GENERAL INTRODUCTION TO THE KANHA TIGER RESERVE

Among the first nine Tiger Reserves launched during 1973-74, Kanha forms part of an eco-region once renowned internationally for its rich floral and faunal attributes. Nestled essentially on the northern slopes of the Maikal hills of the Satpuras in Central Indian highlands, and falling administratively in the Mandla and Balaghat districts of Madhya Pradesh, the present Tiger Reserve and its surrounds were proud witnesses to an amazing era of conservation history. The Kanha landscape chronicles a glorious history of wildlife conservation, and is potentially rich in natural heritage. Besides a viable population of tigers and the only world population of the hard ground barasingha, a wide spectrum of plant and animal species considerably add to the significance of this landscape.

The State Govt. has been mandated to prepare Tiger Conservation Plans for Tiger Reserves, vide Section 38 V (3) and (4) of the Wildlife (Protection) Act, 1972 (as amended upto 2006), to ensure the proper management of the Tiger Reserve area.

As per the Wildlife (Protection) Act, 1972 (as amended upto 2006), Section-38 V (1) & (2), the provisions of Sub-Section (2) of Section-18, Sub-Section (2), (3), & (4) of Section-27, Sections-30, 32 & Clauses (b) & (c) of Section-33 of this Act shall, as far as may be, apply in relation to the Tiger Reserve as they apply in relation to a Sanctuary. Notifications pertaining to the Tiger Reserve are appended **(Appendix-1)**.

The Tiger Reserve is under the administrative control of a Field Director with his headquarters located at Mandla. The Tiger Reserve consists of the following conservation entities:

The Core Zone (Critical Tiger Habitat): The total area of the Core Zone is 917.43 sq. km. The Core Zone is actually part of the erstwhile Kanha National Park and notified as such by the MP State Govt. The entire Core Zone is a Reserved Forest with three sub-divisions and six forest ranges.

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The Buffer Zone (Multiple Use Area): The area of the Buffer Zone Division is 1134.31 sq. km., and it consists of forest land, revenue land and private holdings. Except for some of the eastern part, the Buffer almost completely surrounds the Core Zone. Administratively, there are two sub-divisions and five forest ranges in this zone.

The adjoining forested landscape of the Tiger Reserve falls within the territorial divisions of East & West Mandla, North Balaghat, Kawardha (Chattisgarh), and Mohgaon Project of Forest Development Corporation (Madhya Pradesh).

Administrative Control:

The Field Director of the Kanha Tiger Reserve is administratively overall in-charge of the Tiger Reserve. The zonation or division-wise set up of the Tiger Reserve is as under:

Zonation			
Zone	**Area (In sq. km.)**	**Status**	**Control**
Core Zone (Critical Tiger Habitat)	917.43	Core Zone	Kanha Tiger Reserve
National Park	22.57	National Park	Kanha Tiger Reserve
Buffer Zone	1134.31	Multiple use area	Kanha Tiger Reserve
Total Area of Tiger Reserve	**2074.31**		

Core Zone

Sl. No.	**Range**	**Area Description**				**Total Area (Ha.)**
		RF	**Orange Area (Suitable)**	**Orange Area (Unsuitable)**	**Revenue**	
Mandla District						
1	Kisli	13895.582	0.000	0.000	0.000	13895.582
2	Kanha	12166.834	0.000	0.000	0.000	12166.834
3	Sarhi	13988.180	0.000	0.000	0.000	13988.180
	Total:	**40050.596**	**0.000**	**0.000**	**0.000**	**40050.596**
Balaghat District						
4	Mukki	13022.507	0.000	0.000	0.000	13022.507
5	Bhaisanghat	16923.806	0.000	0.000	0.000	16923.806
6	Supkhar	21746.087	0.000	0.000	0.000	21746.087
	Total:	**51692.400**	**0.000**	**0.000**	**0.000**	**51692.400**
	G. Total:	**91742.996**	**0.000**	**0.000**	**0.000**	**91742.996**

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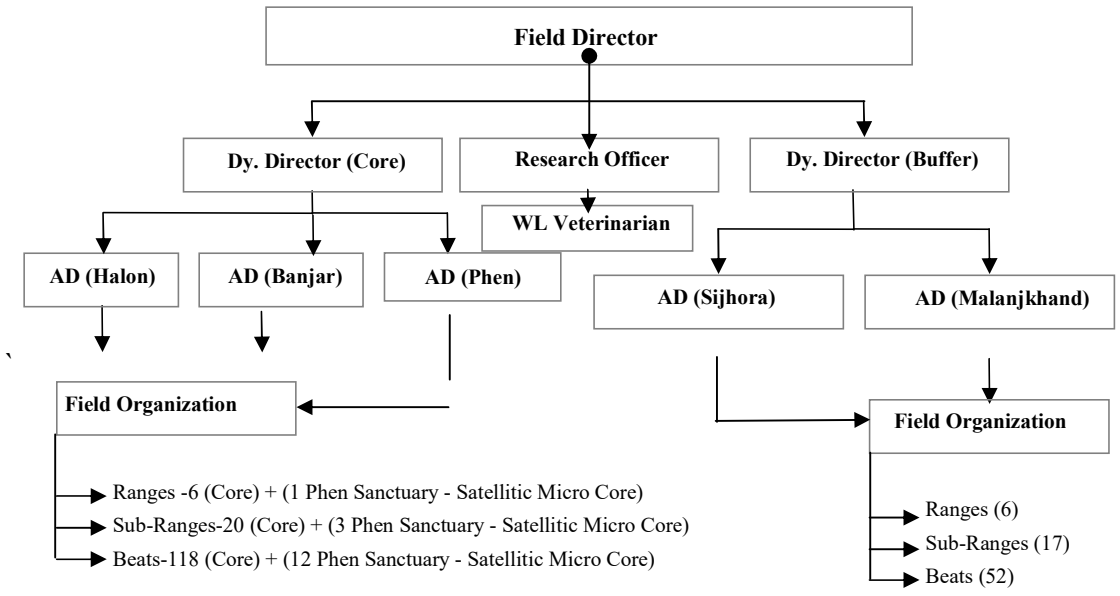
Buffer Zone

Sl. No.	Range	Area Description				Total Area (Ha.)
		RF	Orange Area (Suitable)	Orange Area (Unsuitable)	Revenue	
Mandla District						
1	Khatia	9485.060	272.600	257.920	3927.250	13942.830
2	Sijhora	6534.060	321.540	116.130	11601.020	18572.750
3	Motinala	14807.450	107.790	181.450	5220.320	20317.010
	Total:	**30826.570**	**701.930**	**555.500**	**20748.590**	**52832.590**
Balaghat District						
4	Khapa	6937.965	0.000	0.000	9973.030	16910.995
5	Garhi	15307.799	0.000	0.000	17528.180	32835.979
6	Samnapur	5484.126	0.000	0.000	5368.270	10852.396
	Total:	**27729.890**	**0.000**	**0.000**	**32869.480**	**60599.370**
	G. Total:	**58556.460**	**701.930**	**555.500**	**53618.070**	**113431.960**

Organizational Chart of Kanha Tiger Reserve



The Field Director is not a Drawing and Disbursing Officer (DDO), but has been entrusted with an overall supervisory role, vested with the administrative/ financial powers of a Chief Conservator/ Conservator of Forests. Both the Deputy Directors are DDOs for their respective divisions, with the usual financial and administrative powers as

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envisaged in the Forest Financial Rules/ Financial Code. The Research Officer is responsible for conducting wildlife research and monitoring activities and undertaking conservation planning in the Tiger Reserve, and coordinating and collaborating with outside agencies for the same. The Assistant Directors (AD) function as Sub Divisional Officers in their respective jurisdictions, with all the relevant administrative powers delegated by the forest department.

The Annual Plan of Operations (APO) of the Tiger Reserve is prepared by the Field Director in consultation with the officers and field staff of the Core and Buffer divisions and the same is submitted to the Principal Chief Conservator of Forests & Member Secretary, National Tiger Conservation Authority, New Delhi through the Principal Chief Conservator of Forests (Wildlife), Bhopal. Budgetary allocations are also provided to both the divisions by the Field Director, once sanction is received from the competent authority. The Deputy Director (Core) does not have a separate office, but functions as a DDO in the office of the Field Director. The office of the Deputy Director (Buffer), however, is a separate entity under the management of Kanha Tiger Reserve.

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THE BUFFER ZONE

PART-I

(CURRENT STATUS)

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CHAPTER – 1

INTRODUCTION TO THE BUFFER ZONE DIVISION

1.1 Name, Location, Constitution & Extent:

1.1.1 **Name, Location & Constitution:** This sub-plan of the Tiger Conservation Plan for the Kanha Tiger Reserve has been proposed for the Buffer Zone. The Conservation Plan will attempt to address this conservation entity as per the final notification of the Govt. of Madhya Pradesh.

The Buffer Zone is situated administratively in the Mandla and Balaghat districts of Madhya Pradesh, and geographically forms part of central Indian highlands.

The geographical coordinates of the Buffer Zone are as under:

Conservation Unit	Geographical Coordinates	
Buffer Zone	Latitude	22° 03' 06.8" to 22° 27' 51.2"
	Longitude	80° 25' 43.6" to 81° 07' 15.7"

Extent (Legal Status & Area Statement): The Buffer Zone falls into the Mandla and Balaghat districts at altitudes between around 450 and 940 m. The total area of the Buffer Zone, with the recent expansion into the Motinala range of the East Mandla Division, is 1134.32 sq. km. This has also been notified by the MP State Govt. vide No. F-15-11-2010-X(2) dated 05-10-2010. The status of Buffer Zone is not that of a National Park, and is a multiple use area with various land use patterns, including Reserved Forest, Revenue Land, Orange Area and Private Land. The Buffer Zone derives its legal sanctity from Section-38V (4) (Explanation-ii) of the Wildlife (Protection) Act, 1972 (as amended upto 2006).

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While the detailed compartment-wise area statement is appended **(Appendix-II)**, the sub-division and range-wise area statement of the Buffer Zone is as under:

Sub-Division (HQ)	Range (HQ)	Area (sq. km.)
Sijhora (Mandla)	Khatia (Khatia)	139.428
	Sijhora (Sijhora)	185.727
	Motinala (Motinala)	203.170
Malanjkhand (Baihar)	Khapa (Baihar)	169.109
	Garhi (Garhi)	328.359
	Samnapur (Malanjkhand)	108.523

The detailed existing status of forest area in the Buffer Zone is as under:

Range	Area Description (Ha.)						Total Area
	Reserved Forest		Orange Area (Suitable)		Orange Area (Unsuitable)	Revenue	
	Area	No. of Forest Blocks	Area	No. of Forest Blocks			
Mandla							
Khatia	9485.060	12	272.600	21	257.920	3927.250	13942.830
Sijhora	6534.060	20	321.540	23	116.130	11601.020	18572.750
Motinala	14807.450	9	107.790	14	181.450	5220.320	20317.010
Total:	**30826.570**	**41**	**701.930**	**58**	**555.500**	**20748.590**	**52832.590**
Balaghat							
Khapa	6937.965	28	0.000	-	0.000	9973.030	16910.995
Garhi	15307.799	31	0.000	-	0.000	17528.180	32835.979
Samnapur	5484.126	18	0.000	-	0.000	5368.270	10852.396
Total:	**27729.890**	**77**	**0.000**	**-**	**0.000**	**32869.480**	**60599.370**
G. Total:	**58556.460**	**118**	**701.930**	**58**	**555.500**	**53618.070**	**113431.960**

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1.1.2 Notification: Additions and alterations in the Buffer Zone over the years and its present constitution have been notified by the Govt. of Madhya Pradesh vide the following orders:

Sl. No.	MP Gazette Notification	Area (sq. km.)	Relevant Act	District	Total Area (sq. km.)
1	No. F-14-61-76-X(2) dated 26-02-1977	1004.91	WL (P) Act, 1972, Section-37 (1)	Mandla & Balaghat	1004.91
2	No. F-14-46-92-X(2) dated 11-01-1995	1004.91	WL (P) Act, 1972, Section-37 (1)	Mandla & Balaghat	1004.91
3	No. F-14-46-92-X(2) dated 04-07-1995 (subsequent corrigendum)	-	WL (P) Act, 1972, Section-37 (1)	Mandla & Balaghat	-
4	No. F-25/ 135/ 10/ 3/ 2000 dated 17-01-2001	974.00	WL (P) Act, 1972, Section-37 (1)	Mandla & Balaghat	974.00
5	No. F-15-11-2010-X(2) dated 05-10-2010	1134.31	Section-35 of WL (P) Act 1972 & Section-38V 4 (ii)	Mandla & Balaghat	1134.31

1.2 Approach & Access:

The approximate access and approaches to some of the range headquarter the Buffer Zone are as under:

By Surface

- Jabalpur-Mandla-Bichia-Sijhora-Motinala: 175 km.
- Raipur-Simga-Bemetara-Kawardha-Chilpi-Motinala: 190 km.
- Jabalpur-Mandla-Bichia-Sijhora: 160 km.
- Raipur-Simga-Bemetara-Kawardha-Chilpi-Sijhora: 205 km.
- Jabalpur-Mandla-Bichia-Sijhora-Rajo-Garhi: 210 km.
- Raipur-Simga-Bemetara-Kawardha-Chilpi-Sijhora-Rajo-Garhi: 235 km.
- Balaghat-Baihar-Mukki-Garhi: 95 km.
- Jabalpur-Mandla-Bamhni-Jaharmau-Khatia: 152 km.
- Raipur-Simga-Kawardha-Chilpi-Supkhar-Mukki-Baihar-Tatri-Khatia: 245 km.

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- Balaghat-Baihar-Malanjkhand: 85 km.
- Raipur-Dhamdha-Gandai-Narmada-Saletekri-Damoh-Malanjkhand: 190 km.

By Rail

- Convenient railheads are Jabalpur (Central Railway), Mandla (Mandla-Nainpur narrow gauge section of South Eastern Railway), and Nagpur (Central Railway Junction).

By Air

- Jabalpur (Madhya Pradesh), Raipur (Chhattisgarh) & Nagpur (Maharashtra) are operative civil airports.
- A permanent helipad exists at Khatia.

1.3 Physiography & Drainage:

Geographically, the Maikal range is the most important terrain feature in the Buffer Zone. It forms the watershed between rivers the Narmada and the Mahanadi. This hill-range continues to the west as the Garhi range, bifurcating the Narmada catchment between the Banjar, to the south-west and west, and the Halon, to east and the north-east. The Banjar enters the Balaghat district from the eastern part of the Rajnandgaon district of Chhatisgarh State. It flows on to the Mandla district through the Baihar plateau. The Halon river originates near Sanwahi and Badalpani villages, and flowing through the Garhi and Sijhora forest ranges, it joins the Budhner near Ghughri village. The elevation varies from 450 to 940 m. Motinala, Garhi, and to some extent the Sijhora range harbours highest elevated sites. The same forest ranges have slopes ranging from 23^{o} to 40^{o}. Lower elevations and slopes (0^{o} to 11.3^{o}) occur in the Khatia, Khapa and Samnapur ranges. Many spurs branch out to the north from the main Maikal and the Bhaisanghat ridges, and divide the headwaters of the Halon into a number of tributaries, viz. the Phen, Gourdhuni, Kashmiri and the Gondla.

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1.4 Climate:

The climate of the National Park is typically tropical monsoonal type. There are three distinct seasons, viz:

- **Winter:** November to February (with the night temperature dropping to -2°C sometimes during December and January).
- **Summer:** Late February to mid-June (the hottest period extends from May up to the first or even second week of June, with the day temperature sometimes soaring to 45°C).
- **Rains:** July to late September (August is the wettest month, and the average annual rainfall is around 1300 mm.).

The average meteorological data of five years (2006 to 2010) recorded in the Buffer Zone is as under:

Month	Temperature (o°)				Rainfall (mm.)
	Min.	Max.	Mean Min.	Mean Max.	
Jan.	0.0	34.0	4.5	25.5	16.60
Feb.	3.0	35.0	7.1	32.7	18.00
Mar.	9.0	36.0	12.5	34.5	24.76
Apr.	11.0	41.1	15.0	38.1	25.26
May	17.0	45.0	21.3	42.0	16.79
Jun.	17.0	30.0	21.7	39.5	206.74
Jul.	19.0	40.0	22.3	30.4	359.52
Aug.	18.0	41.0	21.5	32.0	321.61
Sep.	11.0	38.0	20.2	30.8	214.87
Oct.	10.5	37.4	16.7	33.8	52.48
Nov.	4.8	33.8	10. 6	30.5	33.40
Dec.	0.0	32.0	6.5	28.1	3.78

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1.5 Statement of Significance:

Ever since Kanha National Park was upgraded to a Tiger Reserve in 1973-74, its management was ensured on the guidelines of Project Tiger, Govt. of India. The concept of a Buffer Zone surrounding the Kanha National Park was realized by identifying potential forest areas of different territorial divisions contiguous to the existing Kanha National Park. In 1977, the Govt. of Madhya Pradesh notified an area of around 1005 sq. km., carved out of 4 forest divisions (West Mandla, North Balaghat, South Balaghat & Kawardha Divisions) of the undivided State of Madhya Pradesh. The identified areas of Buffer Zone, however, remained with the respective forest divisions for quite sometime, and were transferred to the unified control of the Kanha Tiger Reserve in 1995-96. Before the actual transfer of the area, it was being managed by the respective forest divisions under different Working Plans and silvicultural systems. After the reorganization of Madhya Pradesh in 2000 and the transfer of the Chilpi forest range to the Chhatisgarh State, the subsequent changed boundaries of the Buffer Zone were duly notified comprising forest land, revenue land and orange areas.

The Buffer Zone almost completely surrounds the Kanha National Park, except for the eastern part bordering the Chhatisgarh State. A typical geo-physiographical representative of the Central Indian Highlands, the Buffer Zone occupies the northern slopes of the main Maikal ridge in the Satpuras. It forms part of an eco-region once renowned for un-fragmented forest tracts and pristine wilderness areas in India. However, increasing biotic pressure over the years, including illicit felling and encroachment, have resulted in considerable shrinkages/ dwindling of forests now under the Buffer Zone. As compared to the Core Zone, it is a study in contrast. The lack of wildlife protection in the past has resulted in poaching, decimating herbivores, including the hard ground barasingha which was wiped out in the Supkhar range in the late 50s. Though the Buffer Zone harbours almost the similar composition of forests as the National Park, these forests are fragmented and to some extent degraded due to past biotic pressure.

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The Buffer Zone supports a small spill-over population of wildlife, including the chital *(Axis axis), s*ambar *(Cervus unicolor),* gaur *(Bos gaurus),* barking deer *(Muntiacus muntjack),* nilgai *(Boselaphus tragocamelus),* chousingha *(Tetracerus quadricornis),* wild dog (*Cuon alpinus)* and sloth bear (*Melursus ursinus)* etc. Transient tigers *(Panthera tigris tigris)* are reported in the Buffer Zone and they also kill livestock. Leopards *(Panthera pardus)* are common close to habitations and prey upon small sized animals and birds.

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CHAPTER – 2

THE FORESTS OF THE PLAN AREA

2.1 Introduction:

The total forest area of the Buffer Zone is 598.138 sq. km. of which the area of Reserved Forest is 585.564 sq. km., and that of the Orange Area is 12.574 sq. km. The entire forest area is spread over 330 compartments in 176 forest blocks.

2.2 Classification of Forests:

As per Champion & Seth (1968) the forests of the Buffer Zone have been classified into the following types:

1. Moist Peninsular Sal Forest: 3C/C2e
    a. Moist Peninsular High Level Sal Forest: 3C/C2e
    b. Moist Peninsular Low Level Sal Forest: 3C/C2e
    c. Moist Peninsular Valley Sal Forest: 3C/C2e/(iii)
2. Southern Dry Mixed Deciduous Forest: 3C/C3

2.2.1 **Moist Peninsular Sal Forest-3C/C2e:** The general distribution of sal depends on climate, and on the basis of geology and soil, local distributions occur. In this way, the main among climatic factors on which the distribution of sal forests depends is the rains. The rains vary from 1400 mm. to 1900 mm. with an average daily humidity of 60-70% throughout the year, and 45-60% in the month of March. The Saja (*Terminalia tomentosa*) is the main associate of sal, however, the bija (*Pterocarpus marsupium*) and lendia (*Lagerstroemia parviflora*) also occur with it. They occur in top canopy, while the jamun (*Syzygium cumini*) occurs in the middle canopy on alluvial soil. The Roli, mant and amura also occur in these forests.

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This type of forests has been divided into the following sub-types:

2.2.1.1 **Moist Peninsular High Level Sal Forest-3C/C2e:** These forest types occur in the Motinala, Garhi, Khapa and Samnapur forests ranges. The rocks are generally, Laterite with trap. The colour of soil is radish yellow, it is barren or with kanker. The forest crops are generally middle aged with a large number of mature trees. The density of forests varies between 0.6 to 0.8. Generally, growth is good, however, the quality of crop in the hilly tract is better.

2.2.1.2 **Moist Peninsular Low Level Sal Forest-3C/C2e:** These types of forests occur in patches, generally on the lower slopes of the hills. Miscellaneous forests occur in dry areas. Frost also occurs in these areas, and the site quality classes of sal are I, II, III and IVa. The percentage of sal is around 30-40%, with density between 0.6 and 0.8. These forest types are generally found in the Motinala, Garhi, Khapa and Samnapur forest ranges. In the upper canopy, the main associates of sal (*Shorea robusta*) are saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), dhawda (*Anogeissus latifolia*), gunja (*Lannea coromandelica*) and padar (*Stereospermum chelonoides*), while in the middle canopy, it is aonla (*Emblica officinalis*).

2.2.1.3 **Moist Peninsular Valley Sal Forest-3C/C2e/(iii):** These types of forests occur in moist valleys with deep soil and along the nullahs. Pure sal mainly occurs in alluvial soil. There are quality classes I and II in these forests, with density between 0.6 and 0.8. Regeneration varies from adequate to plentiful, and the forest crop is generally young. These forest types occur in the Motinala, Garhi, Khapa and Samnapur forest ranges. The following vegetation is found in these forests:

- **Top Canopy:** Sal (*Shorea robusta*), saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), safed siras (*Albizzia procera*), jamun (*Syzygium cumini*), dhawda (*Anogeissus latifolia*), semal (*Bombax malabaricum*), haldu (*Adina cordifolia*) and mahua (*Madhuca indica*)

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- **Lower Canopy:** Tinsa (*Ougeinia oojenensis*), kumbhi (*Careya arborea*), tendu (*Diospyros melanoxylon*), achar (*Buchanania latifolia*), aonla (*Emblica officinalis*), gunja (*Lannea coromandelica*), lendia (*Lagerstroemia parviflora*), ghont (*Zizyphus xylopyra*), harra (*Terminalia chebula*), khair (*Acacia catechu*) and bans (*Dendrocalamus strictus*).
- **Shrubs:** Surteli (*Woodfordia fruticosa*), chhind (*Phoenix acaulis*) and karonda (*Carissa opaca*).
- **Grass:** Bhurbusi (*Eragrostis unioloides*), lampa (*Heteropogon contortus*), khas (*Vetiveria zizanioides*) and bhond (*Themeda arundinacea*).
- **Climbers:** Mahul (*Bauhinia vahlii*), ramdatun (*Smilax zeylancia*) and dudhi (*Wrightia tomentosa*).

