of existing water bodies, management of catchment areas, watershed management, groundwater management, soil and moisture conservation, needs of local community and such other aspects of the ecology and environment that need attention.

(6) The Zonal Master Plan shall demarcate all the existing worshipping places, villages and urban settlements, types and kinds of forests, agricultural areas, fertile lands, green area, such as, parks and like places, horticultural areas, orchards, lakes and other water bodies with supporting maps and the Plan shall be supported by maps giving details of existing and proposed land use features.

(7) The Zonal Master Plan shall regulate development in the Eco-sensitive Zone and adhere to prohibited and regulated activities listed in the Table in paragraph 4 and also ensure and promote eco-friendly development for livelihood security of local communities.

(8) The Zonal Master Plan shall be co-terminus with the Regional Development Plan.

(9) The Zonal Master Plan so approved shall be the reference document for the Monitoring Committee for carrying out its functions of monitoring in accordance with the provisions of this notification.

3. **Measures to be taken by State Government.**—The State Government shall take the following measures for giving effect to the provisions of this notification, namely:—

1. Landuse.—(a) 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 residential complex or industrial activities:

Provided that the conversion of agricultural and other lands, within the Eco-sensitive Zone may be permitted on the recommendation of the Monitoring Committee, and with the prior approval of the State Government to meet the residential needs of the local residents such and for activities as,-

- (i) widening and strengthening of existing roads and construction of new roads;
- (ii) construction and renovation of infrastructure and civic amenities;
- (iii) small scale industries not causing pollution;
- (iv) cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stay; and
- (v) promoted activities and given in paragraph 4:

Provided further that no use of tribal land shall be permitted for commercial and industrial development activities without the prior approval of the State Government and without compliance of the provisions of article 244 of the Constitution or 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 Monitoring Committee, 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 correction of error shall not include change of land use in any case except as provided under this sub-paragraph:

Provided also that there shall be no consequential reduction in green area, such as forest area and agricultural area and efforts shall be made to reforest the unused or unproductive agricultural areas with afforestation and habitat and biodiversity restoration activities.

(2) Natural water bodies.- The catchment areas of all natural springs, rivers, channels shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan.

(3) Tourism/ Eco-tourism.- (a) All new Eco-tourism activities or expansion of existing tourism activities within the Eco-sensitive Zone shall be as per the Tourism Master Plan for the Eco-sensitive Zone.

(b)The Eco-tourism Master Plan shall be prepared by the State Department of Tourism in consultation with the State Departments of Environment and Forests.

(c) The Tourism Master Plan shall form a component of the Zonal Master Plan.

(d) The activities of Eco-tourism shall be regulated as under, namely:-

(i) no new construction of hotels and resorts shall be allowed within 1 km from the boundary of the Bagdara Wildlife Sanctuary or upto the extent of the Eco-sensitive Zone, whichever is nearer and beyond the distance of 1 kilometer from the boundary of the said Wildlife Sanctuary till the extent of the Eco-sensitive Zone, the establishment of new hotels and resorts shall be allowed only in pre-defined and designated areas for eco-tourism facilities as per Tourism Master Plan;

(ii) 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, Forest and Climate Change and the eco-tourism guidelines issued by the National Tiger Conservation Authority (as amended from time to time) with emphasis on eco-tourism:

(iii) 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 Monitoring Committee.

(4) Natural heritage.- 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 a heritage conservation plan shall be drawn up for their preservation and conservation as a part of the Zonal Master Plan.

(5) Man-made heritage sites.- Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic, and cultural significance shall be identified in the Eco-sensitive Zone and heritage conservation plan for their conservation shall be prepared as part Zonal Master Plan.

(6) Noise pollution.- Prevention and Control of noise pollution in the Eco-sensitive Zone shall be carried out in accordance with the Noise Pollution (Regulation And Control) Rules, 2000 under the Environment (Protection) Act, 1986.

(7) Air pollution.- Prevention and control of air pollution in the Eco-sensitive Zone shall be carried out in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and rules made thereunder.

(8) Discharge of effluents.- Discharge of treated effluent in the Eco-sensitive Zone shall be in accordance with the provisions of the General Standards for Discharge of Environmental Pollutants covered under the Environmental (Protection) Act, 1986 and rules made thereunder or standards stipulated by State Government.

(9) Solid wastes.- Disposal and management of solid wastes shall be as under:-

(a) the solid waste disposal and management in the Eco-sensitive Zone shall be carried out in accordance with the Solid Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change vide notification number S.O. 1357 (E), dated the 8th April, 2016;

(a) the inorganic material may be disposed in an environmental by acceptable manner at site identified outside the Eco-sensitive Zone .

(b) Safe and Environmentally Sound Management (ESM) of Solid wastes in conformity with the existing rules and regulations using identified technologies may be allowed within Eco-Sensitive Zone.

(10) Bio-medical waste.- Bio medical waste management shall be as under:-

(a) the bio-medical waste disposal in the Eco-sensitive Zone shall be carried out in accordance with the Bio-Medical Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change vide notification number GSR 343 (E), dated the 28th March, 2016.

(b) Safe and Environmentally Sound Management (ESM) of Bio-medical wastes in conformity with the existing rules and regulations using identified technologies may be allowed within Eco-Sensitive Zone.

(11) Plastic waste management.- The plastic waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the Plastic Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change vide notification number G.S.R. 340(E), dated the 18th March, 2016.

(12) Construction and demolition waste management.- The construction and demolition waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the Construction and Demolition Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change vide notification number G.S.R. 317(E), dated the 29th March, 2016.

(13) E-waste.- The e- waste management in the Eco-sensitive Zone shall be carried out as per the provisions of the E-Waste Management Rules, 2016 published by the Government of India in the Ministry of Environment, Forest and Climate Change.

(14) Vehicular traffic.- 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 Competent Authority in the State Government, the Monitoring Committee shall monitor compliance of vehicular movement under the relevant Acts and the rules and regulations made thereunder.

(15) Vehicular pollution.- Prevention and control of vehicular pollution shall be carried out in accordance with applicable laws and the efforts shall be made for use of cleaner fuel for example CNG, etc.

(16) Industrial units.- (i) No new polluting industries shall permitted to be set up within the Eco-sensitive Zone.

(ii) Only non-polluting industries shall be permitted within Eco-sensitive Zone as per classification of Industries in the guidelines issued by the Central Pollution Control Board in February 2016, unless otherwise specified in this notification.

(17) Protection of hill slopes.- The protection of hill slopes shall be as under:-

- (a) the Zonal Master Plan shall indicate areas on hill slopes where no construction shall be permitted;
- (b) no construction on existing steep hill slopes or slopes with a high degree of erosion shall be permitted.

(18) The Central Government and the State Government shall specify other additional measures, if it considers necessary, in giving effect to the provisions of this notification.

4. List of activities prohibited or to be regulated within 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 the rules made there under including the Coastal Regulation Zone (CRZ), 2011 and the Environmental Impact Assessment (EIA) Notification, 2006 and other applicable laws including the Forest (Conservation) Act, 1980 (69 of 1980), the Indian Forest Act, 1927 (16 of 1927), the Wildlife (Protection) Act 1972 (53 of 1972), and amendments made thereto and be regulated in the manner specified in the Table below, namely:-

TABLE

S No	Activity	Description
(1)	(2)	(3)
A. Prohibited Activities		
1.	Commercial mining, stone quarrying and crushing units.	(a) All new and existing (minor and major minerals), stone quarrying and crushing units shall be prohibited except for meeting the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing and for personal consumption. (b) The mining operations shall be carried out in accordance with the order of the Hon'ble Supreme Court dated 4 th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. UOI in W.P.(C) No.202 of 1995 and dated 21 st April, 2014 in the matter of Goa Foundation Vs. UOI in W.P.(C) No. 435 of 2012.
2.	Setting of industries causing pollution (water, air, soil, noise, etc.).	(a) No new industries and expansion of existing polluting industries in the Eco-sensitive zone shall be permitted. (b) Only non-polluting industries shall be permitted within Eco-sensitive Zone as per classification of Industries in the guidelines issued by the Central Pollution Control Board in February 2016, unless otherwise specified in this notification.
3.	Establishment of major hydroelectric project.	Prohibited (except as otherwise provided) as per applicable laws.
4.	Use or production or processing of any hazardous substances.	Prohibited (except as otherwise provided) as per applicable laws.
5.	Discharge of untreated effluents in natural water bodies or land area.	Prohibited (except as otherwise provided) as per applicable laws.
6.	Establishment of large-scale commercial livestock and poultry farms by firms, companies, etc.	Prohibited (except as otherwise provided) as per applicable laws except for meeting local needs.
7.	Setting of new saw mills.	No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
8.	Setting up of brick kilns.	Prohibited (except as otherwise provided) as per applicable laws.
9.	Use of polythene bags.	Prohibited (except as otherwise provided) as per applicable laws.
10.	Commercial use of firewood.	Prohibited (except as otherwise provided) as per applicable laws.
11.	New wood based industry.	Prohibited (except as otherwise provided) as per applicable laws.
B. Regulated Activities		
12.	Commercial establishment of hotels and resorts.	No new commercial hotels and resorts shall be permitted within one kilometre of the boundary of the Protected Area or upto the extent of

Zonal Master Plan of Bagdara Eco-Sensitive Zone

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THE GAZETTE OF INDIA : EXTRAORDINARY

[PART II—SEC. 3(ii)]

		Eco-sensitive Zone, whichever is nearer, except for small temporary structures for eco-tourism activities: Provided that, beyond one kilometre from the boundary of the Protected Area or upto the extent of Eco-sensitive Zone, whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable.
13.	Construction activities.	(a) No new commercial construction of any kind shall be permitted within one kilometre from the boundary of the Protected Area or upto extent of the Eco-sensitive Zone, whichever is nearer: Provided that, local people shall be permitted to undertake construction in their land for their use including the activities listed in sub- paragraph (1) of paragraph 3 as per building byelaws to meet their residential needs. (i) widening and strengthening of existing roads and construction of new roads; (ii) construction and renovation of infrastructure and civic amenities; (iii) small scale industries not causing pollution termed as per Classification done by Central Pollution Control Board of February 2016; (iv) cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stays; and (v) promoted activities listed in this Notification. (b) The construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any. (c) Beyond one kilometre it shall be regulated as per the Zonal Master Plan.
14.	Small scale non polluting industries.	Non polluting industries as per classification of industries issued by the Central Pollution Control Board in February 2016 and non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the Competent Authority.
15.	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 Acts and the rules made thereunder.
16.	Goat farming.	Regulated under applicable laws.
17.	Collection of Forest Produce or Non-Timber Forest Produce (NTFP).	Regulated under applicable laws.
18.	Migratory graziers.	Regulated under applicable laws.
19.	Erection of electrical and communication towers and laying of cables and other infrastructures.	Regulated under applicable law (underground cabling may be promoted).
20.	Infrastructure including civic amenities.	Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines.
21.	Widening and strengthening of existing roads and construction of new roads.	Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines.

22.	Under taking other activities related to tourism like over flying the Eco-sensitive Zone area by hot air balloon, helicopter, drones, Microlites, etc.	Regulated under applicable laws.
23.	Protection of hill slopes and river banks.	Regulated under applicable laws.
24.	Movement of vehicular traffic at night.	Regulated for commercial purpose under applicable laws.
25.	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, aquaculture and fisheries.	Permitted under applicable laws for use of locals.
26.	Discharge of treated waste water/effluents in natural water bodies or land area.	The discharge of treated waste water/effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated waste water, and the discharge of treated waste water/effluent shall be regulated as per applicable laws.
27.	Commercial extraction of surface and ground water.	Regulated under applicable laws.
28.	Open well, bore well, etc. for agriculture or other usage.	Regulated and the activity should be strictly monitored by the appropriate authority.
29.	Solid waste management/bio-medical waste management.	Regulated under applicable laws.
30.	Introduction of exotic species.	Regulated under applicable laws.
31.	Eco-tourism.	Regulated under applicable laws.
32.	Commercial sign boards and hoardings.	Regulated under applicable laws.
C. Promoted Activities		
33.	Rain water harvesting.	Shall be actively promoted.
34.	Organic farming.	Shall be actively promoted.
35.	Adoption of green technology for all activities.	Shall be actively promoted.
36.	Cottage industries including village artisans, etc.	Shall be actively promoted.
37.	Use of renewable energy and fuels.	Bio gas, solar light etc. to be actively promoted
38.	Agro-forestry.	Shall be actively promoted.
39.	Use of eco-friendly transport.	Shall be actively promoted.
40.	Skill development.	Shall be actively promoted.
41.	Restoration of degraded land/ forests/ habitat.	Shall be actively promoted.
42.	Environmental awareness.	Shall be actively promoted.

5. Monitoring Committee.- In exercise of the powers conferred by sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby constitutes a Monitoring Committee for a period of three years, for effective monitoring of the Eco-sensitive Zone, which shall comprise the following namely:-

- | | | |
|-------|---|------------|
| (i) | Divisional Commissioner Division, Rewa | —Chairman; |
| (ii) | District Collector Singrauli District | —Member; |
| (iii) | Superintending Engineer PWD Rewa | —Member; |
| (iv) | Superintending Engineer Public Health Department Rewa | —Member; |

(v)	CEO, District Panchayat Singrauli	—Member;
(vi)	Representative of the Town and Country Planning Department	—Member;
(vii)	Representative of the Pollution Control Board Singrauli	—Member;
(viii)	A representative of the Association of Hotels and Lodges of Singrauli (By whatever name known)	—Member;
(ix)	Member, State Biodiversity Board	—Member;
(x)	One representative of Non Governmental Organisation working in the field of environment to be nominated by the Government of Madhya Pradesh for a term of three years in each case	—Member;
(xi)	One expert in the area of ecology and environment from a reputed institution of University in the State to be nominated by the Government of Madhya Pradesh for a term of three years in each case	—Member;
(xii)	Field Director Sanjay Tiger Reserve District, Sidhi	—Member Secretary.

6. Terms of reference.—(1) The tenure of the Monitoring Committee shall be for a period of three years.

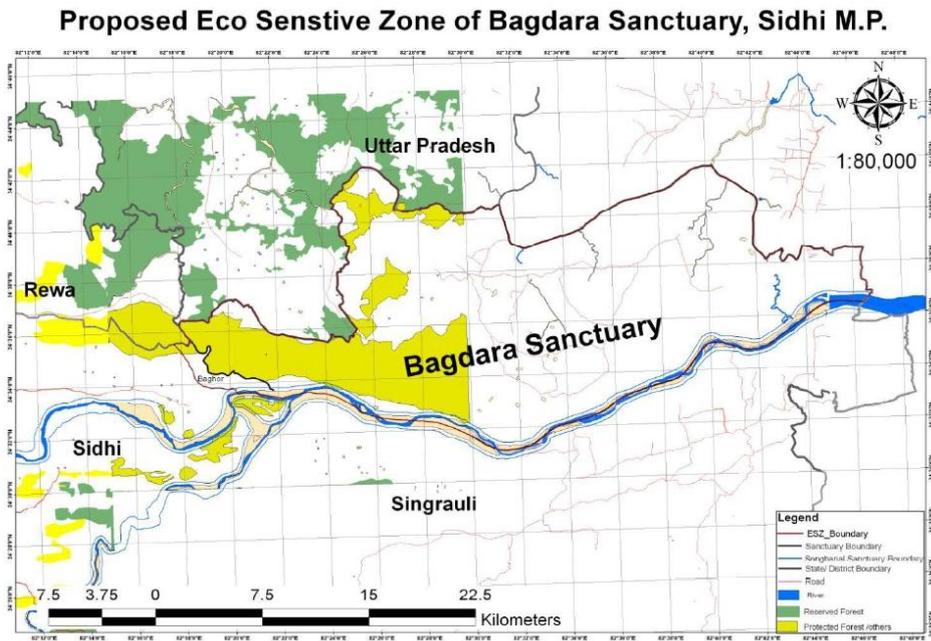
- (2) The Monitoring Committee shall monitor the compliance of the provisions of this notification.
- (3) The activities that are covered in the Schedule to the notification of the Government of India in the erstwhile Ministry of Environment and Forests number S.O. 1533 (E), dated the 14th September, 2006, and are falling in the Eco-sensitive Zone, except for the prohibited activities as specified in the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and referred to the Central Government in the Ministry of Environment, Forests and Climate Change for prior environmental clearances under the provisions of the said notification.
- (4) The activities that are not covered in 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 and are falling in the Eco-sensitive Zone, except for the prohibited activities as specified in the Table under paragraph 4 thereof, shall be scrutinised by the Monitoring Committee based on the actual site-specific conditions and referred to the concerned Regulatory Authorities.
- (5) The Member Secretary of the Monitoring Committee or the concerned Collector(s) or the concerned park Deputy Conservator of Forests shall be competent to file complaints under section 19 of the Environment (Protection) Act, 1986 against any person who contravenes the provisions of this notification.
- (6) The Monitoring Committee may invite representatives or experts from concerned Departments, representatives from Industry Associations or concerned stakeholders to assist in its deliberations depending on the requirements on issue to issue basis.
- (7) The Monitoring Committee 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 Chief Wildlife Warden of the State as per pro forma appended at **Annexure III**.
- (8) The Central Government in the Ministry of Environment, Forest and Climate Change may give such directions, as it deems fit, to the Monitoring Committee for effective discharge of its functions.

7. The Central Government and State Government may specify additional measures, if any, for giving effect to provisions of this notification.

8. The provisions of this notification shall be subject to the orders, if any, passed, or to be passed, by the Hon'ble Supreme Court of India or the High Court or the National Green Tribunal.

[F. No. 25/83/2015-ESZ]

LALIT KAPUR, Scientist 'G'



Geographical Positioning System Co-ordinates of points along the boundary of Bagdara Wildlife Sanctuary

S.No.	Gps	Longitude	Latitude
15.	E01	82° 19.901'E	24° 36.748'N
16.	E02	82° 25.040'E	24° 35.460'N
17.	E03	82° 24.492'E	24° 40.850'N
18.	E04	82° 27.130'E	24° 40.462'N
19.	E05	82° 31.441'E	24° 40.538'N
20.	E06	82° 35.696'E	24° 40.089'N
21.	E07	82° 40.295'E	24° 41.788'N
22.	E08	82° 42.501'E	24° 38.156'N
23.	E09	82° 46.456'E	24° 38.466'N
24.	E10	82° 46.267'E	24° 36.382'N
25.	E11	82° 40.231'E	24° 35.043'N
26.	E12	82° 31.576'E	24° 31.136'N
27.	E13	82° 25.695'E	24° 32.635'N
28.	E14	82° 19.499'E	24° 35.053'N

Geographical Positioning System Co-ordinates of points along the boundary of Eco-sensitive Zone of Bagdara Wildlife Sanctuary

S.No.	Gps	Longitude	Latitude
4.	E01	82 ⁰ 18.000'E	24 ⁰ 36.413'N
5.	E02	82 ⁰ 19.424'E	24 ⁰ 34.503'N
6.	E03	82 ⁰ 20.445'E	24 ⁰ 33.647'N

Annexure-II

Villages with Geographical Coordinates within the Eco-sensitive Zone of Bagdara Wildlife Sanctuary

Sl.No.	Name of Division	Name of Village	District	Latitude	Longitude
01	Sidhi	Baghor	Singrauli	24 ⁰ 34' 8.108"	82 ⁰ 19' 1.198"

Annexure-III

Proforma of Action Taken Report: - 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.
4. Summary of cases dealt for rectification of error apparent on face of land record.
Details may be attached as Annexure
5. Summary of cases scrutinised for activities covered under Environment Impact Assessment Notification, 2006.
Details may be attached as separate Annexure.
6. Summary of case scrutinised for activities not covered under Environment Impact Assessment Notification, 2006.
Details may be attached as separate Annexure.
7. Summary of complaints lodged under section 19 of Environment (Protection) Act, 1986.
8. Any other matter of importance.

ANNEXURE 2: CHAPTERS

CHAPTER 1 PLANNING A GREEN LANDSCAPE

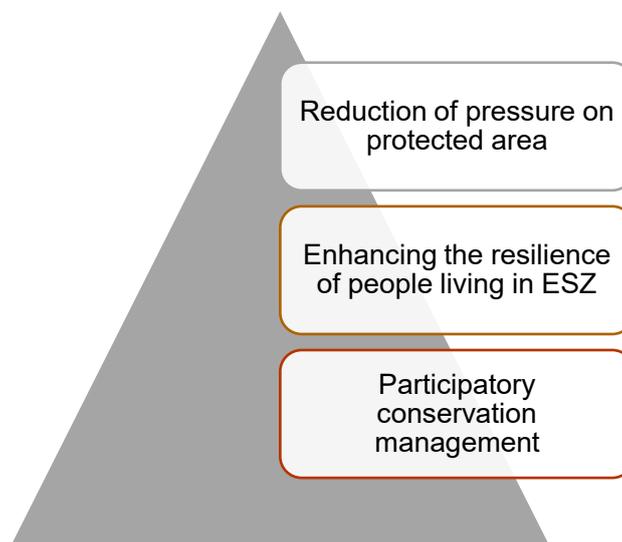
1.1 The vision

The vision for Bagdara ESZ will be:

“Accounting to the services provided by the ecosystem in the ESZ, the plan targets to conserve and develop natural and human habitats, develop resilient livelihood options, promote nature-based tourism assuring preservation and sustainable management of natural resources through cohesive and integrated governance framework.”

The approach towards developing the zonal master plan of ESZ area shall be based on the following key drivers shown in the figure below:

Exhibit 1: Key drivers of Zonal Master Plan



1.1.1 Reduction of pressure on Protected Area (PAs)

Protected areas are the cornerstones for in situ conservation of biological diversity. Their importance ranging from conservation of biological diversity, storehouses of genetic material, provision of essential ecosystems services for human welfare, and contribution to sustainable development, have been recognized at multiple levels. Settings up of PAs at times have been marked with conflicts with local communities living inside and fringe areas of the forest for generations. It has been debated widely nationwide on the governance of PA area management particularly the role of forest official and the community. Institutional linkages between protected areas and the production landscape of buffer and ESZ is very important. Most protected area agencies have little or no mandate for economic development of the production landscape which are invariably beyond the PA boundaries. Protected area authorities can increase their influence in the production landscape when they developed good working relationships with those agencies and stakeholders including local communities with the authority, expertise, and budget to support economic activities in the buffer-zone areas.

“Conservation cannot be imposed from above. Any conservation effort must involve the local people, based on their interests, skills, self-reliance and traditions and it must initiate programs that offer them spiritual and economic benefits.”

- (Schaller, 1993)

A common institutional structure for management of production landscapes and protected areas can also increase opportunities to link ESZ economic development with protected area

conservation goals thereby reduce pressure on the PAs. Long-term sustainability of protected areas and conservation efforts will depend on establishing effective institutional mechanisms and interventions to better address the pressure on the protected area and real causes of biodiversity loss. Protected area manager should ensure that the regional and local development plan are compatible with the objectives of protected areas. It is emerging that the management practice should evolve towards greater participation of community including preparation of management plan of PAs. NGOs and grass root organizations have a greater role to play not only to act as the interface between the forest department and community but actually being a part of monitoring and evaluation process of eco development programmes. Overall increased awareness should be created towards importance of biodiversity conservation and wildlife protection.

The impact of protected areas on local community and economy could be positive or negative. The positive impacts of local community can include direct revenue from environmental protection, and the ecosystem services. The negative impacts can range from displacement of local communities to crop damage by wildlife and sometimes include restricted access to resources and changes in land tenure. Management of protected area and the level of community involvement vary greatly between individual protected areas, organizations and countries, and in relation to their management category and form of governance.

1.1.2 Enhancing the resilience of people living in ESZ

Funding for protected areas rarely reflects the true costs of threat reduction, especially where such costs include modifying economic activities or introducing alternative livelihoods. Those agencies responsible for economic development have little incentive to encourage modification of local economic activities to reduce threats to protected areas. Regular protected area budgets are tightly constrained and rarely provide funds, training, and financing for livelihood support. Both projects and government need to devote much greater attention to budgeting. However, this can be leveraged through convergence, by way of inclusion of the income generation and the employment generation activities in the CD block level plan. Sustainable agriculture, improved livestock, crop diversification, agroforestry, farm forestry could be promoted in convergence mode by dovetailing ongoing programme of different department and agencies. Labour intensive activities like, soil and moisture conservation e.g. check dams and contour bunding etc. can be funded from Mahatma Gandhi National Rural Employment Guarantee Scheme (MNREGS). Energy planning in form of promoting LPG, improved cook stoves and biogas, will not only reduce pressure on forest but also address the health issues arising out of smoke and reduce drudgery of women. Skill development and microfinancing of the Self-Help Group activities can supplement to the family income. Community based ecotourism, home stay, nature guide etc. are some of the opportunities for the community residing in the ESZ. New livelihood interventions will require additional skills and training for involved community members, including simple book-keeping skills as well as training in processing, quality control, and marketing for new cash products. However, protected area staff and conservation NGOs rarely have such skills so it is essential that projects should identify appropriate partners and institutions which can provide the expertise and continue to do so over the long-term.

Important socio-economic benefits of community-based Eco tourism are:

- Employment generation directly in tourism and in the management of eco tourist assets.
- Both on-site and off-site employment may be generated.
- It can lead to the economic growth locally by profitable tourism related activities.
- It diversifies the local economy particularly in such areas where agricultural employment may be sporadic or insufficient. (McNeely et al, 1988).
- It may result in improved transport, communication and other infrastructures. Which help the locals.
- May result in increased demand for local produce to serve the local tourist trade.

- It encourages productive use of lands which are marginal for agriculture enabling large tracts of land to remain covered in natural vegetation'. (McNeely et al, 1992).
- If carefully planned, it can provide a self-financing mechanism for the PA authorities and consequently serve as a tool for conservation of natural heritage.

The panchayat level partnership can ensure that development planning at grass root level complements protected area activities and the economic development of ESZ. A good example is the constitution of Block level advisory committee under JICA assisted Forestry Sector Development Project in Odisha by Government of Odisha to act as a multisector co-ordination body for ensuring optimum intersectoral convergence of various ongoing government programme/schemes at the CD block level in the project villages. This ensures inclusion of the activities, work, infrastructure of the project village in the Block level plan and subsequently becomes a part of the district level plan, thus finance is secured. Protected area managers need to find ways to engage with local governments to leverage funding support for the various developmental activities in ESZ villages.

1.1.3 Participatory conservation management.

Communication, consultation, and participation are key elements for constructive relationships between protected areas and local communities. It is important to strengthen the social organization of local communities and to collaborate with local stakeholders on issues concerning economic activities and protected area objectives. Social cohesion and organization of the communities around the protected area can contribute to improved negotiation, representation, and mobilization of communities against external threats.

Example 1: The India Eco development Project

The India Eco development Project has been able to demonstrate a direct relationship between conservation of biodiversity and improved local livelihood and incomes, along with increased empowerment and decision-making responsibility to the community-level. In peripheral village Eco development Committees (EDCs) now represent the most effectively functioning institution at the village level. These EDCs are officially recognized by the local governments and financial institutions, increasing opportunities for local people to collectively access benefits for other government schemes and programs. In some of the Eco development project sites, local communities have been able to attract substantial outside funding for water resources and agricultural development, income-generation activities and infrastructure improvements in the village. In some of the Eco development sites, government policy now favors the direct transfer of financial resources to local community organizations for implementation of project activities. In Periyar and Pench Tiger Reserves all the Eco development investment funds are transferred to EDC accounts thus providing greater financial and decision-making authority to local communities than ever provided in the past. This represents a major deviation from normal government accounting and financial practice and policy and has been extended to non-project protected areas in other states in India as well. Strong transparency within the committees, arrangements for systematic audits, and leadership within some of the Project entities have given the program a strong local reputation for honesty relative to other government investment programs. Concern for sustainability has already been demonstrated through the focus on revolving funds, local contribution requirement to create ownership, and community monitoring. Similarly, some sites have achieved relatively strong participation of women, both in decision-making of the EDCs, and as beneficiaries and in some cases, women represent over 50% of the total alternative livelihood beneficiaries.

Example 2: Failure to link livelihood modification to threat reduction in the Barandabhar Forest, Nepal

A market feasibility study identified several business opportunities as suitable to support development and operation by the forest corridor communities. They include honey production, mushroom farming, wool spinning, off-season vegetable farming, banana farming,

and ecotourism. However, not all of the 70,000 households living in the vicinity of the corridor use the forest resources unsustainably and are a threat to the protected area. Because of a poor threat analysis and NGO priorities, much of the investment in livelihood modification has targeted an area where a national NGO has already invested much effort in community support and thus households are open to new ideas. Yet because of the long-term NGO activity, this area is one where threats are lowest. Success in terms of the number of families engaging in honey production or ecotourism will therefore have virtually no impact on reducing overall threats to the forest.

Example 3: Converting smugglers to forest protectors – working with former bark collectors

Illicit collection of vayana bark (Cinnamomum sp.) had always been a serious problem in the Peri-yar Tiger Reserve (PTR) in India. In 1997, PTR began to work with a group of collectors who were previously engaged in illegal harvesting and were highly antagonistic toward the Forest Department. A local NGO facilitated the formation of the Ex-vayana Bark Collectors Ecodevelopment Committee (EDC). Utilizing its members' knowledge of the forest, this EDC developed a new and innovative model of ecotourism linked to protection. The Adventurous Trekking and Camping program takes small groups of tourists into the tourism zone to camp for one or two nights, areas where the bark collectors previously poached. Their presence is sufficient to ward off other poachers and smugglers. The EDC entered into an agreement with a travel agency to promote the tourist packages and won a local award for best ecotourism experience. A major part of the earnings (70 percent) goes into the EDC account to be distributed equally among the members, while 10 percent goes to government revenue and honoraria to accompanying forest field staff, 10 percent for food expenses, and the remaining 10 percent to the community welfare fund. The scheme was developed in a highly participatory manner with local NGOs, especially the Thekkady Wildlife Society, hoteliers, PTR staff, and tour operators. (Adapted from Uniyal and Zacharias 2001).

Although the members earned more previously from sale of vayana bark, a major portion of those earnings were used for fines, bribes to various officials, and cuts to middlemen. With the new program, earnings went down but there was considerable enhancement in members' social status and improvement in their relationships within the community. In 2000, ecological monitoring indicated that regeneration of vayana has improved from about 6 percent to more than 13 percent and that debarking damage was much reduced. EDC members have caught other offenders and booked cases against them. With increased patrols, animal sightings in the tourism zone have increased (see www.periyartigerreserve.org).

Example 4: Local government support for conservation: the case of Bhutan

Bhutan has a well-organized system of local government that is critical to the empowerment and development of local communities. The country is divided into 20 districts, known as dzongkhags. Each of these districts is divided into several sub-districts, called geog, each with a development committee. Local government, at both the dzongkhag and geog level, plays a strong role in supporting socioeconomic development of the local communities. Community development planning is bottom-up, with each geog preparing a 5-year plan plus an annual plan based on the needs and priorities identified by the communities themselves. Such plans typically cover road construction, health and education facilities, as well as interventions to support livestock improvement and the promotion of alternative income opportunities such as NTFP commercialization. There is no difference in the administration of local government within and outside protected areas except that geogs and dzongkhags within protected areas prepare "integrated conservation and development plans" instead of simple development plans. Park staff members are represented on geog and dzongkhag development committees and are fully integrated into local planning processes. The role played by park staff in marking timber for community use directly mirrors the role of territorial district forest officers outside the park.

Example 5: Diverting labour and capital away from biodiversity damaging activities

Project designs often assume that individuals who are provided with a new means of income will forego their previous income-generating activity. In reality, however, this is not often the case. Even if some labor is attracted to new activities, there will not necessarily be a reduction in available labor for environmentally damaging activities. The ability to divert labor, particularly in low-income communities, faces four key challenges:

People do not have fixed-income targets. Instead of substituting one economic activity for another, a worker might try to do both to increase his or her income as much as possible. For example, one person may work on a plantation during the day and continue to hunt at night or early morning; other may work in tourism in the dry season and continue to log forests illegally in the wet season.

Where there is under employment there will be surplus labor. It will be difficult to develop economic activities that divert sufficient labor away from damaging activities. Surplus labor, or even underutilized potential labor, including children and women, may fill a labor need. New migrants may take over activities previously abandoned by the locals for more biodiversity-friendly activities.

New activities that rely on technology and are not labor-intensive will not divert much labor and therefore will not have significant impact on the labor market.

Cultural traditions and reluctance to take on more work for small incremental gain may make local communities less receptive to new business ventures, especially if they have already invested capital in existing activities and are concerned about the risk of failure. Without assistance or incentives to exit from existing activities, individuals may be unable or unwilling to transfer their labor to alternative businesses¹.

1.2 Objectives of management

- **Sustainable Management of Resources:** For Eco Sensitive Zone of Bagdara, it was determined how the resources of the park are impacted by people living inside or near the park area, and the different impacts caused by high dependency on the resources, the forest resources, ground water resources have been put to extensive use to fulfil the community needs resulting in frequent forest fires and depletion in the level of ground water. Such extensive use of natural resources without allowing it to replenish in an immeasurable way will after a point in future lead to situations of resource scarcity. A plan that overlooks onto the sustainable management of resources can turn out to be helpful in reducing pressure on protected areas.²
- **Maintenance of Ecosystem Services:** The ecosystem of protected areas and its buffer provide various valuable services to the local communities. These include soil regeneration, nutrient cycling, pollination, recreation, provision of pure water (discussed further below), continued evolution of genetic resources and maintenance of the functioning ecosystem which yields harvestable resources. Such benefits are often difficult to quantify, and even local people may take them for granted. They also help buffer climate change and contribute by storing and sequestering carbon². A large population is dependent on forest and ground water resources extensively, without allowing proper rejuvenation time for the resources. Environmental services do not normally appear in national accounting systems, but they may far outweigh direct values when they are computed. If sustainable benefits are to be provided to local communities, more effective controls may be required to ensure that wildlife populations are maintained at productive levels. Working upon this factor the

¹ Bovarnick and Gupta 2003

² People and Protected Areas: Some Issues from India, Pradeep Chaudhry, J.S. Maan, Animal Biodiversity and Conservation, 2019.

plans aims at developing techniques and guidelines that would account for the value of ecosystem services used by the local communities.³

- **Sustainable Livelihoods to enhance the resilience of people living in the Eco Sensitive Zone:** The livelihoods and well-being of rural poor people are more vulnerable to the establishment of PAs particularly in developing countries, because their livelihoods are dependent mainly on agriculture and on the available natural resources⁴. Benefits and costs experienced by local people because of PAs can influence positive or negative attitudes towards conservation activities⁵. Balancing conservation goals and the needs of the local people has been challenging particularly in recent years⁶. A non-exhaustive list of potential activities that can be promoted are Sustainable agriculture practices, crop diversification, agroforestry, farm forestry, Labour intensive activities like, soil and moisture conservation e.g., check dams, and contour bunding etc. Energy planning in form of promoting LPG, improved cook stoves and biogas, Skill development and micro financing of the Self-Help Group activities, Community based ecotourism, home stay, nature guide etc.
- **Nature Based Tourism:** Tourism in Eco Sensitive Areas come with many implications and challenges. On one hand it provides employment opportunities and ways of income becomes diversified resulting in the betterment of people living in and around reserves. Foreigners and nature lovers are attracted to national parks and wildlife sanctuaries but too much human pressure in and around protected areas may prove harmful to animal populations. Ecotourism from such areas provides a platform to generate substantial benefits for both governments and the local communities. The extent to which nature-based tourism or ecotourism offsets the costs of a Protected Area has been examined in very few cases².
- **Habitat Management:** For conservation practitioners, one of the most challenging issues is to address human-wildlife conflicts. Many ecological and social factors can be responsible for these conflicts. There is a need to develop preventive strategies so as to avoid these conflicts². Managing protected areas while retaining habitat integrity is of paramount importance. Today Protected Areas are often under threat from ad hoc and heavily intrusive 'management' that involves unscientific habitat manipulation, earth moving and construction⁷.
- **Integrated Governance Framework:** Governance is a key factor for protected areas to succeed in conserving biodiversity and supporting sustainable livelihoods. Enhancing protected area governance in terms of diversity, quality, effectiveness and equity can facilitate the achievement of Aichi Biodiversity Target 11 and help face ongoing local and global challenges. Managing any protected area engages different actors, instruments and powers and is embedded in multiple levels of rules and decision-making⁸. It is often observed that these different actors involved are responsible for making decisions on different matters and the local communities are subject to out of the picture of decision making. Communication, consultation, and participation are key elements for constructive relationships between protected areas governments and local communities. It is important to strengthen the social organization of local communities and to collaborate with local stakeholders on issues concerning economic activities and protected area objectives.

³ The role of protected areas for conservation and sustainable use of plant genetic resource for food and agriculture, Jeffery A. McNeely, IUCN.

⁴ People, protected areas and ecosystem services: a qualitative and quantitative analysis of local people's perception and preferences in Côte d'Ivoire. By AMIN, A., ZAEHRINGER, J. G., SCHWILCH, G. & KONÉ, I. in Natural Resources Forum, 2015

⁵ Impacts of protected areas on local livelihoods in Cambodia, by CLEMENTS, T., SUON, S., WILKIE, D. S. & MILNER-GULLAND, World Development

⁶ Factors influencing conservation attitudes of local people in Western Serengeti, Tanzania, by KIDEGHESHO, J. R., RØSKAFT, E. & KALTENBORN, B. P., Biodiversity and Conservation

⁷ Protected Area Management, Conservation India.

⁸ Some stress that a distinction should be made among the substantive rights, procedural rights and competences that affect decisions (Alexander Paterson, 2012)

Social cohesion and organization of the communities around the protected area can contribute to improved negotiation, representation, and mobilization of communities against external threats.



1.3 Short-term objectives

Sector	Short term objective
Environment	<ul style="list-style-type: none"> • To reduce human animal conflict • To flourish wildlife in its natural habitat • To reduce the pressure on Protected Area in terms of usage of natural resources • To reduce dependency on forest • To promote sustainable livelihoods. • To rejuvenate of ground water as a natural resource and allow its replenishment and sustainable use of resource. • To revive of surface water bodies • To sustain the agriculture produce • To ensure both the villagers and animals have the required space. • To promote Wildlife friendly and Harmonious development • To reduce the pollution caused by industries (new or existing) within the ESZ • To control the harmful impacts of air/noise/water pollution in the Eco-sensitive Zone and promote mitigation measures
Economy	<ul style="list-style-type: none"> • To improve the livelihood opportunities for the villagers • To improve the living conditions of the villagers • To reduce out migration and illegal ways of income generation • To boost up local economy • To promote sustainable agriculture practices to maximize productivity and profit while minimizing environmental damage. • To promote sustainable agriculture practices to maximize productivity and profit while minimizing environmental damage.
Tourism	<ul style="list-style-type: none"> • To reduce the pressure on Protected Area in terms of usage of natural resources • To reduce pressure on existing natural resources • To develop job opportunities for the local community • To conserve the fragmenting wildlife habitats • For promoting development of tourist concentrated areas • To control and prevent further Degradation of already degrading natural assets. • To protect indigenous species and biodiversity, harmed from invasion of non-native species. • For regulated human encroachment around natural assets would lead to deterioration of Eco-Sensitive Zones • To reduce impact of development and construction activities around the man-made heritage sites (including encroachment also) • To develop appropriate operation and maintenance of areas around the heritage sites • To control urbanization and regulate tourism and tourist infrastructure development

Infrastructure	<ul style="list-style-type: none"> • To reduce dependency on ground water supply • For at proper disposal and treatment of solid waste (including waste from households, agriculture, commercial, sanitary, and institutional) generated in Eco-Sensitive Zones • To reduce Human Animal conflict and reduce the wildlife – vehicle accidents in the eco sensitive zone. • To improve the sanitation condition in eco sensitive zone
Institution	<ul style="list-style-type: none"> • For ease in implementation of Plan recommendations and strategies in Bagdara Eco sensitive zone

1.4 Long-term objective

Sector	Long term objective
Environment	<ul style="list-style-type: none"> • Non fragmented wildlife habitat development • Promote sustainable development in ESZ area of the sanctuary. • Reduce dependency on ground water resources. • Reduce human animal conflict. • Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species. • Prevention of Air/Water/Noise/land pollution
Economy	<ul style="list-style-type: none"> • Enhance the socio-economic condition. • Promote the local know how of indigenous technologies. • Strengthening agriculture and creating different economic opportunities for all to build resilient communities and their livelihood opportunities
Tourism	<ul style="list-style-type: none"> • Develop Sustainable and Eco Tourism • Develop a conservation strategy for natural as well as manmade heritage sites.
Infrastructure	<ul style="list-style-type: none"> • Deploy Green technology in the water infrastructure development. • Develop a 'Solid Waste Management System' • Regulation of vehicular movement or high-speed movement in a habitat friendly manner • Declaration of Bagdara as 'Open Defecation Free' ESZ
Institution	<ul style="list-style-type: none"> • Develop an overarching institutional framework

1.5 Problems in achieving objectives

In recent years, there has been a growing concern amongst protected area professionals and the public that many protected areas are failing to achieve their objectives, and, in some cases, they are losing the values for which they were established. As a result, improving the effectiveness of protected area management has become a priority throughout the conservation community. Some of the major concerns are:

- Lack of awareness and administrative hurdles to implementation
- Lack of capacity building initiatives for effective policy implementation
- Operation risks within the ESZ (special area)
- Need for a common mandate/ inter agency coordination.
- Current institutional framework and limited resources.

CHAPTER 2 THE STRATEGIES

2.1 Ecofriendly Suggestive Land use planning

This section discusses the detailed methodology followed to arrive at final Zonal Master Plan. **In order to undertake the zoning exercise and to provide location specific recommendations in the designated ESZ area**, it is important to understand two major composite components.

Firstly, it is important to understand the properties of natural resources governing the physical and ecological systems of the area. Each natural resource has its own properties which on one hand provide services to humans but on the other hand also place constraints for specific activities due to its supportable capacity to withstand pressure which can be termed as **Sensitivity**. Natural resources are generally resilient to natural processes and events such as floods, storms, seasonal water scarcity etc., and have a natural capability to recover by virtue of their intrinsic properties. However, when these resources are subjected to human activities, their degree of resilience gets altered as their intrinsic properties gets changed. **Resources whose properties get altered with little impact can be considered more sensitive to human activities, on the other hand, the resources which can withstand higher degrees of impact are lesser sensitive.** For example, forest areas with biodiversity of rare and endangered species might be more sensitive to human activities than sparsely vegetated areas etc. **Hence, identification of those resource areas which are highly sensitive to any human activity is necessary for giving recommendations regarding protection and conservation of natural resources and biodiversity areas.** The methodology adopted for environmental sensitivity analysis has been adopted from the method given by Ian L. McHarg (1969) and the method will be normalized for our requirements based on AHP method provided by Satty (1980).

Secondly, along with sensitivity of natural resources it is important to understand the intensity of human activity in the study area, especially with regards to parameters, which have the potential to alter the properties of the resources that they are affecting. It is well known that some human activities have far more serious consequences on **natural resources than others. Such activities needs to be classified on their particular order of importance and will be further used to derive the impact on the natural resource as per below formula**

$$\text{Impact} = \text{Sensitivity score} * \text{Intensity score.}$$

The above equation is likely to give outputs that can be straight away used into the planning process, to come up with zoning and management recommendations, as indicated in the figure below:

Table 1: Methodology for Impact Analysis

Sensitivity/ Intensity	High	Medium	Low
High	(H,H)	(M, H)	(L, H)
Medium	(H, M)	(M, M)	(L, M)
Low	(H, L)	(M, L)	(L, L)
Legends	Critical areas with absolute very high protection levels required	Management areas with controlled development.	Opportunity areas with high adequate development potential and low human pressure.

The details of the parameters considered for building these two indexes have been presented in and as follows, the same structure will be adopted for all the areas based on final normalization.

2.1.1 Environmental sensitivity analysis

Protected areas are those in which human occupation or at least the exploitation of resources is limited. A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. Every P.A. is endowed with remarkable ecological, floral, faunal and geomorphological significance.

Protected areas are a mainstay of biodiversity conservation, while also contributing to people's livelihoods, particularly at the local level. Protected areas are at the core of efforts towards conserving nature and the services it provides us – food, clean water supply, medicines and protection from the impacts of natural disasters. Their role in helping mitigate and adapt to climate change is also increasingly recognized.

It has been recognized that natural resource and wildlife protection has to go beyond the Protected Areas (PAs) to the extended surroundings, consisting of landscapes for the interaction and movement of wildlife. Thus, Eco- Sensitive Zones are notified around the Protected Areas to guide the management practices in such areas by regulating the human activities in the surroundings of the PAs. This provides a transition zone for the PAs and acts as a shock absorber towards the anthropogenic activities.

The livelihood of the people living in and around the PAs are highly dependent on the natural resources. The ecosystems in the PAs are significantly fragile to any external pressures. Thus, it becomes imperative to understand the environmental sensitivities of the PAs and ESZs to guide the management practices and activities.

As envisaged in the “National Wildlife Action Plan-2017-31, it is increasingly recognized that wildlife conservation has to go beyond Protected Areas (PAs) to the larger landscapes in which these are embedded. A landscape is defined as ‘a large tract of land constituted by a mosaic of interacting land uses with people and the impacts of their activities as the cornerstone of its management’. In this context the ESZ has a significant role to act as the shock absorber of the PA. The landscape approach becomes more in such mosaics where agro-practices, other resources use can put immense pressure on wild species due to unsustainable use by the dependent communities. Lack of awareness can cause far reaching impact by way of resource depletion and retard flow of ecosystem services. In view this it is essential to carry out environmental sensitivity mapping to analyze the sensitivity of environmental features in the study area in context to its sub parameters, as well as interrelationships amongst the environmental features. The main environmental features taken into consideration for the analysis are:

- Wildlife
- Surface Water Bodies
- Stream Flow Direction
- Land Use Pattern
- Distance from Administrative Boundaries
- Level of Ground Water
- Slope

2.1.1.1 Wildlife

The study area is a home to varied species of flora and fauna and offers great ecological and biodiversity value because of the ecotone. They consist of ecotone within, which provides the optimum surroundings for species to thrive, form habitats, breed, and provides corridors for movement and survival of various species. Thus, any change in the local (or regional) ecosystem can hamper the flora and fauna of the area and on the ecosystem services they

provide of the P.A. Therefore, it becomes imperative to analyze the criticality of existing wildlife features in the eco sensitive zone. It has been done by understanding the ecotones, **wildlife corridors, habitats and congregation areas**. A wildlife corridor is a link of wildlife habitat, generally native vegetation, which joins two or more larger areas of similar wildlife habitat. Corridors are critical for the maintenance of ecological processes including allowance for the movement of animals and the continuation of viable populations⁹.

A. Major Wildlife Corridors

Corridors provide for movement of keystone and other important species and connects habitats in different P.A.s. Corridors play an extremely important role in the maintenance of biodiversity, but they can only partly compensate for the overall habitat loss produced by the fragmentation of the natural landscape. It is important, therefore, that vegetation remnants and vegetated corridors are maintained and enhanced as a network across all lands both private and public.

Regional corridors are primary landscape connections between larger important areas of habitat. They are generally substantial in **width (> 500m)** and provide not only for dispersal of individual species but act as habitat in their own right for a range of species.

B. Minor Wildlife Corridors

Local corridors are smaller, less defined linkages that provide local connection of remnant patches of vegetation and landscape features such as creek lines, gullies, wetlands and ridgelines. They may in some cases be **less than 50m** in width and as such may be influenced by edge effects. Local corridors are an important component of an overall regional landscape conservation framework.¹⁰

C. Wildlife Habitats and Congregation Areas

Forests also provide habitat for a vast array of plants and animals. They provide nesting and roosting environments for a wide variety of vertebrate and invertebrate species. Habitat loss and fragmentation are the two main contributors to continuing biodiversity decline. Habitats are important for predicting where wildlife can be found and for developing strategies for their conservation and management.¹¹

S.No.	Parameter	Sub- Parameter	Sensitivity
1	Wildlife	Major Wildlife Corridors	Very High
2		Minor Wildlife Corridors	High
3		Wildlife Habitats and Congregation Areas	Very High

D. Case Study – Bagdara Wildlife Sanctuary

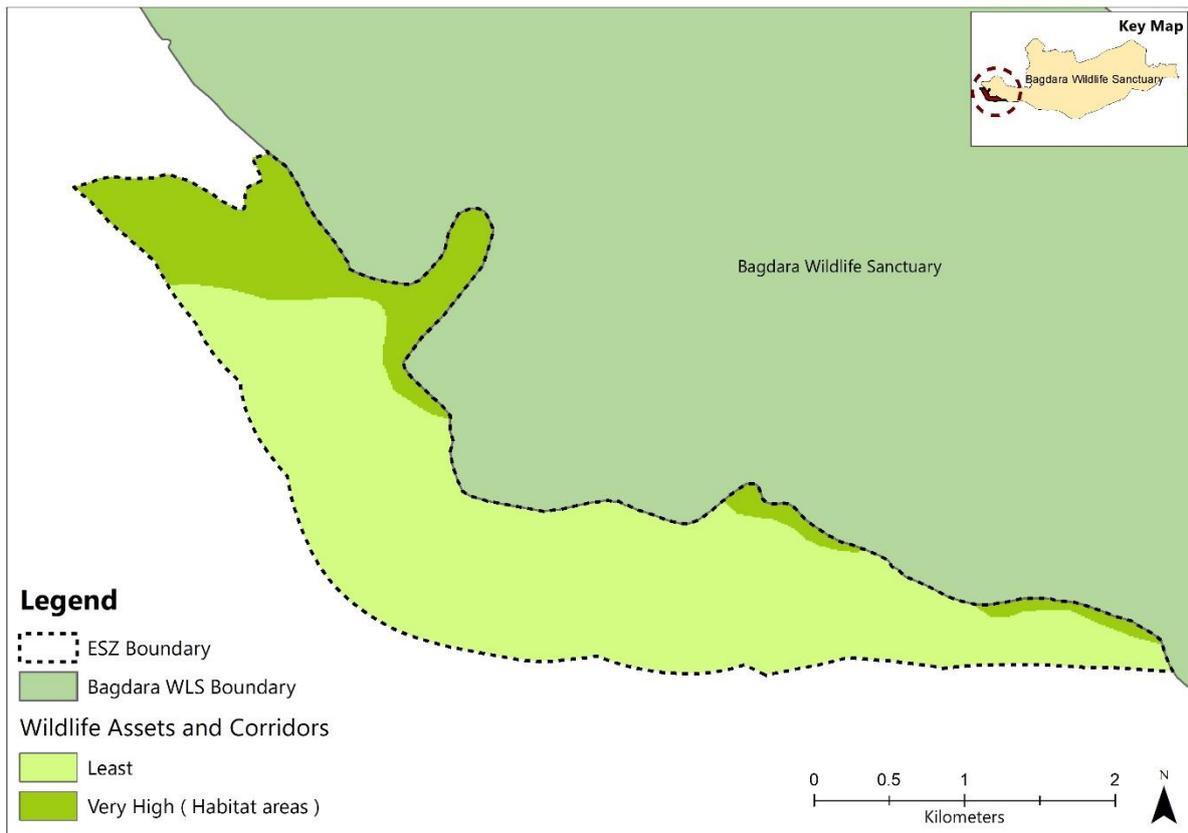
The sensitivity of wildlife creatures in eco sensitive zone of Bagdara wildlife Sanctuary have been analyzed based on Table above. As shown in map around 20% of the area is highly sensitive in reference to wildlife because they are the eco tones. It suggests the presence of major wildlife corridors and congregation areas in the southern and south - western region of Bagdara wildlife sanctuary comprising of areas from Sidhi district, Baghor village which are the important ecological niches. Major concentration of high sensitive areas are found near dense deciduous and forest concentration in the northern part and scrub land concentration on the south eastern part of the ESZ, with a sparsely spread human settlement pattern because of edge effect. The water bodies and slope also play a major role in defining the sensitivity of area in reference to wildlife. The areas of slope >20 degrees, and the meeting points of dense forests and water bodies reflect a high sensitive areas for wildlife in ESZ and are important ecotones.

⁹ <https://www.environment.nsw.gov.au/resources/nature/landholderNotes15WildlifeCorridors.pdf>

¹⁰ <https://www.environment.nsw.gov.au/resources/nature/landholderNotes15WildlifeCorridors.pdf>

¹¹ <https://www.environment.nsw.gov.au/resources/nature/landholderNotes15WildlifeCorridors.pdf>

Map 1: Sensitivity of Wildlife corridors and Habitats in Bagdara ESZ



2.1.1.2 Surface Water

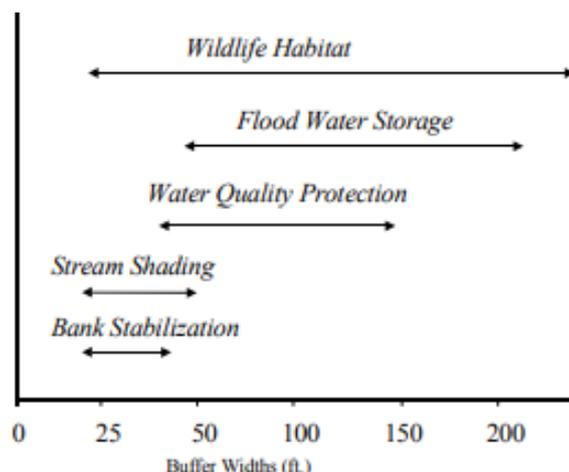
Surface water bodies play an important role in maintaining ecological balance, providing a source of drinking water, continuing ground water recharge, moderating the climate etc. However, lack of awareness about its sensitivity and lack of conservation leads to degradation of these water bodies over a certain period of time. Considering its importance in ecosystem and in sustaining wildlife as well as human life cycle it becomes important to understand the state of criticality for surface water bodies in the study area. Streams, Lakes, and water bodies have been considered to assess the environmental sensitivity for surface water bodies.

A. Streams

The sensitivity of streams can be identified by delineating a buffer around it. The proportion of land around a stream typically known as Riparian Buffer, act as a transition zone between the aquatic and upland ecosystem. It plays a major role in reducing the impacts of anthropogenic activities on the natural elements. The U.S. Department of Agriculture defines it as an important ecological component of the landscape and are essential as it influences quality and quantity of water.¹²

The width of the buffer is definitely subject to question on case-to-case basis, largely a factor of desirable function of its use as specified in the figure below. However, it is independent of the stream order. In fact, studies by USDA suggest “smaller order streams often account for the greatest miles of watercourse in a basin. Buffering low order streams (1st, 2nd and 3rd) has greater positive influence on water quality than wider buffers on portions of larger order streams already carrying polluted water”

¹² https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_010931.pdf



The USDA studies recommend that in order to provide an array of functions, the total width of a riparian buffer should range from 10 - 100 m (this range of widths may not provide adequate habitat for some wildlife). Moreover, the narrow buffer widths require frequent maintenance as it is more susceptible to erosion, sedimentation.¹³

Based on the above considerations, an assessment criterion has been formulated which is shown in table below.

S. No.	Stream Order	Total Buffer Width	Sensitivity
1.	Stream Order 1 (Habitat Conservation)	100 m.	Very High
2.	Stream Order 2 (Habitat Conservation)	90 m.	Very High
3.	Stream Order 3 (Habitat Conservation)	80 m.	Very High
4.	Stream Order 4 (Habitat Conservation)	70 m.	High

B. Lakes and Ponds

National Lake Conservation Plan was referred in order to understand the classification of lakes and understand the sensitivity criteria for lakes. It has mentioned various criteria of lake classification based on its physical characteristic, its current use and its administrative region. For the national level lake conservation, it has prioritized lakes for an area greater than 7 acres and depth beyond 3 m.¹⁴

LAKE CLASSIFICATION Sensitivity Rating Factors					
Criterion	Significance	Criterion Classes	Units of Measure	Points	Comments
Lake Surface Area (size)	Smaller lakes are generally more vulnerable to water quality problems	1 - 10	Acres	1	Very small lakes/ponds
		10 - 100		2	Small lakes
		100 - 500		3	Medium lakes
		500+		4	Large lakes

Since the plan is for lake conservation at national level, the area considered is 7 acres. Referring to the plan, it can also be concluded that Perennial water bodies are highly

¹³ http://www.eightmileriver.org/appendicies/09c3_Riparian%20Buffer%20Science_YALE.pdf

¹⁴ National Lake Conservation Plan – India – Retrieved from https://www.indiawaterportal.org/sites/indiawaterportal.org/files/Guidelines%20for%20National%20Lake%20Conservation%20Plan_MoEF_2008.pdf

susceptible to environmental impacts. ¹⁵ Also referring to the lake sensitivity classification by Dane County of Wisconsin as mentioned¹⁶

Based on the above considerations and the scale of water bodies present in the study area the classes have been identified for classification of lakes and identifying its sensitivity, which is given in table below.

S.No.	Area of the Water Body	Lake	Sensitivity
1.	< 2 Ha.	Very Small Lakes	Very High
2.	2 – 4 Ha.	Small Lakes	High
3.	> 4 Ha.	Medium Lakes	Medium

C. Wetland and its Buffer

As per Department of Western Australia: A general guideline to protect wetland's environmental values, the Water and Rivers Commission recommends that a minimum buffer of 50 m is established from the boundary of wetland dependent vegetation. Where a wetland has significant conservation value **a buffer of 200 m or greater may be recommended.** ¹⁷

(Buffers contribute to wetland protection. Cooke (1992) in an analysis of wetland buffers in King and Snohomish counties in Washington State found that wider buffers (in this case of more than 15 m) were more effective at preventing direct human disturbances from encroaching into protected wetlands. Most buffers of less than 15 m (95%) were consistently linked with more noise, physical disturbance of foraging and nesting areas in the protected wetlands and dumping of refuse and yard waste into the protected wetlands.)

S.No.	Buffer from Wetland (in meters)	Sensitivity
1	50	Very High
2	100	High
3	200	Medium

D. Case Study – Bagdara Eco Sensitive Zone

- **Streams:** Sensitivity of streams for eco sensitive zone of Bagdara wildlife Sanctuary have been analyzed as mentioned in Table above. As shown in map below around 15% of the area along the first and second order stream spread across the ESZ is very highly sensitive in reference to streams. The various kinds of settlement patterns observed in ESZ mainly fall in the lines of buffer across the stream making the areas much more sensitive and critical towards anthropogenic activities

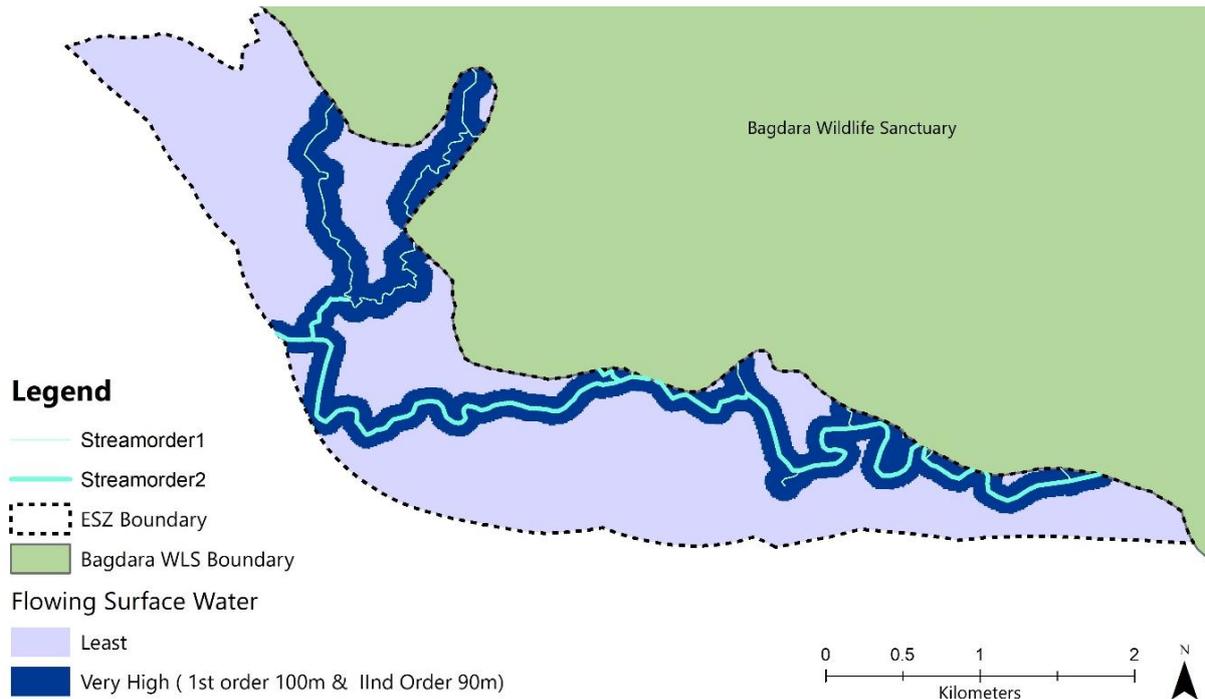
¹⁵ National Lake Conservation Plan – India – Retrieved from https://www.indiawaterportal.org/sites/indiawaterportal.org/files/Guidelines%20for%20National%20Lake%20Conservation%20Plan_MoEF_2008.pdf

¹⁶

https://www.uwsp.edu/cnr-ap/UWEXLakes/Documents/ecology/shoreland/nr115/lake_classification_assessment_june_2007_wal.pdf

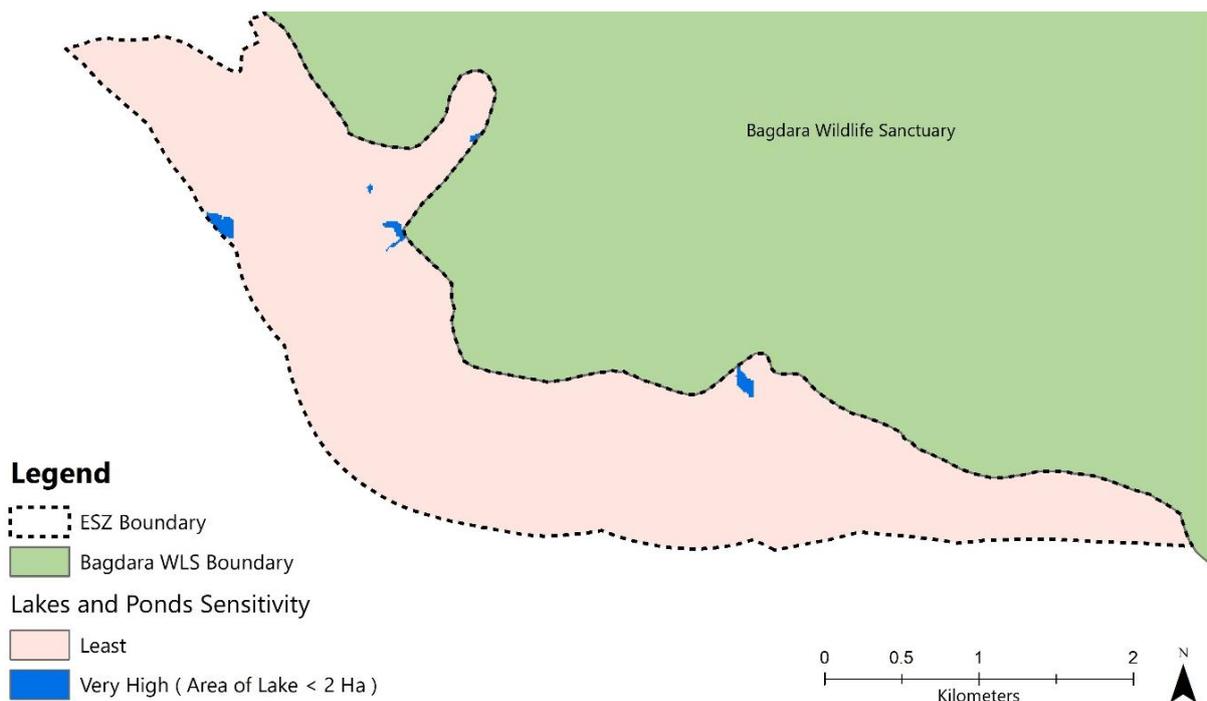
¹⁷ <https://eaaflyway.net/wp-content/uploads/2017/11/WRCWN04.pdf>

Map 2: Sensitivity of Streams in Bagdara ESZ



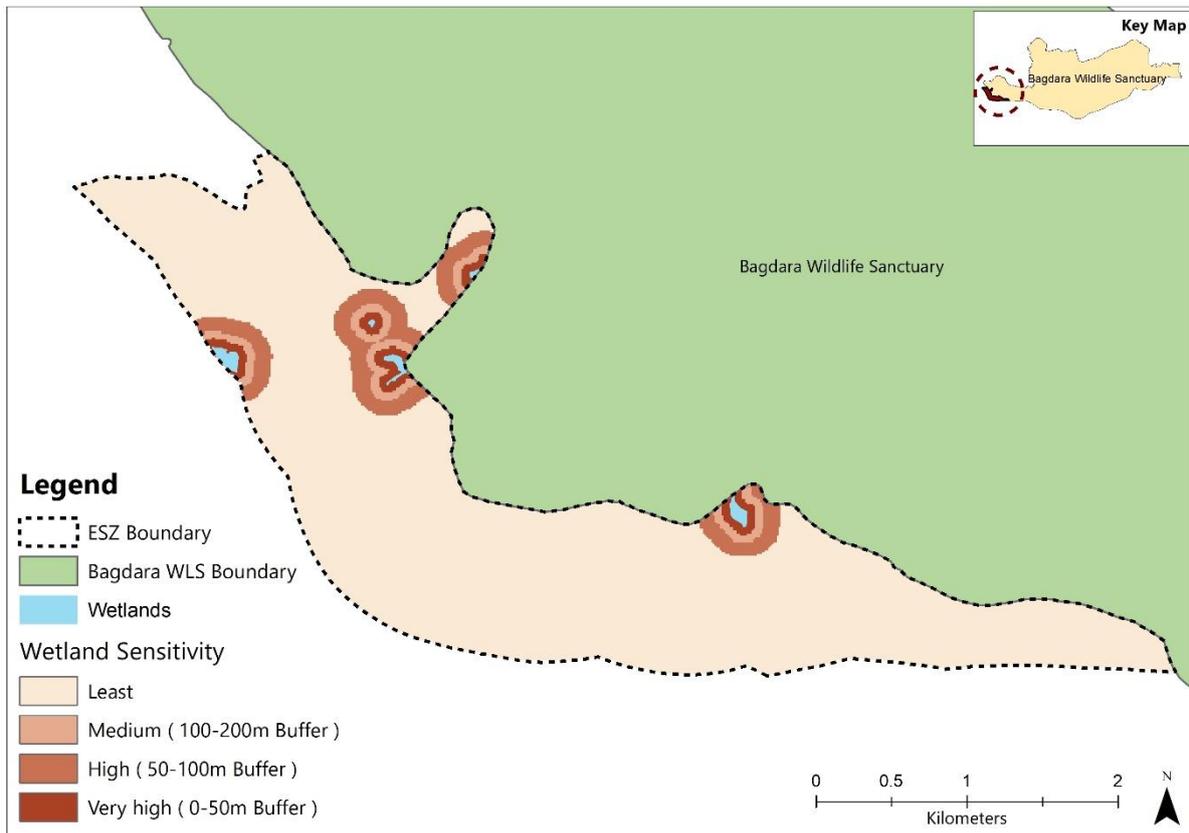
- Lakes and Ponds:** Sensitivity of lakes and ponds for eco sensitive zone of Bagdara wildlife Sanctuary have been analysed as mentioned in Table above. As shown in map below, there are around five very small and sensitive water bodies present in the ESZ. Three out of five water bodies fall exactly on the edge of the wildlife sanctuary as a part of dense forest vegetation, which are the points of wildlife congregation due to edge effects. Whereas in the southern region of the wildlife sanctuary and along the water body there are also sparsely spread settlements observed

Map 3: Sensitivity of Lakes in Bagdara ESZ



- **Wetlands:** Sensitivity of wetlands for eco sensitive zone of Bagdara wildlife Sanctuary have been analysed as mentioned in table above. As shown in map below, around 3% of the area along the wetlands is very highly sensitive, 5% highly sensitive, 7% medium sensitive. Concentration of wetlands observed in the southwestern region of the wildlife sanctuary in Baghor Village which can probably be developed in integration of forest areas present in the wildlife sanctuary considering the wildlife sensitivity criteria.

