



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

ZONAL MASTER PLAN

BANDHAVGARH NATIONAL PARK & PANPATHA WILDLIFE SANCTUARY

VOLUME 2- ANNEXURE REPORT



TABLE OF CONTENTS

DEFINITION.....	iii
ABBREVIATIONS	iv
LIST OF EXHIBITS.....	v
LIST OF TABLES.....	vi
LIST OF MAPS.....	vii
LIST OF IMAGES	viii
LIST OF SUGGESTIVE GUIDELINES	ix
ANNEXURE 1: ESZ NOTIFICATION FOR BANDHAVGARH ECO-SENSITIVE ZONE	1
ANNEXURE 2: LIST OF VILLAGES IDENTIFIED IN BANDHAVGARH ESZ AS PER NOTIFICATION	11
ANNEXURE 3: CHAPTERS	14
CHAPTER 1: PLANNING A GREEN LANDSCAPE	15
1.1 The vision	15
1.2 Objectives of management	20
1.3 Short-term objectives	22
1.4 Long-term objective	23
1.5 Problems in achieving objectives.....	23
CHAPTER 2: THE STRATEGIES.....	25
2.1 Ecofriendly Suggestive Land use planning	25
2.2 Areas for Sustainable Development	78
2.3 Areas for Nature Conservation	80
2.4 Areas for Eco-Restoration.....	80
2.5 Prohibited activities in ESZ	80
2.6 Regulated activities in ESZ.....	81
2.7 Promoted activities in ESZ.....	83
CHAPTER 3: THEME PLANS	89
3.1 Addressing conservation-development issues.....	89
3.2 Restoration of soil moisture regime	100
3.3 Restoration of corridors and connectivity	105
3.4 Rainwater harvesting	111
3.5 Municipal waste management	114
3.6 Wastewater treatment.....	114
3.7 Solid waste management.....	116
3.8 Bio-medical waste management.....	127
3.9 Management of storm water	127
3.10 Vehicular traffic control	128
3.11 Management of resource extraction	133
3.12 Management of hazardous waste.....	133
3.13 Surface and ground water withdrawal.....	134
3.14 Protection of the source water	134
3.15 Development of resilience to climate change.....	135
3.16 Tourism and Heritage conservation (Sub Zonal Tourism Plan)	137
3.17 Agriculture and livestock management	154
3.18 Cottage industries promotion	188
3.19 Abatement of Pollution.....	189
3.20 Human-Wildlife Conflict (HWC) Management.....	190
CHAPTER 4: LIVELIHOOD ISSUES.....	197
4.1 Stakeholder consultation	197
4.2 Promotion of eco-development activities	201
4.3 Micro-plan preparation	210
4.4 Implementation of micro-plan.....	211
CHAPTER 5: SUB-ZONAL TOURISM MASTER PLAN	213

5.1 Promotion of sustainable tourism.....	213
5.1.1. Vision and objectives for the sector.....	215
5.1.2. Tourism assets in Bandhavgarh ESZ	216
5.1.3. Existing Tourism/ Eco-Tourism Infrastructure	230
5.1.4. Potential Tourism zones and circuits	232
5.1.5. Tourism forecast and challenges.....	236
5.1.6. Delineation of Tourism Promotion Areas (TPA)	239
5.1.7. Assessment of carrying capacities of TPA	242
5.2 Conservation education	247
5.3 Management guidelines for tourism.....	248
CHAPTER 6: RESEARCH, MONITORING AND TRAINING	259
6.1. Prioritization of research and monitoring	259
6.2. Development of human resource for implementation of plan.....	264
6.3. Skill development and on the job training	264
6.4. Establishing a learning centre.....	265
6.5. Capacity building and convergence	265
CHAPTER 7: THE BUDGET	266
7.1. The plan budget.....	266
7.2. Source of funding	267
7.3. Drawing and Distribution mechanism	268
CHAPTER 8: REGULATIONS IN THE ESZ.....	269
8.1 Issuance of Permission in ESZ Area	269
8.2 Regulations as per the zones	273
8.3 Regulatory Authority	279
ANNEXURE 4: STAKEHOLDERS CONSULTATIONS & OUTPUTS.....	280
ANNEXURE 5: LIST OF FLORA IN BANDHAVGARH TIGER RESERVE AND ESZ	301
ANNEXURE 6: LIST OF FAUNA IN BANDHAVGARH TIGER RESERVE AND ESZ	309
ANNEXURE 7: LIST OF TOURISM ASSETS, SITES & INFRASTRUCTURE IN BANDHAVGARH ESZ.....	326
ANNEXURE 8: LIST OF GOVERNMENT LAND PARCELS.....	332
ANNEXURE 9: ALL ZONING MAPS.....	336
ANNEXURE 10: REGULATORY ZONES & KHASRAS	338
ANNEXURE 11: SUGGESTIVE MONITORING COMMITTEE STRUCTURE	347
Monitoring committee	347
Structure and responsibilities.....	347
Coordination institution	348
Infrastructure, Staff and Amenities.....	349
Suggestive Monitoring & Evaluation Plan	354

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 favourable 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

BTR	Bandhavgarh Tiger Reserve
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

LIST OF EXHIBITS

Exhibit 1: Key drivers of Zonal Master Plan	15
Exhibit 2: Zoning methodology for defining the Eco-sensitive zones.....	76
Exhibit 3: Bicycle route from TPA-1 to Magdhi and Gharial bank.....	93
Exhibit 4: Bicycle route from TPA-2 to Majhketa (left) and Tala to Manpur (right).....	93
Exhibit 5: Covering of lined and unlined wells in protected areas has become a major priority	95
Exhibit 6: Areas demarcated for restoration in Bandhavgarh ESZ	102
Exhibit 7: Loss of wildlife and their habitat due to roads/linear intrusion	107
Exhibit 8: Results from a study on National Wildlife Vehicle Collision Reduction	108
Exhibit 9: Representation of road construction and habitats	109
Exhibit 10: Waste Management Plan	121
Exhibit 11: Location of riverine zone, nature trail and Chechpur waterfall.....	141
Exhibit 12: Location of Sustainable huts at Magdhi.....	144
Exhibit 13: Proposed sustainability measures at Eco-huts Complex.....	145
Exhibit 14: Project location near Bansagar lake	147
Exhibit 15: Important aspects of Organic farming.....	163
Exhibit 16: Bear/Wild animal resistant bee keeping using wire and Bio fencing.....	167
Exhibit 17: Big buyers of medicinal and aromatic plants	173
Exhibit 18: Example of Grazing Chart for Planned grazing	176
Exhibit 19: Tourist map of Madhya Pradesh	213
Exhibit 20: Ram Van Gram Yatra route in Madhya Pradesh	214
Exhibit 21: Tourism Asset Classification	216
Exhibit 22: Tourism Assets in Bandhavgarh ESZ.....	217
Exhibit 23: Existing Nature Based Assets in Bandhavgarh ESZ	217
Exhibit 24: Existing Culture Based Assets in Bandhavgarh ESZ	217
Exhibit 25: Existing Activity Based Assets in Bandhavgarh ESZ.....	217
Exhibit 26: Carrying capacity framework	242
Exhibit 27: Methodology adopted for calculating Carrying Capacity for TPA-1	244
Exhibit 28: Tourism Management Strategies	249
Exhibit 29: Proposed guidelines for biodiversity, ecosystem, cultural and heritage assets	249
Exhibit 30: Example for Interactive Signage Installation.....	255

LIST OF TABLES

Table 1: Methodology for Impact Analysis	25
Table 2:Suggestive Activity Classification for ESZ	84
Table 3: Preventive and Adaptive strategies for management of human-animal conflicts	193
Table 4: Snapshot of Bandhavgarh Tourism.....	218
Table 5: Core zone vehicle allowed and entry gate information	219
Table 6: Buffer zone vehicle allowed and entry gate information	219
Table 7: Existing Tourist zones in Core and buffer of Bandhavgarh ESZ	220
Table 8 Potential Nature Based Tourist Locations	224
Table 9 Potential sites for various activities in Bandhavgarh ESZ	225
Table 10 Potential Culture Based Tourist Locations	226
Table 11 Booking Office Information in Bandhavgarh ESZ	230
Table 12 Potential Circuits for Tourism Development	232
Table 13: Tourist population projections as per arithmetic projections	237
Table 14 Suggestive Guidelines for Construction	251
Table 15:Activity Classification for ESZ of Bandhavgarh National Park and Panpatha Wildlife Sanctuary	273
Table 16: Regulatory authorities for Regulated and promoted activities in ESZ	279

LIST OF MAPS

Map 1: Wildlife Corridors and Habitats in Bandhavgarh ESZ.....	29
Map 2 Sensitivity of Wildlife Corridors and Habitats in Bandhavgarh ESZ.....	30
Map 3 Streams (with order) in Bandhavgarh ESZ.....	34
Map 4 Sensitivity of Streams in Bandhavgarh ESZ.....	35
Map 5 Sensitivity of Lakes and Ponds in Bandhavgarh ESZ	36
Map 6 Sensitivity of Wetlands in Bandhavgarh ESZ	37
Map 7 Streams in Bandhavgarh PA and ESZ	38
Map 8 Sensitivity of Streams with Respect to Flow Direction in Bandhavgarh ESZ.....	39
Map 9 Sensitivity of Forest Land Use in Bandhavgarh ESZ.....	42
Map 10 Sensitivity of Agricultural Land Use in Bandhavgarh ESZ	43
Map 11 Sensitivity of Wasteland Use in Bandhavgarh ESZ.....	44
Map 12 Sensitivity of Built up and Water bodies Land Use in Bandhavgarh ESZ.....	45
Map 13 Sensitivity of areas in context to administrative boundaries in Bandhavgarh ESZ	47
Map 14 Ground Water Sensitivity in Bandhavgarh ESZ.....	49
Map 15 Sensitivity of Slope in Bandhavgarh ESZ.....	50
Map 16: Environmental Sensitivity in Bandhavgarh ESZ - Conceptual Zoning Idea	52
Map 17: Impact by movement of vehicles through NH and SH in Bandhavgarh ESZ	56
Map 18: Impact by movement of Vehicles through District roads and other roads in Bandhavgarh ESZ.....	57
Map 19: Impact of transmission lines in Bandhavgarh ESZ	58
Map 20: Impact by population density in Bandhavgarh ESZ.....	59
Map 21: Impact by the construction of pucca houses in Bandhavgarh ESZ	61
Map 22: Impact by performing intensive agriculture (projected for future as well) in Bandhavgarh ESZ.....	63
Map 23: Impact by collecting and using more fuel wood from the forest for cooking purposes	65
Map 24: Impact by extracting more ground water for fulfilling the daily requirements	67
Map 25: Impact by rearing livestock in Bandhavgarh ESZ.....	69
Map 26: Impact of noise from settlements on wildlife in Bandhavgarh ESZ	71
Map 27: Dependency on forest and its produce by the people living in Bandhavgarh ESZ	73
Map 28: Output of the Impact Analysis for the Bandhavgarh ESZ and surrounding areas	75
Map 29: Composite Zoning map for Bandhavgarh ESZ.....	77
Map 30: Example of areas identified for sustainable development, nature conservation and Restoration	79
Map 31: Wildlife crossing along SH-10 from Umaria to Manpur as per Wildlife corridors	110
Map 32: Potential Nature Based Tourist sites	227
Map 33: Potential Culture based tourism sites	228
Map 34: Potential sites for various activities in Bandhavgarh ESZ	229
Map 35: Tourist asset and Infrastructure in Bandhavgarh ESZ.....	231
Map 36: Tourism Zones in Core of Bandhavgarh ESZ.....	233
Map 37: Tourism Zones in Buffer of Bandhavgarh ESZ.....	234
Map 38: Location of Proposed Tourism Promotion Area.....	240
Map 39: Detailed map of TPA-1 and TPA-2.....	241
Map 40: Tiger corridors and areas of conflict.....	271
Map 41: Regulated zones for Bandhavgarh ESZ	272
Map 42: Government land parcels demarcated in North Chansura TPA and Camping zone	334
Map 43: Government land parcels demarcated in North Chechpur Tourism Promotion Area.....	335

LIST OF IMAGES

Image 1: Turtle saving program ,Phuket Thailand.....	95
Image 2: Example of use of cactus for bio-fencing in Tamil Nadu.....	96
Image 3: Plantation site in Khokra carried out by the villagers	103
Image 4: Greenhouse arrangement in the nursery (left) and women working in the nursery (right).....	104
Image 5: A view of tiger movement through the underpass created along Kanha-Pench corridor.....	108
Image 6: A safe passage for animals in Banff National Park	110
Image 7: Example of Community Awareness Programs for SWM in India.....	121
Image 8: Sarai at Toria has rammed-earth mud cottage.....	145
Image 9: Water sports at Puri Konark	148
Image 10: Hodka Village, Kutch	151
Image 11: Examples of Display boards (left) and the display panel marking sound levels (right)	153
Image 12: Fish farming in Thadipathar.....	181
Image 13: Agroforestry Practices in India from R-L – PBP, LDBP, HDBP	186
Image 14: Land Degradation caused by Wild boars (left) and intervention for entrapments (right).....	192
Image 15: Rail fences erected in Karnataka (left) and Fodder plantation and EPT in Tamil Nadu (right)	192
Image 16: Plantation site in Khokra carried out by the villagers	202
Image 17: Greenhouse arrangement (left) and women employed (right).....	203
Image 18: Goshala structure in Khokra and the facility	204
Image 19: Fish farming in Thadipathar.....	204
Image 20: Homestay under construction near Thadipathar by Gram sudhar Samiti.....	206
Image 21: New homestay constructed in Juri village	206
Image 22: Bamboo products made by villagers by hand in Thadipathar	207
Image 23: Training process illustrated from collection to assembling in the village.....	207
Image 24: Lantana based furniture made by villagers of Coimbatore	208
Image 25: Bandhavgarh Tiger Reserve Safari	218

LIST OF SUGGESTIVE GUIDELINES

Name of Suggestive Guidelines	Page Number
Guidelines for Sustainable construction practices	90
Guidelines for Railway lines and Power lines	130
Guidelines for forestry sector	136
Guidelines for Water sector	136
Guidelines for Agriculture sector	137
Guidelines for Energy sector	137
Guidelines for Tourism	138
Guidelines for heritage protection	139
Guidelines for agriculture	155
Guidelines for livestock management	157
Guidelines for abatement of air pollution	189
Guidelines for abatement of noise pollution	190
Guidelines for Cultural, Heritage and Nature-based site Management	249
Suggestive Guidelines for Construction	251
Guidelines for Facility Developer / Service Provider	254
Guidelines for Campsites	255
Guidelines for Local Communities	257
Guidelines for Visitors	258

ANNEXURE 1: ESZ NOTIFICATION FOR BANDHAVGARH ECO-SENSITIVE ZONE

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE

NOTIFICATION

New Delhi, the 13th December, 2016

S.O. 4027(E).—WHEREAS, a draft notification was published in the Gazette of India, Extraordinary, vide notification of the Government of India in the Ministry of Environment, Forest and Climate Change number S.O. 1244 (E), dated the 29th 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, objections and suggestions received from all persons and stakeholders in response to the draft notification have been duly considered by the Central Government;

AND WHEREAS, the Bandhavgarh National Park and Panpatha Wildlife Sanctuary are located in Umria district in the State of Madhya Pradesh and both the Protected Areas together constitute the core area of the Bandhavgarh Tiger Reserve (hereinafter referred to as Tiger Reserve) which is spread over 716.903 square kilometres;

AND WHEREAS, the Bandhavgarh Tiger Reserve is spread over an area of 1536.938 square kilometres of which 716.903 square kilometres is core area of the Tiger Reserve and 820.035 square kilometres is the buffer area;

AND WHEREAS, 373 species of flowering plants, 35 species of mammals, 238 species of birds and 111 species of butterflies have been recorded from the Tiger Reserve;

AND WHEREAS, the tiger reserve and the adjoining area is home to wildlife comprising rare endangered and threatened species of Sambar (*Cervus unicolor nigra*), sloth Bear (*Metursus ursinus*), Leoprad (*Panthera pardus*), Four-horned antelope (*Tetracerus quadricornis*), Striped Hyaena (*Hyaena hyaena*), Indian Wild Dog (*Cuon alpines*), Indian Pangolin (*Manis crassicaudata*), Tiger (*Panthera tigris*), Indian bison (*Bos gaurus*);

AND WHEREAS, the Tiger Reserve and the adjoining area is having rare endangered and threatened species of flora including Beeja/Beejasal (*Pterocarpus marsupium*), Bhirra/Bhirha (*Chloroxylon swietenio*).

AND WHEREAS, the Tiger Reserve and the adjoining area comprises rare endangered and threatened species of birds including Asian woolyneck (*ciconia*), Lesser Adjutant Stork (*Leptoptilos javanicus*), Common Pochard (*Aythya farina*), Sarus Crane (*Grus Antigone*), Black-headed Ibis (*Threskiornis melanocephalus*), Grey-headed Ibis (*Threskiornis melanocephalus*), Great Stone Plover(Beach Thick-Knee) (*Esacus magnirostris*), River Tern (*Sterna aurantia*), Alexandrine Parakeet (*Psittacula eupatria*), Pied Cucko (*Clamator jacobinus*), Malabar pied hornbill (*Anthracoceros coronatus*), Red-headed (king) Vulture (*Sarcogyps calvus*), Indian (long-billed) Vulture (*Gyps indicus*), White-rumped Vulture (*Gyps bengalensis*);

AND WHEREAS, it is necessary to conserve and protect the area the extent and boundaries of which is specified in paragraph 1 of this notification around the Bandhavgarh National Park and Panpatha Wildlife Sanctuary, which together constitute the core area of the Tiger Reserve, 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) and clauses (v) and (xiv) of sub-section (2) and sub-section (3) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Central Government hereby notifies the area up to an extent of two kilometers from the boundary of Bandhavgarh National Park and Panpatha Wildlife Sanctuary as Eco-sensitive Zone (herein after referred to as the Eco-sensitive Zone) details of which are as under, namely:-

1. Extent and boundaries of Eco-sensitive Zone.- (1) The Eco-sensitive Zone is spread over an area of 1030.382 square kilometre with an extent of up to two kilometers from the boundary of Bandhavgarh National Park and Panpatha Wildlife Sanctuary and the co-ordinates of core area and the boundary description of the Eco-sensitive Zone is appended as Annexure-I.

(2) The Eco-sensitive Zone is spread over an area of 1030.382 square kilometres which includes 132 villages in three Districts viz. Umaria, Katni and Shahdol of the Madhya Pradesh State.

(3) The map of the Eco-sensitive Zone along with latitude and longitude is appended as Annexure II.

(4) The list of the villages falling within the Eco-sensitive Zone along with co-ordinates of prominent points is appended as Annexure III.

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 final notification in the Official Gazette, in consultation with local people and adhering to the stipulations given in this notification.

(2) The Zonal Master Plan shall be approved by the competent authority in the State Government.

(3) 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.

(4) The Zonal Master Plan shall be prepared in consultation with all concerned State Departments, namely:-

(i) Environment;

(ii) Forest;

(iii) Urban Development;

(iv) Eco-tourism;

(v) Municipal ;

(vi) Revenue ;

(vii) Agriculture ;

(viii) State Pollution Control Board;

(ix) Irrigation;

(x) Public Works Department;

for integrating environmental and ecological considerations into it.

(5) 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.

(6) The Zonal Master Plan shall provide for restoration of denuded 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.

(7) The Zonal Master Plan shall demarcate all the existing worshipping places, village 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.

(8) The Zonal Master Plan shall regulate development in the Eco-sensitive Zone as to ensure eco-friendly development for livelihood security of local communities.

(9) As the buffer zone of the Tiger Reserve is part of the Eco-sensitive Zone, the Tiger Conservation plan relating to the buffer zone shall also be taken into consideration during preparation of the Zonal Master Plan.

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) **Land use.**—Forests, horticulture areas, agricultural areas, parks and open spaces earmarked for recreational purposes in the Eco-sensitive Zone shall not be used or converted into areas for commercial or industrial related development activities:

Provided that the conversion of agricultural lands within the Eco-sensitive Zone may be permitted on the recommendation of the Monitoring Committee, and with the prior approval of the State Government, to meet the residential needs of local residents, and for the activities listed against serial numbers 9,16,22,33 and 36 in column (2) of the Table in paragraph 4, namely:—

- (i) Eco-friendly cottages for temporary occupation of tourists, such as tents, wooden houses, etc. for Eco-friendly tourism activities;
- (ii) widening and strengthening of existing roads and construction of new roads;
- (iii) small scale industries not causing pollution;
- (iv) rainwater harvesting; and
- (v) cottage industries including village industries, convenience stores and local amenities:

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 above 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.

(2) **Natural springs.**—The catchment areas of all natural springs shall be identified and plans for their conservation and rejuvenation shall be incorporated in the Zonal Master Plan and the guidelines shall be drawn up by the State Government in such a manner as to prohibit development activities at or near these areas which are detrimental to such areas.

(3) **Tourism.**—(a) The activity relating to eco-tourism within the Eco-sensitive Zone shall be as per tourism Master Plan, which shall form part of the Zonal Master Plan.

(b) The Tourism Master Plan shall be prepared by Department of Tourism, Government of Madhya Pradesh in consultation with Department of Revenue and Forests, Government of Madhya Pradesh.

(c) The activity of tourism shall be regulated as under, namely:—

(i) 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, eco-education and eco-development and based on carrying capacity study of the Eco-sensitive Zone;

(ii) new construction of hotels and resorts shall not be permitted within one kilometre from the boundary of the Tiger Reserve except for accommodation for temporary occupation of tourists related to eco-friendly tourism activities:

Provided that beyond the distance of one kilometre from the boundary of the protected area till the extent of the Eco-sensitive Zone, the extension of existing establishments may be allowed in accordance with the Zonal Master Plan:

Provided further that beyond one kilometer upto the extent of the Eco-sensitive Zone construction of new hotels and resorts may be permitted as per Zonal Master Plan.

(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 preserved and plan shall be drawn up for their protection and conservation, within six months from the date of publication of this notification and such plan shall form part of the Zonal Master Plan.

(5) **Man-made heritage sites.**- Buildings, structures, artefacts, areas and precincts of historical, architectural, aesthetic, and cultural significance shall be indentified in the Eco-sensitive Zone and plans for their conservation shall be prepared within six months from the date of publication of this notification and incorporated in the Zonal Master Plan.

(6) **Noise pollution.**- The Environment Department of the State Government shall draw up guidelines and regulations for the control of noise pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder.

(7) **Air pollution.**- The Environment Department of the State Government shall draw up guidelines and regulations for the control of air pollution in the Eco-sensitive Zone in accordance with the provisions of the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the rules made thereunder.

(8) **Discharge of effluents.**- The discharge of treated effluent in Eco-sensitive Zone shall be in accordance with the provisions of the Water (Prevention and Control of Pollution) Act, 1974 (6 of 1974) and the rules made thereunder.

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

(i) the solid waste disposal in the Eco-sensitive Zone shall be carried out in accordance with the provisions of 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 as amended from time to time;

(ii) the local authorities shall draw up plans for the segregation of solid wastes into biodegradable and non-biodegradable components;

(iii) the biodegradable material shall be recycled preferably through composting or vermiculture;

(iv) the inorganic material may be disposed in an environmentally acceptable manner at site(s) identified outside the Eco-sensitive Zone and no burning or incineration of solid wastes shall be permitted in the Eco-sensitive Zone.

(10) **Bio-medical waste.**- The bio-medical waste disposal in the Eco-sensitive Zone shall be carried out in accordance with the provisions of 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 G.S.R 343 (E), dated the 28th March, 2016, as amended from time to time.

(11) **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.

(12) **Industrial units.**- (a) No establishment of new wood based industries within the proposed Eco-sensitive Zone shall be permitted except the existing wood based industries set up as per the law.

(b) No establishment of any new industry causing water, air, soil, noise pollution within the proposed Eco-sensitive Zone shall be permitted.

4. List of activities prohibited or to be regulated within the Eco-sensitive Zone.- All activities in the Eco-sensitive Zone shall be governed by the provisions of the Environment (Protection) Act, 1986 (29 of 1986) and the rules made thereunder, and be regulated in the manner specified in the table below, namely:-

TABLE

S. No.	Activity	Remarks
(1)	(2)	(3)
Prohibited activities		
1.	Commercial mining, stone quarrying and crushing units.	<p>(a) 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 <i>bona fide</i> 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.</p> <p>(b) 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 Hon'ble Supreme Court dated the 21st April, 2014 in the matter of</p>

		Goa Foundation Vs. Union of India in Writ Petition (Civil) No.435 of 2012.
2.	Setting up of saw mills.	No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
3.	Setting up of industries causing water or air or soil or noise pollution.	No new or expansion of polluting industries in the Eco-sensitive Zone shall be permitted.
4.	Commercial use of firewood.	Prohibited (except as otherwise provided) as per applicable laws.
5.	Establishment of new major hydroelectric projects and irrigation projects.	Prohibited (except as otherwise provided) as per applicable laws.
6.	Use or production of any hazardous substances.	Prohibited (except as otherwise provided) as per applicable laws.
7.	Discharge of untreated effluents and solid waste in natural water bodies or land area.	Prohibited (except as otherwise provided) as per applicable laws.
8.	New wood based industry.	<p>No establishment of new wood based industry shall be permitted within the limits of Eco-sensitive Zone:</p> <p>Provided that the existing wood-based industry may continue as per law:</p> <p>Provided further that the renewal of licenses of existing saw mills shall not be done on their expiry period.</p>
Regulated activities		
9.	Establishment of hotels and resorts.	<p>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.</p> <p>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.</p>
10.	Undertaking activities related to tourism like over-flying the National Park Area by aircraft, hot-air balloons.	Prohibited (except as otherwise provided) as per applicable laws.
11.	Construction activities.	<p>(a) 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.</p> <p>Provided that, local people shall be permitted to undertake construction in their land for their residential use including the activities listed in sub-paragraph (1) of paragraph 3:</p> <p>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.</p> <p>(b) Beyond one kilometer upto the extent of Eco-Sensitive Zone, construction for <i>bona fide</i> local needs shall be allowed and other construction activities shall be regulated as per the Zonal Master Plan.</p>
12.	Felling of trees.	(a) There shall be no felling of trees on the forest or Government or revenue or private lands without prior permission of the competent authority in the State Government;

		(b) The felling of trees shall be regulated in accordance with the provisions of the concerned Central or State Act and the rules made thereunder. (c) In case of Reserve Forests and Protected Forests the Working Plan prescriptions shall be followed.
13.	Commercial water resources including ground water harvesting.	(a) The extraction of surface water and ground water shall be permitted only for <i>bona fide</i> agricultural use and domestic consumption of the occupier of the land. (b) Extraction of surface water and ground water for industrial or commercial use including the amount that can be extracted, shall require prior written permission from the concerned regulatory authority. (c) No sale of surface water or ground water shall be permitted. (d) Steps shall be taken to prevent contamination or pollution of water from any source including agriculture.
14.	Erection of electrical cables and telecommunication towers.	(i) Erection of New electric poles and cables to be permitted only for villages/areas where there is no electricity. (ii) Augmentation/renovation of Existing electric lines is permitted. (iii) Promote underground cabling.
15.	Fencing of existing premises of hotels and lodges.	(i) Regulated under applicable laws. (ii) Shall be done in a manner to allow free movement of wildlife. (iii) Existing fencing of establishments not compliant with the above condition shall be removed or modified to meet the requirement within six months from the date of final notification.
16.	Widening and strengthening of existing roads.	Shall be done with proper Environment Impact Assessment and mitigation measures, as applicable.
17.	Movement of vehicular traffic at night.	Regulated for commercial purpose, under applicable laws.
18.	Introduction of exotic species.	Regulated under applicable laws.
19.	Protection of hill slopes and river banks.	Regulated under applicable laws.
20.	Discharge of treated effluents in natural water bodies or land area.	Recycling of treated effluent shall be encouraged and for disposal of sludge or solid wastes, the existing regulations shall be followed.
21.	Commercial sign boards and hoardings.	Regulated under applicable laws.
22.	Small scale industries not causing pollution.	Non polluting, non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro-based industry producing products from indigenous goods from the Eco-sensitive Zone, and which do not cause any adverse impact on environment shall be permitted.
23.	Collection of Forest produce or Non-Timber Forest Produce.	Regulated under applicable laws.
24.	Air and vehicular pollution.	Regulated under applicable laws.
25.	Drastic change of agriculture systems.	Regulated under applicable laws.
26.	Trenching Ground.	No new trenching shall be established. However, existing trenching ground will be operated subject to the condition that no open burning will be allowed.
27.	Dairy activities and Cattle rearing.	Regulated as per applicable laws.
28.	Use of polythene bags .	Regulated as per applicable laws.

29.	Goat Farming.	Regulated as per applicable laws.
30.	Solid Waste Management.	Regulated as per applicable laws.
31.	Eco-tourism activities.	Regulated as per applicable laws.
Promoted activity		
32.	Ongoing agriculture and horticulture practices by local communities.	Permitted under applicable laws.
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 sources.	Bio gas, solar light, etc. to be promoted.
38.	Environmental Awareness.	Shall be actively promoted.
39.	Skill Development.	Shall be actively promoted.
40.	Agro-forestry.	Shall be actively promoted.
41.	Community Nature Reserves.	Shall be actively promoted.

5. **Monitoring Committee.**— (1) The Central Government hereby constitutes a Monitoring Committee, for effective monitoring of the Eco-sensitive Zone, which shall comprise of the following, namely:—

- (i) Divisional Commissioner, Shahdol Chairman;
- (ii) Divisional Commissioner, Jabalpur Member;
- (iii) District Collector, Umaria Member;
- (iv) District Collector, Shahdol Member;
- (v) District Collector, Katni Member;
- (vi) Superintending Engineer PWD, Shahdol Member;
- (vii) Superintending Engineer Public Health Department, Shahdol Member;
- (viii) CEO of District Panchayat, Umaria Member;
- (ix) CEO of District Panchayat, Shahdol Member;
- (x) CEO of District Panchayat, Katni Member;
- (xi) Representative of the Town & Country Planning Department Member;
- (xii) Representative of the Madhya Pradesh Pollution Member;

Control Board

- (xiii) 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;
- (xiv) 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;
- (xv) Member State Biodiversity Board - Member
- (xvi) Field Director, Bandhavgarh Tiger Reserve, Umaria Member- Secretary.

2. **Terms of Reference.**— (i) The Monitoring Committee shall monitor the compliance of the provisions of this notification.

- (ii) The tenure of the Committee shall be three years.

29.	Goat Farming.	Regulated as per applicable laws.
30.	Solid Waste Management.	Regulated as per applicable laws.
31.	Eco-tourism activities.	Regulated as per applicable laws.
Promoted activity		
32.	Ongoing agriculture and horticulture practices by local communities.	Permitted under applicable laws.
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 sources.	Bio gas, solar light, etc. to be promoted.
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(i) Divisional Commissioner, Shahdol	Chairman;
(ii) Divisional Commissioner, Jabalpur	Member;
(iii) District Collector, Umaria	Member;
(iv) District Collector, Shahdol	Member;
(v) District Collector, Katni	Member;
(vi) Superintending Engineer PWD, Shahdol	Member;
(vii) Superintending Engineer Public Health Department, Shahdol	Member;
(viii) CEO of District Panchayat, Umaria	Member;
(ix) CEO of District Panchayat, Shahdol	Member;
(x) CEO of District Panchayat, Katni	Member;
(xi) Representative of the Town & Country Planning Department	Member;
(xii) Representative of the Madhya Pradesh Pollution	Member;

2. **Terms of Reference.**-(i) The Monitoring Committee shall monitor the compliance of the provisions of this notification.

(ii) The tenure of the Committee shall be three years.

(iii) 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 the prohibited activities as specified in column(3) of 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, Forest and Climate Change for prior environmental clearances under the provisions of the said notification.

(iv) 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 but are falling in the Eco-sensitive Zone, except the prohibited activities as specified in column (3) of 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.

(v) The Member-Secretary of the Monitoring Committee or the concerned District Collector or the concerned Park in-charge 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.

(vi) 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.

(vii) 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 in the State Government as per proforma given in Annexure IV.

(viii) 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 National Green Tribunal.

Annexure-I

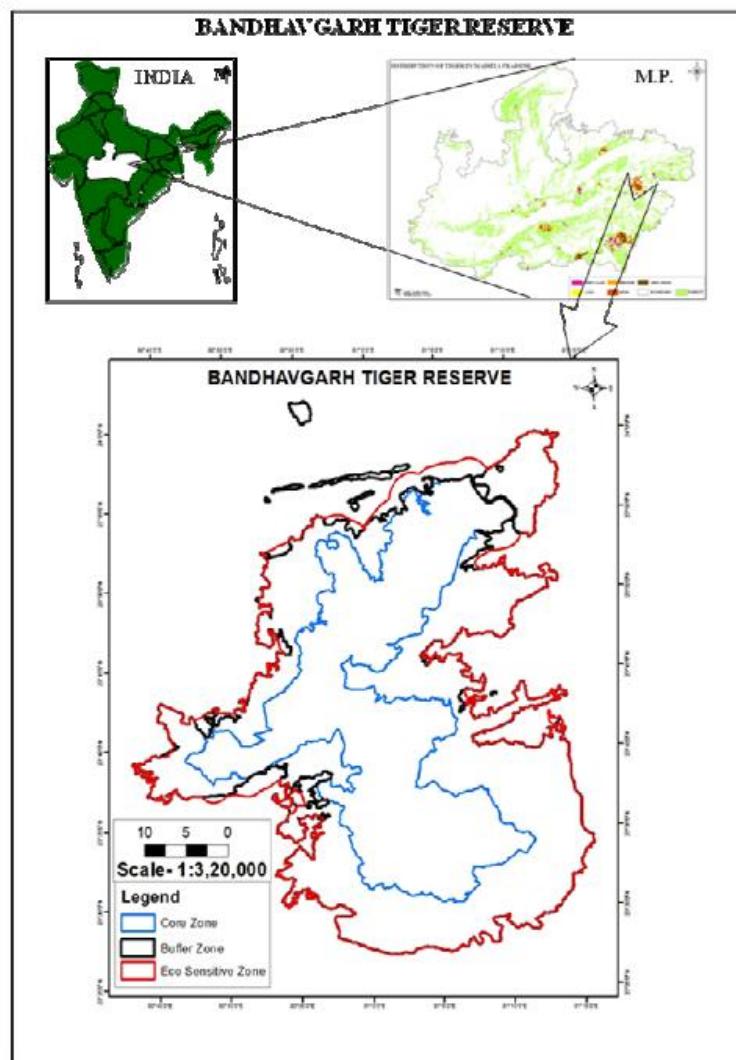
Co-ordinates of Core area of the Eco-sensitive Zone

S. No	Latitude	Longitude
A	23°29'48.9"	80°46'55.2"
B	23°57'2.6"	80°46'55.2"
C	23°57'2.6"	81°11'48.3"
D	23°29'48.9"	81°11'48.3"

Eco Sensitive Zone having distance of 2 KM. from Core boundary

S. No	Latitude	Longitude
A	23°27'17.5"	80°43'19.2"
B	23°59'45.1"	80°43'19.2"
C	23°59'45.1"	81°15'43.3"
D	23°27'17.5"	81°15'43.3"

MAP OF ECO-SENSITIVE ZONE WITH LATITUDES AND LONGITUDES



**ANNEXURE 2: LIST OF VILLAGES IDENTIFIED IN BANDHAVGARH ESZ AS PER
NOTIFICATION**

No.	Name of village	District	Lat	Long
1.	Atariya	Umaria	23.694324	80.792351
2.	Badkhera/Panjraha	Umaria	23.655582	81.113183
3.	Badrehal	Umaria	23.583273	80.964365
4.	Badwahi	Umaria	23.773750	80.956400
5.	Badwahi	Umaria	23.536404	81.139076
6.	Badwahi/Medaha	Umaria	23.536404	81.139076
7.	Badwar	Umaria	23.543846	80.931738
8.	Bagdara	Katni	23.685528	80.861861
9.	Bagdari (FV)	Umaria	23.698521	80.883706
10.	Bagdari/Mautola/Karkachaha	Umaria	23.554444	81.174703
11.	Bagdo	Umaria	23.877139	81.129833
12.	Bakeli	Umaria	23.800389	80.923861
13.	Bardauha	Umaria	23.591967	80.886167
14.	Bartara	Umaria	23.647504	80.882888
15.	Baskuta	Umaria	23.469967	81.007113
16.	Bharhut/Pipra Tola	Umaria	23.469967	81.007113
17.	Bijauri/Harri/Kachhratola	Umaria	23.691698	81.179885
18.	Bijhariya	Umaria	23.726105	81.052019
19.	Bhamraha	Umaria	23.936220	81.138110
20.	Chandwar	Umaria	23.726105	81.052019
21.	Chansura	Umaria	23.726105	81.052019
22.	Chechariya	Umaria	23.514569	81.156519
23.	Chenjhur	Umaria	23.576740	81.182676
24.	Chhapar	Umaria	23.613900	80.925653
25.	Chhapdaur	Umaria	23.726105	81.052019
26.	Chhatantola	Umaria	23.515644	80.982377
27.	Chhayan	Umaria	23.613900	80.925653
28.	Chhot Marai (Marai Khurd)	Umaria	23.954250	81.095972
29.	Chhoti Khari	Shahdol	23.613900	80.925653
30.	Chilhari	Umaria	23.514569	81.156519
31.	Chirwah	Umaria	23.608776	80.825455
32.	Chitraon	Umaria	23.726105	81.052019
33.	Chorha	Umaria	23.608776	80.825455
34.	Dadraudi	Umaria	23.660146	80.765898
35.	Damna	Umaria	23.678531	81.105884
36.	Deori	Umaria	23.643819	81.099246
37.	Deori (Hunchara)	Umaria	23.643819	81.099246
38.	Dhakodar	Umaria	23.632197	80.929358
39.	Dhamokhar	Umaria	23.638306	80.788333
40.	Dhaurkhol/Bandhadev	Umaria	23.643819	81.099246
41.	Dobha	Umaria	23.746056	80.978750

42.	Dulahara	Umaria	23.726596	81.117208
43.	Gajaraha	Umaria	23.734750	80.923667
44.	Garhrola	Umaria	23.719556	80.966611
45.	Gata	Umaria	23.673240	81.103358
46.	Ghaghaud	Umaria	23.689784	81.104002
47.	Ghaghdar	Umaria	23.590570	80.935030
48.	Ghunsu	Umaria	23.488663	80.958334
49.	Gidari	Umaria	23.504431	81.114445
50.	Gobratal	Umaria	23.645375	81.176729
51.	Gohadi	Umaria	23.645539	80.979579
52.	Goraiya	Umaria	23.494375	81.044559
53.	Guruwahi	Umaria	23.753088	81.029845
54.	Hardi	Umaria	23.948472	81.108944
55.	Hardua	Umaria	23.763612	80.884654
56.	Hirauli	Umaria	23.653672	81.189730
57.	Jamunara	Umaria	23.736502	81.066445
58.	Jhal	Umaria	23.938694	81.068750
59.	Jhalwar	Umaria	23.938694	81.068750
60.	Karchuliha	Katni	23.706471	80.794724
61.	Karondi	Umaria	23.530793	81.151202
62.	Katahar	Umaria	23.822500	80.980867
63.	Kathai	Umaria	23.716525	81.160561
64.	Kathli	Umaria	23.721646	81.081520
65.	Kelhari	Umaria	23.721646	81.081520
66.	Khaira	Umaria	23.732697	81.073693
67.	Khamha	Umaria	23.712860	81.091671
68.	Kharibadi	Shahdol	23.613900	80.925653
69.	Kherwakala	Umaria	23.612260	80.854592
70.	Khichhkidi/Sontola	Umaria	23.627583	81.139611
71.	Khitauli	Katni	23.708333	80.832222
72.	Khusariya	Shahdol	23.708333	80.832222
73.	Khusarwah	Umaria	23.708333	80.832222
74.	Kodar	Umaria	23.624233	80.885062
75.	Kuchwahi	Umaria	23.739228	81.044550
76.	Kudari	Umaria	23.739228	81.044550
77.	Kudri tola	Umaria	23.919900	81.044600
78.	Kudri/Khohari	Umaria	23.919900	81.044600
79.	Kudia (Viran)	Umaria	23.879280	80.958530
80.	Kumharra	Umaria	23.571483	81.085833
81.	Kuthuliya	Umaria	23.857067	81.040483
82.	Lakhnauti	Umaria	23.818056	81.101583
83.	Lakhumar	Umaria	23.712860	81.091671
84.	Mahaman	Umaria	23.667196	80.964805
85.	Majhauli	Umaria	23.855917	81.007278
86.	Majhauli	Umaria	23.673383	80.937900

87.	Majhauli (Son)	Umaria	23.712860	81.091671
88.	Majhauli/Mairi	Umaria	23.712860	81.091671
89.	Majhgawa	Umaria	23.612260	80.854592
90.	Majkheta	Umaria	23.638538	81.071200
91.	Makra	Umaria	23.638538	81.071200
92.	Mala	Umaria	23.732697	81.073693
93.	Malahara	Umaria	23.627583	81.139611
94.	Mantola	Umaria	23.772550	81.127445
95.	Marai Kalan	Umaria	23.626483	81.172620
96.	Mardari	Umaria	23.692917	80.882528
97.	Marhaun	Umaria	23.692917	80.882528
98.	Medki	Katni	23.703864	80.831574
99.	Medra	Katni	23.703864	80.831574
100.	Narwar/Dongritola	Umaria	23.471941	81.049628
101.	Naugama	Umaria	23.471941	81.049628
102.	Neosi	Umaria	23.471941	81.049628
103.	Nipaniya	Katni	23.626483	81.172620
104.	Padwar	Umaria	23.626483	81.172620
105.	Paljha	Umaria	23.647982	81.141195
106.	Panpatha	Umaria	23.692917	80.882528
107.	Parasi (Gadawah)	Umaria	23.692917	80.882528
108.	Pataur	Umaria	23.774767	81.035900
109.	Patehara	Umaria	23.626483	81.172620
110.	Pathari	Umaria	23.626483	81.172620
111.	Patparaha	Umaria	23.525488	80.969239
112.	Pitor	Umaria	23.525488	80.969239
113.	Raghopur	Umaria	23.525488	80.969239
114.	Raipur/Sayapur	Umaria	23.663806	80.763583
115.	Rakhi (Amodar)	Umaria	23.724074	81.062096
116.	Ranchha	Umaria	23.731972	80.982083
117.	Rohaniya	Umaria	23.464117	81.080129
118.	Sakariya	Umaria	23.502249	81.120019
119.	Salaiya	Umaria	23.630639	80.794111
120.	Salkhaniya	Umaria	23.758361	80.898611
121.	Samarkoini	Umaria	23.625230	81.158750
122.	Sarwaniya	Umaria	23.603690	80.868521
123.	Sehra	Umaria	23.881583	81.153194
124.	Sehra tola	Umaria	23.471850	80.984367
125.	Semra	Umaria	23.735596	80.852031
126.	Semri	Umaria	23.792138	81.125142
127.	Sukhdas	Umaria	23.792138	81.125142
128.	Tala	Umaria	23.721361	81.017130
129.	Tali	Umaria	23.627861	80.820361
130.	Tekan	Katni	23.881583	81.153194
131.	Umaria	Umaria	23.804800	80.936467
132.	Urdana	Umaria	23.804800	80.936467

ANNEXURE 3: CHAPTERS

CHAPTER 1: PLANNING A GREEN LANDSCAPE

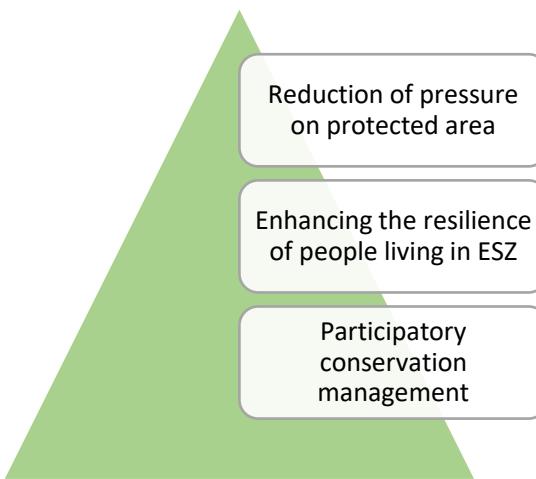
1.1 The vision

The vision for Bandhavgarh 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. (Copy of the notification attached). 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 Periyar 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; others 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 Bandhavgarh National Park, 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 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

¹ Bovarnick and Gupta 2003

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

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

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 cases ².
- **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 conflicts ². 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 construction ⁷.
- **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

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)

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.



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 Eco-Sensitive Zones • 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.

Sector	Short term objective
	<ul style="list-style-type: none"> • 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 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 Bandhavgarh 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 Bandhavgarh 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.
- Sensitization of local self-governance to environmental conservation

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)

Sensitivity/Intensity	High	Medium	Low
Legends	Critical areas with absolute very high protection 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 ESZ 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. Corridors are important for maintaining genetic diversity and vigor thereby addressing the problem of inbreeding. It is important, therefore, that vegetation remnants and vegetated corridors are maintained and enhanced as a network across all landscapes 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

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

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

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. Analysis of Bandhavgarh Eco Sensitive Zone

The Bandhavgarh Tiger Reserve and its ESZ supports a diverse flora and fauna. It has ecosystems within, which provides optimum surroundings for species to thrive by providing habitats, breeding spaces and corridors for movement and survival. Thus, any change in the local (or regional) ecosystem can hamper the flora and fauna of the area. Corridors are critical for the maintenance of ecological processes including allowing for the movement of animals and the continuation of viable populations. Corridors provide for movement of keystone and other important species and connects habitats in different P.A.s.

Thus, it becomes vital to analyze the sensitivity of these corridors, habitats and congregation areas which, if altered, might affect the population and mix of the fauna within the ESZ and surrounding areas. The major wildlife corridor, minor wildlife corridor, and wildlife habitats and congregation areas of the Bandhavgarh ESZ.

The Bandhavgarh Tiger Reserve and its ESZ forms a part of corridor connecting Sanjay Dubri Tiger Reserve and Kanha Tiger Reserve in Madhya Pradesh, and Achanakmar Tiger Reserve in Chhattisgarh. The major corridor (regional corridor, with width >500 m) connecting these larger important areas of habitat provide not only for dispersal of individual species and cross breeding to maintain genetic vigor but act as habitat in their own right for a range of species. It runs along the North- South direction, through the Tiger Reserve and its ESZ, starting from Panpatha Wildlife Sanctuary in the North- Eastern part of the area, falling in Shahdol District to the Southern part of the study area, falling in the Umaria District. Almost 20% of the total ESZ area serves as a major wildlife corridors.

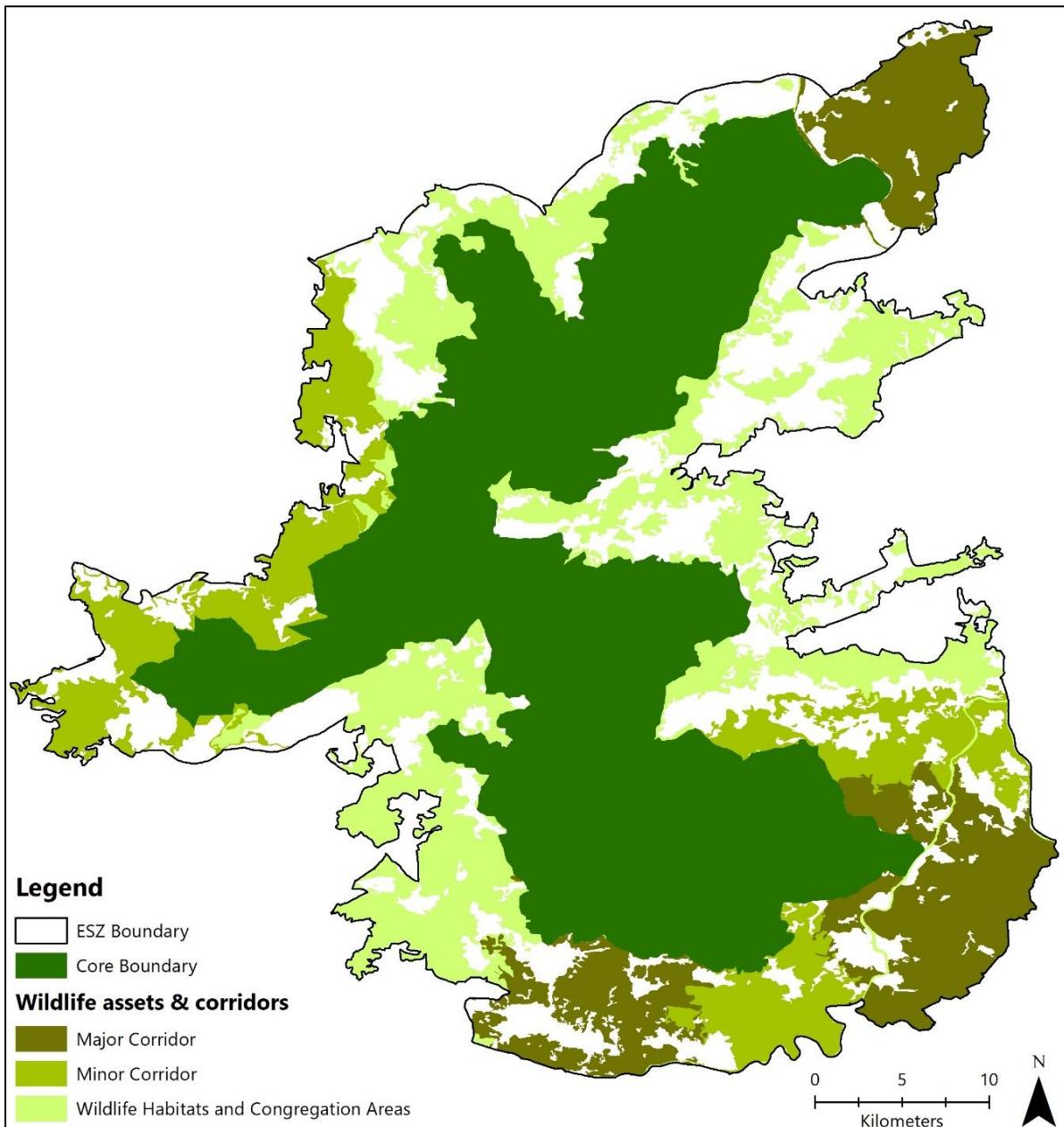
Minor corridors are smaller, less defined linkages that provide local connection of remnant patches of vegetation and landscape features. Minor corridors are an important component of an overall regional landscape conservation framework. The minor corridors in Bandhavgarh ESZ connect the major wildlife corridors in the South, go to the forest areas in the West, beyond the ESZ and extend in the East, connecting Sanjay Tiger Reserve. The minor wildlife corridor amounts to almost 19% of the total ESZ area.

Bandhavgarh ESZ provides habitat and congregation areas to a wide range of fauna and flora. Habitats are of various types depending on the fauna and their basic instincts, like scrub lands,

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

rocky areas, dense forest, etc. These are largely spread over the ESZ area in all directions (North, East, South and West). Almost 30% of the ESZ acts as habitat for a large number of wildlife.

Map 1: Wildlife Corridors and Habitats in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

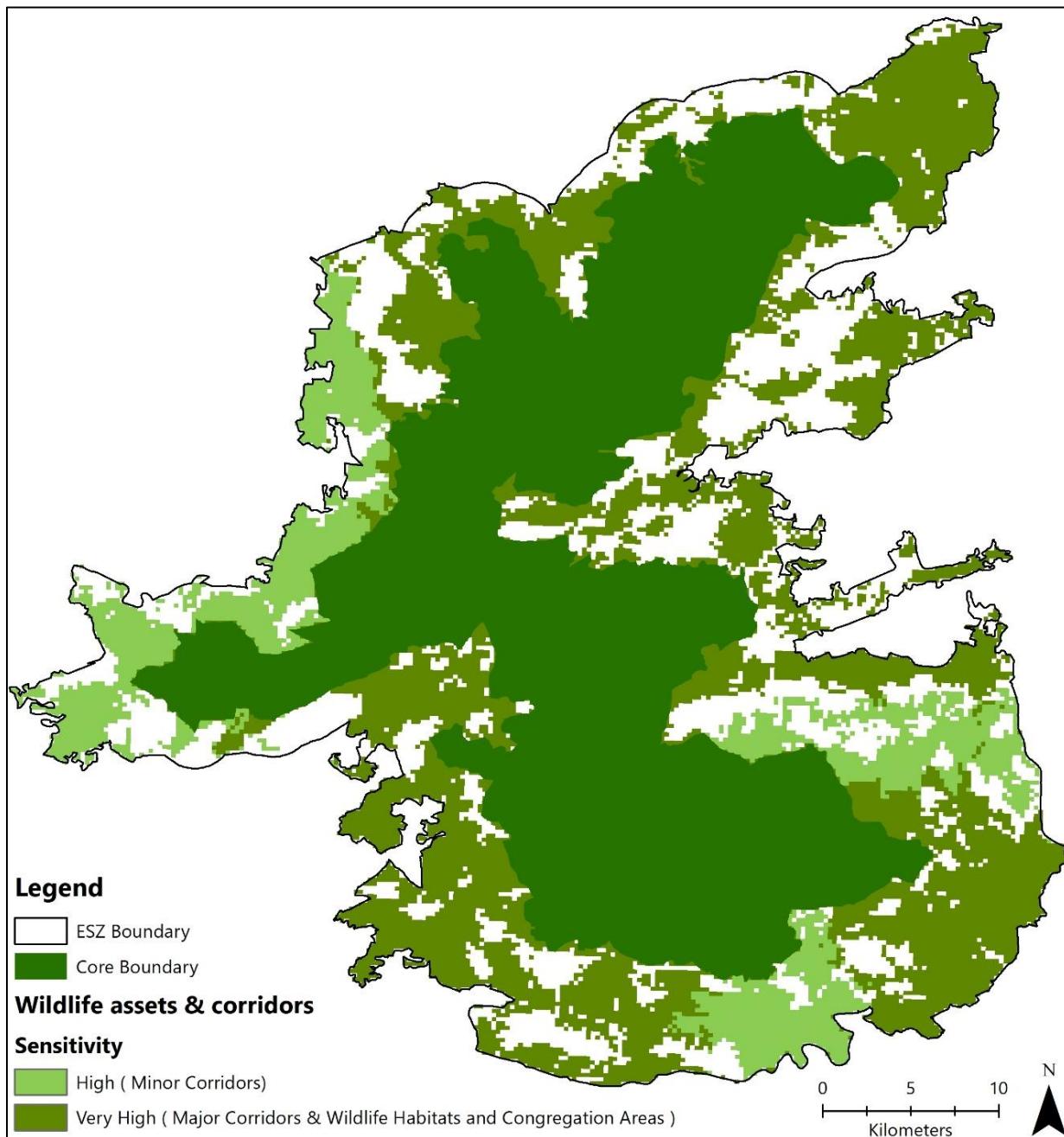
The sensitivity of wildlife corridors and habitats in the Bandhavgarh ESZ has been illustrated in map above. It shows that the around 50% of the ESZ has very high sensitivity with respect to major wildlife corridors and habitats. This is due to the presence of major wildlife species and their movement to different forest areas through these routes.

Major concentration of ESZ areas with very high sensitivity are found near deciduous forest and scrub forest in Southern, Eastern and Northern part of the ESZ. Presence of water bodies in these

areas also drive the frequent incidence of wildlife species, thus increasing its sensitivity to any alterations in the landscape.

The Western and parts of Eastern and Southern areas of the ESZ have high sensitivity due to the presence of minor corridors supporting the movement of species through the habitats and major corridors. This amounts to almost 19% of the total ESZ area.

Map 2 Sensitivity of Wildlife Corridors and Habitats in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

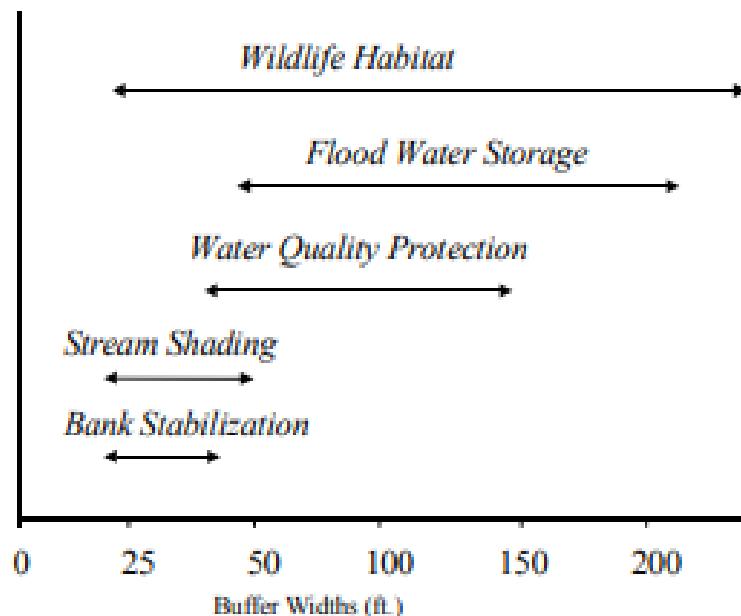
2.1.1.2 Surface Water

Surface water bodies play an important role in maintaining hydrological balance, providing a source of drinking water, continuing ground water recharge, moderating the climate etc.. However, lack of awareness about their values and functions and conservation efforts leads to degradation of these water bodies over a certain period of time. Considering its importance in hydrological cycle and in sustaining wildlife as well as human wellbeing it becomes important to understand the state of criticality for surface water bodies in the study area. Streams, Lakes, and water bodies which are a hydrological continuum 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 criteria 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 10 - 100 100 - 500 500+	Acres	1 2 3 4	Very small lakes/ponds Small lakes Medium lakes 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 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.

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

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

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 in to the protected wetlands.)

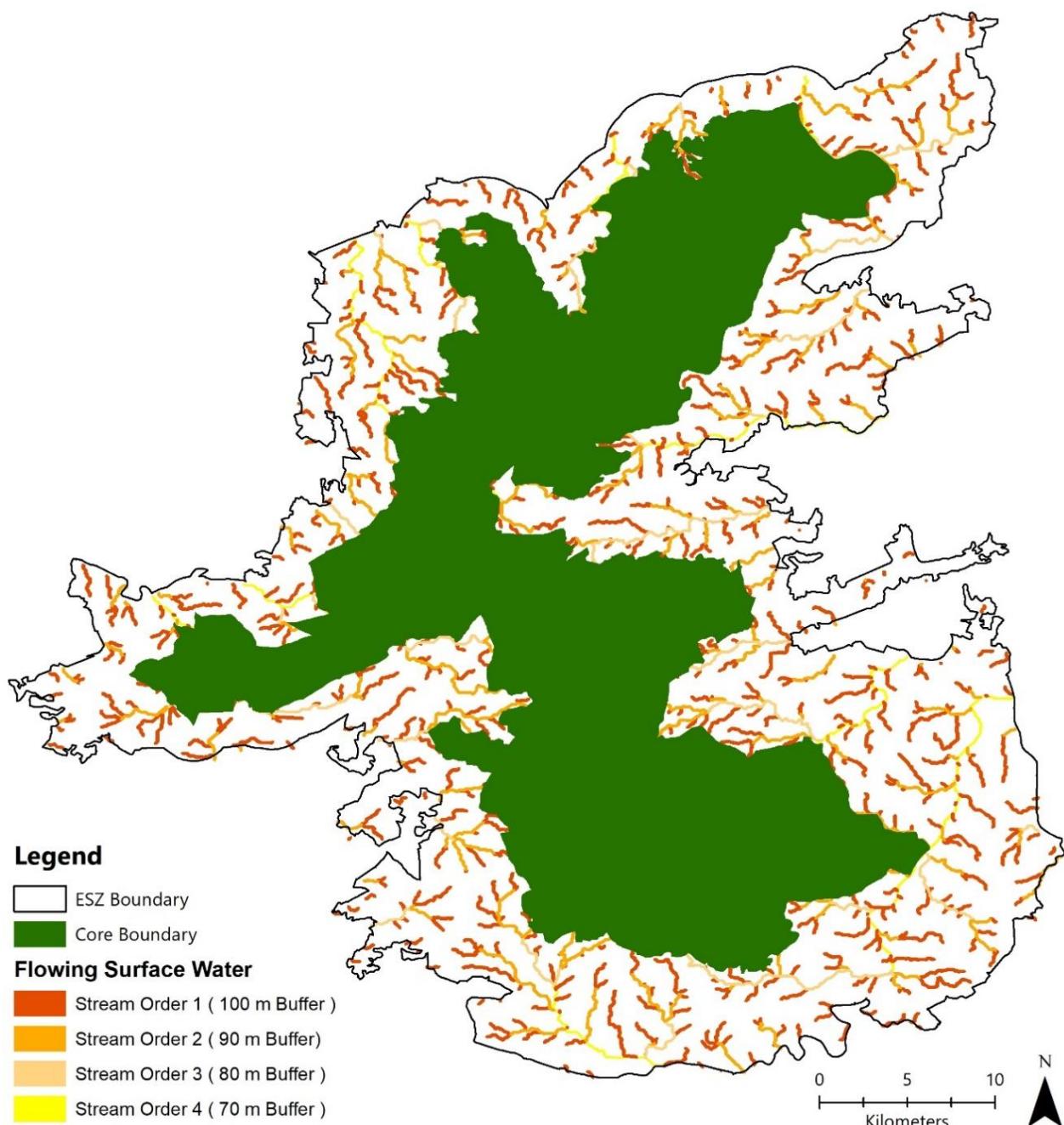
S.No.	Buffer from Wetland (in meters)	Sensitivity
1	50	Very High
2	100	High
3	200	Medium

D. Analysis of Bandhavgarh Eco Sensitive Zone

Streams: The Bandhavgarh ESZ has a number of streams originating within and flowing outside the ESZ, joining major rivers like Johilla, Charanganga, Damnar and eventually to Son River. The ESZ area has streams flowing up to 4th order. These are represented in map below. The first order streams serve as the source of water to the subsequent higher order streams. Thus, the sensitivity of these (origin) is of highest importance as if the flow during initial stage is disrupted, the flow of the final river will be affected.

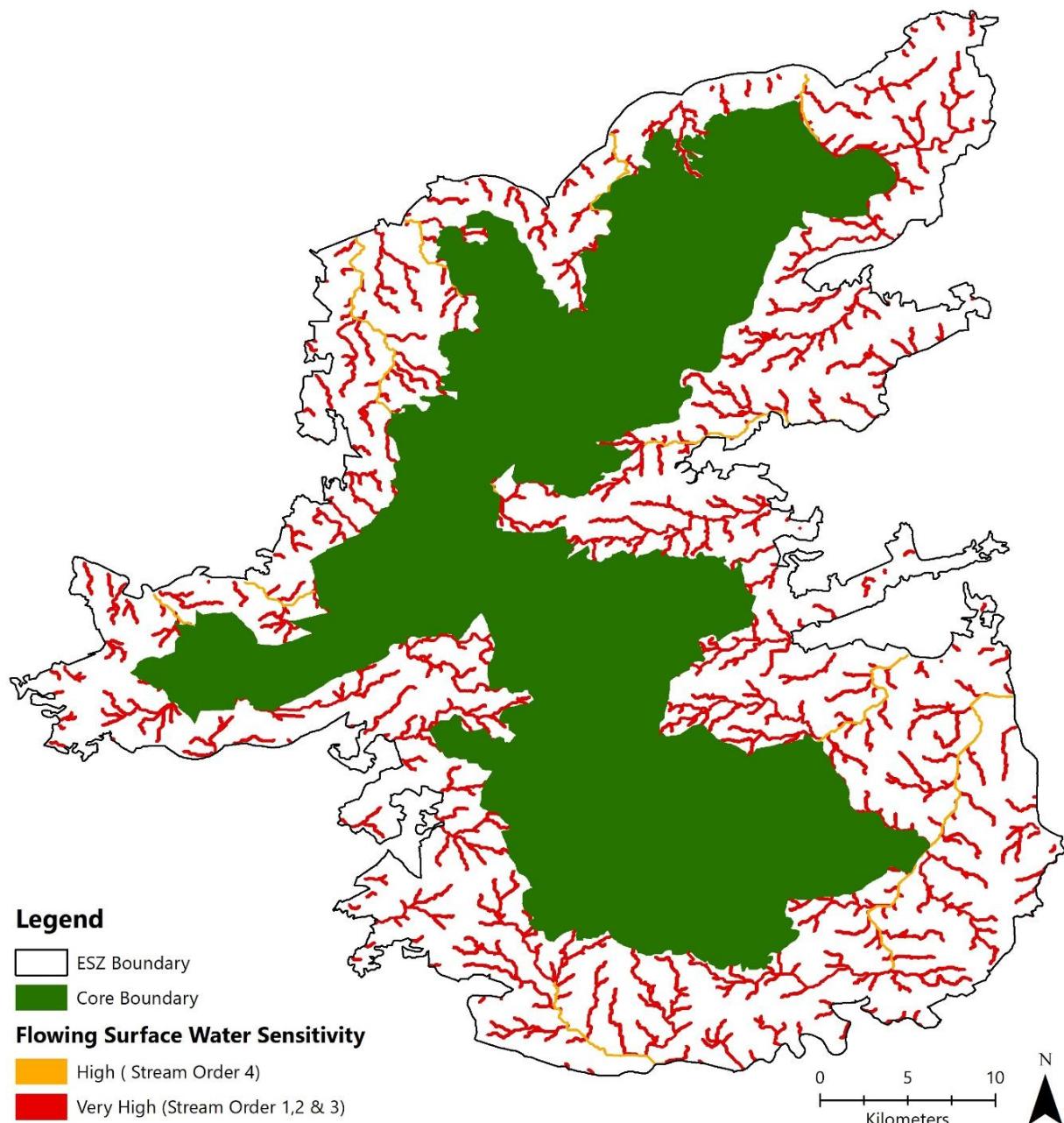
¹⁷ <https://eaaflyway.net/wp-content/uploads/2017/11/WRCWN04.pdf>

Map 3 Streams (with order) in Bandhavgarh ESZ



The sensitivity of streams is depicted in map below. It shows that the area along the first, second and third order stream spread across the ESZ has very high sensitivity in reference to streams. The settlements around such streams in the ESZ make them more sensitive due to the anthropogenic activities and land uses around them.

Map 4 Sensitivity of Streams in Bandhavgarh ESZ

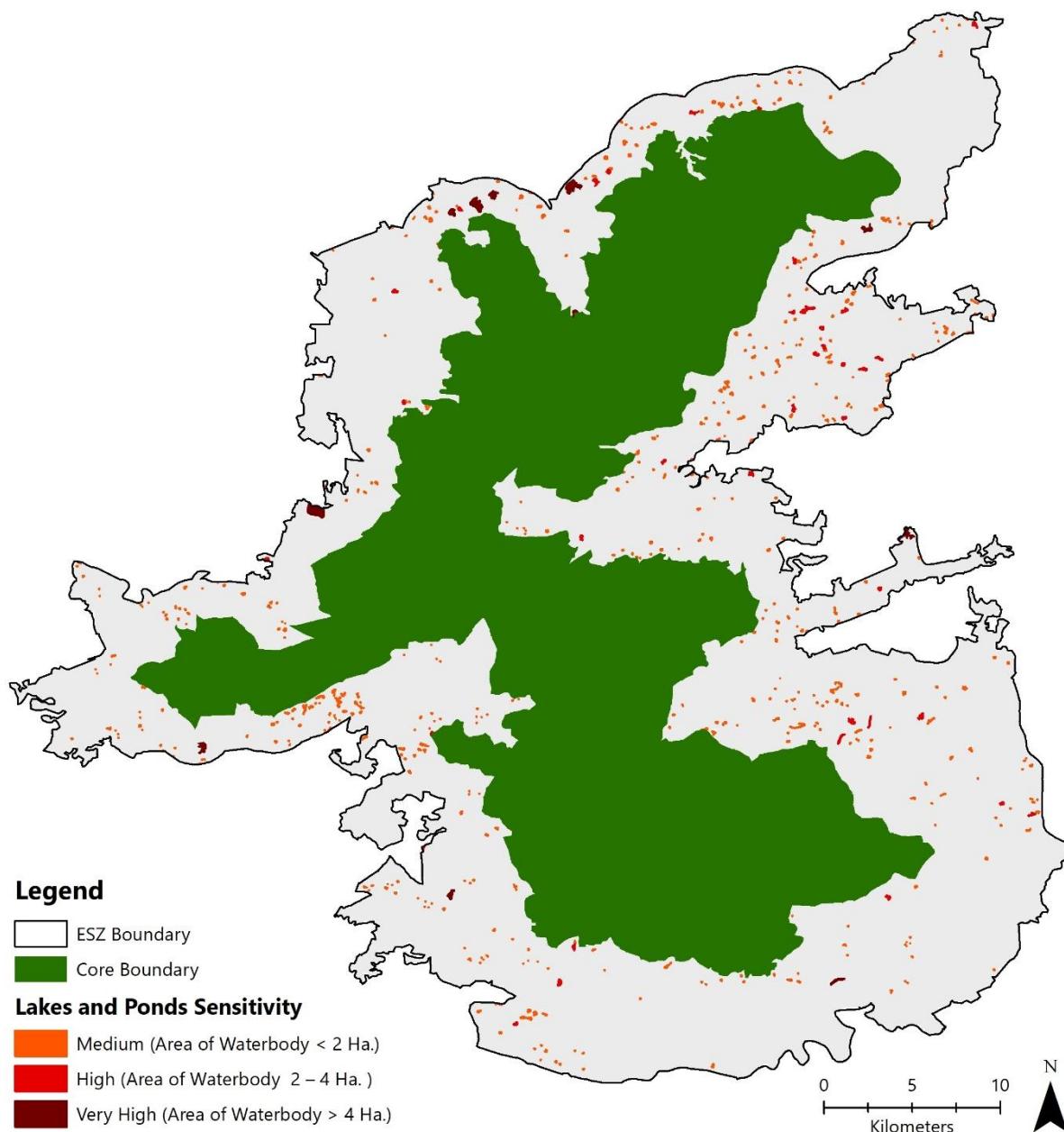


Source: MAPIT and IPE analysis

Lakes and Ponds: Sensitivity of lakes and ponds for eco sensitive zone of Bandhavgarh National Park have been analyzed and shown in map below. There are around ten water bodies with very high sensitivity present, five of which are in the North of the ESZ. These fall on the forest areas and act as points of wildlife congregation due to edge effects.

Water bodies with high sensitivity are present in the Southern, Northern and North- Eastern part of the ESZ, in forest and village settlement areas. Smaller water bodies with medium sensitivity, in a large number are seen in the Eastern, Western and Northern part of the ESZ.

Map 5 Sensitivity of Lakes and Ponds in Bandhavgarh ESZ

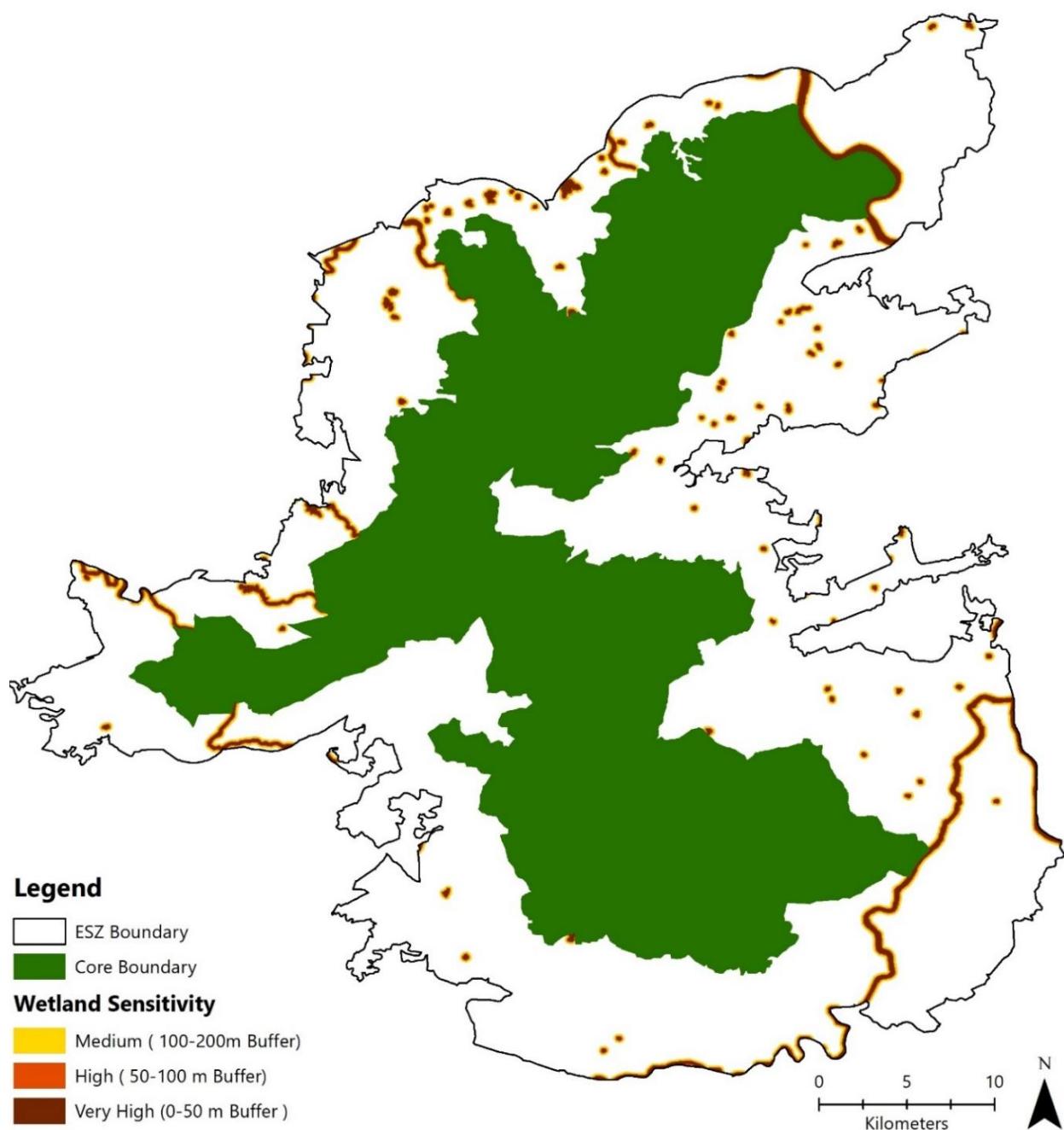


Source: MAPIT and IPE analysis

Wetlands: Sensitivity of wetlands for Bandhavgarh ESZ has been analyzed and depicted in map below. Most of these are located in the Northern, Eastern and Southern part of the study area in Umaria District. The North of the ESZ in the study area sees concentration of these, which fall in the wildlife habitats around the major wildlife corridors.

