Chapter - 01

INTRODUCTION OF THE AREA

The Tiger Conservation Plan has been proposed for the Buffer zone of Pench Tiger Reserve, Seoni, M.P.The plan attempts to address the forest and wildlife management concerns in the buffer areas as per the approval of ministry of Environment and Forest, project tiger's order no. 1-2/92-PT (Part-II) dated 23 November 1992 and National Tiger Conservation Authority, Delhi Letter No. 1-14/2011-NTCA dated 5th Nov, 2012

The buffer zone of the Pench Tiger Reserve, Seoni, has been notified to ensure the integrity of the core area/ critical tiger habitat with adequate dispersal of tigers and other species and aims at promoting co-existence between wildlife and human activity with the recognition of livelihood development along with social and cultural rights of the local people.

1.1 Name, Location, Constitution & Extent

1.1.1 Name:

The buffer zone includes reserved and protected forests and revenue area of Seoni and Chindwara districts. The spread of buffer zone is in Barghat and Kurai blocks situated in the southern part of Seoni district and Chaurai and Bichchua blocks of Chindwara district. The forest area of South Seoni, East Chindwara and South Chindwara divisions have been included in the buffer zone of Pench Tiger reserve. It wil be called buffer zone of the Pench Tiger Reserve.

1.1.2 Location:

Pench Tiger Reserve, nestling in the lower southern reaches of the Satpuda hills, is named after the Pench River which is meandering through the Park from north to south. It is situated on the southern boundary of Madhya Pradesh, bordering Maharashtra, in the districts of Seoni and Chhindwara. The buffer zone of Pench tiger reserve is located in Seoni and Chhindwara district of Madhya Pradesh. The buffer area includes part of reserve and protected forest of South Seoni division, East Chhindwara division and South Chhindwara division of Madhya Pradesh. The buffer zone of Pench tiger reserve falls between the geographical coordinates given below.

Table No. – 1. Buffer Zone, Pench Tiger Resesrve

North	South Seoni Forest Divison Boundary
South	South Seoni Forest Divison Boundary
East	Boundary of balaghat district
West	East and south boundary of chindwara forest divison
Latitude	$21^0$45'17.375"N - $21^0$50'39.070"N
Longitude	$78^0$21'8.533"E -$79^0$19'37.616"E

1.1.3 Constitution:

The Pench Tiger Reserve was declared as 19th Tiger Project in the year 1992 under Centrally Sponsored Scheme Project Tiger vide the Govt. of India Ministry of Environment and Forest, Project Tiger's order no. 1-2/92-PT (Part-II) Dated 23 November 1992. The buffer area of 768.300 sq. kms has been finally notified by MP Government Forest Department notification no. F-15-8/2009/10-2 dated 5th October 2010. The buffer zone was under the direct control of three territorial divisions like South Seoni division, East Chhindwara division and South Chhindwara division. Now, buffer zone has been transferred to Pench Tiger Reserve and the whole area is under the unified control of Field Director, Pench Tiger Reserve, M.P.

Extent (Area Statement & Legal Status)

Area Statement:

The total area of buffer zone is 768.300 sq. km., which spreads over Seoni and Chhindwara districts of MP. District wise area is as follows -

District	Area in sq. km.
Seoni	**500.65**
Chhindwara	**267.650**
Total	**768.300**

Legal Status:

The legal status of the Buffer zone is as follows –

Table No. - 2

Forest Area included in the Buffer zone from Territorial Divisions

S. No.	Divisions	Range	R.F. (ha) with F.V.	P.F. (ha)	Total Area	F.V. Area
1-	South Seoni Territorial	W. Khawasa	2741.670	2611.480	5353.150	119.500
		Kurai	9784.320	595.870	10380.190	823.490
		Rukhad	10871.170	1530.750	12401.920	1063.990
		Ari	7912.360	526.720	8439.080	322.450
	Total Seoni		**31309.520**	**5264.820**	**36574.340**	**2329.430**
2	East Chhindwara Territorial	Chourai	4336.675	2074.765	6411.440	610.450
	South Chhindwara Territorial	Bichhua	3424.433	393.847	3818.280	0.000
		Kanhan	0.000	202.225	202.225	0.000
	Total Chhindwara		**7761.108**	**2670.837**	**10431.945**	**610.450**
G. Total			**39070.628**	**7935.657**	**47006.285**	**2939.880**

Table No. - 3
Notified Ranges and its Area in the Buffer Zone

District	Range	R.F. (ha)	P.F. (ha)	Total Ft. Area	Rev. Area (ha)	Total Area	F.V. Area	No. of Villages
Seoni	Ghatkohka	4446.77	785.11	5231.88	6270.35	**11502**	449.76	21
	Khawasa	3155.65	3131.3	6286.95	5581.79	**11869**	119.5	24
	Rukahd	11076.85	589.04	11665.9	783.83	**12450**	1087.5	7
	Ari	12630.25	759.37	13389.6	854.75	**14244**	672.64	8
Total		**31309.52**	**5264.8**	**36574.3**	**13490.7**	**50065**	**2329.4**	**60**
Chhindwara	Kumbhpani	5684.312	2090.7	7774.98	9349.75	**17125**	610.45	24
	Khamarpani	2076.796	580.17	2656.97	6983.47	**9640.4**		23
Total		**7761.108**	**2670.8**	**10431.9**	**16333.2**	**26765**	**610.45**	**47**
G. Total		**39070.63**	**7935.7**	**47006.3**	**29823.9**	**76830**	**2939.9**	**107**

Table No. - 4
Administrative arrangement for Core and Buffer Zone

Division	Subdivision (HQ.)	Range	Core/ Buffer	Forest area (Ha.)	Rev. area (Ha.)	Total (Ha.)
Pench Core and Buffer Zone Division Seoni	Khawasa (Khawasa)	Karmajhiri	Core	14556.800	-	14556.800
		Ghatkohka	Buffer	5231.880	6270.350	11502.230
		Khwawa	Buffer	6286.950	5581.790	11868.740
	Total			**26075.630**	**11852.140**	**37927.770**
	Rukhad (Seoni)	Kurai	Core	11847.300	-	11847.300
		Rukhad	Buffer	11665.890	783.830	12449.720
		Ari	Buffer	13389.620	854.750	14244.370
	Total			**36902.810**	**1638.580**	**38541.390**
	Bichhua (Chhindwara)	Gumtara	Core	14728.900	-	14728.900
		Kumbhapani	Buffer	7774.977	9349.750	17124.727
		Khamarpani	Buffer	2656.968	6983.470	9640.438
	Total			**25160.845**	**16333.220**	**41494.065**
G. Total				**88139.285**	**29823.940**	**117963.225**

The compartment wise area detail is given in **Annexure No. – 01.** Administrative arrangement is given in **Map No. 01 to 06.** The ranges and their headquarters are shown in **Map No. 07.** The locations of Buffer Villages are shown in Map No. 08

Table No. 5
Administrative arrangements

S.No.	Range	No. of Compartments	Forested area (Hectares)	Geographical area (Hectares)
1	Ghatkhoka	26	5231.880	11502.230
	Khawasa	31	6286.950	11868.740
	Rukhad	46	11665.890	12449.720
	Ari	58	13389.620	14244.370
2	kumbhpani	43	7774.977	17124.727
	khamarpani	27	2656.968	9640.438
		231	**47006.285**	**76830.225**

Table No. 6

Details of Digitized and Notified area

S. No.	Present working plan	No. of compartments in buffer zone	Notified Forest area (hectares)	Percentage of total area	Digitized area	Percentage
1	South seoni working plan by N.S Dongrial (IFS-2003-04 to 2012-13)	160	36340.57	77.31	36750.41	77.39
2	Barghat project, Seoni	01	233.77	0.50	227.34	0.48
3	Working Plan East Chindwara divison by Satish Silawat (IFS 2008-09 to 2017-18)	36	6411.44	13.64	6493.41	13.67
4	Working Plan South Chindwara by Shri. Shamsher Singh (IFS 2011-12 to 2020-2021)	34	4020.50	8.55	4015.75	8.46
	Total	**231**	**47006.28**	**100**	**47486.91**	**100**

Table No. 7

Area included in buffer zone and available for TCP

Legal Status	Forest area available for Buffer Zone(Notified area), Chindwara		Forest area available for Buffer Zone(Notified area), Seoni		Forest area available for Buffer Zone(Notified area), Seoni+ Chindwara	
	No. of blocks	area (hectares)	No. of blocks	area (hectares)	No. of blocks	area (hectares)
Reserved Forest	12 (complete) 2 (partial)	7761.108	15 (complete) 4 (partial)	31309.520	27(complete) 6 (partial)	39070.628
Protected Forest	31(complete)	2670.837	14 (complete) 3 (partial)	5264.820	45 (complete) 3 (partial)	7935.657
Total	**-**	**10431.945**	-	**36574.340**	**-**	**47006.285**

The notified area is planimetered area of compartments. As per block notification, the area is 36791.22 ha.

Table No. 8

Notified and Digitized forest area available for TCP

S. No.	Legal Status	Notified area (hectares)	Digitized area (hectares)	Difference
1	Reserved Forest	39070.628	39449.78	379.152
2	Protected Forest	7935.657	8037.13	101.473
Total		**47006.285**	**47486.91**	**480.625**

Table No. 9

Difference between notified and digitized area

S.No.	Percentage of difference	Reserved beats	Protected beats
1	0-5	30	27
2	5-10	1	13
3	10-20	0	6
4	20-30	2	1
5	30-40	0	0
6	40-50	0	1
7	> 50	0	0
Total		33	48

Table No. - 10

Blocks with a difference of more than 5%

S. No.	Blocks	Legal Status	Notified area	Planimetred area of present working plan	Digitized area	Difference in area	Percentage
1	Jhalagondi D	Reserved	65.114	62.480	60.33	-4.784	-7.35
2	94A pulpuldoh upper	Reserved	548.700	388.375	387.780	-160.920	-29.33
3	93 Dawajhir	Reserved	291.800	291.800	205.360	-86.440	-29.62
4	Kedajhiri	Protected	218.5	186.200	206.96	-11.54	-5.28
5	Chandrapur	Protected	72.1	76.050	76.89	4.79	6.64
6	Ambadi	Protected	50.18	56.700	53.92	3.74	7.45
7	Bawli A	Protected	46.54	33.980	41.3	-5.24	-11.26
8	Saliwada	Protected	12.140	11.925	12.800	0.660	5.44
9	Pathri B	Protected	115.300	119.475	122.000	6.700	5.81
10	Mandria	Protected	36.085	36.925	38.310	2.225	6.17
11	Kadhaiya	Protected	21.760	21.975	23.320	1.560	7.17
12	Kanhargaon B	Protected	35.860	38.025	38.550	2.690	7.50
13	Antara C	Protected	9.690	9.449	10.480	0.790	8.15
14	Sajapani	Protected	124.200	126.025	134.780	10.580	8.52
15	Jamtara	Protected	869.210	993.575	951.290	82.080	9.44
16	Bandhaan	Protected	29.900	31.275	32.810	2.910	9.73
17	Pathra Kalan	Protected	20.050	20.250	18.080	-1.970	-9.83
18	Bandhaan Raiyatwadi	Protected	221.986	241.650	246.630	24.644	11.10
19	Kanhargaon A	Protected	143.700	164.200	164.020	20.320	14.14
20	Pathri A	Protected	198.489	222.075	226.590	28.101	14.16
21	Dudhgaon B	Protected	46.680	48.050	53.300	6.620	14.18
22	Halalkalan B	Protected	16.200	15.750	18.820	2.620	16.17
23	Dudhgaon A	Protected	47.410	60.525	59.320	11.910	25.12
24	Halalkalan A	Protected	43.700	61.450	63.800	20.100	46.00

Table No. 11

Range wise available area for TCP

Range	Reserved Forest		Protected Forest		Total	
	Comptt. no.	Area (Hectares)	Comptt. no.	Area (Hectares)	Comptt. no.	Area (Hectares)
Ghatkhoka	21	4536.58	05	799.80	26	5336.38
Khawasa	14	3159.35	17	3196.55	31	6355.90
Rukhad	44	11247.19	02	597.86	46	11845.05
Ari	54	12668.94	04	771.48	58	13440.42
Kumbhpani	23	5774.13	20	2078.68	43	7852.81
Khamarpani	13	2063.59	14	592.76	27	2656.35
Total	**69**	**9449.78**	**62**	**8037.13**	**231**	**47486.91**

Table No. 12

Geo- Maps

S.No.	Scale	
	1:50000	1:15000
01	55-O-1	55-O-1-B/2, 55-O-1-B/3, 55-O-1-C/2, 55-O-1-C/3
02	55-O-2	55-O-2-B/1,55-O-2-C/1
03	55-O-5	55-O-5-A/1, 55-O-5-A/2, 55-O-5-A/3, 55-O-5-B/2, 55-O-5-B/3, 55-O-5-C/2, 55-O-5-C/3
04	55-O-6	55-O-6-A/1, 55-O-6-B/1, 55-O-6-C/1
05	55-O-9	55-O-9-A/1, 55-O-9-A/2, 55-O-9-A/3, 55-O-9-B/2, 55-O-9-B/3, 55-O-9-C/2, 55-O-9-C/3
06	55-A-13	55-A-13-A/2, 55-A-13-A/3

Highest place is 548.6mts from mean sea level and is in compartment no. 44 and the lowest place is 340mts from mean sea level and is in River Bawanthali.

Table No. 13

Length of boundary and boundary pillar numbers

Forest type	Length of boundary (k.m)			No. of munara as per present working plan
	Artificial	Natural	Total	
Reserved Forest	355.35	76.93	432.28	2257
Protected Forest	317.93	19.9	337.83	2139
Total	**673.28**	**96.83**	**770.11**	**4396**

Table No. 14

Notification details of Reserved Blocks

S.No.	Name of blocks	Notification no. and date
1	Barelipaar A, Barelipaar B, Bhodki, Katangi, Alesur	No. 5-1-79-10-2 Dated 21-02-1979 Reserved under section 20
2	Chelagondi E, Chelagondi D	No. 5-33-78-10-2Dated 17-4-1979 Reserved under section 20
3	Kuppitola, Mahegaon, Paraspani,Potia, Satosa, Jirewada B, Awardhani, Gudapaar B	No. 5-4-79-10-2 Dated -23-03-1979 Reserved under section 20

S.No.	Name of blocks	Notification no. and date
4	21 Kurai part, 25 Khawasa, 22 Agari	No. 885 Dated 20-02-1879 Old reserve forests
5	20 Ganginala part	No. 917 Dated 24-02-1879 Old reserve forests
6	89 Saankh, 92 Kumbhapani, 93 Dawajhir, 95 Kishanpur A, 95 Kanhasagar	No. 917 Dated 22-02-1879 Old reserve forests
7	94 Gumtara, 95 C Bandhaan, 94 B Chargaon, 102 Dudhgaon, 94 A pulpuldoh upper, 94 A pulpuldoh lower, 98 A Puntara, 100 A Saliwada, 101 Marzadpur, 100 Gumaz	No. 917 Dated 24-12-1879

Table No. 15

Details of Legal status of Protected Forests

S. No..	Current Status	No. of Blocks	Area (Hectare)
1	Blocks notified under section 4 of Indian Forest Act 1927	39	7575.422
2	Blocks notified under section 29 of Indian Forest Act 1927	9	360.235
	Total	48	7935.657

1.1.4 Notifications:

449.392 sq. km of area was notified as "Pench Sanctuary" vide the Govt. of M.P. Forest Department Notification no. 15/11/77-10/3, Bhopal dated 30-09-1977**. (Annexure No. – 02)**

Govt. of M.P. has declared its intention to constitute an area of **292.857** sq. km which was carved out from the initially notified sanctuary as Pench National Park; vide the Govt. of M.P. Forest Department's Notification no. 5-15-82-10-(2) Bhopal dated 01-03-1983. **(Annexure No. – 03)**

Out of the remaining portion of **156.535** sq. km, an area of **118.473** sq. km. was retained as Pench Sanctuary, while the remaining area of **38.062** sq. km. was excluded from the initially notified Sanctuary.

The Pench Sanctuary was finally notified vide the Govt. of M.P. Forest Department's Notification no. F.15-65-96-X-2 Bhopal dated 21-8-1998. **(Annexure No. - 04)**

The National Park & Sanctuary were renamed as Indira Priyadarsini Pench National Park and Pench Mowgali Sanctuary respectively vide Govt of M.P. Forest Department's Notification no. F. 15-5-2002-10-2 Bhopal dated 15-11-2002 **(Annexure No. - 05)**

The National Park was finally notified vide Govt of M.P. Forest Department's Notification no. F.15-11-05-X-2. Bhopal dated 16-12-2005 as Indira Priyhadarshini Pench National Park. **(Annexure No. - 06)**

The Govt. of India, Ministry of Environment and Forest, Project tiger, conveyed its approval for the establishment of project tiger (19th) vide his order no. 1-2/92-PT (Part-II) dated 23 November 1992 **(Annexure No. – 07)** as per the proposal received from the State Govt. vide latter no. 14/21/10/2/ 92 dated 10-08-1992. The total area of the project tiger was 757.850 sq. km. out of which Pench National Park (292.857 sq. km.) was declared as core and rest of the area which includes Pench Sanctuary (118.473 sq.km.) and adjoining 346.520 sq. km. as buffer area.

An area of 411.330 sq. km. of Indira Priyadarshini Pench National Park & Pench Mowgli Sanctuary was declared as Core Area of Pench Tiger Reserve, Seoni vide Govt. of M.P. Forest Department's Notification no. F.15-31-2007-X-2 dated 24-12-2007. **(Annexure No. – 08)**

Lastly the Buffer area has been notified by Govt. of M.P. Forest Dept. Notification No. F.15-8-2009-X-2 dated 05-10-2010. **(Annexure No. – 09)**

1.2 Approach and Access:

The Pench Tiger Reserve is approachable by road from Jabalpur, Chhindwara, Seoni and Nagpur.

The headquarters of the Pench Tiger Reserve is located at Seoni, which is situated at 70 Km from Chhindwara, 128 km from Nagpur and 145 km from Jabalpur. The nearest Airports are at Nagpur and Jabalpur.

1.3 Statement of Significance:

The buffer zone of Pench Tiger Reserve boasts its importance in the natural history of central India, as it has great richness in terms of flora and fauna. It has been one of the most important habitats in the world for the conservation of highly endangered Species *Panthera tigris,* The Tiger. Besides the highly endangered Indian Tiger, the forest also harbours a wide range of faunal species some of which figure prominently in the IUCN Red List. It also harbours great biodiversity of floral species, some of them extremely important in the context of conservation. The forest area provides suitable habitat for residential birds. It harbours high ungulate and biomass density.The Pench Tiger Reserve is centrally located in Central highlands of India. It is connected to Kanha Tiger Reserve by forest of Seoni, Balaghat and Mandla districts and satpura Tiger Reserve by forests of chindwara district.

Given such great significance of the buffer area of Pench Tiger Reserve, it becomes important to manage the area in such a way that adequate dispersal habitat and other critical ecological functions are maintained along with the interests of people residing in buffer zone. To achieve these objectives, buffer zone of PTR has been notified. Buffer zone can be defined as-

"Any area, often peripheral to a protected area, inside or outside, in which activities are implemented or the area managed with the aim of enhancing the positive and reducing the negative impacts of conservation on neighbouring communities and neighbouring communities on conservation."

The buffer zone of PTR includes reserved and protected forests and revenue area of Seoni and Chindwara districts. The spread of buffer zone is in Barghat and Kurai blocks situated in the southern part of Seoni district and Chaurai and Bichchua bolcks of Chindwara district. The forest area of South Seoni, East Chindwara and South Chindwara divisions have been included in the buffer zone of Pench Tiger reserve.

The buffer zone is significant in terms of extending the habitat and thus increasing the population of large, wide-ranging species, along with Tiger, in the protected area and providing a filter or barrier against human access and undesirable use of the core. Activities in buffer area will increase the income for local people via tourism, as livelihood is a bigger concern for them rather than conservation. By doing so, our objective is to promote co-existence, as if our wildlife is to be conserved for posterity, as no amount of investment or effort can succeed without the active support and cooperation of local people.

The buffer zone comes in the Pench- Kanha and Pench-Satpura Corridors. The area is very important for gene flow of various species; especially Tiger, Leopard and gaur.Tigers are traditionally using these corridors since time immemorial. It has been proved by camera trap photographs and DNA analysis of scats by CCMB, Hyderabad and WII, Dehradun. The buffer forest is vital for the existence of top predator Tiger in the Central Indian Landscape.

Buffer zone forests constitute mainly very good quality teak forests, mixed forests and Bamboo forests. The density of forest is between 0.4-0.6. The Rukhad range has very good forests of Bamboo in the lower storey. About 40.21% of buffer zone is occupied by Bamboo forests. There were gregarious flowering in the Bamboo clumps in 2004-05. Due to good management practices and protection from fire, etc., the bamboo regeneration has been very well established. Bamboo has attained height of 3-5 mts in areas where flowering occurred. The extraction of Bamboo from these areas will start from 2017-18.

The 48.94% of the buffer zone which is about 23242.86 hectares is occupied by Teak forests. The site quality is mainly III and IV a type. Other associated species are Saja, Dhawda, Bija, Haldu, Mundi, Garari, Dhaman etc.

The 40.38% of the total area is occupied by mixed forest. Main species are Saja, Dhawda, Amla, Achar, Mahua, Arjuna etc. The area is full of important Non Timber Forest Produces and Medicinal Plants.

The rock types are mainly granite and gneiss. In certain pockets, basaltic rocks also exist. The soil type is sandy, loam and black cotton soil. The area is well drained. Palatable grasses like Themala sp. , gunher, shukla etc. are present almost everywhere in the teak forests due to opening in teak canopy during summers.

Many Biological hotspots, Swamps along with unique habitats like Snags, Nesting sites, Cliffs, Overhangs, Talus, Dens, Caves and natural salt licks etc. are found in buffer zone. These are very important wildlife habitats. They have been annexed has **Annexure No. 23.** and the maps has been given as Map No. 36 A to 36 M This area also harbours endangered species like Shisham, Kullu, Bija, Khair, Salai, Moyan, Kusum etc. Such species are important from the angle of biodiversity conservation.

The buffer zone is very important for genetic diversity and gene flow in the landscape. This is vital for keeping Tiger Population Sustainable in the Landscape. The buffer zone takes care of the spillover population of tiger and other species by providing area for dispersal and suitable habitat to Tiger and other species from adjoining core area of Pench Tiger Reserve.

Traditionally also, this area has great potential for wildlife. The habitat is suitable for predators, co-predators and prey base. Rukhad forest is known for its large Gaur population. Tigers, leopards, Wild dogs (Dholes), Sloth bears, Wolf etc are frequently sighted here. In herbivores, Sambhar, Cheetal, Blue bull, Chinkara, Wild Boar etc. are found here in medium density. There is no dearth of water in the area for wildlife. With the taking up of wildlife management activities and strict protection measures and with the active involvement of people of villages of buffer zone, the habitat can be made suitable for spill over population of wildlife. Buffer zone is a multiple use area with eco tourism activities with the participation of local people, can boost the economy of the area.

1.4 Geology, rock, Soil and Climate

1.4.1 Geology and Rock:

The main Geological formations found in the Buffer zone of Pench Tiger Reserve are as under:-

Table No. – 16

Geological Formation of Buffer zone

S. No.	Geological Time Scale	Geological Formation
1	Recent	Alluvium
2	Pleistocene/Recent	Laterite
3	Cretaceous/Eocene	Deccan trap with inter-trappean beds & lametas
4	Archean	Metamorphic and crystalline complex.

1. Archean:

Archean rocks were formed during the very early period when there was no life on the earth. They are mostly of igneous origin, comprising metamorphosed granitic and basaltic rocks together with a subordinate amount of sediments. They consist of greenstone, amphibolites, amphibole schists, granetiferous, micascous and other schists, granodioritis, gneisses and granites etc. These rocks form the basement of all other formation, so they are referred as basement complex or fundamental gniess.
Archaean rocks are found in most parts of the Buffer zone. Lithologically they are of "Pre-Cambrian" age. These rocks are further sub divided in to as follows:

A. The rock of Saunsar Series:

The oldest exposed rocks occur in the form of a linear belt well exposed on National Highway No. 7. This group of rock comprise of a series of schists, gneisses, marbles and calc-gneisses, granulites, conglomerates, dolomitic marbles and other sedimentary and igneous metamorphic rocks. These are associated with granites and ortho and composite gneisses. Granites and amphibolited pegmatite and quartzite later intrude these rocks.

B. Granites and Granite series:

This group comprises of granites, gneisses, crystalline schists, instrusive pegmatites, quartz veins and other acid and basic intrusive. Texture of gneiss varies from holocrystalline muscovite rock to almost felsites with so fine a texture that it appears homogeneous to naked eyes.Ari and Rukhad range rocks are made of mainly biotite gniess.

2. Deccan traps and associated sedimentary rocks:

Deccan trap is basaltic flow, which is one of the extrusive igneous rocks widely distributed in Seoni and Chhindwara. These rocks are often associated with infra-trappeans and inter-trappeans sedimentaries.

A. Deccan – Trap:

Deccan trap are mostly basaltic in nature and comprises of various flows. These are generally dark black in colour and fine to medium grained. The flows are hard, compact and massive in nature, with or without vasicles and amygdules. Amygdules are some time filled with beautiful crystals of variety of quartz. Jointing and culumnar jointing is quite common in Deccan traps. Physiographically the Deccan traps occupy the higher elevation and forms broad levelled grounds with occasional conical hills.

The trap country is characterised by flat-topped hills and step like terraces. This topography is a result of the variation in hardness of the different flows and of parts of the different flows, the hard portions forming the tops of the terraces and plateau. In the amygdular flows the top is usually highly vesicular, the middle fairly compact and the bottom showing cylindrical pipes filled with secondary minerals, while in the ordinary flows, the top is fined grained and the lower portion coarser with a concentration of basic minerals like pyroxene and olivine. Vascular and non-vascular flow may be alternate with each other or the flows may be separated by the beds of volcanic ash or a coriac and by lacustrine sediments known as inter – trappean beds.Thickness is 1mt but at some places its more than that also.

Alternating and weathering of the traps:

The trap weathers with characteristic spherical ex-foliation which gives rise to large rounded boulders on the outcrops. The weathering starts along the well-developed joints, first rounding off the angles and corners and then

producing thin concentric shells or layers which become soft and fall-of gradually. The interiors of the spheroidal masses are however, quite fresh.

B. Infra-trappean rocks:

Infra trappean Rocks are exposed at the base of Deccan trap and comprise of calcarious sand stone, pebble beds, marls and impure limestones. Occasionally a few ill-preserved fossils may be present in these rocks. Infra-trappean rocks found in this area are Lameta, which are fluviatile or estuarine beds occurring below the traps at about the same horizon or slightly above that of Bagh beds of Narmada valley. They are found to rest on various older formations such as the Archeans, the Upper Gondwanas or the Bagh beds. The chief rock types found in them are limestone, with sub-ordinate sandstones and clays. In this area Lametas are found between the trap base and gneissese rocks. They are thin and generally crop out along the base of the trap scarps. Usually thickness is 1 mt. They are calcarious sandstone, conglomerates, grits and felspathic grits derived from the denudation of underlying gneiss and granites.

C. Inter-Trappean beds:

Inter – trappean beds are found in form of thin limestone, sandstone and shales & converted chert beds. They separate two basaltic flows from each other and are comprised of cherts, chrty limestones and impure clay bonds. These rocks also contains at times few well preserved plant and animal fossils.

3. Laterite:

Laterite is a product of tropical alteration suffered by some rocks. It is porous, pitted, clay like rock with red, yellow, brown, grey and mottled colours. It has a hard protective limonitic crust on the exposed surface, which is generally irregular and rough. When dug up, the fresh material is comparatively soft an easily cut by a spade or a saw. When the fresh soft rock is exposed to air it is quickly dehydrated and become quite hard.

Laterite is composed mainly of hydrated oxide of iron and alumina together with those of certain elements which form the group of hydrolystate such as manganese, titanum, V-anadium, zirconium etc. The silica along with magnesia, alumina etc. contained in the original rock are removed of the elements present, laterite may be called ferruginous, aluminous and maganiferous. In general ferruginous laterite is red to red-brown in colour, the aluminous one grey cream, and magniferous one dark brown to black.

Laterite may be derived from alkali rock like nepheline-syenite, trachyte; intermediate and basic igneous rocks like dolarites and basalts; geneissic rocks rich in feldspars and sedimentary rocks including shales and impure limestones

High level and low level laterite:

All the more important occurrence of laterite form massive beds which generally are found capping hills on the Deccan trap country. Laterite also occurs in the plains and at the base of the hills, these being in most cases, of secondary origin, derived from the high level laterite and recemented after deposition in the valleys or plains.

1.4.2 Soils:

Soil is the most precious natural resource of an area. The entire floral and faunal diversity of the area depends upon the soil. Soil is derived from underlying parental rock by means of weathering due to many natural agents like rainfall, temperature, wind and runoff. It is most important abiotic component of natural ecosystem, which is intermediary in the bio-geo-chemical cycle.

Soil of Buffer zone can be divided on following basis

1. Parent Material:

A. Regur or Black Cotton Soil
B. Lateritic Soil
C. Sandy Soil
D. Kankar and saline Soil
E. Alluvial Soil

A. Regur or Black Cotton Soil:

The traps give rise to either a deep brown to rich red soil or to Regur (black cotton soil). Regur is rich in plant nutrients such as lime, magnesia, iron and alkalies on which cotton and certain dry crops flourish. It has the property of swelling greatly and becoming very sticky when wetted by rain. On drying, it contracts again with the production of numerous cracks.

B. Lateritic Soil :

Another product of weathering of trap is laterite, a material from which silica, alkalies and alkaline earths have been leached away, leaving behind alumina, iron, manganese and titanium. It has vermicular or pisolitic structures and contains much water. Some laterites which are highly aluminous form deposits of bauxite. The trap scraps is the vital factor in the drainage of the area acting as watershed.

C. Sandy Soil :

Most of the area of Core and Buffer Zone is covered with sandy loam soil. The soil is the result of weathering of granitic gneisses. This soil type mostly occurs on gentle slope and valleys.

D. Kankar and Saline Soil :

This soil type is found in the foothills in areas with less tree cover and forest gaps. They contain large proportion of silica and orthoclase quartz and have low water holding capacity. They are generally mineral deficient and have low productivity. They are easily eroded under insufficient vegetation cover. Tree species of Dhawai, Khair, Pendra and Garari are found in this soil.

E. Alluvial Soil :

Alluvial soils do not really form a definite group. They represent both transported and residual soils, which may have been re-worked to some extent by water. Most of the alluvial soils are found in valleys & nala beds.

Under the influence of water, wind, rains and heat, the rocks are broken up in fine particles and carried down stream through various rivers & nalas and are subsequently deposited in the valleys, forming superficial layers. These formations carry with them the characteristic of the underlying rocks. Recent alluvial deposits are found along the Pench River and small streams of the tract. Typical examples are area along Pench, Boda nala etc.

2. Geological formation and vegetation in the buffer zone

New Alluvium	Teak Forests
Pliestozone/ New Interite	High Percentage of Teak Forests
Cretaceuos/Euzone (Deccan trap) with inter trappean beds and Lamata	Teak and Mixed Forests
Archean and crystalline complex	
a. Ramtek Quartzite	Mixed Forests
b. Lohangi and Utekata Formation	Mixed Forests
c. Amphibolites (Crystalline limestones)	Mixed Forests
d. Hornblend Sehist	Mixed Forests
e. Granite and Pogmatite	Teak Forests with bamboo
f. Gneiss	Teak Forests with bamboo
g. Crushed Zone	Mixed Forests

1.4.3 Physiography

The PTR is located in the southern lower ridges reaches of the Satpura hill ranges. The folding and upheavals in the past resulted in formation of a series of hills and valleys, rendering the terrain highly undulating with most of the area covered by small hill ranges steeply sloping on the sides. Jutting out of the general undulating ground are many prominent hills, some rising over 600 M. above M.S.L. The Rukhad area is mostly hilly with valleys and some undulating plain at the base of the hills. The Ghatkohka and Ari range are mostly undulating with some prominent hills. These hills have almost flat, gently slopping top and steep sides.

1.4.4 Slopes:

The slope categories in Buffer zone have been identified into three class viz. (0-11 degrees, 12-22 degrees, and 23-34 degrees). Most of the area falls into flat to gentle slope (0-22 degrees) class. In some part of the reserved forests has a highly rugged terrain with steeper slopes (23-34 degrees).

The contour and drainage system of the area is shown in Map No. 09 and 10.

1.4.5 Climate

1.4.5.1 Season:

The PTR lies with in the Tropical Zone, having three district seasons with one less distinct post monsoon season. Due to great variation in temperature, humidity and precipitation in different seasons, these factors serve as regulators of vegetation and habitat of wild animals.

(A) Summer season: -

The summer season set in the month of March and last till around mid June, when the area receives first showers of monsoon. The last fortnight of May is the hottest, and the mercury may shoot up to 45^0C. As compared to the low-lying plains outside the park and sanctuary area, the hilly tract of the buffer area experiences a milder summer. The summer season is usually dry but instances of rains, hailstorms and thunder do occur in the month of March and April. The relative humidity in the early afternoon is as low as 15-20%. The forests, which have been shedding their leaves, now wear a bleak look. The forest floor remains covered with dry grasses and fallen leaves. The water level in the area drops drastically, and by the mid of April most of natural water sources vanish. Except for a few perennial springs, artificially created water tanks, water can be seen only in few area of the riverbed of Pench river, in the shape of small water reservoirs locally called as 'Kassa' or 'Doh'. Summer fires play havoc as the dry tall grass and fallen leaves work as ready fuel. Man-made ground fires are common in this time of the year, and high temperature posses many problems in fire fighting operation. Such man-made fires usually originates as the local people clear the ground by the fire to collect mahua flowers, or set fire to induce new flesh of tendu leaves from the root suckers. At times, wanton fires occur to divert the attention of staff, when the miscreants sneak in to collect fallen antlers or honey. Some time fire is caused by local people to take revenge against the authority for preventing them for illegal activities.

(B) Rainy season: -

The advent of rainy season starts with pre-monsoon showers usually received in the second or third week of June, and regular onset takes place by the first week of July. The wettest months are July and August, when around 80% of the total annual rainfall is received in the season, which is around 1200 mm. The onset of rains transforms the entire landscape very quickly, and the forests and meadows are restored to their previous lush-green condition. The rainy season is from the second week of June to almost middle of September.

(C) The Post monsoon season –

This season, although, not so distinct in the meteorological sense, is distinct from wildlife management point of view. This is a season, which commences when monsoon culminate i.e. from mid September to October. This post monsoon period provides food, water and shelter in abundance. The grasses, seedlings and saplings remain green and palatable; water is available in stream, Nalas, natural depressions in almost every part of the Buffer zone. This is a period during which most ungulates litter and the wilderness experiences sudden growth in a population in the lower forms of life. Therefore, this is season of abundance, which follows the period of respite (rainy season) and then gradually passes into a period of scarcity especially for herbivores.

(D) The winter season –

The winter season starts from November and continues till the end of February. January is the coolest month. The mean minimum temperature is 11.8^{o}c. Frost is not common in the area, but the relative humidity becomes very high during the night and the incidence of dew is heavy. Most of the grass species shed their seeds and gradually become dry and coarse by this. The predominant grass species *Heteropogon contortus, Themeda triandra*, *T. quadrivalvis* and *Aristida spp.* becomes too coarse and tall to be eaten by most herbivores. This month marks the onset of food and water scarcity for many animals, which becomes acute by the end of the winter season. Winter rains in December, January, and February are helpful in the year of low rainfall; it helps in replenishing the drying water holes as well as in keeping the grasses green in low-lying localities. Crop raiding in adjacent cultivated areas, especially by blue bull, wild boar and Cheetal, increases during this period.

1.4.5.2 Rainfall –

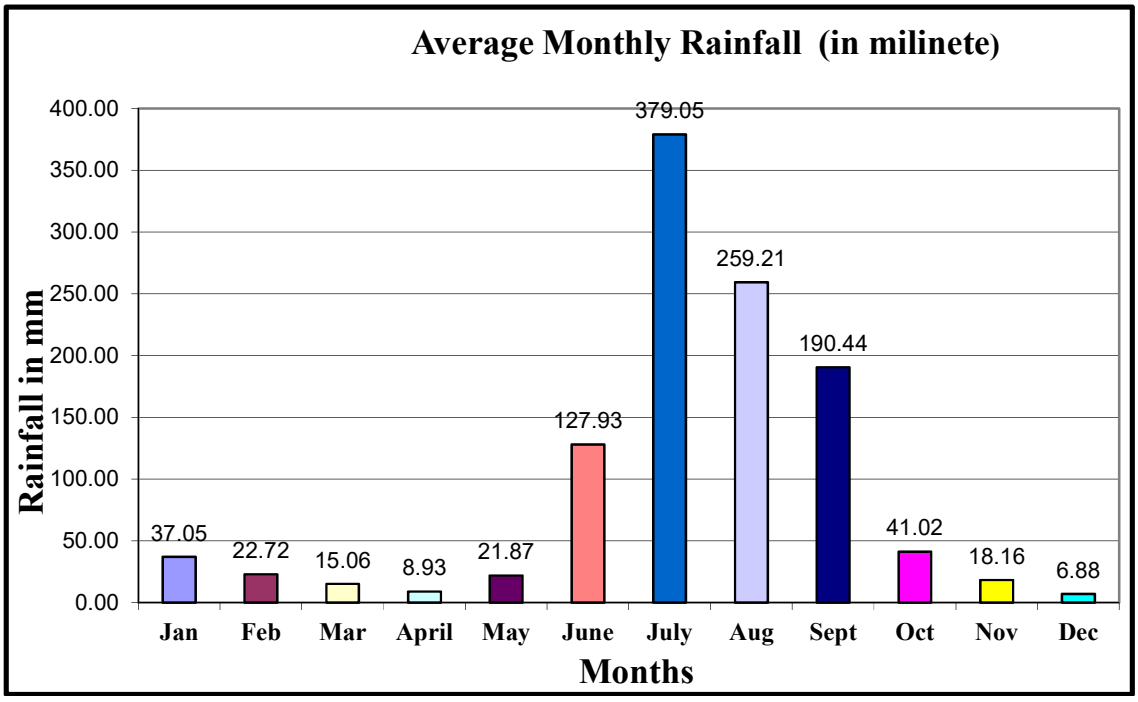
Rain is the source of maximum annual precipitation in the area other than mist, fog and dew. Monsoon is the main source of rainfall, though pre-monsoon showers and some times winter rains are also experienced in this area. The average month wise rainfall is presented below. The detail month wise year wise rainfall data is given in **Annexure No. – 09**

Table No. – 17

The Average month wise average Rainfall data recorded Seoni 2002-2011

Season	Month	Monthly Rainfall	
		Millimetre	Percentage
Rainy Season	June	127.93	11.34
	July	379.05	33.59
	August	259.21	22.97
	September	190.44	16.88
	Total	956.63	84.78

Winter Season	October	41.02	3.64
	November	18.16	1.61
	December	6.88	0.61
	January	37.05	3.28
	February	22.72	2.01
	Total	125.83	11.15
Summer Season	March	15.06	1.33
	April	8.93	0.79
	May	21.87	1.94
	Total	45.86	4.06
Grand Total		1128.32	100.00

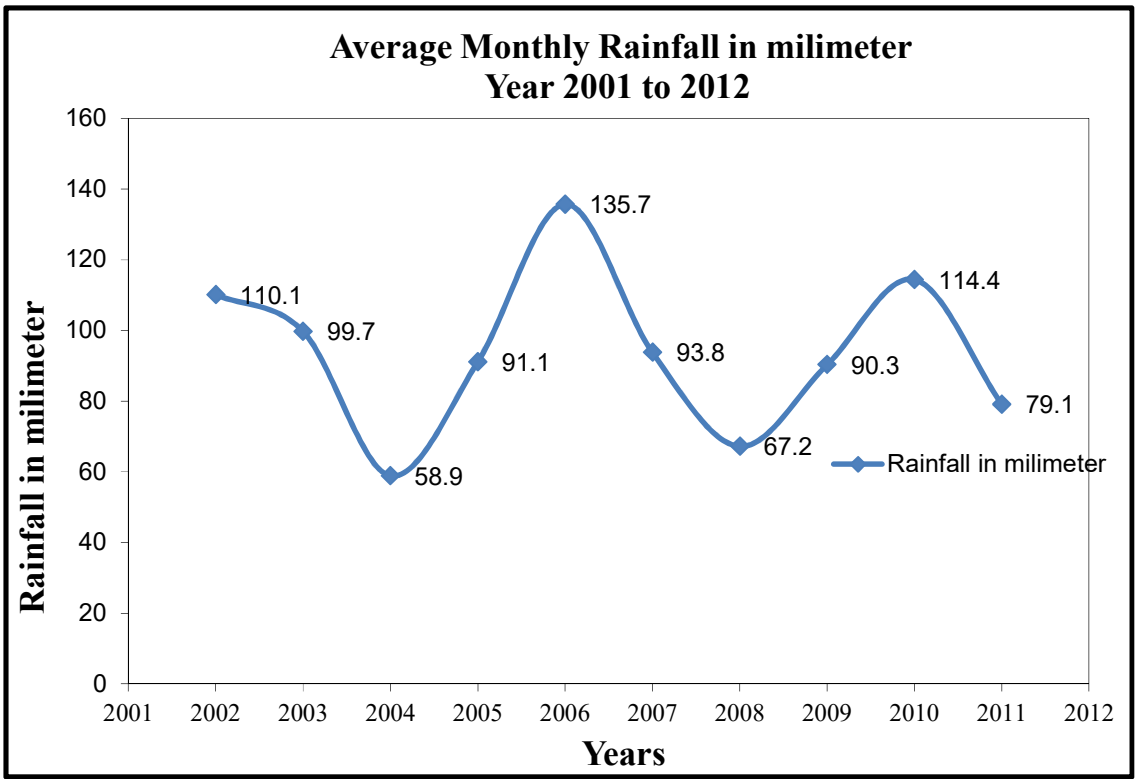


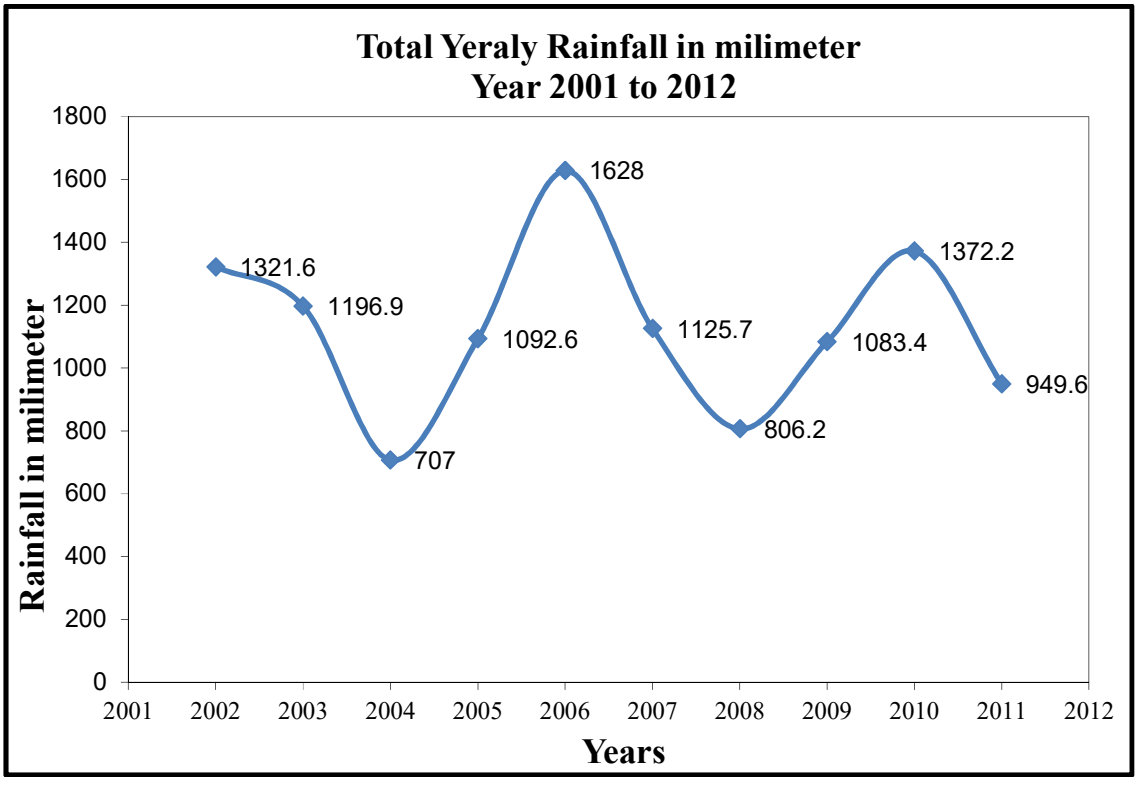
84.78% rain occurs in rainy season, only 11.5% in winters and 4.03% in summer season

Table No. – 18

Total rainfall and average rainfall

Year	Average monthly rainfall(mm)	Total rainfall (mm)
2002	110.1	1321.6
2003	99.7	1196.9
2004	58.9	707
2005	91.1	1092.6
2006	135.7	1628
2007	93.8	1125.7
2008	67.2	806.2
2009	90.3	1083.4
2010	114.4	1372.2
2011	79.1	949.6


Average Monthly Rainfall in milimeter
Year 2001 to 2012
Rainfall in milimeter
160
140
120
100
80
60
40
20
0
110.1
99.7
58.9
91.1
135.7
93.8
67.2
90.3
114.4
79.1
Rainfall in milimeter
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Years


Total Yeraly Rainfall in milimeter
Year 2001 to 2012
Rainfall in milimeter
1800
1600
1400
1200
1000
800
600
400
200
0
1321.6
1196.9
707
1092.6
1628
1125.7
806.2
1083.4
1372.2
949.6
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Years

1.4.5.3 Temperature –

Average highest and lowest temprature

Table No. – 19

Month wise average daily Max. & Min. Temperature (2002-2011)

S.No..	Month	Temperature (^{o}C)			
		Average daily Max	Average Daily Min	Average Daily	Average Daily difference
1	January	26.38	14.62	20.5	11.76
2	February	29.53	15.44	22.485	14.09
3	March	35.01	17.7	26.355	17.31
4	April	38.88	27.91	33.395	10.97
5	May	40.43	23.8	32.115	16.63
6	June	36.1	22.1	29.1	14
7	July	29.6	24.92	27.26	4.68
8	August	25.69	22.02	23.855	3.67
9	September	29.87	24.5	27.185	5.37
10	October	30.76	22.56	26.66	8.2
11	November	28.66	18.67	23.665	9.99
12	December	26.83	15.5	21.165	11.33
Yearly Average		**31.48**	**20.81**	**26.15**	**10.67**

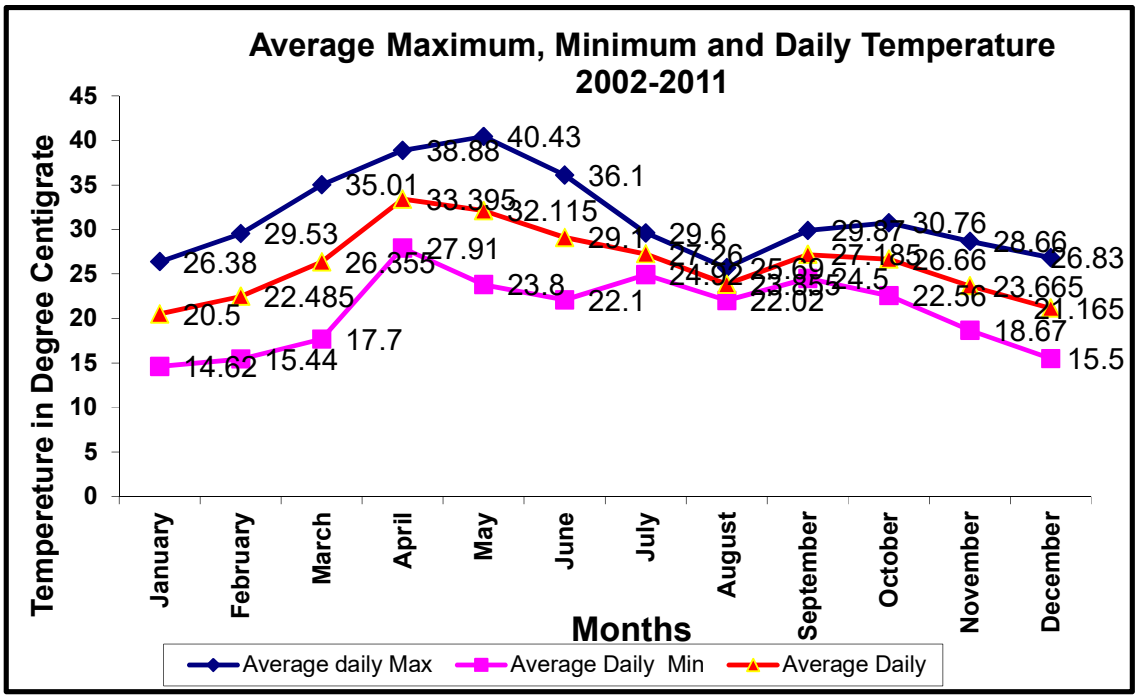
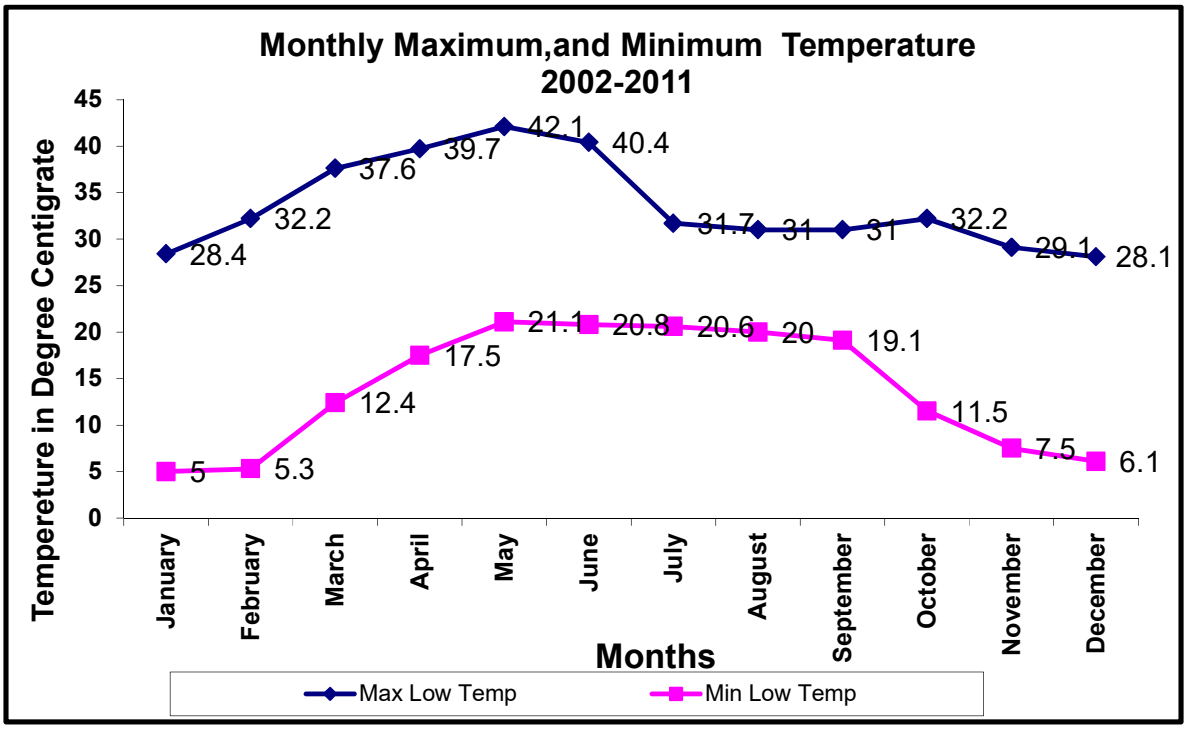


Table No. – 20

Month wise Max. and Min Temperature (2002-2011)

S.No..	Month	Maximum (^{o}C)			Minimum (^{o}C)		
		Lowest	Highest	Difference	Lowest	Highest	Difference
1	January	28.4	35.1	6.7	5	16.1	11.1
2	February	32.2	36.7	4.5	5.3	15.5	10.2
3	March	37.6	41.5	3.9	12.4	20.5	8.1
4	April	39.7	44.1	4.4	17.5	28.2	10.7
5	May	42.1	44.5	2.4	21.1	30.3	9.2
6	June	40.4	44.2	3.8	20.8	24.3	3.5
7	July	31.7	36	4.3	20.6	24.4	3.8
8	August	31	32.6	1.6	20	23	3
9	September	31	35.1	4.1	19.1	24.3	5.2
10	October	32.2	35.7	3.5	11.5	21.4	9.9
11	November	29.1	32.5	3.4	7.5	19.5	12
12	December	28.1	34.2	6.1	6.1	17.5	11.4



Effect of temprature on plant growth

Temprature more than 49 ^{o}C hinders the growth of the plant.As far as the minimum temprature is concerned, within the range of 6 ^{o}C to 16 ^{o}C , the growth is partially affected.Temprature below 6 ^{o}C affects the plant growth in negative way. The temprature is more than 16 ^{o}C from March to October and given the moisture level in the soil, the plant growth is found normal.

Table No. - 21

Month wise minimum temprature range (2002-2011)

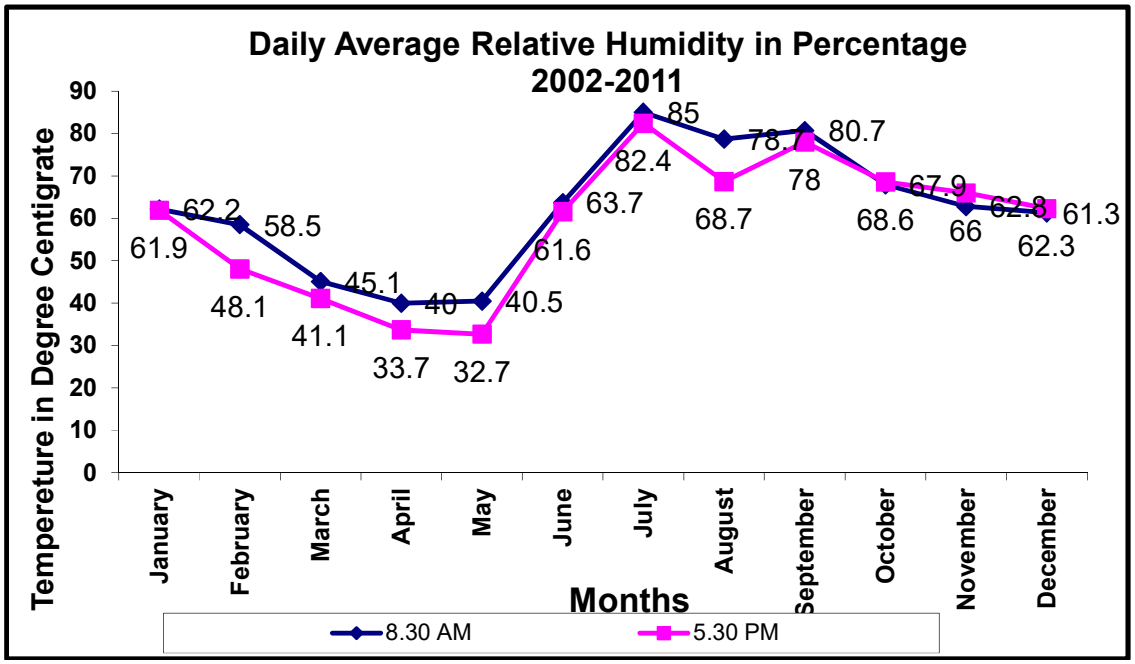
S. No.	Month	No. of months	Temprature Range is Degree Celsius		
			0 to 6	6 to 16	More than 16
1	January	10	1	8	1
2	February	10	1	9	-
3	March	10	-	4	6
4	April	10	-	-	10
5	May	10	-	-	10
6	June	10	-	-	10
7	July	10	-	-	10
8	August	10	-	-	10
9	September	10	-	-	10
10	October	10	-	4	6
11	November	10	-	5	5
12	December	10	-	9	1

1.4.5.4 Relative Humidity:

Table No. - 22

Detail of Relative Humidity in PTR (2002- 2011)

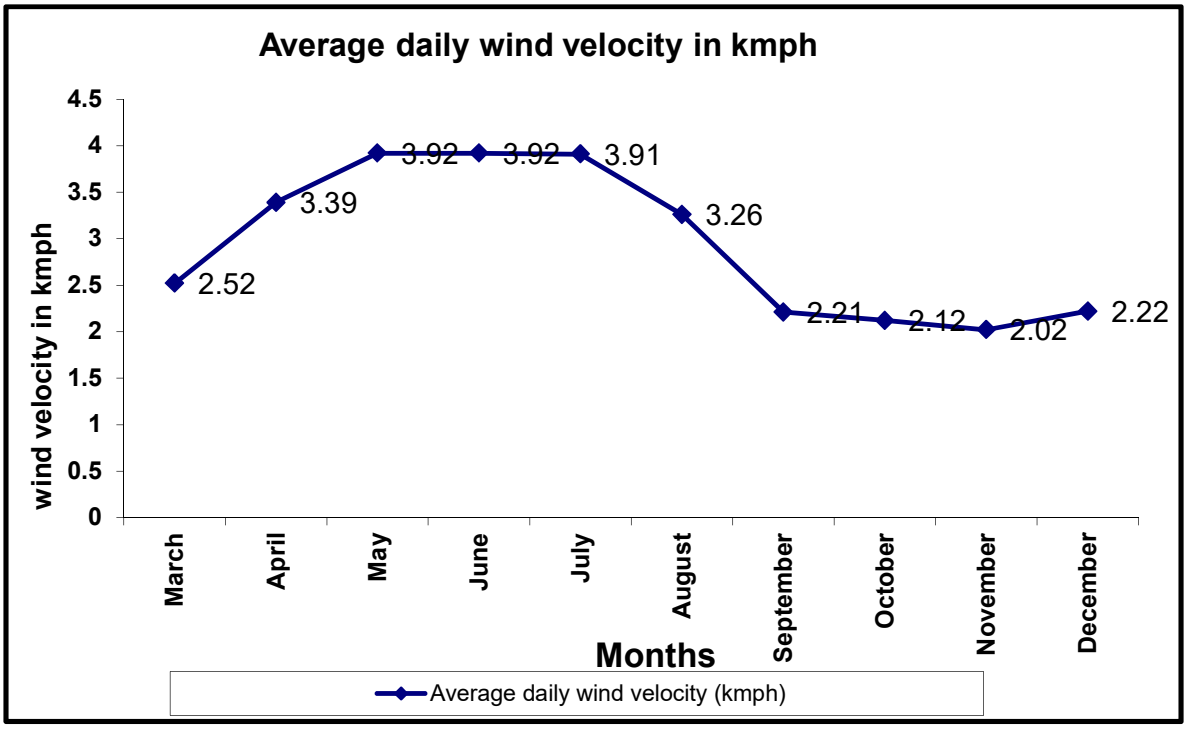
Month	Average Relative Humidity in %		Month	Average Relative Humidity in %	
	8.30 AM	5.30 PM		8.30 AM	5.30 PM
January	62.2	61.9	July	85.0	82.4
February	58.5	48.1	August	78.7	68.7
March	45.1	41.1	September	80.7	78
April	40	33.7	October	67.9	68.6
May	40.5	32.7	November	62.8	66
June	63.7	61.6	December	61.3	62.3



1.4.5.5 Winds –

Table No. - 23
Monthwise Average daily wind velocity

Month	Average daily wind velocity (kmph)
March	2.52
April	3.39
May	3.92
June	3.92
July	3.91
August	3.26
September	2.21
October	2.12
November	2.02
December	2.22



1.4.5.6 Joint effect of Temprature, Rainfall and humidity

A Miller's Formula = 80* Temprature (in degree centigrade)/Rainfall (in mm). As per the formulae given above, classification of climate based on ratio of temprature and rainfall is-

Less than 1 – Very Humid
Between 1 and 2 – Humid
Between 2 and 3- Less Humid
Between 3 and 4- Dry
More than 5 – Very Dry

1. Climograph

Average rainfall in buffer zone is 1128.32mm and average temperature is 25.16 ^{o}C. Miller's coefficient is 1.45, thus the climate of the area is humid, which is favourable and good for plant growth

Table No. - 24

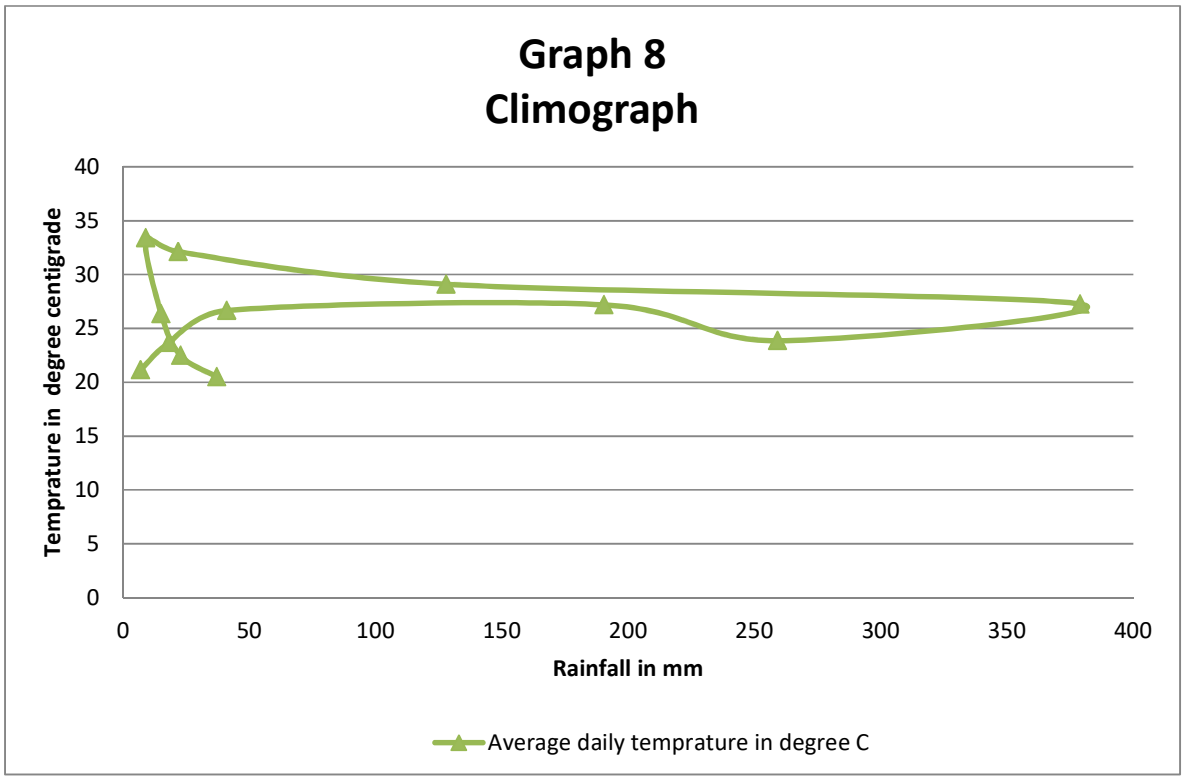
Climographically, monthwise average daily temperature/ rainfall (2002-2011)

S.No.	Month	Average Daily temprature	Avg. Monthly rainfall	
			In Inches	In mm
1	January	20.5	1.46	37.05
2	February	22.485	0.89	22.72
3	March	26.355	0.59	15.06
4	April	33.395	0.35	8.93
5	May	32.115	0.86	21.87
6	June	29.1	5.04	127.93
7	July	27.26	14.92	379.05
8	August	23.855	10.21	259.21
9	September	27.185	7.50	190.44
10	October	26.66	1.61	41.02
11	November	23.665	0.71	18.16
12	December	21.165	0.27	6.88

Table No. 25

Monthly climate based on climograph study

S.No.	Month	Climate
1	January	Cold and Dry
2	February	Cold and Dry
3	March	Hot and Dry
4	April	Very Hot and Very Dry
5	May	Very Hot and Very Dry
6	June	Very Hot and Humid
7	July	Hot and very Humid
8	August	Hot and humid
9	September	Hot and humid
10	October	Hot and humid
11	November	Cold and Dry
12	December	Cold and Dry



Conclusion-

1. Very good time for plant growth is between June to middle of October
2. Middle of October to February is generally considered good for plant growth.