2.2.1.4 **Southern Dry Mixed Deciduous Forest-3C/C3:** These forest types are spread all over the Buffer Zone. They generally occur on kankar soil which is made of quartzite and calcareous rocks. The soil is either excessive dry or moist, and is not suitable for the establishment of sal. Such miscellaneous forests occur here. In the Khatia and Sijhora forest ranges, these forests are mainly of middle to mature age. The natural regeneration of saja (*Terminalia tomentosa*), dhawa (*Anogeissus latifolia*), lendia (*Lagerstroemia parviflora*) and aonla (*Emblica officinalis*) also occur with coppice shoots. Generally, the trees of site quality classes III and IVa are found here, with density between 0.5 and 0.7.

The vegetation structure of this forest type at different levels is as under:

- **Top Canopy:** Saja (*Terminalia tomentosa*), dhawda (*Anogeissus latifolia*), arjun (*Terminalia arjuna*), aam (*Mangifera indica*), padar (*Stereospermum chelonoides*), kekad (*Garuga pinnata*), bija (*Pterocarpus marsupium*), dhamin (*Grewia tiliaefolia*), kasai (*Bridelia retusa*), dhoban (*Dalbergia paniculata*), jamun (*Syzygium cumini*), semal (*Bombax malabaricum*), haldu (*Adina cordifolia*), mahua (*Madhuca indica*), khamer (*Gmelina arborea*) and gular

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(*Ficus racemosa*) occur in moist areas. In dry areas, salai (*Boswellia serrata*) and kullu (*Sterculia urens*) are found.

- **Lower Canopy:** Tinsa (*Ougeinia oojenensis*), khair (*Acacia catechu*), palas (*Butea monosperma*), aonla (*Emblica officinalis*), achar (*Buchanania lanzan*), shisham (*Dalbergia latifolia*), kari (*Saccopetalum tomentosum*), amaltas (Cassia fistula), kachnar (*Bauhinia retusa*), kumbhi (*Careya arborea*), ber (*Zizyphus mauritiana*), bel (*Aegle marmelos*) and bans (*Dendrocalamus strictus*).
- **Shrubs:** Mohti (*Lannea coromandelica*), chhind (*Phoenix acaulis*), dundhi (*Holarrhena antidysenterica*) and gursukhri (*Grewia hirsuta*).
- **Herb:** Chipti (*Desmodium pulchellum*), chhind (*Phoenix acaulis*), chakoda (*Cassia tora*).
- **Grass:** Bhurbusi (*Eragrostis unioloides*), sabai (*Eulaliopsis binata*)
- **Climbers:** Mahul (*Bauhinia vahlii*) and ramdatun (*Smilax zeylancia*).

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CHAPTER – 3

STATUS OF TIGERS, CO-PREDATORS & PREY BASE

3.1 Introduction:

The Buffer Zone supports low populations of various ungulate species. Besides, due to biotic pressure and fragmented forests, there is no resident population of tigers. Co-predators, chiefly leopards, however, operate in the forest and close to habitations. The movements of transient tigers are specially noticed when the cattle of villages are killed by them. These low populations of predators and prey in the Buffer Zone also build a natural predator-prey relationship.

3.2 Distribution:

The prey base of various species is sparsely distributed over some areas of the Buffer Zone. These are mostly spill-over populations, which are generally restricted to the wildlife habitats contiguous to the boundary of the Core Zone. The Khatia range borders the Kisli range of the Core Zone and its several compartments support most of the population of chital. Though chital mostly occur in medium to large herds in the national park, and become spatially conspicuous by there large herds size in the rains, the average herd size in the Buffer Zone is small due to their low population. The presence and movements of the prey species spatially close to the Core Zone boundary has a bearing on distribution of transient predators in the Buffer Zone.

3.3 Abundance Status:

Though the new methodology of wildlife estimation has replaced the old one, the Tiger Reserve does conduct in-house wildlife estimation of ungulates by traditional block counting method. As the results of the All India Wildlife Estimation, 2010 will not be available before July, 2011 (in the Kanha landscape, the 2010 estimation exercise was

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repeated in April, 2011 for corrections), the results of the in-house wildlife estimation of 2010 have been considered for the discussion. The wildlife estimates are as under:

Animal Species	**Khatia**	**Sijhora**	**Garhi**	**Khapa**	**Samnapur**	**Total**
Chital (*Cervus axis*)	517	39	55	99	20	**730**
Sambar (*Cervus unicolor*)	11	12	4	17	-	**44**
Barking deer (*Muntiacus muntjak*)		17	13	14	6	**50**
Barasingha (*Cervus duvauceli branderi*)	-	-	-	-	-	**-**
Blue bull (*Boselaphus tragocamelus*)	16	-	-	4	-	**20**
Chousingha (*Tetracerus quadricornis*)	-	-	-	-	-	**-**
Gaur / Indian Bison (*Bos gaurus*)	2	-	-	27	7	**36**
Langur (*Presbytis entellus*)	486	149	312	202	292	**1441**
Wild pig (*Sus scrofa*)	127	73	71	86	60	**417**
Sloth bear (*Melursus ursinus*)	-	-	1	1	-	**2**
Indian wild dog (*Cuon alpinus*)	-	-	-	6	-	**6**
Jackal (*Canis aureus*)	-	12	9	15	10	**46**

3.3.1 **Monitoring of Signs/ Evidence:** As per the instructions and proforma guidelines received from the Principal Chief Conservator of Forests (Wildlife), Madhya Pradesh, the Buffer Management has been compiling and collating the data on the signs and evidences of various carnivore and herbivore species from patrolling camp registers to understand the trends of wildlife populations. The trends of the past five years are as under:

Year	**Total Signs Seen**		**Directly Seen Adults**		**Directly Seen Cubs**	
	Tiger	**Leopard**	**Tiger**	**Leopard**	**Tiger**	**Leopard**
2006	218	98	4	8	-	-
2007	300	146	6	7	-	-
2008	264	125	7	12	-	-
2009	192	216	6	14	-	-
2010	237	273	12	15	-	-

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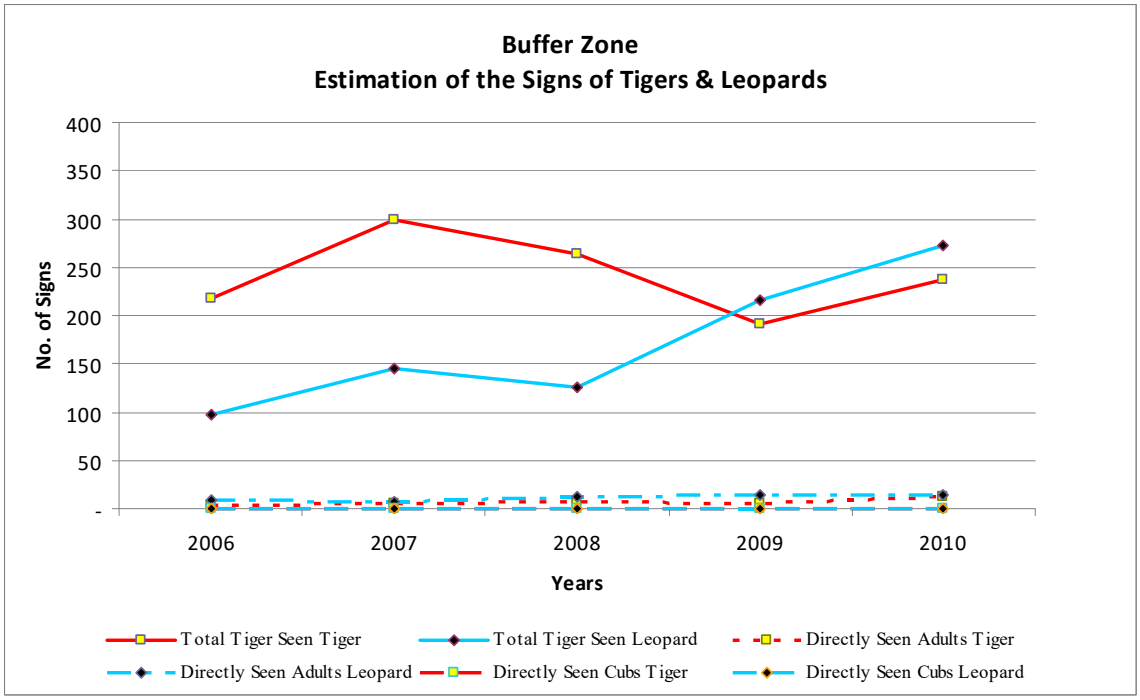

Year	Chital	Sambar	Barking Deer	Nilgai	Chinkara	Chousingha	Gaur	Wild Pig
2006	107.059	3.794	20.373	0.016	-	-	21.213	236.051
2007	218.128	23.517	33.043	0.023	-	-	10.045	440.704
2008	142.954	5.498	54.100	4.035	-	-	0.014	109.532
2009	125.04	3.820	17.860	1.040	-	-	9.640	132.620
2010	123.98	4.070	32.510	1.160	-	-	22.110	223.740

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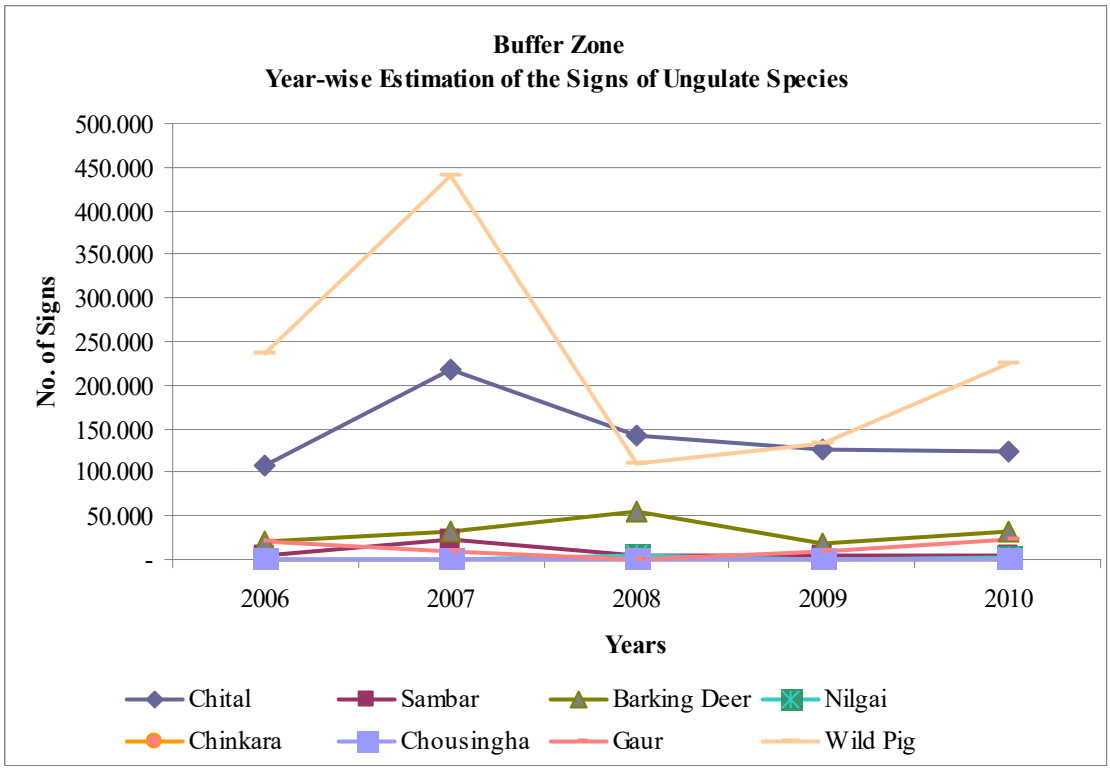

3.4 Prey-Predator Relationships:

Due to small populations of predator and prey species in the Buffer Zone, the clarity of predator-prey relationship is somewhat difficult to observe unlike in the Core Zone that supports huge populations. Transient tigers record their brief movements from time to time in the Buffer Zone and kill domestic cattle. The presence of leopards, however, is more frequently reported along the core-buffer boundary and close to human habitations. The details of cattle killed and human deaths, and compensation paid etc. in the past years are as under:

Year	Total No. of Cattle Killed	Compensation (Rs.)	No. of Human Injury	Compensation (Rs.)	No. of Human Death	Compensation (Rs.)
2000-01	683	941458.000	19	79434.000	1	20000.000
2001-02	336	637709.000	20	63250.000	-	-
2002-03	549	6811522.000	14	56134.000	1	52639.000
2003-04	498	593235.000	16	41368.000	-	-

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2004-05	529	714665.000	21	144792.000	2	104350.000
2005-06	303	358731.000	21	123748.000	-	-
2006-07	264	356350.000	9	50625.000	-	-
2007-08	283	594800.000	11	64845.000	-	-
2008-09	431	1215600.000	17	49495.000	-	-
2009-10	351	1392950.000	7	15130.000	2	200000.000

Other lesser predators such as foxes and jackals prey upon small herbivores, rodents and birds.

3.5 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

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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%.

Prey Biomass (For the Buffer Zone)

Animal Species	**Number**	**Assumed Body Weight (Panwar, 1990)**	**Biomass**
Gaur	36	300	10800
Sambar	44	150	6600
Barking Deer	50	20	1000
Chital	730	50	36500
Langur	1441	12.5	18012.5
Wild Pig	417	80	33360
Nilgai	20	100	2000
Total:			**108272.5**

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Prey Biomass (Range-wise)

Range: Khatia

Sl. No.	Species	Assumed Body Weight of Average Prey Size (Kg.)	Conversion Factor (As equivalent of average prey size) (Kg.)	Estimated Number	Total Biomass (Kg.)	Biomass (Kg./Sq. Km.)	Converted Spotted Deer Equivalent (chital units)
1	Chital	50	1	517	25850	158.07	517
2	Sambar	150	3	11	1650	10.09	33
3	Barking Deer	20	0.4	0	0	0.00	0
5	Nilgai	100	2	16	1600	9.78	32
7	Gaur	300	6	2	600	3.67	12
8	Wild Pig	80	1.6	127	10160	62.13	203.2
9	Langur	12.5	0.25	486	6075	37.15	121.5
	Total:				**45935**	**280.88**	**918.7**

Prey Biomass (Range-wise)

Range: Sijhora

Sl. No.	Species	Assumed Body Weight of Average Prey Size (Kg.)	Conversion Factor (As equivalent of average prey size) (Kg.)	Estimated Number	Total Biomass (Kg.)	Biomass (Kg./Sq. Km.)	Converted Spotted Deer Equivalent (chital units)
1	Chital	50	1	39	1950	7.51	39
2	Sambar	150	3	12	1800	6.93	36
3	Barking Deer	20	0.4	17	340	1.31	6.8
5	Nilgai	100	2	0	0	0.00	0
7	Gaur	300	6	0	0	0.00	0
8	Wild Pig	80	1.6	73	5840	22.49	116.8
9	Langur	12.5	0.25	149	1862.5	7.17	37.25
	Total:				**11793**	**45.42**	**235.85**

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Range: Garhi

Sl. No.	Species	Assumed Body Weight of Average Prey Size (Kg.)	Conversion Factor (As equivalent of average prey size) (Kg.)	Estimated Number	Total Biomass (Kg.)	Biomass (Kg./Sq. Km.)	Converted Spotted Deer Equivalent (chital units)
1	Chital	50	1	55	2750	8.85	55
2	Sambar	150	3	4	600	1.93	12
3	Barking Deer	20	0.4	13	260	0.84	5.2
5	Nilgai	100	2	0	0	0.00	0
7	Gaur	300	6	0	0	0.00	0
8	Wild Pig	80	1.6	71	5680	18.27	113.6
9	Langur	12.5	0.25	312	3900	12.54	78
	Total:				**13190**	**42.42**	**263.8**

Range: Khapa

Sl. No.	Species	Assumed Body Weight of Average Prey Size (Kg.)	Conversion Factor (As equivalent of average prey size) (Kg.)	Estimated Number	Total Biomass (Kg.)	Biomass (Kg./Sq. Km.)	Converted Spotted Deer Equivalent (chital units)
1	Chital	50	1	99	4950	29.27	99
2	Sambar	150	3	17	2550	15.08	51
3	Barking Deer	20	0.4	14	280	1.66	5.6
5	Nilgai	100	2	4	400	2.37	8
7	Gaur	300	6	27	8100	47.90	162
8	Wild Pig	80	1.6	86	6880	40.68	137.6
9	Langur	12.5	0.25	202	2525	14.93	50.5
	Total:				**25685**	**151.88**	**513.7**

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Range: Samnapur

Sl. No.	Species	Assumed Body Weight of Average Prey Size (Kg.)	Conversion Factor (As equivalent of average prey size) (Kg.)	Estimated Number	Total Biomass (Kg.)	Biomass (Kg./Sq. Km.)	Converted Spotted Deer Equivalent (chital units)
1	Chital	50	1	20	1000	9.39	20
2	Sambar	150	3	0	0	0.00	0
3	Barking Deer	20	0.4	6	120	1.13	2.4
5	Nilgai	100	2	0	0	0.00	0
7	Gaur	300	6	7	2100	19.72	42
8	Wild Pig	80	1.6	60	4800	45.07	96
9	Langur	12.5	0.25	292	3650	34.27	73
	Total:				**11670**	**109.57**	**233.4**

3.6 Assessment of Threats:

Ever since the Buffer Zone has been taken over by the Kanha Management, confidences building measures and ecodevelopment programmes have oriented the local communities for support to wildlife conservation to a large extent. While so far no instances of commercial or organized wildlife crime has been detected, sporadic poaching of wildlife does occur in Buffer Zone. Threats to wildlife in the Buffer Zone are as under:

- Electrocution of tigers and other wild animals by high voltage electric lines running across the Buffer Zone.
- Poisoning of cattle kills by aggrieved and distressed villagers.
- Poisoning of waterholes, specially in the pinch period.
- Gin-trapping of tigers by experienced offenders.
- Snaring of wild animals.
- Killing by bows and poisoned arrows.
- Illicit catching of birds, specially parakeets and owls etc.
- Illicit grazing by village cattle on the periphery.

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CHAPTER – 4

HISTORY OF PAST MANAGEMENT & PRESENT PRACTICES

4.1 Geographic Region:

The Buffer Zone is part of an eco-region of the central Indian highlands, one of the seven geographic regions of India. The eco-region was once renowned for its forest and wildlife wealth. Situated on the 22nd parallel of north latitude and between the 76th and 82nd of east longitude, the central Indian highlands, part of the extensive tableland that forms the main peninsula of our country, are extensive undulating plains, with many peaks, hill ranges and flat-topped hills, with the Vindhyas in the north and the Satpuras in the south, sprawling around 500 km. across the state of Madhya Pradesh and Chhattisgarh. In the east, these mountain chains join the Chota Nagpur Plateau of Bihar and other hill chains in Orissa and Andhra Pradesh, and extend well into the States of Gujarat and Maharastra in the west. This geographical sub-region once held extensive, though fragmented, forest belt and accounted for a significant part of the total forests and wildlife habitats in India. Though the sub-region is now under characteristic biotic pressure, it still supports typical floral and faunal species of the region. The highlands also hold the sources of several of the important Indian rivers of the country.

4.1.1 **The Maikal Range & the Satpuras:** The Maikal, a mountain range in Madhya Pradesh, Central India, running in a north-south direction, forms the eastern base of the triangular Satpura range. This mountain range harbors Laterite-capped, flat-topped plateaus with elevations ranging from 2,000 feet (600 m) to 3,000 feet (900 m). The Satpura-Maikal watershed is considered the second largest in India. The Narmada, Sone, Mahanadi, Tapti, Pandu, Kanhar, Rihand, Bijul, Gopad, and Banas rivers run almost parallel from south to north, and have carved extensive basins in the relatively soft rock formations of the Maikal range. The vegetation varies greatly from grass and thorny trees to deciduous trees such as the teak and sal. Agriculture, the principal economic activity, is practiced mostly in the alluvial

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basins. The crops include rice, wheat, gram (chickpea), jowar (sorghum), barley, corn (maize), pulse (legumes), sesame seeds, and mustard seeds. Mineral deposits include coal, limestone, bauxite, corundum, dolomite, marble, slate, and sandstone. Ethnographically important, the Maikal also holds many groups such as the Gonds, Halbas, Bharais, Baigas, and Korkus.

4.1.2 **Ethnographical Attributes:** The region is also rich ethnographically, being the land of Octhonous people. Heavily dependent upon the forest resources, with a touch of aboriginality, they command a strong bearing on natural ecosystems. The following principal tribal groups are found in the region:

4.1.2.1 **The Gonds:** The Gondwana, or the "land of the Gonds", a part of the geologically significant region in Central India covering Kanha Tiger Reserve, comprises parts of old Madhya Pradesh, Andhra Pradesh, and Maharastra states. The present Gondwana tract is basically named after the inhabitants of the principal ethnic tribe Gond. Anthropologically, these Gonds are Proto-Australoid, having a supposed racial affinity with the aborigines of Australia, and belonging to the Dravidian stock of Asian origin.

The Gond was the most significant group of original Indian tribes. In the 1500's, several Gond dynasties were firmly incorporated by the Gond rajas, or kings. They ruled like Hindu princes until Muslim armies conquered them in 1592. In the 1700's, the Gond lost all power to the Maratha kings who forced their culture to make them retreat to the hills.

The majority speaks various and, in part, mutually unintelligible dialects of the Gondi, an unwritten language of the Dravidian family. Some Gonds have lost their own language and speak Hindi, Marathi, or Telugu, depending on the linguistic dominance in their respective areas. Previously, a considerably large part of settlements were temporary, and the Gonds practiced shifting cultivation. A significant percentage of the Gonds are Hindus, worshipping hundreds of gods

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and goddesses. The remaining are animists. The Animist Gond believe that the wood is the dwelling place of the gods, village deities and hereditary spirits. They habitually pray to the ancestral spirits for guardianship and blessings. The staple foods of the Gonds are the two millets known as *Kodo* or *Kutk*i. Rice is their ceremonial feast, which they prefer eating during the time of festivals. Most of the Gonds are meat consumers.

The Gond villages are intended to be communal, territorial units. A chief heads the tribe, and a committee of elders guides each village. The chief is regarded as the judge of all tribal disputes, while the elders have legal authority over their villages. The Gond kinship is patriarchal and line of descent is traced patrilineally. The tribe is divided into clans, each of which stands for the offspring of a common male ancestor. The Gond does not marry within its own clan and cross-cousin marriages are preferred. Multiple spouses are also common. A strong lineal connection exists between all members of the tribe. Equality and brotherhood are the main principles of the tribe. They live by farming, hunting, and eating the fruits of the grove, but they also trade and sell cattle. Others are daily wagers.

4.1.2.2 **The Baigas:** Another ethnic group of the same stock, living around the Tiger Reserve is the Baigas who have been transfused with the material culture of Hindu settlers over the last few centuries but they still remain a very primitive tribe with animistic religion, magic and traditions, and prolific jungle lore. As the Baigas are amongst the oldest inhabitants of India, their origin and affinities are very obscure, but it is believed that they have similarities with the peoples of Northeast India/ Burma and Southeast Asia. They are forest dwellers and skilled woodsmen. The Baigas are the most primitive and interesting forest tribal of the region, but they have completely lost their language, if they ever had one.

Generally, the Baigas take to the *bewar,* form of cultivation that consists of 2 to 3 acres of dense forests chosen usually on a very steep slope. The owner Baiga cuts

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down the entire standing forest crop and burns it in the high summer. Later, in the rains, this ash scattered field is sown with the seeds of marginal crops such as *kodon, Kutki, Baiganitur* or sweet potatoes. In case, the rains are good in subsequently years, the field will provide excellent crops until the fourth or fifth year. After this the owner will abandon the field for a new one. Though the Baigas believe that the forest grows denser after the abandonment of a *bewar*, much damage is inflicted on the existing forests.