Map 4: Sensitivity of Wetlands in Bagdara ESZ



2.1.1.3 Flow Direction

The quality of streams running through the protected areas is not related to the size of these areas, but reflect land use. In the protected areas, the biological quality of streams was higher than for the same streams in the surrounding territory provided that anthropogenic changes were fewer. These data indicate that the creation of protected areas per se does not increase freshwater biodiversity and that land use has a major impact on the biological quality of the stream in a protected area. (Research based in Italy, on 23 streams in and around the P.A.s)^{18, 19}

A. Flowing into the P.A.

Water of the streams flowing into the protected area, is consumed by wildlife and by community for irrigation, therefore, should not be polluted/ disturbed by any interventions

¹⁸[https://www.researchgate.net/publication/225263185 Biological quality of running waters in protected areas The influence of size and land use](https://www.researchgate.net/publication/225263185_Biological_quality_of_running_waters_in_protected_areas_The_influence_of_size_and_land_use)

¹⁹ <https://link.springer.com/article/10.1007/s10531-004-5355-8>

B. Flowing out of the P.A.

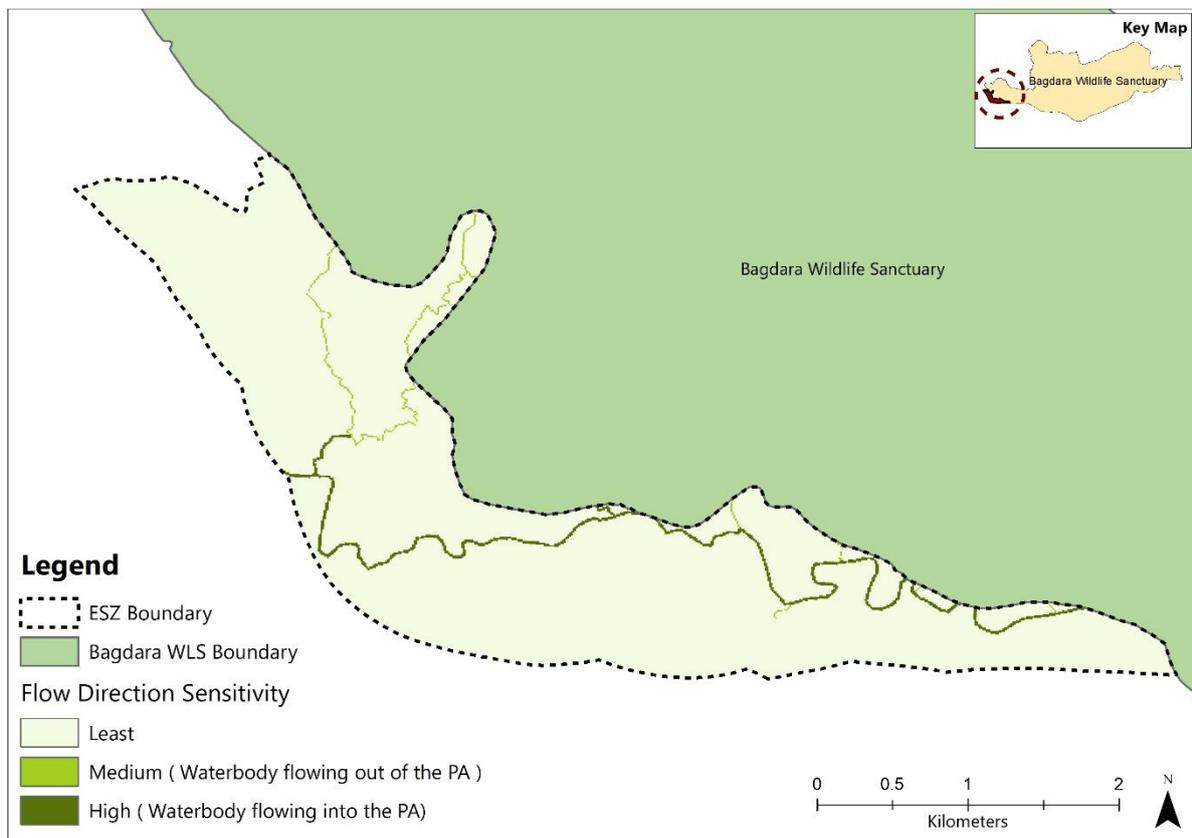
Water from streams flowing out of the protected area can be utilized for various purposes. The sensitivity of the streams with respect to the flow direction is categorized in table below.

S. No.	Parameter	Sub- Parameter	Sensitivity
1	Flow Direction	Flowing into the P.A.	Very High
2		Flowing out of the P.A.	Medium

C. Case Study – Bagdara Wildlife Sanctuary

Sensitivity of streams in eco sensitive zone of the study area is also analyzed based on its flow direction as mentioned in Table above. As shown in map below, the streams flowing in the southern part of eco sensitive zone are in the direction towards the wildlife sanctuary area, making the area in the southern region of wildlife sanctuary more sensitive as compared to the north region. A linear and nuclear settlement pattern of is observed across the streams flowing into the protected area making those streams more sensitive to anthropogenic activities.

Map 5: Sensitivity of Stream Flow Direction in Bagdara ESZ



2.1.1.4 Land Use

Sustainable utilization of land can be beneficial to humankind in generating economic benefits from the land parcel. However, as per Thomas Koellner and Roland W. Scholz, in Assessment of Land Use Impacts on the Natural Environment Part 2: Generic Characterization Factors for Local Species Diversity in Central Europe *“It has caused many adverse impacts on the biodiversity. It has been negatively influenced by the intensive agriculture, forestry and increase in the urban area and infrastructure.”* Environmental sensitivity of the different land uses has been analyzed for a better understanding of the environmentally critical areas and possible interventions.

The broad classes of land use used in the process of ESA are: Forest, Forest (Deciduous, Dense), Forest (Deciduous, Open), Forest Scrub, Tree Clad Area, Tree Plantation Area,

Wasteland Scrub, Gullied/Ravenous Wasteland, Agricultural Crop Land (1 Season), Agriculture Crop land (2 Season), Agriculture Fallow Land, Wetlands, Water bodies, and Other Land Uses.

A. Forest

As per the India Forest Act, 1927, forests are classified into: i) Reserved Forest; ii) Protected Forest.

- ✓ **Reserved Forest:** The State Government may constitute any forestland or waste-land which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest-product of which the Government is entitled, a reserved forest in the manner hereinafter provided.

Activities prohibited in reserved forest are:

- clearing
 - setting fire to a reserved forest, or,
 - trespasses or pastures cattle, or permits cattle to trespass;
 - causes any damage by negligence in felling any tree or cutting or dragging any timber;
 - fells, girdles, lops, or bums any tree or strips off the bark or leaves from, or otherwise damages, the same;
 - quarries stone, bums lime or charcoal, or collects, subjects to any manufacturing process, or removes, any forest-produce;
 - clears or breaks up any land for cultivation or any other purpose;
 - in contravention of any rules made in this behalf by the State Government hunts, shoots, fishes, poisons water or sets traps or snares;
 - in any area in which the Elephants Preservation Act, 1879 (6 of 1879), is not in force, kills or catches elephants in contravention of any rules so made,
- ✓ **Protected Forest:** The State Government may, by notification in the Official Gazette, declare any forest-land or waste-land which, is not included in a reserved forest but which is the property of Government, or over which the Government has proprietary rights, or to the whole or any part of the forest produce of which the Government is entitled as protected forest.
 - ✓ **Forest (Deciduous): Dense.** Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.
 - ✓ **Forest (Deciduous): Open.** Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.
 - ✓ **Forest: Scrub.** Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.
 - ✓ **Forest: Tree Clad Area.** Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.
 - ✓ **Forest: Tree Plantation.** Reserved, Protected and Village Forest categorization (high sensitivity), thus limiting activities.
 - ✓ **Wasteland: Scrub.** Culturable wasteland, with scrubs and dominant plantation. These are dry and hot during summer season.
 - ✓ **Wasteland: Gullied/ Ravenous.** These are culturable wasteland. This is caused majorly by water erosion and most eroded due to soil erosion. These wastelands can be converted into culturable land after required treatment and interventions.
 - ✓ **Agriculture: Cropland (1 season).** The current fallow land is the land under 1 crop harvest per season. The stress and resource utilization on this type of agricultural land (1 crop per season) is lesser as compared to the agricultural land under 2 seasons cropping.

- ✓ **Agriculture: Cropland (2 season).** The land under 2 season agricultural cropping puts more stress on land and resource utilization as compared to single season crop agriculture.
- ✓ **Agriculture: Fallow.** The fallow land as per census is the land kept unseeded/uncultivated for 1-5 or more years, thus, exercising least impact on natural resources and giving the land time for rejuvenation. The land is culturable, therefore, should not be open to land use change.
- ✓ **Wetland.** Wetlands provide food and habitat for many terrestrial and aquatic species; wetland biodiversity is often higher than that of adjacent ecosystems. They play a major role in the biosphere by providing habitats for several plants, animals, and other forms of life; they may also serve as the last refuges for many rare and endangered species. In addition, wetlands can affect the export of organic materials and serve as a sink for inorganic nutrients and atmospheric carbon.
- ✓ **Waterbodies.** Natural ecosystems are heavily dependent on water, as it is essential to the development of life. The ecology and landscape play an important role in the quality and availability of water.²⁰
- ✓ **Remaining.** The remaining land use containing settlements and other infrastructure facilities. These have higher impact on the wildlife but are least sensitive to development.

The above-mentioned land uses along with their sensitivities have been presented in table below:

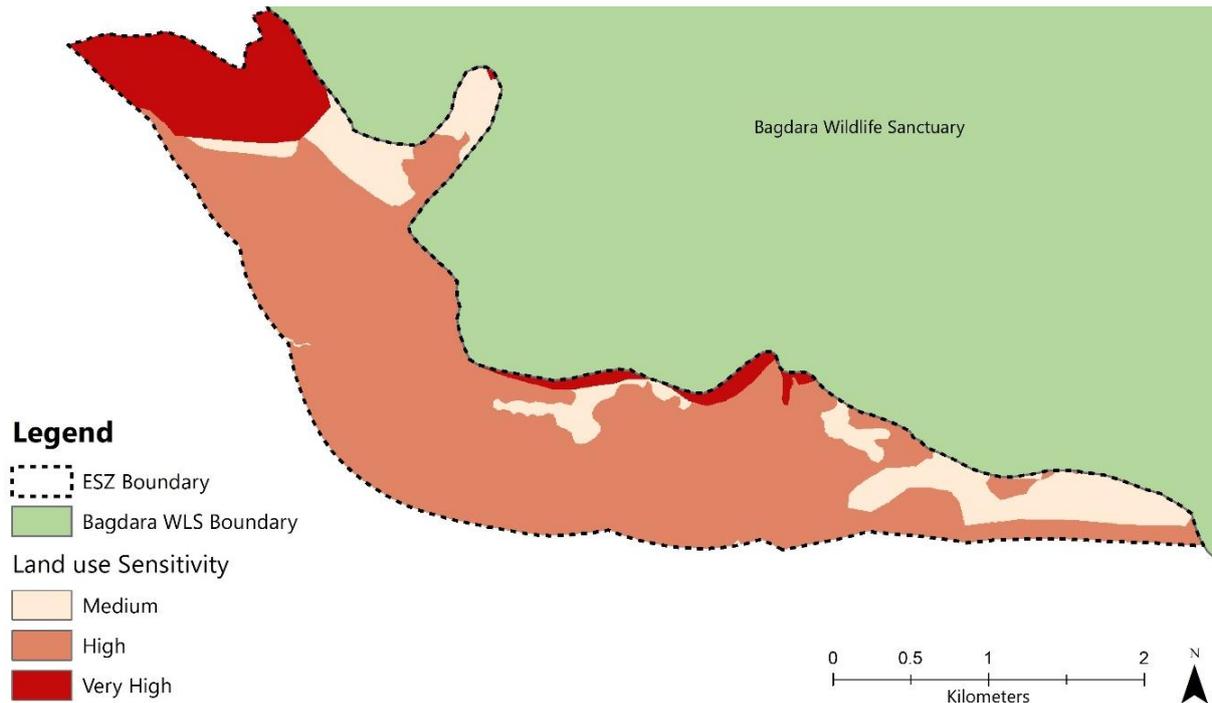
S.No.	Land Use	Sensitivity
1	Forest (Deciduous): Dense	Very High
2	Forest (Deciduous): Open	Very High
3	Forest: Scrub	Very High
4	Forest: Tree Clad Area	High
5	Forest Plantation	High
6	Wasteland: Scrub land	Medium
7	Wasteland: Gullied/ Ravinous	Medium
8	Agriculture: Cropland (1 season)	Medium
9	Agriculture: Cropland (2 season)	High
10	Agriculture: Fallow	Low
11	Wetland	High
12	Water bodies	High
13	Remaining	Least

B. Case Study – Bagdara Eco Sensitive Zone

Sensitivity to land cover in eco sensitive zone of the study area is analyzed as mentioned in Table above. As shown in map below, the concentration of forest areas along the steep slope areas and the edges of wildlife sanctuary make it very highly sensitive. The presence of agriculture land around Baghor village, wasteland, and water bodies and sparse settlement across a large area of the ESZ makes it highly sensitive.

²⁰ <https://www.springer.com/gp/book/9783642163296>

Map 6: Sensitivity of various Landuse in Bagdara ESZ



2.1.1.5 Administrative Boundaries

Administrative boundaries and the activities within generally have a combined impact on the sensitivity of environment and ecosystem of any area. Environment Protected Area of a protected is much more critical and sensitive as compared to the environment of areas outside the Protected Area. However, the ESZ contain the Eco tone and this harbor rich biodiversity. The core and buffer boundaries of the ESZs are chosen here to analyze the environmental sensitivity for the study area.

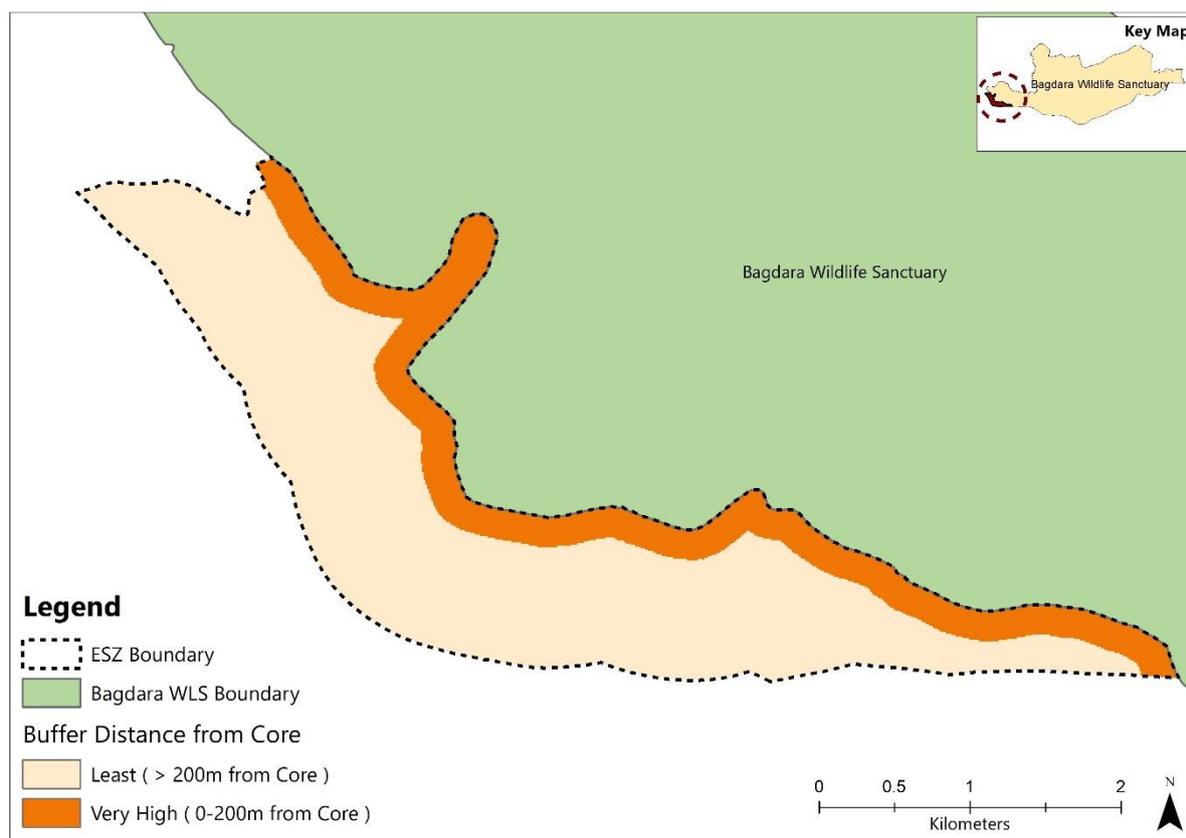
The sensitivity with respect to administrative boundaries is shown in table below.

S.No.	Boundary	Sensitivity
1	Core (Buffer of 200 m. from core)	Very High
2	Buffer	High

A. Case Study – Bagdara Eco Sensitive Zone

Environmental sensitivity of the areas in eco sensitive zone is also analysed based on its proximity to the boundary of core of protected area which harbour rich biodiversity due to edge effect. As shown in map below, the area of 200 meters along the boundary of Bagdara Wildlife Sanctuary is demarcated as very high sensitive area which are ecotones. The area comprises of around 15% of the ESZ, which requires careful planning consideration understanding the activities in that area will have a profound impact on the wildlife sanctuary and its environment.

Map 7: Sensitivity of Area based on Administrative Region in Bagdara ESZ



2.1.1.6 Ground Water Level

Groundwater is another crucial resource in the environment ecosystem. Despite being a replenishable resource, its availability is non uniform of space and time, making it an important component to assess environmental criticality of any area. The basis of the sensitivity analysis of ground water resources has been adopted from the report on initiative of the Government of India, the State Level Working Groups/Technical Committees on groundwater estimation to re-estimate the groundwater resource potential based on the guidelines of GEC-1997. It specifies that sensitivity of groundwater resources can be measured in terms of ground water level development which can be an indicator of fluctuations in levels of ground water²¹, which is mentioned in table below.

S.No.	Decadal fluctuations in Water Level	Sensitivity
1.	Less than 70%	Low
2.	70 - 90%	Medium
3.	90 - 100 %	High
4.	Above 100%	Very High

Block level data by Water Resource Department, Madhya Pradesh for 2015 and 2017 has been considered to calculate the level fluctuations in Ground water. The table above can be modified for calculating sensitivity of any area to ground water as shown in table below:

S. No.	Biennial Fluctuations in Water Level (2015 – 2017)	Sensitivity
1.	Less than 14%	Low
2.	14 - 18%	Medium
3.	18 - 20 %	High
4.	Above 20%	Very High

²¹ <http://www.mpwrd.gov.in/documents/18/4ed6a735-5bea-4ebc-848d-d99490bcc62e>

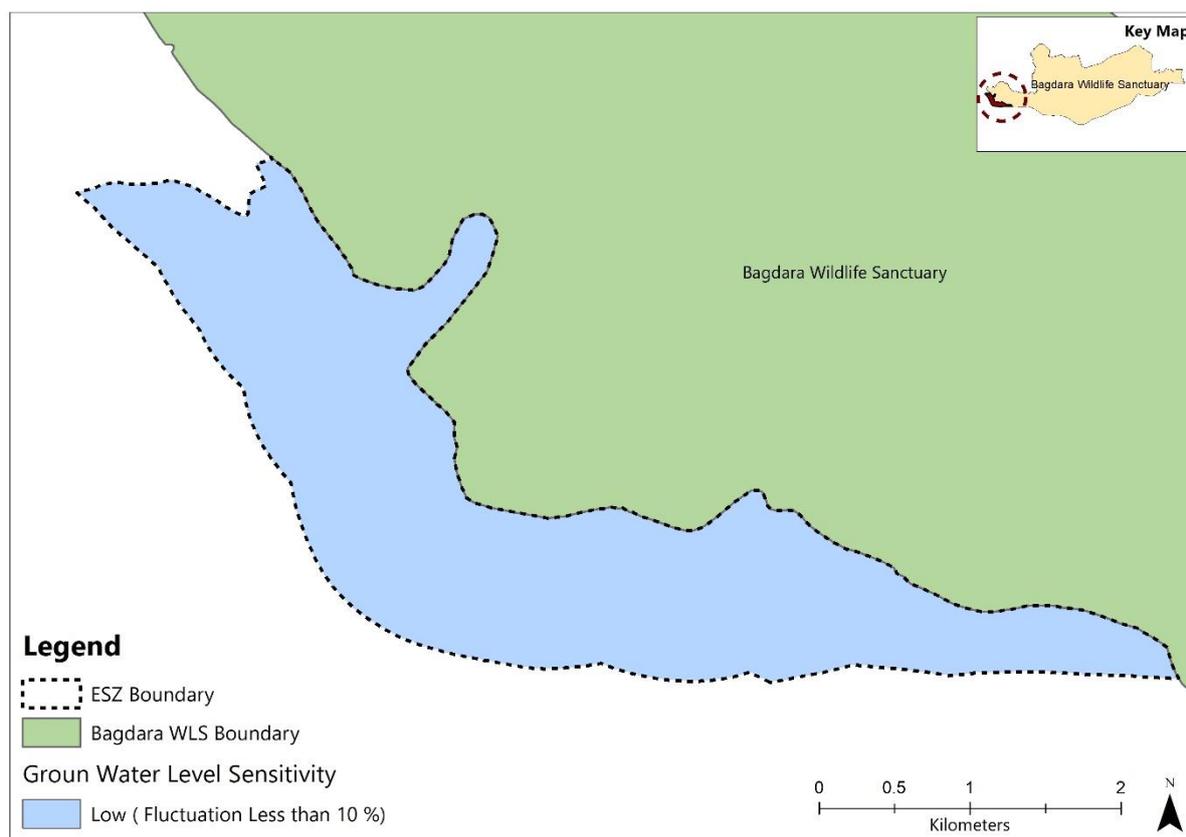
The calculations for ground water fluctuations have been done as per the formula shown:

$$\text{Fluctuations in G.W. Level} = \left[\frac{\text{G.W. Level for 2017} - \text{G.W. Level for 2015}}{\text{G.W. Level for 2015}} \right] * 100$$

A. Case Study – Bagdara Wildlife Sanctuary

Sensitivity to ground water in eco sensitive zone is analysed at block level as mentioned in Table above. As shown in below, entire ESZ have observed a biennial ground water level fluctuations of around 9% (Less than 10%), suggesting that ESZ have a very low sensitivity to ground water level fluctuations. However, the primary site visits and surveys suggests a high dependency of villagers on ground water resources which can be a threat in future periods.

Map 8: Sensitivity of Ground Water in Bagdara ESZ



2.1.1.7 Slope

Topographic condition is one of the significant aspects in determining the ecological sensitivity for an area. It not only defines the scope of human activities but also the chances of occurrences of natural disasters. Slope is one such indicator used here to determine the ecological sensitivity for the study area. Pranab Sen Committee ESA Report on steep and not so steep slopes classifies slopes with 20 degree or more as steep. "It may be seen that the 20° cut off recommended by the Committee represents the upper half of the "Steep" classification and higher gradients"²². The description of landscape with respect to slope as per the Committee is shown in table below.

Slope	Per cent	Description
-	0-3	Flat
2°	3-8	Gently sloping
4°	8-15	Sloping
8°	15-25	Moderately Steep

²² <https://www.ercindia.org/files/otherresource/Pranab%20Sen%20committee%20report%202000.DOC>

Slope	Per cent	Description
14°	25-50	Steep
26°	50-100	Very Steep
45°	>100	Extremely Steep

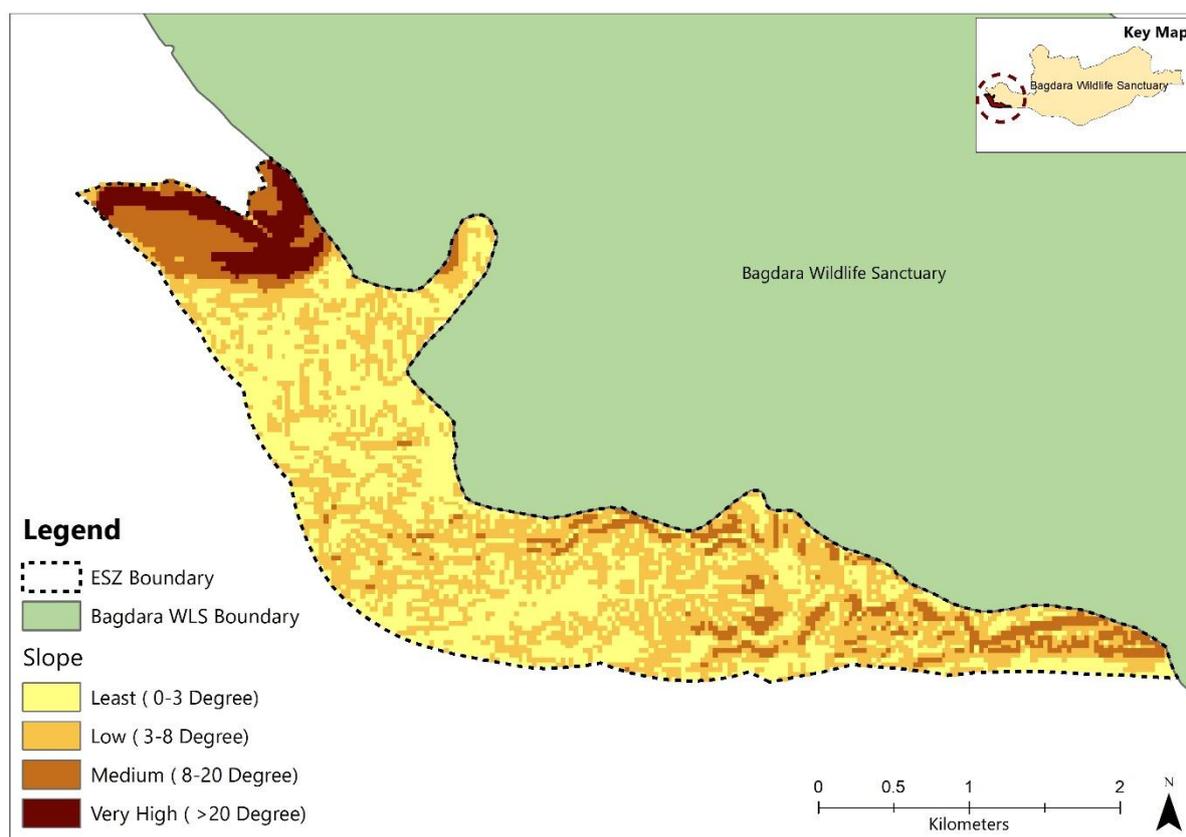
According to the slope categorization mentioned above, the sensitivity pertaining to slope is shown in table below:

S. No.	Slope	Sensitivity
1	>20 degree	Very High
2	8-20 degree	Medium
3	3-8 degree	Low
4	0-3 degree	Least

A. Case Study – Bagdara Eco Sensitive Zone

Slope in eco sensitive zone of Bagdara wildlife Sanctuary has been analysed as mentioned in Table 13. As shown in map below, around 15% of the area is very highly sensitive in reference to slope. It shows that the areas in the south - western region of Bagdara wildlife sanctuary have a slope >20 degree. Understanding the fact that steep slopes naturally restrict human activities and create an environment that supports thriving of diverse organism such area are suggested to be planned accordingly.

Map 9: Sensitivity of Slope in Bagdara ESZ



2.1.1.8 Summary of sensitivity Index parameters

S. No.	Parameter	Sub- Parameter	Sensitivity	Score	Weightage	
1	Wildlife	Major Wildlife Corridors	Very High	5	18	
2		Minor Wildlife Corridors	High	4		
3		Wildlife Habitats and Congregation Areas	Very High	5		
1	Surface Water	Stream Order 1	100 m.	Very High	5	21

Zonal Master Plan of Bagdara Eco-Sensitive Zone

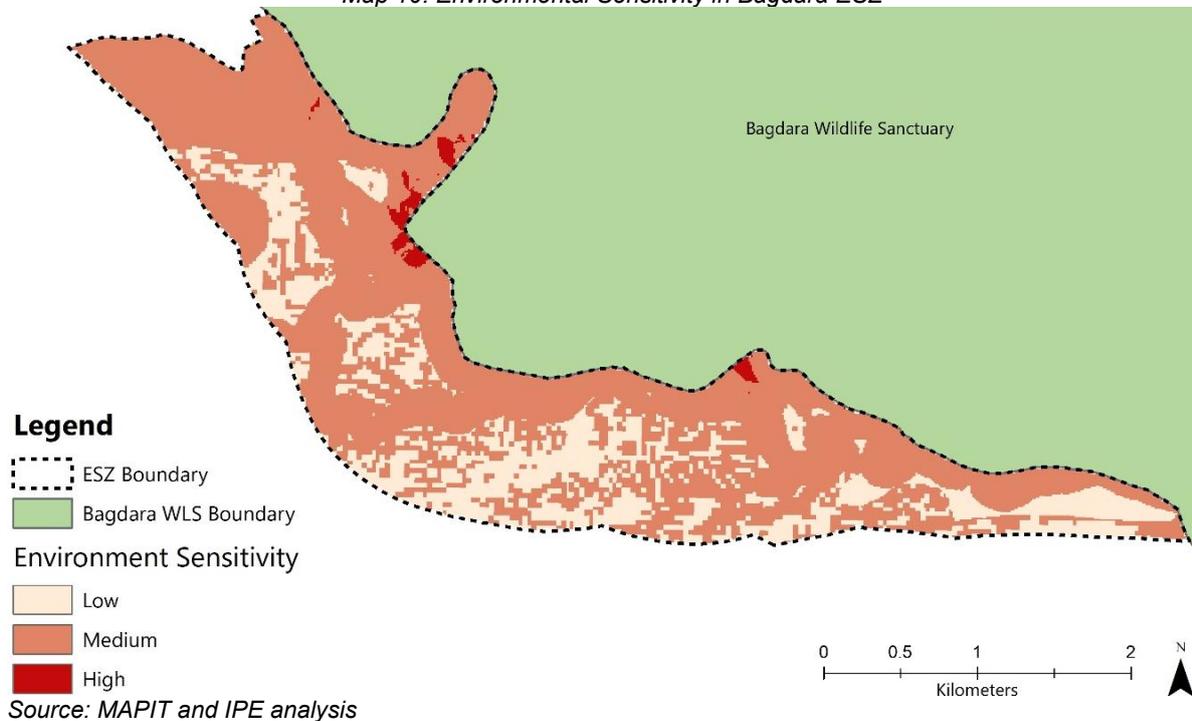
S. No.	Parameter	Sub- Parameter	Sensitivity	Score	Weightage	
2		Stream Order 2	90 m.	Very High	5	
3		Stream Order 3	80 m.	Very High	5	
4		Stream Order 4	70 m.	High	4	
1	Lakes and Ponds	Area of Water body < 2 Ha.	Very Small Lakes	Very High	5	8
2		Area of Water body 2 – 4 Ha.	Small Lakes	High	4	
3		Area of Water body > 4 Ha.	Medium Lakes	Medium	3	
1	Wetland	Buffer from Wetland	50 m	Very High	5	7
2			100 m	High	4	
3			200 m	Medium	3	
1	Flow Direction	Flow Direction	Flowing into the P.A.	Very High	5	7
2			Flowing out of the P.A.	Medium	3	
1	Land use	Forest	Forest (Deciduous): Dense	Very High	5	22
2			Forest (Deciduous): Open	Very High	5	
3			Forest: Scrub	Very High	5	
4			Forest: Tree Clad Area	High	4	
5			Forest Plantation	High	4	
6		Wasteland	Wasteland: Scrub land	Medium	3	
7			Wasteland: Gullied/ Ravenous	Medium	3	
8		Agriculture	Agriculture: Cropland (1 season)	Medium	3	
9			Agriculture: Cropland (2 season)	High	4	
10			Agriculture: Fallow	Low	2	
11		Wetland	Wetland	High	4	
12		Water bodies	Water bodies	High	4	
13		Remaining	Remaining	Least	1	
1	Administrative Boundaries		Core	Very High	5	7
2			Buffer	High	4	
1	Ground Water Level	Decadal fluctuations in Water Level	Less than 70%	Low	2	5
2			70 - 90%	Medium	3	
3			90 - 100 %	High	4	
4			Above 100%	Very High	5	
1	Slope		>20 degree	Very High	5	4
2			8-20 degree	Medium	3	
3			3-8 degree	Low	2	
4			0-3 degree	Least	1	

Legends

Sensitivity	Score
Very High	5
High	4
Medium	3
Low	2
Least	1

The parameters thus after being analysed in isolation were evaluated in interrelation to each other, by weighing each parameter using analytical hierarchy process. The final zoning can be summarised as shown in table above. There is around 1.23% of highly sensitive area concentrated on the boundary that edges Bagdara wildlife Sanctuary. Whereas the medium and low sensitive areas come out to be 72.80% and 25.7% respectively. Highly sensitive areas can clearly be demarcated in the region which can be left as it is without much intervention or allowance of anthropogenic activities.

Map 10: Environmental Sensitivity in Bagdara ESZ



2.1.2 Human Activity and Impact assessment

Activity Intensity mapping exercise analyses the impact of human activities in the study area in context to the natural environment. It identifies the severity of the impact of anthropogenic activities in the buffer area of the notified eco sensitive zone. The categories of anthropogenic activities taken into consideration for analysis are:

- Movement of Vehicular Traffic / Passing of Railway Line
- Passing of Transmission lines
- Population Density
- Built Environment
- Agriculture
- Cooking fuel
- Ground Water Extraction
- Livestock Rearing
- Noise and Settlement
- Forest Dependency

2.1.2.1. Movement of vehicular traffic / Passing of railway line

The growing network of roads in rural landscapes is creating new challenges and opportunities for transportation planning and the conservation of wildlife habitat. One concept for evaluating the ecological footprint of rural road networks and establishing wildlife conservation measures is the “**road-effect zone**”, which is a measure of the spatial extent of ecological effects that extend beyond the physical edge of roads.

As one of humanity's most prolific linear infrastructures, roads are an important direct driver of habitat conversion. Beyond simply reducing the extent of suitable habitat, roads can act as population sinks for many species through traffic-induced mortality. Roads also fragment otherwise contiguous blocks of habitat, and create edge effects such as reduced humidity and increased fire frequency that reach well beyond the roads' immediate footprint. Finally, roads provide conduits for humans to access nature, bringing hunters and nature users into otherwise wilderness locations.

Study – the data on the distribution of roads from the global roads open access data set, and excluded all trails and private roads, which were inconsistently mapped. The data set is the most comprehensive publicly available database on roads, which has compiled nationally mapped road data spanning the period 1980–2000. We mapped the direct and indirect pressure of roads by assigning a pressure score of 8 for 0.5 km out for either side of roads, and access pressures were awarded a score of 4 at 0.5 km and decaying exponentially out to 15 km either side of the road.

While railways are an important component of our global transport system, their pressure on the environment differs in nature from that of our road networks. By modifying a linear swath of habitat, railways exert direct pressure where they are constructed, similar to roads. However, as passengers seldom disembark from trains in places other than rail stations, railways do not provide a means of accessing the natural environments along their borders. To map railways, we used the same data set as was used in the original footprint, as no update of this data set or alternate source has been developed. The direct pressure of railways was assigned a pressure score of 8 for a distance of 0.5 km on either side of the railway.

More recently, study of the effect of road noise on bird populations appears to have resumed with re-evaluation of data from an early study from the Netherlands on grassland habitats (Veen, (119) c.f. van der Zande et al., (116)) that concluded some species would avoid rural roads to a distance of **500-600 m** and busy highways to **1600-1800 m**. The data were subsequently reviewed and it was concluded that road noise appeared to be significant in the distribution (i.e., reduced nest density) of the lapwing (*Vanellus vanellus*), black-tailed godwit (*Limosa limosa*) and, perhaps the redshank (*Haematopus ostralegus*), however the effect was not found for the oystercatcher (*Tringa tetanus*). (116) The levels of noise were not measured in this study. A further series of studies from the Netherlands has supported this argument finding that numbers of breeding birds in wooded areas declined significantly near roads and in proportion to the density of traffic on the road. Reijnen et al. (96) reported a reduction in the numbers of breeding birds adjacent to a busy highway (30,000-40,000 vehicles/day) and at a distance of 300 m. The level of noise was not measured. Reijnen and Foppen (97) studied the willow warbler (*Phylloscopus trachilus*) and found that the density of territorial males was lower distances of up to 200m than at greater distances (up to 400 m). Also, older males were more abundant further from the road. It is suggested that noise may have an important effect (predicted to have a mean of 50 dB(A) at 500 m) along the highway (traffic density 50,000 cars/day). The dispersal of the breeding males away from the road was broken down subsequently to be progressively increasing in zones of 0-200 m, 200-400 m and a >400m control zone. Reijnen and Foppen(98) found 17 of 23 species studied for three years showed some negative effect of road (40-52,000 cars/day). The effect was diminished in years in which the overall population size was large and they suggest measuring effects of several years to ensure an accurate measure of the effect. Similar reductions in grasslands were reported in a subsequent study of 12 passerine species where the density of 7 were found to be reduced and predicted by the number of cars and distance from the road.(100) The effect appears to be most significant above a noise level of about 50 dB(A) with a level of 70 dB(A) on the verge of the road. At a traffic density of 5,000 cars/day most species showed a reduction of 12-56% within 100 m of the road. At distances of **> 100m** only the black-tailed godwit (*Limosa limosa*) and oystercatcher (*Haematopus ostralegus*) showed reduction in density. At a traffic density of 50,000 cars/day density was reduced between 12 and 52% for all species studied at distances of up to 500 m. Sensitive species include both waterfowl (shoveler ducks) and

passerine species (black-tailed godwit, oystercatcher, lapwing, skylark) that were reduced in density between 14 and 44% up to a distance of **1500 m** making it difficult to determine any particular group that might be more sensitive.

A more extensive study of 43 species of woodland birds in both deciduous and coniferous forests found that 26 (60%) showed some reduction in density adjacent to the road. (99) Noise was the only factor found to be a significant predictor and the number of cars and distance from the road were significant factors in the number of breeding birds. The “effect distances” were **40-1500 m** (10,000 cars/day) and **70-2800m** (60,000 cars/day). There was a reduction in density at 250 m from the road of between 20 and 98%. The frequency range of road noise was 100 Hz to 10 kHz with the loudest in the range of 100-200 Hz and 0.5-4 kHz with a threshold at between 20 and 56 dB(A). The authors note that if noise were constant there was no difference between plots with high and low car visibility. Further it is noted that there is no pattern of interference with song calls and, thus, the immediate cause of the effect is not apparent. It is suggested that a supplementary aspect may be stress.

A study along an interstate highway in the United States supported the findings previously reported (41, 96-100), however, the results rely heavily on assumptions from the work in the Netherlands being applicable and there is limited original data that would more conclusively support the earlier findings. (44) A **>100 m** avoidance zone is reported for moose, deer, amphibians, forest and grassland birds. Moose corridors and grassland bird avoidance extended **>100 m**. However, grassland bird data are scarce and scattered in the open areas near the highway and woodland bird data is extrapolated from the earlier studies by Reijnen and colleagues (41, 96-100). More recently, Forman et al. (45) reported that several species of grassland bird (especially the bobolink and eastern meadowlark) decreased in numbers and breeding in patches as the amount of traffic on roadways increased. At light traffic volumes of between 3,000 and 8,000 vehicles there was no effect on distribution, whereas moderate traffic levels of between 8,000 and 15,000 vehicles/day had no effect on the presence of birds, however, breeding was reduced to **400 m**. Both presence and breeding of birds was reduced at traffic levels between 15,000 – 30,000 vehicles/day to a distance of **700 m** and at >30,000 vehicles/day both presence and breeding were reduced up to a distance of **1200 m**. The species affected are mainly the bobolink and eastern meadowlark. The levels of noise in this study are not given although studies that manipulate noise levels are suggested.

In a nocturnal species (the stone curlew, *Burhinus oedicephalus*) in England, roads were found to reduce numbers at distances of up to **3 km**. (56) The authors suggest that visual stimuli (headlights) could have a greater effect than noise alone even though traffic noise or vehicle movements are suggested as primary causes. (56) It should be noted that, in this study there was no evidence of a lessening of the effect if nearby suitable habitat (away from the road) was scarce or abundant.

The general conclusion is that some (although not all) bird species are sensitive at least during breeding to noise levels and that the distances over which this effect is seen can be considerable varying from a few meters to more than **3 km** (see Appendix A - Table 1 for a summary)

The goats did not seem to be disturbed by the noise from trains. Rost and Bailey (102) found that deer and elk avoided coming within 200 m of roads (paved, gravel and dirt)²³

The potential for distant machine noise to have a negative impact is suggested at distances between 100 m and **< 1 km**.²⁴ (Studies on Rhesus Monkeys in the lab have shown that a 30% increase in blood pressure following exposure to as an average 85 dB)²⁵. As per the study

²³ [https://www.fhwa.dot.gov/ENVIRONMENT/noise/noise effect on wildlife/effects/wild04.cfm](https://www.fhwa.dot.gov/ENVIRONMENT/noise/noise%20effect%20on%20wildlife/effects/wild04.cfm)

²⁴ <https://www.nap.edu/read/23479/chapter/4#20>

²⁵ <http://www.naturesounds.org/conservENW.html>

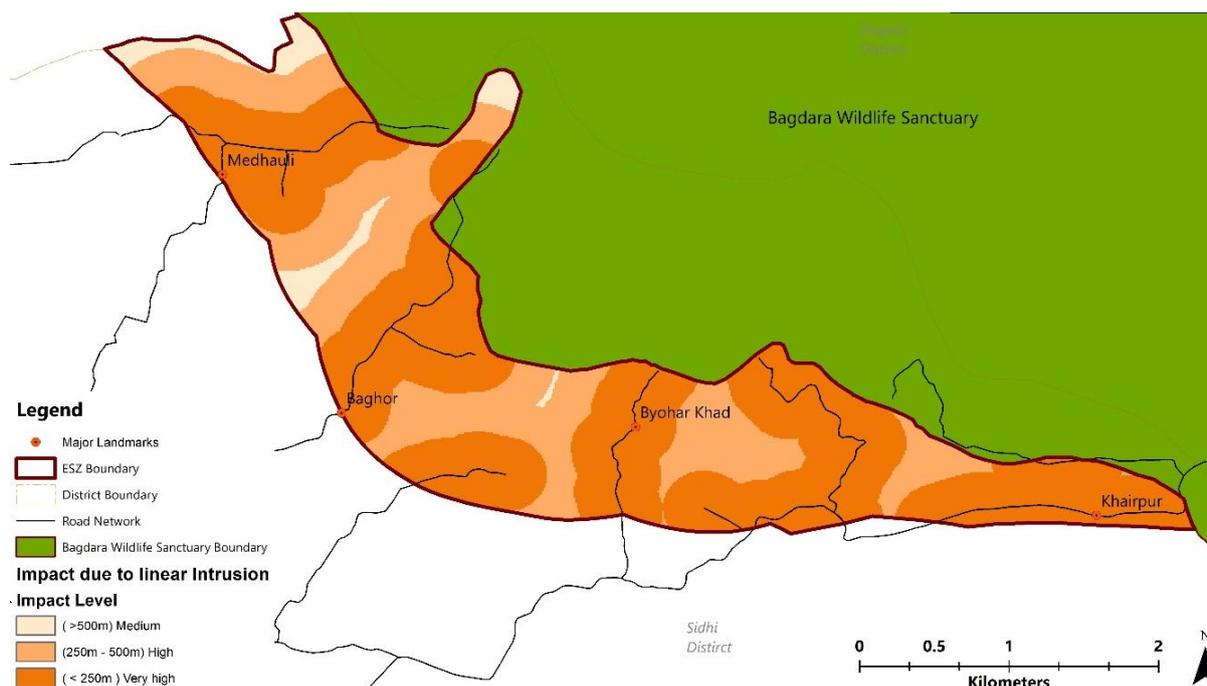
conducted in the link below, the impact of Highways which has high –speed vehicular traffic is considered equivalent to railway lines on wildlife movement.

Sr. No.	Road effect zone for National and State highway (30k-60k vehicles/day) or passing up of railway line	Impact
1	Less than 500m	Very high
2	500m - 1000m	High
3	1000m - 3000m	Medium
4	More than 3000m	Low

Dispersed off-highway vehicle activity on rural road networks creates a disturbance that reduces the effective amount of wildlife habitat and therefore has the potential for an extensive road-effect zone. A spatially explicit study was conducted in rural Alaska, U.S.A to develop resource selection functions for wildlife (especially Moose) at three spatial scales (250 m, 500 m, and 1000 m).²⁶

Sr. No.	Road effect zone for District and local roads (3k-10k vehicles/day)	Impact
1	Less than 250m	Very high
2	250m - 500m	High
3	500m - 1000m	Medium
4	More than 1000m	Low

Map 11: Impact by movement of vehicles through Bagdara ESZ



2.1.2.2. Passing of transmission lines

Transmission lines bring power over long distances across the province, traversing forests, streams and other wildlife habitats. As a result, transmission lines have various effects on wildlife and wildlife habitats. Several construction factors may have an effect on wildlife and wildlife habitat. These include clearing and disposal of vegetation, temporary access trails, crossing water bodies, waste and chemicals and borrow pits. The best way to avoid negative effects on wildlife habitat is to avoid sensitive sites and to adopt variety of mitigation measures to reduce or eliminate negative effects when constructing transmission lines and its

²⁶ <https://esajournals.onlinelibrary.wiley.com/doi/10.1890/ES10-00093.1>

maintenance. These include generally accepted mitigation measures and opportunities to enhance habitat, such as establishing buffer zones around sensitive habitat or scheduling construction activities when they will be least disruptive.

As per the study conducted in Manitoba (*PDF- fur, feather, fins and transmission lines*) which outlines the effects transmission lines on wildlife and wildlife habitats.²⁷

Sr. No.	ROW from transmission lines	Impact
1	Less than 40m	Very high
2	40m - 80m	High
3	More than 80m	Medium

2.1.2.3. Population density

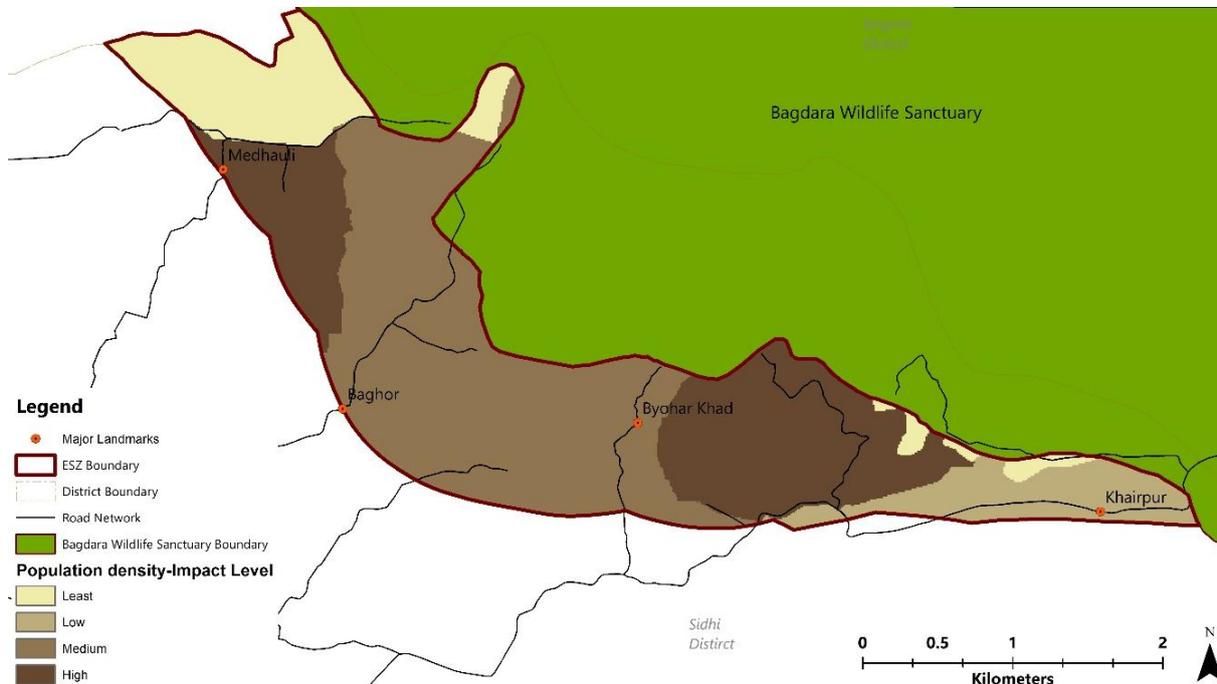
Many of the pressures humans impose on the environment are proximate to their location, these include pressures such as disturbance, hunting and the persecution of non-desired species. Moreover, even low-density human populations with limited technology and infrastructure developments can have significant impacts on biodiversity.

Study - Human population density was mapped using the Gridded Population of the World data set developed by the Centre for International Earth Science Information Network. For all locations with more than 1,000 people per sqkm, maximum impact was allotted. For more sparsely populated areas, we logarithmically scaled the pressure score (Levels of impact) using:

$$\text{Pressure score} = 3.333 \times \log(\text{population density} + 1) \quad (1)$$

Sr. No.	Population density	Impact
1	More than 1000 people per sq. km.	Very high
2	1000 – 500 people per sq. km.	High
3	500 – 250 people per sq. km.	Medium
4	Below 250 people per sq. km.	Low

Map 12: Impact by population density in Bagdara ESZ



²⁷ http://censusindia.gov.in/Census_And_You/housing.aspx

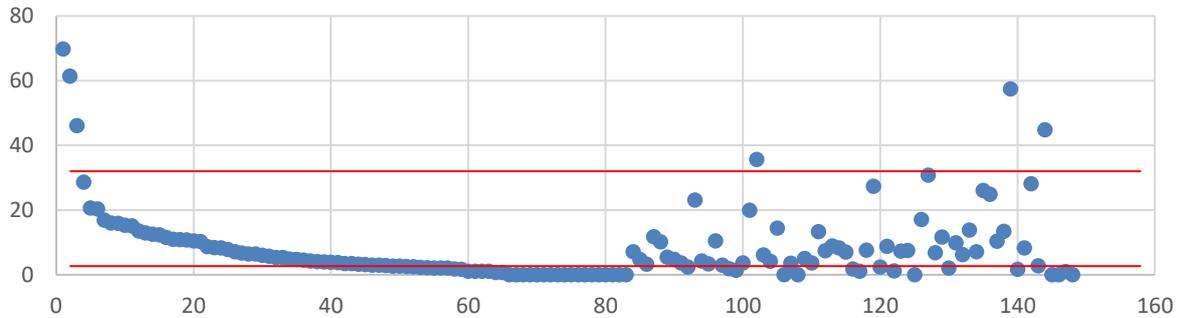
2.1.2.4. Built environment

Built environments are human-produced areas that provide the setting for human activity. In the context of the human footprint, we take these areas to be primarily urban settings, including buildings (made out of bricks, concrete and cement), paved land. Built environments do not provide viable habitats for many species of conservation concern, nor do they provide high levels of ecosystem services. As such, built environments were assigned high impact parameter on forest and wildlife.²⁸

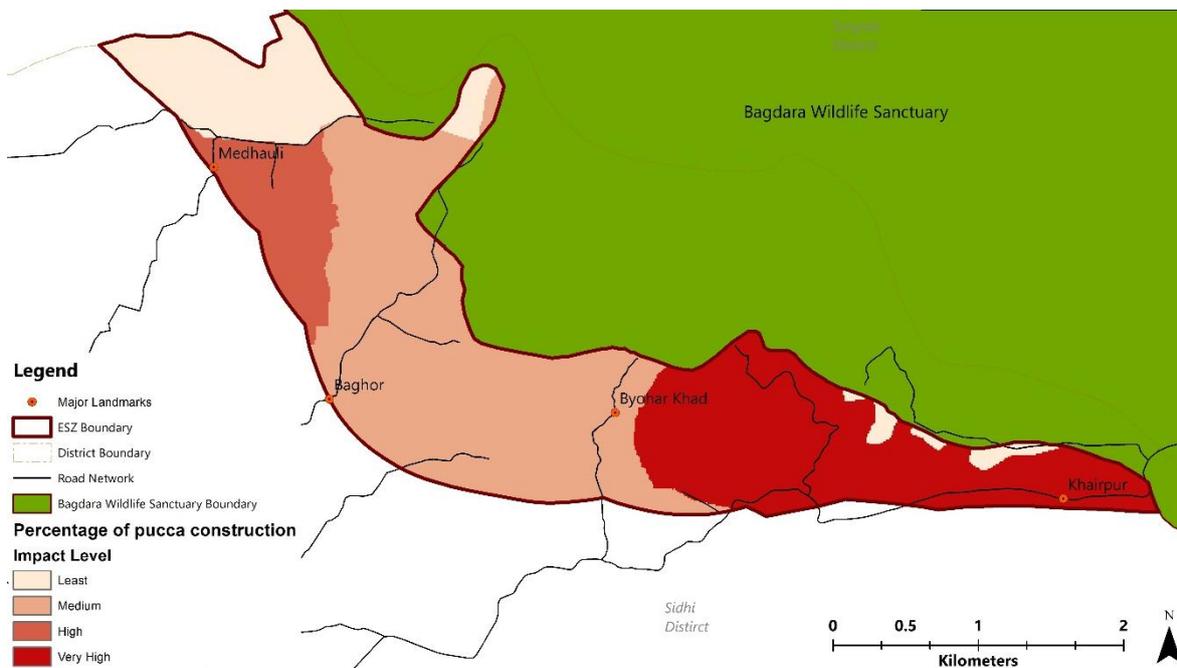
Concrete is one of the most widely used materials in the world, and the energy-intensive process to create it is the third largest source of planet warming CO₂. Of course, all that finished concrete around us not only inhibits biodiversity-wildlife doesn't find paved-over areas particularly hospitable-it also leads to pollution, erosion and flooding as torrents of run-off can't naturally percolate through soils as they make their way downstream. Yet another concern is that concrete absorbs much more heat than does soil, so cities are often significantly warmer than rural areas, exacerbating the greenhouse effect.²⁹

Sr. No.	% of pucca construction	Impact
1	More than 40 %	High
2	40% - 10%	Medium
3	Less than 10%	Low

Exhibit 2: % of pucca construction in Bagdara ESZ



Map 13: Impact by the construction of Pucca Houses in Bagdara ESZ



²⁸ <https://www.nature.com/articles/ncomms12558>

²⁹ http://censusindia.gov.in/Census_And_You/housing.aspx

2.1.2.5. Agriculture

Intensive agriculture, also known as intensive farming, is characterized by a low fallow ratio, higher use of inputs such as capital and labour, and higher crop yields per cubic unit land area. Fallows are non-productive periods that leave essential elements in abundance for the upcoming agro-ecosystem. The practice of fallow farming assumes that by clean cultivation the moisture received during the fallow period is stored for use during the crop season.

As per Indian Census, culturable land that is kept fallow for one reason or another can be classified as follows –

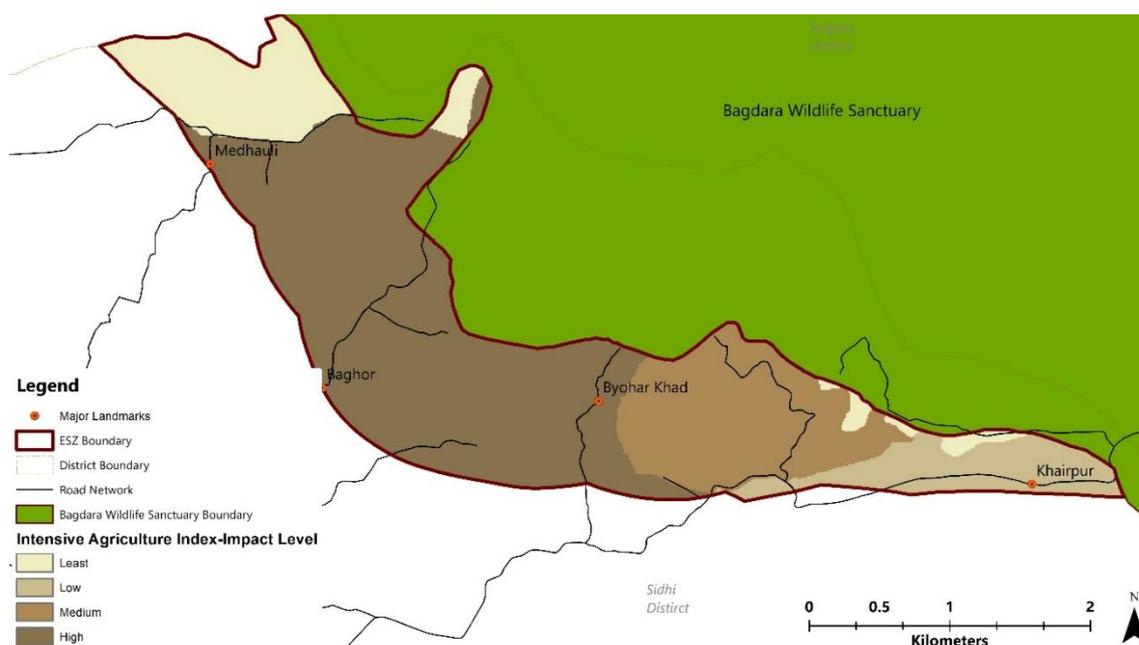
1. **Current fallow (<1 year):** Cropped area, which are kept fallow during the current year but was cultivated in the previous year.
2. **Fallow land other than current fallow (1 – 5 years):** All lands, which are taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years.
3. **Culturable Waste (>5 years):** All lands available for cultivation whether not taken up for cultivation or taken up for cultivation once but not cultivated during the current year and the last five year.

$$\begin{aligned} \text{Agriculture Intensity} &= \text{Net Area Sown} / \text{Net Culturable Land} \\ &= \text{Net Area Sown} / [\text{Net Area Sown} + \text{Total Fallow Land}] \\ &= \text{Net Area Sown} / [\text{Net Area Sown} + (\text{Current Fallow} + \text{Fallow Land other than current fallow} + \text{Culturable Waste})] \end{aligned}$$

Whether a village is subjected to intensive agriculture can be calculated by obtaining the ratio of Net Area Sown to Net Culturable Land. A high agriculture intensity ratio would suggest a high pressure on land resources without adequate fallow periods. The median and the third quartile value of agriculture intensity practiced in Bagdara ESZ is 0.60 and 0.75 respectively. Based on this data, we can classify the agriculture intensity as mentioned below;

Intensive Agriculture Index		
S. No.	Range	Impact
1	<0.6	Low
2	0.60 to 0.75	Medium
3	>0.75	High

Map 14: Impact by performing intensive agriculture (projected for future as well) in Bagdara ESZ



Source: MAPIT and IPE analysis

2.1.2.6. Cooking Fuel

According to Census 2011, firewood was the most extensively used cooking fuel which contributed to 98% of it. However, after the introduction of Ujjwala Scheme in 2016, the ground situation has drastically altered. As per June 2019, more than 64 lakh LPG connections have been released in MP.

Though Ujjwala has led to a substantial increase in LPG ownership among rural households, a study done by Gupta Vyas et.al. 2019 states only 22.6% of the rural population uses LPG solely.³⁰ The rest 77.2% of the population still continues to use chulha or a mix of chulha and LPG. This is because the vast majority of respondents believe that food cooked on chulha is tastier, and is better for the health of the person eating.

No. of households still using solid fuels in 2019 =
 No. of households dependent on solid fuels in 2011 * 0.78 (post- Ujjwala correction factor)

Based on the above factor, a **correction value of .78** has been applied to census data to obtain a true value of the percentage of households per village still using unsustainable sources of cooking fuel, which includes firewood, crop residue, coal, lignite, charcoal and kerosene. This data has been used to calculate the number of households in each village that still uses unsustainable solid fuels for Cooking.

A study focused on fuel wood consumption patterns by semi-nomadic pastoralist community around Corbett Tiger Reserve, India established that on an average the overall fuel wood consumption per day per family was 20.09 ± 0.7 kg, approximately 8 m^3 per year per family.³¹ However, under the current concept of green certification, a yield of $0.7 \text{ m}^3 \text{ ha}^{-1} \text{ year}^{-1}$ is suitable for the sustainable management of forest resources to meet future wood demands.³²

Excess Fuel wood Collected = Sustainable Yield – Total Extraction
 = $0.7 * \text{Forest Area} - 8 * \text{Total no. of households still using solid fuels post Ujjwala}$

Based on the available forest area and household data per village, the total sustainable yield and extraction have been calculated to obtain the excess of fuel wood collected by the villagers from the protected areas.

The data shows that than 75% of the villages in Bagdara obtain more than 154 m^3 of wood per year than the sustainable threshold level. The impact of consumption of fuel wood for cooking can be classified as follows –

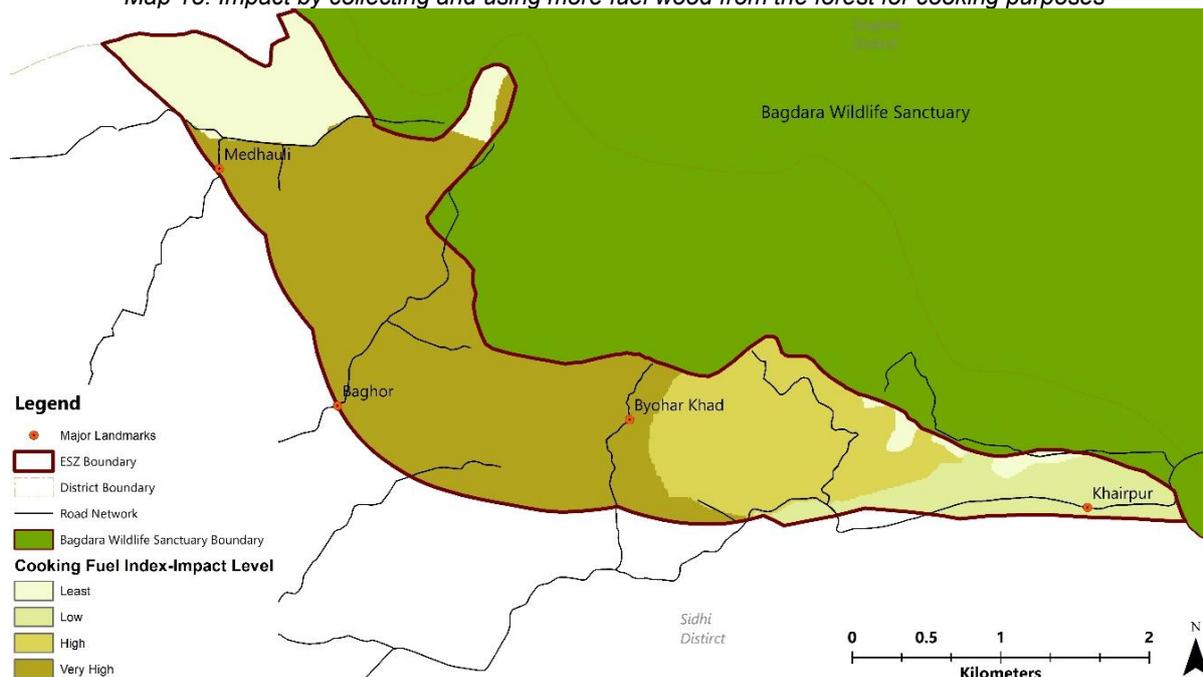
S. No.	Cooking Fuel Index (Range)	Impact
1	0 or above	Low
2	Less than 1 to -154	High
3	< - 154	Very High

³⁰ Gupta, A., Vyas, S., Hathi, P., Khalid, N., Srivastav, N., Spears, D., & Coffey, D. (2019). Persistence of solid fuel use despite increases in LPG ownership: New survey evidence from rural north India. doi: 10.31235/osf.io/yv2es

³¹ Hussain, A., Dasgupta, S., & Bargali, H. S. (2016). Fuelwood consumption patterns by semi-nomadic pastoralist community and its implication on conservation of Corbett Tiger Reserve, India. *Energy, Ecology and Environment*, 2(1), 49–59. doi: 10.1007/s40974-016-0050-7

³² Evans, J. (2001). *The forest handbook*. Oxford: Blackwell Science.

Map 15: Impact by collecting and using more fuel wood from the forest for cooking purposes



Source: MAPIT and IPE analysis

2.1.2.7. Ground Water Extraction

One of the major issues that was highlighted in the Bagdara Eco- Sensitive Zone is the decreasing ground water levels. On conducting Focused Group Discussions with the local communities, it was informed that the ground water levels have been decreasing rapidly in some areas, and some villages report it has gone below 100 ft. bgl.

Since the main livelihood of the people within the ESZ is agriculture, which is highly water dependent, this lowering of groundwater level affects the economic, social and health status of the residents. Moreover, the village community is highly dependent on ground water for fulfilling their needs of water like drinking, washing, cooking, bathing etc.

So, the ground water extraction is dependent two factors, first is ground water extracted for fulfilling the basic needs of villagers and second is the ground water extracted for irrigation purposes.

Basic requirements

As per the CPHEEO manual and the rural water supply scheme, 40 lpcd (Liters per capita per day) is the minimum water required in villages to fulfil their basic requirements. It is indicative quantity of water which is being extracted from groundwater in each village. The following is the breakup for the same.

Sr. No.	Activity	Water required /extracted (liters /person/day)
1	Drinking	5
2	Cooking	5
3	Bathing	5
4	Washing utensils	20
5	Washing cloths	10
6	Ablution	30
7	Cleaning house	10
TOTAL (LPCD)		40

Ground water extracted (liters) = Population of village * minimum water required by each person in a day as per the standards, 1 well serves 250 persons, so the minimum quantity of water that can be extracted from one well = 40lpcd * 250= 10000 liters per day.

As per the district ground water manual of Umaria, the sustainable yield of water that be extracted from ground water table from one well is 50000 liters per day.

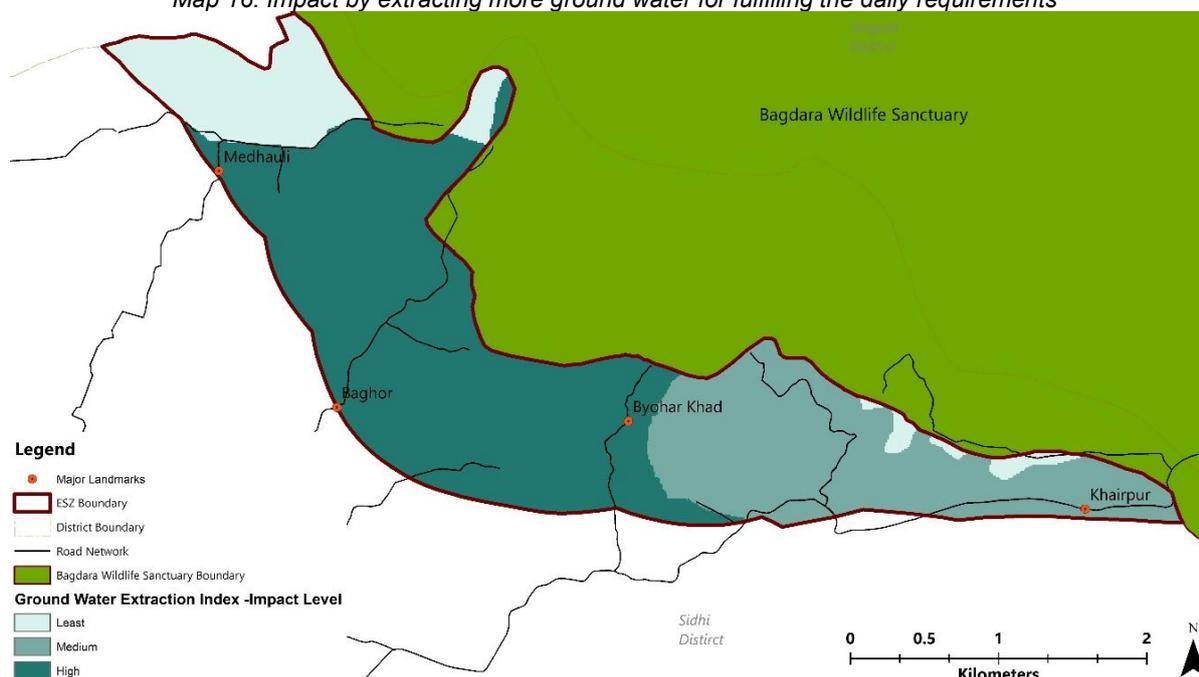
So, daily water requirement of the village people is very less as compared to the available water resources or the recharge the ground water table is very high as compared to the extraction.