1.4.5.7 Effect of soil moisture and climate on plant growth

Table No. - 26

Plant growth in different months as per atmospheric conditions

Month	Underground moisture level in root area	As per Climograph		Importance and Functionality for plant growth
		Temprature	Humidity	
June First Half	Adequate Moisture	Very Hot	Very humid	Good
July	Adequate Moisture	Hot	Very humid	Better
August	Adequate Moisture	Hot	Humid	Better
September	Adequate Moisture	Hot	Humid	Better
October	Adequate Moisture	Hot	Humid	Good
November	Usage of moisture	Cold	Dry	Good
December	Usage of moisture	Cold	Dry	Good
January	Usage of moisture	Cold	Dry	Good
February	Limited Moisture	Cold	Dry	Limited
March	Limited Moisture	Hot	Dry	Limited
April	Moisture deficit	Very Hot	Very dry	Negligible
May	Moisture deficit	Very Hot	Very dry	Negligible
June Second Half	Moisture deficit	Very Hot	Very dry	Negligible

Conclusion-

- Plateaus with less soil depth has soil moisture for very limited time, it should be reserved for grasses and suitable mixed species.
- Valleys with good soil moisture conditions are better suited for evergreen tree species.
- On slopes with less soil depth, plantation of suitable species should only be given priority. Grasses and soil water conservation measures should be given priority in open areas.
- In densely forested area, thinning process shouls start immediately after rain and should be completed before mid of December, so that plants can be benefitted from scanty rain in winter season.
- Last weeding should be completed by middle of October before loss of soil moisture.

1.4.5.8 Frosts –

It is uncommon in the plateau area and it does not have any serious effect on vegetation or on fauna.

1.5 Hydrology & Water Source

1.5.1 Natural Water Source:

The Buffer zone is criss-crossed by number of streams and nalas, but most of them are seasonal. The Pench River becomes dry by the end of March leaving behind few pools of water which are locally known as 'kassa' or 'Doh'. There are very few perennial springs (Jhirs) and seeps. It is obvious; that most of the habitats completely lacks natural water holes during the summer season.

1.6 Vegetation and Cover Types:

1.6.1 Vegetation:

1.6.1.1 Biogeographic Classification:

Pench Tiger Reserve is part of the Indo-Malayan Realm floristically and a member of the Oriental Region Zoo-geographically. As per the Bio-geographic classification of India (Rodger and Panwar, 1988), the area lies in Zone – 6 e – Deccan Peninsula – Central Highlands. The Buffer zone lies in the watershed area of River Pench and Bawanthadi. There are certain natural streams retaining water throughout the year.Some man made reservoirs, stop dams and wells are also present in the area, though they are not well distributed. Water is a limiting factor in major part of the buffer zone. Rainfall is generally very good, but due to poor watershed management practices, most of it goes waste as run-off.

1.6.1.2 Forest Types:

Based on the revised classification of forest by Champion and Seth, the following three types of forest are found in these areas: -

1. **3B/C1c –**South Tropical Moist Deciduous Forest - Slightly moist Teak Forest.
2. **5A/C1b -** Southern Tropical Dry Deciduous Forest - Dry Teak Forest.
3. **5A/C3 –** Southern Dry Mixed Deciduous Forest.

1. 3B/C1c –South Tropical Moist Deciduous Forest - Slightly moist Teak Forest.

All the teak forest of Southern slopes of Satpura range, stretching from South West Kandlai, Karmajhiri along Pench River and in south west Rukhad, Sarakha and Nahlesarra area has been classified under this category. This classification is based on the average rainfall received in Seoni district over past 95 years, which is around 1300 mm. (As per Working Plan of South Seoni Division by Shri S.D. Dwivedi). Rock types are mainly granite and gneiss. Forest density is 0.5-0.8. Site quality is III and IV A. The area lies between 396.24 to 448.68m height from mean sea level.

2. 5A/C1b - Southern Tropical Dry Deciduous Forest - Dry Teak Forest.

This forest type is found on red murrum, rocky soil (Laterite cum trap zone) area. This type exists in northern boundary of Ganginal block of Ghatkohka range, Kumbhapani and Khamarpani Ranges.This type of forest is found on plain ground as well as on the hill slopes. The density of such forest ranges from 0.6 to 0.8 and Teak forms about 25% to 50% of the total crop composition.

3. 5A/C3 – Southern Dry Mixed Deciduous Forest.

This Forest tye exist in Rukhad, Khawasa, Kurai and Khamarpani ranges.The local variations gradually merge into one another and are found intermingled over relatively small areas. Rock types are mainly gneiss and granite and in few places basalt. Soil is well drained sandy loam and at few places black cotton soil.Bamboo is found in lower storey.

Table No. – 27

Forest Types

S.No.	Forest types	Area (in ha)	Area (%)
1	Teak Dense Forest	21788.68	45.88
2	Mixed Dense Forest	17286.00	36.41
3	Teak understocked	1454.18	3.06
4	Mixed	1887.05	3.97
5	Blank	982.97	2.07
6	Plantation	560.38	1.18
7	Encroached/ Cultivation	511.13	1.08
8	Forest villages	2726.92	5.74
9	River beds,etc.	287.60	0.4
	Total	**47486.91**	**100**

1.6.1.3 Floristic composition –

(i) Overwood :

The associates of Teak are Dhawda (*Anogeissus latifolia*), Lendia (*Lagerstroemia parviflora*), Saja (*Terminelia tomentosa*), Salai (*Boswellia serrata*), Moyan (*Lannea coromandelica*), Mahua (*Madhuca indica*), Dhoban (*Dalbergia paniculata*), Mokha (*Schrebera swietenioides*), Siras (*Albizzia odoratissima*), Tendu (*Diospyros melanoxylon*), Bija (*Pterocarpus marsupium*), Tinsa (*Ougeinia oojeinensis*) & scattered trees of Shisham (*Dalbergia latifolia*), Semal (*Bombax ceba*), Haldu (*Adina cordifolia*) also occur. The trees of Koha (*Terminalia arjuna*) and Jamun (*Syzygium cumini*) are found along the bank of river.The area of Teak forest is 23242.86 hactares. Mixed area is 19175.05 hactare.The main species are Saja, Dhawda, Amla, Achar, Mahua, Arjuna etc.

(ii) Underwood :

There is generally an underwood of middle density comprising of Aonla (*Emblica officinalis*), Dhaman (*Grewia tiliaefolia*), Kumbhi (*Careya arborea*), Ghont (*Zizyphus xylopyra*), Baranga (*Kydia calycina*), Amaltas (*Cassia fistula*), Ashta (*Bauhinia racemosa*), Papara (*Gardenia latifolia*), etc. Bamboo (*Dandrocalamus strictus*) occurs in 19120.65 hectares of Teak and Mixed forests under lower storey.In 2004-05, gregarious flowering occured in bamboo clumps.

(iii) Shrubs :

Bekal (*Gymnosporia spinosa*), Dhawai (*Woodfordia fruticosa*), Karonda (*Carissa carandas*), Jhau (*Tamaryix dioica*) (occurs in river beds)

(iv) Grasses :

Apluda mutica, Digitaria setigera, Heteropogon contortus, Eragrostis tenella, Themeda quadrivalvis, T. triandra, Setaria glauca, Sorghum halepense, Sehima nervosum, usually occurs in the ground flora along with many other grass species.

(v) Climbers :

Chilati(*Acacia pinnata*), Mahulbel (*Bauhinia vahlii*), Palasbel (*Butea superba*), Lal bel (*Ventiliago madraspatana*), etc.

(vi) Weeds :

Weeds are prevalent in the over grazed area in most of the area of Buffer zone. The common weeds are Gulmehandi (*Lantana camara*), Chirota (*Cassia tora*), Van Tulsi (*Hyptis sauveolens*) and *Parthenium species*. The *Parthenium species* occurs in open areas near villages in area along the Pench River.

1.7 Wild Fauna, Habitats and Tropic Niches

1.7.1 Fauna:

Physiography, Geology, Climate & Precipitation contribute to decide the type of vegetation and habitat of wild animals in the wild ecosystem. The Buffer zone harbours flat-hilltops, varying degree of slopes and Rolling Meadows in the valleys, which offer unique setting and ecotones for creating diverse type of wild habitat, forming ideal niches for various species of plants and animals.

The animals generally seen in the Buffer Area are the Chital (*Axix axis*), Sambar (*Cervus unicolor*), Barking Deer (*Muntiacus muntjak*), Chousingha (*Tetracerus quadricornis*), Gaur (*Bos gaurus*), Langur (*Presbytis entellus*), Wild Pig (*Sus scrofa*), Jackal (*Canis aureus*), Sloth beer (*Melursus ursinsu*),

Wild dog (*Cuon alpinus*), Panther (*Panthra pardus*), Tiger (*Panthera tigris*). Apart from mammals Buffer zone offers an ideal habitat for a variety of avifauna, reptiles, fishes, amphibians and invertebrates.

The above typical fauna of the Central Indian Highland, part of the Oriental-Zoological Realm, is an amalgam of Indo-Chinese, Ethiopean and Palaearctic elements (Prater, 1948; Roberts, 1977)

The heterogeneity of habitats influences the local distribution of mammals. The presence of the mosaics of meadows within the woodland, being large expanses of herbage availability, also has a bearing on the concentration of herbivores.

Description of major wild animals is given in following tables.

Table No. - 28

Carnivorous mammals

S.No.	Common Name	Scientific name
01	Tiger	*Panthera tigris*
02	Leopard	*Panthera pardus*
03	Hyeana	*Hyaena hyaena*
04	Jackal	*Canis aureus*
05	Wild Dog	*Cuon alpines*
06	Sloth Bear	*Melursus ursinus*
07	Wild cat	*Felis chaus*
08	Palm Civet	*Melivora capensis*
09	Indian Fox	*Vulpes bengalensis*
10	Wolf	*Canis Lupas*
11	Mongoose	*Herpestes edwardsii*
12	Pangolin	*Manis crassicaudata*

Table No. - 29

Mammals (Herbivorous)

S.No.	Common Name	Scientific name
01	Monkey	*Macaca mulatta*
02	Langoor	*Presbytis entellus*
03	Cheetal	*Axis axis*
04	Sambhar	*Cervus unicolor*
05	Blue bull	*Boselaphus tragocamelus*
06	Chinkara	*Gazella gazelle*
07	Barking deer	*Muntiacus muntjac*
08	Wild boar	*Sus scrofa*
09	Hare	*Lepus nigricollis*
10	Squirrel	*Funambulus pennant*
11	Rats	*Bandicota bengalensis*
12	Porcupine	*Hystrix indica*
13	Bison	*Bos gaurus*
14	Black buck	*Antelope cervicapra*
15	Chausingha	*Tetraceros – quadricornis*
16	Indian mouse deer	*Moschiola meminna*

Table No. - 30

Birds

S.No.	Common Name	Scientific name
01	Peacock	*Pavo cristatus*
02	Indian roller	*Coracias benghalenisis*
03	Paradise flycatcher	*Terpsiphone paradise*
04	Red Jungle Fowl	*Gallus sonneratii*
05	Painted Partridge	*Francolinus pictus*
06	Grey Partridge	*Francolinus pondicerianus*
07	Chestnut bellied Sandgrouse	*Pterocles exustus*
08	Jungle Bush Quail	*Perdicula asiatica*
09	Rock Pigeon	*Columba livia*
10	Red Turtle Dove	*Streptopelia tranquebarica*
11	Lesser Golden-backed Woodpecker	*Dinopium benghalense*
12	Eurasian Eagle-Owl	*Bubo bubo*
13	House Sparrow	*Passer domesticus*
14	Common Quail	*Coturnix coturnix*
15	White-rumped Vulture	*Gyps benghalensis*
16	Black Kite	*Milvus migrans*
17	Red-vented Bulbul	*Pycnonotus cafer*
18	Baya Weaver	*Ploceus philippinus*
19	House Crow	*Corvus splendens*
20	cattle egret	*Bubulcus ibis*
21	Yellow-footed Green Pigeon	*Treron phoenicoptera*
22	Common Myna	*Acridotheres tristis*
23	Indian Grey Hornbil	*Tockus birostris*

Table No. – 31

Description of reptiles

S.No.	Common Name	Scientific name
01	Monitor lizard	*Varanus bengalensis*
02	Indian Chameleon	*Chameleon zeylanicus*
03	Oriental ratsnake	*Plyas mucosus*
04	Russel viper	*Vipera ruselli*
05	Krate	*Bangarus ceeruleus*
06	Indian Cobra	*Naja naja*
07	Python	*Python molurus*
08	Indian flapshell turtle	*Lissemys punctata punctata*
09	Indian black turtle	*Melanochelys trijuga trijuga*
10	Bronzeback tree snake	*Dendrelaphis tristis*

Table No. - 32

Fishes found in River

S.No.	Common Name	Scientific name
01	Freshwater shark	*Wallago attu*
02	Green snake head murrel	*Channa punctatus*
03	Gaint snake head murrel	*Channa marulius*
04	Chalar	*Chela bacaila*
05	Katla	*Catla catla*

06	Rohu	*Labeo rohita*
07	Mragla	*Cirrihus mrigala*
08	Orange fin labeo	*Labeo calbasu*
09	Mahur	*Tor putitora*
10	Kunda	*Barbus sarana*
11	Kursa	*Labeo gonius*
12	Bata	*Labeo bata*
13	Snakehead murrel	*Ophiocephalus striatus*
14	Tire track eel	*Mastacembelus armatus*
15	Bronze featherback	*Notopterus notopterus*
16	Devil catfish	*Bagariusbagarius*

1.7.2 Habitat zones, vegetation zones:-

In relation to the various plant assemblages, canopy density and other features of various areas, following habitat / vegetation zones can be broadly identified in buffer zone.

(i) Very dense forest with good ground cover.
(ii) Moderately dense forests with good ground cover.
(iii) Open forests with luxuriant ground cover.
(iv) Open forest with weeds.
(v) Degraded forest with good ground cover.
(vi) Sparse forest with no ground cover.
(vii) Meadows & Grasslands.
(viii) Artificially created wet-land.

1.7.3 Use of different parts of plants by wild animals:

The forest ecosystem has various established food chains incorporating a vast variety of plants and animals. Herbivores of different feeding habits consume not only the grasses but various tree species also. Use of different parts of different plants species by wild animals is given below –

Table No. - 33
Plant species and their parts used by wild animals

S. No	Plant Species	Habit	Parts used			
			Fruits	Flower	Leaves	Bark
1.	Ber	Tree	*	-	*	-
2.	Ghont	"	*	-	*	-
3.	Achar	"	*	-	-	-
4.	Kusum	"	*	-	*	-
5.	Babool	"	*	-	*	-
6.	Baheda	"	*	-	-	-
7.	Jamun	"	*	-	-	-
8.	Mahua	"	*	*	-	*
9.	Tendu	"	*	-	*	-
10.	Karonda	Shrub	*	-	-	-

11.	Lasaura	Tree	*	-	*	-
12.	Kasai	"	*	-	*	-
13.	Aonla	"	*	-	*	-
14.	Pipal	"	*	-	*	-
15.	Bargad	"	*	-	*	-
16.	Gular	"	*	-	*	-
17.	Bel	"	*	-	*	-
18.	Semal	"	-	*	*	-
19.	Mango	"	*	-	-	-
20.	Tinsa	"	-	-	*	-
21.	Palas	"	*	*	-	-
22.	Bija	"	-	-	*	-
23.	Amaltas	"	*	*	-	*
24.	Kachnar	"	*	*	*	-
25.	Khair	"	-	-	*	-
26.	Reonjha	"	*	-	*	-
27.	Siras	"	-	-	*	-
28.	Saja	"	-	-	*	-
29.	Dhaoda	"	-	-	*	-
30.	Kumbhi	"	*	*	*	-
31.	Haldu	"	-	-	*	*
32.	Sewan	"	-	-	*	-
33.	Bamboo	"	-	-	*	-
34.	Chirol	Tree	*	-	*	-
35.	Teak	"	-	-	-	*
36.	Mundi	"	-	-	*	-
37	Papra	"	*	-	-	-
38.	Dhaman	"	-	-	*	-
39.	Flacourtia	"	-	-	*	-
40.	Marod phali	Shrub	-	-	*	-
41.	Lantana	"	-	*	*	-
42.	Jangli tuar	-	*	-	*	-

The following species have been heavily browsed by Spotted Deer, Sambhar, Blue Bull, Four horned Antelope –

Table No. - 34
Plant species heavily browsed by Herbivores

S.No..	Hindi Name	Botanical Name
1.	Ber	*Zizyphus mauritiana*
2.	Ashta	*Bauhinia racemosa*
3.	Rohan	*Soymida fabrifuga*
4.	Saja	*Terminalia tomentosa*
5.	Tendu	*Diospyros melanoxylon*
6.	Khair	*Acacia catechu*
7.	Ainthy	*Helictres isora*
8.	Aonla	*Emblica officinalis*
9.	Dhaora	*Anogeissus latifolia*

1.7.4 Status of Rare & Endangered Species:

Buffer zone holds spill over Tiger population from Pench Tiger Reserve, Tiger is regarded as the most threatened species, almost on the verge of extinction in all tiger range countries in the world. No species of wildlife has captured the imagination and sentiments of international communities in the conservation history as spontaneously as tiger, evoking a tremendous response from all the concerning quarters. The World community of wildlife conservationists has focused its attention on the mobilization of international opinions & efforts to bring this species back to the safer status of its populations. The tiger population has shown remarkable upward trends since the formation of this tiger reserve.

Apart from the tiger, some other species of the same status yet of lesser renowned/publicity found in the Tiger Reserve are as following –

1988 IUCN Red List of Threatened Animals Found in Buffer zone-

Mammals:

1.	Dhole	–	*Cuon alpinus*
2.	Bengal Fox	–	*Vulpes bengalensis*
3.	Sloth Bear	–	*Melursus ursinus*
4.	Smooth Coated Otter	–	*Lutra perspicillata*
5.	Leopard	–	*Panthera pardus*
6.	Tiger	–	*Panthera tigris tigris*
7.	Gaur	–	*Bos gaurus*

Birds

1. All Gyps species (Vultures)

Reptiles

1. Indian Python – *Python molurus*

1.7.5 Locally Extinct species -

Elephant -*Elaphus maximus*

Barasingha -*Cervus duvaucelli branderi*

Cheeta -*Acenonyx jubatus*

1.8 Major conspicuous Changes in the Habitat since Inception –

The following changes have been recorded in the wildlife habitats of buffer since its inception –

1. The crop has improved in remote areas because of prescribed selection cum improvement fellings but it deteriorated near village where regeneration failed in most of cases due to biotic pressure.

2. Overall density of the Forest has not reduced much.

3. Gragarious flowering occured in bamboo forests in 2004-05. Due to protection from grazing and fire, bamboo regenration is about to establish very well.It has attained hieght of 3.5m and production is expected fron 2017-18.

4. Regenation status is better in mixed forests than Teak forests. Teak forests are slowly bieng converted into mixed forests. This is good in context of wildlife habitat. 46.3% of total area has very good regeneration.

5. Forests near villages especially near Turia and Khawasa, where many resorts and hotels have came up, are subject to biotic pressure for grazing, fuelwood and small timber. Here, habitat has changed.

6. Due to biotic pressure, weeds like *Cassia tora,* Van tulsi, *Lantana camara* etc have come on the forest floor instead of regeneration of seed origin.

7. Regeneration status in Kumbhapani and Khamarpani ranges is very low in comparison to other four ranges. Although, overall regeneration has increased.

8. It is found that weeds are taking over palatable grasses. Palatable grasses are reduced considerably in many areas.

9. Some perennial water holes are dried up now.

Chapter – 02

STATUS OF TIGERS, CO-PREDATORS AND PREY BASE

2.1 Introduction:

The Buffer zone supports good population of various ungulate species. The density is low to medium. The buffer zone falls in Pench-Kanha and Pench- Satpuda corridors, Resident population of Tigers is found in Rukhad, Ari and Kumbhpani ranges of buffer zone. Movement of transient Tigers can be found everywhere in the buffer zone due to adjoining core and corridor value. This is supported by large no. of cattle kills in the nearby villages and compensation being paid to the families. Leopards, Wild dog, Sloth bear, Wolf, Jackal etc are resident in whole buffer zone. Prey base density is higher in areas adjoining core. The Rukhad forest habitat is suitable for Gaur. Large herds of Gaurs are found in Rukhad range. Predator-prey relationship is naturally good.

Tiger & its Ecology:

The Tiger is more than the charismatic predator: it is a keystone species in its environment. By saving flagship species, the tiger, we save complex ecosystem, its services & habitats including all native flora and fauna that would otherwise be destroyed in the relentless march of human need and all too often greed. In India saving the tigers symbolises the conservation of the biodiversity and ecological restoration.

The Tiger is the largest obligate terrestrial carnivore in all of the mammalian assemblages in which it occurs in Asia. It is a specialised predator of large ungulates. It is never found far away from water but displays great adaptability in living in different climatic regimes, ranging from temperate oak-pine forests to tropical rain forests and mangrove swamps. The greatest ungulate species diversity and biomass in Asia are reached in areas where grasslands and forests form a mosaic and there is an inter-digitations of many vegetation types. In these relatively closed habitats, the tiger lives and hunts these large ungulates alone. The efficiency of hunting and living alone in close habitat has propelled the tiger's social organisation and is manifest in all its behavioural systems, food finding and feeding, mating, rearing, refusing and dispersal. There is strong sexual dimorphism and adult male can be nearly 1.7 times heavier than females. Tiger was the product of Environmental turmoil of the Pleistocene, evolving as predators to follow the radiations of large ungulates, particularly the Bovidae and Cervidae.

Reproductive capabilities:

In favourable conditions, tiger populations can grow rapidly. Gestation is short, only 103 days; females breed relatively early and they come into oestrus rapidly following loss or dispersal of young. The females first breed at about three years of age after establishing her territory. Average litter size is three varying from 2 to 5; inter-birth interval may be as short as 20 months. A relatively short inter-birth interval enhances the reproductive output of tigresses, especially if litters are large and survival of young

is high. If entire litters lost shortly after birth, the interval between litters may be very less.

Dispersal capability

Dispersal study by Smith (1993) in Chitwan found that male dispersed about three times farther than females most females were philopatric, settling next to their mothers. Age of dispersal vary from 19 months to 28 months. Dispersal is male-biased in mammals and usually the dispersing sex has a higher mortality rate than the philopatric sex.

A tigress requires 5-6 kg of meat a day for maintenance diet (Sunquist 1981) This translates to 1825-2190 kg/per year of meat but as 30% of each carcass is inedible a tigress needs to kill some 2373-2847 kg/year of meat on the hoof.

2.2 Abundance Status

Information about wildlife habitat, dens, salt licks, availability of water, nesting and roosting sites of birds etc. have been collected from each of the compartments of the buffer zone. Natural habitat for the wildlife is available everywhere due to presence of diversity in forests, geomorphologic diversity and natural water availability.

During stock mapping, signs of Tigers and Leopards are found in all ranges of buffer zone. Direct and Indirect signs found for presence of major species during survey of area are given below in the Table-

Table No.1

S. No.	Name of Wild Animal	No. of signs recorded during stock mapping				
		Direct Encounter	Footprint/Pug Marks	Scats/ Droppings	Scratches	Kills
01	Tiger	-	10	19	4	4
02	Leopard	-	1	21	-	-
03	Wild dog	5	-	3	-	-
04	Wolf	-	-	2	-	-
05	Indian Fox	1	-	-	-	-
06	Sloth Bear	-	3	13	3	-
07	Gaur	14	4	25	-	-
08	Sambhar	32	1	53	-	-
09	Cheetal	151	1	61	-	-
10	Blue bull	148	2	48	-	-
11	Chinkara	29	-	-	-	-
12	Barking deer	36	-	28	-	-
13	Wild Boar	169	-	35	-	-
14	Hare	2	-	8	-	-
15	Langur	53	-	-	-	-
16	Monkey	1040	-	7	-	-

2.2.1. Assessment of Prey Biomass:

As the assessment of prey biomass is very important to gauge the health of any wildlife ecosystem, and the conservation of wildlife is also one of the main objectives

of the Buffer Zone, the same has also been calculated on the basis of the 2010 annual population estimates conducted in this zone:

Tiger & co-predators	Prey animals
Tiger	Chital
Leopard	Sambar
Wild Dog	Gaur
	Nilgai
	Chousingha (4 horned antelope)
	Barking Deer
	Wild Boar
	Langur

For an appraisal of the available predator - prey biomass, the following average values were used:

Predator	Average weight in Kg. for both the sexes
Tiger	182.5
Leopard	59
Wild dog	17.5
Prey Animals	**(Assumed Body Weight for Computation in Kg.) (Panwar, 1990)**
Gaur	300
Sambar	150
Barking Deer	20
Chousingha	15
Chital	50
Langur	12.5
Wild pig	80
Nilgai	100

For working out the prey biomass requirement of the predators per year, the calculations were based on the projection made by Panwar (1990).

An adult (male or female) tiger requires 72 chital equivalents (72 x 50 = 3600 Kg.) per annum (1 chital equivalent = 50 kg., which is the assumed average body weight of a chital used in computation). The annual requirements for an average leopard and wild dog were also proportionately worked out by considering their body weights with respect to that of the tiger. Thus, the weight of an average adult leopard is almost 32.33% of the body weight of an average adult tiger, whereas for the wild dog this amounts to 9.59%.

Gaur, Sambhar, Barking Deer, Cheetal, Langoor, Wild Boar, Nilgai etc. are found in buffer forests with density low to medium. The biomass per sq km is also in low to medium range.

2.2.2. Endangered Species

Status and abundance of wild animals in whole working plan area was found to be satisfactory. In the forested area of buffer zone of Pench National park, habitat status, food abundance and water availability was observed to be good. According to I.U.C.N

Red List, species included in Critically Endangered, Endangered and Vulnerable list are given in table below.

Table No. 2

S. No.	Common Name	Scientific name	Status
01	Tiger	*Panthera tigris*	CE
02	Leopard	*Panthera pardus*	CE
03	Wolf	*Canis lupus*	CE
04	Sloth Bear	*Melursu sursinus*	CE
05	Chausingha	*Tetraceros quadricornis*	CE
06	Dhole	*Cuonal pinus*	CE
07	Gaur	*Bos gaurus*	CE
08	Smooth Coated Otters	*Lutrogale perspicillata*	CE

2.2.3. All India Census: Tigers, Co- Predators and Prey base

To monitor Tigers, Co- Predators, Prey base and its habitat, All India Census is done in every four years. It was first started in 2006, then in 2010 and now it is being done in year 2014. Herbivores density is estimated by line transect method and data is analysed on "Distance" software. Carnivore's density is estimated based on direct and indirect evidences/ signs found in the area.

The whole assessment process is divided in three phases. All forest officers were trained properly on the methodology part.

In Phase I, the methodology consisted of double sampling approach wherein the State Forest Department estimated occupancy and relative abundance of Tigers, Co-Predators and prey through signs and encounter rate in all forested area.
In Phase II, Habitat characteristics were quantified using spatial remote sensing data and attributes in a Geographical Information System (GIS).

In Phase III, A team of trained wildlife biologists than sampled a subset of these areas with approaches like mark recapture and distance sampling to estimate absolute densities of Tigers and their prey, using the best modern technological tools like GPS, Laser range finders, remote camera traps.

2.2.4. National Scenario

Data collection in 2010 across all forested habitats of 17 Tiger states of India with an unprecedented effort of about 4, 77,000 forest staff and 37,000 professional biologists. Forest staff walked 6, 25,000 kms on transect line laid in 29,772 beats. 800 camera traps were used to get 635 individual tigers. Tiger occupied landscapes in India are classified into 6 landscapes:-

Landscapes	Tiger Population 2006			Tiger Population 2010		
	Average numbers	Minimum Limit	Maximum Limit	Average numbers	Minimum Limit	Maximum Limit
Shivalik hills and the Gangetic Plains	297	259	335	353	320	388
Central India and	601	486	718	601	518	685

Eastern Ghats						
Western Ghats	412	336	487	534	500	568
North- Eastern hills and Brahmaputra Plains	100	84	118	148	118	178
Sunderbans	-			70	64	90
Total	**1411***	**1165**	**1657**	**1706**	**1520**	**1909**

It is observed from the table above that the Tiger population of 1411 in 2006 has gone up to 1706 in 2010. Data says that the Tiger population of state of M. P of Central Indian Landscape and A.P of Eastern Ghats has gone down.

2.2.5. Status of forest occupancy of Tigers in M.P

Species	Area of occupancy in 2006 (in sq kms)	Area of occupancy in 2010 (in sq kms)	Comparative Situation
Tiger	15614	13833	Decreased
Leopard	34736	24308	Decreased
Wild Dog	28508	22557	Decreased
Bear	40959	43499	Stable
Spotted Deer	41509	43233	Stable
Sambhar	33551	30722	Stable

Table shows that forest area occupied by Tigers, Leopards and wild dog has decreased in time period of four years.

2.2.6. Status of Pench Landscape

Pench Landscape is a very important natural Tiger Habitat. The result of estimation is tabled below:

Landscape	Tiger Census 2006		Tiger Census 2010	
	Tiger Population	Tiger occupied area (in sq kms)	Tiger Population	Tiger occupied area (in sq kms)
India	1411(1165-1657)	93697	1706(1520-1909)	81881
M.P	300(236-364)	15614	257(213-301)	13833
Pench Landscape	33(27-39)	718	54(44-65)	1987

2.2.7. Prey Density in Pench Landscape-

The whole buffer zone is included in the Pench Landscape. Here Tiger population has increased but little decrease in occupancy is observed. Prey density is based on 103 sample surveys in Teak and Mixed forests. Here peafowl is also included in the data.

Table No. - 3

S. No.	Species	Density (Per sq. km)
01	Sum of all Species	107.74
02	Ungulates	51.24

03	Cervids	42.31
04	Bison	2.55
05	Sambhar	5.34
06	Spotted Deer	37.00
07	Blue Bull	1.38
08	Barking Deer	0.61
09	Wild Boar	5.83
10	Peafowl	3.42

The Tiger and its co-predators are not abundant and sparsely distributed in the buffer area of Pench Tiger Reserve. Beat wise the total number of evidences and signs are given in the following table –

Table No - 4
Tiger and its co-predators evidences status in Buffer Area of PTR

S. No.	Name of Beat	Carnivore Sign						
		Tiger	Sloth bear	Panther	Wild dog	Wolf	Jackal	Hayena
1	Turia	0	0	0	0	0	0	0
2	Telia	0	0	0	0	0	0	0
3	East Kohka	1	0	0	1	0	0	0
4	S. Vijaypani	1	0	0	0	0	0	0
5	E. Khawasa	0	0	0	0	1	0	0
6	Riddee	0	0	0	0	1	0	0
7	Khothar	0	0	0	0	0	0	0
8	Jamuntola	0	0	0	1	0	0	0
9	Amajhiriya	0	0	0	0	0	0	0
10	Mohgaon	0	0	0	0	0	0	0
11	Kurai	2	0	0	0	1	0	0
12	Salhey	4	3	1	6	1	0	0
13	E.Karmajhiri	9	3	1	3	0	4	0
14	Tikadi	3	0	0	0	0	0	0
15	Paraspani	1	2	1	5	0	0	0
16	Richhee	0	0	0	0	2	0	0
17	North Murer	0	0	1	1	2	0	0
18	North Pathrai	0	0	1	0	0	0	0
19	Singardeep	0	0	0	0	0	0	0
20	Pulpuldoh	0	0	0	0	0	1	0
21	Kadhiya	0	0	0	0	0	1	0
22	Doodhgaon	0	0	0	0	0	0	0
23	Kokiwada	0	0	0	0	0	0	0
24	Saliwada	0	0	0	0	0	0	0
25	Surangi	0	0	0	0	0	0	0
26	Aamakuhi	0	0	0	0	0	0	0
27	Majhiyapar	0	0	1	0	0	0	0
28	Tekapar	0	0	0	0	0	0	0
29	Gadhiya	0	0	0	0	0	0	0
30	Boriya	0	0	0	0	0	0	0
31	Bichhivi	0	0	0	0	0	0	0
32	Surrewani	0	0	0	0	0	1	0
33	Panathawri	0	0	0	0	0	1	0

34	Ghatkamtha	0	0	0	0	0	0	0
35	Sonpur	0	0	0	0	0	0	0
36	Elkapar	0	0	0	0	0	0	0
37	Aamajhiri	0	0	2	0	0	0	1
38	Chakara	0	0	2	0	0	0	0
39	Kursipar	0	0	2	0	0	1	0
40	Radhadevi	0	0	1	0	0	0	0
41	Badosa	0	0	0	0	0	1	0
42	Konapindrai	0	0	1	0	0	0	1
43	Sajpani	0	0	0	0	0	0	0
44	Halal	0	0	0	0	0	0	0
45	Kumbhapani	0	0	4	0	0	0	0
46	Jamtara	0	0	1	3	0	2	0
47	Gumtara	0	0	0	0	0	0	0
48	Thota	0	0	0	0	0	0	0
49	Rampuri	0	0	0	0	1	2	2
50	Bandhan	3	0	0	0	0	0	0
51	Dola	0	0	0	0	0	0	0
	Total	**24**	**8**	**19**	**20**	**9**	**14**	**4**

2.3 Prey-predator Relationship

The Teak & Miscellaneous dominated Tropical Dry deciduous Forests with inter-digitations of grassland habitat of Buffer zone is very suitable for herbivores.

Composition of the tiger diet:

During the study of Ecology of Gaur in Pench Tiger Reserve, M.K.S. Pasha & G Areendran made a study on Composition of the Tiger diet. The brief of the study is as following –

The analysis of 75 scats revealed the presence of 9 prey species with a high preponderance of medium to large sized ungulates in tiger's diet. Chital, Sambar and wild pig together accounted for 72.7% of all prey consumed, while domestic livestock contributed 8.2%. The combined biomass contribution of Chital, Sambar and Wild pig to the tiger diet was 76.6%.
Though from the above study the domestic livestock had 12.3% biomass contribution and no remains of Gaur and Nilgai were found in tiger scat. The result of study shows heavy biotic pressure during the study duration (i.e. 1997 –2000). Now days for last 3-4 years the grazing has been completely stopped in the core area and the area vacated by domestic cattle has been occupied by the Neelgai and Gaurs.

Distribution and abundance of prey base –

The Chital, Sambhar, Wild pig, Nilgai, Gaur are the main prey base for the tiger and its co-predators in Pench Tiger Reserve. The Langoor, Rhesus monkey and Peacock are also contribute towards the prey base. Other prey base like Chousingha, Barking deer & Chinkara are very few in number.

As per the Monitoring Tiger its co-predators, prey base and their habitat survey conducted during January 2006 in the all the 51 beats of buffer area is as follows -

Table No - 5
Beat wise average prey encounter rate in the Buffer Area of PTR

S. No.	Name of Beat	Average encounter rate				
		Chital	Sambar	Wild Pig	Nilgai	Gaur
1	Turia	12	0	6	1	0
2	Telia	6	0	0	0	0
3	East Kohka	7	0	0	0	0
4	S. Vijaypani	8	2	9	1	0
5	East Khawasa	0	0	0	1	0
6	Riddee	1	0	1	0	0
7	Khothar	0	0	0	0	0
8	Jamuntola	0	0	1	1	0
9	Amajhiriya	0	0	0	0	0
10	Mohgaon	1	0	0	0	0
11	Kurai	3	0	0	0	0
12	Salhey	22	1	0	0	0
13	East Karmajhiri	44	12	3	1	0
14	Tikadi	17	0	24	4	0
15	Paraspani	10	0	2	0	0
16	Richhee	7	0	0	2	0
17	North Murer	0	0	0	0	0
18	North Pathrai	4	1	0	0	0
19	Singardeep	4	0	1	0	0
20	Pulpuldoh	3	0	6	0	0
21	Kadhiya	0	0	0	0	0
22	Doodhgaon	5	0	0	1	0
23	Kokiwada	3	2	9	2	0
24	Saliwada	0	0	0	0	0
25	Surangi	0	0	6	0	0
26	Aamakuhi	0	0	0	0	0
27	Majhiyapar	0	0	0	0	0
28	Tekapar	0	0	0	0	0
29	Gadhiya	0	0	0	0	0
30	Boriya	0	0	0	0	0
31	Bichhivi	0	0	0	0	0
32	Surrewani	0	0	0	0	0
33	Panathawri	0	0	0	0	0
34	Ghatkamtha	0	0	5	0	0
35	Sonpur	0	0	2	0	0
36	Elkapar	0	0	3	0	0
37	Aamajhiri	0	0	3	0	0
38	Chakara	0	0	0	0	0
39	Kursipar	0	0	0	0	0
40	Radhadevi	0	0	0	0	0
41	Badosa	0	0	0	0	0
42	Konapindrai	0	0	0	4	0
43	Sajpani	0	0	0	0	0

44	Halal	0	0	6	3	0
45	Kumbhapani	0	0	0	1	0
46	Jamtara	14	1	12	2	0
47	Gumtara	0	0	0	0	0
48	Thota	0	0	5	1	0
49	Rampuri	7	1	0	1	0
50	Bandhan	0	0	5	6	0
51	Dola	0	0	0	0	0
	Total	**176**	**20**	**106**	**34**	**0**

It is clear from the above table that the buffer area of Pench Tiger Reserve is having low Prey base density.

2.4 Water availability

Sufficient amount of water is available for the prey base of buffer area of PTR. Although, certain new structures have been proposed which are annexed in **Annexure No. 24 & 25 (A, B).**

2.5 Assessment of Threats

- Population pressure in the buffer zone (human/ livestock).
- Interface problems like domestic cattle kills, crop depredation, human injury fostering grudge against the Tiger Reserve management in the minds of local people.
- Lack of adequate grazing/ forest areas for nistar in the buffer.
- Frequent crop raiding by ungulates.
- Contamination of peripheral water points by village livestock with risks of disease transmission.
- Road kills due to presence of National Highway No. 7 in the buffer zone.
- Buffer zone makes border with the State of Maharashtra.
- Traditional footpaths through the buffer zone forest.
- Manmade fires during summer owing to MFP collection.
- Proximity to cities like Katni, Nainpur, Gondia, Nagpur, Jabalpur increasing the risk of wildlife related crimes.
- Traditional practice of poaching by local community by poisoning the water hole, electrocution and chasing wild animals by trained pet dogs.
- Illicit catching of birds especially Parakeets, Owls etc.
- Gin/ Trapping of Tigers by Poachers from outside.
- Illicit felling, illicit grazing, illicit mining etc.

- Mushrooming of resorts/hotels in buffer zone creates biotic pressure as well as hinders free movement of wildlife.
- Poisoning of cattle kills by angry and distressed villagers.
- Electrocution of Tigers and other wild animals by high voltage electric lines running across the buffer zone.

Chapter - 03

HISTORY OF PAST MANAGEMENT AND PRESENT PRACTICES

3.1 Conservation & Forest Management History -

There are two different conservation and forest management history as the forests of buffer zone falls in Seoni and Chhindwara districts of Madhya Pradesh.

3.1.1 General History of the Forests of Seoni -

Prior to 1862 the history of the forests of Seoni District is rather obscure. In 1862 captain J. Forsyth of Bengal Lancers succeeded Sir Richard Tamp as the Second Chief Commissioner of Central Provinces, formed in the year 1851. He toured this area with a view to assessing the potential of these virgin forests: Colonel C.F. Parson was posted as an officer -in- charge Armed Police at Seoni in the year 1858. According to him, "Except for contractors, there was no necessity for any license etc. for cutting the wood. Every Gond was having an axe and numerous logs were lying cut everywhere in the forests which were partly or fully destroyed by summer fires every year". The need for conservation of the forest wealth through establishment of separate department was felt by Colonel Pearson. He submitted a report to this effect to the Chief Commissioner. It was on account" of that, the designation of Conservator of Forests was used by the then government to indicate the entire responsibility of the forest department. Colonel Pearson was subsequently appointed as the first C.F. for Sagar and Harda tract which included Seoni, in the year 1860. The first work taken up by Colonel Pearson and his two assistants was to collect the burnt logs, lying in the forest and transport it to depot; sale price of which provided the first budget for the year, 1861-62. The first Inspector General of Forests of India, Dr. D. Brandis toured this division in the year 1863 with Colonel Pearson, covering Pench valley areas up to Alikatta and further crossing Kurai-ghat and the Wainganga catchments. He decided the basic policies regarding forest conservation. The first step was demarcation of reserved forests, fire protection and moderate attempt was taken up to tap the forest wealth to increase the government revenue.

In the- year, 1862 "Waste land management rules" were enforced , under which cutting of teak, Bija, Saja & Shisham_ was forbidden without the permission of the Dy. Commissioner, However, other species were allowed to be cut on payment of commutation fees.

Past Systems of Management and Their Results

Period 1879 to 1903-

Forests of this division were declared reserved forest between the years, 1879 to 1909. Exploitation of forest was done under license and commutation system till 1892-93. In 1894, improvement fellings were started departmentally in Amagarh, Pakhara, Hathigarh and part of Ugli blocks, after carving out working circle and felling series. They were given up due to lack of demand. Working Plan was separately drawn up for

Ganginala, Kurai and Ugli ranges in the year 1895-96 and 1899 respectively. Coppice with standard system was adopted but given up subsequently in 1903 due to grazing difficulties, lack of demand and inaccessibility of the areas.

1903 to 1928 (Mr. A. Hunt)-

The then DFO Seoni Division prepared a scheme for management of this forest in the year, 1903, covering all the suitable and accessible areas for improvement fellings, which was drastically revised in 1917 by Mr. A.V. Beechey, envisaging the improvement felling for better teak areas and coppice with standard for mixed forests. The scheme continued till 1927-28 except that in 1923 mixed forests of Seoni Range were also taken up and four felling series of clear coppice system were carved out. The results were satisfactory. In 1904 and 1905 fire protection over an area of 360 sq. miles was attempted and in 1903 and 1905 attempts were made to plant Sandal plants.

1928- 29 to 1948-49 (Shri W.N.Sharma) –

The first regular working plan for the forest of Seoni Division including present North Seoni Division was compiled by W.N.Sharma in 1927-1928, which came into force from 1928-29. Whole of the area was stock mapped on 4" = 1 mile map except that the bamboos were not shown as they had flowered in the year 1922. Five working circles were formed namely,

1. High forests, 2. Coppice with standard 3. Low forests 4. Bamboo overlapping 5. Unworked.

1949-50 to 1963-64 (S. Pasupati's) –

1929 plan was revised in 1948-49 Forests were revisited. Compartment history, form No.1 compiled afresh but no stock mapping was done. Allotments of areas to the various working circles were based on the old stock maps which were prepared on fresh toposheets on 4"=1 mile scale. Most of the allotment to working circles and felling series continued to be the same as before and very few deviations were made. The following working circles were formed:-

1. High forest,
2. Improvement,
3. Coppice with reserves,
4. Soft wood (overlapping),
5. Khair (overlapping)
6. Plantation (overlapping) and
7. Miscellaneous.

1966-67 to 1980-81 (R.P.Shrivastava) –

This working plan covered the old reserves of 384.9 sq. miles (986.887 Sq.kms) and the new reserves (Ex-Dewani forests) of 48.54 sq. miles (125.723 sq. kms) totaling 433.44 sq. miles (1122.610 sq. kms) spread over 7 ranges of South Seoni Division. The following working circles were constituted –

1. Teak conversion, 2, Selection-cum-improvement 3. Coppice with reserves, 4. Plantation, 5. Bamboo (over-lapping), 6. Kullu (overlapping), 7. Tendupatta (overlapping). This working plan was prepared for a period of 15 years from 1966-67 to 1980-81, making provisions up to 20 years. Fresh stock-maps on 4"=1 mile scale were prepared, on Survey of India toposheets, adopting standard lines. Salai and bamboos wore shown on overlapping basis. Forest villages were also stock mapped.

1971-72 to 1986-87 Working scheme –

In the working scheme, prepared for the protected forests of South Seoni for the period 71-72 onwards, the following working circles were constituted –

Table No. - 1

S. No.	Working Circle	No. of felling series	Area of the felling series	Rotation	
1	Teak conversion	Confined to linked compartments	1680.24	100 years	Yield by area in all the working
2	Selection-cum-improvement	-do-	3430.43	30 years	
3	Improvement felling	10	14260.23	20 years	
4	Coppice with reserves	5	7795.19	30 years	
5	Rehabilitation	4	8143.79	20 years	
6	Bamboo (overlapping)	3	12556.44	4 years	

The prescriptions were mostly based on the lines of working plan.

1986-87 to 1995-96 Extended up to 31-12-2002 (S.D. Dwivedi) –

Based on the condition of the crop, objects of managements along with the required treatment and the functional classification of forest, the following working circle have been constituted –

1. Teak conversion working circle
2. Improvement Working Circle
3. Coppice with reserves working circle
4. Rehabilitation Working Circle
5. Plantation Working Circle
6. Environmental Preservation and Protection Working Circle
7. Bamboo (overlapping) Working Circle

2003-04 to 2013-14 (N. S. Dungriyal) –

Based on the condition of the crop, objects of managements along with the required treatment and the functional classification of forest, the following working circle have been constituted

1. Improvement Working Circle
2. Selection cum Improvement Working Circle
3. Regeneration of Degraded Forests Working Circle
4. Regeneration of Degraded Bamboo Forests Working Circle

3.1.2 General History of the Forests of Chhindwara –

Early History prior to 1818:

This plateau region of the Satpura was under the rule of Rajput princes of Vaka taka dynasty from the 3rd century. Subsequently, It formed part of the kingdom of Gour. The area south of Chhindwara was probably included in the domain of the Rashtrakuta Rajput dynasty who ruled over this region for two centuries and quarter till about 973 A, D, from their capital at Malkhed in Hyderabad. The history of this part of the country has remained practically in the dark from 973 A.D. till the rise of the Gond kingdom of Deogarh in the 17th century it may probably have been included in the Gond or Gond-Rajput kingdom of Kherla in Betul. Popular tradition tells of a Gaoli kingdom preceding the Gonds. The first Gond king Jatba who build the Deogarh fort and formed the dynasty, is said to have wrested power from the Gaoli king towards the end of the 16th century.

'Bakht Buland', the third or fourth in descent from Jatba reigned in 1700 A.D. His kingdom embraced the Satpura plateau as well as the Nagpur plains. At that time the entire southern hilly regoin and most of the plateau above 'Deogarh' as it was called, now forming the East and West Chhindwara forest division was covered with forest dotted with small villages in fertile valleys only. The prince Bakht Buland had entered the services of the Moghul Emperor Auranzeb and his return from Delhi he set about the development of his own territories. Industrious settlers from all quarters were attracted to this region and the Nagpur country received a great infusion of cultivators and artisans. A large number of villages were found and agriculture manufactures and even commerce made considerable advances. This was the period when large areas of forest were cleared for cultivation and establishment of villages.

In 1743, the power passed into the hands of the 'Maratha Chief, Raghuji Bhonsla of Berar, who had intervened in the dissentions among the contending claimants to the throne of Deogarh. Upto 1803, the area under cultivation continued to increase under a fairly equitable rule of the Marathas.

Pre-reservation period (1818-1878)

The Marathas clashed with the East India Company in 1803. After a period of anarchy that ensued, the area came under the British administration in 1818. Considerable emigration and abandonment of land took place during the intervening period. The settlers gradually returned from 1818 onwards, Chhindwara was finally annexed to the British territories in 1853 on the death of Raja Raghuji III.

The forests were thrown open to the contractors, on royalty system, who could fell timber of any species, any where and to extent they liked. Teak being the only timber of utility was heavily exploited.

Forest conservancy was first thought of in 1862 when colonel Pearson was appointed as Conservator of Forest for the whole province as then constituted. The forests, however, remained directly under the charge of the deputy commissioner. Forests at the time covered three fourths of the total area but shifting cultivation was a common practice and valuable forests were falling rapidly before the axe and fire of the cultivation tribes. The railways were making very heavy demands on the forests for the supply of sleepers for which only teak and sal were considered suitable then. Indiscriminate felling were undertaken to meet the demand. Much of the timber, not accepted by the railways was subsequently burnt in summer fires. The un-burnt logs were salvaged later which formed the main source of revenue.

In 1865, the forests of the province were divided into six forest divisions. Chhindwara was included in Seoni division which was divided into two ranges. The first "Government Forest Act" was passed in the same year.

Early reservation period (1879-1895)

The forests were declared reserved by notification No. 917-C and 917 G dated 24th February 1879, under amended Indian Forest Act of 1878. At first the forests were divided into A and B classes. B class forests were later mostly excised for cultivation and a few transferred to class A. Only the remote forest areas were reserved. Most of the waste land, covered with scrub forests adjoining villages were left unreserved. The general policy was to allot each village an area of waste land limited to twice the area under cultivation. Grazing and nistar rights were generally unrestricted the earlier practice of working the forests under farming system continued even after the reservation. The restrictions in this method related only to Teak, Mahua and other fruit bearing trees. This system was replaced by a system of sales by licence, under which the licences carried out selective fellings of the best stems of the more valuable species leaving an unsound and malformed stock in the forest.

Fire protection measures were introduced soon after the reservation, starting from Sank range in 1879, followed by Sillewani range in 1890 and other ranges later. The forests were surveyed and mapped from 1887 to 1896.

Past Systems of Management and Their Results –
First Working Plan by Ram Chander (1896 to 1912)

The first working plan was drawn up by Ram Chander, separately for each of the five ranges in which the division was then divided. The plans were brought into force for Sillewani range in 1895-96, for Umreth, Sank and Amarwara ranges in 1896-97 and for Ambara range in 1901-02. Fire protection measures were extended to Umreth range in 1896, Amarwara range in 1897 and Ambara range in 1901. The area in each range was divided into three to five (working) circles, one of which was allotted to grazing. In other circles improvement fellings were prescribed on a cycle of 15 years in teak bearing forests of Khadbeli and Sardoni blocks and 30 years elsewhere. A grazing closure of 10 years after felling was prescribed; Departmental fellings were undertaken but had to be abandoned for want of demand. From 1902 onwards coupes were sold standing by auction.

Second Working Plan by V. G. Morgan IFS (1913 to 1928-29)

Morgan's plan was the first consolidated working plan prepared for all the five ranges of Chhindwara forest division. The areas were allotted to the following working circles.

(i) Improvement working circle - (374 Sq. Miles)
(ii) Grazing working circle – (267 sq. miles)
(iii) Miscellaneous working circle (24.2 sq. miles)
(iv) Bamboo (overlapping) working circle (193 sq. miles)

Third Working Plan by G. B. Bakshi (1929-1939)

Morgan's plan was revised by G. B. Bakshi in the year, 1929. The areas were allotted to the following working circles.

(i) High forest working circle (74.987 acres)-
(ii) Coppice with standard working circle (1, 42, 582 acres)
(iii) Simple coppice working circle (69601 acres or 28166 hectares) -
(iv) Miscellaneous working circle (136647 acres or 55299 hectares)-
(v) Bamboo overlapping working circle (58959 acres or 23860 hectares)

Fourth working plan by H. S. Sodhi (1939-55)-

The working plan of G.B. Bakshi was revised by H.S. Sodhi, IFS in 1939, for a period of 10 years, but the prescriptions remained in force till 1955-56. The main structure of the plan remained the same. Part I of the 1929 plan was slightly amended and part II was re-written, the forests were reclassified in accordance with the policy laid down in 1933. The following changes were made in allotment of areas –

(a) The high forest working circle was re-named as 'Teak conversion working circle' and six felling series of the working circle were transferred to the newly constituted coppice with reserves working circle.
(b) The coppice with standards and simple coppice working circles were amalgamated to form a new coppice with reserves working circle. Nine felling series were provisional.

The areas were allotted to the following working circles.

(i) Teak conversion working circle (22639 acres or 9162 hectares) -

(ii) Coppice with reserves working circle (264833 acres or 107174 hectares)

(iii) Bamboo overlapping working circle (58958 acres or 23859 hectares)-

Fifth working plan by R. M. Singhal (1956-57 to 1976-77)

The working plan of H. S. Sodhi came in for revision by R. M. Singhal in 1955 and came into effect from 1956-57. The initial period of the plan was 15 years but it remained operative till 1976-77, in accordance with forest department memorandum No. 4001/3222/ 10/2/75 dated 1st September 1975.

The constitution of the different working circles of the plan are given below-

(i) Selection - cum - improvement working circle

(a) Areas reserved against felling-

(b) Moderately stocked teak and mixed forests-

(c) Better quality teak and mixed forests of Khadbeli block –

(ii) High Forest Conversion Working Circle (80101 acres or 32416 hectares)-

(a) Areas reserved against felling -

(b) Areas not fit for concentrated regeneration and clear felling-

(c) Areas fit for clear felling and concentrated re-generation-

(iii) Coppice with reserves Working circle (1, 88,952 acres or 76,460 hectares)-

(a) Areas reserved against felling.

(b) Areas other than these reserved against fellings.

(iv) Pasture working circle (11,605 acres or 46,945 hectares)
(v) Miscellaneous working circle (28.034 acres or 11,345 hectares)
(vi) Overlapping bamboo working circle (133051 acres or 53,844 hectares)
(vii) Khair overlapping Working circle (2, 05,429 acres or 83.135 hectares)

Sixth working plan by P. S. Dave (1977-78 to 1991-92, Extended up to 30-06-03)

Based on the condition of the crop and the objects of management, the following working circles have been constituted –

(i) Protection Working Circle -

(ii) Teak Conversation Circle –

(iii) Coppice with reserves working circle -

(iv) Rehabilitation working circle -

(v) Fodder cum pasture working circle –

(vi) Miscellaneous working circle -

Seventh working plan 2000-01 to 2009-10 (O. P. Khare) and 1997-98 to 2006-07 (Satish Tyagi)

Based on the National Forest Policy, 1988 and keeping in mind the local conditions & needs this working plan aims to improve growing stock, crop composition, increasing productivity through natural & artificial regeneration, check soil erosion along with meeting the local demand of the people. Special emphasis has been given on obtaining people's participation through J.F.M. To achieve these objectives the following working circles have been constituted.

1. Selection cum improvement
2. Rehabilitation of Degraded forests
3. Rehabilitation of Degraded bamboo forest (over lapping)
4. Maintenance of plantation (overlapping)
5. Protection

3.2 Protection of Tiger, its Prey and Habitat -

The National Forest Policy of 1884 did not lay specific stress on protection and preservation of wild life perhaps due to its abundance. The management of wildlife in the reserved forest had been with the forest department since the commencement of systematic forestry. Various rules for hunting, fixing the bag limits and close seasons, were laid down. Licence fees also varied from time to time and the management was based keeping in view the recreational aspect of hunting.

The earliest legislation "Wild bird protection Act, 1887" was replaced by "Wild bird and animal protection act, 1912". In reserve forest of erstwhile C.P. " C.P. Shooting Rules" as laid down in Appendix of the C.P. Mannual Volume II, were applied. "Wild birds and animal protection act" was amended by Central Province Government and enforced as C.P. Game Act, 1935" under which game rules were framed in the year 1962. The summary of various acts and rules under provisions of which wild life conservation was effected in the State of C.P. and Berar and Madhya Pradesh (1965 onwards) are enumerated below –

(i) The Wild Birds and Animals Protection Act, 1912

(ii) The Indian Forest Act, 1927 (XVI of 1927) with old C.P. & Berar Amendments.

(iii) The Indian Forest (Madhya Pradesh Amendment) Act, 1955 (IX of 1955).

(iv) The Madhya Pradesh Game Act, 1935 (XV of 1935) with old C.P. & Berar Amendments.

(v) The Madhya Pradesh National Park Act, 1955 (VII of 1955).

(vi) The Madhya Pradesh Game Rules Framed under M.P. Game Act, 1955 vide Govt. of M.P. Forest Department Notification No. 1433-X/62 dated 19-02-1962.

(vii) The Madhya Pradesh Forest (Hunting, shooting, fishing, poisoning waters and setting traps or snares in the reserved forests or protected forests) Rules, 1963 framed under Indian Forest Act, 1927 (XVI of 1927) vide M.P. Government Forest Department Notification No. 113/X/63 dated 31-01-1963 published in M.P. Rajpatra dated 15-03-1963.

(viii) The arms Rules, 1962, under Indian Arms Act, 1959 (LIV of 1959) brought into force with effect from 01-01-1962 vide government of India, Ministry of Home Affairs No. G.S.R. 987 dated 13-07-1962 published in M.P. Gazette Part 17 dated 26-10-1962 (Part IV C)

Game rules and shooting ethics were two different chapters between which there was a large gap, which remained un-bridged, all through reported *Shikars* were bearing not even a respectable fraction of what was actually killed. Spot lights would be fitted with the dazzling sealed beams, in fast moving jeeps. The guns would never wait even for the mother animals to deliver the litter. Water holes were never respected. Shooting blocks had delineated the bounds on the shooting permits alone but never in the field. Bag limits was fixed only for reporting that number but field execution was far from satisfactory. Fawns were the easiest victims of the lethal muzzles. Closed seasons were merely recognised for academic magazines. Shooting permits gave coverage to killing of even prohibited game animals under the grab of the permitted ones. Telescopic weapons made the *shikar* task as easy as a child game.

Clear felling system enforced in the previous plans had some good effect on game preservation due to rank growth of grass and weeds which afforded good hiding haunts to the wild denizens. Packs of wild dogs which were controlling the balance of many wild games in the forests were allowed to be shot by the provincial government in view of affording protection to the deer and other big games in the area, but guns would seldom recognise the dogs, deer or cats.

Since inception of South Seoni Division the shooting details have been tabulated species wise and year wise from the year 1949-50 to 1971-72 –

Table No. - 2
Number of animals shot

Year	No. of permits issued	Tiger	Bison	Panther	Wild boar	Sambhar	Cheetal	Other deer	Total
1949-50 to 1963-64	314	42	10	40	90	58	55	90	385
1964-65	10	4	-	8	4	2	6	1	25
1965-66	12	6	1	11	6	10	6	2	42
1966-67	13	10	4	6	7	3	6	5	41
1967-68	22	5	1	6	5	15	9	3	44
1968-69	23	2	1	4	5	8	7	-	27
1969-70	16	3	-	9	18	10	9	-	49
1970-71	18	-	1	-	-	-	4	-	5
1971-72	-	-	-	-	-	-	-	-	-
Total	**438**	**72**	**18**	**84**	**135**	**106**	**102**	**101**	**618**

The above figures were alarming.

In 1952 Government of India enunciated a revised National Forest Policy, after independence. It emphasised the need for affording protection to the animal kingdom and particularly to rare species. The Indian Board for Wild Life (IBWL) was set up by Government of Indian in 1952, for the following purpose –

(a) To devise ways and means for conservation and control of wild life through co-ordinated legislative and practical measures with particular reference to seasonal and regional closures, declaration of certain species as protected and prevention of indiscriminate killings.
(b) To sponsor the setting up to sanctuaries, national parks and zoological gardens.
(c) To promote public interest in wildlife and the need for its preservation in harmony with natural human environments.
(d) To advise government on policy of export of living animal, trophies, skins, fur, leather, feathers and other wild life products.
(e) To perform such other functions as are germane to the purpose for which the boards has been constituted, and
(f) To prevent cruelty to birds and animals caught alive with or without injury.

At its very first meeting the Board (IBWL) made a recommendation that there would be unified legislation for wild life conservation in the country. The "Wild life (Protection) Act, 1972" was passed by the parliament under clause (1) of Article 252 of the constitution. It covers wild life conservation and protection of endangered species both inside and outside the forest areas.

For the purposes of controlling hunting, the most significant step taken under the Act is to classify wild animals, birds, amphibians and reptiles into five different schedules. Schedule I lists the rare and endangered species which are totally protected through out the nation. Schedule II lists special game species which require more stringent protection and for which licences may be given only under special circumstances, schedule III and IV comprise big and small game while schedule V lists vermin's. In 1974, M.P. Wild Life (Protection) Rules were framed under the provision of this Act.

A sub-committee of the IBWL tabled its suggestions for inclusion of 'Flora' component of wildlife also which was committed earlier. Separate schedules for 'Flora' have been framed and notified in 1980 on similar line as in case of fauna.

The trade in wild life products has also been brought under the umbrella of this Act. In order to control the thriving global, legal and illegal trade in endangered species, India becomes a party to the Internal Convention on Trade in Endangered species of Wild Fauna and Flora in 1976, commonly known as 'CITES'.

The subject matter of 'Forests and Wild Life protection' has been brought under the concurrent, list by the parliament in the constitution of India through the 42nd amendment in 1976. As a sequel to this entry, the Government of India may not only directly control and make uniform preservation and conservational policies but may even acquire certain forests of national importance.

With the enactment of the wildlife protection Act 1972 by the parliament, gradually some discipline came into the wildlife protection efforts. The strict rules and statutory provisions generated some different effect on the public as well as the law-enforcing agency.

In the year 1977, an area of 449.392 sq. km. was notified as Pench Game Sanctuary. This area covered about 257 sq. km. of South Seoni Division and rest of the East Chhindwara Division across the Pench River. Similarly, the Maharashtra Government declared an adjoining area of 257.5 sq. km. as Pench National Park. A separate wildlife wing was setup in the Forest department headed by a Chief Conservator of Forest (Chief Wildlife Warden). These were the first sincere efforts towards protecting the fauna and forests of this area. Under the canopy of Wildlife (protection) Act 1972 and the Madhya Pradesh Wildlife Rule (1974) made there under, the Sanctuary staffs were assigned with a specified task of protecting the fauna and forests within the Sanctuary limits. Various rules and regulations regulated the entry and movement within the Sanctuary. It also envisaged regulation of forestry operations, use of waterholes, regulation of Minor Forest Produce collection, regulation of grazing and strict fire protection as well as registration of all arms license- holders within a radius of ten kilometers from Sanctuary boundary.

Later on in March 1983, the Government of Madhya Pradesh notified its intention to constitute an area on 292-85 sq. km. as the Pench National Park. This area had been carved out of the pre-existing Pench Sanctuary. The first Director to manage the Park area was posted in July 1984.

The Pench Sanctuary was finally notified in the year 1998. The National Park & Sanctuary were renamed as Indira Priyadarshini Pench National Park and Pench Mowgali Sanctuary in the year 2002. The National Park was finally notified in the year 2005 as Indira Priyhadarshini Pench National Park.

An area 757.850 sq. km, including 346.520 sq. km. area of the adjoining Forest Division was included and named as Pench Tiger Reserve (19th Tiger Project) in the Year 1992 under Centrally Sponsored Scheme Project Tiger vide the Govt. of India Ministry of Environment and Forests Project Tiger's order no 1-2/92-PT (Part II) Dated 23 November 1992.

An area of 411.330 sq. km. of Indira Priyadarshini Pench National Park & Pench Mowgli Sanctuary was declared as Core Area of Pench Tiger Reserve, Seoni vide Govt. of M.P. Forest Department's Notification no. F.15-31-2007-X-2 dated 24-12-2007.

The buffer area of 768.300 sq. km has been finally notified by MP Government Forest Department notification no. F-15-8/2009/10-2 dated 5th October 2010.

Habitat Management -

As the buffer area was managed by the territorial division no scientific habitat management had been carried out in forest area.

Grassland Management -

Some pasture management was carried out in the buffer, but it was not successful due to so many reasons like biotic pressure, etc.

Weed Eradication –

Obnoxious weeds like Lantana were uprooted in some parts of the forest but not a regular practice.

Fire Protection –

Strict Fire Protection measures were taken up but were not effective in buffer zone due to immense biotic pressure and NTFP collection.

Water Management-

Soil and Moisture Conservation – Loose boulder check dams, contour bunds, contour trenches etc. were constructed for Soil and Moisture Conservation.

Check dams and nala bunding - Creation of series of Low height earthen Check dams on nalas/streams to prolong the availability of water.

Construction of tanks – To provide permanent solution for water availability in water deficient area, a network of small tanks were created. Some tanks are created in village area. But these tanks are not well distributed and there are many areas with low water availability for the use of wildlife in summer season.