4.1.3 **Brief History:** The Kanha eco-region, which includes the present Buffer Zone and its contiguous large forest tracts of the various territorial divisions, prides on a conservation history of almost one hundred years. There is an enormous body of writings - diaries, memoirs, and books etc. - authored by Indian and British wildlife conservationists, and forest and army officers and, of course, huntsmen, on the wide spectrum of wildlife species and their abundance in these wilds. These forest tracts were regarded as some of the finest and hitherto untouched wilderness areas in the country. Many widely traveled Indian and British conservationists, including AA Dunbar Brander, Capt. James Forsyth, and EP Gee, who had also enjoyed the finest wilderness areas of Africa and Europe, were also in awe of this region and expressed themselves generously in their accounts. Till the first two or three decades of the last century, human population in and around the present Buffer Zone, was not a serious threat to the natural heritage. Increasing biotic pressure, however, quietly indicated the shape of things to come in the future.

4.2 Conservation History:

The conservation history of the Buffer Zone is as under:

4.2.1 **Legal Status of Forests:** As stated above, the forest tract was inhabited mainly and traditionally by the Gond and the Baiga tribes, the latter confining themselves largely to the upper valleys and plateaus close to the main Maikal range. Though

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the information on the early history of these forests prior to 1860 is extremely scanty, the old records indicate that the villagers enjoyed free access to cut and burn forests at will. The system of shifting cultivation, locally called the "bewar", flourished almost unchecked on hill slopes until as late as 1870.

The introduction of the Wasteland Rules in 1962, however, formed the outlines of forest management, restricting the cutting of a few tree species such as the sal, saja, shisham and bija. Around 1865, the sal forests were brought under the purview of the First Forest Act, and the Banjar Valley and a few other blocks were declared Reserved Forests. In 1873-74, most of these forests were duly demarcated in the field. The area also chronicles the visit of the legendary Dr. D Brandis, the then Inspector General of Forests, in 1876. Later, in 1879, after the passage of the Indian Forest Act, 1878, the entire forestland constituting the present Tiger Reserve was declared Reserved Forest. Ever since, the forests have retained a firm legal status, and are credited with accurate and reliable topographic maps.

4.2.2 **Dependence of Local People on Forests:** As far as the past dependence of local people on these forests is concerned, the extraction of forest produce for domestic and agricultural use under the commutation system was introduced in 1879 to regulate the unrestricted cutting by villagers. This system also proved ineffective and was gradually curtailed, and finally stopped in 1933. Villagers were drawing most of their domestic requirements from the landlords' proprietary forests, which were not included in the Buffer Zone. After the abolition of the ex-proprietary rights, some supplies of the cut material to meet the petty demands of villagers were permitted from annual coupes under working. Later, even this was terminated, and the petty cut material was made available from special depots opened in the villages.

Grazing was permitted unrestricted upto 1915, when grazing rules came into force. These rules regulated grazing through grazing units and closure of regeneration areas. With the rise in cattle population and poor governance in the

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post-independence period, control over grazing became weak and grazing pressure rose tremendously in the areas close to villages.

4.2.3 **Forest Management:** The tract, comprised of valuable sal forests, recorded the beginning of commercial exploitation in 1862 when the crop was extracted for railway sleepers. The first systematic plans of these forests were prepared by Mr. AP Percival and AA Dunbar Brander in 1900 and 1904 for forest areas in the Mandla and Balaghat district respectively, prescribing the Selection-cum-Improvement felling. Commercial exploitation, however, prevailed over the improvement part of the prescription. The next plan, prepared by Mr. Gurdial Singh, which come into force from 1932, prescribed the Shelterwood system for better sal forests, with floating Periodic Blocks, whereas the Selection-cum-Improvement for the inferior crop. This plan, however, more or less remained suspended due to the indiscriminate heavy felling for World War II and drought mortality of the crop. Later, from 1949-50 to 1963-64 the forests of the Mandla and Balaghat districts were managed under the working plans prepared by Mr. JC Mehta and Mr. SS Buit respectively. These plans prescribed the Conversion to Uniform system in the better quality sal forests, whereas the Selection-cum-Improvement in the inferior quality. Besides, miscellaneous forests were worked under the Coppice with Reserve system. Bamboo also came under the regular exploitation in these plans. The standards of grazing control and fire protection were fairly good from 1910 onwards until the 1940s.

4.2.4 **Buffer Zone Before Inclusion into the Tiger Reserve:** As already stated, the areas of the present Buffer Zone Division were under the East Mandla, West Mandla, North Balaghat and Kawardha Forest Divisions until 1995-96. As described above, all the above four forest divisions have recorded almost the same forest and wildlife conservation history.

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4.2.5 **Buffer Zone After Inclusion into the Tiger Reserve:** The Buffer Zone area was transferred to the Kanha Management in 1995-96, and till now the following management practices are being carried out in the zone:

- Managed under the current Management Plan.
- Special thrust on wildlife conservation.
- Relatively high degree of wildlife protection of tigers, co-predators and prey base
- Silvicultural operations suspended due to sal borer infestation and other reasons.
- Infrastructure development.
- Confidence building measures for cooperation of villagers in conservation.
- Concept of joint forest management.
- Formation of ecodevelopment committees **(Appendix-XII)**.
- Ecodevelopment works.
- Employment generation through conservation.

4.2.6 **Imperatives After Amendments in Wildlife (Protection) Act, 1972:** As per Section-38V (4) (Explanation-ii) of the Wildlife (Protection) Act, 1972 (as amended upto 2006), the legal objectives of the creation of the Buffer Zone are as under:

- To enforce a lesser degree of habitat protection around a CTH or Core area.
- To ensure integrity of the CTH with adequate dispersal for tigers.
- To facilitate co-existence between wildlife and human activity.
- To ensure due recognition of the livelihood, development, social and cultural rights of the local communities.

4.2.7 **Expansion of the Buffer Zone:** The highlights of the changes in the area of the Buffer Zone are as under:

- 1977 – Surrounding areas identified as Buffer (1005 sq. km.).

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- 1995 – Notified under unified control of Tiger Reserve (1009 sq. km.).
- 2010 – Area expanded under new notification (1134 sq. km.).

4.2.8 **Major Conspicuous Changes in the Buffer Zone Since Inception:** The highlights of changes in the area of the Buffer Zone are as under:

- Enhanced wildlife protection.
- Awareness of wildlife conservation.
- Decreased trust deficit of local communities.

4.3 Estimation of Wild Animals:

The estimation of carnivore and herbivore populations in the protected area was one of the most important exercises used to be carried out every year till 2004. The pugmark method was employed to count tigers and panthers and other co-predators in the winter, while by the block count or direct sighting method herbivores were counted after the first showers of the monsoon. 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.

Later, however, these methods were replaced by a new and holistic protocol conceptualized and successfully tested in a joint pilot project of the MP Forest Department, National Tiger Conservation Authority, New Delhi and Wildlife Institute of India, Dehradun.

4.3.1 **Critique of the Pugmark Method:** The estimation of tiger population in the Buffer Zone used to be conducted by the "Cooperation Census" methodology, involving a large number of the Reserve personnel during the estimation week in the winter. The concept of this indirect method of counting tigers, taken as a total count, is based on the identification and documentation of the pugmarks of tigers, tigresses and their cubs in the wild. Adopted many years back, this was regarded

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as the most reliable, cost-effective and user-friendly method. The staff searched for tiger pugmarks all over the Buffer Zone everyday, and the imprinted pugmarks on different soil covers of forest roads **(Appendix-IX)**, firelines, specially prepared pug-impression pads (PIPs) and near water bodies were secured, traced and made plaster-casts with relevant details. As a rule, only the left rear pugmark was taken into account for the counting exercise. The left and right pugmarks of the tiger were easily distinguishable by the position of the lead toe. In the left pugmark, counting clockwise, the lead toe was seen to occupy the third position, whereas in the right pugmark, it occupied the second. The shapes of frame they fitted into also differentiated between the male and female pugmarks. While the male pugmark fitted into a squarish frame, the female into a rectangular one. Even the male and female pugmarks themselves were highly individualistic on account of their morpho-metric differences, facilitating the counting of tigers. Besides, a rule of thumb was that the pugmarks of an around six-month old tiger cub were almost similar in shape and size to those of an adult panther, but such cubs were always accompanied by their mother-tigresses, hence a good cross-check.

Assumptions: The population data was analyzed on the basis of the following broad assumptions in the old methodology:

- The pugmark of each tiger/ panther was distinct.
- The final acceptance of a tracing/ plaster cast of a tiger/ panther pugmark was taken as a count of an individual animal.
- In good habitats with optimal prey base, adult tigers showed clear territoriality.
- In medium habitats with relatively low prey base, adult tigers were not entirely territorial.
- In poor habitats, adult tigers roamed about more or less as transients.
- In a week's time all tigers were deemed traceable despite terrain and poor soil substratum, which did not yield pugmark imprints.

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All such data of pugmarks were corroborated with a lot of other information, recorded by forest guards throughout the year during their routine patrols, and analyzed before arriving at a range of tiger population in the Buffer Zone.

Shortcomings: Based on the fact that there is a clear cut difference between the pugmarks of a tiger, tigress, and a cub, and even among tigers and tigresses each animal has individualistic pugmarks to facilitate their distinct identity, the method, however, has its own quota of shortcomings and limitations, the critics argue. One pugmark may register different imprints on different substrates and be made into tracings and plaster casts of different dimensions, leading to an over count. Besides, areas occupied by tigers may not have proper substrates to register these pugmarks, hence always a chance of an undercount. The method also aims at counting all the tigers of an area and giving an exact number of tigers, an unrealistic approach. As the method is regarded subjective and based on expert knowledge system, it lends ample scope for conjectures and arguments, and thus also for controversies. Further, the method does not have any scope for assessing the suitability of habitat conditions for tigers, so important for effective conservation. Besides, only tiger pugmarks, and no other signs of tigers, were taken into account for this methodology.

4.3.2 **The New Methodology:** In the above backdrop, some forest officers and field biologists came up with a new methodology or a comprehensive monitoring protocol, known as "Monitoring Tigers, Co-predators, Prey and their Habitats". The proposed new technique, to a large extent, was tested in a pilot project of the MP Forest Department, National Tiger Conservation Authority, New Delhi and Wildlife Institute of India for monitoring and evaluating tiger habitats in the Satpuda-Maikal landscape of Madhya Pradesh.

Conservation science in our country started developing since the mid 1970s, and new field methodologies, concepts and ideas gradually got infused in tiger

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conservation practice. At that time there was no computer, and the main thrust of conservation was on overall preservation of wildlife species. Later, in the backdrop of new ideas, new refinements in existing methodologies were incorporated with the help of the latest IT resources.

The new technique broadly has two components: extensive and intensive data collection in the field. The extensive data collection is carried out by forest guards in their respective beats, while the intensive by technical persons. Field data is collected under six prescribed formats containing a host of enquiries. These formats have been specially designed after prolonged discussions to make them as much user friendly as possible for forest guards. Besides, two phases of training and a dry run in between before the actual field exercise have also taken care of all probable doubts and problems. These formats will later furnish a lot of relevant spatial (relating to space) information on the signs of carnivores, sightings of ungulate species; vegetation, human disturbance, and herbivore pellets. Besides, the attribute information like human and livestock density, road network, forest type, meteorological information, socioeconomic parameter, and poaching pressure are also acquired from the forest department as secondary data. The relevant satellite imageries/ data and vegetation maps are used for the final analysis. Under the intensive field data collection, technical persons collect data in their respective sampling areas throughout the state, using standard methodologies like camera traps and transects for effective corroboration of data. Besides, DNA profiles prepared from the scats of tigers and digital photography of tiger pugmarks in Tiger Reserves also give an insight into tiger populations. The researchers of the Wildlife Institute of India, Dehradun analyze the above spatial and a spatial data on the entire forestland of the state, for declaring various results on the population range of tigers, panthers and other wildlife species along with information on habitat conditions. The data is analyzed in a GIS (Geographical Information System), and, using various statistical frameworks, will also model tiger occupancy and population range in different forest units of the state. The method, however, does not give the exact number of tigers in the

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state, which has been a traditional, and unfortunately scientifically absurd, as experts say, way of declaring results. Instead, tiger populations are declared in the density classes of high, medium and low per hundred sq. km. of a particular forest unit. The high and low density classes, for instance, may mean that there are more than 8 tigers and 1 to 2 tigers per hundred sq. km. respectively. Besides, density estimates of the prey base and habitat conditions in each forest unit are also given as results. All such results in the forms of maps, indices and classes give in totality a picture of populations of the tiger, other carnivores, and prey base along with the general health of tiger habitats in the state. The system also has an audit mechanism to check data collection, compilation and analysis. Experts say that the method can also be institutionalized for continuous monitoring and evaluation of tigers and their habitats in every tiger landscape complex in the country.

Under frequent meticulous reviews and monitoring by the PCCF of the wildlife wing of the state and his Bhopal team, and coordination of the Field Director of Kanha Tiger Reserve, the ambitious field exercises for this new monitoring protocol were conducted in January, 2006 and February, 2010 in around 8500 forest beats of the state. As the quality of data collection can make or mar this proverbial Herculean effort, forest officials throughout the state worked tirelessly for the above four-yearly population estimation exercises. All the states of country undertook the above monitoring protocol for population estimation.

4.4 Research, Monitoring & Wildlife Health:

No special research project has been taken up on any aspect of the Buffer Zone. There are, however, only a few studies that also included some parts of Buffer Zone. Ever since, the Buffer Zone came under the Kanha Management, the field staffs have been conducting monitoring of wildlife on the lines of the Core Zone. Special monitoring registers have been provided at each beat headquarters, and forest guards are under instructions to enter in them the required information relating to wildlife and vegetation. These monitoring registers are regularly checked by the range officers and above.

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Wildlife health is the responsibility of the wildlife veterinarian. In case of a death, a postmortem is conducted under a prescribed protocol. Sick and distressed animals are immobilized for treatment. Besides, as per the directives of the Hon'ble Supreme Court of India and the instructions of the Chief Wildlife Warden of Madhya Pradesh, prophylactic immunization of village cattle is carried out against Black Quarter, Hemorrhagic Septicemia, Foot & Mouth Disease, and Tuberculosis.

The details of the number of cattle immunized in the past years are as under:

Year	Name of Vaccination	Total No. of Cattle Vaccinated
2003-04	Raksha Trivac (BQ, HS, FMD)	24072
2004-05	Raksha Trivac (BQ, HS, FMD)	27865
2005-06	Raksha Trivac (BQ, HS, FMD)	24551
2006-07	Raksha Trivac (BQ, HS, FMD)	28787
2007-08	Raksha Trivac (BQ, HS, FMD)	29754
2008-09	Raksha Trivac (BQ, HS, FMD)	17864
2009-10	Raksha Trivac (BQ, HS, FMD)	19540

Animal	Diseases	Vaccine	Dose/ Route	Immunity
Cattle & Buffaloes	Rinderpest (This vaccination is abandoned due to successful eradication of disease)	• F.D.G.T.V. (for Indian breeds) • Tissue culture R.P. Vaccine (TCRP) (for exotic, crossbred cattle, sheep and goats)	1 ml. s/c 1 ml. s/c (can be used in very young calves also)	• 14 yrs. • 2 yrs. (even more as recently reported)
Cattle & Buffaloes	F.M.D.	• Tetravalent (including A-22 Strain) IVRI.	- 10 ml. subcut.	• First vaccination at 3 months age (even earlier)

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		Bangalore, BAIF and Intervet Vaccines - Intervet (Concentrated) - Raksha (Ind Immunol) - Raksha OVAC (Ind Immunol)	- 5 ml. subcut. - 3 ml. i.m. Cattle – 2 ml. i.m. Sheep/ goat – 1 ml. i.m.	• Booster: after 3 months • Afterwards: at 6 monthly intervals
Cattle & Buffaloes	H.S.	• Alum – precipitated • Oil adjuvant (IVBP) Pune	5 ml. s/c 2.5 to 3 ml. i.m.	• 6 months • 1 month
Cattle & Buffaloes	B.Q.	• Alum – precipitated Combined H.S., B.Q. vaccine also available with BAIF	5 ml. s/c	• 6 months
Cattle & Buffaloes	Anthrax	• Spore Vaccine (IVBP Pune & BAIF)	1 ml. s/c	• 1 year
Cattle & Buffaloes	Brucellosis	• Cotton-19" strain. Handle the vaccine with care (IVBP Pune)	9 ml. s/c Vaccination of calves be done at 4-8 month of age only if incidence of disease is more than 25% in the herd	
Cattle & Buffaloes	Theileriasis	NDDB-Raksha-T (Ind. Immunol.) Animals in adv. Pregnancy not vaccinated. Vaccine stored in liquid nitrogen	3 ml. s/c	• 1 year

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Sheep	Enterotoxemia	• Multi-component clostridial vaccine (IVRI & IVBP)	5 ml. s/c (2 doses. 3 weeks apart)	• 1 year
Sheep	Sheep Pox	• Tissue culture vaccine (BAIF, IVRI, IVBP)	0.5 ml. s/c (inside ear)	• 1 year
Goats	C.C.C.P.	• IVRI Vaccine	0.2 ml. (at ear tip)	• 1 year
Goats	P.P.R.	• TCRP vaccine	1.0 ml. s/c	• 1 year
Pigs	Swine Fever	• Freeze dried Tissue culture vaccine (IVBP Pune & BAIF)	1 ml. s/c (inside thigh)	• 1 year

4.5 Conservation Awareness & Health Camps:

The Buffer Management makes all possible efforts to create awareness about the importance of wildlife conservation, wildlife protected areas and the role of Buffer Zone in the Tiger Reserve. Every year wildlife week is celebrated at all the range headquarters. The students of schools are involved in drawing, essay and debate competitions in forest and revenue villages. Winners are given awards and taken to the National Park for jungle excursions. NGOs are also roped in to organize health camps, specially in the rains, in villages for the treatment of common ailments. Serious cases are referred to the major hospitals of Jabalpur and Nagpur.

4.6 Administration & Organization:

The Buffer Zone Division is under the unified control of the Field Director. The Buffer Zone Division is in-charge of a Deputy Director of the rank of Deputy Conservator of

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Forests, with headquarters at Mandla. The broad organizational administration is as under:

- Deputy Director (1)
- Assistant Directors (3)
- Range Officers (5)
- Deputy Rangers (6)
- Foresters (15)
- Forest Guards (49)
- Accountant (1)
- LDC (7)
- Daftari (1)
- Orderly/ Peon (3)
- Driver (1)

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CHAPTER – 5

PRODUCTION SECTORS IN THE LANDSCAPE

5.1 Introduction:

The Buffer Zone is different from a Core Zone and wildlife protected area, and harbours multiple land use patterns, including forest land, revenue land and private holdings. The Zone also harbours 161 forest and revenue villages. Consequently, various government and private production sectors are also operative here for development of villages, infrastructure and industries etc. While some production sectors directly affect wildlife conservation, others do it indirectly. It is imperative that all these production sectors deliver in such a way as not to come into conflict with wildlife conservation.

5.2 Production Sector:

As the Buffer Zone falls into the Mandla and Balaghat districts, production sectors of both these districts are operative here. Some main production sectors are as under:

- Forestry
    - Rehabilitation of degraded forests
    - Small plantation
    - Soil and moisture conservation
    - Water development
    - Road repair
    - Fire protection
    - Boundary pillars
    - Construction
- Agriculture/ farming
    - Double cropping
    - Private plantation
    - Horticulture
    - Vegetable farming

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- Integrated development
    - Ecodevelopment activities
    - Collector sector's initiatives
- Tourism
    - Hotels/ resorts/ dhabas
    - Tour operations
    - Related activities
- Road
    - Construction/ upgradation (specially under the PMGSY)
- Irrigation Projects
    - Under consideration
- Temple Tourism
    - Village fares
    - Occasional gatherings

The Buffer Management has to ensure that these production sectors take into account the concerns of wildlife conservation in the area and work in harmony.

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CHAPTER – 6

LAND USE PATTERNS & CONSERVATION ISSUES

6.1 Introduction:

Besides fragmented Reserved Forest and Orange Areas, the Buffer Zone also harbours small and large habitations as forest and revenue villages. This humanized setting has resulted in multiple land use patterns and related anthropocentric activities. In this background emerge some very important issues that need to be perfectly understood and addressed for the proper management of the Buffer Zone.

6.2 Land Use Classification:

Land use in the Buffer Zone can be divided into the following types:

- Villages/ settlement.
    - Habitations.
    - Clusters.
- Agriculture/ farming.
    - Agricultural fields.
    - Horticultural fields.
    - Back yard farms.
- Minor business ventures.
    - Shops.
    - Mills.
- Govt. development programmes.
    - Buildings.
    - Roads.
    - Anicuts/ dams
- Ecotourism.

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- Hotels/ lodges.
- Tour operation establishments.

6.3 Socio-Economic Profile of Villages:

The majority of population in the Buffer Zone belongs to the Scheduled Tribe (around 70000) & Scheduled Caste (around 3500). The other castes include the baiga, ahirs, and other backward castes. This population mainly depends on a single rain-fed crop during a year. Apart from agriculture, MFP collection and wages earned through manual labour form their main source of livelihood. Basic amenities like irrigation, medical facilities, education, and approach road, improved strain of cattle, electricity, cottage industry and banking facilities are lacking.

6.4 Resource Dependence of Villages

Most of the local inhabitants depend on forests for their day to day sustenance. With the increase in population, this has degenerated into a vicious circle of overuse, resulting in the overall degradation of the forest area and loss of corridor connectivity outside the Core conservation unit. Local communities are poor and depend on forests for the following:

- Forest – Poles/ fuel wood/ bamboo/ Fodder/ MFP.
- Water bodies – Fishing.
- Wildlife – Fallen antlers, poaching for sustenance.

6.5 Human-Wildlife Conflicts:

While human-wildlife conflicts are not common, they do take place in the Buffer Zone. Sometimes villagers try to drive away a tiger from its cattle kill, and get killed. Besides, villagers try to sneak into the forests at the crack of dawn to collect MFP and run into carnivores. There is, however, a mechanism in place through which compensations are

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promptly paid by the Buffer Management. Besides, in case of human death/ injury, there is also a provision to make payment to the next of kin.

6.6 **Assessments of Inputs of Line Agencies/ Other Departments:**

The Buffer Management understands well the importance of cooperation and inputs from the district administration of the Mandla and Balaghat districts and other departments in effective wildlife conservation. The Buffer Zone generally receives inputs from the following departments:

- Revenue
- District rural development agency
- Police
- Irrigation
- Public works department
- Tribal department
- Education
- Veterinary
- Health
- Agriculture

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CHAPTER – 7

SOCIO-ECONOMIC SURVEY & REQUIREMENT OF FOREST PRODUCE

7.1 Introduction:

A multiple use area harbouring different land use patterns, the Buffer Zone of the Kanha Tiger Reserve almost surrounds the National Park. The populations of the forest and revenue villages in the Buffer Zone consist mainly of tribals. The caste structure includes the gonds, baigas, ahirs, panika, and kurmis, besides Scheduled Castes & OBCs. It is a typical rural setting, with marginal agricultural practices, cattle rearing, petty businesses and dependence on forest resources.