Irrigation: The sensitivity of the ground water extraction depends upon the water required for irrigation purposes for Rice, wheat and other crops planted for 1 or 2 seasons.³³

Crop	Water requirement (liters per kg)
Rice / Kodo	4000-3000
Wheat	1500 - 1350
Makka	1200-1300
Food grains - Chana, Masoor	1000-1200
Fruits/vegetables	200-800

Sr. No.	Crops grown and their Water requirement of crops	Impact
1	Two crops are grown and both are high water intensive	Very high
2	Two crops are grown and One of them is high water intensive	High
3	Two crops are grown and both are less water intensive or only one crop grown which is high water intensive	Medium
4	Two crops are grown and one is least water intensive	Low
5	Two crops are grown and both are least water intensive or only one crop grown which is less water intensive	Least

Map 16: Impact by extracting more ground water for fulfilling the daily requirements



2.1.2.8. Livestock Rearing

As per Gol published 2019 report on Livestock ownership in India³⁴, for every 100 rural households in Madhya Pradesh there is an estimated number of 207 bovines and 50 ovine. To determine the impact of livestock rearing within the ESZ, the total number of bovines and

³³ https://www.researchgate.net/figure/Water-requirement-to-produce-different-crops-liter-kg_tbl1_311468386

³⁴ Ministry of Statistics and Programme Implementation, Government of India . (2016). Livestock Ownership in India. Livestock Ownership in India. New Delhi

Zonal Master Plan of Bagdara Eco-Sensitive Zone

ovines for each of the village has been calculated and been converted to Dry Sheep Equivalent (DSE) unit. DSE is a standard unit frequently used to compare the feed requirements of different classes of stock or to assess the carrying capacity and potential productivity of a given farm or area of grazing land. The DSE Values for some common livestock are as follows;

Sr.No.	Classes of Livestock	DSE Value
1	Cows: milking or double suckling (350kg to 500kg)	14.0 to 16.0
2	Dry milk or meat goat	1.5
3	Dry sheep: wethers, ewes, hoggets (45kg)	1.0

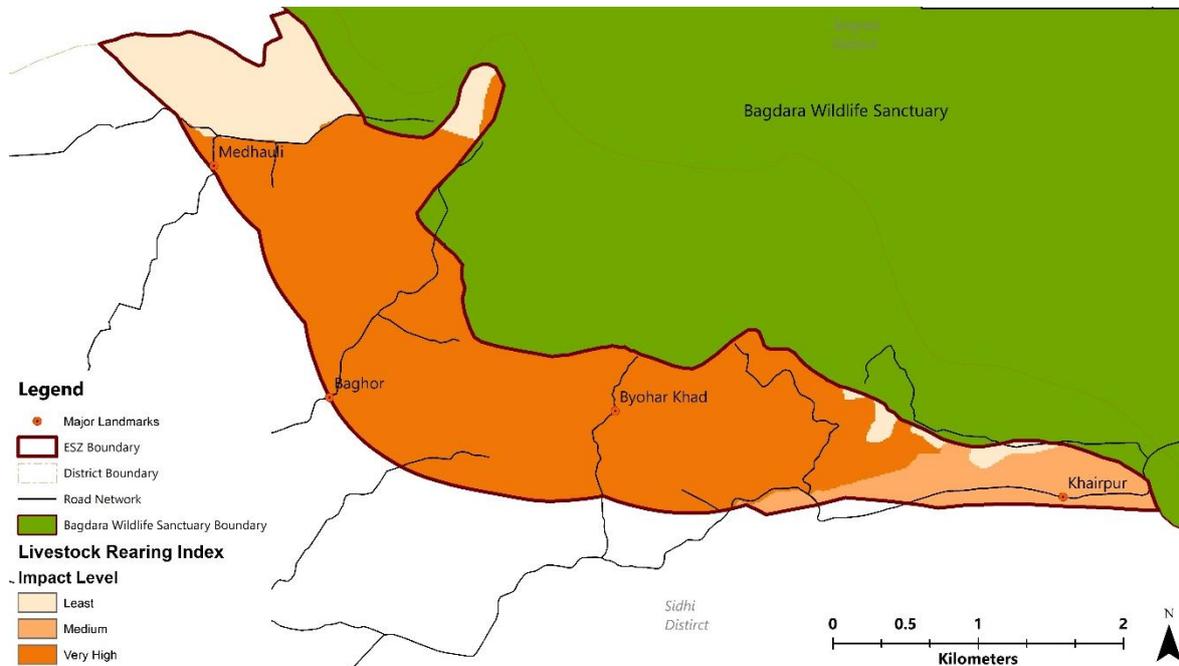
Hosking and Cameron (1985) suggested that improved pastures should carry 1 dry sheep equivalent per hectare (DSE/ha) for every 25 mm of rainfall above 250 mm. The average annual rainfall in Bagdara WLS being 1010 mm, it can be established that pastures within the ESZ have a carrying capacity of 30 DSE.

Due to the lack of proper grazing pastures and high dependency of the villagers on livestock, the average existing DSE per hectare in Bagdara is 120. This creates an increased pressure on the protected areas of the forest for grazing and a high probability of human-wildlife conflict. Based on census data information on grazing pastures and household, it is estimated that some of the villages are operating at a very high carrying capacity of 8733. However, restriction of forest land for grazing without providing adequate provisions for grazing of livestock can trigger a trophic cascade and results in dramatic changes in ecosystem structure and nutrient cycling.

The livestock rearing sensitivity has been classified as below;

Livestock Rearing Index		
S. No.	Range	Impact
1	30-60	Medium
2	60-120	High
3	>120	Very High

Map 17: Impact by rearing livestock in Bagdara ESZ



2.1.2.9. Noise & Settlements

Various human activities and movement have impacts on wildlife (traffic and transport, noise, tourism activities, etc. The link below has a study on the buffers and distances for which flora and fauna are sensitive to various human activities.³⁵

Stressor	Context	Focal Guild / Species	Impact Zone
Human activity (hiking, mountain biking)	Natural	Large mammals - Mule Deer, Bison, Pronghorn Antelope	Found 70% probability of flushing at 100 - 390 m from activity on trails
Human activity (noise, visual of humans)	Various	Birds - raptors	Range in flushing distances of 17 - 990 m; buffers recommended range from 50 - 1600 m (includes forested wetlands)
Human activity (trampling)	Urban	NA	Up to 50 m on average
Human disturbance (waste disposal, landscaping, construction)	Urban	NA	Observed at 99% of sites within 20 m of forest edge, with most severe impacts within 10 m
Human disturbance (waste disposal, landscaping, construction)	Urban	NA	Most encroachments within 16m to 20 m from forest edge

Thus, the buffer after considering all activities on various fauna is as follows:

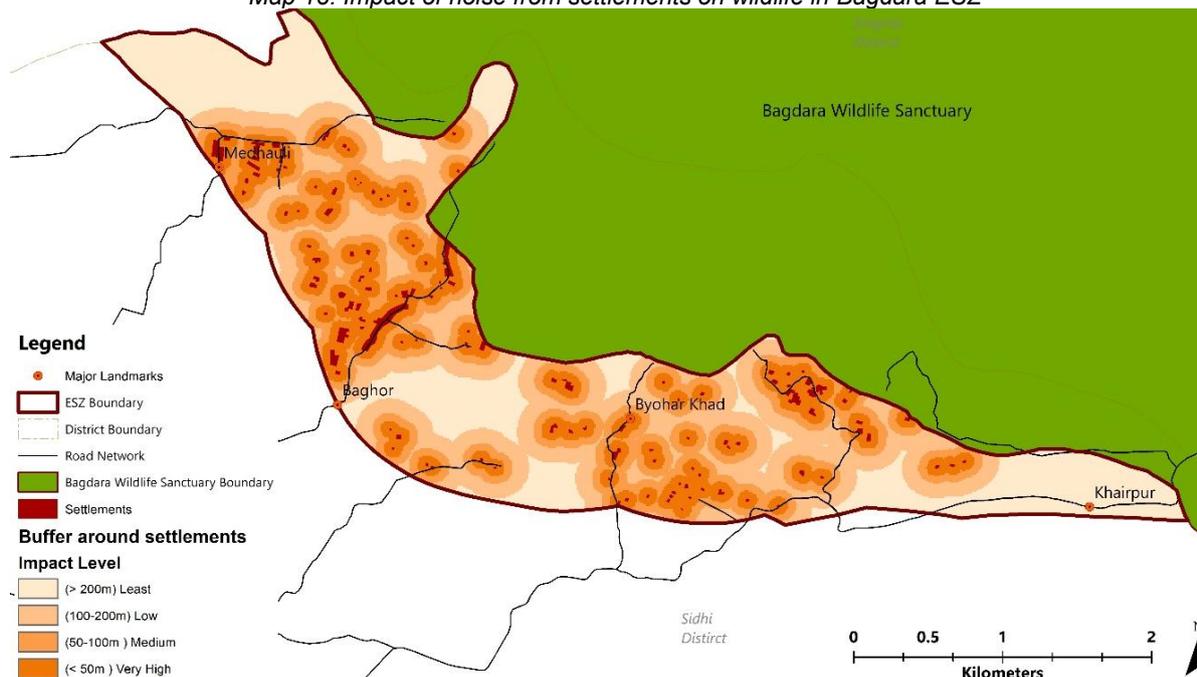
S.No.	Parameter	Impact	Buffer (distance in m)
1	Buffer around settlements	Very High	400 m
2		Medium	1000 m
3		Low	1600 m

The type, size and hierarchy of settlement has varying impacts. A larger settlement (having more urban characteristic) will impact a larger surrounding (thus a larger buffer) than a small, interior, rural settlement. Thus, the buffer around settlements as per their hierarchy are:

S.No.	Parameter	Impact	Buffer (distance in m)
1	Buffer around settlements (Small, interior Settlement)	Very High	400 m
2		Low	1000 m
3	Buffer around settlements (Larger settlement, urban characteristic)	High	1000 m
4		Low	1600 m

³⁵ <https://cvc.ca/wp-content/uploads/2013/08/Ecological-Buffer-Guideline-Review.pdf>

Map 18: Impact of noise from settlements on wildlife in Bagdara ESZ



Source: MAPIT and IPE analysis

2.1.2.10. Forest Dependency

The rural community within the Bagdara ESZ depends to a significant degree on forest resources for income generation, grazing and everyday household requirement. While there are various parameters that can be taken into consideration for quantifying forest dependency, based on available census data and academic research on forest dependency, the following parameters were considered –

- A. Marginal Workers
- B. Illiterate Population
- C. Total SC and ST Population

A study conducted on poverty and resource dependence in rural Jhabua district of Madhya Pradesh has established significant correlation between the above stated parameters and resource dependency.³⁶ The quartile ranges of each variable was assessed to determine the threshold values for impact significance and a score was assigned to quantify and analyze the dependency.

A. Marginal Workers

The median and 1st quartile value of marginal workers within the Bagdara ESZ is 62.04% and 35.43% respectively. Based on this data, we have classified the impact as mentioned below.

Marginal Workers Impact Index		
S. No.	Range	Score
1	>62.04	3
2	35.43 - 62.04	2
3	<35.43	1

³⁶ Narain, U., Gupta, S., & Veld, K. V. t. (2008). Poverty and resource dependence in rural India. Ecological Economics, 66(1), 161–176. doi: 10.1016/j.ecolecon.2007.08.021

B. Illiterate Population

The median and 1st quartile value of illiterate population within the Bagdara ESZ is 45.68% and 42.12% respectively. Since the range between the median and the 1st quartile is not significant, the median has been considered the threshold value.

Illiterate Population Impact Index		
S. No.	Range	Score
1	>45.7	2
2	<45.7	1

C. Total SC and ST Population

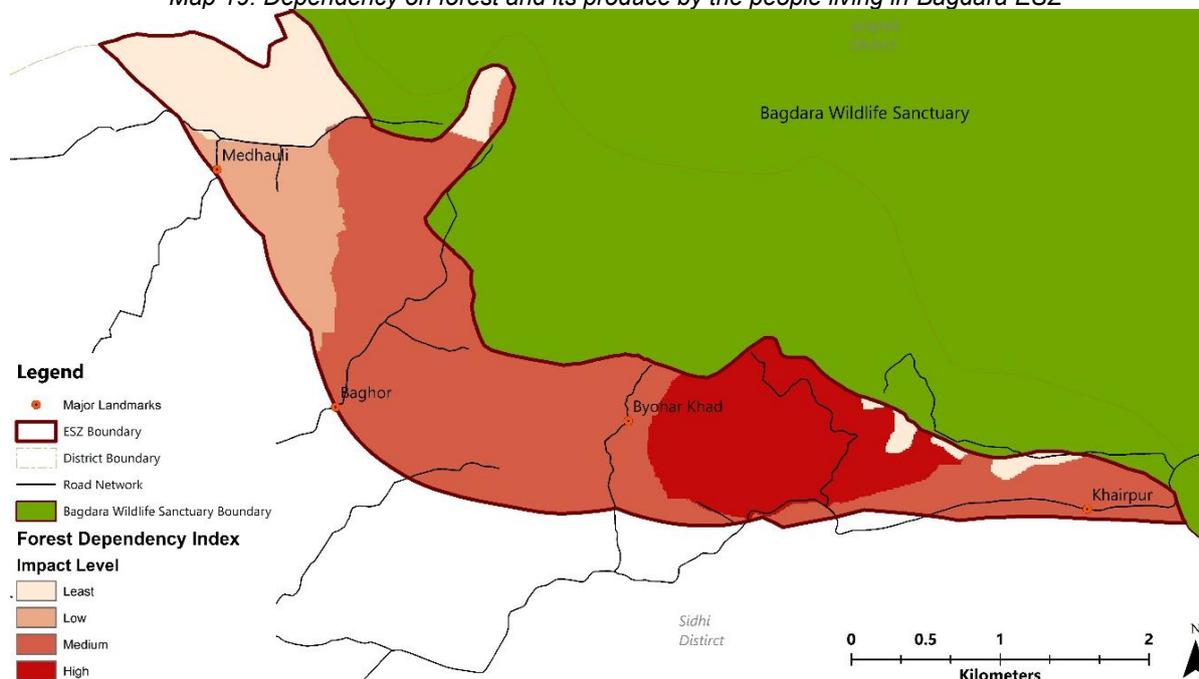
The 1st, median and 3rd quartile value of total SC and ST population within the Bagdara ESZ is 89.05, 61.41 and 42.74 respectively. The impact has been classified as follows;

Total SC and ST Population Impact Index		
S. No.	Range	Score
1	>89.05	3
2	42.74-89.05	2
3	<42.74	1

Based on the above grading structure and a total score of 8, the cumulative score for all individual villages were obtained. The 1st, 2nd and 3rd quartile value obtained for the dataset were 7, 6 and 5 respectively. The cumulative impact of the parameters on forest resource dependency has been classified as follows.

Forest Dependency Index		
S. No.	Range	Cumulative Impact
1	Below 5	Low
2	5 to 6	Medium
3	7 and above	High

Map 19: Dependency on forest and its produce by the people living in Bagdara ESZ



Source: MAPIT and IPE analysis

2.1.2.11. Water Quality

The water quality of the ESZ is assessed using the parameters: pH, TDS, Hardness and alkalinity. Scores are given as per the BIS desirable and permissible limits. The score of

individual parameters is added to get the final score, and the impact is classified in the ranges of the final score (Q) as, $Q < 4$: low impact, $4 < Q < 15$: Medium Impact and $Q > 15$: High Impact.

Parameter	Desirable limit	Permissible limit
pH	6.5 - 8.5	No relaxation
TDS	500 mg/l	2000 mg/l
Hardness	300 mg/l	600 mg/l
Alkalinity	200 mg/l	600 mg/l
Parameter	Desirable limit score	Permissible limit score
pH	1	-
TDS	1	5
Hardness	1	5
Alkalinity	1	5
Range of water quality assessment (Q)	4	15
S.No.	Range of water quality assessment	Impact
1	If $Q = 4$	Low
2	If $4 < Q < 15$	Medium
3	If $Q > 15$	High

2.1.2.12. Summary of Impact Index parameters

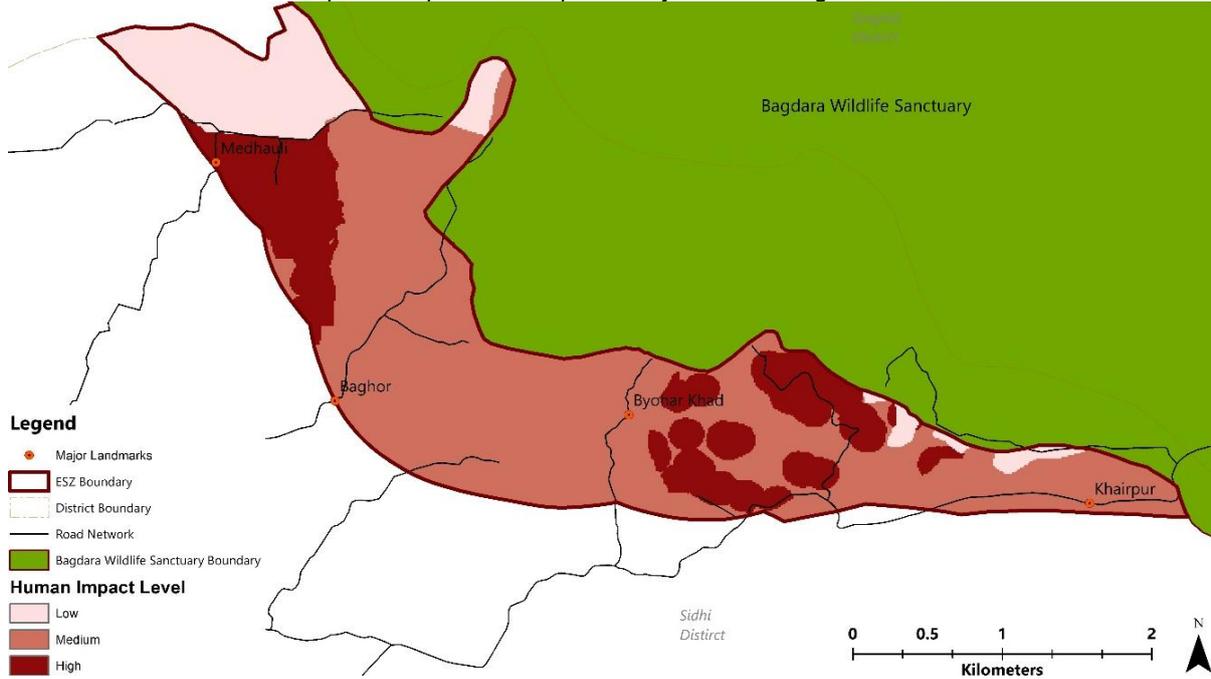
Sr. No.	Activities	Overall Impact
1	Movement of vehicular traffic	Very High
2	Transmission of electrical lines	Very High
3	Ground water extraction	High
4	Settlements (Type, size, density, construction material, growth rate)	High
5	Intensive agriculture	High
6	Livestock grazing	High
7	Use of firewood	Medium
8	Current Waste disposal practices	Medium
9	Fair/festivals grounds	Medium
10	Operation of cottage industries	Medium
11	Tourism activities (In buffer)	Low
12	Tourism activities (In core) - Safaris	Low
13	Collection of forest produce	Low

Legends

Sensitivity	Score
Very High	5
High	4
Medium	3
Low	2
Least	1

The parameters presented above thus after being analyzed in isolation were evaluated in interrelation to each other, by weighing each parameter using **ANALYTICAL HIERARCHY PROCESS**. The final output of the impact analysis is presented in the Map presented below.

Map 20: Output of the Impact Analysis for the Bagdara ESZ

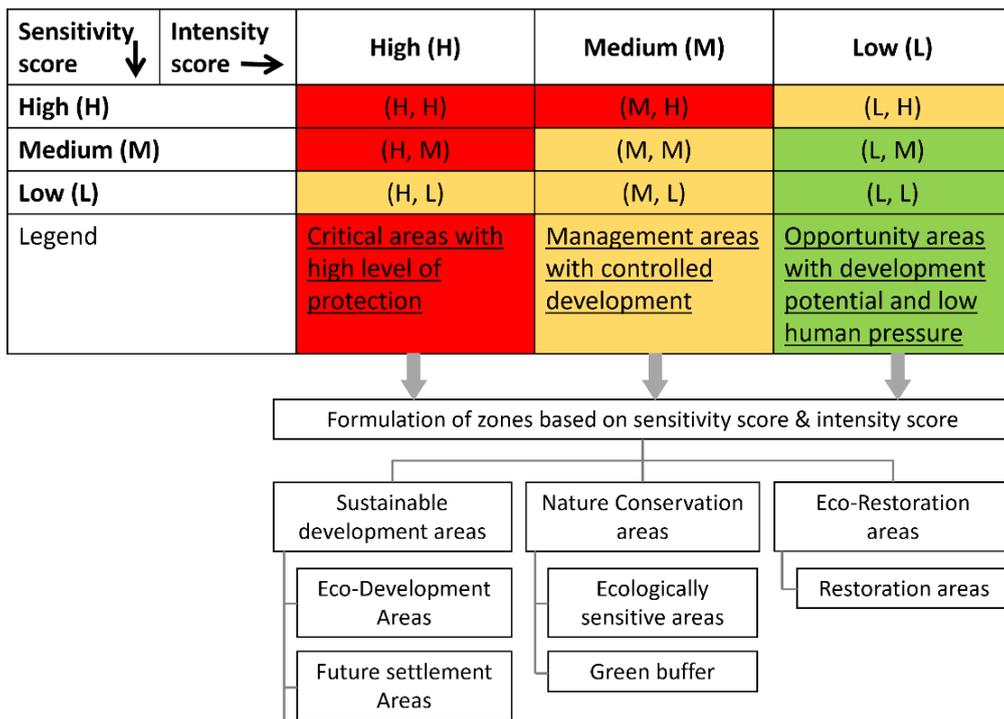


Source: MAPIT and IPE analysis

2.1.3 Composite Zoning (Spatial zones)

Based on the outputs of the analysis presented, the results have been used for decision making regarding formulation of zones for the management of the ESZ area. First and one of the most important steps used is to distribute the entire land under consideration into area which needs to be protected (i.e., Eco sensitive areas with high eco-tone concentration) and area where regulated development can be allowed (i.e., Eco-development areas), Based on the spatial distribution of Eco-tone, their concentration and geographical setting of the area, zones have been defined. The ESZ can be categorized into **sustainable development areas, nature conservation areas and eco-restoration areas** as shown in the exhibit below.

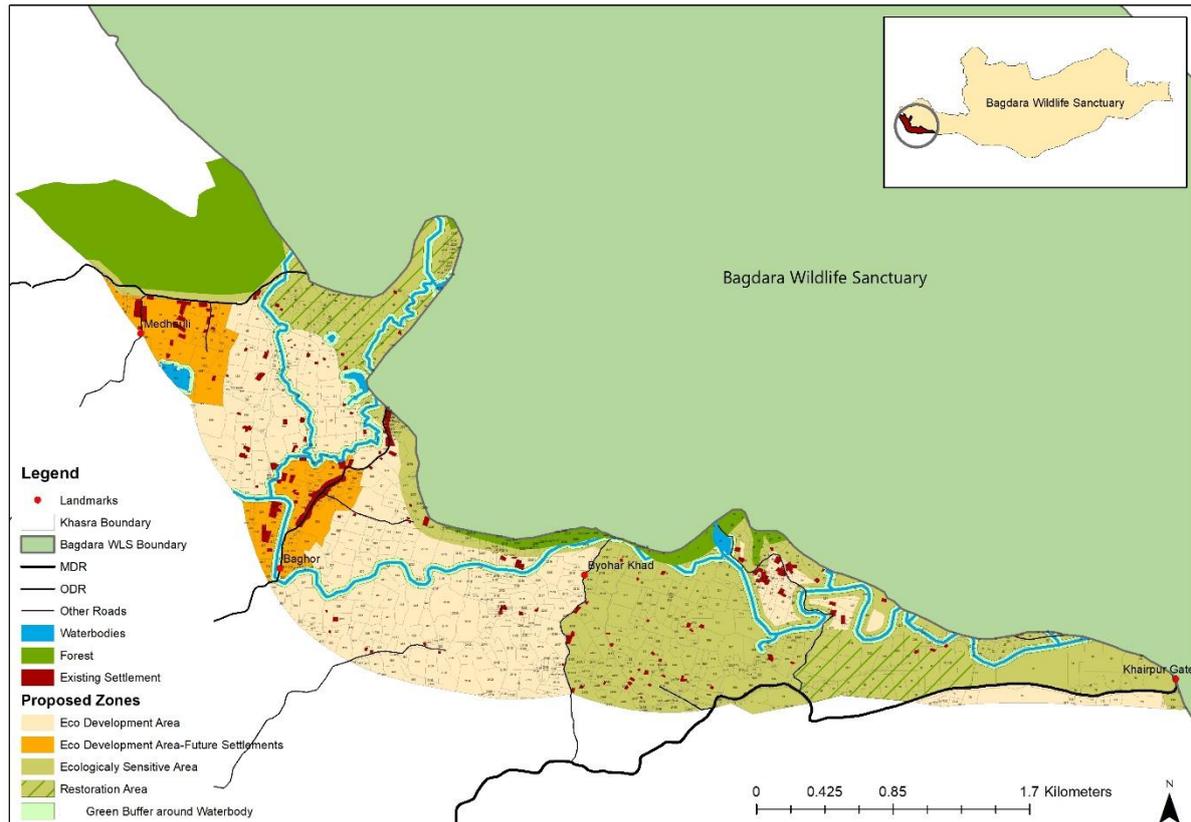
Exhibit 3: Zoning methodology for defining the Eco-sensitive zones



Based on the above methodology, the detailed spatial distribution of the concentration of Sensitive area within the ESZ (refer areas identified in deep red texture in map below). The areas in deep denotes occurrence of sensitive habitats and Eco-tones which needs to be protected and conserved.

The composite map depicts the significance of human presence in the ESZ area in terms of density and identified parameters discussed earlier. The output has been used to identify the areas for sustainable development, nature conservation and eco-restoration. These areas are further classified into ecologically sensitive areas, green buffers, eco-development areas, future settlement areas and restoration areas.

Map 21: Composite zoning map of Bagdara ESZ



2.1.4 Application of Zoning in regulatory framework

The value addition of the suggestive zoning regulation is to introduce spatial component to the Regulatory aspect of the ESZ Notification. This will allow the regulators to take scientific and pragmatic decision for development as well as conservation of the P.A. **The following section elaborates how to use the proposal of Suggestive Zoning with the already in place regulations laid out by the Notification.**

The managers of the park allowing/regulating any activity need to follow the SOP of checking the location and extent of the project. Thereafter it is to be checked that if the activity is Promoted or prohibited under the ESZ notification. If the activity is prohibited, then it will be prohibited throughout all the zones and the same can be rejected. Vice-versa if the activity is promoted it will be promoted prohibited throughout all the zones and the same can be selected for appraisal/approval (subject to already applicable laws and regulations).

However, if the activity is falling in the regulated category, the regulation will be based on the location of the project and the zone under which it is falling into. One need to ascertain the zone of the activity based on which the same can be approved or rejected.

Process flow for project scrutiny under the ESZ.

Prohibited List of activities which are prohibited in the ESZ.
 •The activity is prohibited irrespective of the location of the project.

Promoted List of activities which are promoted in the ESZ.
 •The activity is promoted irrespective of the location of the project
 •Check management guidelines for management practices.

Regulated List of activities which are regulated in the ESZ.
 •The activity is dependent on the location of the project and the zone it is falling into
 •Ascertain the location and zone of the project.
 •Check favorable activity table for the prescribed zones to approve or reject the activity.
 •Check management guidelines for management practices.

2.2 Areas for Sustainable Development

Proposed Zones:

- a) **Eco-Development Areas:** Eco-development areas are areas which can be used for human activities subject to some restrictions and management guidelines (These areas including primarily Revenue land existing around the Buffer and ESZ Boundary, Existing Settlements)
- b) **Eco-Development Areas for Future settlement:** This is the sub-category of Eco development Area which serves as guiding tool for expansion of human settlement to local governing bodies

2.3 Areas for Nature Conservation

- c) **Ecologically sensitive areas (conservation areas):** Conservation Zones is the area with high concentration of Ecologically Sensitive Areas. This includes Ecologically high sensitive areas (including Major wildlife corridors, Wildlife Habitats and Congregation Areas, Areas around water bodies, streams, wetlands, lakes and ponds, High vegetation, Biodiversity, existence of RET species).
- d) **Green Buffers:** This is sub part of the Ecologically sensitive areas which can be used for plantation and conservation activity. Green Buffer around key environmental assets have been suggested based on the suggestion of the ESZ notification.

2.4 Areas for Eco-Restoration

- e) **Restoration Area:** These are degraded zones which have to be restored for ecosystems integrity. After restoration the same can be used as common property resources and conservation areas.

2.5 Prohibited activities in ESZ

1	Commercial mining, stone quarrying and crushing units. <ul style="list-style-type: none"> • All new and existing mining (minor and major minerals), stone quarrying and crushing units shall be prohibited with reference to in the Eco-sensitive except for the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing for personal use. • The mining operations shall strictly be in accordance with the interim order of the Hon'ble Supreme Court dated the 4th August, 2006 in the matter of T.N. Godavarman Thirumulpad Vs. Union of India in Writ Petition (Civil) No.202 of 1995 and order of the
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	Hon'ble Supreme Court dated the 21st April, 2014 in the matter of Goa Foundation Vs. Union of India in Writ Petition (Civil) No.435 of 2012
2	Setting up of industries causing water or air or soil or noise pollution. <ul style="list-style-type: none"> No new or expansion of polluting industries in the Eco- sensitive Zone shall be permitted. Only non-polluting industries shall be permitted within Eco-sensitive Zone as per classification of Industries in the Guidelines issued by the Central Pollution Control Board in February 2016, unless otherwise specified in this notification.
3	Establishment of new major hydroelectric projects and irrigation projects.
4	Use or production of any hazardous substances.
5	Discharge of untreated effluents and solid waste in natural water bodies or land area.
6	Establishment of large-scale commercial livestock and poultry farms by firms, companies, etc.
7	Setting up of saw mills. <ul style="list-style-type: none"> No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
8	Setting up of brick kilns
9	Use of polythene bags .
10	Commercial use of firewood.
11	New wood-based industry.

2.6 Regulated activities in ESZ

1	Commercial establishment of hotels and resorts. <ul style="list-style-type: none"> No new commercial hotels and resorts shall be permitted within one kilometer of the boundary of the protected area except for accommodation for temporary occupation of tourists related to eco-friendly tourism activities. However, beyond one kilometer and upto the extent of the Eco-sensitive Zone all new tourism activities or expansions of existing activities would in conformity and Tourism Master Plan and National Tiger Conservation Authority guidelines.
2	Construction activities ³⁷ <ul style="list-style-type: none"> No new commercial construction of any kind shall be permitted within one kilometer from the boundary of protected area or up to the boundary of the Eco-sensitive Zone whichever is nearer. Provided that, local people shall be permitted to undertake construction in their land for their use including the activities listed in sub- paragraph (1) of paragraph 3 as per building byelaws to meet their residential needs of the local residents such as: <ul style="list-style-type: none"> (i) Widening and strengthening of existing roads and construction of new roads; (ii) Construction and renovation of infrastructure and civic amenities. (iii) Small scale industries not causing pollution termed as per Classification done by Central Pollution Control Board of February 2016. (iv) Cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stays³⁸; and (v) Promoted activities listed in this Notification. Provided further that the construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per the applicable rules and regulations, if any. Beyond one kilometre upto the extent of Eco- Sensitive Zone, construction for bone fide local needs shall be allowed and other construction activities shall be regulated as per the Zonal Master Plan.
3	Small scale industries not causing pollution. <ul style="list-style-type: none"> Non polluting, non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro- based industry producing products from indigenous goods from the

³⁷ Refer Zones delineated in section 2.2. and guidelines mentioned ins section 5.3

³⁸ Refer Section 3.18

	Eco-sensitive Zone, and which do not cause any adverse impact on environment shall be permitted.
4	Felling of trees. ³⁹ <ul style="list-style-type: none"> • 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. • The felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Act and the rules made thereunder. <p>In case of Reserve Forests and Protected Forests the Working Plan prescriptions shall be followed.</p>
5	Commercial goat and sheep farming ⁴⁰
6	Collection of Forest produce or Non- Timber Forest Produce.
7	Migratory graziers
8	Erection of electrical cables and telecommunication towers and laying of cables and other infrastructure. ⁴¹
9	Infrastructure including civic amenities.
10	Widening and strengthening of existing roads. Shall be done with proper Environment Impact Assessment and mitigation measures, as applicable.
11	Undertaking activities related to tourism like over-flying the ESZ by aircraft, hot-air balloons, helicopter, drones, Microlites. ⁴²
12	Protection of hill slopes and river banks. ⁴³
13	Movement of vehicular traffic at night. ⁴⁴ <ul style="list-style-type: none"> • Regulated for commercial purpose, under applicable laws.
14	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture ⁴⁵ .
15	Discharge of treated wastewater/ effluents in natural water bodies or land area. <ul style="list-style-type: none"> • The discharge of treated waste water/effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated waste water, and the discharge of treated waste water/effluent shall be regulated as per applicable laws.
16	Commercial extraction of surface and ground water.
17	Open well, bore well, etc. for agriculture or other usage
18	Solid waste management/bio-medical waste management. ⁴⁶
19	Introduction of exotic species. ⁴⁷ .
20	Eco-tourism activities. ⁴⁸
21	Commercial sign boards and hoardings.

2.7 Promoted activities in ESZ

1	Rainwater harvesting.
2	Organic farming.
3	Adoption of green technology for all activities.
4	Cottage industries including village artisans, etc.
5	Use of renewable energy sources.
6	Agro forestry.

³⁹ Refer guidelines as mentioned in management plan of Bagdara WLS 2017

⁴⁰ Refer section 3.17.4.

⁴¹ Details regarding Management of trunk infrastructure has been provided in the section 3.3 and 3.10.

⁴² Detailed pre-feasibility assessment to be taken up as a project as per recommendations in Gazette Notification and Zonal Master Plan.

⁴³ Such areas are identified under zoning regulations and steep slopes exhibited in section 2.4 and its restoration is detailed out in section 3.2.1.

⁴⁴ More details regarding management of traffic in section 3.10.

⁴⁵ Refer section 3.17

⁴⁶ Refer section 3.7 and 3.8.

⁴⁷ Refer guidelines as described in management plan of Bagdara WLS 2017

⁴⁸ Tourism activities to be carried out as per Sub-Zonal Tourism Plan as detailed out in Chapter 5.

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7	Use of eco-friendly transport
8	Skill Development.
9	Restoration of degraded land/ forests/ habitat
10	Environmental Awareness.

Synergy between spatial and non-spatial recommendations: As observed in the above section that promoted, prohibited and regulated activity are already highlighted in the ESZ notification. The key outcome of the Zonal master plan is to connect these zonal guidelines to actual areas on the ground where it can be implemented as the entire area is not uniform in nature. The synergy between spatial zones on ground and non-spatial regulations in notification is the greatest outcome of the Zonal Master Plan. The inter-relation between forementioned spatial and non-spatial recommendations can be observed in the table below:

Table 2: Activity Classification for ESZ of Bagdara ESZ

Sl No	Activities	Favourable Zone				
		Management Zone		Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Ecologically sensitive zone	Restoration Zone	Green buffer
Regulated Activities (as per extracts of the ESZ Notification)						
1	Commercial establishment of hotels and resorts.					
	(i) No new commercial hotels and resorts establishments	•	•	•	•	•
	(ii) Renovation and reconstruction of already existing commercial construction are allowed within the existing built-up area ⁴⁹	✓	✓	✓	✓	✓
	(iii) Small temporary structures for eco-tourism activities	✓	✓	✓	✓	✓
	Provided that, beyond one kilometre from the boundary of the Protected Area or up to the extent of Eco-sensitive Zone, whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable. ⁵⁰	•	•	•	•	•
2	Construction activities: (a) No new commercial construction of any kind shall be permitted within one kilometre from the boundary of the Protected Area or up to extent of the Eco-sensitive Zone, whichever is nearer:	•	•	•	•	•
	(b) Provided that, local people shall be permitted to undertake construction in their land for their use including the activities listed in sub- paragraph (1) of paragraph 3 as per building byelaws to meet their residential needs of the local residents such as:	-				
	(i) Widening and strengthening of existing roads and construction of new roads;	✓	✓	✓	✓	✓
	(ii) Construction and renovation of infrastructure and civic amenities;	✓	✓	✓	✓	✓
	(iii) Small scale industries not causing pollution termed as per Classification done by Central Pollution Control Board of February 2016;	✓	✓	•	•	•

⁴⁹ To prevent development creep, commercial establishments shall be required to declare their existing service capacities at the evaluation stage. The regulatory authority shall ensure that these capacities are maintained during renovation or reconstruction, both at the approval stage and upon post-completion verification.

⁵⁰ Refer Chapter 5 of Sub-Zonal Tourism Plan for additional details.

Zonal Master Plan of Bagdara Eco-Sensitive Zone

SI No	Activities	Favourable Zone				
		Management Zone		Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Ecologically sensitive zone	Restoration Zone	Green buffer
	(iv) Cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stays ⁵¹ ; and	✓	✓	✓	✓	•
	(v) Promoted activities listed in this Notification.	✓	✓	✓	✓	✓
	(c) The construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any.	✓	✓	•	•	•
	(d) Beyond one kilometre it shall be regulated as per the Zonal Master Plan.	✓	✓	•	•	•
3	Small scale non-polluting industries Non-polluting industries as per classification of industries issued by the Central Pollution Control Board in February 2016 and non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the competent Authority.	✓	✓	•	•	•
4	Commercial goat and sheep farming Regulated under applicable laws. ⁵²	✓	✓	•	•	•
5	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 Acts and the rules made thereunder.	•	•	•	•	•
6	Collection of Forest Produce or Non-Timber Forest Produce (NTFP). Regulated under applicable laws.	✓	✓	✓	✓	✓

⁵¹ Refer section 3.18.

⁵² Subject to the approval of monitoring committee and Management guidelines

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Sl No	Activities	Favourable Zone				
		Management Zone		Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Ecologically sensitive zone	Restoration Zone	Green buffer
7	Migratory graziers. Regulated under applicable laws.	✓	✓	• ⁵³	•	•
8	Erection of electrical and communication towers and laying of cables and other infrastructures. Regulated under applicable law ⁵⁴ .	✓	✓	✓	•	•
9	Infrastructure including civic amenities. Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines.	✓	✓	✓	•	•
10	Widening and strengthening of existing roads and construction of new roads ⁵⁵ .	✓	✓	✓	•	•
11	Undertaking other activities related to tourism like over flying the Eco-sensitive Zone by regulated under applicable law.					
	a) hot air balloon	•	•	•	•	•
	b) helicopter					
	c) drones ⁵⁶	✓	✓	✓	✓	✓
	d) Microlites	•	•	•	•	•
12	Protection of hill slopes and river banks. Regulated under applicable law.	✓	✓	✓	✓	✓
13	Movement of vehicular traffic at night. (Regulated for commercial purpose under applicable laws).	✓	✓	•	•	•
14	On-going agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture. Permitted under applicable laws for use of locals.	✓	✓	✓	✓	✓

⁵³ To be regulated as per village level community resource management plans (*community reserve pasturelands shall be developed in identified areas as per applicable laws) and planned grazing schedule. Refer section 3.17.4 for Proposals and recommendation

⁵⁴ Underground cabling may be promoted as per specific guidelines. Specific linear intrusions to be avoided as per management guidelines.

⁵⁵ Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines

⁵⁶ Based on clearances from Forest Department. Can be extensively used for monitoring and policing purposes by law enforcement agencies. .

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Sl No	Activities	Favourable Zone				
		Management Zone		Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Ecologically sensitive zone	Restoration Zone	Green buffer
15	Discharge of treated wastewater/effluents in natural water bodies or land area. ⁵⁷	✓	✓ ⁵⁸	•	•	•
16	Commercial extraction of surface and ground water. Regulated under applicable law.	•	•	•	•	•
17	Open well; bore well, etc. for agriculture or other usage. ⁵⁹	✓	✓	•	•	•
18	Solid waste management/bio-medical waste management. ⁶⁰	•	•	•	•	•
19	Introduction of exotic species. ⁶¹	•	•	•	•	•
20	Eco-tourism. ⁶²	✓	✓	✓	✓	•
21	Commercial sign boards and hoardings. ⁶³	•	•	•	•	•
Promoted Activities						
1	Rainwater harvesting. Shall be actively promoted.	✓	✓	✓	✓	✓
2	Organic farming. Shall be actively promoted.	✓	✓	✓	✓	✓
3	Adoption of green technology for all activities. Shall be actively promoted.	✓	✓	✓	✓	✓
4	Cottage industries including village artisans, etc. Shall be actively promoted.	✓	✓	•	•	•
5	Use of renewable energy and fuels. Biogas, solar light, etc. to be actively promoted.	✓	✓	✓	✓	✓

⁵⁷ The discharge of treated wastewater/effluents shall be avoided to enter into the water bodies and efforts shall be made for recycle and reuse of treated wastewater, and the discharge of treated wastewater/effluent shall be regulated as per applicable laws.

⁵⁸ Specific treatment facilities has to be provided in areas with high human concentration as identified in the project interventions.

⁵⁹ Regulated under applicable laws and the activity shall be monitored by the concerned authority.

⁶⁰ Regulated under applicable laws

⁶¹ Regulated under applicable laws

⁶² Regulated under applicable laws.

⁶³ Regulated under applicable laws.

*Directional signage's shall be presented in required areas as per applicable laws

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Sl No	Activities	Favourable Zone				
		Management Zone		Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Ecologically sensitive zone	Restoration Zone	Green buffer
6	Agro-forestry. Shall be actively promoted.	✓	✓	✓	✓	✓
7	Use of eco-friendly transport Shall be actively promoted.	✓	✓	✓	✓	✓
8	Skill development. Shall be actively promoted.	✓	✓	✓	✓	✓
9	Restoration of degraded land/ forests/ habitat. Shall be actively promoted.	✓	✓	✓	✓	✓
10	Environmental awareness. Shall be actively promoted.	✓	✓	✓	✓	✓
LEGEND						
✓ Favourable zones						

CHAPTER 3 THEME PLANS

3.1 Addressing conservation-development issues

Aim: Promotion of Sustainable land management which aims to aim to integrate the management of land, water, biodiversity, and other environmental resources to meet human needs while ensuring the long-term sustainability of ecosystem services and livelihoods.

Objective:

- To regulate the activities as per zones delineated in Chapter-2 of Zonal plan and guidelines and as specified in ESZ notification.
- To ensure land is put to proper use and promotes eco-friendly tourism activities and related development.
- To provide sufficient buffer areas around such development like roads, industries to enhance the protection of a conservation area.
- To protect the rights of forest-dependent communities as per 'The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006'.

Issues: Uncontrolled and unorganized expansion of human settlements leading to exploitation of environmental resources and thus impacting the forest area and its wildlife.

Threats: Conversion of forest land for construction and development activities, putting pressure on land and other resources.

Guidelines:

- The activities are to be regulated as per the Regulations mentioned in Chapter 2 and Chapter 5 of Sub-Zonal Tourism Plan..
- The green buffers or recreational zones are proposed to large water Bodies/wetlands, major streams and water flow channels and no building activity should be proposed in the buffer area. The following are the buffer proposed :
 - ✓ 50 m from the river edge for large rivers.
 - ✓ 50 m from the boundary of lakes of area 4 acre and above,
 - ✓ 15 m from the boundary of lakes of area less than 4 acre / ponds/tank bed lands,
 - ✓ 15 m from the boundaries of major canal, stream, etc.,
- Follow 'Draft Guidelines for linear infrastructure intrusions in natural areas: roads and power lines' by National Board for Wildlife, Ministry of Environment and Forests, India, 2011'.
- Encroachment shall be strictly monitored. Proper maintenance of the forest block boundaries shall be done to keep an effective control on future encroachments. New encroachments shall be discouraged or banned, especially in the reserve and protected forests. The size of the settlements to be restricted based on the proposed zoning maps detailed.
- Permission shall not be granted for any development activities in the Major animal corridor(s). If granting of permission is inevitable, then it shall be done with maximum restraints so as to ensure minimal impact on such corridor(s).

Guidelines for Sustainable construction practices

During construction habitat destruction may occur where a habitat is removed to make way for a new development. Ecosystems and wildlife in these areas are usually directly impacted generally resulting in alteration or reduction in biodiversity. Mobile animals (especially birds and mammals) retreat into remnant patches of habitat. Habitat fragmentation is a major concern. Native habitats, which were once continuous, may become divided into separate fragments during construction.

The extent and connectivity of remaining habitats are reduced, and species may or may not be able to survive as a result. Fragmentation may alter the distribution of populations, the migration rates among populations, or the size of local populations. Animals with large home ranges (i.e., badgers) will be the most severely affected. Often habitat fragmentation doesn't present an absolute barrier to movement, but rather subject animals to greater mortality as they try to cross the contrasting habitat.

- **Site Selection:** It is strongly recommended that development projects prioritize locations with minimal biodiversity impact, such as low-sensitivity areas identified in Chapter 2. Large-scale projects within the ESZ area should be actively discouraged or avoided. Infrastructure development, particularly major external or through-lines, should bypass sensitive zones. Linear intrusions should be avoided. Adherence to the guidelines for linear infrastructure outlined in Sections 3.3 & 3.10 is encouraged.
- **Noise Management:** To mitigate potential disturbances to fauna, it is suggested that construction activities generating significant noise, such as drilling and heavy equipment operation, be minimized. Noise levels within the ESZ area should ideally remain below 50 dB(A) in daytime and 40 dB(A) in night-time for the areas within 1km of the protected area, and 65 dB(A) in day-time and 55 dB(A) in night-time for other areas.
- **Watercourse Protection:** It is imperative to implement stringent measures to prevent watercourse pollution. Soil, concrete waste, and toxic runoff from construction sites, including fuel spills, should be meticulously controlled. Mobilization of fine sediments during in-stream construction should be minimized. At all permissible construction sites, consistent monitoring and removal of construction waste from protected areas are strongly recommended.
- **Timing of Construction:** To safeguard vulnerable species, particularly nesting birds, it is advised that construction activities be avoided during critical periods such as nesting or breeding seasons and monsoon periods.
- **Linear Infrastructure Development:** Guidance regarding the construction of roads, railway lines, and power lines is provided in Sections 3.3 & 3.10, and these guidelines should be referred to.
- **Tourism Infrastructure:** Recommendations for campsites and Tourism Information Centers (TICs) are detailed in Section 5.3.2, and this section should be consulted.
- **Homestay Construction:** Development activities related to homestays should adhere to the 'Guidelines for Homestay by Madhya Pradesh Govt.'
- **Village Accommodation:** Guidelines for the construction or expansion of accommodation/homes within villages are provided below.:
 - a) It is to be constructed with locally available materials like mud, thatch, stone etc.
 - b) The disposal of any construction waste should be responsibility of the owner of the house.
 - c) No large construction is not allowed in any villages
 - d) The construction should not be more than G+1 floor.
 - e) All buildings should be numbered and approved by the relevant authority. Expansion of the settlements should be carefully monitored as w.r.t the Zonal Master Plan maps.

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.1.1 Development of Green Infrastructure

Infrastructure development is the construction and improvement of foundational services with a goal of sparking economic growth and improvement in the quality of life. Infrastructure can improve efficiency and productivity. Social and green infrastructure can improve quality of life and make a region more competitive in acquiring top talent and the headquarters of large firms.

Green infrastructure (GI) holds different interpretations for different people. In an urban area, from a social and recreational perspective, it may refer to the trees in the city which provide the necessary ‘green’ benefits, while from an engineering perspective it may involve the integration of several technical approaches (like swales, green roofs, gardens and parks) applied to facilitate various environmental benefits. According to a report by Forest Research (2010), GI can mitigate risks from climate change by protecting regions against floods and other negative effects of changing weather patterns (Krause et al., 2011). In addition to the environmental benefits, there are also potential well-being benefits of GI like increased life expectancy, better mental and psychological health (Nordh et al., 2009).

While US and Europe both lay emphasis on the role of public bodies in planning approaches, Singapore encourages other stakeholders—landowners, private developers to incorporate green features into their developments, and the community to embrace green infrastructure for recreational & educational purposes, in addition to its environmental value (Public Utilities Board, 2013).

Strategies that Support Sustainable Communities and Green Infrastructure:

Sustainable communities that fully integrate green infrastructure approaches use community design to help simultaneously achieve environmental, economic, and social goals. These goals include improving water quality, revitalizing neighbourhoods, reducing flood risk, and providing recreational areas that encourage physical activity. Community planners can enhance these and other benefits by selecting the types and locations of green infrastructure approaches that best support their goals.

The following strategies illustrate how green infrastructure can enhance sustainable communities’ approaches and help achieve a wide range of goals, including to:

A. Preserve and Restore Open Space, Natural Beauty, and Critical Environmental Areas

Forests, wetlands, and other natural areas provide recreational space, shape regional identity, and support regional economies through tourism, agriculture, and other activities. In addition, protecting natural areas is often the least expensive, most efficient way to keep stormwater pollution from further degrading waterways. Natural areas serve a wealth of ecological functions that cannot be easily replaced. For example, wetlands can absorb floodwaters and buffer storm surges, protecting communities from flooding while performing ecological services like providing wildlife habitat and filtering excess nutrients and contaminants from storm water.

B. Create Parks, Community Gardens, and Other Public Green Spaces

Parks, community gardens, and other public green spaces create opportunities in built-up areas for people to gather, exercise, and connect with nature. These spaces are particularly important in low-income and disadvantaged neighborhoods because they provide critical health, social, and environmental benefits. These types of places can also readily incorporate green infrastructure into their design.

C. Direct Development toward Existing Communities

Investing in existing communities brings jobs and services for residents and takes advantage of past infrastructure investments. Redevelopment also spurs cleanup of historical environmental and health hazards at contaminated properties that often disproportionately affect disadvantaged populations. These actions can revitalize areas that have suffered from disinvestment, replacing underused or vacant lands with productive businesses, parks, and other community amenities. Very low levels of impervious cover have been shown to degrade watershed health. Developing compactly on a redevelopment site can avoid creating new impervious surfaces that could further degrade water quality.

D. Create Compact, Mixed-Use Development

Compact, mixed-use development puts buildings close together, creating neighborhoods where residents are near shops, restaurants, and services; public transit, walking, and biking are viable transportation options; and jobs are easily accessible. Strategies include constructing buildings with a mix of uses such as retail on the ground floor and offices or apartments above; reducing (or eliminating) the distance between buildings; positioning buildings closer to the street; rightsizing surface parking to meet demand while minimizing the amount of developable land it uses; and narrowing road lanes where feasible

E. Build Neighborhood Streets, bicycle routes and Trails That Encourage Walking and Biking

Walkable neighborhoods have streets, sidewalks, and paths that are safe and appealing for pedestrians and bicyclists. Streets designed for the safety of all users are also known as “complete streets,” which can encourage residents to lead healthier lifestyles. Green infrastructure plays an important role in designing streets to make a neighborhood walkable. Street trees provide shade, filter airborne pollutants, and help reduce ambient air temperatures, making walking outdoors in hot weather more comfortable. In general, adding greenery, such as a vegetated buffer between people and traffic, can also help to make the area feel more inviting. Walking and biking trails can be designed as linear community parks that link destinations, create opportunities to get around without a car, improve public health by encouraging physical activity, integrate green infrastructure throughout a community, and provide green space in underserved neighborhoods.

F. Cultivate Communities with a Strong Sense of Place

Development that represents the values, history, culture, economy, and geography of a community is key to supporting a strong economy, vibrant neighborhoods, and a high quality of life. Green infrastructure approaches can help create vibrant, interesting neighborhoods with a strong sense of place—a unique combination of characteristics that makes a place special. Many green infrastructure approaches use plants adapted to each region’s climate, helping to create a distinct identity and contribute to a neighborhood’s overall aesthetic appeal, while gray infrastructure is almost entirely underground where it is out of sight and out of mind. Public art and green infrastructure can be integrated into a single site, each reinforcing the sense of place established by the other. Features such as fountains fed by rainwater, living walls, or artist designed storm water infrastructure can help enliven a space and educate visitors about ways to protect water quality.

In rural regions, vegetated areas such as forests, wetlands, grasslands, and working farms often shape the region’s sense of place. Protecting and conserving these areas by directing development to existing neighborhoods and employment centers can help maintain the character that attracts tourism and supports the quality of life resident’s value while protecting valuable water resources.

G. Encourage Community and Stakeholder Collaboration in Development Decisions

Sustainable communities strategies involve residents, business owners, community-based organizations, and other stakeholders early and often to define and implement the community’s vision and goals. Likewise, because green infrastructure can help transform how a community looks and functions, public involvement in the planning process is equally important. Community leaders might need to adapt outreach efforts to reach populations that are disadvantaged, vulnerable to displacement, and often left out of development decisions.

H. Promote Green Building Practices

The term “green building” refers to the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. An important aspect of green building is designing sites and structures to allow the capture, use, infiltration, or evapotranspiration of stormwater to reduce some of development’s negative effects on water quality.

I. Limiting the Size of the major settlements in the ESZ area.

3.1.2 Protection of wildlife through community-based Interventions

The protection of the ESZ Area has to be ensured with the adoption of the following:

- **Strategy for Protection & Communication:**
 - Patrolling: - Foot, Vehicular, Elephant, Boat, Tiger Protection Force.
 - Operation monsoon.
 - Crime and criminals monitoring.
 - Crime dossiers.
 - Monitoring of gangs/ wanderer communities.
 - Village crime registers.
 - Monthly crime map.
 - Monitoring of court case Mukhbir systems.
 - Communication network: Road Network, wireless network, Mobiles /PDAs, MIS/ GIS.
 - Surveillance of hat bazaars.
 - Monitoring of electric lines.
 - Barrier checking.
 - Monitoring of livestock’s predation / losses.
 - Camp halts and beat inspections.
 - Involvement of EDCs.
 - Infrastructure for camps: Buildings, Camp equipment, Watch towers etc.

- **Engagement of Community School kids in EDC and Park Protection activities:**

Involvement of children at various levels are important from the conservation point of view. EDCs should involve children from local primary and secondary schools in forest plantations, conservation and such related exercises for their more informed growth towards conservation activates.



Image 1: Turtle saving program ,Phuket Thailand

- **Management of water bodies and Wells:** People living in ESZ should be sensitised and appraised to keep their wells covered. Uncovered wells are a hazard for the wild animals that often fall inside the wells. All wells are to be mapped and managed by the authorities.

Exhibit 4: Covering of lined and unlined wells in protected areas

Lion deaths: Will cover all wells in Gir by next year, Gujarat government tells High Court

In the fresh affidavit, the government claimed that it will cover the open wells, in which lions often get trapped and killed, with enclosures by the end of 2019.

- **Use of Bio-fencing instead of wired fencing in areas beyond wildlife corridors:** Animal raids from wild boars and monkeys have become major issues for the local communities who experience significant crop losses every season from raids of wild animals. Bio-fencing can be used as an effective strategy to control these animals and limit their access across settlement areas and farms.



Image 2: Example of use of cactus for bio-fencing in Tamil Nadu

3.1.3 Fire control and prevention measures

Fire has different roles to play in Forest Ecology, but mostly it affects the eco-system negatively. It affects vegetative composition of plant communities. Mostly the ground flora is adversely affected by fire and thereby affecting young crops, valuable grasses and regeneration. Forest fires leave the soil bare to the action of natural elements i.e., sun, wind and rain; consequently, soil erosion starts & resulting in loss of top fertile soil. Destruction of soil organic matter affects soil structure adversely & nitrogen reserves of soil are depleted. Fire invariably don't kill large wild animals but causes havoc to micro fauna, birds and reptiles & this in turn affects process of natural succession. Apart from above, it causes damage to recreational and aesthetic values of forest.

Fire occurs by natural factors e.g., lightning, rolling of stones and by rubbing among bamboos. In ESZ Zone, most of the cases of wild fire are man-made. The main causes of man-made fires are due to following reasons:

- Clearing of ground for NTFP collection mostly for mahua collection.
- Intentional fires by miscreants, who are against Tiger Reserve and its management.
- Leaving the burning matchsticks, bidis, cigarettes etc by passer-by, who transverse through forest roads, Foot paths (Pagdandis) or highways passing through forest.
- Burning of agriculture fields after harvesting & accidental spread of fire to adjoining forest areas.
- Graziers put intentional fire, which have notion that this way better grass will regenerate.

As most of the forest fire are manmade it makes sense to involve the community in the fire protection.

Fire Protection Measures - Fire protection strategy involves preventive measures coupled with vigilance & watch and ward of the area. There are different strategies to prevent the occurrence or minimize the chances of occurrence of fires. Fire protection scheme for whole of the ESZ area has to be prepared and implemented each year.

Preventive Measures - Cutting and controlled burning of fire lines, strips adjoining roads, pagdandis, around villages boundaries, RF- PF lines etc. Fire lines shall be cut and burnt before 15th February every year. The width of different categories of fire lines shall be maintained as under:

S. No	Types of Fire Lines	Width of Fire Lines (in m)
1	Outer Boundary of forest Blocks	12
2	Internal boundary lines of blocks / PWD roads and other roads	6
3	Forest Roads & village boundaries	3-3m on each side
4	District/ Reserve boundary	15
5	Sites of rare /Endemic plants/Special habitats/ Sample plots /Preservation plots etc.	12

External and internal fire lines are cut, cleared and controlled burnt every year. Apart from fire lines PWD/other forest- roads, footpaths/ pagdandis, camping sites, places of worship shall also be cleared.

- Fire Watch Towers at Strategic Locations on high attitudes are identified and shall be manned by fire watchers during the fire season. These watch towers have view of large forest areas & any fire can be duly communicated and attended for timely control.
- Forest Roads, Pathways are regularly brushed to clear them of potential inflammable material.
- Engaging fire watchers from local communities as “Special Fire Fighting Squads”.
- 24 Hour vigilance by watchtowers & patrolling is to be ensured.
- Special precaution to be taken during Religious Fares organized within ESZ Area. People shall be educated about not throwing lit bidis etc and extinguish fire used for cooking etc. in temple campus Pamphlets, Posters banners etc. can be used for the purpose.
- Modern communication devices like PDA, Mobiles & Wireless System can be used for timely information and control of fire. Satellite Fire Data can also be used for this purpose.

Controlling Measures - In any case of such incidence, message is communicated to the nearby Fire Fighting Squads, Joint Forest Management Committees (JFMCs). They use following techniques to control the fire.

- Clearing the strip in the direction of fire, so as fire stops at strip. A new clearing machine is being put to use which can be handled by single person, easy to use and clear the strip fast and effectively.
- Extinguishing fire by brush beating.
- Counter fire from opposite direction.

Reporting - Every fire shall be duly reported & preliminary report shall be in following format: -

Date of Fire	Cause of Fire	Location			Fire				Extent of Burnt area (in ha)	Details of Damage	Remarks about (1st/ 2nd/3rd etc. occurrence)
		Comptt. No	Lat	Long.	Occurrence		Extinguish				
					Date	Time	Date	Time			
1	2	3	4	5	6	7	8	9	10	11	12

Fire report shall be registered & a detailed report is to be submitted after due enquiry of the fire, as prescribed format in forest manual.

3.1.4 Protection of wildlife and its habitat

Though the ESZ does not presently harbour much wildlife, the objectives of this Plan along with suggested initiatives/ measures will help build up a good wildlife population in future. Therefore, it is vitally important that the culture of basic wildlife management practices should be inculcated into the ESZ Management staff. It is proposed that protection has to be regarded as one of the most important wildlife management practices in the ESZ Zone and shall be carried out with the following strategies:

Intensive Patrolling of Beats: A forest guard is in-charge of a beat and he should be assisted by at least 2 - 3 camp labourer preferably from the local village. This staff should be made responsible for patrolling their beat intensively. Each beat should be patrolled daily for snares, traps, poisoning, intrusion, illicit felling, illicit grazing and chances for electrocution etc. The description of daily patrols should be clearly entered into the prescribed camp registers and be checked by officers from time to time. This strategy also lends a psychological restraint over the people of surrounding villages. Sufficient budget allocation to ensure all these activities is very essential.

Operation Monsoon: This special protection strategy should be adopted during the rainy season and its preparations, including the assignment of duties and a monsoon patrolling booklet with prescribed formats for the review of progress etc. should be completed by the end of June. During the monsoon, the staff, guided by officers, shall keep the biotic pressure in protected compartments at minimal.

Crime Dossier: A confidential dossier/list of suspects/old criminals with their photographs should also be meticulously prepared and regularly updated for continuous direct or indirect surveillance. The progress of these units should be regularly reviewed by the Deputy Director and Field Director.

Weekly Market Checking: The people of the villages try their luck at sneaking into the forest and grabbing their hands on any article/ produce of wildlife and forest saleable in the market to buy their petty requirements. Therefore, surveillance should be conducted specially on different market days to discourage the tendency.

Waterhole Checking: Generally, waterholes are used by cattle in the ESZ Zone and the possibility of their being poisoned is not that much as it is in core. However, isolated waterholes

should be frequently checked in the pinch period by the ESZ staff to prevent poaching and the poisoning of these restricted waters holes.

Intelligence Gathering: An effective intelligence network to monitor, prevent and pre-empt illegal activities in the ESZ Zone should also be gradually ensured.

Checking for Electrocutation: There are several areas in the ESZ across which high voltage electricity lines pass over. Experienced poachers know about such areas where wild ungulates can be easily electrocuted. They use several methods to electrocute wild ungulates in these areas. The ESZ Management should ensure that these areas are patrolled so that the poachers may not kill the animals through electrocution.

Night patrolling: Wildlife offenders are also known to sneak into the forest at nights. Therefore, if patrols are not conducted at nights, the ESZ may have to incur losses despite protection in the daytime. The ESZ Management should ensure that the frontline staff, including officers, should also remain active for a few nights every month, especially during moonlight nights. Night patrols in the ESZ should comprise the following:

- **On Foot:** At least 3 hours per night after 9.00 pm to check all the vulnerable spots/ sites/ activities.
- **By Vehicles:** At least 4 hours per night after 9.00 pm to check barriers, watch towers, foot paths and patrolling camps.
- This should be reported next day at the District Head Office in the prescribed proforma using wireless.
- On moonlight nights, the patrolling should be done throughout the night especially 3 days preceding full moon night.

Integration with 'ADOPT A TIGER' program. - Establishment of web portal to remotely adopt tigers and knowledge transfer about their status and funds disbursal and management system.

3.1.5 Building construction and approval system.

A building construction and management authority to be setup under the proposed management framework for granting building permission rights to all construction activities in the ESZ. No building should be legalized without the building permission. The resettlement and rehabilitation of villagers located within the forested areas will be the key task and responsibility of this authority.

3.2 Restoration of soil moisture regime

Aim: To restore the soil moisture regime and promote soil conservation practices.

Objective:

- To adopt soil restoration & conservation practices and provide sufficient training to the villagers to comply with the new and old techniques.
- To promote plantation especially of native vegetation and involve villagers in landscape restoration practices (refer section 3.2.1.)

Issues: Lack of soil moisture will reduce the agricultural produce, deplete the soil organic carbon (SOC) pool and loss in biodiversity, loss of soil fertility and elemental imbalance, acidification and salinization.

Threats: A cycle of increasing soil degradation, which ultimately leads to the complete loss of fertility and biological productivity. The significantly reduced biological productivity in degraded areas results in exposed soil, increased water runoff and enhanced erosion.

Guidelines:

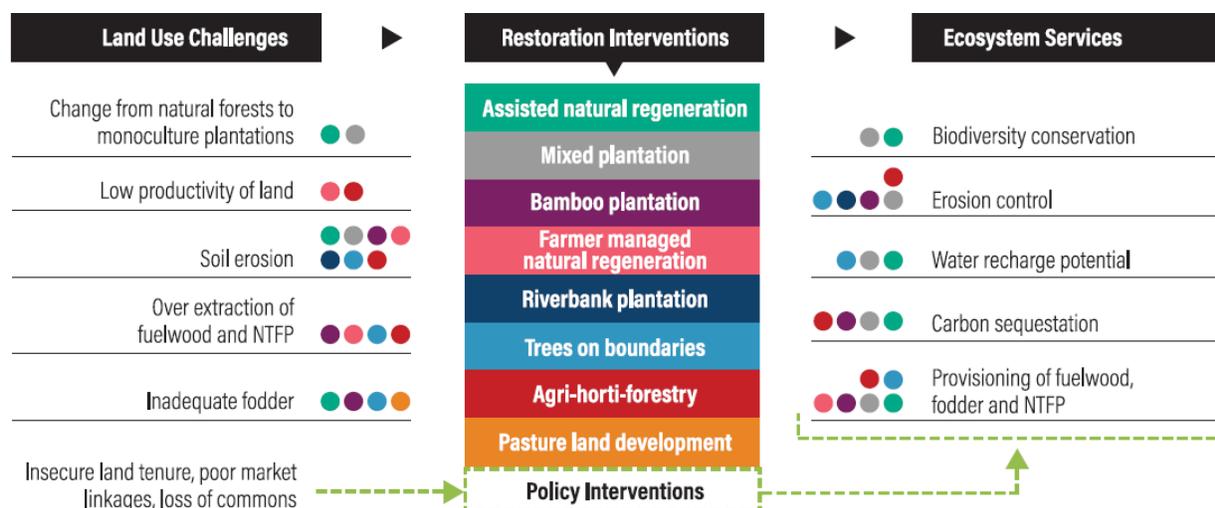
- It is suggested that site-specific techniques for restoring soil quality, such as conservation agriculture, integrated nutrient management, continuous vegetative cover (including residue mulch and cover cropping), and controlled grazing at appropriate stocking rates, be implemented. The strategy should aim to produce “more from less” by reducing losses and increasing soil, water, and nutrient use efficiency.
- It is suggested that topographical remodeling for water harvesting and watershed protection be considered to contribute to controlling soil erosion.
- It is encouraged to promote dense tree planting and the recovery of annual herbaceous vegetation or perennial shrub patches, as only dense vegetation and plant litter can induce the necessary improvement of compacted soils for enhancing infiltration and reducing water runoff.
- It is suggested that the planting of nitrogen-fixing, drought-resistant species be prioritized, as these species can rapidly create thick leaf litter layers and restore soil nutrients and soil organic matter, while reducing water evaporation and runoff.
- It is suggested that continuous monitoring of relevant parameters, such as soil nutrients, soil moisture, infiltration, and biological productivity, be ensured.
- It is suggested that grazing of livestock be regulated (refer to section 3.17.4.).

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.2.1 Landscape Restoration of degraded areas

Landscape Restoration is the deliberate integration and enhancement of tree cover within different land uses. It comprises a range of interventions including forest regeneration, plantations and different types of agroforestry.

The Government of India has committed to a landscape approach under several international agreements and national targets. These include commitments to the Bonn Challenge; Nationally Determined Contributions (NDCs) as part of the Paris Climate Agreement; Sustainable Development Goals; National Mission for Green India; and the sub-mission on agroforestry under the National Mission on Sustainable Agriculture. Identifying restoration potential is a useful first step in planning how these targets can be achieved.



Project Rationale

- The area is degraded and eroded by anthropogenic activities like sand mining, felling of trees etc.
- The ecosystem services need to be restored urgently.

- The livelihood opportunities need to be generated for the nearby villagers.
- The area needs soil and water conservation measures.

Project description

A. Objective

- To control Soil-water erosion and lessen the Land degradation on Forest and Non- Forest area.
- To improve Protection and Management of Forests through greater Community Involvement.
- For remove Barriers to Promoting Sustainable Rural Livelihood and Provide a Broader range of Livelihood options for the Tribal/Rural poor.
- To provide alternative sources of Fuel wood/fodder/non-forest products requirements of people.

B. Project location/ priority area

The project involves restoration of degraded land as marked in the Zoning map in section 2.1.3.

C. Case study/best practices

Landscape Restoration is the deliberate integration and enhancement of tree cover within different land uses. It comprises a range of interventions including forest regeneration, plantations and different types of agroforestry. Sidhi district has more than 350,000 hectares of restoration potential where trees can be integrated into different land uses to improve food production, strengthen biodiversity conservation and sequester carbon. Such initiative is adopted by Sidhi district in areas like Khokra, Thani Pathak etc. These interventions will not only benefit environment but also provide alternate source of livelihood to villagers and reduce their dependency on the forest produce. The following are some details:

- The restoration interventions of type of plantation are based on land ownership, landuse, tree cover density, slope, presence of irrigation, presence of bamboo and proximity to riverbanks. These include Farmer Managed Natural Regeneration, mixed plantation, Bamboo plantation, Trees on boundaries, Agri-horti-forestry, Pasture land development, and Riverbank plantation.⁶⁴
- In case of Khokra, plantation was done in 5 hectares of area with amla, bheda, aam, spanish cherry, sitaphal, anar, kathal, bargad, peepal, paras peepal, neem, chickoo, sindoori, bel, sethtoot, harsingar, karanch, amrud and many other local trees.
- This exercise was carried out by the villagers from nearby villages and they were paid on daily basis with the help of NREGA scheme.
- Since local people has done the work, they have also taken ownership to protect these saplings from harsh climate and other anthropogenic activities.
- Farmers in Sidhi are also experimenting with different models of integrating trees on farms.



Image 3: Plantation site in Khokra carried out by the villagers

⁶⁴ Landscape Restoration for Climate and Communities – Opportunity assessment of Sidhi district by WRI

- This plantation drive was integrated with nursery run by horticulture department and Self-Hel groups which provided them the saplings.
- All types of local and hybrid species are available here.
- The women working in these nurseries are also paid under NREGA scheme.



Image 4: Greenhouse arrangement (left) and women working in the nursery (right)

- Additionally, value chains for key tree species like Mahua, Bamboo, Palash, Jackfruit, Moringa, and Aonla can be developed by promoting microenterprises, cluster and area level federations, and farmer producer companies. These value chains at pre-production, production and processing stages can, at minimum, benefit an estimated 30,000 persons, including women, unemployed youth and landless. These early estimates suggest that landscape restoration could be a catalyst for transformative change in districts with few secondary sector opportunities.