The Eastern part of the ESZ in the study falling in Umaria District has a large concentration of wetlands. This serves as major wildlife habitats and connect the major and minor wildlife corridors. This increases the sensitivity of the wetlands as any disturbance in their natural state will directly affect the wildlife and settlements around them.

Map 6 Sensitivity of Wetlands in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

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.

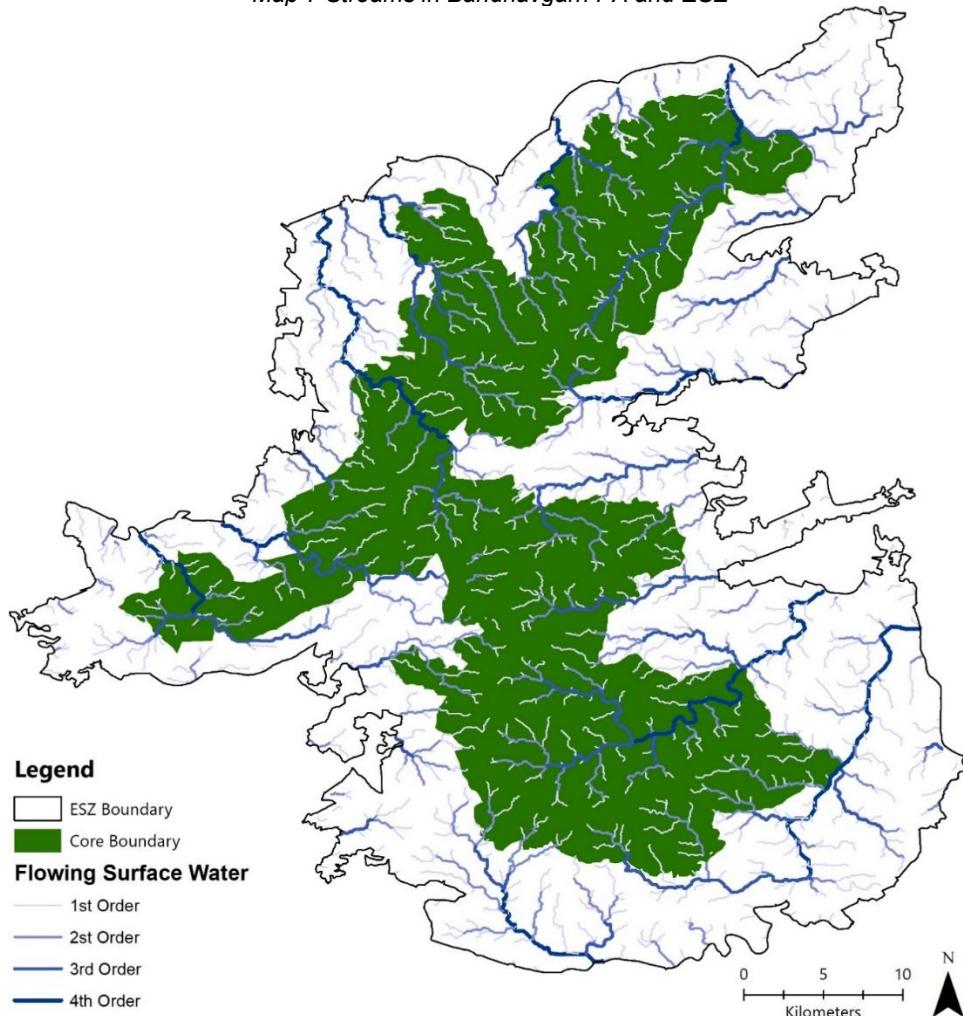
Water of the streams flowing into the protected area, is consumed by wildlife and by community for irrigation, therefore, should not be polluted/ disturbed by any interventions

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

Map 7 Streams in Bandhavgarh PA and ESZ



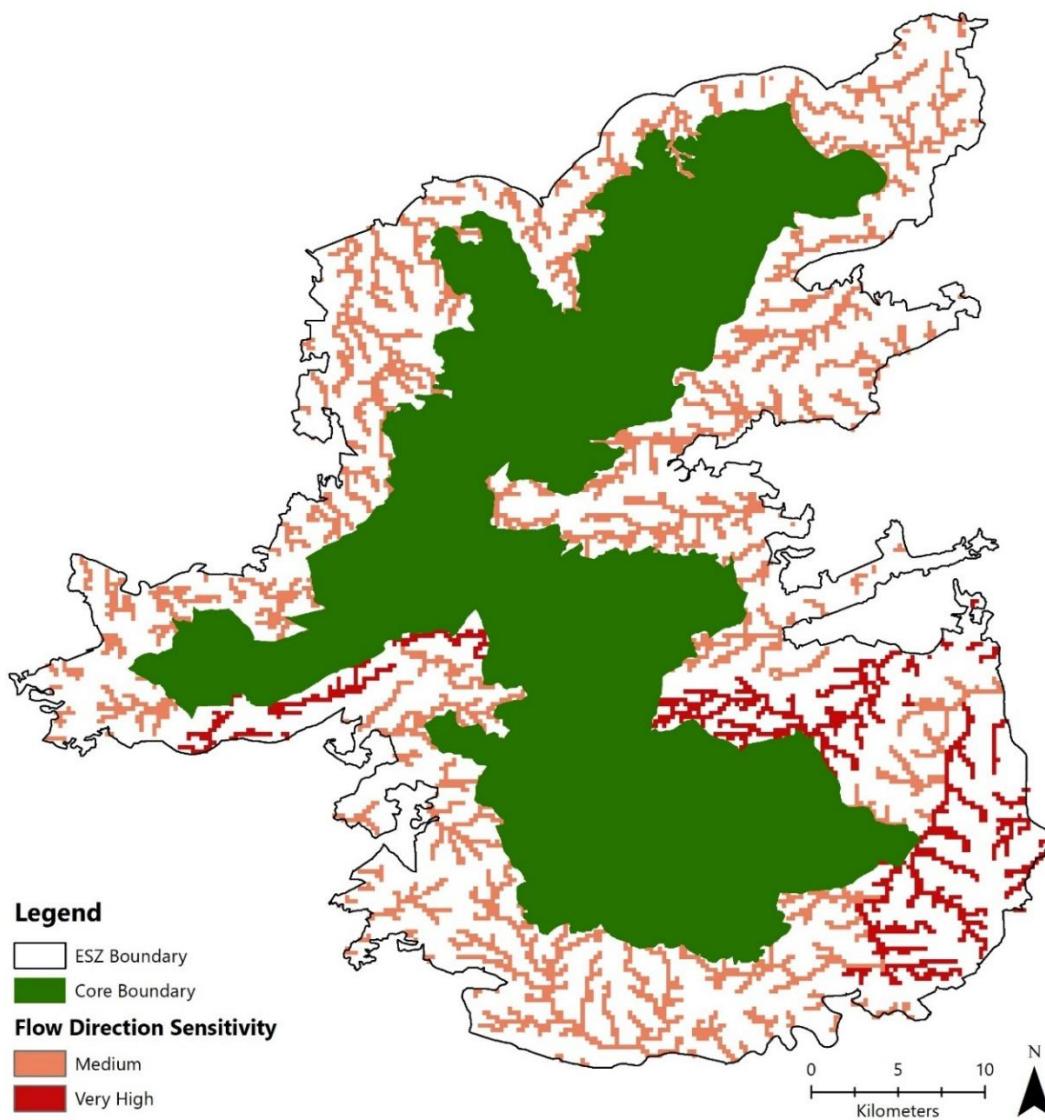
18 https://www.researchgate.net/publication/225263185_Biological_quality_of_running_waters_in_protected_areas_The_influence_of_size_and_land_use

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

C. Analysis of Bandhavgarh Eco Sensitive Zone

The streams in eco sensitive zone of the Bandhavgarh national park are as shown in map above. The sensitivity analysis of the streams in the Bandhavgarh ESZ is done on the basis of direction of flow of the streams (in or out of the PA). The sensitivity is shown in the map below. It shows that the cluster of streams in the Eastern and South- Eastern side of the ESZ, along with some streams in the Western side of the ESZ enter the protected area, thus making their sensitivity very high. The rest of the streams in the ESZ flow out of the PA, thus their sensitivity is medium (lower to the ones flowing into the PA). Further, the presence of anthropogenic activities around such streams flowing into the PA increase their sensitivity even more.

Map 8 Sensitivity of Streams with Respect to Flow Direction in Bandhavgarh ESZ



2.1.1.4 Land Use

Sustainable utilization of land can be beneficial to human kind 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, forest are classifies into: i) Reserved Forest; ii) Protected Forest

i) **Reserved Forest:** The State Government may constitute any forest-land 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,

ii) **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.

B. Forest (Deciduous): Dense

Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.

D. Forest (Deciduous): Open

Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.

E. Forest: Scrub

Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.

F. Forest: Tree Clad Area

Reserved and Protected Forest categorization (high sensitivity), thus limiting activities.

G. Forest: Tree Plantation

Reserved, Protected and Village Forest categorization (high sensitivity), thus limiting activities.

H. Wasteland: Scrub

Culturable wasteland, with scrubs and dominant plantation. These are dry and hot during summer season.

I. 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.

J. 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.

K. 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.

L. 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 changes.

M. Water-bodies

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.

N. Wetland

Wetlands are among the most productive ecosystems in the world, comparable to rain forests and coral reefs. They also support biodiversity and numerous species i.e. all of the major groups of organisms from microbes to mammals. Wetlands provide many societal benefits: food and habitat for fish and wildlife, including threatened and endangered species; water quality improvement; flood storage; shoreline erosion control; economically beneficial natural products for human use; and opportunities for recreation, education, and research. In spite of so many values and functions of the wetlands, there have been a significant pressure on wetlands and loss of wetlands is a major global concern. 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

N. 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

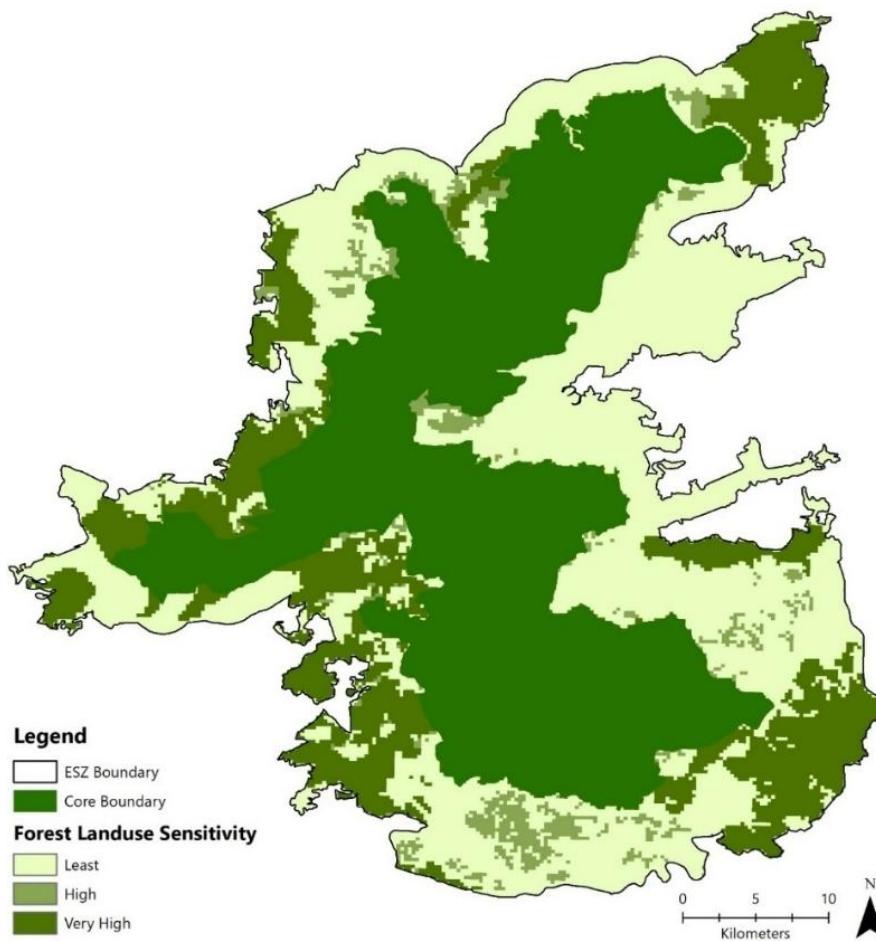
²⁰ <https://www.springer.com/gp/book/9783642163296>

S.No.	Land Use	Sensitivity
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

o. Analysis of Bandhavgarh Eco Sensitive Zone

Sensitivity to land cover in eco sensitive zone of the study area is analyzed as mentioned in the above section. For the purpose of a detailed sensitivity of land use in a large spread of area, it has been understood through three different components of Forest, Wetlands and Agriculture.

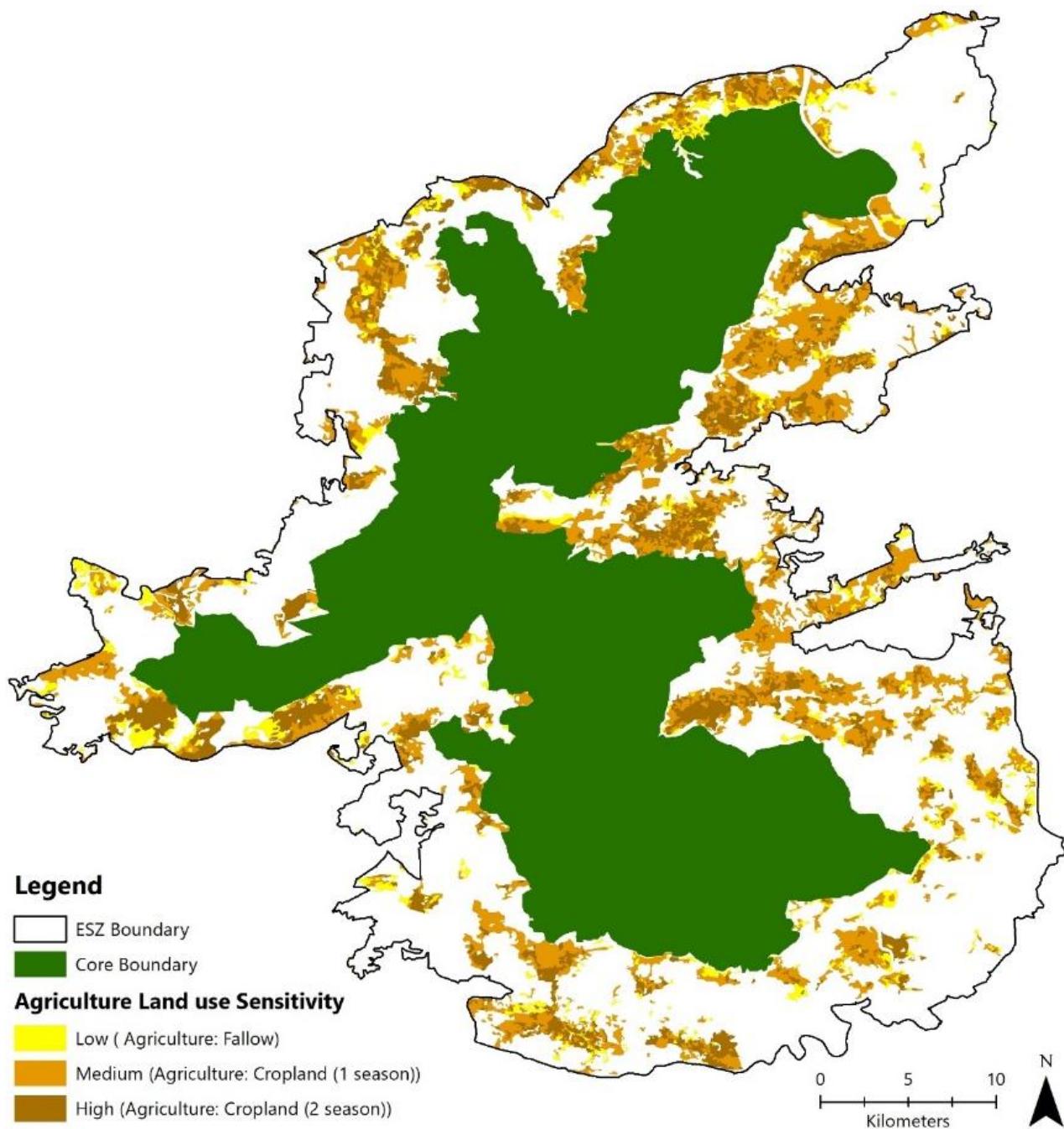
As depicted in map below, almost 30% of the study area is covered under very high sensitivity, and about 7% under high sensitivity. Closer to the boundaries of the Protected Area of Bandhavgarh ESZ, most patches of very high sensitive areas are observed in the Northern and South-Western and South-Eastern region. Simultaneously comparing it with the sensitive areas of the stream flow direction, it can be concluded that these are the regions where stream flow towards the P.A. Also, due to presence of deciduous forest areas, the areas in the north and south west region of the core have also been identified to be very high sensitive from wildlife perspective due to presence of habitats and corridors in the forest region.



Map 9 Sensitivity of Forest Land Use in Bandhavgarh ESZ

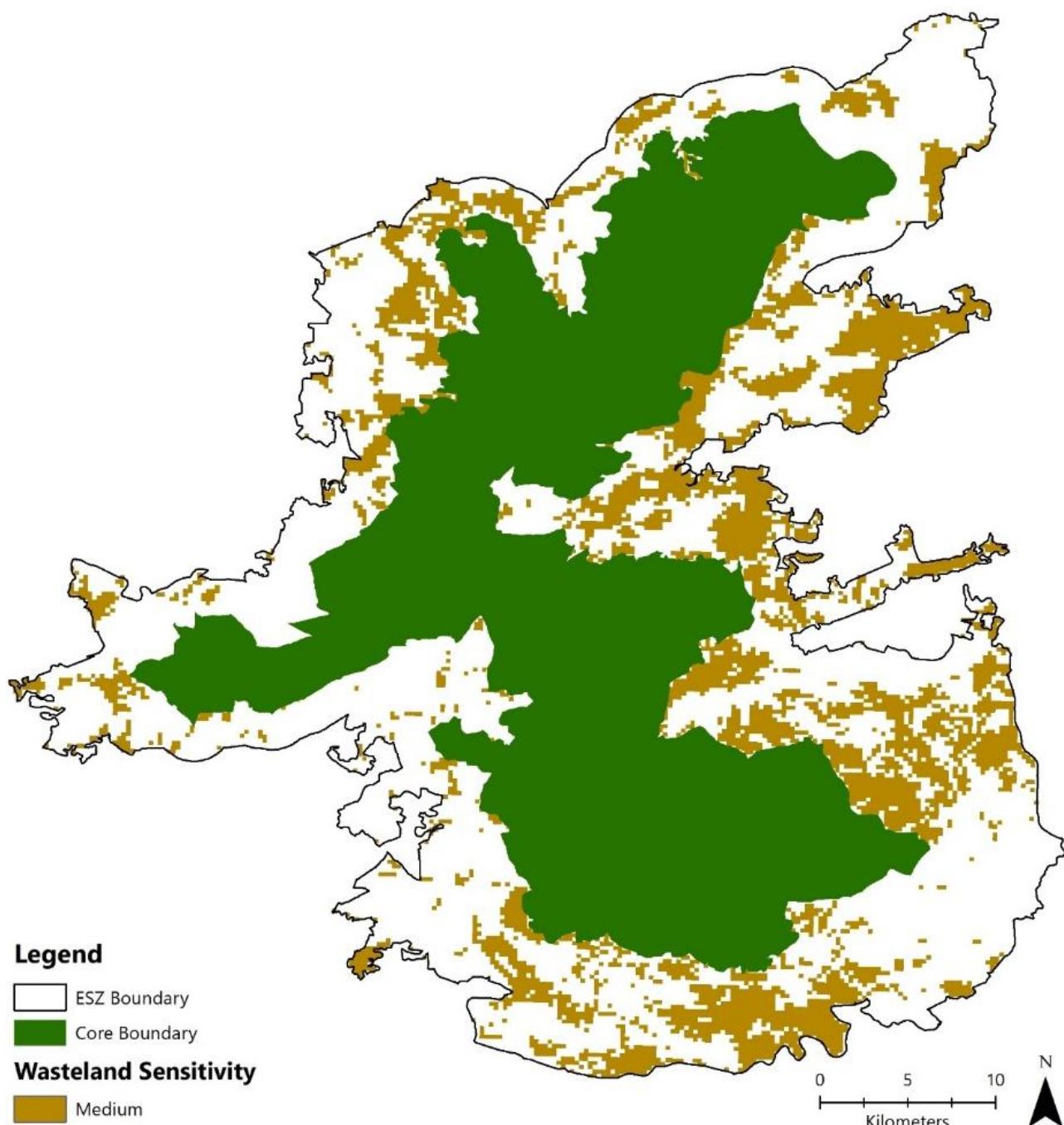
The sensitivity of areas towards various agricultural land uses has been identified as shown in map below, the patches of high sensitive agriculture areas are found in areas with two season cropping, covering approximately 10% of the ESZ area. The agricultural areas with one season cropping have medium sensitivity which constitutes almost 18% of the ESZ. The ESZ has nearly 5% of fallow land, with low sensitivity with respect to agriculture.

Map 10 Sensitivity of Agricultural Land Use in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

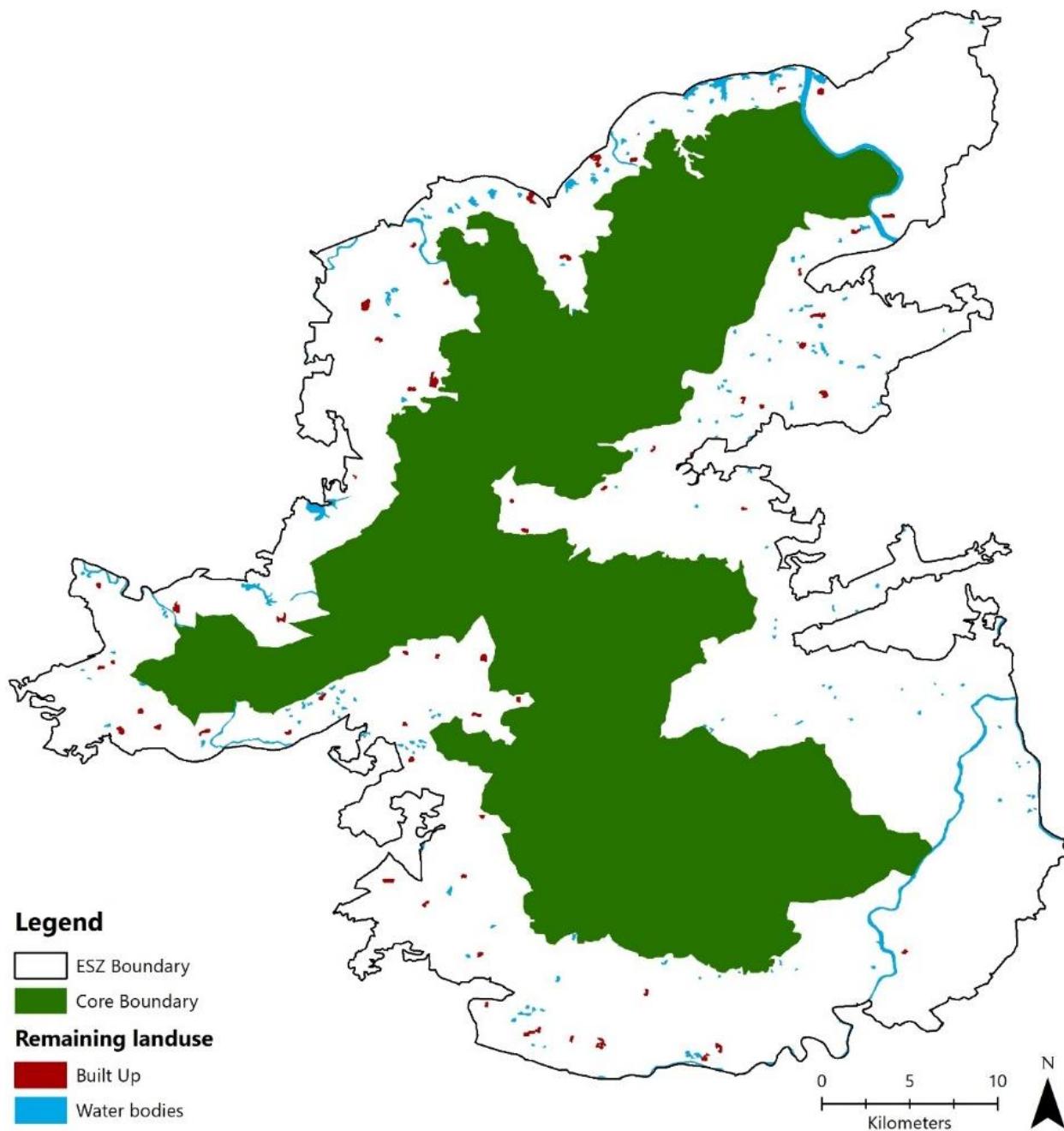
Map 11 Sensitivity of Wasteland Use in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

As shown in map above, around 30% of the ESZ is wasteland, dominantly in the Eastern, Southern and North-Western part. These wastelands can be converted into culturable land upon treatment and required interventions.

Map 12 Sensitivity of Built up and Water bodies Land Use in Bandhavgarh ESZ



The Bandhavgarh ESZ has approximately 0.4% of built-up area in the village settlements, spread majorly in the Western, Northern and South-Western parts. Water bodies comprise of almost 2% of the total Bandhavgarh 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 core of a P.A. is much more critical and sensitive as compared to the environment of areas outside the Protected Area. However, the ESZ contains ecotone which harbours rich biodiversity. The core and buffer

boundaries of the ESZs are chosen here to analyze the environmental sensitivity for the study area.

Protected Area: This is the **most critical area**, prioritizing the conservation of biological diversity and the monitoring of little disturbed ecosystems. The Protected Area also contributes to the maintenance of ecosystem services (provisioning, regulating, supporting and cultural services), for example, carbon capture, soil stabilization or the supply of drinking water, among others.

Buffer: The buffer zone **surrounds the Protected Area** and can host activities that are compatible with the environment. This zone also reduces the impact of human activities on the Protected Area and is essential for maintaining biological and cultural diversity. It also promotes biological connectivity that acts as a natural corridor between the core zone and the transition zone.

ESZ: 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. These are peripheral to a protected area, in which activities are implemented or the area managed with the aim of enhancing the positive and reducing the negative impacts of conservation on communities and neighbouring communities on conservation.

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

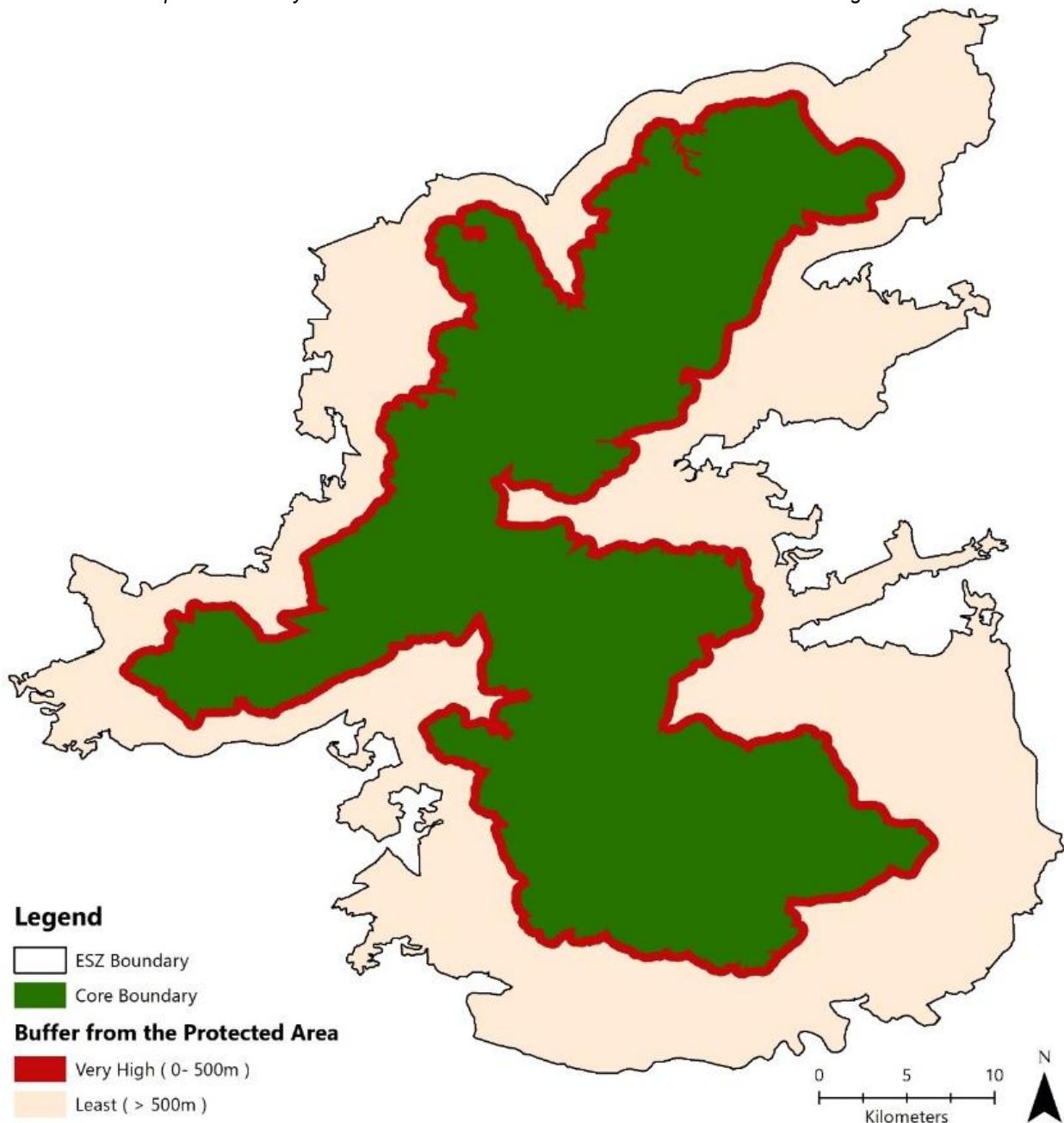
S.No.	Boundary	Sensitivity
1	Protected Area (Core area of the forest)	Very High
2	Buffer	High

Analysis of Bandhavgarh Eco Sensitive Zone

Here, the Protected Area and buffer boundaries of the Bandhavgarh Eco- Sensitive Zone are considered for the sensitivity analysis.

Environmental sensitivity of the areas in Bandhavgarh Eco- Sensitive Zone is analyzed based on its proximity to the boundary of core of protected area which harbour rich biodiversity. The area of 200 meters along the boundary of Bandhavgarh Tiger Reserve is demarcated as very high sensitive area which are ecotone. The area comprises of around 5% of the ESZ, which requires careful planning consideration and understanding of the activities and their impact on the wildlife sanctuary and its environment.

Map 13 Sensitivity of areas in context to administrative boundaries in Bandhavgarh 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

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

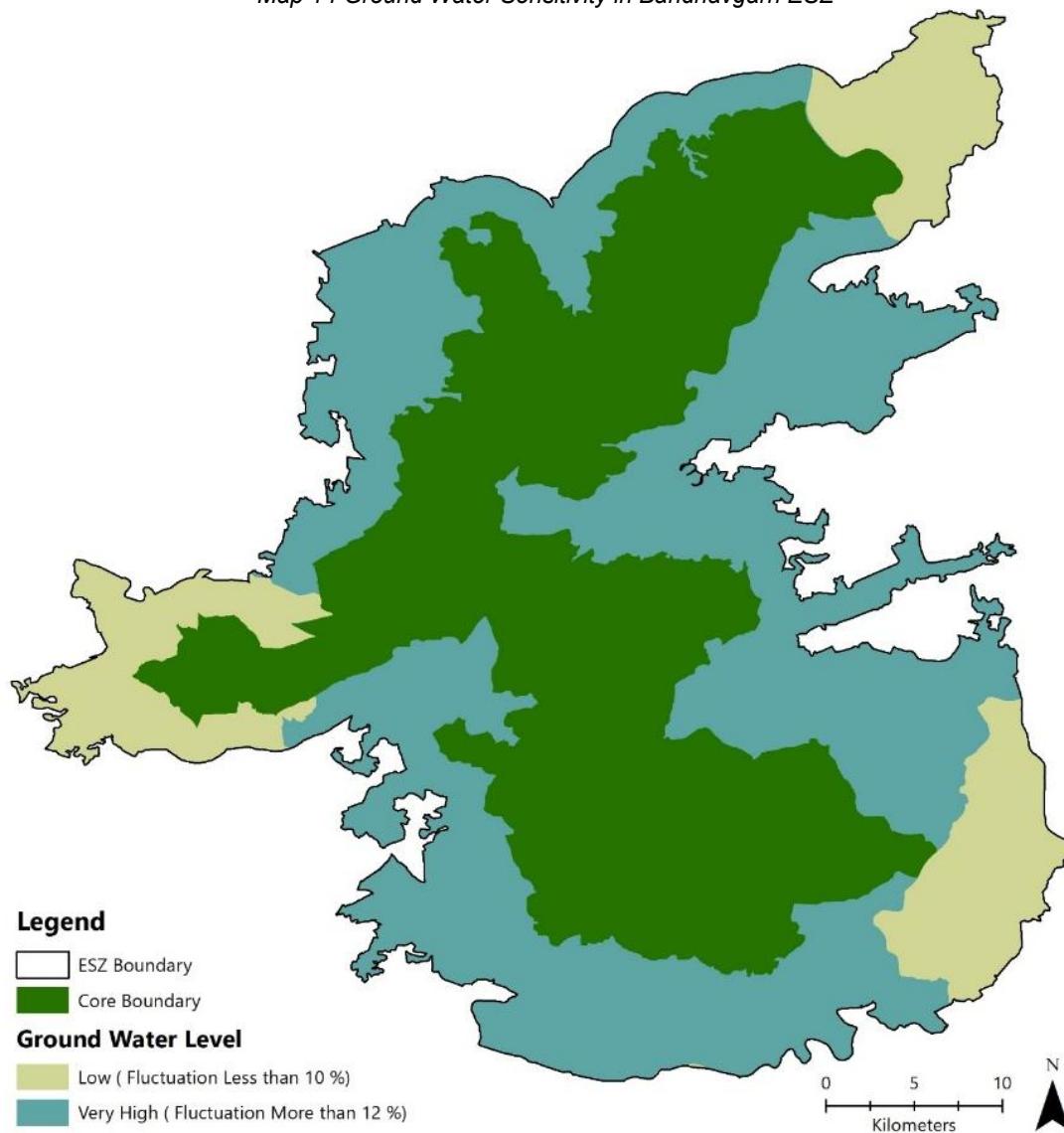
Fluctuations in G.W. Level = $\{[(G.W. Level for 2017 - G.W. Level for 2015)/G.W. Level for 2015] * 100\}$

Analysis of Bandhavgarh Eco Sensitive Zone.

The sensitivity analysis with respect to ground water in Bandhavgarh Eco- Sensitive Zone is analyzed on the basis of parameters mentioned above. The ground water sensitivity of Bandhavgarh ESZ is plotted on map below. The map shows that the Northern, Western and South-Eastern parts, amounting to 30% of the ESZ have a biennial fluctuation of less than 10% suggesting low sensitivity to ground water level fluctuations. The rest of the ESZ, constituting 70% observes a biennial ground water fluctuation on 12%, suggesting a high sensitivity. It was known during the site visit that there is an increase in the dependency of villagers on ground water resources for irrigation and other day-to-day activities, thus the higher water level fluctuations.

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

Map 14 Ground Water Sensitivity in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

2.1.1.7 Slope

Topographic condition is one of the significant aspect 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

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

Slope	Per cent	Description
2°	3-8	Gently sloping
4°	8-15	Sloping
8°	15-25	Moderately Steep
14°	25-50	Steep
26°	50-100	Very Steep
45°	>100	Extremely Steep

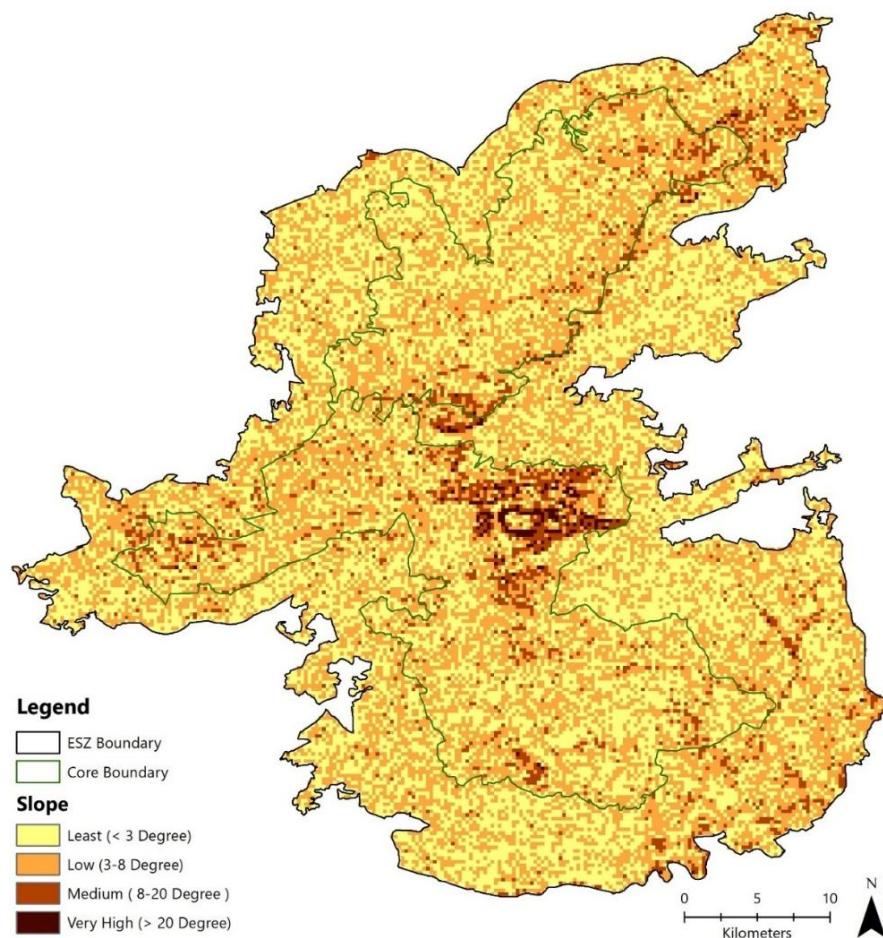
According to the slope categorization mentioned above, the sensitivity pertaining to slope is shown in table below:

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

Analysis of Bandhavgarh Eco Sensitive Zone

The slope of the study area along with its sensitivity is depicted in map below. It shows that some of the extreme Southern and Northern parts of the study area have slopes > 20 degree. These areas support restricted human activities and provide critical habitats for various species, thus have high sensitivity and need to be taken care of while planning activities around them.

Map 15 Sensitivity of Slope in Bandhavgarh ESZ



2.1.1.8 Summary of sensitivity Index parameters

S. No.	Parameter	Sub- Parameter	Sensitivity	Score	Weightage
1	Wildlife	Wildlife	Major Wildlife Corridors	Very High	18
2			Minor Wildlife Corridors	High	
3			Wildlife Habitats and Congregation Areas	Very High	
1	Surface Water	Stream Order 1 (Habitat Conservation)	100 m.	Very High	21
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	
1	Lakes and Ponds	Area of Water body < 2 Ha.	Very Small Lakes	Very High	8
2		Area of Water body 2 – 4 Ha.	Small Lakes	High	
3		Area of Water body > 4 Ha.	Medium Lakes	Medium	
1	Wetland	Buffer from Wetland	50 m	Very High	7
2			100 m	High	
3			200 m	Medium	
1	Flow Direction	Flow Direction	Flowing into the P.A.	Very High	7
2			Flowing out of the P.A.	Medium	
1	Land use	Forest	Forest (Deciduous): Dense	Very High	22
2			Forest (Deciduous): Open	Very High	
3			Forest: Scrub	Very High	
4			Forest: Tree Clad Area	High	
5			Forest Plantation	High	
6		Wasteland	Wasteland: Scrub land	Medium	
7			Wasteland: Gullied/ Ravenous	Medium	
8		Agriculture	Agriculture: Cropland (1 season)	Medium	
9			Agriculture: Cropland (2 season)	High	
10			Agriculture: Fallow	Low	
11		Wetland	Wetland	High	
12		Water bodies	Water bodies	High	
13		Remaining	Remaining	Least	
1	Administrative Boundaries		Core	Very High	7
2			Buffer	High	
1	Ground Water Level	Decadal fluctuations in Water Level	Less than 70%	Low	5
2			70 - 90%	Medium	
3			90 - 100 %	High	
4			Above 100%	Very High	

S. No.	Parameter	Sub- Parameter	Sensitivity	Score	Weightage
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	

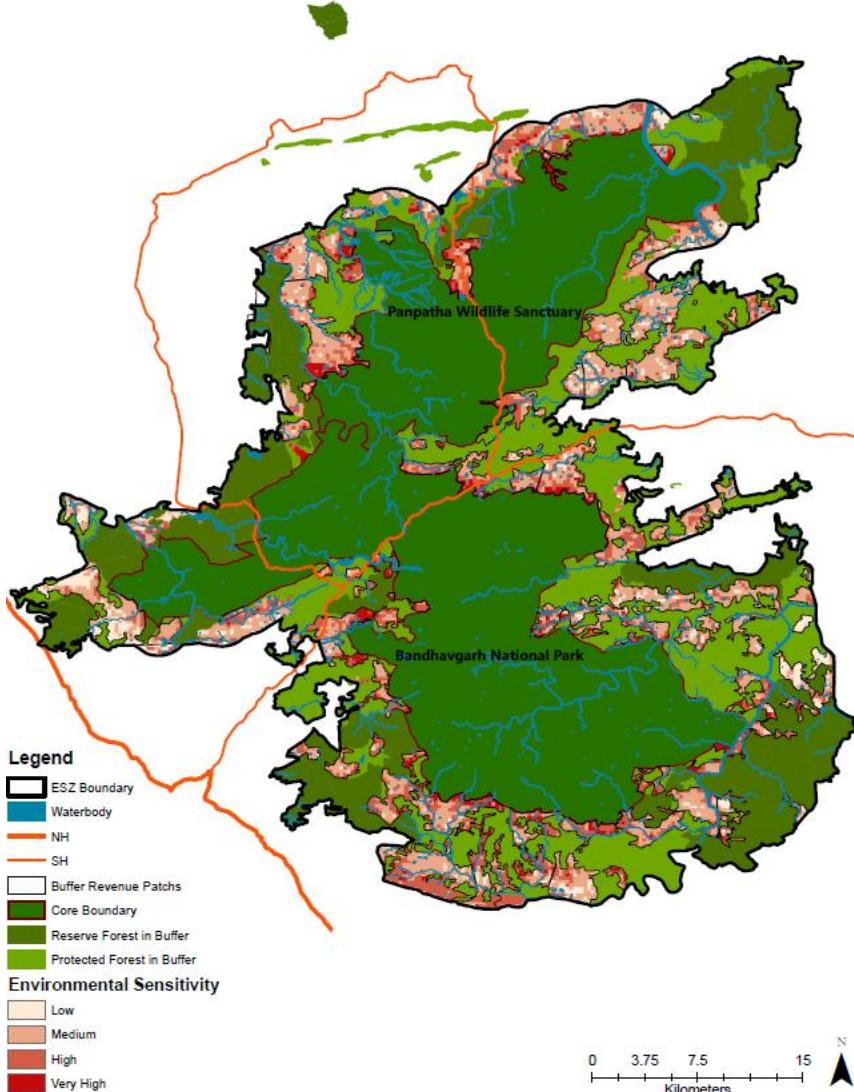
Legends

Very High	5	High	4	Medium	3	Low	2	Least	1
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The parameters thus after being analyzed in isolation were evaluated in interrelation to each other, by weighing each parameter using analytical hierarchy process. The final zoning can be summarized as shown in above table. The ESZ has 8% of high sensitive in Bandhavgarh ESZ. The medium and low sensitive areas come out to be 64% and 28% respectively. High sensitive areas can clearly be demarcated in the region which should be left as it is without much intervention or allowance of anthropogenic activities. Medium and low sensitivity areas are regulated for development activities, infrastructure upgradation and tourism promotion.

Map 16: Environmental Sensitivity in Bandhavgarh ESZ - Conceptual Zoning Idea

Source: MAPIT and IPE analysis



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

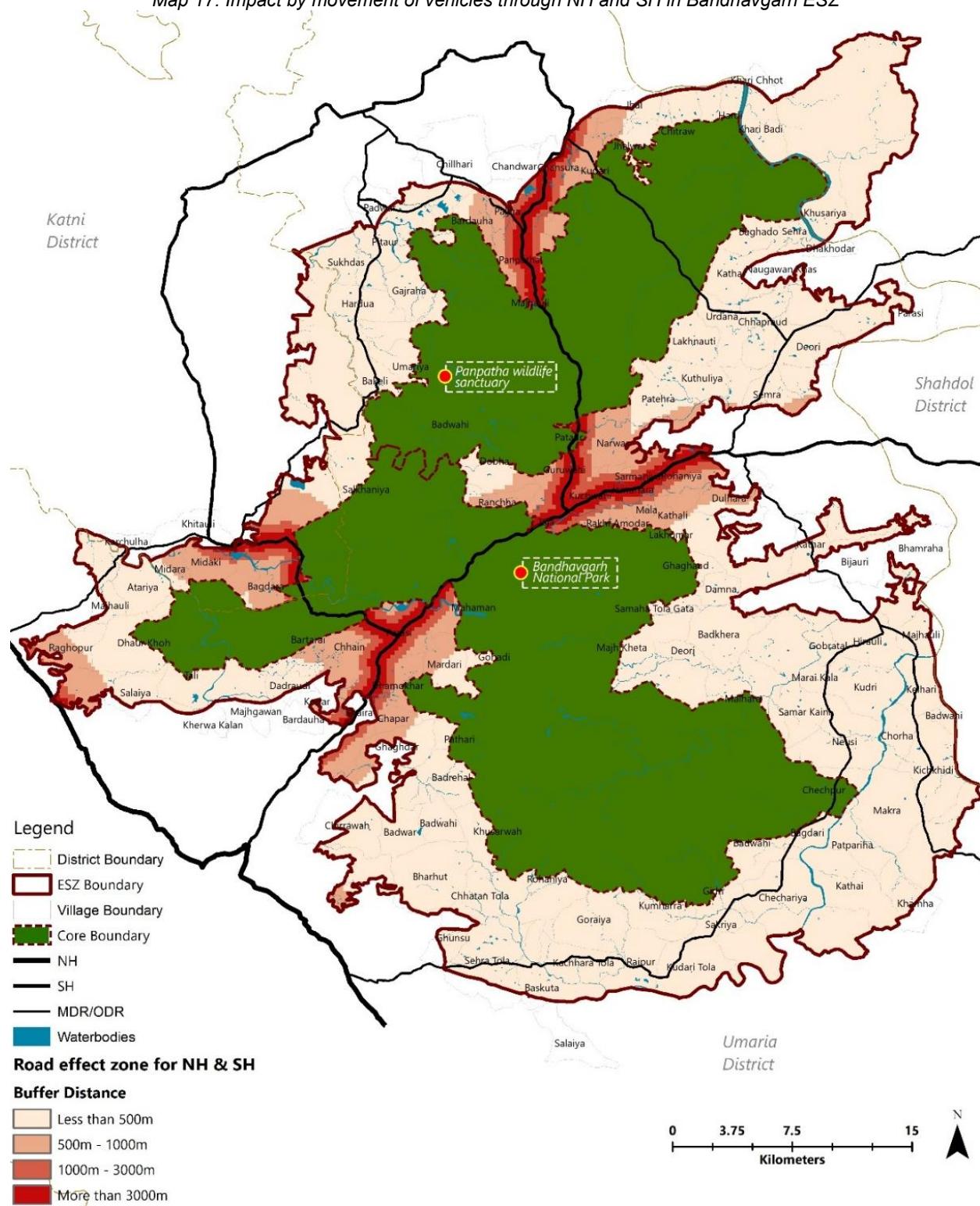
S. No.	Effect of National and State highway (30k-60k vehicles/day) & passing up of railway line	Impact
1	Less than 500m	Very high
2	500m - 1000m	High
3	1000m - 3000m	Medium
4	More than 3000m	Low

²³ https://www.fhwa.dot.gov/ENVIRONMENT/noise/noise_effect_on_wildlife/effects/wild04.cfm

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

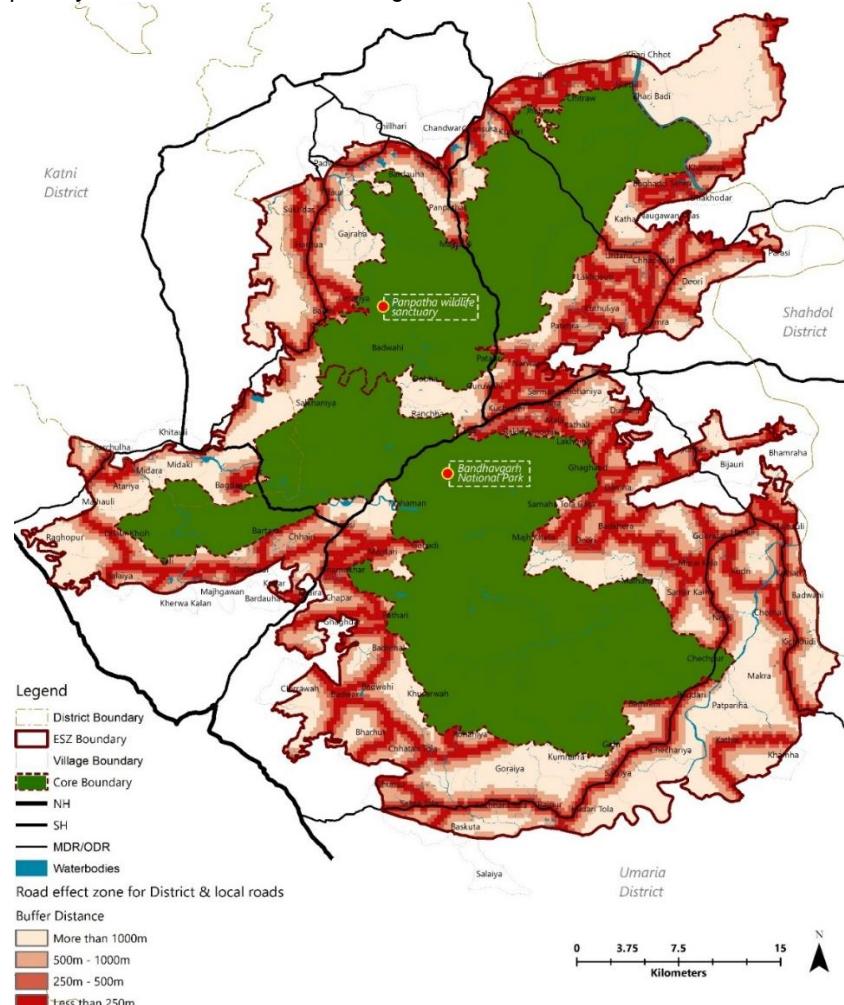
²⁵ <http://www.naturesounds.org/conservENW.html>

Map 17: Impact by movement of vehicles through NH and SH in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

Map 18: Impact by movement of Vehicles through District roads and other roads in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

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

2.1.2.2. Passing of transmission lines

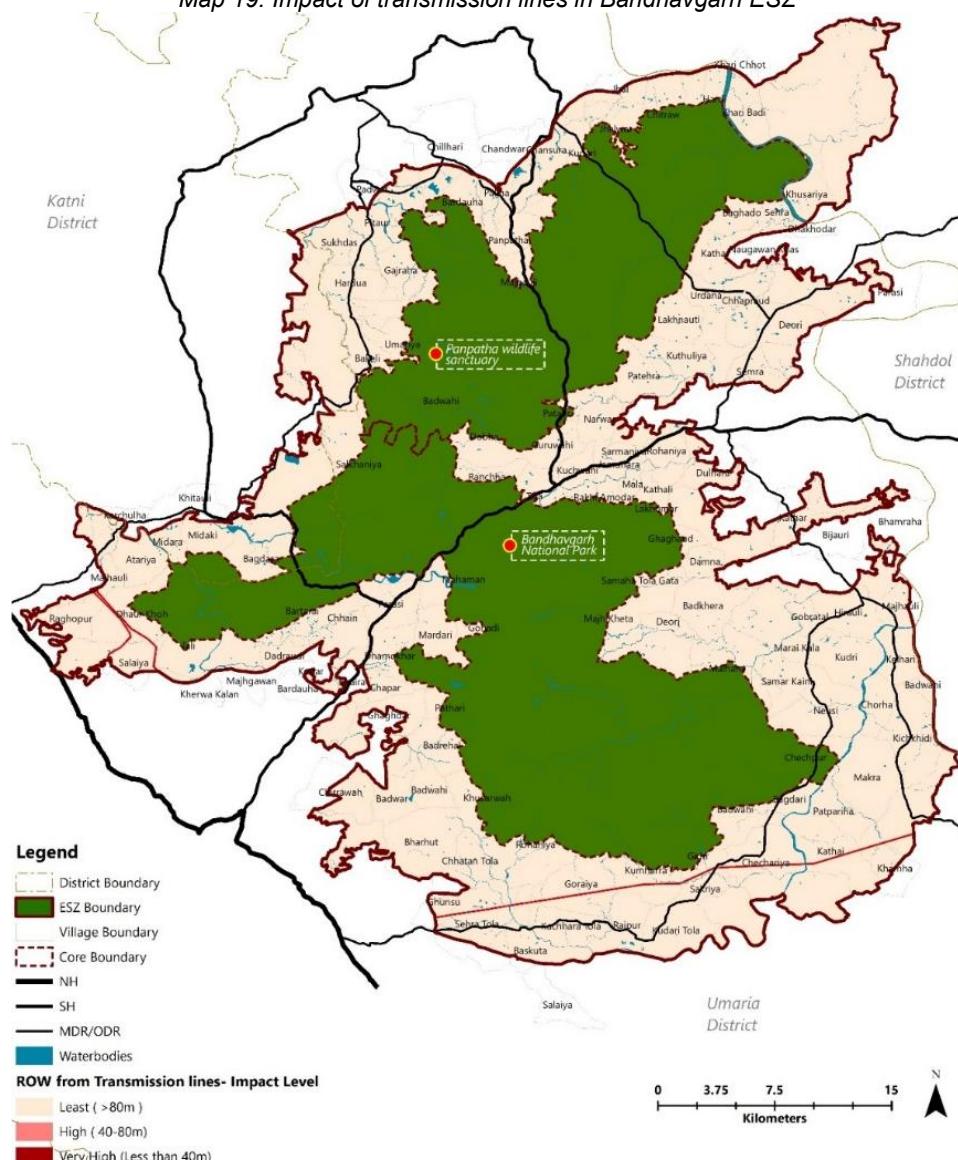
Transmission lines bring power over long distances across the province, traversing forests, streams and other wildlife habitats. As a result, transmission lines have various effects on wildlife and wildlife habitats. Several construction factors may have an effect on wildlife and wildlife

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

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 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.

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

Map 19: Impact of transmission lines in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

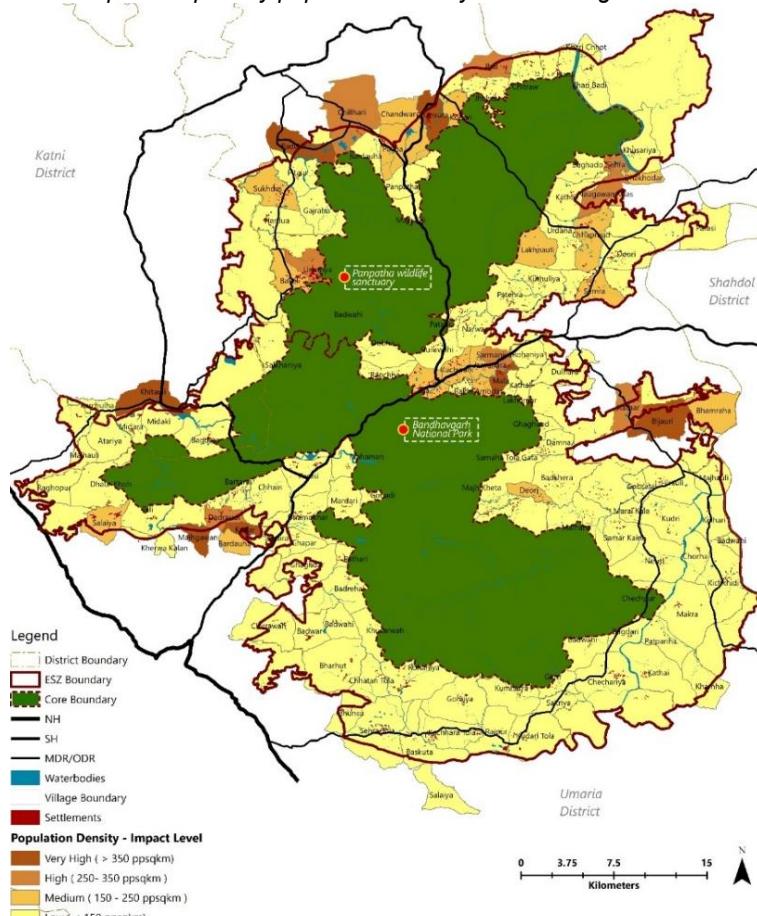
2.1.2.3. Population density

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. 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 20: Impact by population density in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

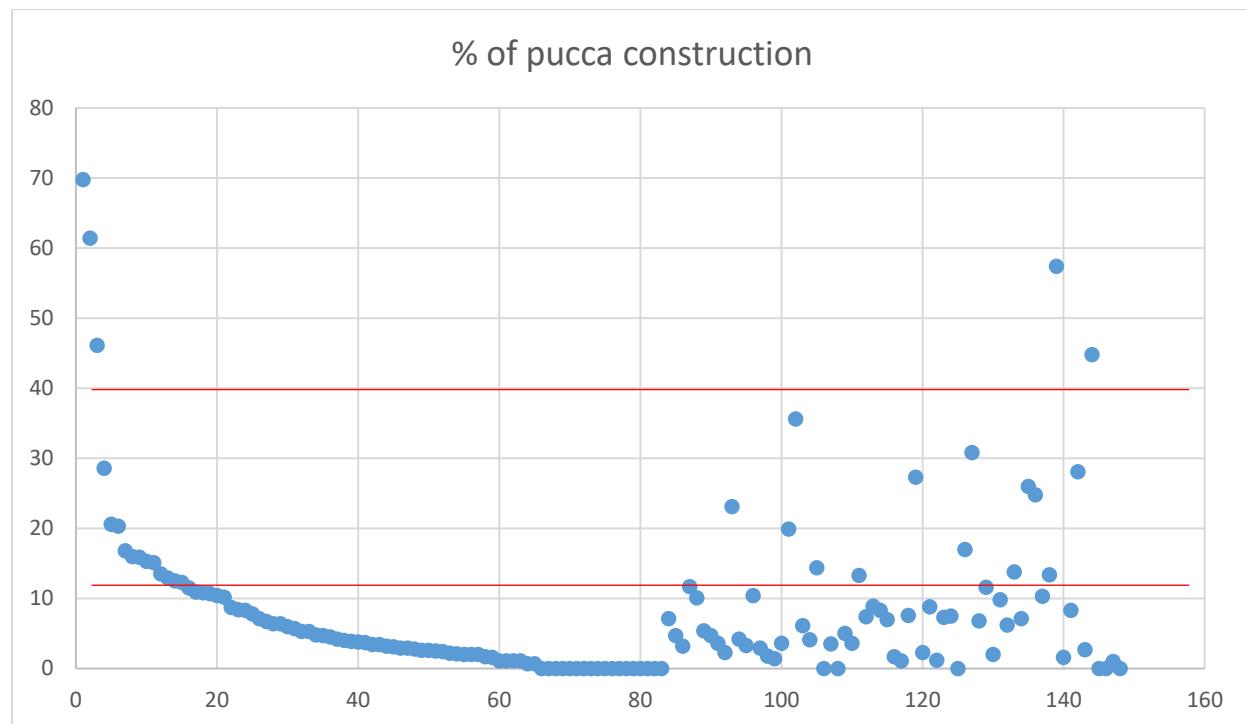
27 <https://www.sciencedaily.com/releases/2018/05/180517143641.htm>

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

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.²⁹

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.³⁰

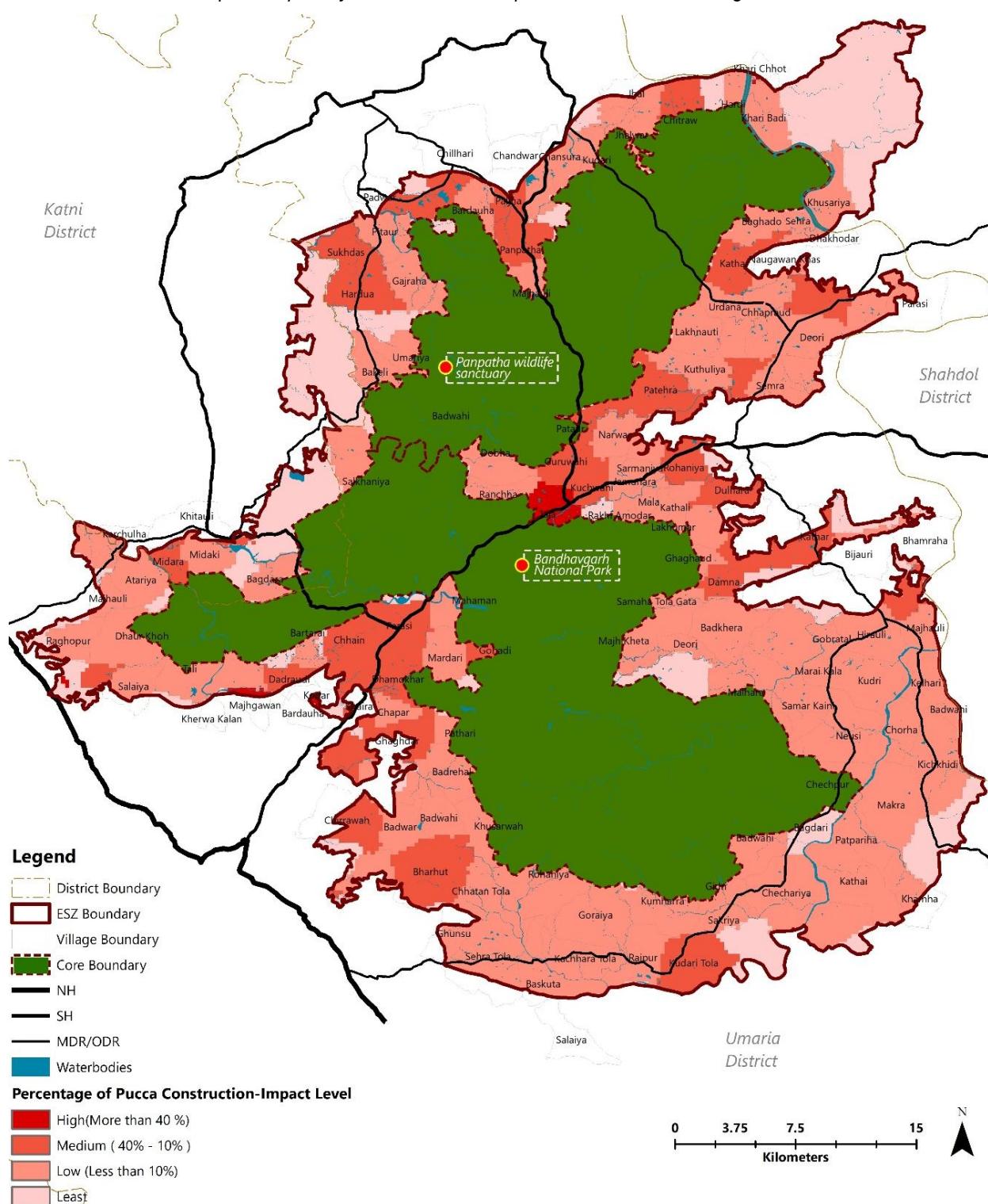


Sr. No.	% of pucca construction	Impact
1	More than 40 %	High
2	40% - 10%	Medium
3	Less than 10%	Low

²⁹ <https://www.nature.com/articles/ncomms12558>

³⁰ http://censusindia.gov.in/Census_And_You/housing.aspx

Map 21: Impact by the construction of pucca houses in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

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.

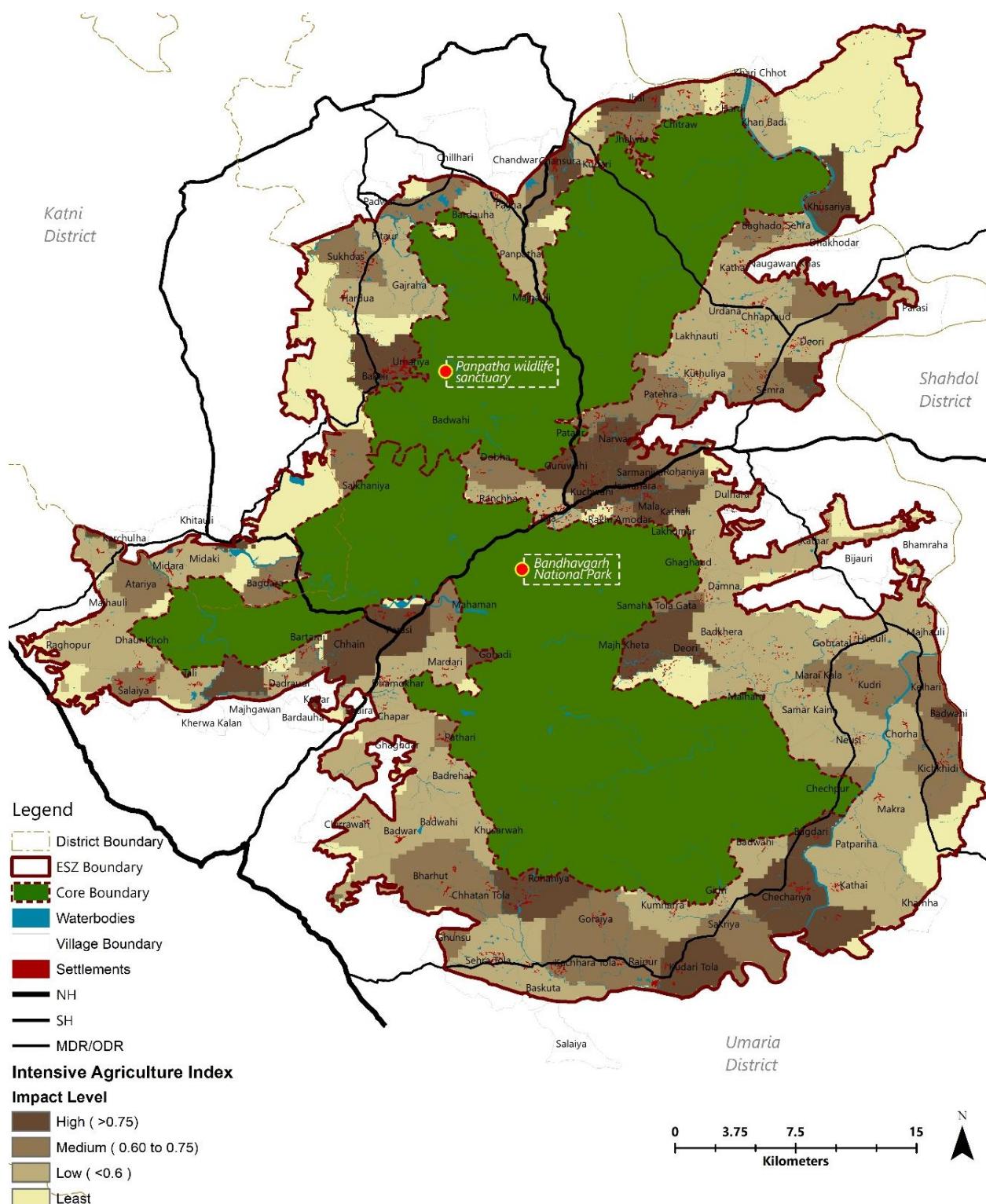
Whether a village is subjected to intensive agriculture can be calculated by obtaining the ratio of Net Area Sown to Net Culturable Land. A high agriculture intensity ratio would suggest a high pressure on land resources without adequate fallow periods.

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

The median and the third quartile value of agriculture intensity practiced in Bandhavgarh ESZ is 0.60 and 0.75 respectively (Refer following table). 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 22: Impact by performing intensive agriculture (projected for future as well) in Bandhavgarh 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.³¹ The rest 77.2% of the population 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

Excess Fuel wood Collected = Sustainable Yield – Total Extraction

$$= 0.7 * \text{Forest Area} - 8 * \text{Total no. of households still using solid fuels post Ujjwala}$$

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, i.e. approximately 8 m^3 per year per family.³² 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.³³ Based on the available forest area and household data per village, the total sustainable yield and extraction has 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 Bandhavgarh 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;

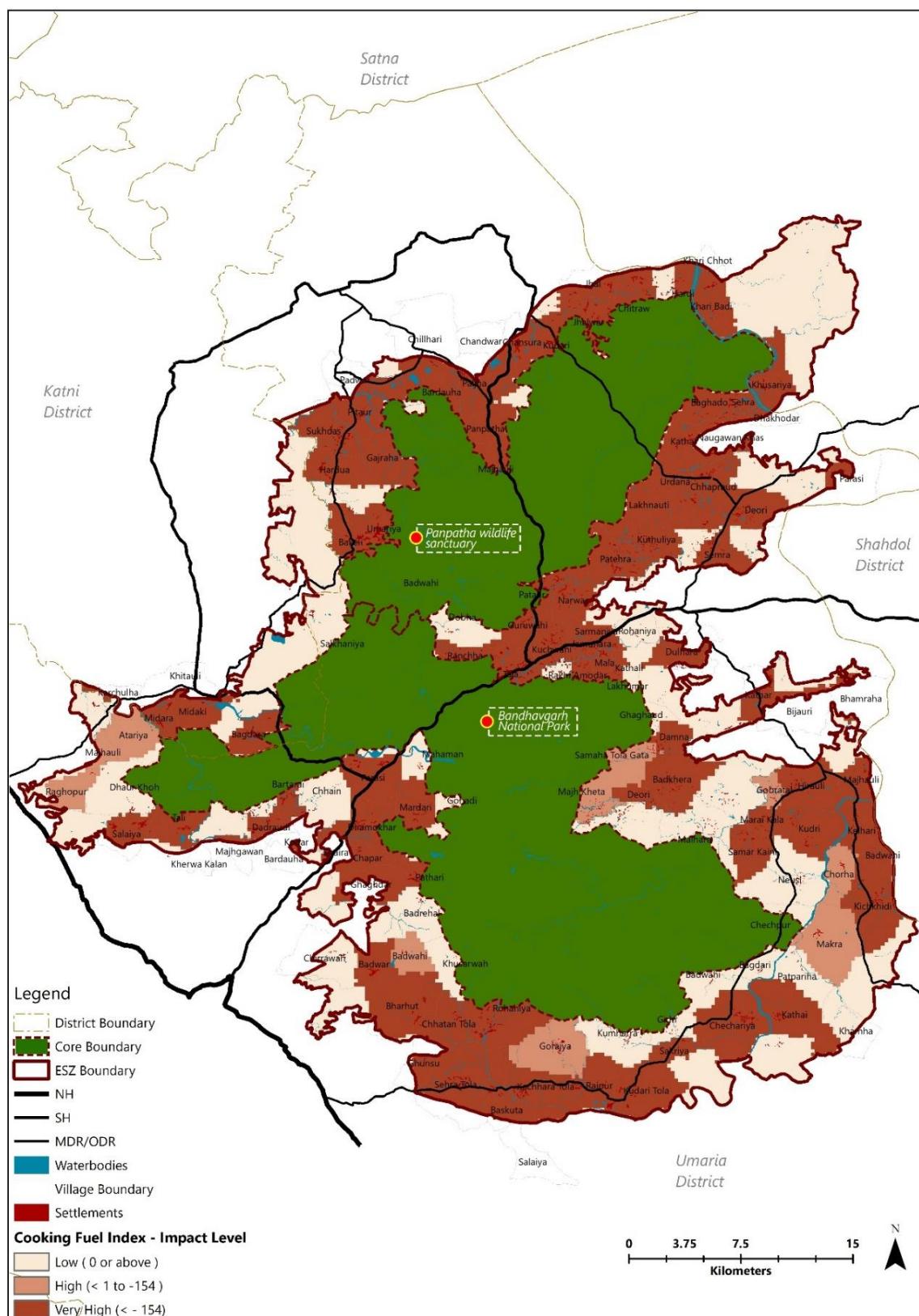
S. No.	Cooking Fuel Index (Range)	Impact
1	0 or above	Low
2	Less than 1 to -154	High
3	< - 154	Very High

³¹ 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

³² 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

³³ Evans, J. (2001). *The forest handbook*. Oxford: Blackwell Science.