The Buffer Zone Division is spread over the Mandla and Balaghat districts of Madhya Pradesh. The total area of the Buffer Zone is 1134.32 sq. km., of which 585.564 sq. km. is forest land forming 51.62% of the total area. The district-wise area of the Buffer Zone is as under:

District	RF	OA	Revenue	Total (Ha.)	No. of Population	
					Revenue	Forest
Mandla	30826.57	1257.43	20748.59	52832.59	52	15
Balaghat	27729.890	-	32869.480	60599.37	74	20
Total:	**58556.46**	**1257.43**	**53618.07**	**113431.96**	**126**	**35**

7.2 Population Statistics:

The demographic data of 1901 and 2001 obtained from the Mandla and Balaghat District Statistical Offices were analyzed to assess the growth patterns, probable population and density for the year 2010. The description is as under:

District/ Division	Year			Geographical Area		Population Density/ Sq. Km.	
	1901	2001	2010	1901	2010	1901	2010
Mandla	318381	894236	1025957	13260.80	8771	24	117
Balaghat	299934	1497968	1642822	9245.00	9229	43	178
Buffer Zone	-	-	129330	-	1134.31	-	114

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7.3 Socio-Economic Survey:

Under the socio-economic survey, 10 villages within 5 km. periphery from the Buffer Zone boundary, and 10 villages each from the Core Zone and Buffer Zone, in this way a total of 30 villages, were surveyed by a direct interview-cum-questionnaire method. On the basis of agriculture and other occupations, all the families were divided into 9 classes, and 5 families from each class were interviewed. The description of the surveyed families is as under:

Description of Selected Families for Survey (Revenue Villages of the Buffer Zone)

Particulars	Occupation Code	Total No. of Selected Families	Total No. of Members of Selected Families	Percentage
Major Cultivators (Over 5 ha.)	A	24	120	10.62
Medium Cultivators (2-5 ha.)	B	47	211	20.80
Minor Cultivators (Upto 2 ha.)	C	50	225	22.12
Landless Labourers	D	40	160	17.70
Cattle Rearer	E	8	48	3.54
Rural Mason	F	10	40	4.42
Traders	G	15	60	6.64
In-service	H	17	51	7.52
Any Other Occupation (If any)	I	15	60	6.64
Total:		**226**	**975**	**100**

Description of Selected Families for Survey (Forest Villages of the Core Zone)

Particulars	Occupation Code	Total No. of Selected Families	Total No. of Members of Selected Families	Percentage
Major Cultivators (Over 5 ha.)	A	9	53	5.59
Medium Cultivators (2-5 ha.)	B	45	222	27.95
Minor Cultivators (Upto 2 ha.)	C	46	242	28.57
Landless Labourers	D	36	157	22.36
Cattle Rearer	E	0	0	0.00
Rural Mason	F	0	0	0.00
Traders	G	0	0	0.00
In-service	H	19	97	11.80
Any Other Occupation (If any)	I	6	34	3.73
Total:		**161**	**805**	**100**

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Description of Selected Families for Survey (Forest Villages of the Buffer Zone)

Particulars	Occupation Code	Total No. of Selected Families	Total No. of Members of Selected Families	Percentage
Major Cultivators (Over 5 ha.)	A	8	34	5.97
Medium Cultivators (2-5 ha.)	B	39	199	29.10
Minor Cultivators (Upto 2 ha.)	C	40	191	29.85
Landless Labourers	D	23	132	17.16
Cattle Rearer	E	0	0	0.00
Rural Mason	F	5	27	3.73
Traders	G	1	3	0.75
In-service	H	12	49	8.96
Any Other Occupation (If any)	I	6	32	4.48
Total:		**134**	**667**	**100**

Description of Selected Families for Survey
(Forest & Revenue Villages of the Core & Buffer Zones)

Particulars	Occupation Code	Total No. of Selected Families	Total No. of Members of Selected Families	Percentage
Major Cultivators (Over 5 ha.)	A	41	207	7.87
Medium Cultivators (2-5 ha.)	B	131	632	25.14
Minor Cultivators (Upto 2 ha.)	C	136	658	26.10
Landless Labourers	D	99	449	19.00
Cattle Rearer	E	8	48	1.54
Rural Mason	F	15	67	2.88
Traders	G	16	63	3.07
In-service	H	48	197	9.21
Any Other Occupation (If any)	I	27	126	5.18
Total:		521	2447	100.00

7.4 Socio-Economic Analysis:

While around 96% population of the Buffer Zone reside in *kuchcha* houses, around 3% and 1% of the total population reside in *pukka* houses and huts respectively. The general socio-economic conditions of the villages are as under:

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- The economy of villagers depends on agriculture.
- Besides agriculture, daily-wage labour and employment are also essential for livelihood.
- Most villagers living in *kuccha* houses and huts, and require bamboos, poles, timber in large quantities for the maintenance of their homes. The demands of this *nistar* material are mostly met from forests.
- As stall-feeding is not practised, almost all cattle graze in the forest areas.
- As the requirement of forest produce for *nistar* is growing along with an increase in demographic population, it is now not possible for the forest to support these growing demands.

The assessment of the requirement of adults per family as per the survey is as under:

Information on Requirements of Total 126 Revenue Villages within 5 Km. Periphery in Mandla & Balaghat Districts

Total No. of Families **:** 19156
Total Population **:** 114937

Sl. No.	Name of Forest Produce & Unit	Requirements of Forest Produce in Revenue Villages (Upto 5 km. Periphery of Forest)		
		Total Requirement	Per Family	Per Member
1	Timber (Cmt.)	7662.72	0.371	0.067
2	Pole (No.)	625629.16	8.141	5.443
3	Bamboo (No.)	499353.92	35.203	4.345
4	Fuel Wood (Qtl.)	344822.40	36.293	3.000

Information on Requirements of Total 35 Forest Villages within 0 Km. Periphery in Mandla & Balaghat Districts

Total No. of Families **:** 2647
Total Population **:** 14393

Sl. No.	Name of Forest Produce & Unit	Requirements of Forest Produce in Forest Villages (Upto 0 km. Periphery of Forest)		
		Total Requirement	Per Family	Per Member
1	Timber (Cmt.)	1688.79	0.638	0.117
2	Pole (No.)	30609.91	11.564	2.127
3	Bamboo (No.)	181687.43	68.639	12.623
4	Fuel Wood (Qtl.)	111708.69	42.202	7.761

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The requirement of the villagers of the forest villages located on the 0 km. Buffer Zone boundary is more than those of the revenue villages located within 5 km. from the boundary. The reason can be attributed to easy availability of forest produce and relatively bad economic conditions of the forest villagers in comparison to revenue villagers. Forest and forest produces play a very important role in the daily lives of forest villagers, and no alternatives of fuel and timber have found ways into their lifestyle. On the basis of the above tables, the requirement of timber, bamboo, pole and fuel wood in the 161 villages of the Buffer Zone shall be as under:

Requirements of Timber, Bamboo, Pole & Fuel Wood
Upto 5 km. Periphery of Forest (Forest & Revenue Villages)

Timber (cmt.)	Poles		Fuel Wood (Qtl.)	Bamboo	
	No.	Cmt.		No.	NT
9351.51	656239	10937	456531.09	681041	1135.06

The abstracts of the requirement of forest produce and the availability of forest produce from all sources in the plan area are as under:

Timber & Pole (cmt.)

Total Required Quantity	Private Area	Revenue Area	Govt. Depot	Total Supply	Difference
20288	3040	1825	50	4915	15373

Fuel Wood (cmt.)

Total Required Quantity	From Coupe Felling	Dried/Fallen /Head Loads	From Agriculture	From Cattle	Total	Difference
91306	5000	9130	200	50	14380	76926

Bamboo (Notional Ton)

Total Required Quantity	Supply (Notional Ton)		Total	Difference
	Govt. Forest	Private Lands/ Other Sources		
1135	250	50	300	835

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- **General Measures for Meeting Demands:** The above tables suggest that there is a big difference between the availability and supply of forest produce. Forest produce is mainly required in form of timber, fuel, bamboo and fodder. The following measures should be considered to reduce, as far as possible, the difference between demand and supply:

  - The production of forest produces to be increased by management techniques.
  - The use of alternative sources of energy such as gas, stove, solar cooker and pressure cooker etc. should be encouraged through publicity.

  There is no need to emphasize that increasing biotic pressure and legal and illegal extraction of forest produce are taking their toll on forests. Over-exploitation of forests also contributes to the present plight of these forests. Therefore, serious efforts have to be made to improve the present condition of forests.

- **Measures for Timber:** Some measures are as under:

  - Taking up planting in fallow lands, on agricultural bunds and in community land.
  - Protecting natural regeneration.
  - Changing under-stocked forests to stocked forests.
  - Planting of improved variety plants.
  - Strengthening of *nistar* arrangements.
  - Using alternative sources.
  - Creating awareness to restrict the use of natural resources.

- **Measures for Fuel:** Some measures are as under:

  - Making use of poles of less than 20 cm. girth left by the production division after felling in the coupes.

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- Fallen/ dead wood in the forests.
- From revenue forests.
- Use of dung cakes.
- Use of biogas, improved chullahs and solar cookers.
- Some other alternatives such as gas, coal, and kerosene etc.

- **Measures for Bamboo:** Some measures are as under:

  - Bamboo planting in private lands.
  - Management of bamboo in private sectors.
  - Better plantation and management of bamboos in forest areas.

- **Measures for Fodder:** Some measures are as under:

  - Efforts shall be made to meet the demands of fodder from the fuel and fodder working circle.
  - The production of fodder should be enhanced in the fallow lands under the plan area.
  - Large number of cattle should be discouraged by improving their breeds.
  - Grazing should be regulated by rotational grazing.
  - New techniques should be used under pasture land development programme so that more fodder can be obtained per ha. of agricultural land.
  - Local graziers should be informed about fodder management.

  As per the data available from the Mandla and Balaghat District Statistical Offices, the number of livestock in the Buffer Zone is as under:

District	No. of Village	Cattle Group	Buffalo Group	Sheep/ Goat	Total
Mandla	67	23645	11515	3573	38733
Balaghat	94	28809	10141	7433	46383
Total:	**161**	**52454**	**21656**	**11006**	**85116**

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Estimation of Grazing Unit

Type of Cattle	No.	Cattle Unit
Cattle Group	52454	39340
Buffao Group	21658	32484
Sheep/ Goat	1006	11006
Total:		**82830**

Available Forest Area for Grazing in the Plan Area

Working Circle/ Area	No. of Compartment	Area (ha.)	Closed Area (ha.)	Actual Available Area (ha.)
SCI WC	128	25574.00	2557.40	23016.60
Fuel & Fodder WC	88	4221.20	422.12	3799.08
Restoraton of Gene-Pool	98	19326.60	19326.60	-
Forest Village	35	10357.10	-	10357.10
Total:				**37172.78**

As per the above tables, a forest area of 37172.78 ha. shall be available for grazing every year. The total number of grazing units in 161 villages is 82830, in this way, of the 45657.22 units of additional grazing pressure, around 20% fodder is supplied from the agriculture area, and the grazing pressure of the rest of the grazing units is on the forest areas.

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CHAPTER – 8

REVIEW OF PAST WORKING PLANS

Till 1995-96 when the area of Buffer Zone came under the unified control of the Kanha Management, it was being managed by the territorial forest divisions of East Mandla, West Mandla, North Balaghat and Kawardha. These forest areas of the respective divisions were under various working plans as under:

- Working Plan for North Balaghat (T) Division (1985-86 to 2000-01) by Shri RN Mishra.

- Working Plan for The Sal Forests of Mandla District (East Mandla portion) (1982-83 to 1996-97) by Shri HV Bajpayee.

- Working Plan for West Mandla (T) Division (1993-94 to 2002-03) by Shri KS Reddy.

At that time, the total area of the Buffer Zone was 1009.70 sq. km., of which 460.01 sq. km. was Reserved Forest, 36.12 sq. km. was Orange Area, and 513.55 sq. km. was Revenue Land.

The district-wise breakup of the Buffer Zone area was as under:

District	RF	Orange Area	Revenue Land
Mandla	184.73	36.12	184.86
Total:	**405.72 sq. km.**		
Balaghat	275.28	-	328.69
Total:	**603.97 sq. km.**		

The details of various working circles/ silvicultural systems, number of the transferred Buffer compartments included in the working circles and areas are as under:

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Working Plan	Working Circles	Number of Buffer Compartments Covered	Area (Ha.)
• N. Balaghat (T) Division Buffer Ranges Covered: Garhi, Sijhora (in part), Samnapur, Khapa (in full)	• Improvement WC (Protection)	112	24761.15
	• Coppice with Reserves WC	2	607.213
	• Rehabilitation WC	28	1831.017
	• Overlapping WC (Sabai, Sisal rope making etc.)	(All)	-
• W. Mandla (T) Division Buffer Ranges Covered: Garhi, Sijhora (in part), Khatia (in full)	• Selection cum improvement WC	20	6404.08
	• RDF – WC	3	187.62
	• Bamboo overlapping WC	19	-
• E. Mandla (T) Division Buffer Ranges Covered: Garhi, Sijhora (in part)	• Sal conversion WC	5	1359.8
	• Improvement WC	3	925
	• Plantation WC	9	1875
	• Socio Rehabilitation WC	20	3503.8
	• Bamboo WC	1	174.40

On the whole, the forests in the Buffer Zone were patchy, except for a few places. Due to biotic pressure, most of the areas were degraded, with density falling below 0.4. The spill-over populations (mainly spotted deer, gaur) used to be seen near Khatola (Sijhora Range), Mocha, Chapri, Sarekha and Khisi (Khatia Range). Salvaging operations due to sal borer infestation were mainly carried out in the Chilpi Range, which was later transferred to the State of Chattisgarh.

Since its formation in 1995, felling for timber has not been executed in the Buffer Zone. The suspension of coupes due to sal borer infestation was also effected, besides, there were also directives from the Hon'ble Supreme Court. The Primary Forest Produce Societies of the West Mandla, East Mandla and North Balaghat territorial forest divisions carried out the collection of tendu *patta* and other nationalized Non Wood Forest Produce. *Nistar* requirements (poles, bamboo) were met from the adjoining territorial divisions. Like any other forest division, the buffer forests were also burdened with rights and concessions.

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In this way, no productive forestry operations have been carried out in the Buffer Zone since the transfer of area. The following table gives an indication about the production of the past three financial years in the forest divisions whose areas were transferred as the Buffer Zone to the Kanha Management.

Division	Year	Total Plan Area (Ha.)	Available Area for Production	Percentage of Available Area for Production	Production (cmt.)
E. Mandla	2007-08	118240.000	3211.910	2.72	42244.000
	2008-09		3502.950	2.96	34908.310
	2009-10		2991.010	2.53	34023.887
W. Mandla	2007-08	136956.240	3420.220	2.50	32080.000
	2008-09		3295.850	2.41	32554.000
	2009-10		3418.080	2.50	14337.000
N. Balaghat	2007-08	208798.496	3279.260	1.57	13712.000
	2008-09		4009.880	1.92	12632.000
	2009-10		6152.410	2.95	14916.000

Now, as per the legal objectives of the creation of Buffer Zone envisaged in the Wildlife (Protection) Act, 1972 (amended subsequently), already discussed in a previous chapter, this Tiger Conservation Plan is submitted for the management of the Buffer Zone.

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CHAPTER – 9

STATISTICS OF GROWTH & YIELD

9.1 Brief Results of Stock Mapping:

Detailed information on species-wise stock of different types of forests occurring in the plan area, its density, growth rate and related statistics is needed for the preparation of future working plan of an area. As the selection girth, felling cycle, yield and thinning cycle etc. are proposed on the bases of these statistics only, the data extracted for the Management Plan provides solution to many management problems in future.

The results of the stock mapping of the Buffer Zone are given below:

Stock	Forest Type	Legal Status	Area (ha.)
(A) Dense Forest	Teak	RF	118.85
		Orange Area	0
	Sal	RF	15896.79
		Orange Area	164.78
	Miscellaneous	RF	23441.68
		Orange Area	86.07
	Total:	**RF**	**39457.32**
		Orange Area	**250.85**
(B)Low Density Area	Teak	RF	45.78
		Orange Area	0
	Sal	RF	528.45
		Orange Area	41.95
	Miscellaneous	RF	3932.05
		Orange Area	135.4
	Total:	**RF**	**4506.28**
		Orange Area	**177.35**
(B) Other Forest Area	Blank	RF	3924.61
		Orange Area	262.09
	Encroachment	RF	358.73
		Orange Area	9.22
	Plantation	RF	432.47
		Orange Area	0

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	River Bank	RF	352.79
		Orange Area	7.8
	Forest Village	RF	10357.1
		Orange Area	0
	Total:	**RF**	**15425.7**
		Orange Area	**279.11**
	G. Total:	**RF**	**59389.3**
		Orange Area	**707.31**
Bamboo Overlapping	Low Density Area		**5543.66**

9.2 Classification of Site Quality:

The site quality of forests in the stock mapping has been determined by the average top height of trees and on the basis of the revised MP site quality classes as under:

Site Quality	Tree Height Based of MP Site Quality	Tree Height Based on All India Site Quality
	Average Top Height (m.)	
I	> 30	30 - 36
II	25 - 30	24 - 30
III	20 - 25	18 - 24
IVa	15 - 20	15 - 18
IVb	12 - 15	< 15
Va	9 - 12	
Vb	< 9	

9.3 Statistics Yield:

Mainly the forests of sal and miscellaneous species are present in the plan area. The main species of miscellaneous forests are saja, tinsa, dhawara, lendia, tendu, achar, khair, mahua, bija, harra, aonla.

9.3.1 **Determination of Yield & Rotation of Sal:** The Yield Table Provisional for Forest of MP is available in which the data on sample plots of the Raipur and Mandla districts have been used. This plan also contains major portion of sal forests of the Mandla district. The above yield table can be used for the analysis

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of the yield of sal in the plan area. The plan area consists of sal forests, which fall in the site quality class I to IVa class of the Madhya Pradesh yield table. The growth data of sal for MP site quality classes II, III, IV are given below:

Age (Year)		Maximum Height (m.) Site Quality-wise			
Coppice Crop	**Seedling Crop**	**I**	**II**	**III**	**IV**
5	-	5.79	4.88	3.66	2.74
10	-	10.60	8.23	6.40	4.57
15	9	13.11	10.67	8.23	6.10
20	14	15.85	12.80	10.06	7.01
25	19	17.98	14.63	11.58	8.23
30	24	20.12	16.46	12.80	9.14
35	30	21.25	17.98	14.02	10.80
40	34	23.77	19.51	15.24	10.67
45	39	25.30	20.73	16.15	11.58
50	44	26.82	21.99	17.07	12.19
55	48	28.04	22.86	17.98	12.80
60	54	29.26	24.08	18.59	13.41
65	62	30.48	24.99	19.51	13.72
70	64	34.70	25.91	20.12	14.33
75	70	32.61	26.52	20.73	14.93
80	75	33.53	27.43	21.34	15.24
85	80	34.44	28.35	21.95	15.85
90	86	35.36	28.96	22.55	16.15
95	91	36.27	29.57	22.86	15.46
100	97	38.88	30.17	23.47	16.76
105	103	37.49	30.78	24.08	17.07
110	108	38.10	31.39	24.38	17.37
115	114	38.71	32.00	24.69	17.68
120	119	39.32	32.31	25.30	17.98
125	125	39.93	32.93	25.60	18.29
130	130	40.54	33.22	25.91	18.59
135	135	41.15	33.53	26.21	18.59
140	140	41.76	34.14	26.52	18.90
145	145	42.06	34.54	26.82	19.20
150	150	42.37	34.75	27.13	19.20

Calculations for the Current Annual Increment, Mean Annual Increment, volume of the crop, average number of trees, average girth and average height, age-wise for sal species of all India quality class III are given below:

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Crop Age (Year)	Average Diameter (cm.)	Average girth (cm.)	Average Height (m.)	No. of Trees Per Ha.	Total Volume of Standing Crop cmt. Per ha.	Yield cmt. Per Ha.	Average Annual Increment cmt. Per Ha.	Current Annual Increment cmt. Per Ha.
10	6.6	20.7	7.57	1720	20.991	20.991	2.099	-
15	8.9	27.9	9.09	1144	31.486	32.186	2.169	2.239
20	10.7	33.5	10.33	909	42.682	44.781	2.239	2.519
25	12.5	39.1	11.51	431	52.476	57.375	2.309	2.519
30	14.2	44.7	12.73	610	62.973	72.069	2.379	2.939
35	16.0	50.3	13.63	526	72.069	86.763	2.449	2.939
40	17.8	55.9	14.54	442	80.465	102.156	2.589	3.079
45	19.3	60.6	15.15	395	88.862	118.949	2.659	3.359
50	21.2	66.2	16.6	366	98.658	139.240	2.799	4.058
55	22.4	70.2	16.66	321	107.540	160.231	2.939	4.198
60	23.6	74.2	17.27	299	114.751	182.622	3.079	4.478
65	24.9	78.2	17.88	277	121.745	206.411	3.219	4.758
70	26.2	82.2	18.48	259	135.742	233.000	3.359	5.318
75	27.4	86.2	19.9	245	142.739	262.387	3.499	5.877
80	28.7	90.2	19.69	230	147.637	293.874	3.938	6.297
85	29.7	93.4	20.30	217	151.835	326.060	3.848	6.437
90	30.7	96.6	20.60	207	153.234	359.646	3.988	6.717
95	31.8	99.8	21.21	195	154.634	392.532	3.128	6.577
100	32.6	102.9	21.51	185	156.733	426.817	4.268	6.857
105	35.5	105.4	22.12	178	157.432	416.802	4.408	6.997
110	34.8	107.8	22.42	170	158.132	496.787	4.548	7.037
115	35.1	110.1	22.72	163	158.132	532.472	4.618	7.737
120	35.8	112.5	23.02	158	158.132	568.156	4.758	7.136
125	36.3	114.1	23.23	153	158.832	603.141	4.828	6.998
130	37.1	116.5	23.63	148	158.832	638.126	4.898	6.997
135	37.6	118.1	23.93	143	158.832	671.712	4.968	6.716
140	38.1	119.7	23.93	138	158.832	703.898	5.028	6.437
145	38.6	121.3	24.24	136	158.832	733.985	5.038	6.017
150	38.4	120.5	24.24	133	157.432	760.574	5.038	5.418
155	39.0	122.56	25.78	129	159.332	780.890	5.038	4.618

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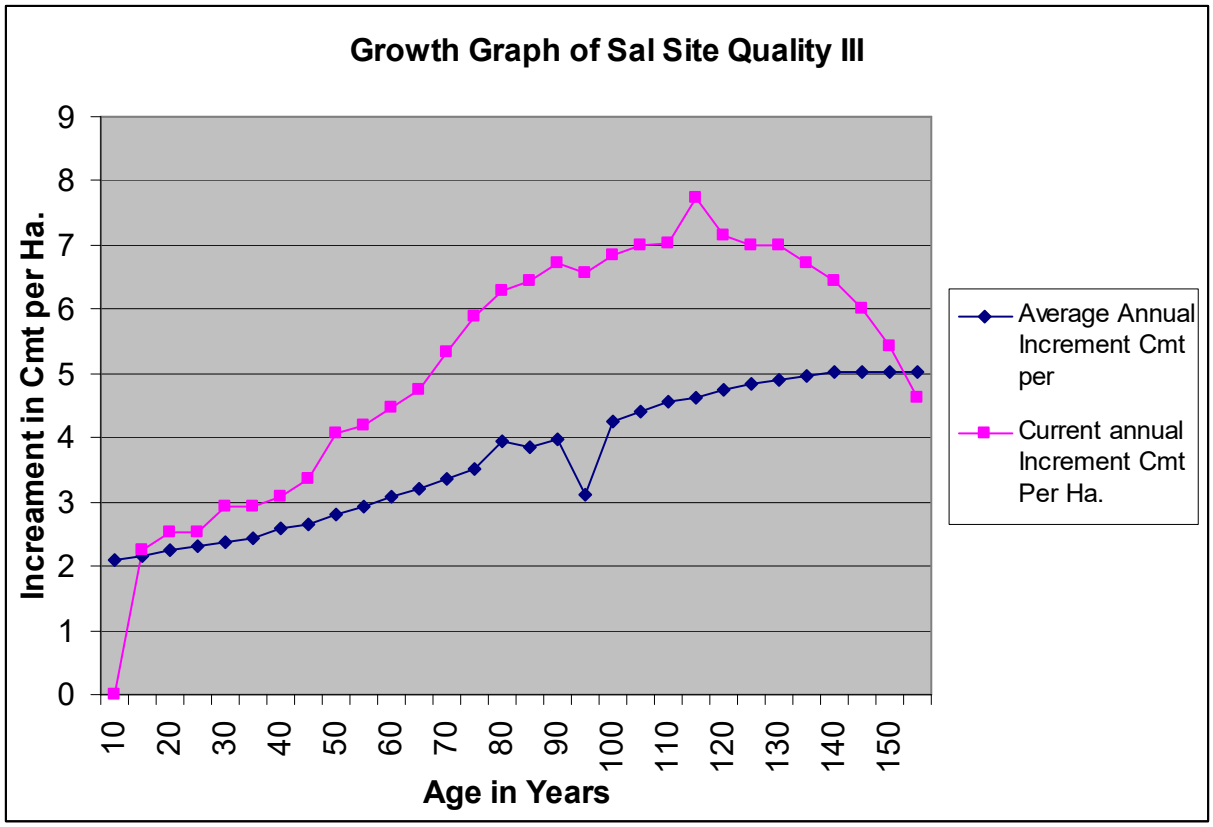

When trends are drawn on the basis of the above mentioned data, the CAI/ MAI graphs meet at the age of 150 years for the site quality class III, and the average girth of the crop at this point is 122 cm. Thus maximum increment in volume will be obtained at girth 122 cm. for the site quality class III. Therefore, girth at breast height at the age of 150 year will be 120 to 125 cm. In current working plan of the Mandla division, the selection girth of sal is 120 cm. The structure of the crop of the plan area is similar to that of the Mandla division so fixing selection girth of sal at 120 cm. is justified.