D. Project components/activities

The area can be restored with the following types of plantations or any other revenue generating species will could also provide livelihood opportunities to nearby villages.

- Farmer Managed Natural Regeneration,
- Mixed plantation,
- Bamboo plantation,
- Trees on boundaries,
- Agri-horti-forestry,
- Pasture land development, and
- Riverbank plantation

The plantation can be done by the following:

- Local trees like amla, bheda, aam, spanish cherry, sitaphal, anar, kathal, bargad, peepal, para's peepal, neem, chickoo, sindoori, bel, sethtoot, harsingar, karanch, amrud and many others.
- Bamboo clumps
- Fodder plots
- Medicinal and aromatic plants etc.

This project can be implemented in coordination with forest department, agricultural department and horticultural department by taking advantage of the NREGA scheme. In coordination with different agencies, this project can also be clubbed with MSME's, capacity building, training, etc.

Project benefits/outcomes

- Increase in Forest Density
- Soil & Water Conservation: Dried water holes will revive and water channels will flow with water for longer duration and soil erosion will decrease magnificently.
- Positive Effects on Biodiversity: Number of species will increase considerably, gradual increase in herbs, shrubs, and tree species.
- Economic benefits: Aajivika Activities in Project area will help poor families to increase their monthly/annual income.
- Impacts on Health: Plantation and Distribution of Medicinal Plants will help the local vaidhya in treatment of diseases.
- Social impact: FPC and VFC Members are paying more attention towards Forest Protection and Tendency towards Stall Feeding of Cattles has increased considerably. Migration of Villagers has reduced considerably. Villager's Dependency on Forest for fuel has gone down. Linking bond between villagers and forest officials becoming stronger day by day for the purpose of Biodiversity Conservation

3.3 Restoration of corridors and connectivity

Aim: Restoration of wildlife corridors and promotion of non-fragmented wildlife habitat development

Objective:

- To maintain the integrity of the wildlife corridor and reduce human animal conflict
- To promote Wildlife friendly and Harmonious development
- To ensure both the villagers and animals have the required space of movement.

Issues:

- Fragmentation of wildlife corridors might distract the movement of wildlife towards human settlements and can cause severe damage to agricultural fields, homes and other infrastructure.
- Distraction from wildlife corridor may lead animal towards highways, railways line etc. and can cause collisions leading to deaths of animals and sometimes humans.

Threats: If the animal movement is disrupted for longer period of time, then it would become impossible to trace the movement of animals and they might fall in human sensitive areas.

Guidelines:

- It is suggested that fragmented corridors be restored with native tree plantations (refer to section 3.2.1.), and biotic pressures in the corridor area be reduced, minimized, or eliminated.
- It is suggested that perennial water sources be developed in the corridor area.
- It is suggested that prior to the development of grass meadows, weeds like Lantana camara, Cassia tora, Hyptis suaveolens, etc., be eradicated.
- It is suggested that in place of forest lands being diverted for non-forest use, attempts be made to acquire revenue and private lands in the fragmented area of the corridor, so as to integrate them into a viable unit.
- It is suggested that discussions be held with people holding private lands in the corridor area regarding planting the areas and maintaining a green cover.
- It is suggested that the Elephant Intrusion prevention and E-alert System developed by the All India Council for Robotics and Automation be utilized. It is also suggested that a databank of all people living on the fringes of the forests and within the migratory route of the elephants

be developed. Once animals are sighted, it is suggested that bulk SMS messages in Hindi and English be sent to people, warning them of the animals' movement.

Technology to be adopted⁶⁵ - Seismic energy transmitting into the earth and propagating along the surface of the earth as Ray waves with a velocity in the range of 250 m/s Footfalls of large mammals (Normal weight of Asian elephant ranges from 1000 kg to 5500kg) are measurable in the ground at varying distances depending on the energy of the signal. The movement of elephant in the surroundings is detected by sensing seismic waves produced by the elephants by this system. A study has shown that elephants are deterred by the sound of buzzing of angry bees. In this E- alert system seismic waves produced by elephants is used to detect them. If it is detected the recorded angry Bee's sound is played. At the same time the high beam flashing lights are turned ON. The system as a whole is controlled by a microcontroller. When the elephant herd runs out of the range the system is turned off automatically. In addition to this alarm and warning system to inform people can also be added. Using this remote terminal unit with GSM modem when elephant intrusion is detected this sends SMS to the control team. The alarms are turned on for the purpose to drive away elephants as well as alert the surrounding people. This device has a series of aspects that discourage elephants from entering human populated areas thus preventing life and crops. This alert system will be installed on pilot basis at several strategic places. Further installation will be carried out depending upon the success of the system in raising the alert.

- It is suggested that regular workshops be conducted with all stakeholders to raise awareness for handling situations arising from the arrival of wild elephants.
- It is encouraged that bamboo and local fruiting trees, such as *Zizyphus* spp, *Bridelia retusa*, *Grevia tillaefolia*, *Sterculia villosa*, and *Dendrocalamus* spp., be planted in the corridor area.
- It is suggested that non-forest activities affecting the integrity of the corridor, such as the construction of permanent structures, depots, and labor camps, be avoided.
- It is suggested that the use of high beam lights and strong illumination be discouraged in the corridor.
- Efforts should be made to minimize pollution from industrial units located in and around the corridor.
- It is suggested that busy roads and rail routes passing through the corridors have mandatory provisions for underpasses.
- A vigil should be maintained for incidences of Human-Wildlife Conflict in the corridor areas.
- It is suggested that discussions be held with local farmers regarding crop types to be sown, considering elephants are attracted to sugarcane, banana, paddy, maize, and jowar.
- It is suggested to follow the 'Guidelines for conserving connectivity through ecological networks and corridors' by IUCN.

3.4 Rainwater harvesting

Aim: Promotion of storm water management by capturing rainwater to replenish ground water and to reduce dependency of villagers on ground water.

Objective:

- To recharge ground water through channelling rainwater through to ground

⁶⁵ Management plan of Bagdara WLS

- To promote rainwater harvesting and storing the same for day-to-day activities and agricultural practices.

Issues: Declining trend in grounds water levels especially in dry season i.e. summers.

Threats: Scarcity of water leading to negative social and environmental impacts

Guidelines:

- It is suggested to follow the 'Manual on Rainwater harvesting and conservation' by CPHEEO.
- Rainwater harvesting shall be made mandatory for all government and institutional buildings.
- It is suggested that all houses with more than 250 sqm area have the provision of rainwater harvesting.
- The concerned department is encouraged to promote the construction of rainwater harvesting structures.
- It is suggested that a rebate of a certain percentage on property tax be offered as an incentive for implementing rainwater harvesting systems.

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.4.1 Installation of Rainwater Harvesting structures

As the world faces an increasingly critical need to address climate change, the impact that water conservation has on a sustainable environment is undeniable. Groundwater is the primary source of freshwater that caters to the demand of ever-growing domestic, agrarian and tourism sector of Bagdara ESZ. Over the years, it has been observed that the necessity for the exploitation of groundwater resources for various everyday needs, like toileting, bathing, cleaning, agriculture, drinking water, industrial and ever-changing lifestyles with modernization is leading towards tremendous water wastage. Additionally, we cannot generate artificial water and must depend on water sources available. Due to increasing population demands and developing tourism sector need of water to suit our ever-expanding modern lifestyle will also increase giving rise to major concerns over water conservation.

Project Rationale

Bagdara Eco- Sensitive Zone is currently observing a trend of the decreasing ground water levels. On conducting Focused Group Discussions with the local communities, it was informed that the ground water levels have been decreasing rapidly, and in some villages, it has gone below 100 ft bgl. Since the main livelihood of the people within the ESZ is agriculture, which is highly water dependent, this lowering of groundwater level affects the economic, social and health status of the residents. With depleting groundwater levels and fluctuating climate conditions, reserving rainwater can help recharge local aquifers, and most notably, ensure water availability in Bagdara ESZ.

Project Description

A. Objective

To ensure the (best) possible beneficial use of rainwater endowment on the entire area of Bagdara ESZ for reducing dependency on ground water, allow natural rejuvenation of aquifers and conserve surface water bodies.

B. Project Location/Priority Areas

- For Agricultural Purposes
- For Non-Agricultural Purposes

C. Case Study/Best Practices

- 1. Nashik Rainwater Harvesting for Agricultural use** - It has been close to 15 years since the 37-year-old first implemented water conservation methods in his 22-acre land and on an average, he saves up to two crore litres of rainwater every year. Besides mitigating water scarcity problems, it has enhanced the farm output, decreased plant damage and increased the vigneron's annual income. Preventing rainwater runoff, recharging groundwater and filling watershed pond is the three-step protocol that ensures availability of water in abundance in Salunkhe's farm.
- 2. Harvesting Rainwater & Solar Energy at the Same Time** - From harvesting rainwater and solar energy, to providing shade to passers-by – Ulta Chaata is one device that does it all. ThinkPhi's flagship product called Ulta Chaata converts rainwater into potable drinking water during monsoons, and produces energy with the help of solar panels in the dry seasons.
- 3. Using Bhungroo for Rainwater Harvesting** - With about 25 years of experience in the water sector, the 48-year-old came up with the idea after the 2001 Gujarat earthquake, when he noticed how the temperatures soared in the state a few months after the disaster, leading to acute scarcity of water. Bhungroo, which means "straw" in Gujarati, is one of the technologies delivered by Naireeta Services—a social enterprise working for the eradication of poverty in India, which was conceptualised and transformed into practical application for farmers by Biplab. With this concept in mind, he went on to establish Bhungroo—a water harvesting technique that uses an injection module to store excess rainwater underground. Farmers can then use the same water for irrigation during summer and winter.

D. Project Component

1. For Agricultural Purposes

- a. **Irrigation Tanks/Jal Kunds** - The irrigation tanks (earthen bounded reservoirs constructed across slopes by taking advantage of local depressions and mounds) are symbols of an ancient and rich tradition of harnessing local rainfall and stream flow for agriculture. The advent of large-scale water storage and energised systems may have left these exemplary examples of local efforts and community management somewhere along the way.
- b. **Networking of Farm Ponds** - The approach is based on a traditional concept where structures were dug out in strategic locations, locally known as kalyani. A series of ponds, constructed along contour lines and connected to one another, allow easy access to water and a better soil moisture regime. This overcomes the shortcomings of constructing check dams, which cannot be constructed in all terrain and the benefits of which are not available to upstream communities. Owing to the topography of Bagdara ESZ, Networking of Farm ponds can be a useful RWH method.

2. For Non-Agricultural Purposes

- a. **Roof Top Rainwater Harvesting System** - It is a system of catching rainwater where it falls. In rooftop harvesting, the roof becomes the catchments, and the rainwater is collected from the roof of the house/building. It can either be stored in a tank or diverted to artificial recharge system. This method is less expensive and very effective in implementation especially for newly constructed hotels and lodges. Empanelment of Green Roof and Reversible umbrellas for harnessing Rainwater and Solar energy can turn out to be fruitful for large resorts and hotels.
- b. **Utilizing the Concept of "Paani Panchayats"** - Women groups/ or volunteer groups can be encouraged and incentivised to join hands to form pani- panchayat. The focus of these paani panchayats can be to create more water resources, revive old ones and

conserve natural water bodies with the help of local traditional practices of water harvesting and management.

Project Benefits/Outcomes

Few of the benefits of promoting the use of rainwater harvesting system are:

- Provides self-sufficiency of water supply to the communities from RWH thereby reduces dependency on ground water.
- Reduces Floods and Soil Erosion: During rainy season, rainwater is collected in large storage tanks which also helps in reducing floods in some low-lying areas. Apart from this, it also helps in reducing soil erosion and contamination of surface water with pesticides and fertilizers from rainwater run-off which results in cleaner lakes and ponds.
- Helps in reduction of carbon and water footprint.
- Suitable for Irrigation: As such, there is little requirement for building new infrastructure for the rainwater harvesting system. Most rooftops act as a workable catchment area, which can be linked to the harvesting system. Rainwater is free from many chemicals found in ground water, making it suitable for irrigation.

3.5 Municipal waste management

Currently, not much municipal waste is getting generated in the area. The villagers are thoughtful to use the municipal solid waste such as food waste, paper, fallen leaves, twigs etc. They convert all the biodegradable wastes into a compost and then use as a manure in the agricultural fields. For more details, follow section 8.7.

3.6 Wastewater treatment

Aim: Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species.

Objective:

- To prevent and control the discharge of untreated effluents in natural water bodies or land area and to ensure proper discharge and treatment of effluent as per the provisions made under the Water (Prevention and control) act, 1974.

Issues: Improper discharge and treatment of effluents causes pollution in water bodies including rivers, streams, lake, and ponds.

Threats: Resulting in water pollution (mainly eutrophication) which causes growth of algae which is a threat to aquatic life and ecosystem.

Guidelines:

- It is suggested that the MP Pollution Control Board ensure that the discharge of wastewater or untreated effluent is in accordance with the Water (Prevention & Control) Act, 1974, and the Municipal Solid Waste Rules, 2000, rules framed under the Environment Protection Act, 1986, and further guidelines issued by the State Govt. in accordance with the recommendation of the SLM & RC.
- It is suggested that no effluent, either treated or untreated, be permitted to be discharged into water bodies and water sources. Adequate infrastructure for centralized/decentralized waste management shall be provided by the Park management/district authorities.
- It is suggested that no hotel discharge any sewage or solid waste into any water body or waterways or in an open pit. Adequate infrastructure for centralized/decentralized waste management shall be provided by the Park management/district authorities.

Case study: Dhamner's Initiative on SLWM

Dhamner Gram Panchayat in Satara district was among the first in Maharashtra to win the NGP and has also won state level awards under the Sant Gadge Baba Gram Swachata Abhiyan (SGBGSA). It is remarkable that this Panchayat has not only achieved ODF status but has also been running a waste management program for more than seven years. This has been possible because of careful planning by the GP and the involvement of the community.

The effort to manage wastewater started when the GP received funds from the government for road construction around seven years ago. The community, under the leadership of the Sarpanch, decided that drains along the roads needed to become functional and it was agreed that:

- ✓ No more digging should be done for any reason once the roads were laid – each household was made responsible for drawing a water pipe from the house to the road, which could then be connected to the water system of the village.
- ✓ Each house was responsible for connecting its black water source to the village sewer system;
- ✓ In some houses, gray water from kitchens was diverted to the vegetable gardens.

To address solid waste, the GP provided one kuchrakundi (dustbin) for every five to 15 households and community kuchrakundis were placed at appropriate locations. The GP recruited two safaikaramcharis to collect waste from the kuchrakundis and transport it to a common treatment site. Here, waste is segregated and biodegradable waste is composted and nonbiodegradable waste recycled. Source: WSP Documentation of Best Practices in SLWM.

3.7 Solid waste management

Aim: Promotion of 'Solid Waste Management' aiming at proper disposal and treatment of solid waste (including waste from households, agriculture, commercial, sanitary, and institutional) generated in Eco-Sensitive Zones.

Objective:

- To ensure proper disposal of solid waste as per the provisions made under the Solid waste management rules, 2016 and as mentioned in ESZ notification.
- To provide adequate solid waste management facilities (including collection, transport, segregation, treatment, recycling/disposal) in priority areas (as per section 8.7.1).
- To ensure proper disposal of plastic waste as per the provisions made under the Plastic waste management rules, 2016.
- Promote 'Plastic free' Zones in ESZ areas.

Issues:

- Improper treatment and disposal of waste causes soil, water and air pollution causing significant harm to humans and wildlife.
- Burning of plastic waste in open air from the villages in ESZ causing air pollution resulting in air-borne diseases

Threats: In long run, increase in volume of wastes and lack in proper disposal and treatment measures leads to air, land and water pollution, including ground-water pollution.

Guidelines:

- It is suggested that the 'Municipal Solid Wastages (Management and Handling) Rules, 2000', as notified by MoEFCC, be adhered to for the collection, segregation, transportation, and treatment of Municipal solid waste collected from households, hotels, resorts, market centres, community bins, etc.

- It is suggested that the 'Plastic Waste Management (Amendment) Rules 2018', as notified by MoEFCC, be followed for the collection, segregation, transportation, and treatment of Plastic waste from villages and forest areas.
- It is suggested that the 'E-Waste (Management) Amendment Rules, 2018' as notified by MoEFCC, be followed.
- Solid waste management for clusters of villages shall be followed as per the 'Municipal Solid Wastages (Management and Handling) Rules, 2000'. It is suggested that the segregated waste be collected by one worker, who shall be responsible for transporting it to a selected disposal site for disposal and treatment.
- It is suggested that one worker can be involved for every 100 households. They shall be involved in various activities such as door-to-door collection of waste, segregation, transporting to a dumping site, and others. It is suggested that for 100 days, they be paid under the MGNREGS.
- Disposal of solid waste shall be done without contaminating groundwater, surface water, and ambient air quality. It is suggested that solid waste be segregated into organic and inorganic, recyclable, and hazardous waste before disposal. Segregation at source shall be done to facilitate easier processing of disposal.
- It is suggested that sites be identified outside the ESZ and forest area for dumping segregated waste, without affecting the environment. It is suggested that three pits be dug, two for composting bio-degradable waste and one for dumping residual solid waste, with suitable protective measures against pollution.
- Community-based organisations (e.g., youth clubs, self-help groups, mahila mandals) shall be engaged in waste management operations, while recyclers (e.g., kabadiwalas) shall be integrated as formal partners. The informal waste sector will be mainstreamed into the structured waste management system through formal identification, financial inclusion (bank accounts), and appropriate incentive mechanisms.
- Comprehensive waste audits shall be undertaken for all tourism and industrial establishments to assess waste composition, volume, and reduction potential, based on which user fees for waste management services will be levied.
- Every hotel shall separate biodegradable waste from non-biodegradable waste. It is suggested that transporting the non-biodegradable waste to a prescribed recycling or disposal site be the responsibility of the hotel. Burning of non-biodegradable waste must be strictly prohibited.
- There shall be a complete ban on burying, burning, or otherwise disposing of non-biodegradable or toxic waste in and around the tiger reserve. It is suggested that a proper plan for the disposal of degradable waste be developed and strictly implemented.
- Local authorities shall draw up plans for the segregation of solid waste into biodegradable, non-biodegradable (recyclable and non-recyclable), and e-waste. It is suggested that the biodegradable waste be recycled by composting or vermiculture.
- Public–Private Partnerships are encouraged for waste management within the ESZ. This would introduce structured solutions, operational efficiencies, financing, and advanced technologies that municipalities may lack. Models such as 'no-gate fee' PPPs, which incentivise private entities to monetise waste, may also be adopted.
- It is encouraged to promote 'Plastic-free' Zones in ESZ areas, specifically tourism promotion areas.

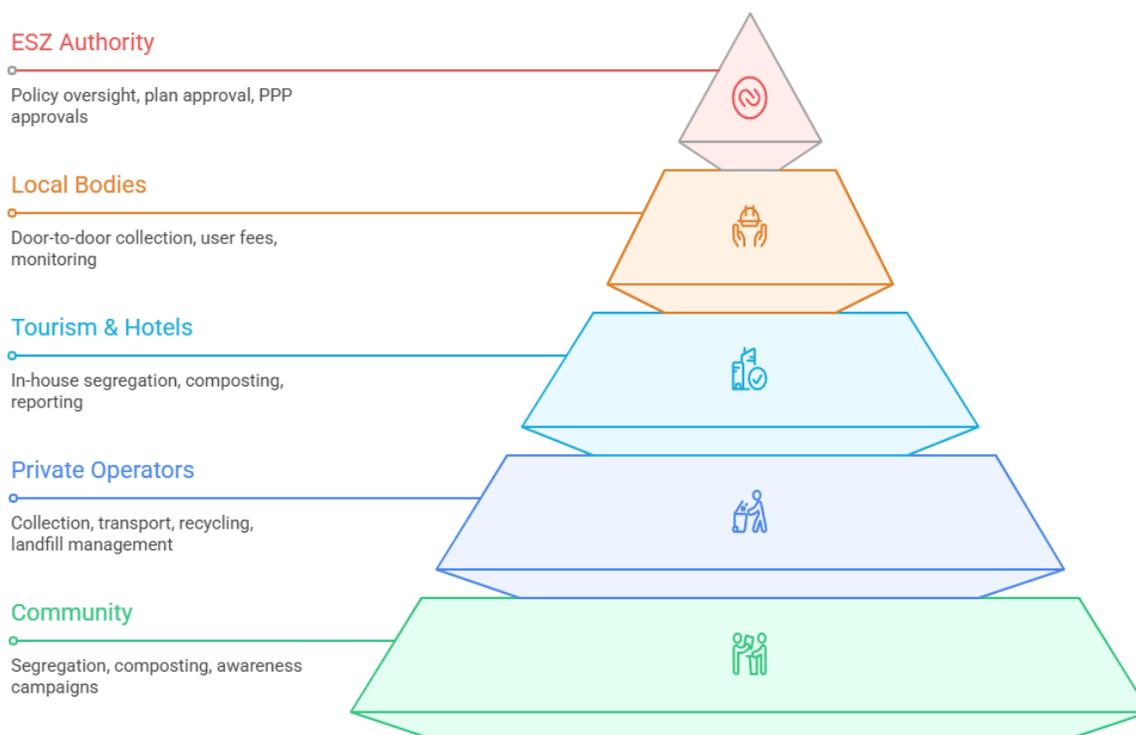
Recognizing SWM as a critical component in mitigating tourism-related impacts, a set of comprehensive SWM guidelines is proposed below for all categories of establishments and activities within the Eco-Sensitive Zone.

Holistic SWM Guidelines and plan for the ESZ

A. Objectives

To establish an environmentally sound, inclusive, and enforceable SWM system for impacts of over tourism, villages, and associated eco-tourism activities within the ESZ, ensuring waste minimization, recycling, and responsible management through the **Polluter Pays Principle** and community participation.

B. Institutional Structure

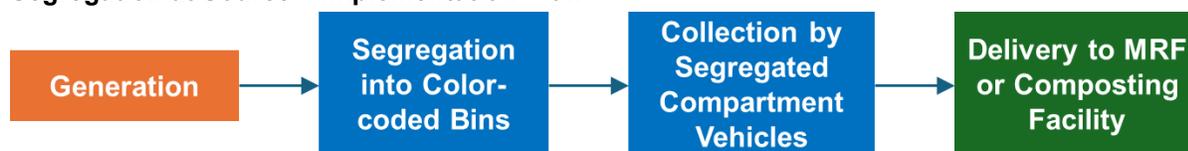


C. Segregation Guidelines

Segregation Categories

Waste Type	Colour Code	Description	Sources
Biodegradable Waste (Wet)	Green Bin	Kitchen and food waste, garden trimmings	Hotels, households, restaurants
Dry Recyclable Waste	Blue Bin	Paper, cardboard, glass, metals, rigid plastics	Shops, hotels, offices
Non-Recyclable / Reject Waste	Black Bin	Contaminated plastics, sanitary waste	Camps, tourist restrooms

Segregation at Source – Implementation Flow



Segregation Protocols

Do's	Don'ts
Place color-coded bins in all rooms, kitchens, and outdoor points	Do not mix wet and dry waste
Train staff and residents on correct waste types	Avoid use of black plastic liners in green bins
Label bins with visuals (for tourists and multilingual clarity)	Do not dispose of electronic or chemical waste in regular bins
Conduct random segregation checks	Avoid open bins in wildlife areas (animal attraction risk)

D. Waste management strategies by category

Hotel-Specific Waste Regulations

Process Flow	Strategy	Do's	Don'ts
Segregation at Source	Mandatory segregation into wet, dry, recyclables (paper, plastic, glass), and hazardous	Provide color-coded bins in rooms and kitchens	Mix wet and dry waste
Food Waste Reduction	Implement “root-to-stem” and “nose-to-tail” cooking; track waste via logbooks/apps	Train chefs on food waste analytics	Overproduce food for buffets
Organic Waste Management	Install on-site composters/digesters; reuse compost in landscaping/farming	Maintain composting units regularly	Dispose food waste with mixed garbage
Single-Use Plastics	Mandate replacement with reusable alternatives	Provide refillable toiletry dispensers	Use PET bottles, plastic cutlery
Waste Audits	Conduct annual audits to identify waste types, volumes, and reduction opportunities	Share results with local authority	Ignore audit findings

Village-Level Waste Management (Within ESZ)

Process Flow	Strategy	Do's	Don'ts
Community Engagement	Involve local communities in waste collection and awareness	Form waste management committees	Exclude local participation

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Process Flow	Strategy	Do's	Don'ts
Integration of Informal Sector	Register informal waste collectors; provide ID, PPE, and incentives	Train and integrate them into MRF operations	Treat informal sector as illegal
Decentralized Composting	Community-level compost pits/biogas plants	Use organic waste from households	Dump organic waste in open fields
Waste Service Fees	Implement direct user fees through Panchayats	Integrate with utility or property tax bills	Provide free waste collection for all
Monitoring	Monthly reviews by Panchayats and ESZ Authority	Maintain records of collection and composting	Ignore data reporting

Tourism-Related Activities (Safaris, Camping, Adventure Parks)

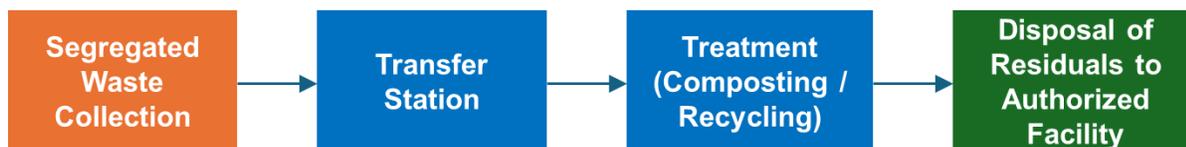
Activity	Waste Type	Strategy	Do's	Don'ts
Safari Vehicles	Food wrappers, bottles, tire waste, oil residues	Install mobile bins at start/end points; collect waste daily	Collect waste after every trip	Litter along routes
Camping Sites	Food waste, paper, biodegradable utensils	Implement "Leave No Trace" protocol; portable composters	Carry back all non-biodegradable waste	Burn or bury waste on site
Adventure Parks	Plastic bottles, packaging, ticketing waste	Provide bin clusters at every 50 m interval; promote refillable bottles	Monitor collection twice a day	Allow disposable packaging
Remote Activities	Minimal waste but scattered	Establish "zero-waste zones"; deploy mobile waste collectors	Encourage tourists to use reusable kits	Dispose waste in open or water bodies

E. SWM transportation guidelines

Tier	Mode	Description
Primary Collection	Handcarts, battery rickshaws, compact tippers	<ul style="list-style-type: none"> From households, hotels, or camp sites to transfer points To ensure all vehicular noise/ sounds horns are as per noise levels permitted within the ESZ.
Secondary Transfer	Compartmentalized collection trucks	<ul style="list-style-type: none"> From transfer points to decentralized facilities or MRFs To ensure all vehicular noise/ sounds horns are as per noise levels permitted within the ESZ.

Tier	Mode	Description
Special Collection	Dedicated vehicles for hazardous/e-waste	<ul style="list-style-type: none"> As per schedule defined by the monitoring committee (weekly/monthly basis)

SWM Transportation Process Flow



Suggested Transportation Protocols

Do's	Don'ts
Use covered vehicles to prevent litter and odour	Do not mix segregated waste during transport
GPS-tag waste vehicles for route monitoring	Avoid overflowing or uncovered transport
Ensure daily collection from hotels and tourism clusters	Do not allow vehicles to discharge near streams or forest fringes
Maintain vehicle hygiene (wash daily)	Do not store waste overnight at collection points

F. On-site organic waste management guidelines

On-site organic waste management shall be suggested for:

- All hotels and resorts with a capacity of more than 20 rooms⁶⁶
- Eco-tourism facilities generating more than 25 kilograms per day of biodegradable waste⁶⁷
- Tourism hubs, camping sites, and large restaurants

Recommended Technologies

Method	Scale	Description	Use of treated waste
Composting Units	Small to Medium	Decentralized units for kitchen and garden waste	Compost for local farms, gardens
Bio-Digesters / Biogas Units	Medium to Large	Converts wet waste into biogas and slurry	Cooking gas, liquid manure
Mechanical Composters	Large	Automated for high-volume hotels	Compost for landscaping
Community Compost Pits	Rural Villages	Pit or drum composting with community management	Soil amendment for agriculture

Management Protocols

⁶⁶ Guidelines for Waste Management in Hotels and Hospitality Sector, Central Pollution Control Board (CPCB, 2018)

⁶⁷ Solid Waste Management Rules, 2016 (Ministry of Environment, Forest and Climate Change, Government of India)

Do's	Don'ts
Maintain daily input/output logbook	Do not feed inorganic material
Use microbial inoculants to aid composting	Avoid open dumping of excess waste
Segregate wet waste at source	Don't use compost before curing period (at least 30 days)
Ensure regular maintenance and odour control	Avoid locating compost pits near water sources
Display composting info publicly (for awareness)	Don't leave waste unattended overnight

Integration with Farmers

Compost generated from tourism facilities or village sites shall be utilized productively by making it available to local farmers and landscaping initiatives at a nominal cost. This will ensure that organic waste is effectively recycled within the local ecosystem while supporting sustainable agricultural and greening efforts.

To streamline this process, a "Compost Bank" is suggested for establishment and should be managed by the Panchayat/Local body. The Compost Bank will facilitate the organized collection, storage, and equitable distribution of compost among beneficiaries, ensuring transparency and community-level participation in promoting circular waste management practices.

G. Penalties & enforcement guidelines

Enforcement follows "Polluter Pays" and "Extended Producer Responsibility" principles, through which these penalties serve both as deterrents and as revenue for SWM infrastructure.

Penalty Structure

Violation	Responsible Entity	Actions
Non-segregation at source	Hotel/Restaurant	Fines/penalty to be established by the ESZ monitoring committee.
Dumping waste in open areas, forests,/water bodies	Individual/Tourism Operator	
Non-installation of on-site composter	Hotel/Resort	
Mixing hazardous/e-waste with regular waste	Any Establishment	
Use of banned single-use plastics	All commercial entities	
Failure to conduct annual waste audit	Hotels / Operators >20 rooms	
Littering by tourists	Individual	
Non-payment of waste service fee	Property owner / operator	

3.8 Bio-medical waste management

Aim: Ensuring proper disposal and treatment of bio-medical waste generated from health care facilities (including Hospitals, dispensaries, PHC's, veterinary, blood banks & camps, funeral services etc. and related colleges & research centres) in Eco-Sensitive Zones.

Objective:

- To ensure proper disposal and treatment of Biomedical Waste as per the provisions made under the Bio-medical waste management rules, 2016 and as mentioned in ESZ notification.

Issues: Lack of segregation practices, results in mixing of hospital wastes with general waste making the whole waste stream hazardous.

Threats: Inadequate Bio-Medical waste management causes environmental pollution and may lead to the transmission of diseases.

Guidelines:

- 'Bio-Medical Waste Management Rules 2016' for collection, segregation, transportation and treatment of Biomedical wastes from hospitals, nursing homes, clinics, and dispensaries etc. shall be followed.
- 'Revised Guidelines for Common Bio-medical Waste Treatment and Disposal Facilities' as notified by Central Pollution Control Board, 2016 shall be followed for judicious management of bio-medical waste, especially masks and other medical supplies.

3.9 Management of storm water

The entire ESZ area is mostly covered with vegetation i.e. permeable surface and so mostly the rainwater is soaked by the ground. There is not much storm water left to manage in the rural areas. Villagers can rainwater harvesting technique as specified in Section 8.4.

3.10 Vehicular traffic control

Aim: Regulation of vehicular movement or high-speed movement in a habitat friendly manner.

Objective:

- To maintain the integrity of wildlife corridor.
- To ensure the development/construction as per Zonal Master plan and 'The Forest (Conservation) Act, 1980' and 'The Forest (Conservation) Rules, 1981'
- To minimize the number of animal road accidents and safeguard the movement of wildlife near the vehicular area to minimize the road crossing by the animals

Issues:

- Destruction of habitat of wildlife reduces the amount of suitable habitat available to them and promotes man-animal conflicts.
- Loss of wildlife (endangered species) due to road accidents.

Threats: Fragmentation of habitats may pose barriers for animal movement, leading to population declines or localized extinctions even over short time scales.

Guidelines:

- For the type, entry, speed limit etc. for vehicles passing through the ESZ shall consult the Management plans of the respective ESZ.
- In the case of certain critical conservation areas, such as National Parks and Tiger Reserves, a complete ban on night traffic along roads may be implemented using existing provisions in the law (Section 38V of the Wildlife Protection Act, 1972). In such cases, the following additional considerations shall apply:
 - a) The night ban shall apply primarily to all tourist and commercial vehicles, and non-commercial vehicles not registered to owners residing in Protected Areas and adjoining buffer zones

- b) Relaxed entry guidelines may be implemented for the benefit of bona-fide users from local communities' resident in the Protected Area or buffer zone (e.g., personal vehicles of people resident within enclaves of protected areas, public transport)
- c) Vehicles carrying crops and produce from plantations and agriculture within or adjoining protected areas may be permitted on contingency basis, only where no
- d) Alternative roads exist, with registration and monitoring of speed norms and checks at designated forest check posts.
- e) Convoy systems with regulated speed and timing may be considered as alternatives to a complete ban on traffic in areas where a dual-check post monitoring system is feasible. In the case of wildlife protected areas, such systems shall be subject to further approval by State Boards for Wildlife and the National Board for Wildlife.
- Speed limits shall be defined and enforced within all roads passing through natural areas with the following conditions:
 - a) Vehicle speeds in excess of 30 kmph shall not be permitted in those stretches of road that pass through any natural area.
 - b) Speed limit monitoring and imposition and collection of fines shall be the prerogative of State Forest Departments as well as highways and traffic police authorities
 - c) The State Forest Departments shall work to install speed-detection devices and speed cameras at all sensitive stretches of road passing through natural areas, particularly wildlife protected areas.
- Road alignments passing through the wildlife habitats shall be aligned in a manner so it does not disturb the natural wildlife habitats utilizing the concept of contiguous habitat management.
- The disturbance caused to wild animals by use of flood lights and high voltage beam search lights in the corridor areas must be stopped. Reflectors that reflect the light downwards and inwards shall be installed.
- All barriers including energized solar fencing erected, across the migratory path way of animals for the purpose of fencing in the private/patta lands shall be removed and free movement of animals shall be ensured for major corridor areas
- Preventive measures such as speed barriers in animal crossing areas with speed limit and ban to use horns shall be enforced strictly in the major animal corridor areas during day time.
- All vehicles delivering loose construction material and any such material gathered at the site must be covered by appropriate material such as tarpaulins to prevent dust spreading, pollution, or wastage.
- Movement of vehicles should be strictly restricted to existing roads and tracks, and creation of new roads and tracks or off-roading shall be prohibited in connection with roads and power lines in natural areas.
- Movements of vehicles and use of heavy machinery along riverine areas and water courses should also be avoided.
- Natural crossings: wherever possible natural vegetated crossings existing across linear intrusions (such as tree canopy overlapping overhead or low natural vegetation below power lines) should be retained or encouraged.
- Where natural crossings cannot be retained, regenerated, or encouraged, and adequate justification exists for construction of artificial structures and passages for wildlife movement, they should be installed on existing or new roads (or power lines) following norms for location and design strictly on the basis of proper field assessments by and on the advice of qualified wildlife scientists and ecologists. Such structures may include:
 - a) Underpasses: well-designed tunnels, culverts, pipes, and other structures can function as underpasses below roads and bridges, for a wide-range of terrestrial and aquatic species, especially frogs, turtles, fish etc.

- b) Overpasses and flyways: built structures that go above the linear intrusion to provide a passage or movement route for wildlife can be considered for roads disrupting movement routes of animals such as some ungulates, small mammals, and arboreal mammals. These tend to be expensive and may be applicable in limited areas and should be considered only after options to restore connectivity by natural means have been explored and found unsuitable.
- c) Canopy bridges: bridges with durable material such as tarpaulin, rubberised hose, bamboo, etc. to connect tree canopies over roads.
- d) Well-designed wildlife crossing structures as indicated in scientific literature such as in Wildlife Institute of India publication Roads, sensitive habitats and wildlife: Environmental guideline for India and South Asia, and other literature cited at the end of this document.
- Management strategies to detect and prevent encroachments or construction of new structures and homesteads along linear intrusions need to be adopted. In the case of existing structures such as households and lands, possibilities of using CAMPA and other funds to purchase these should be explored.
- No material including earth should be used from the sanctuary area. All construction materials should be brought from outside the sanctuary area including earth, stones etc.
- **TR-15:** All outside material left over after construction or repair (including stones, sand, cement, packaging material, papers, cartons, oils, cans, bags, wires, metal objects, housing sheds, plastics and glass) should not be left on site, but should be carefully removed and carried away outside the natural area and safely disposed of or reused elsewhere.
- Width of vegetation clearings along roads should be minimised. Width of vegetation clearing from edge of roadbed shall be:
 - a) not more than 3 metres in areas such as tourism zones and on the inside of sharp curves for the purpose of visibility
 - b) not more than 1.5 metres in general in all other parts of natural areas
 - c) 0 metres where the vegetation is low (grassland, scrub, wetlands)
- Continuous retention walls, fences or other structures that can act as barriers to animal movement should not be installed along roads, especially in hilly terrain. Structures permitted to be installed or already installed along existing roads in natural areas should:
 - a) have sufficient gaps of at least 2 metres width incorporated at regular intervals (every 8 metres) in the case of retention walls/side walls;
 - b) have a height not exceeding 45 cm;
 - c) in the case of fences, not be installed as a matter of policy, unless specifically evaluated and advised regarding height, placement, and animal passages by a competent wildlife scientist after field assessment
 - d) preferentially use crash-guards with single bar (at 0.6 – 1 metre height) over continuous sidewalls, with periodic gaps as mentioned above, as this will facilitate movement of both smaller animals under the bars and larger species through gaps.
- There should be provision of speed breakers at every 400 m of roads passing through natural areas such that the speed is regulated so as to avoid accidental death of wild animals.
- Apart from mandatory sign boards along the road, boards depicting wildlife safety instructions and cautions relating to it should also be placed at every 500 m using good material and having proper font size and pictures.
- All vehicles entering natural shall pay prescribed entry fees. Mechanisms to ensure that such fees are utilised for conservation of the area should be encouraged.

Guidelines for Railway lines and Power lines:

- Any related activities shall be carried out with strict adherence to 'Draft Guidelines for linear infrastructure intrusions in natural areas: roads and power lines' as notified by National Board for Wildlife, Ministry of Environment and Forests, India, 2011'.
- Prevention of linear intrusions in natural areas shall have primacy over permission or sanction-with-mitigation, where alternatives including realignment have not been explored or considered for implementation.
- As far as any permitted new roads or power lines or railways and road-widening works are concerned, the following elements in natural areas shall receive protection and cannot be destroyed, damaged, removed, or altered during construction and other works:
 - a) any mature, native tree species of girth at breast height >30 cm
 - b) all banyan, peepul, neem, and tamarind trees, and any other species valued
 - c) by local communities as determined through open consultations or deemed useful for local people and village communities
 - d) any listed protected or reserved plant or animal species,
 - e) any grove or tree deemed sacred by local communities
 - f) natural streams, rivers, and water bodies and minerals from within the water bodies or along their banks
- Preference for employment of local people in the area through which the road or powerline passes (especially from tribal communities) over outside workers in all vegetation clearing operations, as local people are better at identifying native and alien plant species
- The Ministry of Environment and Forests (India) shall coordinate a nation-wide effort in conjunction with State Forest Departments, conservation NGOs, and individuals to identify linear intrusions that are disused, defunct, abandoned, or particularly harmful for conservation in the natural areas, and begin the process of ecological restoration of these areas with regeneration and recovery of their wildlife and conservation values. Removal/ripping of defunct and disused roads, tramways, power lines, and other disused structures followed by ecological restoration (including natural regeneration of native vegetation) should be undertaken on a nationwide basis. These may be specifically targeted for:
 - a) abandoned roads (e.g., old logging coupe roads)
 - b) unsurfaced roads in infrequent use
 - c) defunct or disused power lines and tramways
 - d) roads and power lines disrupting key habitats, which can be realigned
- The Ministry of Environment and Forests (India) and related statutory authorities and committees including the Forest Advisory Committee and the Standing Committee of the National Board for Wildlife shall encourage and mandate that highways departments and authorities such as the National Highways Authority of India (NHAI) and electricity authorities can and should try to deviate to save critical wildlife areas.
- **LI-RP-07:** The construction of the linear intrusions should be in a manner (quick, with minimum disturbance) and with adequate design and technology to minimise the long-term impacts including by:
 - a) Using prefabricated and special methods to reduce the time taken in the erection/construction of the intrusions.
 - b) Avoiding work during nights to facilitate movement of many species, especially large mammals and carnivores.
 - c) Avoiding camping of people/workers and use of domestic animals.

Specifically, for railway line:

- Railways shall be asked to be install signages highlighting the importance of forest and wildlife in these areas along the railway line.

- The forest department shall identify spots that are used by wildlife to cross the railway line or main traffic carrying road. Such spots shall be jointly monitored by the Forest and Railway departments.
- The railway shall be asked to reduce the speed of the train to 40 km per hour while passing through these spots.
- In case there is development of more railway lines or increase in the frequency of trains plying on this railway line, the Railways shall be asked to practise all precaution so that mortality of wildlife is minimal.
- The Forest department shall make it mandatory on Railways to provide with underpasses, if felt necessary, for movement of wildlife in case of new development / re-development.

Specifically, for Transmission line:

- Any electricity lines passing through the protected area shall be regularly maintained by the electricity board. All necessary precautions shall be taken to avoid incidences of electrocution.
- Linear intrusions such as low power lines and open canals shall not be permitted in natural areas.
- Use of underground power cables along existing road alignments must be carefully considered, which may avoid opening up an intact area.
- In order to prevent electrocution deaths of Asian elephants, the height above the ground at the lowest point of the lowest conductor or grounding wires (i.e., at maximum sag point) of power lines, whether insulated or bare, passing through all-natural areas with known presence or movement of Asian elephants shall be:
 - a) a minimum of 20 feet (6.6 metres) above ground on level terrain (slope <20 degrees)
 - b) a minimum of 30 feet (9.1 metres) above ground on steeper terrain (slope >20 degrees)
- Powerlines located in crucial areas such as flyways, migratory routes, roost sites etc. may cause significant mortality of volant animals such as bats and birds, besides risk of fires and power outage. To minimize bird and bat collisions and electrocutions the following prevention and control measures shall be adopted in such areas:
 - a) Aligning transmission corridors to avoid critical habitats (e. g. nesting grounds, heronries, rookeries, bat foraging corridors, and migration corridors);
 - b) Maintaining 1.5 metre spacing between energized components and grounded hardware or, where spacing is not feasible, covering or insulating energized parts and hardware;
 - c) Existing transmission or distribution systems may be retro-fitted by installing elevated perches, insulating jumper loops, placing obstructive perch deterrents (e.g., insulated "V's"), changing the location of conductors, and / or using raptor hoods.
 - d) Marking of powerline wires with reflectors or other items that will prevent bird collisions and deaths
 - e) Monitoring powerlines for animal deaths and effectiveness of implemented measures
- For power lines passing through natural areas, the following additional safeguards must be evaluated and implemented:
 - a) removing earth wires (and modifying earthing methods),
 - b) modifying line, pole and tower design and placement, to minimise visual (aesthetic), ecological (impact), and wildlife mortalities
 - c) installing underground cables in preference to overhead cables, especially in sensitive stretches
 - d) Conspicuous marking of lines, poles and towers.
- Width of vegetation clearings along power lines should also be minimised. Width of vegetation clearing from the centre of the powerline shall be:

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Category	Voltage	Vertical clearance above ground	Vertical clearance from vegetation	Horizontal clearance from vegetation
Low / medium voltage and service lines	Up to 650 V	5.8 metres*	2.5 metres	1.2 metres
High	Over 650 V to 33 kV	6.1 metres *	3.7 metres	2 metres
Extra high	Over 33 kV	6.1 metres* (plus 0.3 metres for every additional 33 kV or part thereof)	3.7 metres (plus 0.3 m for every additional 33 kV or part thereof)	2.0 metres (plus 0.3 m for every additional 33 kV or part thereof)

®Table based on the clearance requirements for powerlines under Rules 77, 79, and 80, read with Rule 82A(3) in the Indian Electricity Rules 1956 (as amended up to 25 November 2000).

*For natural areas with presence of Asian elephants, Guideline #4.27 specifying minimum 6.6 m above ground on level terrain (slope <20 degrees) and minimum 9.1 m above ground on steeper terrain (slope > 20 degrees) shall apply.

- As far as possible vegetation clearing along the stretches of transmission corridor passing through natural areas shall be minimised or avoided by increasing the height of tower structures to maintain safe vertical clearance over natural vegetation or by using underground power cables along critical stretches to prevent disruption of vegetation or forest continuity.

3.11 Management of resource extraction

All new and existing mining (minor and major minerals), stone quarrying and crushing units shall be prohibited with reference to in the Eco-sensitive except for the domestic needs of bona fide local residents including digging of earth for construction or repair of houses and for manufacture of country tiles or bricks for housing for personal use as per ESZ notification.

For more details refer Bagdara Management Plan.

3.12 Management of hazardous waste

Use or production of any hazardous substances is completely prohibited in the ESZ area as per ESZ notification.

3.13 Surface and ground water withdrawal

Aim: Promotion of 'Ground water Management' practices to reduce dependency on ground water.

Objective:

- To reduce dependency on ground water by provision of piped water supply through 'Jal Jeevan mission' to all villages in ESZ.
- To promote 'water conservation methods' in ESZ by promoting rainwater harvesting methods in villages/ hotels/resorts to recharge ground water levels with the provisions of the concerned Central or State Acts and the rules made thereunder.

Issues:

- Increased ground water dependency due to lack of piped water supply
- Lack of provisions for recharging ground water table or rainwater harvesting

Threats: Extraction of ground water for irrigation purposes leads to declining ground water levels further resulting in disturbance in 'Flow regime'.

Guidelines:

- Extraction of ground water by hotels/resorts etc. for filling up the swimming pools shall be as per the limits permitted from forest department.
- There shall be limited extraction of ground water by farmers for irrigation purposes. A proper monitoring and checking shall be done on monthly basis.
- The supply of piped water supply shall be ensured through 'Jal Jeevan Mission' in those villages where ground water level is very low, to reduce the dependency on ground water.
- No sale of the ground water shall be permitted for domestic or commercial use.
- Rainwater Harvesting projects at community level may be undertaken adopting following techniques like Gully Plug, Contour Bund, Gabion Structure, Percolation Tank, Nala Bund, recharge Shaft.
- Rainwater harvesting structures to be installed in villages/hotels/resorts and other govt buildings. (Refer "Regulations for Construction of Resorts and Hotels" under "Sub zonal Tourism Plan")
- The design of rainwater harvesting system shall be according to the guidance on Rainwater Harvesting published by CGWB.
- New wells shall be constructed for the villagers and old wells shall be repaired to provide potable water to animals and human beings.

3.14 Protection of the source water

Aim: Conservation and rejuvenation of natural springs (including springs, major water courses, lakes and ponds) and their catchment areas (relevant watersheds/ micro-watersheds).

Objective:

- To promote adequate conservation and rejuvenation measures in all natural water bodies elaborated in Chapter 4.
- To regulate development activities around the natural water bodies as per zonal development guidelines in order to minimize detrimental impacts.

Issues:

- Reduction in size of Natural water bodies
- Drying up of wells
- Increased pumping costs
- Land subsidence
- Contamination of Natural water bodies due to anthropogenic activities.

Threats:

- Discharge of solid and liquid waste into the natural water bodies.

Guidelines:

- It is suggested to regulate development activities around the natural water bodies as per zonal development guidelines mentioned in chapter 3.
- Promote adequate conservation and rejuvenation measures in identified natural water bodies especially for water bodies with area more than 5 Ha. All perennial water bodies are of significance to Wildlife, which should be protected/conserved as high value assets.
- Water is available in limited quantity in certain parts of the forest during the summers therefore development of water sources by gully-plugging and by erecting nallah bunds, check-dams, etc. shall be done, especially along the major Animal corridors.
- The water sources may be developed through various means like desilting, deepening, diverting small trickles into dug out troughs adjacent to nallahs, construction of water holes at the appropriate places. This may ensure availability of water sources for wild animals and shall

reduce straying of those animals into agricultural fields thereby reducing conflicts with human settlements.

- Creation of few water sources exclusively for wildlife is extremely essential to keep them contained in forest areas.
- Installation of Rainwater harvesting facility shall be carried out as mentioned in section 3.4.1, the Model building byelaws, 2011 and Manual for artificial recharge of ground water by central ground water board.
- It is suggested to substitute eucalyptus plantation with a native tree which consumes less water. Native Plantations to be introduced which can tolerate higher water stress and dry periods.

3.15 Development of resilience to climate change

Aim: Development of resilience to climate change to regulate ecosystems, protect biodiversity, play an integral part in the carbon cycle, support livelihoods, and can help drive sustainable growth.

Objective:

- Restoring forest landscapes (refer section 3.2.1.)
- Promote soil and water conservation measures (Refer section 3.2.)
- Promote sustainable agricultural practices (refer section 3.17)
- Promote strategies to reduce air, water and soil pollution (refer section 3.6, 3.7, 3.19)
- Reduce dependency on ground water and protect water sources (Refer section 3.13 and 3.14)

Issues and Threats:

- Climate change will likely alter the frequency and intensity of forest disturbances, including wildfires, storms, insect outbreaks, and the occurrence of invasive species.
- The productivity and distribution of forests could be affected by changes in temperature, precipitation, and the amount of carbon dioxide in the air.
- Climate change will likely worsen the problems already faced by forests from land development and air pollution.

Guidelines for forestry sector:

- It is suggested that guidelines under sections 3.1 and 3.2 shall be followed.
- It is suggested that guidelines under 'Tiger Conservation Plan – Bandhavgarh Tiger Reserve' shall be followed.
- Forest Management (Working) Plans, based on the different forest types in view of Climate Change, shall be developed.
- Forest conservation, Afforestation (with special emphasis on Compensatory Afforestation), and Reforestation activities through viable models shall be enhanced.
- Soil and water conservation measures shall be prioritized as part of SFM practices.
- Over-dependence on forests for energy shall be reduced by encouraging alternate energy sources.
- The forest fire management mechanism shall be strengthened throughout the year.
- Corridors for species migration shall be created.
- Market linkages for forest-based livelihood opportunities shall be supported and developed.
- Impetus to Climate Change relevant research and development shall be given.
- A study on the impacts of Climate Change on MP forests shall be conducted.
- Awareness shall be created.

Guidelines for Water sector:

- It is suggested that a comprehensive water database be developed and placed in the public domain.
- Surface water development activities in the state shall be accelerated.
- The recharge of groundwater, with a special focus on over-exploited areas, shall be promoted.
- It is suggested that efficient water supply systems and management be planned.
- Water management practices, such as water auditing, regulated exploration of groundwater, and water recycling, shall be encouraged.
- Basin-level integrated watershed management shall be enhanced.
- It is suggested that existing water storing structures be reviewed in view of excess precipitation.
- The restoration of traditional water storing structures as groundwater recharging structures shall be encouraged.
- Impetus shall be given to climate change relevant research and development.
- Capacity building, both institutional and personnel, to integrate climate change concerns in planning, shall be encouraged. It is suggested that relevant experts be consulted in this process.

Guidelines for Agriculture sector:

- It is suggested that soil and water conservation technologies shall be promoted.
- Dry land agriculture and horticulture shall be promoted.
- It is suggested that cropping systems suitable for each agro-climatic zone be planned.
- Policies for managing climate risks for sustainable productivity shall be introduced.
- Enhancing the dissemination of new and appropriate technologies and strengthening research is encouraged.
- The creation of Agriculture Information management, including information on climate forecast, is encouraged.
- Additional impetus to mechanization and accessibility to markets shall be provided.
- The creation of rural business hubs for diversification of livelihoods is encouraged.
- Capacity building of communities on sustainable harvesting, water management, use of fertilizers, sustainable agri-residue management, etc., shall be undertaken.
- Promotion of climate change relevant research and development is encouraged.
- Capacity building to integrate climate change concerns shall be implemented.
- It is suggested to consult local experts when planning for cropping systems.

Guidelines for Energy sector:

- It is suggested that efficiency in the generation of power shall be enhanced.
- Exploration and feasibility assessment of new technologies using conventional fuel is encouraged.
- It is suggested that a green tariff structure shall be developed for incentivizing the production of clean energy.
- It is suggested that Demand Side Management (DSM) be improved in street lighting, public buildings, and water pumping.
- It is suggested that an improved mechanism for the use of energy-efficient pumps for irrigation shall be developed.
- A campaign for the implementation of Energy Conservation Building Codes (ECBC) is encouraged.

- It is suggested that the potential that exists in the Clean Development Mechanism (CDM) domain shall be explored and tapped, and relevant experts shall be consulted.

3.16 Tourism and Heritage conservation

Aim: Promotion of sustainable tourism development which aims to increase tourism potential in Bagdara WLS and its ESZ and to reduce negative environmental impacts and conservation of natural and man-made heritage sites.

Objective:

- To identify the new potential tourism spots and circuits to increase the tourist inflow and time of engagement.
- To identify and delineate the priority natural and man-made heritage sites and suggest adequate conservation measures to protect and manage the area
- To regulate tourism activities (new and existing) in accordance with Tourism Master Plan prepared as per ESZ notification.
- To promote eco-friendly tourism, eco-education and eco-development activities.

Issues:

- Lack of management and planning at concentrated tourist areas which leads to exploitation of environmental resources.
- Lack of tourist infrastructures such as toilets, dustbins, drinking water, signages, security, tourist information services, accessibility etc.
- Degradation of natural assets by the impacts resulting from increasing human activities like agriculture, extraction of NTFP, tourism etc.
- Negligence and lack of maintenance at other unexplored potential tourist and heritage sites.

Threats: Uncontrolled and unsustainable tourism results in overexploitation and degradation of resources.

Guidelines for Tourism:

- It is suggested to follow the 'Ecotourism guidelines by Ministry of Tourism, 2011' for regulation of eco-tourism activities along the protected areas. Additional guidelines for Tourism Promotion Areas are mentioned in Chapter 5.
- Ecotourism infrastructure shall adhere to eco-friendly, low impact, low height aesthetic codes of architecture. Adoption of eco-friendly practices including solar energy appliances, waste recycling processes, water management and natural cross-ventilation shall be encouraged.
- Tourism activities/initiatives are suggested to implement digital technologies to significantly reduce paper waste generated by tourists within the ESZ.
- Locals may be trained to act as tour guides who shall accompany visitors coming to the Reserve. Promoting eco-tourism in forest areas to increase awareness amongst people regarding importance of conservation and protection of forests and wildlife.
- Homestay facilities shall be developed to ensure income to the villagers / locals. Follow 'Homestay scheme' by MPTB.
- For detailed guidelines for construction, refer the suggestive guidelines mentioned in Section 5.3.2.
- No material including earth cutting, borrow pits shall be from the sanctuary area. All construction materials shall be brought from outside the sanctuary area including earth, stones etc. All outside material left over after construction or repair (including stones, sand,

cement, muck, packaging material, papers, cartons, oils, cans, bags, wires, metal objects, housing sheds, plastics and glass) should not be left on site but should be carefully removed and carried away outside the natural area and safely disposed of or reused elsewhere.

- All facilities shall provide facilities for their waste management if local infrastructure is not available.
- Hotels shall promote water sensitive development and may be levied on additional taxes to maintain pools or other water sports activities.
- Tourism and related activities or infrastructure are promoted only in Tourism Promotion Areas (TPA) as defined in Sub-Zonal Tourism plan
- All forms of activities in TPA shall be identified and regulated as per carrying capacity norms specified by MoEFCC.
- As per Supreme Court Order, no hotel or resort is allowed within 1 km from the boundary of ESZ outside the Tourism Promotion Areas (TPA).
- All the activities related to tourism like over-flying the National Park Area by aircraft, hot-air balloons etc. to be regulated as per the Directorate General of Civil Aviation (DGCA).

Guidelines for heritage protection:

- The area of natural or man-made heritage shall be demarcated by a boundary such as bio-wall/plantation without disturbing the natural ambience and look of the place. The demarcated area needs to be conserved, if necessary, as per the recommendation(s) from the forest department.
- Selected heritage sites (as mentioned in chapter-5) may be open to tourist and may be provided with sufficient infrastructural facilities including accessibility, toilets, ticket counters, signage, benches, lights or as needed.
- The number of visitors may be restricted as per the carrying capacity of the area by
 - a) Restricting entry or closing an area
 - b) Limiting group sizes
 - c) Implementing a quota or permit system, or
 - d) Increasing fees / charges for entry / access
- Options for dispersing or concentrating people to reduce utilize resources within a particular area may include:
 - a) Restricting the number of people who may enter the demarcated area.
 - b) Zoning an area for a particular activity and not permitting certain activity
 - c) Directing tourists to more resilient areas through zoning, visitor education and offering more facilities or fewer facilities.
 - d) Charging different entrance fees on certain days of the week; and
 - e) Using a promotion and interpretation campaign to influence the use of one area over another.
- Visitors' behaviour may be changed through education programmes/penalty for use of plastics - teaching low-impact ways to visit a site, e.g., techniques for observing wildlife without disturbing it; and by interpretation programmes teaching respect for a site's resources and protection issues.

For plantation purposes:

- Plantation shall be carried out to augment the forest resources as per the needs of the wildlife in the ESZ areas. Natural regeneration in the area shall be ensured and if necessary, artificial regeneration shall be undertaken.
- For felling up of trees, follow 'Marking and felling rules' as mentioned in the management plan to be followed. Behavioural changes to be introduced in villagers regarding plantation activities. School children to be given special courses in all primary schools regarding promotion/protection of Wildlife.
- Areas with good and deep soil shall be planted after digging pits, while those with shallow soils shall be used for Fuel wood plantations and fodder development.
- Irrigated plantations shall be preferred in areas near water source. Mahua and Bamboos shall be harvested as per the standard forest rules for bamboo. Degraded and congested clumps shall be rehabilitated through clump cleaning or clear-felling operations. Developing clumps or bamboo plants shall be treated with weeding, cleaning, soil working, protection, etc. until they become well-formed clumps. Bamboo products can be developed as key source of livelihood especially by the **Basaur community in the area**.
- To improve the quality of habitat from the point of view of meeting the needs of the communities, village wood lots may be developed on the fringes so that the locals do not have to venture deep into the forest. The JFMC/EDCs concerned shall play a pivotal role in this exercise.
- Awareness campaigns regarding importance of biodiversity and ecosystem services shall be regularly carried out, villagers should be introduced to the ecosystem services and the importance of wildlife in maintaining the ecosystem services.
- A good network of Forest Protection Committee, (for densely forested areas), Village Forest Committees (open forest areas), Eco-development committee shall be developed that shall be encouraged to work in tandem with each other for the protection of forest.

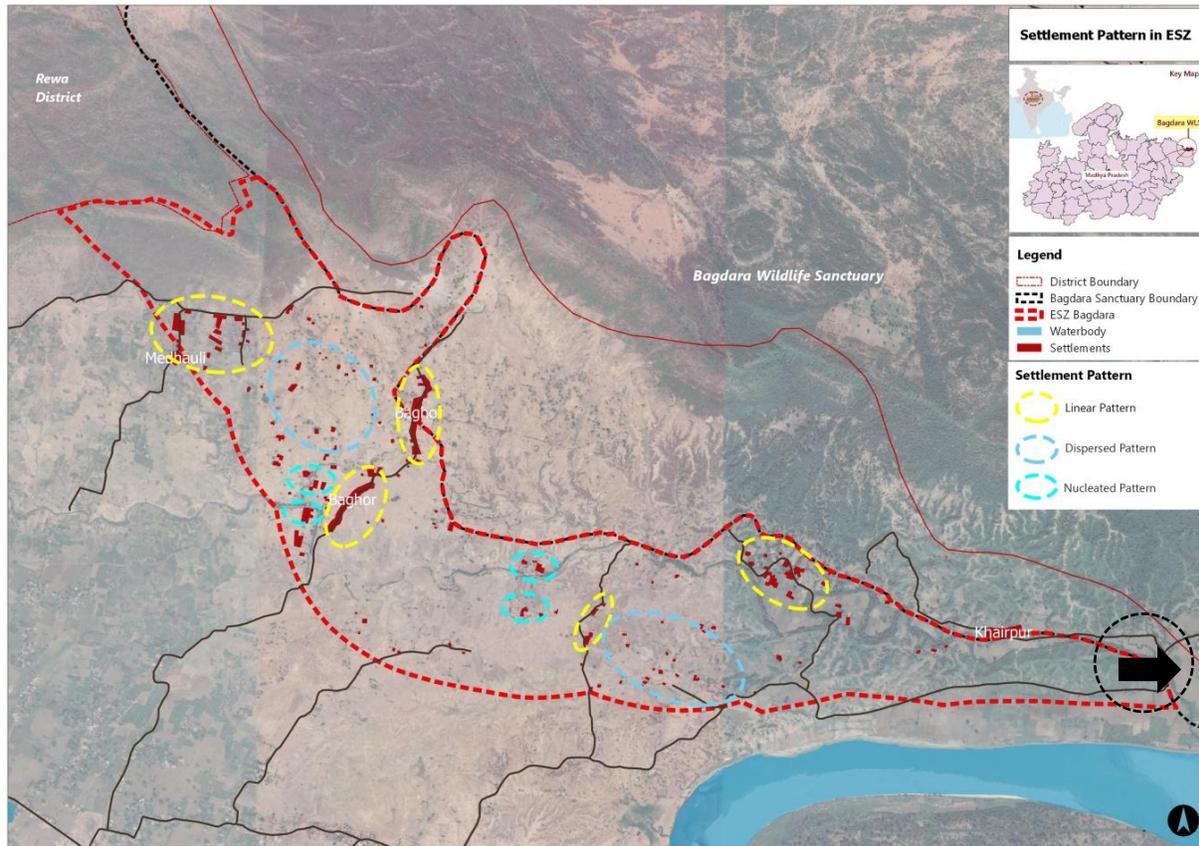
PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.16.1 Bagdara Interpretation center at Baghor entry gate

Sanctuary is well known for black buck population. Black bucks can be seen in any season very easily. Blue Bulls are also seen in abundance. Apart from wildlife, some rock painting of Stone Age periods, rock shelters and view spots are the attractions for tourists. With the development of infrastructure, more tourists can be attracted.

Project Rationale and location

The basic criterion for attracting tourists is to provide basic infrastructure facilities. The ESZ area is having one entrance gate (as marked in the following exhibit) but it is not utilized due to lack of facilities, so it becomes important to develop this area so that tourist enters the forest area from this gate.



Project Description

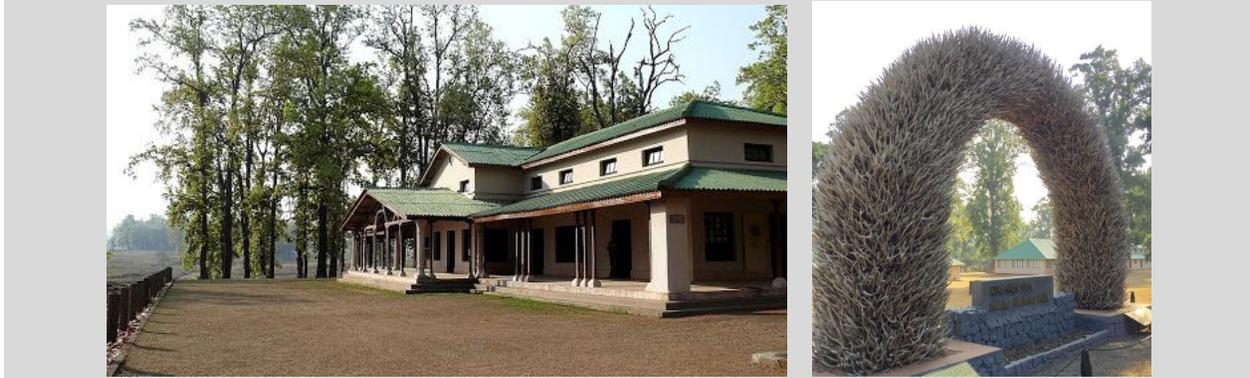
The following are the key components for development around the entrance gate:

1. Tourist interpretation center

- **Construction of tourist interpretation center in local vernacular architecture** such as mud walls and thatch roof and decorate it with 'Ranimachi' paintings. This would generate awareness among local people regarding their valuable knowledge of art and construction. The same could be later passed on to future generations.
- It would consist of **information center** where tourist can know about the sanctuary and wildlife especially black buck. It would also provide information of safari timings, tourists destination and rural tourism. The prehistoric road- paintings rock-carvings, caves, and rock- shelters shall be protected and maintained.
- **Accommodation and travel:** The facilities for boarding & lodging shall be provided for the tourists, minimum 3 rooms in the first phase which can later be expanded if necessary. The Eco-committees shall take care of the catering/ tourists, for which a minibus. A Gypsy shall be purchased.
- **Cafeteria:** Food can attract tourist from different places and is one of the basic necessities. The cafeteria in the interpretation center would not only offer comfort food required by the tourist but also gives them opportunity to taste the local flavors.
- An **orientation center** would also be a part of it where training would be given to local people for guides. It has to be ensured that all guides and drivers compulsorily undergo a short course in park interpretation and rules and regulations for effective tourism management in the Protected Area.

- **Documentary on Bagdara:** The regular film shows for visitors and people shall be arranged, after the construction of the auditorium center at Bagdara. Documentary films on Bagdara wildlife sanctuary need to be prepared and regular show may be started in the centre at Bagdara at least once in a week
- **Sensitization to tourists:** Visitors' behavior may be changed through education programmes - teaching low-impact ways to visit a site, e.g., techniques for observing wildlife without disturbing it; and by interpretation programmes teaching respect for a site's resources and protection issues.

Case study: Kanha Museum. The Kanha museum is located near the Kisli gate inside the Kanha national park. This is a place from where detailed information about the topography of the park and its various aspects can be obtained. The museum is maintained by the forest department of Madhya Pradesh. The museum is opened throughout the day for the visitors. It has an eatery and toilet facilities nearby. This is a very nice museum with the history of development of Kanha National Park with notings of celebrity visitors like Indira Gandhi, Rajiv Gandhi etc. The central hall also had a video room showing videos of tigers of the park.



2. Construction of a **watch tower** from where the activity around the gate can be observed.
3. **Nature walks/trails:** To elevate the tourist experience, nature walks can be arranged near the gate with dense vegetation.
4. **Greening and beautification of the approach road:** The road leading to the gate of the forest entry should be beautified with sideways plantation with signages portraying the significance of the forest area.
5. **Village tourism in Baghor –** Near to the gate, the experience of living in the village, their cuisine, culture, tradition, festivals etc can be seen at Baghor village.

Regulation, monitoring and evaluation: The entrance rules for the sanctuary shall be as follows:

- The tourists shall get the entrance pass form the entrance gate.
- The staff or tourists guide shall accompany the tourists.
- The tourists shall restrict their vests in the tourists, zone only.
- The Tourists shall not go near the natural water resources.
- The tourists shall use the watchtowers established in the tourists, zone only.
- No search light use for spotting the wild animals.
- The visitors shall be allowed from the sunrise to sunset.
- The use of radio, transistors shall be strictly prohibited.
- The blow of horn shall be strictly prohibited.

The register of the tourist's details shall be maintained by the Deputy. Ranger/Forester I/C of the entrance gate Kudheri in which the number of tourists, their occupation, age, address, purpose of visit, etc. shall be entered.

Project Benefit

- The development of cluster along with activities and infrastructure would lead to increase in tourist footfall and increase the duration of stay with so many activities to mingle around. This is increasing the popularity of the place, generate awareness among locals and tourists and help the government to generate revenue.
- Employment Generation – It generates employment and income for the local communities, especially beneficial to women who often have no new opportunities to earn income away from home.
- To create an improved understanding among tourists on the nearby tourist spots and availability of tourist infrastructure, so that they can plan their trip comprehensively
- For State Government to develop the cluster as a whole with necessary infrastructure in a planned way like provision of signage's, providing last mile connectivity, connecting the tourist sites with good transportation facility, etc. and to manage the destination.

3.16.2 Upgradation of village and development of rural tourism

With a growing demand for eco-tourism or nature-based tourism, village tourism is becoming one of the emerging sectors in Indian tourism markets. It is a multi-faceted approach that induces factors such as increasing level of awareness, growing interest in heritage and culture, improved accessibility, and environmental consciousness and have shifted trends towards rural tourism. Ministry of Tourism specifies that any form of tourism that showcases the rural life, art, culture and heritage at rural locations, benefits the local community economically and socially, and enables interaction between the tourists and the locals for a more enriching tourism experience can be termed as rural tourism. Rural tourism may include multiple facets such as farm tourism, cultural tourism, nature tourism, adventure tourism, and eco-tourism. The country has seen successful rural tourism models in states such as Kerala's backwater, Karnataka's Forest, and Tamil Nadu's temple.