Past working plans in buffer zone

Buffer zone is constituted by including forest area of south Seoni, Barghat project, East and South Chhindwara divisions.

Table No. – 3
Forest Areas of Buffer zone in current working plan (Digitized area)

S. No.	Current Working Plan area	Compartments in buffer zone	Total digitized area (hectare)	Percentage of total area
01	Working Plan South Seoni Division, N.S Dungriyaal (2003-04 to 2012-13)	160	36750.41	77.39
02	Barghat Project, Seoni	01	227.34	0.48
03	Working Plan East Chindwara Division, Shri. Satish Silawat(2008-09 to 2017-18)	36	6493.41	13.67
04	Working Plan South Chhindwara division, Shri Shamsher Singh (2011-12 to 2020-21)	34	4015.75	8.46
	Total	231	47486.91	100

Past working circles in buffer zone

Current Working Plan	SCI		Protection		RDF		Plantation		Forest Villages	
	Co. No.	Area	Co. No.	Area	Co. No.	Area	Co. No.	Area	Co. No.	Area
South Seoni	142	32489.66	-	-	13	1519.48	-	-	05	2331.43
Barghat Project	01	233.77	-	-	-	-	-	-	-	-
East Chhindwara	18	3823.882	03	115.505	08	1673.425	05	148.185	02	650.44
South Chhindwara	26	3566.874			06	407.049	02	46.575	-	-
Total	187	40114.186	03	115.505	27	3599.954	07	194.76	07	2981.87

Past managements and its results

Selection Cum Improvement - Forest areas of density more than 0.4 were included in the Working Circle. Prescriptions were followed and due to this in south Seoni forest area, the regeneration has increased from 1198/ ha to 2087.95/ ha. There is increase in no. of mature trees in pre- selection and selection girth class. Biotic pressure is low. Area has shown positive results because of the involvement of local communities in grazing control and fire control measures.

Regeneration of Degraded forests (RDF) working circle- Reserved forests (RF) and Protected forests (PF) of density less than 0.4 have been included. Due to management interventions, forest density has improved now. As the JFMCs have been involved actively in interventions, the positive result has shown up in the area. In some areas, the protection has not been up to the mark and because of that, mixed and bamboo plantations have suffered.

Bamboo (Overlapping) - Bamboo forest is found only in south seoni division in this area. There was gregarious flowering in bamboo in 2000-05 and 2005-06. The bamboo area has been treated as per prescriptions. There is hope of getting good bamboo forests in the coming years.

Analysis of past management and results –

Change in crop composition:

There is no change in no. of teak trees though the no. of mixed trees has increased. No. of lendia and tendu has increased whereas no. of saja and dhawda has shown decrease in number. There is slight increase in no. of fruit bearing trees. There is also increase in 1 120cm gith trees with respect to past working plan. Again, there is slight decrease in 60cm girth trees.

Change in crop density

There is slight change in crop density of south Seoni area. No change is seen in Chhindwara area as working plan is operation for only 2.5 yrs.

Table No. – 4

Change in crop composition

S. No.	Stock type	Area as per current working plan		Area as per proposed working plan	
		Area(ha)	Forest percentage	Area(ha)	Forest percentage
01	Dense Forest	36896.04	78.36	39076.68	82.28
02	Open forest	3388.21	7.21	3341.23	7.04
03	Blank area	1304.98	2.77	982.97	2.07
04	Plantation	2120.89	4.50	560.38	1.18
05	Encroached forest land/Agricultural fields	447.95	0.95	511.13	1.08
06	River bed/ Area under submergence	2925.89	6.21	3014.52	6.35
Total		**47083.96**	**100.00**	**47486.91**	**100.00**

Table No. – 5

Change in age class in forest stock

Forest Type	Area under Current Working Plan (Hectare)				Area under Proposed Working Plan (Hectare)			
	Young	Medium	Mature	Total	Young	Medium	Mature	Total
Teak Forest	3376.34	16292.71	1483.76	21152.81	3171.67	17601.74	1015.27	21788.68
Mixed Forest	2566.04	11447.79	1729.40	15743.23	1652.84	14148.17	1486.99	17288.00
Total	5942.38	27740.50	3213.16	36896.04	4824.51	31749.91	2502.26	39076.68
Percentage	16.11	75.18	8.71	100.00	12.35	81.25	6.40	100.00

Natural regeneration:

Established natural regeneration has increased in south Seoni area from 1198/ha to 2088/ha.

Forest Health:

Crop health is very good in general. No damage by insects, etc has been found except Teak skeletonizer.

Wildlife Management:

Wildlife and its habitat are almost intact. Man- animal conflict is also under control, but there is very much scope of improvement in certain aspects of management. Compensation has been paid in cases of livestock depredation but in cases of crop depredation, improvement is needed. Communities are agitated on this issue. Overall habitat including water and food has improved.

Conclusion:

Due to implementation of prescriptions of different working circles, forest health has improved slightly. But with the active community involvement, it could have improved more. Again there is considerable scope in improving wildlife management and conserving biodiversity by proactive community involvement.

3.3 Other Land use – Villages, Agriculture, Developmental Programmes, Tourism etc -

Land use in Buffer Zone villages

Land use in Buffer Zone villages is as following –

Table No. - 6

Land use Pattern in Buffer Zone

S. No.	Classification	Land (Hectors)	Percentage
1	Forest	10650.27	28.65
2	Agriculture Land	18417.92	55.12
3	Gauchar	3408.95	9.26
4	Uncultivable Land	2522.85	6.97
	Total	35364.33	100.00

Source : District Land Records

Land use in Buffer Zone

Forest area in Kurai tehsil is more than that in Bichhua and Chourai tehsils. Forest boundary of revenue villages is 32.62 % of the total land boundary of villages. Land under agriculture is 47.75 % of the total land and is lower than the average for all the Buffer Zone villages.

Table No. - 7

Land use in Buffer Zone villages in Kurai Tehsil

S. No	Classification	Kurai Tehsil		Bichhua Tehsil		Chourai Tehsil	
		Land (in Ha)	%	Land (in Ha)	%	Land (in Ha)	%
1	Forest	6277.26	32.62	3559.33	27.42	813.68	25.90
2	Agriculture Land	9099.73	47.75	7633.60	59.96	1684.58	57.65
3	Gauchar	2124.82	11.04	1000.03	7.70	284.10	9.04
4	Uncultivable Land	1651.98	8.59	638.06	4.92	232.81	7.41
	Total	18241.94	100	12980.78	100	3141.61	100

Source : District Land Records

Land under forest is highest in villages of Kurai tehsil as compared to Bichhua and Chourai tehsils. Gauchar land on records is highest in Kurai as compared to other tehsils. However ground reality reveals that practically these lands are not utilized as gauchar lands.

Agriculture in Buffer Zone Villages

Agriculture Practices

Agriculture practices in Buffer Zone Villages are still in pre-modern stage. People in some villages are still depending on indigenous agriculture practices due to intensity of poverty. Big farmers of Chourai tehsil are adopting scientific agriculture practices. Agriculture crop yield in Bichhua and Kurai is very low. Farmers in these tehsils are still following primitive agriculture practices.

The old traditional implements consist of hal or nagar, the common plough. This plough is used for breaking wasteland and for ploughing fields of wheat and sugarcane. With minor improvisation it is also used for seed sowing. Another important tool is the bakhar, which is used in preparing all kinds of land and is a kind of bladed harrow. Tiffan is a three tined seed-drill generally used along the Maharashtra border. The Ghana or mill and the kadhai are used for sugar processing. With the progress in sugarcane cultivation the number of crushers in district has also gone up and particularly, the modern power driven crushers has increased substantially. Olped threshers, winnowers, fodder cutters, etc are among the other modern implements. But the threshers yield a rough bhusa and often the bullock are required to trample over it to soften the bhusa.

However, the iron plough an improvement over its wooden counter part is slowly gaining popularity. It may be due to the cheapness over the wooden plough as well as the fact that, it can be used in all kinds of soil and varying conditions. Among the other modern machinery the tractors have also increased substantially in numbers.

Agriculture practices are directly related with communities. Scheduled caste and Scheduled tribes living near to the forest are still using primitive technique of agriculture. Farmers who have large landholding and are educated are adopting scientific agriculture techniques in their fields. Scheduled caste and Scheduled tribes do not have large landholdings.

Table No. - 8
Agriculture Land in Buffer Zone Villages

(In Hectares)

S. No.	Tehsil	Agriculture Land	Irrigated Land	% of irrigated land
1	Kurai	9099.73	1501.46	16.50
2	Bichhua	7633.60	969.47	12.70
3	Chourai	1684.58	303.22	18.00
	Total	18417.92	2774.15	15.06

Source Agriculture department Seoni and Kurai

Crop wise distribution of Agriculture land

Agriculture production is mostly dependent on rains due to unavailability of adequate irrigation facilities in Kurai, Bichhua and Chourai tehsils. The major crops produce in area is as following –

Table No. - 9
Crop wise distribution of Agriculture land

S. No.	Grains	Area (Hectars)	Bichhua (%)	Chourai (%)	Kurai (%)
1	Dhan	1345	3.93	1.83	43.34
2	Wheat	5115	14.95	25.96	16.09
3	Jawar	5319	15.25	6.03	17.77
4	Makka	2144	6.27	12.02	5.41
5	Others	644	1.88	0.90	0.76
B	**Cereals**				
1	Chana	1425	4.16	7.65	6.92
2	Tuer	2054	6.00	3.54	2.66
3	Masoor	54	0.16		0.62
4	Others	758	2.22	3.26	7.01
5	Udad	1083	3.17	3.28	
C	**Oilseeds**				
1	Alsi	103	0.30	0.00	1.41
2	Groundnuts	985	2.88	2.30	0.64
3	Sarsaon	0	0	0	0.10
4	Soyabean	10695	31.26	46.43	12/52
5	Til	69	0.20	0.17	
6	Others	796	2.33	3.77	2.48

Source : Agriculture Department Seoni & Chhindwara

Development Programmes -

Buffer Zone villages in vicinity of Pench Tiger Reserve are having predominant tribal population. Data collected from Kurai, Bichhua and Chourai Janpad Panchayat reveals that 49.20 percent household in Kurai tehsil, 56.78% household in Bichhua tehsil and 43.25 percent household in Chourai tehsil are living Below Poverty Line (BPL) as defined by Government of Madhya Pradesh.

Documentation of all poverty alleviation programmes being implementation in Buffer Zone villages is a difficult and time-consuming task. We have selected some poverty alleviation programmes, which are focusing directly on individual. We selected programmes of Zilla Panchayat, Social welfare department and Agriculture department and have tried to assess their status in Buffer Zone villages

Programmes of Zilla Panchayat

1. **Swarn Jayanti Gram Swarojgar Vojana (SJGSY),**

The main Objective of this Programme is to provide grant and loans to families living below poverty line. In this Programme grants and loans are given for selected activities to individual and self help groups formed in villages and clusters Financial assistance is given in such a way that after repayment of loan; self-employed should earn minimum of Rs. 2000/ per month-Eligibility of Beneficiaries.

2. National Rural Employment Guarantee Scheme (NREGS)

In this scheme there is provision to give employment to a family for 100 days employment in a year. In this scheme following individual and community based works have been taken.

(i) Individual Beneficiary Oriented -

Table No. –10
Individual Beneficiary Oriented Works

S.N.	Name of Sub Scheme	Works
1	Kapil Dhara	1. New Well 2. Khet Talab 3. Masonary Check dam/Stop dam RMS 4. Small Tank
2	Nandan Phalodhyan	Plantation of Horticultural species
3	Bhumi Shilp	1. Land Development 2. Contour Bund 3. Field Bund
4	Resham	1. Plantation of Mulberry 2. Silk Production

(ii) Community Oriented -

Table No. – 11
Community Oriented Works

No.	Name of Sub Scheme	Works
1	Shailparn	1. Contour trenching, Gully plugging, Loose Boulder Check Dam, Construction on barren hills 2. Plantation on barren hills
2	Vanya	Plantation of host plant Arjun & Saj for tasar silk worm

(iii) Sampuran Gramin Rojgar Yojna (SGRY) –

This scheme is to provide additional employment, food security and to improve the quality of nutrition. In this scheme soil and moisture conservation, small irrigation, renovation of drinking water source, augmentation of water table, improvement of tradition sources of water, removal of silt form rural tank, pokhar, rural approach road, trench construction and forestry works will be taken on priority basis. In addition to, other works like road leading to school, Hospital, community center, Panchayat building and local market places will be developed.

(iv) Indira Awas Yojana -

The objective of this programme is to provide financial assistance for construction of houses to homeless families living below poverty line in rural area.

(iv) Food for work Yojna –

This scheme is implemented to provide - additional wages and employment, food security, development of permanent community, social & economical infrastructure in rural areas.

Programmes of Social Welfare Department

Social welfare department of Madhya Pradesh government is implementing programmes like leprosy clinic in rural and urban areas, hostels for tribal girls and boys, Gaon Ki Beti Yojna, Vivekanand Group Insurance Scheme and other programmes providing direct benefits to people. Integrated Social Security Pension programmes is well known programme of this department. Parent implementation agency of this programme is social welfare department but due to implementation of 73rd amendment of constitution Government of Madhya Pradesh had given power to Panchayats for selection of beneficiaries.

1. Integrated Social Security Pension

Integrated Social Security Pension programme is sponsored by state and central government. This programme provides to give Rs. 150/ per month as pension to senior citizens persons or old age persons and widows who do not have other source of income.

Programmes of Agriculture Department

Agriculture Department of Madhya Pradesh has around 30 programmes like integrated grain development programme, Tilhan Dalhan avam Makka ki Akikrit Youjna, Ganna development scheme, to improve agriculture production in the state. There are 7 core programme and others are extension programmes.

1. Improved Seeds Programmes

In this programme the department provides improved seeds to all farmers on subsidy rates.

2. 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.

3. Annapurna Programme

Beneficiaries' eligibility criteria are same as for Surajdhara programme, but in this programme department provide only seeds of cereals.

4. 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.

5. Modern Agriculture Implementation

To encourage use of Modern Agriculture Implement Government provides 50% subsidy directly to the farmers on purchase.

6. 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

7. National Biogas Project –

To encourage and install the other sources of energy and high quality fertilizer this programme is going on for SC/ST, small marginal farmers, landless, laboures and for general class farmers who are eligible. Beneficiaries are selected by Agriculture Development. There is a subsidy of Rs. 3500/- for SC, ST, Small, Marginal, Landless, laboures & Rs. 2700/- for other farmers

3.4 Research, Monitoring and Wildlife Health -

Research: Pench Tiger Reserve is developing to an excellent research centre due to its fauna, flora and diverse habitat. There are 3 Ph.D. theses on various aspects of wildlife in the National Park. Besides many technical papers relating to the wildlife ecology of the National Park have been published in various national and international journals. The field research activities in Pench include the following:

- Well documented description, evaluation & classification of habitats
- Data collection on population dynamics, dispersal pattern of wild animals, intra & inter-specific relations, feeding habits of herbivores & carnivores
- Ecological monitoring of weather/ physical factors
- Check-listing of flowering plants

- Check-listing of birds
- Faunal inventory
- Use of Landsat imageries & space photographs to study the habitat parameters
- Use of radio-telemetry for studying land tenure of tigers
- Study of movement patterns of encumbered tigresses using GPS/ software
- Base line mapping of PA and surrounding areas
- Environmental Education Awareness Strategy Action Plan
- Environmental Assessment of Regional Plan
- PA Level Visitor Management and Participatory Eco-tourism Study
- Process Documentation Research
- Documentation of traditional knowledge
- Study on wetland & riparian areas in PTR with diversity & status of fishes and waterfowls
- Floristic Survey, Vegetation Description, Conservation Status And Distribution of Rare and Endangered Plants/Plants Communities contributed for Herbarium

Field data including animal population figures, water distribution and availability, distribution vegetation etc collected year round. 43 transects are maintained for monitoring of habitat and census.
Intensive studies carried out include

1. Ecology of Gaur (WII)
2. Ecology of Wild-dog (WII)
3. Bird diversity (WII)
4. Faunal diversity (In house by Subhranjan Sen and N.S. Dungriyal)
5. Floral Diversity (In house by N.S Dungriyal)

Training:

The staff of the Tiger Reserve has been involved in the wildlife conservation since long. As the concept of wildlife training/ orientation courses for the frontline staff has been relatively new, internal workshops/ field technique exercises held by trained officers and resource persons were the main source of capacity building for the frontline staff. With the opening up of State-level Institutions, the staff is encouraged to undergo orientation courses.

Estimation of Wild Animals:

This is one of the most important exercises carried out every year in the month of December/January in the Tiger Reserve. Needless to add, such information is essential to monitor changes in the population trends over time or among habitats, and evaluate the success of wildlife management programmes.

Now Tiger Conservation Authority in collaboration with WII has developed a methodology for estimating and monitoring tiger status and habitat. As per this method monitoring will be carried out at an interval of four years.

Wildlife health:

Wild animals are prone to the cattle borne diseases such as Reinderpest, Foot and Mouth disease, Anthrax and other viral and bacterial diseases. Heavy loss of Gaur occurred in 1964 due to Reinderpest. Mortality due to pneumonia has also been observed in the Buffer area. The ever-increasing population of cattle and their interference in the Park area poses a constant threat of epidemics. A systematic approach to get the domestic cattle immunized in adjoining villages is an ongoing regular operation.

3.5 Nature Education and Interpretation -

Wildlife Tourism

Wildlife tourism in Pench Tiger Reserve is subordinated to the main objective of wildlife conservation. The Management believes that the visitors should be provided a meaningful exposure to the Protected Area so that they can appreciate India's magnificent natural heritage and conservation benefits.

The Project Tiger objective "to ensure the maintenance of a viable population of the tiger in India and to preserve, for all times, such areas as part of our natural heritage, for the benefit, education and enjoyment of future generations" also sounds a similar note.

Wildlife tourism in Pench Tiger Reserve is a balance of conservation education and entertainment with the active participation of local people. The underlying principle is that the tourism should be ecologically and socio-culturally sustainable.

The wildlife tourism activities are restricted to a small zone, which amounts to only 14.10% (150 sq. km.) of the Protected Area. The latest annual tourist influx is 52104 of which almost 10.55% are foreigners. The tourist figures of the past and the graphical depictions are indicated below. At times, five to eight thousand tourists visit the park in a month (November/ December), and on holidays the number sometimes goes up to almost seven hundred per day.

Table No. - 12
Total No. of Tourists Visiting in the Park
(During the Last 5 Years)

Year	Indian	Foreigner	Total	Revenue
2009-10	47758	4796	52554	10398096
2010-11	60038	5421	65459	18080606
2011-12	63802	6282	70084	19238430
2012-13	44407	5043	49450	13640176
2013-14	46602	5502	52104	19555350

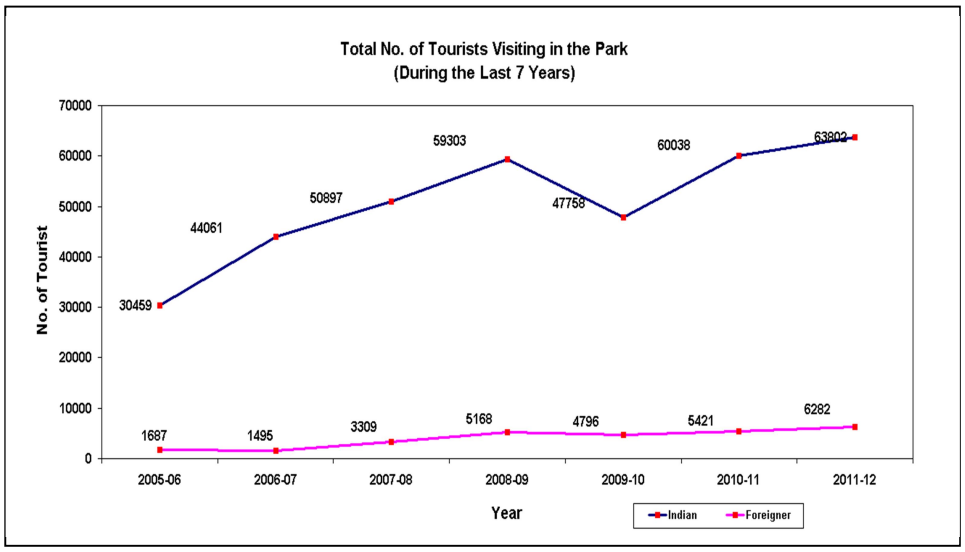


Table No. - 13
Month wise Average Tourists Influx in the Last 7 Years

Month	Indian	Foreigner	Total
October	3573	261	3834
November	6049	634	6683
December	8452	394	8846
January	6572	419	6991
February	4113	742	4854
March	4221	748	4969
April	4783	473	5257
May	6832	234	7066
Jun	6052	73	6125

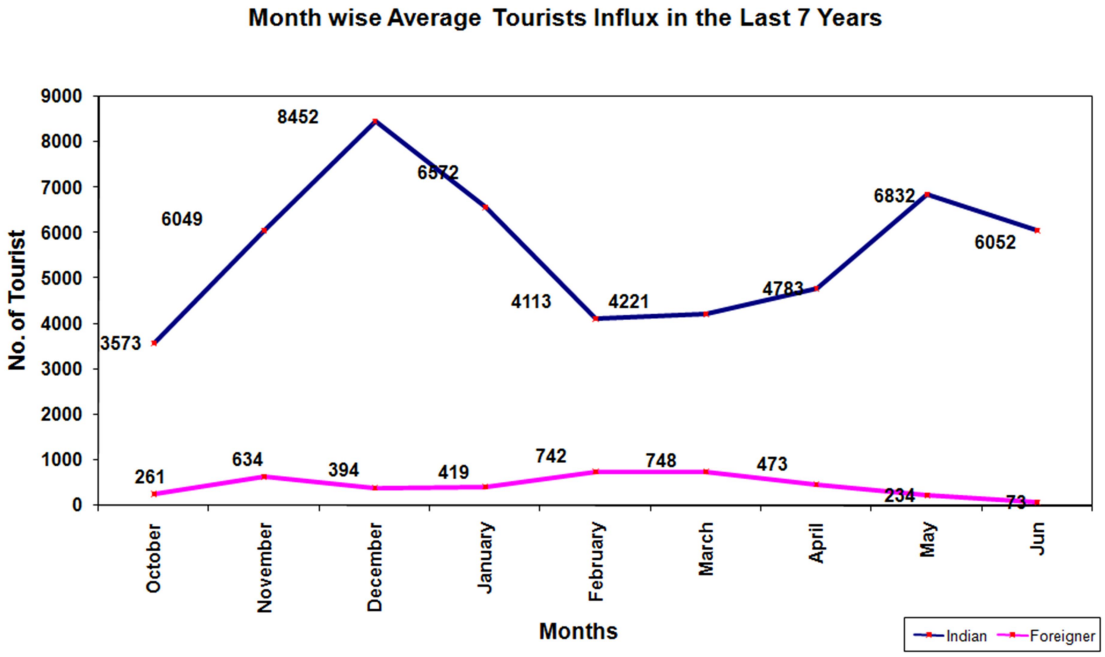
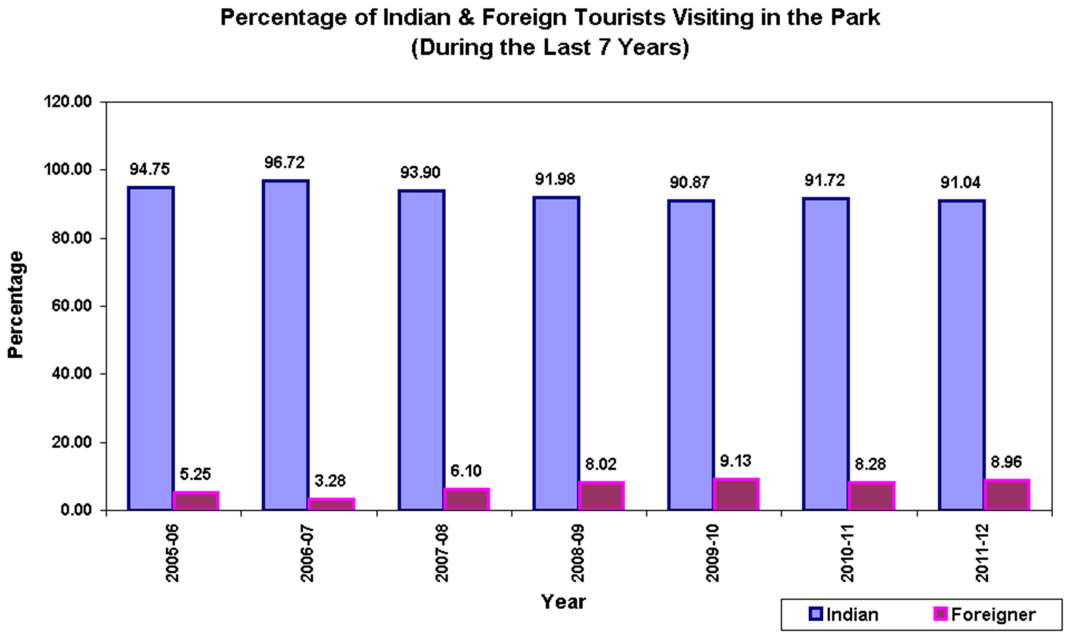


Table No. - 14
Percentage of Indian & Foreign Tourists Visiting in the Park
(During the Last 7 Years)

Year	Indian	Foreigner
2005-06	94.75	5.25
2006-07	96.72	3.28
2007-08	93.90	6.10
2008-09	91.98	8.02
2009-10	90.87	9.13
2010-11	91.72	8.28
2011-12	91.04	8.96



Nature Tourism

There some nature trails in the buffer zone. But these nature trails are not managed properly to attract tourist.

Nature tourism is also a new name for "eco-tourism", which varies in accordance with the ecological setting and seasonal attribute of the site. The potential of eco-tourism involving local indigenous communities for their economic upliftment has been recognised in Pench Tiger Reserve. Essentially, it aims at the enjoyment of nature and an understanding of the ecology, without causing the least destruction to its support system, leading to economic benefits for the indigenous masses.

Eco-tourism is distinct from mass tourism. It is multi-faceted, having various intricate linkages with different forms of human activity, with domestic, regional and international characters. In many countries, eco-tourism plays an important role in the shaping of national economies. The socio-economic and ecological impact of eco-tourism is relevant to a developing country like India, and it is evolving over the vicissitudes of time with new concepts and ideas.

Boarding and Lodging Facilities:

Apart from the limited departmental accommodation at Karmajhiri gate, Boarding and Lodging facilities are available at Turia Gate of Pench Tiger Reserve, "Kipling Court" a unit of Madhya Pradesh Tourism Development Corporation Ltd. along with some private Resorts / Lodges around the Turia Gate at village Turia, Awargani and other near by villages are available for tourist. The total of lodging facilities (Forest Dept, MPTDC & Private) available around the Pench Tiger Reserve is around 900 beds per night.

Park Attraction and Rules:

The Park Management provides elephants and route guides, apart from the interpretation facilities, at a nominal charge to the tourists. Entry on foot and night driving are prohibited inside the park. Only light vehicles are allowed with a route guide. Viewing ungulates from a vehicle and spotting tiger from an elephant back are star attractions for the tourists. The park has a set of rules for regulating the tourism in and around Park and the detail is given in eco-tourism plan.

3.6 Administration and Organization -

Administration and organisation of buffer zone will be functional in two ways.

(i) Protection and management of forest and wildlife.

(ii) Execution of eco-development activities.

(i) Protection and management of forest and wildlife-

Division	**1. South Seoni (T)**				**2. South Chhindwara (T)**		**3. East Chhindwara (T)**
Range	1	2	3	4	1	2	1
	West Khawasa	Kurai	Rukhad	Ari	Bichhua	Kanhan	Chourai
Sub-Range	2	3	6	4	1	1	3
	Turia	Chandrapur	Badalpar	Ari	Pulpuldoh	Sonpur	Kumbhapani
	Khawasa	Kurai	Mohgaon	Gangerua			Meghdon
		Sakata	Nayegaon	Nahlesarra			Sankh
			Rukhad	Sarekha			
			Salhey				
			Vijaypani				
Total of Beats	**8**	**13**	**17**	11	**6**	**1**	**11**

(ii) Execution of eco-development activities-

Administration	1	2	3	4	5
Eco-development Officer	EDO Khawasa	EDO Kurai	EDO Rukhad	EDO Bichhua	EDO Gumtara

There are 5 eco-development officers of the rank of forest ranger posted in Pench Tiger Reserve under Field Director. Therefore 5 eco-units have been formed and 5 forest rangers are entrusted to execute the all eco-development works in 99 villages in buffer zone.

Buffer zone has come under unified control of Field Director, Pench Tiger Reserve. M.P. Forest Dept. Process of reorganisation of buffer divisions, notification of division, Sub-divisions, ranges, etc. is also completed.

Administration and Organization

The proposed administrative and organizational set up after inclusion of buffer zone in Tiger Reserve is as under.

Administrative arrangement for Buffer Zone

Division	Subdivision (HQ.)	Range	Core/ Buffer	Forest area (Ha.)	Rev. area (Ha.)	Total (Ha.)
Pench Buffer Zone Division Seoni	Khawasa (Khawasa)	Ghatkohka	Buffer	5231.880	6270.350	11502.230
		Khwasa	Buffer	6286.950	5581.790	11868.740
	Total			**11518.830**	**11852.140**	**23370.970**
	Rukhad (Seoni)	Rukhad	Buffer	11665.890	783.830	12449.720
		Ari	Buffer	13389.620	854.750	14244.370
	Total			**25055.510**	**1638.580**	**26694.090**
	Bichhua (Chhindwara)	Kumbhapani	Buffer	7774.977	9349.750	17124.727
		Khamarpani	Buffer	2656.968	6983.470	9640.438
Total				**10431.945**	**16333.220**	**26765.165**
G. Total				**47006.285**	**29823.940**	**76830.225**

Chapter - 04

PRODUCTION SECTORS IN THE LANDSCAPE

A number of production sectors operate in the buffer area of Pench Tiger Reserve, These production sectors affect directly or incidentally the tiger conservation. Some of the common production sectors in the buffer area area –

(a) Forestry (affect directly) (D)
(b) Agriculture (D)
(c) Integrated Development (eco-development, development through collector sector) (D)
(d) Tourism (D)
(e) Fisheries (D)
(f) Road (D)
(g) Irrigation projects (D)
(h) Temple tourism (D)

4.1 Forestry -

(i) Forest area:

The total area of forest in the buffer zone is 470.063 sq. km. which is 61.18 % of the total area of the buffer zone. Division wise and Range wise forest area is as follows –

Table No. - 1
Division wise Forest area

S. No.	Divisions	Range	R.F. (ha) with F.V.	P.F. (ha)	Total Area	F.V. Area
1.	Pench Tiger Reserve	Ghatkhoka	4446.770	785.110	5231.880	449.760
		Khawasa	3155.650	3131.300	6286.950	119.500
		Rukhad	11076.850	589.040	11665.890	1087.530
		Ari	13630.250	759.370	13389.620	672.640
	Total Seoni		**32309.520**	**5264.820**	**36574.340**	**2329.430**
2	Pench Tiger Reserve	Kumbhpani	5684.312	2090.665	7774.977	610.450
		Khamarpani	2076.796	580.172	2656.968	0.000
	Total Chhindwara		**7761.108**	**2670.837**	**10431.945**	**610.450**
G. Total			**39070.628**	**7935.657**	**47006.285**	**2939.880**

4.2 Agriculture -

4.2.1 Land use in Buffer Zone villages

Land use in Buffer Zone villages is as following –

Table No. – 2
Land use Pattern in Buffer Zone

S. No.	Classification	Land (Hectors)	Percentage
1	Forest	10650.27	28.65
2	Agriculture Land	18417.92	55.12
3	Gauchar	3408.95	9.26
4	Uncultivable Land	2522.85	6.97
	Total	35364.33	100.00

Source: District Land Records

Land use in Buffer Zone villages of Kurai tehsil

Forest area in Kurai tehsil is more than that in Bichhua and Chourai tehsils. Forest boundary of revenue villages is 32.62 % of the total land boundary of villages. Land under agriculture is 47.75 % of the total land and is lower than the average for all the Buffer Zone villages.

Table No. -3
Land use in Buffer Zone villages in Kurai Tehsil

S. No	Classification	Kurai Tehsil		Bichhua Tehsil		Chourai Tehsil	
		Land (in Ha)	%	Land (in Ha)	%	Land (in Ha)	%
1	Forest	6277.26	32.62	3559.33	27.42	813.68	25.90
2	Agriculture Land	9099.73	47.75	7633.60	59.96	1684.58	57.65
3	Gauchar	2124.82	11.04	1000.03	7.70	284.10	9.04
4	Uncultivable Land	1651.98	8.59	638.06	4.92	232.81	7.41
	Total	18241.94	100	12980.78	100	3141.61	100

Source: District Land Records

Land under forest is highest in villages of Kurai tehsil as compared to Bichhua and Chourai tehsils. Gauchar land on records is highest in Kurai as compared to other tehsils. However ground reality reveals that practically these lands are not utilized as gauchar lands.

4.2.2 Agriculture in Buffer Zone Villages

Agriculture Practices

Agriculture practices in Buffer Zone Villages are still in prmodern stage. People in some villages are still depending on indigenous agriculture practices due to intensity of poverty. Big farmers of Chourai tehsil are implementing scientific agriculture practices. Agriculture crop yield in Bichhua and Kurai is very low. Farmers in these tehsils are still following primitive agriculture practices.

The old traditional implements consist of hal or nagar, the common plough. This plough is used for breaking wasteland and for plashing fields of wheat and sugarcane. With minor improvisation it is also used for seed sowing. Another important tool is

the bakhar, which is used in preparing all kinds of land and is a kind of bladed harrow. Tiffan is a three tined seed-drill generally used along the Maharastra border. The Ghana or mill and the kadhai are used for sugar processing. With the progress in sugarcane cultivation the number of crushers in district has also gone up and particularly, the modern power driven crushers has increased substantially. Olped threshers, winnowers, fodder cutters, etc are among the other modern implements. But the threshers yield a rough bhusa and often the bullock are required to trample over it to soften the bhusa.

However, the iron plough an improvement over its wooden counter part is slowly gaining popularity. It may be due to the cheapness over the wooden plough as well as the fact that, it can be used in all kinds of soil and varying conditions. Among the other modern machinery the tractors have also increased substantially in numbers.

Agriculture practices are directly related with communities. Scheduled caste and Scheduled tribes living near to the forest are still using primitive technique of agriculture. Farmers who have large landholding and are educated are adopting scientific agriculture techniques in their fields. Scheduled caste and Scheduled tribes do not have large landholdings.

Table No. - 4
Agriculture Land in Buffer Zone Villages

(In Hectares)

S. No.	Tehsil	Agriculture Land	Irrigated Land	% of irrigated land
1	Kurai	9099.73	1501.46	16.50
2	Bichhua	7633.60	969.47	12.70
3	Chourai	1684.58	303.22	18.00
	Total	18417.92	2774.15	15.06

Source Agriculture department Seoni and Kurai

Crop wise distribution of Agriculture land

Agriculture production is mostly dependent on rains due to unavailability of adequate irrigation facilities in Kurai, Bichhua and Chourai tehsils. The major crops produce in area is as following –

Table No. - 5
Crop wise distribution of Agriculture land

S. No.	Grains	Area (Hectars)	Bichhua (%)	Chourai (%)	Kurai (%)
1	Dhan	1345	3.93	1.83	43.34
2	Wheat	5115	14.95	25.96	16.09
3	Jawar	5319	15.25	6.03	17.77
4	Makka	2144	6.27	12.02	5.41
5	Others	644	1.88	0.90	0.76
B	**Cereals**				
1	Chana	1425	4.16	7.65	6.92
2	Tuer	2054	6.00	3.54	2.66
3	Masoor	54	0.16		0.62
4	Others	758	2.22	3.26	7.01
5	Udad	1083	3.17	3.28	

C	Oilseeds				
1	Alsi	103	0.30	0.00	1.41
2	Groundnuts	985	2.88	2.30	0.64
3	Sarsaon	0	0	0	0.10
4	Soyabean	10695	31.26	46.43	12/52
5	Til	69	0.20	0.17	
6	Others	796	2.33	3.77	2.48

Source : Agriculture Department Seoni & Chhindwara

4.3 Integrated Development (eco-development, development through collector sector) (D) -

4.3.1 Index of Eco-development Villages

Ranking of Eco-development villages was done after calculation Infrastructure Development Index. Village received highest marked was ranked first number and village "received lowest marked was ranked last. Infrastructure Development Index of Khamarpani village is 95.83 percent it was ranked 1st. Index of Salhe village in Kurai is lowest 45.83 percent it was ranked 99th. Eco-development villages were grouped on the basis of 1DI.

Table No. – 6
Infrastructure Development Index of Eco-development villages

S. No.	Infrastructure Development Index	Villages
1	Below 50%	3
2	Between 50 to 60%	14
3	Between 60 to 70%	18
4	Between 70 to 80%	32
5	Above 80%	32

Villages were grouped as per Infrastructure Development Index. 3 villages have IDI below 50 percent, 14 villages have IDI between 50 to 60 percent, 18 villages have IDI between 60 to 70 percent, villages having IDI between 70 to 80 percent are 32 and villages having IDI above 80 percent are 32.

Murer and Salhe villages in Kurai tehsil and Bandha Ryt in Bicchua tehsil require immediate attention regarding development of infrastructure & services these villages are suffering from severe drinking water problems.

4.3.2 Infrastructure Development Plan for Eco-development Villages

After identification of gaps in Infrastructure & services in Eco-development villages, detail plan is propose for development of each Infrastructure & service. This plan will helpful for responsible authorities to undertake works in Eco-development villages. It will also helpful for authorities for optimum utilisation of budget. Infrastructure facilities like roads, hospitals, school, electric lines are shown on the **Map No. 38.**

1. Anganwadi -

Anganwadi is important institution in villages. The following Eco-development villages around vicinity of Pench Tiger Reserve need immediate attention regarding Anganwadi.

Table No. – 7
Eco-development villages require Anganwadi

S. No.	Villages	S. No.	Villages
1	Tikari Ryt	17	Vijaypani
2	Tikari Mal	18	Arjuni
3	Barelipar Ryt	19	Murer
4	Teoni	20	Rukhad
5	Salhe	21	Karmajhiri
6	Bhodki	22	Kothar
7	Katangi Ryt	23	Kanhasagar
8	Panjra	24	Thota Ryt.
9	Niwari	25	Naharjhir
10	Alesur	26	Bandhan Ryt.
11	Durgapur	27	Antara
12	Ambadi	28	Silota Khurd
13	Kamrreth Ryt	29	Boradi
14	Awargani Ryt	30	Dongargaon
15	KuppiTola Ryt.	31	Dholpur
16	Khamba		

2. Public Distribution Shop -

Public Distribution Shop in every village is prim responsibility of Government. These Shops provide grain and other to peoples in fair price. Especially in villages where intensity of poverty is high, provision of Public Distribution Shops becomes necessary. The following Eco-development villages require immediate attention regarding establishment of PDS: -\

Table No. – 8
PDS requirement of village

Sr. No.	Villages
1	Bandhan Ryt.
2	Tekapar
3	Singardip
4	Marajatpur
5	Pathara Khurd

3. Drinking Water

Peoples in Eco-development villages are depending upon Handpump for drinking water; only 5 villages out of 99 have pipe line water supply system. More then 50 percent villages are suffering from drinking water problems. Villages require immediate attentions regarding drinking water problem is: -

Table No. –9
Village require drinking water facilities

S. No.	Villages	S. No.	Villages
1	Bandhan Ryt.	11	Silota raiyat
2	Marajatpur	12	Dunda Seoni
3	Salhe	13	Kohka
4	Murer	14	Pathari
5	Antara	15	Gumatara
6	Dholpur	16	Pulpuldoh
7	Titari Mohgaon	17	Surewani
8	Erma	18	Rampuri
9	Boriya	19	Banskheda
10	Bandhamal		

4. Medical facilities

Peoples in villages are mainly depending upon Government to provide medical facilities. The following villages have lack of medical facility:

Table No. – 10
Eco-Villages require medical facilities

S. No.	Villages	S. No.	Villages
1	Titari, Mohgaon	8	Khamba
2	Barelipar Ryt	9	Karmajhiri
3	Tekapar	10	Paraspani
4	Tikari Ryt	11	Satosha
5	Tikari Mal	12	Kharanj
6	Ambadi	13	Vijaypani
7	Khamreeth Ryt.		

5. Market Place

Market place is for economic development of peoples in rural area. Marketplace gives opportunity for peoples to buy and sale vegetables and other items such as household industrial goods. Developments of Market place are requiring in following Eco-development villages.

Table No. – 11
Villages require development of Market place

S. No.	Villages
1	Ambadi
2	Khamreeth Ryt.
3	Khamba
4	Kumbhpani
5	Dongargaon

6. Education

Rajiv Gandhi Primary Shiksha Mission had opened formal and informal primary schools in nearly all Eco-development villages. Immediate attention is not requiring in development of primary education institution however attention in development of secondary schools should be given in Eco-development villages.

7. Road

Road network is major problem in Eco-development villages very few are having WBM approach road. Especially in forest village's development of approach road to village should be given prime importance. The following Eco-development villages require immediate attention for approach road development.

Table No. – 12
Villages require approach road

S. No.	Villages
1	Salhe
2	Tikari Ryt.
3	Barelipar Ryt.
4	Tikari Mal
5	Paraspani
6	Sarrahiri

8. Post and Telegraph

Post and Telegraph facilities are not much importance for tribal communities living in Eco-development villages, keeping future point of view these facilities should be develop in villages. From following villages Post and telegraph facilities are available above 10 kms of distance.

Table No. – 13
Villages require Post and Telegraph facilities

Sr. No	Villages
1	Pathra kala
2	Kumbhpani
3	Karmajhiri
4	Thota Mal
5	Kokiwara
6	Tekapar
7	Khursipar

The majority of inhabitants belong to the tribes - viz. the Gonds. Most of the people are illiterate, and are by and large pastoral, though agriculture, collection of minor forest produce and wages earned through routine park works constitute their principal occupation. Though basically “food gatherers” by nature, the Gonds are gradually adopting to agriculture.

4.3.3. Infrastructure Development Programmes

1. Fisheries department

Fisheries department is responsible for promotion of pisciculture in district. Deputy Director heads the department in the district. Fisheries department implements programmes through committees and fisheries societies formed in villages. Presently fisheries department of Chhindwara and Seoni district are implementing improved seeds programme of fishes.

2. Irrigation department

Irrigation department undertakes works for enhancement of irrigation facilities for agriculture in the district. Department had formed irrigation Jal committees in villages for optimum utilization of available irrigation source in district. At present Jal committees are active in Chargaon, Nayegaon, Khamarpani, Surewani Buffer Zone villages.

Irrigation by well is much higher than other source. In Chourai 10699 wells and in Bichhua 3315 wells are under utilization for irrigation. It reflects that ground water table is high in Chourai as compared together tehsils. In Chorai total 38.41 % of irrigated land is irrigated by wells and the Bichhua 19.81% irrigated land is irrigated by wells. In Kurai 42% area is irrigated by wells.

3. Public Works Department (PWD)

Public works department undertakes works related to construction and maintenance of Government assets like road, community building, Lakes, public toilets, rest house etc. This department also executes works proposed through MP and MLA funds as planned by District Planning Committee.

4. Public Health Engineering Department

Public Health engineering department executes drinking water supply schemes in rural and urban areas of district. This Department also maintains Hand pump installed in villages for drinking water purpose.

5. Industries Department

Chhindwara district is in C category of industrialization. Minerals based industries are possible in district due to rich minerals deposits. Industrial Estates in district are established in Parasia, Chandamata and Chhindwara. Seoni district is industrially backward as compared to Chhindwara and other districts of the state. Some small-scale industries are working in Chhapara block of the district. Recently one unit of Baidyanath group has been established in Seoni block. All above mentioned mineral rich areas and industrial set-ups are out of the periphery of the Buffer Zone and also Eco-sensitive Zone.

6. Khadi and Village Industries

Khadi Gram Udhyog Department of Madhya Pradesh Government implements programmes for promotion of cottage industries in the state. Department gives loan to individuals for establishment of cottage industries in rural and urban areas.

7. Madhya Pradesh Mineral Development Corporation

Chhindwara district is very rich in mineral deposits. It is one of the major Manganese producing districts of the country- Coal, Manganese and Dolomite mines in Chhindwara and Seoni districts are situated in Parasia, Sausar, Tamia, Chhapra, Lakhnadoun blocks of the districts, which are far away from Pench Tiger Reserve.

8. Veterinary and Animal Husbandry Department

Animal Husbandry has become a prominent sector for generating employment and income to the rural people, specifically the poor. The activity offers means of supplementary income to families of the cultivators in rural areas adds to the economic growth of the district as well as create employment opportunities in rural areas.

9. Rajiv Gandhi Watershed Mission

This programme is implemented by Zilla Panchayat the main work of the programme is watershed treatment.

Activities going on under this programme are formation of self-help Groups, for Construction of Stop and Check Dams, Soil and Moisture Conservation and Social forestry works.

4.4 Tourism -

Wildlife tourism in Pench Tiger Reserve is a balance of conservation education and entertainment with the active participation of local people. The underlying principle is that the tourism should be ecologically and socio-culturally sustainable.

The wildlife tourism activities are restricted to a small zone, which amounts to only 14.10% (58 sq. km.) of the Protected Area. The latest annual tourist influx is 52777, of which almost 10.55% are foreigners. The tourist figures of the past and the graphical depictions are indicated below. At times, five to eight thousand tourists visit the park in a month (November/ December), and on holidays the number sometimes goes up to almost seven hundred per day.

Apart from the limited departmental accommodation at Karmajhiri gate, Boarding and Lodging facilities are available at Turia Gate of Pench Tiger Reserve, “Kipling Court” a unit of Madhya Pradesh Tourism Development Corporation Ltd. along with some private Resorts / Lodges around the Turia Gate at village Turia, Awargani and other near by villages are available for tourist. The total of lodging facilities (Forest Dept, MPTDC & Private) available around the Pench Tiger Reserve is around 900 beds per night.

4.5 Fisheries -

Fisheries department is responsible for promotion of pisciculture in district. Deputy Director heads the department in the district. Fisheries department implements programmes through committees and fisheries societies formed in villages. Presently fisheries department of Chhindwara and Seoni district are implementing improved seeds programme of fishes.

4.6 Road-

Two major roads pass through the 99 Eco-development villages. 5 Eco-development villages of Kurai Tehsil are situated on National Highway No 7 from Kanya Kumari to Varanasj. These villages are Mohgaon Sadak, Pindkapar, Setewani, NayegaonBanjar and Pachdhar. The State Highway, the other major road passes through Bichhua Tehsil on that only 4 Eco-development villages are situated. These villages are Bisanpur, Khamarpani, Deni and Devari.

The overall condition of approach roads in Eco-development villages is not good. Out t)f 99 Villages only 5 villages are having pucca approach roads. In rainy season Tikari Mai, Tikari Ryt, Karmajhiri, Barelipar Ryt are almost cut off from rest of the villages. In Bicchua and Chorai Tehsils Kumpani, Jamtra, Dholpur, Tekapar, Boriya, Khursipar and Kumpani are cut oft from rest villages in rainy season due to bad condition of roads.

4.7 Irrigation Project -

No major irrigation projects are situated in the buffer area of the Pench Tiger Reserve. Only minor irrigation tanks like Kohka Tank, Potia Tank, Jeerewada Tank, Bodanala Tank etc. exist in the Buffer Zone.

4.8 Temple Tourism -

Temple Tourism 05 Temples / Masjids in buffer zone, but these temples are not used tourism purpose. Banjari mata temple near Siddhaghat and Ambamai Temple are also proposed in eco-tourism development plan.

Chapter - 05

LAND USE PATTERNS AND CONSERVATION – MANAGEMENT ISSUES

5.1 Land Use Classification -

5.1.1 Buffer Zone - Genesis:

The concept of Buffer Zones for Protected Areas emanated from the Project Tiger conservation philosophy. The guiding principle was to keep the core area free of all exploitation and human use, and to insulate it from the external influences by a buffer belt. While implementing this, the core area will be freed of all biotic disturbances.

During the formative years, after the launch of Project Tiger, the buffer zone was merely treated as a forest belt surrounding the Protected Area or the core zone having a high degree of protection and conservation values. The focus was mainly on consolidating the core area and providing appropriate site-specific inputs for conservation. Subsequently, since the late eighties, the emphasis on managing the buffer zone as a multiple use area has gained momentum to achieve the conservation objectives.

The buffer zone can be visualised as a multiple use area zone or simply as an ecodevelopment zone. Eco-development is not just rural development; apart from economic development of indigenous people to a limited extent, it seeks to protect the Protected Area by eliciting the much- needed public support. By and large, it aims to generate the active cooperation of communities peripheral to Protected Areas by providing site-specific, well targeted interventions, so that the people appreciate this as emanating directly from the Protected Area in return for their commitment to Protected Area conservation.

Thus, buffer zones provide scope for inputs to sustainably absorb the human/ biotic impact, apart from enhancing the penumbral effect of the Protected Area on the core zone. Such zones need not have any special legal status, but should be areas delineated for managerial convenience to accomplish specific objectives.

5.1.2 Imperatives & Issues:

The imperatives for tiger conservation at present are:

- Managing the core conservation unit to foster a viable population of tigers.

- Maintaining/ managing the buffer and fringe areas peripheral to the core for providing eco-developmental inputs to the stakeholders, and with their cooperation saving the peripheral forests as “habitat supplement”

- Saving tigers outside the Tiger Reserve/ Protected Area system by identifying the corridors and ensuring restorative inputs in such areas by integrating the Tiger Reserve/ Protected Area management plan in a larger regional management plan.

Our forest management principles were essentially rooted in the earlier colonial policy of commercial exploitation. Gradually, for good, this is undergoing a change. It is being realised by one and all that meeting the needs of indigenous people and involving them in conservation and management are important to ensure the survival of forests and wildlife.

Plants, animals and human beings have co-evolved and are inseparable owing to their interdependence. Therefore, the ailments of forests also affect the wild fauna. This calls for a holistic view to redress the situation. Any strategy advocating a dichotomy would be myopic, since almost 70% of our wild fauna thrives outside the protected area system in regular forests.

5.1.3 Constraints:

There are several constraints which should not be lost sight of. Encroachments on forest lands, diversions of forest lands for non-forestry purposes, pressures of local people and their livestock, threats from migratory cattle, poaching and illegal trade in wildlife and their derivatives, insurgency, law and order problems, lack of land use policy leading to unwise land use outside protected areas, and shrinkage of village pastures are noteworthy.

Much has been said about the goal of balancing conservation and development. But how do we achieve this in a developing country like India? Here it becomes important that the public and private Institutions alike should reconcile conservation with sustainable and equitable development. We have site-specific, region-specific social, economic and natural resource problems that are not easy to solve. Since past experience has proved that there are basic contradictions between human needs and resource attributes owing to population pressure, our National Park Policy does not permit human habitations within. However, the depleted status of general forest areas and the ever-increasing needs of locals may overwhelm the Tiger Reserve if the will and enforcement are weak, with no package of viable alternatives. Therefore, this problem has to be addressed at three levels, viz. local, community and regional.

The Existing Situation in the Impact Zone:

The impact zone (buffer) of the Tiger Reserve comprises of fringe revenue and forest villages, which exert biotic pressure on the peripheral PA resources. The dependency of these villages varies from collection of fuel wood and Minor Forest Produce, to livestock grazing, apart from the use of some water bodies. The impact zone has been delineated carefully after considering the various incidents of interface conflicts and assessment of dependencies of the surrounding indigenous communities on the protected area. The zone of influence extends in the area of 768.302 sq. kms.

5.1.4 The Profile of Impact Zone:

There are 107 villages located within the Zone of influence (ZI) out of which 60 fall in Seoni District and the remaining 47 villages are situated in Chhindwara District. All these villages have also been selected for "Eco-development Programme". The implementation of such programme has been executed through Eco-development committee (EDC) constituted for every village for effective supervision for the activities of such EDCs, the 107 villages have been put under the 6 Eco Units/Range.

The following table contains the names of Eco units/Range and the number of EDCs covered under them:

Table No. - 1
Eco units and the EDCs covered under them

S. No.	Eco-unit	District	No. of EDCs
1	Ghatkohka	Seoni	21
2	Khawasa	Seoni	24
3	Rukhad	Seoni	7
4	Ari	Seoni	8
5	Kumbhpani	Chhindwara	24
6	Khamarpani	Chhindwara	23
		Total	**107**

The following list contains the name of the villages falling within the Zone of Influence and their distances from the boundary of PA.

Table No. - 2
Villages situated in the Zone of Influence (ZI)

S. No.	Eco-Unit/Range	0 to 1 Km.	1 to 2 Km.	2 to 5 Km.	Above 5 Km.
1.	**Ghatkohka** (21)	Tikari Mal	Barelipar	Simariya	--
		Tikari Raiyat	Salhe	Ghatkohka	--
		Karmajhiri	Sarrahirri	Panjra	--
		Bhodki	Tewni	Sindariya	--
		Katangi	Dhutera	Mohgaon Titri	--
		Murer	Patrai	Niwari	--
		Aagri	Aalesur	Paraspani	--
	Total	**07**	**07**	**07**	**--**
2.	**Khawasa** (24)	Raiyarao	Pindkapar	Ambajhiri	Kothar
		Potiya	Kodajhir	Telia	--
		Ambadi	Setewani	Nayagaon	--
		Khamreeth	Mohgaon Yadav	Mudiyareeth	--
		Khamba	Durgapur	Pachdhar	--
		Vijaypani	Awarghani	Kohka	--
		Jeerewada	--	Arjuni	--
		Satosha	--	--	--
		Kuppitola	--	--	--
		Turia	--		
	Total	**10**	**06**	**07**	**01**

3.	**Rukhad** (07)	Gandatola	--	Sawangi	Sakhadehi
		--	--	--	Darasikhurd
		--	--	--	Darasikala
		--	--	--	Bawanthadi
		--	--	--	Nayegaon
	Total	**01**	**--**	**01**	**05**
4.	**Ari** (08)	--	--	--	Khapa
		--	--	--	Aatarwani
		--	--	--	Magarkatha
		--	--	--	Pandayer
		--	--	--	Durhapur
		--	--	--	Mohgaon (FV)
		--	--	--	Sakata
		--	--	--	Mirchiwadi
	Total	**--**	**--**	**--**	**08**
5.	**Kumbhapani** (24)	Jamtara	Thota Mal	Banskheda	Konapindrai
		Thota Raiyat	Pathri	Kumbhapani	Sajpani
		Naharjhir	Singardeep	Dawajhir	Halal Kala
		Gumtara	--	Kanhasagar	Halal Khurd
		Pathra khurd	--	Bandhan Mal	Madaria
		--	--	Bandhan Raiyat	Khairanj
		--	--	Khamariya	--
		--	--	Chargaon	--
		--	--	Kokiwada	--
		--	--	Dhoulpur	--
	Total	**05**	**03**	**10**	**06**
6.	**Khamarpani** (23)	Pulpuldoh	Sawari	Saliwada	--
		Dudhgaon	Chirrewani	Antara	--
		Mohgaon Khurd	Bordi	Dongargaon	--
		Thuepani	Sirrepani	Kadhiya	--
		Pathra Kala	--	Dainy	--
		Kokiwada	--	Marjatpur	--
		--	--	Khamarpani	--
		--	--	Kanhargaon	--
		--	--	Deori	--
		--	--	Bisanpur	--
		--	--	Kundai	--
		--	--	Silota Kala	--
		--	--	Silota Khurd	--
	Total	**06**	**04**	**13**	**--**
	Total (107)	**29**	**20**	**38**	**20**

5.1.5 Land use in Buffer Zone villages

Land use in Buffer Zone villages is as following –

Table No. – 3
Land use Pattern in Buffer Zone

S. No.	Classification	Land (Hectors)	Percentage
1	Forest	10650.27	28.65
2	Agriculture Land	18417.92	55.12
3	Gauchar	3408.95	9.26
4	Uncultivable Land	2522.85	6.97
	Total	35364.33	100.00

Source : District Land Records

5.1.6 Land use in Buffer Zone

Forest area in Kurai tehsil is more than that in Bichhua and Chourai tehsils. Forest boundary of revenue villages is 32.62 % of the total land boundary of villages. Land under agriculture is 47.75 % of the total land and is lower than the average for all the Buffer Zone villages.

Table No. - 4
Land use in Buffer Zone villages in Kurai Tehsil

S. No	Classification	Kurai Tehsil		Bichhua Tehsil		Chourai Tehsil	
		Land (in Ha)	%	Land (in Ha)	%	Land (in Ha)	%
1	Forest	6277.26	32.62	3559.33	27.42	813.68	25.90
2	Agriculture Land	9099.73	47.75	7633.60	59.96	1684.58	57.65
3	Gauchar	2124.82	11.04	1000.03	7.70	284.10	9.04
4	Uncultivable Land	1651.98	8.59	638.06	4.92	232.81	7.41
	Total	18241.94	100	12980.78	100	3141.61	100

Source : District Land Records

Land under forest is highest in villages of Kurai tehsil as compared to Bichhua and Chourai tehsils. Gauchar land on records is highest in Kurai as compared to other tehsils. However ground reality reveals that practically these lands are not utilized as gauchar lands.

5.2 Socio-economic Profile of Villages:

5.2.1 Population / Social Structure -

The villages in Buffer zone are spread over in 4 tehsils. 57 villages are in Kurai tehsil in Seoni District and 03 villages are in Barghat tehsil in Seoni District, 36 villages are in Bichhua tehsil of Chhindwara district and 11 villages are in Chorai tehsil of Chhindwara district. The total population in 107 villages is 47905 of this 31675 population belongs to Schedule Caste and Schedule tribe community i.e. 66.12 % of total population.

Table No. – 5
Population in Buffer Zone villages

S. No.	Tehsil	Villages	Total Population	Population of SC/ST	Percentage of SC/ST
1	Kurai	57	22769	16063	70.55
2	Barghat	03	1820	1250	68.68
3	Bichhua	36	18230	13148	72.12
4	Chourai	11	6906	2464	35.68
	Total	107	47905	31675	66.12

Comparisons between tehsils show that population of Schedule caste and Schedule tribe is highest in Bichhua tehsil of Chhindwara district i.e. 72.12 % & lowest in Chourai i.e. 35.68% of total population.

5.2.2 Social Economic Profile of Buffer Zone Villages

Caste Configuration

Gond, Pardhan, Bharia – Bhumia, Halba or Halbi and Baiger are the major tribes of the area. Gond represents 90% of the total scheduled tribes population in all three tehsils.

Table No. – 6
Caste configuration in Buffer Zone of PTR

(In Percentage)

S.No.	Caste/Tehsils	Kurai	Bichhua	Chourai	% of Total Population
1.	Scheduled Tribes	62.69	60.71	29.06	50.82
2.	Scheduled Castes	7.60	11.40	6.61	8.53
3.	General	29.01	27.89	64.33	40.41

Source : Census of India

Mahar or Mehra, Cham and Basor represent the scheduled caste population in all three tehsils. Mahar, Chamar and Basor are more than 90% of the scheduled caste population of villages in the area.
Bramhins, Rajputs, Vaishyas, Patels (usually landowners), Kirars and Ahirs represent general caste of the project area.

Sex ratio

Sex ratio is defined as the number of females per thousand males. In Kurai tehsil sex ratio is 1010, which is above national average (927).

Table No. – 7
Sex ratio in Buffer zone of PTR

Tehsil	Population	Male	Female	Sex Ratio	Sex Ratio Below 0-6 year
Kurai	22769	11330	11448	1010	976
Chourai	18230	9207	9018	979	977
Bichhua	6906	3622	3484	962	837

Source: Census of India

Literacy

The overall Literacy rate in Buffer Zone Villages is 34.04% which is much below the National Average of 52.21%. The detail of tehsil wise literacy is given below –

Table No. – 8
Literacy in Buffer zone of PTR

S. No.	Tehsil	Male	Female	Person
1	Kurai	63.76	43.93	53.82
2	Bichhua	29.04	15.05	22.11
3	Chourai	35.53	15.01	26.20
4	Total	42.27	24.66	34.04

Source : Census of India & Socio Economic Survey

5.2.3 Economic Profile

Occupation

In agrarain economy land is a complex issue and it is more so in the case of tribal area. The percentages of tehisil wise cultivators is as following –

Table No. – 9
Percentage of cultivators in Buffer zone of PTR

S.No.	Tehsil	% of Cultivators
1	Kurai	60.32
2	Bichhua	58.77
3	Chourai	51.70
4	Total	58.75

Jowar, Rice, Kodan – Katki, Wheat, Sugar cane etc. are major crops of the region. Only Sugar cane is the major cash crop, others are predominantly crops of consumption.

The occupation pattern of the people in the area is as following –

Table No. – 10
Occupational pattern in Buffer zone of PTR

Occupation	Percentage
Agriculture	58.75
Labour	29.47
Services	1.66
Agriculture & Labour	10.56

Source : Primary Survey

Landholding Pattern

Land holding is of almost importance in agrarian economy. Socially it is a status symbol. Landholdings in the area have been divided into 5 categories as given below -

Table No. – 11
Landholding Classes

0 biogas	landless
1-15 acres	Mirginal
16 – 30 acres	Small farmers
31-45 acres	Medium farmers
46 and acres	big farmers

The distribution of different landholding classes among the population in the area has been presented below –

Table No. – 12
Distribution of landholding classes

Land Holding	Numbers	Percentage
Landless	129	22.18
1-15 acres	317	54.36
16 – 30 acres	94	16.23
31-45 acres	17	2.98
46 and acres	27	4.25

Source : Primary Survey by DALAL Consultants
Percentages of landless & landholders range of 1 – 15 acres is very high.

Land Productivity

Return from crops grown in this region is very low. Due to low return from land the intensity of poverty is very high. Income from other sources such as from, Minor Forest Produce is not sufficient to meet the daily needs of a family. The estimates of return from crop is as following –

Table No. – 13
Estimation of return from crop

Area	Production	Price/Quintal (1 Quintal 100 Kgs)	Total Value
Kodari – Katko 1 acres	2 quintals	Rs. 300	Rs. 600
Paddy – 1 acres	3 quintals	Not saleable in local market	
Jowar	2 quintals	Rs. 300	Rs. 600

Source : Primary Survey

The reason for low productivity is primitive or traditional practices of agriculture, and poor irrigation facilities.