Map 23: 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 Bandhavgarh 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 = $40\text{ lpcd} * 250 = 10000$ 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.³⁴

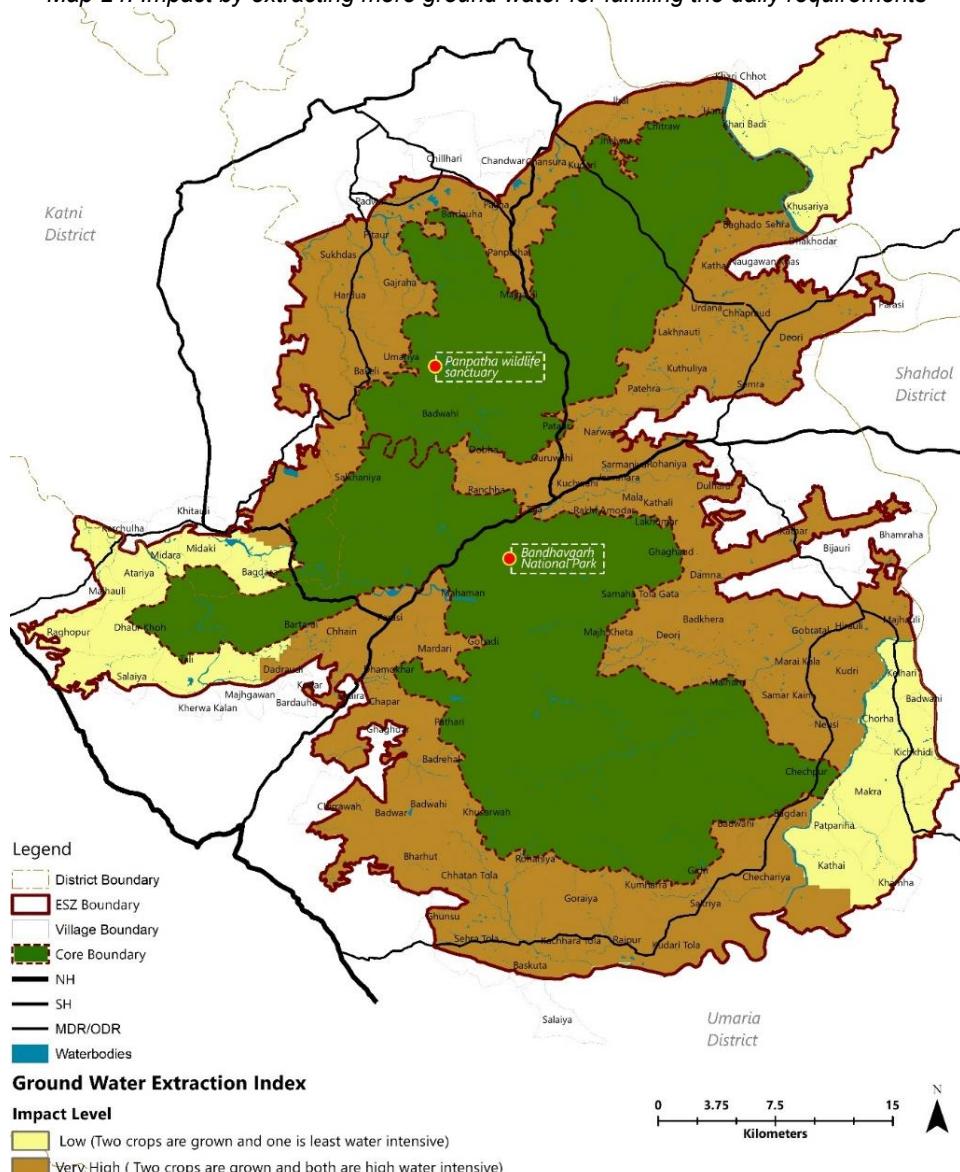
Crop	Water requirement (liters per kg)
Rice	4000-3000
Kodo Millet	Highly drought resistance
Wheat	1500 - 1350
Makka	1200-1300

³⁴ https://www.researchgate.net/figure/Water-requirement-to-produce-different-crops-liter-kg_tbl1_311468386

Crop	Water requirement (liters per kg)
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 24: 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 India³⁵, 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 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:

Classes of Livestock	DSE Value
Cows: milch or double suckling (350kg to 500kg)	14.0 to 16.0
Dry milk or meat goat	1.5
Dry sheep: wethers, ewes, hoggets (45kg)	1.0

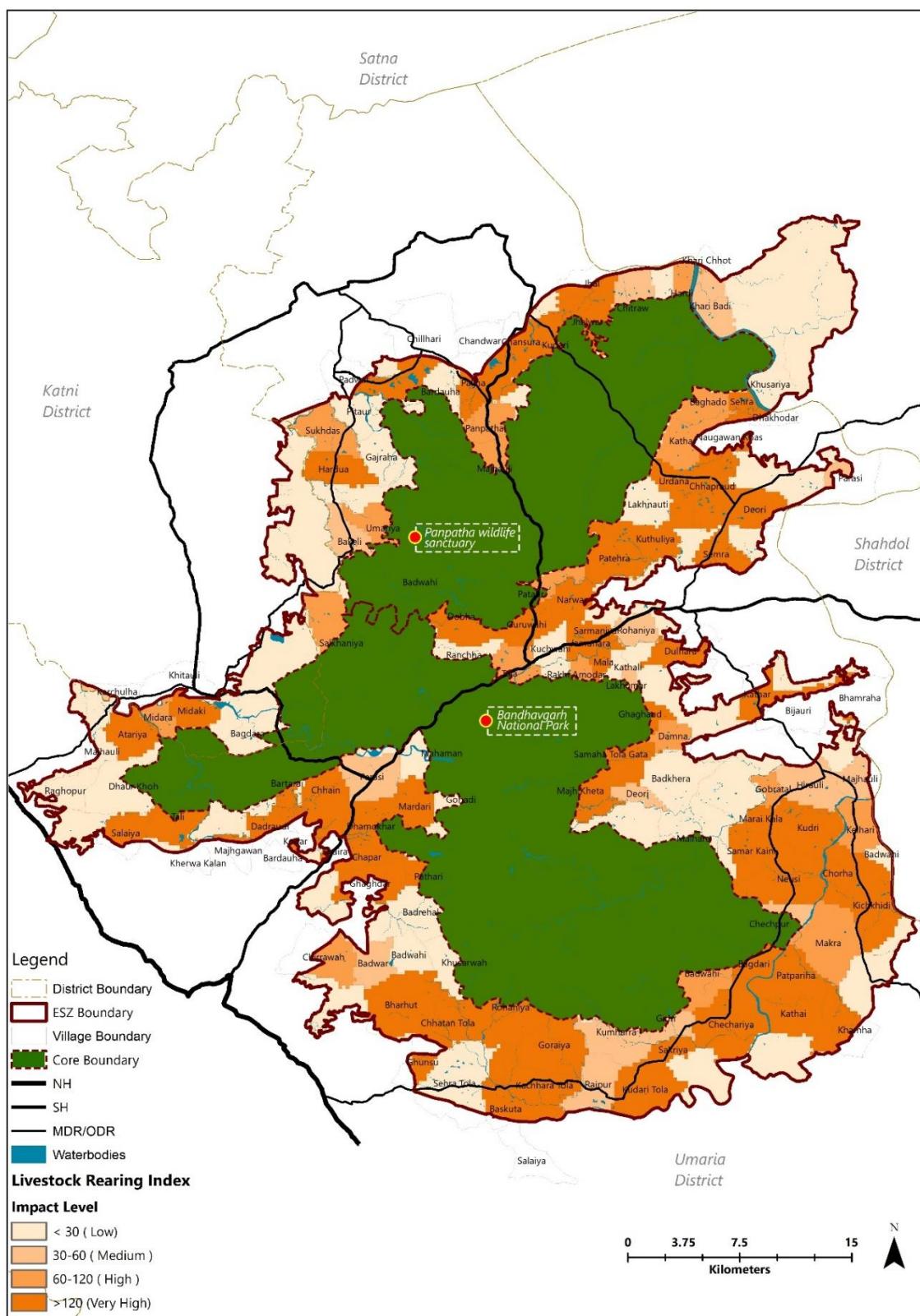
Hosking and Cameron (1985) suggested that improved pastures should carry 1 dry sheep equivalent per hectare (DSE/ha) for every 25 mm of rainfall above 250 mm. The average annual rainfall in Bandhavgarh being 1010 mm, it can be established that pastures within the ESZ have a carrying capacity of 30 DSE.

Due to the lack of proper grazing pastures and high dependency of the villagers on livestock, the average existing DSE per hectare in Bandhavgarh 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

³⁵ Ministry of Statistics and Programme Implementation, Government of India . (2016). Livestock Ownership in India. Livestock Ownership in India. New Delhi .

Map 25: Impact by rearing livestock in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

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.³⁶

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:

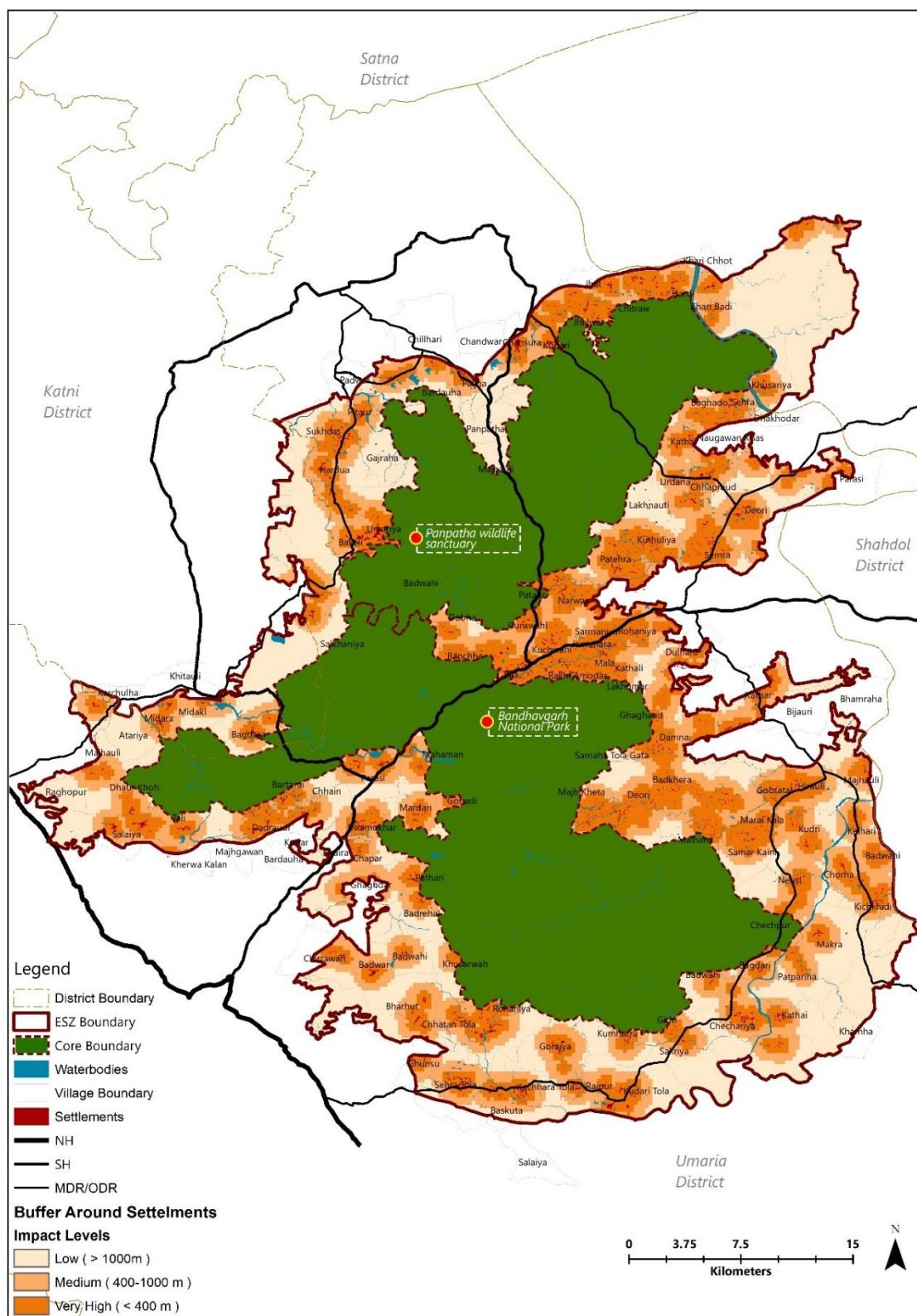
S.No.	Parameter	Impact	Buffer (distance in m)
1	Buffer around settlements	Very High	400 m
2		Medium	1000 m
3		Low	1600 m

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	Buffer around settlements (Larger settlement, urban characteristic)	Low	1000 m
3		High	1000 m
4		Low	1600 m

³⁶ <https://cvc.ca/wp-content/uploads/2013/08/Ecological-Buffer-Guideline-Review.pdf>

Map 26: Impact of noise from settlements on wildlife in Bandhavgarh ESZ



Source: MAPIT and IPE analysis

2.1.2.10. Forest Dependency

The rural community within the Bandhavgarh 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.³⁷ 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 Bandhavgarh 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

B. Illiterate Population

The median and 1st quartile value of illiterate population within the Bandhavgarh 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 Bandhavgarh ESZ is 89.05, 61.41 and 42.74 respectively. The impact has been classified as follows –

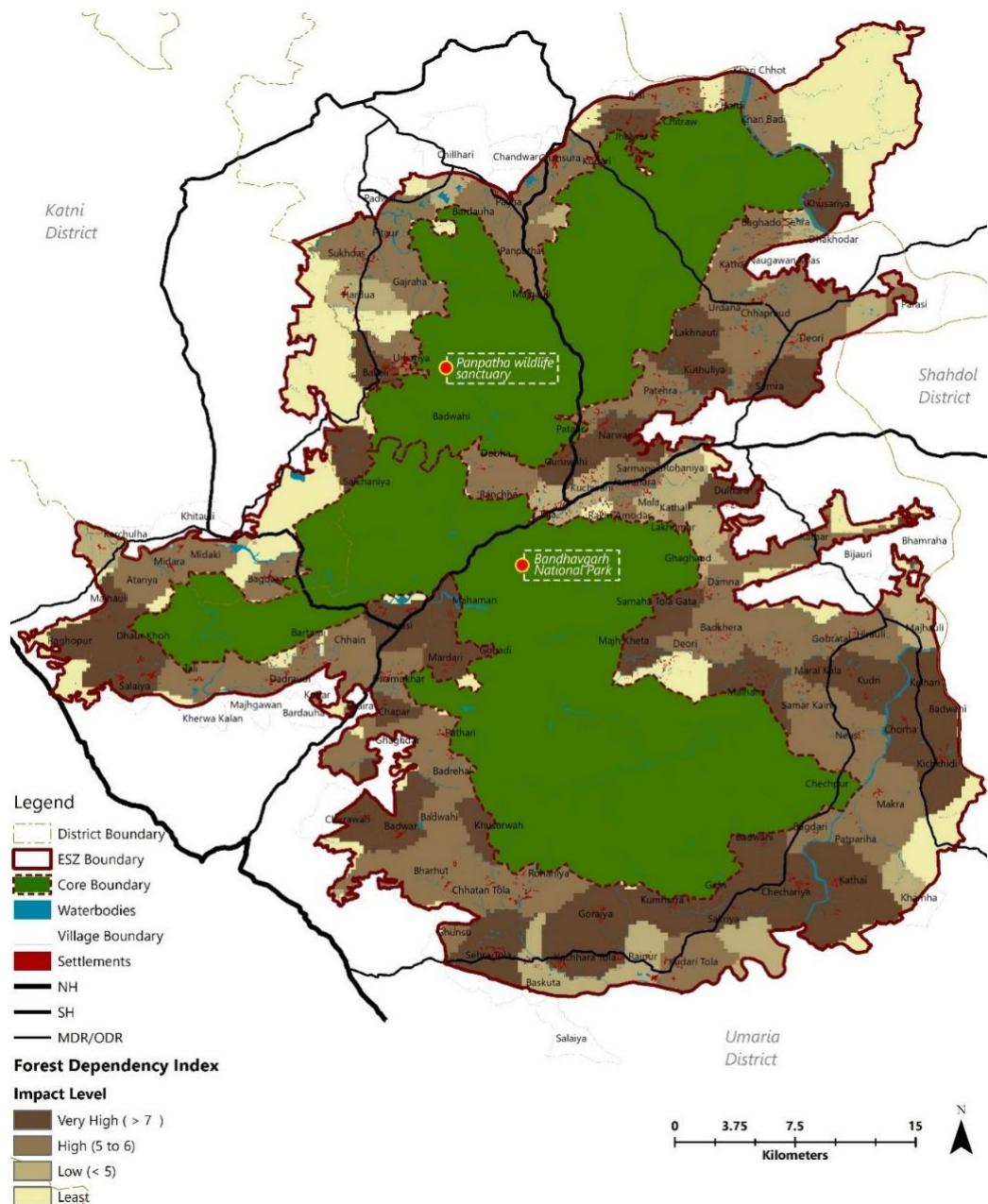
Total SC and ST Population Impact Index		
S. No.	Range	Score
1	>89.05	3
2	42.74-89.05	2
3	<42.74	1

³⁷ 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

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 have 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 27: Dependency on forest and its produce by the people living in Bandhavgarh ESZ



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 are 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

S. 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

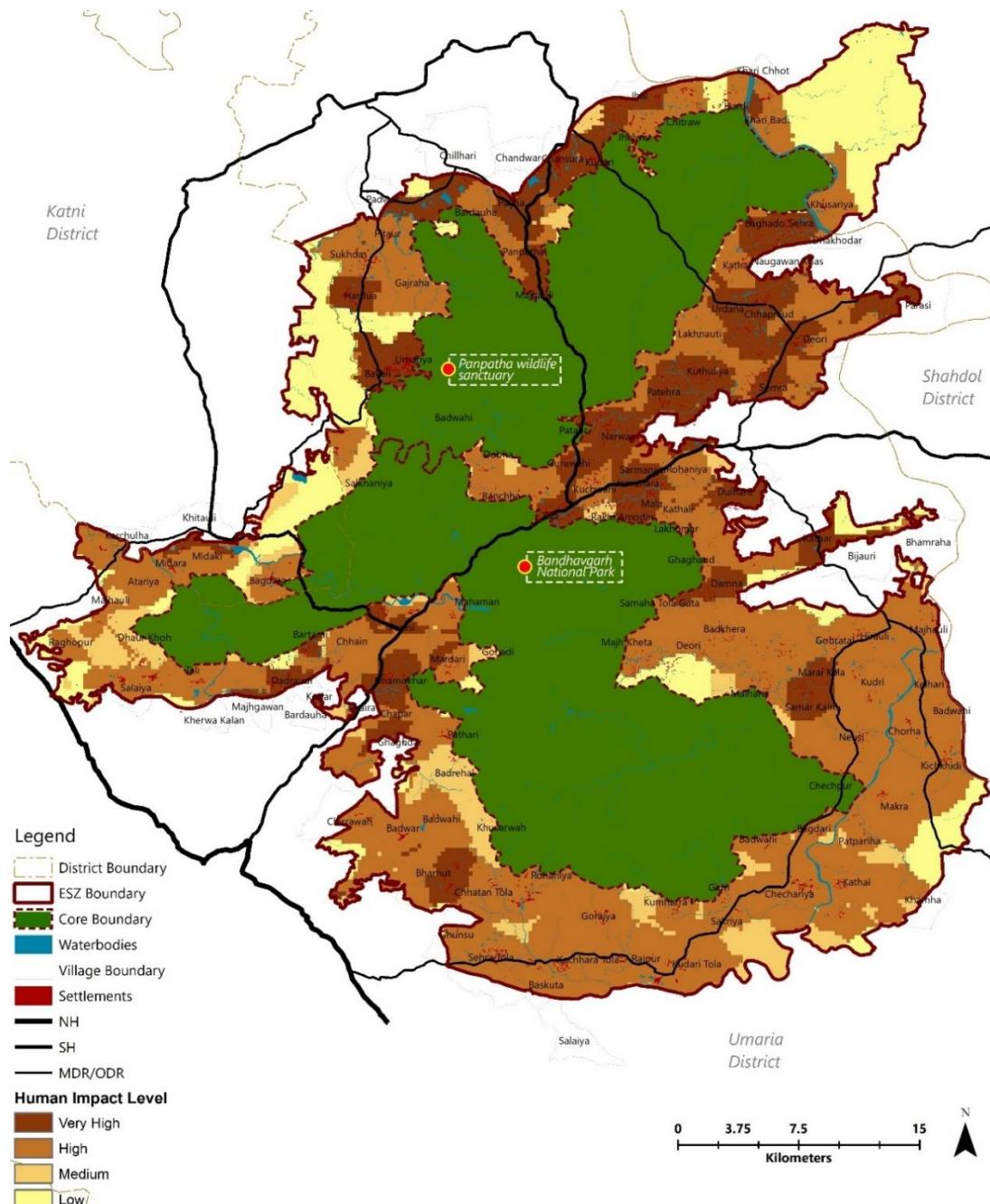
Legends

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.

Interpretation of impact analysis can be summarized as shown in section below. High and much of the medium Intensity areas are saturated areas which have high impact on the adjoining ecosystems and these areas have to be safeguarded so that the situation is not further aggravated. The output of the intensity analysis has been used in the zoning guidelines.

Map 28: Output of the Impact Analysis for the Bandhavgarh ESZ and surrounding areas

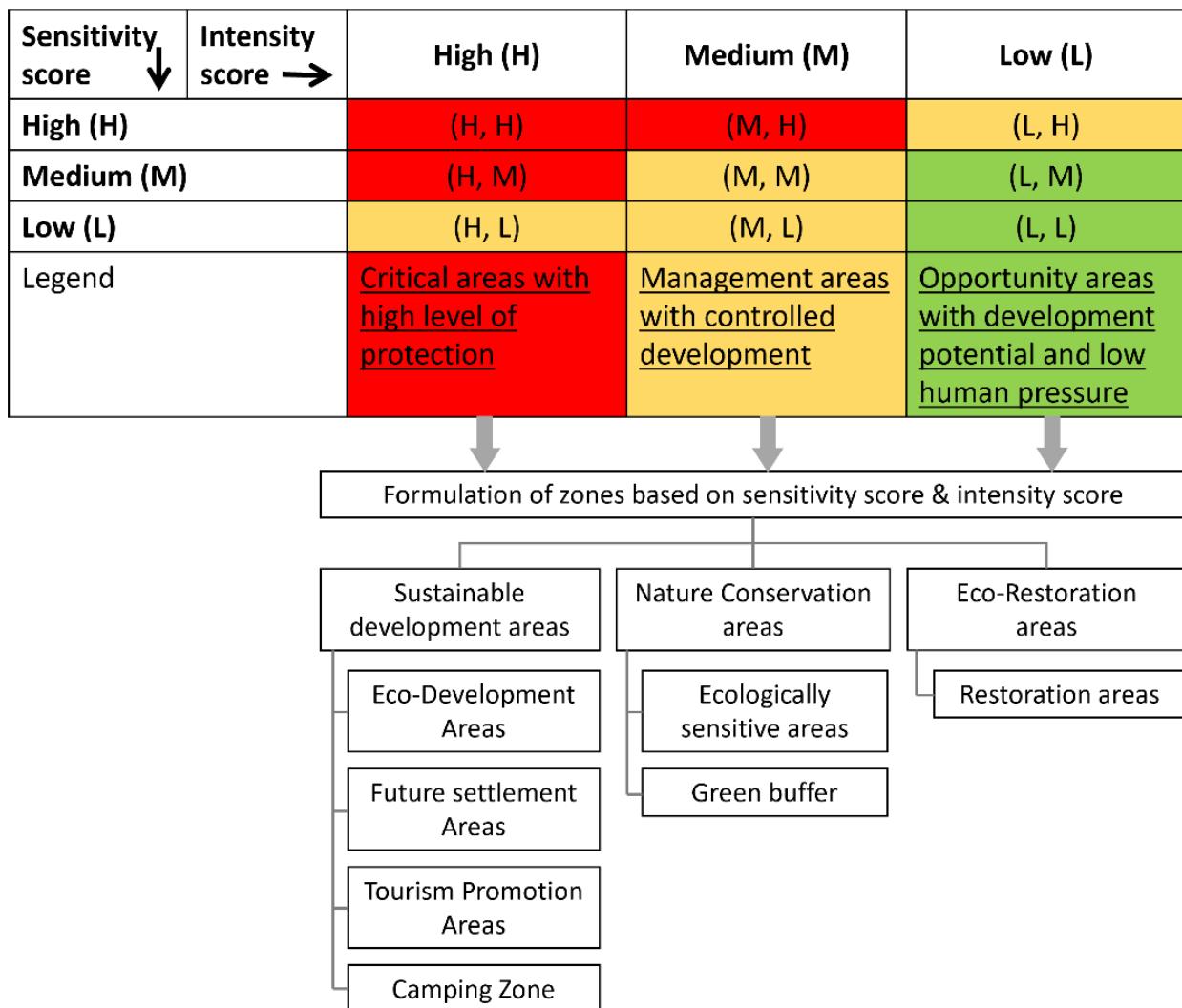


Source: MAPIT and IPE analysis

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.

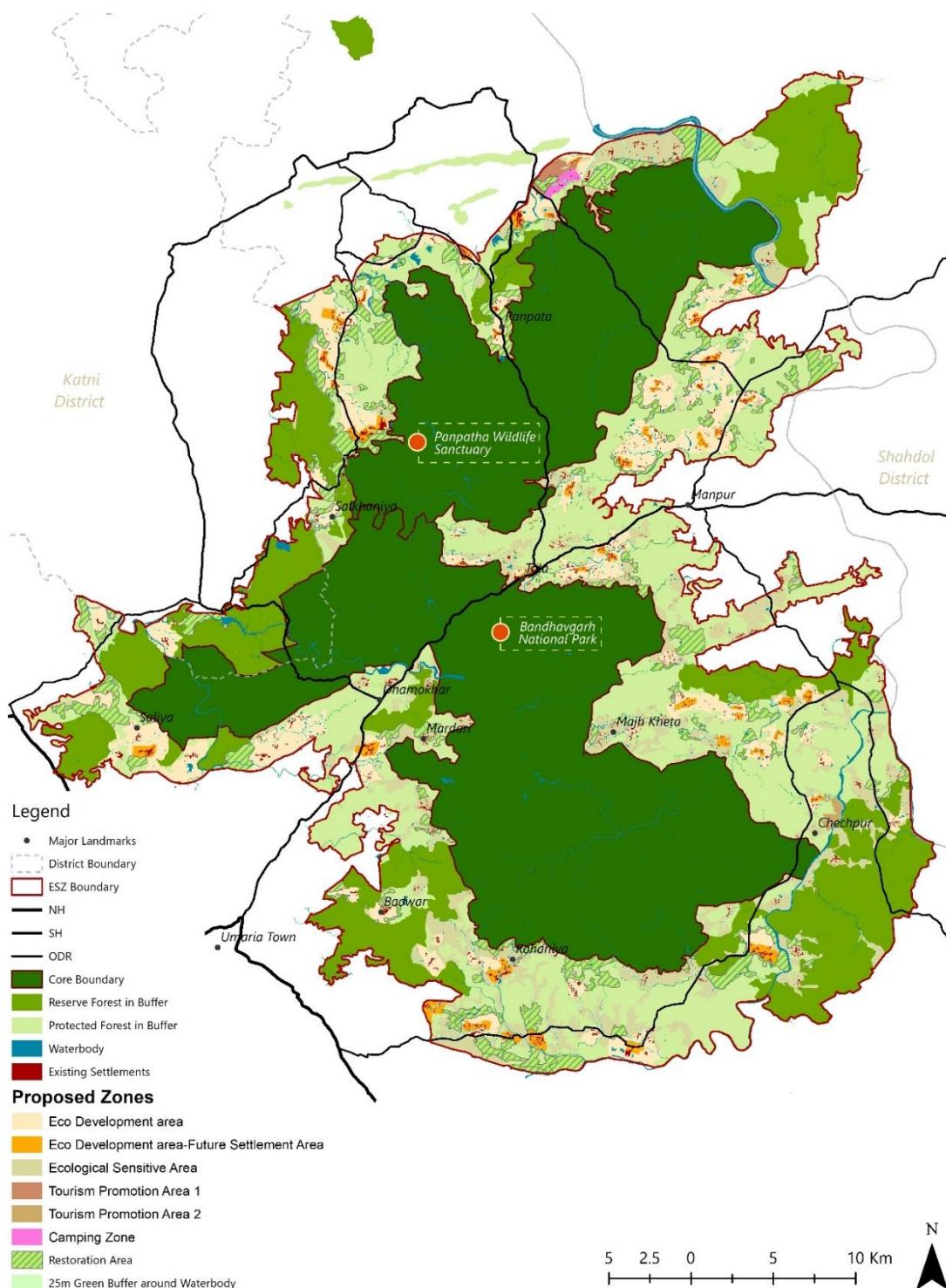
Exhibit 2: Zoning methodology for defining the Eco-sensitive zones



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 red 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, tourism promotion areas, camping sites and restoration areas.

Map 29: Composite Zoning map for Bandhavgarh ESZ



2.1.4 Application of Zoning in regulatory framework

The value addition of the 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 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 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

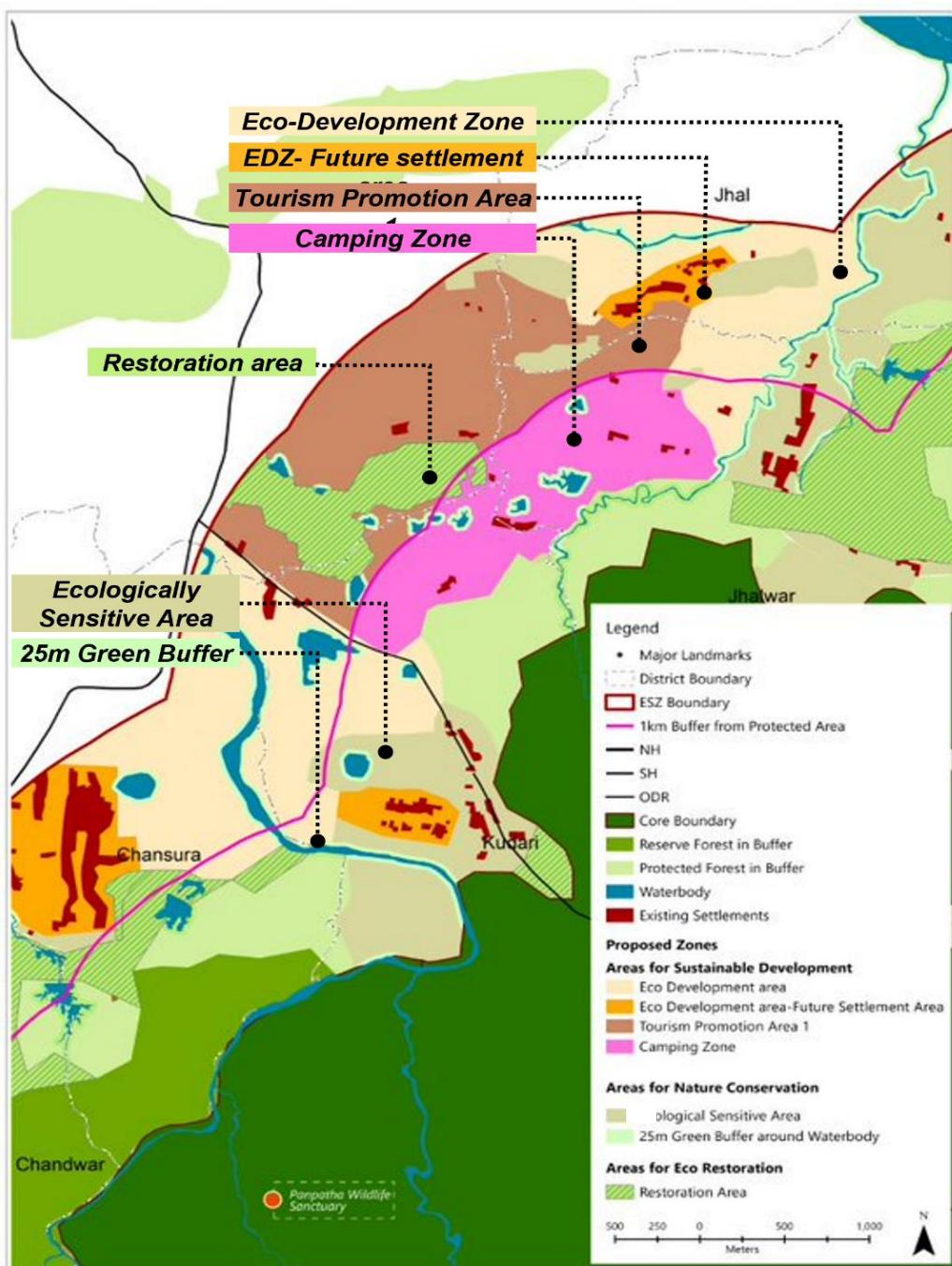
Proposed Zones:

- 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
- c) **Tourism Promotion Areas:** This is another sub-category of Eco-development areas which can be used for controlled eco-tourism activity based on management guideline and

carrying capacity. Tourism Promotion Areas (TPA-1 & TPA-2) has been proposed for Project area.

d) **Camping Zone:** This is another sub-category of Tourism Promotion area where permanent construction is not allowed and is mostly dedicated for camping purposes. The camping zone has to be developed as per the guidelines mentioned in section 10.3.2. and must also be followed by the forest department and tourists enjoy the nature at its core and avoid contribution to environmental degradation.

Map 30: Example of areas identified for sustainable development, nature conservation and Restoration



2.3 Areas for Nature Conservation

- e) **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).
- f) **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

- g) **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

Prohibited activities	
1	<p>Commercial mining, stone quarrying and crushing units.</p> <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 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	<p>Setting up of saw mills.</p> <ul style="list-style-type: none"> • No new or expansion of existing saw mills shall be permitted within the Eco-sensitive Zone.
3	<p>Setting up of industries causing water or air or soil or noise pollution.</p> <ul style="list-style-type: none"> • No new or expansion of polluting industries in the Eco- sensitive Zone shall be permitted.
4	Commercial use of firewood.
5	Establishment of new major hydroelectric projects and irrigation projects.
6	Use or production of any hazardous substances.
7	Discharge of untreated effluents and solid waste in natural water bodies or land area.
8	<p>New wood based industry.</p> <ul style="list-style-type: none"> • No establishment of new wood based industry shall be permitted within the limits of Eco-sensitive Zone. • Provided that the existing wood-based industry may continue as per law. • Provided further that the renewal of licenses of existing saw mills shall not be done on their expiry period.

9	Undertaking activities related to tourism like over-flying the National Park Area by aircraft, hot-air balloons. ³⁸
---	--

2.6 Regulated activities in ESZ

Regulated activities	
1	<p>Establishment of hotels and resorts³⁹.</p> <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	<p>Construction activities⁴⁰</p> <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 stays; 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. <p>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.</p>
3	<p>Felling of trees.⁴¹</p> <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. • In case of Reserve Forests and Protected Forests the Working Plan prescriptions shall be followed.
4	<p>Commercial water resources including ground water harvesting.</p> <ul style="list-style-type: none"> • The extraction of surface water and ground water shall be permitted only for bona fide agricultural use and domestic consumption of the occupier of the land.

³⁸ Detailed pre-feasibility assessment to be conducted for any over-flying activities

³⁹ Refer Tourism Promotion Zones delineated in section 5.1.5, carrying capacity in section 5.1.6. and guidelines mentioned in section 5.3.

⁴⁰ Refer Zones delineated in section 2.2. and guidelines mentioned in section 5.3.

⁴¹ Refer guidelines as mentioned in Tiger Conservation Plan of Bandhavgarh Tiger Reserve 2017

Regulated activities	
	<ul style="list-style-type: none"> Extraction of surface water and ground water for industrial or commercial use including the amount that can be extracted, shall require prior written permission from the concerned regulatory authority. No sale of surface water or ground water shall be permitted. Steps shall be taken to prevent contamination or pollution of water from any source including agriculture.
5	<p>Erection of electrical cables and telecommunication towers.⁴²</p> <ul style="list-style-type: none"> Erection of New electric poles and cables to be permitted only for villages/areas where there is no electricity. (Augmentation/renovation of Existing electric lines is permitted. Promote underground cabling.
6	<p>Fencing of existing premises of hotels and lodges.</p> <ul style="list-style-type: none"> Regulated under applicable laws. Shall be done in a manner to allow free movement of wildlife. Existing fencing of establishments not compliant with the above condition shall be removed or modified to meet the requirement within six months from the date of final notification.
7	<p>Widening and strengthening of existing roads.</p> <ul style="list-style-type: none"> Shall be done with proper Environment Impact Assessment and mitigation measures, as applicable.
8	<p>Movement of vehicular traffic at night.</p> <ul style="list-style-type: none"> Regulated for commercial purpose, under applicable laws.
9	Introduction of exotic species. ⁴³
10	Protection of hill slopes and river banks. ⁴⁴
11	<p>Discharge of treated effluents in natural water bodies or land area.</p> <p>Recycling of treated effluent shall be encouraged and for disposal of sludge or solid wastes, the existing regulations shall be followed.</p>
12	Commercial sign boards and hoardings.
13	<p>Small scale industries not causing pollution.</p> <p>Non-polluting, non-hazardous, small-scale and service industry, agriculture, floriculture, horticulture or agro- based industry producing products from indigenous goods from the Eco-sensitive Zone, and which do not cause any adverse impact on environment shall be permitted.</p>
14	Collection of Forest produce or Non- Timber Forest Produce.
15	Air and vehicular pollution. ⁴⁵
16	Drastic change of agriculture systems. ⁴⁶
17	<p>Trenching Ground.</p> <p>No new trenching shall be established. However, existing trenching ground will be operated subject to the condition that no open burning will be allowed.</p>
18	Dairy activities and Cattle rearing ⁴⁷

⁴² Details regarding Management of trunk infrastructure has been provided in the section 5.3 and 5.10.

⁴³ Refer guidelines as mentioned in Tiger Conservation Plan of Bandhavgarh Tiger Reserve 2017

⁴⁴ 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.

⁴⁵ Follow Air (Prevention and Control of Pollution) Act- 1981

⁴⁶ Refer guidelines in section 3.17.

⁴⁷ Refer guidelines in section 3.17.

Regulated activities	
19	Use of polythene bags
20	Goat Farming.
21	Solid Waste Management. ⁴⁸
22	Eco-tourism activities. ⁴⁹

2.7 Promoted activities in ESZ

Promoted activities	
1	Ongoing agriculture and horticulture practices by local communities.
2	Rainwater harvesting ⁵⁰
3	Organic farming ⁵¹
4	Adoption of green technology for all activities.
5	Cottage industries including village artisans, etc. ⁵²
6	Use of renewable energy sources.
7	Environmental Awareness.
8	Skill Development. ⁵³
9	Agro-forestry ⁵⁴
10	Community Nature Reserves.

As observed earlier 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 key outcome of the Zonal Master Plan (ZMP)s. The inter-relation between forementioned spatial and Non spatial recommendations can be observed in the table prepared below:

⁴⁸ Refer section 3.7 and 3.8

⁴⁹ Tourism activities to be carried out as per Sub-Zonal Tourism Plan as detailed out in Chapter 5.

⁵⁰ Refer section 3.4.

⁵¹ Refer Section 3.17

⁵² Refer section 3.18

⁵³ Refer section 6.3 and 6.5.

⁵⁴ Refer section 3.17.

Table 2:Suggestive Activity Classification for ESZ

SI No	Activities	Favourable Zone						
		Management Zone				Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Tourism Promotion Area	Camping Zone	Ecologically sensitive zone	Restoration Zone	Green buffer
Regulated Activities (as per extracts of the ESZ Notification)								
1	Commercial establishment of hotels and resorts.							
	(i) New commercial hotels and resorts	•	•	•	•	•	•	•
	(ii) Renovation and reconstruction of already existing commercial construction are allowed within the existing built-up area. ⁵⁵	•	•	✓	✓ ⁵⁶	•	•	•
	(iii) Small temporary structures for eco-tourism activities	•	•	✓	✓ ⁵⁷	•	•	•
	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. ⁵⁸	•	•	✓	✓	•	•	•
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:							

⁵⁵ 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.

⁵⁶ 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.**

⁵⁷ 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.**

⁵⁸ Refer Chapter 5 of Sub-Zonal Tourism Plan for additional details.

SI No	Activities	Favourable Zone						
		Management Zone				Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Tourism Promotion Area	Camping Zone	Ecologically sensitive zone	Restoration Zone	Green buffer
1.	(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 ⁵⁹ ; 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.	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.	•	•	•	•	•	•	•
4.	(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.	•	•	•	•	•	•	•
	Commercial extraction of surface and ground water. Regulated under applicable law.	•	•	•	•	•	•	•
5.	Erection of electrical and communication towers and laying of cables and other infrastructures. Regulated under applicable law ⁶⁰ .	✓	✓	✓	✓	✓	•	•

⁵⁹ Refer section 3.18.

⁶⁰ Underground cabling may be promoted as per specific guidelines. Specific linear intrusions to be avoided as per management guidelines.

SI No	Activities	Favourable Zone						
		Management Zone				Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Tourism Promotion Area	Camping Zone	Ecologically sensitive zone	Restoration Zone	Green buffer
6.	Fencing of existing premises of hotels and lodges. Regulated under applicable law	✓	✓	✓	✓	•	•	•
7.	Widening and strengthening of existing roads and construction of new roads ⁶¹ .	✓	✓	✓	✓	✓	•	•
8.	Movement of vehicular traffic at night. (Regulated for commercial purpose under applicable laws).	✓	✓	✓ ⁶²	•	•	•	•
9.	Introduction of exotic species. ⁶³	•	•	•	•	•	•	•
10.	Protection of hill slopes and river banks. Regulated under applicable law.	✓	✓	✓	✓	✓	✓	✓
11.	Discharge of treated wastewater/effluents in natural water bodies or land area. ⁶⁴	✓	✓ ⁶⁵	•	•	•	•	•
12.	Commercial sign boards and hoardings. ⁶⁶	•	•	•	•	•	•	•
13.	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.	✓	✓	•	•	•	•	•
14.	Collection of Forest Produce or Non-Timber Forest Produce (NTFP). Regulated under applicable laws.	✓	✓	✓	✓	✓	✓	✓
15.	Air and vehicular pollution. Regulated under applicable laws.	•	•	•	•	•	•	•

⁶¹ Shall be done with mitigation measures, as per applicable laws, rules and regulations and available guidelines

⁶² Unless otherwise prohibited under any specific law.

⁶³ Regulated under applicable laws

⁶⁴ 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.

⁶⁵ Specific treatment facilities has to be provided in areas with high human concentration as identified in the project interventions.

⁶⁶ Regulated under applicable laws.

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

SI No	Activities	Favourable Zone						
		Management Zone				Conservation Zone		
		Eco Development	Eco Development-Future Settlement Area	Tourism Promotion Area	Camping Zone	Ecologically sensitive zone	Restoration Zone	Green buffer
16.	Drastic change of agriculture systems. Regulated under applicable laws	•	•	•	•	•	•	•
17.	Trenching Ground. Regulated under applicable laws	•	•	•	•	•	•	•
18.	Dairy activities and Cattle rearing. Regulated under applicable laws.	✓	✓	•	•	• ⁶⁷	•	•
19.	Use of polythene bags	•	•	•	•	•	•	•
20.	Goat farming Regulated under applicable laws. ⁶⁸	✓	✓	•	•	•	•	•
21.	Solid waste management/bio-medical waste management. ⁶⁹	•	•	•	•	•	•	•
22.	Eco-tourism. ⁷⁰	✓	✓	✓	✓	✓	✓	•
Promoted Activities								
23	On-going agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture. Permitted under applicable laws for use of locals.	✓	✓	✓	✓	✓	✓	✓
24	Rainwater harvesting. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓
25	Organic farming. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓
26	Adoption of green technology for all activities. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓
27	Cottage industries including village artisans, etc. Shall be actively promoted.	✓	✓	✓	•	•	•	•
28	Use of renewable energy and fuels. Biogas, solar light, etc. to be actively promoted.	✓	✓	✓	✓	✓	✓	✓

⁶⁷ 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 5.17 for Proposals and recommendation

⁶⁸ Subject to the approval of monitoring committee and Management guidelines

⁶⁹ Regulated under applicable laws

⁷⁰ Regulated under applicable laws.

SI No	Activities	Favourable Zone						
		Management Zone				Conservation Zone		
		Eco Develop ment	Eco Development- Future Settlement Area	Tourism Promotion Area	Camping Zone	Ecologically sensitive zone	Restoratio n Zone	Green buffer
29	Environmental awareness. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓
30	Skill development. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓
31	Agro-forestry. Shall be actively promoted.	✓	✓	✓	•	✓	✓	✓
32	Community Nature Reserves. Shall be actively promoted.	✓	✓	✓	✓	✓	✓	✓

LEGEND

✓ Favourable zones | • Not permitted

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-8 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 shall be regulated as per the Regulations mentioned in Chapter 8 and Chapter 5 of Sub-Zonal Tourism Plan.
- The green buffers or recreational zones are proposed to water Bodies/wetlands, major streams and water flow channels and no building activity shall be proposed in the buffer area. The following are the buffer proposed ⁷¹:
 - 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).

⁷¹ Please refer 'Urban Wetland/Water Bodies Management Guidelines' issued by National Mission for Clean Ganga with School of Architecture and Planning, New Delhi.

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 the construction of hotels, resorts, guest houses, 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) Shall 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 shall be allowed in any villages.
 - d) The construction shall not be more than G+1 floor.
 - e) All buildings shall 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 IDENTIFIED 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 neighborhoods, 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 clean-up 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.

Exhibit 3: Bicycle route from TPA-1 to Magdhi and Gharial bank

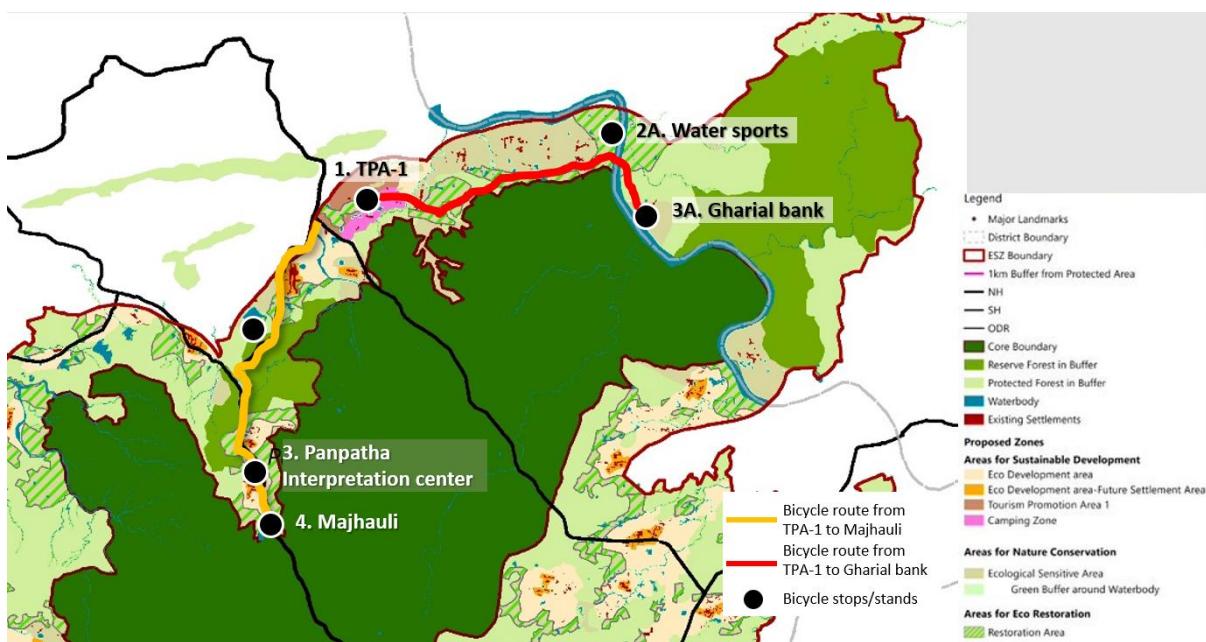
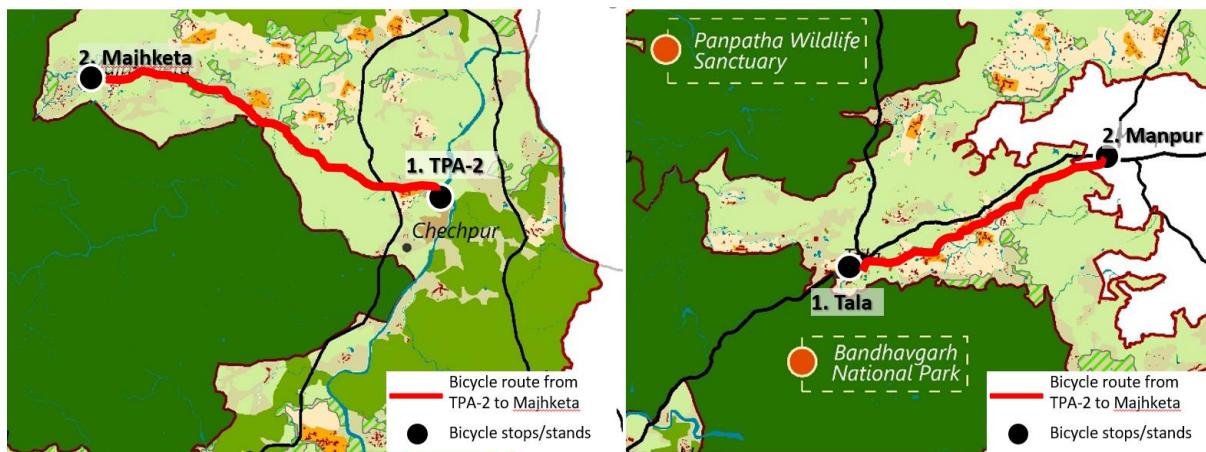


Exhibit 4: Bicycle route from TPA-2 to Majhketa (left) and Tala to Manpur (right)



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 help of Tiger Cell, Task Force and Tiger Protection Force (in case the protected area is a Tiger Reserve)

- **Tiger Protection Force (TPF):** A Tiger Protection Force has been constituted in Tiger reserve this force is divided into six squads i.e., one in each range. Each squad shall be comprised of 8 to 10 local youths and 5 Ex- servicemen. These squads shall be kept in sensitive areas on rotation basis. Wherever they are stationed local staffs and labourers should be part of protection force. These squads should invariably be used for night foot patrolling. Daily record of patrolling should be maintained. ROs and ACFs will accompany at least 4 times in a month with Tiger Protection Force. Tiger Protection Force should be equipped with guns, torches, canes, wireless, vehicles etc.
- **Strategy for Protection & Communication** - Following are various strategies identified: -
 - 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.
 - Tiger cell and Task Force.

- 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 5: Covering of lined and unlined wells in protected areas has become a major priority

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., lightening, rolling of stones and by rubbing among bamboos. In ESZ Zone, most of the cases of wildfire 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 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 Electrocution: 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.

Iron Trap Surveillance: Though the use of iron traps (gin traps) is not common in and around the Tiger Reserve area, there is no scope for complacency. The ESZ Management should ensure that poachers, particularly nomadic tribes/ *pardhees* that sometimes camp in this zone do not set gin traps for Tigers and Leopard and other wild animals.

The ESZ management should also perform the following functions:

- Range officers should always be in constant touch with the nearest police stations to have prior knowledge of the campsite of nomadic tribes, the duration of stay and total number of adult males and females etc.
- It also requires coordination between the range officers of the ESZ and National Park.
- The campsite should be very closely and secretly kept under surveillance to gather information on what kinds of domestic and agricultural instruments are made by these nomads. It should never be expected that they will easily disclose information on iron traps.
- Every forest guard should have good knowledge of forest roads, tracks and dry nala beds for recording movements of tigers.
- Generally, poachers set this iron traps on the above areas of tiger movements in such a way that there is a maximum possibility of a tiger putting its foot on the iron trap. To ensure this possibility, the poachers create such obstructions (thorns and thorny bushes etc.) that tigers/ Leopards have to avoid these paths and are automatically led into the one where the iron trap has been fixed.
- Poachers have good knowledge about the length of the step and stride of animals, and they can even set 4-6 iron traps on a single path.
- Sometimes poachers may also place a kill at the head of a "V" area whose both arms are obstructed by thorny bushes. The tiger is attracted by the kill and is led towards the kill through these thorny arms and gets trapped in the iron trap.
- Every forest guard should very cautiously look for this iron trap continuously for two days in his beat at least once in fifteen days.
- If a forest guard ever comes upon an iron trap or the above signs of leading a tiger to a specific place, he should immediately inform his higher-ups and watch over the iron trap so that no animal may be trapped.

- The ESZ Management should ensure that every forest range has an updated list of villagers whose occupation is iron-smithy.
- The ESZ Management should ensure the monthly review of the above strategy under the following prescribed format:

Name of the Range	Camp Site of Nomads	Date on which the Camp was Established	Probable Date of Wind-up	Type of Occupation	Date of Inspection by the Staff	Name of Beat	Dates of Checks of Tiger Tracks	Remarks
1	2	3	4	5	6	7	8	9

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 8.2.1.)

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 remodelling 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.

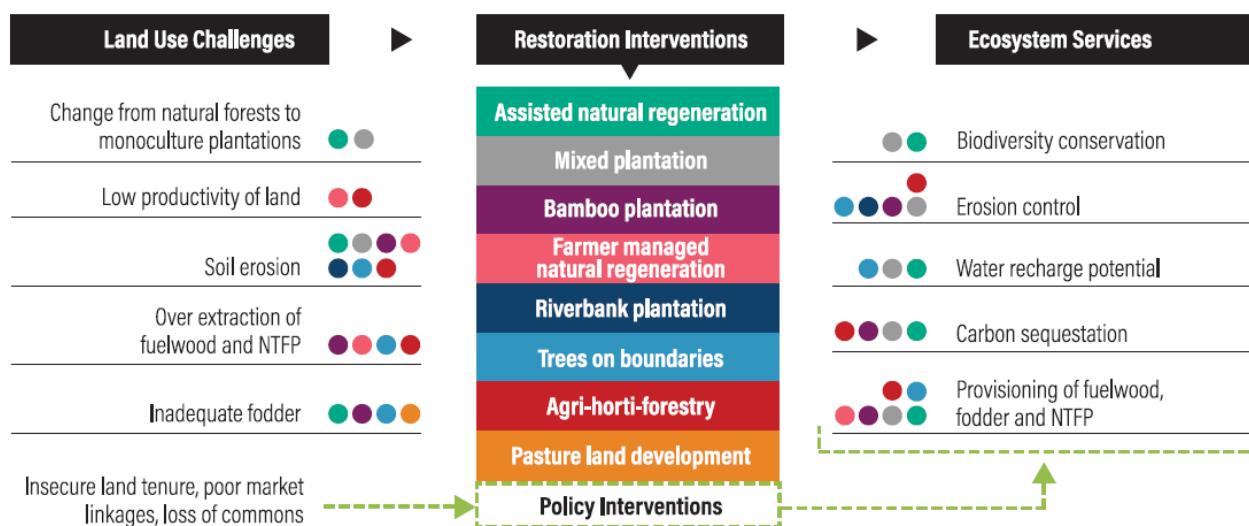
- It is suggested that the planting of nitrogen-fixing, drought-resistant species be prioritized, as these species can rapidly create thick leaf litter layers and restore soil nutrients and soil organic matter, while reducing water evaporation and runoff.
- It is suggested that continuous monitoring 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

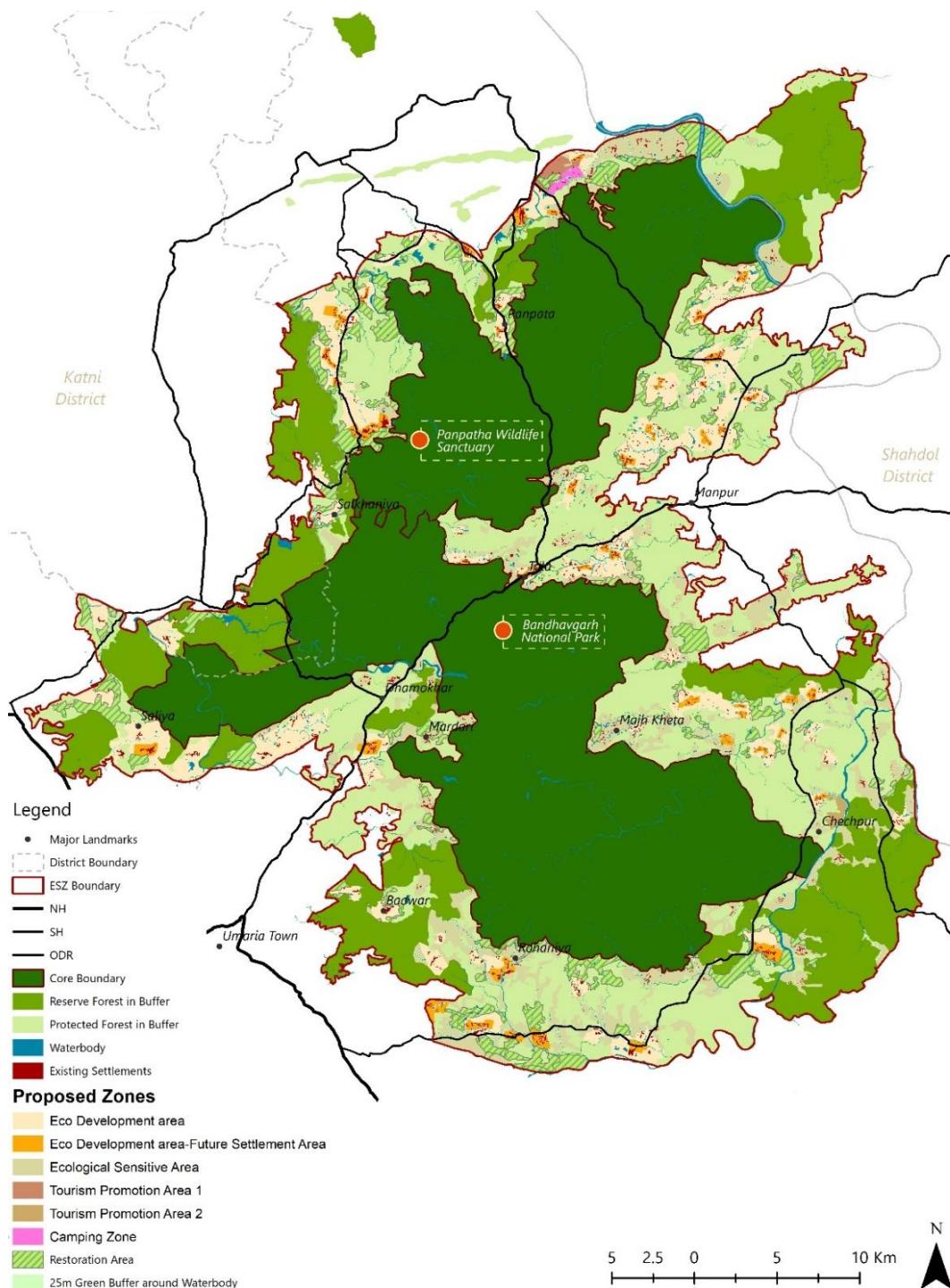
- To control Soil-water erosion and lessen the Land degradation on Forest and Non- Forest area.
- To improve Protection and Management of Forests through greater Community Involvement.
- For remove Barriers to Promoting Sustainable Rural Livelihood and Provide a Broader range of Livelihood options for 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 in north of Bandhavgarh ESZ especially in the watersheds of Jarwahi and Bhandar.

Exhibit 6: Areas demarcated for restoration in Bandhavgarh ESZ



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, land use, 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.⁷²
- 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

- This plantation drive was integrated with nursery run by horticulture department and Self-Help 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.

⁷² Landscape Restoration for Climate and Communities – Opportunity assessment of Sidhi district by WRI



Image 4: Greenhouse arrangement in the nursery (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 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, paras 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 Cattle 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 8.1), 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 adopted⁷³ - Seismic energy transmitting into the earth and propagating along the surface of the earth as Relay 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.

⁷³ Tiger Conservation Plan, 2017-18

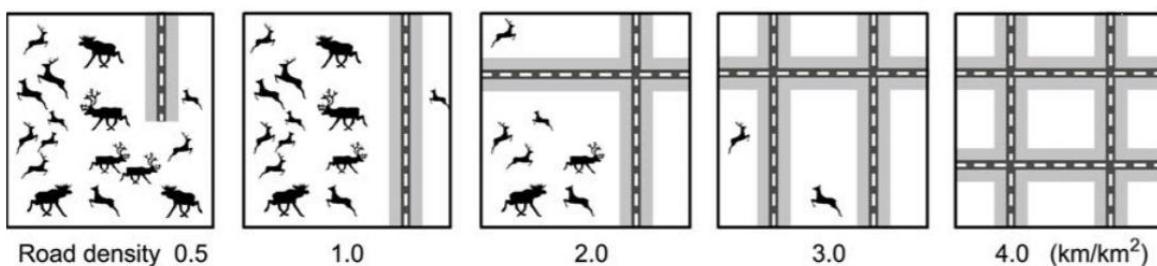
3.3.1 Animal overpass/underpass or phasing out of roads

Wildlife crossings are structures that allow animals to cross human-made barriers safely. Wildlife crossings may include underpass tunnels or wildlife tunnels and overpasses or green bridges. Wildlife crossings are a practice in habitat conservation, allowing connections or reconnections between habitats, combating habitat fragmentation. They also assist in avoiding collisions between vehicles and animals, which in addition to killing or injuring wildlife may cause injury to humans and property damage.

Project Rationale

There is direct loss of habitat during establishment and maintenance of roads and highways. This may happen due to clearing of vegetation, dumping of excavated earth and materials, movement of heavy vehicles and earthmovers, creation of labour camps etc. The effects of these disturbances may persist in the landscape for years to decades.⁷⁴

Exhibit 7: Loss of wildlife and their habitat due to roads/linear intrusion



A study published last year in Biological Conservation, co-authored by Ramakrishnan, used genetic data collected from 10 central Indian tiger reserves including Pench, Kanha and Bandhavgarh, and predicted that if intrusions such as roads continue at the current rate, vital 'heterozygosity', or genetic variability, would decrease by as much as 50% in the next century.

Project description

A. Objective

To maintain the integrity of the wildlife corridor and reduce the number of wildlife road accidents in Bandhavgarh Tiger Reserve and its Eco-Sensitive Zone.

B. Project location/ priority area

The following roads crossings are suggested by Bandhavgarh Tiger Reserve where the probability of the wildlife road accidents is the maximum:

- Umaria to Manpur via Tala – This road can even be phased out over a period of time by constructing an alternate road outside the Protected Area as per the feasibility studies
- Parasi to Khitali via Bagdara
- Tala to Panpatha to Amarpur
- Manpur to Bijauri to Magdhi
- Karkeli to Raipur to Chechariya to Magdhi
- Dewari to Gangitaal to Chansura

⁷⁴ Wildlife Crossing Structure Handbook by U.S. Dept of transportation, 2011

C. Case study/best practices:

Nine 'animal underpasses' were built late last year beneath a stretch of NH 44 on one of the country's most important wildlife corridors, between Kanha and Pench tiger reserves in Madhya Pradesh and Maharashtra, to prevent roadkill and reduce the 'barrier effect' that busy roads have on the movement of animals.



Image 5: A view of tiger movement through the underpass created along Kanha-Pench corridor

A WII study has 468 captures of 15 species for 90 days monitoring of animal movement, including the tiger. Balancing India's infrastructure development needs and wildlife protection has always been a very difficult proposition. It was in 2016, when the roads ministry sanctioned the construction of 25 leafy underpasses for wildlife movement as part of 10 national highways that pass-through wildlife sanctuaries and forests.

D. Project components/activities

Most wildlife-vehicle collisions happen at a location that's within a 100-meter section of roadway where animals (regardless of species) cross. This can be due to migratory patterns and the existing topography that gives them a pathway to cross. After a location is shown to have a high number of accidents with certain species, then the decision must be made on what type of mitigation efforts to implement with consideration to cost and best return on investment. Many different mitigation measures can be taken, from simply putting up warning signs to building a wildlife underpass/overpass and installing fencing. Exhibit 8 provides the percentage reduction of different mitigation measures that can be implemented to prevent wildlife collisions.

Exhibit 8: Results from a study on National Wildlife Vehicle Collision Reduction

Mitigation Measure	% WVC Reduction
Deer whistles	0%
Standard warning signs	0%
Seasonal wildlife warning signs	26%
Vegetation removal	38%
Fence with gap and crosswalk	40%
Population culling	50%
Relocation	50%
Anti-fertility treatment	50%
Animal detection systems (ADS)	82%
Fence with underpasses	87%
Fence with under- and overpasses	87%

For underpass/overpass: Wildlife crossings are permanent structures embedded within a dynamic landscape. The location and design of the crossings need to accommodate the changing dynamics of habitat and climatic conditions and their wildlife populations over time. Some basic principles that management needs to consider:

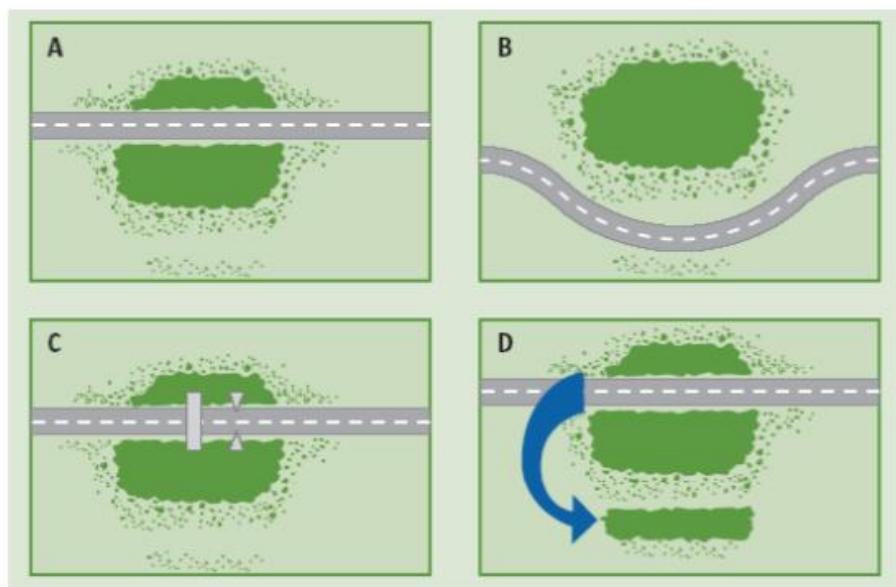
Topographic features: Wildlife crossings should be placed where movement corridors for the focal species are associated with dominant topographic features (riparian areas, ridgelines, etc.). Sections of roadway can be ignored where terrain (steep slopes) and land cover (built areas) are unsuitable for wildlife and their movement.

Multiple species: Crossings should be designed and managed to accommodate multiple species and variable home range sizes. A range of wildlife crossing types and sizes should be provided at frequent intervals along with necessary microhabitat elements that enhance movement. Unlike the physical structure of wildlife crossings, microhabitat elements are movable and can be modified over time as conditions and species distributions change.

Adjacent land management: How well a wildlife crossing structure performs is partly dependent upon the land management that surrounds them. Transportation and land management agencies need to coordinate in the short and long term to ensure that tracts of suitable habitat adjacent to the crossings facilitate movement to designated wildlife crossings.

Larger corridor network: Wildlife crossings must connect to, and form an integral part of, a larger regional corridor network. They should not lead to “ecological dead-ends.” The integrity and persistence of the larger corridor network is not the responsibility of the transportation agency, but that of neighbouring land management agencies and municipalities.

Exhibit 9: Representation of road construction and habitats



(A) fragmentation (B) avoidance (C) mitigation by use of under/overpasses (D) compensation by creation

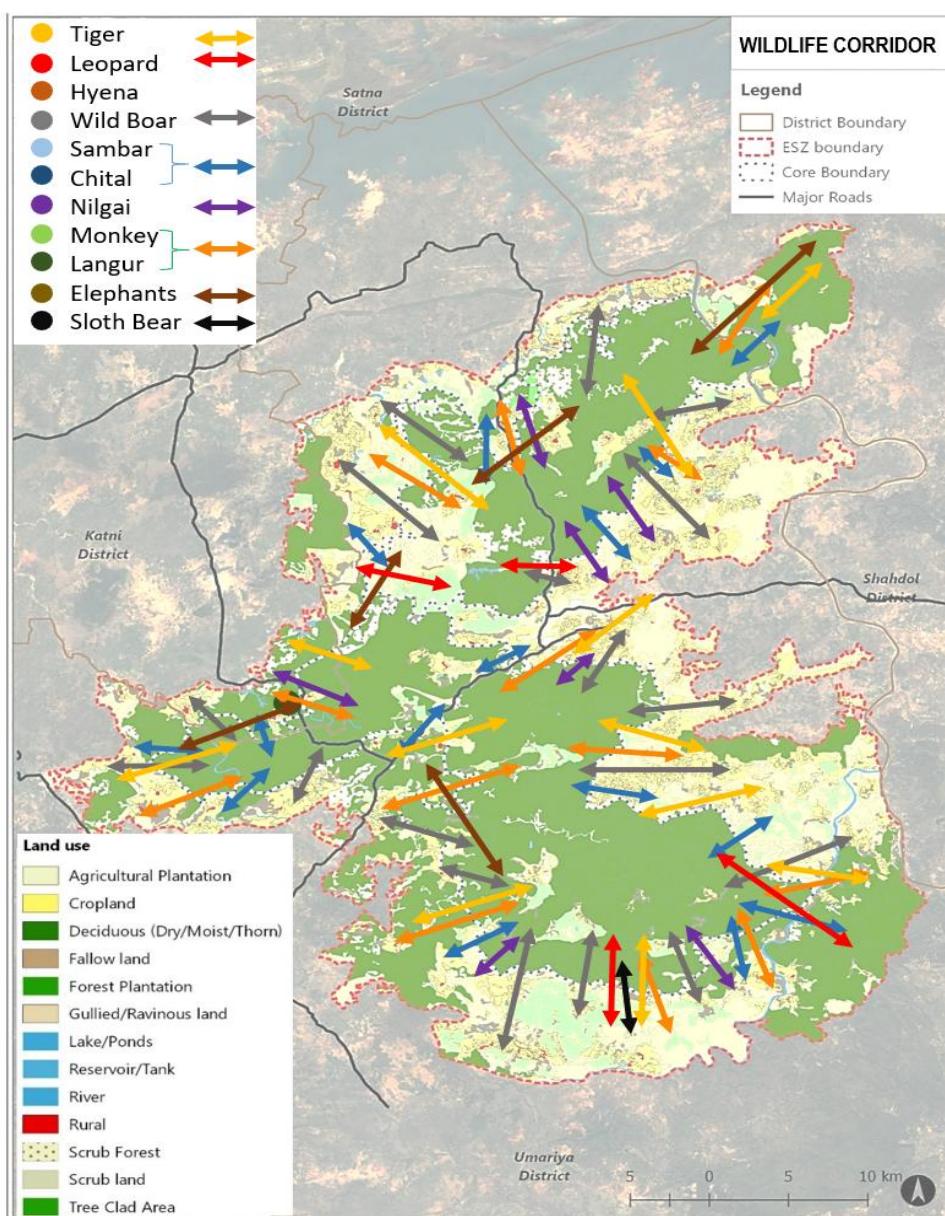
Some basic map and data resources for planning wildlife connectivity and crossing mitigation include Aerial photos, Land cover-vegetation maps, Topographic maps, Landownership maps,

Wildlife habitat maps, Wildlife movement model data, Wildlife ecology field data, Wildlife road-kill data and Road network data.



Image 6: A safe passage for animals in Banff National Park

Map 31: Wildlife crossing along SH-10 from Umaria to Manpur as per Wildlife corridors



Structure Size and Placement. The FHWA recommends a wildlife overpass width to be 165 to 230 feet wide and an underpass to be greater than 40 feet wide by 15 feet in height. Structure length also should be taken into account when choosing an underpass, with larger openings for longer structures. A landscape bridge is an example of an overpass structure that will support all wildlife species but needs to be greater than 330 feet wide. A viaduct or flyover is an example of an underpass structure that will support all wildlife species. The length of the wildlife crossing should be less than 230 feet and reducing noise levels is more important than regulating light levels because most crossings occur at night.⁷⁵

The most-suitable crossings for the greatest number of species are landscape bridges, wildlife overpasses, viaducts and wildlife underpasses. Fencing is a key part of mitigation that should be combined with the crossing structure to funnel wildlife through. Flared wingwalls will help wildlife locate and approach the crossing. Approach ramps should have a gentle slope of 5:1 or less, which, unfortunately, will drive up costs. Wildlife crossings can consist of, but are not limited to, concrete bottomless arches, structural plate, concrete or steel open-span bridges, and concrete box culverts.

Project benefits/outcomes⁷⁶

- Reduce the number of wildlife accidents due to vehicle on the state highway.
- Improving the safety of motorists too.
- Increase uninterrupted movement of wildlife through the forest.
- Ensure conservation of habitats by reducing habitat fragmentation.

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

Issues: Declining trend in ground 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.

⁷⁵ <https://www.conteches.com/knowledge-center/pdh-article-series/design-considerations-for-wildlife-crossings>

⁷⁶ Wildlife Crossing Structure Handbook by U.S. Dept of transportation, 2011

- 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 Bandhavgarh 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

Bandhavgarh 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 Bandhavgarh ESZ.