Project Rationale

The key features of the village which has the potential to be developed for rural tourism:

- Scope of organic agriculture: The main source of livelihood is agriculture; it is done throughout the year (both Rabi and Kharif). Other crops include till, arhar, Sanai (fruit for fibre manufacturing), soyabean, makka, moong, maize and other vegetable. some farmers also use organic fertilizers for agriculture.
- Irrigation techniques: Currently villagers use ground water for irrigation but with the proper canal system from Bansagar, efficient irrigation would take place.
- Collection of forest produce: Villagers are engaged in the collection of Mahua (flower and fruit) from the trees in the forest. It is sold at Rs.40 per kg. From doing so the plants surrounding the tree are burnt so the collection becomes easier.
- Use of forest products: The fruit of mahua is collected and compressed to get oil out of it which is used by the villagers themselves for cooking, massage and as hair oil
- Construction of local houses: The houses are G, G+1, made up of bricks, stones, sand and mortar, the ground floor is for cattle, 1st floor is made of made for storage of grains and cereals. Roof is made of bamboo and insulation with cow dung.

All these points can be explored to attract tourists. Apart from these many interventions/upgradations are needed to make the village easily accessible and comfortable.

Project Description

Village upgradation: As this area and village has a lot of history, it is necessary to develop the village with basic infrastructure and amenities to attract tourists.



Image 5: The village of Baghor and its residents over the FGD's

- **Accessibility:** To provide suitable connectivity of the village with Singrauli district and nearby major centers. Small roads inside the village should also be repaired with no potholes and damages. There are some roads which are already under construction under Pradhan Mantri Gram Sadak Yojna (PMGSY).
- **Accommodation and food:** There is need to encourage some villagers to opt for homestays and develop the property with minimum infrastructure as per the Homestay scheme by MPTB. Once the houses are approved for Homestay, the tourists can live in the village, learn the culture and taste the local cuisine delicacies.
- **Organic agriculture:** Organic farming to be promoted and its produce shall be sent to nearby hotels/guest house and Singrauli district. Refer section 3.17
- **Livestock management:** Refer section 3.17
- **Reviving village pond:** Construction of a small pond like structure to be created for rainwater harvesting which would suffice the water needs to the villagers. And proper protection and security to be arranged to restrict any kind of nuisance created around the pond, this structure has become unfunctional.
- **Training:** In order to create an alternative source of livelihood, some training needs to be organized for the villagers. For the women, the training for making 'Ranimachi' painting should be taught which can also be a tourism product. For men, the training to tourist guide should be organized, so the person would be able to inform the tourist about the circuit and river. Trainings for hospitality should be organized for homestay owners.

Case study/Best practices

Home to an ethnically diverse community, Hodka village is a unique cultural mosaic of cattle herders and traditional crafts persons. Sham-e-Sarhad, Hodka village resort, was an initiative by the Endogenous Tourism Project (ETP) in collaboration between the United Nations Development Programme (UNDP) and the Ministry of Tourism, Government of India. Owned and operated by the Village Tourism Committee of Hodka, the resort is run by local community members and offers an authentic yet incredible experience of the local culture, crafts and heritage. At Sham-e-Sarhad, sustainable visitor strategies based on art, craft, culture, natural heritage and environment care, have led to larger tourism yields, which in turn have contributed to the conservation of Hodka's unique ecology and its community. The beneficiaries have been the area's rural poor, women and unemployed youth. The formation of rural self-help groups and local stakeholder participation has been a successful exercise in sustainable capacity building. By facilitating engaging experiences of rural life for the paying visitor, who is the direct income source for the local communities, Sham-

e-Sarhad has helped improve the local people's quality of life and created an opportunity for conscious eco travellers to experience a whole new perspective.



Image 6: Hodka Village, Kutuch⁶⁸

Village tourism: The village has all the aspects to be developed as village tourism including road connectivity and accommodation. The following are the activities that can be taken up in the villages such as:



Image 7: Type of construction (left) and agricultural practices (right) done in the village

- Accommodations – Homestays can be developed with vernacular architecture with mud construction for thermal comfort. The science of construction and climate can be taught to the villagers.
- Workshops and art fairs - to create awareness and interest towards local art and culture among tourist's local people can take up volunteer Workshops and art trade fair along with folk dance and music.
- Organic produce: The agricultural farming practices can engage the tourists for entire day where he will be taught the steps involved in farming like ploughing, seeding, irrigation, collection etc.
- Livestock: Engaging tourist with cows and goats and the way there are kept. From their living conditions to food, everything would be taught to the tourist.
- Community Guided Walks – Nature walks or village tour where the entire village along with the practices, community involvement etc will be told.
- Concept of a "Life in a village" – Using this concept the tourists can go through activities that a villager does on a daily basis - preparing food the traditional way and farming in the fields. Tourists also get a chance to interact with the villagers enjoying local cuisines and play local games with the children of the village.

⁶⁸ <https://www.flickr.com/photos/rudiroels/5052254682>

Project Benefits

- **Employment Generation** – It generates employment and income for the local communities, especially beneficial to women who often have no new opportunities to earn income away from home.
- **Conservation of Natural Resources** – It encourages conservation and care of natural resources such as the rivers, forests, mountains as well as local fauna and flora, birds, fish and almost extinct animals. When these are valued as living assets to attract income, they are usually cared for.
- **Preserves the traditional practices and customs** - It Provides incentives to preserve some of the old customs and traditions, crafts, traditional festivals, architecture, food and other practices unique to certain cultures.
- **Dissipates the benefits of tourism development directly to the local communities** - Given that services are often provided by residents of the village tourism benefits the village in that there is greater cooperation among villagers as they operate the local enterprises providing for the tourists.
- Conservation of biodiversity and promotion of responsible tourism through low-impact development.
- Creation of awareness about local agricultural practices, produces, medicinal herbs etc.

3.16.3 Installation of display boards, dustbins etc. at main locations

Project Rationale

Bagdara WLS is a special area and needs utmost attention to control and prevent any disturbances caused to animals by anthropogenic activities like use of loudspeakers, throwing garbage or plastic in Protected Area, burning of fuel wood etc. These activities not only affect the health of animals but of villagers also. There is an urgent need to sensitize the people about their actions which can cause a heavy impact on forest and its resources.

Project description

A. Objective

To generate awareness amongst tourists and villagers regarding environmental pollution i.e., air pollution, noise pollution, solid waste management etc.

B. Project location/ priority area

This project involves provision of infrastructure at the following locations:

- Entry gates to Bagdara WLS
- Forest rest houses
- Institutional buildings
- Markets or weekly hatts
- Fair and festival grounds
- Interpretation center

C. Project components/activities

The following infrastructure to be provided:

- Display board generating awareness regarding noise and air pollution or the importance of forest or wildlife (can be digital at some places)



Image 8: Examples of Display boards (left) display panel marking sound levels (right)

- 3 dustbins for biodegradable, non-biodegradable and other-waste with color codes and a board explaining each of them



- Deposit counter especially for plastic related items mostly at entrance gates where visitors deposit the plastic items and make inventory of other items which they are carrying with them in order to make these areas as 'PLASTIC FREE ZONES'

Project benefits/outcomes

- Placing display boards will sensitize people towards environmental pollution and will reduce air/noise/land pollution in the area
- Reduces reliance on landfills and incinerators.
- Recycling protects our health and environment when harmful substances are removed from the waste stream.
- Recycling conserves our natural resources because it reduces the need for raw materials.
- Many reuse programs require fewer resources, less energy, and less labor, compared to recycling, disposal, or the manufacture of new products from virgin materials
- Reduction in consumption and the reuse of plastic will result in less plastic circulating through trash piles that can reach the soil and forests.
- No plastic in forest area will reduce the danger for animal of either being trapped in, inconvenienced by or accidentally consuming this toxic material.

3.17 Agriculture and livestock management

Aim: Promotion of sustainable agriculture and livestock rearing practices to maximize productivity and profit while minimizing environmental damage and acts as a subsidiary source of income for villagers/farmers.

Objective:

- To promote sustainable agriculture practices under the National Mission of Sustainable Agriculture (NMSA).
- To promote 'water management practices' to minimize the use of ground water for irrigation (drip irrigation)
- To ensure regular monitoring of water and soil quality in all seasons to assess intensity of use of pesticides and chemical fertilizer.
- To promote plantation or techniques which repels the animal intrusion in fields (e.g., Bio-fencing, natural repellents)
- To promote and conserve the use of traditional crops and practices so that could be inherited to future generation.
- Provide support for cultivated forage in all ESZ villages and training to farmers for improved feed practices and conservation.
- To create livestock corridors with trained herder (also giving alternate source of livelihood).
- To strengthen the capacity and treatment facilities of community animal health centres.

Issues:

- Less agricultural produce due to improper use of fertilizer, lack of high-quality seeds, lack of efficient farm equipment and proper irrigation facility
- Loss of agricultural produce due to nuisance created by animals in the farms/fields.
- Lack of year-round employment opportunity and no profits from the sales of agriculture sector forcing people to migrate.

Threats:

- Extraction of ground water for irrigation purposes leads to declining ground water levels.
- Use of chemical fertilizers and pesticides may lead to land degradation.
- Instability in agricultural sector leads to fluctuations in income and employment resulting in migration.
- Feed scarcity due to lack of grazing grounds for cattle leads to poor health and less production of milk/dung impacting the productivity of cattle.
- Unavailability of water especially in dry season.
- Killing of cattle by wild animals from the forest (especially for village near core).
- Lack of treatment or health centres for treatment of livestock.

Guidelines for agriculture:

- It is suggested to follow the sustainable agriculture practices under the National Mission of Sustainable Agriculture (NMSA) for carrying and monitoring agriculture and allied activities within the protected areas.
- Agriculture Department of Madhya Pradesh to evolve training program for agriculture around protected area and release manuals. Department has around 30 programmes like integrated grain development programme, Tilhan Dalhan avam Yojna to improve agriculture production in the state. There are 7 core programme and others are extension programmes. It is to be ensured that these 7 programmes are well monitored and implemented on ground and farmers are able to take benefits from them.
 - a) **Improved Seeds Programmes** - In this programme the department provides improved seeds to all farmers on subsidy rates.
 - b) **Surajdhara Programme** - This programme is only for SC/ST/Small Marginal farmers. In this programme. Agriculture department provides pulses / oil seeds to farmers on 75% subsidy. Seeds are provided for 1/10-hectare area.
 - c) **Annapurna Programme** - Beneficiaries' eligibility criteria are same as for Surajdhara programme, but in this programme, department provide only seeds of cereals.

- d) **Culture Distribution Programme** - Continuous use of chemical fertilizers adversely affects the productivity of land. To encourage use of Bio-fertilizers, Government gives subsidy of Rs.4 on every pack of 150 gms of bio-fertilizers for all farmers.
 - e) **Modern Agriculture Implementation** - To encourage use of Modern Agriculture Implement Government provides 50% subsidy directly to the farmers on purchase.
 - f) **Sprinkler Set Distribution Programme** - This programme is also for all farmers. In this Government provides 50% subsidy to farmers belonging to SC and ST Communities, Special preference is for women beneficiaries. Farmers belonging to other castes are eligible for 35% subsidy
- Guidelines for Improving Water Use Efficiency in Irrigation, Domestic & Industrial Sectors as notified by Central Water Commission shall be followed.
 - Extraction of ground water shall be permitted only for bon-a-fide agricultural and domestic consumption of the occupier of the plot. And the extraction of ground water should also be regularly monitored.
 - Plot irrigation through rainwater harvesting as mentioned in the projects may be beneficial for non-water intensive crops.
 - Biodegradable wastes may be used for creating compost manure to reduce the use of chemicals and increase soil fertility by natural means.
 - Agro forestry practices as per the crop combinations specified in the project may be practiced to improve ensured returns from agriculture sector from one crop or the other and improve livelihood security for farmers.
 - People shall be encouraged to reduce usage of chemical fertilizers and pesticides as these through run-offs adversely affect the forest. Training shall be imparted for setting up of vermicomposting pits for production of organic fertilizers. Bio-fencings are lines of trees or shrubs planted on farm or field boundaries that provide protection against cattle and wildlife, act as windbreaks, enrich the soil, provide bee forage, provide shade, and control dust. They are less expensive and more useful than fences made of wood, barbed wire, or stone masonry. Various species have been tested to discover their suitability for use as bio fencing plants ex. thorny species have been widely used.
 - To counter man-animal conflict and to make the atmosphere in the villages more conducive towards wildlife it is being proposed that chain link fencing shall done around fringe villages to avoid crop depredation and entry of livestock into the forests. The height of the fencing would be 1.5 meters so that it stops entry of wild pigs into the fields and at the same time doesn't hinder the movement of other wild herbivores and carnivores. No electrical fencing should be erected or promoted.
 - Timely compensation in case of crop raiding and kills by wild animals may be provided to avoid and reduce the hatred among locals against wildlife. Special crop insurance scheme for protected areas to be researched and implemented.
 - Go-downs shall be constructed to provide storage facility for non-perishable NTFP as per forest rules/management plans so that they may be sold at an appropriate time which would provide better price for subsistence farmers/non-commercial users.
 - Initiatives like Agroforestry, Sericulture, Horticulture, raising Medicinal Plants outside forested areas, development of village woodlots Lac cultivation, raising nurseries for sale of plants to Government agencies, local unit for natural dye manufacture, handmade paper making etc. shall be promoted.
 - Mass awareness camps shall be organized as a part of sustained campaign to educate masses regarding man-animal conflict situations, the reasons, the analysis and the management shall be done by the forest department.
 - A state level manual for agriculture in special areas of ESZ and around National Parks shall be prepared.

Traditional management practices in Telangana state

These methods have been adopted to reduce the amount of damage caused by Wild boars to agricultural produce. Some of them are:

- **Planting of thorny bushes and xerophytes around the crop** - Different xerophytic species like Cacti sp (*Euphorbia caducifolia*, *E. meriifolia*), opentia sp (*Opuntia elatior*, *O. dillenii*), Zizipus sp (*Ziziphus oenopolia*, *Z. mauritiana*), and agave sp (*Agave americana*, *Caesalpinia cristata*) can be planted on the bunds around the crop which will not allow the wild boars due to their thorny in nature.
- **Spraying of local pigs dung solution** - The dung collected from local pigs will be made into solution and should be sprayed on soil to the width of 1 ft around the crop. This will confuse wild boars with a false assumption of entering into the territory of other pigs. For sustained affectivity it is desirable to go 2-3 sprays with 7 days interval between each spray.
- **Fencing around the crops** - The fencing method is more effective, reliable and sustainable than some other methods for damage control [19]. Mainly two type of fencing was used against the harmful animals i.e. barbed fencing and chain linked fencing. In most of the cases average height of fencing was about 4 feet in agriculture
- **Erection of used coloured sarees** - By arranging used sarees of different colours around the crop will make wild boars to assume human presence in the area there by not preferring to enter into such areas.
- **Arrangement of three rows in “NIWAR” soaked in Kerosene** - The NIWAR should be soaked in Kerosene solution for about 2 hrs and will be arranged around the crop in 3 rows by keeping 1 ft distance between rows with the help of wooden poles. Sufficient care should be taken to drain off excess kerosene. The dominating smell of the kerosene does not allow wild boars to identify the crop.
- **Human hair as deterrent** - The human hair in the movement routes of the wild boar gets sucked through nostrils causing severe respiratory irritation. Due to this the wild boar gets totally disturbed and loses its track by making distress calls, which will ward off other wild boars entering into the cropped area.
- **Use of local dogs for scaring away wild boars** - In endemic areas of wild boar attacks farmers do follow using of trained dogs on a community basis to scare away the approaching wild boars. In selected cases this method proved to be effective and sustainable.
- **Creation of sounds and light through born fire:** To scare away the wild boars from damaging their crops farmer's employee methods such as using fire crackers, making sounds through local drums, empty tins, making born fires and shouting.

Guidelines for livestock management:

- Grazing in the forests shall be regulated as per the provisions of Madhya Pradesh Grazing Rules, 1986 and the amendments made therein from time to time.
- Peripheral boundary plantation technique may be used for creation of boundaries around fields to prevent livestock entering forests.
- Villagers shall be encouraged to practise of rotational grazing. Rotational grazing is a system where, areas are opened for grazing in a cyclic manner, to allow for rejuvenation of the already grazed area. Such areas may be closed for a period of 4-5 years or as depending upon the site thus allowing regeneration to attain the height above grazing height thereby preventing destruction from grazing. Rotational grazing areas may be closed with 'social fencing'.
- In areas closed for grazing, fodder development activities shall be taken up under the same arrangement as discussed above in section 5.2. The fodder being generated shall be allowed

to be cut and baled up for further distribution to villagers and if there is a surplus, they may also sell it to other villages. Barren and Wastelands may be developed using agroforestry techniques for creation of grazing land and reduce pressure on forest resources for grazing.

- Villagers shall be encouraged for calf rearing. Allowances including feed subsidy, insurance coverage, alternate capital funding, etc. may be given to ensure their active role in dairy development and rearing of small ruminants for purchase of bullocks and goat.
- Refer Section 3.17.4. for livestock management and to improve the quality of livestock.
- Cattle troughs may be constructed at a number of places within the villages to provide drinking water to the cattle so that pressure on perennial water sources in wildlife rich areas may be reduced.
- The Forest Department with the help of Animal Husbandry Department and NGOs working in this sector may conduct animal health camps in remote inaccessible areas/ villages to treat the livestock. It is essential to provide the desired veterinary services in the interior pockets so as to win the confidence of the tribal. The services that may be provided through such health camps may include:
 - a) Vaccination against Anthrax, Black Quarter, Rinderpest, Foot and Mouth Disease, Mastitis, Foot rot, Ringworm, Milk Fever and other common ailments.
 - b) Treatment of minor ailments
 - c) Referral of complicated Cases
 - d) Early detection of endemic communicable & non communicable diseases
 - e) Minor surgical procedures & suturing
 - f) Artificial Insemination
 - g) Pregnancy Diagnosis
 - h) Referral of Complicated pregnancies
 - i) Castration of male animals
 - j) Vaccination of livestock and poultry
 - k) Public Health Awareness
 - l) Faecal Sample examination
 - m) On-spot estimation of Haemoglobin and urine examination for ketosis
 - n) Collection of blood and serum samples for further diagnosis.
- The Forest Department shall utilize such health camps to create good will among the tribal and prevent the spread of diseases among livestock and wild animal.
- In order to prevent cattle kills at night the villagers shall be encouraged to keep their cattle in community night pens⁶⁹ that may be developed in villages. Night pens shall be developed by the forest department in conjunction with tribal department. The Panchayat/JFMCs/EDCs shall be responsible for the maintenance of these night pens. Stall feeding and night penning shall provide adequate amount of dung (for operation of biogas plants) and farmyard manure (for agriculture).
 - a) Vaccination against Anthrax, Black Quarter, Rinderpest, Foot and Mouth Disease, Mastitis, Foot rot, Ringworm, Milk Fever and other common ailments.

⁶⁹ Night penning is a cost-effective fencing approach that works well, especially for small and medium-sized operations; it involves bringing animals back into a small, predator-fenced area in the evening. Adding lights to night pens increases the effectiveness of the pens.

- b) Treatment of minor ailments
 - c) Referral of complicated Cases
 - d) Early detection of endemic communicable & non communicable diseases
 - e) Minor surgical procedures & suturing
 - f) Artificial Insemination
 - g) Pregnancy Diagnosis
 - h) Referral of Complicated pregnancies
 - i) Castration of male animals
 - j) Vaccination of livestock and poultry
 - k) Public Health Awareness
 - l) Faecal Sample examination
 - m) On-spot estimation of Haemoglobin and urine examination for ketosis
 - n) Collection of blood and serum samples for further diagnosis.
- **LS-09:** The Forest Department shall utilize such health camps to create good will among the tribal and prevent the spread of diseases among livestock and wild animal.
 - **LS-10:** In order to prevent cattle kills at night the villagers shall be encouraged to keep their cattle in community night pens⁷⁰ that may be developed in villages. Night pens shall be developed by the forest department in conjunction with tribal department. The Panchayat/JFMCs/EDCs shall be responsible for the maintenance of these night pens. Stall feeding and night penning shall provide adequate amount of dung (for operation of biogas plants) and farmyard manure (for agriculture).

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.17.1 Pilot intervention of Organic Farming and development of Farmer Producer Organisations' (FPOs)

There has been a rise in consumer's demand for safe and healthy food due to increasing concerns over the quality of food, contamination due to chemicals, serious health hazards and environmental issues. This increasing demand has given way to a new stream of agriculture, popularly known as Organic Agriculture. International Federation of Organic Agriculture Movements (IFOAM), an international organization established in 1972 for organic farming organizations defines goal of organic farming as:

“Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved...”

Project Rationale

Organic Farming⁷¹ has been considered as the immediate demand for the world population which is suffering a lot by the chemical based food grains, vegetables and fruits. Just washing fruits & vegetables before consumption is not sufficient to reduce the residual effect of harmful chemicals. Now a days, like in every field, farmers are running in the race of increasing their production by using heavy dosage of chemical fertilizers, growth hormones, pesticides, herbicides, fungicides

⁷⁰ Night penning is a cost-effective fencing approach that works well, especially for small and medium-sized operations; it involves bringing animals back into a small, predator-fenced area in the evening. Adding lights to night pens increases the effectiveness of the pens.

⁷¹ Source: <http://www.mporganic.com/>

and many other harmful chemicals. In spite of the use of all these chemicals, the numbers of pests and diseases are continuously increasing, so is the amount of chemical to cure them. This is not only affecting the health of the consumers but also harmful for the health of our milching animals, and environment.

To overcome all these problems, **Organic Farming** is considered as one of the solutions. The concept of organic farming precisely follows the principles of eco-system and networking with nature. It is different from chemical farming both in philosophy and practice.

Project description

A. Objective

- To promote organic farming in Bagdara ESZ which aims at increasing of cover crops, green manures, animal manures and crop rotations to fertilize the soil, maximize biological activity and maintain long-term soil healthy.
- **Formulate a farming cooperative for the production and marketing, branding of sustainable agriculture products from Bagdara WLS.**
- **Publication of guidelines for resilient Organic farming in protected areas of Madhya Pradesh.**

B. Project location/ priority area

Practically all the farmers should think of adopting organic farming for its known benefits or at first, practice organic farming in one patch of land and if the profits are more than conventional farming then slowly increase the under organic farming.

C. Case study/best practices

A case study from Madhya Pradesh – Organic farming spread on a 2.5-acre plot lies a five-layered model economically-viable and sustainable farm⁷².

- **1st layer** - The first layer is underneath the surface of the soil at a depth of two inches, which is planted with ginger and covered it with mud.
- **2nd layer** - The next layer, just above the soil is green, leafy vegetables like fenugreek, spinach, or coriander, which will cover the soil within 15-20 days. This prevents weeds from sabotaging the growth of crops, thereby saving labour, time, money and effort on de-weeding. When the time for harvest is near, the farmer doesn't cut the leaves; he uproots the plant from the soil. This loosens the topsoil and helps sunlight and oxygen penetrate deeper and better, improving soil health and making the crop beneath the surface, stronger. If the roots are not uprooted, they can interfere with the growth of the underground crop, in this case, ginger.
- **3rd layer**– Prepare a structure that uses bamboo for support, and wild grass for the roof, is set up to protect the crop from extreme climate changes. The shed substitutes the need for expensive polyhouses. It is weather-proof and biodegradable. It also protects crops from extreme heat, ground frost, and hailstorms. The balance of light and shade helps slow down the process of evaporation too. So, the soil can retain more water, thereby making the process more water-efficient.
- **4th layer** - The bamboo structure also serves as a support for another layer of crops which include climbers. The tallest layer includes papayas that are planted at a distance of 12 x 18 feet that tower over the shed.
- **5th layer** - The fifth layer includes creepers that are grown on a mesh of wires woven from the roof of the shed to the ground. These may include bitter gourd, bottle gourds, ridge gourd or

⁷² <https://www.thebetterindia.com/182640/woman-quits-cushy-us-job-to-go-organic-transforms-farm-into-10-acre-food-forest/>

snake gourd. It helps build a bio diverse ecosystem. Much like multi-story buildings in cities, this model enables multi-layer farming in a limited space. It cuts down investment costs drastically, helps you use space efficiently so that you can replicate the production of a regular five-acre land in one acre.



Young organic farmer from Madhya Pradesh Grows Chemical-Free Food in 5 Layers

Costing -The general cost of setting up the shed using bamboo and wild grass could be in the vicinity of Rs 1.5 lakh per acre, required once every five years.

- An additional source of income is producing and selling vermicompost and milk. He makes different kinds of compost, one of which uses 75 per cent cow dung and 25 per cent rock phosphate; while another utilises farm and kitchen waste.
- He produces 40 tonnes of vermi-compost per year, of which five tonnes is used on the farm. The remaining 35 tonnes are sold for Rs 5,000 per tonne.
- Another method of cutting down costs is the use of indigenous seeds over GMO seeds that industries sell at exorbitant prices. Indigenous seeds are resilient to weather, fruit for longer durations, and are less prone to pest attacks.
- Even the use of water is efficient since multi-layer farming saves 90 per cent water and uses the same amount of water as required by a single crop, but is used to grow five crops.
- The farm either has crop guards which are yellow and blue sheets, smeared with mustard oil and jaggery to trap flying insects so that they do not reproduce.
- Akash has also built a pit 10 x 10 feet wide and 10 feet deep near the field to prevent the topsoil from running off in the monsoons. This pit is filled with vermi-compost or earthworms, with small plants planted around its boundaries.
- During the monsoon, not only does it help recharge groundwater but also collects fertile soil that would otherwise run off.

D. Project components/activities

Baghor village in Bagdara ESZ mainly practice agriculture with prime cultivation of rice and wheat. But there are many other grains/vegetables/fruits which can be grown in these field (with supporting climatic conditions) and yield profit to the farmers. Some of the example are:

- Kodo– Rs.150-250/kg
- Alsi – Rs.280/kg
- Organic wheat – Rs.30-40/kg
- Organic Basmati rice – Rs.70-90/kg
- Moong/Arhar/Urad – Rs.120-150/kg
- Maize/Makka – Rs.30/kg

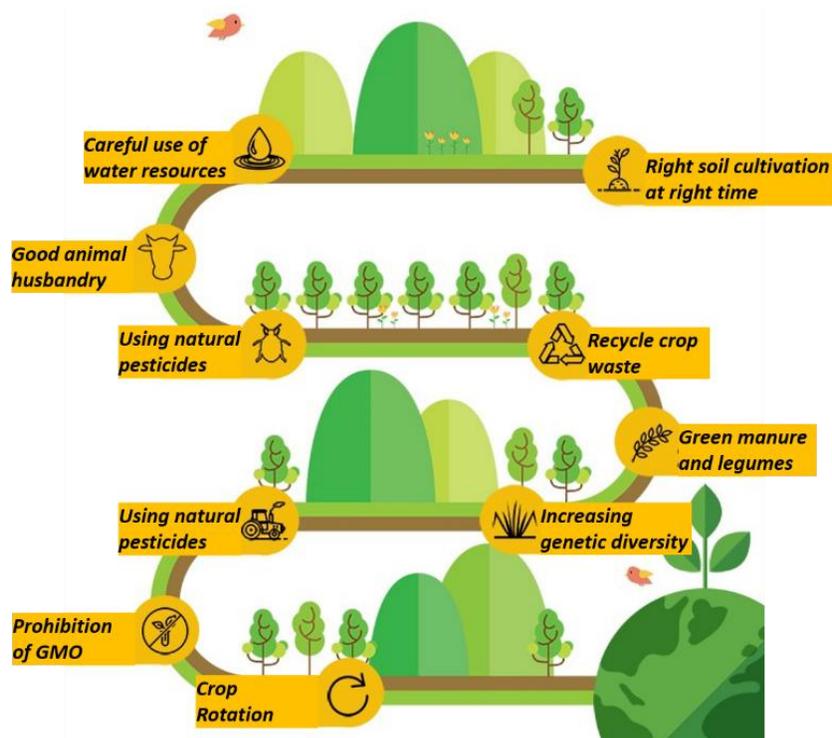
The best organic farming methods includes⁷³⁷⁴:

- **Mulching** - Covering the soil with dead plant material is an easy way to control weeds and protect the soil in annual crops. This practice is currently being done by all the villages in Bagdara ESZ.
- **Intercropping** - Growing two annual crops together, commonly a leguminous crop like beans or a green manure crop in alternating rows with maize or another cereal crop or vegetable is a common practice in organic farming to diversify production and maximize benefits from the land. In intercropping, special attention must be paid to avoid competition between the crops for light, nutrients and water.
- **Composting** - To start compost production, farmers will need enough plant materials and animal manures, if such are available. In case such materials are scarce, farmers would first have to start producing plant materials on the farm by sowing fast growing leguminous plants that build a lot of biomass, and by introducing some livestock on the farm for manure production.
- **Green manuring** - The practice of growing a leguminous plant species for biomass production and incorporation into the soil may be new to most farmers. Nevertheless, this practice can greatly contribute to improvement of soil fertility. Green manures can be grown as improved fallows, as seasonal green manures in rotation with other crops, or in strips between crops.
- **Organic pest management** - Careful associations and management of plants and animals in order to prevent pest and disease outbreaks. Initially, bio-control agents may be applied but organic pest management is best achieved through ecological approaches that establish a pest/predator balance. While the choice of resistant varieties of crops is paramount, other prevention methods include choosing sowing times that prevent pest outbreaks; improving soil health to resist soil pathogens; rotating crops; encouraging natural biological agents for control of disease, insects and weeds; using physical barriers for protection from insects, birds and animals; modifying habitat to encourage pollinators and natural enemies; and trapping pests in pheromone attractants.
- **Appropriate seeds and planting material** - Use of healthy seeds and planting materials, and robust and/or improved cultivars can make a big change in crop production. Generally, locally adapted seeds are preferred because of their resilience to local conditions.
- **Planting of leguminous trees** - Planting of leguminous trees may improve the growing conditions of the fruit crop by providing shade, mulching material and nitrogen through nitrogen fixation. In addition, some leguminous trees provide good fodder for livestock.
- **Growing farm-own animal feeds** - To improve available feeds for the livestock, farmers may grow grasses and leguminous fodder crops around, between other crops or in rotation. As animal feed must be of organic origin, feed sources are best addressed by considering farm grown feed.
- **Terraces and soil bunds** - Construction of terraces and soil bunds along the curves of hills is a key measure for soil conservation. This practice builds the foundation of further improvement to soil fertility on slopes.

⁷³ A guide by Food and agriculture dept of United nation for organic farming

⁷⁴ <https://www.conserve-energy-future.com/organic-farming-benefits.php>

Exhibit 5: Important aspects of Organic farming



“MP Organic” is a brand created by Government of Madhya Pradesh for the promotion of organic farming among the farmers and providing organic seeds & food grains to the farmers and people at large. For this purpose, “Madhya Pradesh Rajya Beej Evam Farm Vikas Nigam (MP Beej Nigam)” is working as a Nodal agency for the production, distribution and extension of organic seeds and food grains. Since MP Beej Nigam organization is Government of Madhya Pradesh Undertaking, it provides organic seed to the farmers and food grains to people at reasonable cost. For example, Organic Moong which is sold in the market over Rs. 200/Kg, is available at Rs. 120/Kg under brand MP Organic.

Keeping in view the expansion and scope in the field of organic farming in the state, the Govt. of Madhya Pradesh constituted **M P State Organic Certification Agency (MPSOCA)** on Aug. 10, 2006, to provide the quality certification of organic production in accordance with the accreditation criteria laid down under revised NPOP 2014. The MPSOCA is an autonomous body of the state Govt. which is registered under the society registration Act. (1993) and is accredited by National Accreditation Board (NAB), APEDA as per certificate No.- NPOP/NAB/022 dated 01-10-2011. The agency is committed to provide valuable, cost effective and organic certification services in Madhya Pradesh and rest part of India. All certification standards and guidelines are available on the website⁷⁵.

The following recommendations/suggestions also need to take up to promote organic farming:

- There is an urgent need to develop market for organic wheat to increase the overall profitability of organic farming as wheat is one of the important food crops of the state.
- Inform farmers about the profitability of Organic farming vis-à-vis conventional or modern farming through awareness programs organized by government and non-government organizations.

⁷⁵ Source: <http://mpsoca.org/Default.aspx>

- Provide better technical support to control pests and diseases. Presently, their ability to control some of the pests is very limited.
- Credit facility to farmers to have access to bio-control agents through board.
- Providing funds to board to promote organic farming practices.
- The farmers' awareness of the certification process should be increased along with enhancement of their capability to fill documents etc. necessary for the ICS Programme.
- Communication between the Board, federations and farmers should be improved. Farmers are most interested in market and price related matters.
- Increasing the efficiency of transportation and procurement system to reduce loss of product due to these inefficiencies.

Project benefits/outcomes

- Provide an alternative source of livelihood to the villagers and giving them a recognition of 'Authorized organic food'
- Organic produce contains fewer pesticides. Chemicals such as fungicides, herbicides, and insecticides are widely used in conventional agriculture and residues remain on (and in) the food we eat.
- Organic food is often fresher because it doesn't contain preservatives that make it last longer. Organic produce is often (but not always, so watch where it is from) produced on smaller farms near where it is sold.
- Organic farming is better for the environment. Organic farming practices reduce pollution, conserve water, reduce soil erosion, increase soil fertility, and use less energy. Farming without pesticides is also better for nearby birds and animals as well as people who live close to farms.
- Organically raised animals are NOT given antibiotics, growth hormones, or fed animal by-products. Feeding livestock animal by-products increases the risk of mad cow disease (BSE) and the use of antibiotics can create antibiotic-resistant strains of bacteria. Organically-raised animals are given more space to move around and access to the outdoors, which help to keep them healthy.
- Organic meat and milk are richer in certain nutrients. Results of a 2016 European study show that levels of certain nutrients, including omega-3 fatty acids, were up to 50 percent higher in organic meat and milk than in conventionally raised versions.
- Organic food is GMO-free. Genetically Modified Organisms (GMOs) or genetically engineered (GE) foods are plants whose DNA has been altered in ways that cannot occur in nature or in traditional crossbreeding, most commonly in order to be resistant to pesticides or produce an insecticide.

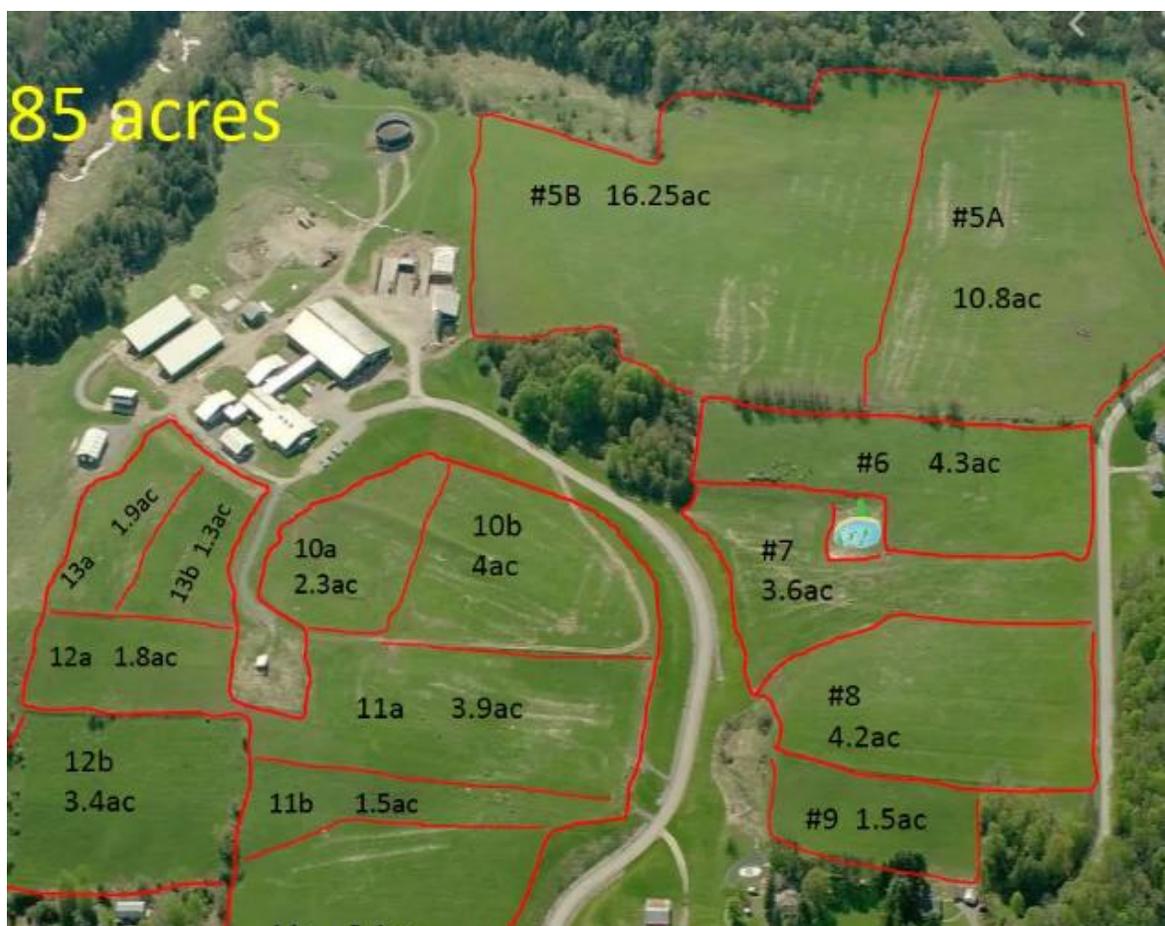
3.17.2 Livestock Improvement practices and Training for Planned grazing in Baghor Village.

Livestock can be a help to meet the equity objective in rural development through their contribution to the cash income of small and marginal farmers and landless labourer.

Poor livestock producers face numerous constraints in production and marketing. They are constrained in access to capital, quality inputs, improved technology and other necessary support services. They have small marketable surpluses, while local rural markets are thin, and sales to distant urban markets results high transaction costs. And hence, adopting livestock management strategies is important.

Project Rationale

Majority of farming families in Bagdara ESZ are engaged in agricultural operations for about 8-9 months in a year. And it is accepted that income derived from agriculture alone is not meeting the basic needs of the farming family. It is apparent that there is heavy dependence on livestock for



C. Project components/activities

Livestock management requires knowledge of animal science and animal husbandry, as well as good business sense. Many livestock managers must also keep financial records for their operations. Depending on the size of the farm, managers may perform some physical tasks like operating and maintaining machinery, as well as personally attending to the livestock. Farms, cattle, swine operations, and poultry farms all require effective livestock management to be successful and profitable.

Type of Livestock and their categorization

Classification	Types of animals
Milch animals: Big animals domesticated for food (Mostly for milk)	Cow and Buffaloes (Milk)
Draught animals: Animals domesticated for labor work	Bullocks, Donkeys, Horse, Mules, Camels etc
Small Ruminants	Goats, Sheep, Pigs, Poultry

The followings steps should be taken to improve livestock⁷⁶:

⁷⁶ Traditional Livestock Management Practices in Andhra Pradesh by Gargi Das

1. There is need to improve livestock diversity in the study areas.

Policy Framework to be strengthen Livestock Diversity by:

- Breed-specific, breeding policy that take into consideration local agro ecological niches and community requirements.
- Planned grazing programme for development of skills within the village headers.
- Issue of ID cards and certificates to grazers who are trained in the art of planned grazing.
- The promotion of indigenous breeds' calls for the need to facilitate community-based breeding programs that will provide local breed stock for livestock, and enhance breed development to increase yield and adaptation to local environments.

2. To address the problem of livestock diseases

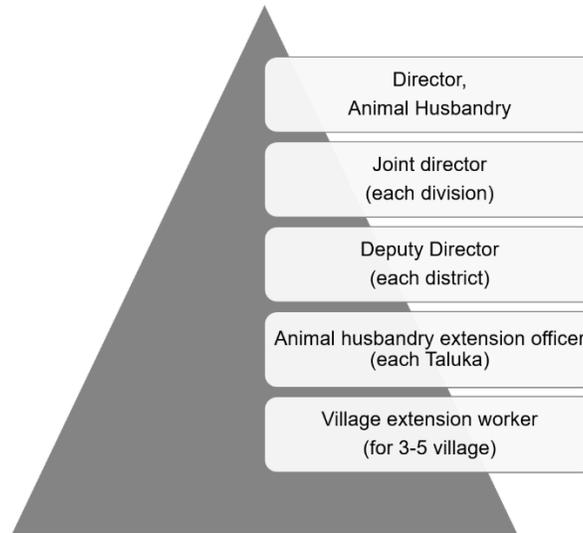
- There should be a stronger collaboration with the government veterinary health workers responsible for the areas.
- Health care monitoring and reporting systems need to be adopted and rooted at the village and the panchayat levels.
- Health services to be delivered by the Govt. through disease control & eradication mode (minimum of 75-80 percent of animals need to be vaccinated)
- In view of the above points –health cover needs to be free with timely availability of vaccines for all diseases for all types of livestock

3. Fodder Security:

- Need to protect CPRs for livestock grazing –further reduction should be stopped, conservation & management of CPRs through community-based groups. Efforts should be made to develop pasture lands involving local communities through soil and water conservation, introduction of improved legumes and grasses, forage tree species and prevention of grazing (Refer 3.17)
- Establishment of fodder banks in fodder scarcity regions through Dairy Federations and People's Organizations can help small farmers to feed their livestock during scarcity. In paddy and wheat growing areas where the straw is wasted, facilities for compacting straw should be installed and arrangement should be made to collect and pack them. Fodder banks can play a critical role in timely supply of feed to livestock owners during the drought years
- **Planned grazing is utmost necessary if there is shortage of fodder and mobilisation of communities is required for the same.**

4. Proposed framework:

Each village extension worker, who is either livestock inspector or any skilled graduate imparted with special training, is allotted 3-5 villages based on animal population and number of farmers in each village. Each animal husbandry extension officer (AHEO) guides, trains and supervises village extension officers (VEW) under the jurisdiction of their Taluka, who is guided and supervised by deputy director of their district. Deputy Directors are accomplished officials who with the help of state veterinary colleges keep updating knowledge of their subject and try to solve problem of farmers with help of research scientists. Deputy Directors are supervised by Joint Directors of their region who are supervised by director of animal husbandry extension.



Project benefits/outcomes

- Grazing livestock can make use of marginal land not suitable for growing crops.
- Livestock provide an additional income stream and help distribute a farmer’s workload through the year.
- The soil improves as it’s fertilized with manure.
- Animals assist with weed management by eating or trampling unwanted plants.
- Farmers have more flexibility when they raise animals. They can choose to sell their crops directly or feed them to the animals as market conditions and other factors shift.
- The nutritional quality of pasture-based products like eggs and milk is higher, containing more omega-3s and fatty acids.

3.17.3 Fish farming near perennial water bodies

Fish farming or pisciculture involves raising fish commercially in tanks or enclosures such as fish ponds, usually for food. A facility that releases juvenile fish into the wild for recreational fishing or to supplement a species' natural numbers is generally referred to as a fish hatchery. Worldwide, the most important fish species produced in fish farming are carp, tilapia, salmon, and catfish.

Demand is increasing for fish and fish protein, which has resulted in widespread overfishing in wild fisheries. China provides 62% of the world's farmed fish. As of 2016, more than 50% of seafood was produced by aquaculture. In the last three decades, aquaculture has been the main driver of the increase in fisheries and aquaculture production.

Project Rationale

The fish farming is appropriate for the villagers in Bagdara ESZ:

- It is also a good source of income for the farmers especially during the period when the growth of crop is still under process.
- Presence of water sources such as Kurherry river and Son River.
- The population in the ESZ area is non-vegetarian.

Project description

A. Objective

To provide an alternate source of livelihood and to bring all kinds of water bodies towards fruitful utilizations in terms of fisheries through good management practices.

B. Project location/ priority area

Fish farming should be started where there is no scarcity of water and it is easy to store water. Any area near a water body, a river or an area where ground water table is high is the most suited ones.

C. Case study/best practices

District Sidhi is very rich in water resources. There are many rivers, streams, ponds, lakes and stop dams. The waters which have covered large area are not much utilized so far for the benefit of the district. These are of great importance from the point of view of fish supply and development of fishery. Knowledge of pisciculture is essential for sound and practical planning in this respect. However, there has been a great difficulty in catching fish from turbulent streams and rivers running between difficult terrains where traditional collecting techniques do not yield the desired result. In view of it, there is a vast scope of exploring the fish fauna by creating a water reservoir. This would not only provide an alternate source of livelihood to villagers but also keep the villagers out of hunger and provide of protein.

Such practice has been carried out in many villages of Sidhi such as Thadipathar, Dadri, Bhaisarah, kuswaha etc. The following are some details:

- The minimum size of fishing pond dredge out is 1 acre with 3 m depth. This could hold 1500 fish seeds of Roopchand fishes (got from Kolkata)
- This system provides fair profits if the quality and quantity of fish is good and is sold at Rs.100 per kg in the village itself. Because of high income in fish culture the people are found interested in this field.
- Under NREGA scheme, an amount of Rs. 2.5 lacs are also provided to take benefit from this opportunity with daily wage rate of Rs.190.
- Some of the ponds have been dredged out and filled with bore water and retained by bunds or check dams



Image 9: Fish farming in Thadipathar

D. Project components/activities

Step 1: Select an Apposite Land Area

The first step in this process is selecting a good land area. This is in terms of size, soil quality, and source of water. To get this land, you can either buy it or use your land.

- **Size:** Ensure that the land is large enough for your pond. Take into consideration your future plans so that this will not limit you when it comes to expanding your business.
- **Soil:** The quality of the soil directly affects the quality and the quantity of the fish that you get. In fact, we advise you to take the soil for testing to ensure that it is at least over 20% clay. Also check for the place that is relatively level. It is important to ensure that the place is not easily prone to floods. This will help in preventing dirt water from getting into the pond. The soil should also have no or little rocks.
- **Water:** Fish rearing with an unreliable water source is not only stressing but also causes unhealthy fish thus low production. Find a place where there is an interrupted source of fresh and clean water. Find a place near the river, lake, streams or even boreholes.
- **Depth:** We recommend that your pond should be about 0.7 meters deep so that you can have a successful farming.



Step 2: Pond Design and Construction

- **Inflow and outflow:** Ensure that the water flows in and out constantly and in the right rates. If the outflow is too much, favourable algae are flushed out which disadvantage the fish. On the other hand, where the water is retained for too long in the pond, it may result in Oxygen
- **Good management:** Cover all the inlets and outlets properly to keep away insects and predators.
- **Good drainage:** An ideal slope for a fish pond is 0.02m for every 10 meters. This will help regulate the inflow and outflow rate.
- **Shape and size:** Productivity tends to be higher in a shallow pond. However, it should not be too shallow. Ensure that the shallow end is approximately 50 cm (0.5m).
- **Spaces between the ponds:** Spaces should therefore be left in between to be used as feeder roads and machine ways if need be. The paths should be standard to avoid straining.

Step 3: Selecting the Fish Species

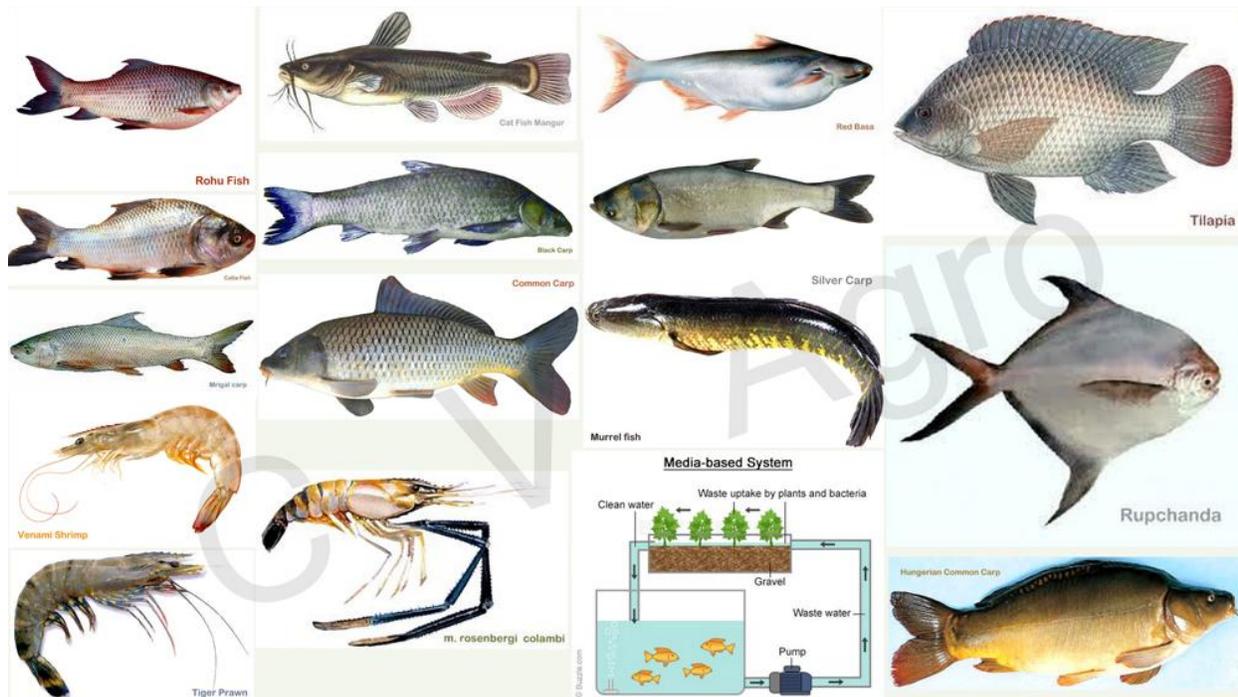
- Freshwater Carps – IMCs and EMCs variable production (2-10 t/ha/yr)
- Catfish – Magur, Pangas, Pabda, etc.
- Fresh Water Prawn
- Pacu (*Piaractus brachipomus*)
- Tilapia

For maximum productivity, ensure that

- Temperatures in the pond are kept between 28.30C to 300C
- The pH of the water in the pond is kept between 6.5 and 8.5
- Water tests are done regularly to check for contamination. The health of the fish in the pond should be checked and the unhealthy ones attended to by a specialist.
- From the foregoing discussion, it is clear that catfish are resilient and productive thus a perfect investment for every fish farmer.

Production and productivity:

- Production levels of 1414 kg /ha Village Ponds & Reservoir productivity is 107 kg/ha/year.
- Increases productivity of village ponds 1414 to 3000 & Reservoir 107 to 135 kg /ha/year.
- Small reservoir (1000ha) National productivity 174 and MP 217 kg (Production potential of small reservoir less than 1000 ha 250 -350kg /ha).
- Medium reservoir (1000 to 5000 ha) National 12 Kg/ha/Yr and MP 20.99 Kg. Potential 150-250 kg /ha.
- Large Reservoir (5000ha) National 11 and MP 36.37 kg /ha/year. Potential 50-100 kg/ha/Yr.



Step 4: Feeding the Fish

- Fish more especially tilapia mostly feed on algae, manufactured fish feeds or water insects. You can buy pellets that are either made of soy, maize, vegetable product and rice.
- Providing proper care and feed for your fish will definitely make them gain weight rapidly and grow fast.
- You can also spur the growth of algae in the pond by simply adding some chicken droppings or fertilizer. They will grow rapidly, hence providing an additional food.



Step5: Fish Harvesting

- This is done using either a net or draining away all the water volume in cases where you are harvesting all the fish. It should be noted that different species of food are harvested at different stages and weight.

- For you to get maximum food and to provide quality fish to your customers, you should ensure that they are harvested in the right way and at the right time.

Step6: Marketing the Fish

- This sector yields a lot of money and there are many reasons as to why you should go into fish farming.
- However, aim at not transporting the fish to very far places as this will reduce your profit margin and reduce the quality of the fish as well. Good quality fish will enable you outperform competition.
- Like any other business, this is a business that you should market. Some of the platforms that you can use are websites, social media platforms such as Facebook among others.
- Ensure that the community around you is aware of what you do. After this, the consumers will come looking for you

Project benefits/outcomes

- Fish is highly nutritious, and it serves to the population of the villages reducing the hunger problem.
- The world is becoming aware of nutritional value of the fish. Fish is known to be a good source of vitamin D, omega -3, vitamin B2 and many others.
- A lot of people are abandoning the red meat to take fish. This is one of the main reasons as to why farming of different aquatic species remains the fast-growing sector.
- Rearing fish will not only create employment for you but also for other people such as sellers, transporters and even those providing for labor in the farm.
- The region has good consumers of the same. There is therefore a reliable, stable market for it all the time.
- It is a source of income.

3.17.4 Promotion of Agroforestry

Substantial area in the country is still dependent on rainfall for farming. Due to the changing climatic pattern, rainfall is becoming more erratic, making cultivation a high risk and less productive profession over the years. It has therefore, becoming increasingly difficult for the majority of the Indian farmers to sustain their farm production, productivity and income. Agroforestry is known to have the potential to mitigate the climate change effects through microclimate moderation, conservation of natural resources and creation of additional source of livelihood and income opportunities.

Project Rationale

Communities in Bagdara Eco Sensitive Zone are as highly dependent on forest products and resource leading to degradation of forest resources. The agriculture dependent economy of the villages is experiencing a transition with changing land fertility patterns and its limited yield leaving some patches of forest and adjacent areas barren for most of the time of the year. Moreover, due to lack of transitional spaces between wildlife habitats and human settlements the events of human animal conflicts and cattle wildlife conflicts have also increased. Agro forestry can be one of the options to utilize the barren non-agricultural lands with low yield, to reduce forest dependency and reduce human animal conflicts to an extent. Agroforestry can play a vital role in such endeavors by meeting the diverse needs of people resorting them as inter-dependent benefits of the three components, viz. trees, crops and livestock in addition to food, fruit, fodder, fuel, fertilizer, fiber from limited land resources.

Project Description

A. Objective

To encourage and expand tree plantation in complementary and integrated manner with crops and livestock to improve productivity, employment opportunities, income generation and livelihoods of households, especially the small farmers.

B. Project Location/Priority Areas

The agro forestry project in phase 1 can be implemented on the agricultural fields as well as barren and waste lands that are near core. For Phase 2 of project implementation the fields under eco sensitive areas of conservation zones can be considered.

C. Case Study/Best Practices

1. **Peripheral Boundary Plantation in Bhattadighi, West Bengal** - For the tough, weather-beaten farmers in the rural heartland of West Bengal, agroforestry is an age-old tradition that even finds mention in their folklore. In the remote village of Bhattadighi, a group of women farmers observes a unique ritual, known as *Paakh Pakhali* or “welcoming birds,” in which they fill an earthen urn with water and top it with mango leaves and green coconut. Placed under a freshly planted neem tree sapling.
2. **Cauvery Calling** - Cauvery Calling is an agroforestry initiative and is a part of a nationwide movement – Rally for River to save rivers in the country. The movement initiators believe that soil erosion is leading to drying up of Cauvery. As a part of the initiative 242 crore trees are to be planted along the one kilometre stretch from the Cauvery River. Afforestation on the banks of the river will help to replenish the soil's nutrients and carbon content, making the soil fertile. Enriched soil can store more rainwater, which can feed the Cauvery River. Afforestation will provide fertile soil along with an adequate supply of water to the debt-ridden farmers.

D. Project Component

1. **Peripheral Boundary Plantation** - To make potential use of the area occupied by these bunds around the periphery of the farmers' fields, tree species can be grown as peripheral/boundary plantations to add more income to the farmers' basket. This will not only make effective use of the precious land for livelihood support but also for generating additional income opportunities to the farmers. It will also help in stabilising the bunds and reducing soil erosion. Peripheral boundary plantation (PBP) with provision for maintenance for a period of four years can be encouraged along the existing agricultural lands. Central Govt. incentives/assistance can be utilized which is given @ 50% of the total cost per plantation which is segregated for a period of four years in a proportion of 40:20:20:20.
2. **Low Density Plantation on Farmlands** - Low Density Block Plantation (LDBP) ranging from more than 100 plants/ha to more than 500 plants/ha without sacrificing the yield of the existing crops/cropping systems, shall be incentivized at the proportionate rates as applicable to per plant expenditure. Low Density Plantations on Farmland (LDPFL) with Intermediate/Strip/Isolated Plantation can be one of the interventions to attract mostly the small and marginal farmers. For sustaining the plantation activities, the central government assistance can be utilised, which is provided in a phased manner spread across four years in the proportion of 40:20:20:20.
3. **High Density Block Plantation** - High density Block Plantations on farmlands (HDBP) will be supported as a complementary source of income to the farmers. Differential planting densities ranging from more than 500 plants/ha to 1500 plants/ha as intermediate blocks / strip plantations /wind breaks would be supported. Farmers can take up block plantation in waste and degraded land not suitable for growing crops to make productive

use of these land in creating livelihood and income opportunities for them. In addition, the trees will help in enriching the soil and making it fertile & more productive thereby bringing land under crops in times to come. Block plantations of agroforestry species starting from 1 ha block to higher areas with varying number of plants per block under different spacing can be undertaken. For sustenance of which central government assistance can be utilised, which is provided in a phased manner spread across four years in the proportion of 40:20:20:20.



Image 10: Agroforestry Practices in India from R-L – PBP, LDBP, HDBP

The indicative list of Agroforestry Combinations in Bagdara ESZ Region can be as Shown in the table:

Agro climatic zone	Major forest trees in agroforestry	Major fruit trees in agroforestry	Major agricultural crops in agroforestry	Common agroforestry combinations
Kymore Plateau and Satpura Hills	Babul, Khamer, Karanj, Teak, Arjun, Mahua, Palash, Shisham, Sirish, Subabul, Eucalyptus, Bamboo	Mango, Jamun, Aonla, Guava, Jackfruit, Lemon, Ber	Wheat, paddy, gram, maize, arhar, moong, urad, masoor	Paddy/Wheat + Babul, Teak + Wheat/Paddy, Wheat + Guava, Wheat + Khamer, Wheat + Mango, Gram/Wheat + Custard Apple, Paddy + Shisham, eucalyptus + Wheat, Subabul + Wheat

Agroforestry caters to the following:

1. Agro-forestry as a **bio fencing role**

Agroforestry as bio-fencing can be used to prevent wild animals from entering residential areas and to protect agricultural crops and livestock in areas adjoining to forests. Bio-fencings are lines of trees or shrubs planted on farm or field boundaries that provide protection against cattle and wildlife, act as windbreaks, enrich the soil, provide bee forage, provide shade, and control dust. They are less expensive and more useful than fences made of wood, barbed wire, or stone masonry. Various species have been tested to discover their suitability for use as biofencing plants ex. thorny species have been widely used.

Lemongrass, agave, rambans, and certain species of chilly and some other plant species have been identified to be grown for fencing. Bio-fencing with lemongrass will be done to prevent entry of elephants because elephants do not like the smell of lemongrass. Likewise, agave will be grown to deter elephant and wild boars. This biotic method is environment-friendly and harvesting of such plants can also be economical for farmers. If local farmers agree to be part of the bio-fencing

exercise, they can earn by growing lemongrass, a good source of oil. Once these plants are in place, the department will string beehives in the next phase to deter elephants.

2. Agro Forestry for enhancement of **community resources**

There are around 30 plant species in arid zone known for their edible use and of these around 20 plant species are known for their edible fruits either raw or use as 298 Multifunctional Agroforestry vegetable. Many of the above play a multiple role in dry zone agroforestry systems viz, wind protection, providing soil cover, biofencing, shelterbelt, fodder and fuel wood as well as food. Most of the fruits of the desert tree species find common use as vegetables when unripe. They are also medicinally important.

As mentioned above in case of bio-fencing, the integrated model where a solution of agro-forestry can provide medicinal plants, aromatic plants, oil producing plants, fodder for cattle, bee-hive culture etc. not only acts as a protection measure but also generates a community reserve for the villagers in nearby areas.

3. Agroforestry for **restoration of degraded areas**

Landscape restoration and agroforestry is described in detail in section 2.4.2.

4. Agroforestry for checking **climate change impacts**.

Agriculture and climate change are deeply intertwined. Agriculture is responsible for almost 30 per cent of global greenhouse gas (GHG) emissions and is the root cause of 80 per cent of tropical deforestation. Intensive agriculture — characterized by monocultures and aimed at feeding farm animals — is one of the sectors that generates the highest amount of CO₂ emissions. Agroforestry, an agricultural method that nurtures natural ecosystems, could reverse these disturbing trends, according to researchers. It is a resilient and future-proof sustainable agricultural method that could effectively mitigate the climate crisis. This climate-smart farming system enables economically viable production while significantly restoring land, mitigating climate change, safeguarding local biodiversity and strengthening food and nutritional securities for the growing population.

It is important to note that agroforestry considerably sequesters more carbon than industrial agriculture and can help restore degraded land. Restoring 900 million hectares could stabilize global GHG emissions for 15-20 years, according to United Nations scientists. With agroforestry, degraded land can be transformed into food-growing carbon sinks.

Project Benefits/Outcomes

- Reduces community's excessive dependency on forest resources like for wood, fodder, and many other products.
- United Nations Food and Agriculture Organisation. In its manual "Agroforestry in rice-production landscapes in Southeast Asia" it states: Integrating trees into rice-production landscapes [helps] reduce temperatures and improve infiltration of water into the soil, store more carbon and diversify farm production, which lowers both climate and market risks. This adds up to greater adaptability and resilience not only for individual farmers and communities but also their environments.
- Biodiversity flourishes in these diverse croplands as it improves wildlife and pollinator habitat.
- Provides livelihood Security - Multi-layered agro forests are storehouses of many varieties of fruit and vegetable that can be sold in the market.
- Established trees can substantially reduce water logging in their immediate area, prevent runoff, and helps in better water management and cleaner groundwater.

- Sequester atmospheric carbon - Trees are extremely efficient at absorbing atmospheric carbon and utilizing it to form their bodies, but they also improve soil quality, making soils rich in organic matter and capable of storing higher amounts of carbon than other cultivated soils
- Reduce deforestation, restore degraded lands and biodiversity - Planting trees on degraded lands are often the key solution to reviving soils and restarting processes that normally take place in these ecosystems.

3.17.5 Promotion of Bee culture as a measure for ecosystem conservation and linkage with Farmer Producer Organisations' (FPOs).

Beekeeping (or apiculture) is the maintenance of bee colonies, commonly in man-made hives, by humans. Honey-producing bees such as *Melipona* stingless bees are also kept. A beekeeper (or apiarist) keeps bees in order to collect their honey and other products that the hive produce (including beeswax, propolis, flower pollen, bee pollen, and royal jelly), to pollinate crops, or to produce bees for sale to other beekeepers.

Honey bee farming can be done as a standalone commercial honey bee farm or can be integrated with crops to increase the crop yield and get additional income



Project Rationale

The bee-culture is appropriate for the villagers in the in the ESZ areas:

- It is also a good source of income for the farmers especially during the period when the growth of crop is still under process.
- Beekeeping does not involve mass feeding of bees because in most cases the bees provide their own food all year round.
- All the necessary inputs and technologies required for beekeeping are available locally. Some may be wasted if bees are not kept, e.g., pollen and nectar from flowering plants.
- The beekeeper requires limited land to keep bees.
- Presence of agricultural farm is an additional benefit for both farmers and bee-keeper.
- Contributes to enhancement of Eco-systems services as Bees are prime pollinators.

Project description

A. Objective

To provide an alternate source of livelihood by keeping the bees for the production of honey, beeswax, propolis, pollen (bee bread), royal jelly and bee venom; for food, medicine and income. It is also important for pollination and recreational activities.

B. Project location/ priority area

Practically all the farmers should think of adopting bee culture as a side endeavour for its known benefits in pollination it can be promoted in Organic agriculture cluster to enable cluster-based services.

C. Case study/best practices

Beekeeping industry is gaining increasing popularity in Uttara Kannada and is accepted as complementary activity to agriculture. Central Western Ghats of the Uttara Kannada provides congenial environment for domestication of bees and organized beekeeping as nectar sources from wild plants are abundant. The first such society was started in Honavar taluk, of Uttara Kannada, in 1941. Five more such societies were established in the district, between 1945 and 1985. From 2004 -2005, the National Horticulture Mission encouraged beekeeping activities through “Suvarnabhoomi Yojana” programmes and also by giving subsidies for purchase of bee boxes.



Wooden bee-hive box provided by the government to the Bee-farms

D. Project components/activities

The following steps should be adopted for setting up of bee-culture facility⁷⁷:

Beekeeping Knowledge - The farmer must gain adequate knowledge on the beekeeping process, zoology of the bees, bee-human relation, sting management, etc. It is advisable to acquire training from the local beekeeping authority. Government organizations like National Bee Board under the Agriculture Department and Central Bee Research Training Institute provides training to farmers in apiculture.

Flora for Honey Bee Farm - The place of rearing must also have a clean drinking water source. The most important requirement is that there must be plenty of forage or plants that yield nectar and pollen for the bees near the hives. Plants contain nectar and pollen both of which are essential for the survival and growth of honeybees. The villages in Sanjay NP ESZ are surrounded by agricultural farms and forested vegetation, which is a positive point to place a bee-culture farm. Plantations of tamarind, eucalyptus, gulmohar, Pulses, trees of citrus fruits etc. also boost honey production.

⁷⁷ <https://www.farmingindia.in/beekeeping-in-india-honey-bee-farm/>

Resilient Beekeeping in Protected area- It is important to upkeep the hives in such a way that it is protected from wild animals such as bears, elephants, Monkeys etc. Horticulture department should study the issue and release SOP for resilient bee farming in protected areas.

Exhibit 7: Bear/Wild animal resistant bee keeping using wire and Bio fencing



Some techniques are mentioned below;

- ✓ **Capturing of bees** - No beehive can function without honeybees. The combs and bees are removed from their natural nests and placed in the wooden hive. This practice is normally done in the early morning or late evening.
- ✓ **Prevention of Desertion** - Recent research has found that insecticide used in orchards is a great threat to honeybees and it causes desertion and mass death of honeybees. The best practice is to keep the beehives near the organic farms that are practicing integrated pest management. And that's why, some village would be suitable for bee-culture as Organic farming is also proposed in the same village.
- ✓ **Honey Harvesting** - Generally honey is harvested at the end of flowering season. Traditionally the hives are puffed with smoke so that the bees fly away. Then the combs are removed and squeezed in cloth to extract honey. In case of clay pots, the pots are broken and the comb is squeezed. The following products are available from bee-keeping:
 - **Honey** - It is a viscous fluid produced from the flower nectar by the bees. Commercially it is the most important product of *apiculture* since it is a whole food containing sugars, antibiotics, enzymes, acids and minerals. Since it has a high sugar content, it is a high energy source. It is a useful carrier for many *ayurvedic* and *unani* medicinal preparations. In severe cases of malnutrition, ulcers and impaired digestion, honey is recommended for regular consumption.
 - **Royal Jelly** - It is a secretion from the hypopharyngeal glands of nurse-bees. It is milky in color and contains proteins, lipids, carbohydrates, minerals like iron, Sulphur, copper and silicon. It increases the vitality and vigor in humans.
 - **Beeswax** - Beeswax is secreted as a liquid but solidifies when exposed to air. It is chiefly used in the candle industry. Other major places where the bees wax is important are for making creams, ointments, capsules, deodorants, varnish, shoe polish, etc.
 - **Propolis** - Propolis is the resin-like exudate collected by honey bees from the trees. It has an adhesive quality and hence mixed with Vaseline. It also has burn healing property and used for preparing ointments that treats cuts, wounds, etc.
 - **Bee Venom** - It is an important secretion used by the worker bees as a defense mechanism. The hives are connected to a live circuit of 12-15 volts. Whenever the bees get in touch with the wire, they receive the shock which irritates them and they react by depositing venom. Bee venom is injected into patients suffering from rheumatism.

Selling of honey products – A small store can be inside just outside the bee-culture farm where all the products obtained from the bees would be sold. Even it would also have a facility where the honey can be tasted and its related food items. Or the honey obtained in larger quantities can be sold to the government under Organic products.

Government assistance for bee-keepers⁷⁸

- People aspiring to take up bee-keeping may be given training and equipments at subsidized rates. On proper utilization of infrastructure granted the entrepreneurs of especially poorer class may be given more assistance.
- Government to help the entrepreneurs with testing and certification of the genuineness of honey produced so as to fetch good market price for them.
- Guidance for forest honey collectors on sustainable and safe harvesting methods.
- Importance of organic honey production.
- Government assistance for honey quality improvement through making available moisture reduction technique.
- To make available ready expertise to deal with bee diseases.