Live Stock

Live stocks are a part and parcel of families in a predominant agrarian economy. Livestock helps the communities in agriculture and provides milk to meet basic needs. Tribal communities keep cattle and poultry. Buffaloes are normally found in household belonging to scheduled caste and general caste communities. The livestock per family in the Buffer Zone area is as following –

Table No. – 14
Livestock per family in the Buffer Zone

Livestock	Number	Per Family
Cattle	2055	3
Buffaloes	623	1
Goats	1564	2
Poultry	2560	3

Source : Primary Survey

5.2.4 Income and Expenditure and Landholding size

Landless

Landless refers to persons who do not have land for agriculture. Their Income Pattern is as following –

Table No. – 15
Income Pattern of Landless persons

S.No.	Source	Income	Percentage
1	Cultivation		
2	Livestock	598	5.30
3	Labour	8400	75.80
4	Household industry	809	7.30
5	Services	133	1.31
6	MFP	1141	10.29
	Total Income	**11081**	

Source : Primary Socio – Economic survey

The Expenditure Pattern in Landless is as following –

Table No. – 16
Expenditure Pattern of Landless persons

S. No	Source	Expenditure	Percentage
1	Food	10773	85.41
2	Fuel	216	1.71
3	Clothing	685	5.43
4	Education	48	0.38
5	Celebration	505	4
6	Purchase of tools, fertiliser and Medicines	265	2.1
7	Labour Hiring	120	0.95
	Total Expenditure	**12612**	

Marginal Farmers

54.36% of the total households fall under the category of marginal farmers (land holdings between 1 to 15 acres). The Income Pattern in Marginal Farmers is as following –

Table No. – 17
Income Pattern of Marginal Farmers

S. No	Source	Income	Percentage
1	Cultivation	13118	74.00
2	Livestock	784	4.39

3	Labour	2781	15.6
4	Household industry	160	0.80
5	Services	89	0.40
6	MFP	962	5.39
	Total Income	**17894**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Marginal Farmers is as following –

Table No. – 18
Expenditure Pattern of Marginal Farmers

S. No	Source	Expenditure	Percentage
1	Food	12158	64.42
2	Fuel	181	0.95
3	Clothing	1794	9.5
4	Education	63	0.33
5	Celebration	743	3.93
6	Purchase of tools, fertiliser and Medicines	2573	13.63
7	Labour Hiring	1359	7 20
	Total Expenditure	**18871**	

Source: - Primary Socio-economic survey

Small Farmers

16.23% of the total households were under the category of small farmers (i.e. landholding between 16 to 30 acres). The Income pattern in Small farmers is as following -

Table No. – 19
Income Pattern of Small Farmers

S. No	Source	Income	Percentage
1	Cultivation	29134	89.5
2	Livestock	1335	4.1
3	Labour	1432	4.4
4	Household industry	163	0.5
5	Services	130	0.4
6	MFP	391	1.21
	Total Income	**32585**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Small Farmers is as following -

Table No. – 20
Expenditure Pattern of Small Farmers

S. No.	Source	Expenditure	Percentage
1	Food	20627	60.75
2	Fuel	269	0.79
3	Clothing	2086	6.14
4	Education	101	0.29
5	Celebration	1178	3.46
6	Purchase of tools, fertiliser and Medicines	5956	17.54
7	Labour Hiring	3735	11
	Total Expenditure	**33952**	

Source: - Primary Socio-economic survey

Medium Farmers

3.16% of the total households in villages were under the category of medium farmers (i.e.31 to 45 acres of landholding). The Income Pattern in Medium Farmers is as following –

Table No. – 21
Income Pattern of Medium Farmers

S.No.	Source	Income	Percentage
1	Cultivation	45107	97.8
2	Livestock	922	2
3	Labour	0	0
4	Household industry	0	0
5	Services	0	0
6	MFP	92	0.2
	Total Income	**46121**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Medium Fanners is as following -

Table No. – 22
Expenditure Pattern of Medium Farmers

S. No	Source	Expenditure	Percentage
1	Food	22521	47.17
2	Fuel	294	0.61
3	Clothing	2502	5.24
4	Education	192	0.4
5	Celebration	1732	3.62
6	Purchase of tools, fertiliser and Medicines	10827	22.67
7	Labour Hiring	9673	20.26
	Total Expenditure	**47741**	

Source: - Primary Socio-economic survey

Large Farmers

2.37% of the total households come under the category of large fanners (45 biogas and more of landholding). The Income Pattern in Large Farmers is as following -

Table No. – 23
Income Pattern of Large Farmers

S. No	Source	Income	Percentage
1	Cultivation	69331	97.39
2	Livestock	926	1.30
3	Labour	641	0.91
4	Household industry	0	0
5	Services	143	0.2
6	MFP	143	0.2
	Total Income	**71184**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Large Farmers is as following -

Table No. – 24
Expenditure Pattern of Large Farmers

S. No.	Source	Expenditure	Percentage
1	Food	33552	45
2	Fuel	298	0.4
3	Clothing	3430	4.60
4	Education	746	1
5	Celebration	2311	3.10
6	Purchase of tools, fertiliser and Medicines	16105	21.62
7	Labour Hiring	18044	24.22
	Total Expenditure	**74486**	

Source: - Primary Socio-economic survey

5.2.5 Income and Expenditure and Occupation Classes

The occupation pattern of peoples in the Buffer Zone villages is as following -

Table No. – 25
Occupation Pattern in Buffer zone

S. No.	Occupation type	% household
1	Agriculture	58.75
2	Labour	29.47
3	Service	1.22
4	Agriculture and labour	10.56

Source: - Primary Socio-economic survey

Agriculture

Most of the people in villages are engaged in agricultural activities (58.75% of the households). The Income Pattern of Agriculturist is as following -

Table No. – 26
Income Pattern of Agriculture

S.No	Source	Income	Percentage
1	Cultivation	31077	87.15
2	Livestock	1449	4.06
3	Labour	1866	5.23
4	Household industry	61	0.17
5	Services	78	0.21
6	MFP	1127	3.16
	Total Income	35658	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Agriculturist is as following -

Table No. – 27
Expenditure Pattern of Agriculture

S. No.	Source	Expenditure	Percentage
1	Food	21133	59.80
2	Fuel	281	0.79
3	Clothing	2043	5.78
4	Education	143	0.40
5	Celebration	1316	3.72
6	Purchase of tools, fertiliser and Medicines	6032	17
7	Labour Hiring	4387	12.41
	Total Expenditure	**35335**	

Source: - Primary Socio-economic survey

Labour

29.47 % of the total households in the villages come under this occupation category. The Income Pattern in Labours is as following -

Table No. – 28
Income Pattern of Labour

S.No.	Source	Income	Percentage
1	Cultivation	73	0.63
2	Livestock	598	5.22
3	Labour	8956	78.23
4	Household industry	924	8.07
5	Services	144	1.25
6	MFP	752	6.56
	Total Income	**1447**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Labours is as following –

Table No. – 29
Expenditure Pattern of Labour

S.No.	Source	Expenditure	Percentage
1	Food	10668	85.4
2	Fuel	210	1.68
3	Clothing	695	5.56
4	Education	47	0.38
5	Celebration	508	4.09
6	Purchase of tools, fertiliser and Medicines	259	2.07
7	Labour Hiring	111	0.9
	Total Expenditure	**12498**	

Source: - Primary Socio-economic survey

Services

1.22 % of the total household in revenue villages were under this occupation category. The Income Pattern in Services is as following –

Table No. – 30
Income Pattern in Services

S. No.	Source	Income	Percentage
1	Cultivation	3903	35.81
2	Livestock	0	0
3	Labour	3286	30
4	Household industry	1708	15.67
5	Services	1854	17.01
6	MFP	165	1.51
	Total Income	**10898**	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Services is as following -

Table No. – 31
Expenditure Pattern in Services

S.No.	Source	Expenditure	Percentage
1	Food	7439	75.59
2	Fuel	148	1.50
3	Clothing	653	6.63
4	Education	90	0.91
5	Celebration	473	4.80
6	Purchase of tools, fertiliser and Medicines	924	9.39
7	Labour Hiring	113	1.14
	Total Expenditure	**9840**	

Source: - Primary Socio-economic survey

Agriculture and Labour

10.56 % of the total households were under this category. The Income Pattern in Agriculture & Labour is as following -

Table No. – 32
Income Pattern in Agriculture and Labour

S. No.	Source	Income	Percentage
1	Cultivation	6832	47.63
2	Livestock	291	2.02
3	Labour	5882	41
4	Household industry	665	4.63
5	Services	159	1.10
6	MFP	514	3.58
	Total Income	14343	

Source: - Primary Socio-economic survey

The Expenditure Pattern in Agriculture & Labours is as following -

Table No. – 33
Expenditure Pattern in Agriculture and Labour

S.No.	Source	Expenditure	Percentage
1	Food	10011	72.01
2	Fuel	171	1.23
3	Clothing	662	4.76
4	Education	62	0.44
5	Celebration	589	4,23
6	Purchase of tools, fertiliser and Medicines	1937	13.93
7	Labour Hiring	469	3.37
	Total Expenditure	**13901**	

Source: - Primary Socio-economic survey

5.2.6 Income and Expenditure of Scheduled Tribe

The Income Pattern in Scheduled tribe is as following -

Table No. – 34
Income Pattern of Scheduled Tribe

S. No.	Source	Income	Percentage
1	Cultivation	12389	62.5
2	Livestock	420	2.12
3	Labour	5612	28.31
4	Household industry	0	0
5	Services	159	0.8
6	MFP	1243	6.27
	Total Income	**19823**	

Source: - Primary Socio-economic survey

The labour earn by working in Nagpur & Chandrapur cities of adjoining Maharashtra.
The Expenditure Pattern of Scheduled Tribe is as following –

Table No. – 35
Expenditure Pattern of Scheduled Tribe

S. No.	Source	Expenditure	Percentage
1	Food	16191	78.75
2	Fuel	154	0.75
3	Clothing	1439	7
4	Education	82	0.4
5	Celebration	1069	5.2
6	Purchase of tools, fertiliser and Medicines	1573	7.65
7	Labour Hiring	51	0.25
	Total Expenditure	**20559**	

Source: - Primary Socio-economic survey

5.2.7 Income and Expenditure of Schedule caste

The Income Pattern in Scheduled caste is as following -

Table No. –36
Income Pattern of Scheduled caste

S.No.	Source	Income	Percentage
1	Cultivation	13245	66.62
2	Livestock	923	4.64
3	Labour	5006	25.18
4	Household industry	342	1.72
5	Services	38	0.19
6	MFP	328	1.65
	Total Income	**19882**	

Source: - Primary Socio-economic survey
Major household industry in this area is Bamboo works.
The Expenditure Pattern in Scheduled caste is as following -

Table No. – 37
Expenditure Pattern of Scheduled caste

S.No.	Source	Expenditure	Percentage
1	Food	13310	65.13
2	Fuel	486	2.38
3	Clothing	732	3.58
4	Education	102	0.5
5	Celebration	466	2.28
6	Purchase of tools, fertilizer and Medicines	3721	18.21
7	Labour Hiring	1619	7.92
	Total Expenditure	**20436**	

Source: - Primary Socio-economic survey

5.2.8 Income and Expenditure of General Castes

The Income Pattern in General Caste is as following -

Table No. – 38
Income Pattern of General Castes

S. No.	Source	Income	Percentage
1	Cultivation	20349	82.48
2	Livestock	1076	4.36
3	Labour	2265	9.18
4	Household industry	392	1.59
5	Services	229	0.93
6	MFP	353	1.43
	Total Income	**24665**	

Source: - Primary Socio-economic survey
The Expenditure Pattern in General caste is as following -

Table No. – 39
Expenditure Pattern of General Castes

S. No.	Source	Expenditure	Percentage
1	Food	15377	60.82
2	Fuel	248	0.98
3	Clothing	1380	5.46
4	Education	121	0.48
5	Celebration	1001	3.96
6	Purchase of tools, fertiliser and Medicines	3977	15.73
7	Labour Hiring	3641	14.4
	Total Expenditure	**25746**	

Source: - Primary Socio-economic survey

Village Economy:

The economy of the villagers is dependent on: -

(i) Agriculture
(ii) As Casual labour
(iii) Collection of NTFP

(i) Agriculture –

Agriculture is the main source of income for majority of the villages located adjoining the PA boundary despite the heavy incidences of crop raiding by the wild ungulates in most of such villages. It is practised generally in rainy season. However the Rabi crops are also taken where the irrigation facilities are available, mostly in the EDCs of Chhindwara district.

Some of the well to do families near the Gumtara and other adjoining villages in the Chhindwara district also raise cash crops mainly the sugarcane. Large-scale sugarcane production has been reported from Thuyepani, Gumtara, Pulpuldoh and Jamtara.

(ii) As casual labours-

The marginal landowners and landless members of the society depend on wages earned as casual labours in forestry operations and other Govt.-sponsored works. They also get sizeable employment in working in the agriculture field of big landowners in the village. Some of them also migrate to Nagpur to work as casual labour especially during the non- agriculture season.

Another important source of income for such group of marginal farmers includes the sale of calves.

(iii) Collection of NTFPs-

Collection of NTFPs, like; the honey, fruit, Tendu leaves and the like are done from the adjoining forest. The Mahua flower and fruits like Achar, Bel,

Aonla are also collected from the forest, which are used for food as well as to sale in the local market.

Occupation and per capita income It is found that agriculture and livestock production is the main occupation. Wage labour, NTFP collection and fishing is also important sources of income. Villagers are more dependent on forest mainly for fuel wood and fodder resources for both food and income. It is observed that 80% of families suffer from varying degrees of poverty and that most of these belong to schedule tribes.

Economy linked relationship with forest-

The EDC members are directly or indirectly linked with the forest and forest produces in the following ways: -

(i) The villages use the timber poles and other thatching materials for construction of their houses and campus including the cattle shed,
(ii) The Medicine system adopted by the Gond is entirely based on the plant parts, collected from the forest. The people still have tremendous faith and confidence on their ancestral knowledge and expertise on such medicine system. Some of the older people have unbelievable skill to identify the plants of medicinal values.
(iii) Collection of usufructs, like; the honey, Fruit, vegetables and the like is, done from the forest. The leaf vegetable, Mahua flower and fruits like, Achar (*Buchnania lanzan*) and the like, the Bel (*Aegle marmelos*) and Aonla (*Emblica officinalis*) are collected from the forest, which are used in their routine diet.
(iv) Rearing of cattle by these villagers are almost dependent on the Forestland.

Customs and traditions-

Cultural activities of tribal population and its impacts- As stated earlier, the predominant human population of these villages consists of tribal class, who are culturally strict and are headstrong in their religious matters. There life style has been traditionally interwoven with forest on which they are dependent on many different ways apart from requirement based dependency.

Most of their festivals are related to forest folklore. Their Gods reside in the forests in the form of Baghdeo, Kumbhadeo, Ambamai, and Bandevi. Many of their religious ceremonies require specific forest produce on the occasion of any birth or deaths in the family; they take them to their holy river Pench. The villagers from about all the adjoining villages collect in Kumbhadeo compartment No. 10 on Shard purnima day to pray and celebrate the occasion. Similarly in *Makar Sankranti* day they, gather in Pench near Alikatta and Ambamai Nala. It is apparent therefore, that the tribal way of life and forests are inseparable.

Many old tribal are experts in the identification and use of medicinal plants as well as body part of animals. These individuals can be of great value in any fundamental research concerning medicinal properties of flora and fauna.

Type of agricultural crops:

Farmers belonging to most of the villages, raise traditional crops for their self-use. Few varieties of cash crops are raised to sale in the markets.

A. Cash crops: -

It is a point of satisfaction that most of the framers both of the groups of villages (Seoni area and Chhindwara area) raise one or other varieties of cash crops. The most common of such crops is the Sugarcane in Chhindwara area. Some of the more- aware farmers raise Soyabean (*Glycine max*) which fetches a handsome price. Vegetables also constitute an important cash crop in most of EDCs of Chhindwara area.

B. Traditional crops

The Bajara (*Pennisetum typhoideum*) is the most common Kharif crop, grown in almost every village in both of the groups. It does not require any type of irrigation. In some of the villages, Maize (*Zea mays*) and Jawar (*Sorghum vulgare*) are also grown for self-use. Paddy cultivation is also done in these villages. Gram and Wheat are the principal Rabi crops raised in both sides of the group of villages.

Different varieties of cash crop raised in various villages are being depicted in the following table:

Table No. – 40
Cash crop grown in various villages

Cash crops	Villages in Seoni area	Villages in Chhindwara district
Soyabean (Glycine max)	Turia, Awarghani, Kohka, Telia, Arjuni, Pipariya, Setewani, Mohgaon (Y), Ghatkohka, Panjara, Sindaria, Dhutera, Karhaiya, Mohgaon (Sadak) Aalesur, Patarai, Airma, Potia, Nayegaon, Pachdhar, Salhe, Sarrahiri	Gumtara, Jamtara, Davajhir, Kumbhpani, Pathrakhurd, Bordi, Pathari, Thota, Kanhasagar, Silotakala, Banskheda, Rampuri, Naharjhir, Bandhanmal, Deori, Sawari, Kundai, Bishanpur, Surewani, Pathrakala, Thuepani, Chirewani, Mohgaonkhurd, Doodhgaon, Pulpuldoh, Kadhaiya, Khamarpani, Kanhargaon
Sugar cane	Turia, Piparia, Setewani, Ghatkohka, Arjuni, Kohka, Telia, Mohgaon (Y), Vijaipani (ii)	Gumtara, Jamtara, Pathri, Banskheda, Silotakala, Silotakhurd, Thuepani, Chirewani, Deori, Sawari, Kadhaiya, Dongargaon, Salhiwada, Antara, Khamarpani, Kundai, Bishanpur, Ghatkamtha, Dainy
Pulses	Turia, Awarghani, Piparia, Setewani, Mohgaon (Y), Mohgaon (T), Karhaiya, Airma, Ghatkohka, Dhutera, Panjara	Gumtara, Jamtara, Thuepani, Chirrewani, Kadhaiya, Ghatkamtha, Pathri, Thotamal, Silotakala
Groundnut	Pipariya, Setewani, Mohgaon	Banskheda, Bandhanmal, Rampuri, Chargaon,

(Arachis hypogaea)	(Y),Mohgaon (T), Turia, Arjuni, Telia, Ghatkohka, Vijaipani (ii), Karhaiya, Airma	Pathri, Kadhaiya, Dongargaon, Thotamal, Kanhasagar,
Vegetables	Turia, Aawarghani, Pipariya, Setewani, Karhaiya, Airma	Thuepani, Jamtara, Gumtara, Chhirewani, Pathri, Banskheda, Rampuri, Thotamal, Kanhasagar, Ghatkamtha

Table No. – 41
Traditional crops grown in various villages

Traditional	Villages Seoni Area	Villages Chhindwara
Jawar (Sorghum vulgare)	Panjara, Bhodki, Katangi, Aalesur, Patarai, Salhe, Sarrahiri, Dhutera, Sindariya, Niwari, Tewani, Vijaipani, Kuppitola, Mudiarith, Satosha, Pindkapar, Paraspani, Khamba, Tikadi, Khamaba, Ambadi, Piparia, Setewani, Mohgaon (Y), Mohgaon(T), Potia Karhaiya, Airma	Deori, Sawari, Bisanpur, Kokiwada, Pathrakala, Surrewani, Chhirewani, Dhodhgaon, Pulpuldoh, Rampuri, Banskheda, Silota, Thota, Jamtara, Naharjhir, Gumtara, Davajhir, Kanhasagar, Salhewada, Antara, Marjatpur, Bordi, Pathri
Bajara (Pennisetum typhoideum)	Vijaipani (ii), Kuppitola, Mudiarith, Harduli, Piparia, Panjara, Bhodaki, katangi, Ghatkohka, Arjuni, Telia, Kohka, Awarghani, Satosha, Rukhad, Gandatola, Barelipar, Paraspani, Karhaiya, Airma	Kundai, Bishanpur, Dhoulpur, Ghatkamtha, Saliwada, Antra, Naharjhir, Bordi, Thotaraiyat, Kanhasagar, Silotakala, Khairanj, Pathrakala, Kokiwada, Surrewani
Paddy (Zehneria umbellata)	Ghatkohka, Mohgaon sadak, Katani, Panjara, Bhodki, Alesur, Patari. Aagri, Karhaiya, Airma, Niwari, Tewani, Mohgaon (Y),Mohgaon(T), Sindria, Dhutra, Potia, Piparia, Setewani, Tuira, Awardhani, Khamaba, Ambadi, Vijaipani, Paraspani, Vijaipani (ii), Amajhiri, Nayegaon, Pachdhar, Barelipar, Tikadi,Karmajhiri	Gumtara, Jamtara, Pathri, Naharjhir, Khumbhpani, Rampuri, Banskheda, Davajhir, Thota, Silota, Kanhasagar, Chargaon, Boardi, Pathrakala, Thuepani, Chhrewani, Sawari, Kundai, Bisanpur, Ghatkamtha, Dhoodhgaon, Pulpuldoh, Marjatpur, Surrewani, Dongargaon, Kokiwada, Kadhaiya
Wheat (Triticum vulgare)	Turaia, Awardhani, Satosha, Piparia, Setewani, Potia, Mohgaon (Y),Mohgaon Sadak, Karhaiya, Airma, Arjuni, Telia, Kothar, nayegaon, Pachdhar, Ghatkohka	Gumtara, Jamtara, Thyepani,Chirrewani, Pathri, Dhoodhgaon, Pulpuldoh, Mohgaonkhurd, Surrewani, Pathrakala, Kadhaiya, Deori, Sawari, Ghatkamtha, Rampuri, Banskheda, Silotakala, Bandhamal, Thotamal, Kanhasagar

Reasons for Backwardness:

In general, there are following reasons for the socio-economic backwardness of the indigenous people:

- Lack of any alternate or additional source of income-other than the wages earned through forestry works
- Extremely low production from the single rain-fed crop
- Inaccessibility and remoteness

- Lack of basic amenities like drinking water, health care, schooling, education, irrigational facilities etc
- Frequent crop damage by wild ungulates

5.3 Resource Dependence of Villages -

The Buffer Zone villages in the vicinity of the PTR are dependent on the forests to meet with their requirements of firewood, timber, grass collection, grazing, and collection of minor forest produce etc. With the increase in human population the pressure on forests for obtaining natural resources also increases. Declaration of a forest area as a National park results in either the people loosing the right to collect the resources or imposition of restriction on removal of resources. Such as Prohibitions/ restriction lead to illegal activities. They are also the main causes of the conflict between people and forest authorities.

To address to this issue it is necessary to assess the domestic needs of the people in respect of particularly, Firewood, timber, grass, minor forest produce etc.

5.3.1 Firewood

Dependence on forest for Firewood is quite high. Primary Survey by DALAL Consultants shows that 56.75% households use firewood for cooking purpose.

37.95% of the total households use Kerosene for cooking- Apart from being used in cooking, wood is also used for heat and illumination in winter. It was noticed that consumption of wood for domestic purpose is almost twice in winter than in summer. On an average, in summer, each household requires 1.5 Kg/per day/person of wood. In winter each household requires approximately 2.5 Kg / per day/ person of wood.

5.3.2 Shelter

Timber, bamboo, thatch material and stones which are all essential requirements for construction of houses, cattle sheds, fences and watch towers are collected from the forest. Houses in forest villages are relatively smaller. Most of the houses are tiled houses.

On an average, each household with an average size of 5 persons requires 2.44 m^3 of timber for construction of house and about 0-91 m^3 of timber for construction of other household items. In addition 50 to 60 bamboos are used for supporting thatch in the construction of a house. In forest villages 1,16 m3 timber is require for construction, including cattle sheds and agriculture implementation.

5.3.3 Fodder

Fodder is another important resource for which dependence on forest is almost complete. Both milch and plough cattle as well as beasts of burden are essential for the rural tribal economy. Fodder for these animals essentially come from the forests.

The Livestock Grazing is as following –

Table No. –42
Livestock Grazing

Place	Number	Percentage
Own premises	**73**	12.47
Village land	103	17.60
Forest	409	69.91

Source:- Primary Survey

The Average rates of per day feeding of the livestock is as following -

Table No. – 43
Per day feeding rate of Livestock

Category of Livestock	**Concentrates (Kg)**	**Green Fodder (Kg)**	**Dry Fodder (Kg)**
i. Crossbred (Milch)	2.75	20.00	6.00
ii. Females 3 years age			
(a) Improved Cows (Milch)	1.20	10.00	6.00
(b) Other Milch Cows and those not calved even once	0.125	3.50	3.16
iii. Males 3 years age	0.17	4.96	5.65
(a) Crossbred (young stock)	1.50	10.00	2.00
(b) Other young stock	0.016	1.58	1.47
Buffaloes			
i. Female 3 years age			
(a) Improved buffaloes	1.50	10.00	6.00
(b) Other milch buffaloes and that not calved even once.	0.41	5.72	5.08
ii Males 3 years age	0.11	6.57	5.43
iii. Males/ females 3 years age	0.01	1.59	1.64
Other Livestock			
i. Improved Sheep/goats	0.28		0.40
ii Horse & ponies	0.50	-	-

Source: - National Commission on Agriculture

5.3.4 Minor Forest Produce

Minor Forest Produce such as Tendu leaf, Mahua, Chirongi (Achar) are sources of Income to villagers of Buffer Zone. Income from minor forest product is seasonal income. Tendu leaf, Mahua and Chironji (Achar) are three types of Minor forest product found in Buffer Zone.

5.3.4.1 Tendu Leaf

Tendu leaf collection is done in the month of May - June. Almost all the families in Buffer Zone collect Tendu leaves. The Income of Households from Tendu Leaf collection is as following –

Table No. – 44
Income from Tendu Leaf

S.No.	Income	No. of Families	% of Families
1	Up to 500	802	45.70
2	501 to 1000	692	39.43
3	1001 to 1500	221	12.59
4	1501 to 2000	40	2.28
	Total	**1755**	100.00

Source:- Primary Survey

5.3.4.2 Mahua

Collection of Mahua provides seasonal income to people from March to June. People who have Mahua trees in their land are able to earn good amount through selling flowers and seeds of Mahua. Normally tree yields approximately 50 Kgs Mahua in a season. People sell Mahua at the rate Rs 4/ per Kg. The market conditions however determine the sale rate.

The Annual Collection of Mahua Seeds and Flowers is as following -

Table No. – 45
Annual Collection of Mahua Seeds and Flowers

People	Mahua Fruits/per family	Mahua Flower / per family
Landless	15.20 Kg	125 Kg
Land Owners with Mahua trees in their land	38.48 Kg	500 Kg

Source:- Primary Survey

In Participatory Rural Appraisal peoples revealed that those who have land are able to earn between Rs. 1500 to 2000 in a season. Peoples who are landless and collect Mahua from forest earn between Rs. 300 to 500 in a season. Income from Mahua also depends upon number of elderly persons in house, who are able to go in forest for Mahua collection. Each person is able to collect 1.5 to 2 Kg Mahua from forest. If it sold at Rs 4 / Kg it means each person will to earn Rs. 6 to 8 per day.

5.3.4.3 Chironji

Chironji (Achar) is another Minor Forest Produce collected in Buffer Zone. Collection of Chironji is normally done in summer Season. In season Chironji Fruits are sold in the market at the rate Rs. 30 to 40 per Kg. Normally each family collect 40 to 45 Kg of Chironji in one season. In the villages having more forests in surrounding areas, quantity increases from 70 to 80 Kg. A family on an average earns Rs 1200 to 2000 through Chironji collections in a year.

5.4 Human – Wildlife Conflicts -

Plant and animal emerged on the earth at the same time during the course of evolution. Long period of evolutionary development and process of succession produced complex and higher forms of both the plants and animals. Conflict between man and animal was not a part of man-nature complex until the 19th century's scientific development. Expansion of British Empire in the continents especially in tropical and subtropical region introduced and enhanced the exploitation of natural resources. This was the time when actually man-animal conflict started. Clear cutting of forests for non forestry purposes like agriculture and establishment of human settlements at work sites and heavy extraction of timber for railways started quick shrinkage of forest cover and loss of habitat both at plain and hilly terrain.
Man encroached into the forest for three attractive amenities i.e. ample availability of (1) water (2) good quality land and (3) fodder.

From ancient times man knows that the forest is main reservoir of ground water. The forest cover available on its water shed regulates annual flow of river. Water is essential for agriculture so that agricultural lands are developed in and around the forest.

Humification of forest litter mixing with weathered parental rock forms fertile soil in due course. Slashing the forest stand on alluvial plains was the highly practiced measure to get best agricultural land from earlier times.

Cattle rearing for sustenance are the oldest economic activity of man adapted by him, even before he started agriculture. Ample availability of leaf and grass fodder is essential and perhaps most important commodity accessed free of cost by man for cattle rearing and thatching huts, since earlier times.

Accelerated process of forest degradation resulted in loss of habitat and space for wild animals in last one and half centuries. Many species have been lost from the evolution chain due to vanishing habitats. Heavy grazing posed many competition over wild animals for their survival in terms of reducing forage and cover, sharing of water with cattle and man, disturbance due to constant presence of livestock and it's master, intentional fire setting and timber and NTFP extraction.

On the other hand people residing close to wild animal's habitat also suffer due to: -

1. Economic loss due to crop raiding by wild animals
2. Cattle depredation
3. Carnivores attack on human being
4. Transmission of diseases from wild animals.

In this man-animal interface conflict, wild animals are affected more adversely by activities of man in two ways –

(i) **Loss of habitat** due to conversion of forestland into non-forestry purposes.

(ii) Losses of animal species/communities due to indiscriminate hunting, till 1972. Purpose of hunting may be just for sport, for livelihood earning by some aboriginal groups. Lust to earn more and more by selling expensive

wildlife products like tiger bones, Tiger skin, etc and Killing of wild animals in retaliation due to crop raiding, cattle depredation and attack on human being.

Contamination of water holes by livestock also poses threat of epidemic diseases among wild animals. Almost all of the water holes, situated in peripheral area of Pench Tiger Reserve are vulnerable to livestock influx from nearby villages. The presence of human being along with grazing cattle causes great disturbance to wild animals.

Setting of fire is another major threat to wildlife.

These fires may be intentional or unintentional, but cause many direct and indirect adverse impacts. 'Mahua' and ' shed antler' collectors intentionally set fire to clear ground to make it easy to search antlers and pick dropping 'Mahua', flowers. Fires cause physiological and psychological shock to animals, sometime it may be fatal to diseased, injured and young animals, may destroy shelters of birds, rodents, small mammals and invertebrates and disturb entire food chain at particular sites. Burnt litter can be blown by wind and break the bio-geo-chemical cycle in terms of non-return of minerals to the soil. Soil moisture is lost due to high temperature and quicker drying of topsoil make it loose, which can be washed away from surface by first showers.

Extraction of edible fruits like 'Amla', 'Achar', 'Ber', 'Tendu', and honey by villager also reduces availability of food to certain wild animals, birds and insects. Presence of NTFP collecting people and their methods of collection also disturb the wild animals and vanish the source by cutting branches/tree, burning honeycomb etc.

It is observed that any human activity harmful to biotic or abiotic components at any level may be destructive to forest ecosystem in terms of disturbance to ecological cycles like- food chain; food web; bio-geo-chemical cycle etc. and cause short and long term adverse impacts in which some may be irreparable also.

Other facet of human animals conflict relation is suffering of human being due to wild animal is also considerable. People residing in close proximity of PA has following problems -

(i) **Crop raiding by wild animals** is very common and destructive threat to the villagers. Wild boar, spotted deer, Blue bull and 'Sambhar' are the main crop raiders. Villagers residing at immediate fringe reported that there crop is being spoiled by wild animals. Villages like Tikadi, Karmajhiri, Murer, Bhodki, Alesur', Patrai, Dhutera, 'Raiyarao', 'Potiya', 'Vijaypani', 'Ambadi', 'Satosha', 'Turiya', 'Awarghani', Thuepani', 'Pulpuldoh', 'Singardeep', 'Gumtara', 'Jamtara' have crop raiding problems. PA management has constructed Game Proof Wall in the periphery of PA along the village boundary during last few years to protect the agricultural crop from wild animals. The incidence of crop raiding by spotted deer, Blue bull and Sambar has come down drastically but still there is some problem of crop raiding by Wild boar. From this year PA Management has improve the design of Game Proof wall to make it more effective against Wild boar. The crop raiding causes discontent among the effected villages.

(ii) **Cattle depredation** is another source of discontent among people. Some time tiger, panther, Wild dogs and wolves enter into the surrounding of the villages and lift the cattle from the village or near by forest area. During the last six year 26 number of cattle lifting were reported by PTR and 129 by surrounding territorial divisions. The detail is given in following table -

Table No. – 46
Cattle Lifting in an around the PTR (2000-01 to 2005-06)

Animal Killed	Compensation paid by PTR	Compensation paid by Divisions
Buffalo	6	10
Cow	13	75
Goat	3	6
Horse	1	0
Ox	3	38
Total	**26**	**129**

The detail of Cattle lifting reported by PTR and other surrounding divisions is given in **Annexure No. – 12 (A & B).**

(iii) **Occasional attacks on human being by wild animals** also develop a feeling of antagonism among the indigenous people residing near the forest.

The detail of attack on human being by wild animals is given in following tables -

1. Human being attack by wild animals – Reported by PTR (1986 - 2007)

Table No. – 47
Human beings attack by wildlife in PTR

S. No.	Human Death/ Injury	Animal	Compensation paid by PTR
1	Death	Tiger	2
2	Injured	Bear	2
3	Injured	Panther	1
4	Injured	Wild boar	1
5	Injured	Tiger	6
		Total	**12**

2. Human being attack by wild animals – Reported by Adjoining Territorial Divisions (1996 - 2005)

Table No. – 48
Human beings attack by wildlife in Adjoining Territorial Divisions (1996 - 2005)

S. No.	Human Death/ Injury	Animal	Compensation paid by Divisions
1	Death	Bear	1
2	Injured	Bear	9
3	Injured	Chital	1
4	Injured	Jackal	5
5	Injured	Langur	2
6	Injured	Panther	5
7	Injured	Wild boar	23
		Total	**46**

The detail of attack on human being by wild animals is given in **Annexure No. – 13 (A & B)**

Problems Faced by the People:

The following problems are generally faced by the people of the Impact Zone:

- Lack of grazing ground for the cattle, owing to the depleted state of ground cover outside the protected area
- Loss of usual rights and concessions like fuel head-load collection, small timber, fishing, etc.
- Loss of income due to the stoppage of forestry, MFP collection, viz. tendu leaves, mahul leaves, sal seeds
- Crop raiding by wild ungulates
- Loss of livestock by wild carnivores
- Human injury and loss of life due to lethal encounters with carnivores

Problems Faced by the Park:

Some of the common problems faced by the Park Management are:

- Illicit grazing
- Petty theft of fallen fuel wood
- Petty theft of poles for house construction by the locals
- Fishing
- Honey collection
- Manmade fires to promote new flush of tendu leaves
- Animal poaching (hunting with bow and arrow, poisoning)
- Contamination of peripheral waterholes by village cattle
- Spreading of weeds due to seed dispersal from the coat of wild ungulates frequenting the nearby village grazing ground

5.5 Assessments of Inputs of Line Agencies / Other Departments -

Development programmes going on in districts are broadly of two types Poverty alleviation programme and economic development programmes. Poverty alleviation programmes are for uplifting economic status of individual or communities living below poverty line. Development programmes are not directly focusing on individuals or communities but are benefiting indirectly by providing employment, developing infrastructure, improving agriculture production etc.

5.5.1 Developmental programmes

Buffer Zone villages in vicinity of Pench Tiger Reserve are having predominant tribal population. Data collected from Kurai, Bichhua and Chourai Janpad Panchayat reveals that 49.20 percent household in Kurai tehsil, 56.78% household in Bichhua tehsil and 43.25 percent household in

Chourai tehsil are living Below Poverty Line (BPL) as defined by Government of Madhya Pradesh.

Documentation of all poverty alleviation programmes being implementation in Buffer Zone villages is a difficult and time-consuming task. We have selected some poverty alleviation programmes, which are focusing directly on individual. We selected programmes of Zilla Panchayat, Social welfare department and Agriculture department and have tried to assess their status in Buffer Zone villages

5.5.1.1 Programmes of Zilla Panchayat

1. **Swarn Jayanti Gram Swarojgar Vojana (SJGSY),**

The main Objective of this Programme is to provide grant and loans to families living below poverty line. In this Programme grants and loans are given for selected activities to individual and self help groups formed in villages and clusters Financial assistance is given in such a way that after repayment of loan; self-employed should earn minimum of Rs. 2000/ per month-Eligibility of Beneficiaries.

2. National Rural Employment Garanti Scheme (NREGS)

In this scheme there is provision to give employment to a family for 100 days employment in a year. In this scheme following individual and community based works have been taken.

Individual Beneficiary Oriented -

Table No. – 49
Individual Beneficiary Oriented Works

S. No.	Name of Sub Scheme	Works
1	Kapil Dhara	**1.** New Well **2.** Khet Talab **3.** Masonary Check dam/Stop dam RMS **4.** Small Tank
2	Nandan Phalodhyan	Plantation of Horticultural species
3	Bhumi Shilp	**1.** Land Development **2.** Contour Bund **3.** Field Bund
4	Resham	**1.** Plantation of Mulberry **2.** Silk Production

Community Oriented -

Table No. – 50
Community Oriented Works

S.No.	Name of Sub Scheme	Works
1	Shailparn	1. Contour trenching, Gully plugging, Loose Boulder Check Dam, Construction on barren hills 2. Plantation on barren hills
2	Vanya	Plantation of host plant Arjun & Saj for tasar silk worm

3. Sampuran Gramin Rojgar Yojna (SGRY) –

This scheme provides additional employment, food security and to improve the quality of nutrition. In this scheme soil and moisture conservation, small irrigation, renovation of drinking water source, augmentation of water table, improve the tradition sources of water, removal of silt form rural tank, pokhar, rural approach road, trench construction and forestry works will be taken on priority basis. In addition to, other works like road leading to school, Hospital, community center, Panchayat building and local market places will be developed.

4. Indira Awas Yojana

The objective of this programme is to provide financial assistance for construction of houses to homeless families living below poverty line in rural area.

5. Food for work Yojna –

This scheme is implemented to provide - additional wages and employment, food security, development of permanent community, social & economical infrastructure in rural areas.

5.5.1.2 Programmes of Social Welfare Department:

Social welfare department of Madhya Pradesh government is implementing programmes like leprosy clinic in rural and urban areas, hostels for tribal girls and boys, Gaon Ki Beti Yojna, Vivekanand Group Insurance Scheme and other programmes providing direct benefits to people. Integrated Social Security Pension programmes is well known programme of this department Parent implementation agency of this programme is social welfare department but due to implementation of 73rd amendment of constitution Government of Madhya Pradesh had given power to Panchayats for selection of beneficiaries.

1. Integrated Social Security Pension

Integrated Social Security Pension programme is sponsored by state and central government. This programme provides to give Rs. 150/ per month as pension to senior citizens persons or old age persons and widows who do not have other source of income.

5.5.1.3 Programmes of Agriculture Department

Agriculture Department of Madhya Pradesh has around 30 programmes like integrated grain development programme, Tilhan Dalhan avam Makka ki Akikrit Youjna, Ganna development scheme, to improve agriculture production in the state. There are 7 core programme and others are extension programmes.

8. Improved Seeds Programmes

In this programme the department provides improved seeds to all farmers on subsidy rates.

9. 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.

10. Annapurna Programme

Beneficiaries' eligibility criteria are same as for Surajdhara programme, but in this programme department provide only seeds of cereals.

11. 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.

12. Modern Agriculture Implementation

To encourage use of Modern Agriculture Implement Government provides 50% subsidy directly to the farmers on purchase.

13. 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

14. National Biogas Project –

To encourage and install the other sources of energy and high quality fertilizer this programme is going on for SC/ST, small marginal farmers, landless, laboures and for general class farmers who are eligible. Beneficiaries are selected by Agriculture Development. There is a subsidy of Rs. 3500/- for SC, ST, Small, Marginal, Landless, laboures & Rs. 2700/- for other farmers.

Chapter - 06

VISIONS, GOALS, OBJECTIVES AND PROBLEMS

6.1 Vision -

To manage buffer area around Critical Tiger Habitat in a way to ensure the integrity of the Critical Tiger Habitat along with adequate dispersal habitat for wildlife and to promote co-existence between wildlife and human activities with due recognition to livelihood, development and cultural rights of local people along with conservation efforts. It aims of enhancing the positive and reducing the negative impacts of conservation on neighboring communities and neighboring communities on conservation.

6.2 Management Goals -

The Buffer area of Pench Tiger Reserve will have following management goals.

(i) To provide habitat supplement to the spill over population of tiger and its prey from the core area, conserved with the active cooperation of stakeholder communities.

(ii) To providing site specific, need based, participatory eco-development inputs to local stakeholders for rationalizing their resource dependency on the Tiger Reserve and strengthen their livelihoods, so as to elicit their support for conservation of the area.

(iii) To mainstream wildlife concerns in various production sectors in the area.

6.3 Management Objectives -

The management objectives of the Buffer Area will be as follows –

(i) Implementation of forestry activities after mainstreaming wildlife concerns.

(ii) Implementation of eco-developmental activities for reducing resource dependency of local people on surrounding forests.

(iii) Coordination with governmental / non governmental production sectors in the landscape for mainstreaming conservation.

(iv) Site specific eco development initiatives based on participatory village level micro plans will be carried out for the local communities for strengthening their livelihoods through a balanced approach of rationalization of resource use, biomass regeneration and alternatives, so that the ecological status of the area could be improved restored and maintained.

(v) Reciprocal commitments by the local people through specific measurable actions as per MOUs for improving protection and conservation of the area will be implemented. This may include rationalization of resources use from the forest, participation in fire protection and anti-poaching efforts.

(vi) Eco-tourism activities in the Buffer Area will be used as an important component of eco-development for strengthening the livelihood of the local people and the protection of the area.

(vii) Capacity building of the field staff as well as eco-development committee/JFMC members will be undertaken on a regular basis through the Tiger Conservation Foundation.

(viii) Intensive nature conservation awareness programme will be undertaken in buffer area with a focus on different stakeholders particularly local communities.

(ix) Weak Linkages in the Corridors will be identified and restoration will be done.

6.4 Problems in Achieving Objectives -

The indigenous people are concerned with short-term issues of immediate interest, viz. meeting the demand for fuel, fodder, small timber, NTFP and the like. The long-term goals of Protected Areas such as biodiversity conservation are considered by many as nebulous and locally irrelevant. Over-population, both humans as well as cattle, has dislocated the man to wilderness ratio, thereby paving the way for overuse and abuse of natural resources. In this scenario, creation of Protected Areas for in-situ conservation has evoked considerable antagonism in the minds of local inhabitants. What goes unappreciated at this juncture is the fact that this is an ecological imperative for our life support system and only a small fraction of our geographical area is under such conservation-oriented land use.

The buffer zone is created to enhance the conservation value of a Protected Area. There are two main functions: Social buffering & Extension buffering.

Social buffering refers to the socio-economic role of the buffer, wherein site-specific eco-developmental inputs are provided in the peripheral villages to sustainably meet the resource requirements. On the other hand, extension buffering pertains to the habitat supplement obtained in the buffer area for the spill-over population of wild animals from the core zone. Buffers also function as corridors linking two nearby Protected Areas.

Constraints: There are several constraints which should not be lost sight of. Encroachments on forest lands, diversions of forest lands for non-forestry purposes, pressures of local people and their livestock, threats from migratory cattle, poaching and illegal trade in wildlife and their derivatives,

law and order problems, lack of land use policy leading to unwise land use outside protected areas, and shrinkage of village pastures are noteworthy.

Much has been said about the goal of balancing conservation and development. But how do we achieve this in a developing country like India? Here it becomes important that the public and private Institutions alike should reconcile conservation with sustainable and equitable development. We have site-specific, region-specific social, economic and natural resource problems that are not easy to solve. In a vicious scenario of overuse and abuse of surrounding areas, with no land use policy, this is imperative. However, the depleted status of general forest areas and the ever increasing needs of locals may overwhelm the Tiger Reserve if the will and enforcement are weak, with no package of viable alternatives. Therefore, this problem has to be addressed at three levels, viz. local, community and regional.

Problems Faced by the People: The following problems are generally faced by the people of the Buffer Zone:

- Lack of grazing ground for the cattle, owing to the depleted state of ground cover outside the protected area
- Loss of usual rights and concessions like fuel head-load collection, small timber, fishing etc. from the protected area.
- Loss of income due to the stoppage of forestry, MFP collection, viz. tendu leaves, mahul leaves, sal seeds from the protected area.
- Crop raiding by wild ungulates
- Loss of livestock by wild carnivores
- Human injury and loss of life due to lethal encounters with carnivores

Problems Faced by the Park: Some of the common problems faced by the Park Management are:

- Illicit grazing
- Petty theft of fallen fuel wood
- Petty theft of poles for house construction by the locals
- Fishing
- NTFP collection
- Manmade fires to promote new flush of Tendu leaves
- Animal poaching (hunting with bow and arrow, poisoning)
- Contamination of peripheral waterholes by village cattle
- Spreading of weeds due to seed dispersal from the coat of wild ungulates frequenting the nearby village grazing ground

These sensitive interface conflicts once again emphasize the importance of enforcing the protection measures after providing reasonable alternatives.

The local inhabitants have remained isolated from the mainstream of development, and owing to their traditional dependence on the wilderness. Population pressures of both human as well as cattle have dislocated the linkage between the local people and the wilderness. Consequently, this culminates in the overuse and abuse of the ecosystem.

6.5 Strengths-Weaknesses – Opportunities – Threats (SWOT) Analyses

The analysis has been conducted by taking into account all the positive and negative factors in the context of the buffer zone of Pench Tiger Reserve.

6.5.1 Strength:

- Buffer zone is notified and is under unified control of Field Director.
- Concerted eco-developmental inputs in the buffer.
- No militant history amongst the indigenous people.
- Recycling gate receipts from Vikas Nidhi to locals.
- The buffer area consists of thick belt of forest growth providing ecological contiguity for core area.
- Easy access to the buffer zone from seoni, the head quarter of field director.
- 50.82% of the population is tribal whose timber requirement is very very less and is traditionally very simple. They only need timber for agricultural and household purpose.

6.5.2 Weakness:

- There are 107 villages, 13784 families, 61096 human population 36143 cattle in buffer. It exerts immense biotic pressure on buffer forests.
- 22.18% of the total families are landless, so pressure on forest for livelihood.
- Lack of adequate staffs, other infrastructure and equipments for protection and field work.
- Simultaneous ageing of frontline staff and ban on fresh recruitment
- Mushrooming of hotels and resorts near Turia gate of buffer zone.
- 105.270 km electric lines pass through the forest of buffer.
- Ground cover of the forest is devoid of palatable grasses and herbs in some areas.
- Cover for wild animals are not adequate in some forest area.
- Inadequate browsing species in some area.

6.5.3 Opportunities:

- Notification of buffer zone extending towards east up to Ari range.
- Sectoral integration and concerted ecodevelopment inputs in the buffer.
- Mainstreaming of wildlife concerns by regulating production forestry operations.
- Evolving landscape architectural code for the areas having tourist lodges in the buffer by creation and notification of eco sensitive zone.
- Involving host communities in eco-tourism and fostering eco-tourism in the buffer.
- Saving tigers outside the national park and sanctuary through the involvement of EDCs in protection and management.
- Maintenance of "village level crime register", "crime maps" to check poaching and other forest offences through EDC.
- Evolving a nature education package for local children.
- Enriching browsing species in the forest of buffer.

6.5.4 Threats:

- Population pressure in the buffer zone (human/ livestock).
- Interface problems like domestic cattle kills, crop depredation, human injury fostering grudge against the Tiger Reserve management in the minds of local people.
- Lack of adequate grazing/ forest areas for nistar in the buffer.
- Frequent crop raiding by ungulates.
- Contamination of peripheral water points by village livestock with risks of disease transmission.
- Road kills due to presence of National Highway No. 7 in the buffer zone.
- Habitat fragmentation due to NH-7.
- Buffer zone makes border with the State of Maharashtra.
- Traditional footpaths through the buffer zone forest.
- Manmade fires during summer owing to MFP collection.
- Proximity to cities like Katni, Nainpur, Gondia, Nagpur, Jabalpur increasing the risk of wildlife related crimes. These places are escape points as well as markets.
- Traditional practice of poaching by local communities by poisoning the water hole, electrocution, snaring and chasing wild animals by trained pet dogs.
- Illicit catching of birds especially Parakeets, Owls etc.

- Gin/ Trapping of Tigers by Poachers from outside.
- Illicit felling, illicit grazing, illicit mining etc.
- Mushrooming of resorts/hotels in buffer zone creates biotic pressure as well as hinders free movement of wildlife.
- Poisoning of cattle kills by angry and distressed villagers.
- Electrocution of Tigers and other wild animals by high voltage electric lines running across the buffer zone.

Chapter – 07

MANAGEMENT STRATEGIES

The 2006 amendment to the Wildlife (Protection) Act, 1972 specifies that subject to the provision of the Act, the State Government shall, while preparing a Tiger Conservation Plan, ensure the agricultural, livelihood, developmental and other interests of the people living in tiger bearing forests or a tiger reserve. For the first time the 'core' and 'buffer' areas of a tiger reserve have also been defined, the former being the critical, inviolate area and the latter the peripheral area to foster coexistence with local people for safeguarding the integrity of the core. Therefore while formulating the management strategies, the following points should be kept in mind.

(i) Protection of tiger reserve and providing site specific habitat inputs for a viable population of tigers, co-predators and prey animals without distorting the natural prey-predator ecological cycle in the habitat;

(ii) Ecologically compatible land uses in the tiger reserves and areas linking one protected are or tiger reserve to another for addressing the livelihood concerns of local people so as to provide dispersal habitats and corridors for spillover population of wild animals from the designated core areas of tiger reserves or from tiger breeding habitats within other protected areas;

(iii) Sustainable compatible and regulation of forestry operations of regular forest divisions and those adjoining tiger reserves as per the needs of tiger conservation.

Owing to habitat fragmentation on account of biotic pressures and ecologically unsustainable land uses, coupled with poaching pressures following approach is imperative in the present content for tiger conservation planning for buffer so that habitat can be restored to facilitate dispersing tigers to repopulate the core area.

The Management interventions would involve:

1. Co-existence agenda in buffer / fringe areas (landscape approach/sectoral integration) with ecologically sustainable development program for providing livelihood options to local people with a view to reducing their resource dependency on the core. The strategy would involve reciprocal commitments with the local community on a quid-pro-quo basis to protect forests and wildlife, based on village level, participatory planning and implementation through eco-development committees (EDC).

2. Addressing man-animal conflict issues (ensuring uniform, timely compensation for human injuries and deaths due to wild animals, livestock depredation by carnivores, crop depredation by wild ungulates)

3. Mainstreaming wildlife concerns in the buffer landscape by targeting the various production sectors in the area, which directly or incidentally

affect wildlife conservation, through "Tiger Conservation Foundation", as provided in the Wildlife (Protection) Amendment Act, 2006.

4. Addressing tiger bearing forests and fostering corridor conservation through restorative strategy in respective working plans of forest divisions, involving local communities, to arrest fragmentation of habitats.

5. Ensuring safeguards / retrofitting measures in the area in the interest of wildlife conservation.

7.1 Delineation of Buffer Areas and Other Zones within the Buffer Area -

The total area of the Buffer division their Buffer zone is 768.302 sq. km. out of which 470.062 sq. km. is forest area and 298.239 sq. km. is revenue area. So there are clear two type of area, that is forest area and revenue area. These two areas require specific type of treatments. Therefore the whole buffer area can be divided in to forestry zone and eco development zone.

7.2 Zone and Theme Approaches to Management Strategies-

The "zone" and "theme" approaches have been adopted in the proposed management strategies of Pench Tiger Reserve. Various managerial situations and needs can be taken care of by an effective combination of the "zone" and "theme" plans. Under this approach, several specific objectives and problems relevant to an identified part of the PA can be recognized as a "management zone". This management zone would have its own measures and strategies. Furthermore, several objectives and different problems, created by a combination of factors, can be tackled by a "theme strategy" under which measures can be prescribed for the entire area.

7.2.1 Zone Plans -

There are two zones in the buffer area. Zone wise management strategies are as follows –

7.2.1.1 Forestry Zone Plan -

All Forestry operations are prescribed as per the approved Management plan of Buffer zone written by Shri. C.K Tyagi, taking into account all wildlife concerns in the management of Buffer area.

Introduction

The forest area of buffer zone is presently managed under three Working Plan prepared by Shri N.S. Dungriyal, (South Seoni Division), Shri Satish Tyagi (East Chhindwara Divison) and Shri O.P. Khare (South Chhindwara Divison) details of working circle and felling series are as follows –

Table No. – 1

S. No.	Name of Division	Duration of the Plan	Name of Working Circle	No. of Felling series	Area of the Working circle (in ha.)
1	South Seoni Division	2003-04 to 2017-18	RDF	06	618.640
			SCI	70	17164.130
2	South Chhindwara Divison	2000-01 to 2009-10	RDF	06	304.999
			SCI	21	3116.483
3	East Chhindwara Divison	1997-98 to 2006-07	RDF	10	1469.310
			SCI	15	3404.875
			Soil/Conv.	8	1132.380
	Total			136	**27210.817**

It is observed that the treatments prescribed for the forest are as per the requirement of forest. So there is no need to change the prescription at present. These working plans are approved by Government of India.

Buffer area of Pench Tiger Reserve is under the unified control of Field Director. Management plan for buffer area is being prepared as per NTCA guidelines. Under the forestry zone plan, an overarching safeguard has been provided with respect to tree felling/ thinning under various systems of silviculture as indicated below:

- Buffer zone forests will be managed to establish co- existence between forests, wildlife and local communities to make core inviolate.
- There is no provision for clear felling. Only some selection and improvement felling is necessary in the very dense high forests. In all silvicultural systems, only selection felling will be done. It will not augment concentrated regeneration. This will not foster wild ungulates and increase human wildlife interface problem.
- A high forest system with diffused regeneration (selection/ improvement felling) will be allowed.
- The status of regeneration will be used as an overarching condition for permitting tree felling. An area with un-established regeneration will not be permitted for felling.
- A relationship between canopy class and mean ungulate density will be worked out for areas subjected to different silvicultural operations.
- As a thumb rule, the buffer areas will be managed for wild ungulates at a level which is lower than the optimal level observed in such habitats (core area will be taken as standard for reference).
- A timber removal/ thinning will be permitted in a selective manner so that the canopy cover doesn't fall below 40% in the months of winter season as more canopy opening will result in more exposed areas which would foster/lure wild ungulates.
- Present working plan prescriptions are commensurate to the NTCA guidelines. By selection and improvement in the high forests, canopy opening will be much lesser. This is in tune with the wildlife habitat management in the area.
- All timber coupes are staggered in such a manner that there will be minimum edge effect.

- The Plantation activities will be staggered to safeguard induced edge effect, especially near human settlements.
- Only species indigenous to the area will be taken up for the plantation.
- There is provision for sustainable harvesting of NTFP (based on the regeneration status of the species).

Existing situation

Classification of the forests:

01	Type 3B/C_{1c}	Tropical Moist Deciduous Forests- Slightly Moist Teak Forest
02	Type 5A/C_{1b}	Tropical Dry Deciduous Forests- Dry Teak Forest
03	Type 5A/C_3	Tropical Dry Deciduous Forests- Southern Dry Mixed Forest

Table No. - 2
Forest type, Area and Percentage

S.no	Forest type	Area(ha)	Percentage
01	Teak Dense forest	21788.68	45.88
02	Mixed Dense Forest	17288.00	36.41
03	Teak Open forest	1454.18	3.06
04	Mixed Open forest	1887.05	3.97
05	Blank area	982.97	2.07
06	Plantation	560.38	1.18
07	Encroached forest land/Agricultural fields	511.13	1.08
08	Forest Village	2726.92	5.74
09	River bed/ Area under submergence	287.60	0.61
Total		**47486.91**	**100**
Bamboo Forest		19159.17	

Biodiversity Index
Simpson's Index = D= ∑n (n-1)/ N (N-1)
Simpson's Index of Diversity = 1-D
Where,
n = total no. of organisms of a particular species
N = total no. of organisms of all species
Shannon Wiener Index

$H' = \sum_{i=1}^{R} pi \log pi$

Where
pi is the relative abundance of species "i" in the community.
Biodiversity Index, Number of species and trees in forest division

Forest Type	No. of Species	No. of trees	Biodiversity Index	
			Simpson Index	Shannon Weiner Index
Teak	61	4191	0.864	2.81
Mixed	73	9531	0.944	3.29
Total forest area	75	13722	0.943	3.27

Biodiversity Index as per Simpson's Index

Table No. - 3
Biodiversity of flora in Working Plan Area

S.no	Biodiversity Index	No. of Grid point	Percentage
01	0.901-1.00	38	17.59
02	0.801-0.900	104	48.15
03	0.701-0.800	34	15.74
04	0.601-0.700	14	6.48
05	0.501-0.600	3	1.39
06	0.401-0.500	7	3.24
07	0.301-0.400	5	2.31
08	0.201-0.300	2	0.93
09	0.101-0.200	0	0.00
10	0.000-0.100	9	4.17
Total		**216**	**100**

The biodiversity index of Teak forests and Mixed forests are 0.864 and 0.944 respectively, which suggests that the biodiversity among Mixed forests is more as compared to Teak forests. At the level of buffer zone, biodiversity is nominal. 80 varieties of trees are found in working plan area.

Forest resources

Forest resources survey data shows average 505 trees per hectare and average volume is 64.35 cubic meter per hectare.

Table No. - 4
No. of trees and their volume/ha girth class wise in Teak forests

Girth (in sq cm)	No. of trees per hectare	Percentage	Volume of treee per hactare (cubic metre)	Percentage
11-20	50.92	21.52	0.00	0.00
21-30	51.08	21.59	0.45	1.27
31-40	34.77	14.69	1.46	4.12
41-60	41.54	17.56	4.73	13.35
61-80	24.00	10.14	6.57	18.54
81-100	16.31	6.89	7.66	21.61
101-120	11.23	4.75	7.76	21.90
121-150	5.85	2.47	5.65	15.94
151-180	0.92	0.39	1.16	3.27
180>	0.00	0.00	0.00	0.00
Total	**236.62**	**100**	**35.44**	**100**

Table No. 5

No. of trees and volume/ ha girth class wise in mixed forests

Girth (in sq cm)	No. of trees per hectare	Percentage	Volume of treee per hactare (cubic metre)	Percentage
11-20	53.62	12.79	0.00	0.00
21-30	117.68	28.08	0.85	1.55
31-40	65.21	15.56	1.99	3.64
41-60	79.42	18.95	7.4	13.54
61-80	46.67	11.13	10.61	19.41
81-100	27.25	6.50	10.27	18.79

101-120	14.35	3.42	8.3	15.18
121-150	8.84	2.11	7.01	12.82
151-180	4.35	1.04	4.78	8.74
180>	1.74	0.42	3.46	6.33
Total	**419.13**	**100**	**54.67**	**100**

Table No- 6
Species and girth class wise average numbers of trees and volume (cubic meter)/ha

Species	11-20	21-30	31-40	41-60	61-80	81-100	101-120	121-150	151-180	>180	Total	%
Number of trees per hectare												
Teak	31.32	31.10	19.85	23.82	13.31	9.12	6.76	3.53	0.51	0.15	139.47	27.63
Mixed	57.36	100.3	57.43	68.09	36.47	22.64	11.55	6.91	3.02	1.54	365.31	72.37
Total	**88.68**	**131.40**	**77.28**	**91.91**	**49.78**	**31.76**	**18.31**	**10.44**	**3.53**	**1.69**	**504.78**	**100**
Percentage	**17.57**	**26.03**	**15.31**	**18.21**	**9.86**	**6.29**	**3.63**	**2.07**	**0.70**	**0.33**	**100**	**-**
Volume (cubic metre)												
Teak	0.00	0.28	0.83	2.73	3.62	4.28	4.68	3.47	0.60	0.31	20.80	32.35
Mixed	0.00	0.72	1.78	6.52	8.17	8.49	6.74	5.25	3.25	2.58	43.50	67.65
Total	**0.00**	**1.00**	**2.61**	**9.25**	**11.79**	**12.77**	**11.42**	**8.72**	**3.85**	**2.89**	**64.30**	100
Percentage	**0.00**	**1.56**	**4.06**	**14.38**	**18.34**	**19.86**	**17.76**	**13.56**	**5.99**	**4.49**	**100**	**-**

Table No - 7
Site Quality wise no. of trees and volume/ha

S.no	Site Quality	Number of trees	Volume (cubic metre)
01	III	454	87.08
02	IVa	535	63.95
03	IVb	413	49.98

Table No - 8
Forest type wise no. of trees and volume/ha

S.no	Forest Type	No. of trees per hectare	Volume per hactare (cubic metre)
01	Teak	556	68.42
02	Mixed	471	62.28

Table No - 9
Age class wise no. of trees and volume/ha

S.no	Age class	No. of trees	Volume(cubic metre)
01	Young	831	40.16
02	Middle	490	67.69
03	Mature	144	84.04

Table No - 10
Density wise no. of trees and volume/ha

S.no	Density	No. of trees	Volume(cubic metre)
01	Dense	560	68.37
02	Open	254	48.51
03	Blank	-	-

Table No - 11
Important species wise no. of trees and volume/ha

Name of Main Species	Forestry resource survey			
	No. of trees per hactare	Percentage of trees	Tree volume per hactare	Volume percentage
Teak	139.49	27.63	20.8	32.35
Lendia	66.47	13.17	3.24	5.05
Tendu	36.54	7.24	1.40	2.18
Bhirra	21.62	4.28	1.68	2.62
Saja	20.00	3.96	6.52	10.14
Moyan	18.9	3.74	4.79	7.45
Achar	15.00	2.97	0.95	1.48
Garari	13.68	2.71	0.84	1.31
Kari	13.08	2.58	1.46	2.27
Dhawda	11.76	2.33	2.17	3.37
Asto	9.56	1.89	0.47	0.73
Tinsa	9.04	1.79	0.87	1.36
Mahua	8.97	1.78	2.85	4.44
Kasai	8.82	1.75	1.32	2.05
Amla	8.75	1.73	0.70	1.08
Kusum	8.46	1.68	0.88	1.37
Palash	7.79	1.54	0.79	1.23
Amaltash	7.72	1.53	0.17	0.27

Table No - 12
Range wise no. of trees and volume/ha

S.no	Range	No. of trees per hactare	volume per hactare
01	Ari	485.81	65.35
02	Ghatkohka	760.71	73.16
03	Khamarpani	391.67	40.63
04	Khawasa	381.00	54.08
05	Kumbhapani	478.42	60.80
06	Rukhad	530.88	71.45

Table No - 13
Area of Bamboo Forest (ha)

Bamboo area	Site Quality			Regeneration	Total
	I	II	III		
Dense	0.00	0.00	0.00	0.00	0.00
Medium	0.00	146.94	212.73	0.00	359.67

Open	0.00	0.00	0.00	0.00	0.00
Regeneration	0.00	0.00	0.00	18529.81	18529.81
Degraded	0.00	0.00	209.55	0.00	209.55
Plantation (Dense)	0.00	0.00	0.00	0.00	0.00
Plantation (Medium)	0.00	10.71	0.00	0.00	10.71
Plantation (Open)	0.00	0.00	10.90	0.00	10.90
Total	**0.0**	**157.65**	**433.18**	**18529.81**	**19120.64**
New plantation	-	-	-	-	**38.52**

Table No - 14
Working circles, Girth class and species wise no. of trees and volume in buffer zone

Name of Management circle	Species	Girth (in sq cm)			Total no. of trees
		Upto 60	61&120	More than 120	
Selection-cum-Improvement	Teak	107.27	28.75	4.06	140.08
	Saja	8.59	10.24	1.72	20.55
	Others	283.36	62.03	10.00	355.39
Regeneration of degraded forest	Teak	87.5	36.25	6.25	130.00
	Saja	8.75	2.50	0.00	11.25
	Others	133.75	42.5	7.5	183.75

Table No - 15
Girth class and species wise volume

Name of Management circle	Species	Girth (in sq cm)			Total Volume (cubic metre)
		Upto 60	61&120	More than 120	
Selection-cum-Improvement	Teak	3.91	12.34	4.34	20.59
	Saja	0.62	4.33	1.92	6.87
	Others	8.67	19.59	9.51	37.77
Regeneration of degraded forest	Teak	2.62	16.49	4.99	24.10
	Saja	0.15	0.60	0.0	0.75
	Others	4.66	14.48	5.38	24.52

Table No - 16
Species wise no. of trees and volume/ha analysis

Forest type	Last Working plan		Present TCP		Percentage of difference	
	No. of trees per hectare	Volume of trees per hactare (cubic metre)	No. of trees per hactare	Volume of trees per hactare (cubic metre)	No. of trees per hactare	Volume of trees per hactare (cubic metre)
Teak	92.652	13.112	139.49	20.80	50.55	58.63
Mixed	476.754	34.19	365.29	43.50	-23.38	27.23
Total-	**569.406**	**47.302**	**504.78**	**64.30**	**-11.35**	**35.94**

Table No - 17
Analysis of girth class wise/ha

Girth (in sq cm)	Current Working plan				Proposed TCP			
	No. of trees	Percen tage	Volume (cubic metre)	Percen tage	No. of trees	Percen tage	Volume (cubic metre)	Percen tage
<60	454.386	79.80	11.346	23.99	389.27	77.12	12.86	20.00
61-120	103.401	18.16	26.252	55.50	99.85	19.78	35.98	55.96
>121	11.619	2.04	9.704	20.51	15.66	3.10	15.46	24.04
;ksx&	**569.406**	**100**	**47.302**	**100**	**504.78**	**100**	**64.30**	**100**

Table No - 18
Species wise established regeneration/ha

S.no	Species	Seeds	Coppice	Total
01	Teak	172.59	53.11	225.70
02	Saja	118.47	22.47	140.94
03	Bija	15.32	0.00	15.32
04	Kari	70.46	5.62	76.08
05	Lendia	112.85	23.49	136.34
06	Dhawda	113.36	35.23	148.59
07	Others	891.55	453.43	1344.98
Total		**1494.60**	**593.35**	**2087.95**

Table No – 19
Sample plot wise result of natural regeneration

Total no. of plots	Abundant		Sufficient		Insufficient		Nil		Blank	
	Sample plot	Percentage	Sample plot	Percentage	Sample plot	Percentage	Sample plot	Percentage	Sample plot	Percentage
136	45	33.1	18	13.2	37	27.2	20	14.7	16	11.8

Table No - 20
Working circle wise natural regeneration/ha

Proposed Working Circle	Forest type	Sample plot	Regeneration/Ha	
			Teak	Mixed
Selection-cum-Improvement	Reserved	118	235.41	1881.49
	Protected	10	152.78	2006.96
Regeneration of degraded forest	Reserved	04	69.45	1423.32
	Protected	04	277.78	1371.54

Table No - 21
Range wise regeneration per hectare

S.no.	Range	Regeneration per hectare
01	Ari	1498.72
02	Ghatkohka	2728.20
03	Khamarpani	995.38
04	Khawasa	3402.81
05	Kumbhapani	968.58
06	Rukhad	2614.40

Table No - 22
Common name and botanical names of Medicinal Plants

S. No.	Common name	Scientific name
01	Amaltas	*Cassia fistula*
02	Adusa	*Adhatoda vasica*
03	Apamarg	*Achyranthes aspera*
04	Amla	*Emblica officinalis*
05	Dhaak	*Calotropis gigantean*
06	Indrayan	*Citrullus colocinthis*
07	Imli	*Tamarindus indica*
08	Indrajau	*Holarrhena antidysenterica*
09	Kanghi	*Abutilon indicum*
10	Kachnar	*Bauhinia variegate*
11	Kantakari	*Solanum surattence*
12	Karanj	*Pongamia pinnata*
13	Kali Musli	*Curculigo orchioides*
14	Khair	*Acacia catechu*
15	Khamer	*Gmelina arborea*
16	Kullu	*Sterculia urens*
17	Gular	*Ficus racemosa*
18	Guncha	*Abrus precatorius*
19	Gorakhmundi	*Sphaeranthus indicus*
20	Ghritkumari	*Aloe indica*
21	Chitrak	*Plumbago zeylanica*
23	Dhatura	*Datura metel*
24	Kali dudhi	*Wrightia tinctoria*
25	Nagarmotha	*Cyperus scariosus*
26	Nirmali	*Strychnos potatorum*
27	Nirgundi	*Vitex negundo*
28	Padar	*Stereospermum suaveolens*
29	Punarnawa	*Boerhaavia diffusa*
30	Bargad	*Ficus benghalensis*
31	Baheda	*Terminalia belerica*
32	Babul	*Acacia nilotica*
33	Bija	*Pterocarpus marsupium*
34	Bel	*Aegle marmelos*
35	Bhringraj	*Eclipta prostrate*
36	Bhilma	*Semecarpus anacardium*

S. No.	Common name	Scientific name
37	Mahua	*Madhuca indica*
38	Makoi	*Solanum nigrum*
39	Kahua	*Terminalia arjuna*
40	Sarpoka	*Tephrosia purpurea*
41	Sankhpushpa	*Evolvulus alsinoides*
42	Shatawar	*Asparagus racemosus*
43	Harsinghar	*Nyctanthes arbortristis*

Table No - 23
Break up of Forest Area

S.no	Forest type	TCP area	Percentage
01	Teak Dense forest	21788.68	45.88
02	Mixed Forest	17288.00	36.41
03	Open forest	3341.23	7.03
04	Blank area	982.97	2.07
05	Plantation	560.38	1.18
06	Encroached land/Agricultural fields	511.13	1.08
07	Forest Village	2726.92	5.74
08	River bed/ Area under submergence	287.60	0.61
Total		**47486.91**	**100**
Bamboo forest		19159.17	

Table No - 24
Site Quality wise area and planning

Forest type	Site Quality (area in hactares)								
	II	III	IVa	IVb	Va	Under stocked	Plantation	Under stocked	Total
Teak	1385.23	11291.42	7899.72	1212.31	-	1454.18	207.09	-	23449.95
Mixed	97.31	4496.22	11095.66	1437.64	161.17	1887.05	353.29	0	19528.34
Unstocked	0	0	0	0	0	0	0	4508.62	4508.62
Total	**1482.54**	**15787.64**	**18995.38**	**2649.95**	**161.17**	**3341.23**	**560.38**	**4508.62**	**47486.91**
%	**3.12**	**33.25**	**40.00**	**5.58**	**0.34**	**7.04**	**1.18**	**9.49**	**100**

Table No - 25
Age class wise area (ha) and percentage

Forest type	Young	Medium	Mature	Total
Teak	3171.67	17601.74	1015.27	21788.68
Mixed	1652.84	14148.17	1486.99	17288.00
Total	**4824.51**	**31749.91**	**2502.26**	**39076.68**
Percentage	**12.35**	**81.25**	**6.40**	**100**

Table No - 26
Density wise area (ha) and percentage

Forest Type	Dense Forest	Open Forest	Total	Percentage
Teak Forest	21788.68	1454.18	23242.86	48.95
Mixed Forest	17288.00	1887.05	19175.05	40.38
Total	**39076.68**	**3341.23**	**42417.91**	**89.33**
Percentage	82.28	7.04	89.32	-
Blank, Submerged, Encroached, Forest village, Plantations etc			5069.00	10.67
Total			**47486.91**	**100**

Table No - 27

Site and quality of bamboo forestsSite Quality	As per present TCP	
	Area (ha)	Percentage
First	0.00	0.00
Second	157.65	0.82
Third	471.71	2.46
Regeneration	18529.81	96.72
Total	**19159.17**	**100.00**

Table No - 28
Density of bamboo forests

Site Quality	As per present TCP	
	Area (ha)	Percentage
Dense	0.00	0.00
Medium	408.90	2.13
Open	10.90	0.06
Degraded	209.56	1.09
Regenerated	18529.81	96.72
Total	**19159.17**	**100.00**

Table No - 29
Site quality wise

S.no	Site Quality	Number of trees	Volume (cubic metre)
01	III	454	87.08
02	IVa	535	63.95
03	IVb	413	49.98

Table No - 30
Age class wise

S. No.	Age class	No. of trees	Volume(cubic metre)
01	Young	831	40.16
02	Middle	490	67.69
03	Mature	144	84.04

Bamboo resource

Total bamboo area is 19120.65 ha in which well stocked bamboo forest is 590.84 ha and rest 18529.81 ha is gregariously flowered bamboo area with a stand height of 3-5mts.