In India, around 80 % of the population is agrarian and the majority of them live a miserable life due to poor livelihood opportunities especially in the rural areas. More than 80% farmers are small landholders (having less than two hectares) and comprises of 60% of the total cultivated area. The irrigation depends on the rainfall, primarily. These rainfed farms are always under pressure due to lack of definite means of irrigation unlike rainfalls, which is compounded due to presence of less biodiversity zones. Agroforestry could be one viable solution for to meet the challenges of food, nutrition, energy, livelihood and environmental security. In India, around 80 % of the population is agrarian and the majority of them live a miserable life due to poor livelihood opportunities especially in the rural areas. More than 80% farmers are small landholders (having less than two hectares) and comprises of 60% of the total cultivated area. The irrigation depends on the rainfall, primarily. These rainfed farms are always under pressure due to lack of definite means of irrigation unlike rainfalls, which is compounded due to presence of less biodiversity zones. Agroforestry could be one viable solution for to meet the challenges of food, nutrition, energy, livelihood and environmental security

Project Description

- Objective:** To ensure the (best) possible beneficial use of rainwater endowment on the entire area of Bandhavgarh 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 water 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 Bandhavgarh 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 3.7.

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; and
- 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.

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.6.1 Integrated liquid Waste Management for Bandhavgarh (especially hotels in Tala)

Liquid waste generation for Hotels- Generation of Liquid waste is estimated as per tourist population visited Bandhavgarh in the year 2017-18. As per CPHEEO norms considering water consumption of 135 Liter per person per day²⁹ wastewater generation will be 108 liters per person per day therefore wastewater generation is 97 KLD for the year 2018-19. As per the survey out of 33 hotels, 3 hotels are practicing decentralized wastewater treatment.

Projected liquid waste generation for Hotels - The average growth rate for the tourists visiting Bandhavgarh is incremental and more than 10 % ranging (as per the table above, whereas as per the projection for the year 2028 it will reach to. 215.4 KLD. The floating population projection with respect to the generation of liquid waste is taken as 12% growth rate year on year.

Treatment methods:

1. **For wastewater (Greywater & Blackwater) generated from hotels & Tala village**- It is proposed to intercept drain coming from Tala village and treat the liquid waste at a centralized treatment system proposed (location may be finalized subject to the land acquisition/ land allocation by the authorities)

For all the hotels including those who have not installed a treatment system, it is proposed to have a doorstep liquid waste collection system and the same shall be transported through a honeysucker/desludging vehicle up to a centralized wastewater treatment facility (based on Sequential Batch Reactor technology).

2. **Proposed Faecal waste (Black water) treatment for Hotels & Tala Village**- The generated faecal waste from hotels and villages shall be treated in a centralized co-treatment facility along with greywater. 1.0 KLD capacity holding tank with screening chamber and recirculation system is proposed for the discharge of septage (0.49 KLD for Tala village +0.2 KLD for hotels). The septage would be subjected to centrifugation for separation of solid and liquid waste, in a regulated flow liquid waste is allowed to be mixed with wastewater in a treatment facility. The solid waste is further co-composted with the sludge generated from wastewater.

Actions to be taken for establishing a centralized co-treatment facility

- To determine Influent raw liquid waste quality & quantity per day in the drain coming from tala village.
- To ensure that each household/commercial/semi commercial establishment/Govt building/Schools etc. within tala village must be get connected to the natural drainage line.
- To upgrade Soak pits (single tanks) toilets to septic tank-based toilet (double tank type).
- Encourage to construct new Toilets within Swacch Bharat Abhiyan.

Advantages of SBR technology

- Excellent effluent quality
- Smaller footprint because of absence of primary, secondary clarifiers and digesters
- Biological nutrient (N&P) removal
- High degree of coliform removal
- Less chlorine dosing required for post disinfection
- Ability to withstand hydraulic and organic shock loads

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.

PROPOSED PROJECTS AND PILOT INTERVENTIONS

3.7.1 Integrated Solid Waste Management for Bandhavgarh

Natural areas have a high value associated with the existence of a variety of priceless natural resources. It is important to employ sustainable development in these areas by protecting the natural resources. Reasonable waste management is need of the hour that can significantly contribute to the protection of the environment and to sustainable development simply by accepting pro-environmental behaviour patterns. In regions such as Bandhavgarh Eco Sensitive regions where lack of environmental awareness of both residents and tourists is conducive to the degradation of the natural environment. One of the most significant threats in such protected areas is inappropriate waste management⁷⁷.

Waste management is an essential service in any society. The growth centres in Bandhavgarh ESZ and settlements are lagging behind this service. The proposed project intents to develop new waste management practices in the context of local development as well as tourism management and achieve goals of SBM and the conserve natural and unique ecosystems of Bandhavgarh ESZ.

⁷⁷ Waste Management in Selected National Parks – A Review, Journal of ecological engineering.

Project Rationale

Bandhavgarh ESZ constitute one form of nature protection, created in order to maintain biodiversity, resources, creatures and elements of inanimate nature and landscape. It is important to maintain its sustainable development by ensuring that natural resources remain in an undamaged state, despite increasing pressure on protected areas, often caused by the anthropogenic impact on the environment. Some of the impacts are related with the increase of waste and waste management, which contributes to the degradation of the natural environment.

Project Description

A. Objective

To develop effective, sustainable and integrated waste management options that ensures ecological safety, reduced environmental pollution while creating community employment options and awareness of the individuals.

B. Case Study/Best Practices

- Community Vermicomposting** - Large scale community vermicomposting units were developed in Dhupad cluster (Nalgonda) in order to promote effectively recycle and convert waste to valuable energy. Community participation from framer group, and SHGs were highly encouraged in order to make it a success in the longer run.
- Waste Reuse** – Ambikapur, a town in Chhattisgarh has come up with an innovative waste management strategy. It has set an example in terms of eco-friendly and effective solid liquid waste management. The initiative has intervened into entire chain of solid waste management starting from waste generation to disposal tagging it as a “Trash to Treasure System”
- Waste Recycling** - As a part of segregated waste management project, Port Blair. A unique Segregated Waste Collection Centre (SWCC) has been implemented by the Defence Wives Welfare Association (DWVA) as a part of ‘Swachh Bharat Aabhiyaan’. The DWVA started the Segregated Waste Collection Centers (SWCC) for disposal of waste generated by the Defence community. The defence areas accommodating about 10,000 residents have become almost ‘Zero Waste’ giving negligible amounts of waste to the Port Blair Municipal Corporation (PBMC).

C. Project Component

An effective and sustainable solid waste management system is developed upon following components:



Wet waste:

- Wet waste originating from households, officer colony, park and hotels will be collected in a segregated manner by an appointed agency/ collection worker and bought to a

demarcated processing facility (outside ESZ) housing a drum composter/biomethanation plant. Two sites have to be identified by the district administration, one processing center for Manpur block and another processing center for Umaria block. Please note that both the processing centers have to be outside ESZ area.

- Apart from the above, waste from some hotels is sent to local piggeries. It is proposed that the piggeries are permitted to continue collecting waste from these hotels to ensure no loss to their livelihood.
- It is proposed that hotels currently in the process of composting waste may continue with the same practice.

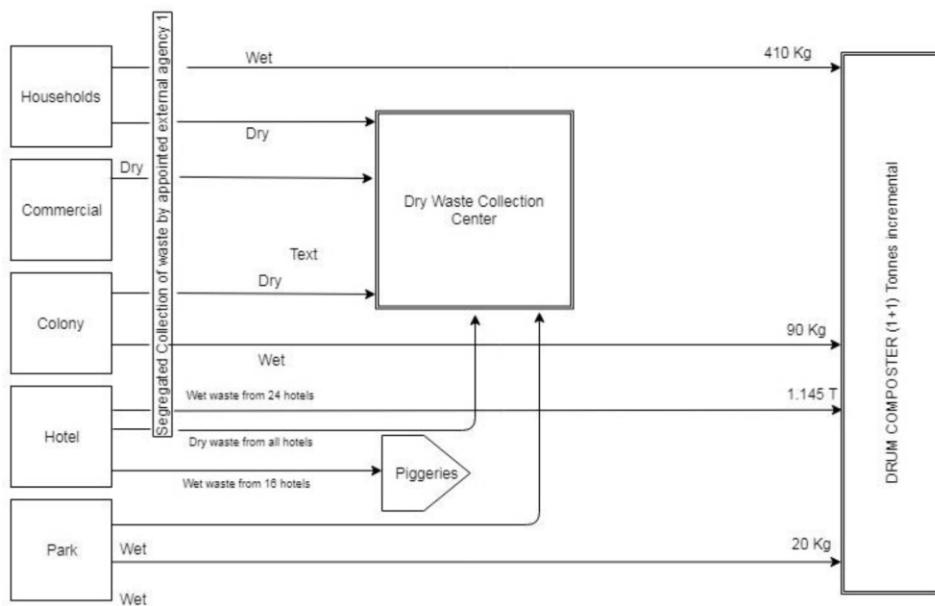
Dry waste:

- The dry waste originating from these stakeholders would be collected in a segregated manner and taken to a dry waste collection center that is housed adjacent to the demarcated area housing the composter/biomethanation. This waste will be collected by Self Help Groups (SHGs) or group of unemployed youth in the village may be identified for collection and transportation of household waste to community storage/ treatment site. Each member may be responsible for collection of waste for about 75-100 households.
- Dry waste in the center would be sorted and the recyclables would be sold to the kabadiwala. Plastic waste to be segregated at source.
- The non-recyclable combustible waste would be bailed & sent to Umaria in order to be sent to the cement plants.
- Sanitary waste incinerators to be installed at the dry waste resource center to process pads & napkins.

E-waste: E-Waste from households, office, institutions and other areas of generation has to be segregated separately and handed over to the Department of Forest / Madhya Pradesh Tourism for the E- Waste collection. This aggregated E-Waste shall be handed over to the authorized recycler at regular intervals based on the quantities.

Park- Waste: A gypsy vehicle shall be engaged on an annual contract basis to collect segregated waste from 5 locations within the park area and drop it at the dry waste collection center/composter/bio methanation unit.

Exhibit 10: Waste Management Plan



Disposal mechanism

Transportation of waste through a protected area is a big area of concern and many animals can come in contact with it. To avoid such scenario, it is proposed that 2 nos. dry waste collection center or waste segregation unit and 4 nos. of composter shall be proposed outside ESZ in eastern and western sides of the protected area. One would cater to waste coming from Manpur block and other would cater to Umaria block.

Awareness

- Training program - The SHG members must be imparted a 15-day Training Programme on waste handling and management before execution of the waste management project
- Campaigns – Campaigns can be efficiently designed in the form puppet shows, street plays to make aware households for taking up waste composting within the premises to reduce the amount of waste generated.



Image 7: Example of Community Awareness Programs for SWM in India

Project Benefits/Outcomes

- Reduces the amount of waste to Landfill, thus reducing the burden of administrative authorities relating to waste disposal, thus reduces pollution in terms of GHGs emitted from landfill site.

- Creation of green jobs by providing employment to SHGs and volunteers into the chain of waste management.
- The reusable and recycled items can be sold into open markets for revenue generation and sustenance of waste management program.
- Reusing the reusable products also helps in reducing the carbon footprint on the area.
- Enhances environmental awareness amongst the local communities and tourists.
- No Plastic Tourist destinations can be one of the innovative and USP for promoting sustainable eco sensitive tourism in Bandhavgarh ESZ.
- Recycling efforts also create new businesses like collection, transportation, processing, manufacturing, packaging and selling of recycled products, paving the way for a greener future.

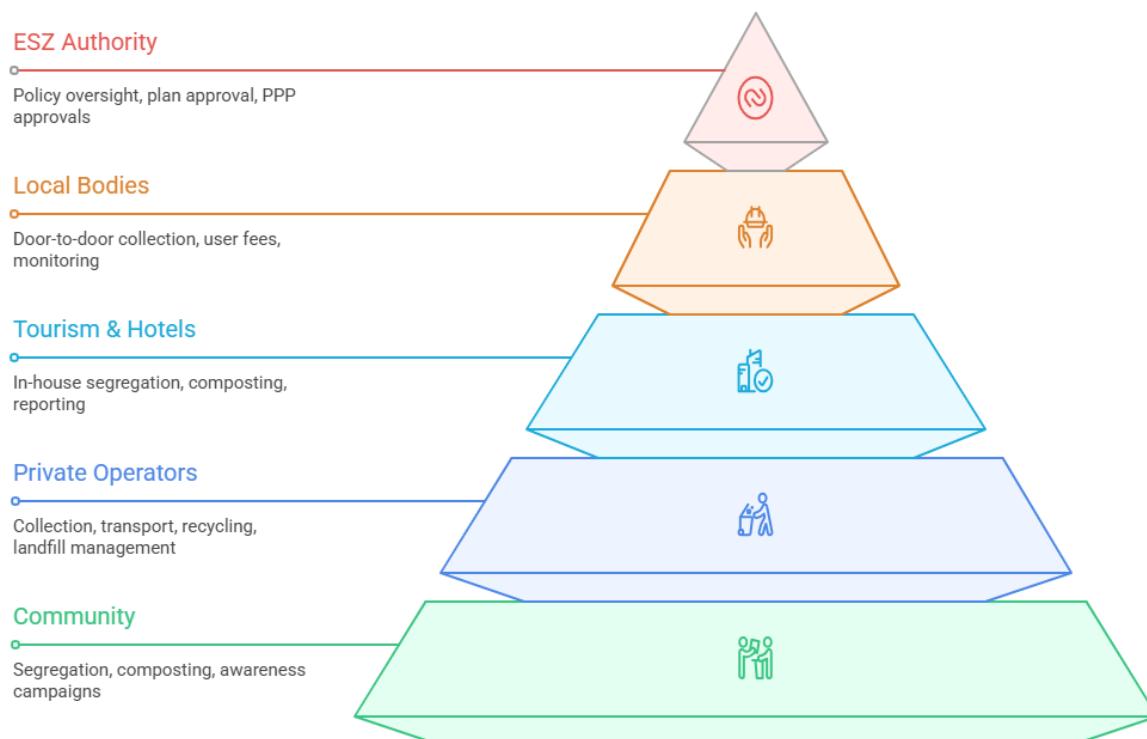
Recognizing SWM as a critical component in mitigating tourism-related impacts, a set of comprehensive SWM guidelines is proposed below for all categories of establishments and activities within the Eco-Sensitive Zone.

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

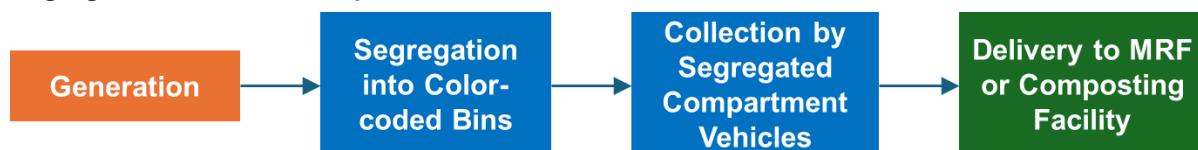


C. Segregation Guidelines

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
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)

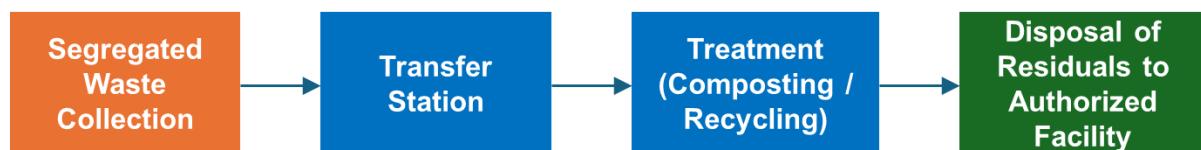
Activity	Waste Type	Strategy	Do's	Don'ts
Safari Vehicles	Food wrappers, bottles, tire waste, oil residues	Install mobile bins at start/end points; collect waste daily	Collect waste after every trip	Litter along routes
Camping Sites	Food waste, paper, biodegradable utensils	Implement "Leave No Trace" 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

Activity	Waste Type	Strategy	Do's	Don'ts
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.
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 rooms⁷⁸
- Eco-tourism facilities generating more than 25 kilograms per day of biodegradable waste⁷⁹
- 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

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

⁷⁸ Guidelines for Waste Management in Hotels and Hospitality Sector, Central Pollution Control Board (CPCB, 2018)

⁷⁹ Solid Waste Management Rules, 2016 (Ministry of Environment, Forest and Climate Change, Government of India)

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 (67% by forest, 20% by agriculture, 10% by barren land, rest is water bodies and 0.06% by rural area) 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 ban on night traffic along roads shall 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 were 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 shall be stopped. Reflectors that reflect the light downwards and inwards are encouraged.
- All barriers including energized solar fencing erected, across the migratory pathway 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 daytime.
- All vehicles delivering loose construction material and any such material gathered at the site shall 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 shall 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 shall be installed on existing or new roads (or power lines) following norms for location and design 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 shall be adopted. In the case of existing structures such as households and lands, possibilities of using CAMPA and other funds to purchase these shall be explored.
- No material including earth shall be used from the sanctuary area. All construction materials should be brought from outside the sanctuary area including earth, stones etc.
- 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) shall not be left on site and to 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 shall 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 shall 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 shall 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 that highways departments and authorities such as the National Highways Authority of India (NHAI) and electricity authorities shall try to deviate to save critical wildlife areas.
- The construction of the linear intrusions shall 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 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 while moving through any eco-sensitive location. 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 underpasses/overpasses.

Specifically, for Transmission line:

- Electricity lines passing through the Tiger Reserve 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 should 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 minimum of 20 feet (6.6 metres) above ground on level terrain (slope <20 degrees)
 - 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:
 - Aligning transmission corridors to avoid critical habitats (e. g. nesting grounds, heronries, rookeries, bat foraging corridors, and migration corridors);
 - Maintaining 1.5 metre spacing between energized components and grounded hardware or, where spacing is not feasible, covering or insulating energized parts and hardware;
 - Existing transmission or distribution systems may be retrofitted 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.
 - Marking of powerline wires with reflectors or other items that will prevent bird collisions and deaths
 - Monitoring powerlines for animal deaths and effectiveness of implemented measures

- For power lines passing through natural areas, the following additional safeguards shall be evaluated and implemented:
 - removing earth wires (and modifying earthing methods),
 - modifying line, pole and tower design and placement, to minimise visual (aesthetic), ecological (impact), and wildlife mortalities
 - installing underground cables in preference to overhead cables, especially in sensitive stretches
 - Conspicuous marking of lines, poles and towers.
- Width of vegetation clearings along power lines shall also be minimised. Width of vegetation clearing from the centre of the powerline shall be:

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 therefore)

[@]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.

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.
- 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 8.
- 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:

- Suggestive guidelines under sections 3.1 and 3.2 shall be followed.
- It is suggested that regulations under 'Tiger Corridors' (Refer section 8.1-Sensitive zones) 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 viable1 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 (Sub Zonal Tourism Plan)

Aim: Promotion of sustainable tourism development which aims to increase tourism potential in Bandhavgarh Tiger Reserve 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 activities, eco-education and eco-development as per the issued guidelines by NTCA and carrying capacity of the ESZ

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 activates.

- 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 new hotel or resort is allowed within 1 km from the boundary of protected area outside the Tourism Promotion Areas (TPA).

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 Riverine Tourism and Nature Walk at Chechpur

The Bandhavgarh Tiger Reserve is blessed with numerous river streams that generate from the central part of the Reserve, at the higher elevation and feed into the other bigger rivers. Because of the popularity of tourism worldwide, coastal, lake, and riverfront development has dramatically increased in recent decades. With the emergence of riverfront parks and conversion of sandy river banks into tourist zones, land near rivers is becoming highly desirable.

One of the important river of the Eastern side of the reserve is the Johilla river which is already a part of an existing tourist circuit due to the presence of Chechpur (Johilla) waterfall and Kuthulia waterfall. However, due to existing gaps and lack of tourist infrastructures, the Johilla zone is underperforming and is not being able to capture the existing tourist flow from other regions of the reserve. This provides an opportunity to promote recreational activities such as riverine tourism and nature trail along the river that can amplify the existing tourist flow and generate revenue that can be channelled back to the development and preservation of the reserve.

Project Rationale

The presence of an existing underperforming tourism zone alone necessitates the need for strengthening and capitalizing the tourism potential of the Johilla zone. Additionally, the geophysical quality of the river banks makes it ideal for promoting riverine tourism and introducing a nature trail that connect the riverine assets with the existing tourist spot - Chechpur and Kuthulia waterfall. By concentrating differential tourism products and assets, the zone will be able to harness comparative and competitive advantages of a tourism cluster that can yield desired benefits of social and economic upliftment.

Project Description

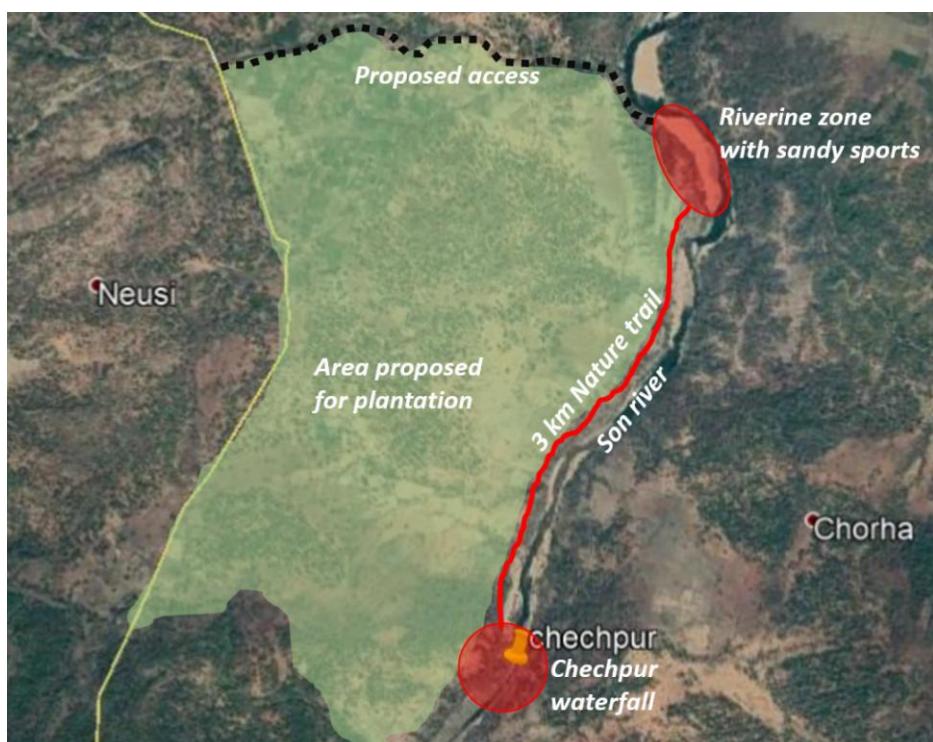
A. Objective:

To capture the tourism potential of the banks of the Johilla river by promoting river bank tourism and by providing associated infrastructure such as nature trails that can connect the different proposed tourism activities with the existing tourism assets of the zone to strengthen the revenue stream, local involvement in conservation and livelihood opportunities within the reserve.

B. Project location/priority area

The proposed project will be located along the Johilla river, within Chechpur village, which is already a popular destination within the National Park and has some degree of road connectivity. However, to access the sandy banks of the river for riverine tourism, additional road connectivity will be required. The proposed project will be located at an approximate distance of 46 km and 159 km from Shahdol and Rewa respectively.

Exhibit 11: Location of riverine zone, nature trail and Chechpur waterfall



C. Case study/Best practices

The Vistula River in Warsaw, Poland is a wild river with limited regulation. On the right side of the river bank there are large terrains, several hundred meters wide, with wild, varied foliage and a few vaguely marked footpaths. During summers, the several sandy areas are intensively used and draw tourist and sport enthusiasts from all the country. There is a biking road running the entire length of the river with small playgrounds, cafes and bars adjacent to it.⁸⁰ The footpath and three sandy areas equipped with games areas, public baths, sports fields and barbecue zones have enabled citizens to reclaim the right bank of the Vistula River and use it as an active public space.

⁸⁰ (n.d.). Retrieved from <http://www.warszawaguide.info/Langs flodenEng/index.htm>



D. Project component/activities

The proposed project will have three major components – riverine zone, nature trail and associate infrastructure and amenities. All these components need to be developed as per the carrying capacity of the TPA's as mentioned in Chapter 5.

Riverine Zone

1. Riverine tourism will be developed along the northern sandy banks of Johilla River from tourists to experience the admirable landscape and ecological environment of inland territory and enjoy a swim in the fresh water.
2. The riverine zone will also accommodate activities such as volleyball and other sandy sports as per the feasibility studies.
3. Promotion of the tourism product will be required to capture the existing tourist inflow from the other zones. Artwork such as sand art can be exhibited at the sandy banks to promote local art and socio-cultural history of Bandhavgarh communities.

Nature Trail

1. A 2.5 km Nature Trail that would start from the end of the proposed vehicular road and end at Chechpur (Johilla) Waterfall.
2. The landscaping along the walkway will utilize local plants and have educational boards describing each plant species for the guided tours.

Accommodation

1. With the use of responsible material and sustainable design practices, the eco-huts will offer a sustainable and luxurious alternative to conventional tourist accommodation in the region.
2. It would be an example of vernacular architecture of the place.

Infrastructure and Amenities

1. A 2 km vehicular Road is proposed to connect the existing road network to the sandy delta area of the river bank, which will be developed as the riverine zone.
2. Since littering is a problem across the country, adequate measures must be taken to incorporate social responsibility among tourists to mitigate dumping of waste in inappropriate places through signage, conservation measures and provision of waste bins at frequent intervals.
3. Amenities such as toilets and changing rooms will be provided at intervals.

4. Local tourist establishments such as cafes and snack bar will be developed along the nature trail.

Project benefits/outcomes

There are multiple socio-economic benefits the local communities can enjoy because of promotion of riverine tourism and introduction of river-based tourist infrastructure and establishments. Some of the benefits of the proposal are as follows -

- Strengthening of the tourism perspective of Johilla zone by providing tourists an innovative sandy area experience within inland territory, in addition to the existing tourist assets.
- Improvement of local tourism infrastructure and amenities.
- Opportunity for local employment that can facilitate economic upliftment of communities.
- Involvement of local communities in the conservation of natural ecosystems.
- Increase in the sales of local products, industries, and services, etc.

3.16.2 Sustainable Eco-huts at Magdhi

With a growing demand for eco-tourism or nature-based tourism, eco-huts are becoming a highly preferred alternative accommodation choice. Eco-huts are constructed by use of eco-friendly materials, designed to immerse with surroundings and sourcing the locally available building materials. These are of particular interest to the community and sustainable, because they are small, medium and microenterprises that can generate a variety of positive economic development impacts in highly rural, biodiverse areas, where other types of development underway or under consideration are frequently damaging to the environment.⁸¹

Bandhavgarh Eco Sensitive Zone has a number of accommodation facilities including resorts and hotels of different types and ranges. However, with expected tourism growth, several other accommodations will be necessary to support the existing tourist inflow and future growth. To address the adverse impacts of the unplanned tourism on the sensitive ecosystem, it is essential to follow sustainable tourism guidelines and management practices that would ensure a balance of social, economic and environment goals. Eco-huts offer an ideal solution for promoting nature-based tourism by increasing incentives and resources for conserving biodiversity and promoting responsible development in an area.

Project Rationale

The goal of the Tourism Master Plan is to provide appropriate interventions and infrastructure in areas of tourism interest or potential within ESZ. There is a proposed interpretation and tiger care center at Panpatha, which is currently under construction. It is expected that this center would generate visitors' interest and create an additional demand for homestays and eco-huts in the surrounding areas. The proximity of Magdhi village to Panpatha makes it an attractive location for eco-huts and sustainable development to cater to the needs of the eco-tourists.

⁸¹ Ecolodges: Exploring Opportunities for Sustainable Business. (n.d.). Retrieved from https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_report_ecolodges_wci_1319576869279

Project Description

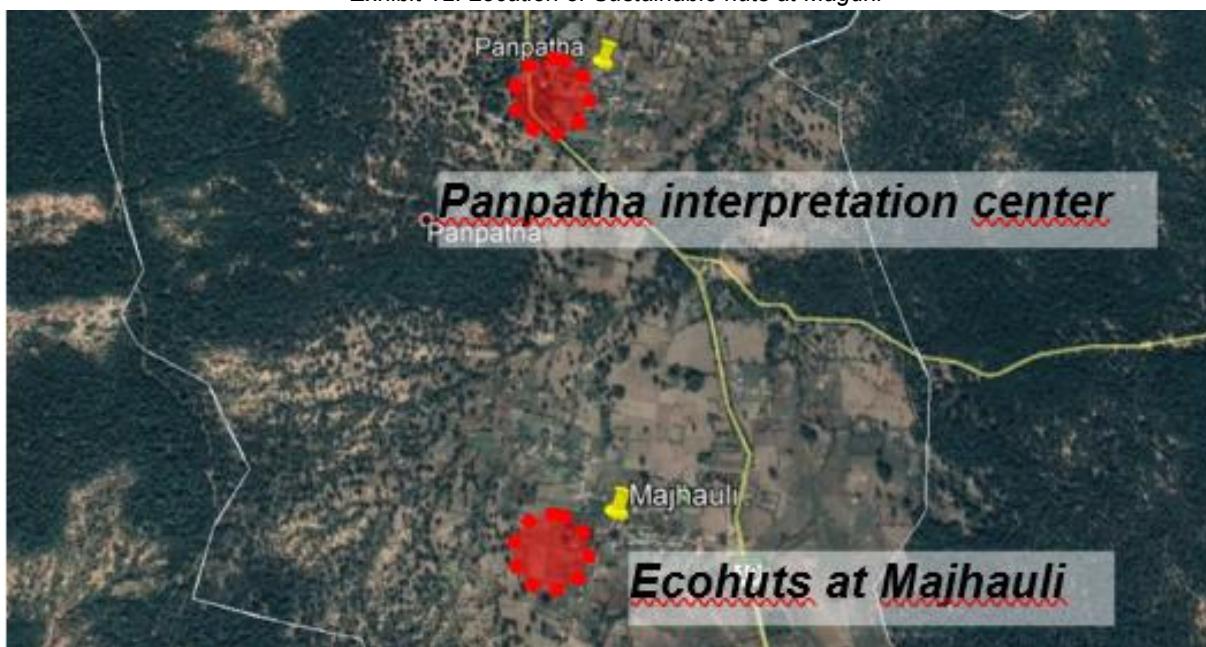
A. Objective

To develop eco-huts as a sustainable alternative to hotel stays by creating a local experience that upholds sustainable living by using low-impact construction, local food and culture, use of renewable energy, being facilitated by local community partnerships through direct employment or other types of socio-economic contributions.

B. Project location/priority area

The eco-huts will be located within the village of Magdhi, which falls under Pataur range and within Umaria District. The village is in the Northern part of the Bandhavgarh Tiger Reserve, adjacent to the Protected Area. It is well connected through the National Highway and is around 46 km away from Umaria and 14 km away from Tala. Both the villages of Panpatha and Magdhi have water availability at very deep level, which go beyond 16 m bgl.

Exhibit 12: Location of Sustainable huts at Magdhi



C. Case study/Best practices

Sarai at Toria is an earth friendly retreat located in the grasslands of Khajuraho, Madhya Pradesh, along the west bank of the beautiful Ken River. Its rammed-earth mud cottages are decorated with natural and handmade elements. A stay at the resort is all about downtime with nature, and its many nooks and crannies encourage guests to read a book sheltered by the tall grasses.

Even the dining area looks out over the river, and it is common to glimpse jackal, jungle cat, civet, or mongoose. Sarai at Toria's attempt to maintain the sanctity of the area is evident from the in-house solar plant which meets all the property's electricity requirements. The flora is completely indigenous to the landscape. Pests are controlled using tobacco, lemon, citronella, and eucalyptus products. There are no plastic mineral water bottles (only filtered water), and chemical-free toiletries are purchased in bulk and decanted into glass vials. The establishment supports local economic development of the staff from the neighbouring areas.

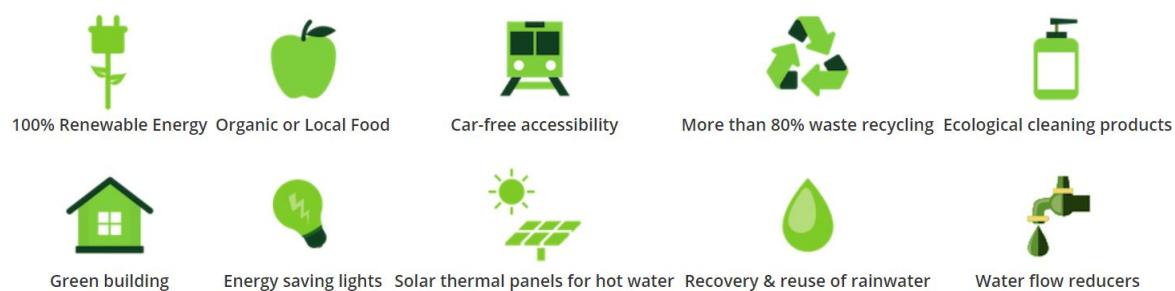


Image 8: Sarai at Toria has rammed-earth mud cottage

D. Project component/activities

1. **Luxury bungalows amidst nature** – Through the use of responsible material and sustainable design practises, the eco-huts will offer a sustainable and luxurious alternative to conventional tourist accommodation in the region.
2. **Solar powered facility** - Magdhi has a precedent of adopting solar initiatives. The proposed eco-huts will be powered by renewal energy and will advocate for the wider adoption of solar technologies in the village.
3. **Organic farming** – Since agriculture is the main source of livelihood in this area, there is scope of promoting newer farming technologies in agriculture and promoting organic farming. Guests will also be allowed to take part in farming activities and get hands on experience at the fields.
4. **Yoga and meditation classes** – The proposed eco-huts will offer guests daily yoga and meditation classes. The natural and pristine setup of Magdhi will provide an ideal atmosphere to relax, rewind and connect to the inner self and the nature.
5. **Gardens and forest trails** – All through the eco-hut complex there will be gardens and forest trails. The landscaping within the gardens will utilise plants and trees local to the region to conserve the biodiversity of the forest area.

Exhibit 13: Proposed sustainability measures at Eco-huts Complex



Project benefits/outcomes

A well-designed eco-hut project can provide tremendous benefits to the community without sacrificing the fragile ecosystem of a natural forest reserve such as -

- Promotion of nature-based tourism, instead of mass tourism.
- Conservation of biodiversity & promotion of responsible tourism.

- Employment of community members and direct financial contribution to local villages.
- Increase in consumable goods, produces, local handicrafts and artworks.
- Creation of awareness about local agricultural practices, yoga and meditation.
- Development of creative partnerships with local communities and the reserve to fund the conservation of endangered species.
- Promote the use of green architectural design and low-impact construction in other areas of the reserve.
- Facilitate local people economic alternatives to encroachment in conservation areas.

3.16.3 Water based Activities near Bansagar Lake

Eco-tourism can give water resources great potential, because it facilitates the development of attractive resources, combining their protection with respectful use.⁸² Territories such as Bandhavgarh Tiger Reserve and Panpatha Wildlife Sanctuary which is endowed with water resources can offer a wide variety of products and experiences related to water and associated wildlife, such as Gharial conservation.

The Bandhavgarh ESZ falls in the Ganga Basin within the Son Sub Basin. Most important streams such as Johilla, Charnganga, Damnar, Janadh, Banbei, Ambanala and Andhyari Jhiria eventually flows into the Son River. The proposed project intents to harness the opportunity to give water a renewed value within the tourism context and develop a positive relationship between the development of tourism and the conservation of natural and unique ecosystems based on these resources.

Project Rationale

Water has always been considered a social and economic asset; the tourism sector has always ascribed great importance to this resource because of its potential to revitalize and develop tourist destinations. If opportunities for eco-tourism and water-based sport activities are developed along the Son River through sustainable water management, it could vastly contribute towards promoting the responsible conservation of local water-based ecosystems and the socio-economic wellbeing of local communities and other associated stakeholders.

Project Description

A. Objective

To give recognition to water-based tourism, sports, recreation, and leisure as well as to the diversity in water resources to sustainably explore ecology, promote conservation, and create lasting community benefits.

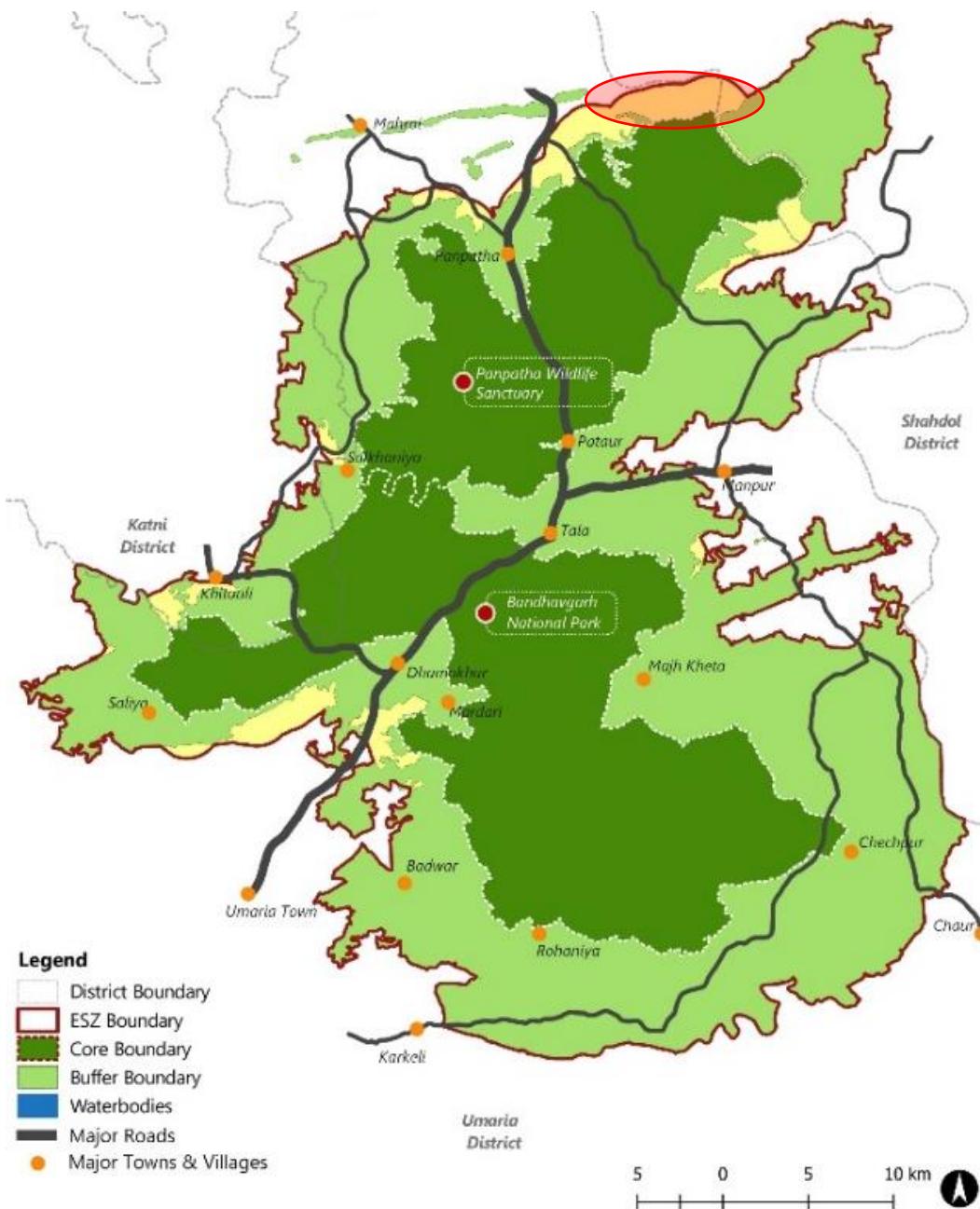
B. Project location/priority area

The proposed water-based activities will be located surrounding the Ban Sagar Lake which is situated on the Son river in the Ganges basin of Madhya Pradesh. The Ban Sagar Lake is a direct

⁸² Folgado-Fernández, J., Di-Clemente, E., Hernández-Mogollón, J., & Campón-Cerro, A. (2018). Water Tourism: A New Strategy for the Sustainable Management of Water-Based Ecosystems and Landscapes in Extremadura (Spain). *Land*, 8(1), 2. doi: 10.3390/land8010002

result of the Ban Sagar Dam, a multipurpose river Valley Project constructed in the Deolond village in Shahdol district. The site is located at a distance of 106 km from Sidhi, 110 km from Rewa, 147 km from Maihar and 195 km Katni.

Exhibit 14: Project location near Bansagar lake



C. Case study/Best practices

Water-based sport activities - The Puri Konark Marine Drive has Odisha's most popular water sports camps. Right from kayaking, snorkeling, water scooters, speed boats, surfing, tourists have a plethora of water-based activities to engage in.



Image 9: Water sports at Puri Konark

D. Project component/activities

- **Water Sports** – Development of water sport activities in the Ban Sagar Lake will be able to cater to consumers seeking niche tourism experiences such as adventure tourism and sports tourism, which is vastly popular among the younger demographic. Opportunities for water-based sport activities such as motor boating and water trampoline will be provided to create a sense of adventure and enjoyment within a short distance from the ESZ and contribute towards generating a tourism cluster. The tourism cluster will facilitate a rewarding holiday experience for its visitors by benefiting from the increased synergy and competitiveness of the destination and tourism products.
- **Motor boating** – Motor boating has become a key part of varied suite of touristic experience offered at destinations associated with water resources. One of the reasons behind the popularity of motor boating is that it can be conducted as a group activity with family and friends. The catchment area of 18648 sq.km of the Ban Sagar Dam and reservoir is ideal for promoting motor boating as an opportunity to experience challenge and adventure, amidst the pristine forest environment of the Bandhavgarh ESZ.
- **Water trampoline** – Water trampoline are inflatable bouncing platforms that are used for recreational purposes at rivers, sandy areas and lakes. The water trampolines will be placed at designated locations along the banks of the Ban Sagar lake that can be easily accessed by the tourists via guides.
- Hospitality hub near Bansagar lake to be proposed as per the feasibility studies

Project benefits/outcomes

The proposed project components and activities will bring various benefits to tourists and local communities, such as –

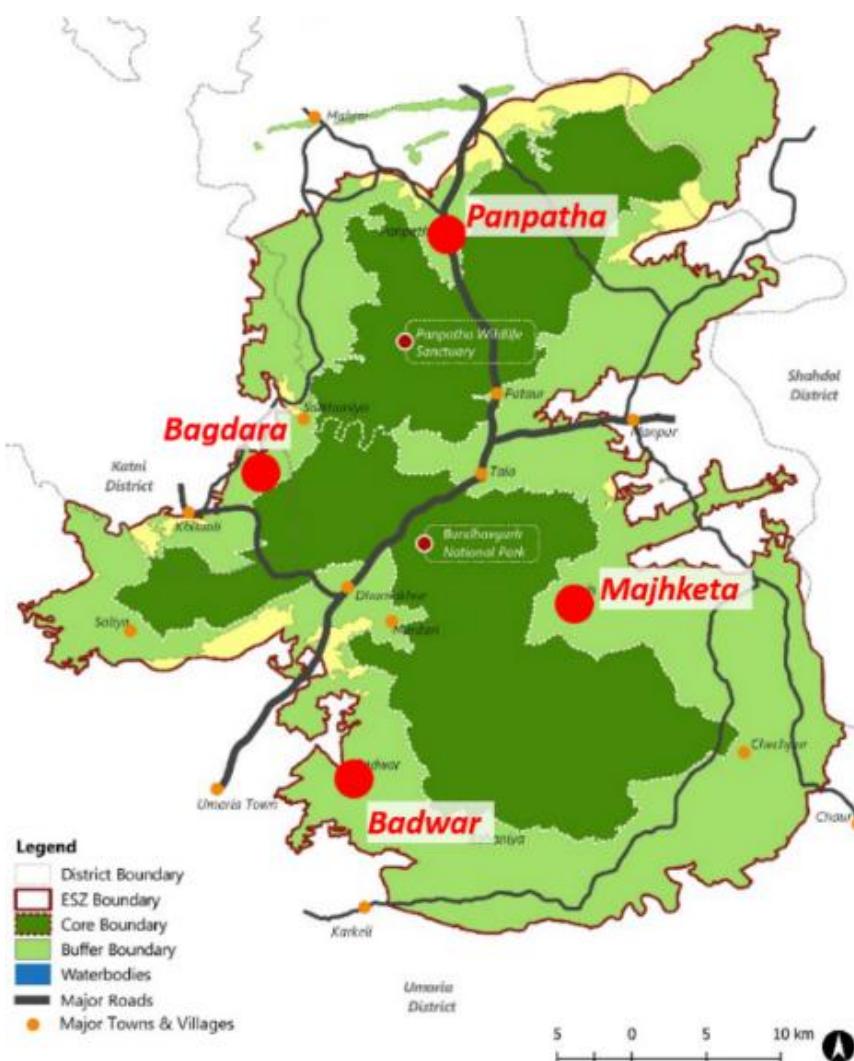
- Provide opportunities for niche tourism themes and products like water-based tourism, adventure tourism, sport tourism etc.
- Provide ease of traveling between locations in regard to transportation
- Offer participants personal challenges, self-actualization.
- Potentially enable participants to access “back areas,” wilderness, remote settings, or engage with nature.
- Benefit communities economically from the increase in employment opportunities due to diversity in tourism product offerings.
- Provide improved infrastructure and social services
- Benefit from regulation in regard to safety and amenity management
- Facilitate revenue generation for conservation efforts and promote low-impact tourism
- Provide opportunities for skill development and learning for local communities.

3.16.4 Village 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.



Bandhavgarh Eco Sensitive Zone has a number of culturally appreciative sites including caves and Ghats that represent immense rich culture and heritage of the indigenous practices. These sites possess immense potential to be developed under rural tourism initiative of central government to support alternate livelihood options and boost the socio-economic development of villages in Bandhavgarh.

Project Rationale

The goal of the Tourism Master Plan is to provide appropriate sustainable interventions and infrastructure in areas of tourism interest or potential. Ample of villages in Bandhavgarh region have their uniqueness in terms of agricultural practices, the flora and fauna it poses and the art and culture the place exhibits. Development of those places under the concept of Village tourism will not only preserve the culture and heritage but will also generate employment in the villages since it can be leveraged to provide skill development in tourism related job roles such as that of guide, driver, cook, housekeeping and hospitality to the tourists.

Project Description

A. Objective

The main idea for developing the project and promote village tourism is for Sustainable Development and Livelihood Generation for local communities in Bandhavgarh.

B. Project location/priority area

The villages identified for development of village tourism are Majhketa, Panpatha, Bagdara and Badwar. The villages are in the close proximity of the core region in the north - eastern part of the Bandhavgarh Tiger Reserve. Located within the reach from national highway, yet distant from the everyday hustle and traffic theses villages have the potential of providing serene and cultural feels to the tourists.

Even Ranchha can be taken up in next phase of development. This village has been identified by MPTB for promotion of Rural tourism.

C. Case study/Best practices

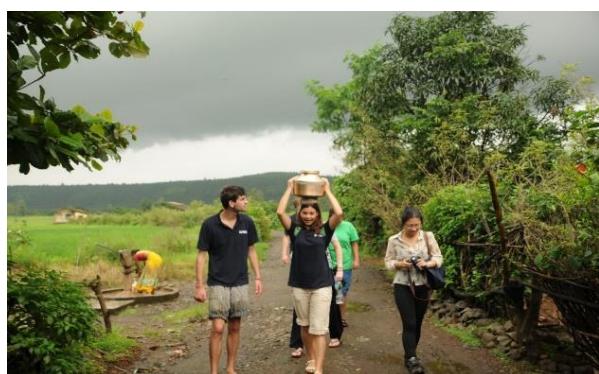
Home to an ethnically diverse community, Hodka village is a unique cultural mosaic of cattle herders and traditional crafts persons. Sham-e-Sarhad, Hodka village resort, was an initiative by the Endogenous Tourism Project (ETP) in collaboration between the United Nations Development Programme (UNDP) 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 10: Hodka Village, Kutch⁸³

D. Project component/activities

- Accommodations – accommodations can be developed in the form of Eco huts and Farm stays which promotes local architectural practices and agro tourism concepts.
- 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 in selected Villages of Buffer area.
- Community Guided Herbal Walks – herbal walks can be developed involving the local communities as guides. These walks can be arranged after the rains to identify and appreciate a wide range of herbs having medicinal importance and other floral attributes of the forest.
- 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.



⁸³ <https://www.flickr.com/photos/rudiroels/5052254682>

Project benefits/outcomes

- 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. When these are valued as living assets or natural capital 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.
- Provides opportunities for mutual sharing of cultures.
- Creates a market and appreciation for local products and services and keeps them alive.

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

Project Rationale

Bandhavgarh ESZ 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 causing 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 in Bandhavgarh ESZ:

- Entry gates to core and buffer area
- 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 11: Examples of Display boards (left) and the 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 shall 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 shall 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-afide 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 be 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*), *Ziziphus* 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 8.17.4. 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 pens⁸⁴ 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...”

⁸⁴ 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.

Project Rationale

Organic Farming⁸⁵ 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 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

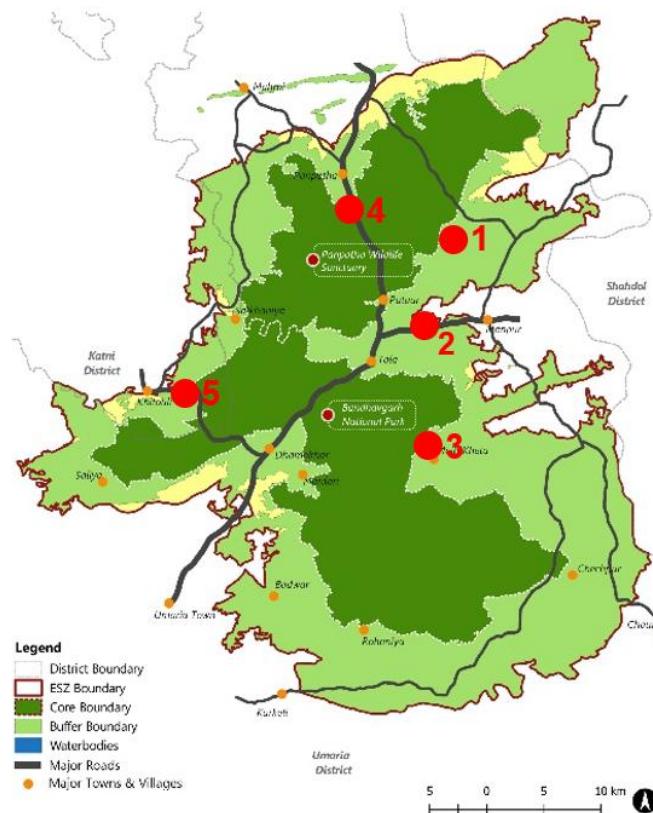
- To promote organic farming in Bandhavgarh NP ESZ which aims at increasing of cover crops, green manures, animal manures and crop rotations to fertilize the soil, maximize biological activity and maintain long-term soil healthy.
- Formulate a farming cooperative for the production and marketing, branding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

B. Project location/ priority area

Farmers should think of adopting organic farming for its known benefits and sustainability or at first, practice organic farming in one patch of land and if the profits are more than conventional farming then slowing increase the under organic farming. But some of the potential villages which can adopt and start organic farming on a pilot basis and setting up an example for others are:

⁸⁵ Source: <http://www.mporganic.com/>

- **Lakhnauti** – Practice cultivation of Kodo and is near to Tala where hotels and resorts can sell Kodo as organic products to the tourists. Kodo is gradually getting in to the menu of health conscious urban consumers. It is gluten free, high protein content and fibber and numerous dietary minerals. So, organic certification and branding can fetch premium value and would make the farming profitable and sustainable.
- **Sarmaniya** – Near to Tala and some farmers in this village do gets organic seeds and manure from Manpur.
- **Majhketa** – Grows Kodo and some farmers were given training for organic farming but due to lack of resources they couldn't continue with the practice.
- **Magdhi** – Some farmers use organic manure and does not use any chemical fertilizers. It is located near to Panpatha (proposed tourist interpretation center).



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 farm⁸⁶.

- **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

⁸⁶ <https://www.thebetterindia.com/182640/woman-quits-cushy-us-job-to-go-organic-transforms-farm-into-10-acre-food-forest/>

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 snake gourd. It helps build a biodiverse 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, Earns Millions from Just 2.5 Acres

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

The villages in Bandhavgarh 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 examples 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 includes⁸⁷⁸⁸:

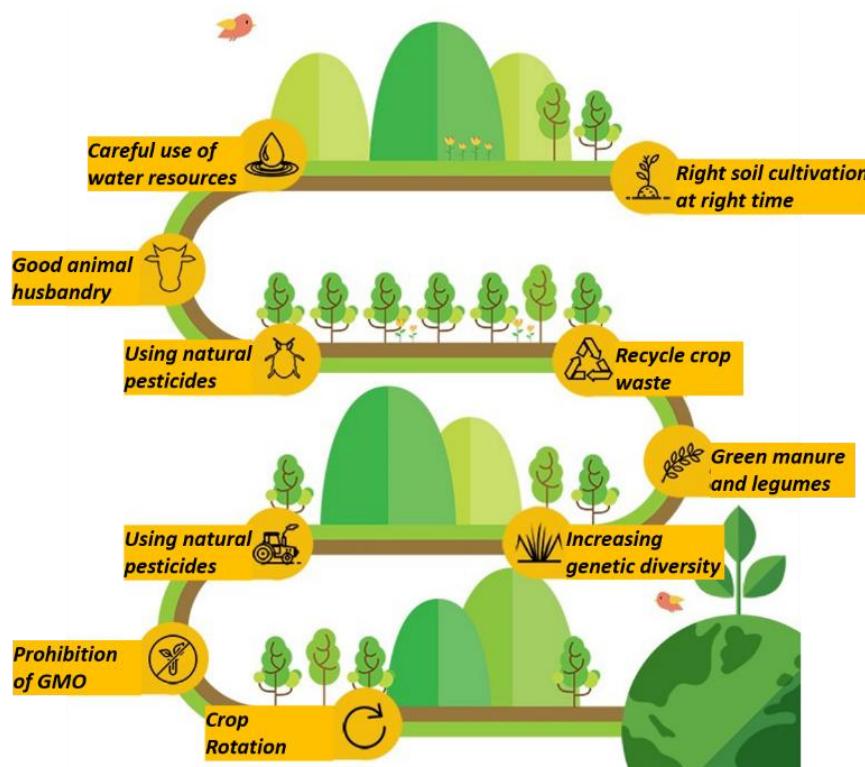
- **Mulching** - Covering the soil with dead plant material is an easy way to control weeds and protect the soil in annual crops. This practice is currently being done by all the villages in Bandhavgarh ESZ.
- **Intercropping** - Growing two annual crops together, commonly a leguminous crop like beans 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.

⁸⁷ A guide by Food and agriculture dept of United nation for organic farming

⁸⁸ <https://www.conserve-energy-future.com/organic-farming-benefits.php>

- **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.

Exhibit 15: 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 website⁸⁹.

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.
- 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.

⁸⁹ Source: <http://mpsoca.org/Default.aspx>

- 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 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

During focused group discussion, it was known that some villagers in Bagdara perform bee keeping practices. But as it is done in very less quantity it is not profitable. But with proper training and resource availability this practice can again be regenerated in the village.

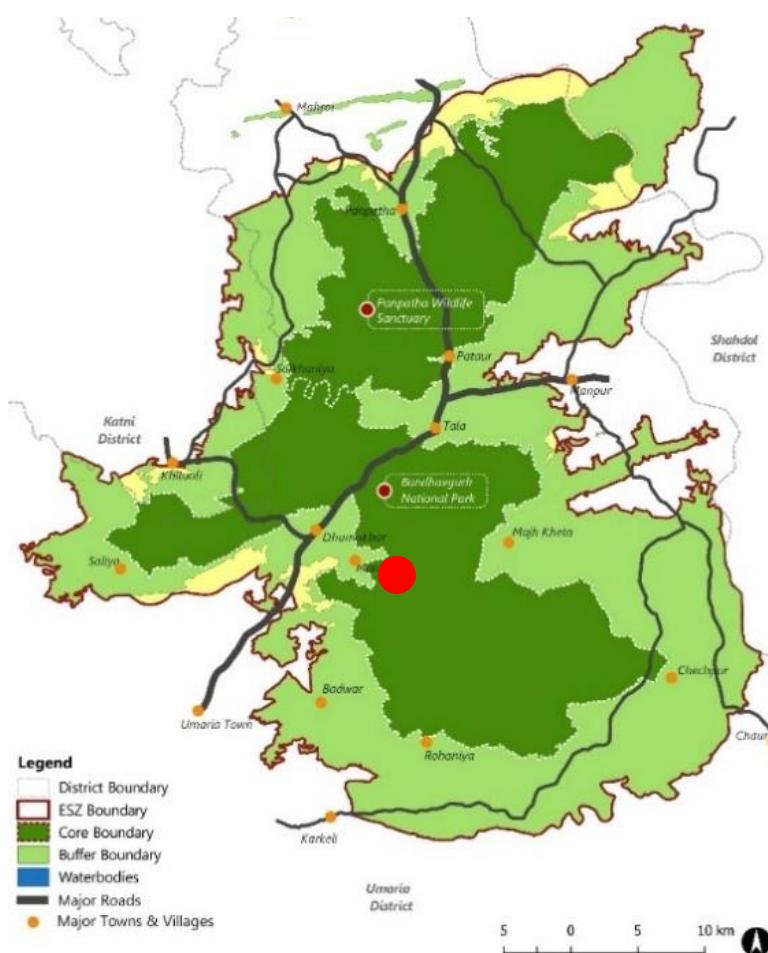
C. Case study/best practices

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.

D. Project components/activities

The following steps should be adopted for setting up of bee-culture facility⁹⁰:

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



⁹⁰ <https://www.farmingindia.in/beekeeping-in-india-honey-bee-farm/>

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 Bandhavgarh 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.

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



- **Some techniques**

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-keepers⁹¹

- 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

⁹¹ <http://wgbis.ces.iisc.ernet.in/biodiversity/pubs/ETR/ETR49/conclusion.htm>

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.

3.17.3 Medicinal and Aromatic plants at cultivation, marketing along with wellness tourism clusters.

Whole plant or individual plant part such as root, stem, leaves, bark, flower, fruits, seeds etc. or the chemicals derived from these parts are used in different system of medicines (Allopathy, Ayurveda, Homeopathy, Siddha, Unani, Herbomineral, Folklore etc.) to cure the disease are known as medicinal plants. The utilization of medicinal plants is: direct utilization in the form of plant parts (root, stem, leaf, seed and bark), powder, extracts, medicinal chemicals (alkaloids, glycosides) and plant drugs.

The following is the list of medicinal and aromatic plants that are grown in Madhya Pradesh⁹²

⁹² Medicinal and Aromatic Plants in Madhya Pradesh: SWOT Analysis By Pandey C.S.* , Upadhyay S.D. and Pandey Vibha

S. No.	Medicinal Crops	Useful part	Uses
1	<i>Ashwagandha (Withania Somnifera)</i>	Root	Skin disease, Blood pressure, Swelling, Wounds, filler, Joint pain.
2	<i>Sargandha (Rauvolfia Serpentina)</i>	Root	High blood pressure, hysteria
3	<i>Kalmegh (Andrographis Paniculata)</i>	Plant	Skin disease, Malaria, fever, blood purifier
4	<i>Safed Musali (Chlorophytum borivillinum)</i>	Rhyzome root	Ayurvedic medicine- Chavanprash, making diabetic medicine
5	<i>Satawar (Asparagus racemosus willd)</i>	Root	Acidity, Ulcer, to increase milk production in Cow & buffalo, skin disease, eye disease, develop resistance power.
6	<i>Sanai (Cassia angustifolia)</i>	Leaf	Stomach disease
7	<i>Gudmar (Gymnema sylvestre</i>	Leaf	Liver tonic, diabetes, heart disease, fever, white spot, snake bites, stomach pain, eye pain.
8	<i>Chandrasur (Lepidium Sativum L.)</i>	Leaf, Seed	Seed- as vegetable, salad, gum, increase milk production in mother, and in dairy cow & buffalow, digestion, eye disease, loose motion, ladies disease, child development, Asthama, piles, siflice, Leaf- anti scarbutic
9	<i>Ratanjot (Jatropha curcus L.)</i>	Plant Branch	Exima, Dad Used as Daton, Bio diesel, skin disease
10	<i>Isabgol (Plantago Ovata Forsk)</i>	Husk	Piles, Loose motion, Stomach disease
11	<i>Tulsi (Ocimum Sanctum)</i>	Leaf, Seed	Cosmetics, Cough seerup, digestion, ear pain, oil
12	<i>Bhui Aounla (Phyllanthus amarus)</i>	Plant	Urinary disease, Jaundice, stomach pain
13	<i>Mulaithi (Glycyrriza glabra L.)</i>	Under ground stem	Heart disease, Prepare tasteful medicine
14	<i>Kalihari (Gloriosa Superba Linn)</i>	Rhyzomes	Medicine of anticancer, antijaundice, Piles, Asthama
15	<i>Giloe (Tinospora Cordifolia Willd)</i>	Root, Stem, Leaf, Fruit	Root- Laprocy, Stem- Jaundice, Cough fever, white discharge, control of heart beeting, control blood pressure Leaf- Jaundice, Chicken pox Fruit- Jaundice, tonic
16	<i>Brahmi (Bacopa monnieri L.)Penn.</i>	Plant	Increase memory, Nerve tonic, Histeria
17	<i>Pattharchur (Coleus aromaticus)</i>	Leaf	Stomach pain, Karminative, Urine disease, kidney stone
18	<i>Makoy (Solanum nigrum L.)</i>	Plant	Fruit- Fever, Loose motion, eye disease Plant- Piles , Liver disease Leaf – Urinary disease
19	<i>Bia vidung (Embelia ribes Brum F.)</i>	Fruit	Anti worms, Loose motion, skin disease, tonic snake & crabs bites.
20	<i>Ajwain (Hyoscyamus niger L.)</i>	Seed	Loose motion, teeth pain relief, eye disease, Asthama, cough, urine, infection, siflice
21	<i>Pan (Piper betle)</i>	Leaf	Worms, Cough, digestion, heart

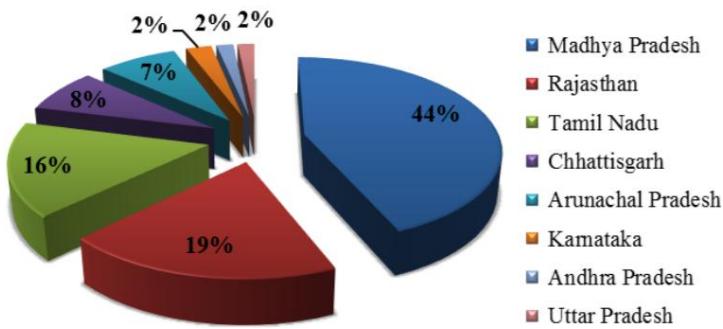
S. No.	Crops & their botanical name	Useful part	Uses
1	<i>Lemongrass (Cymbopogon flexuosus steud)</i>	Oil	Cosmetic creams, soaps, insecticide, joint pain, odomas, gulab jal
2	<i>Pamarosa (Cymbopogon maritini stapf)</i>	Oil	Soap, Cosmetic, Scent, from its oil Jernoil extracted which used in Aroma industries
3	<i>Java citronela (cymbopogon winterianus)</i>	Oil	Cosmetic, soap, preparation of aromatic jeeraniol, Hydroxisionel chemical, Anti mosquito ointment deodorant.
4	<i>Tulsi (ocimum basilicum)</i>	Leaf, Seed	Cosmetics, cough seerup, digestion, earpain, oil
5	<i>Mentha (Mentha arvensis L)</i>	Oil	Karminative, expectorant, stomach disease, cough & cold, throat infection, fever, gas
6	<i>Pachouli (Pogostemon calin Benth)</i>	Oil	Scent, oil is itself top quality scent, soap, cosmetic tobacco, cream, Anti worms, Medicine, its juice used in T.B.
7	<i>Rajnigandha (Polianthes tuberosa L.)</i>	Oil & Flower	Oil- in Aroma industries Flower- making Buckle, cut flower
8	<i>Jama rosa (Cymbopogon nardus)</i>	Oil	Cosmetic, knee pain and arthritics
9	<i>Lavender (Lavandula Officinalis L.)</i>	Oil	Soap, shaving cream, powder, Anti-worm, Aromatherapy
10	<i>Khus (Vetiveria Zizanioides)</i>	Oil, Root	Oil- Scent, Cosmetic, Medicine, Root- Used in cooler
11	<i>Nagarmotha (Cyperus Scarious)</i>	Rhizomes	Heart disease, Loose motion, Ladies disease, body resistance, siflice
12	<i>German Chameli (Matricaria Chamomella)</i>	Oil	Oil- Anti allergy, body resistance, cream, shampoo, Flower & plant- Digestion, Cough, hair die, wine industries
13	<i>Jasmine (Jasminum grandiflorum)</i>	Leaf, flower & plant	Leaf- mouth ulcer, Ear disease Flower- Crab bite, skin disease Plant- Loose motion, anti-worms, urine disease, and diseases concern with ladies.

Project Rationale

Scope in the state and its schemes- The Madhya Pradesh with 11 agroclimatic zones having diversity in soil composition and climatic conditions are most suitable for cultivation and growth of medicinal and aromatic plants. Madhya Pradesh had an area of 18364 hectare with production 110184 ton under medicinal and aromatic crops during the year 2003, which increased to 65,617 ha area with production of 4,14,043 ton during 2014-15. The state is natural habitat for over 50 percent of the herbs used in pharmaceutical industry. The collection and conservation are being done by primary co-operative societies. The increasing demands for herbal medicines have renewed interest of the multinational pharmaceutical in bioprospecting. This indicates that production, consumption and trade (domestic and international) in MAP based products are going to grow at a significant rate.

As indicated in, Madhya Pradesh is largest producer for medicinal and aromatic plants. This is because of the physiography, climatic setting of the region. This provides a huge potential for the villages of Protected area to be developed in such a way that they can also contribute in increase production for the state.

State wise production of medicinal and aromatic plants in India



Costing and benefits - Estimates show that the potential returns to farmer from cultivation of medicinal plants are quite high (Nautiyal, 1995; Rao and Saxena, 1994). The cultivation of certain high altitude Himalayan herbs could fetch products price anywhere between Rs. 7,150 to 55,000 per hectare (Nautiyal, 1995). Although it is not clear that at which stage of the marketing chain these prices are paid but it is obvious that despite varying returns production of medicinal plants could raise the income of farmers to a great extent. Rao and Saxena (1994) reported an average annual income of Rs. 120,000 per hectare through mixed cropping of high-altitude medicinal herbs. Even the low altitude MAPs assume significant economic importance and can be judiciously cultivated to bridge the current gap between demand (40 thousand tons) and supply (20 thousand tons) is estimated to be 40,000 to 200,000 tons, which is expected to rise to 152,000 to 400,000 tons by 2005 (Planning Commission, 2000 & CRPA, 2001) to improve the income and status of the rural farm household⁹³.

Selling centers - Major Ayurvedic companies trade from Bhopal, Katni, Dewas, Shivpuri, Mandsaur, Neemuch, Indore and Mandieep.

Project description

A. Objective

To increase the production of medicinal and aromatic plants production which would also provide a suitable income generating options with additional security from some wild animals' invasion in the crop fields.

B. Project location/ priority area

In the first phase, the cultivation farm can be established in Ranchha - The villagers are aware about the herbs and medicinal plants of the forest. Some ancient technique and knowledge are available with them. This will help them to explore the opportunities for the growth of medicinal and aromatic plants sector. Secondly, Ranchha is close to Tala, so tourists can also plan a visit to medicinal plant and cultivation center where they will be given knowledge about the herbs found in forest and how they can use to treat themselves.

⁹³ Source: https://mpra.ub.uni-muenchen.de/50571/1/MPRA_paper_50571.pdf

In second phase, Panpatha and Lakhnauti can be taken up if the cultivation farm at Ranchha is successful— Few people are aware about few medicinal plants in the forest. This would help them to grow in this sector and pass on their knowledge to future generations.

C. Case study/best practices

Vidya Karan, a 2-acre farmer, in Sangla village in Himachal Pradesh's Kinnaur district, has a multi-herb portfolio: ateesh, Rs 2.5-3 lakh per acre, rattan jot, Rs 1.15 lakh per acre, and karu, Rs 1.5-2 lakh per acre. He points to another big advantage these crops give to growers. “We don't have to water the herbs too much or spray fertilizers on it,” he says. This has allowed farming in areas where even one crop a year was tough on account of poor rainfall.

Example: Dabur works with farmers to grow medicinal plants like shankhapushpi in Barmer, Rajasthan. Companies who buy these herbs and aromatic plants are equally bullish. “Some high-value herbs like ateesh, kuth, kutki are currently more profitable because of supply shortage,” says Amit Agarwal, director, Natural Remedies. He says on an average a farmer can earn Rs 60,000 per acre by growing herbs, provided there'd assured demand. Natural Remedies says it is doing contract farming of herbs on 1,043 acres of land. Patanjali's CEO Acharya Balkrishna says the company is “helping farmers cultivate herbs on 40,000 acres”. Kutki, shatavari, and chirayata are on top of his list of best earners.

Exhibit 17: Big buyers of medicinal and aromatic plants

Crop	Return/acre (₹)	Buyer
LAVENDER	1,00,000	Body Shop, Kama, Himalaya, export houses
ATISH	2,50,000	Dabur, Himalaya
ASHWAGANDHA	1,00,000	Patanjali, Dabur, Organic India, export houses
TULSI	1,00,000	Tata Tea, Dabur, Himalaya
BRAHMI	90,000	Hamdard, Tata Tea, export houses

D. Project components/activities

The cultivation of medicinal and aromatic plants is just the same way as the organic farming (refer 0). Some of the plantation which can be done in Bandhavgarh ESZ includes:

Plantation	Climatic Feasibility	Growing requirements	Economic Viability	Cost per kg
Medicinal plants				
Ashwagan dha	High	<ul style="list-style-type: none"> • Kharif Crop: Pre monsoon to Jan-March • 400-500 kg/ hectare root yield 	Yes High	One kg sold around Rs. 100-200 depending on the type of yield
Stevia	Medium to Low	<ul style="list-style-type: none"> • 20-35 deg C temp preferred. 1st harvest in 3-4 months. • Multiple harvests possible in a year 	Yes Very High	One kg is sold around Rs. 100

Plantation	Climatic Feasibility	Growing requirements	Economic Viability	Cost per kg
		<ul style="list-style-type: none"> Yield is around 7000 kg per hectare 		
Senna	High to Medium	<ul style="list-style-type: none"> Dry and Warm Sensitive to rainfall Yield 2000 kg leaves and 800-1000 kg pods per hectare 	Yes High	One kg of leaves is sold around Rs.50
Aromatic plants				
Lemon grass	High to Medium	<ul style="list-style-type: none"> Warm Humid with plenty of sunshine First harvesting in 90 days and subsequent in 50-60 days Can give harvest for 5-6 years 1,50,000 herbage yield/hectare 750 kg oil per hectare in 1st year and 350kg/hectare in subsequent years. 	Yes Very High	Oil sold around Rs.1000 per kg Lemongrass sold around Rs. 70 /kg
Davana	Medium to Low	<ul style="list-style-type: none"> Warm Humid Preferably in November 12–13-ton herbage per hectare 0.2% oil extraction, i.e., 250 kg oil per hectare 	Yes Very High	One kg oil sold around Rs. 10,000

Additionally, aromatic herbs such as Lemon Grass and Khas can be easily grown, even in rain fed croplands and require very little maintenance. These are also not eaten by wild animals and therefore a suitable alternative crop in our plan area.

Project benefits/outcomes

- Plants are a very important source of many products considered as useful for human bodies. Many plant species are used as a source of treatment of various disorders, so these plants are also known as Medicinal and Aromatic plants.
- Plants have been used since ancient times of all civilizations and cultures, mostly as home remedies for treating seasonal flu viruses, cough, cold, stomach ache, sore throat and headaches.
- Besides, the aromatic plants are still used in making perfumes, because of their pleasant-smelling flowers, in cooking because of their strong flavours, and liquor industries.
- At the present there are used many herbal treatments that are becoming very popular in the society because of their efficiency and less side effects.
- Of course, the medicinal and aromatic plants are less expensive, more available and have potential to control disorders.
- The use of these plants is also a potential material for maintaining good health and conditions, not only for a remedy for specific diseases.
- Of course, the role of medicinal and aromatic plants in national economy is also enormous.

3.17.4 Livestock Improvement practices and Training for Planned grazing at all Villages within the ESZ.

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 laborer.

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 Bandhavgarh 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 various agricultural activities. At the same time, livestock sector constitutes an important aspect of the rural livelihood, mostly as an allied agricultural activity.

There are many rural poor who have little access to land and thus there are limited opportunities for them in crop production. On the other hand, livestock wealth is more equitably distributed compared to land and the expanding demand for animal food products generates significant opportunities for the poor to escape poverty through diversifying and intensifying livestock production.

Project description

A. Objective

To promote only productive livestock rearing and management practices for reduction of Intensive grazing from livestock.

B. Project location/ priority area

There are four veterinary hospital in Bandhavgarh ESZ namely (1) Khitauli, (2) Kodar, (3) Raipur and (4) Chansura. The first phase of project should be applicable to those villages which are near to these facilities so in case of emergency proper treatment could be provided.