Project benefits/outcomes

Some of the important benefits of Bees-Keeping are:

- **For cultural purposes** - Honey is used for beverage brewing and occasionally served at important cultural ceremonies such as weddings. The Maji Maji rebellion used bees as a weapon to defend themselves against the colonialists. Honey was used in Egypt as cosmetics.
- **As source of food** - Honey is delicious and nutritious. It is consumed whole or mixed with other foods as supplement. Royal jelly and pollen are consumed for their high protein value.
- **As source of medicine** - Bee products such as bee venom, honey and propolis are used for treatment of many conditions following the antibiotic nature of the products. The conditions/diseases treated using bee products include stomach upsets, diarrhoea, vomiting, wounds, burns, cough, measles, false teeth, toothaches and fungal infections. It also helps to boost the immunity of people living with HIV/AIDS.
- **For income generation** - The honeybee products can be marketed locally or abroad to get money, with or without value addition. Beekeeping industry also provides incomes to various stakeholders in the value chain. These include bee farmers, artisans, pharmaceutical industry, food, beverage industry, honey dealers among others.
- **Pollination** - The honeybees provide pollination services, thereby playing a vital role in food production and overall agricultural productivity. More bees mean better pollination and high yields. In other countries pollination by bees is hired and fetches additional money to the beekeeper.
- **Conservation of natural resources** - Beekeeping is a non-destructive activity that could be employed in the conservation of biodiversity in protected areas. Farmers realizing that vegetation is a source of forage for bees will guard against the destruction and be encouraged to plant more plants for supplying pollen and nectar. In the process many plants are conserved and protected from destruction.

⁷⁸ <http://wgbis.ces.iisc.ernet.in/biodiversity/pubs/ETR/ETR49/conclusion.htm>

3.18 Cottage industries promotion

Aim: Reducing the pollution caused by industries (new or existing) within the Eco-Sensitive Zones.

Objective:

- To promote setting up and functioning of cottage industries to enhance the livelihood opportunities.
- To promote business opportunities mainly involving handicrafts/handlooms to benefit local communities and tourism sector.

Issues: Small scale cottage industries are unable to earn the living and hence many traditional techniques are losing away.

Threats: Setting up of industries (including establishment, operation and maintenance) causes water, air, soil and noise pollution.

Guidelines:

- No establishment of new wood-based industry within 1 km from the boundary of ESZ shall be permitted.
- No establishment of any new polluting or highly polluting industry within 1 km from the boundary of ESZ shall be permitted.

Category	Description
RED	Industrial sectors with Pollution Index score 60 or above
ORANGE	Industrial sectors with Pollution Index score between 41 and 59
GREEN	Industrial sectors with Pollution Index score between 21 and 40
WHITE	Industrial sectors with Pollution Index score up to 20

Promotion of 'Green' and 'White' Category industries shall be encouraged.

- Forest based cottage industry shall be promoted whereby local artisans shall be encouraged to practise and impart trainings to others in handicrafts. As the area has good bamboo forests, production of bamboo-based articles like baskets, mats, toys, agarbatti sticks may be promoted. People may be trained to make Triphala, Amla preserves and pickle, wood carving, packing cases, bidi making, rope making, making of cups and plates from Mahul leaves and various other allied activities at household Level.
- No permission shall be granted for expansion of existing industrial units in the major animal corridor areas. If granting of permission is inevitable, then it shall be done with maximum restraints so that the adverse effect on corridor is minimum.
- Existing Non-polluting permitted industrial units within shall be asked to develop a comprehensive conservation plan so that disturbance to animal movement through these areas shall be reduced. If they have made one during the process of forest clearance, it needs to be ensured that it is strictly followed. If they haven't done so, they shall be asked to make one within a stipulated timeline. Polluting industries should be relocated if present.

3.19 Abatement of Pollution

Aim: Prevention and control of air and noise pollution and its ill-effects on wildlife in Eco-Sensitive Zone.

Objective:

- To control the harmful impacts of air pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 and rules made thereunder.
- To reduce the vehicular emissions by diverting the movement of vehicles and by promoting clean fuel-based transport system.
- To promote the use of LPG under Ujjwala scheme by each household in ESZ villages and to regulate the collection of firewood by the villagers from the core forest area.

Issues:

- Air pollution caused by forest fires especially in bamboo plantations, collection of Mahua etc. affecting the health of wildlife and avian species.
- Use of firewood for cooking purposes affects the health of villagers (especially women) causing respiratory diseases.
- Harmful effects to wildlife including hearing loss, psychological and biological effects.

Threats:

- Increased vehicular movement and emission in ESZ affecting the air quality of the area and impacting the health of the animals.
- Prolong exposure to noise pollution may also lead to abandonment of territory and migration of animals and birds, disturbing the ecosystem.

Guidelines for abatement of air pollution:

- 'Air (Prevention and Control of Pollution) Act 1981' shall be followed to provide for the prevention, control and abatement of air pollution.
- The use of battery-operated vehicles may be encouraged to minimize pollution on suitable terrains in the tourism area especially for Tiger Safaris.
- Use of CNG based vehicles inside ESZ especially for public transportation such as auto rickshaws, buses etc. shall be promoted.
- All the fire cases shall be properly recorded. Fire Protection Scheme shall be strictly followed. The forest personnel shall be trained in modern fire-fighting methods.
- Effort should be undertaken to reduce the dependency on the fire wood as a cooking fuel. Extensive implementation of Ujjwala Scheme shall be taken up in this regard.

Reduction in Fuel wood harvesting from Forests.

- As a mid-term solution, the Panchayat/JFMCs/EDCs shall be asked to make minor contribution in setting up biogas plants and solar cookers because if commodities are provided free of cost, they fail to make the required impact. Villagers shall be trained to repair biogas plants as well as solar cookers.
- As a long-term option for fuel wood reduction, villagers shall be encouraged to take up agroforestry whereby they may grow trees on the field bunds or intercrop them with their usual crops.
- Fuel wood plantation shall also be taken up with the help of Panchayat/JFMCs/EDCs on open patches around the villages. Tree species like Gmelina arborea, Leucena leucocephala, Glyricidia sepium, Dalbergia sisso, Sesbania sesban, Acacia nilotica, Albizzia lebbeck, Albizzia procera, Pithecolobium dulce, Bauhinia variegata, Erythrina spp etc. may be planted as fuelwood trees. When planted under agroforestry, apart from Gmelina arborea all

the trees shall help in increasing the fertility of the soil as they all are leguminous trees that fix nitrogen.

Guidelines for abatement of noise pollution:

- The MP Pollution Control Board shall control noise pollution in the ESA in accordance with the Noise Pollution (Prevention & Control) Rules 2000, framed under Environment Protection Act, 1986 & guidelines issued by the State Govt. from time to time.
- Eco-sensitive zone shall be designated as 'Silent Zone' in accordance with Noise Pollution (Prevention & Control) Rules 2000 and decibel levels to be maintained accordingly.
- All commercial establishments, related to tourism and hospitality, (including tea shops) shall not use any sound enhancing instrument such as loudspeakers/ amplifier/fire crackers.
- Honking shall be fined and vehicular speed/movement is to be restricted in the designated corridors as per the prescribed forest road limits, Suitable night time restrictions to be enforced as per the management plans.

3.20 Human-Wildlife Conflict (HWC) Management

Aim: Prevention and management of human-wildlife conflict in Eco-Sensitive Zone.

Objective:

- To ensure safety of wild animals as well as livestock and promote harmony in living conditions of both.
- To promote wildlife friendly strategies to reduce number of deaths and reduce agricultural loss by wild animals.

Issues:

- Death of livestock and at time human beings due to intrusion of wildlife into villages or movement of livestock in forest areas for grazing.
- Loss of agricultural produce due to nuisance created by animals in the farms/fields.

Threats: Killing of cattle and humans by wild animals from the forest (especially for village near core).

Guidelines:

Human animal wildlife conflict management can grouped into six conflict management elements: policy, prevention, mitigation, understanding the conflict, response, and monitoring. An integrated management approach to Human Wildlife Conflict (HWC) means that all six elements must be accounted for in any site / area-based program, and none should be implemented in isolation. Actions and lessons from each element must inform and reinforce actions in the other elements, and the effectiveness of the approach is contingent on all elements being implemented concurrently. Actions within some elements will require tested and transferable methodologies (e.g., in hotspot mapping and attack risk modelling), while other areas will require detailed protocols and decision-trees to be developed from scratch (Brooks 2014).

Some of the suggestive HWC management interventions can be as follows:

- Ensure alternative livelihoods programs are in place and ongoing to increase community resilience from crop loss and other HWC outcomes.
- Have operational insurance schemes linked to prevention of HWC incidents.
- Informant networks in place and functioning for Monitoring and warning.
- Wildlife friendly farming strategies and actions in place through dedicated effort of the concerned department with clear policy and planning approach.

- Have an operating, and highly utilized, conflict reporting system and additionally have locally based, operational Response Teams.
- Have conflict information systems readily accessed by local communities
- Have HWC Management Plans developed and implemented
- Development of community education manuals and resources developed and updated
- Development of projects that foster positive links between wildlife and people
- Implementing enhanced livestock & cropping practices through participatory approach.
- Invasive weed management plans in place
- Wild pig culling pilot programs & immunization and sterilization programs wherever required.

The HWC issues for Wild Boars is one the most acute issue concerning majority of the farmers and crop producers in the area. The issue is concentrated in most areas across the national park. Following are some specific management measures listed for HWC related to wild Boars.⁷⁹



Image 11: Land Degradation caused by Wild boars (left) and intervention for entrapments (right)

Another HWC issues in the park is related to Wild elephants intrusion which is presently the prime concern the local authorities and district administration as it has caused more damage to the local communities and their life and livelihoods. The issue is mainly transboundary interstate matter and is concentrated in most migration routes across the national park.



Image 12: Rail fences erected in Karnataka (left) and Fodder plantation and EPT in Tamil Nadu (right)

⁷⁹ A Landowner's Guide For Wild Pig Management Practical Methods For Wild Pig Control, Bill Hamrick Et.Al, MSUES.

Table 3: Preventive and Adaptive strategies for management of human-animal conflicts

Species	Management approach (Preventive strategies)	Management approach (Adaptive Strategies)
Wild Boars	<p>Habitat Management: Bio-fencing with specific varieties of dense vegetation along ravines and key movement corridors.</p> <p>Access control: Passive fencing/bio fencing such as and dense plantations, chilly plantation etc. Active bio-fencing around identified community resources in specific village areas. Non-lethal animal traps and relocation wherever early warning is available.</p>	<p>Detection & Warning: Use of Watch towers, Drones and Animal collars for heard movement tracking and warning. Awareness training and capacity building for early warning detection.</p> <p>Crop management: Production of non-carbohydrates/root-based crops which attract Wild Boars. Production of alternative cropping patterns and crops.</p> <p>Post incident interventions: Scaring away though non-lethal interventions such as drones, high powered torches and sounding equipment. Crop insurance and life insurance payments.</p>
Wild Elephants	<p>Habitat Management: 80 Active Development of Grasslands/fodder/bamboo plantation in Elephant Movement areas. Development of perennial water bodies for drinking water sources. Ensuring that overgrazing is not taking place due to livestock population. Ensuring free movement in wildlife corridors through wildlife overpasses and underpasses, Resettlement of major conflict settlements etc.</p> <p>Access Management: Development of elephant proof trenches (EPT) Development of fencing such as rail and concrete heave fencing in not so eco sensitive locations. Passive fencing/bio fencing such as dense plantations, chilly plantation etc.</p>	<p>Detection and Warning: Use of Watch towers, Drones and Animal collars for heard movement tracking and warning. Daily Monitoring and preparation of Dossiers. Understanding movement patterns. Use of signages near trunk infrastructure. Awareness training and capacity building.</p> <p>Post incident interventions: Scaring away though non-lethal interventions such as drones, high powered torches and sounding equipment. Relocation of problem animals wherever possible or rehabilitation, if necessary, in established facility. Crop insurance and life insurance payments. Mob control and consultation mechanism.</p>

⁸⁰ Based on Best Practices of Human Elephant Conflict Management in India, Project Elephant Division, MoEF&CC Elephant Cell, Wildlife Institute of India

The following are the key guidelines in individual sectors as mentioned in ESZ notification and have been aligned with strategic goals

Sector	Key guidelines	Strategic goals
Natural Springs	<p>Conservation and rejuvenation measures in natural water with area >5 Ha</p> <p>Development of water sources along the major animal corridors</p> <p>Installation of Rainwater harvesting facility</p>	<p>Environment:</p> <p>Reduce dependency on ground water resources</p> <p>Infrastructure:</p> <p>Deploy Green technology in the water infrastructure development</p>
Tourism	<p>Tourism and related activities or infrastructure are promoted only in Tourism Promotion Areas (TPA) as defined in Sub-Zonal Tourism plan</p> <p>All forms of activities in TPA should be identified and regulated as per carrying capacity norms specified by MoEFCC.</p> <p>Construction of any structure like hotel, resort, Lodge, guest house, TIC etc. providing facilities to tourists shall be regulated with applicable building byelaws (Bhumi Vikas Rule 2012 or subsequent regulation). All structures should be constructed within eco-friendly materials. Use of Concrete is discouraged.</p> <p>Promotion of ecotourism & infrastructure within TPA identified in zonal guidelines</p> <p>Tourism establishments to identify waste composition, quantities, and areas for reduction and submit the same to competent regulatory authorities for compliance.</p>	<p>Environment:</p> <p>Promote sustainable development in ESZ area of the sanctuary in Tourism Promotion Areas</p> <p>Economy:</p> <p>Enhance the socio-economic condition and Promote the local know how of indigenous technologies</p> <p>Tourism:</p> <p>Develop Sustainable and Eco Tourism and Develop a conservation strategy for natural as well as manmade heritage sites.</p> <p>Infrastructure:</p> <p>Declaration of Bagdara as 'Open Defecation Free' ESZ</p>
Natural & Man - made heritage	<p>Heritage areas to be demarcated and needs to be conserved by restricting the number of visitors as per carrying capacity of area</p> <p>Plantation shall be carried out to augment the forest resources as per the needs of the wildlife in the ESZ areas</p> <p>Awareness campaigns regarding importance of biodiversity and ecosystem services</p>	<p>Environment:</p> <p>Non fragmented wildlife habitat development</p> <p>Tourism:</p> <p>Develop a conservation strategy for natural as well as manmade heritage sites.</p>
Noise pollution	<p>No loudspeakers allowed within 1 km from the protected area.</p>	<p>Environment:</p> <p>Control the harmful impacts of air/noise/water pollution in the Eco-sensitive Zone and promote mitigation measures</p>

Air pollution	Air (Prevention & Control) act, 1981 Use of battery-operated or CNG based vehicles shall be encouraged Involvement of the EDC & FPC members and villagers in fire protection	Environment: Control the harmful impacts of air/noise/water pollution in the Eco-sensitive Zone and promote mitigation measures
Effluent discharge	No hotel shall discharge any sewage or solid waste into any water body or in an open pit.	Environment: Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species
Solid wastes	SWM to be followed for clusters of villages and sites should be identified outside ESZ and forest area for dumping. Promote 'Plastic free' Zones in ESZ areas.	Economy: Enhance the socio-economic condition Infrastructure: Develop a 'Solid Waste Management System'
Vehicular traffic	Roads should be aligned with the wildlife habitats with natural and artificial crossing.	Environment: Non fragmented wildlife habitat development and to reduce human animal conflict Infrastructure: Regulation of vehicular movement or high-speed movement in a habitat friendly manner
Industrial units	No establishment of any new polluting or highly polluting industry within 1 km from the boundary of ESZ or in animal corridor. Promote Cottage industry shall be promoted for local livelihoods.	Environment: Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species Economy: Enhance the socio-economic condition and Promote the local know how of indigenous technologies
Agriculture	Promotion of Organic farming, Agroforestry, Sericulture, Horticulture, Medicinal Plants, raising nurseries for sale of plants to Government agencies etc. shall be promoted. Special tourism products like honey, medicinal plants etc. from the villages in the ESZ to be marketed through formation of farmers production organization (FPO's) in TPA. Farmers to be trained in bio-fencing and agricultural techniques in special area i.e., ESZ, facilitation through extension activities, agricultural policy and insurance is proposed.	Environment: Reduce human animal conflict Economy: Strengthening agriculture and creating different economic opportunities for all to build resilient communities and their livelihood opportunities Infrastructure: Deploy Green technology in the water infrastructure development

<p>Ground water</p>	<p>Extraction of ground water shall be permitted only for bona fide agricultural & domestic consumption of the occupier of the plot. And extraction of ground water should be regularly monitored. All ground water wells should be covered and new wells to be constructed.</p>	<p>Environment: Reduce dependency on ground water resources</p> <p>Infrastructure: Deploy Green technology in the water infrastructure development</p>
<p>Livestock</p>	<p>Creation of boundaries around fields to prevent livestock entering into forests. Encourage rotational grazing, fodder development activities, capacity building for planned grazing and reduction of non-productive cattle.</p>	<p>Environment: Reduce human animal conflict</p>
<p>Railway and transmission lines</p>	<p>Existing railway lines to be phased out through alternate routes. 'Draft Guidelines for linear infrastructure intrusions in natural areas: roads and power lines' as notified by National Board for Wildlife, MoEFCC, 2011'.</p>	<p>Environment: Non fragmented wildlife habitat development and Reduce human animal conflict</p> <p>Infrastructure: Regulation of vehicular movement or high-speed movement in a habitat friendly manner</p>

CHAPTER 4 LIVELIHOOD ISSUES

4.1 Stakeholder consultation

Stakeholder engagement is the process to engage relevant stakeholders for a purpose to achieve accepted outcomes for better project delivery. Stakeholder consultation helps in informed decision making and gives a sense of ownership to communities, government and agencies in the intervention area.

Institutional arrangements refer to formal government organizational structures as well as informal norms which are in place in a state or country for arranging and undertaking policy work. These arrangements are crucial as they provide the government at all levels (national, state and Local) with a framework within which to formulate and implement policies. Informal institutional structures include the general public, non-government organizations and private sector groups (UNGGIM, 2019).

During preliminary studies and visits, following stakeholders have been identified. These stakeholders are primarily government departments and NGOs working in the fields ranging from environment, forest, wildlife protection and tourism.

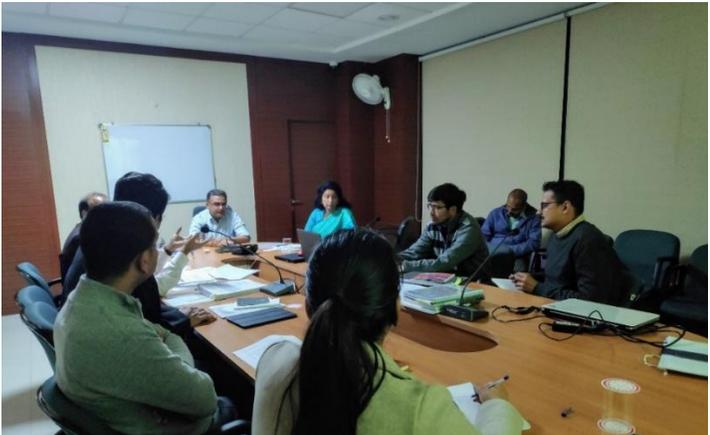
Name	Level	Sector	Function
State Government Department			
Madhya Pradesh Tourism Board (MPTB)	State	Tourism	Tourism promotion and development
Madhya Pradesh State Tourism Development Corporation Ltd. (MPSTDC)		Tourism	Tourism promotion and development
MP State Pollution Control Board (MPPCB)		Environment	Regulation and Policy making
Water Resource Department, MP		Environment	Project, Schemes and conservation
Urban Administration and Housing Department, MP (UADD)		Urban Development	Projects, Schemes and Reforms
MP State Forest Development Corporation (MPSFDC)		Environment	Management, Forest Conservation & Development
Madhya Pradesh Forest Department		Environment	Regulation, Conservation and Protection
Town and Country Planning Department, MP (T&CP)		Urban/ regional Development	Planning and Regulation for Urban Development
Revenue Department Madhya Pradesh		Revenue	MIS and Land related transactions
Farmer Welfare and Agriculture Development Department, MP		Environment	Extension schemes and Agro development
Narmada Valley Development Authority, MP		Environment	Narmada Valley conservation planning
Public Works Department, MP		Infrastructure Development	Project development and infrastructure provision
Panchayat & Rural Development Department		Rural Development	Provision of schemes and programmes to rural areas

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National Informatics Centre, MP (MPNIC)		Digital Information	Maintaining and visualizing services of spatial and non-spatial data
Madhya Pradesh Agency For Promotion of Information Technology (MAPIT)		Digital Information	Implements state IT polices
M. P. Council of Science & Technology (MPCST)		Digital Information	Research and development in socio-economic and spatial development
MP State Mining Corporation Limited (MPSMCL)		Mining	Mining regulation and development
MP Power Transmission Company Limited (MPPTCL)		Infrastructure Development	Power supply infrastructure development and provision
Directorate of Archaeology, Archives and Museums, MP		Heritage	Regulation, management and maintenance of state heritage sites
Central Government Departments/ Institutions			
Ministry of Environment & Forest (MoEF)		Environment	Regulations, Rules, Guidelines and Monitoring
National Informatics Centre (NIC)		Digital Information	Maintaining and visualizing services of spatial and non-spatial data
National Bureau of Soil and Land Use Survey	National	Environment	Studies, documentation and research on soil and land data
National Remote Sensing Centre (NRSC)		Digital Information	Acquisition, research and selling of spatial and satellite data
Archeological Survey of India (ASI)		Heritage	Regulation, management and maintenance of ASI sites
Institutes/ NGOs/ Societies			
National Centre for Human Settlements and Environment (NCHSE)	State	Environment / Digital Information	Spatial studies, project development, formulation, data mapping and training
MP Tiger Foundation Society	State	Wildlife Protection	Animal protection organization
The Corbette Foundation	National	Wildlife Protection	Wildlife conservation, awareness, Livelihood development and CSR Partnerships (Bandhavgarh Area)
Wildlife Conservation Trust	National	Forest & Wildlife Protection	Assess gaps in protection mechanisms, address and donate essential equipment, organise training sessions for frontline forest staff, and provide technical support.
Wildlife Protection Society of India	National	Wildlife Protection	Studies, Law enforcement, conservation and protection, publication and awareness.
WWF India	International	Wildlife Ecology & Protection	Addresses issues such as the conservation of species and its habitats, climate change, water and environmental education, among many others.
Local Level Agencies			
District Collector, Umaria	Local	Administration	General Administration
Umaria Municipal Council	Local	Municipal	Municipal Functions
Jila Panchayat Umaria	Local	Administration	General Administration & Development

SDM, Bandhavgarh, Umaria	Local	Forest & Wildlife Conservation	Forest Development & Conservation
Divisional Forest Officer, Umaria	Local	Forest & Wildlife Conservation	Forest Development & Conservation
Director, Bandhavgarh Tiger Reserve, Umaria	Local	Forest & Wildlife Conservation	Forest & Wildlife Conservation
Dy. Dir., Bandhavgarh Tiger Reserve, Umaria	Local	Forest & Wildlife Conservation	Forest & Wildlife Conservation
District Collector, Sidhi	Local	Administration	General Administration
Sidhi Municipal Council	Local	Municipal	Municipal Functions
District Forest Officer, Sidhi	Local	Forest & Wildlife Conservation	Forest Development & Conservation
District Collector, Shahdol	Local	Administration	General Administration
Shahdol Municipal Council	Local	Municipal	Municipal Functions

4.1.1 Department level stakeholder consultations

Meeting details	Picture
<p>Date: 4th January 2020, Rewa Headed by: Divisional Commissioner, Rewa Attendees : CCF (Rewa), F.D. (STR), DFO (Sidhi/ Singrauli), Deputy Commissioner (Rewa), DM(Rewa), DM (Singrauli), DM (Sidhi), S.E. (PHED Rewa), Z.O. (MPPCB, Rewa), Joint Director (TCPO), D.D. (Commissioner Office, Rewa), S.H.D.O. (Horticulture), JDH (Rewa), R.H.E.O.(Horticulture), E.E. (WRD Singrauli), D.D. (Agriculture, Sidhi), Asst. Director (PRO, Tourism), PRO (Rewa), A.E.(B/S Canal Circle Rewa), DPE (PWD PIU Sidhi), SDO (O/O EE PWD Rewa), C.E. (PWD Rewa), E.E. (PWD Sidhi), E.E. (PWD Rewa)</p>	
<p>Date: 12th February 2020, MPTB, Bhopal Representatives of MPTB: Joint Director (Planning), Tourism Planner (MPTB) Evaluation Committee Members: Addl. MD (MPTB), Joint Director (Directorate of Town and Country Planning, Bhopal), Dy. CCF (Wildlife, Bhopal), Chief Scientific Officer (EPCO Bhopal), Nodal Officer (Consultant, MAP-IT Department, Bhopal), Field Director (Sanjay Tiger Reserve) Consultants: Sr. Vice President (M/s Feedback Infra Pvt. Ltd., Gurugram), Team Leader (M/s Sai Consulting Engineers Pvt. Ltd., Ahmedabad),</p>	

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Manager (M/s IPE Global Ltd., New Delhi)

Date: 18th November 2020, Rewa

Headed by: Divisional commissioner, Rewa

Attendees: CCF and Field Director (SDTR), DD (SDTR), Collector Sidhi, Collector Singrauli, Collector Satna, SDM (Beohari, Shahdol), SDM (Rampur, Satna), Joint Commissioner (Rewa), MPPCB (Rewa), Z.O. (MPPCB), Rewa (Joint Director, TCPO), Asst. Director (TCPO), Asst. Director (TCPO) and R.C.M.S. Consultant.



Date: 20th November 2020, Sidhi

Headed by: Collector, Sidhi

Attendees: DFO (Sidhi), SDM (Churhat), SDM (Gopad-Banas), SDM (Churhat), Addl. Collector (Sidhi), AD (RES), Deputy Director (Agriculture), Deputy Director (Veterinary), Z.O. MPPCB (Rewa), EE (WRD), EE (Railways), EE (PWD), EE (Bansagar), Asst. Director (Fisheries), Asst. Director (SDTR), Asst. Director (SDTR), Superintendent (Bagdara), Representative (GSS NGO), R.O. (Son Gharial Sanctuary), R.O. (SDTR), R.O. (Majhauri) and R.O. (Churhat)



Date: 28th November 2020, Sidhi Zila Panchayat

Headed by: Collector, Sidhi

Attendees: Sansad (Sidhi), BJP MLA, DFO (Sidhi), SDM (Churhat) and representatives from various NGOs, departments and secretaries of Village Panchayats under ESZ



Date: 24th March 2021, MPTB, Bhopal
Representatives of MPTB: Joint Director (Planning), Tourism Planner (MPTB)
Evaluation Committee Members: Addl MD (MPTB (Chairperson)) Addl PCCF (Wildlife, Bhopal), Joint Director (Directorate of Town and Country Planning, Bhopal), Chief Scientific Officer (EPCO Bhopal), Nodal Officer (Consultant, MAP-IT Department, Bhopal), Field Director (Sanjay Tiger Reserve National Park), Field Director (Bandhavgarh Tiger reserve).



4.1.2 Local level consultations

Village: Baghor, Date: 26th June 2019

“Villagers reported many incidences of man-animal conflict due to intrusion of wild animals in the agricultural fields. The villagers also informed about Lack of irrigation even in monsoon season due to change in the rain quantity.”



4.2 Promotion of eco-development activities

Strengthening livelihoods means helping people to become less vulnerable to poverty through eco-development activities afforestation, plantation etc . This would also reduce the dependence on the forest and the protected area as a whole. Thereby reduce pressure on protected area and reduce man animal conflicts. This is achieved by helping them to gain greater access to a range of assets and supporting their capacity and enhancement of skill to build these assets into successful livelihood activities. The following additional income generating activities need to be promoted as a means of improving the income generation capability of residents in the ESZ area:



Organic farming



Livestock improvement



Fisheries

Current practices in Sidhi District:

1. Plantation for landscape restoration

Landscape Restoration is the deliberate integration and enhancement of tree cover within different land uses. It comprises a range of interventions including forest regeneration, plantations, and different types of agroforestry. Sidhi district has more than 350,000 hectares of restoration potential where trees can be integrated into different land uses to improve food production, strengthen biodiversity conservation and sequester carbon. Such initiative is adopted by Sidhi district in areas like Khokra, Thani Pathak etc. These interventions will not only benefit environment but also provide alternate source of livelihood to villagers and reduce their dependency on the forest produce. The following are some details:

- The restoration interventions of type of plantation is based on land ownership, landuse, tree cover density, slope, presence of irrigation, presence of bamboo and proximity to riverbanks. These include Farmer Managed Natural Regeneration, mixed plantation, Bamboo plantation, Trees on boundaries, Agri-horti-forestry, Pastureland development, and Riverbank plantation.⁸¹
- In case of Khokra, plantation was done in 5 hectares of area with amla, bheda, aam, spanish cherry, sitaphal, anar, kathal, bargad, peepal, paras peepal, neem, chickoo, sindoori, bel, sethoot, harsingar, karanch, amrud and many other local trees.
- This exercise was carried out by the villagers from nearby villages, and they were paid on daily basis with the help of NREGA scheme.
- Since local people has done the work, they have also taken ownership to protect these saplings from harsh climate and other anthropogenic activities.
- Farmers in Sidhi are also experimenting with different models of integrating trees on farms.



Image 13: Plantation site in Khokra carried out by the villagers

- This plantation drive was integrated with nursery run by horticulture department and Self-Hel groups which provided them the saplings.
- All types of local and hybrid species are available here.
- The women working in these nurseries are also paid under NREGA scheme.

⁸¹ Landscape Restoration for Climate and Communities – Opportunity assessment of Sidhi district by WRI



Image 14: Greenhouse arrangement in the nursery (left) and women working in the nursery (right)

- This plantation site was also integrated with Goshala which acts as a source of manure to these plantations and is described in detail below.
- Additionally, value chains for key tree species like Mahua, Bamboo, Palash, Jackfruit, Moringa, and Aonla can be developed by promoting microenterprises, cluster and area level federations, and farmer producer companies. These value chains at pre-production, production and processing stages can, at minimum, benefit an estimated 30,000 persons, including women, unemployed youth and landless. These early estimates suggest that landscape restoration could be a catalyst for transformative change in districts with few secondary sector opportunities.

2. Goshala/Cowshed

A goshala is a protective shelter for cattle mainly Cows to provide shelter and selfless service to many injured, stray, old and abandoned cattle. The number of unproductive and stray cows in Sidhi has been rising continuously due to lack of quality fodder, lack of grazing grounds, killings by wild animals, and release of stray cattle from nearby state to Sidhi etc.

In India, cow is considered sacred, and this has resulted in cultural sensitivity towards their welfare. With so many stray cows around, a pilot intervention of Goshala was initiated in Sidhi. There are 15 Goshalas in Sidhi are under construction, out of which 5 has been constructed in Khokra, Sihawal, Rampur naikin, Majhauri and Kusmi. The following is the details of Goshala in Khokra:

- The Goshala is a permanent structure made from brick and concrete. The outer wall of the structure is well painted by local artists. There is an open area for cows to roam, eating area where a trough has been constructed to put hay, grains etc and a treatment room for sick or pregnant cows.
- There 90 cows and 11 buffalo which were rescued and sheltered here.
- The villagers from nearby villages maintain and take care of these Goshalas, also provide them livelihood opportunity.
- There is also a provision of collecting cowdung and cow urine as they can be reused and sold.
- Almost 100 Goshalas are envisioned by the district collector and make it a cattle-based economy.
- Soon the Goshala will also be integrated with pastureland and the work is under process.



Image 15: Goshala structure in Khokra and the facility for eating

3. Fish farming

District Sidhi is very rich in water resources. There are many rivers, streams, ponds, lakes and stop dams. The waters which have covered large area are not much utilized so far for the benefit of the district. These are of great importance from the point of view of fish supply and development of fishery. Knowledge of pisciculture is essential for sound and practical planning in this respect. However, there has been a great difficulty in catching fish from turbulent streams and rivers running between difficult terrains where traditional collecting techniques do not yield the desired result. In view of it, there is a vast scope of exploring the fish fauna by creating a water reservoir. This would not only provide an alternate source of livelihood to villagers but also keep the villagers out of hunger and provide of protein.

Such practice has been carried out in many villages of Sidhi such as Thadipathar, Dadri, Bhaisarah, kuswaha etc. The following are some details:

- The minimum size of fishing pond dredge out is 1 acre with 3 m depth. This could hold 1500 fish seeds of Roopchand fishes (got from Kolkata)
- This system provides fair profits if the quality and quantity of fish is good and is sold at Rs.100 per kg in the village itself. Because of high income in fish culture the people are found interested in this field.
- Under NREGA scheme, an amount of Rs. 2.5 lacs is also provided to take benefit from this opportunity with daily wage rate of Rs.190.
- Some of the ponds have been dredged out and filled with bore water and retained by bunds or check dams.



Image 16: Fish farming in Thadipathar

4. Homestay

Madhya Pradesh Tourism Board introduced schemes giving opportunity to all those house owners of urban and rural areas who are willing to give a portion of their house as a tourist accommodation for domestic and international visitors. These unique and profitable schemes will enable property

Zonal Master Plan of Bagdara Eco-Sensitive Zone

owners to introduce tourists to the rich culture, cuisine, customs and lifestyle of “The heart of India”. At the same time, these schemes will also ensure a recurring source of income for property owners and also generate employment opportunities. To supplement the available tourist accommodation in cities, villages and places near to tourist’s interest in Madhya Pradesh, MP Tourism Board has introduced Home Stay establishment schemes namely Homestay Establishment (Registration and Regulation) Scheme 2010 (revised 2018), Bed and Breakfast Scheme 2019, Farm stay Scheme 2019, Gram Stay Scheme 2019.

No.	Particular	Homestay Scheme 2010	Bed and Breakfast Scheme	Farm stay Scheme	Gram Stay Scheme
1.	Operation of the unit by	Property owner	Property owner or Caretaker	Property owner or Caretaker	Property owner
2.	Accommodation/ Rooms	Minimum 01 & Maximum 06 rooms (up to 12 beds).			
3.	Registration fee (18% GST extra)	Silver – ₹ 1000 Gold – ₹ 2000 Diamond - ₹ 3000	₹ 2000	₹ 5000	₹ 1000
4.	Registration Validity	3 years			
5.	Tourist facilities	Accommodation and catering		Recreational activities/ related to rural life with accommodation and catering	
6.	Area	Urban/Rural areas		Outside of urban area (near to city)	Gram panchayat
7.	Room size (Minimum)	100 sq. ft	120 sq. Ft.	Single bedded 150 sq. Ft. & Double bedded 200 sq. Ft.	100 sq. ft.
8.	Wash Room Size (Minimum)	Silver – 30 sq. ft. Gold – 45 sq. ft Diamond - 60 sq. ft	30 sq. ft.	32 sq. ft.	-
9.	Renewal fee	₹ 1000 + GST	₹ 2000 + GST	₹ 5000 + GST	₹ 1000 + GST
10.	Incentives (one time)	Silver: Nil. Gold: 25,000 Diamond; 50,000	After 1st year- completing 50 days guest accommodation- award amount Rs. - 15,000 / - After 2nd year- completing 75 days guest accommodation- award amount Rs. - 20,000 / - After 3rd year- completing 100 days guest accommodation- award amount Rs. - 25,000 / -		
11.	Promotion support (one time)	Brochure/ website maximum Rs. 10,000	Brochure preparation maximum amount - Rs. 10,000/ - Website preparation maximum amount - Rs. 10,000/ -		
12.	Support in Travel mart	Partial support for Participation in National & International Travel Mart – 50% of total expenditure or maximum Rs. 50,000/-			
13.	Support for Skill Training	Travel allowance support for skill development training in other city, support of Rs. 500 per person per Homestay.			

To take the advantage of this scheme an NGO named Gram Sudhar Samiti is working for development of some of the most deprived and vulnerable communities in Singrauli, Sidhi, Rewa and Satna districts in Madhya Pradesh. GSS also works in promoting (and protecting the right to) education, health, proper nutrition for children, community-based initiatives to address varied forms of exploitation, deprivation, atrocities; culture, local literature and livelihood, and natural resources to create a better enabling environment for good local governance.



Image 17: Homestay under construction near Thadipathar by Gram sudhar Samiti



Image 18: New homestay constructed in Juri village

5. Bamboo products

Bamboo clumps are one of the major types of plantations in the region and is readily available to the villagers. Bamboos are fast growing and are a low-cost material that is strong and durable. It can be used for various purposes from house building to functional and decorative objects such as Chairs, stools, hats, baskets, cups, bowls, musical instruments and more.

One such example were presented to us in the village of Thadipathar where this art was fading away but few people still continue its use in day-to-day objects like basket, cap, thal etc. This knowledge of bamboo weaving needs to be passed on to future generations and it will also provide an additional source of income.



Image 19: Bamboo products made by villagers by hand in Thadipathar

MPSBM and Bamboo Craft Development Board has been formed to promote bamboo based development and entrepreneurship leading to the creation of a sustainable bamboo economy. They not only provide training to such people but also help in the sale and marketing of such products.

Convergence of schemes for livelihood generation⁸²:

For livelihood generation, the schemes and programmes of Ministry of Rural Development (MoRD) and the Ministry of Agriculture (MoA) both operate in rural India and the target beneficiaries are primarily common. Whereas MoRD schemes and programmes focus on employment generation/guarantee, as well as asset creation in rural areas, both for community benefit and individual livelihood support, MoA targets basically the agriculture sector with schemes and programmes which typically benefit individual farmers, though there are certain interventions which are for collective benefit to the farming community. Thus, while both the Ministries are channelizing their efforts for the benefit of primarily the same population, currently there exists very limited convergence or meeting point of these two streams. This hiatus needs to be removed and the operations of MoA and MoRD needs to be synergized at the implementation level, typically the district level.

MoA implements several programmes for accelerating growth in agriculture and allied sectors but to start with the efforts at convergence with NREGA could focus on the National Food Security Mission (NFSM), Rashtriya Krishi Vikas Yojana (RKVY), National Horticulture Mission (NHM), the Integrated Nutrient Programme, National Watershed Development Programme for Rainfed Areas (NWDPRRA), Soil conservation in river catchment areas and flood prone areas (RFP & FPR), Development of Inland Fisheries and Aquaculture, Development of Brackish Water Aquaculture, Cold Water Fisheries and Aquaculture, Development of Waterlogged areas, Productive Utilisation of Inland Saline/Alkaline Water for Aquaculture, Inland Capture Fisheries (Reservoirs/Rivers) and the Fodder And Feed Development Scheme. However, in case there are any other schemes where convergence is possible, the district administration need not limit itself to the above schemes alone and innovate depending upon the local needs.

In the year 2007-08, the Government had introduced the new scheme RKVY which had, amongst many other objectives, the objective of integrating livestock, poultry and fishery more fully. This resulted in considerable convergence of effort at the district and block level in the activities of the Department of Agriculture and the Department of Animal Husbandry, Dairying and Fisheries. The benefits of such convergence were visible in the implementation of the scheme in 2007-08 as well as 2008-09.

For convergence to be effective, there has to be at least one link in the two separate hierarchies of

- a) **MoRD - State Department of Rural Development - District Collector/DRDA - Zila Parishad - Gram Panchayat and;**
- b) **MoA - State Department of Agriculture/Animal Husbandry/Fisheries - District Collector – Block Agriculture Officer - Gram Panchayat.**

The obvious common link is the District Collector. Therefore, the District Collector should be the nodal point for conceiving and implementation of all convergence efforts. The District Collector being the District Programme Coordinator for NREGA as well as responsible for District Agriculture Planning Unit for RKVY, convergence of the plans at the district level would be easier.

Programmes of MOA have been examined for convergence suitability with NREGA and following convergence parameters emerge broadly:

- a. Convergence of resources available under MOA programme for public lands and NREGA will be very useful. Labour component of these programmes and material component to the extent

⁸² https://nrega.nic.in/netnrega/writereaddata/Convergence/circulars/guideline_conver_MOA.pdf

available of the approved unit cost can be funded from NREGA and the remaining material component can be funded from MOA programme.

- b. MOA programmes on individual farmers, which satisfy the conditions of eligibility under NREGA i.e., small and marginal farmers, farmers belonging to Below Poverty Line (BPL) families etc. where labour component is identifiable can also be converged with NREGA for meeting the cost of labour and material component, to the extent permissible. Remaining part of the unit cost can be funded from MOA programmes.
- c. Any other programmes of MoA in which the District Collector feels it would be feasible to converge efforts with NREGA.

To illustrate, establishment of new gardens envisaged under NHM involves soil testing, cleaning and ploughing of land and excavation of pits. For an acre of mango orchard, the expenses on the above would be around Rs.4000/- which can be entirely dovetailed with NREGA. Similarly, where an NREGA work site has dug up a pond of 3,000 cubic meters, the same could be used for scampi farming under the inland fisheries development project as value addition, or used in conjunction with MoA Programme of Micro Irrigation and Horticulture to provide sustainable livelihood to small and marginal farmers.

4.3 Micro-plan preparation

Joint Forest Management (JFM) is an approach and program initiated in the context of the National Forest Policy of 1988 wherein state forest departments support local forest dwelling and forest fringe communities to protect and manage forests and share the costs and benefits from the forests with them. Communities organize themselves into a JFM Committee to protect and manage nearby forests, guided by locally prepared byelaws and 'micro plans'.

A village level Micro-Plan is a blueprint of village development plan and forest development plan, which is need based and site specific, commensuration to available resources. As the unit of the plan is small, it is called a micro plan. In contrast, the macro plan covers larger units like district or state. Micro Plan activities are planned at the village level utilizing available village resources for the fulfilment of the requirements of the rural population. It outlines the strategy for meeting the requirements of people after prioritization of needs and defines the target for development. It contains a description of problems being faced by the villagers along with their feasible solutions, assessment of need and capacity of resources in addition to the list of activities to be conducted in the JFMC area.

Micro plan is an official/formal document. It is an important document for balancing the complementary as well as competing demands on the available resources for example forests for forest produce for subsistence and sale vis-à-vis managing forest for ecosystem services. The micro-plan is a living document that must be responsive to emerging concerns and as such is an adaptive document. It must, therefore, contain clear provisions for amendments according to requirements. The micro plan should be developed with the help of the villagers using participatory approach of PRA/RRA exercise. This approach is useful because

- It helps to understand the location specific problems in a better manner.
- It helps to know priorities of the local people of the village.
- It is likely to be more acceptable to the villagers as they participate in the process of developing the plan and are co-creators of the plan. It creates a sense of ownership amongst the people.
- It helps in developing trust of the villagers towards the JFMC and helps in building relations between the people and the organization.

Preparation of Micro-plan: Depending on the size of the village and its population, each gram panchayat has jurisdiction over 1-5 villages and is responsible for conducting the election of the

JFM Executive Committee. The Executive Committee coordinates the preparation of the ‘Forest Micro Plan’ and the Annual Work Plan for meeting the rural community’s demand for fodder, fuel wood, NTFPs, timber, and other forest products, as well as to secure ecosystem services.

Points to be kept in mind while drafting a micro plan

- Village will be the unit for preparing a micro plan.
- Focus will be on the existing resources of the village.
- Local people should be motivated for active participation and co-preparation.
- An initial public meeting should be held to discuss the objectives and process and outcome from the micro planning process.
- Targets should be defined for all stakeholders.
- The micro plan document should be simple and easy to understand.
- Local resources should be aligned with local requirements and objectives of the program.
- The micro plan should be prepared within 20-25 working days.
- Use of standard and average statistics of demand and utilization, without customization for the specific context of each JFMC may result in a faulty microplan with lower chances of success.
- In order to strengthen the relationship between people and forest, the micro plan should include and build on traditional community management and conservation practices such as sacred grove protection, protection of spring zones, and other cultural practices as well as newly developed procedures such as kesar-chirka, Panchvati Ropan, Vriksha-yagya, Deep-yagya etc.
- Participatory Methodology should be used to assess the forest produce requirements of the villagers.
- It should be ensured that the micro plan is different from the Management plan, but it will be a factual reflection of all resources including forests in the area.

4.4 Implementation of micro-plan

The ESZ Project Management Unit (EPMU), proposed in this plan, can be an agency which may take up facilitation & pilot interventions with village communities and EDCs to execute financial independence and micro planning initiatives. Within EPMU it can be the role of ‘Development Planner’ to facilitate drafting and execution of these micro plans in consonance with ESZ plan in order to undertake various development activities listed therein. This process may be encouraged through various training and capacity building programs that the EPMU may decide to organize with village communities to help them efficiently run Eco Development Committees along with other Panchayat committees.

Performance and monitoring of these EDCs and Micro plans can be done with the help of various indicators and benchmarks as mentioned in the table below. These indicators are generic in nature and only act as a guide for EDCs and EPMU, who may modify and customize these indicators based on ground realities of their area of operation.

Examples of Monitoring Indicators⁸³

Criteria	Criteria Indicators
Ecological Criteria & Indicators	

⁸³ Source: Joint Forest Management A Handbook (MoEF and JICA)

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Improvement of forests and vegetative diversity	<p>Forests regenerating properly</p> <p>Species succession towards Climax Stage</p> <p>Increased growth of grass</p> <p>New and degraded forest lands brought under forest cover</p> <p>Kinds of floral species now grown</p> <p>Tree growth abundant and quality of forests improved</p> <p>Forests is well retained</p>
Maintenance of eco-system services	<p>Soil erosion reduced/stopped</p> <p>Increased level of groundwater</p> <p>Availability of food to fauna</p> <p>Availability of clean air</p>
Economic Criteria & Indicators	
Improvement in the economic conditions of the village	<p>Individual families are earning more income from SHG activities</p> <p>Economic development through savings in community fund</p> <p>Individual families are meeting their own needs</p> <p>Additional sources of income are available to the villagers</p> <p>Type of micro-enterprise(s) started</p> <p>Increased food stock</p> <p>Dependence on forest reduced</p> <p>Breaking away from money lender</p> <p>Decreased of local migration to urban areas</p>
Continuous availability of forest produce	<p>Increase of availability of NTFP for sale</p> <p>Increase of availability of fodder, fuel wood, bamboo and other species for agricultural implements and poles for use by families of the village</p> <p>Sustainable gains from forest</p>
Institutional Criteria & Indicators	
Collective decision making and active participation of members	<p>Everybody is equally responsible</p> <p>Villagers serve the FPC on their own initiative</p> <p>Collective and careful decision-making process</p>
Unity and conflict management	<p>FPC is a platform to create unity and opportunity to work</p> <p>Bring opponents to FPC</p> <p>Sharing of opinions on forest issues</p> <p>Good and clear rules</p> <p>FPC settles local disputes and problems</p> <p>Reduction of inter village conflicts</p> <p>Number of disputes of FPC</p>
Equitable sharing of forest produce	<p>Clear demarcation of land for each village</p> <p>Complete rights of ownership over NTFP and other forest materials that are needed by villagers</p> <p>Awareness for development of appropriate protection mechanisms</p>

	Systems of equitable distribution
Social Criteria & Indicators	
Feeling of community ownership and responsibility	Focus changed from selfish motives to community benefits Sense of commitment and discipline developed Village community is shouldering a major task of carrying FPC activities Dependence on forest for livelihood
Village problem solving and development	Eradication of any social evil Village cleanliness and improved health Resources are available for public functions Community development by operating community fund in a co-operative way Overall village development undertaken through FPC Peaceful environment in the village
Changes in behaviour to protect forests	Haphazard lopping is reduced Fuel wood extraction systematically Using other alternatives for fuelwood Practice of rotational grazing

CHAPTER 5 SUB ZONAL TOURISM PLAN

Ecotourism, Interpretation and conservation education

5.1 Promotion of sustainable tourism

5.1.1. Vision and objectives for the sector

Vision: Tourism depends for its very existence on quality natural environments; it is equally dependent on human environments, resources and cultures⁸⁴. "Sustainable tourism" is often equated with nature or eco-tourism; but sustainable tourism development means more than protecting the natural environment - it means proper consideration of host peoples, communities, cultures, customs, lifestyles, and social and economic systems⁸⁴.

Bagdara Wildlife Sanctuary is the most pristine and untouched destination for wildlife tourism in Madhya Pradesh. It can be developed in major tourist destination in Madhya Pradesh, well known for Black Buck Safari. Apart from Nature based tourism it also have several historical and tourist sites. Given the diversity of assets, promotion of ecotourism/nature-based tourism will provide an ecological sustainable tourism alternative, socio-economically benefit the village communities and other associated stakeholders and facilitate wildlife conservation. Therefore, to understand the natural context and existing situation of tourism in Bagdara Eco Sensitive Zone the vision for the area can be:

“Utilizing the natural possessions of the region the plan intends to develop Sustainable and Nature-based Tourism in the region to increase tourism related benefit to the local communities, reduce negative externalities on environmental resources that widens employment opportunities for indigenous communities.”

Objectives

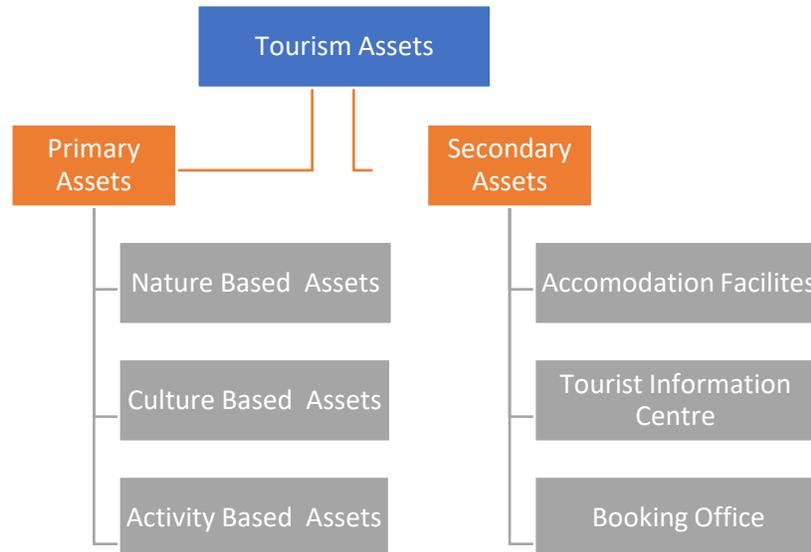
1. **Promotion of Experiential Tourism** - To enhance the Eco-Tourism experience among the visitors by providing informed wilderness experience through a mix of different activities in buffer zone while reducing the pressure of tourism in the Protected Area.
2. **Identification of tourism assets and clusters** - To identify the new potential tourism spots and circuits to increase the tourist inflow and time of engagement.
3. **Regulation of Tourism footprint as per environmental guidelines** - To regulate tourism activities (new and existing) in accordance with Tourism Master Plan prepared as per ESZ notification.
4. **Strengthen wildlife security** - To develop Eco-tourism as an activity for monitoring wildlife security from illegal activities like poaching and others.
5. **Facilitate socio-economic upliftment** - To promote the interest of indigenous communities who are the major stakeholders, and compliment local economy through eco-tourism activities.
6. **Sensitisation and knowledge sharing** - To promote eco-friendly tourism activities, eco-education and eco-development.

⁸⁴ Sustainable Tourism and Eco Tourism by Annalisa Koeman.

5.1.2. Tourism assets, zones and circuits

Sustainable tourist development requires management of all tourist resources/assets⁸⁵. Bagdara sanctuary is the adobe of many untouched and unexplored locations. The type of attractions range from nature based attractions; Historic & Cultural based attractions, Religious Tourism Sites and wildlife tourism. The current tourism in Bagdara Wildlife Sanctuary is quite dormant and mostly concentrated around the locations in the Protected Area of the sanctuary.

Exhibit 8: Tourism Asset Classification



Bagdara ESZ Owing to its limited area possess immense potential to be developed as a model for Eco-Ethnic Tourism.

- Festivals and Fares around Makar Sankranti to exhibit unique celebrations of the local communities.
- Establishment of community centres to exhibit the unique and sustainable rural lifestyle of different communities in the ESZ.
- Art learning and display centres can be developed with the help of local community to create awareness and preserve the art and traditional practices of the local communities with tourist participation.
- Few of the other infrastructural improvement potentials the site can handle are development of orientation centre at the entrance gate Kudheri shall be constructed, interpretation centre at Bichhi/Khairpur, visitor’s centre at Bagdara where the facilities for boarding & lodging shall be provided.

However there existing tourist locations in ESZ that can be upgraded adopting the following suggestions and can be developed as major tourist destinations in the area.

5.1.2.1. Nature-based and Cultural Tourism Sites

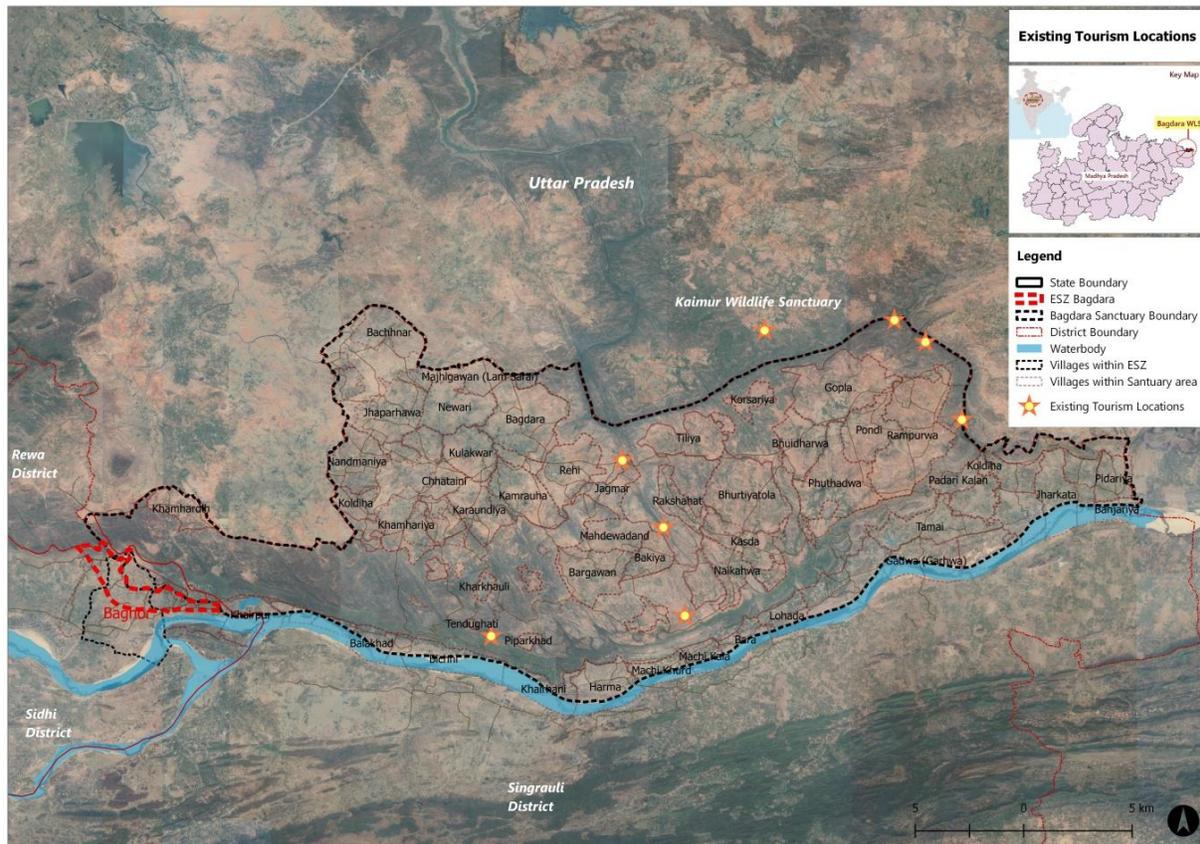
The following are some of the potential sites for nature-base and cultural tourism:

⁸⁵ Urban Asset Management on Tourism Destination to Support Sustainable Development in Surabaya by Eko Budi Santoso, Rini Ratna Vaidya, Belinda Aulia at th 5th ISRA International Institute: Tourism and Sustainable Development.

Zonal Master Plan of Bagdara Eco-Sensitive Zone

S.No.	Location	Description
1.	Singhi Waterfall	The site can be developed as a festival camping site for celebrations and to enjoy natural scenery.
2.	Budhi Dari Waterfall	Upgrading the approach to it, and tourist infrastructure this spot can be developed as an eco-tourism place.
3.	Rani Machi Shail Chitra	This spot also needs approach road and stair to facilitate tourists. This spot can be developed as a tourist place providing means of various facilities like communication, guide, roads, drinking water facility etc.
4.	Mugalmara Den	This spot can be developed as a eco-tourism place by improving infrastructure live approach roads, means of communication and others.
5.	Baghunha Shail Chitra	This place can also be developed as a tourist place in providing some basic facilities means of communication like approach roads, vehicle, guide etc.
6.	Gaura Pahadi Shail Chitra	This spot is liable to be improved by providing approach road and other infrastructures like drinking water facility, concrete platform and stairs for easy travelling.
7.	Dhawlagiri	This spot also needs some basic improvement such as approach road, stair construction to reach up to spot and water facility for tourists.
8.	Khairpur and Harma Hills	Self-guided walking and trekking trails can be developed at this spot.

Map 22 : Existing Tourism location near ESZ



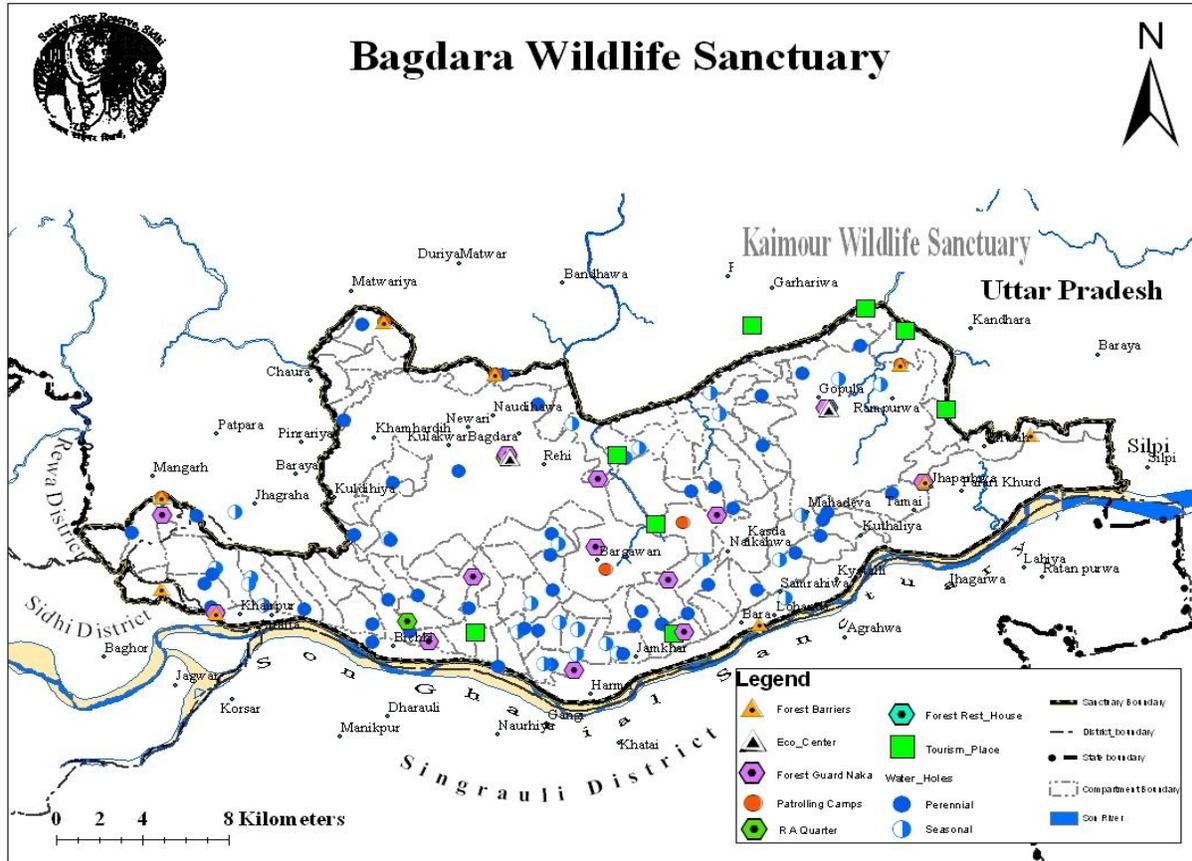
5.1.2.2. Activity-based tourism sites

The following are some activity-based potential sites:

S.No.	Activity	Potential Sites
1	Self-Guided Walking/ Trekking Trail	Khairpur and Harma Hills
2	Wildlife Viewing	Alakhdand, Semrahwa, Mairahwa, Bodrahiya, Kathahwa, Jhagrahiya
3	Picnic and Camping Spots	Singhi Waterfall,
4	Cultural Activities (Observing village craftsmanship at work, Tribal dance, Visit local fairs, festivals)	Baghor

5.1.2.3. Existing Tourism/ Eco-Tourism Infrastructure

The following are some existing tourism assets and infrastructure in Bagdara WLS:



Potential Tourism Circuit:

- Connection with Son Gharial Tourism circuit with Marwasgram rail head: The tourist can directly come to Marwasgram railway station and explore the Sanjay Dubri region on tourist railway line from Kusmi to Banjari (close to Deosar).
- Marwasgram – Kusmi – Water bodies/ Protected Area – Banjari (near TPA-2) Ecotourism – Shikarganj - Parsili resort /Jogdaha - Bagdara WLS— Bharatpur - Rewa or Chitrakoot

5.1.3. Delineation of Tourism Promotion Areas

Tourism Promotion Areas (TPA): Tourism Promotion Areas have been delineated on the basis of Geographical context (majorly in the Eco-development zones), environmental sensitivity analysis, closeness to the National Park gates and views to the Sone River. The TPA has been proposed based on the following considerations;

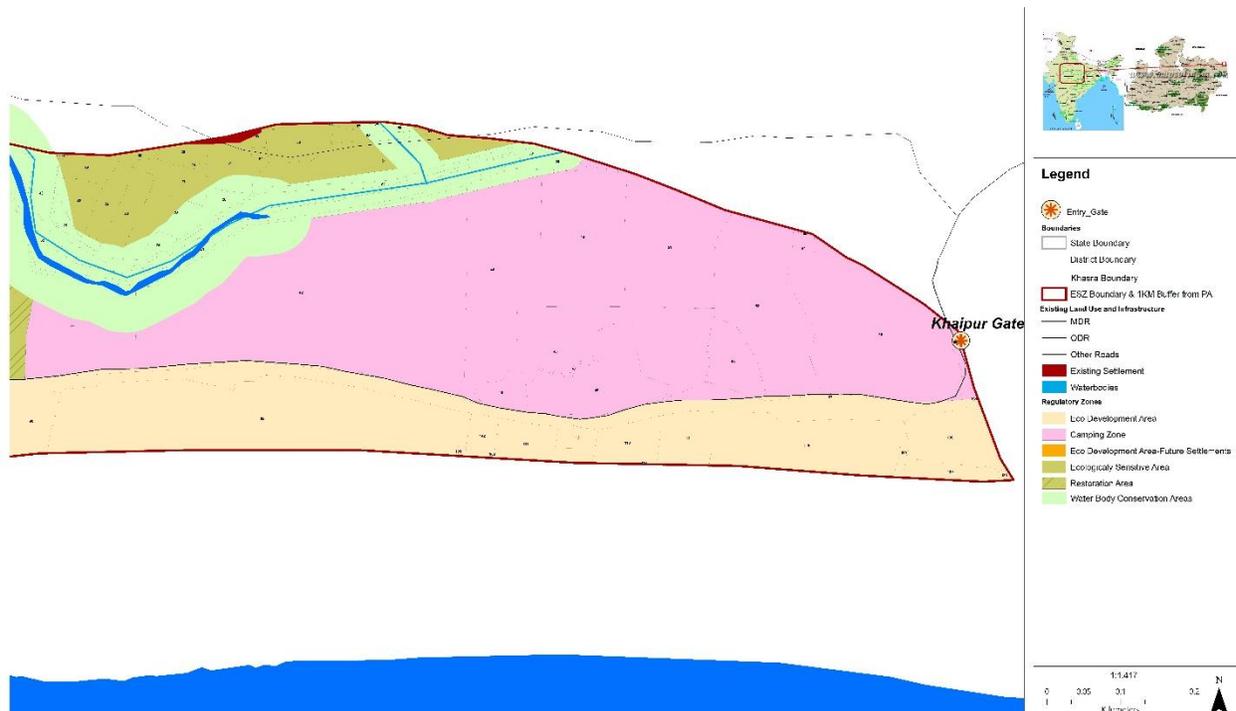
Zonal Master Plan of Bagdara Eco-Sensitive Zone

- Falls under low sensitivity area of eco-development zone
- Located in the vicinity of the main entry to Bagdara Wildlife Sanctuary.
- Abutting the main road leading to the Sanctuary
- Given that the ESZ fully falls within the 1km buffer from the Protected Area, the site is only suited for temporary structure like tents/camps.
- The elevation of the proposed campsite provides the perfect vantage point towards the Sanctuary and the River.



- The campsites can be positioned on the higher elevations and clubbed with rural activities, agricultural activities, plantation activities etc near to their campsites. The campsite can be developed in cluster-based approach of 4-5 tents with 4-occupancy in each cluster with shared facilities. The cluster should be at a minimum distance of 200m from each other so tourists can have privacy if they are coming in groups.

Map 23: Detailed map for Camping Zone



5.1.4. Assessment of carrying capacities of Campsites

Carrying Capacity of Camping Zone (for Campsites)

We need to first find the total area which can be developed for tourism purposes. Please note, the campsites will be self-sufficient in themselves and so it will not exert any pressure on outside infrastructural services. The carrying capacity of campsites is subject to infrastructure availability for the assigned number of tourists/occupants.

1. For calculating 'A'-total area for development

Calculation for 'A'	Area (in Sq.m)
Total Developable area (A)	2,86,230

2. For calculating 'B'- Area suitable for campsite

Land use	Percentage requirement as per URDPFI (in %)	Area (in Sq.m)
Residential	50	143115
Commercial	3	8586.9
Public and Semi Public	8	22898.4
Recreational	14	40072.2
Transportation	12	34347.6
Others	2	5724.6
Total	89	2,54,744.7
Total area required to be deducted from development area (x)		2,54,744.7
Remaining land for tourism is 11% (B) (A-X)		31,485 =3.1485 Ha

3. Final Calculation

Estimated number of occupants that can be accommodated in campsites = Total land available for tourism purposes x No. of occupants per ha (15 occupants per Ha)
 = 3.14 ha * 15 occupants per ha
= 47 occupants = 11 tents (4-occupancy per tent)

5.2 Conservation Education

Forest based educational tourism is one of the potential way for the diversification of child education. Large international organizations such as World Wildlife Fund and The Nature Conservancy have given emphasize on this learning system.

Education about conservation has a strong influence on the extent to which student become committed to arguments for conserving species and habitats (Tim Caro, 2003). This depends on the successful implementation of educational program. So, awareness and education regarding forest conservation have been successfully implemented by educational tourism in child level. There are some reasons of including forest conservation in child education.

- The environmental awareness regarding forest area will underpin the implementation of the education plan.
- The forest based educational tourism will be to inform and entertain, and to ensure that school children are familiar with the forest resources.
- Disseminate information regarding the forest ecology to the children, the flora and fauna especially those related to native, endemic and endangered species.

- Learning about conservation would make students more sympathetic to the awareness of environment. –
- To promote the development of the nation and of individual citizens.
- Learn about and engage the children with environmental issues in their communities and within wider national discussion.
- To discuss the environmental concerns are helpful to understand the national and international environmental legislation.

The child education diversification of forest conservation depends on proper implementation of educational tourism. There are some ways of implementation the educational tourism as discussed below:

Planning team: It will be important to have a planning team of excellent communicators who can take the environmental awareness and education program forward. They can work together for a conservation awareness plan of action, with short and long-term targets and a budget estimate.

Develop educational materials: Information of forest conservation needs to be presented in various formats to ensure that it is relevant for the children. Useful materials include brochures, posters, maps, comic books, wildlife guides, videos, slide shows and interactive displays.

Exhibition and visiting activities: Traveling exhibition may be arranged to foster the educational tourism. Some events such as video, film show, quizzes and other competitions can be included in this exhibition. Necessary and relevant government offices and institutions also visit in this regard.

Local community involvement: One of the most important techniques is involvement of local people to implement educational tourism. They can influence the children to gather information and build their awareness to forest conservation.

Tour operator activities: Tour operator can arrange special tour package for children on forest conservation. They can involve the local people for proper implementation of this program. Open discussion meeting, workshop and field trips can be arranged in this regard.

Media: There is high public awareness of educational tourism; the national media can play an effective role. Newspapers, television and radio broadcasts are developing particularly strong public support for conservation education.

School curriculum: Schools can develop special course and curriculum for the students, which can improve their knowledge regarding forest conservation.

Teacher: Teachers are also helping the children to achieve and foster their awareness to nature and conservation by their teaching and classroom activities.

Local and international organization: Local and international organization have a strong role for implementing educational tourism. They can support the conservation education by their wide range education programs and projects. Educational tourism can focus the various environmental and conservation issues of forest to the children. Successful implementation of educational tourism depends on some matter of environmental aspects.

Nature protection: There have been increasing attempts to protect local species, flora fauna of forest and these fragile ecosystems. So implement environment and biodiversity related policies and activities for nature protection.