9.4 Miscellaneous Species:

It is essential to know the data of the rate of growth till rotation age for miscellaneous species because of their ecological importance and abundance in the forest crop. The growth data of saja, anola, tendu and lendia based on the growth of coppice for the Mandla district is given below:

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Age (Year)	Maximum Height (m.)			
	Saja	Dhawra	Lendia	Anola
5	15.24	15.44	17.78	20.07
10	27.22	25.40	31.11	30.2
15	37.38	36.56	41.91	37.46
20	46.35	44.78	52.07	42.94
25	54.61	51.80	60.32	41.62
30	61.59	57.40	66.67	52.07
40	72.43	64.10	77.23	58.92

The growth data of saja, dhawara as published in the Growth & Yield Statistics of Common Indian Timber Species issued by Forest Research Institute, Dehradun, 1970 is given below. The selection girth of saja can be fixed at 120 cm. which will be obtained at the rotation age of 80 years, on the basis of data given in the table:

Growth Data of Saja

Age (Year)	Girth (cm.)	Volume Per Tree (cmt.)	MAI (cmt.)	CAI (cmt.)
10	26.70	0.20	0.002	0.000
20	44.00	0.077	0.004	0.006
30	68.40	0.180	0.006	0.010
40	84.80	0.309	0.008	0.013
50	91.10	0.497	0.0210	0.019
60	102.90	0.697	0.012	0.020
70	114.00	0.846	0.012	0.015
80	124.10	0.957	-	0.011

Growth data of Dhawara

Age (Year)	Girth (cm.)	Volume Per Tree (cmt.)	MAI (cmt.)	CAI (cmt.)
10	25.90	0.048	0.005	0.000
20	40.90	0.080	0.004	0.003
30	53.10	0.137	0.004	0.006
40	64.40	0.274	0.007	0.010
50	73.90	0.340	0.007	0.007
60	81.70	0.386	0.006	0.005
70	88.80	0.466	0.007	0.008
80	94.30	0.546	0.007	0.008

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The growth data of different miscellaneous species have been found scattered and is incomplete for the calculation of rotation. Even then these data are useful for the study of growth of miscellaneous species of the plan area. The selection girth of miscellaneous species has been fixed based on available growth data in the old working plans. Therefore, the selection girth of miscellaneous species is fixed based on available growth data, market demand and local circumstances for the current plan, which is given below:

Selection Girth for Miscellaneous Species

Species	Selection Girth (cm.)	Pre Selection Girth (cm)
Saja, Bija, Haldu	120	91 To 120
Dhawda	90	61 To 90
Lendia, Palas	60	41 To 60
Other Miscellaneous Species	120	90 To 120

9.5 Selection-cum-Improvement Working Circle:

- **Sal Species:** On the basis of the results of the forest resource survey, the description of the number of sal trees of various girth classes per ha. is as under:

Sl. No.	Species	(11-20)	(21-30)	(31-40)	(41-60)	(61-90)	(91-120)	Above 120	Total
1	Sal	43.66	21.94	20.32	15.4	20.24	18.35	12.24	152.51
2	Miscellaneous	104.94	92.00	44.71	38.82	33.41	15.06	10.94	339.88

Data of Sal Forests for Calculation of the Smithy's Safeguarding Formula

Sl. No.	Girth Class (cm.)	No. of Tree/ Ha.	Interval in Age Classes	Mortality Percentage	Class
1	61-90	20.24	30	9.30	III
2	91-120	18.35	60	33.33	II
3	Above 120	12.24	50	-	I

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It is apparent from the above table, that out of the 18.35 trees of the pre-selection girth class, only 12.24 trees are reaching the selection girth, and form around 67%. This means that around 33% trees are not able to reach the selection girth. Similarly, of the 20.24 trees of the pre-pre-selection girth, only 18.35 trees are reaching the pre-selection girth. In this way, 9.30% of trees are not able to reach the pre-selection girth due to mortality or some other reasons. The above data are used to determine the number of those trees of the class-II that will come into the class-I in the determined felling cycles of 20 years. The above number is calculated as under:

- **Number of trees coming from pre-selection girth (II) to selection class (I) calculated as per Smythies' safeguarding formula.**

M = F / T (II - II x Z%)
F = Felling Cycle
T = Time taken by class II trees passing into class I
Z = Percentage of II class tree that do not pass into I class in time T years due to mortality or removal in thinning

- **Number of trees passing into class II from class III**

M1 = (20/30) x (20.24-(20.24 x 9.30/100))
= **12.24%**

- **Percentage of trees which pass from girth class (61-90) into girth class (91-120)**

Annual Yield Y1 = (M x 100 / II + M / 2) ± A %
M = No. of trees calculated as per Smythies' safeguarding formula
A = Arbitrary selected constant
= (12.24x100)/(18.35+12.24/2)
= **50.02%**

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- **Number of trees passing into class I from class II**

M2 = (20/60) x (18.35-(18.35 x 33.33/100))
= **4.08%**

- **Percentage of trees which passes from girth class (91-120) into girth class above 120**

Y2 = (4.08 x 100)/(12.24+4.08/2)
= **28.57%**

- It is clear from the values of M1 and M2 that the percentage of trees passing from class III into class II is 50.02, in the felling cycle of 20 years, which is more than the percentage of trees passing from class II into class I (28.57).

- The value of arbitrary constant is taken as (+) 5.00, the reason being less biotic pressure, the status of regeneration and trees are part of rich wildlife habitat.

- Therefore, only 33% trees should be felled silviculturally i.e. only one tree out of three silviculturally available trees should be felled.

For Trees of Miscellaneous Species

- As in the case of sal, only one tree of miscellaneous species out of three silviculturally available trees should be felled. The selection girths have already been fixed.

Yield Regulation in the SCI Working Circle by the Von Mantel Formula:

Yield regulation based on growing stock is determined by the Von Mantel's formula:

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Y = (2 x GS) / R
Y = Annual Yield
GS = Growing Stock
R = Rotation

- Based on forest resources survey, the average stock of compartments included in the SCI is 76.90 cmt. out of which sal trees form 42.98 cmt., and the volume of miscellaneous trees is 33.74 cmt.

- Therefore, the volume of sal trees to be extracted will be:

Y = (2 x GS) / R
= 2 x 42.98/150
= **0.57307 cmt. / ha.**

- As per the instructions issued by the Department of Agriculture and Co-Operatives, Govt. of India, New Delhi, vide there letter dated 21-07-83, only 50% of the total annual yield as calculated by the Von Mantel's formula should be extracted.

- Therefore, the annual maximum volume of trees selected for felling will be 0.28653 cmt. per ha. Of the total area 25574.08 ha. included in the Working Circle, the stocked area is 23314.24 ha.

- Hence, the annual maximum yield will be as follows:

Annual Maximum Yield = Y x Area
= 0.2865 x 23314.24
= **6680.229 cmt.**

- Similarly, the annual yield for miscellaneous species included in the Working Circle will be:

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Y = (2 x GS) / R
= (2 x 33.74)/100
= **0.6748 cmt./ ha.**

- As the maximum yield shall be 50% of the Y calculated above:

Therefore maximum annual yield = Y x Area
= 0.3374 x 23314.24
= **7866.22 cmt.**

Therefore annual maximum yield of this Working Circle will be 6680.229 cmt. + 7866.22 cmt. = 14546.44 cmt.

Yield Regulation in the SCI Working Circle by the Smythies Formula:

- It will not be possible to estimate the number of trees silviculturally available for felling in this WC, but 33% of the trees as calculated shall be available for felling, and the annual yield will be regulated by the maximum estimated yield as per the Smythies formula:

Total Yield (cmt.) in the Duration of Complete Felling Cycle of 20 Years Based on the Smythies Formula

Species	Selection Girth (cm.)	Volume of Trees of Selection	Percentage	Total Yield (Per Ha.)
1	**2**	**3**	**4**	**5**
Sal	120	26.567	33	8.767
Saja, Mundi	120	3.464	33	1.143
Dhawara	90	1.405	33	0.464
Lendia	60	1.135	33	0.375
Total		32.571		10.749

- As the main yield in the Selection-cum-Improvement Working Circle is available from the trees of selection girth, it is clear from the above table that the total selection

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yield per ha. is 10.749 cmt. in 20 years' felling cycles or 0.537 cmt. per ha. per annum.

Maximum Annual Yield = Y x Area
= 0.537 x 23314.24
= **12530.24 cmt.**

- The above yield is less than the yield calculated by the Von Mantel formula (as per the GOI instruction). Therefore, the percentage of trees fixed for felling (33%) as calculated above is in accordance with the GOI directive.

- **Selection Girth:** Considering the conditions of the areas under this working circle, the following selection girths are proposed:

Species	Selection Girth (cm.)
1	**2**
Sal, Saja	120
Dhawara	90
Lendia, Palas	60

9.6 Yield Regulation:

Though yield depends on the density of forest area, site quality, topography and the number of silviculturally available trees, approximate yield is determined for each year. Based on the Smythies' safeguarding formula, only a certain percentage of the trees of the selection girth shall be marked. It has been taken into account while deciding the area of the annual felling series, so that the volume of crop and yield also remain almost the same in the annual treatment series.

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THE BUFFER ZONE

PART-II

(PROPOSED MANAGEMENT)

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CHAPTER – 10

VISIONS, GOALS, OBJECTIVES & PROBLEMS

10.1 Vision:

The Buffer Zone of the Kanha Tiger Reserve has to be managed to minimize biotic pressure on the Core Zone by taking up ecodevelopment programmes and meeting the demands of *nistar* materials for local communities, conserve spill-over wildlife populations, and make efforts to strengthen ecological connectivity beyond the Buffer Zone.

In this way, the Buffer Zone can be envisioned **"as a multiple use area of harmonical coexistence between local communities and wildlife"**.

10.2 Management Goal:

The management goal of the Buffer Zone is **"to manage forest and wildlife under mutually benefiting and participative programmes with low impact ecotourism"**.

10.3 Management Objectives

The management objectives of the Buffer Zone have been fixed as per the forest policies of the State Govt. and the Govt. of India **(Appendix-XIII & XIV)**. The guidelines of the National Tiger Conservation Authority, New Delhi have also been followed as per the Technical Document NTCA/01/07. Besides, the objectives have also been finalized in the light of the Govt. of MP Resolution on Joint Forest Management dated 07-02-2000 **(Appendix-XV)**. The specific management objectives of the Buffer Zone are as under:

- Improvement of forest crops through adequate forestry operations.
- Providing *nistar* and fodder to the local communities for *bonafide* use.
- Development/ improvement of wildlife habitats.

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- Management of spill-over populations of tigers, co-predators and other species.
- Restoration of weak links in the corridors.
- Undertaking ecodevelopment for rural upliftment.
- Initiation of various ecotourism activities.
- Undertaking activities for awareness of conservation and education.

10.4 Rationale of Objectives

The support of local communities is important for the conservation of wildlife outside the Core Zones and wildlife protected areas. The Buffer Zone has to be managed under mutual benefiting and participative programmes wherein the *nistar* demands of local communities are met and their socio-economic conditions are improved. In this backdrop of confidence building measures, the concerns of wildlife management, including restoration of habitats are addressed through public support.

10.5 Problems in Achieving Objectives:

The following problems in achieving the above objectives have been identified in the Buffer Zone.

- Illiteracy and lack of awareness in the area.
- Traditional dependence on forest.
- Adherence to traditional agricultural practices.
- Lack of employment opportunities.
- Defective animal husbandry practices, with a large number of scrub cattle.

10.6 SWOT Analysis:

SWOT analysis is a strategic planning method employed to evaluate the strengths, weaknesses, opportunities, and threats involved in a project. The analysis involves

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specifying the objectives of the project in question and identifying the internal and external factors that are favourable and unfavorable to achieve these objectives.

10.6.1 **Strength:** These are the attributes of the Buffer Zone that are helpful to achieving the stated objectives.

- Buffer Zone is duly notified and undisputed with clear boundaries.
- Recent inclusion of part of the Motinala range (East Mandla Division) into the Buffer.
- Functional ecodevelopment committees.
- Microplans for developmental works in place.
- Possibility of ecological linkages in the landscape.
- Possibility for a host of ecotourism activities.
- No militant history of the indigenous people living in the Buffer Zone.
- Improved infrastructure.
- Contiguity of Phen Wildlife Sanctuary (Satellitic Micro Core).

10.6.2 **Weakness:** These are the features of the Buffer Zone which are harmful to achieving the stated objectives:

- Lack of awareness in the indigenous communities and their reluctance to deviate from traditional occupation.
- Dependence on forest resources.
- Small forest area with patchiness.
- Large population of scrub cattle.
- Presence of villages close to the National Park boundary.

10.6.3 **Opportunities:** These are the external conditions that are helpful to achieving the stated objectives of the management of the Buffer Zone:

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- Gradual awareness about the importance of Buffer Zone.
- Productive forestry operations under the Joint Forest Management.
- Positive response of local communities in participative management programmes.
- Proposal for declaring the areas close to the Buffer Zone as "eco-sensitive zone" with adequate provisions to regulate/ control mushrooming of hotels/ resorts.
- Sectoral integration for development through district coordination committees.

10.6.4 **Threats:** These are the external conditions which could adversely affect the efforts to achieve the objectives:

- Biotic pressure on forests.
- Animosity/ acrimony against the protected area resulting in general dissatisfaction.
- Self-styled social activists sometimes inciting the local communities against the Buffer Zone.
- Extremist engineered disturbances in the adjoining district.

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CHAPTER – 11

MANAGEMENT STRATEGY

11.1 Legal Status:

The status of the Buffer Zone is not that of a Core Zone or National Park, and is a multiple use area with various land use patterns, including Reserved Forest, Revenue Land, Orange Area and Private Land. The Buffer Zone derives its legal sanctity from Section-38V (4) (Explanation-ii) of the Wildlife (Protection) Act, 1972 (as amended upto 2006).

11.2 Boundaries of the Buffer Zone:

The existing boundaries of the Buffer Zone are described briefly as under:

- **North:** Beginning from the Chhattisgarh state boundary and the north boundary of Phen WLS to the south boundary of Umardih revenue village.
- **East:** From Manori forest village along the inter-state boundary of the MP and CG states to compartment number 449 of the Phen WLS.
- **South:** From Kohka revenue village to the inter-state boundary of the MP and CG states near Barbaspur revenue village.
- **West:** From Umardih revenue village, across the Tannour river near Kohka revenue village.

11.3 Management Issues:

The significance of this multiple use area, past experience and the stated objectives for its management dictate the following major management issues:

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11.3.1 **Local Communities' Dependence on Forests**: Generally, local communities in the Buffer Zone depend on forest resources. They require timber, fuel, poles, bamboos and other minor forest produce. There annual demand of *nistar* material for bonafide use has been assessed by the socio-economic survey. Besides, the villages close to the National Park boundary also exert biotic pressure on the protected area.

11.3.2 **Economic Constraints**: Local communities in the Buffer Zone are generally poor and face economic constraints. They need regular developmental inputs for their villages and agriculture to improve their living standard. Needless to add, development/ upliftment of villages include a wide range of inputs.

11.3.3 **Wildlife Concerns:** The spill-over wildlife populations need protection as well as good wildlife habitats for survival and dispersal to adjoining areas. Initiatives for the effective management of wildlife in the Buffer Zone require the support/ cooperation of local communities.

11.4 Delineation of Buffer Area:

The management of Buffer consists in the redressal of forests, needs/ demands of local communities and wildlife concerns. On the basis of the types of managerial activities to be taken up in the Buffer Zone, it has been delineated into several working circles and overlapping working circles. The main activities are as under:

- Production forestry operations.
- Wildlife management practices.
- Ecodevelopment activities in forest and revenue villages.
- Ecotourism activities in forest areas/ villages.

11.5 Working Circles/ Management Zone:

On the basis of management objectives, working circles and overlapping circles have been constituted in the forest areas. These working/ overlapping working incorporate the

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relevant forest compartments, based on forest types, density, site quality classes, and slope etc., for undertaking silvicultural operations of a particular silvicultural system and habitat improvement for wildlife. Management zones, outside the forests, have been delineated for undertaking activities directly related to local communities. In this way, the proposed management in the Buffer Zone has been divided into the following working circles/ management zones:

- Main Working Circles
    - Selection-cum-Improvement
    - Restoration of Gene-Pool
    - Fuel and Fodder
- Overlapping Working Circles
    - Rehabilitation of Degraded Bamboo Forests
    - Wildlife Management
- Management Zone
    - Ecotourism
    - Joint Forest Management and Ecodevelopment
    - Conservation Education and Awareness

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CHAPTER – 12

SELECTION-CUM-IMPROVEMENT WORKING CIRCLE

12.1 Objectives:

The main objectives of the selection-cum-improvement working circle are as under:

- Conservation of existing forests to ensure sustainable production
- Imparting improvement treatment to the existing crops for maintaining continuity of dense areas and increasing forest stock
- To improve conditions for better regeneration and biodiversity conservation

12.2 Basis of the Constitution of the Working Circle:

- Compartments included with dense forests in more than 50% areas
- Compartments included with less than 30% slope in 50% areas
- Compartments included with forests of middle and mature age classes

12.3 Description of Vegetation:

As per the Champion & Seth classification (1968) the following types of forests occur in the working circle:

12.3.1 Moist Peninsular Sal Forest-3C/C2e: The general distribution of sal depends on climate, and on the basis of geology and soil, local distributions occur. In this way, the main among climatic factor on which the distribution of sal forests depends is the rains. The rains vary from 1400 mm. to 1900 mm. with an average daily humidity of 60-70% throughout the year, and 45-60% in the month of March. Saja (*Terminalia tomentosa*) is the main associate of sal, however, bija (*Pterocarpus marsupium*) and lendia (*Lagerstroemia parviflora*) also occur with

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it. They occur in top canopy, while jamun (*Syzygium cumini*) occur in middle canopy on alluvial soil. Roli, mant and amura are sub-species occurring in these forests.

This type of forests has been divided into the following sub-types:

12.3.1.1 Moist Peninsular High Level Sal Forest-3C/C2e: These forest types occur in the Motinala, Garhi, Khapa and Samnapur forests ranges. The rocks are generally, laterite with trap. The colour of soil is reddish yellow, it is barren or with *kanker*. The forest crops are generally middle aged with a large number of mature trees. The density of forests varies between 0.6 to 0.8. Generally, growth is good, however, the quality of crop in the hilly tract is better.

12.3.1.2 Moist Peninsular Low Level Sal Forest-3C/C2e: These types of forests occur in patches, generally on the lower slopes of the hills. Miscellaneous forests occur in dry areas. Frost also occurs in these areas, and the site quality classes of sal are I, II, III and IVa. The percentage of sal is around 30-40%, with density between 0.6 and 0.8. This forest types are generally found in the Motinala, Garhi, Khapa and Samnapur forest ranges. In the upper canopy, the main associates of sal (*Shorea robusta*) are saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), dhawda (*Anogeissus latifolia*), gunja (*Lannea coromandelica*) and padar (*Stereospermum chelonoides*), while in the middle canopy, it is aonla (*Emblica officinalis*).

12.3.1.3 Moist Peninsular Valley Sal Forest-3C/C2e/(iii): These types of forests occur in moist valleys with deep soil and along the nullahs. Pure sal mainly occurs in alluvial soil. There are quality classes I and II in these forests, with density between 0.6 and 0.8. Regeneration varies from adequate to plentiful, and the forest crop is generally young. These forest types occur in the Motinala, Garhi, Khapa and Samnapur forest ranges. The following vegetation is found in these forests:

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- **Top Canopy:** sal (*Shorea robusta*), saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), safed siras (*Albizzia procera*), jamun (*Syzygium cumini*), dhawda (*Anogeissus latifolia*), semal (*Bombax malabaricum*), haldu (*Adina cordifolia*) and mahua (*Madhuca indica*)
- **Lower Canopy:** Tinsa (*Ougeinia oojenensis*), kumbhi (*Careya arborea*), tendu (*Diospyros melanoxylon*), achar (*Buchanania latifolia*), aonla (*Emblica officinalis*), gunja (*Lannea coromandelica*), lendia (*Lagerstroemia parviflora*), ghont (*Zizyphus xylopyra*), harra (*Terminalia chebula*), khair (*Acacia catechu*) and bans (*Dendrocalamus strictus*).
- **Shrubs:** Surteli (*Woodfordia fruticosa*), chhind (*Phoenix acaulis*) and karonda (*Carissa opaca*).
- **Grass:** Bhurbusi (*Eragrostis unioloides*), lampa (*Heteropogon contortus*), khas (*Vetiveria zizanioides*) and bhond (*Themeda arundinacea*).
- **Climbers:** Mahul (*Bauhinia vahlii*), ramdatun (*Smilax zeylancia*) and dudhi (*Wrightia tomentosa*).