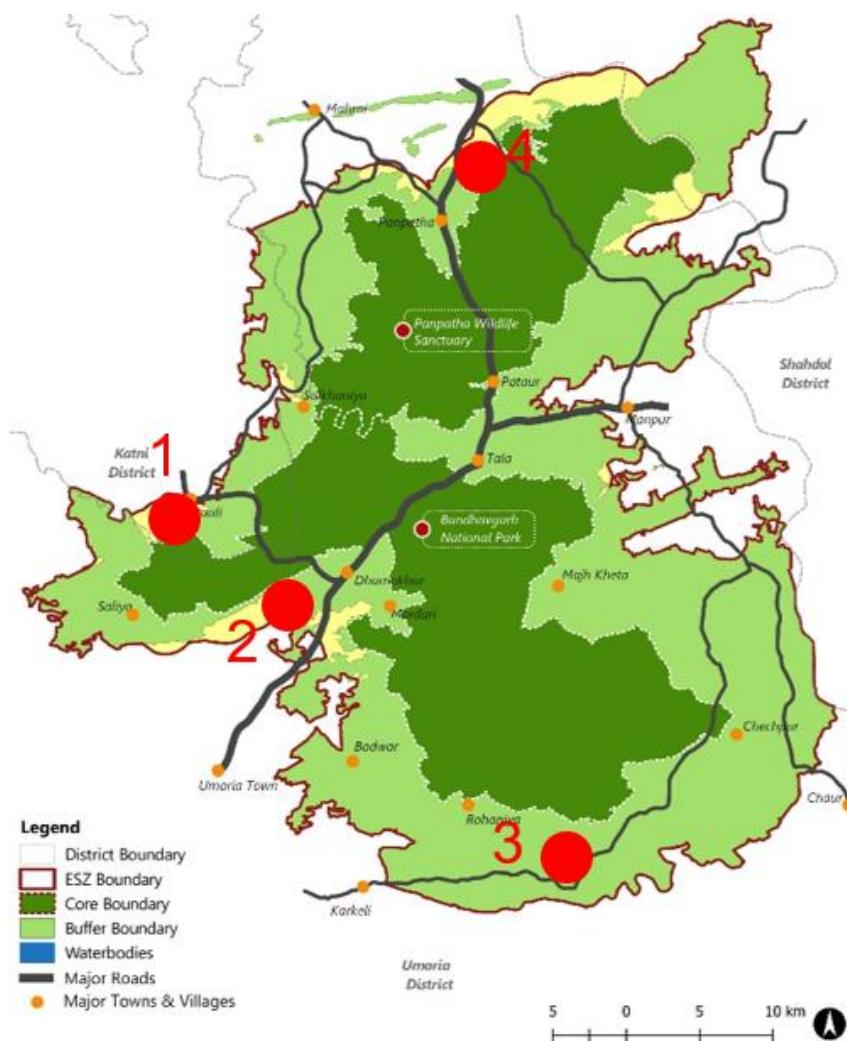


Exhibit 18: Example of Grazing Chart for Planned grazing



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 livestock⁹⁴:

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

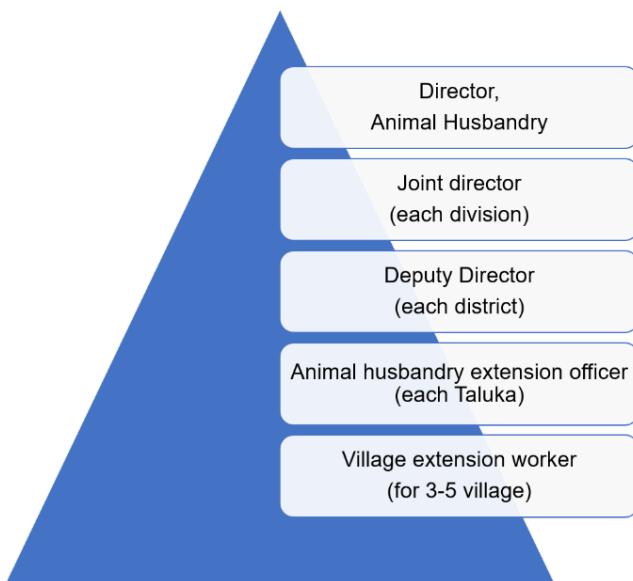
3. Fodder Security:

- 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.
- 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.**

5. 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.

⁹⁴ Traditional Livestock Management Practices in Andhra Pradesh by Gargi Das

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.

3.17.5 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 Bandhavgarh ESZ area:

- 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 many water bodies especially in the north side of the Bandhavgarh ESZ

- 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. The pilot intervention for this concept can be started in area between Jhalwar diversions.

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, Bhaisharah, 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

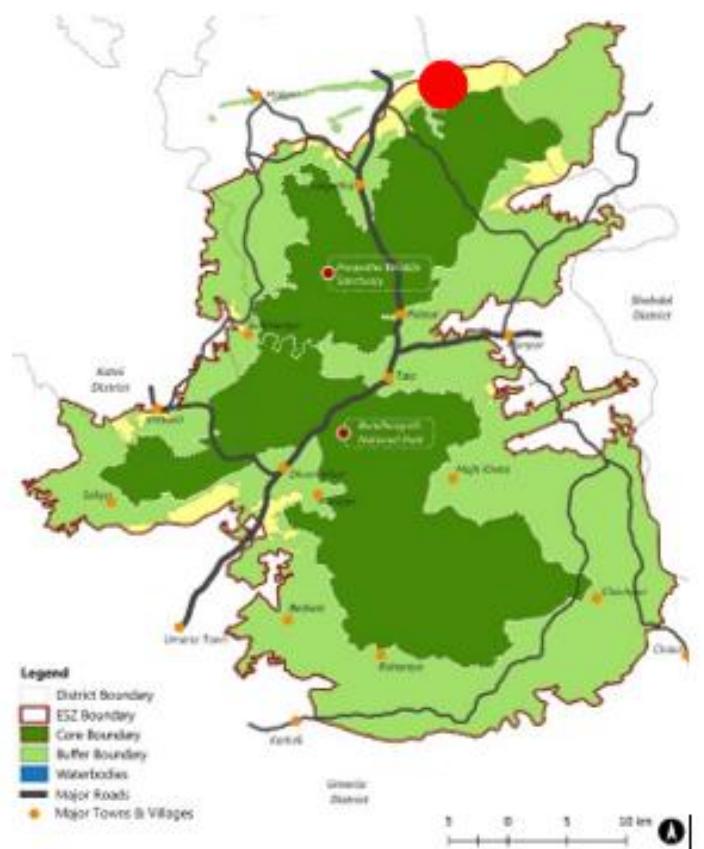




Image 12: Fish farming in Thadipathar

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 bond. 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

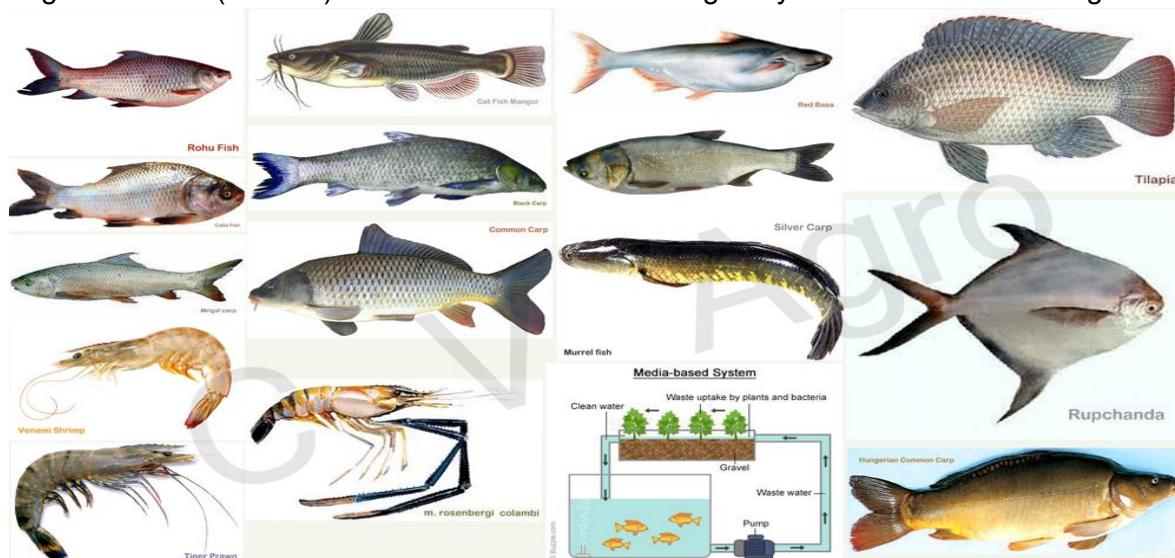
- Freshwater Carps – IMCs and EMCs variable production (2-10 t/ha/yr)
- Catfish – Magur, Pangas, Pabda, etc.
- Fresh Water Prawn
- Pacu (*Piaractus brachipomus*) – still not cleared by the Ministry; but widely cultured in many places
- Tilapia – Cleared by the Ministry; only all male of nile tilapia or improved hybrids/strains permitted.

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.



Step 5: 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.

Step 6: 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.

3.17.6 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 Bandhavgarh 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. Agroforestry 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 coincides with 100m. buffer of green buffer. 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 Farm Land (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 farm lands (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 13: Agroforestry Practices in India from R-L – PBP, LDBP, HDBP

The indicative list of Agroforestry Combinations in Bandhavgarh 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	<ul style="list-style-type: none"> • 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 3.2.1.

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 help 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

3.18 Cottage industries promotion

Aim: Reducing the pollution caused by industries (new or existing) within the ESZ

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 as mentioned in NCTA guidelines.
- 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, Leucaena leucocephala, Glyricidia sepium, Dalbergia sisso, Sesbania sesban, Acacia nilotica, Albizzia lebbeck, Albizzia procera, Pithecellobium 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 be 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 as well as immunization and sterilization programs

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 for Wild Boars.⁹⁵

⁹⁵ A Landowner's Guide For Wild Pig Management Practical Methods For Wild Pig Control, Bill Hamrick Et.Al, MSUES.



Image 14: Land Degradation caused by Wild boars (left) and intervention for entraptments (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. Following are some specific management measures listed for HWC related to wild elephants.



Image 15: Rail fences erected in Karnataka (left) and Fodder plantation and EPT in Tamil Nadu (right)

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

Species	Management approach (Preventive strategies)	Management approach (Adaptive Strategies)	Priority areas
Wild Boars	<p>Habitat Management:</p> <ul style="list-style-type: none"> • Bio-fencing with specific varieties of dense vegetation along ravines and key movement corridors. <p>Access control:</p> <ul style="list-style-type: none"> • 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>Detection & Warning:</p> <ul style="list-style-type: none"> • Use of Watch towers, Drones and Animal collars for heard movement tracking and warning. • Awareness training and capacity building for early warning detection. <p>Crop management:</p> <ul style="list-style-type: none"> • Production of non-carbohydrates/root-based crops which attract Wild Boars. • Production of alternative cropping patterns and crops. <p>Post incident interventions:</p> <ul style="list-style-type: none"> • Scaring away though non-lethal interventions such as drones, high powered torches and sounding equipment. • Crop insurance and life insurance payments. 	Villages close of river, Protected Area etc. are the most vulnerable and priority areas such as Ranchha, Tala etc.
Wild Elephants	<p>Habitat Management: 96</p> <ul style="list-style-type: none"> • Active Development of Grasslands/fodder/bamboo plantation in Elephant Movement areas. • Development of perennial water bodies. • 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>Access Management:</p> <ul style="list-style-type: none"> • 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>Detection and Warning:</p> <ul style="list-style-type: none"> • 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>Post incident interventions:</p> <ul style="list-style-type: none"> • 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. 	Villages which are coming in-between the elephant corridor as mentioned in section 1.4 (wildlife corridors) should be the priority areas.

⁹⁶ Based on Best Practices of Human Elephant Conflict Management in India, Project Elephant Division, MoEF&CC Elephant Cell, WII

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	<ul style="list-style-type: none"> Conservation and rejuvenation measures in natural water with area >5 Ha Development of water sources along the major animal corridors Installation of Rainwater harvesting facility 	Environment: <ul style="list-style-type: none"> Reduce dependency on ground water resources Infrastructure: <ul style="list-style-type: none"> Deploy Green technology in the water infrastructure development
Tourism	<ul style="list-style-type: none"> 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 should be identified and regulated as per carrying capacity norms specified by MoEFCC. 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. Promotion of ecotourism & infrastructure within TPA identified in zonal guidelines Tourism establishments to identify waste composition, quantities, and areas for reduction and submit the same to competent regulatory authorities for compliance. 	Environment: <ul style="list-style-type: none"> Promote sustainable development in ESZ area of the sanctuary in Tourism Promotion Areas Economy: <ul style="list-style-type: none"> Enhance the socio-economic condition and Promote the local know how of indigenous technologies Tourism: <ul style="list-style-type: none"> Develop Sustainable and Eco Tourism and Develop a conservation strategy for natural as well as manmade heritage sites. Infrastructure: <ul style="list-style-type: none"> Declaration of Bandhavgarh as 'Open Defecation Free' ESZ
Natural & Man - made heritage	<ul style="list-style-type: none"> Heritage areas to be demarcated and needs to be conserved by restricting the number of visitors as per carrying capacity of area Plantation shall be carried out to augment the forest resources as per the needs of the wildlife in the ESZ areas Awareness campaigns regarding importance of biodiversity and ecosystem services 	Environment: <ul style="list-style-type: none"> Non fragmented wildlife habitat development Tourism: <ul style="list-style-type: none"> Develop a conservation strategy for natural as well as manmade heritage sites.
Noise pollution	<ul style="list-style-type: none"> No loudspeakers allowed within 1 km of the protected area. 	Environment: <ul style="list-style-type: none"> Control the harmful impacts of air/noise/water pollution in the Eco-sensitive Zone and promote mitigation measures

Air pollution	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Control the harmful impacts of air/noise/water pollution in the Eco-sensitive Zone and promote mitigation measures
Effluent discharge	<ul style="list-style-type: none"> • No hotel shall discharge any sewage or solid waste into any water body or in an open pit. 	Environment: <ul style="list-style-type: none"> • Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species
Solid wastes	<ul style="list-style-type: none"> • 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. • Ensure source segregation mandates, requiring not just wet/dry, but also specific recyclables (paper, plastic, glass) and detailed organic waste separation. 	Economy: <ul style="list-style-type: none"> • Enhance the socio-economic condition Infrastructure: <ul style="list-style-type: none"> • Develop a 'Solid Waste Management System'
Vehicular traffic	<ul style="list-style-type: none"> • Roads should be aligned with the wildlife habitats with natural and artificial crossing. 	Environment: <ul style="list-style-type: none"> • Non fragmented wildlife habitat development and to reduce human animal conflict Infrastructure: <ul style="list-style-type: none"> • Regulation of vehicular movement or high-speed movement in a habitat friendly manner
Industrial units	<ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • Regulation for discharge of treated effluent in Eco-Sensitive Zone impacting the wildlife and aquatic species Economy: <ul style="list-style-type: none"> • Enhance the socio-economic condition and Promote the local know how of indigenous technologies
Agriculture	<ul style="list-style-type: none"> • 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 	Environment: <ul style="list-style-type: none"> • Reduce human animal conflict Economy: <ul style="list-style-type: none"> • Strengthening agriculture and creating different economic opportunities for all to build resilient communities and their livelihood opportunities Infrastructure: <ul style="list-style-type: none"> • Deploy Green technology in the water infrastructure development

	extension activities, agricultural policy and insurance is proposed.	
Ground water	<ul style="list-style-type: none"> 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. 	Environment: <ul style="list-style-type: none"> Reduce dependency on ground water resources Infrastructure: <ul style="list-style-type: none"> Deploy Green technology in the water infrastructure development
Livestock	<ul style="list-style-type: none"> 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. 	Environment: <ul style="list-style-type: none"> Reduce human animal conflict
Railway and transmission lines	<ul style="list-style-type: none"> 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'. 	Environment: <ul style="list-style-type: none"> Non fragmented wildlife habitat development and Reduce human animal conflict Infrastructure: <ul style="list-style-type: none"> Regulation of vehicular movement or high-speed movement in a habitat friendly manner

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

Name	Level	Sector	Function
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
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)	National	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		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 Corbett 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.

Name	Level	Sector	Function
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
District Collector, Shahdol	Local	Administration	General Administration
District Collector, Katni	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

4.1.1 Department level stakeholder consultations

Meeting details	Picture
<p>Date: 31st October 2019, Tala</p> <p>Headed by: Divisional Commissioner, Shahdol</p> <p>Attendees: CCF (Bandhavgarh), DM (Umaria), DM (Shahdol), DFO (Umaria), AD (BTR), DD (Bandhavgarh), CEO (Zila Panchayat, Umaria), CEO (Zila Panchayat, Shahdol), SDM (Jaisinghnagar), SDM (Manpur), SE (PWD, Shahdol), Joint Director (TCPO, Shahdol), SE (MPEB, Umaria), PRO, (Umaria), EE (PHE, Umaria), Regional officer (MPPCB), Jr. Scientist (MPPCB)</p>	

Date: 18th November 2019, Umaria

Headed by: CEO, Zila Panchayat, Umaria

Attendees:

DFO (Umaria), SDM (Manpur), DD (Bandhavgarh), Manager (Forest dept), Representative from Urban development dept, Dep. Director (Farmer welfare & Agriculture Development dept, Umaria), E.E. (WRD), Jr. Scientist (PCB), Dist. Exise officer (Umaria), Manager (Tourism dept., Tala), EE (Vidyal Vitrin company), Sub-divisional officer (PWD), Exe officer (Dist Panchayat, Karkli), Exe officer (Dist Panchayat, Umaria), Chief officer (Municipal corp, Umaria), representative from MP Wildlife protection, Tala, Umaria.

Date: 10th January 2020, Umaria

Headed by: Divisional Commissioner, Shahdol
Attendees: CCF (Bandhavgarh), DM (Umaria), DM (Shahdol), DFO (Umaria), SDM (Bandhavgarh), DD (Bandhavgarh), CEO (Zila Panchayat, Umaria), (Deputy Director (Agriculture, Umaria), EE (PWD, Shahdol), (TCPO, Shahdol), EE (PHE, Umaria), Regional officer (MPPCB), Jr. Scientist (MPPCB) and Nodal officer



Date: 23rd September 2020, Shahdol

Headed by: Divisional Commissioner, Shahdol
Attendees: CCF (Bandhavgarh), DM (Umaria), DM (Shahdol), DFO (Umaria), DD (Bandhavgarh), Forest officer (North Shahdol), Forest officer (Katni), Representative from Tourism Department (Jabalpur), Representative from Tourism Department (Tala), Sub-Divisional revenue officer (Manpur), DDVS (Animal Husbandry Shahdol), EE (WRD, Shahdol), EE (PWD, Shahdol), EE (PWD, Umaria), EE (RES, Shahdol), Sarpanch (Tala) and Sarpanch (Pataur).



Date: 2nd December 2020, Tala

Headed by: District Magistrate, Umaria
Attendees: CEO (Zila panchayat, Umaria), SDO (Manpur), DD (BTR), AD (BTR) and representatives from various departments, hotels, NGOs 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).



Date: 7th September 2021, MPTB, Bhopal

Representatives of MPTB: Joint Director (Planning), Tourism Planner (MPTB)

Evaluation Committee Members: Secretary, Tourism & Managing Director (MPTB), Addl. Managing Director (MPTB), PCCF (MP), CCF (Bandhavgarh), CCF (Son Gharial WLS), Lt. Director (DICP), representative from MAPIT.



4.1.2 Local level consultations

Village: Ranchha, Date: 3rd July 2019

“As the village is located near to the Protected Area, villagers reported many incidences of man-animal conflict due to intrusion of wild animals in the agricultural fields and issues regarding getting the compensation for loss of produce. They also complained about killing of cattle by tiger.”



Village: Mardari, Date: 5th July 2019

“The village is located in the western part of the Bandhavgarh National Park, in Tala range, adjacent to the Protected Area. The village was attacked by 5-6 wild elephants once in the late evening. The houses were destroyed, and all the cereals and grains were eaten by them. None of the person was killed or harmed during the incidence.”



Village: Bagdara, Date: 5th July 2019

“The village faces many incidences of forest fires and as informed during the focussed group discussion by the village community is that the main reason for forest fire is throwing of bedi or cigarette, burning of small plants for collection of Mahua and friction generated by rubbing of dry wood (bamboo) in the jungle.”



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:

A. Case study: 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, land use, 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.⁹⁷
- 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 has 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 16: Plantation site in Khokra carried out by the villagers

- This plantation drive was integrated with nursery run by horticulture department and Self-Help 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.

⁹⁷ Landscape Restoration for Climate and Communities – Opportunity assessment of Sidhi by WRI



Image 17: Greenhouse arrangement (left) and women employed (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, Magdhi, 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 are 90 cows and 11 buffaloes 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 pasture land and the work is under process



Image 18: Goshala structure in Khokra and the facility

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 19: 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 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.

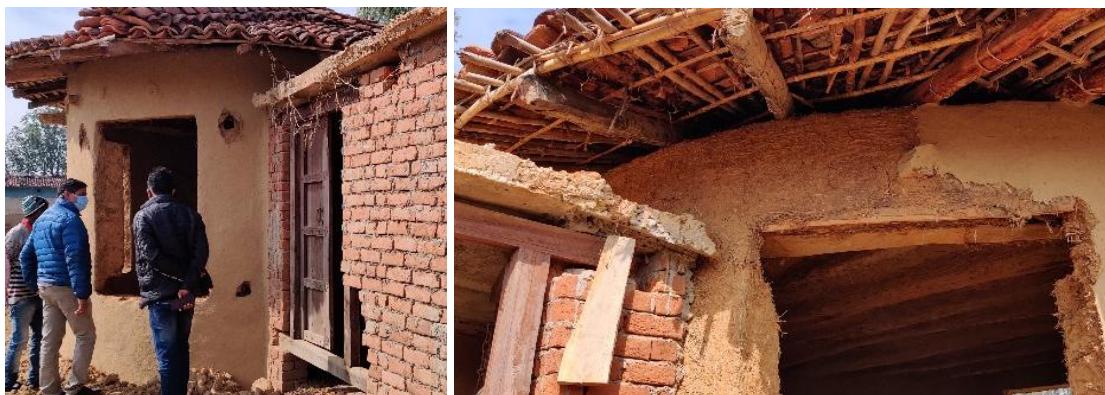


Image 20: Homestay under construction near Thadipathar by Gram Sudhar Samiti



Image 21: 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 additional source of income.



Image 22: 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 sustainable bamboo economy. They not only provide training to such people but also helps in sale and marketing of such products.

B. Case study: Lantana furniture making in Coimbatore:

Lantana Camara is an exotic weed of South American origin which is invading different forest areas and posing a serious threat to the native vegetation in Western Ghats, including Siruvani area in Coimbatore. Getting rid of the lantana weed is a little tricky as chemicals used to remove the shrub could affect the native species of plants too, and mechanical methods of removal are too expensive. A PhD scholar from Coimbatore thought that as lantana looks exactly like bamboo but was more durable than it, furniture can be made out of the weed.

So, a Bengaluru based organisation named ATREE came in to train villagers in furniture-making. Around 40 residents of the three villages were trained in a three-month training programme. The project was funded by the department of science and technology. In this project, the tribal community is involved in the mechanical control of lantana by manually cutting, and at the same time, they are trained in making low- cost furniture, handicraft, toys and other utility articles using lantana wood. Thus, a generation of sustainable livelihood options for tribals and forest conservation is achieved at the same time.



Image 23: Training process illustrated from collection to assembling in the village

Around 80% of removed bushes are given to villagers for use as fuel wood. Locals have also been trained to make furniture items and small souvenirs out of the wood, which are sold in four shops of the area. The furniture looks exactly like the bamboo or cane furniture but is more durable. The cost of lantana furniture is also much lesser than bamboo furniture as the raw material is available for free. The skill helps the villagers earn around Rs 4,000 per month by putting in a few hours every day.

Assistance was provided to the communities in marketing the products in potential areas in India. Market linkages were being established in Coimbatore and other major cities in India with the help of Tribal Cooperative Marketing Development Federation of India (TRIFED).

Even though the business is still in its primitive stage, villagers have so far sold furniture worth Rs 1,70,000, and have orders worth Rs 70,000 pending with them.



Image 24: Lantana based furniture made by villagers of Coimbatore

Such practices are also followed in some villages of Madhya Pradesh

C.Convergence of schemes for livelihood generation⁹⁸:

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

⁹⁸ https://nrega.nic.in/netnrega/writereaddata/Convergence/circulars/guideline_conver_MOA.pdf

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 (NWDPRA), 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 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 Indicators⁹⁹

Criteria	Criteria Indicators
Ecological 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

⁹⁹ Source: Joint Forest Management A Handbook (MoEF and JICA)

Criteria	Criteria Indicators
	Tree growth abundant and quality of forests improved Forests is well retained
Maintenance of eco-system services	Soil erosion reduced/stopped Increased level of groundwater Availability of food to fauna Availability of clean air
Economic 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 are meeting their own needs Additional sources of income are available to the villagers Type of micro-enterprise(s) started Increased food stock Dependence on forest reduced Breaking away from money lender Decreased of local migration to urban areas
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 forest
Institutional Criteria & Indicators	
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
Unity and conflict management	FPC is a platform to create unity and opportunity to work Bring opponents to FPC Sharing of opinions on forest issues Good and clear rules FPC settles local disputes and problems Reduction of inter village conflicts Number of disputes of FPC
Equitable sharing of forest produce	Clear demarcation of land for each village Complete rights of ownership over NTFP and other forest materials that are needed by villagers Awareness for development of appropriate protection mechanisms Systems of equitable distribution
Social Criteria & Indicators	
Feeling of community ownership & 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 & 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

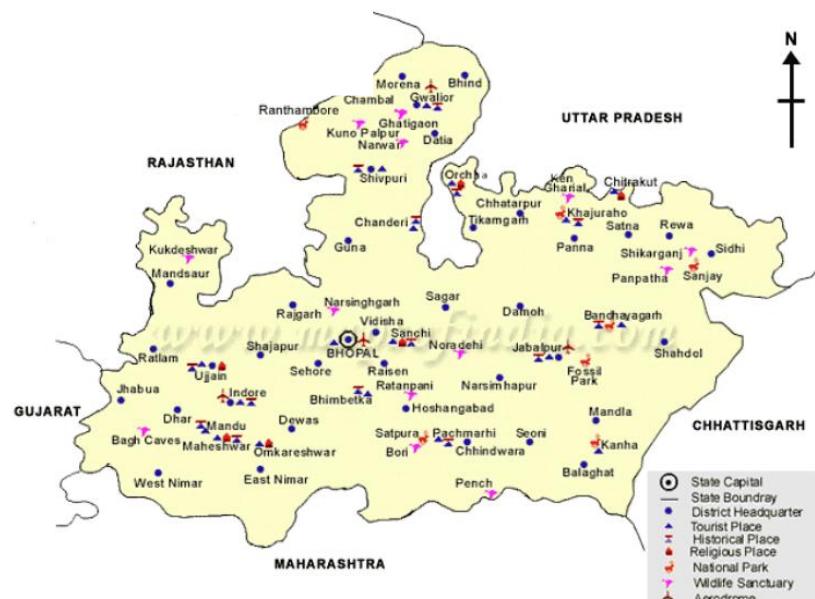
CHAPTER 5: SUB-ZONAL TOURISM MASTER PLAN

5.1 Promotion of sustainable tourism

Regional Profile: There is no doubt that Madhya Pradesh is the land of paradoxes. Be it history, nature or culture, this state contributes equally or sometimes even more in making India a unique destination. The vast and lush jungles here make incredible shelters for variety of animals. Towns that are situated on the bank of the rivers offer scenic places to escape to and the temples and religious edifices add an unusual charm to the state. Therefore, taking circuit tours in Madhya Pradesh seems like a good idea. In such tours, one has the opportunity to visit diverse places and get travel experience like never before. The following are some of the best circuit tours in Madhya Pradesh:

- Circuit 1: Gwalior – Shivpuri – Orchha – Khajuraho
- Circuit 2: Indore – Ujjain – Maheshwar – Omkareshware – Mandu
- **Circuit 3: Bhedaghat – Kanha – Mandla – Jabalpur – Bandhavgarh (further connecting with Sanjay Dubri and Son Gharial WLS)**
- Circuit 4: Sanchi – Bhopal – Bhojpur – Bhimbetka – Pachmarhi

Exhibit 19: Tourist map of Madhya Pradesh



Source: 20 years Perspective Plan of Tourism for the State of Madhya Pradesh

A) Bhedaghat – Kanha – Mandla – Jabalpur – Bandhavgarh Circuit

Sanjay Dubri can attract tourists from circuit-3 with the following places of interest:

- **Bhedaghat:** White marble rocks, Dhuandhar Waterfall, and Chausath Yogini Temple
- **Kanha:** Kanha National Park & Tiger Reserve
- **Mandla:** Mandla Fort, Shah Burj, and Jay Stambha
- **Jabalpur:** Bargi Dam, Madan Mahal Fort, Dumna Nature Reserve, Rani Durgavati Memorial & Museum, and Pisan Hari Jain Temple
- **Bandhavgarh:** Bandhavgarh National Park, Shesh Shaiya, Bari Gufa, Three Cave Point, Rajbahera, Climber's Point, and Chenchpur Waterfall. This would further connect to Sanjay Dubri and Son Gharial WLS.

The total Tour duration is 6 nights 7 days. But we would like to explore the opportunities wherein we can increase the duration of stay of the tourists and provide them with unique experiences.

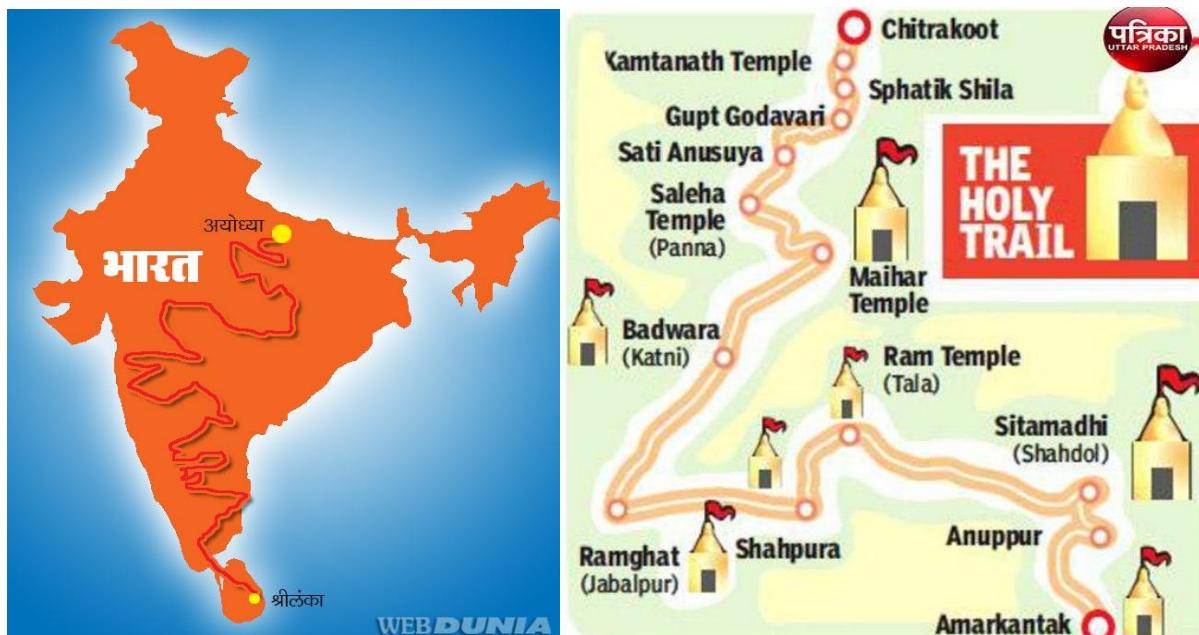
B) Ram Van gram yatra

Prabhu Shriram was 14 years in exile. During this exile period, Shri Ram received education and learning from many sages and ascetics, performed penance and organized the tribal, forest dwellers and all kinds of Indian society and led them on the path of religion. He tied the whole of India in the thread of one ideology, but in the meantime something happened to him which changed his life.

According to many researchers mentioned in Ramayana and when Lord Rama was exiled, he started his journey from Ayodhya to Rameswaram and then to Sri Lanka. During this period, more than 200 incidents have been identified with them wherever they occur.

Eminent historian and archaeologist researcher Dr. Ram Avtar has unearthed more than 200 places connected with the events of the life of Shri Ram and Sita, where the memorial sites still exist where Sri Ram and Sita stayed or stayed. The time period of the monuments, graffiti, caves etc. were investigated by scientific methods. Some of those points are Tamsa River, Shringverpur Tirtha, Kurai Village, Prayag, Chitrakunut, Satna, Dandakaranya, Panchavati Nasi, Sarvatirtha, Parnashal., Tungabhadra, Shabri Ashram, Rishyamuk Mountains, Kodikarai, Rameshwaram, Dhanushkodi, Nuwara Eliya 'mountain range etc.

Exhibit 20: Ram Van Gram Yatra route in Madhya Pradesh



One of the famous site which falls in Madhya Pradesh is Chitrakoot. The following is the mythology related to the same:

Prabhu Shriram crossed the Yamuna River near Prayag Sangam and then reached Chitrakoot. Chitrakoot is the place where Bharat arrives with his army to persuade Rama. Then when Dasharatha dies, India takes the step foot of Rama from here and rules by keeping his foot paduka. There was an ashram of Atri Rishi located near Satna (Madhya Pradesh) near Chitrakoot. Although Anusuya's husband Maharishi Atri lived in Tapovan in Chitrakoot,

Sri Ram stayed at a place called 'Ramavan' in Satna, where Rishi Atri had an ashram on one side.

As depicted in above exhibit, the path to Chitrakoot is traced by the following points:

Amarkantak - Sitamadhi (Shahdol) - Ramghat (Jabalpur) - Ram mandir (Tala) –
Bandhavgarh - Badwara (Katni) - Maihar temple - Saleha temple (Panna) - Gupt Godavari -
Kamtanath temple

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 cultures¹⁰⁰. "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 systems¹⁰⁰.

Bandhavgarh Tiger Reserve 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 its Tiger Reserve and Safari. Apart from Nature based tourism, Bandhavgarh Tiger Reserve also have a 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 through the Tiger Reserve Management. Therefore to understand the natural context and existing situation of tourism in Bandhavgarh Tiger Reserve 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 as per the issued guidelines by NTCA and carrying capacity of the ESZ.

¹⁰⁰ Sustainable Tourism and Eco Tourism by Annalisa Koeman.

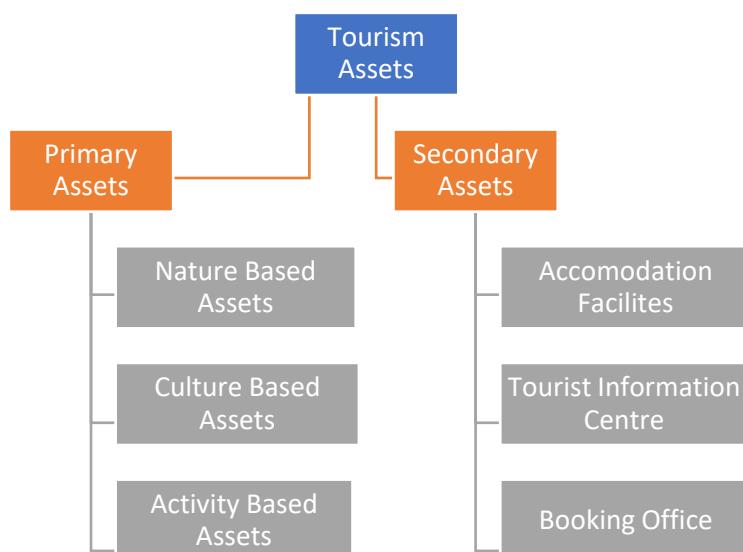
5.1.2. Tourism assets in Bandhavgarh ESZ

A. Existing Tourism Assets

Sustainable tourist development requires management of all tourist resources/assets¹⁰¹. In case of Bandhavgarh ESZ, it comprises of diverse tourism assets, varying from scenic forests and rare wildlife to cultural and historical attractions. The current tourism in Bandhavgarh Tiger Reserve is underdeveloped to say the least. Refining the classification of tourism assets mentioned in the Baseline study, Tourism assets in Bandhavgarh ESZ has been classified as explained in exhibit.

The Bandhavgarh ESZ and its vicinity have beautiful and scenic landscape that are truly enchanting and breath-taking. There are rugged mountains, beautiful falls, sprawling white sand banks of Son & other major rivers - Banas and tall majestic Sal trees.

Exhibit 21: Tourism Asset Classification



At places, the forest is too dense to allow the sun to reach the ground. The Reserve supports a wide variety of birds (large number being winter visitors), animals and flora which include many endangered species. Culturally and historically, the district is rich in aboriginal/tribal art and culture. A wide variety of handicraft items made up of bamboo, wood etc. are produced. There is a Carpet & Durrie weaving center at village Hatwa Khas in tehsil Sinhawal. The village is being developed to promote rural tourism & thereby provide sustenance to the village craftsmen.

¹⁰¹ 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.

Exhibit 22: Tourism Assets in Bandhavgarh ESZ



Exhibit 23: Existing Nature Based Assets in Bandhavgarh ESZ

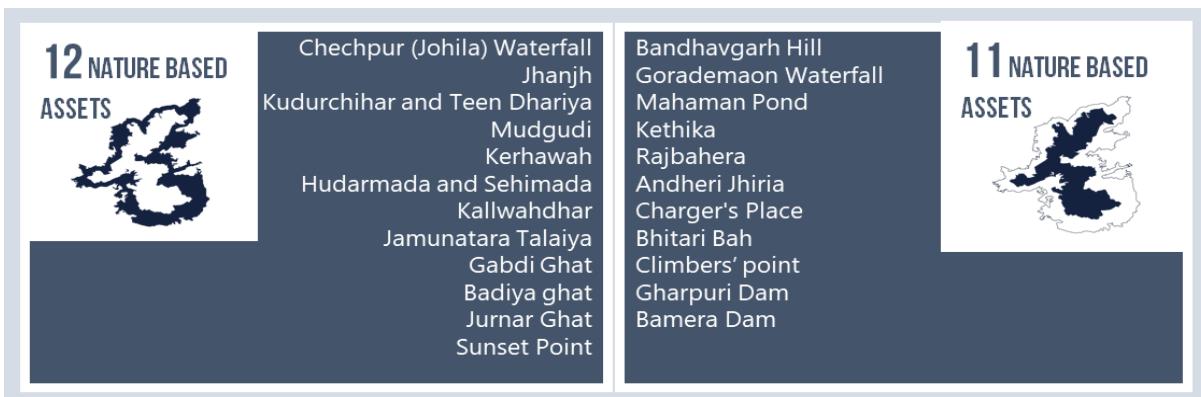


Exhibit 24: Existing Culture Based Assets in Bandhavgarh ESZ

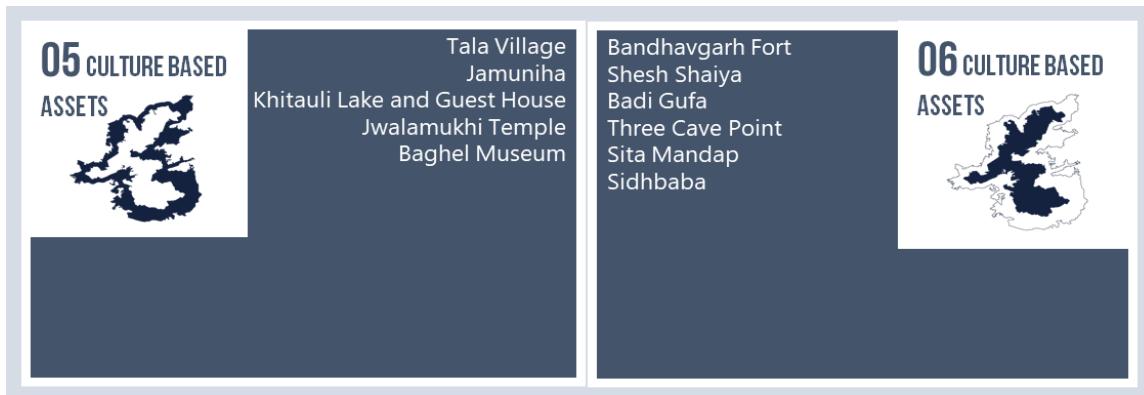


Exhibit 25: Existing Activity Based Assets in Bandhavgarh ESZ



Forest Safari: The Bandhavgarh Tiger Reserve and its ESZ is a highly preferred tourist destination due to the rich Biodiversity. The main attraction for the tourists is the Safari for animal sighting. These Safaris run on specific routes in given timings and pass-through various tourist spots.



Image 25: Bandhavgarh Tiger Reserve Safari

Table 4: Snapshot of Bandhavgarh Tourism

Parameter	Observation
Tourist footfall	2017 - 94073 (Domestic), 29387 (International)
Zones	3 Core Zones (Tala, Magdhi, Khitauli) and Eco Tourism Zones
Tourist season	1st October to 15th June (Except MP Eco Tourism Zones)
Safari season	Winter jeep safari (Oct. to Jan.), Summer jeep safari (Feb. to June)
Charges	<ul style="list-style-type: none"> Rs 1500/- per safari permit (for 6 people) in Protected Area plus 50/- portal charges. Rs 1200/- in buffer zone plus 50/- portal charges Single ticket Rs 250/- per head + 10/- portal charges Gypsy charges are extra (decided by gypsy union). Guide charges Rs 600/- for G1 category, Rs 480/- for G2 category.
Tourist spots(core)	Bandhavgarh Fort, Shesh-shaiya, Chakradhara Hide, Bhitari Wah
Tourist spots in ESZ	Chechpur Waterfall, Jhanjh, Mudgudi, Kudurchihar and Teen Dhariya, Kerhwah, Hudarmada and Sehimada, Kallwahdhar, Jamunatara Talaiya, Gabdi Ghat, Badiya Ghat, Sunset Point, Jamuniha, Tala Village, Khitauli Dam, Jwalamukhi Temple, Baghel Museum
Accommodation	60 accommodation facilities including resorts and hotels
Toilets	6 nos.
Bookings	3 nos. @ 3 zone gates each

The Bandhavgarh ESZ and its vicinity have beautiful and scenic landscape that are truly enchanting and breath-taking. There are rugged mountains, beautiful waterfalls, sprawling white sand banks of Son & other major rivers – Son with its tributaries and tall majestic Sal trees. At places, the forest is too dense to allow the sun to reach the ground. The Reserve supports a wide variety of birds (large number being winter visitors), animals and flora which

include many endangered species. Culturally and historically, the district is rich in aboriginal/tribal art and culture. A wide variety of handicraft items made up of bamboo, wood etc. are produced.

Table 5: Core zone vehicle allowed and entry gate information

Zone	Round	Max Allowed Vehicle	Online Full Vehicle Permit	Online Waitlist (Full Vehicle Permit)	FD Quota (Full Vehicle Permit)	Online Single Vehicle Permit	Single Seat Permit at Tourism Gate	Entry gate / Gates for Full Vehicle	Entry gate / Gates for Single seat
Khitauli	Morning	21	15	2	2	2	2	Khitauli	Tala
Khitauli	Evening	20	14	1	2	2	2	Khitauli	Tala
Magadhi	Morning	26	17	2	3	3	3	Magadhi	Tala
Magadhi	Evening	25	16	2	3	3	3	Magadhi	Tala
Tala	Morning	28	19	2	3	3	3	Tala	Tala
Tala	Evening	27	18	2	3	3	3	Tala	Tala

Table 6: Buffer zone vehicle allowed and entry gate information

Buffer Zone/ Sanctuary	Round	Max Allowed Vehicle	Online Full Vehicle Permit	Online Waitlist (Full Vehicle Permit)	FD Quota (Full Vehicle Permit)	Full Vehicle Permits at the Entry Gate	Entry gate/ Gates
Dhamokhar	Morning	20	14	1	2	4	Parasi
Dhamokhar	Evening	20	14	1	2	4	Parasi
Johila	Morning	20	14	1	2	4	Chechpur/Gajwahi
Johila	Evening	20	14	1	2	4	Chechpur/Gajwahi
Panpatha	Morning	20	14	1	2	4	Pachpedi
Tala	Evening	20	14	1	2	4	Pachpedi

The Safari routes identified operate for the tourists in both the core zone and in the ESZ (buffer) zone. The details of the Safari routes available in the buffer area with the tourist destination under them are listed in the table below:

Table 7: Existing Tourist zones in Core and buffer of Bandhavgarh ESZ

ZONE	DESCRIPTION	ROUTE/ DESTINATIONS
CORE ZONE		
Tala Zone (Zone I)	<p>It is the oldest safari zone of Bandhavgarh. Till year 2010, there was only one safari zone in Bandhavgarh. As Tala was the oldest safari zone thus all the major Forest Department establishments like their office, ticket counter, interpretation center, police station etc. were established in Tala village, close to Tala entrance gate.</p>	<ul style="list-style-type: none"> Siddha Baba: Siddha Baba or Lord Shiva Lingam resides besides the stretch of swampy grassland in Tala Zone. Chakradhara: Chakradhara is a large stretch of marshy grassland which offers passage to River Charanganga. Chakradhara Hide: Overlooking the stretch of Chakradhara meadow is an old watch tower built during the shikaar days. Gopalpur Pond: It is home to many wetland birds. It is one of the main elements of life support system that becomes crucial in hot summers. Badi Gufa: One of the biggest man-made caves dating back to 10th AD, the cave is of great archaeological importance and home to a colony of wide variety of bats. Shesh-shaiya: It has a pool and a reclining Vishnu on its edge and is the source of Charanganga River. Bandhavgarh Fort: The fort of Bandhavgarh is a place of considerable archaeological and historical importance. It is a natural impregnable fort and stands on a hill, at an altitude of about 2430 metres above sea-level. The Bamnia hill is also a part of the fort, because it is enclosed by a rampart. The fort is on the Rewa-Umaria road, at a distance of about 41Km from Umaria Town. Ketkiha: Ketki shrubs, aromatic plant Pandanus (Kewra) grow in wild abundance. Bhitari Hide: The watch tower or hide overlooks the Bhitari Wah Meadow. Bhitari Wah: The Bhitari Wah meadow that always remains inundated by the Bhitari River. Sita Mandap: The stream flows below the small strip of arch like bridge called Sita Mandap. Three Cave Point: Used as shelter by wild animals and big cats, the caves are man-made. Vulture Nest: Long Billed Vulture and other species nest on the walls of the steep hills can be seen on steep walls of the rocks surrounding Sita Mandap Ghoda-demon: This is a deep gorge between two mountains that is curved towards the mouth and creates excellent shelter for tigers. Rampur Hillock: Rampur Pahadi offers panoramic view of the reserve. Banbehi Hide: The watch tower or hide faces perennial Banbehi Nullah Banbehi ideal for keeping an eye on the surroundings for wildlife watching.

ZONE	DESCRIPTION	ROUTE/ DESTINATIONS
Magdhi Zone (Zone II)	Magdhi zone is the core zone forest area of Bandhavgarh tiger reserve. It is just adjoining to Tala zone in south-east forest of tiger reserve area. It is also referred as Gate No. 2. Just like Tala zone, Magdhi zone is also a popular core zone area thus tourists love to see this forest area. Famous Charger point of Bandhavgarh is also located in this zone.	<ul style="list-style-type: none"> Andhiyari Jhiriya: The dense canopy of mango, arjun and saptaparni trees prevents much of the sunlight from reaching the floor. Charger Point: Abode of Charger Tiger for years. Died in 2000, rests here in peace. Dinosaur Rock: Rocky outcrop surrounded by greenery, reminds of the 'Jurassic Age' Bhadrashila Hide: A hide facing Bhadrashila pond to watch wild animals and birds. Mahaman Pond: Waterhole surrounded by dense bamboo visited by wildlife. Soookhi Talab: Waterhole located in a meadow and attracts lots of waterfowls including black storks, woolly-necked storks, lesser adjutant storks, herons and ibises as well as red jungle fowl. Rajbehra: This marshy meadow is the origin of river Damnar. One can have the clear view of Bandhaini hillock from here. Climber's Point: Woody climbers such as Butea superba and Bauhinia vahlii reaching from one tree to another amidst the lush green Sal trees offer spectacular view. Suwari Wah: A meadow located on the southwestern boundary of the Park Soookhi Dam: A seasonal water source, place is frequented by tigers Baherha: This meadow is a favorite haunt of tigers. Patihia Camp: A temporary elephant camp located in marshy grassland. Dabhadol Tank: Perennial artificial water tank, attracts a number of winter birds. Badbada: Grassland with herbivores such as chital, Nilgai, chinkara etc. Kerhawah: Marshy grassland with spring and a small patch of wild banana. Dhaua Tower: A hillock with a camp with a 360° panoramic view of forests.
Khitauli Zone (Zone III)	Khitauli zone came into existence after year 2010. Khitauli zone is well known for Birding and herbivores animals sighting. Here prominently seen mammal species are Leopard, Nilgai, Spotted Deer, Wild Dog (Dholes).	<ul style="list-style-type: none"> Charkighatiya: A hillock giving a wide view of forests. Kumbhi Kachhar: A forest patch with bamboo and grasslands attracting large number of herbivores and tiger habitat. Garhpuri Dam: An irrigation dam on the periphery of village Garhpuri attracting a large number of winters visiting birds. Nigaha Nala: A perennial water course and summer abode of tiger. Tedka Munara: A wildlife habitat attracting large number of herbivores and a good tiger and leopard habitats.

ZONE	DESCRIPTION	ROUTE/ DESTINATIONS
BUFFER ZONE		
Dhamokar Zone	Dhamokhar Buffer area is extension of the Magadhi Protected Area of the forest. The entry point of Dhamokhar buffer area is Mahaman. The area of Dhamokhar and Jamunia are densely populated with Deer, Sambhar, Chital, wild boar and is home to plentiful species of the birds. Jamunia is quite close to Gohni and Mardari Village.	<ul style="list-style-type: none"> Jhaanjh: Slow moving river cuts the forest and becomes ferocious waterfall here. Tiger movement is often observed. Mudgudi: It is next to jhaanjh and houses Mudgudi dam. This dam contains water throughout the year and home to various birds. Kerawah: It is very close to Badrehal village and is famous for wild banana trees more than 70 years old and is origin of Kerha River. Kadewaha – Madehavah: They are share the area with Magadhi Protected Area. It has grassland easy wildlife sightings. Hundaarmaada and Sehimaada: They have lot of natural caves which are home to hyenas and Porcupines. Kalwahdhaar: It is home to lot of wildlife Badawar: This is the Exit gate.
Manpur Zone	It is adjacent to Tala and is full of dense forest and all type of wild animals with river, rivulets, landscape, waterfalls and natural scenic spots etc. exists here, which has a great potential for attracting tourists.	<ul style="list-style-type: none"> Badia Ghaat: Reached through Badkhera, sighting varied fauna and has habitation of wild animals. Zurnaar Ghaat: It is 1 km away from Badia Ghaat. Damnaar and Janaadh River meet here. Chindia Ghaat: Two caves are present here inhabited by tigers. Kuthulia Fall: Kuthulia (Chechpur) fall is a popular tourist place. There is a temple of Maharaja kartikey at Dashrath Ghaat, which can be visited through boating Johila Fall: The other end of Kuthulia fall is known as Johila fall. Sunset Point Gajwaahi Gate: Exit from here.
Panpatha Zone	It is known for its scenic forest. This was previously known as Pachpedi Zone. It is attached to Khitali core zone. Two shifts operate in a day. Maximum 20 jeeps are allowed on both the shifts every day.	<ul style="list-style-type: none"> Khitali Dam and 100-year-old guest house: It is 5 Km from Pachpedi Gate, and 500 m from Khitali Barrier. Sighting of Sloth Bear : RF-499 at Richuha place Wildlife sighting: In Beat Jagua, Compartment number RF-504 is adjacent to huge Irrigation Tank and compartment No RF-503 has Bandharchuhai place. Jamunatara Tallaiya: A beautiful tourism spot in RF-503 rich in wild animals.

ZONE	DESCRIPTION	ROUTE/ DESTINATIONS
	Route: Khitauli (Pachpedi)-to-Biruhali	<ul style="list-style-type: none"> Banks of Bhadar River, Gabdi Ghat: natural beauty of green grass and lush green wilderness in compartments RF-503 and RF-513 has good potential for animal sighting.
Johila Zone	Johila waterfall is accessible in this zone in the vicinity of few villages. Johila Zone can be explored by Jeep safari. There are two safaris in a day from October to June, one in the morning and the other late in the afternoon. Maximum 20 jeeps are allowed on both the shifts every day.	<ul style="list-style-type: none"> Johila Fall <p>The buffer area of Manpur is adjacent to the Tala Protected Area of Bandhavgarh National Park. This area is also blessed with rich forests and wildlife, plateaus, rivers, ravines, waterfalls, landscape etc. Proposed zone harbours number of visiting points and a huge potential for tourist attraction. Many a time's tourists have to return back from Tala due to the non-availability of the entry in core tourism area. For such tourists the Manpur ecotourism zone offers the best alternative in the adjoining area.</p>

B. Potential Tourism Assets

With the increased footfalls of tourists, the deep need today is that tourism like another sector be planned and managed suitably. For the development of sustainable tourism, a middle path between these extremes one which manages growth within acknowledge resource conservation limits is generally held to offer the best prospects. Therefore, sustainable tourism needs to,

- Ensure that renewable resources are not consumed at a rate that is faster than rates of natural replacement,
- Maintain biological diversity,
- Recognize and value the aesthetic appeal of environments.
- Follow ethical principles that respect local cultures livelihoods and customs.
- Involve and consult local people in development processes
- Promote equity in the distribution of both the economic costs and the benefits of the activity amongst tourism developers and hosts.

The list of potential tourist sites which can be developed for sustainable tourism is based on following principles:

- To reduces pressure in the Core unit of Bandhavgarh Eco Sensitive Zone
- Sites that are currently underutilised and can be used to alleviated livelihood options for the local communities
- Sites that exhibit a scenic beauty and is a rich source of bio diversity and provides a site for spotting birds and wildlife.
- Sites of historical importance that can provide the tourists a sense of culture the BTR Practices.
- Sites that experience a large number of visitors and currently need an augmentation in existing infrastructure services.

Potential for Nature Based Asset Development

Table 8 Potential Nature Based Tourist Locations

S. No.	Name	Location	Description
1	Chechpur (Johila) Waterfall	ESZ	The waterfall is located in Chechpur village, on Johila river. It is located in the Eco- Sensitive Zone, at a distance of 44 km from Tala. It is an ideal location for the tourists for relaxing and get-to-gathers
2	Jhanjh	ESZ	It has wonderful water streams flowing in a zigzag manner creating a sound that resembles the musical instrument "Jhanjh". It is also a religious place as the villagers believe "Jhanjh Baba".
3	Kudurchih ar and Teen Dhariya	ESZ	Chances of Tiger sighting. Teen Dhariya has three small local streams flowing the confluence, is a unique site. The presence of wild animals like Spotted Deer, Sambhar and other herbivores is always reported here. Tiger presence in this area has been noticed for the whole year by locals.
4	Mudgudi	ESZ	Village Mudgudi is very rich in avifauna with perennial water source where different species of birds can be sighted.

S. No.	Name	Location	Description
5	Kerhawah	ESZ	Kerhawah is situated near Badrehal village. 70-80 year old vast wild Banana grooves are found in this area. The local Kerha River emerges from this place.
6	Hudarmada and Sehimada	ESZ	This is situated 1 km away from Kerhawah. This place is famous for Hyena sighting due to the suitable habitat and caves. Beautiful caves can also be seen in compartment RF-100 near Sehimada.
7	Kallwahdhar	ESZ	Kallwahdhar area has idyllic forest and regular sighting of Wild bear and other ungulates. It is situated in RF-102 which is 1.7 km away from Madihawah.
8	Jamunatara Talaiya	ESZ	A picturesque spot, rich in wild animals which can be easily spotted.
9	Gabdi Ghat	ESZ	On the banks of Bhadar River, Gabdi Ghat is a green area with good animal sighting potential.
10	Badiya ghat	ESZ	Travelling through lush green forest patches of Badkhera and one can enjoy wildlife sightings and bird songs, one can reach Badiya Ghat, where scenic beauty of Damnar River is a wonderful experience for tourists
11	Jurnar Ghat	ESZ	Jurnar Ghat, confluence of Damnar and Janad Rivers, is about 1 km away from Badiya Ghat, with a unique and mesmerizing view. This area is surrounded with large trees and sandy banks on either side of the rivers.
12	Sunset Point	ESZ	It gives a remarkable and panoramic view of lush-green forest.

Potential for Activity Based Asset Development

Table 9 Potential sites for various activities in Bandhavgarh ESZ

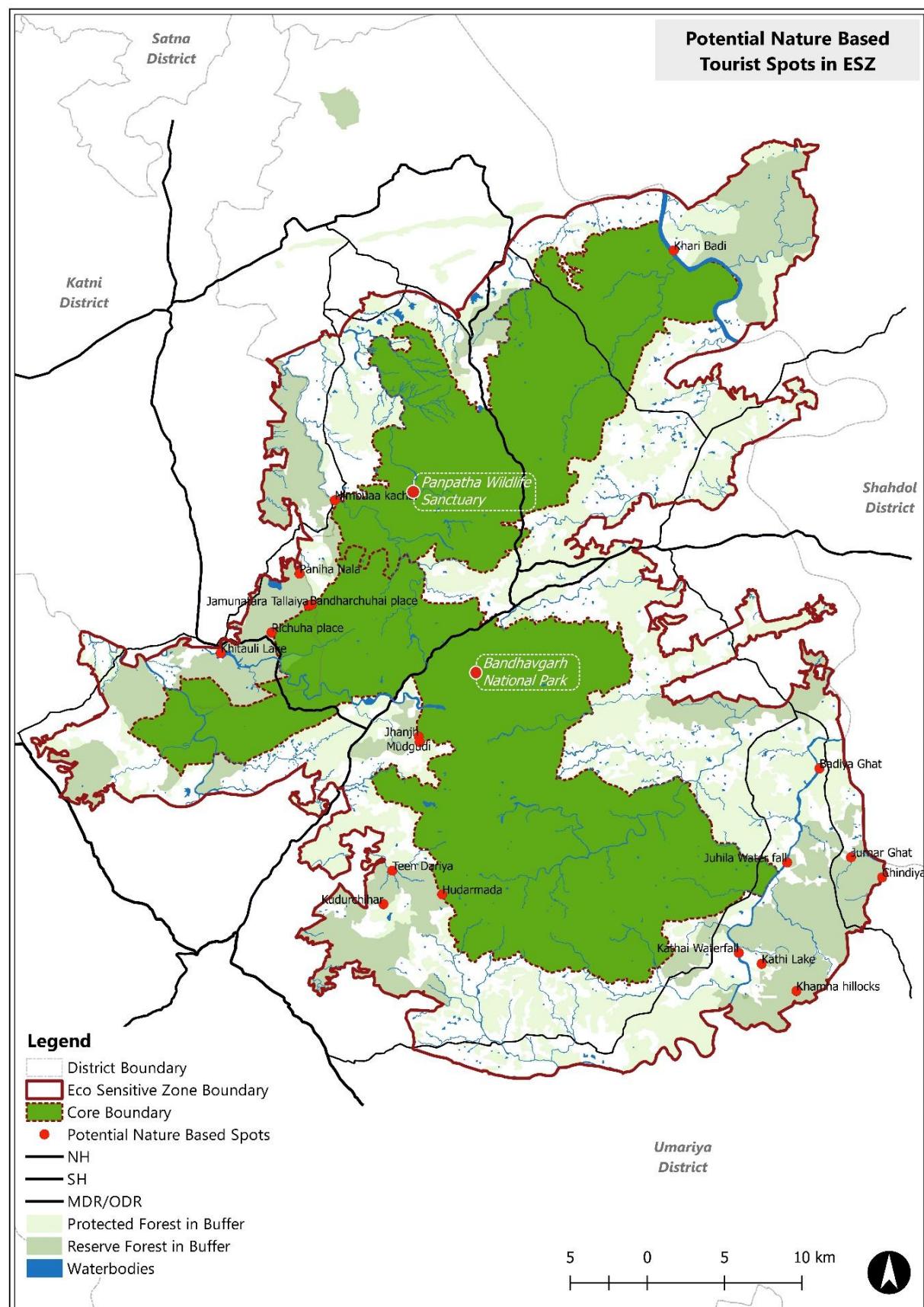
S.No.	Activity	Potential Sites
1	Safari Trail	Kudurchihar and Teen Dhariya, Hudarmada and Sehimada, Kallwahdhar, Richuha place, Jamunatara Tallaiya, Chindiya Ghat
2	River Cruise/ Safari	Bhadar River, Gabdi Ghat, Jurnar Ghat, Chechpur Water Fall
3	Trekking Trails	Janjh
4	Bicycle Trail	Badawar
5	Jungle Camping	Panjha Nala
6	Nature Walk	Janjh, Mudgudi, Kerhawah, Jurnar Ghat
7	Bird Watching	Jamuniha, Mudgudi, Khitauli Dam, Jamunatara Tallaiya, Jurnar Ghat
8	Yoga and Meditation	Mudgudi, Kerhawah, Nimbuaa kachar

Potential for Culture Based Asset Development

Table 10 Potential Culture Based Tourist Locations

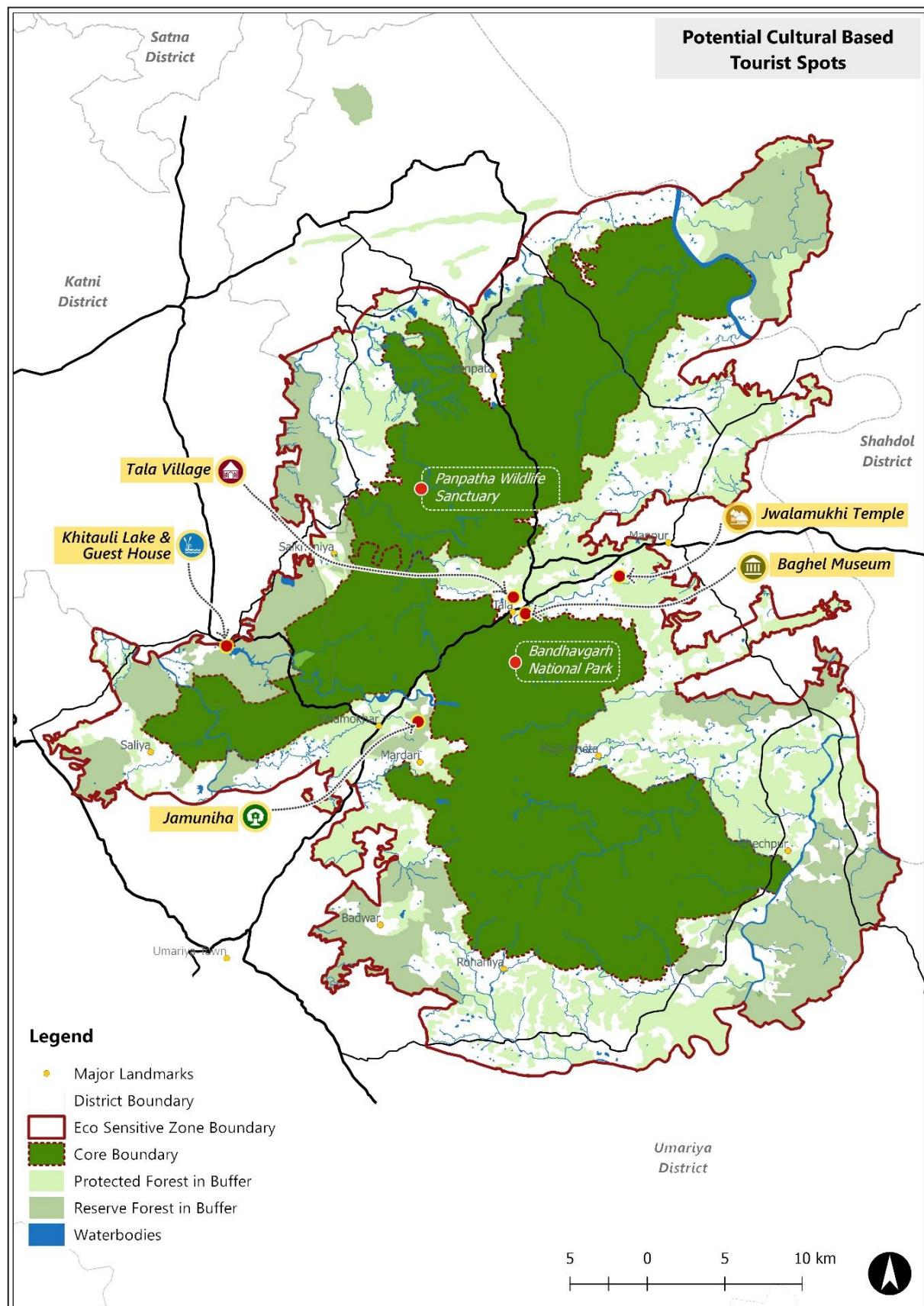
S. No.	Name	Location	Description
1	Tala Village	ESZ	Tala village has a number of hotels and resorts with comfortable accommodation in Bandhavgarh. The village at the same time gives one the feel of a quintessential Indian Village with a quaint and traditional setting. .
2	Jamuniha	ESZ	Jamuniha is situated in compartment number RF-108. Mardari and Gohadi villages are nearest villages to Jamuniha. One Tree House with 12-acre property is available in the village Jamuniha which is not in use currently
3	Khitauli Dam and Guest House	ESZ	Khitauli Dam and a 100-year-old guest house is 5 km away from Pachpedhi gate.
4	Jwalamukhi Temple	ESZ	It is situated on the bank of river Charan Ganga and is dedicated to Goddess Jwalamukhi. This shrine is believed to be amongst the most revered in the region. It is located 10 km from Bandhavgarh National Park.
5	Baghel Museum	ESZ	The Baghel museum showcases of all personal belongings of Maharaja of Rewa. The museum also boasts ancient hunting equipments by the Maharajas along with some of the military equipment.

Map 32: Potential Nature Based Tourist sites



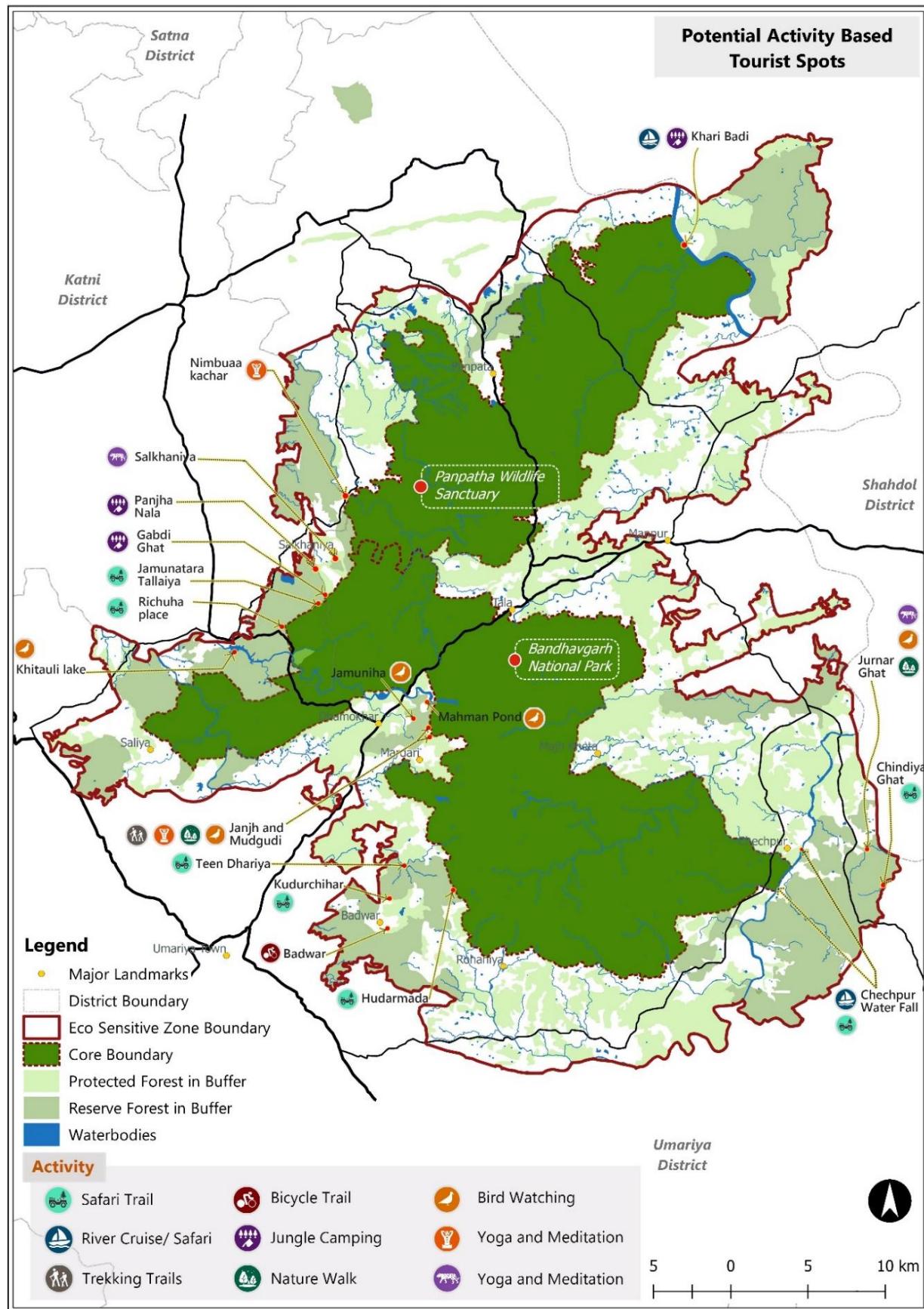
Source: Bandhavgarh Tiger Reserve and IPE Global Ltd.

Map 33: Potential Culture based tourism sites



Source: Bandhavgarh Tiger Reserve and IPE Global Ltd

Map 34: Potential sites for various activities in Bandhavgarh ESZ



5.1.3. Existing Tourism/ Eco-Tourism Infrastructure

Accommodation Facilities

Bandhavgarh Eco Sensitive Zone has a number of accommodation facilities including resorts and hotels of different types and ranges. There diversity varies from luxury resorts with extravagant facilities to budget hotels with basic required amenities for a comfortable stay.

Government: There is one Government accommodation property in Bandhavgarh Eco Sensitive Zone. This is owned and maintained by Madhya Pradesh State Tourism Development Corporation (MPSTDC). The MPT White Tiger Forest Lodge has amenities like thirty-eight rooms, Reception, restaurant, bar, kitchen & store, swimming pool, toilet & conference hall, gym, souvenir shop & playground, garden and parking.

Private: Bandhavgarh ESZ has around 60 registered resorts, hotels, camps and guest houses. The accommodation facilities of different categories varying from luxury like Taj: Mahua Kothi to budget facility like Hotel Narmada Palace are available for the tourists.

Tourist Information Centre

There is a proposed Forest Information Centre, which is under construction. It is located in Panpatha. Apart from the Information Centre, the facility will have a Cafeteria, Canopy Walk, open air Amphitheatre, camping site, toilet, pathway and chain link fencing.

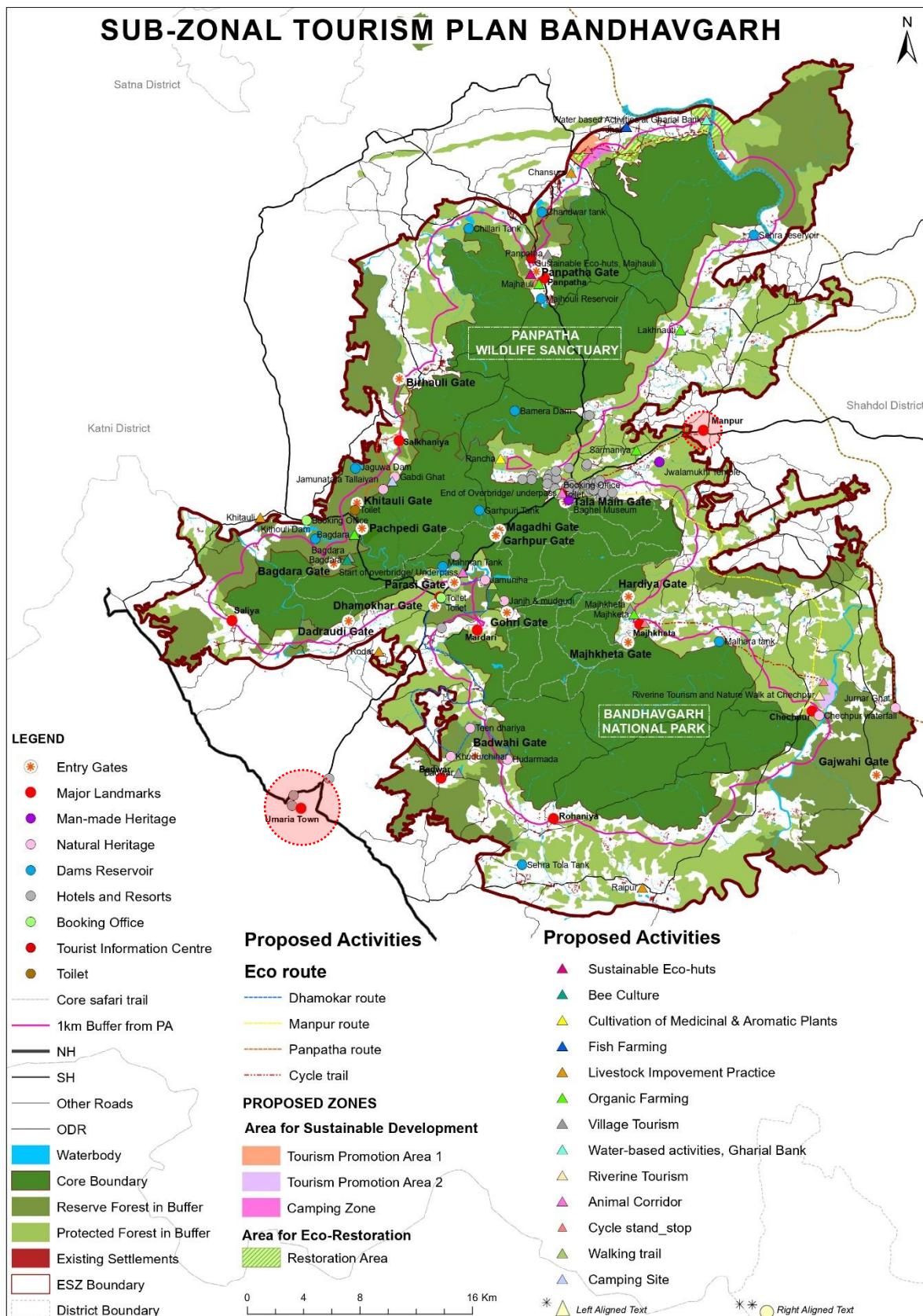
Booking Office

There are three booking office facilities provided by the government. The details of these are listed in the table.