Preservation of biodiversity: Biodiversity development is a key element for environment conservation of present and future generations. Major international organization have stressed the importance of conservation and suitable use of biodiversity.

Level of ecological awareness: The sustainability of conservation and diversity efforts depends on public awareness. If much people give emphasize to achieve ecological awareness of nature, the children get benefit from it.

5.3 Management guidelines for tourism

5.3.1. Existing Management Guidelines/Situation

Bagdara Wildlife Sancturay has two management and conservation agencies – the Ministry of Environment, Forests and Climate Change (MoEFCC) at the national level and Departments of Forests and Environment at the Madhya Pradesh State level.

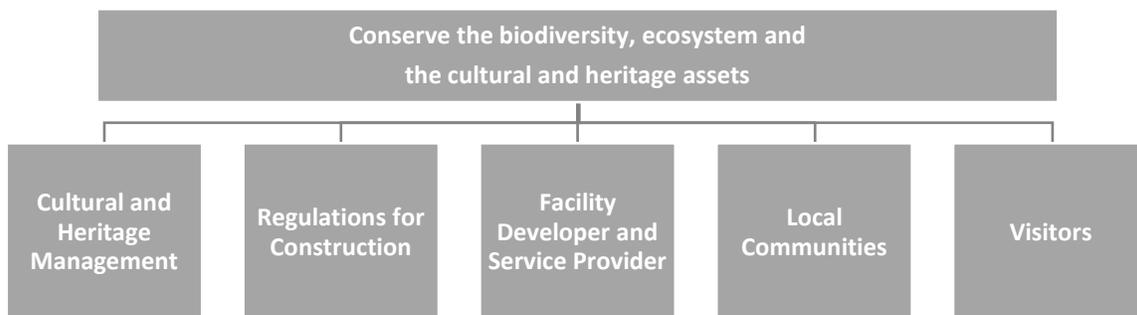
Exhibit 9: Tourism Management Strategies



5.3.2. Proposed Guidelines

The objectives of the guidelines described below are to conserve the biodiversity, ecosystem and the cultural and heritage assets of Bagdara Wildlife Sanctuary and address the rules for trekkers, tour operators, guides, all other visitors, and the local communities of Bagdara WLS. Guidelines set out for the for the ecotourism operators and guides operating within Bagdara Eco Sensitive Zone attempt to facilitate the Nature, Cultural and Historic conservation as well as ensure their clients' safety⁸⁶.

Exhibit 10: Proposed guidelines for conservation of biodiversity, ecosystem, cultural and heritage assets



⁸⁶ <http://www.ecotourismsocietyofindia.org/file/State%20Policies/Sikkim%20Ecotourism%20Policy.pdf>

A. Guidelines for Cultural, Heritage and Nature-based site Management

Bagdara eco sensitive zone has many natural and cultural tourist sites. As long as a site meets established standards, continuous monitoring and routine maintenance can be extended. However, if ecological, physical and/or social conditions approach or reach unacceptable levels, action must be taken. Management strategies affecting the level and nature of exploitation of a site and its physical and socio-economic environment seek to minimize or reduce the impact of each visitor. Factors, or variables that can be affected or controlled, include the number of visitors, the types of activity, visitors' behavior and the environment's physical and social resistance and resilience⁸⁷.

Management options **for reducing the number of visitors to a site** can include:

- Restricting entry or closing an area;
- Limiting group sizes;
- Implementing a quota or permit system;
- Increasing fees;

Options **for dispersing or concentrating people to reduce use in a particular area** can include:

- Restricting the number of people who can enter the threatened area;
- Limiting the permissible length of stay in the threatened area;
- Raising the entrance fee for the threatened area only;
- Not providing facilities in the threatened area;
- Zoning an area for a particular activity and not permitting the activity in the threatened area;
- Directing tourists to more resilient areas through zoning, visitor education and offering more facilities or fewer facilities;
- Charging different entrance fees on certain days of the week; and
- Using a promotion and interpretation campaign to influence the use of one area over another.

Visitors' behavior can be changed through:

- Education programmes teaching low-impact ways to visit a site, e.g., techniques for observing wildlife without disturbing it;
- Interpretation programmes teaching respect for a site's resources and protection issues.

A site's physical environment can be made more resistant to impacts by:

- Using infrastructure to "harden" a site, e.g., hardening a trail with a wooden boardwalk or installing permanent moorings;
- Relocating infrastructure to more resilient areas, e.g., moving a mountain refuge to an area less prone to erosion.

Actions for **reducing conflicts between visitors** include:

- Zoning an area for compatible activities;
- Influencing the types of tourism activities practiced at a site by providing or not providing facilities.

⁸⁷ Managing Tourism at World Heritage Sites: a Practical Manual for World Heritage Site Managers, By UNESCO world Heritage Centre.

B. Regulations for Construction

Table 4 Suggestive Guidelines for Construction

<p>Site Preservation</p>	<p>It is suggested that 100% of existing water bodies and channels be retained to safeguard aquifers within the site. Consider retaining at least 75% of the existing natural topography (by surface area), excluding building footprints, especially for projects on slopes of 25 percent (4 to 1 slope) or more. New hotels and resorts are encouraged to implement systems that eliminate landfill disposal or incineration of solid waste generated on-site. It would be beneficial to document the flora and fauna present within the resort premises. Hotels and lodges located near core boundaries are advised against fencing their properties. Owners and managers of such properties could be encouraged to remove existing fences or non-porous enclosures. It is recommended that new construction be avoided on hill slopes with gradients exceeding 15 degrees. Building within 100 meters of river high banks and 50 meters of nala high banks should be avoided.</p>
<p>Type of Construction</p>	<p>It is suggested that existing Hotels/ Resorts or expansion of existing residents may conform to environment-friendly, low-impact, low height aesthetic architecture adopting the principle of immersion with surroundings; renewable including solar energy, waste recycling, sustainable water management, rain water harvesting, natural cross-ventilation, no use of asbestos, discharge of only treated sewage, no air pollution, minimal outdoor lighting, and merging with the surrounding landscape.</p>
<p>Construction Material</p>	<p>Encourage use of natural and recyclable source materials for at least 20-40% of building envelope to achieve comfort condition during all climatic conditions in that location such as mud bricks, fly-ash bricks etc. It is suggested to use at least 2.5 - 10% (by cost) of GreenPro certified products and materials for renovation and annual maintenance of resorts. Eco-friendly material like Bamboo, tents may be used and local labour may be involved in construction of New Hotels/Resorts.</p>
<p>Clearances and Certification</p>	<p>Tourism facilities should strive to adhere to all environmental clearances, noise pollution norms, and operate in a non-polluting manner, seamlessly integrating with the natural surroundings. Consider implementing robust mechanisms to encourage and support compliance. It would be beneficial for new construction activities related to hotels and resorts to aim for IGBC certification, promoting sustainable building practices. To minimize environmental impact, it is suggested that commercial establishments, including tea shops, refrain from using firewood, sound-enhancing instruments like loudspeakers/amplifiers, and firecrackers. Tourism facilities are encouraged to consistently meet all pollution norms (noise, solid waste, air, and water) as outlined in the relevant laws and regulations.</p>
<p>Ventilation</p>	<p>Consider maintaining a differential CO2 level of a maximum of 530 ppm. It is suggested that windows and/or doors in living spaces, bathrooms, and common areas be designed to open to the exterior. Perhaps specify open area requirements as a factor of carpet area, such as:</p> <ul style="list-style-type: none"> • Kitchen – 8% • Bathroom – 5% • Lobbies – 12% • Other Areas – 10%

	It would be beneficial if windows/doors were designed to have no obstructions within 2 meters from the exterior surface, with the exception of shading devices. For projects with unitary air conditioning systems serving less than 10% of the total regularly occupied area, compliance for fresh air ventilation could be demonstrated through the criteria outlined for naturally ventilated spaces.
Day lighting	Ideally, aim for 75% to 95% of the resort's spaces—guest rooms, administrative areas, and meeting rooms—to achieve a daylight illuminance level of at least 110 lux. It's recommended to avoid considering areas with daylight illumination levels of 2,200 lux or more.
Outdoor Views	Ideally, all guest rooms should have access to the exterior. It is recommended that over 75% of the administrative areas have exterior access. 88
Solar Energy	Use of Solar lamps in rooms as well as in campus area may be encouraged. Solar powered water heater system and solar powered cooking system may be used to maximum extent so as reduce load on other sources of energy is encouraged.
Rainwater Harvesting	It is suggested to design rainwater harvesting system to capture at least 'one-day rainfall*' runoff volume from roof and non-roof areas ⁸⁹ . In areas where the water percolation is limited, collection tanks / water bodies may be provided to meet the above requirement.
Wastewater Discharge/ Reuse	It is suggested to provide an on-site treatment system to treat 100% of waste water generated in the resort to the quality standards suitable for reuse as prescribed by Central (or) State Pollution Control Board. No untreated discharge/ effluent shall be permitted into water bodies and water sources. Natural wastewater treatment systems may be used for treating waste water generated <ul style="list-style-type: none"> ○ Root Zone treatment ○ Phytoremediation ○ Phytoid May use treated wastewater or captured rain water for at least 50% of landscaping & flushing water requirements.
Usage of Forest Resources (Wood)	The use of wood as fuel shall be prohibited, except for campfires for which wood must be procured from State Forest Department/Forest Development Corporation depots.
Services for Differently Abled Persons	Accessible information at the entrance to the site Important information communicated via two senses or more (tactile, audible and visual) Uniformity in floor level for hindrance-free movement in common areas such as washrooms, restaurant and common assembly area Rest rooms (toilets) in common areas for differently abled people ☞ Visual warning signage in common areas & exterior areas

⁸⁸ Access to exterior can either be to sky or flora & fauna or both.

⁸⁹ Installation of Rainwater harvesting facility as per specifications of Model building byelaws, 2011 and Manual for artificial recharge of ground water by central ground water board.

Ramps	Non-slippery ramps for easy access to the main entrance. Such ramps should have with handrails on atleast one side.
Zero Landfill / Waste management	<p>No burying, burning or otherwise disposing non- biodegradable or toxic waste in and around the tiger reserve. Proper plan for disposal for degradable waste shall be developed and strictly implemented.</p> <p>Provide two bins at each guest room (wet and dry waste) and one bin at the bathroom to collect the sanitary waste.</p> <p>Ensure source segregation mandates, requiring not just wet/dry, but also specific recyclables (paper, plastic, glass) and detailed organic waste separation.</p> <p>Provide sufficient number of bins in the kitchen and dining area to collect the wet waste. (include food wastes, fruit and vegetable peelings, leftovers (including meat and fish), egg and nutshells, tea leaves, husks and seeds,)</p> <p>Ideally, an on-site waste treatment system may be installed for handling 100 % of the organic (kitchen & landscape) waste generated in the building. The generated manure or biogas shall be utilised as appropriate or Natural treatment methods like vermicomposting, leaf litter can be used.</p> <p>Encourage food waste reduction strategies at hotel, including “nose-to-tail” or “root-to-stem” cooking, tracking food waste in logbooks/apps, and adjusting portion sizes based on plate waste analysis.</p>
Tree Cover and Landscape Design	<p>It is suggested to ensure atleast 50 - 75% of total site area of the resort has tree cover.</p> <p>It is suggested to ensure atleast 20 - 60% of landscape area is planted with native and/ or drought tolerant species. The resort is encouraged not to plant monocultures (single species) or excessive number of same species⁹⁰.</p>
Indoor Landscaping	<p>There may be atleast 1 indoor plant per 100 sq. ft. of the carpet area.</p> <p>Select species suitable for indoor environment. The requirement is to have atleast one plant in every 100 sq. ft of carpet area of occupied spaces.</p> <p>These plants can help in absorbing toxins like VOCs, formaldehydes, etc. and improve the indoor air quality, besides enhancing the aesthetics.</p>
Organic Production of necessary resort requirements	<p>It is suggested to replace atleast 5 - 10% of the fruits and vegetables (by weight) purchased in a year with organically produced fruits and vegetables produced within the resort.</p> <p>Use organic manures & pesticides for 100% of requirement for landscape area⁹¹.</p>
Plastic Free Environment	All the plastic encouraging uses like in case for carry bags, packaging materials, water bottles, toiletries, etc. may be replaced with eco-friendly materials.
Net Zero Energy⁹²	It is suggested to install on-site renewable energy system to meet at least 20 - 30% of the total annual energy consumption of the resort ⁹³ .
Eco-friendly commuting practices, within the premises⁹⁴	<p>It is suggested to provide internal transportation in the resort through eco-friendly vehicles such as electric vehicles or CNG powered or biogas powered for guests & staff.</p> <p>Encourage walking/ bicycling in the resort through proper walkways/ cycling ways with sufficient illumination.</p> <p>Design walkway/ bicycle lane network to connect to all amenities</p>

⁹⁰ For landscape area calculations, potted plants should not be taken into consideration

⁹¹ Vermi compost, Leaf mould, Bone meal, Farmyard manure, Deoiled cakes like neem cake, pongamia cake, Castor cake, etc.

⁹² Applicable only for Large Resorts

⁹³ Renewable energy sources include solar energy, wind power, biomass; etc.

⁹⁴ Applicable only for Large Resorts

Theme Gardens⁹⁵	Encourage the development of atleast 2 theme gardens pertaining to preservation and conservation of natural plant species within the resort.
Monitoring Resource Use	Encourage sub-metering and continuous monitoring to identify improvement opportunities in building's energy performance, thereby optimising the use of resources. Energy Metering Water Metering

C. Guidelines for Facility Camping/ temporary structures

The camping zone is demarcated very carefully in the zoning plan (refer section 2.2). There are certain guidelines which needs to be followed to ensure safety to tourists, wildlife, and environmental resources. Please note, the following guidelines are not applicable for existing settlements in the camping zone.

- No permanent infrastructure is allowed in campsites. All the infrastructure has to be either temporary or movable.
- The boundary of campsites has to delineated properly with natural vegetation and it has to be ensured that no tents are outside the demarcated zone.
- All tents should be 200ft. away from water bodies, streams etc. as there might be rare chance of encounter with wild animals.⁹⁶
- Some basic facilities like temporary tents (4-occupant), temporary toilets (E-toilets), parking facility, fireplace, signages, solid waste management bins, boundary security and pathways has to be provided in the campsite by the developer or camp host. The permission of fireplace has to be taken from the forest department.
- Solid waste to be disposed and segregated properly in the bins provided. No waste should be left behind on the camping sites otherwise heavy fine will be imposed. If bins are not accessible or provided, the tourists should carry the waste with them outside the forest boundary.
- The camping zone must be declared as 'Plastic free Zone'.
- The campsite is to be non-powered. Some electric lanterns can be used at night times carefully.
- Drinking water must be carried by the tourists themselves.
- Tourists must ensure noise control in such sensitive location. No loudspeaker or loud music or instrument should be played.
- A permit needs to be taken from forest department prior to the visit of the tourists as the campsite will be available on first-come-first-serve basis.
- Tourists have to respect the climatic conditions and tourists' season as stated by the forest and tourism department.
- Upon the arrival of tourists, ranger officer or camp host must be informed.

⁹⁵ Applicable only for Large Resorts

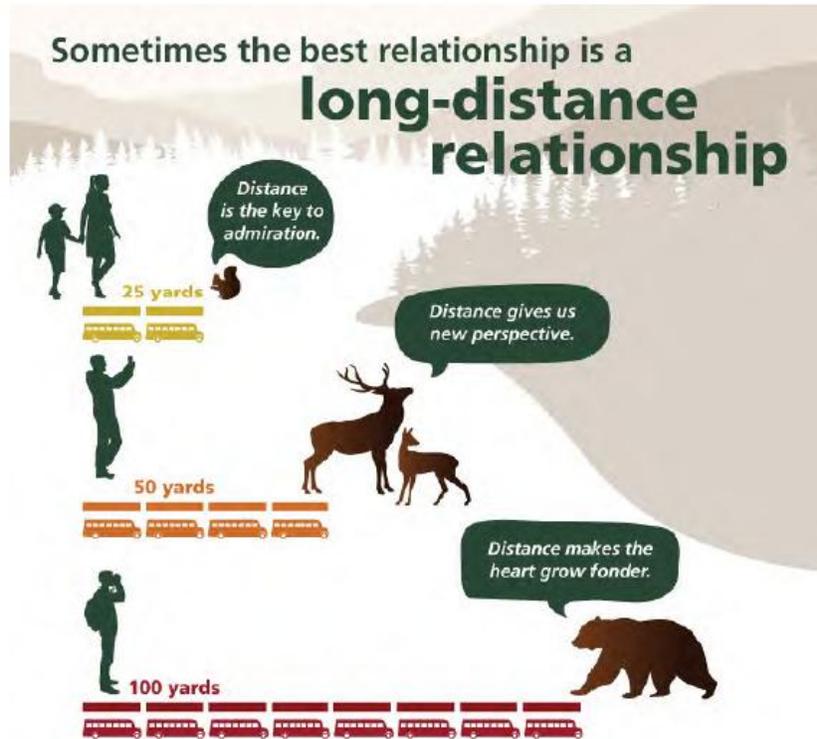
⁹⁶ <https://www.oars.com/blog/the-golden-rules-of-camping-etiquette/>

- It has to be ensured that all guides and drivers shall undergo a short course in park interpretation and rules and regulations for effective tourism management in the Protected Area. This course should conclude in an oral examination, with all successful candidates being certified by the Madhya Pradesh Tiger Foundation Society.
- Tourist facilities/tour operators shall not cause disturbance to animals while taking visitors on nature trails.
- All the Facility Developer/ Service Provider shall abide by the planning restrictions, codes and standards prescribed by the authorities
- All the Facility Developer/ Service Provider shall conduct EIA/ environmental audits for new/ ongoing eco-tourism projects
- All the Facility Developer/ Service Provider shall ensure construction of structures blending with the environment as per the prescribed building code
- All the Facility Developer/ Service Provider shall consider the carrying capacity and sociological use-limits of the site while creating tourist facilities, and ensuring safety & convenience of tourists
- All the Facility Developer/ Service Provider shall use local material and design as far as possible for construction of any resort or tourist facilities.
- The planning, architectural design and construction of tourist facilities should use eco-friendly techniques viz., solar energy, recycling of garbage, rainwater harvesting, natural cross-ventilation, self-sufficiency in food through kitchen garden & farming etc.
- Energy & water saving devices should be used apart from controlled sewage disposal.
- All the Facility Developer/ Service Provider shall respect the historic and religious sites in the area
- All the Facility Developer/ Service Provider shall ensure proper marketing of eco-tourism products
- All the Facility Developer/ Service Provider shall ensure training of staff on environmental issues
- All the Facility Developer/ Service Provider shall ensure safety and security of visitors
- All the Facility Developer/ Service Provider shall engage people from local communities in provision of trekking service providers who possesses knowledge on the local routes of importance.
- Visitor as well service provider shall register at the forest /wildlife check posts before entering a wildlife area;
- All the Facility Developer/ Service Provider shall segregate degradable and non-degradable litters and burn or bury all biodegradable items and carry back all other non-degradable items;
- All the Facility Developer/ Service Provider shall kkeep to the permitted nature trails and treks;
- Inform the nearest wildlife check post, in case the parties come across forest fire, wildlife offence by someone, death/carcass of wild animals during their nature trip⁹⁷;
- Educate visitors on community-based ecotourism initiatives and the guidelines before start of the tour/trek and respecting local inhabitants, culture & involving them in various activities and vocations as far as possible.
- Work in cooperation with local NGO and government to develop plans for visitor management that protects local people and environment.

⁹⁷ <http://www.ecotourismsocietyofindia.org/file/State%20Policies/Sikkim%20Ecotourism%20Policy.pdf>

- Offer site sensitive accommodation⁹⁸.
- Appropriate signage for educational and indicative purposes must be developed for the visitors as shown in the exhibit below.

Exhibit 11: Example for Interactive Signage Installation



A visitor education sign designed to address visitor-wildlife interaction issues in Grand Canyon and other US national parks. © US National Park Service

E. Guidelines for Local Communities

Involving the community is a critically important and complex subject for successful and sustainable tourism⁹⁹. It is now widely accepted that local stewardship of resources plays an important role in the sustainable use of natural resources. The participation of local communities in the management of biodiversity not only promotes conservation but can also help to achieve economic development goals¹⁰⁰. The set of guidelines thus formulated shall ensure the involvement as well as enhancement of local community's knowledge on biodiversity conservation and to enable the community to influence, manage and benefit from ecotourism development and practice. For the same Local Communities and the Home Stay service providers must

- Ensure involvement in all stages of tourism planning and waste management to leveraging their traditional knowledge and social structures to ensure a benefit sharing model within the ESZ.
- Respect the value of environment, conservation and cultural heritage.
- Co-operate with the authorities in ensuring healthy eco-tourism.
- Realize and react to the threat of investors against exploitation.

⁹⁸ <http://www.unep.fr/shared/publications/other/WEBx0137xPA/part-two.pdf>

⁹⁹ https://www.widecast.org/Resources/Docs/WWF_2001_Community_Based_Ecotourism_Develop.pdf

¹⁰⁰ <http://mekonginfo.org/assets/midocs/0002615-environment-manual-on-community-based-eco-tourism-in-protected-areasparticipatory-nbca-management.pdf>

- Be friendly with the visitors as effective “nature guides” & “conservationists”.
- Develop a participatory community-based tourism strategy, in collaboration with local communities, to ensure long-term local community benefit-sharing, and promotion of activities run by local communities
- Forest dwellers that have been relocated from core or critical tiger habitat to the Buffer shall be given priority in terms of livelihood generation activities related to community-based ecotourism in the Tiger Reserve. The Reserve Management shall make a special effort in this regard, besides a periodic review to ensure its compliance.
- Ensuring training programme to the host community in:
 - a) Lodge ownership/ management.
 - b) Basic education and awareness.
 - c) Health and sanitation.
 - d) Skill development for preparation of local souvenirs as appropriate.
 - e) Codes of conduct.
 - f) Forest and wildlife conservation.
 - g) Litter control.
 - h) Forging partnerships with tourists & tourism industry.
 - i) Environmental management.

F. Guidelines for Visitors

Visitors play a very important role in maintaining the sanctity and serenity of any tourist spot, and their behaviour and attitude towards any destination becomes more important when it comes to sustainable maintenance of an Eco tourism area. Below is the list of some defined behavioural guidelines that tourist visiting Bagdara Wildlife Sanctuary are recommended to abide by:

- Observe sanctity of Eco-parks, holy sites / temples and local culture
- Maintain silence, minimize noise pollution, Chat within sound limit without disturbing others
- Dispose waste responsibly. All non-degradable waste such as bottles, tins, and plastic bags shall be carried back by tourists and disposed of only at designated municipal collection points. Non-compliance may be addressed through a ‘Pay-as-you-throw’ penalty mechanism.
- Defecate only in designated places
- Follow check out timings
- Move in battery operated' vehicles only
- Polythene bags are banned in the area; please use alternatives
- Respect local traditions
- Follow instructions of the: authority! staff present in the facility
- Treat the Protected Area with respect, try & take pictures without disturbing wildlife.
- Keep a reasonable distance from wild animals, and do not provoke them
- When in a vehicle, remember wild animals have right of way and keep to the speed limit, don't use horn, and do not startle animals
- Follow the signage in the area and take safety measures during transit, boating, picnic & stay etc.
- Carrying blare aloud radios, tape recorders and other electronic equipment in resorts, and National Park is strictly prohibited.
- Don't smoke or leave live cigarette butts or light fire except in designated areas
- Don't take away flora and fauna in the form of cuttings, seeds and roots
- Don't litter in open areas or water bodies even for feeding the fish or aquatic animals.

Zonal Master Plan of Bagdara Eco-Sensitive Zone

- Don't get out of the vehicle to approach wild animals or approach animals closer than 15 m or disturb them while they are resting¹⁰¹.

¹⁰¹ <https://forest.tripura.gov.in/sites/default/files/guidelines%20foe%20eco%20tourism.pdf>

CHAPTER 6 RESEARCH, MONITORING AND TRAINING

6.1. Prioritization of research and monitoring

The objectives of the management related research & monitoring is to reduce progressively the extent of degree of uncertainty on which decisions are based and management strategies are decided. Long term aim of the plan is to achieve better understanding of the ecosystem of the Wildlife Reserve, functional relationships among biotic communities and impact of anthropological pressure on natural systems. This can be achieved through plans, strategic and continuous research, and monitoring activities.

The section envisaged that the scientific staff of the reserves would undertake basic research programmes aimed at evaluating systematic factors and influences, for devising pragmatic management practices to cover specific populations and the entire ecosystems. Research constitutes a very important aspect of effective management of wildlife protected areas. Research based wildlife management is crucial for the success of any Reserve. This is a legitimate activity and must be compatible with the objectives of wildlife management in the protected area.

Research along with Monitoring and Evaluation (M&E) is recognized to be a key element in understanding and effectively tracking and documenting the results of development interventions. Weaknesses in M&E are traced back to the design of the M&E system, particularly the absence of clearly identifiable monitorable indicators and a lack of ownership and participation by the stakeholders. M&E systems often reflect shortcomings in the description of project objectives, components and implementation arrangements. Delays in conducting complicated baseline surveys and impact assessment, and in operationalizing the M&E system, are weaknesses often encountered during project implementation.

A monitoring and evaluation (M&E) plan helps to track and assess the results of the interventions throughout the life of a program. It is a living document that should be referred to and updated on a regular basis. While the specifics of each program's M&E plan will look different, they should all follow the same basic structure and include the same key elements.

An M&E plan will include some documents that may have been created during the program planning process, and some that will need to be created new. For example, elements such as the logic model/logical framework, theory of change, and monitoring indicators may have already been developed with input from key stakeholders and/or the program donor. The M&E plan takes those documents and develops a further plan for their implementation.

It is important to develop an M&E plan before beginning any monitoring activities so that there is a clear plan for what questions about the program need to be answered. It will help program staff decide how they are going to collect data to track indicators, how monitoring data will be analyzed, and how the results of data collection will be disseminated both to the donor and internally among staff members for program improvement. M&E data alone is not useful until someone puts it to use! An M&E plan will help make sure data is being used efficiently to make programs as effective as possible and to be able to report on results at the end of the program.

Step 1: Identify Program Goals and Objectives

The first step to creating an M&E plan is to identify the program goals and objectives. Defining program goals starts with answering three questions:

- What problem is the program trying to solve?
- What steps are being taken to solve that problem?
- How will program staff know when the program has been successful in solving the problem?

Answering these questions will help identify what the program is expected to do, and how staff will know whether or not it worked. For example, we may consider improvement in milk productivity in our project area:

Problem	Lack of technology at collection centers leading to wastage and souring of milk produce
Solution	Introduction of Automatic Milk Collection Units
Success	Reduced wastage and better returns for milkmen leading to increase in revenue

It is also necessary to develop intermediate outputs and objectives for the program to help track successful steps on the way to the overall program goal.

Step 2: Define Indicators

Once the program’s goals and objectives are defined, it is time to define indicators for tracking progress towards achieving those goals. Program indicators should be a mix of those that measure process, or what is being done in the program, and those that measure outcomes.

Process indicators track the progress of the program. They help to answer the question, “Are activities being implemented as planned?” Some examples of process indicators are:

- Number of trainings held with Milk collection cooperatives
- Number of outreach activities conducted for technology demonstration at village level
- Number of Automatic Milk Collection units installed
- Percent of village level cooperatives introduced to modern technology of milk collection

Outcome indicators track how successful program activities have been at achieving program objectives. They help to answer the question, “Have program activities made a difference?” Some examples of outcome indicators are:

- Percent increase in the total milk collection at individual collection centers
- Percent increase in business after introduction of technology
- Increase in the number of farmers switching to dairy business as a result of the benefits of the intervention.

Step 3: Define Data Collection Methods and Timeline

After creating monitoring indicators, it is time to decide on methods for gathering data and how often various data will be recorded to track indicators. This should be a conversation between program staff, stakeholders, and donors. These methods will have important implications for what data collection methods will be used and how the results will be reported.

The source of monitoring data depends largely on what each indicator is trying to measure. The program will likely need multiple data sources to answer all of the programming questions.

Once it is determined how data will be collected, it is also necessary to decide how often it will be collected. This will be affected by donor requirements, available resources, and the timeline of the intervention. Some data will be continuously gathered by the program (such as the number of trainings), but these will be recorded every six months or once a year, depending on the M&E plan.

Step 4: Identify M&E Roles and Responsibilities

The next element of the M&E plan is a section on roles and responsibilities. It is important to decide from the early planning stages who is responsible for collecting the data for each indicator.

This will probably be a mix of M&E staff, research staff, and program staff. Everyone will need to work together to get data collected accurately and in a timely fashion.

Data management roles should be decided with input from all team members so everyone is on the same page and knows which indicators they are assigned. This way when it is time for reporting there are no surprises.

An easy way to put this into the M&E plan is to expand the indicators table with additional columns for who is responsible for each indicator.

Step 5: Create an Analysis Plan and Reporting Templates

Once all of the data have been collected, someone will need to compile and analyze it to fill in a results table for internal review and external reporting. The M&E plan should include a section with details about what data will be analyzed and how the results will be presented. Another good thing to include in the plan is a blank table for indicator reporting. These tables should outline the indicators, data, and time period of reporting. They can also include things like the indicator target, and how far the program has progressed towards that target.

Step 6: Plan for Dissemination and Donor Reporting

The M&E plan should include plans for internal dissemination among the program team, as well as wider dissemination among stakeholders.

Dissemination of printed or digital materials might occur at more frequent intervals. These options should be discussed with stakeholders and the team to determine reasonable expectations for data review and to develop plans for dissemination early in the program. If these plans are in place from the beginning and become routine for the project, meetings and other kinds of periodic review have a much better chance of being productive ones that everyone looks forward to.

Sample Monitoring Format:

1. Process Monitoring

Activity	Indicator	Current Value	Target Value	% target achieved	Responsible Official
Tourist Guide Competence	No. of Trainings / year	2	4	50%	DFO
Sanitation Coverage	No. of Functioning Community Toilets	4	12	33.3%	BDO
Maternal Health	Institutional Deliveries	80	100	Depends on the previous year's count	CMO

2. Outcome Monitoring

Activity	Indicator	Current status	Target Status	% Target Achieved	Data Source/ Official Responsible
Tourist Guide Competence	Tourist Satisfaction Level	65%	>90%	Depends on the previous year's count	Survey forms at hotels/DFO
Maternal Health	Maternal Mortality Ratio (MMR)	200	<100	Depends on the previous year's count	Health Dept Records/CMO

Sample Indicators which may be used:

1. Ecological Criteria and Indicators:

Criteria	Indicators
Improvement of forests and vegetative diversity	Forests Regenerating properly Species succession towards Climax Stage Increased growth of grass New and degraded forest lands brought under forest cover Kinds of floral species now grown Tree growth abundant and quality of forest improved Forest is well retained
Conservation of wildlife	Increase in wildlife Diversity of fauna
Maintenance of eco-system services	Soil erosion reduced/stopped Increased level of groundwater Availability of food to fauna Availability of clean air
Improvement of agro ecology	Undertake watershed development Increased interest in agriculture due to favourable conditions

2. Economic Criteria and Indicators

Criteria	Indicators
Improvement in the economic conditions of the village	Individual families are earning more income from SHG activities Economic development through savings in community fund Individual families meeting their own needs Additional sources of income are available to the villagers Types of micro enterprises started Increased food staff Dependence on forest reduced Breaking away from money lenders Decrease in local migration to urban areas
Management of Forest Protection Committee (FPC) fund and village assets	Profits from forest go to FPCs Do Shramdan (voluntary labour) & contribute to village common fund Building a common fund Maintenance of money in bank account Full rights of collection and marketing of NTFP Village assets improved.
Continuous availability of forest produce	Increase of availability of NTFP for sale Increase of availability of fodder, fuel wood, bamboo and other species for agricultural implements and poles for use by families of the village Sustainable gains from forests
Increased employment opportunities	FPC provides employment Forest development provides employment Increased self-employment opportunities

3. Institutional Criteria and Indicators:

Criteria	Indicator
Collective decision making and active participation of members	Everybody is equally responsible Villagers serve the FPC on their own initiative Collective and careful decision-making process
Gender equality	Female involvement should be more

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Criteria	Indicator
	<ul style="list-style-type: none"> • Unity among female members • Good cooperation between male and female members • Active participation of females in FPC • Unity
Unity and conflict management	<ul style="list-style-type: none"> • Opponents coming to FPC • Sharing of opinions on forest issues • Clear set of rules • FPC settles local disputes and problems • Reduction of inter village conflicts • Number of disputes of FPC • FPC works well with other village institutions
Equitable sharing of forest produce	<ul style="list-style-type: none"> • Clear demarcation of land for each village • Complete rights of owner ships over NTFP and other forest materials that are needed by the villagers • Awareness for development and other protective mechanisms • Systems of equitable distribution of benefits accruing from various sources.
Recognition by Government	<ul style="list-style-type: none"> • FPC should have a legal status • Govt should help in financial and policy matters • FD and local community mutually decide the terms and conditions of punishment

4. Social Criteria and Indicators:

Criteria	Indicators
Social justice to weaker sections	<ul style="list-style-type: none"> Interest of weaker sections is looked after Access to education for children of weaker families Decrease in exploitation by powerful people in the village
Feeling of community ownership and responsibility	<ul style="list-style-type: none"> Focus changed from selfish motives to community leadership Sense of commitment and discipline developed Village community is shouldering the major task of carrying fpc activities Dependence on forests for livelihood
Unity and co-operation among FPC families	<ul style="list-style-type: none"> Motivation for protection due to benefit sharing Decrease in internal village conflicts FPC assists individual families in trouble Families act in cooperation
Villagers protecting the forests	<ul style="list-style-type: none"> Stopping of unauthorized felling of trees Preventing and fighting forest fires Control of illicit felling
Villagers protecting the forests	<ul style="list-style-type: none"> Haphazard lopping is reduced Fuel wood extraction systematically Using other alternatives for fuel wood Practice of rotational grazing
Village problem solving and development	<ul style="list-style-type: none"> Eradication of any social evil Village cleanliness and improved health Resources are available for public functions Community development by operating the community fund in a cooperative way Overall village development undertaken through FPC Peaceful environment in the village

6.2. Development of human resource for implementation of plan

The development of human resources in the following sectors is important for implementation of the plan:

- Forest and Wildlife Protection
- Wildlife Habitat Elements, Wildlife Behaviour and Wildlife Observations
- Ecotourism Management
- Resort or hotel management
- Training for guides
- Driving Skills for safari drivers
- Individual Skills Promotion- Singing, Instrumental Music, Comedy Skills, acting, anchoring of programs and Oratory skills
- Communication Skills
- Personality Development Training and Meditation and Yoga
- Public Relations, Hospitality and Etiquette
- Ayurveda (to understand the medical herbs in the forest)

6.3. Skill development and on the job training

Skill development has been considered one of the critical aspects for job creation. Currently many youths are not having any jobs and some of them have lost their jobs after the COVID pandemic and returned back their villages. This has increased the number of unemployed people in the area.

With the new plans and project coming up, it can be an opportunity for the youths to upgrade their skills in training center. It will open lot of new avenues for employment in their home towns and they might not have to migrate to other cities.

One of the training center is situated in Tala named as 'Biodiversity Training Centre (BTC)'. BTC is meant for imparting 6 months training on Wildlife & Biodiversity Conservation to forest employees by conducting short-term courses. The staff of Bagdara WLS involved in protection and development of wildlife is proposed to get the training and refreshers course conducted in BTC.

The following Modules meant for Game Guard Training exist in BTC:

- Wildlife habitat-management and monitoring.
- Wetland management.
- Grassland Management
- Detection and investigation of wildlife offences.
- Fire arms, first aid and wireless.
- Fire Protection.
- Boundaries and Patrolling.
- Protection Infrastructure and machans.
- Human-wildlife conflict management.
- Animal end stress and problem animal (Rescue).
- Wildlife health management.
- Eco-development.
- Tourism/Interpretation.
- Accounts and service matter.

In addition to the above, BTC should add few more courses mentioned in section 6.2 such as the resort management/tourism facility management to impart training to local villagers in skill development and then employ 75% of skilled workers from the same village or neighbouring village.

6.4. Establishing a learning centre

The entire idea behind eco-tourism is enjoyment of nature coupled with learning and education. This helps visitors not only understand and assimilate what they see and experience but also builds a strong lobby for the cause of conservation.

In order to meet this objective, a well-conceived plan for interpretation center is proposed (refer section 3.16.1. This plan will include several features and activities viz information materials, interpretation centre, guided tours, self-guided trails, slide/ film shows, expert talks and other such activities.

6.5. Capacity building and convergence

It is essential to train the tourist guides and staff (forester, forest guard, driver and other stakeholders) who are associated with the tourism activity in the reserve on wildlife and forest and the rules and regulations of the reserve.

Such training is proposed to be conducted for the tourist guides and other forest staff at least twice in a year in the reserve.

The entire success or failure of an ecotourism venture as well as the conservation of natural resource is dependent on the skills, knowledge, dedication and practices of field guides and staff. Training in eco-tourism must impart a combination of knowledge, attitude and skills. The whole gamut of training activity is covered as under:

- a) Content: Knowledge, Attitude, Skills.
- b) for whom: Staff and Potential Local guides.
- c) Location of training: Tourism institute. Forest training school
- d) Mode of training: Classroom session. Exposure visits.
- e) Time schedule- October on onwards.
- f) by whom? Master Trainers

Table 5: Summary of Pilot interventions and projects

Sr.No.	Project name	Project brief	Priority	One time/ Continuous	Lead department
1	Bagdara Interpretation center at Baghor entry gate	<p>1. Tourist interpretation center</p> <ul style="list-style-type: none"> • Construction of tourist interpretation center in local vernacular architecture • Accommodation and travel • Orientation center • Documentary on Bagdara • Sensitization to tourists. <p>2. Construction of a watch tower from where the activity around the gate can be observed.</p> <p>3. Nature walks/trails: Nature walks can be arranged near the gate with dense vegetation.</p> <p>4. Greening and beautification of the approach road: The road leading to the gate of the forest entry should be beautified with sideways plantation with signages.</p> <p>5. Village tourism in Baghor</p>	Medium	One-time	MPTB and Forest department
2	Upgradation of village and development of rural tourism	<p>As this area and village has a lot of history, it is necessary to develop the village with basic infrastructure and amenities to attract tourists.</p> <p>Accessibility: Connectivity of the village with Singrauli district and nearby major centers.</p> <p>Accommodation and food: Develop homestays with minimum infrastructure. The tourists can live in the village, learn the culture and taste the local cuisine.</p> <p>Organic agriculture: Organic farming to be promoted and its produce shall be sent to nearby hotels/guest house.</p> <p>Livestock management</p> <p>Reviving village pond: Construction of a small pond like structure to be created for rainwater harvesting.</p> <p>Training – For the women, the training for making ‘Ranimachi’ painting should be taught which can also be a tourism product. For men, the training to tourist guide should be organized.</p>	Medium	One-time	MPTB and Rural Engineering services (RES)
3	Pilot intervention of Organic Farming	<p>Promotion of organic farming with the following activities:</p> <p>Mulching, Intercropping, Bio Composting, Green manuring etc.</p> <p>Organic pest management</p> <p>Appropriate seeds and planting material</p> <p>Planting of leguminous trees</p>	Medium	Continuous	Agriculture department

Sr.No.	Project name	Project brief	Priority	One time/ Continuous	Lead department
		Growing farm-own animal feeds Terraces and soil bunds			
4	Bee culture	Beekeeping Knowledge Flora for Honey Bee Farm: The place of rearing must also have a clean drinking water source. The most important requirement is that there must be plenty of forage or plants that yield nectar and pollen for the bees near the hives. Place for Honey Bee Farm must be dry and protected from harsh sunlight. Methods of Beekeeping by using clay pots, Modern hives etc.	Medium	Continuous	Agriculture and Horticulture department
5	Livestock Improvement practices	Promotion of livestock rearing and management practices (cow, buffalo, goat, hen) as subsidiary source of income and to also reduce the number of cattle deaths in villages identified for organic farming (AG/P1). The following are the main components: Livestock diversity improvement plan Livestock disease control Fodder security Support for small farmers Identification of all community grazers and issuing them ID cards. Management of existing cattle and provision of Gaushala for stray cattle and promotion of only high milk yielding breeds who are not left to stray. Long term delineation of community resources through management micro plans steered by individual EDCs . Introduction of double fencing where ever human animal conflicts are exceedingly high (around community resources, prime farm lands).	Medium	Continuous	Animal Husbandry department
6	Fish farming near perennial water bodies	Fish farming or pisciculture involves raising fish commercially in tanks or enclosures such as fish ponds , usually for food which also provided an alternative source of livelihood to villagers. This activity can be performed by creating a check dam at the mouth of water body joining the river to store the water . This is followed by putting fish eggs with food and later capturing them and selling in the village itself or in nearby areas. The project can be executed in any village near to a water source for easy retention of water. Convergence under MNREGA scheme must be explored.	Medium	Continuous	Fisheries department

Sr.No.	Project name	Project brief	Priority	One time/ Continuous	Lead department
7	Protection of forest and wildlife through community-based Interventions	Protection of forest and wildlife through community-based Interventions with the help of Good network of Forest Protection Committee, (for densely forested areas), Village Forest Committees (open forest areas), Eco-development committee	High	Continuous	Forest department
8	Fire control and prevention measures	The following are the main components: Fire Protection Measures: Preventive measures with vigilance & watch and ward of the area. Preventive Measures: Cutting and controlled burning of fire lines, strips adjoining roads, pagdandis, around villages boundaries, RF-PF lines etc. Controlling Measures: In any case of fire, message is communicated to the nearby Fire Fighting Squads and JFMCs. Reporting	Medium	Continuous	Forest department
9	Protection of wildlife and its habitat	Involves Intensive Patrolling of Beats, Night patrolling, Iron trap surveillance, Intelligence Gathering etc.).	High	Continuous	Forest department
10	Agroforestry	Agroforestry caters to the following: 1. Agro-forestry as a bio fencing role. 2. Agro Forestry for enhancement of community resources . 3. Agroforestry for restoration of degraded areas . 4. Agroforestry for checking climate change impacts . The project to be carried out in following phases: Phase 1: Agricultural fields as well as barren and waste lands that are near core . Phase 2: Fields under eco sensitive areas of conservation zones can be considered	Medium	Continuous	Forest department and agricultural department
11	Landscape Restoration of degraded areas	The project involves restoration of degraded land in Bagdara ESZ The area can be restored with plantation of local species, bamboo clumps, medicinal plants or any other revenue generating species will could also provide livelihood opportunities to nearby villages.	Medium	Continuous	Forest department, agricultural department and horticultural department

Sr.No.	Project name	Project brief	Priority	One time/ Continuous	Lead department
		This project can be implemented in coordination with forest department, agricultural department and horticultural department by taking advantage of the NREGA scheme .			
12	Rainwater Harvesting	<p>The following methods will be adopted:</p> <p>Irrigation Tanks/Jal Kunds: Ancient and rich tradition of harnessing local rainfall and stream flow for agriculture.</p> <p>Networking of Farm Ponds: A series of ponds, constructed along contour lines and connected to one another like a cascade, allow easy access to water and a better soil moisture regime.</p> <p>Roof Top Rainwater Harvesting System</p> <p>Utilizing the Concept of “Paani Panchayats”: Women groups/ or volunteer groups can be encouraged and incentivized to join hands to form paani- panchayat. The focus of these paani panchayats can be to create more water resources, revive old ones and conserve natural water bodies with the help of local traditional practices of water harvesting and management.</p>	Medium	Continuous	Water resources department
13	Green Infrastructure	<p>The components involved in Green Infrastructure are as follows:</p> <p>Preserve and restore open space, natural beauty, and critical environmental areas</p> <p>Create parks, community gardens etc.</p> <p>Development of nurseries for provision of seeds and sampling for plantation</p> <p>Bio diversity register under bio diversity act.</p> <p>Direct development toward existing communities</p> <p>Create compact, mixed-use development</p> <p>Promote green building practices</p> <p>Build neighborhood streets, bicycle tracks and trails that encourage walking and biking</p> <p>Cultivate communities with a strong sense of place</p> <p>Encourage community and stakeholder collaboration in development decisions</p>	Low	One-time	Municipal council and RES
14	Installation of display boards, dustbins etc. at main locations	<p>This project involves provision of infrastructure at the following locations in Bagdara ESZ:</p> <p>Entry gates to core and buffer</p> <p>Forest rest houses</p> <p>Institutional buildings</p>	Medium	One-time	Forest Department

Sr.No.	Project name	Project brief	Priority	One time/ Continuous	Lead department
		<p>Markets or weekly hatts Fair and festival grounds Interpretation center The following infrastructure to be provided:</p> <p>Display board generating awareness regarding noise and air pollution or the importance of forest or wildlife (can be digital at some places) 3 dustbins for biodegradable, non-biodegradable and E-waste with color codes and a board explaining each of them Deposit counter especially for plastic related items mostly at entrance gates where visitors deposit the plastic items and make inventory of other items which they are carrying with them in order to make these areas as 'PLASTIC FREE ZONES'</p>			
15	Building construction & approval system	<p>A building construction and management authority to be setup under the proposed management framework for granting building permission rights to all construction activities in the ESZ. No building should be legalized without the building permission. The resettlement and rehabilitation of villagers located within the forested areas will be the key task and responsibility of this authority.</p>	Low	One-time	Building Construction & Management Authority (proposed)

6.6. Infrastructure, Staff and Amenities

State-level Institutional Structure

A. State Project Management Unit (SPMU)

For effective implementation of the ZMP, there is great need of inter-sectoral coordination and integration, sustainable financing and policy support from the highest levels of Government. To make it happen a formal institutional mechanism is needed. Institution of the Monitoring Committee can ensure interdepartmental coordination and convergence at the district level as Divisional Commissioner and District Collectors are a part of the committee, but it will not be able to ensure the most vital requirement of inter-sectoral coordination and integration, sustainable financing, policy support that can happen only at the state level.

With this objective, a State Project Management Unit (SPMU) at state level is suggested as an institution to ensure inter-sectoral coordination and integration, sustainable financing, and policy support. The SPMU will be a Special Purpose Vehicle (SPV) for this purpose. SPMUs shall be a registered society to ensure quick decision making, flexibility, and to ensure efficient fund flow. The role of the SPMUs would be to serve as the apex state level organization to manage the zonal development at the state level. It would be governed by a Steering Committee with the Chief Secretary as the Chairperson. This institutional mechanism is essential to achieve inter-departmental/agency/sectoral coordination and sustainable financing at state level.

The SPMU will also ensure for monitoring, learning and evaluation (ML&E) to measure the progress of the project implementation by the EPMUs of the state. ML&E can facilitate organization learning by providing continuous feedback in the management process of monitoring and evaluating progress toward a given goal.¹⁰² The ML&E will ensure smooth running of the pilots through continuous learning and timely mid-course corrections during project implementation.

The SPMU would facilitate a result and outcome-based management and facilitate learning and process enhancement through participatory methods as well as through independent technical, financial and social audits, and beneficiary satisfaction survey.

B. Steering Committee

Steering Committee will be the apex body to oversee the progress of the implementation of the ESZMs as well as to provide directions and most importantly ensure the inter-sectoral coordination and sustainable financing essential for the successful implementation of the project. The Steering Committee may be convened every six months to review the progress and short out the issues if any regarding inter-sectoral coordination, approve the annual action plan and the budget. SC will take all important decisions regarding continued financing, interdepartmental coordination, and policy support.

¹⁰² Kusek, J. Z., & Rist, R. C. (2007). *Ten steps to a results-based monitoring and evaluation system: a handbook for development practitioners*. Washington, DC: World Bank.

CHAPTER 7 THE BUDGET

7.1. The plan budget

The estimated budget for the implementation of the proposals as mentioned in the plan for the duration of the planning period will be around INR 2 Cr.

The major component of the budget provisions will be capacity building, livelihood development, infrastructure augmentation and environmental management. The expenditure is likely for improving the community resilience and environmental conservation status of the Protected area.

The details of the estimated individual components for expenditure are stated as follows with description and priority areas:

Sr.No.	Components	Quantity	Units	Total (in lacs)
1	Plantation around streams and water bodies	Total number of trees=Area/density	Nos.	31.65
2	Bagdara Interpretation center at Baghor entry gate	250	Sq.m.	10.09
3	Preserve and restore open space, natural beauty, and critical environmental and watershed conservation.	50	Acres	59.83
4	Engagement of community school kids in EDC and park protection activities	500	Nos.	15
5	Fire protection measures and fire watch towers at strategic locations	5	Nos.	15
6	Upgradation of village and development of rural tourism	1	Nos.	20
7	Restoration of forest guesthouses and other buildings for tourism purposes	1000	Area in sq.ft	20
8	Installation of display boards, dustbins etc. at main locations	40	Nos.	1.04
9	Bee culture Development	1	No. of clusters	20
10	Microplanning for Community resource management	1	No. of clusters	10
Total (in Lacs)				202.6
Total (in Crores)				2.0

7.2. Source of funding

The convergence of funds will be the key requirement of the management and project implementation of the ESZ as this is a special area requiring simultaneous focus of many departments.

NRLM & MANREGA: The livelihood activities including some of the pilot projects for development tourism products, plantation, fisheries etc. can be taken up under the programs of NRLM and MANREGA. The fund managers have to be sensitized by the agencies to take up specific projects which are linked to conservation, development or livelihoods.

Pradhan Mantri Matsya Sampada Yojana (PMMSY) of the Government of India, will be key source of funding for the project development, establishment of facilities and operation for fisheries development.

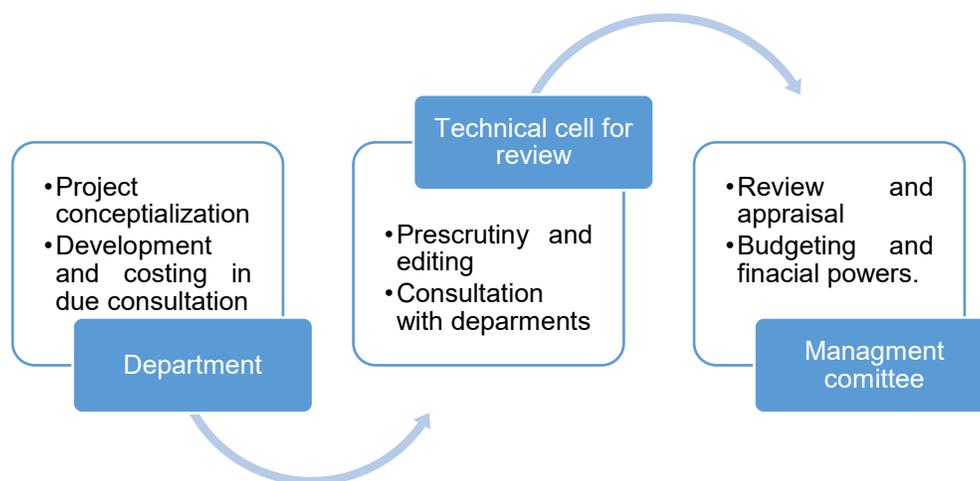
The second source of funding can be through the **National Fisheries Development Board (NFDB)** assistance for the farmers, Honorarium to resource persons, Assistance to implementing agencies the assigned department will be responsible for selection of beneficiaries and co-ordination with NFDB for receiving funds. Apart from the above **Various wildlife conservation programs**: Various wildlife Action plans for tiger, elephant and other wildlife conservation projects are available which can be cross lined with the proposals of the ESZ Master Plan.

For Area restoration and plantation **State Action Plan for Climate Change (SAPCC) and fund** can be updated as any plantation will help in carbon sequestration. The project formulation, appraisal, sanction, disbursement of fund, monitoring & evaluation and capacity building of can be taken up by the Nodal agencies including forest and environment department.

For Livestock and related conservation and management activities RKVY (Rashtriya Krishi Vikas Yojana) and Various other livestock and agriculture development schemes) can be utilized for the management of the special areas under the P.A. it is noted that already such initiatives have been taken up for the project areas.

7.3. Drawing and Distribution mechanism

The drawing and distribution of funds will be in conformity with the proposed institutional framework of implementation under the purview of the management committee.



The project development and detailed cost estimates will be the responsibilities of various department in consultation with the technical cell for implementation. The same will be placed for decision of the management committee in presence of the finance representative. Once the disbursement is approved the same can be implemented through due procurement process.

CHAPTER 8 Regulations in the ESZ

Protected areas have been identified through the Wildlife protection act, 1972. The purpose of declaring ESZs is to create some kind of “shock absorbers” to the protected areas by regulating and managing the activities around them. Guidelines for declaring Eco-sensitive Zones (ESZs) were notified by MoEF&CC under Environment Protection Act, 1986 with an aim to regulate certain activities around National Parks and Wildlife Sanctuaries so as to minimize the negative impacts of such activities on the fragile ecosystem encompassing the protected areas.

The MoEF&CC through a Gazette notification notified ESZ for Bagdara Wildlife Sanctuary. The Sanctuary is located in the 'Kaimur hills' in the Singrauli district of Madhya Pradesh and encompasses an area of 478 square kilometres with protected forest area of 213.047 sq. km. and rest 246.953 sq. km. is the revenue area¹⁰³.

As per the recommendations of the ESZ Notification and consecutive Departmental Meetings, the ZMP comprise of following key sections:

- A. Spatial Conservation and Management zones (Recommended) (Refer to Chapter 2)
- B. Non-spatial (Restricted, Regulated and Permitted Activities)
- C. Management Guidelines (Refer to Chapter 5, Section 5.3)
- D. Pilot projects and interventions (Refer to Chapter 3)
- E. Regulatory Zones

This chapter further elaborates on section E. Regulatory Zones.

8.1 Issuance of Permission in ESZ Area

For the purpose of issuance of permission in the ESZ area following process should be considered.

1. The eco-sensitive zone (ESZ) Zonal Master Plans do not define any land use or land cover in the ESZ Master Plan. (Refer Chapter 2 of this volume for suggestive land use zoning)
2. The permission will be issued as per provisions laid down in the ESZ Notification, only for the activities which are not Prohibited. (Refer sections 2.6 & 2.7 of this volume)
3. The Permission for Regulated and Promoted activities has to be provide by Regulatory Authorities after recommendation of Monitoring Committee as per the provisions laid down in this ESZ Master Plan. (Refer sections 8.3 of this volume)
4. For Activities which are not mentioned in the ESZ Notification or in this ESZ Master Plan, the permission will be provided by Regulatory Authority after recommendation by the Monitoring Committee. (Refer sections 8.3 of this volume)
5. As per provision of this ESZ Master Plan, the Regulated and Promoted activities, are Spatially Permitted in the Sensitive Zone defined in Chapter 2.
6. The per Permission within the Sensitive Zone are to be provided on the basis of:
 - a. Activity Classification for ESZ in Chapter 2.
 - b. Sensitive Zones of ESZ. Refer Map no. 23.
7. For area outside Sensitive Zone, Suggestive Zones has been identified in Chapter 2 of this ESZ Master Plan, the Permission shall be allowed by Regulatory Authorities after recommendation of Monitoring Committee. Due consideration shall be given to the Theme Plans (Chapter 3) and Management Guidelines (Chapter 5) of this ESZ Master Plan before permission from concerned department.

¹⁰³ Management Plan of Bagdara Wildlife Sanctuary, 2017

8. For details of building regulation Bhumi Vikas Rule 2012 or subsequent regulation to be followed.
9. List of Regulatory Authority is mentioned in Section 8.3

Sensitive Zone:

Based on the suggestions received from all the stakeholders and as per the Minutes of the Meeting from 1st, 2nd, 3rd and 4th inter-state departmental meeting dated 10.10.2024, 08.11.2024, 14.05.2025, and 16.09.2025, the Sensitive Zones are defined as follows:

(i) 1 km distance from the Protected Area: As per the Supreme Court Order dated June 2022 and subsequent modification in April 2023, this is a protective ring extending 1 kilometer from the core Tiger Reserve or the Eco-Sensitive Zone (ESZ) boundary, whichever is closer. Its primary purpose is to minimize immediate human impact, hence the restriction on new construction. In the case of Bagdara ESZ, the whole ESZ falls within the 1 kilometre buffer from the protected area.

(ii) Steep Hill Slopes ($\geq 20^\circ$): These zones encompass areas with significant inclines, vulnerable to erosion and landslides. They require special protection to maintain soil stability and prevent environmental degradation. In these zones, only Local people shall be permitted to undertake construction on their land for their residential use, widening and strengthening of existing roads and construction of new roads and Construction and renovation of infrastructure and civic amenities. (Refer to section 2.1.1.7-Slope)

(iii) Water Body Conservation Areas (Green Buffer): These areas surround water bodies (lakes, rivers, etc.) and are critical for maintaining aquatic ecosystems and water quality. They aim to prevent pollution and protect riparian habitats. (Refer to section 2.1.1.2-Surface Water)

The green buffers or recreational zones are proposed to large water Bodies/wetlands, major streams and water flow channels and no building activity should be proposed in the buffer area. The following are the buffer proposed ¹⁰⁴:

- 50 m from the river edge for large rivers.
- 50 m from the boundary of lakes of area 4 acre and above,
- 15 m from the boundary of lakes of area less than 4 acre / ponds/tank bed lands,
- 15 m from the boundaries of major canal, stream, nallahs and storm-water drains

(iv) Denuded Areas: These are regions where vegetation cover has been significantly depleted, leading to soil erosion and reduced biodiversity. Restoration and reforestation efforts are prioritized in these zones.

(v) Locations of Religious Importance: These are areas that hold cultural and religious significance. They are required to be handled with care, balancing the religious needs, and the environmental needs.

(vi) Silent Zone: The silent zone should be clearly defined and should be enforced within 1 km of the PA (Protected Area) boundary, where the permissible noise level should be 50 dB(A) in day-time and 40 dB(A) in night-time. For the entire ESZ beyond one km from PA, the permissible noise level should be limit of 65 dB(A) in day-time and 55 dB(A) in night-time as per the Noise Pollution (Regulation and Control) Rules, 2000. Noise pollution should be prevented and controlled in accordance with the Gazette notification.

(vii) Tiger Corridors: As per the National Tiger Conservation Authority published guidelines for development in the Tiger Corridor. Following regulations are:

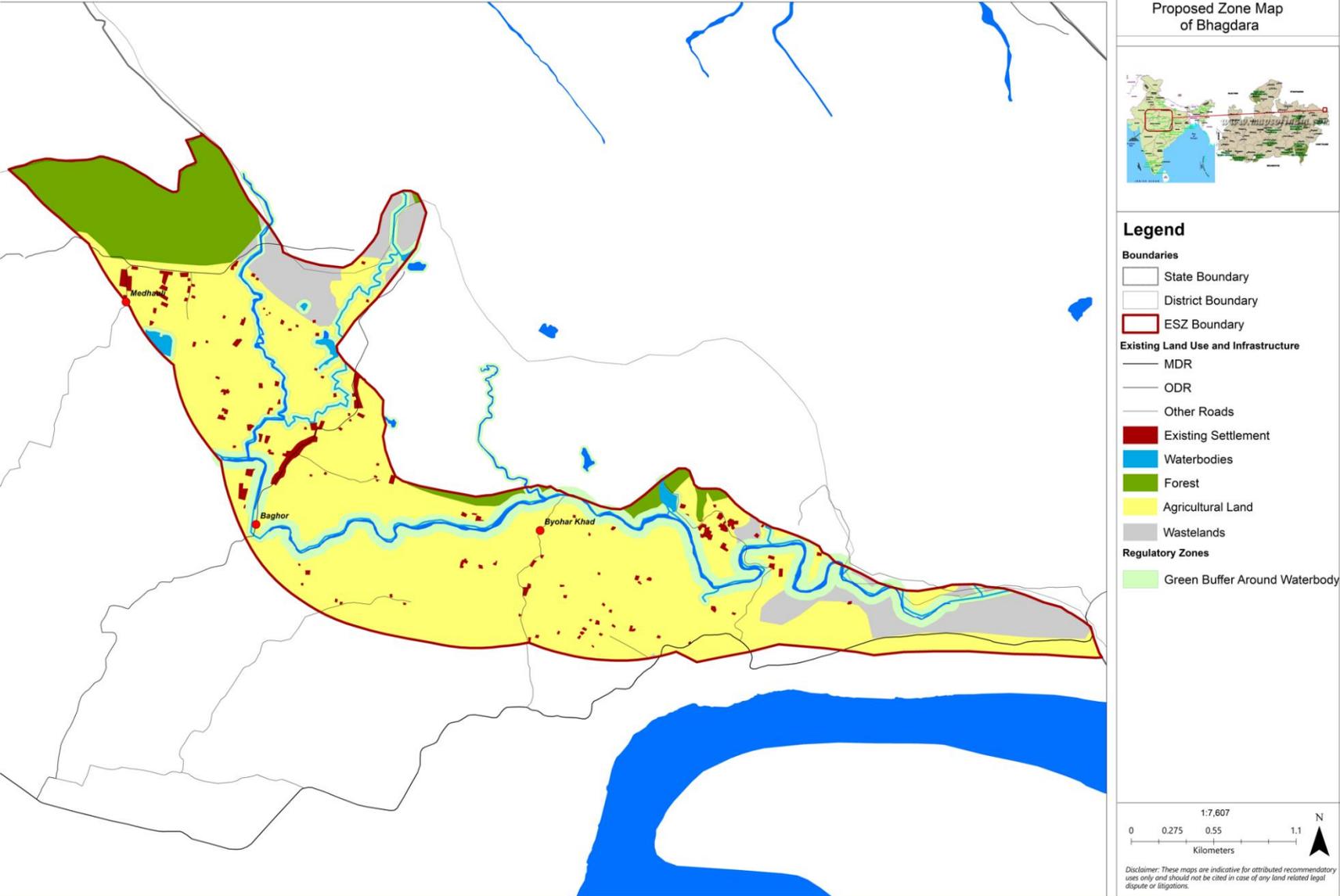
¹⁰⁴ Please refer 'Urban Wetland/Water Bodies Management Guidelines' issues by National Mission for Clean Ganga with School of Architecture and Planning, New Delhi.

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- a. Residential Construction shall be allowed in all abadi land and till 100 meters distance from the Abadi Land.
- b. In non-Abadi land, residential construction is allowed with FAR restriction of 0.1
- c. Widening and strengthening of roads shall be allowed only after obtaining approval from the Forest Department. (Wildlife board)
- d. Construction and renovation of infrastructure and civic amenities are allowed.
- e. No new commercial construction allowed in Tiger corridor area.

In the case of Bagdara ESZ, no tiger corridors are present.

Map 24: Regulated zones for Bagdara ESZ



Zonal Master Plan for Eco-Sensitive Zone of Bagdara Wildlife Sanctuary

8.2 Regulations as per the zones

Table 6: Activity Classification for ESZ of Bagdara WLS

Sr. No	Activities	1 km distance from the Protected Area	Hill slopes $\geq 20^\circ$	Denuded areas	Conservation areas around water bodies (Green buffer)	Locations of Religious importance
Regulated Activities (as per extracts of the ESZ Notification)						
1	Commercial establishment of hotels and resorts.					
	(i) No new commercial hotels and resorts establishments	x	x	✓	x	x
	(ii) Renovation and reconstruction of already existing commercial construction are allowed within the existing built-up area. ¹⁰⁵	✓ ¹⁰⁶	x	✓	x	✓
	(iii) Small temporary structures for eco-tourism activities	✓	x	✓	x	✓
	Provided that, beyond one kilometre from the boundary of the Protected Area or up to the extent of Eco-sensitive Zone, whichever is nearer, all new tourist activities or expansion of existing activities shall be in conformity with the Tourism Master Plan and guidelines as applicable. ¹⁰⁷	NA	x	✓	x	x
2.	Construction activities: (a) No new commercial construction of any kind shall be permitted within one kilometre from the boundary of the Protected Area or up to extent of the Eco-sensitive Zone, whichever is nearer:	x	x	x	x	x
	(b) Provided that, local people shall be permitted to undertake construction in their land for their use including the activities listed in sub- paragraph (1) of paragraph 3 as per building byelaws to meet their residential needs of the local residents such as:					

¹⁰⁵ To prevent development creep, commercial establishments shall be required to declare their existing service capacities at the evaluation stage. The regulatory authority shall ensure that these capacities are maintained during renovation or reconstruction, both at the approval stage and upon post-completion verification.

¹⁰⁶ As per the safeguards mentioned in Section 5.3.2. **If Management committee wants to allow camping in any specific area it has to be identified as camping zone and changes have to be made in the ESZ Zoning Maps accordingly.**

¹⁰⁷ Refer Chapter 5 of Sub-Zonal Tourism Plan for additional details.

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Sr. No	Activities	1 km distance from the Protected Area	Hill slopes $\geq 20^\circ$	Denuded areas	Conservation areas around water bodies (Green buffer)	Locations of Religious importance
	(i) Widening and strengthening of existing roads and construction of new roads;	✓	✓	✓	✗	✓ ¹⁰⁸
	(ii) Construction and renovation of infrastructure and civic amenities;	✓	✓	✓	✗	✓
	(iii) Small scale industries not causing pollution termed as per Classification done by Central Pollution Control Board of February 2016;	•	✗	•	✗	•
	(iv) Cottage industries including village industries; convenience stores and local amenities supporting eco-tourism including home stays ¹⁰⁹ ; and	✓	✓	✓	✗	✓
	(v) Promoted activities listed in this Notification.	✓	✓	✓	✓	✓
	(c) The construction activity related to small scale industries not causing pollution shall be regulated and kept at the minimum, with the prior permission from the competent authority as per applicable rules and regulations, if any.	✓	✓	✓	✗	✓
	(d) Beyond one kilometre it shall be regulated as per the Zonal Master Plan.	Applicable same as 2 (b) and (c)				
3	Small scale non-polluting industries Non-polluting industries as per classification of industries issued by the Central Pollution Control Board in February 2016 and non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous materials from the Eco-sensitive Zone shall be permitted by the competent Authority.	•	✗	•	✗	•
4	Commercial goat and sheep farming Regulated under applicable laws. ¹¹⁰	•	•	•	•	•
5	Felling of trees.	•	•	•	•	•

¹⁰⁸ Only temple related activities permitted.

¹⁰⁹ Refer section 3.18.

¹¹⁰ Subject to the approval of monitoring committee and Management guidelines

Sr. No	Activities	1 km distance from the Protected Area	Hill slopes $\geq 20^\circ$	Denuded areas	Conservation areas around water bodies (Green buffer)	Locations of Religious importance
	(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 Acts and the rules made thereunder.	•	•	•	•	•
6	Collection of Forest Produce or Non-Timber Forest Produce (NTFP). Regulated under applicable laws.	•	•	•	•	•
7	Migratory graziers. Regulated under applicable laws.	•	•	•	•	•
8	Erection of electrical and communication towers and laying of cables and other infrastructures. Regulated under applicable law ¹¹¹ .	•	•	•	•	•
9	Infrastructure including civic amenities. Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines.	✓	✓	✓	✗	✓
10	Widening and strengthening of existing roads and construction of new roads ¹¹² .	✓	✓	✓	✗	✓ ¹¹³
	Undertaking other activities related to tourism like over flying the Eco-sensitive Zone by regulated under applicable law.					
11	a) hot air balloon	✗	✓	✓	✓	✓
	b) helicopter	✗	✓	✓	✓	✓
	c) drones ¹¹⁴	✓	✓	✓	✓	✓
	d) Microlites	✗	✓	✓	✓	✓

¹¹¹ Underground cabling may be promoted as per specific guidelines. Specific linear intrusions to be avoided as per management guidelines.

¹¹² Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines

¹¹³ Only temple related activities permitted.

¹¹⁴ Based on clearances from Forest Department. Can be extensively used for monitoring and policing purposes by law enforcement agencies.