12.4 Area Incorporated:

The total number of compartments incorporated into this working circle is 128, with a total area of 25574.08 ha. The compartments of this working circle have been classified into 10 felling series. The details of incorporated forest areas in this working circle are appended (**Appendices-XXXVIII & XXXIX**). The range-wise felling series and the extent of their areas are as under:

Short Description of Forest Areas Allotted to the Working Circle

Sl. No.	Range	District	Felling Series	Total No. of Compartments	Compartment No.	Area of the FS
1	Khatia	Mandla	Aroli	9	320, 316, 315, 314, 313, 297, 295,294, 302	2890.8
			Dhamangaon	4	319, 318, 317, 330	1266.97
2	Khapa	Balaghat	Khapa	14	253, 252, 254, 255, 258, 265, 266, 264, 263, 262, 259, 267, 269, 275	2213.74

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			Parsatola	20	228, 229, 230, 233, 235, 246, 245, 244, 241, 243, 242, 240, 238, 239, 236, 237, 257, 256, 250, 251	3107.03
3	Motinala	Mandla	Kikara	18	142, 143, 148, 144A, 145A, 146, 176A, 175A, 177A, 147A, 149, 150A, 151A, 169, 171, 152, 164, 153	3040.28
			Motinala	13	135, 155, 159, 137, 138, 139, 140, 141, 134, 133A, 132, 131A, 130	2231.56
4	Sijhora	Mandla	Dhamangaon	5	3, 2, 14, 6, 13	1173.92
5	Samnapur	Balaghat	Samnapur	14	207, 206, 205, 204, 198, 199A, 211, 210, 212, 214, 216, 218, 221, 225P	2618.91
6	Garhi	Balaghat	Dhiri	13	109, 110A, 111A, 115A, 117, 118, 119, 120, 122, 127A, 81, 82, 83	2308.94
			Khirsari	8	86, 87, 88, 89, 90, 91, 93,94	2201.13
			Moharai	10	95A, 96, 97A, 98A, 103A, 104, 105, 106, 107, 84	56.81
	Total:			**128**		**25574.08**

12.5 Description of Forest Types:

The forest areas of the Khatia, Khapa, Sijhora, Samnapur, Garhi and Motinala ranges have been incorporated into this working circle. Teak, sal and Miscellaneous forests form 0.07%, 39.26% and 51.09% respectively of the total area. The low density, blank and other areas form 1253.5 ha. (4.83%), 841.6 ha. (3.25%) & 385.95 ha. (1.49%) respectively of the total area of the working circle. The details of incorporated forest types in this working circle are appended (**Appendix-XXXV**). The summary of the incorporated forest types is given as under:

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Areas (Ha.) Included in the Working Circle as Per Forest Type

Legal Status	No of Comptt.	Stocked Area			Total	Under-Stocked area	Blank	Others	Total
		Teak	Sal	Miscellaneous					
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RF	128	17.6	10053.74	13242.90	23314.24	1164.44	696.59	398.81	25574.08
OA	0	0	0	0	0	0	0	0	0
Total	**128**	**17.6**	**10053.74**	**13242.9**	**23314.24**	**1164.44**	**696.59**	**398.81**	**25574.08**
%		**0.07**	**39.31**	**51.78**	**91.16**	**4.55**	**2.72**	**1.56**	**100.00**

12.6 Description of Site Qualities:

The forests of site quality classes I, II, III, IVa, IVb, Va and Vb occur in the compartments incorporated in this working circle. Most of the forest area belongs to the site quality class IVa and III with 8840.10 ha. (37.69%) and 7333.86 ha (31.27%). The details of incorporated site quality-wise forests in this working circle are appended (**Appendix-XXXVII**). The description of site quality class-wise forests in this working circle is as under:

Site Quality-wise Forest Area (Ha.) in the Working Circle

Forest Type	I	II	III	IVa	IVb	Va	Vb	Total
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Teak	0.00	0.00	0.00	17.60	0.00	0.00	0.00	17.60
Sal	282.80	1963.68	6079.42	1367.85	489.14	0.00	0.00	10182.89
Miscellaneous	0.00	7.65	1254.44	7454.65	4534.46	0.00	0.00	13251.20
Total	**282.80**	**1971.33**	**7333.86**	**8840.10**	**5023.60**	**0.00**	**0.00**	**23451.69**
Percentage	**1.21**	**8.41**	**31.27**	**37.69**	**21.42**	**0.00**	**0.00**	**100.00**

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12.7 Description of Age Classes:

In this working circle, middle age class constitutes the highest percentage, with 15371.59 ha. (65.93%) followed by young age class, with 3972 ha. (17.04%). The details of incorporated forest age classes in this working circle are appended (**Appendix-XXXVIII**). A short description of forest age classes in this working circle is as under:

Age Class-wise Forest Area (Ha.) in the Working Circle

Forest Type	Young	Middle	Mature	Total
1	**2**	**3**	**4**	**5**
Teak	0	17.6	0	17.6
Sal	182.84	7279.66	2591.24	10053.7
Miscellaneous	3789.16	8074.33	1379.41	13242.9
Total	**3972**	**15371.59**	**3970.65**	**23314.2**
Percentage	**17.04**	**65.93**	**17.03**	**100**

12.8 Description of Density Classes:

In this working circle, most of the incorporated compartments form the highest percentage of stocked forests, with 23314.24 ha. (91.16%). While the under-stocked and blank areas form 1164.44 ha. (4.55%) and 696.59 (2.72%) respectively, the other density classes form only 1.569% (398.81 ha.) of the total area of the working circle. The details of incorporated density classes in this working circle are appended (**Appendix-XXXVIII**). A short description of density classes in this working circle is as under:

Density-wise Forest Area (Ha.) in the Working Circle

Density	Area (Ha.)	Percentage
1	**2**	**3**
Stocked	23314.24	91.16
Under Stocked	1164.44	4.55
Blank	696.59	2.72
Others	398.81	1.56
Total	**25574.08**	**100.00**

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12.9 Topography:

Most of the area of the compartments incorporated into this working circle falls under the plain and medium slope classes, with 16972.73 ha. (66.37%) and 7083.10 ha. (27.70%) area respectively of the working circle. Areas with steep slopes form only 1518.25 ha. (5.94%) of the total area. The details of the topography of forest areas in this working circle are appended (**Appendix-XXXVI**). A short description of the topography classes in this working circle is as under:

Slope-wise Forest Area (Ha.) in the Working Circle

Range	No. of Comptt.	< 10%	10 – 30%	30 – 40%	> 40%	Total
Khatia	13	3446.29	649.29	62.19	0.00	4157.77
Khapa	34	4460.86	764.24	92.61	3.06	5320.77
Sijhora	5	823	333.77	17.15	0	1173.92
Samnapur	14	1484.94	966.85	130.34	36.78	2618.91
Grahi	31	4579.69	2261.35	179.74	10.09	7030.87
Motinala	31	2177.95	2107.59	745.16	241.13	5271.84
Total	**128**	**16972.73**	**7083.10**	**1227.19**	**291.06**	**25574.08**
Percentage		**66.37**	**27.70**	**4.80**	**1.14**	**100**

12.10No. of Trees (Per Ha.):

On the basis of the forest resources survey, the average number of tress in this working circle has been estimated at 526.55 per ha. Of this number, teak, sal and Miscellaneous trees form 0.0.82%, 28.90% and 70.29% respectively. The detailed description of girth class-wise number of trees per ha. is appended (**Appendix of Forest Resource Survey XIX**). A short description of the girth class-wise number of trees per ha. in this working circle is as under:

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Girth Class-wise No. of Trees (Per Ha.)

Species	Number of Trees per ha. As per Girth Class				Percentage
	Up to 60 cm.	60- 120 cm	Above 120 cm	Total	
1	**2**	**3**	**4**	**5**	**6**
Teak	2.37	0.32	1.61	4.30	0.82
Sal	46.99	36.45	68.71	152.15	28.90
Miscellaneous	176.34	51.08	142.69	370.11	70.29
Total	**225.70**	**87.85**	**213.01**	**526.56**	**100**
Percentage	**42.86**	**16.68**	**40.45**	**100**	

12.11Volume of Trees (Per Ha.):

On the basis of the forest resources survey, the volume of average number of trees in this working circle has been estimated at 76.90 per ha. The percentages of teak, sal and Miscellaneous trees form 0.22%, 55.89% and 43.88% respectively of the total volume. The detailed description of girth class-wise volume of average number of trees per ha. is appended (**Appendix of Forest Resource Survey XVIII**). A short description of the volume of girth class-wise number of trees per ha. in this working circle is as under:

Girth Class-wise Volume (cmt.) of Trees

Species	Volume of Trees per ha. As per Girth Class				Percentage
	Up to 60 cm.	60- 120 cm	Above 120 cm	Total	
1	**2**	**3**	**4**	**5**	**6**
Teak	0.099	0.073	0.000	0.172	0.22
Sal	2.247	14.167	26.567	42.981	55.89
Miscellaneous	7.040	15.044	11.661	33.745	43.88
Total	**9.39**	**29.28**	**38.23**	**76.90**	**100**
Percentage	**12.21**	**38.08**	**49.71**	**100**	

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12.12Description of Regeneration:

On the basis of the forest resources survey, the average regeneration in this working circle has been estimated at 1197.74 per ha. The regeneration of teak, sal and Miscellaneous species form 0.00, 489.85 and 707.89 respectively of the total regeneration per ha. The detailed description of the average regeneration per ha. is appended (Appendix of F**orest Resource Survey XX**). A short description of the regeneration per ha. in this working circle is as under:

Total Regeneration (Per Ha.)

WC	No. of Plot	Teak	Sal	Miscellaneous	Total
SCI	93	0	489.85	707.89	1197.74
Reg. In All Plots :	**185**	**0**	**352.85**	**649.03**	**1001.88**

12.13Treatment Methods to be Adopted:

The compartments of sal and miscellaneous forest areas have been incorporated into this working circle. As per the forest resource survey, average number of trees, average volume of forest stock and the level of regeneration per ha. are 487.65, 62.36 and 1253.28 respectively. As the level of regeneration comes under inadequate category, these forests cannot be placed under the productive forest category. Therefore, it is not proper to manage these forests for intensive exploitation under any silvicultural system considering the present outside interventions, terrains and the level of regeneration. As these forests are also supposed to support spill-over wildlife populations of the Kanha Core Zone and their future propagation, there is an urgent need to slightly modify the standard silvicultural system that can serve the main objective of ensuring sustainable yield and creating more suitable conditions for biodiversity/ wildlife conservation. Therefore, the forests incorporated in this working circle shall be managed under the working circle.

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12.13.1 **Species to be Prioritized:**

- As sal is the main species in this working circle, it shall be prioritized over other species for retention at the time of main felling and other silvicultural operations. However, in such areas where the sal forms over 50%, miscellaneous species shall be prioritized for retention.
- No fruit tree species such as aonla, harra, mahua, tendu, achar etc. shall be felled.
- The felling of khair, semal, bija, amaltas, salai and gunja etc. tree species that form less than 1% shall be banned

- **Rotation, Selection Girth & Yield Regulation:**

12.13.1.1 **Rotation:** As the Sal Selection-cum-Improvement Working Circle is based on felling cycles, there is no practical use of the calculation of rotation from the standpoint of silviculture. The average site quality classes incorporated into this working circle are III and IVa. The rotation for sal has been considered as 150 years.

12.13.1.2 **Selection Girth:**

12.13.1.3 **Determination of selection girth and rotation of Sal:** The Yield Table Provisional for Forest of Madhya Pradesh compiled by Shri OP Saxena is available in which data of sample plots of Raipur and Mandla District has been used. Since this working plan also contains major portion sal forest of Mandla District, the Yield Table by Shri OP Saxena can be used for the analysis of yield of sal in the plan area. The plan area consists of sal forest which falls in site quality class I To IV A Class of Madhya Pradesh yield table. Growth data of sal for MP site quality class II, III,IV is available and given below:

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Maximum Height of Sal Age-wise & Site Quality-wise

Age (Year)		Maximum Height (Meter) Site quality wise			
Coppice Crop	**Seedling Crop**	**I**	**II**	**III**	**IV**
5	-	5.79	4.88	3.66	2.74
10	-	10.60	8.23	6.40	4.57
15	9	13.11	10.67	8.23	6.10
20	14	15.85	12.80	10.06	7.01
25	19	17.98	14.63	11.58	8.23
30	24	20.12	16.46	12.80	9.14
35	30	21.25	17.98	14.02	10.80
40	34	23.77	19.51	15.24	10.67
45	39	25.30	20.73	16.15	11.58
50	44	26.82	21.99	17.07	12.19
55	48	28.04	22.86	17.98	12.80
60	54	29.26	24.08	18.59	13.41
65	62	30.48	24.99	19.51	13.72
70	64	34.70	25.91	20.12	14.33
75	70	32.61	26.52	20.73	14.93
80	75	33.53	27.43	21.34	15.24
85	80	34.44	28.35	21.95	15.85
90	86	35.36	28.96	22.55	16.15
95	91	36.27	29.57	22.86	15.46
100	97	38.88	30.17	23.47	16.76
105	103	37.49	30.78	24.08	17.07
110	108	38.10	31.39	24.38	17.37
115	114	38.71	32.00	24.69	17.68
120	119	39.32	32.31	25.30	17.98
125	125	39.93	32.93	25.60	18.29

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130	130	40.54	33.22	25.91	18.59
135	135	41.15	33.53	26.21	18.59
140	140	41.76	34.14	26.52	18.90
145	145	42.06	34.54	26.82	19.20
150	150	42.37	34.75	27.13	19.20

Calculation for current annual increment, mean annual increment, volume of the crop average no. of trees, average girth and average height age wise for sal species of all India quality class III is given below:

Data for Rate of Increment for Sal Species in all India Site Quality Class III

Crop Age (Year)	Average Diameter (cm.)	Average Girth (cm.)	Average Height (m.)	No. of Trees Per Ha.	Total Volume of Standing Crop cmt. Per Ha.	Yield cmt. Per Ha.	Average Annual Increment cmt. Per Ha.	Current Annual Increment cmt. Per Ha.
10	6.6	20.7	7.57	1720	20.991	20.991	2.099	-
15	8.9	27.9	9.09	1144	31.486	32.186	2.169	2.239
20	10.7	33.5	10.33	909	42.682	44.781	2.239	2.519
25	12.5	39.1	11.51	431	52.476	57.375	2.309	2.519
30	14.2	44.7	12.73	610	62.973	72.069	2.379	2.939
35	16.0	50.3	13.63	526	72.069	86.763	2.449	2.939
40	17.8	55.9	14.54	442	80.465	102.156	2.589	3.079
45	19.3	60.6	15.15	395	88.862	118.949	2.659	3.359
50	21.2	66.2	16.6	366	98.658	139.240	2.799	4.058
55	22.4	70.2	16.66	321	107.540	160.231	2.939	4.198
60	23.6	74.2	17.27	299	114.751	182.622	3.079	4.478
65	24.9	78.2	17.88	277	121.745	206.411	3.219	4.758
70	26.2	82.2	18.48	259	135.742	233.000	3.359	5.318
75	27.4	86.2	19.9	245	142.739	262.387	3.499	5.877

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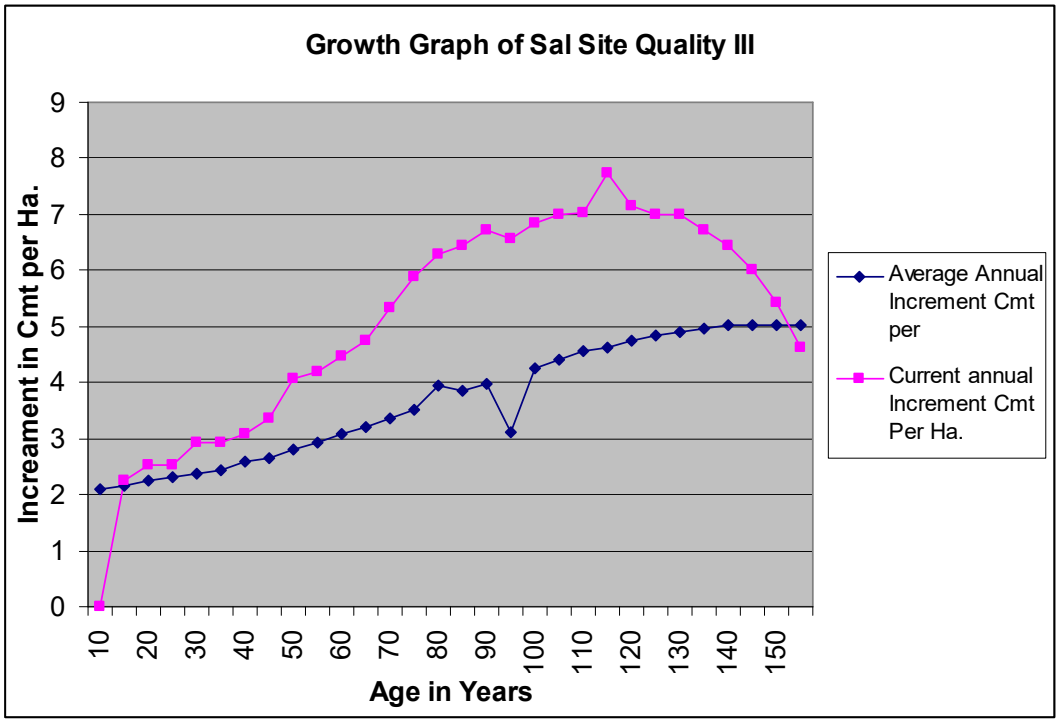
80	28.7	90.2	19.69	230	147.637	293.874	3.938	6.297
85	29.7	93.4	20.30	217	151.835	326.060	3.848	6.437
90	30.7	96.6	20.60	207	153.234	359.646	3.988	6.717
95	31.8	99.8	21.21	195	154.634	392.532	3.128	6.577
100	32.6	102.9	21.51	185	156.733	426.817	4.268	6.857
105	35.5	105.4	22.12	178	157.432	416.802	4.408	6.997
110	34.8	107.8	22.42	170	158.132	496.787	4.548	7.037
115	35.1	110.1	22.72	163	158.132	532.472	4.618	7.737
120	35.8	112.5	23.02	158	158.132	568.156	4.758	7.136
125	36.3	114.1	23.23	153	158.832	603.141	4.828	6.998
130	37.1	116.5	23.63	148	158.832	638.126	4.898	6.997
135	37.6	118.1	23.93	143	158.832	671.712	4.968	6.716
140	38.1	119.7	23.93	138	158.832	703.898	5.028	6.437
145	38.6	121.3	24.24	136	158.832	733.985	5.038	6.017
150	38.4	120.5	24.24	133	157.432	760.574	5.038	5.418
155	39.0	122.56	25.78	129	159.332	780.890	5.038	4.618



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When trends are drawn on the basis of above mentioned data, the CAI/ MAI graphs meet at the age of 150 years for the site quality class III, and the average girth of the crop at this point is 122 cm. Thus maximum increment in volume will be obtained at girth 122 cm. for the site quality class III. Therefore, girth at breast height at the age of 150 year will be 120 to 125 cm. In current working plan of the Mandla division, the selection girth of sal is 120 cm. The structure of the crop of the plan area is similar to that of the Mandla division so fixing selection girth of sal at 120 cm. is justified.

Species	Selection Girth (cm.)
1	**2**
Sal, Saja	120
Dhawara	90
Lendia, Palas	60

12.13.1.4 **Yield Regulation:** Though yield depends on the density of forest area, site quality, topography and the number of silviculturally available trees, approximate yield is determined for each year. Based on the Smythies' safeguarding formula, only a certain percentage of the trees of the selection girth shall be marked. It has been taken into account while deciding the area of the annual felling series, so that the volume of crop and yield also remain almost the same in the annual treatment series.

12.14Selection-cum-Improvement Working Circle:

12.14.1**Sal Species:** On the basis of the results of the forest resource survey, the description of the number of sal trees of various girth classes per ha. is as under:

Sl. No.	Species	(11-20)	(21-30)	(31-40)	(41-60)	(61-90)	(91-120)	Above 120	Total
1	Sal	43.66	21.94	20.32	15.4	20.24	18.35	12.24	152.51
2	Miscellaneous	104.94	92.00	44.71	38.82	33.41	15.06	10.94	339.88

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Data of Sal Forests for Calculation of the Smithy's Safeguarding Formula

Sl. No.	Girth Class (cm.)	No. of Tree/ Ha.	Interval in Age Classes	Mortality Percentage	Class
1	61-90	20.24	30	9.30	III
2	91-120	18.35	60	33.33	II
3	Above 120	12.24	50	-	I

It is apparent from the above table, that out of the 18.35 trees of the pre-selection girth class, only 12.24 trees are reaching the selection girth, and form around 67%. This means that around 33% trees are not able to reach the selection girth. Similarly, of the 20.24 trees of the pre-pre-selection girth, only 18.35 trees are reaching the pre-selection girth. In this way, 9.30% of trees are not able to reach the pre-selection girth due to mortality or some other reasons. The above data are used to determine the number of those trees of the class-II that will come into the class-I in the determined felling cycles of 20 years. The above number is calculated as under:

- **Number of trees coming from pre-selection girth (II) to selection class (I) calculated as per Smythies' safeguarding formula.**

M = F / T (II - II x Z%)
F = Felling Cycle
T = Time taken by class II trees passing into class I
Z = Percentage of II class tree that do not pass into I class in time T years due to mortality or removal in thinning

- **Number of trees passing into class II from class III**

M1 = (20/30) x (20.24-(20.24 x 9.30/100))
= **12.24%**

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- **Percentage of trees which pass from girth class (61-90) into girth class (91-120)**

Annual Yield Y1 = (M x 100 / II + M / 2) ± A %
M = No. of trees calculated as per Smythies' safeguarding formula
A = Arbitrary selected constant
= (12.24x100)/(18.35+12.24/2)
= **50.02%**

- **Number of trees passing into class I from class II**

M2 = (20/60) x (18.35-(18.35 x 33.33/100))
= **4.08%**

- **Percentage of trees which passes from girth class (91-120) into girth class above 120**

Y2 = (4.08 x 100)/(12.24+4.08/2)
= **28.57%**

- It is clear from the values of M1 and M2 that the percentage of trees passing from class III into class II is 50.02, in the felling cycle of 20 years, which is more than the percentage of trees passing from class II into class I (28.57).

- The value of arbitrary constant is taken as (+) 5.00, the reason being less biotic pressure biotic pressure, the status of regeneration and trees are part of rich wildlife habitat.

- Therefore, only 33% trees should be felled silviculturally i.e. only one tree out of three silviculturally available trees should be felled.

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For Trees of Miscellaneous Species

- As in the case of sal, only one tree of miscellaneous species out of three silviculturally available trees should be felled. The selection girths have already been fixed.

Yield Regulation in the SCI Working Circle by the Von Mantel Formula:

Yield regulation based on growing stock is determined by the Von Mantel's formula:

$$Y = (2 \times GS) / R$$

Y = Annual Yield
GS = Growing Stock
R = Rotation

- Based on forest resources survey, the average stock of compartments included in the SCI is 76.90 cmt. out of which sal trees form 42.98 cmt., and the volume of miscellaneous trees is 33.74 cmt.

- Therefore, the volume of sal trees to be extracted will be:

$$Y = (2 \times GS) / R$$
$$= 2 \times 42.98/150$$
$$= \mathbf{0.57307 \text{ cmt. / ha.}}$$

- As per the instructions issued by the Department of Agriculture and Co-Operatives, Govt. of India, New Delhi, vide there letter dated 21-07-83, only 50% of the total annual yield as calculated by the Von Mantel's formula should be extracted.

- Therefore, the annual maximum volume of trees selected for felling will be 0.28653 cmt. per ha. Of the total area 25574.08 ha. included in the Working Circle, the stocked area is 23314.24 ha.

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- Hence, the annual maximum yield will be as follows:

Annual Maximum Yield = Y x Area
= 0.2865 x 23314.24
= **6680.229 cmt.**

- Similarly, the annual yield for miscellaneous species included in the Working Circle will be:

Y = (2 x GS) / R
= (2 x 33.74)/100
= **0.6748 cmt./ ha.**

- As the maximum yield shall be 50% of the Y calculated above:

Therefore maximum annual yield = Y x Area
= 0.3374 x 23314.24
= **7866.22 cmt.**

Therefore annual maximum yield of this Working Circle will be 6680.229 cmt. + 7866.22 cmt. = 14546.44 cmt.