Table 11 Booking Office Information in Bandhavgarh ESZ

S.No.	Facility	Location
1	Tala Booking Office	Tala
2	Pachpedhi Booking Office	Pachpedhi Entry Gate, RF- 500
3	Dhamokhar Booking Office	Dhamokhar Entry Gate, P- 144

Map 35: Tourist asset and Infrastructure in Bandhavgarh ESZ



5.1.4. Potential Tourism zones and circuits

Based on the above identified list of potential sites for tourism development and the different characteristics portrayed, the zones that have been identified in Tiger Conservation Plan of Bandhavgarh Tiger Reserve with the potential of improvements in tourism circuits are **Dhamokhar, Manpur, Panpatha and Johila Zone.**

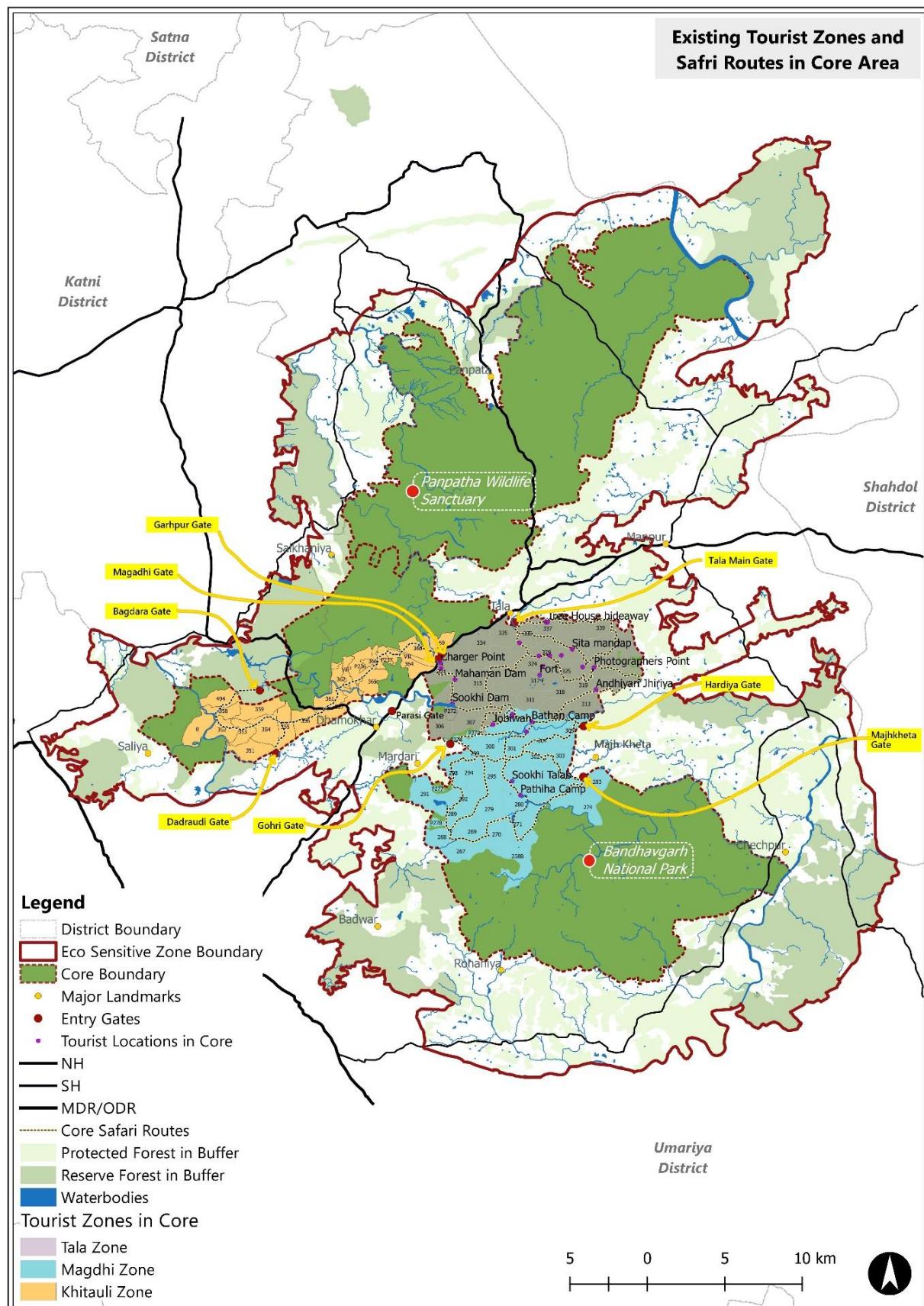
The following is the brief description about the zones:

- **Dhamokhar Circuit:** Dhamokhar zone is the extension of the Magadhi zone in the Protected Area of the forest. This zone is believed to be densely populated with Deer, Sambhar, Chital, wild boar and is home to plentiful species of the birds and is quite close to Gohni and Mardari Village.
- **Manpur Circuit:** It is adjacent to Tala and is full of dense forest. All type of wild animals with river, rivulets, landscape, waterfalls and natural scenic spots etc. exists here.
- **Panpatha Circuit:** It is known for its scenic forest. This was previously known as Pachpedi Zone. It is attached to Khitali core zone.
- **Johila Circuit:** Johila waterfall is accessible in this zone in the vicinity of few villages. Johila Zone can be explored by Jeep safari and exhibits immense potential for development of cultural tourism products and related activities.

Table 12 Potential Circuits for Tourism Development

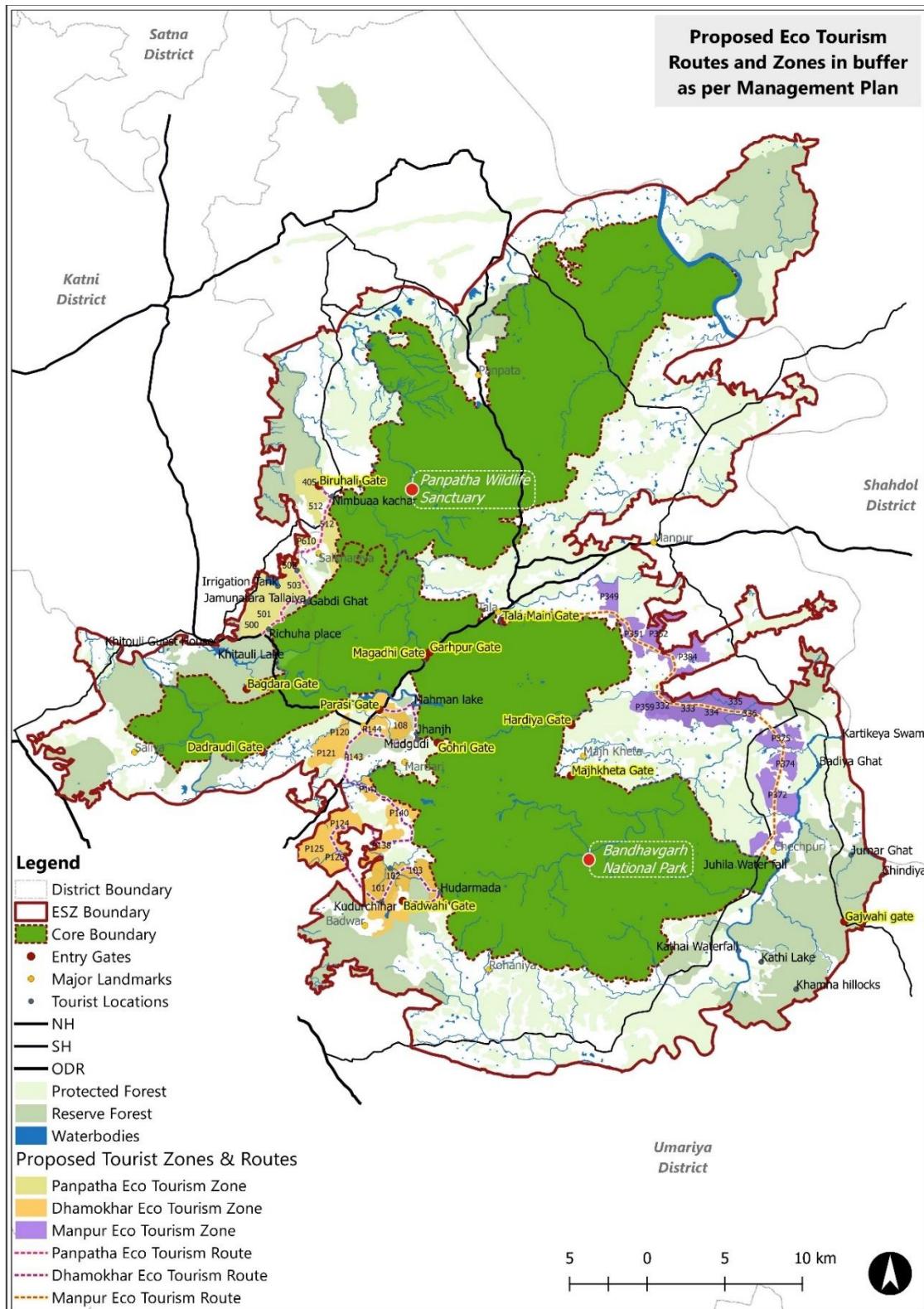
Zone	Route/ destinations
Dhamokhar Circuit	Janjh – Mudgudi – Kerawah - Kadewaha – Madehavah - Hundaarmaada and Sehimaada – Kalwahdhaar - Badawar
Manpur Circuit	Badia Ghat – Zurnaar Ghat – Chindia Ghat – Kuthulia Fall – Joshila fall – Sunset Point – Gajwaahi Gate
Panpatha Circuit	Pachpedi - Khitali
Johila Circuit	Joshila Falls

Map 36: Tourism Zones in Core of Bandhavgarh ESZ



Source: Tiger Conservation plan : Bandhavgarh and IPE Global Ltd

Map 37: Tourism Zones in Buffer of Bandhavgarh ESZ



Source: Tiger Conservation plan : Bandhavgarh and IPE Global Ltd

Potential tourism circuits:

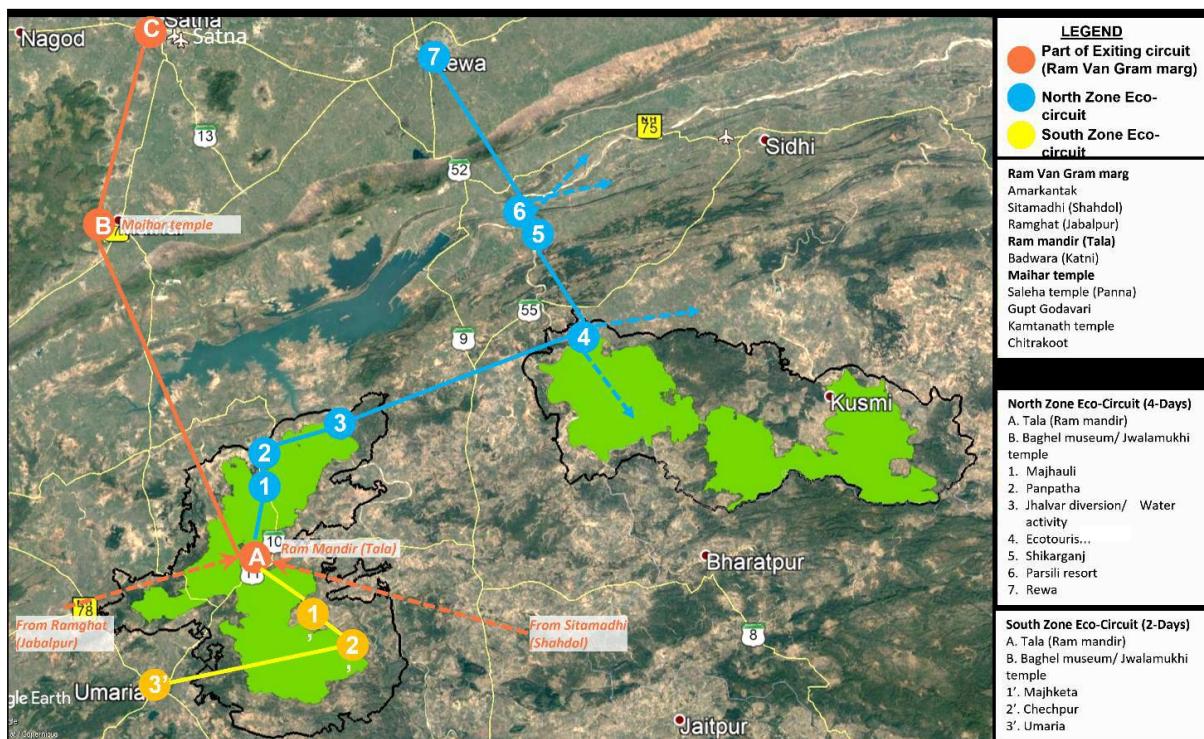
The first place where the tourist land in Bandhavgarh Tiger Reserve is Tala. This place is very close to the core and has many hotels and resorts to relax. There are two zones which can be explored in Bandhavgarh i.e., North zone and South Zone.

A) North Zone: This zone offers a 3–4-day tour which also connects with nearby Sanjay National Park and Son Gharial Wildlife sanctuary.

North Zone Circuit (4-Days): Tala –Baghel museum/ Jwalamukhi temple – Magdhi – Panpatha - Jhalvar diversion/Water activity – Nebuha/ Deosar Ecotourism – Shikarganj - Parsili resort – Bharatpur - Rewa

This tour includes the following:

- Day 1: Tourist can start with the early morning safari in the Tala zone where one can also visit the ram temple (part of Ram van gram marg) followed by a local cuisine lunch at MPTB resort in Tala. In the evening, the tourists can explore the nearby villages especially Raancha village where people perform organic farming and also medicinal and aromatic plants. Here they can learn about ancient Ayurvedic techniques for treating cold, cough, fever etc, and they can even take some of them home. One can also explore Baghel museum and Jwalamukhi temple.
- Day 2: From Tala, tourist can move to sustainable huts in Magdhi and experience the mud houses with thatch roof. They can also rent a bicycle from here and start their journey to Panpatha and an interpretation center proposed by MPTB which includes amphitheatre for performances for folk dance and music, local cuisine, souvenir shop. And this is a place where you can surely find tiger as this interpretation center also houses a rehabilitation center for tigers. If you are interested in water sports, then some water activities are also proposed in Gopad river bank where you can also find Gharials. And if you are interested in plants and trees, then get involved in the plantation drive and farming exercises in Panpatha.
- Day 3: From Sustainable huts in Magdhi, the tourists can either move to Parsili resort in Son Gharial Wildlife Sanctuary. Or explore the Eco Tourism, River trails and Nature Walks at Nebua and Deosar in Sanjay Dubri Tiger reserve. In Parsili you can also explore tents accommodation, Khat Bungalow, Chandreh temple, Bhawarsen ghat and explore the 'life of a village' in Shikarganj. In Deosar, one can get involved in bird watching, Bon Fire, sand art by locals, Nature walk etc and stay in luxurious tents.
- Day 4: You can spend another day in the same location or explore the other cluster.
- Day 5: Return back to Rewa/Allahabad via Bharatpur.



B) South Zone: This is for shorter period of time for 2 day where a person can explore local village culture, farming techniques and Chechpur water fall.

South Zone Circuit (2-Days): Tala - Baghel museum/ Jwalamukhi temple – Majhketa – Chechpur - Umaria

- Day 1: Tourist can start with the early morning safari in the Tala zone where one can also visit the ram temple (part of Ram van gram marg) followed by a local cuisine lunch at MPTB resort in Tala. In the evening, the tourists can explore the nearby villages especially Ranchha village where people perform organic farming and also medicinal and aromatic plants. Here they can learn about ancient Ayurvedic techniques for treating cold, cough, fever etc, and they can even take some of them home. One can also explore Baghel museum and Jwalamukhi temple.
- Day 2: For second day, one might get early to see the sunrise and visit the Chechpur waterfall. This place provides opportunity for bird watching, sand art by locals, Nature walks, Water sports, Gharial watching etc. And can return by the evening to Majhketa village where the tourist can explore the 'life of a village' by living in homestays, local cuisine, local culture etc.
- Day 3: Return back to Jabalpur via Umaria or can explore the northern zone of Bandhavgarh.

5.1.5. Tourism forecast and challenges

A. Planning Forecasts

The Bandhavgarh Tiger Reserve is a preferred location for tourism. The Tiger Reserve is famous for its Safaris and trails. It is famous as it has high probability of Tiger sighting. Thus, every year, it is frequented by a large number of domestic and international tourists.

The tourist footfall data for five years, starting from 2013 to 2017 is shown in the Table below.

Year	Domestic Tourist (in numbers)	International Tourists (in numbers)	Total (in numbers)
2013	69226	39538	108764
2014	72895	34754	107649
2015	85031	25032	110063
2016	94648	26662	121310
2017	94073	29387	123460

Source: BTR

As Bandhavgarh is a famous tourist spot with more than 1 lac of tourist population and with many tourist interventions proposed in the area, we would go with geometric projections: The same has been depicted in the following table:

Table 13: Tourist population projections as per arithmetic projections

Year	Domestic Tourist	International Tourists	Total	% Increase
2013	69226	39538	108764	-
2017	94073	29387	123460	0.017
2021	100921	31526	132448	0.017
2031	120304	37581	157885	0.017
2041	143409	44799	188208	0.017

Source: BTR and IPE Global

B. Challenges

Ecotourism is a rapidly growing industry where destinations with a serene environment and rich wildlife. International organizations such as the World Bank also see a role of eco-tourism in fulfilling the goals for sustainable development. However, a sustainable ecotourism management requires a multifaceted approach. Not only is it necessary to ensure that derived benefits are distributed to local communities, it is also necessary to conduct awareness campaigns to educate and encourage cooperation among stakeholders along with introduction of practices such as visitor management and monitoring.

1. Attracting New Visitor and Monitoring:

One of the biggest challenges that development of Eco tourism poses in this area is to attract tourists from nearby market and offer them sustainable products. Volume creation in tourism is important to facilitate and develop new facilities. At the same time, we have to ensure that tourism development does not cause Environmental stress.

By simply travelling to a protected area, for instance, visitors almost always leave a carbon footprint, while visitor use inside the area will need to be managed to avoid degrading fragile habitats. Visitor management is often too narrowly connected with mass/individual tourism in protected areas. Generally, visitor management can be used in any destination for mass and individual tourism also in connection with optimization of visitor flows, visitor concentration, and optimization of visitor impacts in a very broad sense¹⁰².

2. Education and Awareness

For the sustainable development of tourism in destination areas, it is important to have responsible visitors as well as service providers with high pro-environmental orientation and a

¹⁰² Tourism and visitor management in protected areas, IUCN.

critical minimum knowledge of ecotourism. Understanding tourists' environmental orientation is critical for destination management¹⁰³.

3. Resource Dependency, Poverty

It has been proved through various dedicated studies that the local communities living near ecotourism sites typically have incomes lower than the national average, and they have limited options for economic activities because they are often financially neglected and poorly managed. Relations between development and environment are complicated by this rural poverty and the general absence of environmental awareness. As a result, incidence of resource dependency and exploitation is observed because demands by the urban population for medicinal and horticultural plants are high, prompting local communities to collect them for immediate financial gain (Amat, 2002). They engage in consumptive activities that offer tangible products¹⁰⁴. As compared to indigenous people who treat the forest as a resource provider, most of the local communities treat the forest as a commodity provider.

If poverty and resource dependency is to be reduced, the challenge for a sustainable tourism development is provision of a viable economic alternative. Local people can participate in chalet operation, homestay programme, food, handicraft and transport businesses, and local community organizations can act as concessionaires for these support services. Essentially, when local people can meet many of the needs of tourists themselves, they are more likely to retain some control over tourism.

4. Effectiveness of Management Strategies

An essential component of any tourism management strategy is a commitment to sustained monitoring that tracks current conditions, evaluates the efficacy of management actions, and provides the basis for taking appropriate remedial action and any needed adjustments to management plans

Protected areas are an important resource for conserving biodiversity and at present approximately one tenth of the world's land surface is a protected area in some form. Tourism within protected areas is one of a number of human values associated with protected areas. Tourism is the vehicle by which park managers come into greatest direct contact with society, and it provides a rich opportunity for explaining park values, ensuring their ongoing existence and directly contributing to human welfare through the reflective and active recreation opportunities they provide.

5. Institutional Capacity for Tourism Management

Ecotourism being a niche tourism product faces immense competition from traditional forms of commercial tourism. Quite often the economic returns from a project are low and commercial feasibility is not possible, these barriers often serve as a disincentive to invest in the absence of a subsidies or fiscal incentives offered by government. Globally lot of subsidies and fiscal incentives is given to private players for development of projects in the field of ecotourism or sustainable tourism. For e.g.-Costa Rica government provides payment for environment service which is a market-based mechanism for conservation of service under

¹⁰³ Environmental orientation and ecotourism awareness among pilgrims, adventure tourists, and leisure tourists by Satish Bagri, Bharti Gupta and Babu George in Tourism Preliminary Communication

¹⁰⁴ Tourism in Protected Areas: Constraints and Challenges, by Ahmad Puad Mat Som, Badaruddin Mohamed and Wong Kong Yew, in TEAM Journal of Hospitality & Tourism.

which farmers or land owners are given financial incentives for providing ecological services, South African government provide biodiversity fiscal incentive (which includes deductions for corporate tax, property tax rebate, income tax holidays etc.) for commercial tourism projects which promotes and preserves natural habitat and biodiversity. National and state government of Australia provide preferential marketing opportunities to tour operators certified by ecotourism Australia, Philippines has special development zones for ecotourism related projects.

There is limited participation by private players in ecotourism projects in India due to lack of fiscal subsidy provided by the government. Majority of ecotourism initiatives are restricted to rural home stays and cultural tourism which provide source of livelihood to rural people. Lack of soft skills and adequate capacity building programs to cater to international tourist is another big challenge.

5.1.6. Delineation of Tourism Promotion Areas (TPA)

Tourism promotion zones have been delineated on the basis of Geographical context, environmental sensitivity analysis and human impact assessment (majorly in the management zones) and in those areas where other tourist sites can be connected. The following two Tourism Promotion Areas (TPA's) has been demarcated (Refer the map below):

A. TPA-1: North Chansura Tourism Promotion Area

Tourism Promotion Area-1 is identified in the north of Chansura. The following are the reasons for this delineation of TPA-1:

- Falls under low sensitivity area of management zone
- Reducing pressure on Tala to northern side of the ESZ near the Bansagar Dam
- Connectivity from State highway – 10.
- Near to hanuman mandir, Panpatha interpretation center, proposed Magdhi sustainable huts, Proposed gharial bank etc.
- This provides a need for development of tourism infrastructure in the vicinity of these areas such as sustainable accommodation, connectivity, cafes etc.
- This TPA-1 falls along the North zone Eco-circuit of Bandhavgarh.

Camping Zone: A camping zone is proposed adjacent to Chansura TPA-1 to provide a chance to tourist to live near the nature with minimal facilities. The campsites proposed in camping zone is 11% of the total area dedicated for tourism purposes (refer section 10.1.7 for details). The camping works best when clubbed with other activities such as adventure tourism, rural tourism etc. The tourists from camps can be involved in rural activities, agricultural activities, plantation activities etc near to their campsites. The campsites 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. The detailed guidelines for camping zone are provided in section 10.3.2.

B. TPA-2: North Chechpur Tourism Promotion Area

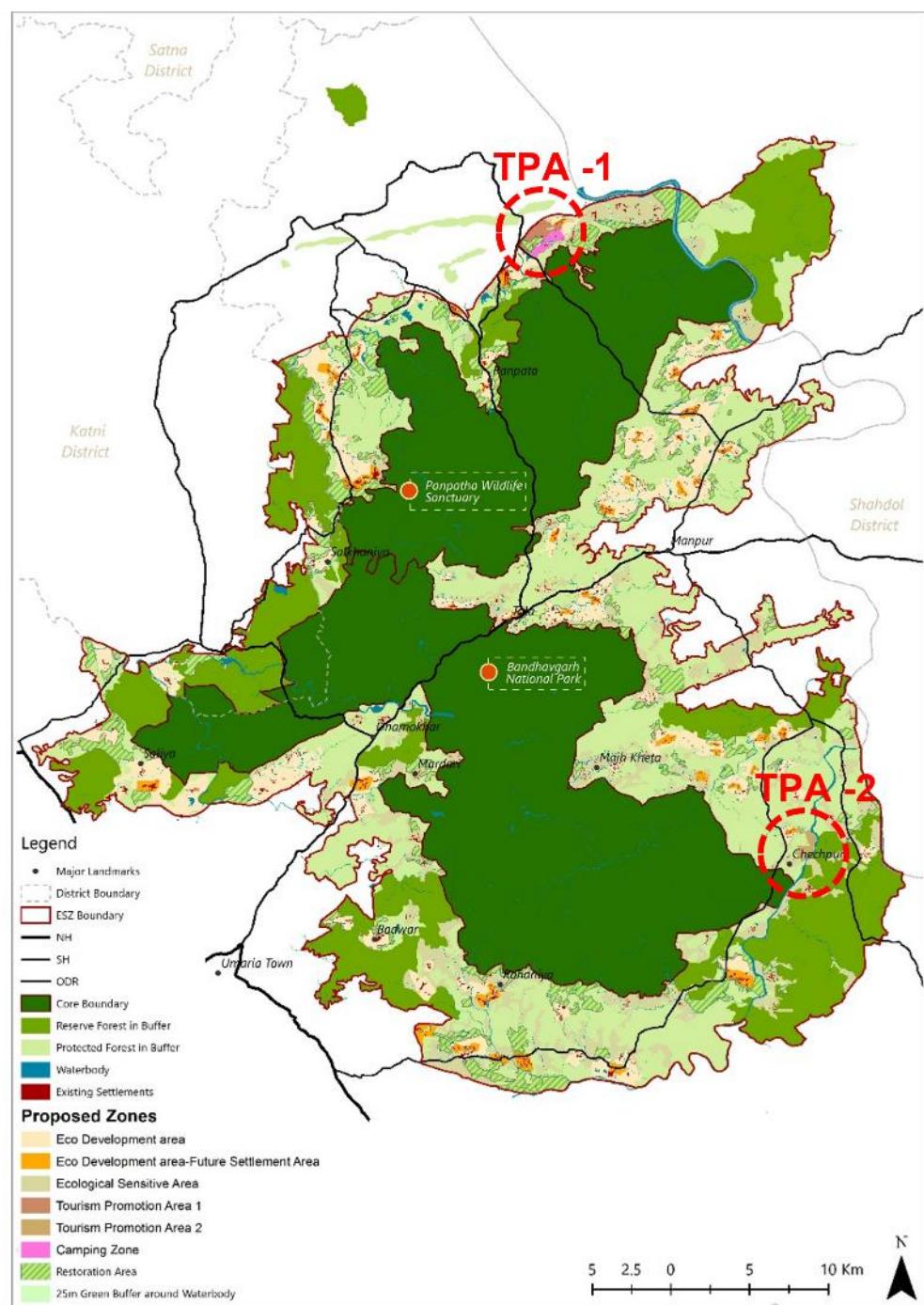
Tourism Promotion Area-2 is identified in the north of Chechpur near the waterfall. The following are the reasons for this delineation of TPA-2:

- Falls under low sensitivity area of management zone

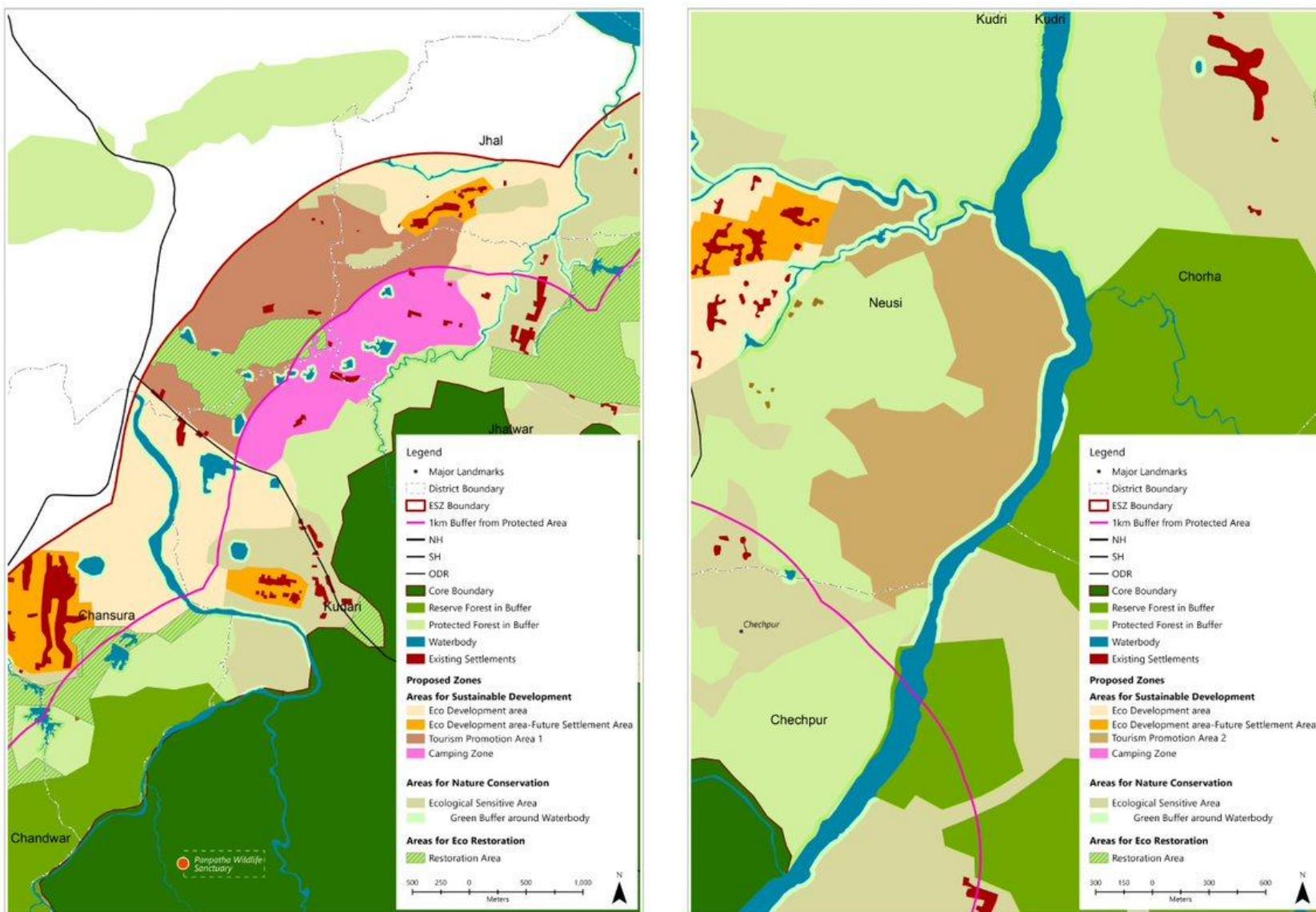
- Reducing pressure on Tala to southern side of the ESZ near the Chechpur waterfall.
- Connectivity from road on both sides of TPA.
- Near to Chechpur waterfall, near to Son river, Majhketa village tourism, water sports activities in riverine areas etc.
- This provides a need for development of tourism infrastructure in the vicinity of these areas such as Eco huts, bicycle tracks, nature trail, cafes etc.
- This TPA-2 is in line with project of landscape restoration as mentioned in section 8.2.1.
- This TPA-2 falls along the South zone Eco-circuit of Bandhavgarh.

Map 38: Location of Proposed Tourism Promotion Area

These Tourism Promotion Zones, both TPA-1 and TPA-2, can be taken up further by Town and Country Planning department for further detailing such as land realignment, provision of infrastructure etc. Please note, TPA-2 to be developed with necessary eco-friendly infrastructure (mostly for camping or eco-huts).



Map 39: Detailed map of TPA-1 and TPA-2

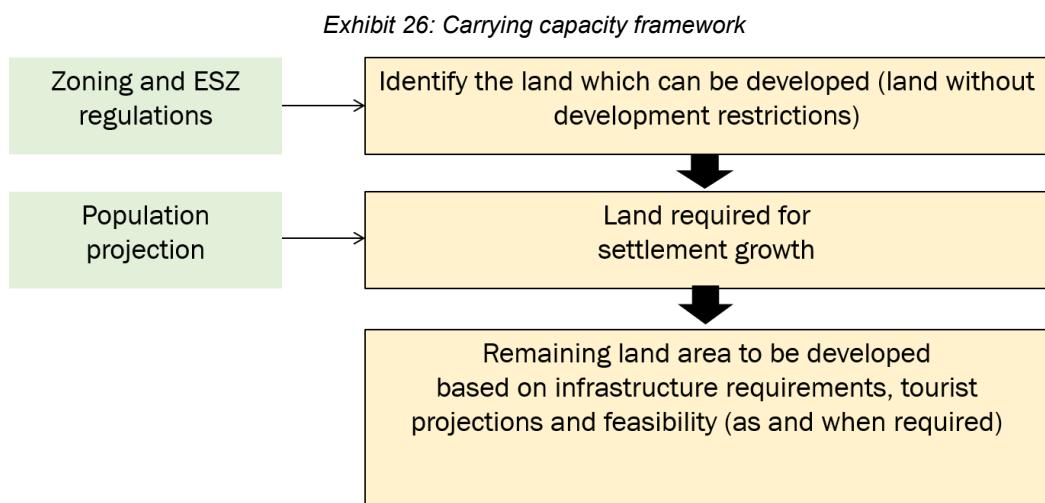


5.1.7. Assessment of carrying capacities of TPA

"Tourism Carrying Capacity" is defined by the World Tourism Organization (WTO) 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". Depending on the type of study, area and its objectives, the methodology of carrying capacity has been derived.

This implies that the prudent and judicial use of environmental resources is a must. Bandhavgarh is a pristine area with natural gifts and thus, it becomes mandatory for its conservation.

As described in Tiger Conservation Plan, the forest department has calculated the possible influx of tourists in the forest area for Safari purposes as per the carrying capacity (refer section 5.1.7) so this section will highlight the framework needed to calculate the carrying capacity for the accommodation related facilities needed by the tourists:



METHOD USED FOR CALCULATIONS

For determining the number of beds that can be physically accommodated in Tourism Promotion Areas, a distinctive methodology was developed as described below:

1. All plots within the delineated TPA-1 area were considered for estimating the number of beds.
2. Areas falling within the ecological sensitive areas were deducted from the total plot area.
3. Total area of all the individual plots was calculated.
4. If major part of a plot falls under the TPA, the whole plot was taken into account. If a plot partially falls under the TPA, then that partial area was considered as a single plot for area calculations.
5. The built-up area of each plot was calculated based on the FAR recommended in the Justice Raveendran Committee Report.

FAR as per Justice Raveendran Committee

- a. For plots up to 200 sqm - max FAR of 1.00
- b. For plots between 201sqm and 500sqm – max FAR of 0.80
- c. For plots between 501sqm and above – max of 0.50

6. Based on the standards derived from National Building Code (NBC) and Architects Handbook by Ernst and Peter Neufert, a model was developed for determining the area required for each bed. From the table below, it is clear that a standard area of 36 sqm is required for two beds in a single room and an area of 18 sq m is required for each bed.

Particulars	Area per room in sq.m *
Room (2 beds)	27.8
Reception	0.4
Admin	0.3
Restaurant	1.1
Kitchen	3.8
Maintenance	0.8
Common toilets	0.4
Furniture store	0.1
General store	0.9
Caretaker	0.3
Total area	35.9 ~ 36

7. Number of beds in each plot was estimated and the overall maximum number of beds within the developable area was determined.

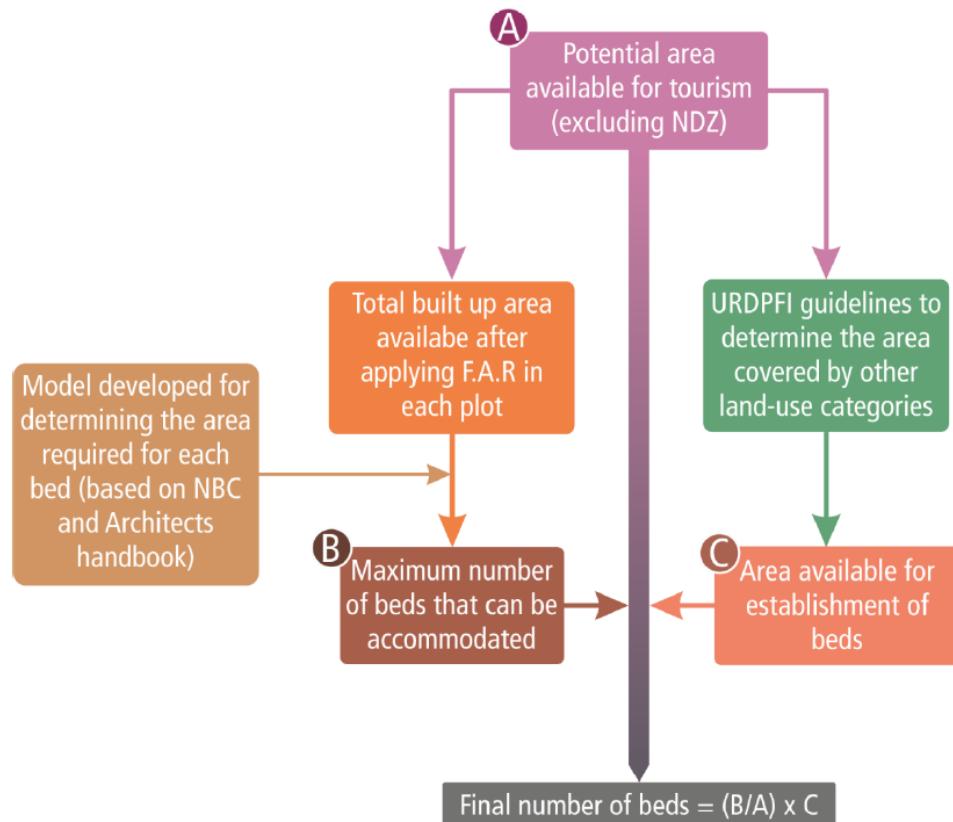
8. Area available for establishing the beds was calculated after deducting the other major land-use categories such as residential, commercial, recreational etc., within the TPA. The percentage of land-use categories was obtained from URDPFI guidelines. URDPFI guidelines were not applied to the areas having very few numbers of small size plots.

9. Based on the final area available, the number of beds was estimated proportionately

Methodology for determining the sustainable number of beds in the area demarcated for tourism is given in the exhibit below with the formula as

$$\text{Estimated number of beds that can be accommodated} = (B / A) \times C$$

Exhibit 27: Methodology adopted for calculating Carrying Capacity for TPA-1



Source: NCSCM

Carrying Capacity of TPA-1 (Chansura Tourism Promotion Area)

1. For calculating 'A'

Calculation for 'A'		Area (in sqm)	
1	Total TPA Area	1967814.90	
2	Settlement/ Area which can be used	Waterbody	
		30287.09	
		Green buffer	
		48456.05	
		Settlement	
		25593.002	
		Roads	
		20169.1	
		Total	
Total Developable area (A)		= 1967814.90 - 124505.2 = 1843309.66	

2. For calculating 'B'

Plot Area	FAR Allowed	Area (in sqm)	Area*FA R
up to 200	1	1159	1159
201 to 500	0.8	4893	3914
above 501	0.5	1846452	923226
Total			928299
Total area available for Beds after applying FAR (11 % of land available for tourism from table below)			= 928299 / *0.11

Plot Area	FAR Allowed	Area (in sqm)	Area*FA R
			= 102112. 9
Maximum beds estimated (B)		= 102112.9 / 18 (area for one bed) = 5673	

3. For calculating 'C'

Land use	Percentage requirement as per URDPFI (in %)	Area (in sqkm)
Residential	50	921654.83
Commercial	3	55299.29
Public and Semi Public	8	147464.77
Recreational	14	258063.35
Transportation	12	221197.16
Others	2	36866.19
Total	89	1640545.59
Total area required as per standards (X)		1640545.59
Remaining land for tourism is 11% (C) (A-X)		= 1843309.66 - 1640545.59 = 2027.64.07

4. Final Calculation

Estimated number of beds that can be accommodated = (B / A) x C

= (5673 / 1843309.66) X 2027.64.07 = 624 beds

Carrying Capacity of Camping Zone near Chansura (for Campsites)

The capacity of campsites will be calculated slightly differently as the concept of FAR is invalid in this case. We need to first find the total area which can be developed for tourism purposes i.e. for campsites and then on the basis of various case studies we can define the carrying capacity of the camping zone. 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'

Calculation for 'A'		Area (in sqm)
1	Total TPA Area	1442161
2	Settlement/ Area which can be used	Waterbody
		30279
		Green buffer
		72782
		Settlement
		36509
		Roads
		16748
		Total
		156319
Total Developable area (A)		= 1442161 - 156319 = 1285842

2. For calculating 'B'

As campsites will be developed on the basis of number of occupants or tents on ground (no floors), the concept of FAR is invalid in this case.

3. For calculating 'C'

Land Use	Percentage requirement as per URDPFI (in %)	Area (in sqkm)
Residential	50	642921.00
Commercial	3	38575.26
Public and Semi Public	8	102867.36
Recreational	14	180017.88
Transportation	12	154301.04
Others	2	25716.84
Total	89	1144399.38
Total area required as per standards (X)		1144399.38
Remaining land for tourism is 11% (C) (A-X)		$= 1285842 - 1144399.38$ $= 141442.5 \text{ sqm}$ $= 1.4 \text{ Ha}$

4. 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 - as per case studies in section 10.3.2.)

$$= 1.4 \text{ ha} * 15 \text{ occupants per ha} = 21 \text{ occupants}$$

Carrying Capacity of TPA-2 (Chechpur Tourism Promotion Area)

1. For calculating 'A'

Calculation for 'A'		Area (in sqm)
1	Total TPA Area	512389.4
2	Settlement/ Area which can be used	Waterbody
		0
		Green buffer
		0
		Settlement
		8205.3
		Roads
		6840
		Total
		15045.3
	Total Developable area (A)	$= 512389.4 - 15045.3$ $= 497344.1$

2. For calculating 'B'

As this area needs to be developed with minimum infrastructure with mostly campsites or eco-huts, it will occupy area mostly on ground (no floors), the concept of FAR is invalid in this case.

3. For calculating 'C'

Land Use	Percentage requirement as per URDPFI (in %)	Area (in sqkm)
Residential	50	248672.1
Commercial	3	14920.3

Land Use	Percentage requirement as per URDPFI (in %)	Area (in sqkm)
Public and Semi Public	8	39787.5
Recreational	14	69628.2
Transportation	12	59681.3
Others	2	9946.9
Total	89	442636.2
Total area required as per standards (X)		442636.2
Remaining land for tourism is 11% (C) (A-X)		= 497344.1 - 442636.2 = 54707.8

4. 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 - as per case studies in section 10.3.2.)

= 5.47 ha * 15 occupants per ha = **82 occupants = 20 tents approx. (4-occupancy per tent)**

5.2 Conservation education

Education about conservation has a strong influence on the extent to which students become committed to arguments for conserving species and habitats (Tim Caro, 2003). This depends on the successful implementation of educational program. Educational tourism ensures this type of education system. So, awareness and education regarding forest conservation have been successfully implemented by educational tourism in child level.

- ✓ 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, implementation of environment and biodiversity related policies and activities for nature protection would be effective.

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.

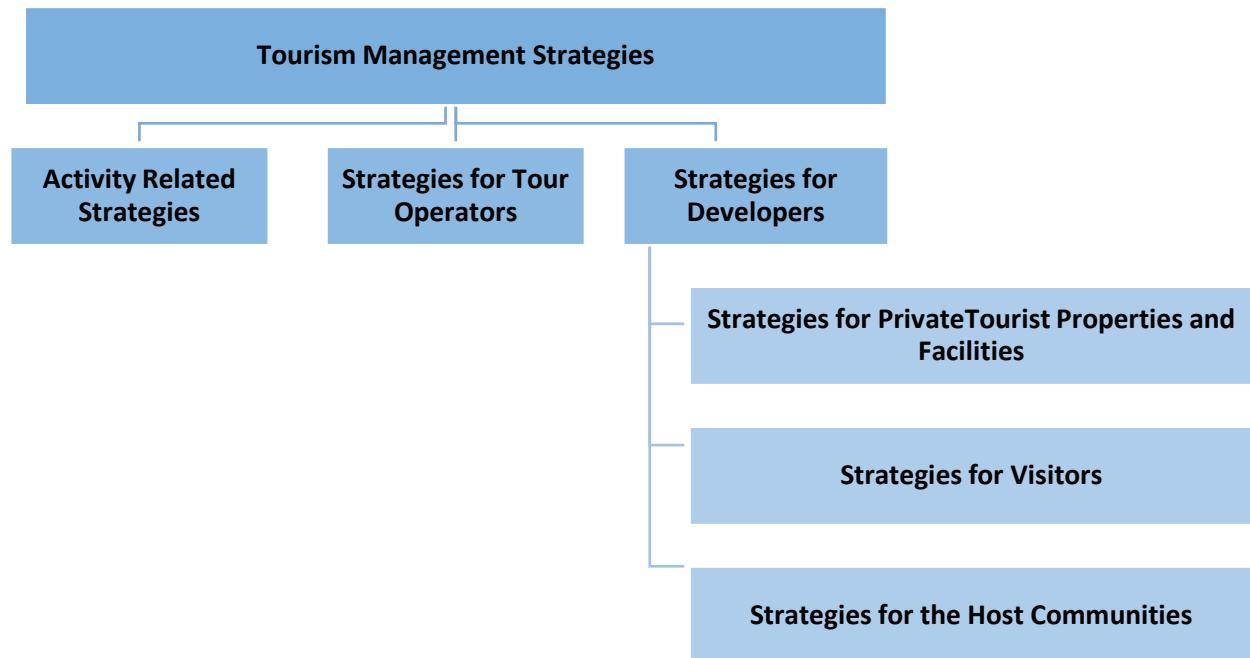
Level of ecological awareness: The sustainability of conservation and diversity efforts depends on public awareness. If many people give emphasize to achieve ecological awareness of nature, the children get benefit from it.

5.3 Management guidelines for tourism

5.3.1. Existing Management Guidelines/Situation

Bandhavgarh Reserve 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.

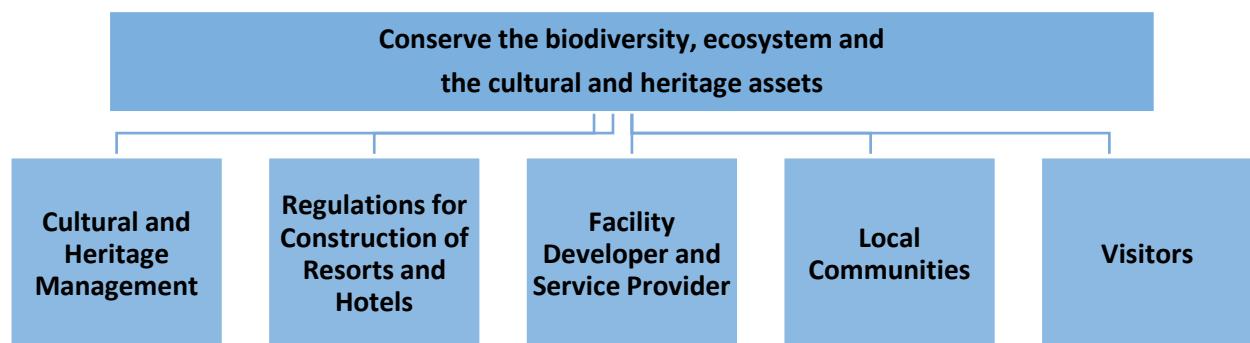
Exhibit 28: Tourism Management Strategies



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 the Bandhavgarh and address the rules for trekkers, tour operators, guides, all other visitors, and the local communities of Bandhavgarh. Guidelines set out for the for the ecotourism operators and guides operating within Bandhavgarh Eco Sensitive Zone attempt to facilitate the Nature, Cultural and Historic conservation as well as ensure their clients' safety¹⁰⁵.

Exhibit 29: Proposed guidelines for biodiversity, ecosystem, cultural and heritage assets



A. Guidelines for Cultural, Heritage and Nature-based site Management

Bandhavgarh eco sensitive zone comprises of about 50% of the total touristic destinations that inherits the potential to be developed as sites for heritage and cultural tourism. 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

¹⁰⁵ <http://www.ecotourismsocietyofindia.org/file/State%20Policies/Sikkim%20Ecotourism%20Policy.pdf>

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 resilience¹⁰⁶.

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.

¹⁰⁶ Managing Tourism at World Heritage Sites: a Practical Manual for World Heritage Site Managers, By UNESCO world Heritage Centre.

B. Regulations for Construction (especially for hotels and resorts)

Table 14 Suggestive Guidelines for Construction

Development Area	<ul style="list-style-type: none"> New hotels/Resorts may be developed in Tourism Promotion areas, with priority development in identified priority tourism development zone, based on administration of carrying capacities by the nodal agency.
Ground coverage, setbacks, height restriction, FAR etc.	<ul style="list-style-type: none"> Follow Revised 'Rural Area Development Plan Formulation and Implementation' (RADPFI) guidelines, 2021 issued by Ministry of Panchayati Raj, Government of India.
Site Preservation	<ul style="list-style-type: none"> 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.
Type of Construction	<ul style="list-style-type: none"> It is suggested that new Hotels/ Resorts 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.
Construction Material	<ul style="list-style-type: none"> 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.
Clearances and Certification	<ul style="list-style-type: none"> 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.
Ventilation	<ul style="list-style-type: none"> 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:

	<ul style="list-style-type: none"> • Kitchen – 8% • Bathroom – 5% • Lobbies – 12% • Other Areas – 10% <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Ideally, all guest rooms should have access to the exterior. • It is recommended that over 75% of the administrative areas have exterior access.¹⁰⁷
Solar Energy	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • It is suggested to design rainwater harvesting system to capture at least 'one-day rainfall*' runoff volume from roof and non-roof areas¹⁰⁸. • In areas where the water percolation is limited, collection tanks / water bodies may be provided to meet the above requirement.
Wastewater Discharge/ Reuse	<ul style="list-style-type: none"> • 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 ◦ Phytodid • May use treated wastewater or captured rain water for at least 50% of landscaping & flushing water requirements.
Usage of Forest Resources (Wood)	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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

¹⁰⁷ Access to exterior can either be to sky or flora & fauna or both.

¹⁰⁸ 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	<ul style="list-style-type: none"> Non-slippery ramps for easy access to the main entrance. Such ramps should have handrails on atleast one side.
Zero Landfill/ waste management	<ul style="list-style-type: none"> 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. Provide two bins at each guest room (wet and dry waste) and one bin at the bathroom to collect the sanitary waste. Ensure source segregation mandates, requiring not just wet/dry, but also specific recyclables (paper, plastic, glass) and detailed organic waste separation. 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,.) 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. 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.
Tree Cover and Landscape Design	<ul style="list-style-type: none"> It is suggested to ensure atleast 50 - 75% of total site area of the resort has tree cover. 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 species¹⁰⁹.
Indoor Landscaping	<ul style="list-style-type: none"> There may be atleast 1 indoor plant per 100 sq. ft. of the carpet area. 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. These plants can help in absorbing toxins like VOCs, formaldehydes, etc. and improve the indoor air quality, besides enhancing the aesthetics.
Organic Production of necessary resort requirements	<ul style="list-style-type: none"> 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. Use organic manures & pesticides for 100% of requirement for landscape area¹¹⁰.
Plastic Free Environment	<ul style="list-style-type: none"> 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 Energy¹¹¹	<ul style="list-style-type: none"> It is suggested to install on-site renewable energy system to meet at least 20 - 30% of the total annual energy consumption of the resort¹¹².
Eco-friendly commuting practices, within the premises¹¹³	<ul style="list-style-type: none"> 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 Encourage walking/ bicycling in the resort through proper walkways/ cycling ways with sufficient illumination. Design walkway/ bicycle lane network to connect to all amenities

¹⁰⁹ For landscape area calculations, potted plants should not be taken into consideration

¹¹⁰ Vermi compost, Leaf mould, Bone meal, Farmyard manure, Deoiled cakes like neem cake, pongamia cake, Castor cake, etc.

¹¹¹ Applicable only for Large Resorts

¹¹² Renewable energy sources include solar energy, wind power, biomass; etc.

¹¹³ Applicable only for Large Resorts

Theme Gardens¹¹⁴	<ul style="list-style-type: none"> Encourage the development of atleast 2 theme gardens pertaining to preservation and conservation of natural plant species within the resort.
Monitoring Resource Use	<ul style="list-style-type: none"> Encourage sub-metering and continuous monitoring to identify improvement opportunities in building's energy performance, thereby optimising the use of resources. <ul style="list-style-type: none"> ○ Energy Metering ○ Water Metering

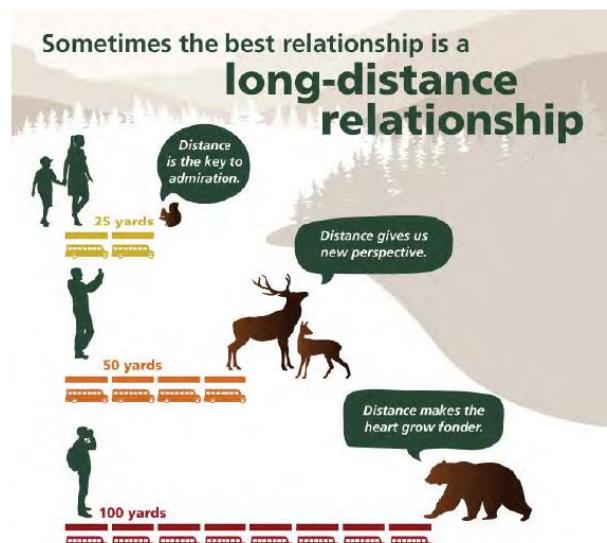
C. Guidelines for Facility Developer / Service Provider

- The Reserve Management shall develop suitable curricular for training of park guides and drivers. The curricula should include, besides art, craft and ethics of wildlife tourism, the history and evolution of the Tiger Reserve, basic ethnographic and cultural attributes of the districts, and information on the wildlife species occurring in the Protected Area. Such trainings should be conducted during the non-tourism season and must result in adequate certification.
- 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 should 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

¹¹⁴ Applicable only for Large Resorts

- 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 keep 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 trip¹¹⁵;
- 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.
- Offer site sensitive accommodation¹¹⁶.
- Appropriate signage for educational and indicative purposes must be developed for the visitors as shown in the exhibit below.

Exhibit 30: Example for Interactive Signage Installation



D. Guidelines for Campsites (11% of camping zone)

The camping zone is demarcated very carefully in the zoning plan (refer section 5.1 to 5.3). 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.

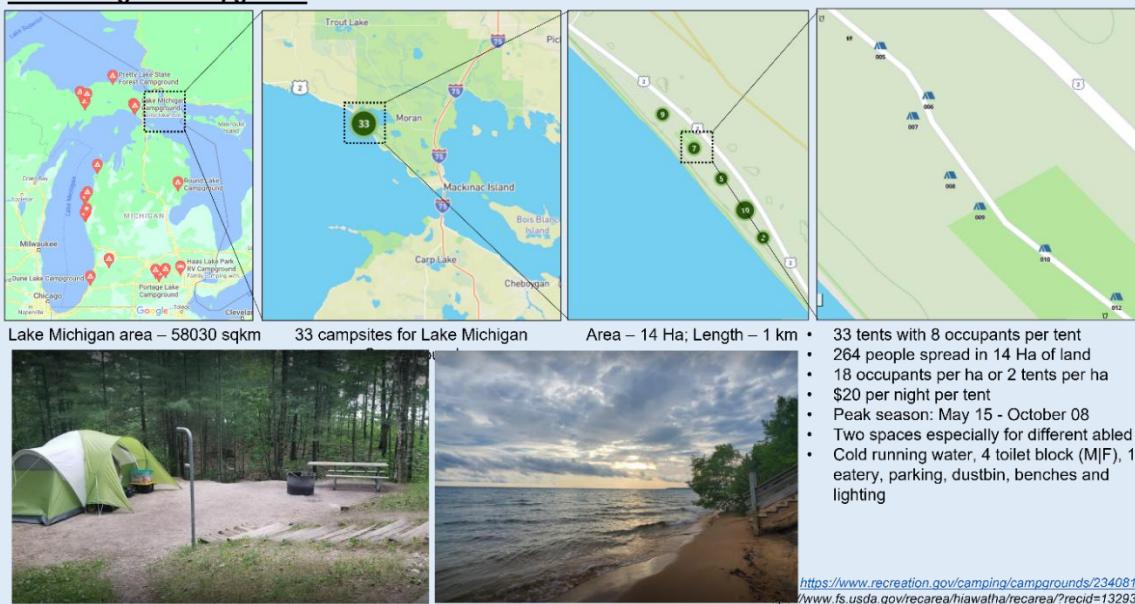
¹¹⁵ <http://www.ecotourismsocietyofindia.org/file/State%20Policies/Sikkim%20Ecotourism%20Policy.pdf>

¹¹⁶ <http://www.unep.fr/shared/publications/other/WEBx0137xPA/part-two.pdf>

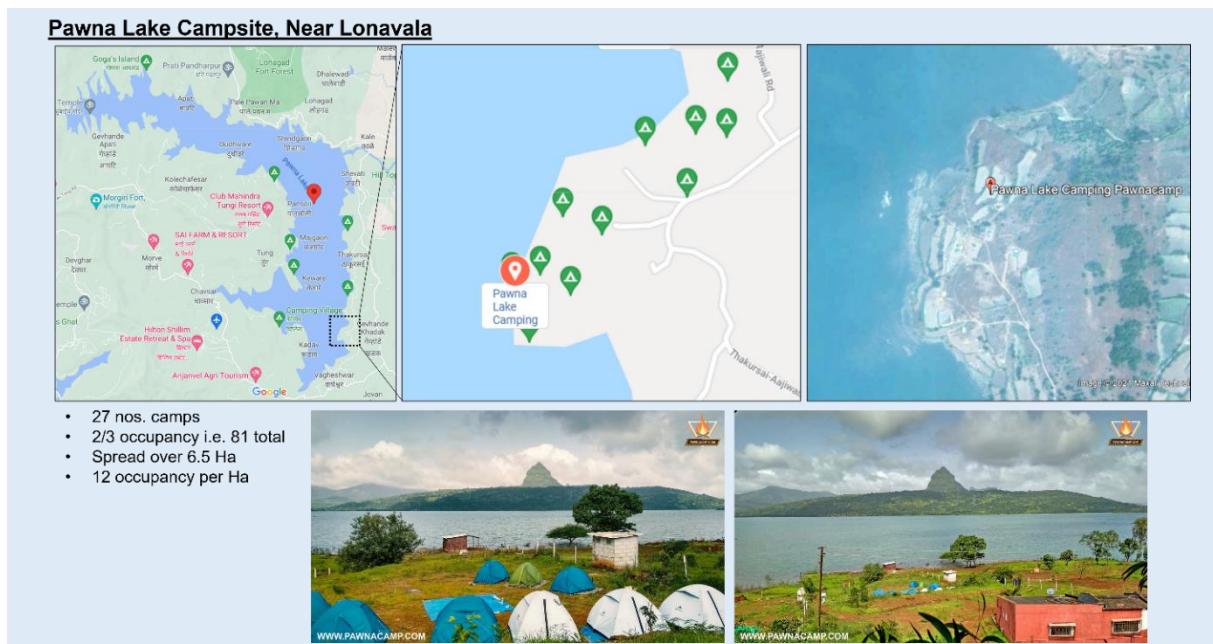
- No permanent infrastructure is allowed in campsites. All the infrastructure has to be either temporary or movable.
- The boundary of campsites has to delineated properly with natural vegetation and it has to be ensured that no tents are outside the demarcated zone.
- All tents should be 200ft. away from water bodies, streams etc. as there might be rare chance of encounter with wild animals.¹¹⁷
- Some basic facilities like temporary tents (4-occupant), temporary toilets (E-toilets), parking facility, fireplace, signages, solid waste management bins, boundary security and pathways shall 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 should 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. There is a limitation on number of tourists to be entering in campsite as per the carrying capacity as indicated section 5.1.5.
- 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.

Case studies

Lake Michigan - Campground



¹¹⁷ <https://www.oars.com/blog/the-golden-rules-of-camping-etiquette/>



E. Guidelines for Local Communities

Involving the community is a critically important and complex subject for successful and sustainable tourism¹¹⁸. 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 goals¹¹⁹. 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.
- 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.

¹¹⁸

https://www.widestream.org/Resources/Docs/WWF_2001_Community_Based_Ecotourism_Develop.pdf

¹¹⁹ <http://mekonginfo.org/assets/midocs/0002615-environment-manual-on-community-based-eco-tourism-in-protected-areas-participatory-nbca-management.pdf>

- 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 behavior 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 behavioral guidelines that tourist visiting Bandhavgarh TR 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 regulatory authority & staff present in the facility
- Treat the Protected Area/wilderness area with respect, try and 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 and 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.
- Don't get out of the vehicle to approach wild animals or approach animals closer than 15 m or disturb them while they are resting¹²⁰.

¹²⁰ <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

This Tiger Reserve and its ESZ has a tremendous potential for research. It is important to understand biodiversity value of tiger reserve to enhance its protection accordingly.

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 Tiger Reserve, functional relationships among biotic communities and impact of anthropological pressure on natural systems. This can achieve 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 Tiger 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 help 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	4	12	33.3%	BDO

	Community Toilets				
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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Increase in wildlife Diversity of fauna
Maintenance of eco-system services	<ul style="list-style-type: none"> Soil erosion reduced/stopped Increased level of groundwater Availability of food to fauna Availability of clean air
Improvement of agro-ecology	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Profits from forest go to FPCs Do Shramdan (voluntary labour) and contribute to village common fund Building a common fund Maintenance of money in bank account

Criteria	Indicators
	<ul style="list-style-type: none"> • Full rights of collection and marketing of NTFP • Village assets improved.
Continuous availability of forest produce	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Everybody is equally responsible • Villagers serve the FPC on their own initiative • Collective and careful decision-making process
Gender equality	<ul style="list-style-type: none"> • Female involvement should be more • 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 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 aspect 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 hometowns 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 Bandhavgarh Tiger Reserve 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.
- Firearms, 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 2.2 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 3.16.4). 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

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 252 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:

S.No.	Components	Quantity	Units	Total (in lacs)
1	Plantation around streams and water bodies	Total number of trees = Area/density	Nos.	6330
2	Build neighbourhood streets, bicycle routes and trails that encourage walking and biking	20000	Meters	806.85
3	Preserve and restore open space, natural beauty, and critical environmental and watershed conservation (refer restoration areas as mapped in ZMP)	100	Acres	119.66
4	Create parks, community gardens, and other public green spaces	60000	Sq.m	2400
5	Beautification and management of water bodies	5	Nos.	15
6	Covering of wells	500	Nos.	10
7	Engagement of community school kids in EDC and park protection activities	500	Nos.	15
8	Bio-fencing and other fencing around critical areas	50000	Meters	1500
9	Fire protection measures and fire watch towers at strategic locations	20	Nos.	60
10	Building construction and approval system	1	Nos.	20
11	Construction of animal overpass/underpass at various locations (as per feasibility study)	2	Nos.	292
12	Installation of rainwater harvesting structures	10000	Sq.m	200
13	Integrated Solid Waste Management (including CAPEX, OPEX, Capacity building of local bodies etc.)	4 nos. of composter and 2 segregation units	Nos.	3000
14	Integrated wastewater management at major TPAs (including CAPEX, OPEX, Capacity building of local bodies etc.)	10000	KLD	3000
15	Site development for Riverine Tourism and Nature Walk at Chenchpur	10000	Sq.m	300
16	Site development for Sustainable Eco-huts at Magdhi	10000	Sq.m	300
17	Site Development for Water based Activities near Bansagar Lake	10000	Sq.m	300
18	Preservation of important natural sites and heritage structures	10000	Sq.ft	300
19	Village tourism development at key areas	4	Nos.	400

S.No.	Components	Quantity	Units	Total (in lacs)
20	Restoration of forest guesthouses and other buildings for tourism purposes	30000	Sq.ft	600
21	Installation of display boards, dustbins etc. at main locations	400	Nos.	10.4
22	Bee culture development	2	No. of clusters	200
23	Livestock improvement practices and training for planned grazing at all villages within the ESZ	4	No. of clusters	800
24	Organic fish farming near perennial water bodies (training of local communities)	4	No. of clusters	400
25	Microplanning for community resource management	6	No. of clusters	2400
26	Development of homestays	As per actual		
27	Development of handloom and Craft center at TPAs with training	2	Nos.	300
28	Establishment of technical cell for implementation.	1	Nos.	150
29	Establishment of TPAs	2	Nos.	1000
Total (in Lacs)				25228.9
Total (in Crores)				252

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.

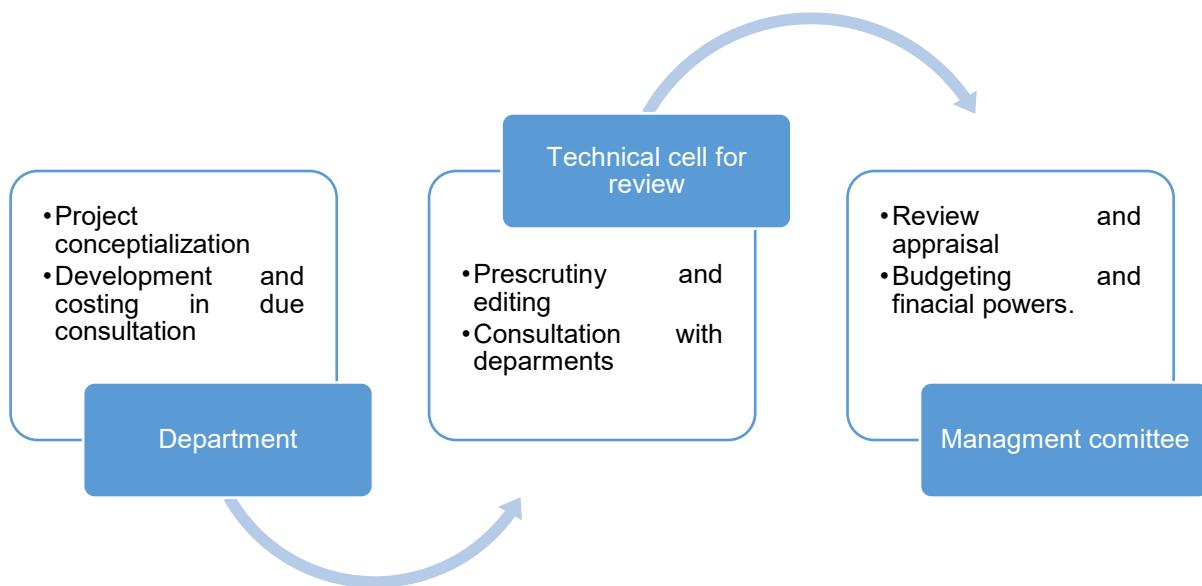
For Area restoration and plantation **State Action Plan for Climate Change (SAPCC) and fund** can be updated as any plantation will help in carbon sequestration. The project formulation, appraisal, sanction, disbursement of fund, monitoring & evaluation and capacity building of can be taken up by the 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 Bandhavgarh National Park and Panpatha Wildlife Sanctuary. The Sanctuary is located in the eastern Satpura hill range of Umaria and Katni districts. The Bandhavgarh Tiger Reserve is spread over an area of 1536.938 square kilometres of which 716.903 square kilometres is Protected Area of the Tiger Reserve and 820.035 square kilometres is the buffer area.

As per the recommendations of the ESZ Notification and consecutive Departmental Meetings, the ZMP comprise of following key sections:

- A. Spatial Zones for Development (Recommended) (Refer to Chapter 2)
- B. Suggested Tourism Promotion Areas (TPA) (Refer to Chapter 5, Section 5.1.6)
- C. Non-spatial (Restricted, Regulated and Promoted Activities)
- D. Management Guidelines and Policy (Refer to Chapter 5, Section 5.3)
- E. Pilot projects and interventions (Refer to Chapter 3)
- F. Regulatory zones

The following chapter further elaborates on section F. 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 provided 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 permission within the Sensitive Zone are to be provided on the basis of:
 - a. Activity Classification for ESZ in Section 8.2, Table no. 17.
 - b. Sensitive Zones of ESZ. Refer Map no. 40.
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) of this ESZ Master Plan before permission from concerned department,

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 kilometre 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.

(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 ¹²¹:

- a. 50 m from the river edge for large rivers.
- b. 50 m from the boundary of lakes of area 4 acre and above,
- c. 15 m from the boundary of lakes of area less than 4 acre / ponds/tank bed lands,
- d. 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

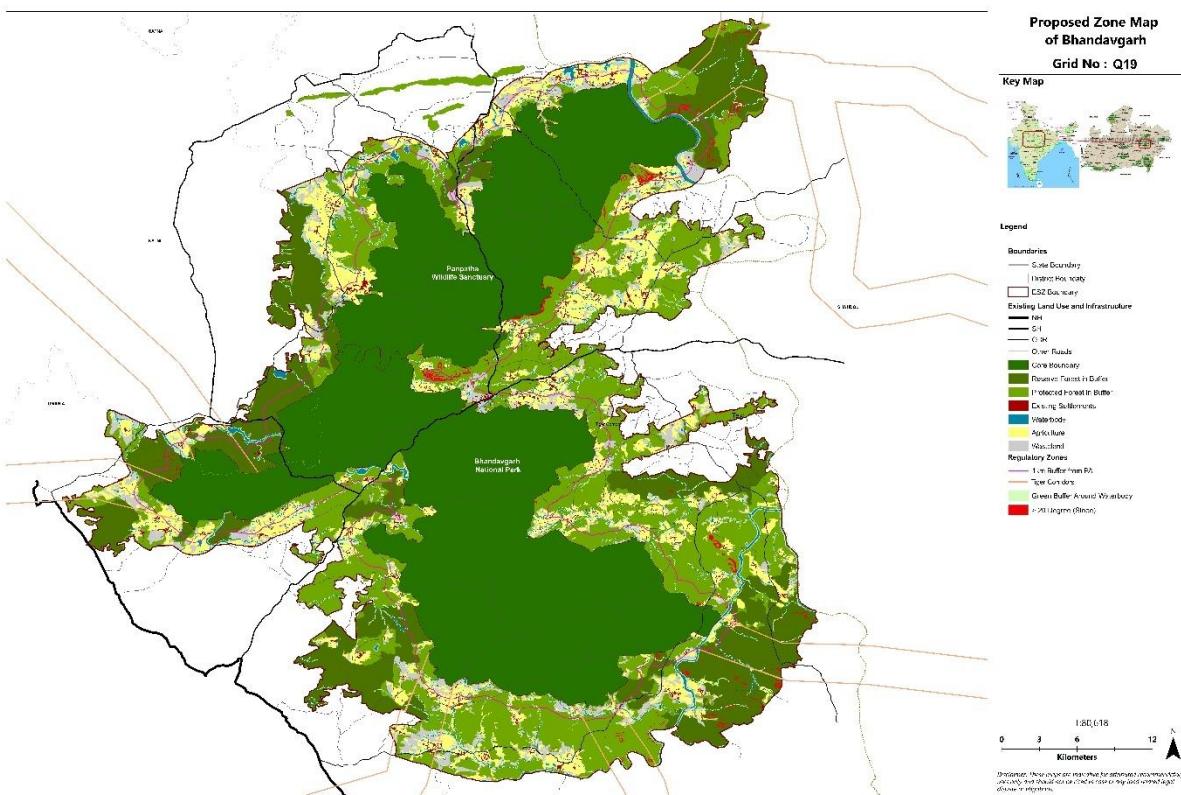
¹²¹ Please refer 'Urban Wetland/Water Bodies Management Guidelines' issued by National Mission for Clean Ganga with School of Architecture and Planning, New Delhi.