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Sr. No	Activities	1 km distance from the Protected Area	Hill slopes >= 20°	Denuded areas	Conservation areas around water bodies (Green buffer)	Locations of Religious importance
12	Protection of hill slopes and river banks. Regulated under applicable law.	✓	✓	✓	✓	✓
13	Movement of vehicular traffic at night. (Regulated for commercial purpose under applicable laws).	✓	✓	✓	✓	✓
14	On-going agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture. Permitted under applicable laws for use of locals.	✓	✓	✓	✓	✓
15	Discharge of treated wastewater/effluents in natural water bodies or land area.	✓	✓	✓	✓	✓
16	Commercial extraction of surface and ground water. Regulated under applicable law.	•	•	•	•	•
17	Open well; bore well, etc. for agriculture or other usage.	✓	✓	✓	✓	✓
18	Solid waste management/bio-medical waste management.	•	•	•	•	•
19	Introduction of exotic species.	•	•	•	•	•
20	Eco-tourism.	•	•	•	•	•
21	Commercial sign boards and hoardings.	✓	✓	✓	•	✓
Promoted Activities						
1	Rainwater harvesting. Shall be actively promoted.	✓	✓	✓	✓	✓
2	Organic farming. Shall be actively promoted.	✓	✓	✓	✓	✓
3	Adoption of green technology for all activities. Shall be actively promoted.	✓	✓	✓	✓	✓
4	Cottage industries including village artisans, etc. Shall be actively promoted.	✓	✓	✓	✓	✓
5	Use of renewable energy and fuels. Biogas, solar light, etc. to be actively promoted.	✓	✓	✓	✓	✓
6	Agro-forestry. Shall be actively promoted.	✓	✓	✓	✓	✓
7	Use of eco-friendly transport. Shall be actively promoted.	✓	✓	✓	✓	✓
8	Skill development. Shall be actively promoted.	✓	✓	✓	✓	✓

Zonal Master Plan of Bagdara Eco-Sensitive Zone

Sr. No	Activities	1 km distance from the Protected Area	Hill slopes $\geq 20^\circ$	Denuded areas	Conservation areas around water bodies (Green buffer)	Locations of Religious importance
9	Restoration of degraded land/ forests/ habitat. Shall be actively promoted.	✓	✓	✓	✓	✓
10	Environmental awareness. Shall be actively promoted.	✓	✓	✓	✓	✓

**Note: On the basis of the comments received during 1st and 2nd inter-state departmental meeting dated 10.10.2024 and 08.11.2024*

LEGEND

- ✓ Listed activity permitted in the zone defined
- ✗ Listed activity not permitted in the zone defined
- Subject to permission from regulatory authority

8.3 Regulatory Authority

Table 7: Regulatory authorities for Regulated and promoted activities in ESZ

S.N.	Regulated Activities	Regulatory Authority
1	Commercial establishment of hotels and resorts.	Revenue & Forest Dept., Local body
2	Construction activities	Revenue & Forest Dept., Local body
3	Small scale non-polluting industries.	Revenue & Local Body
4	Commercial Goat and sheep farming	Revenue & Local Body
5	Felling of Trees	Revenue & Forest Dept., Local body
6	Goat Farming	Local Body
7	Collection of Forest produce or Non- Timber Forest Produce (NTFP).	Local Body
8	Migratory graziers	Local Body, Forest Department
9	Erection of electrical and communication towers and laying of cables and other infrastructures	Revenue Dept., Local Body, DISCOM
10	Infrastructure including civic amenities	Revenue & Forest Dept., Local body
11	Widening and strengthening of existing roads and construction of new roads.	Revenue & Forest Dept., Local body
12	Under taking other activities related to tourism like over flying the ESZ area by hot air balloon, helicopter, drones, Microlites, etc.	Revenue & Forest Dept., Local body
13	Protection of Hill Slopes and river banks	Local body, Collector
14	Movement of vehicular traffic at night.	Local body, Forest Department
15	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture.	Local body
16	Discharge of treated waste water/effluents in natural water bodies or land area.	Local Body, MPPCB
17	Commercial extraction of surface and ground water	Local Body, WRD, CGWA, Collector
18	Open Well, Bore Well etc. for agriculture or other usage	Local Body, Collector
19	Solid Waste Management/Biomedical Waste Management	Local Body, CMHO, MPPCB, Health Department
20	Introduction of Exotic species.	Local Body, Collector, Forest Department
21	Eco-tourism	Local Body, Tourism Department, Forest Department
22	Noise Pollution	Local Body, MPPCB, District administration.
23	Commercial Sign boards and hoardings.	Local Body, Transport Department, Forest Department
24	Any other activity not listed above	Regulated as per the recommendation of the Monitoring Committee

*Note: On the basis of the comments received during 1st and 2nd inter-state departmental meeting dated 10.10.2024 and 08.11.2024

ANNEXURE 3: STAKEHOLDERS CONSULTATIONS AND OUTPUTS

S.N.	Major common sectoral points discussed during FGD's	
1	Village	Baghor (25.06.2019)
2	Location	The village is located in the center of Bagdara wildlife sanctuary with the total population of 4943 approx.
3	Agriculture	<ul style="list-style-type: none"> • Main crops grown are wheat, rice, maize, till, arhar, Sanai (fruit for fibre manufacturing), soya bean, makka, moong, and other vegetable • There is no issue of water scarcity. The irrigation of the fields is mostly dependent on rains and on ground water which is extracted by hand pumps and bore wells. • The manure is produced by mixing cow dung with biodegradable waste. Villagers also use DNP & fertilizer. • The agricultural produce is destroyed by animals such as Monkeys, Langurs, bear and Wild pigs. The fields are protected by fencing with bamboo or wood. The compensation for the destroyed crops is only provided to the villagers if the forest officer validates that the destruction of crops is more than 70% and the revenue officer (patwari) validates the ownership of the land. • Irrigation is mostly done by rainwater and from river
4	Cattle /Livestock	Mostly cows and goats are reared in the village but there are no grazing fields available. The milk produced from cow is mostly self- consumed. There have been few incidences of cattle killing by the wild animals.
5	Resource management	<ul style="list-style-type: none"> • Forest produce: Another major source of livelihood is by collecting non timber forest products like Mahua seeds, Tendu leaves, Jamun fruit, Amla fruit, Bel fruit etc and is sold to contractors. Firewood (fallen branches, twigs) is also collected in small quantities for cooking. • Rainwater is collected in small irrigation pond, Ban Sagar canal also a major source.
6	Other employment opportunities	<ul style="list-style-type: none"> • The decreasing profits in agriculture along with the lack of other formal livelihood opportunities has made people shift their livelihoods to other employment opportunities such as labours in agriculture (as per the season), construction activities etc. Many villagers have migrated permanently to cities like Jabalpur, Allahabad, Surat, Chennai and Kolkata etc. • Fishing is done by some villagers, and they sell the fishes to contactors. • Villagers also inform that they are not getting benefitted from NREGA scheme. Only registration is done.
7	Cottage industry	All the villagers practice animal husbandry at small scale for the various benefits obtained by cattle like in agriculture, milk, cow dung for manure and are also sold in the market for meat.
8	Community practices	<ul style="list-style-type: none"> • Mostly Hindu community resides in the village with maximum population belonging to Baiga and Gond Adivasi. • The villagers are also involved into construction of their own houses with mud, handmade bricks and tiles, bamboo or wood and cow dung. • They use Kodo paira (thick base) for wall construction for ambient temperature in summers and winters • The community uses forest products especially Mahua in various traditional ways. Apart from selling the collected mahua seeds, the community uses Mahua in various food items, extracts oil from it, feed it to cattle and makes wine from traditional distillation method. • Villagers perform 'Saila karma' folk dance during the harvesting season
9	Physical Infrastructure	<ul style="list-style-type: none"> • Road connectivity - The internal roads are not in proper condition. But some roads are under construction under PMGSY. • Transport facilities available - Public transport connectivity is till Baghir village centre and no connectivity to ESZ area.

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		<ul style="list-style-type: none"> • Water supply - Ground water is extracted from borewells, hand pumps and wells. • Sewage & Sanitation - Under Swacch Bharat Mission (SBM), many toilets have been constructed in villages. But due to lack of proper toilet facility in households such as small size of toilet, lack of water, small size of pit etc, villagers perform open defecation. • Solid waste management - It is monitored by Swachh Bharat Mission- Gramin. But still garbage is thrown on the road or on designated area without segregation. The cow dung is utilized to make manure, but the rest of the plastic waste is burnt. • Power supply - The village have all electrified house but frequent power cuts are the major issue raised by villagers. • Cooking fuel - Most of the houses use LPG for cooking provided under Ujwala scheme. While some villagers also use firewood and cow dung. • Telecommunication - Network services of only BSNL, jio and Airtel are available in the village
10	Social Infrastructure	<ul style="list-style-type: none"> • Educational facilities - One Higher sec. school, one LP school and Two private school are present in a distance of 3.5 to 4 km and there is no schools in available in the EZA area • Healthcare facilities - there is one PHC sub-centre in the Village
11	Forest fire	<ul style="list-style-type: none"> • Villagers throw the bedi or cigarette on ground and the dry vegetation of the fire catches fore immediately. Second reason is burning of small plants for collection of Mahua
12	Tourism	<ul style="list-style-type: none"> • No villager is involved in any occupation related to Tourism.

ANNEXURE 4: FLORA SPECIES IN BAGDARA WILDLIFE SANCTUARY

FLORA	HABITAT CHARACTERISTICS	USES
<p>MARORPHALI</p> 	<p>Found distributed in dry forests throughout Central and Western India, from Bihar as far West as Jammu and Western Peninsula</p>	<p>Has antioxidant, anticancer, anti-diabetic and anti-microbial properties Fibers from the bark are used to make rope They are also visited by many butterflies and Hymenoptera</p>
<p>MANGO</p> 	<p>Predominant in hot tropical or subtropical regions of the world with mild rainfall</p>	<p>Low-calorie fruit that is high in fiber, and is a great source of vitamins A and C Source of antioxidants, containing certain phytochemicals such as <i>Gallo tannins</i> and <i>mangiferin</i></p>
<p>AMALTAS</p> 	<p>Prefer deciduous forests, subtropical and tropical regions Also found in moist forest, woodlands, and mountain habitats</p>	<p>Bark is used in the treatment of inflammatory swellings and as a cleaning agent for ulcers and wounds The fruits are also used as a laxative</p>
<p>AMARBEL</p> 	<p>Found throughout the temperate and tropical regions of the world Greatest species diversity in subtropical and tropical regions The genus becomes rare in cool temperate climates</p>	<p>Enlargement of the spleen, the liver complaints, constipation, flatulence Piles (bleeding, non-bleeding) Excessive abdominal gas Itching Wound Hair fall, Dandruff</p>

FLORA	HABITAT CHARACTERISTICS	USES
<p>KHATUA</p> 	<p>evergreen or deciduous forests, borders of forests, scrubs, foothills and tropical Himalayan forests, Sal and bamboo forests</p>	<p>Folk medicine Leaves are eaten as vegetable, slightly acidic, also leaves can be preserved for later use. Fruits are acidic and edible</p>
<p>AMARA</p> 	<p>Found in primary and mixed forests In more open, secondary formations, in teak-forest, savannahs In dry areas, sometimes on limestone</p>	<p>leaves are used for flavoring Fruit - raw or cooked The fruit is used as an astringent and antiscorbutic The bark is recommended in the treatment of stomach aches and dysentery The root is considered to be useful in regulating menstruation The wood is used for moldings, interior finishing, drawers, pulp, matchboxes, boxes, crates, carvings</p>
<p>AMTA</p> 	<p>Open areas, forest edges Deciduous forests</p>	<p>Flowers are eaten cooked System of Medicines Used in Ayurveda, Siddha</p>
<p>ADHU KAMINI</p> 	<p>Common on hills, especially in shaded ravines above 750-1400m. Indian subcontinent and Malaysia. Found in deciduous and semi-evergreen forests</p>	<p>Wood very hard, used for construction works and agricultural implements. System of Medicines Used in Ayurveda, Siddha, Traditional Chinese medicine</p>

FLORA	HABITAT CHARACTERISTICS	USES
<p>AMLA</p> 	<p>Easily found growing in semi – arid regions and plains of northern India. Uttar Pradesh, Tamil Nadu, Rajasthan and Madhya Pradesh are preferable subtropical area for its cultivation</p>	<p>most important foods in Ayurvedic medicine and is a storehouse of good health</p>
<p>ACHAR</p> 	<p>Moist deciduous, dry deciduous and semi-evergreen forests</p>	<p>Seed - raw or cooked - Eaten as a dessert seed and also used in sweetmeats Oil obtained from seed - Light yellow with a sweet flavor and pleasant aroma, it can be used as a substitute for almond or olive oil The bark is used in tanning The gum from the tree is used against leprosy in traditional medicine The fruits are used in treating coughs and asthma</p>
<p>BABUL</p> 	<p>Found in arable lands and scrub jungles from plains to 300m.</p>	<p>The gum extracted from the pod is used for making inks and dyes. Wood is very hard, durable and preferred for agricultural implements. Cattle feed on the fruits.</p>
<p>BAHERA</p> 	<p>common on plains and lower hills in Southeast Asia</p>	<p>Considered a good fodder for cattle Fruit is used in the popular Indian herbal rasayana treatment triphala</p>

FLORA	HABITAT CHARACTERISTICS	USES
<p>BAOBERANG</p> 	<p>Broad-leaved forests, shrubby areas Semi-evergreen, evergreen and shola forests</p>	<p>Medical uses- Anthelmintic, alterative, astringent, carminative, stimulant and tonic. Used in colic, constipation, flatulence and worms.</p>
<p>BAMBOO</p> 	<p>Deciduous forests, also grown in the plains</p>	<p>The stem is used to make the buttermilk churning stick. Skin of the stem mixed with lime and lichens are used to make a bandage to heal knife and axe cuts.</p>
<p>SAFED SIRIS</p> 	<p>Moist deciduous forests and also in the plains Semi-evergreen forests</p>	<p>System of Medicines Used In- Ayurveda, Folk medicine, Siddha</p>
<p>BANSULI</p> 	<p>Western Ghats, Moist Deciduous Forests Open forest areas</p>	<p>Bark is used in fiber industry.</p>
<p>BARGAD</p>	<p>It is grown throughout the sub- Himalayan region and in the deciduous forests.</p>	<p>The Banyan tree is still used as a source of shade in many villages. Each and every part of this tree has its own unique medical uses. The bark and seeds can be used as a tonic to maintain body temperature and treat diabetes. The roots can be used to strengthen your teeth and gums by brushing with them.</p>

FLORA	HABITAT CHARACTERISTICS	USES
		
<p>BAHVA-DANDA</p> 	<p>Mixed forest Along banks of streams and backwaters</p>	<p>System of Medicines Used In - Ayurveda, Siddha, Traditional Chinese medicine</p>
<p>BAEL</p> 	<p>Plain areas, forests, near roadsides Grown in temple premises and homesteads</p>	<p>Medicinal: Leaf, Fruit, Seed, Root Pest Management</p>
<p>BER</p> 	<p>grows in cooler regions of Asia</p>	<p>anti-fungal, anti-bacterial, anti-ulcer, anti-inflammatory purposes and sedation, antispastic, antifertility/contraception, hypotensive and antinephritic, cardiogenic, antioxidant, immunostimulant, and wound healing properties</p>
<p>BILWA</p>	<p>Degraded semi-evergreen forests Moist deciduous and semi-evergreen forests</p>	<p>System of Medicines Used In - Ayurveda, Folk medicine, Homoeopathy, Sowa-Rigpa, Unani, Siddha</p>

FLORA	HABITAT CHARACTERISTICS	USES
		
<p>NEEL</p> 	<p>Waste field, roadsides, margin of cultivable fields Degraded forest areas and scrub jungles, also in the plains</p>	<p>A deep blue dye is obtained from the leaves The deep blue dye obtained from the leaves is sometimes used to counteract the slightly yellow color of icing sugar A tincture of the seed is used in India to kill lice The dried, crushed leaves are used as an ingredient in commercial cosmetic preparations as a masking agent and tonic</p>
<p>TAROTA</p> 	<p>Common in plains from the coast in low lying places, river banks, fallow fields, wastelands.</p>	<p>Young leaves are used as vegetables by Bodos, favorable with pork / fish or as mixed vegetable. The leaves, seeds and roots are considered to having medicinal properties for skin diseases</p>
<p>BIRHA</p> 	<p>Very common in lower dry deciduous slopes.</p>	<p>The crushed leaves are applied externally to treat wounds, snakebites and rheumatism A paste of the leaves and roots is taken internally to treat headache and is applied to the forehead as a balm for the same purpose The root bark in milk is drunk to treat impotence A bark extract is considered astringent and taken to treat fever, chest pain and in a mixture with other plants to treat asthma In friction it is used to treat bruises and painful joints The seeds contain 16% non-drying oil</p>

FLORA	HABITAT CHARACTERISTICS	USES
<p>BIJA</p> 	<p>Common on hill slopes even in dry and fully exposed areas Moist and dry deciduous forests, also in the plains</p>	<p>The resin is applied topically in the treatment of skin conditions Grown as shade tree for coffee plantations Extracts of the wood and bark are used as skin and hair conditioners in commercial cosmetic preparations Wood is used for various purposes including musical instruments, door and window frames, posts, agricultural implements, boat building, carts, railway carriages, railway ties, etc.</p>

ANNEXURE 5: FAUNA SPECIES IN BAGDARA WILDLIFE SANCTUARY

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>MONKEY WITH RED MOUTH (<i>Rhesus macaque</i>)</p> 	<ul style="list-style-type: none"> Grasslands, woodlands, forested areas In mountainous regions up to 2,500 m (8,200 ft) in elevation Close to human settlements 	<ul style="list-style-type: none"> Feeds on fruits, seeds (make up 60 - 90% of their diet), also eat leaves, flowers, roots, and bark. 	<ul style="list-style-type: none"> Tolerance of a broad range of habitats Regular swimmers 	<ul style="list-style-type: none"> Habitat loss Urban migration 	<p>IUCN – Least concern (Lower risk) WPA - Sch II (part I)</p>
<p>MONKEY WITH BLACK MOUTH/ GRAY LANGUR (<i>Presbytis entellus</i>)</p> 	<ul style="list-style-type: none"> Ranges from 100 to 1700 sq km in tropical rainforest, moist and dry and deciduous forest Near human habitats Sacred groves and open scrub 	<ul style="list-style-type: none"> Feeds on leaves, fruits, buds and flowers 	<ul style="list-style-type: none"> Well adapted to cultivated areas Arboreal, semi-terrestrial Group size varies from 15 to 150 	<ul style="list-style-type: none"> Habitat loss Urban migration 	<p>IUCN – Least concern (Lower risk) WPA - Sch II (part I)</p>
<p>SLOTH BEAR (<i>Melursus ursinus</i>)</p> 	<ul style="list-style-type: none"> Wet or dry tropical and deciduous forest Scrublands and grasslands Rugged hills and deep valleys 	<ul style="list-style-type: none"> Subsists primarily on termites, ants, fruits and honey Rarely prey on other mammals 	<ul style="list-style-type: none"> Avoids areas where human disturbance is high 	<ul style="list-style-type: none"> Habitat loss Poaching 	<p>IUCN – Vulnerable WPA - Sch I (part I)</p>

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SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>BARKING DEER (<i>Muntiacus muntjac</i>)</p> 	<ul style="list-style-type: none"> Tropical and subtropical deciduous forests, grasslands, savannas and scrub forests Hilly country on the slopes of the Himalayas 	<ul style="list-style-type: none"> Eats grass, fruit, shoots, seeds, bird eggs, and small animals Occasionally scavenges on carrion 	<ul style="list-style-type: none"> never wander far from water 	<ul style="list-style-type: none"> Hunting & trapping terrestrial animals Logging & wood harvesting 	<p>IUCN – Least concern (Lower risk) WPA - Sch III</p>
<p>INDIAN RATEL (<i>Mellivora capensis</i>)</p> 	<ul style="list-style-type: none"> Montane forests Arid grasslands and semi-deserts 	<ul style="list-style-type: none"> Feeds on fish, birds, reptiles particularly snakes and insects Fond of honey 	<ul style="list-style-type: none"> Adapted to survive both on wet and dry habitats Range over areas above 500 sq km 	<ul style="list-style-type: none"> Used as bush meat and in traditional medicine, but mostly they are directly persecuted (through the use of, for example, steel-jawed traps and poisons) by apiculturists and small livestock farmers throughout their range 	<p>IUCN – Least concern (Lower risk) WPA - Sch I (part I)</p>
<p>SPOTTED DEER (<i>Axis axis</i>)</p> 	<ul style="list-style-type: none"> dense deciduous forests, semi-evergreen forests, and open grasslands 	<ul style="list-style-type: none"> Shoots, herbs, shrubs, foliage, fruits, and forbs 	<ul style="list-style-type: none"> They prefer to be near water and will drink in mornings and evenings in hot weather. 	<ul style="list-style-type: none"> Habitat encroachment and hunting, Poaching for wild meat 	<p>IUCN – Least concern (Lower risk) WPA - Sch III</p>
<p>HYAENA (<i>Hyaena hyaena</i>)</p> 	<ul style="list-style-type: none"> Dense thickets and scrub forests Woodlands and grasslands Rocky terrain Near human habitation 	<ul style="list-style-type: none"> Feeds on small animals, insects, fruits and dates Regular scavenger and remains on other animals kill 	<ul style="list-style-type: none"> Inhabits cave that can extend over a distance of 4 to 5 m 	<ul style="list-style-type: none"> Poaching 	<p>IUCN – Near threatened WPA - Sch III</p>

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>COMMON INDIAN HARE (<i>Lepus nigricolis</i>)</p> 	<ul style="list-style-type: none"> • Short grasslands • Barren agriculture fields and crop fields • Forest roads • Open scrub 	<ul style="list-style-type: none"> • Forbes and grasses constitute the bulk 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Habitat loss • Poaching 	<p>IUCN – Least concern (Lower risk) WPA – Sch IV</p>
<p>BLACK BUCK (<i>Antelope cervicapra</i>)</p> 	<ul style="list-style-type: none"> • Artificial/Terrestrial, Grassland, Desert, Forest 	<ul style="list-style-type: none"> • Graze on low grasses 	<ul style="list-style-type: none"> • Prefer areas where water is perennially available 	<ul style="list-style-type: none"> • Conversion to agricultural use and hunting, they are increasing in many protected areas. • Conversion of dense scrub and woodland to grassland and agriculture also increases the area of suitable habitat. 	<p>IUCN – Least concern WPA – Sch I (part I)</p>
<p>JACKAL (<i>Canis aureus</i>)</p> 	<ul style="list-style-type: none"> • Forest and mangroves • Agricultural areas • Rural and semi-urban habitats 	<ul style="list-style-type: none"> • Feeds on birds, reptiles, amphibians and small mammals • Intakes fruits and other waste • Carrion, insects 	<ul style="list-style-type: none"> • Tolerance of dry habitats 	<ul style="list-style-type: none"> • Poaching 	<p>IUCN – Least concern (Lower risk) WPA – Sch II (part II)</p>

Zonal Master Plan of Bagdara Eco-Sensitive Zone

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
FOX(<i>Vulpus bengalensis</i>) 	<ul style="list-style-type: none"> • Semi-arid, flat to undulating terrain • Scrub and grassland • Near human settlement • Open rocky country avoids dense forests 	<ul style="list-style-type: none"> • Feeds on small mammals, insects, reptiles, birds, eggs, carrion, crabs and fruits 	<ul style="list-style-type: none"> • Indian fox is endemic to Indian subcontinent • Avoids dense forests, steep terrain and true deserts 	<ul style="list-style-type: none"> • Habitat disturbance • Poaching 	IUCN – Least concern (Lower risk) WPA – Sch II (part II)
WILD RAT/ BROWN RAT(<i>Rattus norvegicus</i>) 	<ul style="list-style-type: none"> • They have spread and established themselves along routes of human migration and now live almost everywhere humans are 	<ul style="list-style-type: none"> • In the wild, they'll often feed on grains, seeds, nuts, fruits and vegetables. • They might also eat smaller animals or insects, though this may be less common because it calls for hunting. 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • There are no major threats to this species. 	IUCN – Least concern (Lower risk) WPA -No data
INDIAN MONGOOSE (<i>Herpestes edwardsii</i>) 	<ul style="list-style-type: none"> • Dry and thorn forests • Open scrub • Near to the human settlements • Cultivated land • Rocky patches • Forest edges 	<ul style="list-style-type: none"> • Feeds on insects, snakes, small mammals, birds, reptiles and fruits 	<ul style="list-style-type: none"> • Most common in disturbed areas near garbage dumps • Commensal with humans 	<ul style="list-style-type: none"> • Has no range-wide threats sufficient to drive significant population declines. • It is likely that in some areas the levels of harvest are sufficient to reduce local densities 	IUCN – Least concern (Lower risk) WPA – Sch II (part II)

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>BLUE BULL (<i>Boselaphus tragocamelus</i>)</p> 	<ul style="list-style-type: none"> • Avoids dense forest and deserts • Dry deciduous forest • Agricultural area • Arid areas and scrublands 	<ul style="list-style-type: none"> • Eats grasses, grains, leaves, buds and fruits 	<ul style="list-style-type: none"> • A crop menace, causing large scale damages • Lives close to waterholes 	<ul style="list-style-type: none"> • Poaching 	<p>IUCN – Least concern (Lower risk) WPA - Sch III</p>
<p>SAMBAR (<i>Cervus unicolor</i>)</p> 	<ul style="list-style-type: none"> • Thorn and arid forest • Deciduous forest, grassland and scrub • Evergreen and semi-evergreen forest • Undulating terrain 	<ul style="list-style-type: none"> • Feeds on 130-180 species of plants • Fruits 	<ul style="list-style-type: none"> • Highly tolerant of forest degradation • Highly sensitive to any sort of forest resource extractive activities 	<ul style="list-style-type: none"> • Habitat loss • Poaching 	<p>IUCN – Vulnerable WPA - Sch III</p>
<p>PORCUPINE (<i>Hystrix indica</i>)</p> 	<ul style="list-style-type: none"> • Tropical, temperate shrubland • Rocky hillsides • Grassland and forests • Plantation and gardens 	<ul style="list-style-type: none"> • Feeds on plants, shrubs and leaves • Gnaw on animal bones for salt • Roots, fruits and grains 	<ul style="list-style-type: none"> • A broad habitat tolerance 	<ul style="list-style-type: none"> • Poaching 	<p>IUCN – Least concern (Lower risk) WPA - Sch IV</p>

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>WILD DOG/DHOLE (<i>Cuon alpinus</i>)</p> 	<ul style="list-style-type: none"> found in dense rainforests and moist and dry deciduous forests, which provide thick cover for hunting as well as alpine, evergreen and thorn scrub forests 	<ul style="list-style-type: none"> hunt small prey, such as fawns and hares, but at times it may hunt in pairs and will kill medium-sized ungulates, such as deer. sometimes scavenge from leopard and tiger kills 	<ul style="list-style-type: none"> can survive in a wide array of environments. 	<ul style="list-style-type: none"> Poaching 	<p>IUCN – Endangered WPA – Sch II (part I)</p>
<p>INDIAN WILD BOAR (<i>Sus scrofa</i>)</p> 	<ul style="list-style-type: none"> Tropical rain forests Temperate woodlands, grasslands Reed jungles 	<ul style="list-style-type: none"> Feeds on fruits, seeds, roots and tubers Feeds on earthworms and fishes 	<ul style="list-style-type: none"> Often venture on agricultural land to forage 	<ul style="list-style-type: none"> Habitat destruction and hunting pressure, either for food, sport or in reprisal for crop damage, particularly in areas near human habitation, consideration as major agriculture pest 	<p>IUCN – Least concern (Lower risk) WPA - Sch III</p>
<p>PANTHER (<i>Panthera pardus</i>)</p> 	<ul style="list-style-type: none"> Deciduous and evergreen forest Near habitation Dry scrubland and grassland Rugged hills and deep valleys 	<ul style="list-style-type: none"> Feeds on a greater diversity of prey-monkeys, reptiles, amphibians, birds, cattle, dogs 	<ul style="list-style-type: none"> Territory varies between 30 and 78 sq km 	<ul style="list-style-type: none"> Habitat loss Poaching Human animal conflict Decline in prey species 	<p>IUCN – Near threatened WPA – Sch I (part I)</p>

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
ASIAN SMALL CLAW OTTER (<i>Aonyx cinerea</i>) 	<ul style="list-style-type: none"> Marine Intertidal, Marine Coastal/Supratidal, Artificial/Aquatic & Marine, Wetlands (inland), Forest, Shrubland, Marine Neritic, Grassland 	<ul style="list-style-type: none"> Their diet includes mainly crabs, crustaceans and other mollusks, in India 	<ul style="list-style-type: none"> An outer fur - which acts like a waterproof jacket that protects the soft, warm inner fur. 	<ul style="list-style-type: none"> Hunting & trapping terrestrial animals Logging & wood harvesting Fishing & harvesting aquatic resources 	IUCN Vulnerable WPA – Sch I (part I)
TIGER (<i>Panthera tigris</i>) 	<ul style="list-style-type: none"> from tropical forests, evergreen forests, woodlands and mangrove swamps to grasslands, savannah and rocky country 	<ul style="list-style-type: none"> Mainly eat Sambar deer, wild pigs, water buffalo and antelope. Also known to hunt sloth bears, dogs, leopards, crocodiles and pythons as well as monkeys and hares. Old and injured tigers have been known to attack humans and domestic cattle. 	<ul style="list-style-type: none"> They are mostly nocturnal (more active at night) and are ambush predators that rely on the camouflage their stripes provide. 	<ul style="list-style-type: none"> habitat loss conflict with humans poaching to feed to the illegal trade in tiger parts and products 	IUCN Endangered WPA – Sch I (part I)
KING COBRA (<i>Ophiophagus Hannah</i>) 	<ul style="list-style-type: none"> Wetlands (inland), Forest, Artificial/Terrestrial, Artificial/Aquatic & Marine, Shrubland, Grassland 	<ul style="list-style-type: none"> Feeding mainly on other snakes, venomous and nonvenomous. They will also eat lizards, eggs, and small mammals. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Annual & perennial non-timber crops Hunting & trapping terrestrial animals Logging & wood harvesting 	IUNC Vulnerable WPA - Sch II (Part II)

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>PYTHON (<i>Python bivittatus</i>)</p> 	<ul style="list-style-type: none"> Wetlands (inland), Forest, Caves and Subterranean Habitats (non-aquatic), Desert, Grassland 	<ul style="list-style-type: none"> Mammals are preferred prey, but pythons will also eat birds, other animals, even fish 	<ul style="list-style-type: none"> Pythons often live near water and are good swimmers Pythons drape across tree branches, camouflaged by their light and dark patterned skin, waiting to ambush their next meal. 	<ul style="list-style-type: none"> Annual & perennial non-timber crops Hunting & trapping terrestrial animals 	<p>IUCN – Vulnerable WPA - Sch I (Part II)</p>
<p>EGYPTIAN VULTURES (<i>Neophron percnopterus</i>)</p> 	<ul style="list-style-type: none"> Rocky areas (eg. inland cliffs, mountain peaks), Wetlands (inland), Grassland, Shrubland, Savanna, Artificial/Terrestrial 	<ul style="list-style-type: none"> Egyptian vultures mostly feed on carcasses of dead birds and small mammals. They can also eat rotten fruits and vegetables. Rarely, they will hunt weak and injured small animals. Egyptian vultures also eat eggs. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Annual & perennial non-timber crops Livestock farming & ranching Other ecosystem modifications Invasive and other problematic species, genes & diseases 	<p>IUCN – Endangered WPA - No data</p>
<p>INDIAN VULTURE (<i>Gyps Indicus</i>)</p> 	<ul style="list-style-type: none"> Forest, Grassland, Shrubland, Savanna, Artificial/Terrestrial 	<ul style="list-style-type: none"> feeding mostly from carcasses of dead animals 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Other ecosystem modifications Agricultural & forestry effluents 	<p>IUCN – Critically endangered WPA - Sch I (Part III)</p>

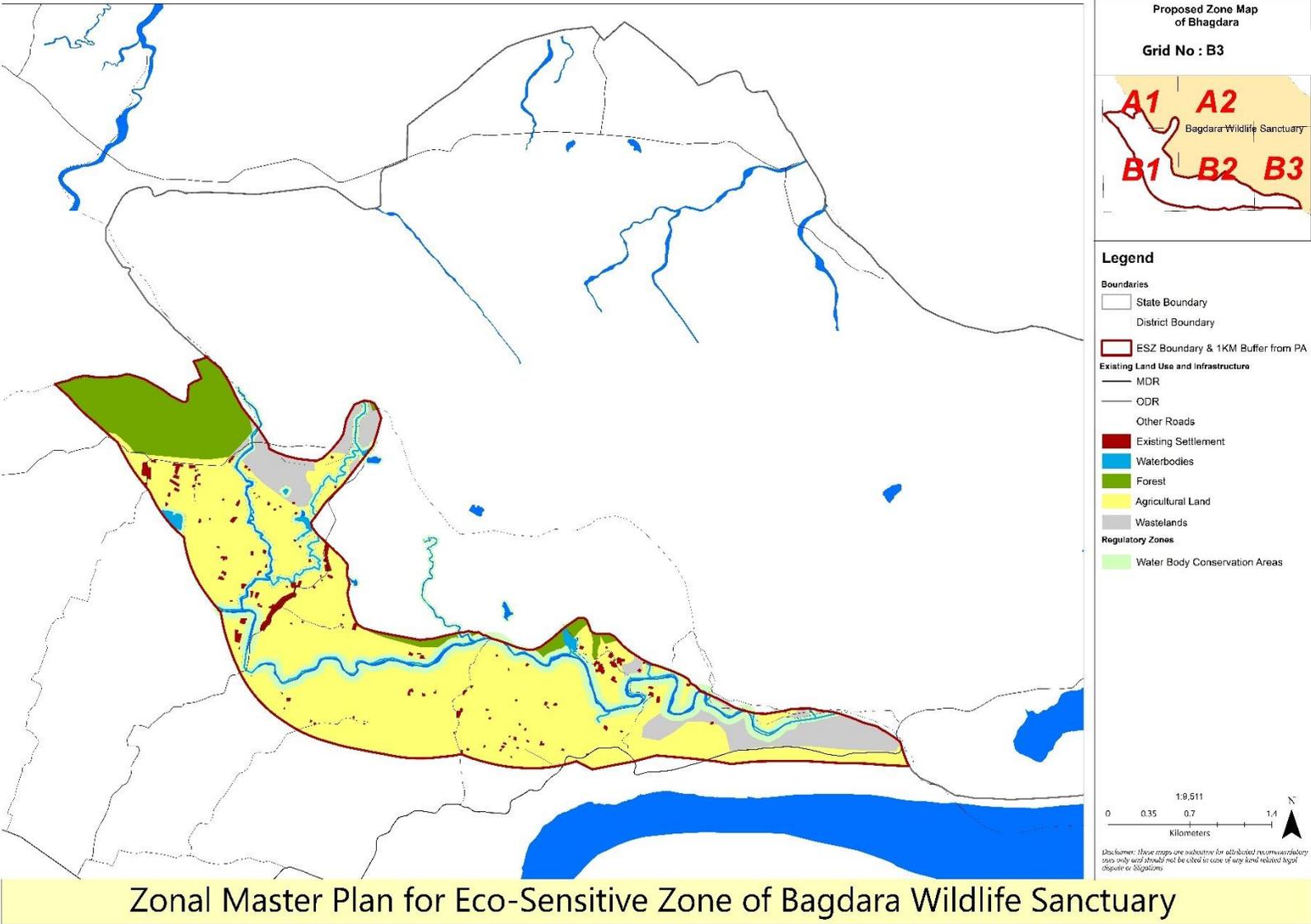
SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>RED HEADED VULTURE (<i>Sarcogyps calvus</i>)</p> 	<ul style="list-style-type: none"> • Forest, Grassland, Shrubland, Savanna, Artificial/ • Terrestrial 	<ul style="list-style-type: none"> • feed on the carcasses of a variety of species including large ungulates, birds, turtles and fish 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Other ecosystem modifications • Agricultural & forestry effluents 	<p>IUCN – Critically endangered WPA - No data</p>
<p>WHITE-RUMPED VULTURE (<i>Gyps bengalensis</i>)</p> 	<ul style="list-style-type: none"> • Forest, Grassland, Shrubland, Savanna, Artificial/ • Terrestrial 	<ul style="list-style-type: none"> • feeding exclusively on carrion, and mainly carcasses of cattle. 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Annual & perennial non-timber crops • Hunting & trapping terrestrial animals • Fire & fire suppression • species, genes & diseases • Problematic native species/diseases • Agricultural & forestry effluents 	<p>IUCN – Critically endangered WPA – Sch I (part III)</p>
<p>GRIFFON VULTURE (<i>Gyps fulvus</i>)</p> 	<ul style="list-style-type: none"> • Rocky areas (eg. inland cliffs, mountain peaks), Grassland, Shrubland 	<ul style="list-style-type: none"> • Griffon vultures are carnivores and scavengers, they typically feed on the soft tissue from the carcasses of medium to large mammals and sometimes injured or weak cattle or sheep. 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Livestock farming & ranching • Renewable energy • Utility & service lines • Hunting & trapping terrestrial animals • Agricultural & forestry effluents 	<p>IUCN – Least concern WPA - No data</p>

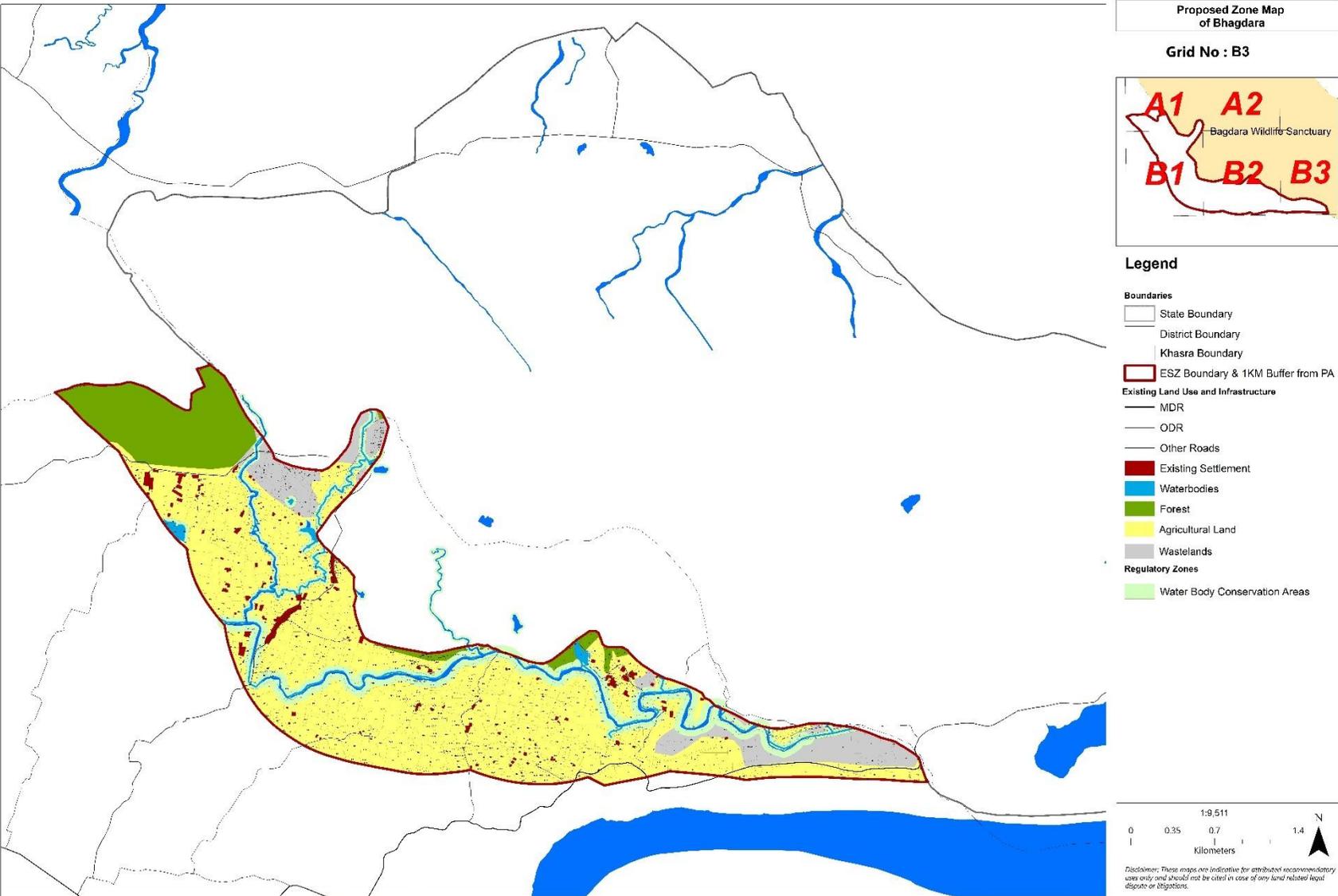
SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
HIMALAYAN GRIFFON (<i>Gyps himalayensis</i>) 	<ul style="list-style-type: none"> Rocky areas (eg. inland cliffs, mountain peaks), Grassland 	<ul style="list-style-type: none"> feeds only on carrion 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Livestock farming & ranching Agricultural & forestry effluents 	IUCN – Near threatened WPA - No data
CINEREOUS VULTURE (<i>Aegypius monachus</i>) 	<ul style="list-style-type: none"> Forest, Shrubland, Grassland 	<ul style="list-style-type: none"> Like all vultures, the cinereous vulture eats mostly carrion. The cinereous vulture feeds on carrion of almost any type, from the largest mammals available to fish and reptiles. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Annual & perennial non-timber crops Livestock farming & ranching Hunting & trapping terrestrial animals Climate change & severe weather 	IUNC – Near threatened WPA - No data

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
PEAFOWL (<i>Pavo cristatus</i>) 	<ul style="list-style-type: none"> Artificial/Terrestrial, Forest, Shrubland 	<ul style="list-style-type: none"> As omnivores, peacocks eat plants, berries, seeds and insects. While domestic peafowl consume commercial feeds designed for their dietary needs Wild or free-ranging peacocks eat just about anything, including small creatures such as reptiles and amphibians. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> 	IUCN – Least concern WPA – Sch I (part III)
JUNGLE FOWL (<i>Gallus</i>) 	<ul style="list-style-type: none"> preferred habitats are thickets on the forest floors and open scrub. 	<ul style="list-style-type: none"> feed up on bamboo seeds, grains, termites, insects and berries. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> Hunted for meat and the long neck hackle feathers which are used for making fishing lures. Habitat loss 	IUCN – Least concern WPA - Sch IV
ROCK DOVE/PIGEON (<i>Columba livia</i>) 	<ul style="list-style-type: none"> Caves and Subterranean Habitats (non-aquatic), Rocky areas (eg. inland cliffs, mountain peaks), Artificial/Terrestrial 	<ul style="list-style-type: none"> They eat mainly seeds including corn, oats, cherry, and barley. In cities, feral pigeons also eat popcorn, cake, peanuts, bread, and currants. 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> It is difficult to evaluate the conservation status and security of "natural" populations due to the confusion concerning the degree of mixing with feral birds. Natural populations are threatened by interbreeding with feral pigeons in many areas 	IUCN – Least concern WPA - No data

SPECIES NAME	HABITAT CHARACTERISTICS	FOOD HABITS	OTHER CHARACTERISTICS	THREATS	STATUS
<p>PARAKEET (<i>Psittacula kramera</i>)</p> 	<ul style="list-style-type: none"> Savanna, Grassland, Artificial/Terrestrial, Wetlands (inland), Forest, Shrubland 	<ul style="list-style-type: none"> Usually feed on buds, fruits, vegetables, nuts, berries, and seeds. Wild flocks also fly several miles to forage in farmlands and orchards, causing extensive damage. they feed on cereal grains, and during winter also on pigeon peas 	<ul style="list-style-type: none"> 	<ul style="list-style-type: none"> 	<p>IUNC – Least concern</p> <p>WPA - Sch IV</p>

ANNEXURE 6: REGULATORY ZONES & KHASRAS





Zonal Master Plan for Eco-Sensitive Zone of Bagdara Wildlife Sanctuary

ANNEXURE 7: SUGGESTIVE MONITORING COMMITTEE STRUCTURE

Monitoring committee

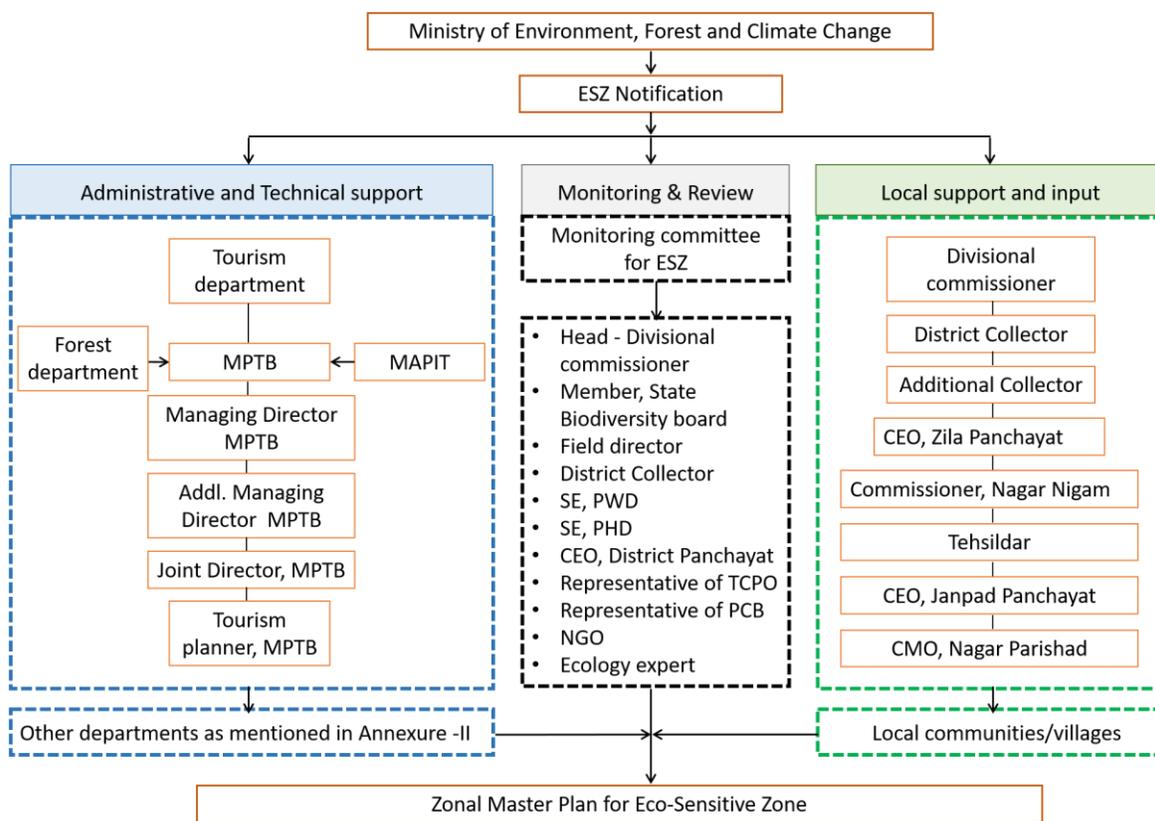
As per the gazette notification, the Zonal Master Plan shall be prepared in consultation with all stakeholder line Departments i.e., Forest & Environment, Urban Development, Eco-tourism, Municipal, Revenue, Agriculture, State Pollution Control Board, Irrigation and Public Works Department, for integrating environmental and social considerations into it.

In order to monitor and review the Zonal Master Plan prepared by the State Government, the Central Government proposed a Monitoring Committee. The same monitoring committee will be responsible for the administration of ESZ Master plan once it becomes operational. The following represents an institutional framework and organization hierarchy of various departments and committees involved.

Structure and responsibilities

As per the gazette notification, The Zonal Master Plan shall be prepared in consultation with all concerned State Departments including Environment, Forest, Urban Development, Eco-tourism, Municipal, Revenue, Agriculture, State Pollution Control Board, Irrigation and Public Works Department, for integrating environmental and ecological considerations into it.

Institutional support for preparation of Zonal Master Plan for Eco-Sensitive Zone



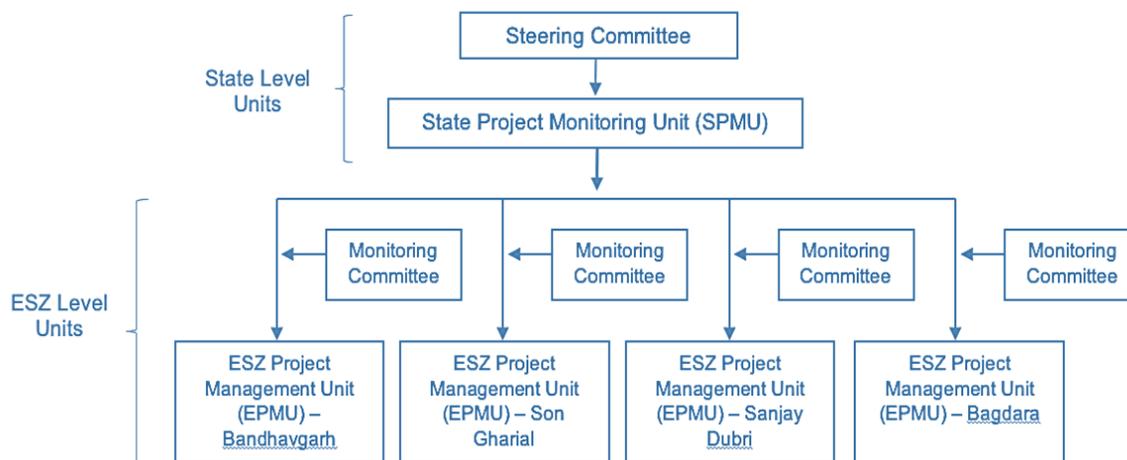
In order to monitor and review the Zonal Master Plan prepared by the State Government, the Central Government proposed a Monitoring Committee which shall comprise of - Divisional Commissioner, Shahdol (chairman), Divisional Commissioner (Jabalpur), District Collector of Umaria, Shahdol and Katni, SE PWD (Shahdol), SE PHD (Shahdol), CEO of District Panchayat of Umaria, Shahdol and Katni, Representative TCPO, MPPCB, NGO, Ecology expert, Member State Biodiversity Board and Field Director, Bandhavgarh Tiger Reserve, Umaria. The following represents an institutional framework and organization hierarchy of various departments and committees involved.

Coordination institution

The coordination/implementation mechanism proposed in the ESZ Plan is a two-level institutional structure:

1. **State Project Management Unit (SPMU)** – The SPMU will be the state level coordinating agency for all EPMU of the ESZ of Madhya Pradesh. SPMU would be governed by the steering committee headed by the Chief Secretary GoMP. SPMU will be responsible for the overall co-ordination, project management, compliance with project deliverable objectives (PDOs).

2. **ESZ Project Management Unit (EPMU)** – The EPMU would be the institution for implementation of the pilot interventions at the ESZ level for each cluster, under the administrative control of the SPMU. EPMU will be governed by the Monitoring Committee of the respective ESZ.



The main function of the ESZ Project Management Unit would be –

- Preparation of DPRs as per nationally accepted technical standards and specifications.
- Collaboration and coordination with the relevant other government departments/agencies, local government bodies, NGOs, CBOs and local communities.
- Procurement of works and goods with financial support from SPMU.
- Construction/installation of facilities including contract management and day to day supervision, ensuring compliance with project's safeguard policies, certifying works and making payments and preparing completion reports.
- Managing project funds including compliance with the agreed policies and procedures.

Infrastructure, Staff and Amenities

State-level Institutional Structure

C. **State Project Management Unit (SPMU):** For effective implementation of the ZMP, there is great need of inter-sectoral coordination and integration, sustainable financing and policy support from the highest levels of Government. To make it happen a formal institutional mechanism is needed. Institution of the Monitoring Committee can ensure interdepartmental coordination and convergence at the district level as Divisional Commissioner and District Collectors are a part of the committee, but it will not able to ensure the most vital requirement of inter-sectoral coordination and integration, sustainable financing, policy support that can happen only at the state level.

With this objective, a State Project Management Unit (SPMU) at state level is suggested as an institution to ensure inter-sectoral coordination and integration, sustainable financing, and policy support. The SPMU will be a Special Purpose Vehicle (SPV) for this purpose. SPMUs shall be a registered society to ensure quick decision making, flexibility, and to ensure efficient fund flow. The role of the SPMUs would be to serve as the apex state level organization to manage the zonal development at the state level. It would be

governed by a Steering Committee with the Chief Secretary as the Chairperson. This institutional mechanism is essential to achieve inter-departmental/agency/sectoral coordination and sustainable financing at state level.

The SPMU will also ensure for monitoring, learning and evaluation (ML&E) to measure the progress of the project implementation by the EPMUs of the state. ML&E can facilitate organization learning by providing continuous feedback in the management process of monitoring and evaluating progress toward a given goal.¹¹⁵ The ML&E will ensure smooth running of the pilots through continuous learning and timely mid-course corrections during project implementation.

The SPMU would facilitate a result and outcome-based management and facilitate learning and process enhancement through participatory methods as well as through independent technical, financial and social audits, and beneficiary satisfaction survey.

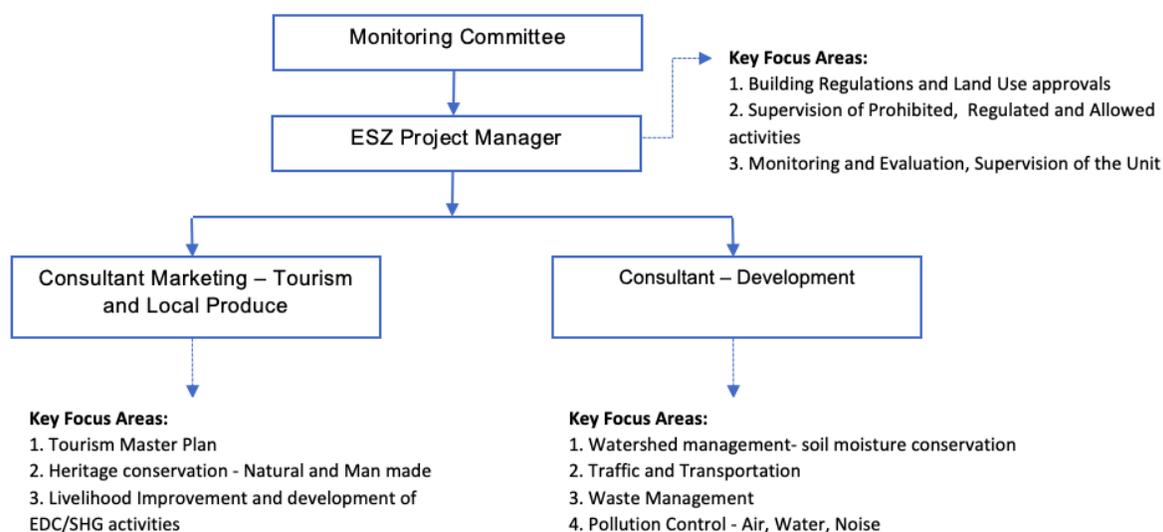
D. **Steering Committee:** Steering Committee will be the apex body to oversee the progress of the implementation of the ESZMs as well as to provide directions and most importantly ensure the inter-sectoral coordination and sustainable financing essential for the successful implementation of the project. The Steering Committee may be convened every six months to review the progress and short out the issues if any regarding inter-sectoral coordination, approve the annual action plan and the budget. SC will take all important decisions regarding continued financing, interdepartmental coordination, and policy support.

ESZ-level Institutional Structure

A. **ESZ Project Management Unit (EPMU):** Considering the challenges of implementation of the ESZ Plan, a flexible institution with ability to engage with multiple stake holders, inter-sectoral and inter-agency coordination are a requisite. Considering this challenging task, it is suggested that for smooth implementation of the ESZ plan an "ESZ Project Management Unit" be constituted in each ESZ, which shall be given the mandate of implementing the plan and reporting developments to the Monitoring Committee. As per the ESZ notification ESZ plan implementation will be supervised by a Monitoring Committee.

The ESZ Project Management Unit would be primary body to be mandated to carry out the implementation of the activities as per the ESZMP and ensure acceptable implementation standards for achieving the desired outputs and targets. EPMU, would report the progress and performance to the Monitoring Committee. EPMU will also ensure inter-sector coordination between line departments and convergence at the district level as the Divisional Commissioner and District Collectors are part of the Monitoring Committee. The Proposed institutional mechanism will make micro-management and day to day implementation of provisions of the ESZ plan effectively. EPMU shall report to the 'Monitoring Committee' for various approvals and permissions and will act in accordance with the guidance advisory from the monitoring committee.

¹¹⁵ Kusek, J. Z., & Rist, R. C. (2007). *Ten steps to a results-based monitoring and evaluation system: a handbook for development practitioners*. Washington, DC: World Bank.



a) **ESZ Project Manager:** This position can be held by a senior level official. This is essential to ensure inter-sectoral and inter-agency coordination. For example, the Field Director of the PA, can be designated as the ESZ Project Manager who can then oversee the activities of this team and ensure that the EPMU gets the necessary recognition and authority in the project area and among line departments. This can also provide the much-needed vital linkage between the ESZ Plan Management Unit and the Forest Department of Madhya Pradesh.

Alternatively, he/she can also be a mid-level management graduate with 5- 7 years of experience who will have the overall responsibility to ensure that provisions of the ESZ plan are implemented properly.

The ESZ Project Manager shall devise indicators to monitor the progress of activities being performed by his management unit. It is important that the implementation of the project components are well monitored and evaluated. Clear criteria and indicators must be described before the actual implementation. Indicators need to be created for all major aspects of the ESZ plan focus areas in order to ensure quantitative and objective progress in the focus areas of the plan. In practice this means that indicators will have to be developed in the following fields: ecology, socio-economics, institutional, policy and physical. This will also help in assessing the performance of the EPMU team as they work on different themes of the ESZ plan. While devising Monitoring indicators it will be worthwhile to consider using the concept of 'Failure Standards' as an effective monitoring tool. It means that every activity shall define the objective value of progress below which the efforts would be considered a Failure. This will go a long way in preventing procrastination and improving efficiency of the entire unit. Key Focus Areas:

1. Building Regulations and Land Use approvals
2. Supervision of Prohibited, Regulated and Allowed activities
3. Monitoring and Evaluation, Supervision of the Unit

ToR:

- He shall be responsible for overall administration of EPMU.
- Shall Report to the Monitoring Committee with progress reports of activities being undertaken by EPMU.
- He shall ensure monitoring, evaluation and learning through continuous learning and process enhancement through participatory methods.
- He will devise indicators for monitoring progress of various activities recommended in ESZ plan to ensure quantitative and objective progress in the focus areas of the plan.
- He will be the nodal officer responsible for collecting and compiling all requests for land use change approvals and putting it up to the Monitoring Committee for consideration.

- He shall ensure that new constructions in the ESZ area are following building regulations before getting approval for registration.
- He shall maintain a list of activities as per the Prohibited, Regulated and Allowed sections of the Gazette Notification and being undertaken or planned within the ESZ. He shall ensure that the Monitoring Committee stays updated about all such activities in order for better implementation of provisions of the ESZ plan.
- He shall represent his EPMU at the State Project Management unit and enlist his recommendations and suggestions for better execution of the provisions of the ESZ Plan. These inputs shall be conveyed to the Steering Committee for its consideration.
- He shall look into the interdepartmental, interagency coordination, institutional linkages needs of EPMU and liaise with concerned line departments.
- He shall ensure effective tools for transparency, participation and redress fails to provide indicators and outcomes of the forest management efforts.

b) **Marketing Specialist-** Tourism and Local Produce: His responsibility would be to act as a triggering/catalyst agent who can bring in modern marketing skills and innovation to devise new and context specific tourism products. He will also act as a liaison between various production activities in the ESZ and the markets by creating a unique brand for all types of produce in the area. He shall also be responsible for training and orienting SHGs/EDCs/Panchayat members in supply chain and marketing skills so as to impart sustainability to business activity in the ESZ. In performing all these duties the ESZ Plan and its provisions will act as his guide and he needs to put the directives present in the plan in to action. Key Focus Areas:

1. Tourism Master Plan
2. Heritage conservation - Natural and Man made
3. Livelihood Improvement and development of EDC/SHG activities

ToR:

- He shall prepare detailed DPRs for each identified project and ensure compliance.
- He shall help design new tourism products in the area and help the facilities of the MP Tourism board as a Consultant in improving their overall services.
- He shall conduct trainings for forest department staff and tourism staff in tourist management. He shall also orient SHGs/EDC members in innovative tourist products and activities like Home Stay management and adventure activities in the ESZ area.
- He shall be responsible for creating a market identity (Branding) for products produced within the ESZ. In this capacity he shall act as consultant for SHGs/EDCs and other societies who are into production activities.
- In collaboration with the SPMU, he shall ensure capacity building of the local communities, manage campaigns and stakeholder participation.
- He shall also introduce new and innovative livelihood concepts and ideas as per the ESZ plan and help the local communities adapt and adopt and integrate in the micro-plan these ideas in order to make a substantial improvement in the quality of their lives.
- He shall also look at the subject of scheme convergence and facilitate pilot projects in Gram Panchayats and facilitate integration in the micro-plan in order to exhibit the societal benefits inherent in these activities.

c) **General Development Specialist:** He shall be responsible for liaison with line departments in districts concerned, coordinate with the District Level Coordination Committee (DLCC) for ensuring inclusion of relevant prioritized activities in to the micro-plan, getting various plan activities completed in a time bound manner, in accordance with an annual work plan, in each field of responsibility. With the ESZ

plan as a guiding document he can design and develop his work plans and get the necessary permissions via the instrument of the Monitoring committee. His chief areas of work would be:

1. Watershed management- soil moisture conservation
2. Traffic and Transportation
3. Waste Management
4. Pollution Control - Air, Water, Noise

ToR:

- He shall be responsible for liaison with different line department officials in the districts concerned in order to direct/regulate various development activities according to ESZ plan provisions.
- He shall work in collaboration with the Forest Department to create awareness about on the process of forest management and the applicable rights and concession they are eligible for under the JFM.
- He shall prepare detailed work plans for each of the concerned sectors like Watershed management or waste management and then liaise with the concerned line departments in order to get the work completed.
- He shall also act as a vehicle for creating synergy between line departments of the districts concerned, so that planned activities in the ESZ can be carried out involving line departments of districts concerned. This would prevent piecemeal initiatives from one district while the other districts act without synergy with the actions of the former.
- He shall be instrumental in facilitating formulation of micro plans in consonance with the ESZ plan in respective villages in order to undertake various development activities envisaged in the Plan. Some of these activities will require detailed location and context specific planning, which shall be his responsibility. Such micro-plans can be in the area of traffic and parking management, heritage conservation, waste management etc.
- He shall collaborate with a range of agencies to strengthen the capacity of the EPMU. This will include various research and academic institutes, civil society groups, NGOs, etc.
- Shall follow the instructions of the ESZ Project Manager and carry out work assigned to him.

ESZ Unit: Key Positions and Responsibility

S. No.	ESZ Unit Positions	Key Responsibilities
1	ESZ Project Manager	<ul style="list-style-type: none"> • Inter-sectoral, Inter- Agency coordination. • Liaison with stakeholders • Monitoring and Evaluation of activities in the plan • Administrative and Budgeting • Formulation of Annual Plan • Reporting to the Monitoring Committee • Reporting to SPMU
2	Marketing Expert– Tourism and Local Produce	<ul style="list-style-type: none"> • Eco Tourism activities - Planning, training and execution • Bridging the gap between local production and the markets • Responsible for branding of local produce and establishing a market presence • Training and orientation of SHGs/EDCs in modern business practices
3	Development Expert	<ul style="list-style-type: none"> • Liaise with line departments in concerned districts to accomplish the tasks and targets in the ESZ plan. • Prepare detailed work plans for each of the concerned sectors. • Collaborate with a range of agencies to strengthen the capacity of the EPMU • Facilitate micro plans in consonance with the ESZ plan in order to undertake various development activities enlisted in the Plan

Suggestive Monitoring & Evaluation Plan

The proposed framework is indicative, and the Monitoring Committee shall develop a comprehensive Monitoring & Evaluation plan for the ESZ, incorporating a robust and independent data management system for waste and environmental parameters. The plan shall include annual data reviews, continuous troubleshooting, evaluation of standard operating procedures, and periodic audits to ensure data integrity and reliability. The resulting data inventory will serve as a reference for long-term impact assessments and the formulation of appropriate mitigation measures.

An IT-enabled dashboard could also be established for performance monitoring, aligned with benchmarks such as Swachh Survekshan and 'Garbage-Free City' standards, and extended to facilitate public social auditing. Further, a grievance redressal mechanism could be instituted through an e-governance module to enable citizens to lodge complaints, ensure timely resolution, and publicly report actions taken.

S.No.	Regulated Activity	Regulatory Authority	Monitoring Methodology	Frequency of Monitoring	Evaluation & Compliance Mechanism
1	Commercial establishment of hotels and resorts	Implementing agency for monitoring shall be decided by Monitoring Committee	<ul style="list-style-type: none"> Mandatory Environmental Impact Assessment verification of eco-sensitive design (RADPFI 2021) GIS mapping of land use change Waste and water audits 	Annual compliance review	Annual eco-certification: Non-compliant establishments face closure under ESZ rules
2	Construction activities		<ul style="list-style-type: none"> Permit vetting against ZMP land-use zoning GIS monitoring ESZ clearance before start Eco-sensitive design guidelines compliance 	Monthly during construction.	Non-compliance triggers stop-work orders; social audit of projects every year
3	Small scale non-polluting industries		<ul style="list-style-type: none"> Registration records Energy and effluent audits by MPPCB Inspection of waste management practices 	Bi-annual	Renewal of licenses tied to MPPCB clearance; penal action under Air & Water Acts if violated
4	Commercial Goat & Sheep Farming		<ul style="list-style-type: none"> Livestock census Grazing maps prepared by Forest Dept Ecological carrying capacity assessments 	Pre & post grazing season	Grazing intensity reviewed annually; permits adjusted or withdrawn in case of overuse.
5	Felling of Trees		<ul style="list-style-type: none"> Tree felling permits Geo-tagging of felled trees Satellite imagery for deforestation tracking 	Monthly reconciliation	Annual tree cover report through remote sensing. Violations will attract penalties as per Indian Forest Act.

S.No.	Regulated Activity	Regulatory Authority	Monitoring Methodology	Frequency of Monitoring	Evaluation & Compliance Mechanism
6	Goat Farming		<ul style="list-style-type: none"> Village-level registers 	Quarterly	Panchayat reports submitted to ESZ monitoring committees; overstocking corrected through awareness + fines
7	Collection of NTFPs		<ul style="list-style-type: none"> SHG-managed collection quotas GPS-tracked zones 	Seasonal	Annual sustainability audit; quotas revised with Forest Dept.
8	Migratory Grazing		<ul style="list-style-type: none"> Entry/exit permits Check-post records Monitoring of grazing routes with GPS collars 	Seasonal	Annual ecological impact assessment; renewal of permits conditional on compliance
9	Towers, cables & infrastructure		<ul style="list-style-type: none"> Location clearance via ESZ monitoring cell Geo-tagging Radiation compliance checks 	Biennial	Certification from DISCOM/DoT; removal of illegal structures
10	Infrastructure including civic amenities		<ul style="list-style-type: none"> ESZ-compatible design verification Site inspections GIS overlay with eco-sensitive maps 	Quarterly	Environmental audits; corrective redesign if violations
11	Roads (widening/strengthening)		<ul style="list-style-type: none"> ESZ Impact Assessment Site inspections/GIS tracking Wildlife underpass/overpass compliance 	During construction + Annual	Audit report to Monitoring Committee; penalties for non-adherence
12	Hill slopes & river banks protection		<ul style="list-style-type: none"> Slope stabilization audits Sediment load analysis 	Pre & post monsoon	Annual erosion risk report; stricter zoning in vulnerable slopes
13	Night vehicular traffic		<ul style="list-style-type: none"> Check post permits CCTV monitoring Roadkill data records 	Monthly	Adaptive traffic regulation; violators fined by Transport Dept.
14	Agriculture, horticulture, dairies, aquaculture		<ul style="list-style-type: none"> Soil/water testing Agro-chemical usage surveys 	Annual	Compliance with sustainable farming guidelines; incentives for eco-friendly practices
15	Treated wastewater discharge		<ul style="list-style-type: none"> STP/ETP inspection Random water quality tests 	Quarterly	Compliance certification tied to MPPCB norms; repeat violators face closure.

S.No.	Regulated Activity	Regulatory Authority	Monitoring Methodology	Frequency of Monitoring	Evaluation & Compliance Mechanism
16	Commercial water extraction		<ul style="list-style-type: none"> Water meters Aquifer recharge studies 	Bi-annual	Aquifer status reports; restrictions if thresholds breached
17	Wells and borewells		<ul style="list-style-type: none"> GPS tagging Water table measurement 	Annual	Renewal of permits subject to groundwater audits
18	Solid & Biomedical Waste		<ul style="list-style-type: none"> Segregation & collection audits Facility inspections Disposal logbooks 	Quarterly	Third-party annual audit; public disclosure of compliance
19	Exotic species introduction		<ul style="list-style-type: none"> Nursery inspections Biodiversity registers checks 	Annual	Removal of invasive species; penalties under Wildlife Protection Act
20	Eco-tourism		<ul style="list-style-type: none"> Carrying capacity assessments Visitor logbooks 	Seasonal	Annual eco-tourism review; benefit-sharing compliance checked
21	Noise pollution		<ul style="list-style-type: none"> Noise meters in hotspots Festival/event monitoring 	Quarterly	MPPCB compliance reports; penal fines for excess noise
22	Air Pollution		<ul style="list-style-type: none"> Ambient air quality monitoring stations Stack emission checks for industries 	Continuous online monitoring + Quarterly field checks	MPPCB compliance reports or violation notices. Closure or fines for exceeding prescribed limits
23	Signboards/hoardings		<ul style="list-style-type: none"> Field checks Cross-verification with permits 	Bi-annual	Removal of unauthorized boards; fines imposed
24	Any other activities	<ul style="list-style-type: none"> Case-by-case review Application screening 	-	Recommendations of ESZ Monitoring Committee enforced	