Critically Endangered, Endangered and Vulnerable tree species

No tree species from IUCN Red list is found in Working Plan Area. Tree species which are found less than one percentage in proposed working plan area as well as in current working plan is given below.

Table No - 31
Tree species which are found less than one percentage

S. No	Name	Proposed Working Plan	Current Working Plan
01	Bargha	0.77	0.20
02	Rohan	0.68	0.77
03	Bija	0.78	1.08
04	Kakai	0.74	1.17
05	Mundi	0.71	0.48
06	Papda	0.71	0.64
07	Bhilwa	0.70	0.69
08	Khair	0.68	1.04
09	Lokhandi	0.55	2.24
10	Paadar	0.47	0.44
11	Salai	0.52	0.77
12	Chichola	0.37	0.22
13	Sheesham	0.34	0.26
14	Jaamun	0.28	0.28
15	Harra	0.28	0.24
16	Haldu	0.32	0.10
17	Mokha	0.23	0.48
18	Kekad	0.22	0.12
19	Arjun	0.10	0.09
20	Bhormaal	0.10	0.06
21	Semal	0.10	0.16
22	Pakhad	0.09	0.01
23	Kumbhi	0.07	0.09
24	Rinjha	0.07	0.10
25	Behda	0.05	0.12
26	Chirol	0.05	0.02
27	Kullu	0.04	0.06
28	Bargad	0.02	0.01
29	Peepal	0.01	0.02
30	Gular/Umar	0.01	0.08

Crop Structure of Teak Forests

Tropical Moist Deciduous Forests- Slightly Moist Teak Forest

a. **Top Canopy-** *Teak (Tectona grandis)* (20 to 60 %), *Terminalia tomentosa, Lagerstroemia parviflora, Anogeissus latifolia, Ougenia oojeinensis, Madhuca indica, Adina cordifolia, Pterocarpus marsupium, Schrebera swietenioides, Mitragyna parvifolia, Schleichera oleosa, Boswellia serrata, Dalergia latifolia, Delbergia paniculata, Albizzia odoratissima, Holoptelea integrifolia, Terminalia belerica, Syzygium cumini, Sterospermum personatum, Soymida fabrifuga, Bombax ceiba, Garuga pinnata, Lannea coromandelica*

b. Middle Canopy- *Emblica officinalis, Bauhinia racemosa, Aegle marmelos, Buchanania lanzan, Miliusa tomentosa, Kydia calycina, Semecarpus anacardium, Grewia tiliaefolia, Bridelia retusa, Careya arborea, Cordia macleodii, Cordia dichotoma, Butea monosperma, Ixora arborea, Gardenia latifolia, Diospyros melanoxylon, Cleistanthus collinus, Ehretia laevis, Elaeodendron glaucum, Cassia fistula, Casearia graveolens, Chloroxylon swietenia, Casearia elliptica, Gardenia resinifera, Gardenia turgida, Bauhinia variegata, Ficus hispida, Flacourtia indica, Sterculia urens, Dendrocalamus strictus*

***c.* Lower Canopy-** *Helicteres isora, Desmodium pulchellum, Indigofera cassioides, Woodfordia fruticosa, Grewia hirsuta, Adhatoda vasica, Alangium salvifolium, Phoenix acaulis, Nyctanthus arbortristis, Petalidium barlerioidis, Lantana camara, Anona squamosa, Premna barbata, Holarrhena antidysenterica, Murraya koenigii, Embelia tsjeriam-cottam, Caesalpinia decapetala, Antidesma diandrum, Clerodendron serratum, Vitex negundo, Acacia donaldi*

d. Shrubs- *Crotalaria dericea, Cassia tora, Asparagus racemosus, Barleria cristata, Calotropis procera, Ocimum basilicm, Flemengia semialata*

e. Grasses- *Apluda mutica, Heteropogon contortus, Eragrostis tenella, Themeda caudata, Saccharum spontaneum, Cymbopogan martini, Dichanthium annulatum, Bothriochloa pertusa, Thysanolaena maxima, Imperata cylindrica*

f. Climbers- *Bauhinia vahlii, Butea superba, Ventilago calyculata, Millettia auriculata, Smilax zeylanica, Zizyphus oenoplea, Mimosa hamata, Celastrus paniculata, Butea parviflora, Mucana prurita, Vitis carnosa, Pergularia daemia, Ichnocarpus frutesicens*

***g.* Parasites and epiphytes-** *English-Loranthus, Dendropthoe falcata, Cuscuta reflexa, Vanda tessellata*

Tropical Dry Deciduous Forests- Dry Teak Forest-

a. Top Canopy - Tectona *grandis, Terminalia tomentosa, Anogeissus latifolia, Diospyros melanoxylon, Lagerstroemia parviflora, Pterocarpus marsupium, Ougeinia oojeinensis*

b. Middle Canopy - *Acacia catechu, Emblica officinalis, Randia uliginosa, Zizyphus xylopyra, Aegle marmelos, Santalum album, Cassia fistula, Buchanania lanzan, Dendrocalamus strictus*

c. Lower Canopy- *Nyctanthus arbortristis, Woodfordia fruticosa, Helicteres isora, Grewia hirsuta, Indigofera cassioides, Adhatoda vasica, Carissa opaca, Holarrhena antidysenterica*

d. Shrubs- *Crotalaria dericea, Cassia tora, Asparagus racemosus, Barleria cristata, Calotropis procera, Ocimum basilicum, Flemengia semialata*

e. **Grasses-** *Eragrostis tenella, Heteropogon contortus, Apluda varia, Eulaliopsis binata*

f. **Climbers-** *Zizyphus oenoplia, Butea superba, Ventilago calyculata, Bauhinia vahlii*

g. **Parasites and epiphytes-** *English-Loranthus, Dendropthoe falcata, Vanda tessellate*

Tropical Dry Deciduous Forests- Southern Dry Mixed Forest

a. **Top Canopy-** *Terminalia tomentosa, Lagerstroemia parviflora, Anogeissus latifolia, Ougeinia oogeinsis, Madhuca indica, Adina cordifolia, Pterocarpus marsupium, Schrebera swietenioides, Mitragyna parvifolia, Schleichera oleaosa, Boswellia serrata, Dalbergia latifolia, Delbergia paniculata, Albizzia odoratissima, Terminalia belerica, Syzygium cumini ,Sterospermum personatum, Garuga pinnata, Lannea coromandelica, Sterculia urens*

b. **Middle Canopy-** *Emblica officinalis, Bauhinia racemosa, Aegle marmelos, Buchanania lanzan, Semecarpus anacardium, Bridelia retusa, Butea monosperma, Gardenia latifolia, Diospyros melanoxylon, Cleistanthus collinus, Cassia fistula, Casearia graveolens, Chloroxylon swietenia, Gardenia resinifera, Gardenia turgida, Flacourtia indica, Acacia catechu, Dendrocalamus strictus*

c. **Lower Canopy-** *Nyctanthes arbor-tristis, Woodfordia fruticosa, Helicteres isora, Grewia hirsuta, Indigofera cassioides, Adhatoda vasica, Carissa opaca, Holarrhena antidysenterica, Zizyphus mauratiana, Randia dumetorum, Flacourtia indica*

d. **Shrubs -** *Crotalaria dericea, Cassia tora, Asparagus racemosus, Barleria cristata, Calotropis procera, Ocimum basilicum, Flemengia semialata*

e. **Grasses-** Apluda *mutica, Eragrostis tenella, Heteropogon contortus*

f. **Climbers-** *Zizyphus oenoplea, Butea superba, Smilax zeylanica, Asparagus racemosus*

g. **Parasites and epiphytes-** *English-Loranthus, Dendropthoe falcate, Vanda tessellata*

Natural Regeneration Working Circle wise

S. No	Working Circle	Regeneration/ha
1.	Selection cum Improvement	2120.24
2.	Regeneration of Degraded Forest	1571.19

Annual Yield

Annual yield has been calculated with the use of Smithy's safeguarding formula. It comes to 11047.01 cubic meter/year.

General Prescriptions:

It is observed that the ground floor and under growth are not adequate for the food and cover value for the wild animals. So there is an urgent need to give treatment for ground floor and under growth which not only improve the food and cover value for the wild animals but also the livelihood of the local people can be enhanced to a great extent. The following activities area proposed for the forest area in addition to the treatments prescribed in the respective working plans. –

(1) Restoration of ground cover -

Plantation of Medicinal plants indigenous to the area should be carried out in the forest area with the following species -

Table No - 32

S. No.	Scientific Name	Local Name
1	*Acorus calamus*	Buch
2	*Gloriosa superb*	Kalihari
3	*Cassia angustifolia*	Sanay
4	*Rauvolfia serpantina*	Sarpagandha
5	*Withania somnifera*	Ashwagandha
6	*Abelmoschus moschatus*	Muskdana
7	*Andrographis paniculata*	Kalmegh
8	*Ocimum sanctum*	Tulsi
9	*Commifera mukul*	Gugal
10	*Emblica officinalis*	Aonla
11	*Cymbopogon flaxiosus*	Lemon grass
12	*Cymbopogon martini*	Pamarosa
13	*Mucuna puriens*	Kewanch
14	*Pogostemon cablin*	Pachouli
15	*Costus spaciosus*	Keokand
16	*Chlorophytum*	Safed musli
17	*Curculigo orchioides*	Kali musli
18	*Curcuma angustilsolia*	Tikhur
19	*Dioscorea daemona*	Baichandi
20	*Plumbago Zeylanica*	Chitrak
21	*Asparagus ralemosus*	Shatawar
22	*Embelica robusta*	Baibidang

The local medicinal species can also be planted. State Forest Research Institute Jabalpur has done some study for the sustainable harvest of medicinal plants. Some of the harvesting units are as follows-

Table No. - 33

S. No.	Botanical Name	Local Name	Sustainable harvest limit SHl
1	*Chlorophytum*	Safed musli	30 %
2	*Curculigo orchioides*	Kali musli	68 %
3	*Curcuma angustilsolia*	Tikhur	64 %
4	*Dioscorea daemona*	Baichandi	44 %
5	*Plumbago Zeylanica*	Chitrak	64 %
6	*Asparagus ralemosus*	Shatawar	52 %
7	*Embelica robusta*	Baibidang	

To ensure progressive sustainable yield, the harvesting limit should be less than the calculated sustainable harvest limit (SHL) at least 5% so that overused habitat can be restored. The cultivation techniques have been developed by the SFRI for different species. These techniques can also used for plantation.

(2) Preference of indigenous species for plantation-

The forest ecosystem has various established food chains incorporating a vast variety of plants and animals. Herbivores of different feeding habits consume not only the grasses but various tree species also. The detail is given in following table –

Table No. - 34
Indigenous Plant species and their parts used by wild animals

S. No.	Plant Species	Habit	Parts used			
			Fruits	Flower	Leaves	Bark
1.	Ber	Tree	*	-	*	-
2.	Ghont	"	*	-	*	-
3.	Achar	"	*	-	-	-
4.	Kusum	"	*	-	*	-
5.	Babool	"	*	-	*	-
6.	Baheda	"	*	-	-	-
7.	Jamun	"	*	-	-	-
8.	Mahua	"	*	*	-	*
9.	Tendu	"	*	-	*	-
10.	Karonda	Shrub	*	-	-	-
11.	Lasaura	Tree	*	-	*	-
12.	Kasai	"	*	-	*	-
13.	Aonla	"	*	-	*	-
14.	Pipal	"	*	-	*	-
15.	Bargad	"	*	-	*	-
16.	Gular	"	*	-	*	-
17.	Bel	"	*	-	*	-
18.	Semal	"	-	*	*	-
19.	Mango	"	*	-	-	-
20.	Tinsa	"	-	-	*	-
21.	Palas	"	*	*	-	-
22.	Bija	"	-	-	*	-
23.	Amaltas	"	*	*	-	*

24.	Kachnar	"	*	*	*	-
25.	Khair	"	-	-	*	-
26.	Reonjha	"	*	-	*	-
27.	Siras	"	-	-	*	-
28.	Saja	"	-	-	*	-
29.	Dhaoda	"	-	-	*	-
30.	Kumbhi	"	*	*	*	-
31.	Haldu	"	-	-	*	*
32.	Sewan	"	-	-	*	-
33.	Bamboo	"	-	-	*	-
34.	Chirol	Tree	*	-	*	-
35.	Teak	"	-	-	-	*
36.	Mundi	"	-	-	*	-
37	Papra	"	*	-	-	-
38.	Dhaman	"	-	-	*	-
39.	Flacourtia	"	-	-	*	-
40.	Marod phali	Shrub	-	-	*	-
41.	Lantana	"	-	*	*	-
42.	Jangli tuar	-	*	-	*	-

The above species except Lantana should be preferred while planting in the forest.

(3) Creation of cover and forest -

The following species seen to be heavily browsed by Spotted Deer, Sambhar, Blue Bull, Four horned Antelope –

Table No. – 35
Plant species heavily browsed by Herbivores

S. No.	Hindi Name	Botanical Name
1.	Ber	*Zizyphus mauritiana*
2.	Ashta	*Bauhinia racemosa*
3.	Rohan	*Soymida fabrifuga*
4.	Saja	*Terminalia tomentosa*
5.	Tendu	*Diospyros melanoxylon*
6.	Khair	*Acacia catechu*
7.	Ainthy	*Helictres isora*
8.	Aonla	*Emblica officinalis*
9.	Dhaora	*Anogeissus latifolia*

As no grass is available in the forest of buffer zone the following species which are heaving browsed should be planted.

Ber, Ashta, Rohan, Saja, Tendu, Khair, Ainthy, Aonla, Dhaora, Morod phali, Koronda.

(4) Systematic Plantation of bamboo -

The bamboo area is shrinking on an alarming rate. Therefore bamboo should be planted in a programmed manner. Existing bamboo clumps should be regularly worked in scientific manner. Prescriptions have been made for bamboo working and regeneration/ rehabilitation of degraded bamboo clumps.

(5) Preparation of inventories by actual ground survey and measurement of specific structure of the vegetation.

It has been done as resource survey and compiled for reference and use by management in the Management Plan of Buffer Zone prepared by Shri. C.K Tyagi.

(6) Provision of water on the basis of resource distribution, cover condition and cruising radii of the animal.

There should be at least one perennial, either natural or manmade water hole in every 25 sq km area. The maps showing all existing artificial and natural waterholes are shown in Map No. 11 to 14 and the detail has been annexed as **Annexure No. 26 (A, B, C, D, E, F) and 27 (A, B).** Following measures are prescribed in the plan:

- Survey and mapping of existing water holes and putting on GIS domain
- Deepening and de silting of existing water holes.
- Creation of new water holes, small tanks, hand pumps with saucer, stop dams/ earthen dams, dykes, jhiria, contour trench, contour bunds, gully plugging, brushwood check dams, boulder check dams.
- Soil water conservation measures in the catchment of existing water holes and their maintenance.
- Provision of water from tankers during summer season.
- Catch water drain, bringing water through gravity and pipeline in deficient area.

(7) Erection of barriers and repellents near agriculture field.

Erection of crop protection wall will be done in such areas.

(8) Preservation and creation of the cover and forage.

Following climbers, shrubs and herbs found in the area will be protected and conserved for getting good cover value and food for wild ungulates.

Table No. – 36

Climbers	
Mahul Bela	*Bauhinia vahlii*
Palas Bela	*Butea parviflora*
Shrubs	
Aithi	*Helicteres isora*
Bambo	*Bamboo sp.*
Gorsukdu	*Grewia hirsuta*
Koduru	*Grewia sp.*
Lantana	*Lantana camara*
Herbs	
Jagni	*Guizotia abyssinica*
Khareta	*Sida acuta*
Lapti	*Desmodium pulchellum*
Sida	*Sida sp.*

(9) Pasture development.

Indigenous grasses such as Bhurbhusi, *Imperata cylindrical* (cheer grass), *Cynodon dactylon* (Doob), *Themeda quadrivalvis* (Guneri), *Heteropagon sp*. (Sukra), *Thysanolaena sp*. (Somgrass), Phundra etc. should be preffered. The information of large grasslands of buffer zone in annexed as **Annexure No. 28 (A, B),** and the information of Lantana Infestation in annexed as **Annexure No. 29 (A, B).**

Forestry Zone Plan

Objectives:

- Sustainable forest management for better status of eco-system.
- Establishing co-existence between forests, wildlife and local communities.
- Ensure good natural habitat for spill over population of core area.
- Ensure Production forestry is in tune with wildlife and local communities needs.
- Participation of local communities in forest and wildlife management.
- Ensure sustainable production of small timber, fuel wood, bamboo, NTFP to fulfil needs of local communities.
- Augment water supply in the water bodies including water holes by keeping forest cover in the catchment.
- Ensuring sustainable alternative livelihood options for local communities to safeguard natural wildlife habitat.

Proposed Management Practices:

- Maintain forest cover for securing ecosystem, conserving soil and watershed areas.
- Conservation of Tiger's natural habitat and wildlife conservation and provide alternate livelihood from ecotourism to maintain co-existence.
- Conservation of endangered flora and fauna and their habitat for biodiversity conservation.
- Keeping forest based livelihood in the centre to involve local communities in conservation and management.
- Establishing natural regeneration to get good cover value.

Proposed Working Circles:

Working Circles and their prescriptions have been proposed on the basis of resources survey and stock mapping after mainstreaming tiger and other wildlife protection concerns. Following working circles have been prescribed in the buffer zone forests:

(i) Selection cum Improvement
(ii) Regeneration of degraded forests
(iii) Bamboo overlapping
(iv) NTFP overlapping

Proposed area in a present TCP of Buffer zone

Table No. – 37

Proposed area in a present TCP of Buffer zone			
Selection cum Improvement		Regeneration of degraded forests	
No. Of Compartments	Area	No. Of Compartments	Area
190	40688.80	34	382.39

Selection cum Improvement (SCI) working circle

Teak and Mixed Forests with natural regeneration potential which consist of young, middle and mature trees of density more than 0.5 have been included. No. of trees per hectare is 516.02 and volume 65.22 cubic metre. Established regeneration is 2120.24/ha. No. of felling series is 19. Felling cycle is of 20yrs taking into account grazing and NTFP collection. Selection girth is equal to or greater than 120 for Teak, 90 for Tinsa, Dhawda, Kasai, Lendia, Bhirra, Garari, Moyan, Kari and miscellaneous species respectively. All trees of selection girth will be counted and only 50% will be marked for felling. Main objective is of environment and biodiversity conservation along with sustainable production due to more than sufficient natural regeneration in the area.

Objectives:

- To create normal forest with all age gradation
- Facilitate biodiversity conservation/ ecological restoration.
- To create natural wildlife habitat for spill over population from core.
- Optimum production through sustainable forest management through supply of small timber, fuel wood for local stakeholders.
- Conservation of endangered and fruit bearing species.
- Stakeholders participation in forest protection and enhance livelihood options for them.

Prescriptions:

- Priority to Ecological restoration.
- Conservation of endangered species, trees of religious importance, fruit bearing trees, medicinal plants and MFPs.
- Conservation of trees near wells, springs, dens, hides up to 50 mts from banks of perennial rivers and up to 20mts from roadsides and nallahs.
- Conservation of trees in the diameter of 50 metres on the places of biodiversity and wildlife importance which includes biological hotspots, swamps, old growth stands, cliffs, overhangs, wallows, talus, dens caves, gorges.
- Two dead trees will be left for birds, wherever available.
- No felling on slopes more than 22^0 (40%)
- In areas where density of forest is more than 0.5, all selection girth trees will be enumerated but only 50% silviculturally trees will be marked for felling for community use and for fulfilling demand of timber in the market.

- No felling in high slopes (>22^0), area prone to soil erosion and frost, along main roadsides (up to 20 metre width), along nallahs (up to 20 metre width), along forest roads (up to 6 metre width), along perennial river banks (up to 50 metre width), along enter boundary of forest blocks (in 10 metre width)
- No felling in and around biological hot spots, caves, swamps, dens etc.
- Some small interventions like cut back, stump dressing and thinning to restore health of the forest.

Regeneration of Degraded Forest (RDF) Working Circle

The area in this Working Circle is 3832.39 hectares comprising of 34 compartments and 12 felling series of 10 year cycles. All degraded teak and mixed forests are included in this Working Circle. More than 50% area is either blank or open forest with enough root stock.

Objectives:

- Regeneration of degraded forests to rich biodiversity and for ecological restoration.
- Develop good habitat for wildlife (spill over population of core area).
- Ensure soil and water conservation.
- Control on grazing, fire, encroachment and illicit felling.
- To reduce biotic pressure by giving stakeholders alternate livelihood options.
- Produce small timber, fuel wood, palatable grasses for the use of local communities.

Prescriptions:

- Conservation of endangered species, fruit bearing trees, NTFPs and medicinal plants.
- Conservation of trees near wells, streams, dens etc.
- Conservation of trees/ plants in 50 m diameter of places of importance to biodiversity and wildlife conservation.
- Conservation of trees up to 20 m from roads and nallahs and up to 50 m from Perennial River.
- Two dead trees will be left for birds, wherever available.
- No working in area up to 2 ha of biological hotspots, swamps, old growth stands, cliffs, overhangs, wallows, talus etc.
- No working on slopes more than 22^0 (40%).
- Grassland development, removal of obnoxious weed, thinning, cut back and stump dressing in live stumps, seed sowing, soil water conservation will be prescribed.
- Grazing control and fire protection measures will be taken.
- Priority to facilitate natural regeneration and eco-development instead of plantation.

Bamboo overlapping Working Circle

Bamboo forests exist in 102 compartments of 19120.65 ha.

Objectives:

- Maintain productivity of natural bamboo forests.
- To regenerate degraded bamboo forests and improves its health.
- To fulfil local stakeholder's needs.
- Conserve Wildlife habitat.
- To produce industrial and commercial bamboo for the welfare of local community.

Prescriptions:

There are four categories of bamboo forests in the buffer zone-

- Bamboo area with good dense clumps (>100 clumps/ha).
- Bamboo area with malformed and degraded clumps.
- Low density bamboo area (31-50 clumps/ha).
- Gregarious flowering area.

Felling cycle is of 4 years. Clearing of clumps, soil working, grazing control, fire protection etc. will be done as per prescribed bamboo coupe working rules.

Prohibition:

- No bamboo felling in 50 m diameter, where area is a biological hot spot, wallows, natural salt lick, den, caves etc.
- No felling in or near denning sites.
- No felling during rainy season, from July onwards to October end.
- No fire and no grazing.

NTFP overlapping working circle

Introduction:

For futuristic conservation of forest and wildlife, and to make conservation sustainable, involvement of local communities is essential. Management should address their livelihood concerns. Local communities of the area are majorly dependent on NTFPs as a source of livelihood. They collect Tendu leaves, Mahua, Achar, Bel, Amla, Van tulsi, Harra, Beheda, Musli etc.
Medicinal plants found in this area are mainly Amaltas, Beheda, Arjun, Amla, Van tulsi, Neem, Bel, Bhilwa, Harra, Kali Musli, Asto, Kumbhi, Gudmar, Jamun, Dikamali, Dudhi, Marodfalli, Kalmegh, Nagarmotha, Ram datum, Baibiding, Dhabai etc. Local community collects them for personal usage as well as for commercial purpose. NTFP collection is an income generating activity for them.

Objectives:

- Sustainable management of NTFPs.
- Development of community by community based decentralised sustainable managerial interventions and planning.
- To fulfil NTFP needs of local communities.
- Capacity building of stakeholders for value addition.
- Data collection and development of indicators for effective evaluation of resources.

Prescriptions:

- Ground survey of NTFP resources.
- Sustainable collection and use.
- Extension of NTFP area.
- Arrangement for strong value addition, marketing etc.
- Conservation of critically endangered, endangered and vulnerable species.
- Create balance between wildlife conservation and community needs.
- No NTFP collection in and around areas of wildlife natural habitat.
- Non destructive harvesting measures
- Monitoring and evaluation of resources.
- To avoid overexploitation, it is important to prescribe site specific indicators for their ecologically sustainable management, vis-a-vis the regeneration status.
- Measures to increase productivity of NTFPs.
- NTFP management plan will be prepared in consultation with JFMC after detailed survey of resources for sustainable use.
- Floor fire for NTFP collection should be prohibited and fire should not be used to promote new flush of Tendu leaves.
- Timings for NTFP collection should be regulated while avoiding early mornings and late evenings.
- Collection should not be permitted in areas with endangered arboreal fauna.
- The patterns of NTFP collection should be studied for prescribing ecologically permissible collection. In areas where density of NTFP is low, fruit collection should be checked to maintain supply for frugivorous species.

7.2.1.2 Eco-development Zone Plan -

1. Introduction:

Eco-development with a twin objective of Eco-restoration of the hitherto overused habitat of the Forest Area and economic upliftment of the indigenous people wholly or partially dependent on the nearby Protected Area has proven useful for the existence of the wildlife reserves. Injudicious use of the natural resources in the past by the fast multiplying human population and their livestock had necessitated the imposition of certain restrictions on human activities for protection and conservation of the various ranges of wild animals and their surrounding habitats. Such restrictions, although very genuine in nature, have caused some degree of dissatisfaction among the dependent people, which resulted in the development of antagonism for the PA. It was experienced that mere restriction without providing viable alternatives can not fulfill the objectives of protection and conservation of the wilderness of the PA. Some of the vital requirements like the fuel wood and fodder have to be met with anyhow.

The basic aim under the Ecodevelopment is to reduce the dependence of local indigenous people inhabiting in villages positioned on the fringes of this Protected Area. These objectives cannot be fulfilled unless adequate employment opportunities for the local people and availability of viable alternatives to procure fuel and fodder for their day to day requirement are not created.

Ecodevelopment concept

Ecodevelopment is a recent concept mainly applicable for indigenous people inhabiting the fringes of any Protected Area. Different groups of people define this concept in various ways. Some relevant definitions are as below:

(i) "A site-specific package of measures, developed through people's participation with the objective of promoting sustainable use of land and other resources as well as on-farm and off-farm income-generating activities which are not deleterious to PA values." (Panwar 1992)

(ii) Rodgers (1992) opines ecodevelopment as "limited rural development designed with the participation of local people, for the purpose of reconciling genuine human needs with the specific aims of PA management." The same author has put the definition in other way as "In terms of the conservation of wildlife protected areas ecodevelopment can be defined as activities leading to the protection and regeneration of the biological resources through the economic development of local communities."

(iii) Eco-development has also been defined as: "the process of ecologically sound and sustainable resource use." (CEE, 1997).

(iv) It can also be called ecologically sustainable socio-economic development as applied to PAs as a special case. Ecodevelopment necessarily involves conservation of the local environment.

(v) The definition of the Ecodevelopment as per the Project Tigers concept is "the basic objective of the ecodevelopment Programme is the reduction of biotic pressure on core areas of PAs.

(vi) The objective ultimately is, 'Ecological Development' or, better conservation, but this in turn should mean better lives for local. Since this has now been accepted as necessary part of PA management, rural development Programmes will have to be undertaken to reduce the dependence of local communities on diminishing forests resources. The Programmes must promote more efficient use of the resources and/or provide alternatives where appropriate (WII, 1995)

(vii) The Indicative Plan on Ecodevelopment, which formed the basis of the GEF project, defines Ecodevelopment as "a strategy for protecting ecologically valuable areas (protected areas) from unsustainable or otherwise unacceptable pressures resulting from the needs and activities of people living in and around such areas. " (Singh et. al. 1994)

(viii) The final project document of the India Ecodevelopment Project characterizes Ecodevelopment as a strategy which "aims to conserve biodiversity by addressing both the impact of local people on the protected areas and the impact of the protected areas on local people."

(ix) Ecodevelopment is aimed to evolve local people in PA planning and protection to develop incentives for conservation and to support sustainable alternatives to harmful use of resources. It supports collaboration between the state forest departments and local communities in and around ecologically valuable areas. Eco development addresses the welfare and behaviour of local people and integrates these concerns into management of protected areas (World Bank, 1996).

2. Objectives:

It has been experienced that the people living in villages situated within a radius of approximately two kilometers from the PA boundary exert maximum adverse impacts. Hence sufficient focus must be aimed to address the problems of fifty-one villages, positioned within a radius of two kilometers of the Pench National Park and Pench Sanctuary. This zone may be called as Priority Zone. The concerns of remaining forty-eight villages would also be taken into consideration. Several income- generating activities and other arrangement to create fodder land would be provided preference over other works.

The central objective to carry out ecodevelopment activities is the conservation of bio-diversity of the PA. Every activity must have some

linkages with the protection of wilderness along with their flora and fauna occurring in the Protected Area. The major objectives include the followings: -

(i) To rehabilitate approximately two thousands hectares of over-degraded forests of the PA caused due to overuse and misuse by the human settlements located around the PA through restorative measures.

(ii) To ensure upliftment of economic status of the indigenous people of ninety nine villages, located within the Zone of Influence (ZI) by strengthening their traditional system of occupation (agriculture) along with creation of new means of self employment. Such enhanced income would reduce their day to day dependence on the forest of the PA.

(iii) To reduce the dependence of human settlements of 107 villages located within a radius of 5 kms of the PA boundary with respect to grazing of 36143 no. of livestock of such villages. It would be made possible by creating Silvipasture plantation on the adjoining degraded forestlands, already identified for this purpose.

(iv) To arrange the ensured means of livelihood for landless families (22.18%) people and most forest-dependant people in such identified 107 villages where such ecodevelopment activities are carried out. This objective can be made fulfilled by providing soft-term loan to such needy poor people.

(v) To reduce the negative impact of PA on people and people on PA

(vi) To make the efforts to reduce the use of fuel wood consumption by 50% of the people inhabiting such identified 51 villages in the next five years by encouraging the use of renewable source of energy by installing the bio-gas plant for the formers possessing livestock

(vii) To compensate by providing inputs into site-specific packages of ecodevelopment measures e.g. lift irrigation along reservoir and along the river upstream and downstream.

3. Basic principles:

(i) The Ecodevelopment activities should be by the locals and for the welfare of the locals. Use of local materials and local technologies with participation of indigenous people should be the basic principles to be implemented.

(ii) The Ecodevelopment works should be properly planned and well thought off.

(iii) The site-specific requirements should match the availability of local resources

(iv) For creation of employment opportunities, local professional skill of the local people should be assessed while drafting the micro plans

(v) The identified works should be socially, institutionally, financially and technically feasible and environmentally sustainable.

(vi) The approved works should be selected and owned by the EDCs

(vii) All of the villages should be linked with the ongoing Govt. welfare Programmes. Every investment made under the Village Ecodevelopment is additionality

(viii) Voluntary contribution up to 25 percent from the EDC members towards a common **Village Ecodevelopment Fund** that would be spent on future maintenance of infrastructure so created and on other activities, which could not be created by other sources of fund.

(ix) Every type of work, opted for the ecodevelopment activities, should be either directly or indirectly linked with the ultimate objective of conservation of biodiversity of the PA.

Intensive efforts to carry out Village Eco-development programme has been under implementation in the Pench Tiger Reserve (M.P.) since 1997-98. Such activities are managed by the respective EDCs (Ecodevelopment Committees) constituted for 107 villages situated on the periphery of the Pench National and Pench Sanctuary. All of such villages are positioned in the Buffer Zone of this Reserve. Such intensive and holistic approach to reduce the dependence on the forest of the PA has yielded a good response despite its slow take-off in its initial years.

4. Target villages:

Ecodevelopment activities must be initiated in the following 99 villages located on the fringes of the PA. These villages also fall within the Zone of Influence (normally within a radius of 5km from the PA boundary).

Table No. – 38

The following list contains the names of the villages within the zone of influence.

No.	Eco-Unit	0 to 1 Km.	1 to 2 Km.	2 to 5 Km.	Above 5 Km.
1.	**Ghatkohka** (21)	Tikari Mal	Barelipar	Simariya	--
		Tikari Raiyat	Salhe	Ghatkohka	--
		Karmajhiri	Sarrahirri	Panjra	--
		Bhodki	Tewni	Sindariya	--
		Katangi	Dhutera	Mohgaon Titri	--
		Murer	Patrai	Niwari	--
		Aagri	Aalesur	Paraspani	--
	Total	**07**	**07**	**07**	**--**
2.	**Khawasa** (24)	Raiyarao	Pindkapar	Ambajhiri	Kothar
		Potiya	Kodajhir	Telia	--
		Ambadi	Setewani	Nayagaon	--
		Khamreeth	Mohgaon Yadav	Mudiyareeth	--
		Khamba	Durgapur	Pachdhar	--
		Vijaypani	Awarghani	Kohka	--
		Jeerewada	--	Arjuni	--
		Satosha	--	--	--
		Kuppitola	--	--	--
		Turia	--		
	Total	**10**	**06**	**07**	**01**

3.	**Rukhad** (07)	Gandatola	--	Sawangi	Sakhadehi
		--	--	--	Darasikhurd
		--	--	--	Darasikala
		--	--	--	Bawanthadi
		--	--	--	Nayegaon
	Total	**01**	**--**	**01**	**05**
4.	**Ari** (08)	--	--	--	Khapa
		--	--	--	Aatarwani
		--	--	--	Magarkatha
		--	--	--	Pandayer
		--	--	--	Durhapur
		--	--	--	Mohgaon (FV)
		--	--	--	Sakata
		--	--	--	Mirchiwadi
	Total	**--**	**--**	**--**	**08**
5.	**Kumbhapani** (24)	Jamtara	Thota Mal	Banskheda	Konapindrai
		Thota Raiyat	Pathri	Kumbhapani	Sajpani
		Naharjhir	Singardeep	Dawajhir	Halal Kala
		Gumtara	--	Kanhasagar	Halal Khurd
		Pathra khurd	--	Bandhan Mal	Madaria
		--	--	Bandhan Raiyat	Khairanj
		--	--	Khamariya	--
		--	--	Chargaon	--
		--	--	Kokiwada	--
		--	--	Dhoulpur	--
	Total	**05**	**03**	**10**	**06**
6.	**Khamarpani** (23)	Pulpuldoh	Sawari	Saliwada	--
		Dudhgaon	Chirrewani	Antara	--
		Mohgaon Khurd	Bordi	Dongargaon	--
		Thuepani	Sirrepani	Kadhiya	--
		Pathra Kala	--	Dainy	--
		Kokiwada	--	Marjatpur	--
		--	--	Khamarpani	--
		--	--	Kanhargaon	--
		--	--	Deori	--
		--	--	Bisanpur	--
		--	--	Kundai	--
		--	--	Silota Kala	--
		--	--	Silota Khurd	--
	Total	**06**	**04**	**13**	**--**
	Total (107)	**29**	**20**	**38**	**20**

Sites of implementation –

There are ninety nine villages located within the Zone of influence (ZI) and have been selected as sites for implementation of the Ecodevelopment activities in the Pench Tiger Reserve. Out of ninety-nine village fifty-one fall in the Seoni district and remaining forty-eight villages are situated on the Chhindwara district. All ninety-nine villages have been put under the five units for supervisions and execution of EDC activities.

Table No. – 39

S. No.	Eco-unit	District	No. of EDCs
1	Ghatkohka	Seoni	21
2	Khawasa	Seoni	24
3	Rukhad	Seoni	7
4	Ari	Seoni	8
5	Kumbhpani	Chhindwara	24
6	Khamarpani	Chhindwara	23
		Total	**107**

The dependence of any village on the PA is inversely proportional to its distance from the PA boundary. This means that the more the villages is close the more the dependence. In the Pench Tiger Reserve Fifty-one villages are located within a radius of two Kilometre which are really more dependent on this PA.

Table No. – 40

Group	Distance from the PA boundary	No. of villagers
A	Within one Kilometre	29
B	Between one to two Kilometre	20
C	Between two to five Kilometre	38
D	Above 5 Kilometre	20
	Total	**107**

It is observed that for villagers living around the PA, agriculture and cattle rearing are the main occupations. Paddy, Wheat, Soyabean, and maize are major crops. Most villagers are marginal cultivators, and 22.18% of the employable work force does not have access to land. Employment in forestry operations and MFP collection (For food and income) are their main sources of income.

The villages have concentration of the Scheduled Tribes/scheduled caste comprises 66.12% of the total population. Other social groups found in the area are Patels (usually landowners) Kirars and Ahirs (scheduled castes).

5. Summary of indicative list of possible village ecodevelopment activities -

On the basis of group discussions meetings and observations of each village and socio economic and demographic data identified, an indicative list of possible site specific activities has been suggested to meet above criteria. The activities can be grouped as follows –

Table No. – 41

S. No.	Type	Activities
1	PA protection	- Community patrolling - Chain link fencing - Site specific -

2	Grassland development and mix plantations	- A ↔B - Rotational grazing - Pasture regeneration - Fodder (mix) plantation - Establishment and operations of nurseries
3	Energy conservation	- Installation of Bio-gas plants - Pressure cooker - Improved smokeless chulhas
4	Livestock improvement	- Cattle breed improvement - Facilities for stall feeding - Consultation with local veterinary department field staff.
5	Soil and water conservation works provide irrigation facilities	- Small scale irrigation schemes. - Check dams, stop dams, on small rivers (nala) - Impoundment on small streams with minor irrigation schemes. - Tube wells with pipelines - Repairing of existing tanks.
6	Reducing wildlife damages	- Chain link fencing - Community patrolling - Site specific
7	Alternative income generation on the basis of loan agreement without interest.	- Tailoring - Kirana shop - Small scale, candle making, Agarbatti making - Mushroom cultivation through training the villages - Site specific on the basis of social infrastructure and ethnic groups composition - Medicinal plant cultivation and fruit plant cultivation.
8	Ecotourism	- Nature guides - Tourist accommodations - Operation of visitor attractions e.g. museums - Other eco-tourism services concessions.
9	Credibility works- The activities completed as credibility works	- Drinking water facilities - Road up gradation - Community hall in the village - A sage platform with flat roof. - School children uniform and bags. - Well repairing - Site specific on the basis of social infrastructure and ethnic groups compositions.
10	Other activities	- Health and family welfare (MCH programme), literacy improvement need to be linked to Objectives and reduce human pressure on PA.

6. Different category of activities -

Category - I - Activities leading to the protection, regeneration resources and restoration of the biological -

The group of activities mainly aims to eliminate the undesirable biotic disturbances on flora, fauna and various other essential ingredients of habitats of the PA. Such activities also include the efforts to reduce grazing pressure, fuel-wood and timber collection from the forest of PA, biomass generation and other efforts to enrich the biodiversity.

The following activities are suggested to be taken up: -

(i) **Biomass substitution through energy-saving devices: -**

Such group of works include use of renewable sources of energy, like: Installation of biogas plant, use of pressure cookers and other energy saving devices.

(ii) **Creation of Pastureland to make alternative arrangements for fodder:**

Pasture land development on revenue wasteland, if found available; on adjoining degraded forestland and other community land. It includes Silvi-pasture plantation that includes weed eradication supplemented with gap filling with local varieties of perennial grass species by providing complete closures. A survey conducted to locate the revenue wasteland revealed discoursing result.

The degraded Protected Forestland (PF), located near villages has been identified to develop them as Pastureland. Silvipasture plantation would be done in such forestland in phased manner for 51 villages located within a radius of 2 Km. of the Park and Sanctuary boundary.

(iii) **Raising fuel wood plantation on revenue wasteland or on nearby degraded forestland:**

Creation of woodland, including plantations of appropriate fuel wood species on these chunks of land. Such efforts should also include the accepted Soil and Moisture conservation treatments to accelerate the growth of planted species. Such treatments would also help in quick resurrection of the degraded sites.

Fast growing fuel wood species would be planted in Silvipasture plantation to meet fuel wood requirement for the inhabitants of the above villages. Complete protection of such area would encourage the rejuvenation of pollarded and other suppressed fuel wood species.

(iv) **Simple water harvesting and catchment treatment works:**

This group of activities may include the construction of small- sized anicuts; series of stop dams on nalas traversing the agriculture land. Such water harvesting structures should also include other accepted practices being adopted for Soil and Moisture conservation.

(v) Joint Forest Management (JFM) as per the guidelines, issued by the Govt. of Madhya Pradesh in the year 2000.

Category – II - Activities leading to economic development of local communities -

Such activities would provide alternate arrangements for fuel for self- use and fodder for the domestic cattle. Since agriculture is the major source of income of these indigenous people, intensive efforts require to be initiated in the direction. The following main activities would help in reducing the dependence of these indigenous people on forest: -

(i) **Construction of site- specific water harvesting and Irrigation structures** (surface and groundwater), simple diversion or diversion cum storage type of minor irrigation schemes including development of village tanks. Such efforts may include the adoption of Lift irrigation schemes, using pump sets utilizing the water from rivers, reservoirs and wells.

(ii) **Soil conservation measures on agriculture fields to augment crop yield. -** Various activities under this group include the bunding of agriculture land by local earth and loose boulders. Such bunding of crop-field would allow maximum percolation of rainwater, which would result in better yield of paddy and other *Kharif* crops.
Such enhanced agriculture production would increase the income status of the farmers as well as it would make extra agriculture wastes available to EDC members. Such dried biomass can be used as fuel for self-use and fodder for the cattle.

(ii) **Small-scale crop and agricultural development activities** and improved farming techniques by using improved varieties of certified seeds, application of farm-yard manure, other appropriate fertilizers and other site-specific activities.

(iii) **Small-scale farm and non-farm-based alternative income-generation activities** (bee-keeping, mushroom cultivation. sericulture, Lac production, handicrafts, tailoring, weaving, improved livestock and Eco-tourism.). Such employment generation would also include the production of candle, toy or basket and other activities suiting to local market demand.

(vi) Preference to cash crops e.g. pulses, oil spices, cotton, medicinal plants and efforts for Agro-forestry.

(vii) Plantation of climate- suitable fruit-bearing species.

(viii) **Cultivation of medicinal plants, essential oil bearing herbs.**

(ix) **Phased reduction in population of scrub livestock and improvement of cattle breed through controlled fertilization** of female stock in proper health and age with males of better local breeds, aided by sterilization of female stock in proper health and age with males of better local breeds, aided by sterilization of scrub bulls.

(viii) **Cooperative dairying with marketing support.**

(ix) **Obligatory use of local guides (after training) on nature trails,** preferential employment to locals in PAs and tourism facilities after required education and training.

Category – III- Activities related to rural development programmes -

(i) To link these villages with the ongoing Government run welfare programmes, including District Panchayat, Forest Departments (Territorial wings)

(ii) Any other activities found appropriate, from time to time to achieve the goal of Ecodevelopment

Maintenance of records and registers as appended in the **Annexure no. – 14, 15**

7.2.2 Theme Plans –

Since conservation initiatives would foster tiger abundance in the area in a concerted manner, no specific zone or theme approach is necessary for the flagship species – tiger. Several objectives and different problems created by a combination of factors can be tackled by a "theme strategy" under which measures can be prescribed for the entire area. The following theme have identified in the Tiger Reserve.

- Fire Protection
- Anti poaching
- Live stock immunization

7.2.2.1 Fire Protection

Fire, which is now recognised as part of the natural environment, commands profound effects on forest communities and wildlife. Though fires usually do not kill a large number of animals, they do harm micro-fauna, and vastly alter wildlife habitats. Fire changes the abundance and composition of wildlife communities drastically, and a general ecological effect of fire is to reverse the process of the natural plant succession.

As far as fire hazards in Pench Tiger Reserve are concerned, they mainly cause the following two effects:

- Fires immediately result in the removal of dry, coarse, and fibrous and unpalatable forage, and produce a new flush of nutritious and palatable green shoots of grasses based on the availability of moisture
- Fires kill or partly destroy seedlings, saplings and shrubs, giving rise to small openings

Fire protection is one of the many conservation initiatives carried out every year to protect the habitat within the Tiger Reserve. The fire season sets in around mid-February and lasts until the area experiences the first showers of

monsoon. During the fire season the temperature may go upto 46^{o}C in the last week of May, leaving the grasslands/ ground flora completely dry and susceptible to fire. Dense ground flora and grasses only add to the in flammability of the area.

No natural fires occur in the Tiger Reserve area, and it also does not experience fires by lightning. Only man-made fires occur during the season. The following reasons may be assigned to the occurrence of fires in the Tiger Reserve:

- The clearing of forest floors for collection of MFP in the buffer zone and right burdened surrounding forests by the local inhabitants

- Setting fire in the peripheral areas of the Tiger Reserve by miscreants/ disgruntled elements nurturing a grudge against the Park Management

- The presence of a public highway adding to the vulnerability in a port of the Tiger Reserve

Fire Protection Measures:

In view of the incalculable damage which may be caused by the man-made fires, the Management has to continue the all-round prevention/ protection strategy well in advance, involving the local people, before the fire season actually sets in. The protection measures include the following steps:

1. Preventive:

- The cutting and burning of specially created firelines along with strips adjoining forest roads range boundary lines and compartment lines well before the fire season

- Creation of temporary fire watchtowers at strategic locations throughout the area

- Regular sweeping and removal of dry leaves from fire-lines throughout the fire season

- Monitoring progress and occurrence of fire by fire watchers through round the clock wireless network

- Deployment of fire extinguishing squads (vehicular and non-vehicular)

- Constant patrolling by the patrolling camp staff
  The details of cutting and burning of strips along Forest Roads has been annexed as **Annexure No. 30.**

2. Control:

- Strip clearance by the fire extinguishing squad
- Manual putting out of fire by fire beaters
- Counter firing by the squads

Constant-patrolling in-groups are resorted to from vantage points. This is in addition to the round the clock wireless facility and patrolling from the various patrolling camps. Regular patrolling on foot near the peripheral area is of utmost importance. The local villagers (predominantly tribal) would be deployed for this purpose through Pench Workers' Society in "short term fire protection projects".

It is pertinent to point out that all the labourers are drawn from the indigenous communities of the peripheral villages, and this is a source of livelihood to them during the summer months, and hence also qualifies as an important eco-development intervention.

Table No. 42
Location of Fixed Wireless Stations

S. No.	Name of Station	Beat	Sub Range	Range
1	C-7 Rukhar	Rukhar	Rukhar	Rukhar (T)
2	C- 2	Kurai	Kurai	Kurai
3	S-18	Van Chouki Doodhgaon	Pulpuldoh	Bichhua
4	Sonpur	Sonpur	Sonpur	Kanhan
5	Kumbhapani	Kumbhapani	Kumbhapani	Chourai

7.2.2.2 Anti-poaching:

As the protection aspect tops all other priorities, and forms a very important managerial strategy, the Tiger Reserve is known to have adopted a protectionist attitude for a long time, with its reliable communication system, strategically located forest camps and intensive patrolling by the ever-vigilant staff, resulting in an appreciable increase in wildlife populations, and intrusion and encroachment well under control. Protection plays a very important role in wildlife conservation in a country like India with its inherent demographic and economic problems. The following protection measures form an effective over-all protection strategy in Pench Tiger Reserve.

1. **The Tiger Cell:** Along the basic lines of the Tiger Cell created by the State Govt., a similar Cell has also been created at the office of the Chief Conservator of Forests & Field Director, Pench Tiger Reserve, in pursuance of the broader objectives of this State-level Cell at local level, covering the Tiger Reserve and the surrounding districts. The Cell has been entrusted with the responsibility of gathering information relating to offenders, and to establish an intelligence network and monitor the progress of pending court cases related to wildlife offences. The Cell also collaborates with the local

NGOs, the Police department and informers for achieving the above objectives.

2. **Law Enforcement:** Considering the ever-increasing biotic pressures on wildlife protected areas, it is very important that the law enforcing officers/ staff of wildlife protected area are well-acquainted with and updated on the various forest and wildlife Acts, such as the Indian Forest Act, 1927; the Indian Wildlife (Protection) Act, 1972 and the Forest Conservation Act, 1980, and maintain a very close working relationship with the police and judiciary to put across the government's point of view more effectively.

The government has empowered the various ranks of field staff of forest department to take cognizance of offences relating to forest and wildlife. The frontline staffs of Pench Tiger Reserve is always required to be kept well - prepared with necessary documents/ proforma prescribed under the above Acts for taking appropriate action and registering a forest/ wildlife offence. The Park Management should also ensure that the staff remains trained and updated on the latest amendments to the concerning Acts, and for this purpose easy Hindi translation of the concerning Acts may be circulated down to the lowest level for a better understanding of the subject. Besides, periodic Legal Workshops and discussions should also be organised, involving resource persons from the judiciary and the police department to guide the staff in the proper investigation of forest offences, procedural norms, and to simplify the intricacies of the laws. The staff would be benefited by such arrangements, as these close interactions point out the various shortcomings/ mistakes in the entire procedure which render the cases weak, increasing the possibility of criminals going scot-free.

The management of a Tiger Reserve is a great learning process, and the lesson learnt is that procedural flaws would help the offenders escape prosecution, and even the staff may find themselves facing legal proceedings for improper arrest or seizure.

Taking cue from the above, the Park Management is now convinced that the staff of the Tiger Reserve requires internal periodic refresher courses discussions, and high levels of discipline and motivation. Such discussions and workshops would build the confidence of the staff in the following:

- Arrest or apprehension of persons/ offenders engaged in illegal acts inside the Tiger Reserve
- Proper documentation of illegal activities for court proceedings, including evidence in the form of confiscated wildlife articles, relevant photographs, signed statements, and reports
- Proper seizure of items prohibited under the Laws, or required as evidence to testify to an illegal act

- Simple legal procedures in delivering the arrested offenders to the police/ court, and filing charges

3. **Creation of Strike Force:** One strike forces, has also been created with vehicular mobility in the Tiger Reserve. This well-staffed and well-equipped strike force looks after Pench Tiger Reserve. A Range Officer, who has been provided with the necessary route-chart and the other logistics, heads each force. The strike forces have been entrusted with the following responsibilities.

- Building up an effective intelligence network to monitor, prevent and pre-empt illegal activities in the Tiger Reserve
- Intensive night patrolling throughout the Tiger Reserve, and the villages surrounding it
- Raid and seizure of illegal wildlife products
- Weekly market checking and general surveillance
- Periodic checking of village level crime registers and updating crime maps

Detailed instructions have also been issued vide Govt. of M.P., Home (Police) Department's order No. F-16-266/ LIC/ 96-B (1) 2, dated 06/07/96, authorizing forest personnel (Forest Guard and above) to use firearms provided by the department for self-defence while protecting Govt. property. Instructions have been received in this regard from the Principal Chief Conservator of Forests vide Letter No. 1856, date 16/08/96.

4. **Special Protection Measures:** The Buffer zone has a very effective network of 51 strategically located forest camps. A forest guard and one or two camp watchers man each camp. This provides an added impetus to the over-all protection scheme by creating the following special measures.

5. **Operation Monsoon:** This exclusive operation is carried out during the rainy season when most of the Reserve's area becomes inaccessible for regular patrolling by vehicles, and the probability of intrusion from the surrounding villages increases. This operation includes:

- Sensitivity mapping
- Additional temporary patrolling camps
- Foot patrolling
- Foot -path surveillance
- Patrolling Squads

6. **Foot Patrolling:** With the ever-increasing biotic pressure on the wildlife protected areas, the importance of regular foot patrolling by officers in a Tiger Reserve is an undeniable and indisputable fact. Aside from inspiring the regular patrolling staff, this also lends a psychological restraint over the surrounding villages. Taking note of this, the following distances for monthly foot patrolling has been made mandatory for the officers:

- Range Assistants (100 km./ month)
- Range Officer (80 km./ month)
- ACF (65 km./ month)

7. **Patrolling Strategy:** The overall patrolling strategy of the Tiger Reserve includes the following features:

- Staff/ camps listed with duty allocation and route chart
- The teams are equipped with mobile wireless sets and firearms
- The patrolling teams systematically cover the area of allotted to them
- Special instructions/ provisions for squads:
  - Surveillance : hotels, tourist points, vehicles, bus stand
  - Surveillance: Bahelias, traditional hunters etc.
  - Coordination with local police
  - Sanctioning labourers for patrolling (2/ team)
  - Special POR book issued
  - Preparation of daily schedule
  - Market checking (5 places/ week)
  - Surprise checking of barriers
  - Preparation of "crime maps" with periodic updating
  - Monitoring cattle kill, human kill and injury incidences
  - Monitoring issues relating to compensation
  - Monitoring water points near habitation
  - Preparation of crime gang dossiers
  - Preparation of individual crime dossiers
  - Conveying progress to higher official on a daily basis through wireless
  - Deviating from routine schedule during emergencies
  - Taking note of offences registered in local police station
  - Using tape recorder/ camera etc. to record evidences

7.2.2.3 Disease Surveillance & Livestock Immunisation

Infections by disease organisms are known to be common in both wild and captive populations. Animal populations may be infected by micro-parasites, such as viruses, bacteria, and protozoa, or macro-parasites such as Helminth worms and parasite arthropods.
Wildlife disease may also be one of the decimating factors causing high mortality among wild mammals even in well-established Wildlife Protected Areas. Therefore, regular disease surveillance becomes all the more important for the Tiger Reserve harboring some of the highly endangered species of wildlife.

Sporadic mortality of a few animals may be of little concern, unless, of course, it is an indicator of some epidemic. Though the National Park is well protected against grazing by domestic cattle, some species of which are known to be the resistant carriers of many diseases, there is every reason to believe that some chital and nilgai populations may come in contact with the domestic cattle while raiding the crops on the periphery of the National Park. Besides, instances of intermingling of domestic and wild ungulates in the Buffer Zone can not be ruled out.

The above situation calls for regular and timely immunisation of livestock against the major diseases such as Anthrax, Rinderpest, Foot & Mouth, and Pasteurellosis to prevent the outbreak of any such pestilence. Besides, the services of a specially trained veterinarian is also required in the Tiger Reserve to look after the general health care, diagnosis, treatment, prophylaxis and control of wildlife diseases.

Some common cattle diseases around Pench Tiger Reserve are as under:

Table No. 43

VIRAL DISEASES	**MYCOTIC DISEASES**
1. Rabies	1. Dermatomycosis
2. Louping ill.	2. Histoplasmosis
3. Infectious Hepatitis	3. Cryptoccosis
4. Vesicular Stomatitis	**HELMINTH DISEASES**
5. Encephalomylitis	1. Fasciolopsiosis
BACTERIAL DISEASES	2. Amphistomiasis
1. Paratuberculosis	3. Schistosomiasis
2. Salmonellosis	4. Echino coccosis
3. Leptospirosis	5. Trichinosis
4. Pasturellosis	6. Anchylostomiasis
5. Brucellosis	7. Ascariasis
6. Anthrax	8. Strengyloidosis
7. Actino bacillosis	9. Taeniasis
8. Black disease	**ECTOPARASITIC**
9. Campylobacteriosis	1. Acariasis
PROTOZOAN DISEASES	2. Myiasis

1. Trypanosomiasis	
2. Toxoplasmosis	
3. Babesiosis	
4. Sarcosproridiosis	
5. Anaplasmosis	

Wild animals may contract the following zoonotic diseases which normally affect the livestock:

Table No. – 44

VIRAL DISEASES	**MYCOTIC DISEASES**
1. Rabies	1. Dermatomycosis
2. Encephalomylitis	2. Histoplasmosis
3. Herpes B. Virus	3. Cryptoccosis
4. Vesicular Stomatitis	**PROTOZOAN DISEASES**
5. Psittacosis	1. Trypanosomiasis
6. Influenza	2. Toxoplasmosis
7. Louping ill.	3. Leishmaniasis
8. Lassa fever	4. Amaebiasis
9. Infectious Hepatitis A.	5. Malaria
10. Lymphocytic choriomeningitis	6. Sarcosporidiosis
RIKETTSIAL DISEASES	**HELMINTH DISEASES**
1. Q. Fever	1. Fasciolopsiosis
BACTERIAL DISEASES	2. Paragonimiasis
1. Tuberculosis	3. Amphistomiasis
2. Salmonellosis	4. Schistomiasis
3. Anthrax	5. Echinococcosis
4. Leptospirosis	6. Hymenolepiasis
5. Listeriosis	7. Cysticercosis
6. Pasturollosis	8. Trichinosis
7. Tularaemia	9. Filariasis
8. Brucellosis	10. Anchylostomiasis
9. Melioidosis	11. Angiostrongyliasis
10. Campylobacteriosis	**ECTOPARASITIC**
MYCOTIC DISEASES	1. Acariasis
1. Dermatomycosis	2. Myiasis
2. Histoplasmosis	
3. Cryptococcosis	

7.2.3 Retrofitting Measures Plan

Pench Tiger Reserve, Seoni is connected to Kanha Tiger Reserve and Satpuda Tiger Reserve through active corridors, which pass through forest and revenue areas of buffer zone. The Tiger Reserve is also contiguous to Pench Tiger Reserve, Maharashtra. There is scientific evidence of tigers using corridors and gene flow from one tiger bearing area to another. The tiger reserve is an important area of source population of tigers in the central Indian landscape.

A special retrofitting measures theme plan is proposed for ensuring retrofitting safeguards for wildlife in Buffer area in the context of dams, windmills, mining, roads or any other development project within the buffer area of Pench Tiger Reserve.

Roads

The buffer zone of Pench Tiger Reserve has a network of existing roads like National Highway No.7, State highways, PWD roads and Forest Roads. All such roads will have provisions of underpasses and flyovers, which will be site specific, so that the movement of wild animals does not get restricted. Other retrofitting measures will include:

- Speed breakers at desired places (if passing through the forest area),
- Speed limit should be set at less than 40 km per hour
- Proper sign boards/ Signages at the desired places would be placed
- High chain link fencing completely camouflaged with natural vegetation and plantation will be provided on either side of the road boundary and same will be maintained by NHAI / its agency in case of upgradation of NH-7
- Slab culverts or pipe culverts, whichever required as per site, should be installed at necessary strategic locations so as to facilitate movement of water bodies and wildlife including aquatic fauna.
- Upgradation will require permission from competent authorities to safeguard wildlife concerns.