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 (Refer Annexure 10-Regulatory zones & kharas for mapped areas following within the tiger corridor). Following regulations are:

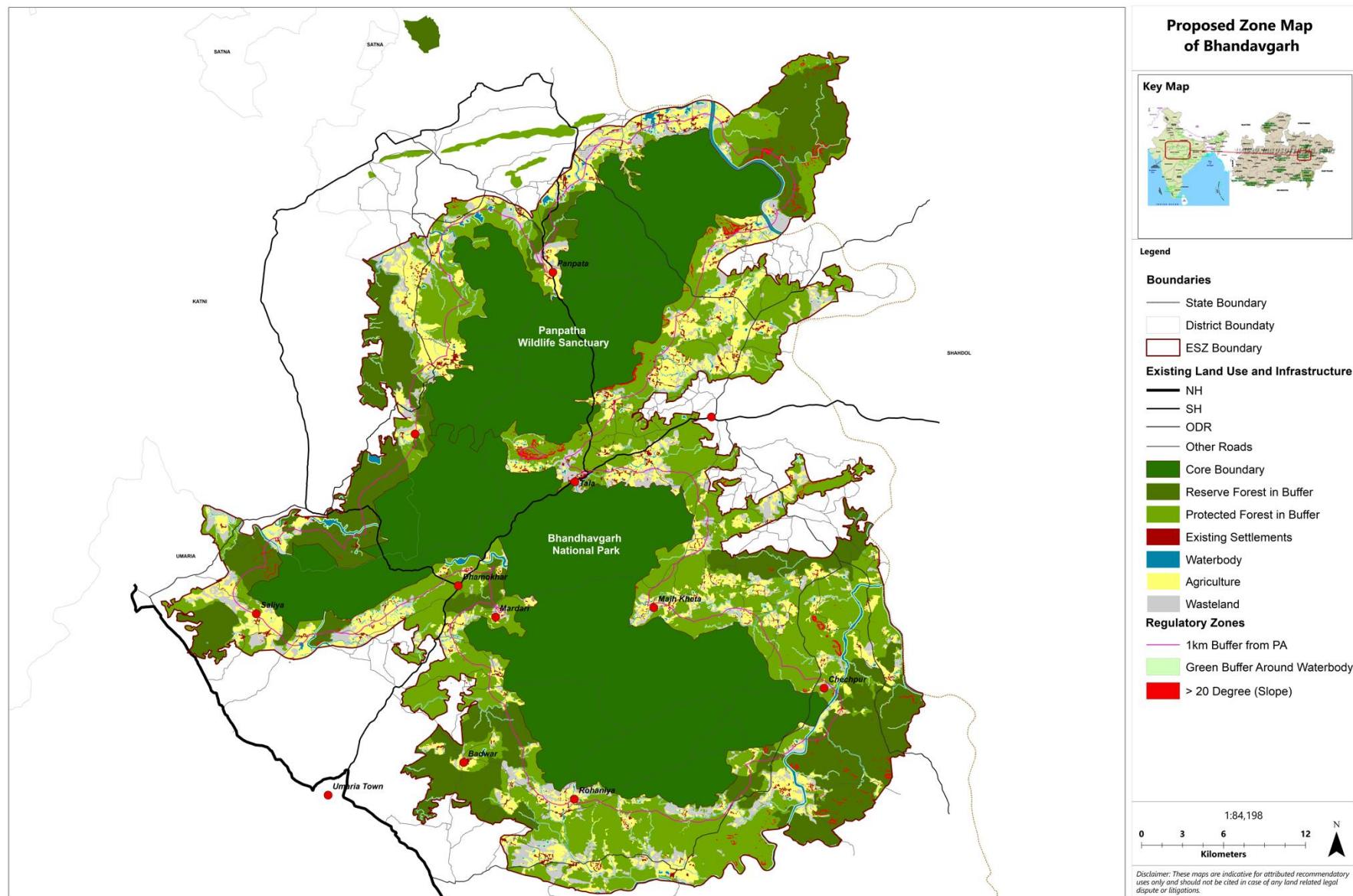
- a. Residential Construction shall be allowed in all abadi land and till 100 meters distance from the Abadi Land.
- b. In non-Abadi land, residential construction is allowed with FAR restriction of 0.1
- c. Widening and strengthening of roads shall be allowed only after obtaining approval from the Forest Department. (Wildlife board)
- d. Construction and renovation of infrastructure and civic amenities are allowed.
- e. No new commercial construction allowed in Tiger corridor area.

Map 40: Tiger corridors and areas of conflict



Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Map 41: Regulated zones for Bandhavgarh ESZ



8.2 Regulations as per the zones

Table 15: Activity Classification for ESZ of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

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) New commercial hotels and resorts	✗	✗	✗	✗	✗
	(ii) Renovation and reconstruction of already existing commercial construction are allowed within the existing built-up area. ¹²²	✓ ¹²³	✗	✓	✗	✓
	(iii) Small temporary structures for eco-tourism activities	✓ ¹²⁴	✗	✓	✗	✓
	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. ¹²⁵	NA	✗	✓	✗	✗
2.	Construction activities:	✗	✗	✗	✗	✗

¹²² 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.

¹²³ 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.

¹²⁴ 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.

¹²⁵ Refer Chapter 5 of Sub-Zonal Tourism Plan for additional details.

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) 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;	✓	✓	✓	✗	✓ 126
	(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 ¹²⁷ ; and	✓	✓	✓	✗	✓ 181
	(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.	✓	✓	✓	✗	✓ 181

¹²⁶ Only temple related activities permitted.

¹²⁷ Refer section 3.18.

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
	(d) Beyond one kilometre it shall be regulated as per the Zonal Master Plan.	Applicable same as 2 (b) and (c)				
3.	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.	•	•	•	•	•
4.	Commercial extraction of surface and ground water. Regulated under applicable law.	•	•	•	•	•
5.	Erection of electrical and communication towers and laying of cables and other infrastructures. Regulated under applicable law ¹²⁸ .	•	•	•	•	•
6.	Fencing of existing premises of hotels and lodges. Regulated under applicable law	•	•	•	•	•
7.	Widening and strengthening of existing roads and construction of new roads ¹²⁹ .	✓	✓	✓	✗	✓
8.	Movement of vehicular traffic at night. (Regulated for commercial purpose under applicable laws).	✓	✓	✓	✓	✓
9.	Introduction of exotic species.	•	•	•	•	•
10.	Protection of hill slopes and river banks. Regulated under applicable law.	✓	✓	✓	✓	✓

¹²⁸ Underground cabling may be promoted as per specific guidelines. Specific linear intrusions to be avoided as per management guidelines.

¹²⁹ Shall be done with mitigation measures, as per applicable laws, rules and regulations and available 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
11.	Discharge of treated wastewater/effluents in natural water bodies or land area. ¹³⁰	✓	✓	✓	✓	✓
12.	Commercial sign boards and hoardings.	✓	✓	✓	•	✓
13.	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.	•	✗	•	✗	•
14.	Collection of Forest Produce or Non-Timber Forest Produce (NTFP). Regulated under applicable laws.	•	•	•	•	•
15.	Air and vehicular pollution. Regulated under applicable laws.	•	•	•	•	•
16.	Drastic change of agriculture systems. Regulated under applicable laws	•	•	•	•	•
17.	Trenching Ground. Regulated under applicable laws	•	•	•	•	•
18.	Dairy activities and Cattle rearing. Regulated under applicable laws.	•	•	•	•	•
19.	Use of polythene bags	•	•	•	•	•
20.	Goat farming Regulated under applicable laws. ¹³¹	•	•	•	•	•

¹³⁰ 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.

¹³¹ 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
21.	Solid waste management/bio-medical waste management.	•	•	•	•	•
22.	Eco-tourism. ¹³²	•	•	•	•	•
	Promoted activities					
23.	On-going agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture. Permitted under applicable laws for use of locals.	✓	✓	✓	✓	✓
24.	Rainwater harvesting. Shall be actively promoted.	✓	✓	✓	✓	✓
25.	Organic farming. Shall be actively promoted.	✓	✓	✓	✓	✓
26.	Adoption of green technology for all activities. Shall be actively promoted.	✓	✓	✓	✓	✓
27.	Cottage industries including village artisans, etc. Shall be actively promoted.	✓	✓	✓	✓	✓
28.	Use of renewable energy and fuels. Biogas, solar light, etc. to be actively promoted.	✓	✓	✓	✓	✓
29.	Environmental awareness. Shall be actively promoted.	✓	✓	✓	✓	✓
30.	Skill development. Shall be actively promoted.	✓	✓	✓	✓	✓
31.	Agro-forestry. Shall be actively promoted.	✓	✓	✓	✓	✓
32.	Community Nature Reserves. Shall be actively promoted.	✓	✓	✓	✓	✓

¹³² Eco-tourism activities (no permanent structures) are regulated under applicable laws.

**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 16: 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	Protection of Hill Slopes and river banks	Local body, Collector
13	Movement of vehicular traffic at night.	Local body, Forest Department
14	Ongoing agriculture and horticulture practices by local communities along with dairies, dairy farming, and aquaculture.	Local body
15	Discharge of treated waste water/effluents in natural water bodies or land area.	Local Body, MPPCB
16	Commercial extraction of surface and ground water	Local Body, WRD, CGWA, Collector
17	Open Well, Bore Well etc. for agriculture or other usage	Local Body, Collector
18	Solid Waste Management/Biomedical Waste Management	Local Body, CMHO, MPPCB, Health Department
19	Introduction of Exotic species.	Local Body, Collector, Forest Department
20	Eco-tourism	Local Body, Tourism Department, Forest Department
21	Noise Pollution	Local Body, MPPCB, District administration.
22	Commercial Sign boards and hoardings.	Local Body, Transport Department, Forest Department
23	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

The concerned department / Regulatory authority should provide relevant permission for execution / operation of the activity as per recommendations of monitoring committee.

ANNEXURE 4: STAKEHOLDERS CONSULTATIONS & OUTPUTS

Villages under Bandhavgarh Eco-sensitive Zone					
S.NO	Major common sectoral points discussed during FGD's		Village wise additional points		
1	Village	Salaiya (05.07.2019) 	Bagdara (05.07.2019) 	Salkhaniya (05.07.2019) 	Ranchha (05.07.2019) 
2	Location	The village is located on the West side of Bandhavgarh Tiger Reserve near to National Highway with the total population of 2000 approx.	The village is located in the South- western part of the Tiger Reserve. It is around 17 km away from Umaria and 33 km away from Tala.	The village is located in the Northern part of the Bandhavgarh Tiger Reserve, adjacent to the Protected Area of the Panpatha Sanctuary. It is around 50 km away from Umaria and 40 km away from Tala.	The village is located in the Eastern part of the Bandhavgarh Tiger Reserve and lies adjacent to the south of Protected Area of the Panpatha Sanctuary. It is around 37 km away from Umaria and 4 km away from Tala.
3	Agriculture	<ul style="list-style-type: none"> Agriculture is the major source of livelihood and the crops which are mainly grown are wheat, rice and maize. The irrigation of the fields is mostly dependent on rains and on ground water which is extracted by handpumps and borewells. The manure is produced by mixing cowdung with biodegradable waste. The agricultural produce is 	- <ul style="list-style-type: none"> Crops are destroyed by animals like monkey, chital, wild boar, Nilgai The crops which are saved from wild animals are sold in 'khada mandi' and society centre where it is purchased by the government, for rice Rs.1500 per quintal in MP. Cow dung is used as 	- <ul style="list-style-type: none"> The irrigation of the fields is mostly dependent on rains and on ground water which is extracted by handpumps and borewells. The manure is produced by mixing cowdung with biodegradable waste, while some buy urea, DAP and other pesticides from Parasi society. 	-

Villages under Bandhavgarh Eco-sensitive Zone				
S.NO	Major common sectoral points discussed during FGD's		Village wise additional points	
		<p>destroyed by animals such as Monkeys, Langurs, cheetal, sambar 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.</p> <ul style="list-style-type: none"> • The crops which are saved from the fields are sold in Chandiya society • The markets are organized every Saturday from where the farmers buy seeds and fertilizers. 	<p>manure</p> <ul style="list-style-type: none"> • Irrigation is done with the ground water collected through bore wells, hand pumps and wells and from one seasonal river near the village. • Mostly electric pumps are used in irrigation. 	<ul style="list-style-type: none"> • The villagers informed that the pulses have to be bought from outside, from market in Barhi which is 30 km away, as it eaten by wild animals and not much is left to suffice even self-consumption
4	Cattle /Livestock	<ul style="list-style-type: none"> • Mostly cows, buffaloes 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. • The community performs 'aira pratha' (March - July) where cattle are left to roam and get them back at night. • A man was killed by tiger 	<ul style="list-style-type: none"> • Mostly cows, buffaloes 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. • Sometimes cattle go to the buffer area for grazing. • It has also been rumoured that the villagers throw cattle which are dead in the 	-do- -do-

Villages under Bandhavgarh Eco-sensitive Zone				
S.NO	Major common sectoral points discussed during FGD's	Village wise additional points		
	who went to forest for grazing his cattle.	forest which tempts the wild animals to come outside for the food.		
5	<p>Resource management</p> <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, Chiraunji seeds, Jamun fruit, Amla fruit, Bel fruit etc and are sold to contractors. Firewood (fallen branches, twigs) is also collected in small quantities for cooking. Fruits and flowers is eaten by wild animals. Water: Rainwater is collected in fields by making small bunds by soil and sand. Mostly ground water is used for everyday activities and irrigation. Soil: Soil moisture is conserved by spreading a layer of leaf litter over a given area of land and the bunds helps to reduce to flow of the water. 	-do-	-do-	<p>-do-</p> <ul style="list-style-type: none"> Water: Rainwater is collected in fields by making small bunds by soil and sand. Mostly ground water is used for everyday activities and irrigation. <p>Talab are also made for storing water for cattle</p>

Villages under Bandhavgarh Eco-sensitive Zone					
S.NO	Major common sectoral points discussed during FGD's		Village wise additional points		
6	Other employment opportunities	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 labors in agriculture (as per the season), construction activities etc. Many villagers have migrated permanently to cities like Jabalpur, Allahabad etc.	<ul style="list-style-type: none"> Some people have migrated temporarily to Rajasthan, Gujarat and Mumbai for jobs in Construction and some got jobs in companies. Other people go to nearby cities in search of job in off-season of agriculture. 	- do-	<ul style="list-style-type: none"> Most of the villagers have migrated permanently to Jabalpur, Allahabad, Nagpur and to nearby cities in search of job in off-season of agriculture
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.	- do-	- do-	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 Gond Adivasi, and forest-dwelling tribal communities. The villagers believed in Hanuman ji and worship him. The villagers worship Tiger: Bagheshwar Maharaj and believe that if during Dussehra or Diwali, Tiger eats cattle then he is angry 	- do-	<ul style="list-style-type: none"> Most of the residents of the village are Gond, followed by Kol, Baiga, Pandit and few Yadavs The villagers informed that there is a famous Bholenath temple where Mela is organised every year. The villagers informed that they have planted lemon, guava, jackfruit and mango trees for self-consumption. 	- do-

Villages under Bandhavgarh Eco-sensitive Zone				
S.NO	Major common sectoral points discussed during FGD's		Village wise additional points	
		<p>and they perform Havan and Pooja for the same.</p> <ul style="list-style-type: none"> The villagers are also involved into construction of their own houses with mud, handmade bricks and tiles, bamboo or wood and cow dung. 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. The villagers have knowledge about medicinal plants and ancient treatment techniques 		
9	Physical Infrastructure	<ul style="list-style-type: none"> Road connectivity - The roads are not in proper condition. But some roads are under construction under Pradhan Mantri Gram Sadak Yojna. Transport facilities available - Auto service is accessible to all the people on the main road of the village to Umaria Water supply - Ground water is extracted from borewells, handpumps and 	<ul style="list-style-type: none"> Road connectivity -do- Transport facilities available - do- Water supply - do- Sewage & Sanitation - do- Solid waste management - do- Power supply - The village gets electricity for about 15-16 hrs a day. No solar lights are used or provided. Cooking fuel - do- 	<ul style="list-style-type: none"> Road connectivity -do- Transport facilities available - Taxi is accessible to all the people till Karela, from where they get bus Water supply - do-, Nearby Bet Ganga river is dying due to siltation Sewage & Sanitation - do- Solid waste management -do- Power supply - The village gets electricity for about 18-20 hrs a day. No solar lights are used or provided. Cooking fuel - do-

Villages under Bandhavgarh Eco-sensitive Zone				
S.NO	Major common sectoral points discussed during FGD's			
	<p>wells with the use of electric pumps. so if there is no light then they do not have water to drink.</p> <ul style="list-style-type: none"> Sewage & Sanitation - Under Swachh 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 gets electricity for about 18-20 hrs a day. No solar lights are used or provided. Cooking fuel - Most of the houses use LPG for cooking provided under Ujjwala scheme. While some villagers also use firewood and cowdung. Telecommunication - Network services of only Jio is available in the village 	<ul style="list-style-type: none"> Telecommunication - do- 	<ul style="list-style-type: none"> used or provided. Cooking fuel - do- Telecommunication - do- 	<ul style="list-style-type: none"> Telecommunication - do-

Villages under Bandhavgarh Eco-sensitive Zone				
S.NO	Major common sectoral points discussed during FGD's		Village wise additional points	
10	Social Infrastructure	<ul style="list-style-type: none"> Educational facilities - one anganwadi and one school in the village till 10th class Healthcare facilities - No healthcare facility is available 	<ul style="list-style-type: none"> Educational facilities - one school in the village till 8th class Healthcare facilities - No healthcare facility is available 	<ul style="list-style-type: none"> Educational facilities - one anganwadi and one school in the village till 8th class Healthcare facilities - No healthcare facility is available
11	Forest fire	No big incidence of forest fire is recorded till now	<ul style="list-style-type: none"> The main reason for forest fire is throwing of bedi or cigarette. Second reason is burning of small plants for collection of Mahua. Third by friction of dry wood (bamboo) in the jungle. 	<p>No big incidence of forest fire in last 20 years.</p> <p>Caused by heat and friction of dry wood (bamboo) in the jungle in summer season</p>
12	Tourism	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. Hanuman dham: - It lies on the border of Bandhavgarh National Park. It is 3km from the village and it hosts mela every year in February. It is filled with visitors and tourists on Tuesday and Saturday from aashad mass to purnima 	<p>No villager is involved in any occupation related to Tourism.</p> <p>One tourist guide from the village.</p>	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism.

Villages under Bandhavgarh Eco-sensitive Zone							
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points				
1	Village	Mardari (05.07.2019) 	Badwar (05.07.2019) 	Majhketa (05.07.2019) 	Chechpur (04.07.2019) 	Kumarhha (05.07.2019) 	
2	Location	The village is located in the Western part of the Bandhavgarh National Park, in Tala range, adjacent to the Protected Area. It is around 20 km away from Umaria and 20 km away from Tala. With a population of 400 approx.	The village is located in the South- western part of the Tiger Reserve. It is around 17 km away from Umaria and 33 km away from Tala. The village falls in the buffer area of the Bandhavgarh National Park.	The village is located in the Eastern part of the Bandhavgarh National Park in Tala Range, adjacent to the Protected Area. It is around 52 km away from Umaria and 21 km away from Tala.	The village is located in the South- eastern part of the Bandhavgarh Tiger Reserve and lies adjacent to the Protected Area. It is around 48 km away from Umaria and 42 km away from Tala.	The village is located in the Southern part of the Bandhavgarh Tiger Reserve and lies adjacent to the Protected Area. It is around 42 km away from Umaria and 56 km away from Tala.	
3	Agriculture	<ul style="list-style-type: none"> • Agriculture is the major source of livelihood and the crops which are mainly grown are wheat, rice and maize. • The irrigation of the fields is mostly dependent on rains and on ground water which is extracted by handpumps and borewells. • The manure is produced by mixing cowdung with biodegradable waste. • The agricultural produce is 	- -do- <ul style="list-style-type: none"> • The crops which are saved from wild animals are sold in 'khada mandi' and society centre where it is purchased by the government, for rice Rs.1500 per quintal in MP. • Seasonal stream water is also used for 	- -do- <ul style="list-style-type: none"> • Rice, maize along with til, urad and Kodo are the main crops grown here. The villagers mostly practice mixed farming. • Seeds for crops are mostly bought from main market 	- -do- <ul style="list-style-type: none"> Maize is the main crop grown here but agricultural land is very less as the soil is not fertile, no proper irrigation facility, crop destruction by animals etc. 	- -do- <ul style="list-style-type: none"> • Crops grown are: Dhan (Rice), Kodo and Kutki rice, and Arhar (pulse), wheat, til and corn • wild boar and monkey causes huge amount of loss by eating and destroying the 	

Villages under Bandhavgarh Eco-sensitive Zone				
S.N O	Major common sectoral points discussed during FGD's	Village wise additional points		
	<p>destroyed by animals such as Monkeys, Langurs, cheetal, sambar 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.</p> <ul style="list-style-type: none"> • The DNP and seeds are brought from Umaria society • The markets are organized every Saturday from where the farmers buy seeds and fertilizers. • The villagers informed that the land of some villagers were acquired by the forest department in the Protected Area. 	<p>irrigation</p> <ul style="list-style-type: none"> • Mostly electric pumps are used in irrigation. 	<p>in Manpur</p> <ul style="list-style-type: none"> • Irrigation is done mostly from water from nearby river but that also gets dry so the villagers face some water shortage during harvest season 	<p>crops and vegetable</p> <ul style="list-style-type: none"> • Fields are irrigated 2 nala nearby and using electric pumpss

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
4	Cattle /Livestock	<ul style="list-style-type: none"> Mostly cows, buffaloes and goats are reared in the village but there are no grazing fields available. The milk produced from cow is mostly self-consumed. There has been few incidences of cattle killing by the wild animals. A man was killed by tiger who went to forest for grazing his cattle. The village was attacked by 5-6 wild elephants once in the late evening. The houses were destroyed, and all the cereals and grains were eaten by them. None of the person was killed or harmed during the incidence. 	-do- No elephant attacks were informed	-do-	-do- Some families have cattle but not goats.	-do- Cow, buffalo, bull, goat and hen are owned by people in the village.
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, Chiraunji seeds, Jamun fruit, Amla fruit, Bel fruit etc and are sold to contractors. Firewood (fallen branches, twigs) is also collected in small quantities for cooking. Fruits and flowers is eaten by wild animals. Water: Rainwater is collected in fields by making small bunds by soil and sand. Mostly ground water is used for everyday activities and irrigation. 	-do- • Water: 4 to 6 water holes constructed for collection of rainwater	-do- • Forest produce: No fruit-bearing trees except Tendu and Amla are present in the part of forest near the village. • Water: Canals were made through watershed program almost a decade ago but they are mostly	-do-	-do- • Water: A pond is under construction and the work is carried by the Panchayat

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
		<ul style="list-style-type: none"> Soil: Soil moisture is conserved by spreading a layer of leaf litter over a given area of land and the bunds helps to reduce the flow of the water. 		dry during summer		
6	Other employment opportunities	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 labors in agriculture (as per the season), construction activities etc. Many villagers have migrated permanently to cities like Jabalpur, Allahabad etc.	-do-	-do-	-do-	- do- There is one Surakshakarmi from the village and none are employed in the resorts.
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.	-do-	-do-	-do-	-do-
8	Community practices	<ul style="list-style-type: none"> Mostly Hindu community resides in the village with maximum population belonging to Gond Adivasi, and forest-dwelling tribal communities. They worship bada dev (tiger) and there is a statue of the tiger at the entrance of the village. The villagers are also involved into construction of their own houses with mud, hand made bricks and tiles, bamboo or 	- do- <ul style="list-style-type: none"> There is a one very famous local god of tribal peoples named as Baghesur, Badadev and chandin etc. Most of the villagers belong to ST category or are adivasis like Baiga and Gond. 	-do-	-do-	- do- <ul style="list-style-type: none"> The villagers worship Lord Bholenath and Lord Ghamsayan (Bagheshwar) They have planted lemon, sitaphal and mango trees for self-consumption.

Villages under Bandhavgarh Eco-sensitive Zone					
S.N O	Major common sectoral points discussed during FGD's	Village wise additional points			
	<p>wood and cow dung.</p> <ul style="list-style-type: none"> 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. The villagers do not have knowledge about medicinal plants and ancient treatment techniques A mela is organized in Makar Sankranti in the month of January every year in a temple near the village. 	<ul style="list-style-type: none"> A mela is organized in Makar Sankranti and Shivratri in the month of January and March every year at old shiva temple in the village. 			
9	<ul style="list-style-type: none"> Road connectivity - The roads are not in proper condition. But some roads are under construction under Pradhan Mantri Gram Sadak Yojna. Transport facilities available - Auto service is accessible to all the people on the main road of the village to Umaria Water supply - Ground water is extracted from borewells, handpumps and wells with the use of electric pumps. So if there is no light then they do not have water to drink. Sewage & Sanitation - Under 	<ul style="list-style-type: none"> Road connectivity - do- Transport facilities -do- Village use jeep, auto and taxi to go to Umaria or their own private vehicle Water supply - do- No. of handpumps are not sufficient and the quality of water is not good. Sewage & Sanitation - do- Solid waste management -do- Power supply - do- Cooking fuel - do- 	<ul style="list-style-type: none"> Road connectivity - do- Transport facilities -do- They have road connectivity and transportation issues as they have to travel long distances. Water supply - do- No. of handpumps are not sufficient and the quality of water is not good. Sewage & Sanitation - do- 	<ul style="list-style-type: none"> Road connectivity - do- Roads are in good condition Transport facilities -do- One bus comes daily for Manpur, at one time only Water supply - do- No. of handpumps are not sufficient and the quality of water is not good. Sewage & Sanitation - do- 	<ul style="list-style-type: none"> Road connectivity - do- Roads are not in good condition Transport facilities -do- they have to go to Raipur road, 5 km away, by either taking an auto or by walking. Water supply - do- No. of handpumps are not sufficient and the quality of water is not good, it is red in color

Villages under Bandhavgarh Eco-sensitive Zone					
S.N O	Major common sectoral points discussed during FGD's	Village wise additional points			
	<p>Swachh 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.</p> <ul style="list-style-type: none"> 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 gets electricity for about 18-20 hrs a day. No solar lights are used or provided. Cooking fuel - Most of the houses use LPG for cooking provided under Ujwala scheme. While some villagers also use firewood and cowdung. Telecommunication - Network services of only Jio is available in the village 	<ul style="list-style-type: none"> Telecommunication - Network of only Jio is available 	<ul style="list-style-type: none"> Solid waste management - do- • Power supply - Frequent power cuts • Cooking fuel - Almost half of the village has gas connection • Telecommunication - No network available 	<ul style="list-style-type: none"> management - do- • Power supply - do- • Cooking fuel - do- • Telecommunication - No network available 	<ul style="list-style-type: none"> Sewage & Sanitation - do- • Solid waste management - do- • Power supply - Frequent power cuts • Cooking fuel - The refilling of gas centre is very far so people use firewood and cow dung cakes • Telecommunication - No network available
10	Social Infrastructure	<ul style="list-style-type: none"> Educational facilities - one school in the village till 8th class Healthcare facilities - No healthcare facility is available. They have to travel to Umaria 	<ul style="list-style-type: none"> Educational facilities - one school in the village till 8th class Healthcare facilities - No healthcare facility 	<ul style="list-style-type: none"> Educational facilities - one Govt private school Healthcare 	<ul style="list-style-type: none"> Educational facilities - Nearest school upto 10th class is in Manpur Healthcare

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
		which is 15-20 km away for the treatment.	is available. They have to travel to Umaria which is 15-20 km away for the treatment.	facilities -one PHC is available	facilities - No healthcare facility is available.	facilities - No healthcare facility is available.
11	Forest fire	No big incidence of forest fire is recorded till now	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	-do-	No big incidence of forest fire is recorded till now	No big incidence of forest fire is recorded till now
12	Tourism	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. Hanuman dham: - It lies on the border of Bandhavgarh National Park. It is 3km from the village and it hosts mela every year in February. It is filled with visitors and tourists on Tuesday and Saturday from aashad mass to purnima 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. No tourist attraction nearby except for Juhila waterfall. 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. No tourist attraction nearby except for Juhila waterfall. 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. No tourist attraction nearby except for Juhila waterfall.

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
1	Village	Magdhi (05.07.2019) 	Sarmaniya (05.07.2019) 	Pataur (05.07.2019) 	Lakhnauti (05.07.2019) 	Panpatha (05.07.2019) 
2	Location	The village is located in the Northern part of the Bandhavgarh Tiger Reserve, adjacent to the Protected Area. It is around 46 km away from Umaria and 14 km away from Tala.	The village is located in the Eastern part of the Bandhavgarh Tiger Reserve. It is around 38 km away from Umaria and 8 km away from Tala.	The village is located in the Eastern part of the Bandhavgarh Tiger Reserve and adjacent to the Protected Area of the Panpatha Sanctuary. It is around 38 km away from Umaria and 6 km away from Tala.	The village is located in the North- eastern part of the Bandhavgarh Tiger Reserve, adjacent to the Protected Area. It is around 53 km away from Umaria and 20 km away from Tala.	The village is located in the Northern part of the Bandhavgarh Tiger Reserve, adjacent to the Protected Area of the Panpatha Sanctuary. It is around 50 km away from Umaria and 17 km away from Tala.
3	Agriculture	<ul style="list-style-type: none"> Agriculture is the major source of livelihood and the crops which are mainly grown are wheat, rice and maize. The irrigation of the fields is mostly dependent on rains and on ground water which is extracted by handpumps and borewells. The ground water quality is bad and no proper irrigation system or canal 	-do-	- do- <ul style="list-style-type: none"> Approximately 10 quintal wheat is cultivated by one household, all of which is self-consumed. 	- do- <p>The community informed that this year 30-40 elephants have entered in the village and caused serious</p>	- do-

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
		<p>system exists in the village.</p> <ul style="list-style-type: none"> The manure is produced by mixing cowdung with biodegradable waste. The agricultural produce is destroyed by animals such as Monkeys, Langurs, cheetal, sambar 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. Even elephants created nuisance in the agricultural fields They get seeds and manure from the society/market in Panpatha <p>The villagers are benefitted by the govt. scheme for manure and seeds.</p>			destruction to houses and crops.	
4	Cattle /Livestock	<ul style="list-style-type: none"> Mostly cows, buffaloes 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. <p>Villagers tell us the crops which are saved from wild animals are sold in 'Panpatha society' where it is purchased by the MP government.</p>	-do-	-do-	<p>-do-</p> <p>People claim that tiger has also entered in the village a few times and attacked the cattle.</p>	-do-

Villages under Bandhavgarh Eco-sensitive Zone					
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points		
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, Chiraunji seeds, Jamun fruit, Amla fruit, Bel fruit etc and are sold to contractors. Firewood (fallen branches, twigs) is also collected in small quantities for cooking. Fruits and flowers is eaten by wild animals. Water: Rainwater is collected in fields by making small bunds by soil and sand. Mostly ground water is used for everyday activities and irrigation. Soil: Soil moisture is conserved by spreading a layer of leaf litter over a given area of land and the bunds helps to reduce to flow of the water. 	<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, Chiraunji seeds and are sold to contractors. Firewood (fallen branches, twigs) is also collected in small quantities for cooking. Fruits and flowers is eaten by wild animals. 	-do-	<p>-do-</p> <p>People collect mushrooms (Pihiri) from the forest which they sell in market in Manpur at 100 INR per kg.</p> <p>Few people from the village are involved in extraction of honey from the forest.</p> <p>The village has 4 ponds, which dries up in summer.</p>
6	Other employment opportunities	<ul style="list-style-type: none"> The main source of livelihood is agriculture and animal husbandry. Other occupation is work as labours they work under Rojgar guarantee yojna appointed by panchayat. Labours work at road, construction sites and in gardening. 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 labors in agriculture (as per the season), construction activities etc. Many villagers have migrated 	<ul style="list-style-type: none"> Some people in the village makes Dholak, Madak etc. for living. This work is going in their families from generations. Many people in the village works as labourers. Many people from the village migrate to cities during non-peak season for work. 	<ul style="list-style-type: none"> The villagers informed that since agriculture is not profitable, some of the villagers (20-25 people) have taken employment in the hotel industry, mostly in the hotels in Tala. They are involved in various activities such as gardening, cooking, delivering 	<p>-do-</p> <p>It was informed that there are 3 women organisations in the village. Women are working in Anganwadis as helpers and for the preparation of mid-day meals.</p> <p>-do-</p>

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
		permanently to cities like Jabalpur, Allahabad etc.		<p>vegetables. However, no training has been given to these villagers for these activities, they mostly learn about the job from their employers.</p> <ul style="list-style-type: none"> • Some of the villagers (15-20 people) have even gone to cities for better livelihood options to places like Mumbai, Nasik, Gujarat, etc. 		
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.	-do-	-do-	-do-	-do-

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
8	Community practices	<ul style="list-style-type: none"> Mostly Hindu community resides in the village with maximum population belonging to Gond Adivasi, and forest-dwelling tribal communities. The villagers believed in Hanuman ji and worship him. The villagers are also involved into construction of their own houses with mud, handmade bricks and tiles, bamboo or wood and cow dung. 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. The villagers have knowledge about medicinal plants and ancient treatment techniques 	-do-	-do-	<ul style="list-style-type: none"> -do- The village is inhabited by people from Harijan community. The community informed that people in the village also believe in the practice of Jhad Phook and there is 1 person in the village who do that. 	-do-
9	Physical Infrastructure	<ul style="list-style-type: none"> Road connectivity - The roads are not in proper condition. But some roads are under construction under Pradhan Mantri Gram Sadak Yojna. Transport facilities available - main road is 2km away from where they get buses Water supply - The water is extracted from borewell and handpumps. The quality of ground water is not very good and the water looks a little muddy. 	<ul style="list-style-type: none"> Road connectivity - do- Water supply - do- Sewage & Sanitation - do- Solid waste management - do- Power supply - The village gets electricity throughout the 	<ul style="list-style-type: none"> Road connectivity - do- Water supply - do-, Water pipelines are laid but no community taps are installed. Sewage & Sanitation - do- Solid waste management - do- Power supply - 	<ul style="list-style-type: none"> Road connectivity - The condition of the roads in the village is very poor. Most of the roads are Kutcha roads. Water supply - 10% of the village is provided with community taps but it is not in use Power supply - 	<ul style="list-style-type: none"> Road connectivity - do- Water supply - do- Sewage & Sanitation - do- Solid waste management - do- Power supply - do Cooking fuel - do-

Villages under Bandhavgarh Eco-sensitive Zone					
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points		
		<ul style="list-style-type: none"> Sewage & Sanitation - Under Swachh 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 faces frequent power cuts Cooking fuel - Most of the houses use LPG for cooking provided under Ujwala scheme. While some villagers also use firewood and cowdung. Telecommunication - Network services of only Jio and airtel is available in the village 	<p>day. No solar lights are used or provided.</p> <ul style="list-style-type: none"> Cooking fuel - do- Telecommunication - No network is available in the village. 	<p>The village gets electricity but faces frequent power cuts. No solar lights are used or provided.</p> <ul style="list-style-type: none"> Cooking fuel - do- Telecommunication - No network services available in the village 	<p>because the water pipeline is broken.</p> <ul style="list-style-type: none"> For drinking purpose people use water from wells. Sewage & Sanitation - do- Solid waste management - do- Power supply - All households have electricity Cooking fuel - Majorly use firewood Telecommunication - No network
10	Social Infrastructure	<ul style="list-style-type: none"> Educational facilities - one anganwadi and one school in the village till 10th class Healthcare facilities - No healthcare facility is available 	<ul style="list-style-type: none"> Educational facilities - one anganwadi and one school in the village till 10th class Healthcare facilities - No healthcare facility is available 	<ul style="list-style-type: none"> Educational facilities - one school in the village till 8th class Healthcare facilities - Healthcare facility available for minor ailments but villagers usually 	<ul style="list-style-type: none"> Educational facilities - one school in the village till 10th class Healthcare facilities - No healthcare facility is available

Villages under Bandhavgarh Eco-sensitive Zone						
S.N O	Major common sectoral points discussed during FGD's		Village wise additional points			
				go to Tala, Manpur or Umaria.		
11	Forest fire	No big incidence of forest fire is recorded till now	No big incidence of forest fire is recorded till now	<ul style="list-style-type: none"> The villagers informed that forest fires sometimes occur but the villagers are scared to put it out themselves. 	No big incidence of forest fire is recorded till now	-do-
12	Tourism	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. There is one potential site of tourism activity which is Shiv temple there is yearly fair organise on makar sankranti occasion. 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. 	<ul style="list-style-type: none"> There were 4-5 tourist guides from the village. They have not received any training or information about such occupation. There are no businesses or tourist attractions nearby to attract tourists 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism. The villagers informed that there is an Ashram and Hanuman temple in Chapror which is at a distance of 1.5 km from the village. 	<ul style="list-style-type: none"> No villager is involved in any occupation related to Tourism.

ANNEXURE 5: LIST OF FLORA IN BANDHAVGARH TIGER RESERVE AND ESZ

	Species	Locations	Characteristic	Uses
FLORA	Sal (<i>Shorea robusta</i>) Order: Malvales Family: Dipterocarpaceae Genus: <i>Shorea</i> 	<ul style="list-style-type: none"> Asia- Indian subcontinent to south western China Bandhavgarh NP, Corbett NP and Dudhwa NP in India A rare plant in China, it is gregarious in savannah woodlands at elevations below 800 metres in south-eastern Xizang Often the main tree in forests of Nepal at elevations up to 1,400 metres 	<ul style="list-style-type: none"> Evergreen tree Grow up to 40.00 m in height Not self-fertile Wild tree 	<ul style="list-style-type: none"> The resin is used as an astringent and detergent and is given in diarrhoea and dysentery. In ointments for skin diseases and in ear troubles. In foot care cream. The fruits of Sal tree - for treatment of excessive salivation, epilepsy, and chlorosis. The powdered seeds are used to treat dental problems. Cleanses the skin of oily secretion and is used as the cleanser for washing hair.
	Dhobin(<i>Dalbergia paniculata</i>) Order: Fabales Family: <u>Leguminosae</u> Genus: <i>Dalbergia</i> 	<ul style="list-style-type: none"> India Cambodia Myanmar Thailand Vietnam Usually found in mixed deciduous forest, evergreen and open forest, along streams, at elevations up to 1,500 metres Low country, mainly in dry areas of Sri Lanka 	<ul style="list-style-type: none"> Deciduous tree Grow up to 22.00 m in height Ornamental and wild cultivation 	<ul style="list-style-type: none"> The timber is being used for making tool handles, boats, rafters, scantlings. Use in making of aromatic oils The bark is an astringent Reforestation projects on degraded lands.
	Saja (<i>Terminalia elliptica</i>) Order: Myrtales Family: Combretaceae Genus: <i>Terminalia</i>	<ul style="list-style-type: none"> India Bangladesh Myanmar Thailand Cambodia Laos Vietnam Common in Sal forest at elevations of 200 – 1,400 metres in Nepal 	<ul style="list-style-type: none"> Deciduous tree Grow up to 30.00 m in height Cultivated and wild cultivation 	<ul style="list-style-type: none"> Astringent juice from the bark used in manufacture of palm sugar The bark, and especially the fruit, yield pyrogallol and catechol. Pyrogallol has antiseptic properties, whilst catechol is an antioxidant. The juice of the bark is applied externally to cuts and wounds The bark, and especially the fruit, yield the tannins pyrogallol and catechol which are used to dye and to tan leather

	Species	Locations	Characteristic	Uses
		<ul style="list-style-type: none"> Mixed deciduous forest, sometimes in dry dipterocarp forest 		<ul style="list-style-type: none"> A copious transparent gum exudes in large globular tears from the trunk. It is used as an incense and cosmetic Used for a range of purposes including house building, furniture, cabinet making, tool handles, and for underwater purposes
	Dhatura (Anogeissus latifolia) Order: Myrtales Family: Combretaceae Genus: Anogeissus 	<ul style="list-style-type: none"> India Nepal Sri Lanka Myanmar Deciduous or semi-evergreen forest, it is a common element in teak forests but also occurs in the understorey of dipterocarp forest, in bamboo forest and even in vegetation under semi-arid conditions like savannah woodland and dry rocky hills 	<ul style="list-style-type: none"> Deciduous tree Grow up to 20.00 m in height Cultivated and wild cultivation 	<ul style="list-style-type: none"> The gum that exudes from the trunk, known as 'ghatti gum', has been used in sweetmeats and as an emulsifier in the food industry. The plant is used in treating snake bites and scorpion stings in India The tree is a good survivor on eroded land It is used in river bank stabilization The tree contributes to soil nutrient cycling, exhibiting high leaf-litter decomposition rates Ghatty gum is an exudation obtained from the wood; It is a good substitute for gum arabic and is used in calico printing, for sweetmeats, in dye processes, and as a binding agent in pharmaceuticals The leaves yield a black dye that is used commercially in India
	Tendu (Diospyros melanoxylon) Order: Ericales Family: Ebenaceae Genus: Diospyros	<ul style="list-style-type: none"> India Sri Lanka Dry deciduous forest as a constituent species of <i>Tectona grandis</i>, <i>sal</i> and mixed forests of <i>Acacia leucophleba</i>, <i>Boswellia serrata</i>, <i>Butea monosperma</i>, <i>Lannea coromandelica</i> and <i>Terminalia tomentosa</i> 	<ul style="list-style-type: none"> Evergreen tree Grow up to 20.00 m in height Cultivated and wild cultivation 	<ul style="list-style-type: none"> The fruits are edible The seeds can be intoxicating; they have been prescribed in India as a cure for mental disorders, nervous breakdowns and palpitations of the heart The fruits have a cooling and an astringent effect The dried flowers are reportedly useful in urinary, skin and blood diseases The leaves are used as the wrapping around tobacco to make bidi cigarettes The timber is used for ornamental works

	Species	Locations	Characteristic	Uses
	 <p>Arjun (Terminalia arjuna) Order: Myrtales Family: Combretaceae Genus: Terminalia</p> 	<ul style="list-style-type: none"> India Sri Lanka Myanmar Wet, marshy areas and on riverbanks Banks of streams and rivers in central India 	<ul style="list-style-type: none"> Evergreen tree Grow up to 30.00 m in height Cultivated, ornamental and wild cultivation 	<ul style="list-style-type: none"> A decoction of the bark with milk is used as a beverage The bark of the tree contains a number of medically active ingredients, including tannins, flavonoids, sterols and triterpenoid saponins The bark is a cardiac tonic, lowers blood pressure and reduces blood cholesterol levels The bark is taken internally to treat a range of heart conditions and seems to work best when blood supply to the heart is poor, as in angina and ischaemic heart disease The tree is planted to provide shade, especially in coffee plantations A transparent gum is obtained from the tree The timber is used for a number of purposes including the construction of carts and boats, for general construction, agricultural implements and mine props
	<p>Amla (Phyllanthus emblica) Order: Malpighiales Family: Phyllanthaceae Genus: Phyllanthus</p>	<ul style="list-style-type: none"> Indian subcontinent China East Asia Myanmar Thailand Cambodia Laos Vietnam 	<ul style="list-style-type: none"> Deciduous Shrub Grow up to 15.00 m in height Cultivated, ornamental 	<ul style="list-style-type: none"> Edible fruit; used in variety of food items Believed to be a sacred fruit among some communities; used for cleansing the body after fasting Rich source of Vitamin D Used for various medicines and treatments in Ayurveda They also exhibited cholesterol-lowering, antitussive, anti-ulcerative and hepatoprotective properties and

	Species	Locations	Characteristi c	Uses
		<ul style="list-style-type: none"> • Malaysia • Indonesia • Mixed forests • Drier forests • Dry open sparse forests or scrub, village groves at elevations of 200 - 2,300 metres in southern China 	<ul style="list-style-type: none"> • and wild cultivation 	<ul style="list-style-type: none"> • showed potent inhibitory activity on HIV reverse transcriptase • Leaf extracts have shown inhibitory activity on human leukocytes and platelets, which at least partly confirms their anti-inflammatory and antipyretic properties • The juice of the fruit is also given in order to strengthen the pancreas of diabetics, as well as in the treatment of eye problems, joint pain, diarrhoea and dysentery
	Salai (<i>Boswellia serrata</i>) Order: Sapindales Family: Burseraceae Genus: <i>Boswellia</i> 	<ul style="list-style-type: none"> • Indian subcontinent • Tropical dry deciduous forests, in very dry teak forests or in dry mixed deciduous forests at elevations up to 1,150 metres • Characteristically found on slopes and ridges, as well as on flat terrain, attaining a larger size on fertile soils 	<ul style="list-style-type: none"> • Deciduous Tree • Grow up to 12.00 m in height • Cultivated, ornamental and wild cultivation 	<ul style="list-style-type: none"> • Edible Flower, seed and a gum extracted from the plant • An alcoholic extract of the root has shown anti-cancer activity against human epidermal carcinoma of the nasopharynx • Both fruit and stem extracts have shown hypoglycaemic activity • The gum resin is used in the treatment of chronic lung diseases, diarrhoea, dysentery, pulmonary diseases, menorrhoea, dysmenorrhoea, gonorrhoea, syphilitic affection, piles and liver disorders • The tree is a suitable species for re-forestation on poorer soils in areas with a mean annual rainfall of 500 - 1.250mm • The tree is also tapped for a resin called 'lobal', which is used as incense • A fibre obtained from the bark is used for cordage • Timber is used for items such as cheap furniture, tea boxes, bowls, dishes etc, and as a source of pulp for paper production
	Bhirra (<i>Chloroxylon swietenia</i>) Order: Sapindales Family: Rutaceae Genus: <i>Chloroxylon</i>	<ul style="list-style-type: none"> • East Asia • India • Sri Lanka • Dry deciduous forest on poor, well-drained sandy or rocky soils, at low to medium altitudes 	<ul style="list-style-type: none"> • Deciduous Tree • Grow up to 18.00 m in height 	<ul style="list-style-type: none"> • Both the leaf and the stem oils exhibit moderate to strong activities against a panel of bacteria and fungi • 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

	Species	Locations	Characteristics	Uses
	 <p>Dhaman (Grewia tiliaceifolia) Order: Malvales Family: Malvaceae Genus: Grewia</p> 		<ul style="list-style-type: none"> • Cultivated and wild cultivation • Conservation Status: Vulnerable 	<ul style="list-style-type: none"> • The root bark in milk is drunk to treat impotence • A decorative timber, it is used for furniture, panelling, pattern making, interior trim, cabinet work, flooring, boxes, crates, interior joinery, carvings, toys, musical instruments and luxury goods.
	<p>Dhaman (Grewia tiliaceifolia) Order: Malvales Family: Malvaceae Genus: Grewia</p> 	<ul style="list-style-type: none"> • East Asia • India • Southern China • Sri Lanka • Myanmar • Thailand • Cambodia • Vietnam • Laos • Open woodlands, shrublands, grasslands; at elevations from 800 - 1,600 metres in southern China 	<ul style="list-style-type: none"> • Deciduous Tree • Grow up to 18.00 m in height • Wild cultivation 	<ul style="list-style-type: none"> • The fruit is edible with rich content of micro nutrients and vitamin C • The fruit is an anti-oxidant • A fibre from the inner bark is used to make cordage • The wood is close-grained, hard. It is used for shafts, shoulder poles, masts, golf clubs, tool handles, oars and all purposes for which elasticity, strength and toughness are required
	<p>Mango tree (Mangifera indica) Order: Sapindales Family: Anacardiaceae Genus: Mangifera</p>	<ul style="list-style-type: none"> • East Asia • Indian subcontinent • Myanmar • A mid-canopy tree in humid tropical forests, usually growing in the more open, secondary formations, at elevations usually below 500 metres, but occasionally ascending to 1,700 metres 	<ul style="list-style-type: none"> • Evergreen Tree • Grow up to 30.00 m in height • Cultivated and Wild cultivation • Self-fertile 	<ul style="list-style-type: none"> • The fruit is edible as raw or cooked • Drinks are made up from extracted juice of the fruit • The leaves are used to clean teeth • Mouth wash being prepared from the leaves help in treating dental problems and hardening the gums • The stem is astringent. It is used to treat diarrhoea and to remedy stomach-ache • The roots are diuretic • The fruit is antiscorbutic and anti-dysenteric • The slender branches are used as toothbrushes to treat toothache • The flowers are used to repel mosquitoes

	Species	Locations	Characteristic	Uses
	 <p>Jamun (<i>Syzygium cumini</i>) Order: Myrtales Family: Myrtaceae Genus: Syzygium</p>  			<ul style="list-style-type: none"> The wood is used for many purposes, including indoor construction, meat-chopping blocks, furniture, carpentry, flooring, boxes, crates and boat building
	<p>Jamun (<i>Syzygium cumini</i>) Order: Myrtales Family: Myrtaceae Genus: Syzygium</p>  	<ul style="list-style-type: none"> East Asia China India Malaysia Most tropical and subtropical forest habitats in India, ranging from evergreen broadleaved to deciduous and coniferous, from wet to fairly dry areas, near the coast and even in swamps 	<ul style="list-style-type: none"> Evergreen Shrub Grow up to 20.00 m in height Cultivated, ornamental and Wild cultivation Weed potential plant 	<ul style="list-style-type: none"> The fruit is edible as raw or been used as food products as jams, jellies, Juices, puddings etc. A coffee-like beverage is made from the dried and ground up seeds The seeds also reduce blood sugar levels and are useful in the treatment of diabetes The juice of the bark is considered good for treating wounds and enlargement of the spleen An infusion of the bark is used to treat irregular menstruation, diarrhoea, dysentery, children's thrush et An infusion of the leaves is used in the treatment of diabetes and diarrhoea The roots are sometimes used as a treatment for epilepsy The plant is amenable to trimming and can be grown as a hedge or to provide shelter from the wind The branches are used to whiten the teeth The wood is used for construction, boat building, commercial tea and chest plywood, agricultural implements, tool handles, cart wheels, well curbs and troughs, sleepers, furniture and as props for shafts and galleries in mines. It is also used for building bridges and for making musical instruments, especially guitars
	<p>Giant Thorny Bamboo (<i>Bambusa Bambos</i>) Order:</p>	<ul style="list-style-type: none"> East Asia Southern China 	<ul style="list-style-type: none"> Evergreen Bamboo 	<ul style="list-style-type: none"> Young shoots – cooked are edible The sugary sap is made into a drink

	Species	Locations	Characteristic	Uses
	<p>Poales Family: Poaceae Genus: Bambusa</p>  	<ul style="list-style-type: none"> • Indian subcontinent • Myanmar • Thailand • Laos • Cambodia • Vietnam • Found most abundantly in mixed moist deciduous forest, and not so commonly in mixed dry deciduous forest and in semi-evergreen forest, growing best along river valleys and in other moist conditions, on hills at elevations up to 1,000 metres 	<ul style="list-style-type: none"> • Grow up to 30.00 m in height • Cultivated and Wild cultivation 	<ul style="list-style-type: none"> • Seed is used to make food • The root is used to treat joint pain and general debility • The leaves are taken internally to stimulate menstruation and to help relieve period pain • The young sprouts, harvested as they emerge from below soil level, are taken internally to relieve nausea, indigestion • The juice of the plant is rich in silica and is taken internally to aid in the strengthening of cartilage in conditions such as osteoarthritis and osteoporosis • Planted along rivers in order to check floods • The stems have a huge range of applications, being manufactured in different ways to make items as diverse as scaffolding, rafts, furniture, paper and dozens of other items • They are used to make the sails of ships, as well as their masts and rigging • Used in making of furniture and decorative elements • Use to manufacture mats and plyboards
	<p>Beeja (Pterocarpus marsupium) Order: Fabales Family: Fabaceae Genus: Pterocarpus</p>	<ul style="list-style-type: none"> • East Asia • India • Nepal • Bangladesh • Sri Lanka • Mainly found in moist or dry, mixed deciduous forests in hilly areas; at elevations up to 1,200 metres 	<ul style="list-style-type: none"> • Deciduous tree • Grow up to 25.00 m in height • Cultivated, ornamental and Wild cultivation • Conservation Status: Near Threatened 	<ul style="list-style-type: none"> • Flowers and seeds are edible • The resin obtained from wounds in the bark is astringent; It is used in the treatment of chronic diarrhoea and the irritation caused by gastric infection and colitis • Commonly used in cases of toothache and also as a douche to treat vaginal discharge • The bark is used, either as a powder or in decoction, in the treatment of diarrhoea • Provides a good bulk of leaves for green manure and also fixes atmospheric nitrogen • The wood is used for various purposes including musical instruments, door and window frames, posts,

	Species	Locations	Characteristic	Uses
	 			agricultural implements, boat building, carts, railway carriages, railway ties etc

ANNEXURE 6: LIST OF FAUNA IN BANDHAVGARH TIGER RESERVE AND ESZ

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
MAMMALS (CARNIVORES)	Bengal (Panthera Tigris) Tiger Tigris Order: Carnivora Family: Felidae Genus: Panthera	Habitats are near a body of water, such as a lake, pond or river. <ul style="list-style-type: none"> • Shrubland • Forest • Grassland <u>Biome</u> <ul style="list-style-type: none"> • Tropical moist forest <u>Climate Zones</u> <ul style="list-style-type: none"> • Tropical • Temperate 	Can consume 18-40 Kg of meat according to the size of the prey, like: <ul style="list-style-type: none"> • Sambar Deer • Water Buffalo • Wild pig • Antelope Rarely Hunt: <ul style="list-style-type: none"> • Sloth Bear • Dog • Monkey • Hare • Python • Crocodile 	Life span of 10-15 years. Weighing 65-306 kg. Grow up to 200-390cm in length. Dash at a speed of 96 km/Hr.	Habitat fragmentation Poaching	IUCN Red list Status: Endangered WPA 1972: Schedule I (Part I) Population Trend: Decreasing
	Leopard (Panthera Pardus) Order: Carnivora Family: Felidae Genus: Panthera	<ul style="list-style-type: none"> • Forest • Desert • Rocky areas • Grassland • Savanna • Shrubland <u>Biome</u> <ul style="list-style-type: none"> • Tropical Savanna • Tropical moist forest • Desert and Xeric shrublands 	<ul style="list-style-type: none"> • Jackal • Antelope • Gazelle • Monkey • Duiker • Eland • Impala • Wildebeest • Birds • Rodent • Hyrax • Hare • Snake • Sheep • Goats 	Life span of 10-20 years Weighing at 28-90 kg Grow up to 57-70 cm in Height and 90-190 cm in length Runs at a speed of 45km/Hr Hunts at night Usually seen on ground or on trees	Climate change and severe weather Human intrusions Habitat destruction Exploitation of biological resources Mining activities	IUCN Red list Status: Vulnerable WPA 1972: Schedule I (Part I) Population Trend: Decreasing

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
		<ul style="list-style-type: none"> Temperate broadleaf and mixed forest <p>Climate Zones</p> <ul style="list-style-type: none"> Tropical Temperate Dry/Desert 		Live solitary; avoid territory conflicts		

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
MAMMALS(OMNIVORES)	Striped hyaena <i>(Hyaena hyaena)</i> Order: Carnivora Family: Hyaenidae Genus: Hyaena 	Forest, Grassland, Savanna, Shrubland, Wetlands(inland), Biome, desert and Xeric shrublands <ul style="list-style-type: none"> Mediterranean forests, Woodlands and scrub Tropical Dry Forest Montane Grasslands and shrublands Climate Zones <ul style="list-style-type: none"> Tropical Temperate Dry/Desert 	<ul style="list-style-type: none"> Wildebeest Zebra Gazelle Impala Bones of animals Fruits Nuts Insects Reptiles Birds 	Life span of 10-25 years Grow up to 60-80 cm in Height and 85-130 cm in length Weighing at 22-55 kg Runs at a speed of 50km/Hr Active during day and forges at night They raise their impressive manes when threatened or upset, which makes them appear nearly double the size.	Diseases Habitat fragmentation Human intrusions	IUCN Red list Status: Near Threatened WPA 1972: Schedule III Population Trend: Decreasing Number of mature individuals: 5,000-9,999
		<ul style="list-style-type: none"> Forest Grassland 	<ul style="list-style-type: none"> Rodents Wild pig 	Life span of 16 years	Diseases	

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	Indian wild Dog (<i>Cuon alpinus</i>) Order: Carnivora Family: Canidae Genus: Cuon 	<ul style="list-style-type: none"> • Shrubland • Biome • Tropical Dry Forest, Tropical moist forest, Temperate broadleaf and mixed forest, Temperate grasslands, Temperate coniferous forest, Desert and Xeric shrublands, Montane Grasslands and shrublands, Tropical coniferous forest • Climate Zones • Tropical, Cold, Dry/Desert, Temperate 	<ul style="list-style-type: none"> • Wild goat • Hare • Sheep • Monkeys • Lizards • Wild berries 	<p>Weighing at 12-18 kg</p> <p>Grow up to 42-55 cm in</p> <p>Height and 88-113 cm in length</p> <p>Runs at a speed of 72.4km/Hr</p> <p>Active at dawn and dusk</p> <p>Lives in a pack of 5-12</p> <p>Sometimes the packs join to form group of 40</p>	Habitat destruction Human intrusions	IUCN Red list Status: Endangered WPA 1972: Schedule II (Part I) Population Trend: Decreasing Number of mature individuals: 949-2,215
MAMMALS(OMNIVORES)	Sloth Bear (<i>Melursus ursinus</i>) Order: Carnivora Family: Ursidae Genus: <i>Melursus</i> 	Forest: Artificial/ Terrestrial <ul style="list-style-type: none"> • Savanna • Shrubland • Grassland Biome <ul style="list-style-type: none"> • Tropical moist forest • Tropical dry Forest Climate Zones <ul style="list-style-type: none"> • Tropical • Temperate 	<ul style="list-style-type: none"> • Termites • Ants • Fruits • Flowers • Honey 	<p>Life span of 40 years</p> <p>Weighing at 65-160 kg</p> <p>Grow up to 150-180 cm in length</p>	Climate change and severe weather Human intrusions Habitat destruction Exploitation of biological resources Mining activities	IUCN Red list Status: Vulnerable WPA 1972: Schedule I (Part I) Population Trend: Decreasing
			<ul style="list-style-type: none"> • Ants 	Life span of 13 years	Mining activities	

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Indian Pangolin (<i>Manis crassicaudata</i>) Order: Pholidota Family: Manidae Genus: <i>Manis</i></p> 	<p>Forest: Artificial/ Terrestrial</p> <ul style="list-style-type: none"> • Savanna • Shrubland • Grassland • Biome • Tropical Dry Forest • Tropical moist forest • Desert and Xeric shrublands • Tropical Savanna Climate Zones • Tropical • Temperate • Dry/Desert 	<ul style="list-style-type: none"> • Termites • Ant eggs • Termite eggs • Beetle wings • Worms • Cockroach 	<p>Weighing at 5-35 kg</p> <p>Grow up to 45-75 cm in length</p> <p>Runs at a speed of 5km/Hr</p> <p>Searching out for food during nighttime while spends most of the day time in burrows</p> <p>Burrows normally 2-6 m deep</p>	Invasive diseases	<p>IUCN Red list Status: Endangered</p> <p>WPA 1972: Schedule I (Part I)</p> <p>Population Trend: Decreasing</p>
MAMMALS (OMNIVORES)	<p>Golden Jackal (<i>Canis aureus</i>) Order: Carnivora Family: Canidae Genus: <i>Canis</i></p> 	<p>Forest: Artificial/ Terrestrial</p> <ul style="list-style-type: none"> • Grassland • Shrubland • Savanna • Biome • Tropical savanna • Tropical dry Forest • Desert and Xeric shrublands • Temperate grasslands • Mediterranean forests, Woodlands and scrub • Climate Zones • Tropical • Dry/desert • Temperate 	<ul style="list-style-type: none"> • Gazelles • Hares • Reptiles • Ground birds and their eggs • Fish • Frog • Insects • Carrion • Fruits 	<p>Life span 0f 8-16 years</p> <p>Weighing at 7-15kg</p> <p>Grow up to 44-50 cm in</p> <p>Height and 60-110 cm in length</p> <p>Jackal families hunt on a territory of about 2-3 sq. km. all year round</p> <p>The main social unit of these animals is a mated pair as well as a family, consisting</p>		<p>IUCN Red list Status: Least Concern</p> <p>WPA 1972: Schedule II (Part I)</p> <p>Population Trend: Increasing</p>

Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
Wild boar <i>(Sus scrofa)</i> Order: Cetartiodactyla Family: Suidae Genus: Sus 	<ul style="list-style-type: none"> Cold <p>Artificial/ Terrestrial Forest, Artificial/ Aquatic and Marine Wetland (inland)</p> <ul style="list-style-type: none"> Desert Grassland Shrubland Savanna Biome Tropical savanna Temperate coniferous forest Temperate broadleaf and mixed forest Tropical moist forest Tropical coniferous forest Tropical dry Forest Desert and Xeric shrublands Temperate grasslands Mediterranean forests, Woodlands and scrub <p>Climate Zones</p> <ul style="list-style-type: none"> Tropical Dry/desert Temperate Cold 	<ul style="list-style-type: none"> Crops Fruits Nuts Roots Green plants Bird eggs Carriion Small rodents Insects Worms Small livestock – calves and lambs 	<ul style="list-style-type: none"> of a mated pair and its young <p>Life span Of 2-27 years</p> <p>Weighing at 80-175kg</p> <p>Grow up to 55-100 cm in</p> <p>Height and 153-240 cm in length</p> <p>Usually a group of 6-30 individuals</p> <p>Male boars lead solitary life and socialize only in the reproductive season</p> <p>The group usually called as sonder or herd</p>	<p>Invasive diseases</p> <p>Biological resource depletion</p>	IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Unknown
MA MM		<ul style="list-style-type: none"> Grass 	Life span Of 26 years		

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Indian Bison (<i>Bos gaurus</i>)</p> <p>Order: Cetartiodactyla Family: Bovidae Genus: Bos</p> 	<p>Forest</p> <ul style="list-style-type: none"> • Artificial/ Terrestrial • Savanna • Shrubland • Grassland <p>Biome</p> <ul style="list-style-type: none"> • Tropical Dry Forest • Tropical moist forest • Desert and Xeric shrublands <p>Climate Zones</p> <ul style="list-style-type: none"> • Tropical • Temperate • Dry/Desert 	<ul style="list-style-type: none"> • Leaves • Forbes • Coarse • Dry grass 	<p>Weighing at 650-1000 kg</p> <p>Grow up to 165-220 cm in Height and 250-330 cm in length</p> <p>Most active in the morning and evening</p> <p>Sociable animals; in a group of 8-11</p> <p>Territory covers about 78 sq.km</p>	<p>Habitat Destruction</p> <p>Deforestation; destruction of termite mounds</p>	<p>IUCN Red list Status: Vulnerable</p> <p>WPA 1972: Schedule I (Part I)</p> <p>Population Trend: Decreasing</p> <p>Number of mature individuals: 6,000-21,000</p>
	<p>Four horned antelope (<i>Tetracerus quadricornis</i>)</p> <p>Order: Cetartiodactyla Family: Bovidae Genus: Tetracerus</p>	<ul style="list-style-type: none"> • Forest • Shrubland <p>Biome</p> <ul style="list-style-type: none"> • Dry deciduous mixed forest; hilly areas <p>Climate Zones</p> <ul style="list-style-type: none"> • Tropical 	<ul style="list-style-type: none"> • Grass • Herbs • Shrubs • Climbers • Forbes 	<p>Life span Of 10 years</p> <p>Weighing at 19 kg</p> <p>Grow up to 100 cm in length</p> <p>Active during all the day</p> <p>Solitary gazers but form group of 3-5 sometimes</p>	<p>Hunting and trapping</p> <p>Habitat destruction</p> <p>Climate change</p>	<p>IUCN Red list Status: Vulnerable</p> <p>WPA 1972: Schedule I (Part I)</p> <p>Population Trend: Decreasing</p> <p>Number of mature individuals: 7,000-10,000</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
						
	Sambar (Rusa unicolor) Order: Artiodactyla Family: Cervidae Genus: Rusa 	Artificial/ Terrestrial Forest <ul style="list-style-type: none"> • Savanna • Shrubland • Grassland • Wetlands (inland) Biome <ul style="list-style-type: none"> • Tropical moist forest, • Tropical dry Forest Climate Zones <ul style="list-style-type: none"> • Tropical • Dry/Dessert 	<ul style="list-style-type: none"> • Grass • Herbs • Fruits – especially berries • Water plants • Leaves • Foliage • Shrubs • Bamboo • 	Life span Of 20-26 years Weighing at 100-350 kg Grow up to 102-160 cm in Height and 162-270 cm in length Solitary gazers; female forms group of 6 at sometimes	Mining & quarrying Hunting & trapping terrestrial animals Logging & wood harvesting Habitat destruction	IUCN Red list Status: Vulnerable WPA 1972: Schedule III Population Trend: Decreasing
MAMMALS (HERBIVORES)	Spotted deer (Axis axis) Order: Cetartiodactyla Family: Cervidae Genus: Axis	Forest: Artificial/ Terrestrial <ul style="list-style-type: none"> • Savanna • Grassland • Biome • Tropical moist forest • Tropical dry Forest 	<ul style="list-style-type: none"> • Grass • Flowers and fruits • Grasses and sedges • Mushrooms 	Life span Of 9-11 years Weighing at 25-75kg Grow up to 70-90 cm in Height and 170 cm in length	Mining & quarrying Hunting	IUCN Red list Status: Least Concern WPA 1972: Schedule III

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
		<ul style="list-style-type: none"> Desert and Xeric shrublands Climate Zones Tropical Dry/Dessert Temperate 		<p>Highly sociable; in a group of 6-30 and 2 or 3 are Stags</p> <p>Active in the morning and late afternoon</p>	Habitat destruction	Population Trend: Unknown
	<p>Northern Red Muntjac <i>(Muntiacus vaginalis)</i></p> <p>Order: Cetartiodactyla Family: Cervidae Genus: Muntiacus</p> 	<ul style="list-style-type: none"> Forest Artificial/ Terrestrial Savanna Grassland Shrubland Biome Tropical moist forest Tropical dry Forest Climate Zones Tropical Temperate 	<ul style="list-style-type: none"> Herbs Fruits Bird's eggs Sprouts Seeds Grasses Small animals 	<p>Life span 0f 15-20 years</p> <p>Weighing at 16-34kg</p> <p>Grow up to 40-65 cm in</p> <p>Height and 89-135 cm in length</p> <p>Solitary gazers; sometimes in a group of 4-5</p>	<p>Mining & quarrying</p> <p>Hunting</p> <p>Habitat destruction</p> <p>Infrastructure development</p>	<p>IUCN Red list Status: Least Concern</p> <p>WPA 1972: Schedule III</p> <p>Population Trend: Decreasing</p>
	<p>Nilgai <i>(Boselaphus tragocamelus)</i></p>	<ul style="list-style-type: none"> Forest Artificial/ Terrestrial Grassland Shrubland Biome 	<ul style="list-style-type: none"> Herbs Grass Woody plants 	<p>Life span 0f 12-20 years</p> <p>Weighing at 180-240kg</p>	<p>Mining & quarrying</p>	<p>IUCN Red list Status: Least Concern</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	Order: Cetartiodactyla Family: Bovidae Genus: Boselaphus 	<ul style="list-style-type: none"> • Tropical moist forest • Tropical dry Forest • Climate Zones • Tropical • Temperate 		Grow up to 120-150 cm in Height and 170-200 cm in length	Hunting Habitat destruction	WPA 1972: Schedule III Population Trend: Stable
	Barasingha (Rucervus duvaucelii) 	Prefers swampy grasslands, floodplains, marshes, riverine meadows, and moist deciduous forests. Dependent on tall grasses and wetlands.	Grasses, aquatic plants, sedges, and leaves; occasionally browses on crops near human settlements.	Known as "swamp deer" due to affinity for wetlands; males have distinctive antlers with more than 3 tines (often 12–20 points). Moves in herds, especially during rutting season.	Habitat loss due to wetland drainage, conversion to agriculture, and developmental activities; poaching for antlers and meat; competition with livestock; small, isolated populations prone to genetic bottlenecks.	IUCN: Vulnerable ; Listed in Schedule I , Wildlife (Protection) Act, 1972 (India) ; CITES Appendix I. Population restricted to fragmented pockets in India (Kanha, Dudhwa, Kaziranga, etc.).
MAMMALS(HERBIVORES)	Northern Plains Gray Langur (Semnopithecus entellus) Order: Primates Family: Cercopithecidae Genus: Semnopithecus	<ul style="list-style-type: none"> • Forest • Artificial/Terrestrial • Shrubland • Savanna • Biome • Tropical savanna • Tropical dry Forest • Temperate coniferous forest 	<ul style="list-style-type: none"> • Leaves • Fruits • Seeds • Foliage 	Terrestrial, found near human habitats Variety of habitats at places with elevation up to 400 meters	Habitat destruction Biological resource depletion	IUCN Red list Status: Least Concern WPA 1972: Schedule II (Part I)

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
		<ul style="list-style-type: none"> Urban Wildlife Climate Zones Tropical Temperate 		<p>Weigh as 11-20kg</p> <p>Grow up to 55-80 cm in length</p> <p>Live in a group of 20-50</p>		Population Trend: Decreasing
	<p>Rhesus Monkey <i>(Macaca mulatta)</i></p> <p>Order: Primates Family: Cercopithecidae Genus: Macaca</p> 	<ul style="list-style-type: none"> Forest Artificial/ Terrestrial Shrubland Savanna Biome Temperate coniferous forest, Tropical dry and Tropical coniferous forest, Urban Wildlife Climate Zones Tropical Temperate 	<ul style="list-style-type: none"> Leaves Fruits Seeds Foliage 	<p>Not territorial</p> <p>Very active and loud</p> <p>Weigh as 5.3-7.7kg</p> <p>Grow up to 47-53 cm in length</p> <p>In a group of as many as 200</p>	<p>Habitat destruction</p> <p>Biological resource depletion</p>	<p>IUCN Red list Status: Least Concern</p> <p>WPA 1972: Schedule II (Part I)</p> <p>Population Trend: Unknown</p>
REPTILES	<p>Cobra <i>(Naja naja)</i></p>	<ul style="list-style-type: none"> Savanna Open woodlands Plains Rocky hillsides Wetland Grasslands 	<ul style="list-style-type: none"> Mouse Rat Ground squirrel Rabbits Amphibians 	<p>Life span of 20-30 years</p> <p>Grow up to 210cm ; 570cm for King cobra</p> <p>Weighs around 9kg</p>	<p>Habitat destruction</p>	IUCN Red list Status: Not Listed

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Order: Squamata Family: Elapidae Genus: Naja</p> 	•	<ul style="list-style-type: none"> • Birds • Lizards • Other snakes • Eggs • 	<p>Can lie motionless as dead to escape from threats</p> <p>Lightning fast when strikes and highly venomous</p>		<p>WPA 1972: Schedule II (Part II)</p> <p>Population Trend: Unknown</p>
	<p>Indian Krait (Bungarus caeruleus)</p> <p>Order: Squamata Family: Elapidae Genus: Bungarus</p> 	<ul style="list-style-type: none"> • Forest • Wetlands • Grasslands • Plains and hills • Urban Wildlife • Rocky terrain 	<ul style="list-style-type: none"> • Other snakes • Rodents • Frogs • Toads • Lizards 	<p>Grow up to 165 cm</p> <p>Prefers wet surroundings</p> <p>Aggressive during night time</p>	<p>Killing due to high venomous nature</p> <p>Skin trade</p> <p>Some places hunting for food – trade of edible flesh</p>	<p>IUCN Red list Status: Not Listed</p> <p>WPA 1972: Not Listed</p> <p>Population Trend: Unknown</p>
	<p>Brown spotted pit Viper (Protobothrops mucrosquamatus)</p> <p>Order: Squamata Family: Viperidae Genus: Protobothrops</p>	<ul style="list-style-type: none"> • Forest • Wetlands • Plains and hills • Urban Wildlife • Rocky terrain • Bamboo forest • Agricultural land 	<ul style="list-style-type: none"> • Other snakes • Rodents • Frogs • Birds • Insects 	<p>Grow up to 116 cm</p> <p>Greyish skin with brown spots</p> <p>Head is in triangular shape</p> <p>Nocturnal and mainly terrestrial</p>	<p>Killing due to high venomous nature</p> <p>Biological resource depletion</p>	<p>IUCN Red list Status: Not Listed</p> <p>WPA 1972: Schedule II (Part II)</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	 Indian rock Python (<i>Python molurus</i>) Order: Squamata Family: Pythonidae Genus: Python 	<ul style="list-style-type: none"> • Grasslands • Swamps • Marshes • Rocky foothills • Woodlands • River valleys • Forest 	<ul style="list-style-type: none"> • Mammals • Birds • Reptiles 	Sluggish and docile but will bite if provoked Grow up to 750 cm with an average length of 520cm Swallows prey bigger than its own size Slow moving Non-venomous	Road kills Skin trade Pet trade Habitat destruction	Population Trend: Unknown IUCN Red list Status: Not Listed WPA 1972: Schedule I (Part II) Population Trend: Unknown
AVIFAUNA	White browed fantail (<i>Rhipidura aureola</i>) Order: Passeriformes  Family: Rhipiduridae Genus: Rhipidura	<ul style="list-style-type: none"> • Shrubland • Forest • Savanna • Artificial/ Terrestrial 	<ul style="list-style-type: none"> • Worms • Ants • Termite • Fruits • Leaves 			IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Stable

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Steppe eagle (<i>Aquila nipalensis</i>) Order: Accipitriformes Family: Accipitridae Genus: Aquila</p> 	<ul style="list-style-type: none"> • Rocky areas • Grassland • Savanna 	<ul style="list-style-type: none"> • Carrion • Rodents • Hares • Birds 	<ul style="list-style-type: none"> • Full Migrant birds 	<p>Pollution Human intervention Hunting Infrastructure development</p>	<p>IUCN Red list Status: Endangered</p> <p>WPA 1972: Schedule I</p> <p>Population Trend: Decreasing</p> <p>Number of mature individuals: 50,000-75,000</p>
	<p>Green Pigeon (<i>Treron capellei</i>) Order: Columbiformes Family: Columbidae Genus: Treron</p> 	<ul style="list-style-type: none"> • Forest • Rain forests 	<ul style="list-style-type: none"> • Fruits • Leaves • Worms • Insects 		<p>Pollution Deforestation Habitat destruction</p>	<p>IUCN Red list Status: Vulnerable</p> <p>WPA 1972: Schedule IV</p> <p>Population Trend: Decreasing</p> <p>Number of mature individuals: 10,000-19,999</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>White-rumped shama <i>(Kittacincla malabarica)</i> Order: Passeriformes</p>  <p>Family: Muscicapidae Genus: Kittacincla</p>	<ul style="list-style-type: none"> Forest Shrubland Artificial/ terrestrial 	<ul style="list-style-type: none"> Fruits Insects 		<p>Trapping to use as pets or for displaying Hunting for food</p>	<p>IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Decreasing</p>
	<p>Malabar Grey Hornbill <i>(Ocyceros griseus)</i> Order: Bucerotiformes</p>  <p>Family: Bucerotidae Genus: Ocyceros</p>	<ul style="list-style-type: none"> Forest Artificial/ terrestrial 	<ul style="list-style-type: none"> Fruits Insects Fig Lizards 	<ul style="list-style-type: none"> Flocks of 6-20 birds 	<p>Habitat destruction</p>	<p>IUCN Red list Status: Least Concern WPA 1972: Schedule I Population Trend: Decreasing</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Blossom headed Parakeet  <i>(Psittacula roseata)</i></p> <p>Order: Psittaciformes Family: Psittacidae Genus: Psittacula</p>	<ul style="list-style-type: none"> Forest Artificial/ terrestrial Shrubland 	<ul style="list-style-type: none"> Fruits Grains 		<p>Habitat destruction Trapping to use as pets or for displaying</p>	<p>IUCN Red list Status: Near Threatened WPA 1972: Schedule IV Population Trend: Decreasing</p>
	<p>Blue bearded bee eaters  <i>(Nyctyornis athertoni)</i></p> <p>Order: Coraciiformes Family: Meropidae Genus: Nyctyornis</p>	<ul style="list-style-type: none"> Forest Artificial/ terrestrial 	<ul style="list-style-type: none"> Flying insects Honey bees 		<p>Habitat destruction Trapping to use as pets or for displaying</p>	<p>IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Stable</p>
	<p>White bellied Drongo  <i>(Dicrurus caerulescens)</i></p>	<ul style="list-style-type: none"> Forest Artificial/ terrestrial Savanna 	<ul style="list-style-type: none"> Insects Flower Seeds Fruits 		Deforestation	<p>IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Stable</p>