Yield Regulation in the SCI Working Circle by the Smythies Formula:

- It will be not be possible to estimate the number of trees silviculturally available for felling in this WC, but 33% of the trees as calculated shall be available for felling, and the annual yield will be regulated by the maximum estimated yield as per the Smythies formula:

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Total Yield (cmt.) in the Duration of Complete Felling Cycle of 20 Years Based on the Smythies Formula

Species	Selection Girth (cm.)	Volume of Trees of Selection	Percentage	Total Yield (Per Ha.)
1	2	3	4	5
Sal	120	26.567	33	8.767
Saja, Mundi	120	3.464	33	1.143
Dhawara	90	1.405	33	0.464
Lendia	60	1.135	33	0.375
Total		32.571		10.749

- As the main yield in the Selection-cum-Improvement Working Circle is available from the trees of selection girth, it is clear from the above table that the total selection yield per ha. is 10.749 cmt. in 20 years' felling cycles or 0.537 cmt. per ha. per annum.

Maximum Annual Yield = Y x Area
= 0.537 x 23314.24
= **12530.24 cmt.**

- The above yield is less than the yield calculated by the Von Mantel formula (as per the GOI instruction). Therefore, the percentage of trees fixed for felling (33%) as calculated above is in accordance with the GOI directive.

12.15Organization of Working Circle:

Total area	:	25574.08 ha.
Total compartments	:	128
Felling series	:	10
Average area of the coupe	:	100 ha.
Method of regeneration	:	Artificial
No. of trees	:	526.55/ ha.
Volume of tree	:	76.9 / ha.
Total regeneration	:	1197.74 / ha.

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12.16Treatment Cycle:

The compartments included in this working circle have been divided into 10 felling series. All these felling series have been further divided into 20 annual coupes. The felling series-wise description of these coupes is appended **(Appendices-XXXVIII, XXXIX & XXXIX-A)**.

12.17Treatment Type:

Various treatment types shall be shown on the treatment map. The treatment type shall be written on the trees of boundaries with coal tar (*damar*), and bands painted to demarcate different treatment types.

12.17.1Treatment class-A (Protected Area)

- Areas with over 25^{o} slope
- 20 m. wide strip on either side of rivers/ nalas of well defined banks
- Seriously eroded areas, and areas with exposed rocks
- Frost affected and permanent blank areas
- 6 m. wise strip on either side of forest and other roads

12.17.2Treatment class-B (Fuel & Fodder species: Less than 0.4 density)

- Blanks and under stocked areas with good soil and suitable for plantations
- Areas with adequate root stocks of coppice species
- Areas with shallow soils and suitable for pasture development
- Rugged, bouldery and rocky areas with scarce soil

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12.17.3Treatment class-C (Successful Treated Areas)

- Successful Plantation Areas:
  - All unirrigated plantation areas with more than 30% live plants, and irrigated alternative plantation areas with less than 75% live plants
- Unsuccessful Plantation Areas:
  - All unirrigated plantation areas with less than 30% live plants, and irrigated and alternative plantation areas with less than 75% live plants

12.17.4Treatment class-D (Rest of the Stocked Dense Forest Area: Less than 25^{o} slope & over 0.4 density)

- All such areas to be included with more than 0.4 density and less than 25^{o} slope

12.18Enumeration:

The tree species with already fixed selection girths, and the trees of sal and miscellaneous species with higher girths shall be enumerated by classifying them into 20 cm. girth class intervals. The sound, half sound and unsound trees of each species shall be enumerated separately. Treatment type-wise record of enumeration shall be maintained. The definitions of various condition-types of trees are as under:

- **Sound:** Without any fault/ demerits, the tree apparently looking like timber.
- **Half Sound:** The tree out of which 50 to 75% timber can be obtained.
- **Unsound:** The tree out of which less than 50% timber can be obtained.
- **Dead:** A tree with two-thirds part from top to bottom died up.
- **Dying:** A tree with one-thirds part from top to bottom died up.
- **Diseased:** An acutely insect attacked tree the possibility of whose survival until the next felling cycle is very low.

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12.19Treatment Implementation (All Classes):

- A treatment map shall be prepared by an officer not below the rank of Range Officer to ensure that no important wildlife habitat in the area is disturbed by forestry operations. The Field Director's approval shall be final
- As per the Govt's order all banned trees i.e. aonla, harra, bahera, mahua, tendu, achar, kachnar, palas etc. shall be protected and not be marked.
- Trees such as bargad, pipal etc. related to religious sentiments shall not be marked for felling.
- Threatened species such as shisham, haldu, bija, tinsa, kasai, kullu, kosum etc. shall not be marked for felling.
- Groves of shade bearing trees around wells, camps, cattle sites, tanks, falls and picnic spots, and the trees of complexes of buildings of archeological importance shall be protected.
- A minimum of 8 trees per ha. having habitat values of wildlife/ birds such as nests and hollows shall be retained, specially on steep slopes.
- No felling shall be carried out within 200 m. of important dens and water bodies.
- Some of the dead and windfall trees shall be retained from wildlife point of view.
- No tree shall be marked for felling along 10 m. wide strips on the outer boundaries of forests, and trees on 20 m. either side of highways and other roads, and 6 m. either side of cart tracks shall be protected.
- Required soil conservation works shall be carried out as per standard procedure.
- Bamboo fellings in degraded clumps shall be carried out as per standard procedure.
- Live stumps upto pre-selection girth of important coppice species shall be dressed.
- All malformed coppice species upto 20 cm. girth shall be cutback. Except for two coppice shoots, the rest will be removed.
- The conservation of medicinal plants in the area shall be carried out as per standard procedure.
- Wherever there is a dominant tree species in the crop with 50% occurrence or over, miscellaneous species shall be protected from felling with a view to encourage them.

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- No tree species with less than 1% occurrence shall be marked for felling.
- All such trees shall be treated as silviculturally available that have at least 2 trees of freely growing, healthy and undamaged leading shoots between 31 to 90 cm. girth within a periphery of 6 m.
- Under no circumstances shall the crop density be reduced below 0.5 after treatment in this working circle.
- Lantana eradication shall be carried out in all areas having less than 40% slope as per approved standard procedure.
- No tree of sample plot, preservation plot, growth plot, teak seed orchard, plus trees or any experiment shall be cut.
- Trees on 20 m. wide strip on either side of rivers/ nullahs/ streams of well defined banks retaining water upto January shall be protected.
- The felling of maida, lodh and kahuwa trees shall be banned and so shall be the removal of barks.
- No climber shall be cut.
- To monitor the production of large trees, at least two trees per ha. of sal, saja, ledia, dhawa and bhirra species with maximum girth class shall be retained.
- The seeds of local species shall be sown as per requirement.
- No teak trees shall be felled as they are small in number and have come up from plantations in the nearby areas.

12.20Marking Rules for Different Treatment Types:

Marking rules are appended **(Appendix-XLVII)**.

12.20.1Treatment type-A (Protected Area)

- Trees shall not be marked for any type of felling.
- The area shall be protected completely from grazing, and works may be taken up to check soil erosion. However, contour bunding and gully plugging etc. shall be carried out in areas with slopes as per the appendix of miscellaneous regulations. On

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too much slopes, contour bunds shall be built with the help of local stones and brushwood. Stones shall not be dug up from slope areas to carry out the above works.

- Work shall be executed in bamboo clumps as per the standard marking rules.
- Lantana eradication work shall not be carried out.

12.20.2Treatment type-B (Rehabilitation Areas: Less than 0.4 density)

- (B-1) Suitable blank and under-stocked areas with good soil for plantation

    - The planting of fruit and fodder species like aonla, bamboo and local species shall be prioritized.
    - Based on the suitability of site, the area shall be enclosed by a cattle proof trench, cattle proof wall, barbed wires or thorny fence.
    - Lantana eradication, if required, shall be carried out as per the provisions appended **(Appendix-LX)**.
    - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
    - Site preparations for plantation shall be carried out in the first year of treatment, and the next year, plantation shall be taken up in the rains.
    - In the treatment area, next year of site preparations, planting will be done as per standard procedure.
    - For plantations, time plan and the particular of works shall be followed as per the description appended **(Appendix-LVII)**.
    - As per the requirement of the area, soil and water conservation works shall be taken up as per instruction given in the relevant chapter.

- (B-2) Rehabilitation areas with adequate root-stocks

    - All malformed coppice species upto 20 cm. girth shall be cutback.
    - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.

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- Except for two or three healthy coppice shoots, the rest will be removed from the stump.
- No plantation will be taken up in this area, and as per requirement, the seeds of select species shall be sown in suitable areas.
- The area shall be effectively protected from grazing and fire.
- As per requirement, soil and water conservation works shall be carried out as appended **(Appendix-XLIX)**.

- (B-3) Areas with shallow soils suitable for pasture development

  - As per requirement, the area shall be enclosed by a cattle proof trench, cattle proof wall, chain-link fencing or thorny fence prior to one year of treatment.
  - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
  - Lantana eradication, if required, shall be carried out as per the provisions appended **(Appendix-LX)**.
  - As per requirement, soil and water conservation works shall be carried out as appended **(Appendix-LXIX)**.
  - In the year of the treatment of coupe, the area shall be ploughed or beds prepared therein for the site preparation for development of fodder and pasture land. And next year the planting of grass/ sowing of seed shall be carried out. Generally, local species shall be prioritized.
  - Unpalatable and dry grass, weeds shall be weeded out in the rains before the plantation.
  - Grazing shall be prohibited in these areas, and fire protection of such areas shall be carried out as done in the treatment type A areas. In the first year, the grass shall not be cut until the seed fall, and grass seeds shall not be collected.
  - After the establishment of pasture land development areas, the Deputy Director shall accord permission to local villagers/ members of ecodevelopment committees for the cutting and collection of grass after the seed fall. The cutting

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of grass and collection of grass seeds shall be conducted by the Forest Department or through ecodevelopment committees.

- (B-4) Rugged bouldery and rocky areas with no soil (B-4)

  - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
  - As per requirement, soil and water conservation works shall be carried out.

12.20.3Treatment type-C (Successful Treated Areas)

- (C-1) Successful plantation areas

  - In successful plantation area cleaning, thinning and maintenance works shall be carried out as per standard procedure. What is meant by successful plantation area is that the established plants may in future rehabilitate as forests.
  - The Sagreiya formula or the All India Yield Table can be used for thinning in plantation areas. As the yield table can only be used for the pure plantation of a species, and cannot be applied to miscellaneous plantations, the Sagreiya formula can be used universally.

- (C-2) Unsuccessful plantation areas

  - As per the instructions vide the MP Forest Department letter No. F-25/63/92/10/2 dated 16-06-1994, the Deputy Director shall analyze the reasons for the failure of plantation areas, and give suitable treatment so that they may recover and change into successful plantation areas.

12.20.4Treatment type-D (Rest of the Stocked Dense Forest Area: Less than 25^{o} slope & over 0.4 density)

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Under this treatment type, marking for felling shall be carried out from the standpoint of silviculture. Along with the top storey, sufficient mix of miscellaneous species shall be kept in the middle and lower storey. The marking procedure to be adopted shall be as under:

- As per the enumeration records of the species with specified selection girths, a maximum of 30%, which means 1 out of 3 trees, of available trees over selection girths shall be marked, if silviculturally available.
- Except for 8 dead/ dying and dried trees per ha., the rest of the seriously diseased, damaged, malformed fuel and half sound tree shall be marked initially. Healthy trees shall be marked finally to complete the specified percentage for felling.
- Efforts shall be made to maintain the present representation of species during marking. To ensure the uniform distribution of the trees of selection girth class in the crop, a two-ha. forest area shall be treated as a unit. Where sal occurs as a pure crop (more than 50%), other miscellaneous species shall be prioritized for protection.
- No tree of pre-selection girth class shall be marked for felling. The selection/ pre-selection girths of different species are as under:

Species	**Pre-Selection Girth (cm.)**
1	**2**
Sal	90-120
Saja, Haldu, Mundi	90-120
Dhawara	60-90
Lendia, Ghot, Palas	40-60
Other	60-90

- All the shrubs species that are suppressing the seedling and sapling level of the regeneration of sal and miscellaneous species shall be cut-cleaned.
- Thinning shall be carried out in the girth class of the young crop of below the pre-selection girth class.
- Thinning shall only be carried out in congested crop.

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- The area shall be roamed about to have an idea of congested crop, irregularly dense crop, with abundant young crop whose average girth is less than the pre-selection girth.
- Sample plots shall be laid out to determine the average girth. The number of sample plots shall be based on the size of coupes. However, it shall be ensured to lay out a minimum of four sample plots of the area of 0.25 ha. each.
- The concerned Sub Division Officer shall inspect the plots and certify them accordingly.
- Except for plantation areas, the following Sagreiya formula shall be used for thinning in general forest areas:

$$S = G/10 + 1$$

Where, S = Distance (in m.) between two trees
G = Average girth (in cm.) of the crop occurring in the area

- The following points should be taken into account for thinning:

  - The interval obtained from the Sagreiya formula is maximal. The interval should be kept less than this in the thinning.
  - Only silviculturally available trees shall be felled in the thinning.
  - No tree of any species banned from felling for any special purpose shall be felled in the thinning.
  - No thinning shall be carried out in the areas with over 25^{o} slope.
  - No tree of the girth over the pre-selection girth shall be felled.
  - After thinning, the canopy density should not be less than 0.5, and no permanent blanks should be created in the canopy.

- From the standpoint of environment, no pure crop of any species shall be encouraged. The crop should have a mix of miscellaneous species. As per the

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instructions given at point 8 and 11 of the treatment type D for calculation, if trees are available for felling, they shall be prioritized for marking as under:

- All dried and fallen trees.
- All live stumps of illicit fellings and pollards, with the possibility of obtaining coppices, shall be marked. In such areas, the live stumps of over 20 cm. with malformed and good coppices, and pollards (upto 60 cm.) shall be cut at the ground level for dressing. Among several coppices of one stump, only 2 or 3 healthy coppices shall be retained and the rest shall be cut.
- Suppressed trees.
- Dead/ dying/ diseased trees.
- Malformed trees.

12.21Subsidiary Silvicultural Operations:

The following works shall be carried out next year of the main felling to help natural regeneration:

- Leftover trees during the main felling, trees with damaged canopies or seriously damaged trees during the felling shall be felled.
- Except for 2–4 healthy shoots per live stump, the rest shall be cut.
- All the regeneration of less than 20 cm. girth of malformed and damaged sal and other coppice species shall be cut.
- Stump shall be cleared of debris within 1 m. radius.
- If required, lantana eradication shall be carried out only after getting approval from the Field Director, Kanha Tiger Reserve. However, lantana shall not be eradicated in soil erosion prone areas.
- Works shall be carried out in the plantations of under stocked and blank areas as per approved projects.

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- The collection of sal seed and that of other species shall be banned for two years in these areas after the main felling.
- Leftover stumps of coppice species of upto 60 cm. girth and pollards shall be dressed as per the standard procedure.

12.22Regeneration Improvement (Time Plan):

12.22.1**First Year:**

- **Soil & Water Conservation Works:** Generally, soil and water conservation works shall not be required in this working circle. However, if required vitally, the same can be carried out by May-June.
- **Seed Sowing:** Treated seeds of local species shall be sown in blank areas in the months of June-July.
- **Lantana Eradication:** Lantana eradication shall be completed in the rains (July-September) before the onset of flowering.
- **Cutback**: Generally, stump and pollard dressing works are carried out by the staff of production division, in case some live stumps are left in the area, the same shall be cutback to facilitate healthy shoots for a healthy crop. This work shall be done between September and March. Malformed and damaged crop of below 20 cm. girth shall also be cut.
- **Cleaning of Bamboo Clumps**: Cleaning and soil working/ raising in all the available bamboo clumps in the area shall be completed between November and February.
- **Protection**: After the return of the coupes from the production division, or in case of no felling, the protection of coupe shall be ensured from the 1st April, after one year of coupe demarcation.

12.22.2**Second Year:**

- If soil and water conservation works were carried out in the past, their improvement shall be completed between April and May.

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- If lantana was eradicated in the past, mopping works shall be carried out between July and September.
- If the seed originated healthy plants of sal and miscellaneous species require soil working, the same shall be carried out between September and October. Fruit species shall be prioritized.
- Bamboo plants shall be marked, and soil raised around them.
- With reference to the works done in the first year, regeneration survey will be conducted in the second year between November and December.

12.22.3**Third Year:**

- The improvement of soil and water conservation works shall be completed by April and May.
- Lantana mopping and other works shall be completed between July and September.
- Protection work.

12.22.4**Fourth & Fifth Year:**

On inspection of the Deputy Director and with his special permission:

- The improvement of soil and water conservation shall be completed by April and May.
- Lantana mopping and other works shall be completed between July and September.
- Regeneration survey shall be conducted only in the fourth year.
- Protection work.

12.22.5**Sixth Year Cleaning:**

The following cleaning works shall be carried out in the treatment unit area in the sixth year including the main working year:

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- All the shrubs damaging trees and regeneration shall be cut.
- Except for a minimum of three healthy coppice shoots, the rest malformed and damaged shoots shall be removed from the stump.
- All the useless shrubs suppressing the main species shall be cut, provided soil erosion does not accelerate in the area.
- Without creating permanent blanks, established malformed regeneration of upto 20 cm. girth shall be cut.
- All the live stumps and pollards of good coppice species having upto 60 cm. girth shall be cut for dressing as per standard procedure.

The annual detailed description of the sixth year cleaning of coupes after the main felling is appended **(Appendix-XL)**.

12.22.6 **Eleventh Year Cleaning & Thinning:**

Including the year of the main working, the following cleaning and thinning works shall be carried out in the treatment unit area in the eleventh year.

- Without creating blanks, the malformed plants of all the species of upto 20 cm. girth shall be cut.
- The live stumps and pollards of coppice species of upto 60 cm. girth shall be cut at ground level and dressed.
- Except for a maximum of two healthy shoots, the rest shall be cut.
- No tree of the pre-selection and selection girth shall be cut.
- Felling shall be banned on 20 m. wide strips on either side of rivers and nullahs.
- Felling shall be banned around the places having importance of religious and tourists' attraction.
- No felling shall be executed in the areas with over 25^{o} slope.
- The Sagreiya formula shall be used for thinning in young congested crop. The retention of seed originated plants shall be prioritized in thinning. No sal tree of

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over 60 cm. girth and miscellaneous tree of over 60 cm. girth shall be cut in thinning.

$$S = G/10 + 1$$

Where, S = Distance (in m.) between two trees
G = Average girth (in cm.) of the crop occurring in the area

The annual detailed description of the eleventh year thinning of coupes after the main felling is appended **(Appendix-XLI)**.

12.23Mode of Working:

All the works shall be carried out by the Forest Department with public participation. The extraction of timber shall be carried out as per the **Appendix-XLVII**. Works in the areas affiliated to forest protection shall be carried out under the departmental guidance and control through the ecodevelopment committees. In the rest of the areas, works shall be carried out through the Department. Under the Joint Forest Management, works shall be carried out and the distribution of produce among ecodevelopment committees shall be ensured as per the provisions given in the MP Govt.'s Resolutions for Joint Forest Management, 2001 and amended upto 2003.

12.24Fire Protection & Grazing Control:

All the worked coupes shall be placed in class A from the point of view of fire protection. After the main felling, these coupes shall be provided special fire protection for the next 10 years, including the year of felling. Cattle grazing shall be banned for 5 years in all working units, including the year of working. Adjoining villagers shall be accorded permission to cut and carry grass under the watch and ward of forest employees. However, the complete protection of areas affiliated to protection shall be ensured.

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12.25Other Regulations:

The maintenance of planting areas shall be carried out upto the years described in the plan approved by the competent authority. A copy of the approved projects of plantations, soil conservation, bamboo planting and conservation and development of medicinal plants with treatment maps, and that of the completion report of all sanctioned works shall be filed in the compartment history file. The enumeration list of the trees of selection girth and that of the trees marked for felling shall also be filed in the compartment history file.

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CHAPTER – 13

RESTORATION OF GENE-POOL WORKING CIRCLE

13.1 Introduction:

In the backdrop of current scenario of fragmentations in forests and wildlife populations, the concept of ecological corridors and exchange of gene-pools is steadily growing in importance. The Kanha Core Zone supports two endangered wildlife species, the hard ground barasingha, the only world population of the sub-species, and the tiger. The tiger is a highly peripatetic species and needs safe corridors for moving long distances, and the movements of one or two radio-collared tigers of the Kanha and Pench National Parks have also been reported quite far from these protected areas. Presently, the Kanha-Pench corridor is the only promising linkage that can be strengthened to ensure safe passage for tigers. The dispersal of barasingha, biologically considered a small population, outside its present distribution within the Core Zone is also very important to establish a new population. The Phen Wildlife Sanctuary also harbours almost the same crop compositions and large clearings, with very low predation pressure, and can support another population of this endangered cervid.

13.2 Objectives:

While the broad objective of the restoration of gene-pool is to enhance animal movements, specially tigers and barasingha, through possible ecological connectivity/ corridors linking the Buffer Zone and Phen Wildlife Sanctuary and the forest areas of neighbouring divisions, the specific objectives are as under:

- To protect the only world population of the hard ground barasingha - the state animal- through managing the potential barasingha habitat in Phen Wildlife Sanctuary by manipulating corridor areas between Supkhar and Phen Wildlife Sanctuary.

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- To improve wildlife habitats and ensure continuity in corridors for tigers between Supkhar and Phen Wildlife Sanctuary.
- To facilitate movements of tigers along the Kanha-Pench corridor by increasing prey base population in the linkage.
- To protect the bordering compartments of the Buffer Zone touching the National Park and Phen Wildlife Sanctuary having animal use from avoidable disturbances of forestry operations, and facilitate wildlife dispersal further into the Buffer Zone.

13.3 Description of Vegetation:

As per the Champion & Seth classification (1968) the following types of forests occur in the working circle:

13.3.1 **Moist Peninsular Sal Forest-3C/C2e:** The general distribution of sal depends on climate, and on the basis of geology and soil, local distributions occur. In this way, the main among climatic factors on which the distribution of sal forests depends is the rains. The rains vary from 1400 mm. to 1900 mm. with an average daily humidity of 60-70% throughout the year, and 45-60% in the month of March. Saja (*Terminalia tomentosa*) is the main associate of sal, however, bija (*Pterocarpus marsupium*) and lendia (*Lagerstroemia parviflora*) also occur with it. They occur in top canopy, while jamun (*Syzygium cumini*) occur in middle canopy on alluvial soil. Roli, mant and amura are sub-species occurring in these forests.

This type of forests has been divided into the following sub-types:

13.3.1.1 **Moist Peninsular High Level Sal Forest-3C/C2e:** These forest types occur in the Motinala, Garhi, Khapa and Samnapur forests ranges. The rocks are generally, Laterite with trap. The colour of soil is reddish-yellow, it is barren or with kanker. The forest crops are generally middle aged with a large number of

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mature trees. The density of forests varies between 0.6 and 0.8. Generally, growth is good, however, the quality of crop in the hilly tract is better.

13.3.1.2 **Moist Peninsular Low Level Sal Forest-3C/C2e:** These types of forests occur in patches, generally on the lower slopes of the hills. Miscellaneous forests occur in dry areas. Frost also occurs in these areas, and the site quality classes of sal are I, II, III and IVa. The percentage of sal is around 30-40%, with density between 0.6 and 0.8. This forest types are generally found in the Motinala, Garhi, Khapa and Samnapur forest ranges. In the upper canopy, the main associates of sal (*Shorea robusta*) are saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), dhawda (*Anogeissus latifolia*), gunja (*Lannea coromandelica*) and padar (*Stereospermum chelonoides*), while in the middle canopy, it is aonla (*Emblica officinalis*).