Electrical transmission lines:

Electrical transmission lines exist in the buffer area of PTR. These services will be maintained with taking proper mitigative measures prescribed by MOEF&CC and NTCA. Retrofitting measures required for the existing electrical lines are:

- All sensitive electric lines should be insulated in a phased manner. Such sensitive transmission lines have been identified.
- All trees that touch the transmission lines should be trimmed at regular interval.
- Earth leakage circuit breakers should be there at sub stations in all wildlife sensitive areas, subject to regular monitoring.
- All electrical lines should be thoroughly inspected and maintained before and after monsoon.
- All existing electrical lines should be maintained at proper height to keep it above the reach of wild animals, if any of the line is found at fault by Forest department personnel during monitoring, it should be taken care of at the

earliest by MP State Electricity Board. The joint inspection should be carried out in case of wild animal death due to electric fault.

- All the rules and regulations related to ground clearance should be followed.
- Linear stress in the wires between poles should be maintained to check suspending wires that may hang loose over time.
- In case of break down in 11 KV line due to earth fault, the forest department and state electricity department should jointly enquire the matter to safeguard the interest of wildlife.
- Any transmission line passing through agricultural fields and heavy forested areas should be constantly monitored, maintained and repaired, if required.
- The shrubs and the dry vegetation below the transmission lines should be cleaned at regular interval.
- There should be regular patrolling of electrical lines for the purpose of monitoring and to avoid any danger to wild animals.
- There should be coordination between Forest department and Madhya Pradesh State Electricity Board and the information sharing channel should be maintained.

Mining:

No significant Mining activities are present within the buffer zone. Only few scattered mines of sand and murum are present in the area. For such small mines the retrofitting measures include their restoration to previous state after they have been abandoned and their maintenance.

Dams/Hydroelectric projects:

Some irrigation tanks like kohka tank, potiya tank etc are situated in the buffer area and managed by the irrigation/water resources department for providing water for irrigation purposes in nearby villages. An MOU will be put in place with the irrigation/HRD department to keep sufficient water in these reservoirs to be used by wildlife during crunch period especially in summer season. That minimum water level will be maintained in the reservoirs during peak summers for wildlife. No hydro electric project is situated in the buffer zone of Pench Tiger Reserve.

Waste Management Strategy

Management is planning to have a non biodegradable waste collection centre at Turia, which would be run by SHG of EDC/ JFMC. All commercial establishments including FRH's will collect and segregate wastes at designated place in this premises. Then they will bring these segregated materials to the main centre on the monthly

basis. At main centre, compressing, weighing and packaging will be done. Storage facility will also be there. Tie ups with the markets of Seoni, Nagpur and Jabalpur will be explored. At competitive rate, materials will be sold to the buyer and the money received will be deposited in the SHG account. SHG will make payments to the members engaged at centre for various activities. From the rest of money, maintenance of centre, other village development works, etc can be undertaken.

Chapter - 08

ECODEVELOPMENT AND LIVELIHOODS

8.1 Policy and Institutional Framework -

8.1.1 Establishment of Tiger Conservation Foundation -

The section 38X of the amendment to the Wildlife (protection) Act, 1972 specify the establishment of tiger conservation foundation as under.

(1) The State Government shall establish a Tiger Conservation Foundation for tiger reserves within the State in order to facilitate and support their management for conservation of tiger and biodiversity and, to take initiatives in ecodevelopment by involvement of people in such development process.

(2) The Tiger Conservation Foundation shall, inter alia, have the following objectives:

(a) To facilitate ecological, economic, social and cultural development in the tiger reserves;
(b) To promote eco-tourism with the involvement of local stake-holder communities and provide support to safeguard the natural environment in the tiger reserves;
(c) To facilitate the creation of and /or maintenance of, such assets as may be necessary for fulfilling the above said objectives;
(d) To solicit technical, financial, social, legal and other support required for the activities of the Foundation for achieving the above said objectives;
(e) To support research, environmental education and training in the above related fields.

8.1.2 Ecodevelopment Policy Frame Work:

As far as ecodevelopment is concerned, during the initial stages, the Govt. of Madhya Pradesh Resolution (amended in 1995) was the basic guiding document. However, this resolution was basically concerned with JFM in areas outside the National Parks and Sanctuaries. There was no provision for ecodevelopment committee. On 07-02-2000, Govt. of Madhya Pradesh again revised the resolution of 1995 and made provisions for EDCs. The new guidelines issued in this resolution regarding ecodevelopment are summed up as below:

- All forest lands have been classified in 3 zones:

  - Zone-I All National Parks and Wildlife Sanctuaries
  - Zone-II other dense forests (density 0.4 and above)
  - Zone-III Areas which have become open due to biotic pressures (density less than 0.4)

- In all the villages falling either within a NP or WLS or within the 5km radius of 5kms from PA or within identified buffer zone of PA, EDCs will be constituted to get people's support and their participation in managing the forests

- A detailed procedure has been laid down regarding constitution of committees (EDCs)

- The composition of the governing body is also clearly defined

- The forest area outside the boundary of a PA could be allotted for joint management, but no area within the PA would be allotted to EDC

- The micro plan of the EDC would be prepared by the members of the EDC with the help of forest department. The micro plan would incorporate both the forest management as well as village resource development. The members of EDC would contribute (up to 25% of the cost) in all the activities carried out as per the micro plan

- The minimum number of meetings of the governing body and general body meeting have been fixed, apart from the quorum

- The responsibilities and rights of the EDCs have been clearly laid down, as well as that of the forest department

- One of the duties requires the EDCs to prepare an Annual Plan of Operation on the basis of the micro plan and implement it on their own. Only if the committees are found incapable of implementation or they refuse to carry out the works themselves, the forest department can carry out the works departmentally

- There is a provision for an MoU between EDC and FD

If the working of the EDC is not found in conformity with the provisions of the resolution, the EDC could be dissolved.

8.1.3 Dependency on buffer forests by nearby villages

There is a grazing pressure of 33586 livestock units on buffer forests. It is 0.7 livestock unit per hectare. With the involvement of EDCs in forest protection, this will be managed properly. About 4368.26 cubic metre small timbers and 186638 no. of bamboo is being used by villagers in the buffer zone. Out of this quantity, 80% of

small timber and 68% of bamboo demand is covered by buffer forests respectively. About 98% villagers are still using fuel wood for various purposes. Out of this 71% comes from buffer forests. The average fuel wood consumption yearly per family in buffer zone is 16.65 quintals. It includes small timber, bamboo as well as fuel wood legally provided on subsidized rates as nistar from forest department's depot. Encouraging plantation on private fallow land, usage of alternative sources of energy, control on illicit felling, stall feeding, rearing of improved variety of livestock etc. through EDCs and through their active involvement which will result in lowering dependency on forest resources.

8.1.4 Eco development Interventions

The Govt. of India has issued guidelines for the implementation of ecodevelopment around National Parks and Sanctuaries, including Tiger Reserves. This has been launched to ameliorate the hardship faced by the villagers living in and around Protected Areas, due to the curtailment of their access for grazing, collection of fuel, fodder, minor forest produce and the like.

The implementation of Project Tiger has strongly vindicated the basic fact that conservation strategy would lead to the resurrection of flora and fauna. Though styled as a special project to conserve tiger, the terminal consumer in the ecosystem, Project Tiger has a holistic, multilateral thrust, addressed to the totality of wilderness.

In the "core-buffer" strategy, the guiding principle was to keep the core area free of all exploitation and human use, and to insulate it from the external influences by a buffer belt. While implementing this, the core area was freed from all biotic disturbances. This also gave an opportunity to understand the dependence of rural communities on the adjoining forests.

It is noteworthy that rural communities raise rain fed crops on marginal lands, which meet only a part of their livelihood. Hence, these communities have no other option but to depend on forest for their sustenance, viz. raising cattle dependent on forest pastures, gathering MFP and earning wages from forestry works.

With complete protection inside the core area, it is essential to reduce the people's dependence on forests by primarily strengthening the agricultural base, and carrying out the ecodevelopment works simultaneously for the socio-economic upliftment.

Needless to add, due to population explosion and consequent land hunger, the land use has been solely dictated by expediency. Thus unfit lands were brought under plough accompanied by excessive stock grazing, resulting in the shrinkage of wilderness. It must be appreciated here that this has failed to improve the living standard of the rural communities. Since no other viable livelihood alternatives exist for these communities, ecodevelopment in the right perspective would bring about their socio-economic upliftment,

reduce their dependence on the protected area, and at the same time would also pave the way for the much needed public support.

Such ecologically sound rural development of the surrounds is essential to ensure the long-term viability of the core-buffer of tiger reserves. Ecodevelopment of the surrounds will also provide habitat supplements to wildlife and strengthen the protected area network.

8.1.5 Participatory Process:

Detailed guidelines have been issued by the Forest Department for micro planning through PRA, apart from the implementation and monitoring strategy, in accordance with the Govt. of MP resolution No. F-16-4/10/2/91, Bhopal, dated 04/01/95. These instructions/guidelines were followed for micro planning. Likewise, necessary provisions have been made in the micro plans for implementation and monitoring.

The inhabitants of the target villages were the guiding spirits, who gave necessary motivation for the creation of the respective Village Level Committees.

The target villages are in close proximity to the PA, and the inhabitants are familiar with the ongoing conservation efforts under Project Tiger for the last two decades. Though many of the villagers earn their livelihood from the labour oriented park works, there are quite a few interface problems warranting redressal. These inhabitants do not have a violent militant history, but many of them are used to shifting cultivation in the past. On the whole, the village community though heterogeneous, shows considerable homogeneity as far as the park- people interface conflicts are concerned. Adoption of a participative approach through the Village Level Committees for providing reasonable alternatives would ensure the much-needed public support for the protected area.

The Participatory Rural Appraisal was done to assess the park- people interface problems, which included social mapping as well as resource mapping. These meaningful, participatory discussions culminated in the form of a comprehensive site-specific package of eco developmental activities (linked to the protected area), for the next 10 years.

8.1.6 Memorandum of Understanding:

The Village Level Committees (EDC) of target villages of the Buffer Zone Pench Tiger Reserve would have the joint responsibility to ensure that the provisions of this Micro plan are successfully implemented. The cooperation for implementation has to be sought, as and when required, from various State Govt. Agencies, Govt. of India, and Public Representatives.

8.1.7 Institutional Framework:

Presently the Buffer Zone of Pench Tiger Reserve is under the unified control of the Park Management. Now the Field Director is responsible for implementation of eco development work.

Village Level Committees have been formed in all the 107 target villages, in accordance with the Government resolution. These would be autonomous under the respective Gram Panchayats with independent financial and management functions. The composition of the individual Village Level Committees is furnished in the site-specific micro plans.

8.2 Livelihood Support Initiatives through Village Micro-plans -

107 ecodevelopment committees (EDCs) have be formed with local forest guard or forester as ex-officio secretary. Micro plans of 107 villages have been prepared based on PRA and other technique. Entry point works of various activities suggested by the EDC numbers are executed to establish a linkage between the EDC members and the project implementing agency (the forest department). Different ecodevelopment works have been carried out in all 107 villages in the period 1998-99 to 2013-14.

At present, schemes like restoration of bio gas plants, distribution of LPG connections, construction of tanks, hand pumps for drinking water, road repair, tank repair; skill development training, provision of fuel, fodder and small timber on subsidized rate etc. are going on. Various schemes like Forest Village Development, Green India Mission, Ecotourism development with the help of MPEDB, NTFP Sustainable harvesting, state bamboo Mission etc. have been taken up or proposed through EDC for their economic development.

Table No. – 1
Abstract of Ecodevelopment works

S. No.	Ecodevelopment Works	Unit		Expenditure
1	CPT	44147	Running M.	1800051
2	Farm bunding	199636	Cu.M.	16681953
3	Plantation	196621	Number	2135369
4	Pond Repairing/deepening	134	Number	14459241
5	Tank/Pond	104	Number	31233540
6	Repairing of well	108	Number	632200

7	new well	189	Number	9548527
8	Check dams	5384	Number	634848
9	Pasture development	842	ha.	2549981
10	Help for self employment	892	Beneficiary	4343600
11	Road repairing	14054	Running M.	915213
12	Road up-gradation	79798	Running M.	9274210
13	GPW	18520	Running M.	6275381
14	Assistance for seed and fertilizer	669	Beneficiary	132641
15	Educational facilities(school bag,sitting mat, furniture etc.)	0	Number	48142
16	Nutan stove	1259	Number	252904
17	LPG	3200	Number	12500000
18	Pressure cookers	8101	Number	4695670
19	Biogas plant	1409	Number	10274437
20	Stop dam	9	Number	886952
21	Canal system	6296	Running M.	1086266
22	Electric pump set	58	Number	470500
23	Lantern	0	Number	0
24	Culvert construction	1	Number	148412
25	Community hall with shops	1	Number	31706
26	Irrigation water course	1861	Running M.	122299
27	Bicycle for sewing trainees	153	Number	282569
28	Sewing machine	102	Number	258850
29	Nadep Tank	43	Number	115544
30	Tube well	2	Number	100600
31	Low lift pump	2	Number	5040
32	Kalmegh distribution	7	Beneficiary	11200
33	Vermicompost	263	Beneficiary	843013
34	Others	**177587**	Other	**6622052**
	Total	**760223**		**130576699**
Others Eco-development Works				
1	Lac production	201	Beneficiary	71200
2	Pond construction	22	Number	1794962
3	Fire watcher	0	Number	39000
4	Drinking water tank	3	Number	90886
5	Floor Machine	4	Beneficiary	60920
6	Rapta construction	1	Number	56945
7	Village industries training	87	Beneficiary	115336
8	Small industries training	86	Beneficiary	43000
9	Urinal Construction	2	Number	19629
10	School building construction	3	Number	520502
11	Dari Purchase	1	Number	1400
12	Pump house plaster	1	Number	26500
13	Candle making training	30	Beneficiary	15000
14	Diesel pump	14	Number	352286
15	Construction of Meeting Stage	1	Number	12645
16	Agriculture	5	Beneficiary	37720
17	Earthen dam	1	Number	439074
18	Bricks purchase	16000	Number	19008
19	Watchers	300		-
20	Water course construction	4	Number	120580

21	Pond deepening	1	Number	81856
22	RCC Pipe	97	Number	44922
23	Nalla closure	3	Number	81337
24	Plough oxen	177	Number	828700
25	Tiles purchase	160649	Number	768747
26	Office labour	6	Number	32390
27	Torch	84	Number	20176
28	PVC Pipe	15	Number	97000
29	House repair	1	Number	24530
30	Community Building	2	Number	399711
31	Computer training	65	Beneficiary	15480
32	Rope Machine	9	Number	26940
	Total	**177587**		**6622052**

8.3 Integration of Rural Development Programmes -

Development programmes going on in districts are broadly of two types Poverty alleviation programme and economic development programmes. Poverty alleviation programmes are for uplifting economic status of individual or communities living below poverty line. Development programmes are not directly focusing on individuals or communities but are benefiting indirectly by providing employment, developing infrastructure, improving agriculture production etc.

8.3.1 Developmental programmes

Buffer Zone villages in vicinity of Pench Tiger Reserve are having predominant tribal population. Data collected from Kurai, Bichhua and Chourai Janpad Panchayat reveals that 49.20% household in Kurai tehsil, 56.78% household in Bichhua tehsil and 43.25% household in Chourai tehsil are living Below Poverty Line (BPL) as defined by Government of Madhya Pradesh.

Documentation of all poverty alleviation programmes being implemented in Buffer Zone villages is a difficult and time-consuming task. We have selected some poverty alleviation programmes, which are focusing directly on individual. We selected programmes of Zilla Panchayat, Social welfare department and Agriculture department and have tried to assess their status in Buffer Zone villages

8.3.1.1 Programmes of Zilla Panchayat

1. **Swarn Jayanti Gram Swarojgar Vojana (SJGSY),**

The main Objective of this Programme is to provide grant and loans to families living below poverty line. In this Programme grants and loans are given for selected activities to individual and self help groups formed in villages and clusters Financial assistance is given in such a way that after repayment of loan; self-employed should earn minimum of Rs. 2000/ per month-Eligibility of Beneficiaries.

2. National Rural Employment Guarantee Scheme (NREGS)

In this scheme there is provision to give employment to a family for 100 days employment in a year. In this scheme following individual and community based works has been taken.

Individual Beneficiary Oriented works -

Table No. – 2
Individual Beneficiary Oriented works

S.No.	Name of Sub Scheme	Works
1	Kapil Dhara	5. New Well 6. Khet Talab 7. Masonary Check dam/Stop dam RMS 8. Small Tank
2	Nandan Phalodhyan	Plantation of Horticultural species
3	Bhumi Shilp	4. Land Development 5. Contour Bund 6. Field Bund
4	Resham	3. Plantation of Mulberry 4. Silk Production

Community Oriented works -

Table No. – 3
Community Oriented works

S.No.	Name of Sub Scheme	Works
1	Shailparn	1. Contour trenching, Gully plugging, Loose Boulder Check Dam, Construction on barren hills 2. Plantation on barren hills
2	Vanya	Plantation of host plant Arjun & Saj for tasar silk worm

3. Sampuran Gramin Rojgar Yojna (SGRY) –

This scheme is to provide additional employment, food security and to improve the quality of nutrition. In this scheme soil and moisture conservation, small irrigation, renovation of drinking water source, augmentation of water table, improve the tradition sources of water, removal of silt form rural tank, pokhar, rural approach road, trench construction and forestry works will be taken on priority basis. In addition to, other works like road leading to school, Hospital, community center, Panchayat building and local market places will be developed.

4. Indira Awas Yojana

The objective of this programme is to provide financial assistance for construction of houses to homeless families living below poverty line in rural area.

5. Food for work Yojna –

This scheme is implemented to provide - additional wages and employment, food security, development of permanent community, social & economical infrastructure in rural areas.

8.3.1.2 Programmes of Social Welfare Department:

Social welfare department of Madhya Pradesh government is implementing programmes like leprosy clinic in rural and urban areas, hostels for tribal girls and boys, Gaon Ki Beti Yojna, Vivekanand Group Insurance Scheme and other programmes providing direct benefits to people. Integrated Social Security Pension programmes is well known programme of this department Parent implementation agency of this programme is social welfare department but due to implementation of 73rd amendment of constitution Government of Madhya Pradesh had given power to Panchayats for selection of beneficiaries.

1. Integrated Social Security Pension

Integrated Social Security Pension programme is sponsored by state and central government. This programme provides to give Rs. 150/ per month as pension to senior citizens persons or old age persons and widows who do not have other source of income.

8.3.1.3 Programmes of Agriculture Department

Agriculture Department of Madhya Pradesh has around 30 programmes like integrated grain development programme, Tilhan Dalhan avam Makka ki Akikrit Yojna, Ganna development scheme, to improve agriculture production in the state. There are 7 core programme and others are extension programmes.

15. Improved Seeds Programmes

In this programme the department provides improved seeds to all farmers on subsidy rates.

16. 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.

17. Annapurna Programme

Beneficiaries' eligibility criteria are same as for Surajdhara programme, but in this programme department provide only seeds of cereals.

18. 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 gm of bio-fertilizers for all farmers.

19. Modern Agriculture Implementation

To encourage use of Modern Agriculture Implement Government provides 50% subsidy directly to the farmers on purchase.

20. 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.

21. National Biogas Project –

To encourage and install the other sources of energy and high quality fertilizer this programme is going on for SC/ST, small marginal farmers, landless, labors and for general class farmers who are eligible. Beneficiaries are selected by Agriculture Development. There is a subsidy of Rs. 3500/- for SC, ST, Small, Marginal, Landless, laborers & Rs. 2700/- for other farmers.

8.4 Monitoring and Evaluation –

The field execution of the activities/interventions proposed in the Micro plan would be continuously monitored by the Deputy Director, Pench Tiger Reserve. In accordance with the Resolution - 1995 of the Government of Madhya Pradesh, the Deputy Director, will review the progress after every three months, and the indicators for the review are as follows:

Table No. – 4

Area	Primary Management Objectives	Compartment & Sub-Compartment	Administrative Structure	Activities	Indicators
Target Villages (Buffer Zone Division)	Conservation of Biodiversity	Ecodevelopment	• EDC Members • Forester • Forest Guard	**1. Agricultural Development**	1. Increase in agricultural produce 2. Increase in agricultural income 3. Increased sale in the market 4. Use of improved seed & fertiliser

Ear-marked, areas of Target Villages				**2. Off-farm Income Generation:** a) Pisci culture b) Poultry development c) Apiculture d) Mushroom culture e) Bamboo craft f) Motor vehicle g) General store/shop h) Supply of tailoring machine i) Eco-tourism	1. Increased per capita income 2. Availability of the product in the local market 3. Change in dietary habits 4. Availability of the facility 5. Reduced availability/ emigration of labourers/ wage earners
				3. Skill Development Training	1. Availability of trained guides 2. Availability of skilled beneficiaries
				4. Forest Protection through EDC/FPC/VFC: a) Control on man-made fires b) Illicit felling c) Illicit grazing d) Fallen wood theft e) Trespassing f) Illicit collection of MFP from PA g) Fishing from PA h) Encroachment i) Stone quarrying j) Poaching k) Poisoning of water points l) Poisoning of cattle kills m) Lopping and girdling of trees	1. Reduction in the number of offences 2. Reduction in fire incidences 3. Reduction in disease transmission from cattle to wildlife and vice - versa 4. Increase in plant richness/ diversity per unit area of the forest 5. Reduced cattle related field evidences in the PA and close areas 6. Improved health status of wild animals. 7. Reduction in wild animal mortality due to human causes
				5. Resource Substitution: a) Bio-gas plants b) Fuel efficient chullahs/ stoves c) Fuel wood production d) Firewood supply e) Livestock improvement f) Fodder development	1. Decrease in fuel wood consumption 2. No. of devices/ plants installed 3. Fuel wood availability 4. Increased milk production and per capita income 5. Stall feeding 6. Reduced cattle evidences in the forests 7. Reduction in cattle number
				6. Community Cooperation: a) Crop protection b) Infrastructure development c) Drinking water d) Soil and water conservation	1. Extent of area fenced 2. Reduced crop damage and interface conflicts 3. Availability of infrastructure for the community 4. Amount utilised for infrastructure 5. No. of functional points for drinking water supply 6. Improvement in ground water table 7. No. of check dams constructed 8. Increase in agricultural production

8.5 Monitoring Agencies:

- **Forest Department:** Quarterly review by the Deputy Director, Pench Tiger Reserve; Monthly review by the Assistant Directors, Fort-nightly review by the respective Range Officers.

- Ecodevelopment Committees (EDC) of respective villages, monthly participatory review by the Executive Committee.

Chapter - 09

IMPLEMENTATION STRATEGY

9.1 State Level Monitoring Committee -

Implementation Strategy:

The buffer zone of a tiger reserve will not have the status of a national park or Sanctuary. However, as a "multiple use area", it may encompass conservation or community reserves, apart from revenue lands, private holdings, villages, towns and other production sectors.

The buffer zone is notified as required under the Wild Life (Protection) Amendment Act, 2006, and is being placed under the unified control of the Field Director of the tiger reserve.

Subject to the provisions of the Wild Life (Protection) Act, 2006, the existing land uses in the buffer zone can continue with due mainstreaming of wildlife concerns as indicated above. Also local needs of villagers will be safeguarded. Forestry operations will be carried out as per provisions of approved TCP. The focus will shift from production forestry to local and wildlife concerns. The objective will be to meet the local needs of nistar, NTFP for their livelihood betterment. Aim is to facilitate ecotourism in the area with active involvement of local villagers to generate employment wages to compensate loss of wages due to production forestry.

The role of Deputy Director (Buffer Zone) of a tiger reserve would be to carry out implementation of prescriptions of TCP (Forestry/Joint Forest Management /Ecodevelopment) in forest areas, while ensuring coordination with other sectors. Wildlife protection would be an overlapping mandate for the entire area.

To facilitate coordination and mainstreaming of wildlife concerns at the field as well as state level, the following Committees are suggested:

(a) **State level Monitoring Committee**

(i)	Chief Secretary of the State	Chairman
(ii)	Secretaries of related departments	Members
(iii)	Chief Wildlife Warden (assisted by the Field Director of tiger reserve)	Member Secretary

(b) **District level Coordination Committee for ensuring convergence of other sectors**

(i)	District Collector	Chairman
(ii)	CEO	Members
(iii)	Representative officials from: PWD, Social Welfare, Tribal Department, Health Department, Agriculture Department, Education Department, Power and\ Irrigation Departments	Members
(iv)	Representatives of various Government/ private production sectors	Members
(v)	Deputy Director of the Tiger Reserve/PA	Members Secretary

The TCP provisions for forest areas in the buffer zone would be implemented after duly mainstreaming wildlife concerns.

The existing rights/concessions of local people would be regulated as per the legal provisions in place.

As provided in Section 38-V of the Wild Life (Protection) Act, 1972 (as amended in 2006), the provisions of sub-section (2) of section 18, sub-sections (2), (3) and (4) of section 27, sections 30, 32 and clauses (b) and (c) of section 33 shall apply to the buffer zone of a tiger reserve, to accord protection to wildlife in the area.

Eco development as well as Joint Forest Management activities in the area would be implemented using a participative strategy as codified by the State, through village forest committees and ecodevelopment committees.

Buffer zone management should address threats to wildlife conservation emanating from regional developmental activities such as forest concessions, industrial pollution, highway development, extensive high value farming or ecologically unsustainable and intensive land uses like mining through appropriate mainstreaming in such sectors.

Integrated development (eco development and developmental activities from Collector Sector) should be innovatively used for addressing conflicts arising on account of pressures on forest resources from local people. There will be a provision of solar fencing in the agricultural fields if at all necessary.

For areas with ongoing conflicts on account of law and order, integrated development should be complemented by deploying native workforce and homeguards/ex-army personnel to contain the situation, as the site specific situation warrants.

9.2 Tiger Conservation Foundation and district level coordination committee:

The Wild Life (Protection) Amendment Act, 2006 (Section 38X provides for establishment of Tiger Conservation Foundation in each tiger reserve, to facilitate and support management, apart from taking initiatives for involving people in conservation. The Foundation is a new institutional framework which can complement the tiger reserve management and liaison with various ecodevelopment committees and their confederations apart from production sectors in the landscape. The Foundation should be registered under the relevant rules of the State as a Trust, and as prescribed in the guidelines, will have a State level Governing Body, apart from a field level executive committee under the Chairmanship of the Field Director with representatives of the ecodevelopment committees as nominated by the Governing Body. The Foundation would act as a “non profit center” and as a “development agency” by increasing local participation. It can secure the tiger reserve from financial constraints by providing funding support through various sources: recycling of gate receipts, service charges, donations and benefits as a CSR from private sector. The Foundation, may undertake various activities related to mainstreaming of conservation: ecodevelopment, staff welfare, visitor regulation, field research, facilitating ecodevelopment committees for market excess, conducting capacity building programs, ecotourism and Joint Forest Management. Till the tiger conservation foundation is formed, the ecodevelopment confederation will execute all activities like FDA.

9.3 Formation of Ecodevelopment Committees (EDCs), Confederation of EDCs and Other Supporting Institutions like Self Help Groups (SHGs).

9.3.1 List of Eco-development Committees -

Table No. - 1
Villages situated in the Zone of Influence (ZI)

S. No.	Eco-Unit	0 to 1 Km.	1 to 2 Km.	2 to 5 Km.	Above 5 Km.
1.	**Ghatkohka** (21)	Tikari Mal	Barelipar	Simariya	--
		Tikari Raiyat	Salhe	Ghatkohka	--
		Karmajhiri	Sarrahirri	Panjra	--
		Bhodki	Tewni	Sindariya	--
		Katangi	Dhutera	Mohgaon Titri	--
		Murer	Patrai	Niwari	--
		Aagri	Aalesur	Paraspani	--
	Total	**07**	**07**	**07**	**--**
2.	**Khawasa** (24)	Raiyarao	Pindkapar	Ambajhiri	Kothar
		Potiya	Kodajhir	Telia	--
		Ambadi	Setewani	Nayagaon	--
		Khamreeth	Mohgaon Yadav	Mudiyareeth	--
		Khamba	Durgapur	Pachdhar	--
		Vijaypani	Awarghani	Kohka	--
		Jeerewada	--	Arjuni	--
		Satosha	--	--	--
		Kuppitola	--	--	--
		Turia	--		
	Total	**10**	**06**	**07**	**01**
3.	**Rukhad** (07)	Gandatola	--	Sawangi	Sakhadehi
		--	--	--	Darasikhurd
		--	--	--	Darasikala
		--	--	--	Bawanthadi
		--	--	--	Nayegaon
	Total	**01**	**--**	**01**	**05**
4.	**Ari** (08)	--	--	--	Khapa
		--	--	--	Aatarwani
		--	--	--	Magarkatha
		--	--	--	Pandayer
		--	--	--	Durhapur
		--	--	--	Mohgaon (FV)
		--	--	--	Sakata
		--	--	--	Mirchiwadi
	Total	**--**	**--**	**--**	**08**
5.	**Kumbhapani** (24)	Jamtara	Thota Mal	Banskheda	Konapindrai
		Thota Raiyat	Pathri	Kumbhapani	Sajpani
		Naharjhir	Singardeep	Dawajhir	Halal Kala
		Gumtara	--	Kanhasagar	Halal Khurd
		Pathra khurd	--	Bandhan Mal	Madaria
		--	--	Bandhan Raiyat	Khairanj
		--	--	Khamariya	--
		--	--	Chargaon	--
		--	--	Kokiwada	--
		--	--	Dhoulpur	--
	Total	**05**	**03**	**10**	**06**

6.	**Khamarpani** (23)	Pulpuldoh	Sawari	Saliwada	--
		Dudhgaon	Chirrewani	Antara	--
		Mohgaon Khurd	Bordi	Dongargaon	--
		Thuepani	Sirrepani	Kadhiya	--
		Pathra Kala	--	Dainy	--
		Kokiwada	--	Marjatpur	--
		--	--	Khamarpani	--
		--	--	Kanhargaon	--
		--	--	Deori	--
		--	--	Bisanpur	--
		--	--	Kundai	--
		--	--	Silota Kala	--
		--	--	Silota Khurd	--
	Total	**06**	**04**	**13**	**--**
	Total (107)	**29**	**20**	**38**	**20**

9.4 Livelihood Support Initiatives through Village Micro Plans -

There are 107 villages in the zone of influence. 99 ecodevelopment committees (EDCs) have been formed with local forest guard or forester as ex-officio secretary. Rest of the villages in the zone of influence has JFMC's. After transfer of buffer in the control of Field Director, the JFMC's has been converted into EDC's. Micro plans of 107 villages have been prepared based on PRA and other technique. Entry point works of various activities suggested by the EDC numbers are executed to establish a linkage between the EDC members and the project implementing agency (the forest department.

9.5 Integration of Rural Development Programmes -

Development programmes going on in districts are broadly of two types Poverty alleviation programme and economic development programmes. Poverty alleviation programmes are for uplifting economic status of individual or communities living below poverty line. Development programmes are not directly focusing on individuals or communities but are benefiting indirectly by providing employment, developing infrastructure, improving agriculture production etc. Programmes of forest department, rural department and other sectors will be incorporated in the micro plan and integrated for the socio economic development of buffer zone villages.

Forestry Sector Programmes

1. **Forest Development Agency (FDA):** FDA has been constituted in the buffer zone comprising of JFMC to implement MOEF&CC schemes of forestry and village resource development.

2. **Green India Mission (GIM):** Forestry and Livelihood generation works will be implemented through JFMC/ EDC. This scheme has been proposed in Pench-Kanha and Pench-Satpuda corridor.

3. **State Bamboo Mission:** State Bamboo Mission through JFMC/ EDC provides alternative employment options to local community by bamboo plantations, regeneration of degraded bamboo forests, bamboo extraction and value addition activities, bamboo based handicrafts etc.

4. **Forest Village Development:** This program is implemented through EDC.

5. **Eco tourism development:** Ecotourism development work is done in the area with collaboration of MPEDB and PTR through EDC and SHGs to generate alternative sources of income.

6. **NTFP:** The work is done with the collaboration of MP MFPFED and Forest department through EDC and SHG to provide livelihood opportunities to families residing in buffer zone.

7. **Local Area Committee (LAC):** LAC has been constituted and notified to regulate, promote and monitor local community and wildlife concerns in and around PA.

9.6 Monitoring and Evaluation -

The filed execution of the activities / interventions proposed in the Micro plan would be continuously monitored by the Deputy Director, Pench Tiger Reserve. District Level Coordination Committee will review the progress after every three months.

State level monitoring committee headed by Chief Secretary of the State will monitor the mainstreaming of wildlife concerns once in a year.

Chapter - 10

MAINSTREAMING STRATEGY WITH VARIOUS PRODUCTION SECTORS

Mainstreaming wildlife concerns in various production landscapes -

A number of production sectors operate in the buffer area of a tiger reserve, which directly or incidentally affect tiger conservation. Therefore, the basic managerial strategy for the buffer area should focus on mainstreaming wildlife concerns amongst such sectors. Some of the common production sectors in the buffer areas are:

(a) Forestry
(b) Agriculture
(c) Integrated Development
(d) Tourism
(e) Fisheries
(f) Road / Rail transport
(g) Irrigation projects
(h) Temple tourism

What is 'Mainstreaming'?

Mainstreaming of wildlife concerns should be understood as a process to integrate wildlife conservation in the various production sectors of the buffer zone where the primary emphasis is not conservation. This would safeguard wildlife interests by ensuring habitat supplements in outer areas beyond the core for tiger spatial land tenure dynamics. Further, it would also strengthen conservation by reducing the possible interface conflicts between various production sectors and conservation, which otherwise leads to wild animals earning a pest value and eventually getting eliminated from the area. Thus, mainstreaming of wildlife concerns in the outer buffer landscape is essential to prevent such area from turning into *'ecological sinks'*.

Process of mainstreaming

Mainstreaming tiger (wildlife) conservation concerns in the various production sectors is imperative for the buffer zone to be viable and fulfill its objectives. This would involve modification of developmental activities /practices in the key production sectors to make more 'conservation friendly'. The process is sector as well as landscape specific.
The following points should be ensured for mainstreaming tiger (Wildlife) conservation concerns in the various production sectors –

10.1 Forestry sector -

- monitoring wildlife/tiger presence in standardized formats on a daily basis
- foot patrolling by staff to ensure protection
- exchange of tiger/wildlife presence data with nearby protected area or tiger reserve
- monitoring of carnivore kills
- monitoring of water points
- timely payment of compensation for cattle depredation by wild carnivores
- To meet the demand of small timber, bamboo, pasture and fuel wood of local people.
- regulating cattle grazing in areas prone to wild ungulates
- payment of compensation for crop damage by wild animals
- fire protection through Village Forest Committees
- review of wildlife status in the meetings of Forest Development Agency
- regulating collection of Non Timber Forest Produce
- monitoring village cattle for disease
- maintenance of village level wildlife crime dossier
- protection of riparian margins
- retention of old/dead trees
- staggering of stands belonging to different age groups
- maintaining natural blanks and grasslands
- retention of endemic species
- Incentives to local communities from the fund accruing through recycling of gate receipts, as a reciprocal commitment for their involvement in addressing wildlife concerns, forming part of a MOU with the Tiger Conservation Foundation in the village level micro plan.
- Other forestry operations after mainstreaming wildlife concerns will be carried out as per approved working plan in operation for the management of buffer forests.
- Individual and community right on the forest area will be safeguarded under the provision of Forest Dwellers Rights Acts, etc.

10.2 Agriculture sector -

- Adoption of 'éco-agriculture' as a land use to produce food as well as to conserve wildlife by change in cropping pattern.
- maintaining non -domestic habitat
- discouraging sudden change in cropping patterns , lure crops , to avoid changes in cover values for wild animals , which may foster man-wild animal conflicts
- Maintaining a mosaic, viz. fallow land, cultivation field, fruit orchard, plantation, under planting of spices, small timber etc. to mimic natural forest
- promoting soil and moisture conservation
- providing economic incentives for safeguarding wildlife concerns
- providing incentive for carbon , water and other environmental services to local people
- compensating losses like crop depredation, cattle depredation, loss of human life etc due to wildlife
- Farm protection by fencing should be done.
- recognizing the value of traditional farming in conservation
- fostering use of green manure rather than pesticides
- facilitating trade through the Tiger Conservation Foundation
- recognizing property rights of farmers for genetic resources
- Fostering rural tourism like home stays, village ways etc.
- use of market instruments through the Tiger Conservation Foundation (production certificate for organic products)

10.3 Integrated Development sector -

10.3.1 Ecodevelopment -

- This is a multiple use area, to be managed in a participatory mode. No village will be relocated from the buffer zone.
- participatory village level planning and preparation of village level micro plans for eco development
- providing inputs for resource substitution, income generation, community welfare, ecotourism for reducing the resource dependency of local people on surrounding forests
- ensuring reciprocal commitments with the local people through respective ecodevelopment committees , forming part of a MOU in the micro plan for safeguarding wildlife interests

10.3.2 Development through Collector sector

This involves a multiplicity of sectors operating in the landscape pursuing development, where wildlife concerns have to be integrated through formal contracts between the Tiger Conservation Foundation, district authorities and eco development committees. The responsibilities of various parties should be spelt out in the contract for safeguarding wildlife concerns along with reciprocal commitments. Normally, such contracts should discourage any detrimental practice and assign responsibility to the community for carrying out some interventions. In return, the community should receive an assurance from the tiger reserve authorities for access to certain natural resources in the area or benefits.

10.4 Tourism sector -

- facilitating wildlife ecotourism involving local host communities
- facilitating wildlife tourism on private lands in the vicinity as per the normative guidelines
- obtaining contributions from private commercial tour operators and lodge owners for local community development
- obtaining contributions from tour operators for maintaining tourist facilities , staff welfare
- recycling of tourist gate receipts for community welfare through the Tiger Conservation Foundation
- Facilitating eco tourism activities like cycling, tenting, and nature walks etc.

10.5 Fisheries sector -

- granting permits to ecodevelopment committees(EDCs)
- regulation through the Tiger Conservation Foundation and EDC
- MOU with EDCs for safeguarding nesting sites , breeding areas
- reciprocal commitments for patrolling , fire protection
- facilitating marketing through the Tiger Conservation Foundation

10.6 Road sector –

- safeguarding floral / faunal values in the route
- speed level regulation
- regulation of traffic flow
- maintenance of noise level as per noise abatement criteria
- adoption of cut and fill technology in construction
- establishment of local vegetation on filled up area and road side land
- adoption of erosion control measures
- protection and up gradation of drainage system
- dumping of escalated material on ecological principles

- safeguards to prevent road / train hits of wild animals by taking mitigative measures like construction of bridges, tunnels, flyovers, speed breakers, fences etc.
- safeguards to prevent fires
- compensation for habitat fragmentation and barrier effect

10.7 Irrigation project sector –

- safeguards for preventing landslides on the periphery of reservoir
- safeguards for potential seismic impact on account of reservoir loading
- monitoring recharge of ground water
- identification of areas prone to siltation and erosion
- retention of trees in the impounded area to facilitate roosting of birds
- fostering ecotourism by introducing eco-friendly activities like canoeing, boating, bird watching etc. through the Tiger Conservation Foundation in the impounded area
- assisting the management in patrolling the water body
- providing an attractive relocation / rehabilitation package for relocation (if any) with provisions for handholding beyond the process

10.8 Temple tourism sector –

- preparation of a master plan and adherence to its normative standards for crowd regulation and visitor facilitation
- ensuring proper garbage disposal
- providing accommodation facilities for pilgrims in nearby satellite township
- the architectural code of civil works as contained in the master plan should blend with the environment
- avoiding / safeguarding passages / corridors used by wild animals
- avoiding contamination / pollution of local streams and water bodies
- providing local shopping facilities to tourists through the Tiger Conservation Foundation, involving the Ecodevelopment Committees

Chapter - 11

RESEARCH, MONITORING, TRAINING AND WILDLIFE HEALTH

Research is one of the major issues in the Plan Outline of the Project Tiger document, 1972. The document 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. The Tiger Reserve should have a clear wildlife research policy based on the following priorities.

11.1 Research Priorities, main project and implementation -

Wildlife management is a mix of field craft and science based on field research. Research in the Tiger Reserve should focus on the critical information needs, which are by and large common to most of our Protected Areas. Professional researchers working in isolation on topics or species relating to their field of interest can contribute very little for fostering wildlife management. The research should be "problem solving studies", based on a consultative process involving PA management, indigenous people and overall ground reality prevailing in our tropical setting. Some "pressure points" for PA management are common to most of our PAs, and in addition to the ongoing small term projects, wildlife research in Pench Tiger Reserve should preferably focus on these:

Table No. - 1

PA Managerial Priorities	Research Areas
A) **Values Relating to PA :** 1. Ecological/ Regional landscape	- Regional changes in species richness & diversity - Changes in species occurrence - Effect on water table - Habitat fragmentation - Endangered species: prey base, age/ sex ratio, biomass computation, life table computation
2. Habitat degradation	- Types of exotic infestation - Control methods
1. Livestock depredation by carnivores & crop damage by wild ungulates	- Reasons for livestock depredation - Percentage of livestock in the food-spectrum of carnivores - Reasons for crop damage
4. Habitat management practices	- Biodiversity conservation vis-a-vis management practices in-vogue
5. Poaching	- Magnitude - Modus operandi (variations) - Wildlife crime intelligence and networking - Wildlife crime prevention

6. Fire	- Nature and efficacy of existing preventive and control measures - Changes in the habitat due to fire - Changes in animal use pattern due to fire
7. Insects as agents of ecological change	- Impact (magnitude) - Ecological changes - Periodicity
8. In-situ conservation	- Founder population size - Translocation
9. Eco-tourism	- Involvement of host-communities - Mechanism - Impact assessment
10. Jurisprudence	- Morphological studies - Biochemical studies - DNA fingerprinting
11. Wildlife disease	- Landscape epidemiology studies - Linkages between sylvatic & pastoral cycles
12. Animal monitoring and estimation techniques	- Customisation of softwares suited to Pench setting - Estimation procedures, indices for various species - Home range studies
B) Biotic Pressure on PAs:	
Vision beyond the PA	- Sustainable harvest of medicinal plants - Adverse impact on forest habitat due to villagers
Interface problems	- Change of crop composition in forest due to forestry practices - Change of growing stock due to forestry practices. - Development of protocol for health care - Effect of existing land use - Mechanism/ strategy to mitigate ill effects - Magnitude of crop damage outside PAs - Methods for mitigation - Decadal population growth in impact zones outside PAs (human/ cattle) - Resource use pattern of indigenous people - Impact of PAs on indigenous people - Legal status of the impact zone & related problems - Community role in conservation - Levels of sustainable use - Grazing impact - Regeneration status in right burdened forests - Impact of rights and concessions on habitat quality - Socio-economics of indigenous community - Resource requirements of indigenous people & dependencies - Traditional knowledge & occupation of indigenous communities - Impact assessment of Eco-development woks

Apart from the above biological/ ecological researches, the Pench management should also encourage the collection of relevant information on the effects of the Tiger Reserve on local economy and communities of the surrounding villages. Such social

researches should also be developed into reports, status papers, micro plans, and other documents resulting in the formation of effective policies for up liftment / eco-development of local communities. Although these social projects may sound purely academic or official, and may not have any immediate obvious management significance, they would prove to be of a great value later, as the present scenario of the park - people interface in our country is bound to go a very long way.

11.1.1 Future strategy: -

1. Development of Infrastructure

A. Research Labs -

One main Research Lab at Seoni and two Field Labs at Karmajhiri and Jamtara have been constructed. Few instruments for research have been provided. The additional instruments required for different field research may be procured. There is an urgent need to carrying out systematic and basic research related to habitat, herbivore and carnivore status population density habitat use pattern etc. and impact of various works being carried out in an around the Protected Area. There is an urgent need of full time research officer, researcher and assistants.

B. Meteorological Stations –

Metrological Station at Alikatta, Dhutera and Kokiwara has been established. There is an urgent need to take proper information and collate the data systematically.

Similarly, Chemical Immobilization equipment and drugs would also be required to capture the diseased or other wild animals in stress requiring help and treatment. This procurement has recently been done.

C. Constitution of Animal Rescue team:-

An Animal Rescue Team has been constituted by Shri. Sumukh Joshi, Assistant Conservator of Forest, Seoni. Team will carry out the rescue and rehabilitation of wild animals. The details of team as following –

Table No. – 2
Members of Rescue Squad

S. No	Name	Designation	Position
1.	Shri. Sumukh Joshi	ACF	Team Leader
2.	Dr. Akhilesh Mishra	Veterinary Doctor	Member
3.	Shri. Arun Singh	Range Officer	Member
4.	Shri. D.K Shukla	Deputy Ranger	Member
5.	Shri. Indramani Tiwari	Deputy Ranger	Member
6.	Shri. Santosh Patel	Forester	Member

7.	Shri. Rambharose Pathak	Forester	Member
8.	Shri. Manoj Kumar Vaishya	Forest Guard	Member
9.	Shri. Iqbal Khan	Forest Guard	Member
10.	Shri. Guruprasad Rajak	JFMC Member	Member
11.	Shri. Kailash Janghela	JFMC Member	Member

The team members will be trained in, tranquilizing, trapping the distressed animal and providing it first aid; and in application of various useful instruments.

2. Constitution of Research Advisory Committee

A **Research Advisory Committee** may be constituted with the following members–

1	The Chief Wildlife Warden, M.P.	Chairman
2	C.C.F. Seoni Circle	Member
3	Field Director, Kanha Tiger Reserve	Member
4	A representative from WII	Member
5	State Wildlife Health Coordinator from Veterinary College, Jabalpur.	Member
6	Field Director, Pench Tiger Reserve	Member Secretary
7	Any other Scientist / Forest officials nominated by The Chief Wildlife Warden of M.P.	Member/Special invitee

The Committee would have the following main activities: -

(a) To finalize the selection/identification of relevant research based studies.

(b) To review the progress of research activities carried out for the PTR

(c) Provide suggestion/recommendations for improvement and smooth functioning of the research activities.

The meeting should be arranged as per the requirement, but at least once in six months. The members would be eligible to get TA/DA and other facilities, decided by the Government from time to time.

11.1.2 Research Projects

The following research works have been conducted by concerning agency under India Eco-development project –

Table No. – 3

S. No.	Consultancy services	Contracted Individual/ organizations
1	Baseline mapping of PA and surrounding areas	-
2	Environmental Assessment of Regional Plan	-
3	PA Level Visitor Management and Participatory Eco-tourism Study	-
4	Process Documentation Research	The Indian Institute Of Forest Management, Bhopal
5	Documentation of traditional knowledge	State Forest Research Institute, Jabalpur
6	Study on wetland and riparian areas in PTR with diversity and status of fish and waterfowl and mammals	Zoological Survey of India, Jabalpur
7	Faunal Survey, on insects, fishes, reptiles and Amphibians; Conservation Status and distribution of Rare and Endangered Animals.	Zoological Survey of India, Jabalpur
8	Floristic Survey, Vegetation Description, Conservation Status And Distribution of Rare and Endangered Plants/Plants Communities contributed for Herbarium	Division of Biodiversity & Ecology, SFRI, Jabalpur
9	Mapping of the Protected Area (PA) & Surrounding Areas in Pench Tiger Reserve M.P.	WII Dehradun
10	Study on Wildlife health Disease Surveillance and monitoring	Veterinary College, Jabalpur
11	Development and establishment of long term ecological programme in PTR with reference to physical, biological and sociological aspects and linking it up with spatial data base	IIFM, Bhopal

Apart from above short-term research work, following research works have been conducted by individuals or organization.

1. Ecology of Gaur (*Bos gaurus*) in Pench Tiger Reserve M.P. – WII
2. Ecology of Wild Dog in Pench Tiger Reserve M.P. – WII
3. Ecology of Tiger in Pench Tiger Reserve M.P. is an ongoing project of WII.
4. Ecological Studies and conservation of Tiger in India - Dr. Ullahas Karant – Wildlife Biologist, Maysur, Karnataka

5. Prey selection in Tigers & Habitat occupancy across anthropogenic disturbance in sympatric regulate species - WII
6. PA Management and Human dimensions - Ashish Dwivedi, Indian Industrial Institute, Pawai, Mumbai
7. Ecology diversity and conservation oriented study on parasites of wild animal - Shri Milind Bavte, HOD Micro biology Department, Garwale college Pune
8. Research on Birds – WII
9. Study on understanding the ecological impact of the Pench Tiger Reserve, Seoni – PSI, Dehradun
10. Biodiversity Characterization at Landscape Level using Satellite Remote Sensing of GIS in M.P.
11. Energy and mass exchange in vegetation systems (TFRI, Jabalpur)
12. Conservation of status and ecology of ungulates in PTR, MP (AMU, Aligarh).
13. Ecology of Tiger in PTR: Phase-II (WII)
14. DNA based monitoring of presence of Tiger and their movement in the Pench-Kanha corridor(TFRI)
15. Documentation of diversity of scorpions, spiders, dragon flies- Zeeshan A. Mirza, Banglore
16. Documentation of Amphibians and Reptiles in PTR- Shri. Mukesh
17. Assessment of ecological status and necessity forprescribed burning in the grassland and forest communities in PTR, M.P.
18. Impact of eco development in buffer villages- Biljana Macura.
19. Phenological study on forests of PTR by automatic weather station and seasonal changes in vegetation, ISRO.

Apart from ongoing researches, Tiger Foundation Society can fund other research projects.

11.2 Monitoring Framework

The Park Management should continue to ensure that the monitoring of biological resources form a basic routine activity in protected area management, and it is the principal way in which the management can identify trends or changes, and so gauge the effectiveness of its managerial inputs. Though it may sound an unplanned and subjective procedure, it is easy to collect useful biological information in a simple, systematic and scientific manner. The management should strive to include a number of useful monitoring activities in the routine duties of the staff, as well as regular

annual estimation of wildlife, counts and other activities. All such data should be incorporated in the MIS in a routine manner.

The Tiger Reserve should continue the present system of ecological monitoring of flora and fauna. As stated above, the Reserve has a very good network of forest camps covering all vegetation cover types and habitats of wildlife. All these forest camps have been provided with camp registers containing printed proforma of information/ data collection relating to the broad phenology of the vegetation type, species-wise animal sighting with their age-class and sex-class structures, females with fawns, lactating females, and others etc. The proforma for recording indirect evidence of tiger and panther has also been included. As far as the management is concerned, a useful inventory could be as simple as information on the distribution of important species, whose numbers reflects important ecological processes. Even crude indications of the numbers of these animal species would add to the value of inventory. A coloured photographic guide for identification of animals has been prepared and distributed among all the field staff. A photographic album of ground flora covering many species of grasses, herbs and forbs should be prepared and should be distributed to all field staff involved in the day to day monitoring to facilitate easy identification of species from the management point of view. The data generated from such continuous monitoring should later be inferred/ analysed into very interesting trends, and bases for species-specific and habitat specific planning in the Tiger Reserve. The proforma of the above camp register is given below. Each Forest Guard in-charge of the respective camp must fill in the requisite information derived from the daylong patrolling of his beat. This would lead to the generation of a lot of data on the basic parameters required for managing a wildlife protected area.

The data can be complied for large carnivore on the basis of camp registers and monthly presence map for tiger and panther may be prepared.

Table No. – 4

Format of Patrolling Camp Register for Routine Ecological Monitoring

Particulars of Patrolling			Phenology			
Date	Place & Compartment No.	Time	Flowering trees/ Plants	Fruiting Trees/ Plants	Leaf Fall	New Leaves
1	2	3	4	5	6	7

Herd Structure of Ungulates														
Total No. of Herds (Chital/ Sambar/ Nilgai/ Gaur)	All Male Herd				Female-Fawn Herd				Mixed Herd					
	Adult	Sub-Adult	Fawn	Total	Adult	Sub-Adult	Fawn	Total	Male Adult	Male Sub Adult	Female Adult	Female Sub Adult	Fawn	Total
8	9	10	11	12	13	14	15	16	17	18	19	20	21	22

Various Stages of Antler Development					Birth Frequency of Ungulates (15 days Intervals)		Stages of Gestation	
Males with Fallen Antlers	Males with Developing Antlers	Males with Branched velvet Antlers	Males with Developed Hard Antlers	Total	Date	Total New Borns	No. of Pregnant Female	No. of Lactating Females
23	24	25	26	27	28	29	30	31

Data/ Evidence Relating to the Tiger										
Male/ Female Pugmark (No./ Unit Distance Walked)	Urination (No./ Unit Distance Walked)	Scraping (No./ Unit Distance Walked)	Call (No./ Unit Distance Walked)	Scratches (No./ Unit Distance Walked)	Scat (No./ Unit Distance Walked)	Cattle Kill	Other Kill	Stride Measurement	Straddle Measurement	Signature Inspecting Officer
32	33	34	35	36	37	38	39	40	41	42

A few monitoring studies are being conducted in Pench Tiger Reserve to assess the impact of habitat improvement interventions with the help of some simple formats being filled by lower field staff. These formats are presented in the **Annexure No. – 16.**

11.3 Training Needs Assessments

Though the management of the Pench ecosystem itself is a learning process for the majority of the frontline staff, the Park Management should ensure that the newly inducted staffs undergoes wildlife training conducted by various Institutes in the State and outside. Officers should be encouraged to undergo Diploma as well as Certificate and Capsule courses conducted by the Wildlife Institute of India, Dehradun for officers down to the Forest Ranger. The information about the training and institute providing training is as following –

Table No. – 5

S. No	Course Name	Course Type	Course Duration	Participant Level	Resource person/ org.	Frequency
1	Improved Wildlife Management	Diploma Course	Nine Months	A.C.F./ DCF	WII, Dehradun	Once
2	Eco-development	Module	Three Months	A.C.F./ DCF	WII	Once
3	Improved Wildlife Management	Certificate Course	Three Months	F.R.	WII	Once

Besides, Forest Guards posted in wildlife area should be trained as Game Guard in Bandhavgarh Training School, Tala. Apart from above basic training, some very important training is required to staff/officers for their day to day functioning.

1. Weapon training -

The staff has to face the anti-social elements including hard-core criminals, who are engaged in unlawful activities. To have an effective control, the staff must be equipped with modern arms and ammunitions and should know how to handle the arms ammunitions. Thus full course training to handle the arms and ammunition should be arranged for the field staff on regular basis.

2. Wildlife Health Monitoring Training

Monitoring of wildlife health and treatment of various contagious diseases require some technical skills. The staff must also know the techniques to collect samples to send it to forensic laboratory or to the research centre at WII, Dehradun for its detailed analysis.

3. Chemical immobilization training -

It has been realized that frequent strayal of wild animals occurs near the human habitation especially during summer season. Such unusual situation creates problems, both for wild animals and human beings. Such animals that come under distress should be safely captured to release in wild after proper treatment.

4. Wildlife offence investigation, collection of forensic evidences.
5. Wildlife monitoring and evaluation by transect method and camera trap.
6. Use of modern equipments, camera trap, range finder, GPS, PDA, Compass etc.
7. Collection of scats, signs
8. Wildlife rescue (physical capture) and training on SOPs (Schedule Operation Procedure) for handling tiger mortality, injury, straying tiger etc.

9. Tourism and interpretation training

Tourism and Interpretation are very sensitive issues. Even a slight discourteous behaviour can defame the PA as well as the Forest Department. The staff engaged in handling the tourists must be properly trained to handle the situation in a cordial manner. In doing so, the implementation of various Rules and Enactment, related with the wildlife tourism and management, is ensured also. Similarly, staff deputed for interpretation activities must have sufficient knowledge about the Protected Area and other on-going activities. If the tourists are not satisfied for their queries, the purpose of extension and Interpretation can not be achieved. A fundamental training and regular refresher course training to the staff should be done. At present no

systematic training on tourism and interpretation activities has been organized.

10. Computer Application Training:

Use of Computer application and related software has now become an indispensable task for day-to-day management. Application of GIS and other related software and their interpretation could improve the efficiency of the P.A. Management. All these efforts may be useful, when the staff capable enough to handle these machines. Hence three- month **Capsule course training** for the selected staff / officers should be arranged at Seoni.

Apart from these training some other important topics may be included if required.

11.4 Human resources development Plan (HRD Plan)

Wildlife management is a specialized branch, which need special orientation, skill and knowledge. Training makes a technocrat and field staffs perfect in his profession. Exposure of good efforts done in the *Par excellence* site develops a feeling of motivation to achieve the goal to the same degree or sometimes higher also. Not only this, tremendous degree of confidence is also developed if the initiative done is appreciated by others. Hence it is nice to initiate effort to impart special training to all level of staff in various relevant fields.

Imparting of training to the field staff and the official posted in the Pench Tiger Reserve has got much relevance, as they have to handle sensitive bio-diversity conservation vis-à-vis eco-development issue. Adequate technical assistance and guidance would be availed from the concerned experts. Hence imparting regular refresher courses covering different topics is recommended for the various levels of staff of Pench Tiger Reserve as following -

Table No. – 6

S. No	Course Name	Course Type	Course Duration	Participant Level	Resource person/ org	Frequency
1	General wildlife management course	Orientation Course	One week	D.C.F./ C.F.	WII, Dehradun	Once
1 a	--do--	Orientation Course	10 days	A.C.F./ D.C.F.	WII, Dehradun	Once
1 b	--do--	Orientation Course Module I	One week	Dy. Ranger Foresters, & Forest Guard	Wildlife training school, Bandhavgarh	Once
1 c	--do--	Orientation Course Module II	Two weeks	Dy. Ranger Foresters, & Forest Guard	Wildlife training school, Bandhavgarh	Once
1 d	--do--	Orientation Course Module III	One week	Dy. Ranger Foresters, & Forest Guard	--do--	Once

1e	--do--	Orientation Course Module IV	Two weeks	Dy. Ranger Foresters, & Forest Guard	--do--	Once
1f	--do--	Orientation Course Module V	Two weeks	Dy. Ranger Foresters, & Forest Guard	--do--	Once
1g	--do--	Orientation Course Module VI	One week	Dy. Ranger Foresters, & Forest Guard	--do--	Once
1h	--do--	Orientation Course Module VII	One week	Dy. Ranger Foresters, & Forest Guard	--do--	Once
1i	--do--	Orientation Course Module IX	One week	Dy. Ranger Foresters, & Forest Guard	--do--	Once
1j	--do--	Orientation Course Module X	One week	Dy. Ranger Foresters, & Forest Guard	--do--	Once
2	Soil and moisture Conservation	Orientation Course	One week	Dy. Ranger Foresters, & Forest Guard	WALMI, Bhopal	Once in a year
3	Rural development	Orientation Course Module II	One week	Dy. Ranger Foresters, & Forest Guard	State Rural Development Institute, Jabalpur	Once in a year
4	Enforcement of Law and Enactment's	Refresher Course	Three days	Range officers Dy. Ranger Foresters & Forest Guards	Circle Headquarters or at Seoni	Once in six months
5	Fire protection training	Local training and Orientation course	One week	Dy. Ranger Foresters, & Forest Guard	Should be organized locally at Divisional level	Once in a year
6	Grassland Management	Local training and Orientation course	One week	Range Officer	Should be organized locally at Divisional level	Once in a year
7	Weed Management	Local training and Orientation course	One week	Range Officer	Should be organized locally at Divisional level	Once in a year
8	EDC account keeping capsule course	Refresher course	Three days	EDC chairmen and associated staff	Divisional Headquarters at Seoni	Once in Two year
9	Research and Monitoring course	Capsule course	One week	DCF, ACF, Range officers, Foresters and Forest guard.	WII, Dehradun for DCF and ACF; Wildlife training school, Bandhavgarh For lower staff	Once in Two year
10	Education Awareness course	Refresher course	One week	ACF, Range officers, Foresters and Forest guard	WII, Dehradun for DCF and ACF; Wildlife training school, Bandhavgarh For Foresters and Forest guards.	Once in two year

The senior as well as lower field staff should be exposed to latest trends and developments achieved in different subjects related with wildlife management. Such exposure would help the field staff to carry out various management practices for effective management. A regular short- course requires to be organized from time to time for the ground level field staff to impart technical expertise to carry out various routine works, like; population estimation, water hole management, wildlife habitat management and the like.

To impart training in the above topics and other useful subjects, the selected staff should be sent to Wildlife training school at Bandhavgarh (M.P.) and other concerned institute, like; the State Rural Development Institute, Jabalpur, State Forest Research Institute, Jabalpur, Water And Land Management Institute (WALMI), Bhopal and the like.

Conducting Study tours at par-excellence sites: -

(i) Eco-development study tour for EDC members and associated staff
(ii) Wildlife management study tour for Officers & field staff.
(iii) International study tours
(iv) Working visit for PA Director

Workshops and Field Study: -

Every year workshop and field study should be organized at PTR level to share the experience gain during the field works and disseminate the new knowledge and practices being used in other PAs. Some of the topic for workshop and field study may be –

1. Wildlife and its habitat monitoring and understanding the objective of data collection during regular patrolling.
2. Wildlife census and field techniques
3. Anti poaching, Legal proceeding and forensics
4. Micro planning for eco-development in surrounding villages
5. Fire protection training and grassland development
6. EDC Account keeping
7. Environmental Education and Awareness
8. PA planning workshop
9. Regional planning workshop
10. PA management plan finalization workshop

During these types of workshop and field training regular interactions/ discussions between officers and field staff would also add to the understanding of new perspectives relating to wildlife management.

11.5 Wildlife Health Monitoring

11.5.1 Disease surveillance and Prophylactic Immunization:

Protected areas are established with an aim to conserve components of biodiversity to maintain their status in the natural ecosystem to protect the species from premature extinction. Outbreak of fatal diseases among the population of wild animals has lost considerable wild fauna in the past. Large-scale mortality of Bison in South India during (1968 and 1975) and Kajiranga National Park (1981) by Reinderpest and by Foot and Mouth Disease (FMD) in 1952 had been reported in the past. Dissemination of a number of diseases, like; Reinderpest, FMD, Anthrax, TB and Rabies are common in wild animals. In order to maintain the good health status of the wild animals, efforts for disease surveillance is extremely important in the Protected Areas.

There is a great competition of survival among wild ungulates and cattle for both forage and water. The domestic animals come in contact with wild animals, particularly ungulates at common grazing fields and at waterholes. Due to this, chances of the transmission of various fatal infectious diseases from livestock, to wild animals, namely Rinderpest (RP), Anthrax, Foot and Mouth Disease (FMD), Haemorragic Septicaemia (HS) etc., are extremely high. It is also known that there are few diseases which are communicable to carnivores form diseased ungulates; e.g. Rabies, Anthrax, Hydatidosis and Trypanosomiasis (Arora, 1994)

Free-ranging wild animals are as susceptible to diseases as any other living beings. Diseases have been a major cause of local extirpation of a number of wild animal species in India. With the increasing interaction between wild and domestic animals, the chances of disease transmission amongst them are high. Therefore, similar to the attempts made for recording the occurrence of disease outbreaks in wild animals of protected regions, efforts should also be made to know the occurrence of specific infectious and contagious diseases in domestic animals at the periphery of the protected wildlife areas. Until and unless different epizootiological cycles of various parasitic and infectious diseases are delineated, it will not be possible to plan out measures to eradicate these diseases from free ranging wild animals.

For maintenance of health of wild animals, it is essential to monitor and survey the parasitic and infectious diseases periodically so that necessary actions could be taken to prevent disease outbreaks and control large-scale mortality. Surveillance programmes will be a major aid in the implementation of long-term health management plan on the appropriate measure to maintain healthy population of wild animals and guarding them against the risk of sudden and heavy mortality or morbidity in Protected Areas. This can be best achieved by preventing transmission of diseases between wild and domestic and in-between wild animals by manipulating the factors involved in the transmission. Establishing the database for forecasting the diseases by performing epizootiological studies in and

around the Protected Areas round the year is of utmost importance and needs attention. To study the prevalence of parasitic, infectious and epidemic diseases one study was granted to Veterinary College Jabalpur.