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	Order: Passeriformes Family: Dicruridae Genus: Dicrurus					
	Golden fronted leaf bird (<i>Chloropsis aurifrons</i>) Order:  Passeriformes Family: Chloropseidae Genus: <i>Chloropsis</i>	<ul style="list-style-type: none"> Forest Artificial/ terrestrial 	<ul style="list-style-type: none"> Fruits Nectar Leaves and foliage 			IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Stable
	Little Minivet (<i>Pericrocotus lansbergei</i>) Order: Passeriformes Family: Campephagidae  Genus: <i>Pericrocotus</i>	<ul style="list-style-type: none"> Forest 	<ul style="list-style-type: none"> Small insects Small Fruits 			IUCN Red list Status: Least Concern WPA 1972: NA Population Trend: Stable

	Specimen	Habitat Characteristic	Food Habits	Other Characteristic	Threats	Status
	<p>Lesser Florican</p>  <p>(<i>Sypheotides indicus</i>) Order: Otidiformes Family: Otididae Genus: Sypheotides</p>	<ul style="list-style-type: none"> • Grassland • Artificial/ Terrestrial 	<ul style="list-style-type: none"> • Small insects • Frogs • Lizards • Leaves • Crop shoots • Herbs • Berries 	<ul style="list-style-type: none"> • 40-51 cm in size • Breeding preferably in the areas with cotton soil 	<p>Mining Habitat destruction Biological resource depletion Invasive diseases</p>	<p>IUCN Red list Status: Endangered WPA 1972: Schedule I (Part III) Population Trend: Decreasing Number of matured individuals: 1500</p>
	<p>Green Avadavat</p>  <p>(<i>Amandava formosa</i>) Order: Otidiformes Family: Otididae Genus: Sypheotides</p>	<ul style="list-style-type: none"> • Grassland • Artificial/ Terrestrial • Forest • Shrubland 	<ul style="list-style-type: none"> • Small insects • Worms • Toads 	<ul style="list-style-type: none"> • 10 cm in size • Olive green in colour • Mainly in scrub regions 	<p>Mining Habitat destruction Biological resource depletion Invasive diseases Natural system modification</p>	<p>IUCN Red list Status: Vulnerable WPA 1972: Not listed Population Trend: Decreasing Number of matured individuals: 6000 - 15000</p>

**ANNEXURE 7: LIST OF TOURISM ASSETS, SITES & INFRASTRUCTURE IN
BANDHAVGARH ESZ**

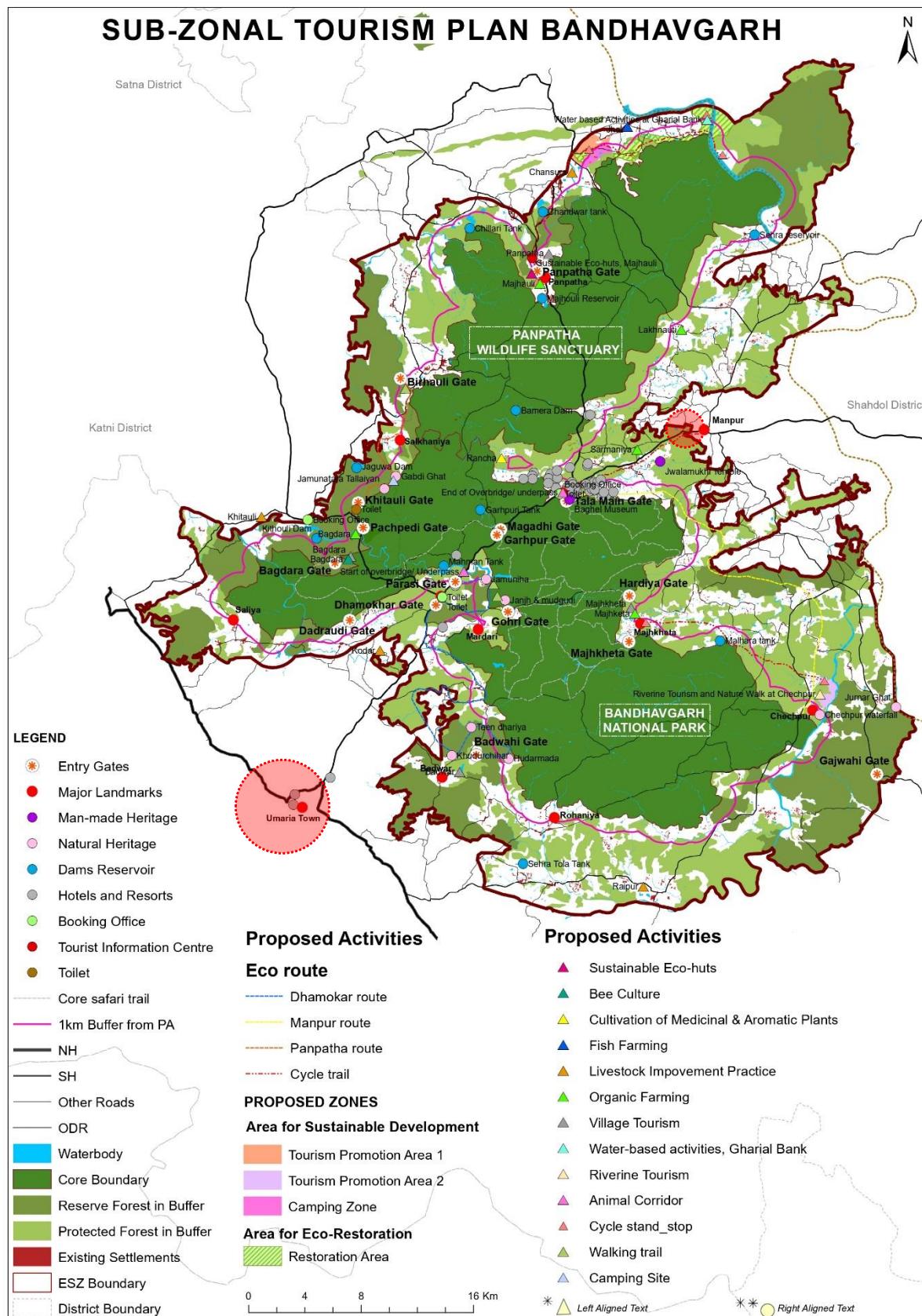
Sr.No.	Name / Location of Tourism assets, sites and infrastructure	Reference in Grid map number
Natural Heritage Sites		
1.	Chenchpur (Johilla) Waterfall	Q18
2.	Jhanjh	N10
3.	Kudurchihar	Q9
4.	Teen Dahriya	Q9
5.	Mudgudi	N10
6.	Hudarmada	R10
7.	Sehimada	R10
8.	Jamunata Talaiya	K7
9.	Gabdi Ghat	K7
10.	Junar Ghat	Q20
Man-made heritage sites		
1.	Khitauli Dam and Guest house	L5
2.	Jwalamukhi temple	K14
3.	Baghel Museum	K12
4.	Jamuniha	M10
5.	Tala Village	L12
Activity based assets		
1.	Walking trail in Jhanj	N10
2.	Walking trail in Jamuntara	K7
3.	Walking trail in Birhuli	H8
4.	Camping site at Gabdi Ghat	K7
Tourist Information center (TIC)		
1.	TIC, Panpatha - Forest Information Centre, Cafeteria, Canopy walk, open air Amphitheatre, camping site, toilet, pathway and chain link fencing	F11
Entry Gates and checkpoints		
1.	Tala Main Gate	K12
2.	Khitauli Gate	K6
3.	Pachpedi Gate	L7
4.	Dhamokhar Gate	N8
5.	Panpatha Gate	F11
6.	Badwahi Gate	R9

Sr.No.	Name / Location of Tourism assets, sites and infrastructure	Reference in Grid map number
7.	Gohri Gate	N10
8.	Parasi Gate	M9
9.	Majhkjeta Gate	O13
10.	Hardiya Gate	N13
11.	Magadhi gate	L10
12.	Garhpur gate	L10
13.	Bagdara gate	M6
14.	Biruhali Gate	H8/I8
15.	Dadraudi gate	N6
16.	Chechpur/ Gajwahi Gate	R20
Toilets and Booking office		
1.	Parasi Tiraha Toilet	N9
2.	Pachpedi Toilet	L6
3.	Damdamda Toilet	N8
4.	Tala Booking Office	K12
5.	Khitauli Booking Office	L5
6.	Dhamokhar Booking Office	N8
Dams and Reservoirs		
1.	Sehra Tola Tank	T11
2.	Malhara tank	O16
3.	Chillari Tank	E9
4.	Chandwar Tank	E11
5.	Majhouli Reservoir	G11
6.	Sehra Reservoir	E17
7.	Bamera Dam	I11
8.	Garhpuri tank	L10
9.	Jaguwa Dam	K6
10.	Kithouli Dam	L5
11.	Mahman Lake	M9
Accommodation facilities - Hotels/ Resorts / Guest house		
1.	MPT White Tiger Forest Lodge	K12
2.	Mahua Kothi (Taj)	K11
3.	Bandhav Vilas	K12
4.	Lemon Tree Wildlife Resort	K12

Sr.No.	Name / Location of Tourism assets, sites and infrastructure	Reference in Grid map number
5.	Syna Tiger Resort	K12
6.	Pugdundee Safaris: Kings Lodge	K11
7.	The Roaring Salvan County	M8
8.	Tiger Trails Resort	K13
9.	Aranyak Resort	K12
10.	The Celebration Van Vilas	K12
11.	Baghela Resort	K12
12.	The Sun Resort	K12
13.	Greenwoods Resort	I12
14.	Tiger's Den Resort	K12
15.	Maati Jungle Lodge	K13
16.	Tiger Haven Resort	K12
17.	Nature Heritage Resort	K12
18.	Golbro Tiger View Resort	K12
19.	Mint Bandhavgarh Resort (Bundela resort Bandhavgarh)	K11
20.	Maharaja's Royal Retreat	K12
21.	Infinity Resort	K13
22.	Bagh Sarai Resort (or Atulya Kanchi Camp Bandhavgarh)	M9
23.	Tigergarh Resort	K11
24.	Tiger Lagoon Bandhavgarh	I12
25.	OYO 35848 Mogli Jungle Resort	K13
26.	Bandhavgarh Meadows	K13
27.	The Wildflower Resort	K11
28.	Walk in Woods (Hotel Jungle Palace)	K12
29.	Bandhavgarh Jungle Lodge	K12
30.	Churhat Kothi (Maple Bundela Tiger Retreat, Bandhavgarh)	K12
31.	Camp Aranya (Arkeso Bandhavgarh)	K13
32.	Kolkata Kutir	K12
33.	Hotel Bagh Vihar	N9
34.	Badhtola	N9
35.	Tala Camp	K11
36.	Bandhavgarh 365	K12
37.	Royal Heritage	K12
38.	Royal Guest House	K12

Sr.No.	Name / Location of Tourism assets, sites and infrastructure	Reference in Grid map number
39.	Whispering Grass	K13
40.	Wild Haven Resort	K12
41.	ADB Rooms: The Ashoka Resort	K12
42.	Monsoon Forest	K11
43.	Hotel Narmada Palace	K12
44.	Palash Kothi	J7
45.	Tiger Hut Resort (Renest Bandhavgarh Meadows)	K12
46.	Skay's Camp	K12
47.	Bandhavgarh Vilas	K12
48.	Mahua Tiger Resort	K11
49.	BanHill Resort	M9
50.	Jungle mantra	K11
51.	Rainbow Resort Bandhavgarh	K13
52.	Panther On Lodge Bandhavgarh (under const)	K13
53.	Grand Narmada homestay - Resort hotel	K11
54.	Blue Lotus Safari Resort	K13
55.	Tree House Hideaway	K13
56.	Bandhav Kothi	K12
57.	Maharaja Kothi Resort	K12
58.	Kumkum Home Hotel Bandhavgarh	K12
59.	Bandhavgarh Railway Officers Rest House	K12
60.	MM Resort Bandhavgarh	K12
61.	Dharohar Kothi	K11
62.	The Untamed Bandhavgarh	K11
63.	Rest House Khitouli	L5
64.	Samode Safari Lodge	N10
65.	Gohadi Retreat	N10
66.	Tiger Inn Resort	K12
67.	Lemon Grass Resort	P7
68.	Nirmal Chhaya Nature Resort - Biruhali	H6
69.	The Tiger Valley Resort	L10
70.	Wildlife Adventure Resort	K12
71.	The Tiger Home Resort	K12
72.	Badrika Farm Stay	K12

Sr.No.	Name / Location of Tourism assets, sites and infrastructure	Reference in Grid map number
73.	Bamera House Resort	I12
74.	The Jungle Tree Resort	K11
75.	Geetanjali Resort	K12



ANNEXURE 8: LIST OF GOVERNMENT LAND PARCELS

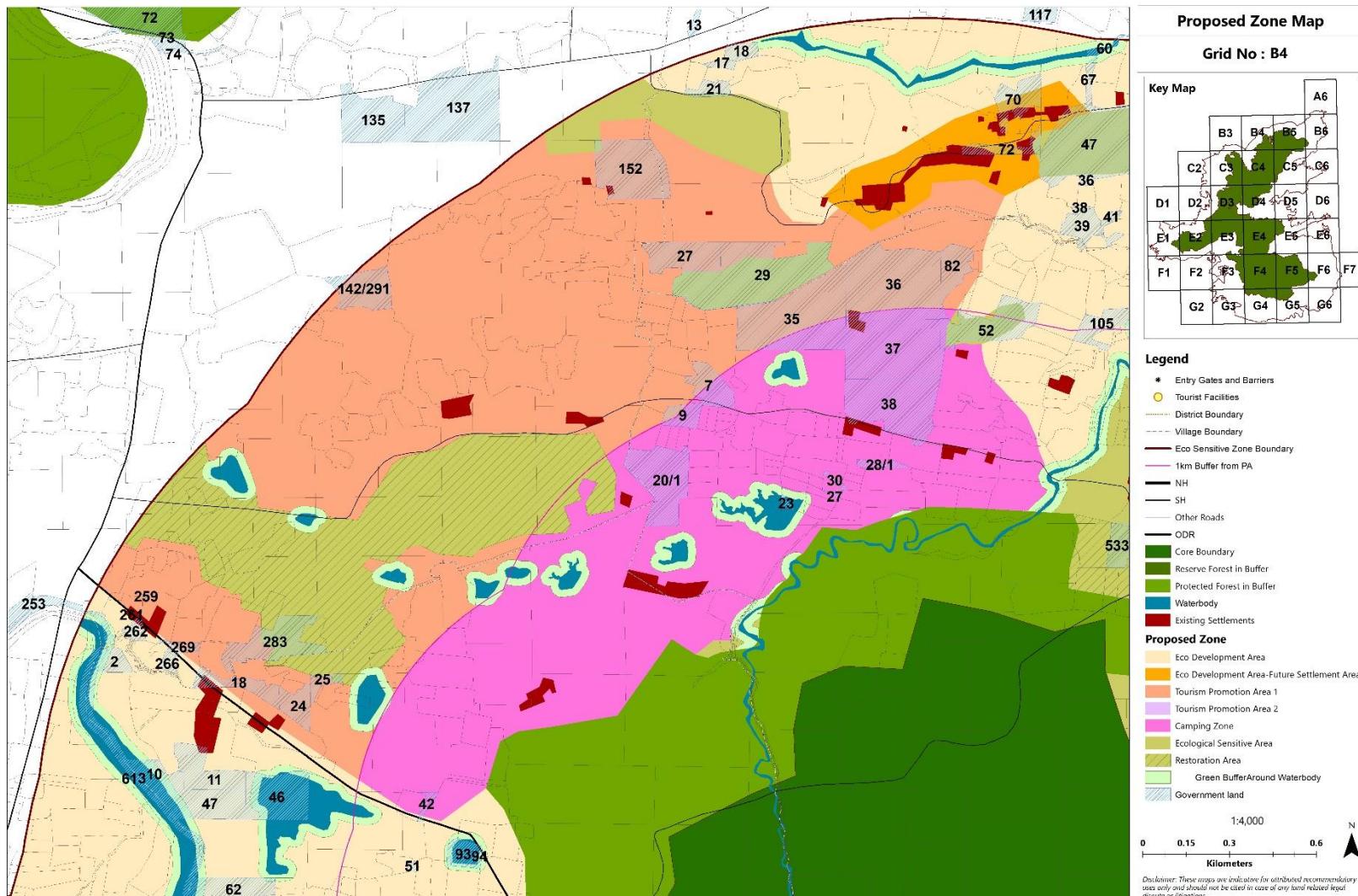
FID	Village	Khasra number	Area (Ha)
0	Baturawah	152	4.258
1	Baturawah	253	0.043
2	Baturawah	259	0.039
3	Baturawah	261	0.003
4	Baturawah	262	0.001
5	Baturawah	269	0.269
6	Baturawah	271	0.002
7	Baturawah	283	1.118
8	Baturawah	142/291	1.991
9	Chansura	61	2.013
10	Jhal	27	2.302
11	Jhal	29	1.241
12	Jhal	534	0.037
13	Jhal	535	0.079
14	Jhal	536	0.010
15	Jhal	539	0.034
16	Jhal	540	0.044
17	Jhalwar	7	1.510
18	Jhalwar	9	0.871
19	Jhalwar	23	0.104
20	Jhalwar	27	0.060
21	Jhalwar	30	0.127
22	Jhalwar	35	7.208
23	Jhalwar	36	7.234
24	Jhalwar	37	6.241
25	Jhalwar	38	5.059
26	Jhalwar	52	0.253
27	Jhalwar	82	1.418
28	Jhalwar	20/1	3.774
29	Jhalwar	28/1	0.318
30	Kudri No. 2	3	1.639
31	Kudri No. 2	10	0.389
32	Kudri No. 2	18	0.943

FID	Village	Khasra number	Area (Ha)
51	Neusi	41	0.718
52	Neusi	42	15.595
53	Neusi	43	0.208
54	Neusi	44	0.504
55	Neusi	45	0.891
56	Neusi	354	0.680
57	Neusi	356	0.255
58	Neusi	358	0.572
59	Neusi	359	0.336
60	Neusi	360	4.289
61	Neusi	362	4.294
62	Neusi	365	0.658
63	Neusi	366	0.294
64	Neusi	370	0.128
65	Neusi	371	0.618
66	Neusi	372	0.050
67	Neusi	373	0.195
68	Neusi	374	0.217
69	Neusi	376	0.141
70	Neusi	384	0.602
71	Neusi	386	0.038
72	Neusi	388	0.164
73	Neusi	394	0.182
74	Neusi	403	0.412
75	Neusi	407	0.286
76	Neusi	410	0.076
77	Neusi	415	0.198
78	Neusi	416	0.338
79	Neusi	417	0.656
80	Neusi	418	0.612
81	Neusi	419	0.073
82	Neusi	426	0.566
83	Neusi	428	2.584

FID	Village	Khasra number	Area (Ha)
33	Kudri No. 2	24	1.090
34	Kudri No. 2	25	0.355
35	Kudri No. 2	42	0.222
36	Kudri No. 2	47	0.242
37	Kudri No. 2	62	0.141
38	Neusi	24	0.503
39	Neusi	28	0.311
40	Neusi	29	0.812
41	Neusi	30	3.880
42	Neusi	31	1.836
43	Neusi	32	0.637
44	Neusi	34	1.148
45	Neusi	35	0.174
46	Neusi	36	0.254
47	Neusi	37	0.450
48	Neusi	38	3.501
49	Neusi	39	0.774
50	Neusi	40	1.073

FID	Village	Khasra number	Area (Ha)
84	Neusi	438	0.234
85	Neusi	42	0.296
86	Neusi	446	3.473
87	Neusi	451	0.354
88	Neusi	458	1.251
89	Neusi	461	2.710
90	Neusi	463	0.214
91	Neusi	465	0.225
92	Neusi	466	5.922
93	Neusi	467	0.379
94	Neusi	361	1.080

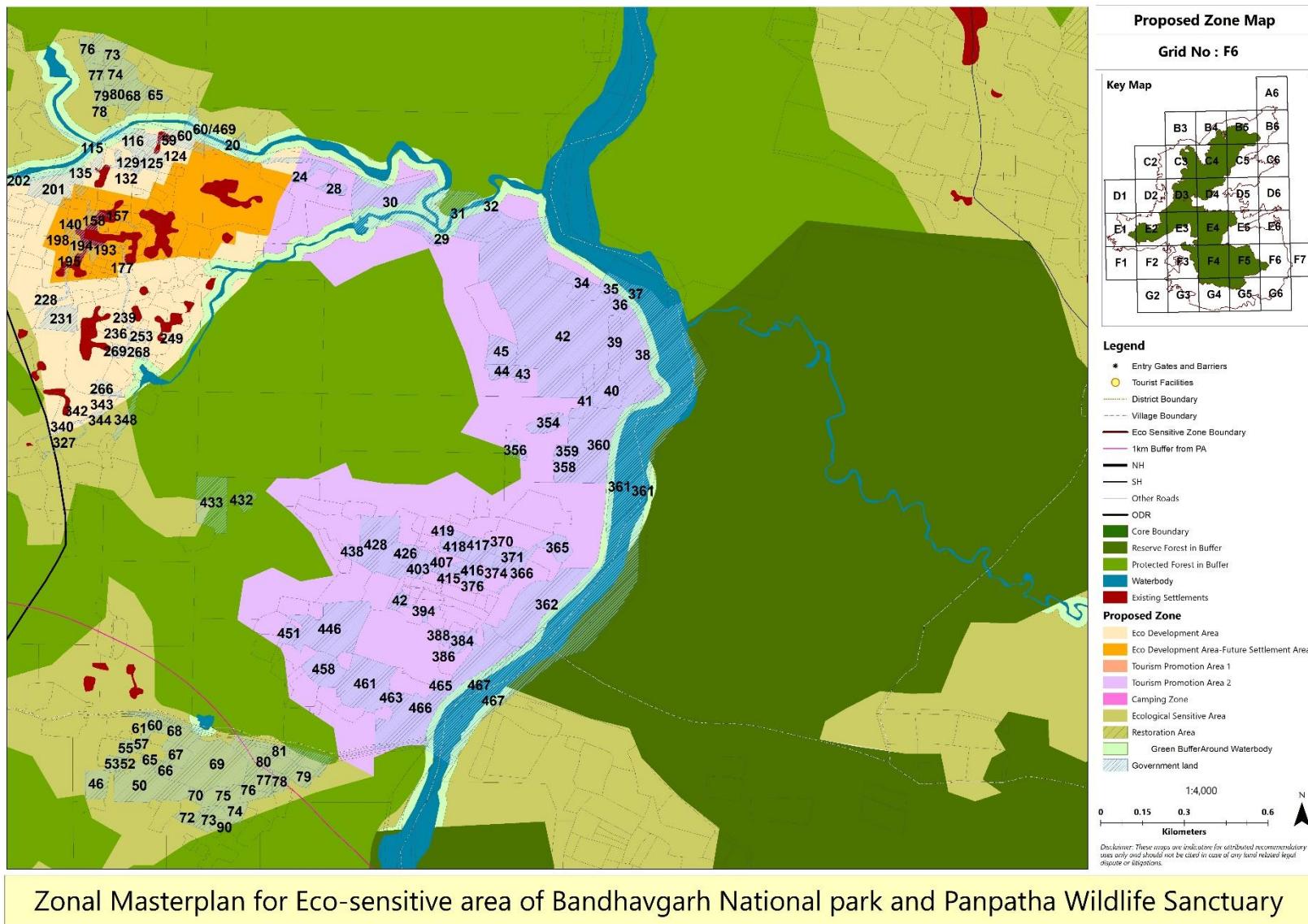
Map 42: Government land parcels demarcated in North Chansura TPA and Camping zone



Zonal Masterplan for Eco-sensitive area of Bandhavgarh National park and Panpatha Wildlife Sanctuary

Source: <https://mpbhulekh.gov.in/>

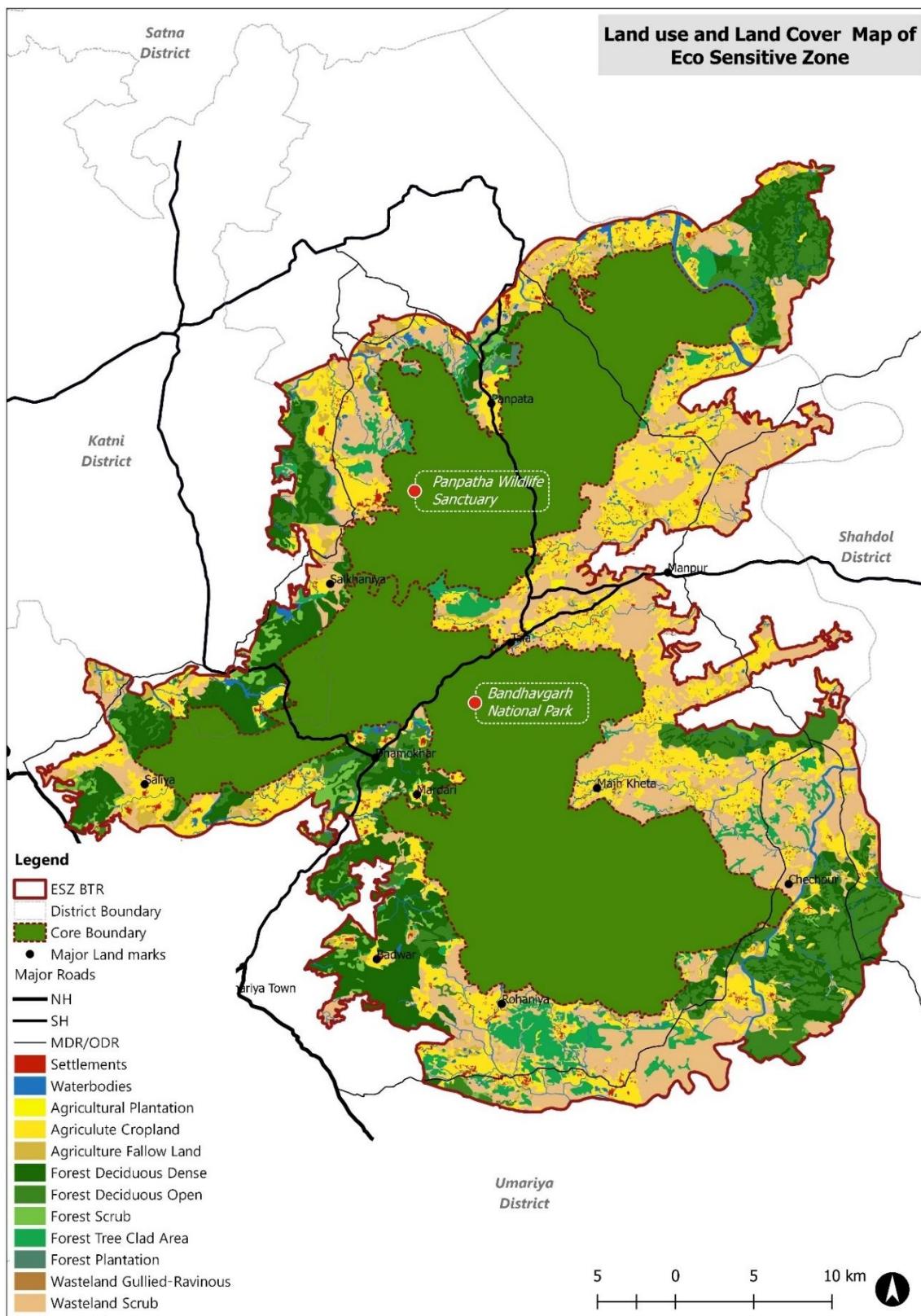
Map 43: Government land parcels demarcated in North Chechpur Tourism Promotion Area



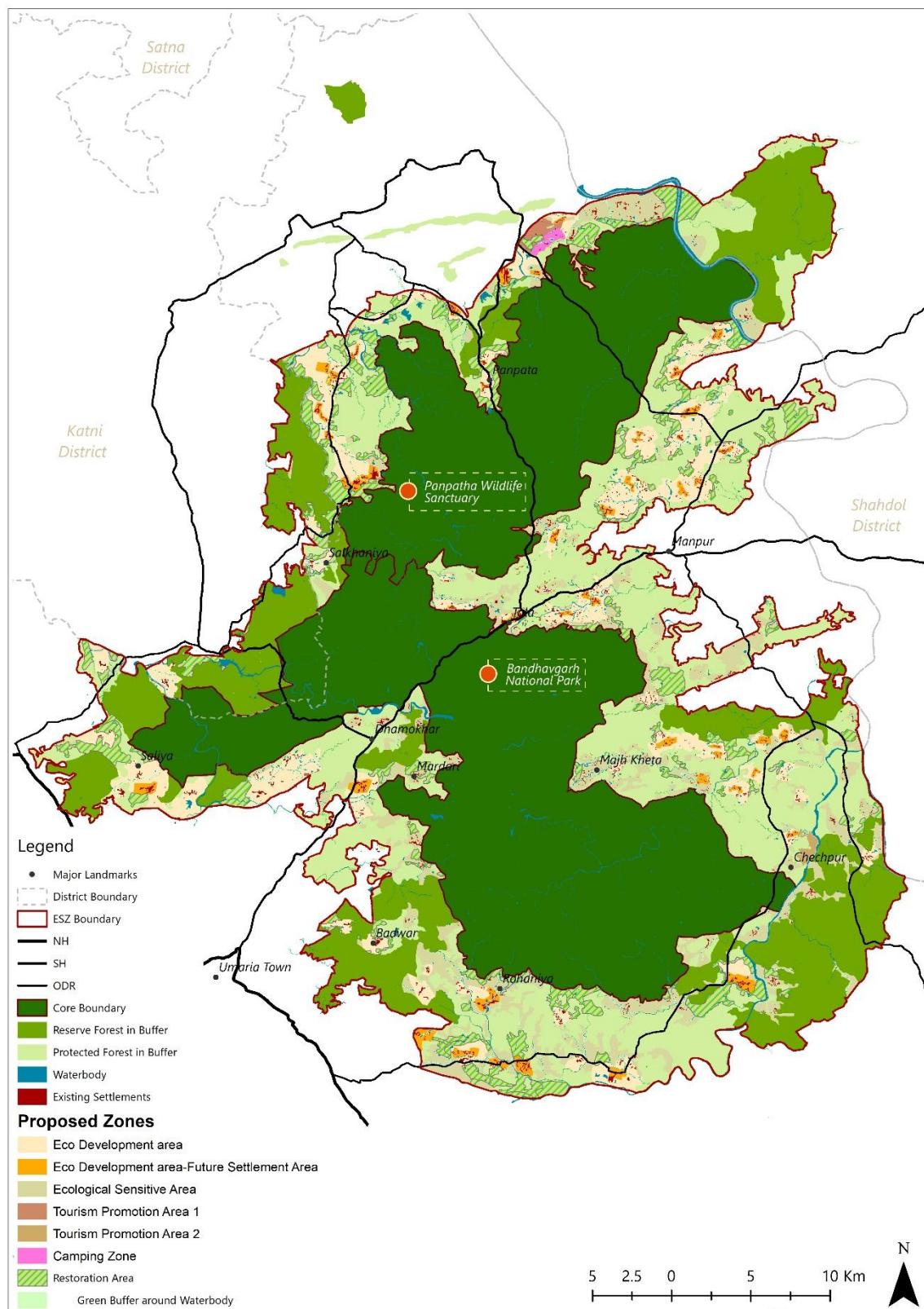
Source: <https://mpbhulekh.gov.in/>

ANNEXURE 9: ALL ZONING MAPS

Land Use/ Land Cover Map of Bandhavgarh Eco- Sensitive Zone

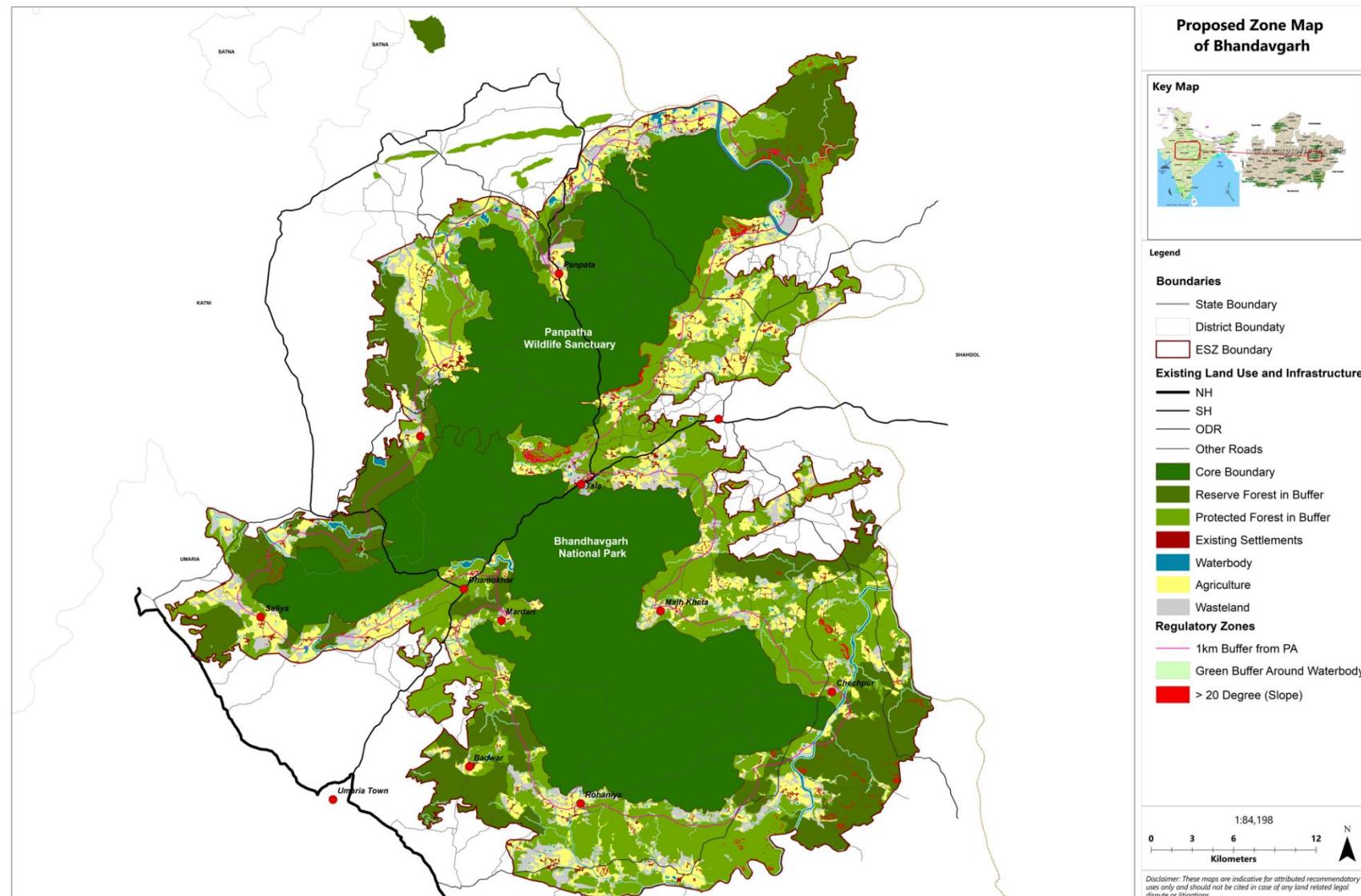


Composite Zoning map for Bandhavgarh ESZ



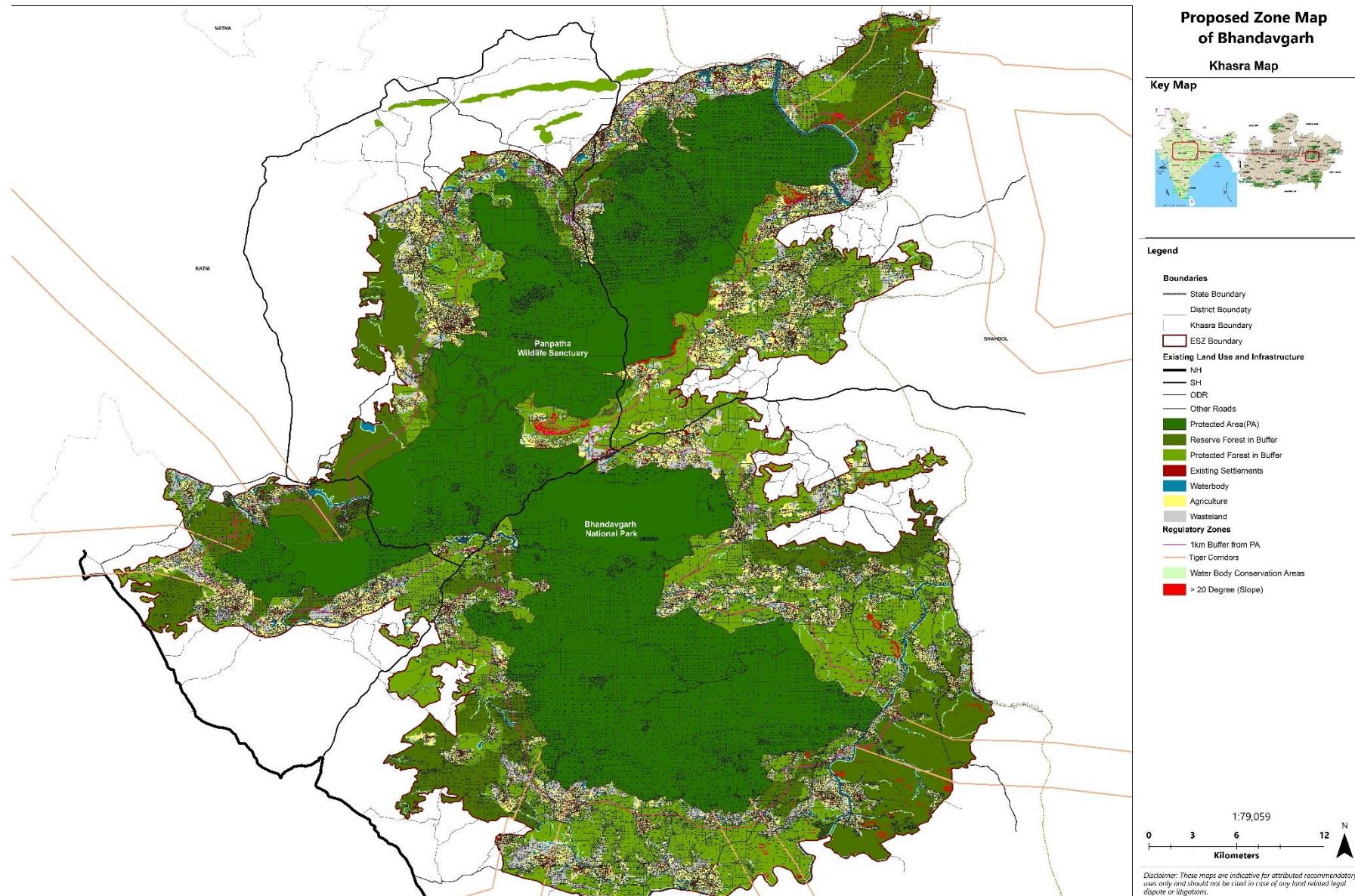
ANNEXURE 10: REGULATORY ZONES & KHASRAS

Regulatory Zones



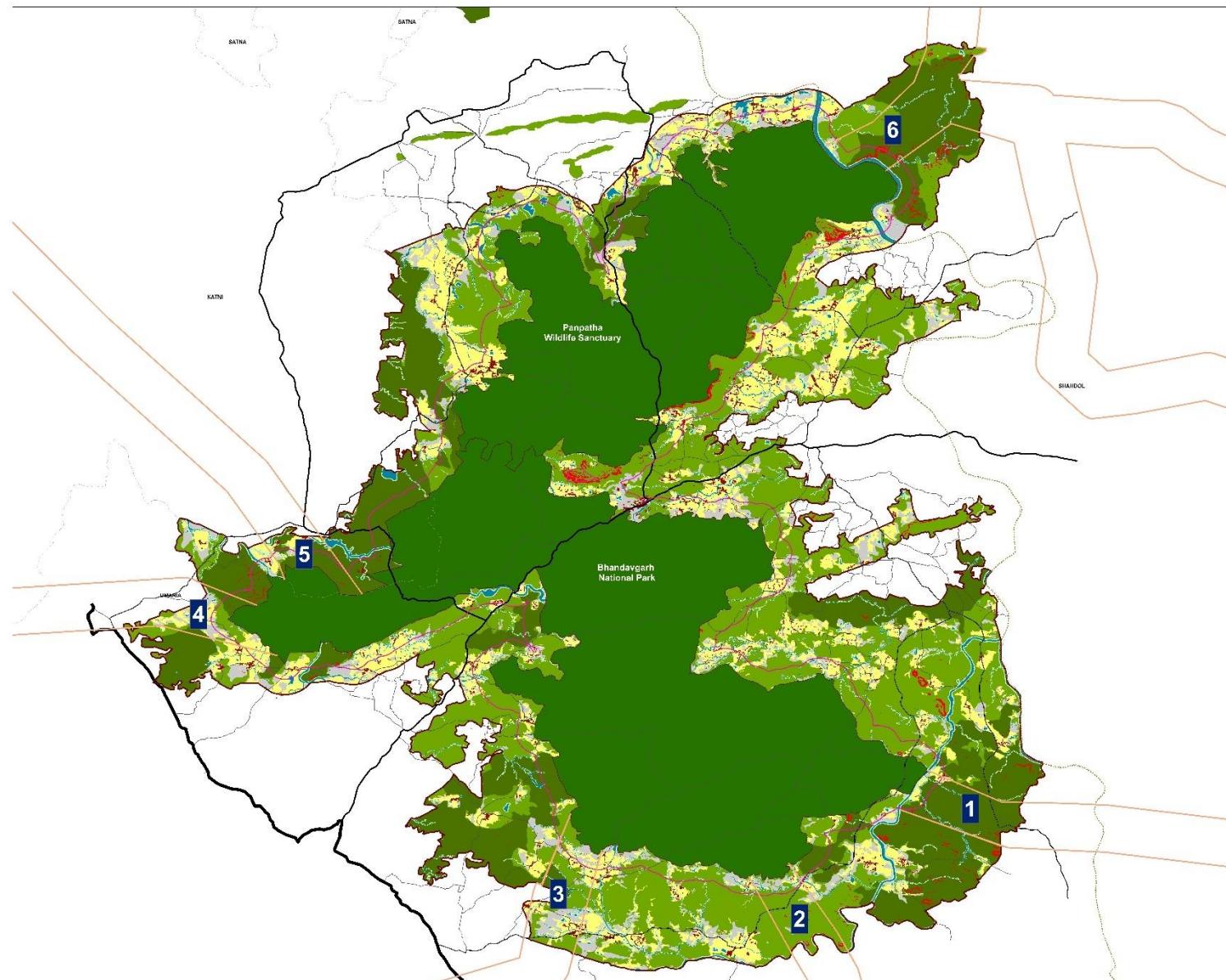
Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Khasra overlay with regulatory zones



Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Tiger Corridors



Proposed Zone Map
of Bhandavgarh

Grid No : Q19

Key Map



Legend

Boundaries	
State Boundary	
District Boundary	
Khesra Boundary	
ESZ Boundary	

Existing Land Use and Infrastructure	
NH	
SH	
ODR	
Other Roads	

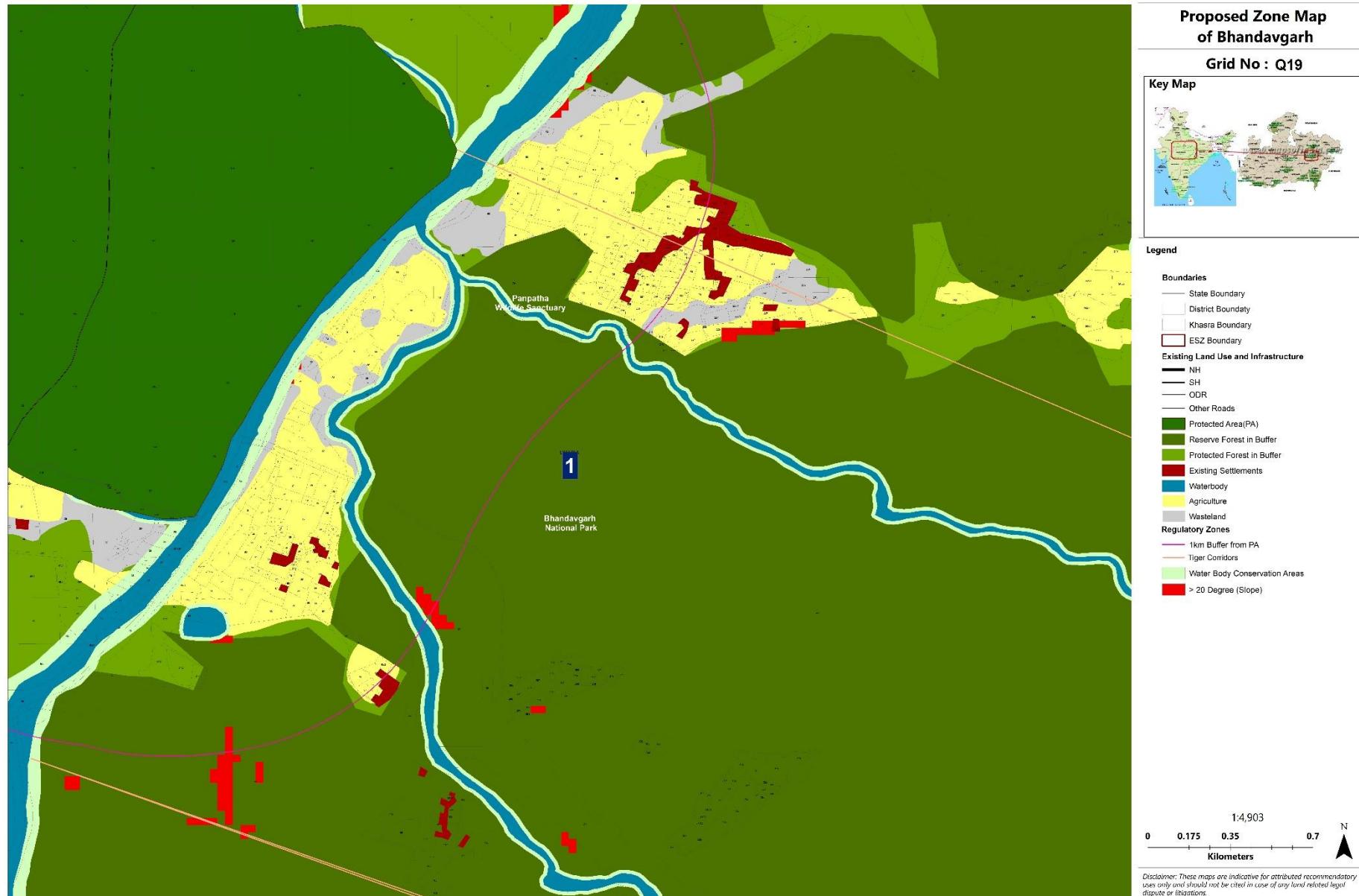
Protected Area(PA)	
Protected Area(PA)	
Reserve Forest in Buffer	
Protected Forest in Buffer	
Existing Settlements	
Waterbody	
Agriculture	
Wasteland	

Regulatory Zones	
1km Buffer from PA	
Tiger Corridors	
Water Body Conservation Areas	
> 20 Degree (Slope)	

Disclaimer: These maps are indicative for attributed recommendatory uses only and should not be cited in case of any land related legal dispute or litigations.

Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-1



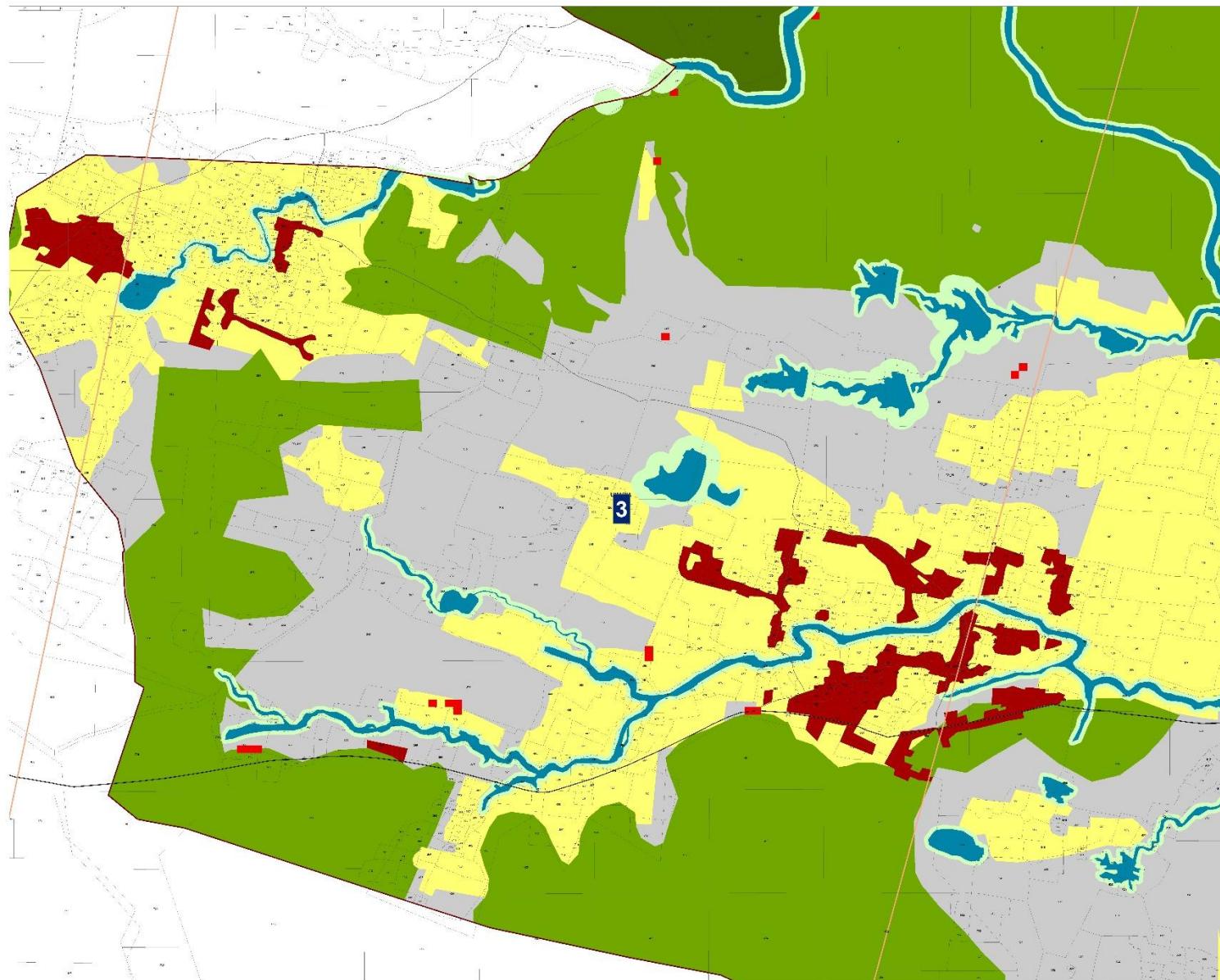
Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-2



Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-3



Proposed Zone Map
of Bhandavgarh
Grid No :



Legend

Boundaries	
State Boundary	
District Boundary	
Khastra Boundary	
ESZ Boundary	

Existing Land Use and Infrastructure	
NH	
SH	
ODR	
Other Roads	
Protected Area(PA)	
Reserve Forest in Buffer	
Protected Forest in Buffer	
Existing Settlements	
Waterbody	
Agriculture	
Wasteland	

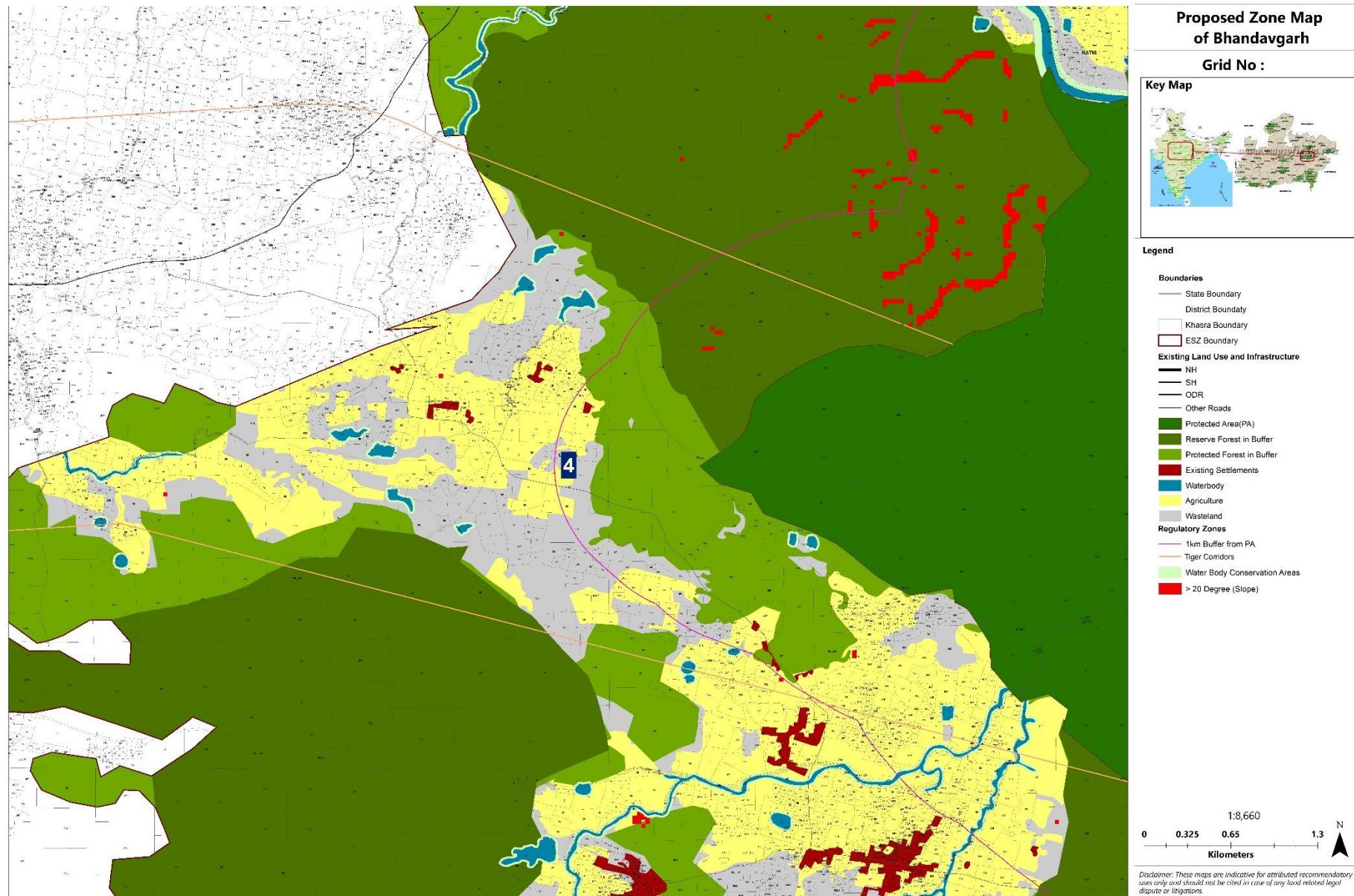
Regulatory Zones	
1km Buffer from PA	
Tiger Corridors	
Water Body Conservation Areas	
> 20 Degree (Slope)	

1:4,903
0 0.175 0.35 0.7 Kilometers
N

Disclaimer: These maps are indicative for attributed recommendatory uses only and should not be cited in case of any land related legal dispute or litigations.

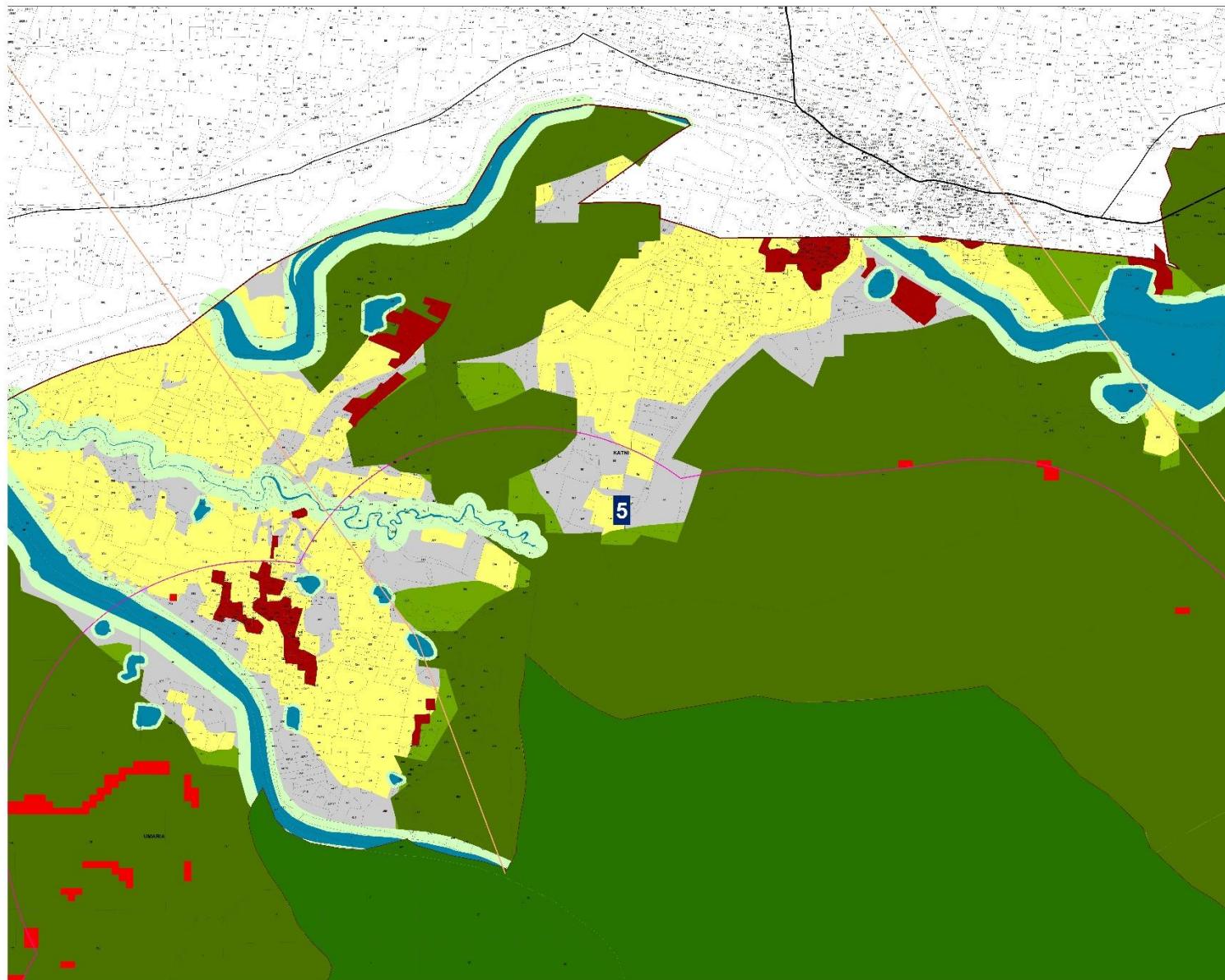
Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-4



Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-5



Proposed Zone Map
of Bhandavgarh

Grid No :

Key Map



Legend

Boundaries

- State Boundary
- District Boundary
- Khasra Boundary
- ESZ Boundary

Existing Land Use and Infrastructure

- NH
- SH
- ODR
- Other Roads

Protected Area (PA)

Reserve Forest in Buffer

Protected Forest in Buffer

Existing Settlements

Waterbody

Agriculture

Wasteland

Regulatory Zones

1km Buffer from PA

Tiger Corridors

Water Body Conservation Areas

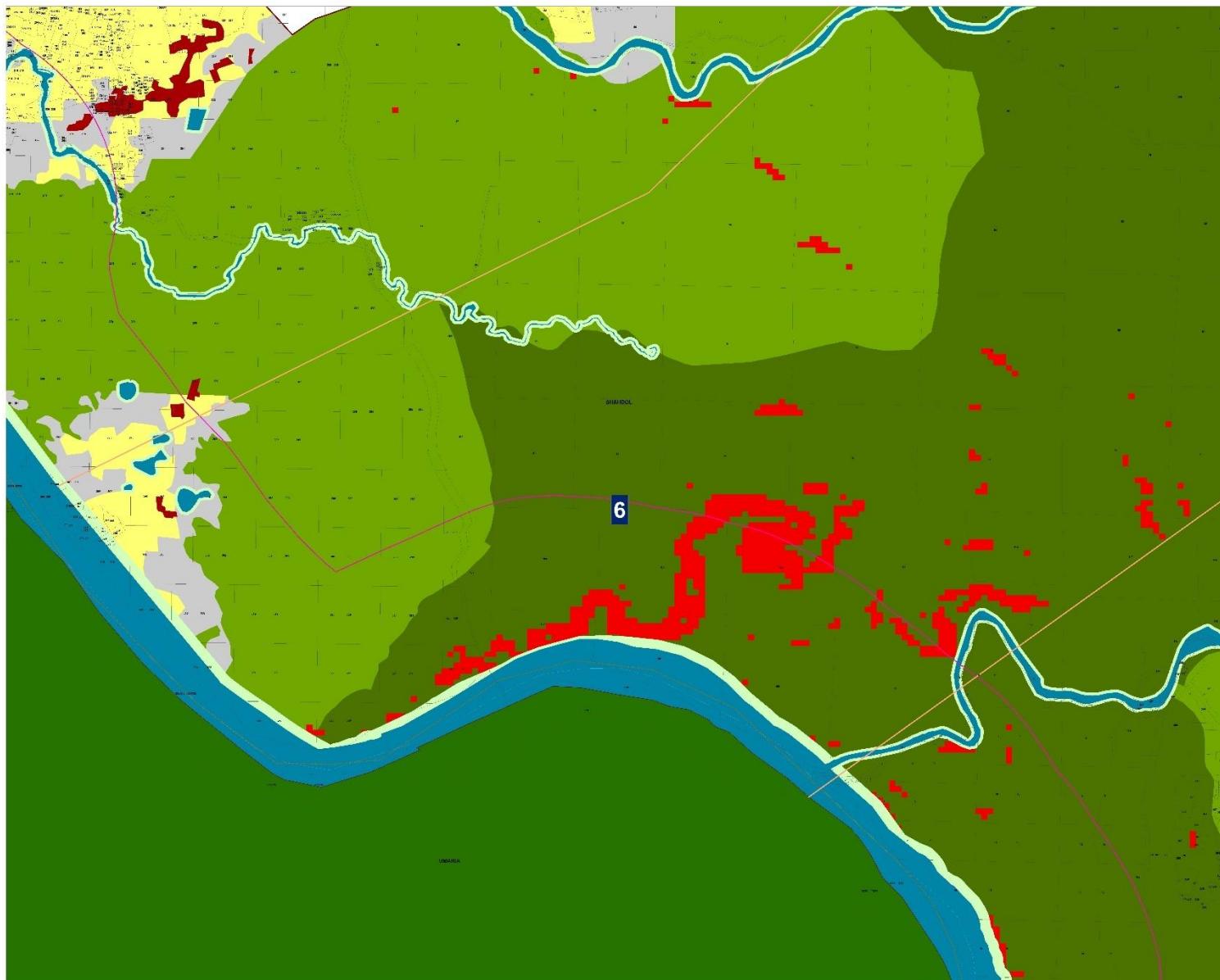
> 20 Degree (Slope)

1.5611
0 0.2 0.4 0.8
Kilometers
N

Disclaimer: These maps are indicative for attributed recommendatory uses only and should not be cited in case of any land related legal dispute or litigations.

Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

Conflict Zones with Tiger Corridors-6



Proposed Zone Map
of Bhandavgarh
Grid No :

Key Map



Legend

- Boundaries:**
 - State Boundary
 - District Boundary
 - Khasra Boundary
 - ESZ Boundary
- Existing Land Use and Infrastructure:**
 - NH
 - SH
 - ODR
 - Other Roads
 - Protected Area(PA)
 - Reserve Forest in Buffer
 - Protected Forest in Buffer
 - Existing Settlements
 - Waterbody
 - Agriculture
 - Wasteland
- Regulatory Zones:**
 - 1km Buffer from PA
 - Tiger Corridors
 - Water Body Conservation Areas
 - > 20 Degree (Slope)

Disclaimer: These maps are indicative for attributed recommendatory uses only and should not be cited in case of any land related legal dispute or litigations.

Zonal Master Plan for Eco-Sensitive Zone of Bandhavgarh National Park and Panpatha Wildlife Sanctuary

ANNEXURE 11: SUGGESTIVE MONITORING COMMITTEE STRUCTURE

Monitoring committee

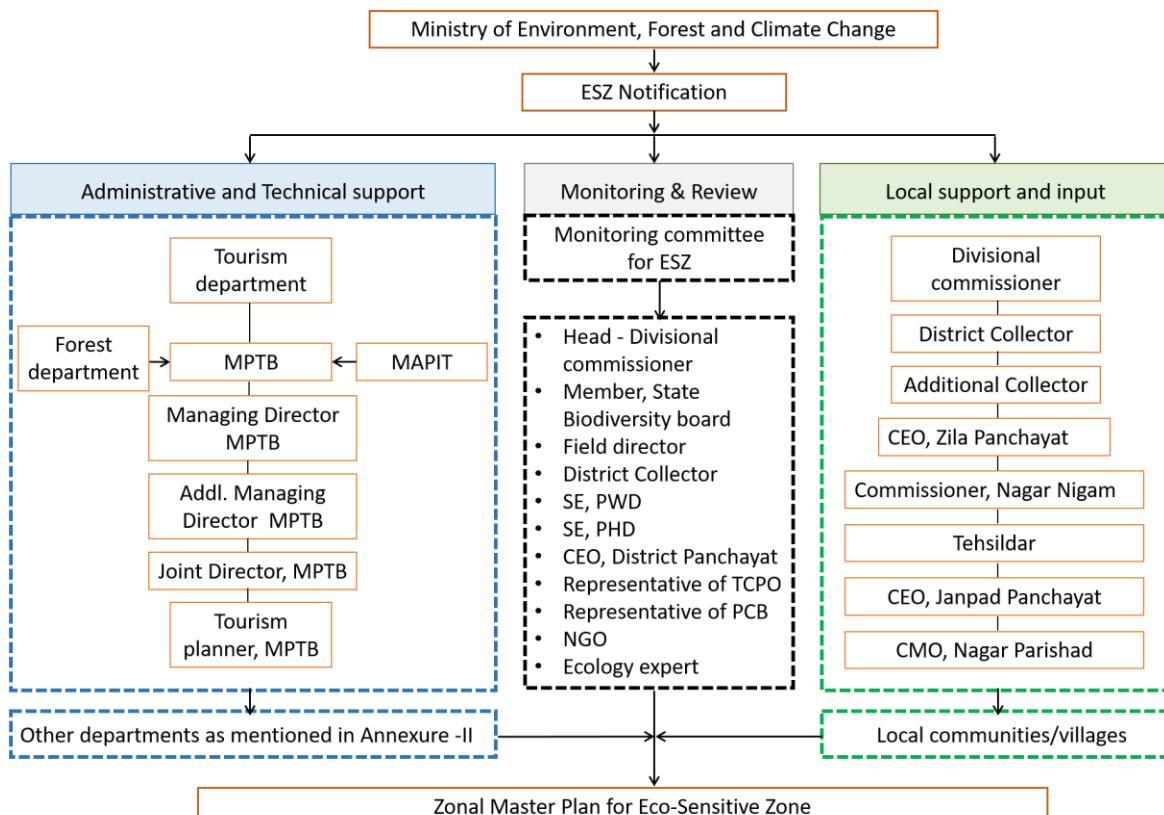
As per the gazette notification, the Zonal Master Plan shall be prepared in consultation with all stakeholder line Departments i.e., Forest & Environment, Urban Development, Eco-tourism, Municipal, Revenue, Agriculture, State Pollution Control Board, Irrigation and Public Works Department, for integrating 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



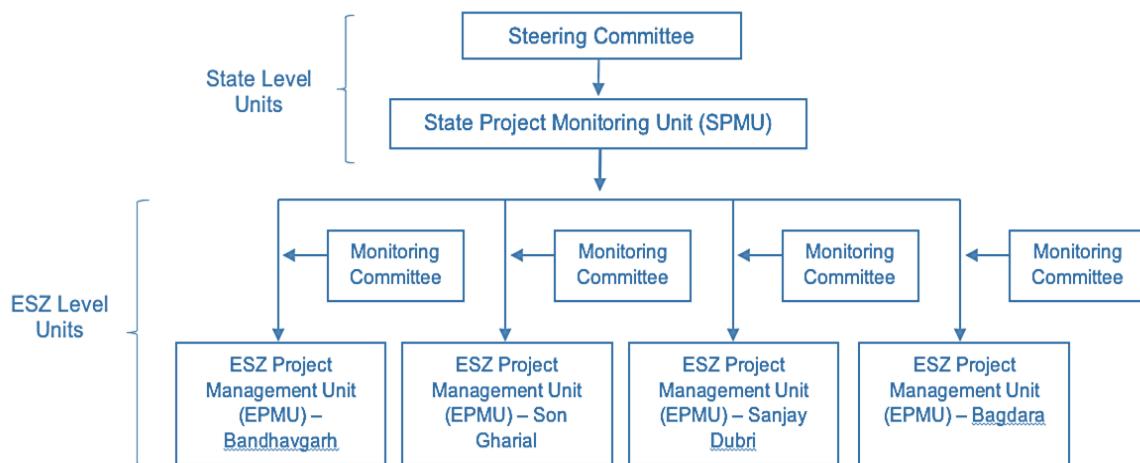
In order to monitor and review the Zonal Master Plan prepared by the State Government, the Central Government proposed a Monitoring Committee which shall comprise of - Divisional

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 coordination, 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

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.¹³³ 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.

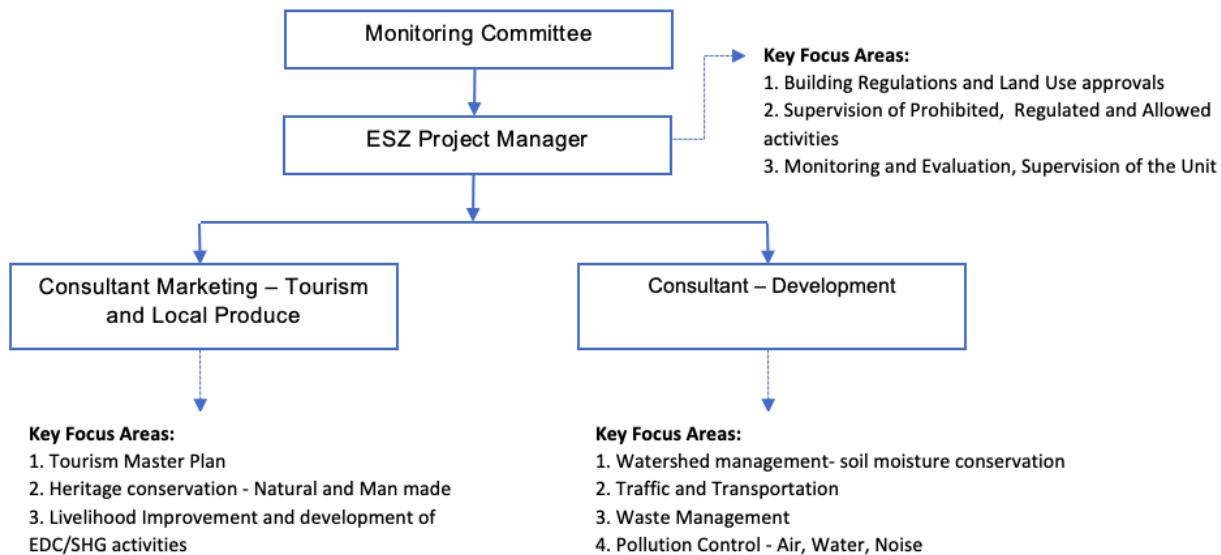
ESZ-level Institutional Structure

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-

¹³³ 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.

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.



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 piece meal 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 carryout 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 		
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.
16	Commercial water extraction		<ul style="list-style-type: none"> • Water meters • Aquifer recharge studies 	Bi-annual	Aquifer status reports: restrictions if thresholds breached

S.No.	Regulated Activity	Regulatory Authority	Monitoring Methodology	Frequency of Monitoring	Evaluation & Compliance Mechanism
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	<p>MPPCB compliance reports or violation notices.</p> <p>Closure or fines for exceeding prescribed limits</p>
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