During the study Faecal samples of 311 wild animals (chital - 132, sambar - 59, nilgai -53, gaur - 23, Tiger -7, dhole- 11, Jackals - 9, common langur - 11 and peafowl - 6) were collected from the core area of Pench Tiger Reserve. Faecal samples of 314 domestic animals (cattle -186, buffalo - 62 and goat - 66) were collected from the buffer zone. The domestic animals at the peripheral villages were clinically examined for parasitic and infectious diseases and information about the history of disease outbreak in the area was gathered. Each sample was examined for parasitic infection by qualitative concentration technique and positive samples were subjected to quantitative technique to determine egg/oocyst load. The results so accrued, were correlated between different species, seasons and areas of the Park to assess the prevalence of endoparasite infection. Blood samples of 24 domestic animals were collected for haematological and serological studies to know the prevalence of diseases like foot and mouth disease, bluetongue, rinderpest, brucellosis, haemorrhagic septicaemia, schistosomosis and blood protozoan infections. (cattle -12, buffalo - 6 and goat - 6) were collected for haematologicaland serological studies to know the prevalence of diseases; Necropsy of a chital fawn, an adult chital (kill), an elephant calf and 2 adult sambars was conducted. Body condition of 100 wild herbivores and 100 domestic animals was evaluated by judging the condition of the animals based on visual examination of the degree of protuberance of bony processes on the body surface and condition of skin coat. (Chital - 40, sambar - 25, nilgai - 25 and gaur -10) and 100 domestic animals (cattle - 40, buffalo - 30 and goat - 30) was also evaluated.

The results of survey revealed that the wild animals and resident livestock population are infected with one or the other seasonally and topographically fluctuating parasitic infections. In wild herbivores, the rate of prevalence of parasitic infection was found to be 32.79% with maximum infection of strongyles (27.54%). The overall prevalence was highest (41.66%) during rainy season. The highest prevalence was recorded in nilgai (35.84%), followed by gaur (30.4%), chital (29.54%) and sambar (28.81%). The rate of prevalence in wild carnivores was 55.55% with highest infection of Sarcocystis sp. (33.33%) and highest (88.88%) during summer season. Jackal showed maximum infection (66.6%), followed by dhole (54.5%) and tiger (42.85%). Among omnivores 29.41% animals were positive. Strongyles and Strongyloides sp. dominated with 23.52% infection of each. The prevalence was highest (66.66%) during rainy season.

Interestingly, the rate of prevalence of parasitic infection was higher in domestic animals (47.70%) as compared to their wild counterparts with maximum infection of strongyles (38.83%). Similar to wild herbivores, the prevalence of pssarasitism was highest during rainy season [cattle (62.06%), buffalo (50%) and goats (45%)]. Maximum infection was recorded in cattle (53.22%) followed by buffalo (43.54%) and least in goats (36.36%).

The area-wise prevalence of parasitic infection in wild herbivores was highest (52.17%) in beat 1-6 and least (12.12%) in beat 24-29. In domestic animals as well, the highest (54.32%) prevalence was recorded in the villages of central zone adjoining beat 1-6. Similarly, the infection in domestic animals in villages of west zone near to beat 24-29 was least (32%). Qualitatively the load of the parasitic infection in and around a particular area also showed similar pattern in both wild and domestic animals. The EPG/ OPG in domestic animals as compared to their wild counterparts suggest the former to be responsible for dissemination of infection amongst wild animals also. In present survey, the parasitic infection in wild herbivores and domestic counterparts in an area appeared topographically to be parallel denoting the fact that the infection is being maintained in the environment through aegis of domestic animals.

Serum samples of domestic animals revealed 11 animals (5 cattle, 4 buffaloes and 2 goats) positive for FMD by LPB ELISA method. One cow and 2 buffaloes with history of abortion were positive for brucellosis and 3 cattle in apparently healthy condition showed doubtful reaction by standard tube agglutination test. Three cattle and 2 goats were positive for schistosomosis with 2 cattle and 1 goat showing + reaction and 1 cattle and a goat showing +++ reaction by Cercarian Hullen Reaction. The high prevalence of infectious diseases in domestic animals of Pench Tiger Reserve is an alarming sign for the Park authorities as these animals intermingle with the wild animal population thus exposing them to a number of hazardous diseases.

During the survey, the average value of total erythrocyte count, haemoglobin concentration and packed cell volume in domestic animals were much lesser than the values of normal healthy animals. The interpretation of erythrocyte indices revealed microcytic hypochromic anaemia in some animals and macrocytic hypochromic anaemia in few animals. The mean total leucocyte count was high with elevated lymphocyte and eosinophil counts. The mean total plasma protein values in domestic animals were significantly lower. The findings are suggestive of high prevalence of infectious and parasitic diseases. The present study did not reveal any blood protozoan infections, which could probably be due to non-prevalence of ticks on the body of animals and absence of insect vectors in their proximity.

Among wild animals, the body condition of 48% animals was judged to be in good, 34% in average and only 18% in poor condition, whereas in domestic animals only 19% animals were in good, 63% in average and 18% in poor body condition. The picture indicates that the wild aninmals are in better body condition and health status as compared to the resident livestock. The reason attributed to the current scenario might be higher parasitic load and stress condition in the later.

Postmortem examination of a chital fawn, an adult chital (kill) and an elephant calf did not reveal significant changes indicative of any disease. The gross, histopathological and microscopic examination of the carcass of

two sambars was suggestive of pasteurellosis. The disease in sambars might have been transmitted from domestic animals of buffer area, as both the carcasses were found at the periphery of the park. The detail of seasonal prevalence of parasitic infection in wild carnivore, omnivores and herbivore & area wise prevalence of infection in wild animals is given in **Annexure No. – 17 (A, B, C & D).**

In free ranging Wild animals, only a fraction of mortalities due to diseases are visible at a time, except during epizootics, when the mortality exceeds the rate of predation and scavenging. Hence, the impact of diseases visible in these animals is far lesser than the actual scenario. Therefore it is essential to understand the magnitude of disease problem in free-ranging wild animals. More recent investigations by conservation agencies have shown that diseases and parasites are a decimating factor affecting population dynamics of wild animals.

It is of utmost importance to carry out epizootiological studies covering at least 3 complete years so as to generate information on prevalence of infectious and parasitic diseases and various climatic factors influencing the rate of infection. This will help in proper mapping and developing a forecasting system on various infections among native wild animals. This contribution will be a major aid in the implementation of long-term health management plan and guarding the wild animals from the risk of sudden and heavy mortality or morbidity. To achieve the above objective need of establishing a well-equipped field veterinary laboratory is of utmost importance along with the trained staff.

(A) Prophylactic Immunization:

Some diseases which are common to this area and are epidemic in nature and spread by both wild and domestic animals, preventive treatment against these diseases by the means of prophylactic immunization to the domestic animals is given. Domestic cattle, which may transmit the disease among wild fauna, can be vaccinated to prevent the occurrence of FMD, Reinderpest, BQ and HS.

Such immunization is carried out in 99 villages located within a radius of 5 Km. from the National Park and Sanctuary. It is believed that an animal can cover maximum distance of 5 Km. to graze and browse.

Prophylactic immunization to cover FMD, BQ and HS are regularly carried out with the help of Veterinary Department of Seoni and Chhindwara district every year, to reduce the chances of spread of disease from cattle to the wildlife.

(B) Disease Surveillance:

A quick disease reporting detection treatment system only can achieve proper disease surveillance. In the case of wild animals, detection of disease is only

based on observation on animal behaviour and their day to day activities. Concept of landscape epidemiology that associates the occurrence of a certain disease with the existing landscape may also be kept in the mind. The knowledge of animal species typical to the given area and particular disease maintained and spread by them may be extremely useful in disease detection and treatment. If such a disease is detected, its prophylactic treatment by immunization, water hole treatment or aerosol immunization can be done. To protect and maintain wildlife in PA with good health, it is necessary to achieve disease surveillance of –

(i) Native wild population

(ii) Domestic cattle of adjoining villages

Parameters for the monitoring of wild animals health –

1. General examination
    a. Physical examination
    b. Clinical observation

2. Laboratory investigations
    a. Faecal examination
    b. Heamatological examination
    c. Serological examination

3. Study of kill / Mortality
4. Detailed post-mortem examination
5. Collection of material for laboratory examination

The detail about the general examination, Laboratory investigation, study of kill / mortality, Post mortem examination and collection of material of laboratory examination is given in **Annexure no. – 18**

11.6 Mortality Survey

This should be continued as before every six months. The camp staff should be suitably instructed to collect all mandibles/ skulls from the habitat for an assessment of species specific/ age – specific mortality.

Chapter - 13

PROTECTION AND INTELLIGENCE GATHERING

13.1 Deployment of Native Workforce -

Concerned beat guard of the beat is supposed to be responsible for the protection of flora and fauna of the beat but it is unavoidable to provide some help to control the commission of forest offences. In addition to this, some anti-social elements also become active during festive occasions. Similarly, a few people of some particular local tribe always look for an opportunity to kill wild animals to sale in the nearby markets. In order to supplement the protection activities, constitution of a separate **Tiger Protection Force** was felt.

According to the direction of NTCA tiger protection force has been deployed in PTR Seoni. Tiger protection force has two units, one in Chhindwara district and another in Seoni district. Deployment of ex-army men and educated youths of peripheral villages form the tiger protection force.

The Tiger Protection Force would be under the direct control of a range officer with his headquarters at Khawasa & Bichhua. The DCF of the reserve should be made supervisory officer, who would ensure the proper functioning. There should be a schedule of patrolling prepared by DCF and supervised by ACF for every party of Tiger Protection Force.

The Tiger Protection Force will be equipped with firearms and provided a vehicle & mobile wireless. There will be a protection plan for protection in buffer forest ranges.

Duties of the Protection Staff -

(a) Periodical checking of village grocers

The village grocers should be regularly checked. Most of the village- based shopkeepers purchase the antlers and other body parts of various wild animals. They also encourage the unsustainable collection of NTFP within the forest area; especially shops and local markets in the buffer zone should be checked and kept on surveillance on a regular basis.

(b) To patrol the villages located on the fringes to check illegal collection of NTFP

Certain parts like gum, roots etc of endangered species is being illegally collected by the villagers in Seoni and Chhindwara district. Such collection has been banned from the buffer area. The local shopkeepers act as collection agents. They instigate the locals to cut blaze in the Salai (*Boswellia serrata*) and the Kullu (*Sterculia urens*) trees to allow the resin to exude for final collection. Hence, a regular watch should be kept on such middle men. In addition to this, these middlemen also persuade the villagers to collect medicinal plants and other NTFPs which are endangered and

prohibited to sell in the markets. Hence a strict patrolling should be performed by the front line staff to curb the commission of such undesirable activities.

(c) Illicit grazing control: -

Huge herds of domestic cattle, thousand in number, try to enter the forest during the monsoon period when most of the agricultural lands are put to crop. Cattle are allowed in the forest areas open for grazing. All regeneration coupes, RDBF coupes, Plantation etc should be strictly closed for grazing. In open areas, grazing should be allowed in a controlled and regulated manner. Since these cattle are not properly vaccinated, they carry the pathogens of contagious diseases, like; the F.M.D, Anthrax, BQ etc. Chances of dissemination of these diseases among the population of wild animals cannot be ruled out as most of the components forming the habitat, are shared both by wild animals as well as domestic cattle. An intensive campaign of prophylactic immunization to cover the common diseases will be undertaken by the Park Management with the help of local veterinary department.

Besides these, Pastureland development on the revenue wasteland or degraded forests located adjoining the villages can be one of the workable options to get fodder and small timber, poles etc.

(e) Regular checking of nearby weekly markets, bus stops and railway stations

There will be a mandate for front line staff to regularly check the weekly market. Bus stops at nearby areas should be regularly checked to restrict the illegal transit of any wild animal article or any Forest produce.

(f) Intensive regular patrolling on highly sensitive paths: -

In addition to the regular patrolling on sensitive roads, intensive patrolling is required on the following roads/pathways: -

(i) Thuyepani – Khamarpani-Bichua road

(ii) Turiya- Kohka - Teliya road

(iii) Suktara – Ghatkohka – Vijay pani- Bareilipur- Karmajhiri road

(iv) Rukhar-Alesur - Ghatkohka road

(v) Barelipar-Lapagariya-Khamreeth road

(vi) Khamreeth-Satosa-Turia road

(vii) Jamtara- Kumbhapani- Seoni- Chindwara road

(viii) Turia- Khawasa road

(ix) NH-7

(x) Jamtara- Chand- Chaurai road

(xi) Bareilipar- Karmajhiri- Tekadi- Jamtara road

(xii) Seoni-Ari-Balaghat road

(xiii) Kurai- Sakata road

(xiv) Rukhad- Sakata road

13.2 Patrolling Strategy including Joint Patrolling -

Protection of flora and fauna in any tiger reserve is of top priority, which forms a very important managerial strategy. Pench Tiger Reserve is known to have adopted a protectionist attitude with its reliable communication system, strategically located forest patrolling camps and intensive regular patrolling by the ever-vigilant staff. Such system results in an appreciable increase in wildlife populations and intrusion well under control. Same strategies will be adopted for the protection of buffer forests also.

13.2.1 Problems / Threats –

The main problems related to protection in and around the Buffer Forests are as following –

(1) Poaching –

i. **Poisoning of Water Sources –**

During pinch period in the summer water becomes limiting factor; it remains in a limited number of water holes in and around the Buffer forests. During this period there is distress movement of animals towards the villages in search of drinking water. Some poachers mix the ditches or small pool of water with Urea and other insecticides like Aldine, Zinc phosphate, which cause immediate death of the animals. This type of incidences mainly occurs in Buffer forests and village areas.

The strict watch and frequent patrolling of water- holes during the pinch period is the only remedy to avoid the chances of poisoning or contamination of water holes.

ii**. Chasing with Domestic dogs**

Some people train the domestic dogs for this purpose. Some time stray dogs of the nearby villages make groups like wolves and chase the wildlife. The incidences of killing wild animals by dogs are common near the village Turiya, Awarghani, Jamtara, Kokiwada, Karmajhiri & Khawasa where many resorts and tourism activities are going on, which attracts stray dogs.

iii. **Muzzle loaders**

Muzzleloaders uses locally made guns or Gun purchased by them for the crop protection. Some of the muzzleloaders have been identified; a strict vigilance is required on their activities.

iv. **Poaching by organised gang like Paradhees**

A nomadic community called *Paradhi*, basically native of Katni district is involved in this kind of poaching. Paradhis killed tigers and leopards in many Protected Areas and other forest area of the country. They have developed very strong and effective network with the middlemen, in the illegal trade of body parts of wildlife and their derivatives. Their modus operandi is to lay iron traps in the pre-surveyed and treaded paths of big cats. Once the animal steps in the trap, iron clamps spring up forcefully and tightly grip the leg of the animal. While the trapped animal suffers acute pain, poachers lurking for such opportunity beat the animal on its head with club shaped wooden rod till death. Kanhiwada and Bandol are the two villages of Seoni district where Pardhees are supposed to reside should be kept on strict supervision. Areas of Rukhad, Khawasa, Ari and Kumbhapani ranges are very sensitive to tiger poaching by organized gangs of Pardhees.

v. **Electrocution–**

The most common way of poaching in buffer area is by electrocution. This method is mainly used for the poaching of herbivores; some time carnivores also get electrocuted in the process. A thin GI binding wire is erected on animal path about 1 to 1.5 feet above the ground with the help of dry wooden pegs or twigs without touching the ground, one end of which is connected to the 11 K.V. main - line. As soon as the wild animal comes in the contact of such wire, it gets electrocuted by the high voltage of current passing through its body resulting in its immediate death. Some time farmer also uses such live current wires at the periphery of their fields to protect the crop from wild animals.

There are many cases of electrocution in territorial division; some case in and around the Pench area as following:-

Table No. – 1

Details of poaching by electrocution (to be changed)

S. No.	Range	Place	Wild animals Electrocuted	Year
1	2	3	4	5
1	Ghatkohka Buffer	Paraspani	Tiger	1996
2		Near Tikadi village	Spotted deer	1996
3		Barelipar	Tigress	1998
4		Barelipar	Sambhar	1998
5		Near Tikadi village	Sloth bear	1998
6	Rukhad Buffer	P - 322, Alesur	Sambhar	1999
7		Comptt. no. 421, 412	Tiger	2004
8		Tikadi Raiyat	Leopard, Sloth bear, Spotted deer, Neel gai.	2005
9	Kumbhapani Buffer	Beat Halalkhurd, Village Sajpani Comptt. no. P 1381	2 Leopard, 1 Sloth bear	2005
10	Rukhad Buffer	Beat Bichhua, Comptt. no. 254 Sawrireeth	Tiger	2005

Methods for the prevention of electrocution:

(i) Patrolling along transmission line to detect the GI Wire before it is connected to the main line.

(ii) Daily report of tripping should be received from nearby power sub station and concerned electric line must be quickly checked for detection of poaching.

(iii) Bunch cable should be used for electric transmission line and more vulnerable transmission line passing through the forest should be shifted to nearby road.

(iv) Day to day coordination with MPEB staff.

(v) Insulation of existing sensitive electric lines.

(2) Illicit felling

There are 107 villages in the buffer zone. A strict patrolling mechanism must be maintained in the area sensitive for illicit felling.

(3) Grazing

The park and sanctuary are surrounded by 99 villages in the periphery of 5 km. These villages have almost 60,000 cattle. In this area except bull and stall fed cow, all the cattle graze in forest and adjoining revenue area. Rotational and regulated grazing will be allowed in the buffer forests.

(4) Illegal extraction of non timber forest produce (NTFP)

Due to high anthropogenic pressure, there is very high demand of NTFP. NTFP collection will be allowed on sustainable basis through EDCs only.

(5) Road Hit cases on NH-7

National Highway - 7 passes along the boundary of the Kurai range (Pench Mowgli Sanctuary), Rukhad, and Khawasa buffer range which always poses great risk of accident by high-speed vehicle. Various animals killed in such accident is given in **Annexure no. – 19.**

13.2.2 Status of forest offences in last five years

Table No. – 2
Status of forest offence cases in plan area during last 5 years

S. No.	Type of Offence	2008-09	2009-10	2010-11	2011-12	2012-13
1	Illicit Felling	417	562	439	418	166
2	Illegal Mining	3	1	1	0	0
3	Encroachment	0	0	0	0	0
4	Illicit grazing	34	9	14	16	11
5	Illegal Saw mills	0	0	0	0	0
6	Illegal Transportation	5	16	20	12	14
7	Forest Fire	14	62	44	71	36
8	Poaching	10	20	14	22	25
9	Miscellaneous	0	0	0	0	0
Total			**483**	**670**	**532**	**539**

Illicit felling:

Table No. – 3
Compartments prone to illicit felling are as follows:

Illicit felling	No. of compartments				
	Negligible	Low	Medium	High	Total
Plan Area	10	44	140	186	380
Percentage	2.63	11.58	36.84	48.95	100

Table No. – 4
Forest fire cases in Plan Forest Area

Forest fires	No. of compartments				
	Negligible	Low	Medium	High	Total
Plan Area	14	63	211	92	380
Percentage	3.68	16.58	55.53	24.21	100

Table No. – 5
Status of Grazing

Illicit Grazing	No. of compartments				
	Negligible	Low	Medium	High	Total
Plan Area	4	22	87	267	380
Percentage	1.06	5.79	22.89	70.26	100

Status of encroachment in Plan Forest Area

Table No. – 6
Land use status other than forestry in forest blocks

Description	Current Working Plan		Proposed Management Plan	
	Agricultural use (No. of forest blocks)	Agriculture and other land use area (in hectare)	Agricultural use (No. of forest blocks)	Agriculture and other land use area (in hectare
Reserved Forest	2	5.31	22	77.39
Protected Forest	13	55.74	53	583.41
Total	15	61.05	75	660.80

Table No. – 7
Status of encroachment in forest land

Year	No. of cases of encroachment	Encroached area (hectare)
Before year 2000	62	18.988
After year 2000, no new case of encroachment came into light.		

Table No. – 8
Wildlife cases in last 5 yrs

S. No.	Year	Human Death Cases	Human Injury Cases	Cattle loss
1.	2006	-	36	47
2.	2007	1	27	19
3.	2008	1	13	37
4.	2009	-	51	52
5.	2010	-	-	15
	Total	**2**	**127**	**170**

13.2.3 Protection Strategy-

(1) Proper Communication Systems

i. Roads-

Two major roads pass through the buffer zone of PTR. 5 Eco-development villages of Kurai Tehsil are situated on National Highway No 7 from Kanya Kumari to Varanasi. These villages are Mohgaon Sadak, Pi'ndkapar, Setewani, NayegaonBanjar and Pachdhar. The State Highway, the other major road passes through Bichhua Tehsil on that only 4 Eco-development villages are situated. These villages are Bisanpur, Khamarpani, Deni and Devari.

The overall condition of approach roads in Eco-development villages is satisfactory. The Forest roads and other approach roads are shown in Map No. 15. and the list of forest roads is annexed as **Annexure No. 31.**

ii. Barriers

There are 23 barriers in buffer zone. The barriers should be maintained properly with barrier hut and other infrastructures. Though due to shortage of staff some barrier only guarded by watchers. In future provision for barrier guard may be made compulsory and wireless system should be given in all the barriers. The list of barriers is annexed as **Annexure No. 32.**

iii. Wireless system -

For the proper communication and conducting anti poaching operation an effective wireless network system is required. For this purpose Buffer zone

of Pench Tiger Reserve has installed 05 fixed wireless stations. These fixed wireless stations are not at all sufficient for the round the clock effective wireless communication. All the frontline staff and executive staff have not been provided with handsets. The proper maintenance and replacement of these wireless sets should be a regular task. All the wireless sets, Batteries & Solar panels must be properly maintained and always kept in ready condition. Depending on the nature of work and deployment of staff the requirement of wireless set may be calculated every year in advance and 25% extra sets should be kept to avoid repairing delays. The detail of wireless station is given below –

Table No. – 9

A. Fixed Station

S. No.	Name of Station	Beat	Sub Range	Range
1	C-7 Rukhar	Rukhar	Rukhar	Rukhar (T)
2	Ari	-	-	Ari
3	S-18	Van Chouki Doodhgaon	-	Khamarpani
4	Khawasa	Khawasa	Khawasa	Khawasa
5	Kumbhapani	Kumbhapani	Kumbhapani	Kumbhapani
6	Ghatkohka	-	-	Ghatkohka

Table No. – 10

B. Mobile Wireless (Vehicular)

S. No.	Vehicle No.	In charge of Vehicle	
		Name	Range
1	MP-02-AV-0537	Range Officer	Khawasa

iv. Telephone, Computers & Internet communication

For day-to-day communication telephone is one of the most efficient ways of the communication. In Buffer Zone Pench Tiger Reserve all the range offices, sub divisions and head quarter have been provided either with telephone or mobile/PDA for communication. For some field staff mobile facilities also have been provided.

All the offices have been provided with computer and Internet connection to have proper office MIS and access to the Forest Offence Management System and other data base.

v. Vehicles

At present no Range Officer has been provided with vehicles for touring and protection works. All the ranges should be provided one Vehicle for carrying out regular patrolling program. All the RAs should be provided with motor cycles. All the vehicles should be maintained properly and always kept in ready condition. The replacement of old vehicle should be decided in advance and budgetary provision should be made.

vi. Boundary and boundary pillars

The boundary of forest area of buffer zone is well defined on the map as well as on the ground. Most of the boundary pillars are constructed by cement concrete. The survey demarcation and cleaning of boundary line and maintenance of boundary pillars must be carried out as per the standard practices in forest department. The regular checking of the boundary also must be carried out as per the standard practices in Forest Department. The artificial boundary line and boundary pillars may be maintained by dividing the entire artificial boundary line of a range into five segments and maintaining it at the rotation of five years. Construction and maintenance of boundary pillars will be carried out as per prescription and time frame given in the management plan. The information of boundary pillars of Pench Buffer area is annexed as **Annexure No. 33.**

vii. Network of Patrolling Camps in buffer area-

There will be manned patrolling camp in strategically sensitive location having watchers / forest guard round the clock through the year. New camps may be constructed as per the site-specific requirement for protection. As far as possible the permanent camp should be constructed. Regular maintenance of building should be carried out. The Map showings Patrolling Camps, Barriers and Check post are given Map No. 16 to 18. The provision of camp kit, medical kit, & drinking water & lighting facilities must be made at each camp site. All the patrolling staff should be provided with patrolling gear like hunter shoes, Gum boots, mosquito net, rain coats and other basic camp and patrolling requirement. Subject to provision of budget, uniform provision of dresses may be made. The list of existing and proposed Patrolling camp is annexed as **Annexure No. 34 (A, B).**

The patrolling party of the camp must carry the patrolling on foot. There should be a daily schedule of patrolling of the area in its control. Seeing the size of the area every patrolling party revisit the area at least at an interval of 3 – 4 days.

There must be a different schedule during different seasons, like monsoon patrolling, summer season patrolling etc., which should be focused on specific problems during the period.

The Patrolling should be focused on following sensitive areas -

a. Water Sources and their approaches
b. Saltlicks and their approaches
c. Nala beds specially junctions with other nallas and roads.
d. Electric lines
e. Fire sensitive areas and
f. Checking the water holes in the forests and adjoining villages
g. Laying out impression pad near water point in villages to ascertain the presence of carnivores in the area.

The patrolling party must maintain the PIP and check for the carnivore, herbivore signs and enter them in patrolling register. After completing the patrol they should send the patrolling report to competent authority.

To ensure the daily recording of the presence of different animals along with the description of the habitats, the time of sighting, their activities especially the feeding habits; portion of plant parts being used, plants species, time of sighting, herd strength, Season, breeding activities interaction with other animal species. Such useful information should be recorded in prescribed camp register.

The Patrolling camp Register must be put up to the Range officer, Assistant Director and other officials for inspection and also to obtain necessary instructions during their tour. Message of any incidence of fire, human intrusion of suspected nature, suspected death of any animal, arrival of migratory birds, cattle lifting etc. shall be immediately informed to higher authority by wireless or telephone.

Monitoring of the camps-

Daily monitoring of activities carried out by patrolling camps should be a part of the duties of the concerned Range Assistant.

The concerned Range officer, having his jurisdiction over various camps, should regularly report in brief the activities done in patrolling camps to ACF.

All the patrolling schedules and actual patrolling must be monitored by concerning ACF. The higher authority also must go on patrolling with some patrolling party to check the patrolling activities

There should be surprise checking by higher authority like R.O., ACF and higher officer to ensure the presence of staff and watcher in the camps. This should be specially carried out in the night with night patrolling by concerning authority.

viii. Operation Monsoon:

This exclusive operation is carried out during the rainy season when most of the forest area becomes inaccessible for regular patrolling by vehicles, and the probability of intrusion from the surrounding villages increases. This operation includes:

- Sensitivity mapping
- Surveillance on encroachment
- Surveillance on habitual offenders
- On foot patrolling in remote forest areas
- Surveillance on illicit felling and grazing
- Special Patrolling Squads

ix. On Foot Patrolling by officers:

With the ever-increasing biotic pressure on the forest areas, the importance of regular on foot patrolling by officers is an undeniable and indisputable fact. Aside from inspiring the regular patrolling staff, this also lends a psychological restraint over the surrounding villages.

x. Patrolling Strategy:

The overall patrolling strategy of the Buffer zone includes the following features:

- Staff / camps listed with duty allocation and route chart
- The teams are equipped with mobile wireless sets and firearms
- The patrolling teams systematically cover the area of allotted to them
- Special instructions/ provisions for squads:

- Surveillance: hotels, tourist points, roads, bus stand, railway station and other means of transportation.
- Surveillance: *bahelias*, Paradhi's & traditional hunters etc.
- Coordination with local police
- Sanctioning labourers for patrolling (2/ team)
- Networking
- Special POR book issued
- Preparation of daily schedule
- Regular checking of market
- Surprise checking of barriers
- Preparation of "crime maps" with periodic updating
- Monitoring cattle kill, human kill, injury incidences and crop raiding
- Monitoring issues relating to compensation
- Monitoring water points near habitation
- Preparation of crime gang dossiers at range level
- Preparation of individual crime dossiers
- Monitoring of habitual offenders
- Preparation of monthly Crime Map on 1:50,000 scale indicating location of each crime with date.
- Conveying progress to higher officer on a daily basis through wireless
- Deviating from routine schedule during emergencies
- Taking note of offences registered in local police station

- Using tape recorder/ camera etc. to record evidences
- Special monitoring of salt licks and water holes near human habitation during the pinch period
- Incineration of half eaten carcasses of livestock on account of carnivore depredation should be carried out in presence of gazetted officer to eliminate the possibilities of poising of revenge killing relation by local people.
- Continuous monitoring of the area were more than three incidents of livestock depredation reported within a fortnight.
- Village level crime register should be maintained at the EDCs level to keep track of villagers involve in wildlife offences.
- Maintained list of vehicles passing through manned barrier and surprise check by senior officer at such point every month.
- Active involvement of EDC's in protection.
- Strengthening of informer's network.

13.2.4 E- Surveillance-

All the modern tools and techniques will be used at Pench Tiger Reserve for the purpose of E- Surveillance. Technologies like GPS, Compass, Range Finder, High Quality Cameras, night vision equipments etc are already in use. For the purpose of surveillance, monitoring of forests and wildlife would be done through satellites using technologies like drones and others.

13.3 Maintenance of village level crime Dossiers:

A village level crime register should be maintained at the EDC level to keep track of villagers involved in wildlife offences. At the range level, dossiers of perpetual/habitual offenders should be maintained which may help in tracing new crimes. Periodic monthly meetings should be ensured with the neighboring district officials for exchanging wildlife crime dossiers to facilitate joint action. Apart from organizing monthly review meetings with the Superintendent of Police, crime dossiers should be exchanged with local police to facilitate their updating.

13.4 Fire Protection:

One of the important factors which command profound effects on forest and wildlife is fire. Forest fire has beneficial effect under control but has hazardous effect when it is wild. Fires usually do not kill a large number of animals but they do harm micro fauna and flora of the habitat. Fire destroys the organic matter, which contributes to the humus content of the substratum. Fire changes the abundance and composition of wildlife communities drastically, and a general ecological effect of fire is to reverse the natural plants succession. The fire also destroys the eggs of a number of ground-

nesting birds and reptiles. The fire compels animal and bird population to abandon the habitat and migrate randomly in various directions, which may disturb the spatio-temporal utilization of a habitat. Many seeds and several plant species are completely destroyed by fire and their regeneration is affected adversely.
Specific fire protection scheme would certainly check spreading of fire, with a system of immediate detection of fire, speedy communication, quick arrival to the fire site, immediate action to extinguish the fire on war footing scale. One of the most important fire protection majors is to get reciprocal commitments regarding control of forest fire through regular meetings with local people of the surrounding villages.

13.4.1 Causes of Forest fire:

The following causes may be the reason of occurrence of forest fires:

1. Fire by the existence of NH-7 which leads a heavy traffic to the vulnerability in a part of Pench Tiger Reserve, Seoni.
2. Fire caused by Tendu Patta Contractors.
3. Fire caused by antlers collectors.
4. Fire by carelessness of Mahua collectors.
5. Resentment against the prohibitive activities initiative by park staff.
6. Innocent activities by pastorals.
7. Fire, some times also start and spread from the adjoining village areas.
8. Keeping the burning materials inside forests by grass cutters, camp laborers and sometimes also by passers.
9. During poaching of wild ungulates.

13.4.2 Fire Protection Measures:

The management has to continue the all round prevention and protection strategy well in advance, involving the local people, before the fire season actually sets in. A fire protection plan will be prepared. The protection measures include the following steps -

(I) Identification and categorization of fire prone area –

Depending on the history and probability of such fire accidents, the sensitive areas prone to occurrence of fire will be identified.

Some of the important areas of Rukhad, Ari and Ghatkohka Ranges have grass and bamboo abundance and these areas are prone to forest fire. Such highly sensitive areas require special attention.

(II) Preventive measures -

In case of forest fire, prevention is better than reaction after fire occurrence in the area. Such preventive activities are completed well before the fire period, i.e. 15th of February every year. Given the climate change scenario, this date can be changed by field director, looking at climatic conditions. The following main activities are carried out in the field to control the situation -

1. Cutting and burning of fire lines.
2. Cutting and burning of strips along Forest roads.
3. Cutting and burning of state, district and outer boundary of PA.
4. Regular sweeping and removal of dry leaves from fire-lines through out the fire seasons.
5. Monitoring progress and occurrence of fire by watchers through round the clock wireless network.
6. Deployment of fire extinguishing squads. (Vehicular and non-vehicular).
7. Constant patrolling by the patrolling camp staff.
8. Proper communication network through wireless, mobile etc.

List of Fire Lines of Buffer Area of PTR is annexed as **Annexure No. 35.**

(III) Detection of Fire incidences

(A) Erection of Watch towers

Controlling of fire best depend on early detection of fire incidence. For this purpose some elevated points should be selected in buffer zone to erect watch towers. Watch towers should be properly manned during entire fire season. The men attending the watch tower should have binoculars along with wireless sets to detect fire and immediate to communicate to higher authorities.

(B) Establishment of Fire Control Rooms –

Fire control room must be made operational every year during the fire season. Wireless station cum fire control room located at different places. They would be made responsible to implement the Fire protection activities for their jurisdiction.

(C) Deployment of fire-watchers & fire fighting squad -

Deployment of fire-watchers and fire fighting squad would help in early detection of fire and their prompt suppression.

(D) Fire Camps -

During the fire seasons temporary fire camps are maintained at higher location to keep strict watch on fires. These camps are manned thorough the fire seasons. Some permanent anti-poaching camps may be manned for fire surveillance activities. The list of fire camps has been annexed as **Annexure No. 36.**

(i) For regular patrolling of the beat –

One or two fire-watchers should be engaged for every beat to conduct regular patrolling along with the concerned beat guards. Such regular patrolling must be ensured in the entire fire season.

(ii) Control room –

Each control room must be manned by watchers, some for the day hours, and some for the night hours. Such team would help in flashing the massage of occurrence of fire to the extinguish party of some labors who would be attached to each control room in all of the six Ranges.

(iii) Fire fighting squad -

A group of casual labors must be attached to every control room to help the other fire watchers to extinguish the fire. On getting command from the control room, the party would immediately rush to the spot to suppress the fire without any delay.

At least one fire- watcher should be attached with every beat guard for four months in a year to help in detection and early suppression of fire as and when occurred in his beat. The beat guard should also mobilize other watchers, deputed under his control for warning the Patrolling camps in the early detection and prompt suppression of fire.

(iv) Suppression of Fire: -

Prompt suppression of fire should be the first and foremost duty of the "fire fighting squad" attached to every fire control room. On getting information of occurrence of fire in an area allotted to the team, the control room In-charge would manage to send it immediately to the fire spots to control it. Such team should consist of a group of some labors. Usually the following three types of operations are done while extinguishing the fire.

(a) To create an inflammable-material free line -

A line generally up to a width of 1.5 to 2 meters is cleared off of the fallen leaves, twigs and other inflammable materials to restrict the further advancement of the flames of the fire. Depending upon the site, such instantly created fire lines should be in the shape of a circle or a semi circle to compel the flames to confine within that small area.

(b) Counter burning: -

This technique is also very effective. A fire of a small magnitude is lit in opposite direction of the advancement of the flames. The initial spread of such counter burning is very slow as the wind direction remains opposite to the advancing flame. However after a few minutes, when the advancing flame confluences with the flames of counter burning, the rage of the fire becomes cool down. Since the inflammable materials, near the "Counter burning" sites have already been burnt, the advancing flame ceases there only for want of any burning material. However, this should be the last option and used only when all other methods fail.

(c) Beating the fire -

Beating the advancing line of fire by a group of labors is also very effective. Generally a small twig with green leaves is used in most of the cases. Use of modern tools and fire- beaters can also help in extinguishing such fire.

(v) Active involvement of local people/ communities through EDCs -

Active involvement of people in preventive and combative measures of fire protection should be preferred to tackle the situation in an effective way. The local people are the cause of almost every case of fire-occurrence, either intentionally or unintentionally. Educating such indigenous people regarding the harmful effects of fire would be really effective. Employing locals from EDCs as fire watchers will be a useful intervention. The following activities are suggested:

(vi) To organize regular meetings with local people: -

A series of meetings with the local people should be organized every year. Organization of such series of meetings should be commenced just after Holi, which coincides with the onset of Mahua collection season. It has been observed that more than eighty percent of forest fire occurs during the Mahua flower collection season, which lasts up to the end of April. Since the leaf fall precedes the flowering in the Mahua, the flower collectors find difficulty in searching the fallen corolla in a heap of dry fallen leaves. In order to make it easier, the ground floor beneath the Mahua tree crown is burnt in initial days of Mahua collection. The uncared flames that spread in all directions always result in vast spread of fire all around. The layers and layers of fallen dry leaves supported by force of dry wind offers very good pre-disposing factors to spread the fire.

The inhabitants of these villages should be adequately educated to adopt various precautionary measures. Villagers especially the women group must also be convinced to take utmost care to extinguish the spreading flames of fire while cleaning the ground floor beneath the Mahua tree. Similarly, these people should also be convinced not to lit a fire to satisfy the religious obligations.

A number of other matters require being convinced to these indigenous people, who generally, intentionally or unintentionally cause the spread of fire in the PA.

(vii) Environmental awareness and nature education for fire protection: -

In order to aware the rural mass especially the children group, a regular distribution of pamphlets in these villages would certainly work. Such pamphlets or posters should contain the harmful effects of fire; need to adopt precautionary measures, ways to inform the occurrence of fire to the nearest forest naka and also the penal provisions, if the fire is caused intentionally.

Similarly, a few roadside signboards displaying the above contents of matters should also be erected in the villages. In the peripheral villages school children and EDC members should be educated through organization of nature awareness and environmental education camps.

(viii) Rewards to informers and EDC members offering excellent contribution in fire protection efforts-

The principle of encouraging suitable people by giving away prizes and rewards would also be made applicable in this case. Such rewards should contain a cash award and citations and should be distributed to informers and EDC members who have performed excellent in fire-protection measures. Such prizes should be given in a small function organized in respective village. Such awards would motivate others to do excellent performance in future.

(ix) Rewards to forest staff -

To keep the enthusiasm awake among the good workers, a few token cash rewards and citations should be distributed every year to distinguished staff and officers performing exemplary services in fire protection activities.

(x) Vehicular patrolling -

Apart from regular vehicular patrolling by range patrolling vehicles at least one vehicle should be provided in each range during fire season for effective vehicular patrolling.

13.5 Intelligence Gathering and Coordination

13.5.1 Intelligence Gathering

Intelligence gathering is most important step in prevention of crime. There should be a proper network of informers. Informers should be cultivated personally. The name of informer should not be disclosed. There should be proper system of payment to informers. Identify local people and EDC members and impart them the basics of wildlife crime detection so as to

avail their services as and when required as informers. A local staff and watchers can provide valuable information, which should be systematically recorded and further investigation may be taken. Some key persons like shopkeeper, taxi drivers, hoteliers, cattle grazers and some wildlife-oriented persons may provide valuable information.

13.5.2 Trainings

Training of frontline staff needs to be assessed and executed properly. Yearly training on prevention of wildlife crimes, prevention of encroachment, illicit felling, fire protection, detection of crimes, use of weapons etc are to be organized by frontline staff and EDC members.

13.5.3 Coordination

For proper coordination following measures may be taken –

1. **Meeting with S.P. –** There should be a regular monthly meeting with S.P. of concerning district and sub ordinate staffs to review the crime against wildlife. The exchange of crime dossiers must be carried out at range and thana level by concerning range officer and T.I.

2. **Meetings with district judge –** A periodical meeting with district judge to expedite to disposal of pending cases relating to wildlife cases must be carried out.
3. There should be a monthly meeting with neighboring district officials like Collector, DFO etc. for exchange of wildlife crime dossier to facilitate joint action.

4. There should be surprise raids jointly with the local police in Railway Station, Local trains; Bus Stop, Hotels etc may be organized.

5. A regular tri monthly inter state meeting with officer of the adjoining state must be organized. The interstate crime control coordination strategy may be developed.

6. Regular periodical meeting with other law enforcing agencies like narcotics, revenue & others through tiger cell and other bodies.

7. Regular meeting of District Task Force and implementation of its decision on ground.

8. Co- ordination of WCCB and other enforcement agencies.

Chapter - 14

ECO-TOURISM, INTERPRETATION AND NATURE EDUCATION

(Ecotourism Zone Plan of Buffer Zone of PTR)

Introduction to Ecotourism

Ecotourism is a form of tourism inspired primarily by the natural history of an area, including its indigenous cultures. The eco tourist visits relatively undeveloped areas in the spirit of appreciation, participation and sensitivity. The eco tourist practices a non-consumptive use of wildlife and natural resources and contributes to the visited area through labor or financial means aimed at directly benefiting the conservation of the site and the economic well-being of the local residents.

Objective behind initiating ecotourism activities in buffer zone is to decrease biotic pressure on forested area which is created by direct dependence of villagers on forest resources and also, to increase conservation value of the buffer zone forests. Ecotourism will provide alternate livelihood option to the villagers, and will inculcate sense of ownership towards forest resources and will foster conservation value in them which will ultimately helps in conserving biodiversity of the area. Tourism in the buffer zone of Pench Tiger Reserve will be used as a conservation tool to educate visitors and elicit public support of conservation rather than as a commercial, resource degrading mass tourism operation. Role of Forest Department is to facilitate, supervise and monitor the activities.

14.1 Tiger Conservation Foundation and Management of Community Based Eco-tourism Programmes –

The eco-tourism inputs proposed for the buffer would serve as a complementing package for the visitors during the intervening time period between the National Park excursions. Besides being an added attraction, it would also help to reduce the tourist traffic inside the core zone, while providing income-generating activities to the host communities.

The income accruing from eco-tourism would be distributed to the beneficiaries through the SHGs of concerned EDCs. The committee will also deposit two percent of its annual income to the Vikas Nidhi. Loan facilities for various activities of eco-development, as indicated in the plan, would be provided to the beneficiaries from the Vikas Nidhi. The SHGs and EDCs would be responsible for maintaining the accounts and taking disciplinary action as warranted.

Community based eco-tourism is important in the present context. The host community should be actively involved in conservation and eco-tourism planning. Professional and technical training should be imparted to the local people who would ensure them a sustained income from eco-tourism initiatives, apart from according a priority status. At present, in Pench, the involvement of local people in eco-tourism is as below:

- as route guides
- as vehicle owners/ operators of park excursions
- as small cafeteria owners
- as petty shop keepers
- as small scale lodge owners

There is more scope for involving the host community in several activities, viz. owners of modest tourist accommodation (home stays), catering (ethnic dishes), souvenir making, cultural events and the like. There are several examples of local community involvement in eco-tourism, viz., Nepal (Annapurna Conservation Area, Sagarmatha National Park), Canada and South Pacific (Fiji group).

An eco-tourism package has been proposed for the Buffer Zone, which would complement the tourism inputs already existing in the National Park (Core Zone). The proposals form a part the site-specific eco development programme evolved in a participatory manner with the indigenous people from villages peripheral to the park. Eco-tourism is visualised here as an important source of income for the host communities living close to the Protected Area, compensating for the curtailment of their access to the PA, and as an incentive for wildlife conservation. The Govt. of Madhya Pradesh have laid down the guiding principles for constituting Eco development Committees (EDC), apart from micro planning through these committees, to ensure the active participation of the local people for forest protection and rehabilitation. The package addresses both to the indigenous host communities and the visitors (urban/ rural).

The Govt. of India have also issued a directive vide letter No. 4-29/86-FRY/ PT dated 17-02-87 to ensure tranquillity in the core zone. Therefore, as a part of the eco development project envisaged in the buffer, eco-tourism is being promoted by providing low cost tourist facilities managed by the village forest committees.

- For the Indigenous Host Communities:
- Creation of EDC
- Providing Soft loan to village beneficiaries from "Pench Vikas Nidhi" for fostering eco-tourism

In accordance with the directives from the Government, a fund has been created to ensure cycling of gate and tariff receipts to support Park Management/ eco-tourism ("Project Tiger – Kanha- Vikas Nidhi"). The beneficiaries drawn from the peripheral villages would be provided loan from the Nidhi for eco-tourism infrastructure development:

- Low cost accommodation for tourists
- Procurement of cycles, canoes/ boats
- Setting up of cafeteria
- Angling facilities
- Facilities for souvenir making, fostering folk dance

The identified beneficiaries would be imparted free training in public relation, visitor management and guide service also. The execution, management and over all coordination of the eco-tourism interventions would remain with the Dy. Director, Pench Tiger Reserve.

Potential of Buffer area for ecotourism

The buffer zone falls in Pench-Kanha and Pench- Satpuda corridors, Resident population of Tigers is found in Rukhad, Ari and Kumbhpani ranges of buffer zone. Movement of transient Tigers can be found everywhere in the buffer zone due to adjoining core and corridor value, which is an attraction for tourists. The Buffer zone supports good population of various ungulate species. Leopards, Wild dog, Sloth bear, Wolf, Jackal etc are resident in whole buffer zone. Prey base density is higher in areas adjoining core. The Rukhad forest habitat is suitable for Gaur. Large herds of Gaurs are found in Rukhad range. Apart from good faunal density, buffer zone is also rich in floral diversity. Due to naturally scenic beautiful forests and also such good wildlife sighting, buffer has good potential for ecotourism. Here, the ecotourism is proposed to be "Nature centric", rather than "Tiger centric" or "Wildlife centric".

In the Buffer zone of Pench Tiger Reserve, there is ample potential to explore such ecotourism opportunities which can be a sustainable source of livelihood for the local population. Certain areas like Rukhad, Sakata, Kumbhpani, Karmajhiri and Khawasa have already been identified and eco-tourism activities are in its nascent stage over there. In Karmajhiri village which is situated in the northern tip of buffer zone of Pench Tiger Reserve, Community and Cultural Centre is under construction, which will boost ecotourism activities in area. The income that has been generated by such activities is distributed among the beneficiaries by transparent and fair mechanism. The natural resources that are present in the area basically belong to the local communities as they have been the custodians of it from generations. So it is a moral obligation to provide them with better livelihood options as they are important stakeholders and their satisfaction is important in the process of sustained conservation.

14.2 Eco-tourism Guidelines and Constitution of Park Welfare Funds –

For the proper regulation of tourism in nature Govt. of India has formulated Eco-tourism: Policy & Guidelines (2002) which is given in **Annexure No. - 20.** Further NTCA has issued circular for proper regulation of eco-tourism dated 14 December 2007 is annexed as **Annexure No. – 21.**

PCCF (WL) through there letter no. / Prabandha/4005 dated 29-09-03 prescribed instruction for healthy tourism is annexed as **Annexure No. - 22.**
Following regulation are prescribed for different categories of stakeholders

14.2.1 For the Park Management

The following operational guidelines are proposed:

- The eco-tourism planning should be flexible, site-specific and participatory, and should form part of a larger eco-development/ eco-regional plan for the area
- Assessment of existing infrastructure, surface transportation, air service, road, electricity, water supply, law and order situation
- The eco-tourism package should invariably include :
  - Simple, adequate boarding and lodging facilities, in tune with the environment and the general setting of the landscape
  - Road network within the identified tourism zone
  - Self - guided Nature trails
  - Transportation options
  - Interpretive Centres
  - Way-side exhibits
  - Signages
  - Observation towers
  - Public conveniences
  - garbage disposal facility
  - Living quarters for staff/ personnel
- Structures with an exotic look causing visual pollution and non-compatible and un-aesthetic architecture should be avoided
- Site-specific micro - planning for community based eco-tourism should be resorted to
- Providing soft-loans from the "Vikas Nidhis" to identified beneficiaries
- Temporary housing structures blending with the surrounding should be encouraged
- Establishing building codes in consultation with the Panchayats apart from other regulations to ensure pollution free environment, with the concurrence of the respective "Zilla Sarkar"
- Environmental, physical & social carrying capacities to limit the various developmental activities in the fringe area to be identified for eco-tourism
- Mechanism to ensure continuous monitoring of adverse effects of tourism for quick redressal should be devised
- Recognize eco-tourism operators, provide incentives to deserving cases and award quality labels

- Provide visitor information & interpretation services (bilingual) covering:
  - "Do's" and "Don'ts"
  - What to see?
  - Where to see?

  (Brochures, leaflets, guide service, visitor centres)
- Periodic training programmes on eco-tourism should be conducted for tourism administration, planners, operators and general public
- Ensuring training programme to the host community in:
  - Lodge ownership/ management
  - Basic education and awareness
  - Health and sanitation
  - Skill development for preparation of local souvenirs as appropriate
  - Codes of conduct
  - Forest and wildlife conservation
  - Litter control
  - Forging partnerships with tourists & tourism industry
  - Environmental management
- To evolve and implement eco-tourism package in a few selected sites initially as pilot projects.
- Ensuring training to guides, drivers, cooks, naturalists, staff, SHG members etc.
- To maintain half a kilometre distance between two vehicles and not clump vehicles on the name of Tiger sighting. Strictly, no harassment of endangered species by disturbing it by clumping of vehicles should be there.
- A feedback system should be developed to record crucial feedbacks of the visitors. A system of monthly meeting with all important stakeholders to review these feedbacks should be there.

14.2.2 For Tour Operators/ Developers

- To abide by the planning restrictions, codes and standards prescribed by the authorities
- Implementation of desired environmental principles through regulation
- Conducting EIA/ environmental audits for new/ ongoing eco-tourism projects
- Being sensitive to the conservation of endangered species & corridor value of the area

- To ensure construction of structures blending with the environment as per the prescribed building code
- To take into consideration the carrying capacity and sociological use-limits of the site while creating tourist facilities, and ensuring safety & convenience of tourists
- To use local material and design as far as possible, while avoiding over construction
- The planning, architectural design and construction of tourist facilities should use eco-friendly techniques viz., solar energy, recycling of garbage, harvesting of rain water, natural cross-ventilation instead of AC, self-sufficiency in food through kitchen garden & farming
- Energy & water saving devices should be used apart from controlled sewage disposal
- Control of noise pollution, chemical pollution and air emissions
- Use of signage/ boards as per the standard prescriptions in the code
- Reduced use of environmentally unfriendly items like asbestos, CIS, pesticides, inflammable material
- Respecting the historic and religious sites in the area
- Providing appropriate interpretive service to visitors for communication with nature & local culture
- Ensuring proper marketing of eco-tourism products
- Ensuring training of staff on environmental issues
- Ensuring safety and security of visitors
- Respecting local inhabitants, culture & involving them in various activities and vocations as far as possible

14.2.3 For the Visitors –

- Abiding by the code of conduct, “Do's” & “Don’ts”
- Helping conservation, apart from protecting any site natural or cultural, which may be adversely affected by tourism
- Avoiding wastage of resources
- Avoiding littering & carrying back all non - degradable litter
- Leaving the camp sites clean before departing
- Avoiding removal of plants, seeds, drift - wood from the site
- Respecting local culture/ customs
- Respecting holy places
- Strictly adhering to the safety precautions

14.2.4 For the Host Community

- Respect the value of environment and cultural heritage
- Avoid overusing the area
- Co-operate with the authorities in ensuring healthy eco-tourism
- Realize and react to the threat of investors who see opportunities and exploit the locals
- Be friendly with the visitors as effective "nature guides" & "conservationists"

14.3 Management Strategies

14.3.1 General Principles and Strategies

Ecotourism operations in Buffer area will be run primarily on the basis of the following general principles:

a. The three primary tenets of ecotourism, as enshrined in the definition of the word itself, i.e. *responsible visitor behavior, conservation of the environment and improvement of the well-being of local people"* shall be the primary guiding principles of this project.
b. Low impact activities such as walking, cycling, nature trails, hides machaan etc shall be encouraged as far as, and wherever, possible in preference to safari drives which have a higher impact on the environment.
c. Responsible visitor behavior will be encouraged through appropriate literature and briefings by tour guides and naturalists, before entry into the forests.
d. Conservation of the natural resources, which people come to enjoy, shall be promoted by developing the stakes of the local communities in their conservation by linking their jobs and livelihoods with the existence and health of these resources, through ecotourism.
e. Well-being of the local communities shall be *improved* by creating job opportunities and business opportunities for them, in the tourism operations and supporting facilities.
f. Safari drives will be allowed on designated routes after estimation of the visitors' carrying capacity/ effective permissible carrying capacity of the tourism area.
g. Ecotourism will be permitted with all mitigative measures.
h. Visitor management in the forests shall be based on the principle of ***'Limits of Acceptable Change (LAC)'***. Although a detailed LAC

framework shall be generated through a formal process of consultations and site visits in due course, some of the parameters and indicators to be used in this analysis may be as follows :

Parameters	Indicators/ Criteria	Desired Condition	Management Approaches/Strategies
Wilderness (Forest) Quality	Wild Looks and Pristine Scenery	Preservation, preferably Improvement	No off-roading, control over illicit felling and overgrazing, no major permanent and conspicuous infrastructure in forest land, selection felling for regeneration of trees.
Wildlife	Numbers and Density	Improvement	Better anti poaching operations, more waterholes, habitat management to improve fodder availability and distribution, local support.
Community Benefits	Income, jobs and businesses	Improvement	Guiding jobs to be reserved for locals, training and financial support for community businesses in hospitality and handicrafts, share in govt. revenue.
Community Involvement	Role in decision making, Frequency of consultations	Improvement	Approval of JFM committees to all major decisions, regular information dissemination, monthly briefings and consultations.
Visitor Experience	Staff Quality	Courteous, efficient and well informed	Training, orientation and motivation.
	Information/interpretation availability,	Improvement, adequate	Literature, guiding service, Visitor Briefings, interpretation/visitor centers.
	Convenience,	Reasonable	Sensitive staff, Adequate facilities for toilets, resting and eating places.
	Safety	Assured	Risk information, safety conscious and experienced guides, Safe infrastructure, Regulation, enforcement.
	Crowding	Minimal	Site Specific and Activity Specific carrying capacity, Group size limits on group activities (e.g. walking), Activity-wise Zonation, Additional areas to be opened if needed.
	Pollution, dust, noise	Minimal	Low Density/intensity traffic, speed limits, visitor education (e.g. no horns, no loud talking), enforcement.
	Garbage (inside the forest)	Zero	Visitor Education, Monitoring, Enforcement, Collection and disposal system.

	Garbage (Outside)	Minimal	Visitor Education, Community Education, Monitoring, Collection and disposal System.
	Wildlife (mammals) sightings	Improvement	Strategic location of waterholes, Guide/Naturalist training, Promoting growth in population (of animals).
	Exposure to other life forms (Birds, butterflies, spiders and other arachnids, snakes, Plants, etc.) and scenery	Desirable	Guide/Naturalist training, visitor orientation, intelligently laid walking/biking trails, literature.
	Diversity of Experience (Safari Drives, Walking, Biking (Cycling), Camping, Hides/Machans etc.)	Desirable	Combo entry/activity permits, infrastructure (trails, campsites, hides/machans etc.) for all activities, Guide/Naturalist training, Literature, staff training.
	Exposure to local culture, cuisine, arts and crafts	Desirable	Community training, product development, marketing,
	Quality of Guiding	Progressive Improvement	Guide Training and Motivation, code of conduct, Enforcement.
	Grievance Redressal	Easy, Quick	Transparency, communication with clients, empowerment of local officials/committees, accessibility/availability of senior officers (on phone or email).
Infrastructure	Availability	Assured	Only minimal development in the forests, suitably located, modest.
	Quality	Reasonable	Local architecture, local materials, low cost, unobtrusive
Impact on Resources	Erosion	Minimal	Prevention, Maintenance and repairs (road, trails etc.), regulation of intensity of use.
	Deforestation	None	No cutting of trees to be allowed
	Degradation	None	No off-roading, Regulation of intensity of use of sensitive sites, rotation/closure of sites/routes if necessary, visitor/guide education.
	Garbage	Zero	Visitor Education, Monitoring Enforcement, Collection and disposal system.
	Reduction in animal or bird populations,	None	Population monitoring, Restorative action if required.

	Changes in Animal Behaviour	Minimal	No human contact, Some habituation to human presence will improve visitor experience, No feeding or luring by visitors to be allowed, No edible garbage around eating places.
	Water Quality	No deterioration	Careful location of campsites, vegetal cover, no chemicals, no garbage (plastics etc).
	Forest Offences	Progressive Reduction	Likely to decline due to visitor presence, better protection/patrolling using local revenues.
Impact on Communities and Surrounding Environment	Degradation of local infrastructure (e.g. roads, water bodies)	Minimal	Repair and Maintenance, education, commercial houses to pay more for maintenance, regulation of access to water bodies.
	Garbage	Minimal	Education, Collection and disposal systems, regulation.
	Clustering of shops in the villages (e.g. near the gate)	Minimal	Permit system, dispersal of activities to as many locations as possible, regulation
	Clustering (mushrooming) of Lodges	Minimal	Permit System, dispersal of activities, multiple entry points, Regulation
	Noise, Dust	Minimal	Education, Regulation
	Water Quality	No Deterioration	No solid waste disposal in water bodies, No disruption in flow, to plastic waste.

14.3.2 Selection Criteria

- Breeding areas of the important species should be excluded from the tourism area.
- Environmentally vulnerable areas like riparian zones, biological hotspots , caves and dens, cliffs and over hangs , magic sites, saltlicks, seepage springs etc. should be excluded from the tourism area.
- Residence areas of bigger sizes should be excluded from the tourism areas to create feeling of tranquillity.
- 70 % of the habitat of the most endangered species should be excluded from the tourism area.
- 50% of most thickly wild animal populated areas should be kept out of tourism area.

- Different types of topography like plateaus, rolling slopes, valley, etc. should be included for variety in animal species sighting and good experience.
- Different types of habitats like Teak/Sal forests, misc. forests, grasslands, etc. should be included for variety in species.
- Village areas should be excluded.
- If unnecessary changes in the wild life habitat is observed /noticed, the tourism should be stopped in the area.
- Carrying capacity of the tourism area should be scientifically determined.
- Tourism plan should be prepared as per the carrying capacity of the PAs.
- At last but not the least, to make the criteria for the selection of tourism areas, a matrix can be prepared as the tourism and conservation contradict each other. The rows can be used for different components of conservation where as columns can be used for the different components of tourism. The judgement values can be used for the different components. Management can get the guidance from WII Dehradun and site specific matrix can be prepared for each PA.
- Based on selection criteria identification of crucial dispersal areas can be done and this can be declared as "No Development Zone" by Government.

14.3.3 Carrying Capacity

The Effective Permissible carrying capacity for all the destinations will be scientifically calculated.

Carrying Capacity for "Rukhad" Buffer Area for Eco-Tourism Purpose
Calculations As Per NTCA Guidelines

As per the NTCA Circular No 7-16 / 2012 - NTCA Dated 19/11/2012,

There are two methods of calculating the area open for tourism purpose, the details of the circular are as follows

Option I - Total linear length of Park Road used for tourism multiplied by 20 meter (sighting distance) on either side.

Option II - In case the roads are closely networked, the entire area of a compartment may be taken for computation.

It must be noted here that, before issuing the above mentioned circular, the Sighting distance was considered as 200 Meter on either side from the center of the road for calculating the area open for tourism as per the guidelines submitted by the NTCA to the Supreme Court in Oct 2012 with respect of this.

Therefore, The carrying capacity for "Rukhad" - Buffer Area of Pench Tiger Reserve (MP), has been estimated considering the sighting distance of 200 Meters on either side of the road, which is as per the guidelines submitted by NTCA to Supreme Court for calculating the Torisum Area in and around Tiger Reserves :

Total Buffer Area of Rukhad - 124.497 Sq. Km.

Total Road Length (Toursim) - 66 Km

Tourism Area = (66 Kms x 400 Mtrs) / 124.497 Sq. km

= 26.400 / 124.497 Sq Kms

= 21.20% of the Buffer Area

Determination of Carrying Capacity :

(a) Physical Carrying Capacity (PCC)

This is the "maximum number of visitors that can physically fit into a space, over a particular time". It is expressed as following -

PCC = A x v/a x Rf
Where, A = available area for public use
v/a = one visitor / M^2
Rf = rotation factor (number of visits per day)

In order to calculate the PCC, the following criteria must be taken into account :

- Only vehicular movements on forest roads are permitted, hence **road length is more relevant than area.**
- "Standing area" is not relevant, but "closeness" between vehicles is important.
- There is a required distance of at least 500 m (1/2 km) between **2 vehicles** to avoid dust (2 vehicles / km)
- At least **3.5 hours** are needed for a single park excursion.
- The Buffer Area is open to tourists for **9 months in a year** and alm ost **9 hours per day**.
- Linear road length (for tourist) = **66 Kms**

$$\textbf{Rotation Factor (Rf)} = \frac{\text{Opening period}}{\text{Average time of one visit}} = \frac{\mathbf{9}}{\mathbf{3.5}} = \mathbf{2.6}$$

Physical Car rying Capacity (PCC) = 66 km x 2 vehicles / km x 2.6

= 343 visits / day

(b) Real Carrying Capacity (RCC)

RCC is the maximum permissible number of visits to a site, once the "reductive factors" (corrective) derived from the particular characteristics of biophysical, environmental, ecological, social and management variables.

$$RCC = PCC - Cf1 - Cf2 \text{ ---------- } Cfn,$$

Where Cf is a corrective factor expressed as a percentage. Thus, the formula for calculating RCC is :

$$RCC = PCC \times \frac{100 - Cf1}{100} \times \frac{100 - Cf2}{100} \times \ldots\ldots \frac{100 - Cfn}{}$$

Corrective Factors are "site-specific", and are expressed in percentage as below :

$$Cf = \frac{M1 \times 100}{Mt}$$

Where Cf = corrective factor, M1 = limiting magnitude of the variable
Mt = total magnitude of the variable

(i) Road erosion : Here the susceptibility of the site is taken into account.

Total road length = **66 Km** (Mt)

Medium erosion sink = **10 Km** (weighting factor = 2)

High erosion risk = **5 Km** (weighting factor = 3)

M1 = (10 x 2) + (5 x 3) = 35 Km

$$\textbf{Cfe} = \frac{\textbf{35 km}}{\textbf{66 km}} \times 100 = \textbf{53 \%}$$

(ii) Disturbance to Wildlife:

Here, species which are prone to disturbance owing to Visitation are considered. The peak courtship activity for spotted deer lasts for two months before the onset of regular monsoon. As far as tigers are concerned, newborns are seen between March and May and also during the rain, hence an average value of two months in a year can be considered as the matter phase.

$$\text{Corrector Factor (Cf)} = \frac{\text{Limiting months / year}}{\text{12 months / year}} \times 100$$

Corrective Factor for spotted deer (2 months)

$$\text{Cf w1} = \frac{2}{9} \times 100 = 22.2\%$$

Corrective Factor for tiger (2 months)

$$\text{Cf w2} = \frac{2}{9} \times 100 = 22.2\%$$

Overall Corrective Factor for disturbance of wildlife in "Rukhad" - Buffer Area of Pench Tiger Reserve (MP) is ….

Cfw = Cfw1 + Cfw2 = 22.2 + 22.2 = 44.4 % or 44

(iii) Temporary Closing of Roads :

For maintenance or other managerial reasons, visitation to certain roads may be temporarily restricted within the Buffer Area. The Corrective Factor in this regard is calculated as :

$$\text{Cft} = \frac{\text{Limiting weeks / year}}{\text{total weeks / year}} \times 100$$

In "Rukhad" - Buffer Area of Pench Tiger Reserve (MP), an average value of 2 limiting weeks per year may be considered as the "Limiting weeks", and thus the corrective factor works out to :

$$\text{Cft} = \frac{\textbf{2 weeks} \text{ / year}}{\textbf{36 weeks} \text{ / year}} \times 100 = \textbf{5.5\% or 6 \%}$$

Computation of RCC

$$RCC = PCC \times \frac{100-Cfe}{100} \times \frac{100-Cfw}{100} \times \frac{100-Cft}{100}$$

$$RCC = 343 \times \frac{100-53}{100} \times \frac{100-44}{100} \times \frac{100-6}{100}$$

= 343 x (0.47 x 0.56 x 0.94)

= 84.86 or **85 visits / day**

(c) Effective Permissible Carrying Capacity (EPCC) :

The EPCC is the maximum number of visitors that a site can sustain, given the management capacity (MC) available. EPCC is obtained by multiplying the real carrying capacity (RCC) with the management capacity (MC). MC is defined as the sum of conditions that administration requires if it has to carry out its functions at the optimum level. Limitations in management like lack of staff and infrastructure limit the RCC.

In "Rukhad" - Buffer Area of Pench Tiger Reserve (MP), we don't have sufficient number of staff for the effective management of tourism activity. Since Tourism is a full day activity for the whole 9 months, therefore the management capacity cannot go beyond 50%

Effective Permissible Carrying Capacity (EPCC)

Managerial Capacity = 50%

Hence, EPCC = RCC x MC = 85 x 0.50 = 42.5 say 43 Vehicles / day

Thus, the Effective Permissible Carrying Capacity

on any day is only 43 vehicles per day.

Break-up for Gate wise Entry of Number of Vehicles

In " Rukhad " Buffer Area of Pench Tiger Reserve (MP)

Park Entry	**Number of Vehicles Per Day**	
	Morning	**Evening**
Rukhad Entry Gate	23	20
Total Vehicles Per Day	**43**	

Break-up for Proposed - Gate wise Online and Offline Entry tickets for above notified vehicles in " Rukhad " Buffer Area of Pench Tiger Reserve (M.P.)

Park Entry	**Number of Vehicles Per Day**			
	Morning		**Evening**	
	Online	Offline	Online	Offline
Rukhad Entry Gate	16	07	15	05
Shift Total	23		20	
Total Vehicles Per Day	**43**			

Carrying Capacity for "Khawasa" Buffer Area for Eco-Tourism Purpose
Calculations As Per NTCA Guidelines

As per the NTCA Circular No 7-16 / 2012 - NTCA Dated 19/11/2012,

There are two methods of calculating the area open for tourism purpose, the details of the circular are as follows (Copy attached herewith as Annexure - B)

Option I - Total linear length of Park Road used for tourism multiplied by 20 meter (sighting distance) on either side.
Option II - In case the roads are closely networked, the entire area of a compartment may be taken for computation.

It must be noted here that, before issuing the above mentioned circular, the Sighting distance was considered as 200 Meter on either side from the center of the road for calculating the area open for tourism as per the guidelines submitted by the NTCA to the Supreme Court in Oct 2012 with respect of this.

Therefore, The carrying capacity for "Rukhad" - Buffer Area of Pench Tiger Reserve (MP), has been estimated considering the sighting distance of 200 Meters on either side of the road, which is as per the guidelines submitted by NTCA to Supreme Court for calculating the Torisum Area in and around Tiger Reserves :

Total Buffer Area of Khawasa - 118.687 Sq. Km.

Road Length : Wolf trail (Both Side of Khawasa – Turia Road) - 60 Km

Road Length : Telia - Kohka - Chatangotta Camp - 30 Km

Total Road Length: - 90 Km

Tourism Area: = 90 Kms x (200 + 200 Mtrs)/ 118.687 Sq. km
= 36 / 118.687 Sq Kms = 30.33 % of the Buffer

Determination of Carrying Capacity :

(a) Physical Carrying Capacity (PCC)

This is the "maximum number of visitors that can physically fit into a space, over a particular time". It is expressed as following -

PCC = A x v/a x Rf
Where, A = available area for public use v/a = one visitor / M^2
Rf = rotation factor (number of visits per day)

In order to calculate the PCC, the following criteria must be taken into account :

- Only vehicular movements on forest roads are permitted, hence **road length is more relevant than area.**
- "Standing area" is not relevant, but "closeness" between vehicles is important.
- There is a required distance of at least 500 m (1/2 km) between **2 vehicles** to avoid dust (2 vehicles / km)
- At least **3.5 hours** are needed for a single park excursion.
- The Buffer Area is open to tourists for **9 months in a year** and almost **9 hours per day**.
- Linear road length (for tourist) = **90 Kms**

$$\textbf{Rotation Factor (Rf)} = \frac{\text{Opening period}}{\text{Average time of one visit}} = \frac{\mathbf{9}}{\mathbf{3.5}} = \mathbf{2.6}$$

Physical Carrying Capacity (PCC) = 90 km x 2 vehicles / km x 2.6

= 468 visits / day

(b) Real Carrying Capacity (RCC)

RCC is the maximum permissible number of visits to a site, once the "reductive factors" (corrective) derived from the particular characteristics of biophysical, environmental, ecological, social and management variables.

$$RCC = PCC - Cf1 - Cf2 \text{ ---------- } Cfn,$$

Where Cf is a corrective factor expressed as a percentage. Thus, the formula for calculating RCC is :

$$RCC = PCC \times \frac{100 - Cf1}{100} \times \frac{100 - Cf2}{100} \times \ldots\ldots \frac{100 - Cfn}{}$$

Corrective Factors are "site-specific", and are expressed in percentage as below :

$$Cf = \frac{M1 \times 100}{Mt}$$

Where Cf = corrective factor, M1 = limiting magnitude of the variable
Mt = total magnitude of the variable

(i) Road erosion : Here the susceptibility of the site is taken into account.

Total road length = **90 Km** (M_t)

Medium erosion sink = **12.5 Km** (weighting factor =2) High erosion risk = **7.5 Km** (weighting factor = 3) $\mathbf{M_1}$ **= (12.5 x 2) + (7.5 x 3) = 47.5 Km**

Mt = 47.5 Km

$$\mathbf{Cf_e = \frac{47.50\ km}{90\ km} \times 100 = 53\ \%}$$

(ii) Distu rbance to Wildlife

Here, species which are prone to disturbance owing to Visitation are considered. The peak courtship activity for spotted deer lasts for two months before the onset of regular monsoon. As far as tigers are concerned, newborns are seen between March and May and also during the rains, hence an average value of two months in a year can be considered as the matter phase.

$$\text{Corrector Factor (Cf)} = \frac{\text{Limiting months / year}}{12 \text{ months / year}} \times 100$$

Corrective Factor for spotted deer (2 months)

$$Cf\ w_1 = \frac{2}{9} \times 100 = 22.2\%$$

Corrective Factor for tiger (2 months)

$$Cf\ w_2 = \frac{2}{9} \times 100 = 22.2\%$$

Overall Corrective Factor for disturbance of wildlife in "Khawasa" - Buffer Area of

Pench Tiger Reserve (MP) is ….

$$\mathbf{Cfw = Cfw_1 + Cfw_2 = 22.2 + 22.2 = 44.4\ \%\ or\ 44\ \%}$$

(iii) Temporary Closing of Roads :

For maintenance or other managerial reasons, visitation to certain roads may be temporarily restricted within the Buffer Area. The Corrective Factor in this regard is calculated as :

$$Cft = \frac{\text{Limiting weeks / year}}{\text{total weeks / year}} \times 100$$

In "Khawasa" - Buffer Area of Pench Tiger Reserve (MP), an average value of 2 limiting weeks per year may be considered as the "Limiting weeks", and thus the corrective factor works out to :

$$Cft = \frac{\textbf{2 weeks} / \text{year}}{\textbf{36 weeks} / \text{year}} \times 100 = \textbf{5.5\% or 6 \%}$$

Computation of RCC

$$RCC = PCC \times \frac{100-Cfe}{100} \times \frac{100-Cfw}{100} \times \frac{100-Cft}{100}$$

$$RCC = 468 \times \frac{100-53}{100} \times \frac{100-44}{100} \times \frac{100-6}{100}$$

= 468 x (0.47 x 0.56 x 0.94)

= 115.78 or **116 visits / day**

(c) Effective Permissible Carrying Capacity (EPCC) :

The EPCC is the maximum number of visitors that a site can sustain, given the management capacity (MC) available. EPCC is obtained by multiplying the real carrying capacity (RCC) with the management capacity (MC). MC is defined as the sum of conditions that administration requires if it has to carry out its functions at the optimum level. Limitations in management like lack of staff and infrastructure limit the RCC.

In "Khawasa" - Buffer Area of Pench Tiger Reserve (MP), we do not have sufficient number of staff for the effective management of tourism activity. Since Tourism is a full day activity for the whole 9 months, therefore the management capacity cannot go beyond 50%

Effective Permissible Carrying Capacity (EPCC)

Managerial Capacity = 50%

Hence, EPCC = RCC x MC = 116 x 0.50 = 58 Vehicles / day

Thus, the Effective Permissible Carrying Capacity on any day is only 58 vehicles per day.

Thus, the Effective Permissible Carrying Capacity on any day is only 58 vehicles per day. Thus 24 vehicles in the morning and 34 vehicles in the evening will be permitted in two zones.

Carrying Capacity o f "Khawasa" Buffer Area of Pench Tiger Reserve (MP)

Break-up for Gate wise Entry of Number of Vehicles

In " Khawasa" Buffer Area of Pench Tiger Reserve (MP)

Park Entry	Number of Vehicles Per Day	
	Morning	Evening
Khawasa wolf trail Entry Gate	12	18
Telia-Kohka-Chatangotta Zone	12	16
Shift Total	**24**	**34**
Total Vehicles Per Day	**58**	

Break-up for Proposed - Gate wise Online and Offline Entry tickets for above notified vehicles in " Khawasa " Buffer Area of Pench Tiger Reserve (M.P.)

Park Entry	Number of Vehicles Per Day			
	Morning		Evening	
	Online	Offline	Online	Offline
Khawasa wolf trail Entry Gate	6	6	12	6
Telia-Kohka-Chatangotta Zone	6	6	10	6
Total	**12**	**12**	**22**	**12**
Shift Total	**24**		**34**	
Total Vehicles Per Day	**58**			

14.4 Suitable Eco- tourism spots in the buffer zone of PTR

14.4.1 Rukhad and Sakata

Developing Rukhad- Sakata Forests into a Model Ecotourism Destination

1. **Introduction:** Rukhad is a small forest village situated on the Jabalpur-Nagpur highway, nearly 20 km south of the district town of Seoni in Madhya Pradesh. The village is the headquarters of a forest range with the same name, in buffer zone of Pench Tiger Reserve. These forests have been famous for their wildlife for a long time and have now been opened to tourists, under the aegis of the MP Ecotourism Development Board (EDB), after the Principal Chief Conservator of Forests directed (Circular no. 2012/223 dated 12 October, 2012) all forest officers of the state to promote ecotourism in their areas, even outside protected areas, particularly in the wake of the recent restrictions on tourism in the core areas of the Tiger Reserves. The Rukhad forests are a part of the buffer zone of the Pench tiger reserve. The area opened to tourism also includes adjoining Ari range , but the entire areas will be called as Rukhad forests in this document, for the sake of convenience. The first tourist vehicles entered the forests on 14th November, 2011, the day after Diwali, and the area has created a fantastic first impression on the visitors, as people saw tigers, gaur and a whole lot of common fauna in the first few days. Over the last few years, Pench Tiger Reserve has become very popular for wildlife tourism, particularly fed by the metropolitan city of Nagpur, especially over the weekends, and a large number of hotels and lodges have come up around the park gate at Turia. Although Rukhad was always a popular place for discerning nature lovers, the demand for this place suddenly soared as the number of tourist vehicles allowed into the Pench Tiger Reserve (core area) were suddenly cut down to half, supposedly, in compliance with the NTCA guidelines. From the initial response, it appears that soon Rukhad may become a hot ecotourism destination, with all the usual ills and benefits of tourism, and that it is necessary to keep the development of this nascent initiative on a socially and ecologically sustainable track. This framework is a rapid attempt to provide direction to the programme in its early stages, but is not a substitute for a detailed management plan which should be developed through detailed consultations among stakeholders as soon as possible.

2. **Ecotourism:** In this action plan, the most widely accepted definition of ecotourism, given by The International Ecotourism Society (TIES) will be used to guide future operations and objectives. As per this definition (TIES 1990), ecotourism is ***"responsible travel to natural areas that conserves the environment and improves the well-being of local people".***

3. **Rukhad Forests:** The area opened to ecotourism is approximately 100 km^2. The Rukhad forests are generally dominated by teak and bamboo, although there are fairly large patches of mixed forests without either of these species. The ecotourism area also includes large teak plantations which are now 40-50 years old. The forest floor has plenty of edible grasses while several

intermediate storeys of forest trees provide plenty of browse for the animals. The flowering of bamboo in 2004-05 has resulted in a profusion of bamboo regeneration resulting in a spurt in food availability in the area.

4. **Terrain:** The Rukhad terrain is generally plain to mildly rugged.

5. Water Courses and Water Bodies: The area is drained by several perennial and seasonal streams. The most prominent among them is Bavanthadi River. Some of the seasonal streams have perennial pools of water which affect animal distribution in summers. The ecotourism forest also has some perennial tanks, particularly, the Dudhia talab, Daldali talab, Osekata talab etc.

6. Human Habitation: The ecotourism forest is virtually without any villages in its core, although it is bounded by several villages namely Rukhad, Kurai, Nayagaon, Bavanthadi, Chanderpur, Mohgaon, Sakata etc. The rural population is dominated by the *gond* tribe. Naturally, the local culture is also dominated by the traditions and customs of the *gonds*.

7. **Forest Utilisation:** The local communities use the forests primarily for grazing their livestock and meeting their fuel wood needs. Collection of non-timber forest produce, such as tendu leaves, mahua flowers, chironji, amla and several medicinal plants is also a major source of earning for the local people. As the human density in the area is rather low, the forests are able to sustain these pressures without any visible signs of serious deterioration in their condition.
   The forest department manages these forests under a system of selection felling (selection cum improvement) under which selected trees are annually removed from nearly 7 coups (felling areas) each approximately 70 ha in size, on an average. The thinning of young plantations also provides some timber, annually.

8. **Roads and Footpaths:** The area has an extensive network of forest roads and old extraction paths which can be readily used as safari routes and trekking/biking trails. Total road length available is approximately 100 km. The forests do not have many regular foot paths connecting villages as the villages are only at the periphery and are connected by fair-weather or all-weather roads.

9. **Potential Ecotourism Activities:** Visitors shall be allowed to enjoy and encourage nature through following activities:

   a. Safari drives or safari drives, including limited movement in late evenings;
   b. Camping; limited use of forest rest houses at Rukhad and Sakata etc. shall also be allowed.
   c. Short Nature walks and long treks, with or without overnight stays in designated camps;
   d. Mountain Biking;

e. Bird watching
f. Watching Wildlife at waterholes from hides or *machans*.
g. Light adventure activities in the campsites, or nearby, such as five point obstacle course, river crossing, Burma Bridge, commando net, monkey crawling etc. (list to be corrected and completed).
h. Cultural experience and interaction with local people. The potential eco-tourism activities of Rukhad are shown in Maps 19 to 23 and the forest rest houses are shown in Map No. 24

i. One of the main criticisms of ecotourism (wildlife Tourism) in India has been that increase in tourism leads to mushrooming of commercial establishments (hotels and lodges) near the entry points. Whereas such a development restricts the benefits of tourism, like job creation, appreciation of properties etc. to a small area, its ill effects (road degradation, garbage, noise etc.) also tend to be concentrated in a small area. Moreover, the lodges tend to occupy all the private lands, cultivated or fallow, scattered around government forests, thus weakening the corridors between various forest patches. In order to maximize the economic and ecological benefits of tourism, following measures shall be taken:

(i) Rather than limiting the entry into the forests from one point, multiple entry points shall be considered in order to thinly disperse the commercial establishments all around the park;

(ii) The FD will hold immediate discussions with the district administration to find ways of regulating the development of lodges and hotels around the Rukhad Ecotourism Forests. The buffer zone consisting of forests and revenue area is being notified as Eco Sensitive Zone (ESZ). This area, the lodges will be obliged to comply with the following criteria:

1. The minimum area of a forest (wildlife) lodge shall be 5 hectares, in which the built up area shall not be more than 5%.
2. If the boundary of a lodge touches the forest area, the lodge will keep that boundary unfenced. No forest lodge touching the forest areas shall use barbed wire fence on any of its other boundaries.
3. The lodge buildings shall be low profile and low impact.
4. The lodges shall ensure that any animals or birds visiting its premises have no access to edible or other garbage.
5. The lodges will not discharge any solid waste or effluents into any natural waterways. Their septic tanks or any other waste disposal facilities shall be at least 50 meters from the nearest waterway or water body.
6. The lodges will not use fuel wood for cooking food or for heating water.

7. The lodge shall employ at least 70% of its workforce from the same district, preferably from the nearby villages.
8. The lodges shall be audited by the Park Authority on an annual basis. Any lodge which does not comply with any of the above stipulations may be forbidden from taking its guests into Rukhad ecotourism forests.

10. **Guides/Naturalists:** Good guiding is the backbone of any ecotourism project. Local tribal youth, if reasonably educated and trained can become excellent nature guides, as they have an innate connection with the local wilderness. The visitors shall be accompanied by authorized guides in all activities. Guide training shall be one of the primary responsibilities of the EDB. The training shall focus on nature interpretation, presentation as well as visitor safety, among other things. The new guides should be encouraged to learn the art of guiding from the lodge naturalists accompanying the visitors from Turia. They will also be responsible for enforcing the rules and reporting violations. However, training is an ongoing activity and the programme can be launched after giving the guides a basic understanding of the job. All guides shall be from the villages whose forest area forms part of the ecotourism forest, as far as possible.

11. **Carrying Capacity:** There will be carrying capacity limits for vehicles or persons entering the forests. These limits will be implemented on a site specific and activity specific basis and shall be monitored in the light of the LAC suggested in the table above. The baseline limits on numbers shall be decided by the local authorities in consultation with other stakeholders. An independent body or committee, with no vested interests in the operations, shall be designated to monitor the impact of various activities on the visitor experience as well as on the site, on an annual basis. If an adverse impact is noticed, the number of persons participating in the activity or the aspects of the activity seen to have an unacceptable adverse impact shall be modified as required. As a general rule, the following norms will be applied to decide the intensity of use of a site/activity:

    a) Entry of vehicles will be regulated through effective permissible carrying capacity of the zone. Entry of vehicles can be staggered to avoid clumping. Maximum speed limit of 20 km must be enforced strictly.

    b) Carrying capacity of short nature trails (up to 5 kms) should be one group per km of trail length. Group size should not be more than a family size (4-5 persons). Capacity of overnight trekking trails should be limited to the availability of lodging accommodation en route.

    c) Carrying capacity of hides/machans at water holes, safari trails or viewpoints should be one group of upto 4-5 persons per site. Second group should arrive only one the first has left.

d) Carrying capacity of a campsite should be limited to only 4 persons per toilet.
    a. These norms can be reviewed or revised on the basis of visitor or management feedback and impact on the site or the surroundings.

12. An Ecotourism Committee, consisting of representatives from all the JFM Committees, whose forest area is part of the Rukhad Ecotourism Forest, shall be constituted for consultation. All the ecotourism operations shall be explained to the committee members, who will explain the same to their parent JFM committees and shall obtain their approval. Any activity or programme about which the committee has any reservations or objections shall not be run, or shall be run only after acceptable modifications.

13. The revenue generated through the entry/activity fee etc. shall be shared between the MP Ecotourism Development Board/ Development fund of Pench Tiger Reserve and the local JFM Committees. Approval of the Government shall be approved to the sharing formula at the earliest, so that the communities can be convinced to lend support to this programme as early as possible.

14. **Ecotourism Guidelines:** Ecotourism Guidelines issued by the Chief Wildlife Warden MP for planning and implementing ecotourism in protected areas are attached herewith as Annexure-1. These guidelines are applicable to all areas, *mutatis mutandis* and should be used to guide the process of development of Rukhad Ecotourism.

15. **Management:** The Rukhad ecotourism programme will be run by Pench Tiger Reserve through a dedicated ecotourism manager and necessary support staff specially appointed for this purpose. The main emphasis shall be to burden the regular staff of the department as little as possible with ecotourism duties, so that forest patrolling is not adversely affected.

16. **Important Circulars:** The following circulars/letters issued by the PCCF MP and CEO MP Ecotourism Development Board should be used as reference materials for ecotourism operations outside Protected Areas:

- PCCF's no. 2011/PA/146, dated 8 June, 2012 (FCA does not bar ecotourism).

- PCCF's Circular no. 2012/223 dated 12 October, 2012 (Ecotourism Outside PAs).

- MPEDB/2012/3981 dated 8 November, 2012 (Procedures and rates for ecotourism outside PAs).

Para 14.4.2 in Approved TCP -

14.4.2 Khawasa safari zone (Wolf Trail): Khawasa buffer range is adjoining to Karmajhiri range of core area of Pench Tiger reserve. The ecotourism zone is near the main entry gate Turia. The area has scenic beauty along with good biodiversity of flora and fauna including Tigers. Wolf sighting is very common in this zone. A good road network is also present over there. Nature trails and safari routes are laid down there. There is big reservoir in the village Kohka which attract Bird watchers. Vehicle safari will be allowed with the assistance of trained members of Local SHG. Safari drive will be regulated through effective permissible carrying capacity of the area. There are 5-6 villages in and around this zone. This will provide additional livelihood options to these villagers. Management plans to introduce night patrolling along with tourists to a limited extent with all safety measures. About 25-30 km road length is available for vehicular patrolling. The forest patrolling will be allowed between 5 am to 10:30 pm along with forest staff and local community member as a guide. No searchlight is allowed during patrol. All guidelines for visitors will be same as in core area while safari, but they will be able to experience forest after sunset also in buffer zone. Wolf Trail is shown in Map No. 25.

Proposed Amended Para

14.4.2 Khawasa Safari Zone -

14.4.2.1 Wolf Trail: Khawasa buffer range is adjoining to Karmajhiri range of core area of Pench Tiger reserve. The ecotourism zone is near the main entry gate Turia. The area has scenic beauty along with good biodiversity of flora and fauna including Tigers. Wolf sighting is very common in this zone. A good road network is also present over there. Nature trails and safari routes are laid down there. There is big reservoir in the village Kohka which attract Bird watchers. Vehicle safari will be allowed with the assistance of trained members of Local SHG. Safari drive will be regulated through effective permissible carrying capacity of the area. There are 5-6 villages in and around this zone. This will provide additional livelihood options to these villagers. Management plans to introduce night patrolling along with tourists to a limited extent with all safety measures. About 25-30 km road length is available for vehicular patrolling. The forest patrolling will be allowed between 5 am to 10:30 pm along with forest staff and local community member as a guide. No searchlight is allowed during patrol. All guidelines for visitors will be same as in core area while safari, but they will be able to experience forest after sunset also in buffer zone. Wolf Trail is shown in Map No. 25.

14.4.2.2 Tiger Interpretation Area: In view of often recurring problem of abandoned, orphaned or problem tigers, part of the Khawasa Safari Zone may be used for the establishment of a tiger interpretation area. Where in area tigers will be kept and if suitable, be on display for the general public. This will solve a recurring problem that confronts the park management every time the management has to deal with area an abandoned orphaned or problem animal. It will also be good for the tourists as they will then have an option for a different wilderness experience with almost assured tiger sightings. For this purpose an area of about 500 hectares is proposed to be fenced off. The area is as shown in the Map below.

14.4.3 Kumbhapani Zone: This part of buffer area is located in Chhindwara district. The area is scenic and has potential for Bird watching, nature trails, machans etc. Limited activities can be promoted to give additional livelihood options to local JFMC members.

14.4.4 Other Places identified for Eco- tourism activities:

- **Siddhaghat- Bainganga** : Siddhaghat, a beautiful religious spot, is located 70kms away from Seoni, 1 km inwards Keolari- Mandla road on the bank of Bainganga River. Mashaanbarra – Sonkhar forest area is a beautiful and biodiversity rich area which can be covered from here. Rumaal Water reservoir and Banjari mata temple is also situated in the same area. Forest guest house facility is also available in Sonkhar. In this eco tourism area, 120 sq km forest area from Kanha- Pench corridor area of Keolari and Ugli ranges are included. Major activities will be Trekking, Camping, Cycling and Safari.
- **Amodagarh- Hirri**: Amodagarh is situated in the middle of dense forests, 10 km east from Chui, which is 30kms from Seoni Mandla road. Hirri River, which is situated below Amodagarh, presents an extremely beautiful scene to the tourists. This area famous as it has been mentioned as Mowgli land in Rudyard Kipling's "The Jungle Book". Forest areas from Kanhiwada and Barghat ranges of Pench- Kanha corridor will make part of this eco-tourism area. Major activities will be Trekking, Camping, Cycling and Safari.

Tiger Safari

- **Amangarh- Ambamai- Nanhikanhar:** This is a beautiful religious tourism spot with a perennial waterfall and a temple. This area also has basic tourist facility, making it convenient location for tourists. This eco tourism area is located near Seoni town, in Seoni and Amagarh forest ranges.

14.4.5 Community and Cultural Centre in the Forest Village of Karmajhari

14.4.5.1 Introduction

Karmajhari is a village situated in the northern tip of buffer zone of Pench Tiger Reserve, Madhya Pradesh. Initially this forest village was established so that ample labor can be made available for the ongoing forestry activities, but eventually with the establishment of the National Park and then Tiger Reserve declaration, the traditional forestry activities were stopped which led to the adverse impacts on the livelihoods of the villagers. The natural resources basically belong to the local communities as they have been the custodians of it from generations. So it becomes our moral obligation to provide them with better livelihood options as they are important stakeholders and their satisfaction is important in the process of sustained conservation.

The primary objective of a Tiger reserve is conservation of tigers, which sometimes get overlooked in handling the tourism pressure of the tourism zone and the purpose of conservations gets defeated. This concept of community and cultural centre takes away the excessive pressure of handling tourists from forest department and helps to safeguard the concept of sustainable tourism, benefitting community as well as department. On the other hand, large scale construction of luxury hotels and resorts in the buffer area near the Touria gate is providing huge inflow of money to the entrepreneurs, most of them non

locals. In order to protect environment, land, natural resources and interest of local people, the Park management is taking up lots of work and is employing the villagers in various activities of the park. A moral perspective argues that management by local people accompanied by devolved decision-making is more preferable since it can be more accountable and sustainable in the long-term. This concept of community and cultural centre is latest in this regard.

14.4.5.2 Demography of Karmajhari

Karmajhari is a forest village located near the karmajhari gate of Indra Priyadarshini Pench National Park. The village is located on RF 390. The major population of the village belongs to Gond tribe. The primary occupation of the people living over there is agriculture. The village faces serious challenges in terms of livelihood, education and development.

14.4.5.3 General Information

Name of the Village	Karmajhir
Panchayat	Paraaspani
Tehsil	Kurai
District	Seoni M.P.
Distance of TEhsil from Headquarter	47 Kms.
Distance between village and Park boundary	0.1 Km.

14.4.5.4 Formation of Eco development Committee

Eco development committee (EDC) for forest village Karmajhari was formed by the Eco development officer of Khawasa in June 1998. The plan for the ecologically sustainable development of village under official guidelines was prepared in this regard. Presently, the Secretary is Shri. Indramani Tiwari and the President of the EDC is Smt. Shantabai.

14.4.5.5 Formation of Self Help Group

Self help group (SHG) to run and maintain the community and cultural centre was formed on 06.04.2014 in Karmajhari village. It has 20 members along with Secretary Ku. Sulochana and President Smt. Sushila Bai.

14.4.5.6 Tribe and Culture

Around 85% of the residents of Karmajhari village are tribals and most of them belong to the Gond tribe. They have lived in these forests since generations and have mastered the skill of peaceful co-existence with the wildlife and forest. They work hard and celebrate life with many Gond festivals and dances. Their main occupation of agriculture has been depleted due to the abundance of wildlife in the area, hence creating livelihood challenges for them. Still they have adapted themselves in the conservation activities along with the department. They seem to be very conscious of hygiene and their villages are

very neat and well kept. As a result of state government's decision of participatory management of forests, a eco-development committee (EDC) has been set up at karmajhari to bring about welfare of their entire village by fostering, conserving and adding to the well-being of the local people.

14.4.5.7 Land Status and allocation

As per the application dated 26.01.2014, Eco Development Committee demanded 1000sqft/ 0.092 hectare of land for the construction of Community and Cultural Centre. The land was transferred to the EDC as per Letter no./DM/1254 dated 25.03.2014.The land was village common land and is in buffer zone. It was barren land and devoid of any tree. The total cost of the project is 1.5 crores.

14.4.5.8 Concept and Purpose

A responsible nature travel experience is one that contributes to the conservation of the ecosystem while respecting the integrity of host communities and wherever possible ensures that activities are complementary, or at least compatible with the existing resource usage pattern and supplements concept of sustainability.

The **concept** of developing a Community and Cultural Centre is to create a well-equipped centre at the cost of the Madhya Pradesh Eco Tourism Board and hand it over, free of cost to the Karmajhari EDC/ SHG, to run and maintain this centre. This centre will have provision for accommodation for tourists, local cultural activities, local food, and display of local art forms and will provide boost to the eco-tourism activities in the area. It should be run on the age old principle – 'OF the people, BY the people, FOR the people'. Once handed over, the EDC will assign responsibility to the village level SHG to run and maintain the centre. There will be a transparent mechanism of benefit sharing between SHG, EDC and MP Eco Tourism Board. SHG will take turns to cook, to clean, to serve, to sell, to perform and manage all activities required by the visiting tourists. This will give a sense of purpose and ownership to the villagers and the strong local experience to the tourists. This concept will also involve a lot of local villagers especially those who are not already engaged with the forest and will ensure that they are not diverted towards any unnecessary activities and their contribution towards protection of wildlife and conservation is further strengthened.

The **Purpose** of this Community centre is multifold as detailed below:-

1. To provide monetary assistance to the villagers through the earnings of the Eco Development Committees.
2. To provide cost effective and comfortable lodging and food facilities to the high number of tourists who come to Pench National Park through Karmajhari Gate. Presently there is not a single resort on this side of the park.

3. To make the forest department free from the burden of handling tourists in their guest houses and enable them to concentrate on their core responsibility of protection of wildlife and conservation.
4. To provide a respectable platform for performance of local cultural dances and other activities with added monetary gain through this.
5. To provide a secure outlet for display and sale of local arts and crafts with possibility of added monetary gain through this activity.
6. To educate and sensitize tourists on environmental and conservation front, creating interpretation and learning experience and also sensitizing villagers towards sustainable usage of their natural resources and cultural heritage.
7. Inculcating the sense of ownership in villagers towards wildlife and natural heritage leading to the attainment of goal of sustainable tourism in the area.
8. To create opportunity of ecotourism in nearby buffer forest areas.
9. To organize village level cultural and social activities in the centre, villages level meetings and social functions.
10. To organize village level trainings on various sectors like environmental awareness/education programmes for villagers and their school going children.
11. To organize village level health camps.

14.4.5.9 Proposed Infrastructure

It is proposed to provide the following:-

1	Reception
2	Administration cum Accounts Office
3	Souvenir Shop
4	Tourist bedrooms air-cooled, well-furnished with attached toilets Four rooms in phase 1 & Four more in Phase 2
5	House Keeping Store Rooms
6	TV Lounge
7	Fully equipped Kitchen
8	Kitchen Store and Wash Area
9	Dining Room – 14 seater
10	Common Toilets
11	Volunteers accommodation with attached toilets
12	Open air stage and seating in courtyard
13	Open air platform for observation of birds and wildlife
14	Fencing with Attractive Gate
15	Landscaping, Garden, Plantation of local species
16	Borewell, plumbing lines and Sprinkler System
17	Solar geysers and Solar lights
18	Generator
19	Lightening Conductor

14.4.5.10 Proposed Additional Activities

We propose that with the provision of this infrastructure, it will be possible to introduce additional activities which will be managed by EDC. All the activities that will be carried out will be developed on the principle of creating zero negative impact on the wildlife and natural resources of the area, also the guidelines of do's and don'ts will be supplemented by National Park . These additional activities can be-

- Nature Walk
- Organic Farming
- Bee Keeping
- Vermi composting,
- Camping
- Bird watching
- Herbal Gardens
- Small Adventure sports
- Cycling
- Hides/ Machaans
- Library etc.

Further, since a fairly large piece of land, which will be properly fenced and secure, it may be considered in Phase 2 to introduce a few tented accommodations also within the compound.

Also, eco-tourism in the buffer zones being promoted by the government can easily be organized and managed from this Centre. It will also help to maintain livelihoods even during the off season of National park.

14.4.5.11 Location and Tourism

This Community centre will be located 30 km from Suktara, a village on the National highway no. 7 of north south corridor connecting Nagpur and Jabalpur. It is 130 km from Nagpur and approximately 170 km from Jabalpur. Ever since the number of vehicles inside the park has been fixed, tourists are finding it difficult to get confirmed entries in the tourism zone of Pench Tiger Reserve. New avenues of community based ecotourism will be duly created in the buffer zone in the times to come. To achieve the objective of zero pressure on the core, this community and cultural centre at karmajhari will laid the objective and will improve the socio economic conditions of the villagers of karmajhari village thus aiding in the overall sustained conservation of nature and natural resources.

Summarizing the whole concept and purpose of this Community and cultural centre will welcome, involve and satisfy Visitors, achieve a profitable and prosperous Industry, engage and benefit host Communities and protect and enhance the local Environment. It will also become the centre for social and cultural activities in the village.

14.5 Buffer zone eco-tourism package:

The following facilities would be provided to the visitors in the buffer zone, as a part of the buffer zone eco-tourism package:

- **Nature Trail**

  9 nature trails have been designed near the Turia and Karmajhiri entry points and in Khawasa buffer range. Other nature trails are proposed in Rukhad-Sakata and Kumbhpani forest area of buffer. This trail would enable the visitors to feel the forest by trekking and closely observing the nature. A field brochure highlighting the interpretive points would be provided to the visitors. Eco friendly interpretation facilities will be developed on these trails.

Trails for walking

Following 09 Paths have been identified for the purpose of nature walking trails in the buffer zone

S.No.	Location (Path)	Distance (kms)	Important locations in between track
1	Turia gate-Kohka Talab	6.50	Baans nala, 36 no. camp, Panda jhod, Jhakodi line, Semal Barra, Kohka talab
2	Karmajhiri- Boundary line Karmajhiri	3.00	Teak Plantation, Ghursalghat
3	Karmajhiri-Runijhuni-Karmajhiri	3.00	Mowgli hut, Rooni Jhooni
4	Karmajhiri-Runijhuni	2.00	Rooni Jhooni ,Mowgli hut,Data choupan, Boundary line
5	Karmajhiri-Kummbhadev-Pench River	6.00	Botikassa nala,lahor khodi, Jamun nala camp, pench Nadi.
6	Khawasa-Neemtola-Turia road	6.50	Neemtola (Kohka), Eco talab, Mundia reeth (Khawasa Turia road)
7	Khawasa-Renga van-Kohka Talab	4.00	Renga van vikas nigam plantation (Turia road), kohka talab
8	Khawasa-Van vikas nigam plantation(Turia road)-Kothaar chauraha	8.50	Vanvikas nigam plantation (Turia road), Arjuni plantation, Manegaon nala, Kothar chauraha
9	Khawasa depot- Van vikas nigam plantation(Turia road)	6.70	Khawasa depot, Kothar chauraha, Vanvikas nigam plantation, Kohka depot

- **Hides/ Machaans**

  For wildlife sighting, following six places for machaan are identified and proposed in Rukhad

  1. Daldali Talab
  2. Sakata Tiraha (On Rukhad-Nayegaon village road)

  (Iron Machaans are established in places above.)

  3. Dudhia Talaab
  4. Kohka Talaab
  5. Pench River (Kumbhapani buffer)
  6. Hathidoh (Rukhad)

- **Camping Sites**

  1. Sakata (Near forest rest house)

  2. Rukhad (Near forest rest house)

- **Proposed Home stays as per the concept of village ways**

  1. Rukhad
  2. Naayegaon
  3. Sakata
  4. Karmajhiri

- **Boating**

  1. Dudhia Talaab
  2. Kohka Talaab

- **Cycling**

  1. Rukhad Forest

  2. Sakata Forest

  3. Kumbhapani Forest

  4. Khawasa Forest

- **Vehicular Excursions/ Safari Drives**

  A network of forest roads would be available to the tourists in Rukhad, Ari and Khawasa buffer forests for vehicular excursions with a route guide, as in the core. This has been identified in Rukhad, Kumbhpani, Khawasa and other adjoining suitable forest area.

- **Picnic Spots**

  Tikadi causeway on Pench River (1.5 Km. from Karmajhiri) and Pachdhar River on NH-7 between Kurai and Khawasa, Dudhia talaab and Kohka talaab would serve as ideal picnic spots for the tourists. Other picnic spots are there in Rukhad, Sakata, Khawasa and kumbhpani forests.

- **Ethnic Art/ Folk Dance/ Ethnic food**

  Talented beneficiaries would be provided loan for skill development and to foster talent, which would serve as added attractions to the visitors in the area, apart from generating income.

- **Nature Camps**

  Annual nature camp will be organized for the inhabitants of selected villages.

- **Nature Education Camps for Students**

  Annual nature education camps will be organized for the students of Khawasa, Seoni and Bichhua to convince and persuade them to conserve nature.

- **Experience of Tribal Cultural Heritage -**

  The unique cultural heritage of local indigenous tribal community will be experienced by providing an opportunity for tourists to attend the mela (fair), mandai (religious assembly) or other religious activities periodically organized by Gonds, the local community.

- Bird watching, hides, machaans, cycling, tenting, night patrolling with tourists with other activities with due safety, precautions and effective mitigative measures are also included in the buffer ecotourism packages.

14.6 Monitoring methodology

14.6.1 LAC

Regular monitoring will be done by District level Local Advisory Committee (LAC). A local Advisory Committee (hereinafter referred as LAC) has been constituted by Govt. of MP. as per Comprehensive Guidelines issued by NTCA

order F.No. 15-31/2012-NTCA dated 15th October 2012 for tiger conservation and tourism as provided under section 38(O) (1) (c) of the Wild Life (Protection) Act, 1972. It has been notified by the State Government.

The LAC has the following functions namely –

a) To review the tourism strategy with respect to the tiger reserve and make recommendation to the state government.

b) To ensure computation of reserve specific carrying capacity and its implementation through periodic review.

c) To ensure site specific norms on buildings and infrastructures in areas inside and close to tigers reserve, keeping in view the corridor value and ecological aesthetics;

d) To advice local self government and state government on issues relating to development of tourism in and around tiger reserve.

e) Monitor half yearly all tourist facilities in and around tiger reserve vis-à-vis environmental clearance, area of coverage, ownership, type of construction, number of employees etc. for suggesting mitigation and retrofitting measures in needed.

f) Monitor regularly activities of tour operators to ensure that they do not cause disturbance to animals, while taking visitors in to the tiger reserves;

g) To encourage tourism industry to augment employment opportunities for members of local communities.

Apart from it, yearly Environment Impact Assessment would be carried out by an external agency. If any violations of the rules and regulations are found in the area, action as per law will be taken.

14.6.2 Framework

For monitoring of impacts of ecotourism, a holistic framework needs to be prepared which can take care of all the categories of impacts. Broadly, these categories of impact can be identified:

1) Environmental impacts – on protected area and surrounding lands
   - Physical impacts
   - Biological impacts
2) Experiential or psychological impacts - on visitors
3) Economic impacts – on communities and protected area
4) Socio-cultural impacts – on communities
5) Managerial or infrastructural impacts – in protected areas and surrounding lands

The following steps are recommended for initiating and implementing an ecotourism impacts monitoring program.

A) Planning for Monitoring

1) Formation of a steering committee
2) Holding a community meeting

B) Developing a Monitoring Program

3) Identifying impacts and indicators to be monitored
4) Selecting methods of measurement
5) Identifying limits or ranges of acceptable change
6) Developing an operational monitoring plan

C) Conducting Monitoring and Applying Results

7) Training staff, managers and community representatives
8) Carrying out monitoring and examining data
9) Presenting monitoring results

D) Evaluating and Advancing Monitoring

10) Evaluating the monitoring program and conducting outreach

Monitoring responsibility might be divided up among various stakeholders in the following way:

- Environmental monitoring – protected area managers, rangers and guides
- Experiential monitoring – guides
- Economic monitoring – Protected area managers, ecotourism managers, and community representatives from LAC
- Socio-cultural monitoring – community representatives and others (possibly a sociologist or anthropologist)
- Managerial monitoring –Rangers and community representatives

14.6.3 Potential Ecotourism Monitoring Indicators (Sample indicators which must be reviewed)

Environmental

- Species of special tourism interest – numbers recorded per time or area, breeding sites
- Endangered species – numbers recorded per time or area, breeding sites
- Keystone species – numbers recorded per time or area, breeding sites
- Trail width - Vegetation trampled near trails and infrastructure
- Water quality

Experiential

- Number of other people or groups encountered on trails
- Number and size of vehicles in parking areas
- Degree of solitude experienced by visitors
- Number of repeat visitors
- Tourist ratings of guides
- Ratings of food and accommodations

Socio-cultural

- Quality of historical, cultural sites
- Knowledge of traditional uses of flora and fauna and rituals
- Changes in land use near protected areas
- Quality and quantity of consumption
- Changes in dress and language
- Use of free time
- Community attitudes about tourists and tourism

Economic

- Income levels of-Residents working directly in ecotourism, Residents providing ecotourism services indirectly, Residents not involved with ecotourism
- Amount of protected area budget spent on ecotourism-related management

- Revenue generated by ecotourism for protected area
- Amount of money spent on community improvements
- Changes in costs of local goods and services
- Rate of new construction in the area
- Population changes
- Number and volume of new businesses

Infrastructure (or managerial)

- Number and length of trails
- Amount of infrastructure development within protected area
- Amount of time spent in maintenance of infrastructure
- Lodging capacity in and around the protected area
- Degree of road maintenance required
- Methods of communication and transport

14.7 Concept Note on Attracting Private Investments for Rejuvenating Depleted and Open Forests and for conservation of wildlife and development of ecotourism

It is proposed that in the buffer zone of Pench Tiger Reserve, holistic projects for the conservation of wildlife, increasing forest area and benefitting local communities via eco-tourism, PPP models will be put in place. The concept note for the same is given below:

Background

Forests provide numerous goods and services that help maintain the earth's life-support systems. Besides providing an array of forest products, they conserve soil, mitigate floods and droughts, maintain the water cycle, enhance environmental quality, influence micro-climates, sequester carbon and are repository of biodiversity (a significant futuristic resource).

In India, forests also play a vital role in the sustenance of about 200 million people and 300 million cattle living around 31 million hectares of forests in 1,70,000 villages. There are many million more whose livelihoods are directly or indirectly linked with the forests.

Madhya Pradesh has the second largest geographical area and the largest forest area in the country. While forest area of Madhya Pradesh is 95,221 km^2, the forest cover of the State of Madhya Pradesh is 77,522 km^2, including 12289 km^2 forest cover outside notified forests (Forest Survey of India, 2013). The tree cover of 7087 km^2 is in

addition to the forest cover. The data in the following table depicts changes that have occurred in forest cover between 2011 and 2013.

Change in Forest Cover of States/UTs between 2011 and 2013 (Area in km^2)

State	Geo-graphical Area	2011 Assessment				2013 Assessment				Change			
		VDF	MDF	Open forest	Total	VDF	MDF	open forest	Total	VDF	MDF	OF	Total
MP	308,245	6,640	34,986	36,074	77,700	6,632	34,921	35,969	77,522	-8	-65	-105	-178

Source: (FSI Report 2013)

The data shows that total dense forest cover has reduced by 8 km^2 and the total forest cover has reduced by 178 km^2. The reasons for this change in forest cover in Madhya Pradesh are attributed to encroachment, mining and submergence of forest land under irrigation and hydroelectric projects. If we look at the long term trend, MP has been able to achieve stabilisation in total forest cover over the last decade and has even reversed the trend, if we off-set diversion of forest land for non-forestry purposes. However, huge areas of forest cover are under various stages of degradation.

The productivity of forests plays a very important role in poverty alleviation for the population that depends on forest produce for sustenance. Health of the forests on the other hand plays an important role in mitigating climate change, regular flow of water in rivers, life of dams and productivity of agriculture. Conservation and development of forests is thus crucial to achieving the objectives of sustainable development and flow of goods and ecological services. *Therefore, as a nation and state, we must address large tracts under degradation.*

What is causing this degradation?

One of the major reasons is that we were 345 million at the time of independence. Now our number is 3.5 times. The trend in MP is similar. In addition, poverty, though decreasing of late, has been high. The demands on forests for consumptive needs and on forest lands for development needs are immense and are increasing. There are umpteen numbers of studies that point out that there is widening gap in demand and supply of goods from the forests. *Unless the local demands are met, the qualitative degradation will not stop.*

Is there a ray of hope?

Countries like Japan and States like Kerala have high population densities but still have dense forests. The forest cover in Kerala is 44% and there is an additional 8% tree cover. Most of the local population is not dependent on forests for consumptive needs. So, there is a definitive ray of hope for MP and other similar states that in-spite of increasing population density, by adopting contextualised and holistic approach we can arrest and in due course reverse the trend of degradation. However, business as usual or doing more of the same may not be a feasible solution.

What can we do?

There are many things that we can do, such as: -

- Making our Joint Forest Management Committees more rational, empowered and competent in planning, using and monitoring forest resources in their areas
- Aggressively and pro-actively support agro-forestry and push for extension of tree cover to quickly enhance supply of forest goods to meet consumptive demands. Carry out legal and policy reforms to support this
- Attract private investments for afforestation of open, degraded and scrub forests and for wildlife management thereon. Section 2, sub-section (iii) of the Forest Conservation Act, 1980 needs to be amended

We do not have the time to try out the solutions one by one. We have to make all out efforts to try all possible solutions. However, this concept note will concentrate on option 3.

Why private investment in forestry sector?

A. Afforestation

- There are about 36 lakh hectares of notified open-forests in Madhya Pradesh. The task is enormous and would require huge financial resources.
- Neither the State of MP nor the MoEF&CC has the required resources in a reasonable time frame. Among other sources the options are limited - some of it may be mobilized from corporate sector under CSR but most of it has to be garnered from private enterprises in return of agreed benefits to them
- The cost of rejuvenating degraded forests is already very high. With every passing day the soils are getting eroded, thereby making the task of rejuvenation costlier and more difficult
- The opportunity cost of degraded forests is very high. The state and the nation can't afford to lose the potential benefits.
- The import of forestry goods is hovering at number 5 in the import list of India, pushing adverse trade balance and impacting exchange value of rupee
- Private investment will not only bring additional financial resources, but also technical know-how, business efficiency and managerial skills in reforestation

of highly depleted and tree less forest lands and rehabilitation of degraded forests

- The intervention in degraded lands and consequent enhanced supply will indirectly help in protection of existing good forest areas
- It will contribute considerably in realizing the so far elusive goal of forest cover
- It will enhance ecological services, open-up new opportunities for local employment and will provide raw material to forest based artisans and entrepreneurs

B. Wildlife Management

- Rejuvenation of degraded forests will not only improve the forest cover but will also create habitat and revive corridors for long ranging species like tiger and allow continuous distribution of other species, ensuring genetic continuity.
- The restoration of corridors may reduce man: animal conflicts
- It will provide sources of income and sustainable partnerships for forest dependent communities through development of ecotourism on rejuvenated forest lands
- Degraded forests offer excellent opportunity for development of grasslands and consequent management of wildlife. Wild herbivore in farmlands can be shifted in such areas, reducing man-animal conflict.
- Direct private investment in wildlife management in degraded forests creates strong incentives for conservation; provide sustainable employment for non-consumptive use of forests and throw-up new and exciting opportunities for tourism industry.

The Model

A. Afforestation

For afforestation, not much of detailing is required. The open, scrub and degraded forest areas can be opened up for investment in that priority.

There are three major stake-holders - local people, the government and the private entrepreneur/investor. The local people may be deriving fodder, other minor forest produce and some fuel-wood from that patch of open forest. The entrepreneur must

ensure that the level of collection of fodder and the NTFP is at-least maintained. About 10% or any such agreed part of forest land can be reserved for production of quick-growing fuel-wood and 100% supply of the same to local people. In the meanwhile alternate arrangement may be the responsibility of the investor. The Government should be happy that forest cover is getting enhanced and people's needs are being met. If needed, the Government may have to shell out money for deficit financing in the initial years. This may be capped to the level of present investment by the Government in that area.

The involvement of JFMCs is detailed for wildlife management. Same principal can be applied in case of afforestation projects.

B. Wildlife Management – People's Nature Reserve

Patches of 200 to 500 hectares or more of degraded/open forestland can be identified in remote areas for rejuvenation. The project area can include degraded forests that are away from critical movement corridors for wildlife and in certain situations even some contiguous private land of willing local people as well as degraded forest land under the administrative control of other government agencies. This project will be implemented in Community-Public-Private Partnership mode.

Efforts will be made to identify 2-5 hectares of non-forest land (revenue or privately owned) either contiguous or near the forest patch. In case of privately owned land of villagers the owner may be offered co-partnership in the project. While the forest land would be fenced with appropriate fence and treated to rejuvenate degraded woodland, the bare and highly degraded areas would be converted into grasslands and wetlands as habitats of different species of wild animals, birds, and other smaller life-forms. The wild animals if they are already present in that patch of forest would benefit from these interventions besides wild animals rescued from villages and cities or from agricultural fields may be released in such rejuvenated habitats.

About 10 to 20 percent of forests will be managed to meet the need of firewood and fodder for the JFMCs that have community rights under FRA over the forest land included in the project. The JFMCs who have community rights on the forest land included in the project will receive a part of the profits from the ecotourism on those lands under an agreement which would entail some reciprocal commitment from the JFMCs.

Private investors will be invited through open and transparent process to participate in the Forestland Rejuvenation-cum-Ecotourism project. The project will be run in CPPP mode comprising of – Community through local SHGs facilitated by the JFMCS and DFO, Government through its DFO, and Private Investor.

The task of rejuvenation of forests and creation of habitats and will be carried out by the DFO and he will administer the forest area. The private sector partner would finance fencing and rejuvenation work in the forest area and would hire wildlife ecologist, wildlife veterinarian and adequate number of qualified naturalist. The private sector partner would create tourist infrastructure and facilities on non-forest

land/ private land included in the project. The private partner would have exclusive right to bring in tourists and to own and manage tourist facilities.

Activities for Rejuvenation

Creating mosaic of woodlands, grasslands and wetlands to ensure appropriate juxtaposition and interspersion of habitats that would support a variety of wildlife from dragonflies to tigers.

Positives

i. Economically more viable, high chances of success and sustainability
ii. No legal hurdle in creating accommodation and other tourist facilities on Private and revenue land
iii. A refuge for rescued wild animals that cannot be rehabilitated in PAs
iv. Restocking of degraded forests and creation of habitat for wildlife
v. More freedom to cater to various recreational needs of tourists
vi. Chief Wildlife Warden has the legal powers to allow rehabilitation of rescued animal in any other suitable habitats
vii. As animals would be free ranging in natural habitat permission of CZA may not be necessary

Constraints

i. Would require commitment on the part of Private sector to provide adequate compensation to local people who have allowed the inclusion of their land for the project to tide over the gestation period.
ii. If translocation of Schedule-I species from other natural habitats is envisaged for restocking, this would require permission from MoEF&CC and /or NTCA.

Roles of partners

1. **Private Sector**
   a. Obtaining informed consent of Local villagers to participate in the project through a transparent process.
   b. Making detailed management plan for the identified area in consultation with Participating villagers, Gram Sabha, and concerned DFO and qualified ecologists.
   c. Explore visitor markets, and market the new tourist destination all over the world. Bring in Tourists.
   d. Manage accommodations and other facilities created for tourists, organize various visitor activities in the people's Nature reserve in collaboration with local partners and levy fees for their services
   e. Signing a tripartite agreement with partners including the mechanism for benefit sharing among partners and getting approval of the state government.
   f. Creating infrastructure and habitat restoration and habitat creation as per plan

g. Empowering local partners through skill trainings on visitor management, impact monitoring, accounting, catering and hospitality, interpretation and communication skills to villagers and staff involved.
h. Putting in place mechanisms for environmental safety, visitor safety and impact monitoring.
i. Obtaining necessary permissions/clearances under prevailing laws.
j. Appointing Ecologist, biologists and wildlife Vets to assess improvement in habitats, wild animal management and health care.
k. Marketing and advertisements
l. Ensuring Annual Audits, Tax payments
m. Conflict resolution among partner.

2. Territorial DFO

Facilitating the project, overseeing project implementation and Law enforcement. Conducting periodic assessment and evaluation of the project

3. Local Partners (village SHGs Facilitated by the DFO and JFMCs)

Managing visitor facilities and other infrastructure and implementing various tourism activities, hospitality and catering, interpretation centres. Maintaining accounts and ensuring benefit sharing with other partners as agreed. Suggesting improvements.

4. Role of Government

A. Allowing use of open forest land and other abutting land (if available) for People's Nature Reserves for creation of habitats and ecotourism infrastructure.
B. Make rules for visitor fees, taxes
C. Developing standards for building design and for the use local natural resources and developing rules to enforce it.
D. Vetting the mechanism developed for equitable benefit sharing among partners.
E. Monitoring and reviewing progress of the project.
F. Intervening in case of serious lapses
G. Resolution of disputes

Tourist Activities

1. Guided Vehicular excursions (wildlife watching)- For all categories and age class
2. Guided Nature treks - long treks for physically able tourists
3. Guided Nature treks with night camping in the forest- long treks for physically able tourists
4. Guided and self-guided Nature trails – for all age groups
5. Bird watching walks - for specialist tourists
6. Machan and hide experience- For all categories and age class
7. Film shows and thematic talks in the evenings at camp - For all categories and age class
8. Interpretation centre

Infrastructure

1. Securing the area with right kind of outer fencing
2. Developing varied habitats suitable for animals found locally
3. Landscaping and zoning
4. Creating suitable inner fences to separate zones if desirable
5. Suitably designed environment friendly accommodations merging with the landscape (no monstrosity should be constructed), cafeteria, interpretation centres and guided and self guided nature trails on forest, private and revenue lands included in the project.

Planning

1. Master plan - Conceptual document that would include zoning plan, standards, monitoring and evaluation, capacity building and benefit sharing mechanism, ecological and financial viability, marketing strategy.
2. Roads, buildings, Trails and treks, machans and hides management plan
3. Visitor residential accommodation and recreational area plan on no-forest land
4. Waste management plan.
5. Ground water use and recharge plan
6. Energy management plan
7. Staff development Capacity building plan
8. Interpretation and outreach plan
9. Habitat development and ecological monitoring plan.

Expected Outcomes

1. Rejuvenation of degraded forests
2. Creation of habitats for an array of wildlife species
3. Creation of suitable habitats for problematic species involved in man: animal conflicts.
4. Augment financial resources of the participating village
5. Create jobs and livelihood opportunities for local villagers
6. Higher financial returns to the private partner

Chapter - 15

ORGANIZATION, ADMINISTRATION AND BUDGET

15.1 Buffer Areas Coordination Committee and its Linkages with Tiger Steering Committee & Tiger Conservation Foundation

The buffer zone of a tiger reserve will not have the status of a national park or Sanctuary. However, as a "multiple use area", it may encompass conservation or community reserves, apart from revenue lands, private holdings, villages, towns and other production sectors as indicated above.

The role of Deputy Director (Buffer Zone) of a tiger reserve would be to carry out implementation of prescriptions of TCP (Forestry/Joint Forest Management /Eco development) in forest areas, while ensuring coordination with other sectors. Wildlife protection would be an overlapping mandate for the entire area.

To facilitate coordination and mainstreaming of wildlife concerns at the field as well as state level, the following Committees are suggested:

(a) **State level Monitoring Committee**

(i)	Chief Secretary of the State	Chairman
(ii)	Secretaries of related departments	Members
(iii)	Chief Wildlife Warden (assisted by the Field Director of tiger reserve)	Member Secretary

(b) **District level Coordination Committee for ensuring convergence of other sectors**

(i)	District Collector	Chairman
(ii)	CEO	Members
(iii)	Representative officials from: PWD, Social Welfare, Tribal Department, Health Department, Agriculture Department, Education Department, Power and\ Irrigation Departments	Members
(iv)	Representatives of various Government/ private production sectors	Members
(v)	Deputy Director of the Tiger Reserve/PA	Members Secretary

Tiger Conservation Foundation

The Wild Life (Protection) Amendment Act, 2006 (Section 38X provides for establishment of Tiger Conservation Foundation in each tiger reserve, to facilitate and

support management, apart from taking initiatives for involving people in conservation. The Foundation is a new institutional framework which can complement the tiger reserve management and liaison with various ecodevelopment committees and there confederations apart from production sectors in the landscape. The Foundation would act as a "non profit center" and as a "development agency" by increasing local participation. It can secure the tiger reserve from financial constraints by providing funding support through various sources: recycling of gate receipts, service charges, donations and the like. The Foundation, may undertake various activities related to mainstreaming of conservation: ecodevelopment, staff welfare, visitor regulation, field research, facilitating ecodevelopment committees for market excess, conducting capacity building programs, ecotourism and Joint Forest Management.

M.P Tiger Foundation conservation society has been registered under Madhya Pradesh Society Registration Act, 1973. Field Director, PTR is the executive director of the foundation for his jurisdiction. The foundation is in functional stage, receiving donation from various government and private agencies including national and international NGOs. The foundation is keeping its separate accounts.

15.2 Coordination with EDCs, Confederation and other Line Agencies/ Departments/ Production Sectors

Co-ordination with line agencies / departments are needed for :-

- Better protection - Police, revenue, railway authorities, Judiciary etc.
- Eco-development - Revenue, Rural development, Agriculture, health, Veterinary, Horticulture, Jila Panchayat, Women and child development, PHED, Education, Tribal welfare etc.
- Gaps in habitat development - Jila Panchayat, Rural development, Agriculture etc.
- Conflict resolution - Revenue, Police, Tribal welfare, Judiciary etc.

It is evident that co-ordination can be obtained in many ways and in many fields. Better co-ordination will not only ease pressure on limited resources of reserve management but will earn general goodwill among various sectors.

For co-ordination following measures could be adopted:-

- Regular meetings with line department.
- Co-ordinating with District Collector and CEO, ZP for organising special meetings with line departments.

- Knowing various schemes of line departments and identifying schemes suitable for the reserve area.
- Reserve tour of officials of line departments.
- Accreditation and highlighting achievements of other departments in reserve area.

These are few suggestive things, but in practice convergence could be achieved only through good interpersonal relationship with officials of line departments of various levels from district to village. Officer of reserve should interact with their respective counterparts in other departments.

15.3 Staff Deployment -

Administration and organisation of buffer zone can be divided functionally in two ways. (i) Protection and management of forest and wildlife. (ii) Execution of eco-development activities.

(i) Protection and management of forest and wildlife-

Division	**1. South Seoni (T)**				**2. South Chhindwara (T)**		**3. East Chhindwara (T)**
Range	1	2	3	4	1	2	1
	West Khawasa	Kurai	Rukhad	Ari	Bichhua	Kanhan	Chourai
Sub-Range	2	3	6	4	1	1	3
	Turia	Chandrapur	Badalpar	Ari	Pulpuldoh	Sonpur	Kumbhapani
	Khawasa	Kurai	Mohgaon	Gangerua			Meghdon
		Sakata	Nayegaon	Nahlesarra			Sankh
			Rukhad	Sarekha			
			Salhey				
			Vijaypani				
Total of Beats	**8**	**13**	**17**	11	**6**	**1**	**11**

(ii) Execution of eco-development activities-

Administration	**1**	**2**	**3**	**4**	**5**
Eco-development Officer	EDO Khawasa	EDO Kurai	EDO Rukhad	EDO Bichhua	EDO Gumtara

Administrative arrangement for Core and Buffer Zone

Division	Subdivision (HQ.)	Range	Core/ Buffer	Forest area (Ha.)	Rev. area (Ha.)	Total (Ha.)
Pench Core and Buffer Zone Division Seoni	Khawasa (Khawasa)	Karmajhiri	Core	14556.800	-	14556.800
		Ghatkohka	Buffer	5231.880	6270.350	11502.230
		Khwawa	Buffer	6286.950	5581.790	11868.740
	Total			**26075.630**	**11852.140**	**37927.770**
	Rukhad (Seoni)	Kurai	Core	11847.300	-	11847.300
		Rukhad	Buffer	11665.890	783.830	12449.720
		Ari	Buffer	13389.620	854.750	14244.370
	Total			**36902.810**	**1638.580**	**38541.390**
	Bichhua (Chhindwara)	Gumtara	Core	14728.900	-	14728.900
		Kumbhapani	Buffer	7774.977	9349.750	17124.727
		Khamarpani	Buffer	2656.968	6983.470	9640.438
	Total			**25160.845**	**16333.220**	**41494.065**
G. Total				**88139.285**	**29823.940**	**117963.225**

15.4 Buildings

In the buffer zone, there is shortage of infrastructure including buildings, vehicles etc. New buildings for housing range officers, frontline staff, range offices are immediately required. Existing and Proposed buildings have been annexed as **Annexure No. 37 (A, B)** and maps showing all existing building are shown in Map No. 26 to 31.

15.5 Fund Raising Strategies

The State Government and NTCA will be the main fund provider for forest and wildlife management, eco-development, research, protection, environmental education and other activities. The gate money deposited in vikas nidhi will be used for protection and management of Protected Area, Eco-tourism and development of host community. Fund may be raised from different donors through Tiger Foundation.

The State Govt. will help in establishment, other developmental activities and tourism. State Government will provide funds for forestry operations, infrastructure development, establishment etc prescribed yearly in the management plan. Additional funds for the prescribed activities will be generated through Finance Commission, MNREGA, CAMPA, Green India Mission, MPMFDFED, State Bamboo Mission and Central assistance programs of MOEF&CC, GOI. Plan assistance will come through state finance commission.

15.6 Schedule of Operations

All the operations in the PA will be completed as per the direction and scheduled prevailing in the department. The scheduling for some Operations are given below.

Table No. – 1

Operations	Months											
	Jan	Feb	Mar	April	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Protection												
Line cutting & burning												
Fire Protection												
Road Repairs												
Water conservation work												
Water supply by Hand pumps/ tankers												
Lantana uprooting												
Weed uprooting												
Biomass Substitution												
Creation of Pastureland												
Raising of Fuel wood Plantation												
Agricultural development												
Alternative income generate												
Bunding of Agricultural Field												
Up gradation of approach road												
Construction of water harvesting structure												
Habitat Improvement (Ground floor and under story)												

15.7 Activity Budget

Table No. –

S. No.	Funding agency	Scheme works	Activities /works
1.	Government of India	Centrally Sponsored Scheme (A) Development of National Park and Sanctuary.	1. Habitat improvement 2. Strengthening of protection Measures. 3. Creation of infrastructure For various purposes. 4. Eco-tourism and Interpretation facility. 5. Supplementation of prey Base. 6. Research monitoring and Documentation. 7. Publicity and extension. 8. Trainings
		(B) Eco-development	Eco-development works including the activities for biomass generation, fuel and fodder plantation, Pastureland development, Ravine reclamation and efforts related with employment generation.
2.	Govt. of India; NTCA	(A) Special Central Assistance. Fifty percent grant in the establishment and other regular maintenance works, (B) India Ecodevelopment Project as 100 % grant in (C) Recurrent costs for O&M (Operation and Maintenance)	(A) Routine maintenance works (B) Ecodevelopment works (C) Operation and maintenance works (D) Habitat Development (E) Infrastructure (F) Protection (G) Monitoring and Evaluation

3.	State Government Forest Department	P.C.C.F, Wildlife (Non-Plan) To meet out the expenditure for regular maintenance and Establishment cost including 50% state share recurring expenditure.	1. Maintenance of roads and buildings. 2. Demarcation 3. Fire protection 4. Maintenance of various Plantations. 5. Efforts for Soil and Moisture conservation including raising plantations of suitable species. 6. Petty construction and maintenance works
4.	State Govt. Forest department	• APCCF (Dev.) Plan • APCCF Non Plan • APCCF (Protec.) • APCCF (Production) • APCCF (Finance and Budget)	• Implementation of working plan • Non recurring expenditure • Establishment expenditure • Maintenance of existing infrastructure • Protection aspect of Forest and Wildlife. • Production aspect. • Roads, buildings, maintenance etc
5.	District Level (District Panchayat)	All schemes of the districts	• Individual beneficiary. • Community beneficiary. • Village development activities. • Forestry works including habitat development
6.	Agriculture Department and MP Land Development Department	Various schemes to provide subsidy to encourage installation of Bio gas plants.	Installation of bio- gas plant
7.	Special Funds	• Vikas Nidhi • Funds provided by NGOs and other agencies in Tiger foundation society.	Any specific activity proposed and sanctioned.

Security audit: A security audit i.e. systematic evaluation of a Reserve's confirmation to a set of established criteria is already in set procedures of Pench Tiger Reserve. NTCA assess Pench Tiger Reserves via its MEE (Management Effectiveness Evaluation) process, which happens to be global framework to evaluate the performance of protected area. There is a provision of audit by AGMP every year. There is a provision that all necessary security audits through independent agencies (third party) will be carried out at Pench as per the orders of Government of India.