13.3.1.3 **Moist Peninsular Valley Sal Forest-3C/C2e/(iii):** These types of forests occur in moist valleys with deep soil and along the nullahs. Pure sal mainly occurs in alluvial soil. There are quality classes I and II in these forests, with density between 0.6 and 0.8. Regeneration varies from adequate to plentiful, and the forest crop is generally young. These forest types occur in the Motinala, Garhi, Khapa and Samnapur forest ranges. The following vegetation is found in these forests:

- **Top Canopy:** sal (*Shorea robusta*), saja (*Terminalia tomentosa*), bija (*Pterocarpus marsupium*), safed siras (*Albizzia procera*), jamun (*Syzygium cumini*), dhawda (*Anogeissus latifolia*), semal (*Bombax malabaricum*), haldu (*Adina cordifolia*) and mahua (*Madhuca indica*)
- **Lower Canopy:** Tinsa (*Ougeinia oojenensis*), kumbhi (*Careya arborea*), tendu (*Diospyros melanoxylon*), achar (*Buchanania latifolia*), aonla (*Emblica officinalis*), gunja (*Lannea coromandelica*), lendia (*Lagerstroemia parviflora*), ghont (*Zizyphus xylopyra*), harra (*Terminalia chebula*), khair (*Acacia catechu*) and bans (*Dendrocalamus strictus*).
- **Shrubs:** Surteli (*Woodfordia fruticosa*), chhind (*Phoenix acaulis*) and karonda (*Carissa opaca*).

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- **Grass:** Bhurbusi (*Eragrostis unioloides*), lampa (*Heteropogon contortus*), khas (*Vetiveria zizanioides*) and bhond (*Themeda arundinacea*).
- **Climbers:** Mahul (*Bauhinia vahlii*), ramdatun (*Smilax zeylancia*) and dudhi (*Wrightia tomentosa*).

13.4 Area Incorporated:

The total number of compartments included into this working circle is 98 with a total area of 19164.64 ha. The compartments of this working circle have been classified into 7 treatment series. The details of included forest areas in this working circle are appended (**Appendix-XXXVII & XLII**). The range-wise treatment series and the extent of their areas are described as given below:

Short Description of Forest Areas Allotted to the Restoration of Gene Pool

Sl. No.	Range	District	Treatment Series	No. of Compartment	Compartment No.	Area of the TS
1	Khatia	Mandla	Khisi	2	323, 325	824.89
			Batwar	27	322, 312, 310, 308, 307, 328, 282, 283, O-327, O-284, O-298, O-300, O-299, O-301, O-304, O-303, O-277, O-278, O-279, O-280, O-281, 311, 286, 291, 305, 306, O-285	3510.77
2	Khapa	Balaghat	Mukki	12	231, 232, 234, 247, 248, 249, 261, 270, 271, 272, 273, 276	1689.33
3	Motinala	Mandla	Devgaon	8	178A,179, 180A, 181A, 182, 183A, 184A, 185A	2376.19
			Bhimori	6	195A, 194A, 196, 192A, 193A, 186A	2272.16
			Manori	5	187A, 188A, 191A, 189A, 190A	1192.7
4	Sijhora	Mandla	Manoharpur	9	53, 52, 51, 54, 49, 34, 33, O-56, O-55	1455.17
			Khisi	9	4, 31, 9, 29, 8, 7, 5, 11, 12	1905.65
5	Samnapur	Balaghat	Mukki	7	203A, 202A, 201A, 200, 197, 226, 227	1620.29

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6	Garhi	Balaghat	Manori	4	99A, 100, 101A, 102A	1075.46
			Manoharpur	9	129A, 128A, 126, 125, 68, 70, 71, 72, 73	1242.03
	Total:			**98**		**19164.64**

13.5 Description of Forest Types:

The forest areas of the Khatia, Khapa, Sijhora, Samnapur, Garhi and Motinala ranges have been included into this working circle. The teak, sal and miscellaneous forests form 0%, 28.9% and 51.0% respectively of the total area. The low density, blank and other areas form 1859.73ha. (9.30%), 1403.3 ha. (7.3%) & 251.58 ha. (1.3%) respectively of the total area of the working circle. The details of included forest types in this working circle are appended (**Appendix-XXXV**). The summary of the included forest types is given as under:

Areas (Ha.) Included in the Restoration of Gene Pool as Per Forest Type

Legal Status	No of Comptt.	Stocked Area			Total	Under stock area	Blank	FV	Others	Total
		Teak	Sal	Miscellaneous						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
RF	82	0.00	5594.34	9851.72	15446.06	1797.50	1403.30	0.00	251.58	18898.44
Orange	16	0.00	117.90	86.07	203.97	62.23	0.00	0.00	0.00	266.20
Total	**98**	**0.00**	**5712.24**	**9937.79**	**15650.03**	**1859.73**	**1403.30**	**0.00**	**251.58**	**19164.64**
Percentage		**0.00**	**29.81**	**51.85**	**81.66**	**9.70**	**7.32**	**0.00**	**1.31**	**100.00**

13.6 Description of Site Qualities:

The forests of site quality classes I, II, III, IVa, IVb, Va and Vb occur in the compartments included in this working circle. Most of the forest area belongs to the site quality classes III and IVa with 8606.45 ha. (54.99%) and 4657.54 ha (29.76%). The details of included site quality-wise forests in this working circle are appended (**Appendix-XXXVII**). A short description of site quality class-wise forests in this working circle is as under:

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Site Quality-wise Forest Area (Ha.) in the Working Circle

Forest Type	Status	I	II	III	IVa	IVb	Va	Vb	Total
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Teak	RF	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Orange	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sal	RF	13.50	1336.20	2993.94	877.35	373.35	0.00	0.00	5594.34
	Orange	0.00	0.00	117.90	0.00	0.00	0.00	0.00	117.90
Miscellaneous	RF	12.30	593.19	5475.04	3771.19	0.00	0.00	0.00	9851.72
	Orange	0.00	0.00	19.57	9.00	57.50	0.00	0.00	86.07
Total		**25.80**	**1929.39**	**8606.45**	**4657.54**	**430.85**	**0.00**	**0.00**	**15650.03**
Percentage		**0.16**	**12.33**	**54.99**	**29.76**	**2.75**	**0.00**	**0.00**	**100.00**

13.7 Description of Age Classes:

In this working circle, the middle age class constitutes the highest percentage, with 9473.23 ha. (60.53%) followed by young and mature age classes, 4202.04 ha. (26.85%) and 1974.76 ha. (12.62%) respectively. The details of incorporated forest age classes in this working circle are appended (**Appendix-XXXVII**). A short description of forest age classes in this working circle is as under:

Age Class-wise Forest Area (Ha.) in the Working Circle

Forest Type	Status	Young	Middle	Mature	Total
1	**2**	**3**	**4**	**5**	**6**
Teak	RF	0.00	0.00	0.00	0.00
	Orange	0.00	0.00	0.00	0.00
Sal	RF	373.35	3871.29	1349.70	5594.34
	Orange	0.00	117.90	0.00	117.90
Miscellaneous	RF	3771.19	5475.04	605.49	9851.72
	Orange	57.50	9.00	19.57	86.07
Total	**Total**	**4202.04**	**9473.23**	**1974.76**	**15650.03**
Percentage	Percentage	26.85	60.53	12.62	100.00

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13.8 Description of Density Classes:

In this working circle, most of the included compartments form the highest percentage of stocked forests, with 15650.03 ha. (81.66%), the under-stocked, blank and other forest areas form 1859.73 ha. (9.70%), 1403.30 ha. (7.32%) and 251.58 (1.31%) respectively. The details of incorporated density classes in this working circle are appended (**Appendix-XXXVII**). A short description of density classes in this working circle is as under:

Density-wise Forest Area (Ha.) in the Working Circle

Growing Stock	Area (Ha)	Percentage
1	**2**	**3**
Stocked	15650.03	81.66
Under stock area	1859.73	9.70
Blank	1403.30	7.32
Others	251.58	1.31
FV	0.00	0.00
Total	**19164.64**	**100.00**

13.9 Topography:

Most of the area of the compartments included into this working circle falls under the gentle and medium slope classes, with 11150.59 ha. (58.18%) and 6240.38 ha. (32.56%) areas respectively of the working circle. Areas with steep and very steep slopes form only 1327.81 ha. (6.93%) and 445.86 ha. (2.33%) of the total area. The details of the topography of forest areas in this working circle are appended (**Appendix-XXXVI**). A short description of the topography classes in this working circle is as under:

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Slope-wise Forest Area (Ha.) in the Working Circle

Range	No. of Comptt.	< 10 percentage	10 - 30 percentage	30 - 40 percentage	> 40 percentage	Total
Khatia	20	3343.37	922.74	69.55	0.00	4335.66
Khapa	15	1341.24	270.96	70.99	6.14	1689.33
Sijhora	18	2464.38	852.41	44.03	0.00	3360.82
Samnapur	11	823.13	751.02	36.63	9.51	1620.29
Grahi	13	1496.74	715.69	105.06	0.00	2317.49
Motinala	15	1681.73	2727.56	1001.55	430.21	5841.05
Total:	**92**	**11150.59**	**6240.38**	**1327.81**	**445.86**	**19164.64**
Percentage		**58.18**	**32.56**	**6.93**	**2.33**	**100.00**

13.10Description of Regeneration:

On the basis of the forest resources survey, the average regeneration in this working circle has been found 668.99 per ha. The regeneration of teak, sal and Miscellaneous species form 0.00, 188.66 and 480.33 respectively of the total regeneration per ha. The detailed description of the average regeneration per ha. is appended **(Appendix of Forest Resource Survey XX).** A short description of the regeneration per ha. in this working circle is as under:

Total Regeneration (Per Ha.)

No. of Plot		Regeneration of Sal	Regeneration of Miscellaneous Species	Total
GPR	60	188.66	480.33	668.99
Reg. In All Plots	185	352.85	649.03	1001.88

13.11Strategies & Management Prescriptions:

Three area types have been selected in the Buffer Zone for the restoration of gene-pool. These types are as under:

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- Area between Supkhar and Phen WLS.
- Area at the Kanha end of the Kanha-Pench corridor.
- Compartments of Buffer Zone bordering the National Park.

In view of the stated objectives, the following management strategy and prescriptions are proposed for each of the above three select area:

13.12Broad Prescriptions:

- No production felling shall be executed in the compartments selected for the restoration of gene-pool.
- Though the area has been divided into 7 treatment series, the order of working in these treatment series shall be subjected to the discretion of the Field Director based on the presence/ absence of wildlife **(Appendix-XLIII)**.
- Vegetal biomass such as shrubs, saplings and trees etc. shall only be removed under habitat improvement inputs such as creation of water body and for increasing area of grassland.
- The area proposed mainly for barasingha management has to be protected completely from biotic pressure.
- Before demarcating the coupe a treatment map shall be prepared by the officer not below the rank of range officer, giving details of the works proposed.

13.12.1Area Between Supkhar & Phen WLS: There are 23 compartments with a total area of 6916.51 ha. details are given below:

Area Between Supkhar & Phen WLS, Range-wise

Sl. No.	Range	Treatment Series	Compartment No.	Area
1	**2**	**3**	**4**	**5**
1	Motinala	Deogaon GPR T.S	178 A	282.66
2	Motinala	Deogaon GPR T.S	179	455.2
3	Motinala	Deogaon GPR T.S	180 A	323.01

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4	Motinala	Deogaon GPR T.S	181 A	219.35
5	Motinala	Deogaon GPR T.S	182	368.21
6	Motinala	Deogaon GPR T.S	183 A	47.04
7	Motinala	Deogaon GPR T.S	184 A	315.46
8	Motinala	Deogaon GPR T.S	185 A	365.26
		Total:		**2376.19**
9	Motinala	Bhimori GPR T.S	195 A	261.68
10	Motinala	Bhimori GPR T.S	194 A	325.63
11	Motinala	Bhimori GPR T.S	196	385.44
12	Motinala	Bhimori GPR T.S	192 A	417.21
13	Motinala	Bhimori GPR T.S	193 A	390.1
14	Motinala	Bhimori GPR T.S	186 A	492.1
		Total:		**2272.16**
15	Garhi	Manori GPR T.S	99 A	270.85
16	Garhi	Manori GPR T.S	100	346.12
17	Garhi	Manori GPR T.S	101 A	223.42
18	Garhi	Manori GPR T.S	102 A	235.07
19	Motinala	Manori GPR T.S	187 A	331.65
20	Motinala	Manori GPR T.S	188 A	243.57
21	Motinala	Manori GPR T.S	191 A	137.78
22	Motinala	Manori GPR T.S	189 A	324.48
23	Motinala	Manori GPR T.S	190 A	155.22
		Total:		**2268.16**
		Grand Total:		**6916.51**

The following prescriptions are proposed:

- **Protection:** The connectivity passes through the forest area under tremendous biotic pressure, and unless it is completely protected against the same, it cannot be developed as a promising habitat for the movements of barasingha. The management should ensure protection by building a network of patrolling camps/ beat headquarters of forest guards in this area to have complete control over forest and wildlife offences.
- **Improving Stepping Stones in the Corridor:** The tiger moves fast and at a greater spatial scale and does not require much except undisturbed passage and occasional water bodies. However, once the protection and quality of this habitat corridor is improved, the spill-over population of ungulate species shall also start using this area, and will also support tigresses with cubs. The stepping stones of

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suitable habitats will enhance connectivity tremendously for the barasingha, a food specialist, to cover short distances through inhospitable environment. The movement of barasingha is punctuated by several stopovers for foraging, resting and other activities. These improvements include: eradication of weeds, creation of grasslands with preferred species, such as *Saccharum spontaneum, Bothriochloa odorata, Heteropogon contortus, Themeda triandra and Ischaemum indicum* etc., creation of shallow water bodies with wallows and restocking with tall grass for parturition. Officers/ staff responsible for building/ improving these stepping stones should also visit the prime habitats of the hard ground barasingha in the Core Zone to have an idea/ understanding from the past works already carried out there.

- **Structural Connectivity:** The habitat corridor should be managed in such a way as to minimize gaps in the connectivity. The provision of the above stepping stones at appropriate sites will take care of this consideration. Besides, considering the width of the corridor, a network of alternative links should also be developed to minimize unforeseen problems.
- **Support from Local Community:** The success of such habitat corridors going through multiple use areas also depends on support from local communities. The management should take them into confidence, explaining the significance of such efforts vis-à-vis confidence building measures taken for the development of villages in the Buffer Zone.
- **Monitoring:** The success of this corridor should be assessed by a good monitoring protocol. Besides, recording direct and indirect signs/ evidence of habitat use by different wildlife species, specially barasingha and tigers, in the prescribed proforma, camera traps can also be installed to capture the movements of tigers in the corridor.

13.12.2 **Area at the Kanha End of the Kanha-Pench Corridor:** There are 22 compartments with a total area of 2268.97 ha. details are given below:

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Area at the Kanha End of the Kanha-Pench Corridor, Range-wise

S. No.	Range	Treatment Series	Compartment No.	Area
1	**2**	**3**	**4**	**5**
1	Khatia	Batwar GPR T.S	310	394.51
2	Khatia	Batwar GPR T.S	308	370.1
3	Khatia	Batwar GPR T.S	307	346.61
4	Khatia	Batwar GPR T.S	282	111.57
5	Khatia	Batwar GPR T.S	283	36.18
6	Khatia	Batwar GPR T.S	O-284	9.67
7	Khatia	Batwar GPR T.S	O-278	34.2
8	Khatia	Batwar GPR T.S	286	355
9	Khatia	Batwar GPR T.S	291	68.63
10	Khatia	Batwar GPR T.S	305	185.37
11	Khatia	Batwar GPR T.S	306	160.9
12	Khatia	Batwar GPR T.S	O-285	5.4
13	Khatia	Batwar GPR T.S	O-298	57.5
14	Khatia	Batwar GPR T.S	O-300	2.4
15	Khatia	Batwar GPR T.S	O-299	8.5
16	Khatia	Batwar GPR T.S	O-301	8.33
17	Khatia	Batwar GPR T.S	O-304	11.25
18	Khatia	Batwar GPR T.S	O-303	76.05
19	Khatia	Batwar GPR T.S	O-277	9.9
20	Khatia	Batwar GPR T.S	O-279	7.12
21	Khatia	Batwar GPR T.S	O-280	4.6
22	Khatia	Batwar GPR T.S	O-281	5.18
		Total:		**2268.97**

The following prescriptions are proposed:

- **Protection:** Biotic pressure in this area needs to be minimized to ensure effective management of the target species. The management should also build a good network of patrolling camps/ beat headquarters of forest guards in this area to have control over forest and wildlife offences.
- **Habitat Improvement:** The area needs basic habitat improvement initiatives to attract prey species of tigers. These include creation of good water bodies, weed eradication, and opening up congested patches of forests to serve as meadows.
- **Support from Local Community:** The local communities should be gently convinced, either directly or through ecodevelopment committees, about the importance of tigers and the Kanha landscape in the background of various beneficial ecodevelopment works proposed for villages in the Buffer Zone.

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- **Monitoring:** The use of this area by tigers should be monitored meticulously. Besides, recording various signs/ evidence of tigers, camera traps should also be fixed at selected points to capture the movement of tigers.

13.12.3 **Compartments of Buffer Zone Bordering the National Park:** There are 53 compartments with a total area of 9979.16 ha. details are given below:

Area at the Kanha End of the Kanha-Pench Corridor, Range-wise

S. No.	Range	Treatment Series	Compartment No.	Area
1	**2**	**3**	**4**	**5**
1	Garhi	Manoharpur GPR T.S	129 A	222.75
2	Garhi	Manoharpur GPR T.S	128 A	103.98
3	Garhi	Manoharpur GPR T.S	126	281.44
4	Garhi	Manoharpur GPR T.S	125	306.14
5	Garhi	Manoharpur GPR T.S	68	81.67
6	Garhi	Manoharpur GPR T.S	70	16.2
7	Garhi	Manoharpur GPR T.S	71	92.67
8	Garhi	Manoharpur GPR T.S	72	109.11
9	Garhi	Manoharpur GPR T.S	73	28.07
10	Sijhora	Manoharpur GPR T.S	53	275.06
11	Sijhora	Manoharpur GPR T.S	52	175.6
12	Sijhora	Manoharpur GPR T.S	51	101.07
13	Sijhora	Manoharpur GPR T.S	54	64.1
14	Sijhora	Manoharpur GPR T.S	49	189.76
15	Sijhora	Manoharpur GPR T.S	34	251.91
16	Sijhora	Manoharpur GPR T.S	33	384.62
17	Sijhora	Manoharpur GPR T.S	O-56	4.05
18	Sijhora	Manoharpur GPR T.S	O-55	9
		Total:		**2697.2**
19	Khatia	Khisi GPR T.S	323	391.25
20	Khatia	Khisi GPR T.S	325	433.64
21	Sijhora	Khisi GPR T.S	4	434.3
22	Sijhora	Khisi GPR T.S	31	83.3
23	Sijhora	Khisi GPR T.S	9	123.95
24	Sijhora	Khisi GPR T.S	29	137.41
25	Sijhora	Khisi GPR T.S	8	165.7
26	Sijhora	Khisi GPR T.S	7	229.77
27	Sijhora	Khisi GPR T.S	5	407.8

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28	Sijhora	Khisi GPR T.S	11	135.53
29	Sijhora	Khisi GPR T.S	12	187.89
		Total:		**2730.54**
30	Khatia	Batwar GPR T.S	322	309.34
31	Khatia	Batwar GPR T.S	312	410.9
32	Khatia	Batwar GPR T.S	328	43.77
33	Khatia	Batwar GPR T.S	O-327	13.05
34	Khatia	Batwar GPR T.S	311	464.74
		Total:		**1241.8**
35	Samnapur	Mukki GPR T.S	203 A	274
36	Samnapur	Mukki GPR T.S	202 A	286.25
37	Samnapur	Mukki GPR T.S	201 A	540.67
38	Samnapur	Mukki GPR T.S	200	238.79
39	Samnapur	Mukki GPR T.S	197	197.65
40	Samnapur	Mukki GPR T.S	226	32.91
41	Samnapur	Mukki GPR T.S	227	50.02
42	Khapa	Mukki GPR T.S	231	65.28
43	Khapa	Mukki GPR T.S	232	14.43
44	Khapa	Mukki GPR T.S	234	70.01
45	Khapa	Mukki GPR T.S	247	398.95
46	Khapa	Mukki GPR T.S	248	217.74
47	Khapa	Mukki GPR T.S	249	292.39
48	Khapa	Mukki GPR T.S	261	63.78
49	Khapa	Mukki GPR T.S	270	150.77
50	Khapa	Mukki GPR T.S	271	11.52
51	Khapa	Mukki GPR T.S	272	70.76
52	Khapa	Mukki GPR T.S	273	4.5
53	Khapa	Mukki GPR T.S	276	329.2
		Total:		**3309.62**
		Gr. Total:		**9979.16**

The following prescriptions are proposed:

- **Protection:** These compartments should be well protected from biotic pressure. The management should enhance patrolling in these compartments by forest employees and watchers.
- **Habitat Improvement:** The area needs basic habitat improvement initiatives to support spill-over populations of ungulates of the Core Zone, and also to divert them deep into the Buffer Zone through good habitats. The initiatives also include

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creation of good water bodies, weed eradication, and opening up congested patches of forests to serve as meadows.

- **Monitoring:** The use of this area by spill-over wildlife population should be monitored by recording various direct/ indirect evidence signs of various ungulate species.

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CHAPTER – 14

FUEL & FODDER WORKING CIRCLE

14.1 Objectives:

The main objectives of the fuel and fodder working circle are as under:

- To improve the current crop by rehabilitating degraded forest areas.
- To undertake water and soil conservation works in degraded/ eroded forest lands.
- Utilizing the available root stocks to undertake required artificial regeneration.
- Ensuring biodiversity conservation and enhance it to the maximum possible status in particular forest type.
- To meet the demands of *bonafide nistar* of local community.

14.2 Justifications & Area:

- Compartments included with more than 63.30% low density & blank forest areas
- Compartments with adequate root stocks
- Total area included in the Fuel & Fodder WC (4404.72 ha.)
- Detailed description of compartment is **enclosed**

14.3 Description of Vegetation:

As per the Champion & Seth classification (1968) the following types of forests occur in the working circle:

14.3.1 **Southern Dry Mixed Deciduous Forest-3C/C3:** These forest types are spread all over the Buffer Zone. They generally occur on kankar soil which is made of quartzite and calcareous rocks. The soil is either excessive dry or moist, and is not suitable for the establishment of sal. Such miscellaneous forests occur here.

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In the Khatia and Sijhora forest ranges, these forests are mainly of middle to mature age. The natural regeneration of saja (*Terminalia tomentosa*), dhawa (*Anogeissus latifolia*), lendia (*Lagerstroemia parviflora*) and aonla (*Emblica officinalis*) also occur with coppice shoots. Generally, the trees of site quality classes III and IVa are found here, with density between 0.5 and 0.7.

Vegetation structure of this forest type at different levels is as under:

- **Top Canopy:** Saja (*Terminalia tomentosa*), dhawda (*Anogeissus latifolia*), arjun (*Terminalia arjuna*), aam (*Mangifera indica*), padar (*Stereospermum chelonoides*), kekad (*Garuga pinnata*), bija (*Pterocarpus marsupium*), dhamin (*Grewia tiliaefolia*), kasai (*Bridelia retusa*), dhoban (*Dalbergia paniculata*), jamun (*Syzygium cumini*), semal (*Bombax malabaricum*), haldu (*Adina cordifolia*), mahua (*Madhuca indica*), khamer (*Gmelina arborea*) and gular (*Ficus racemosa*) occur in moist areas. In dry areas, salai (*Boswellia serrata*) and kullu (*Sterculia urens*) are found.
- **Lower Canopy:** Tinsa (*Ougeinia oojenensis*), khair (*Acacia catechu*), palas (*Butea monosperma*), aonla (*Emblica officinalis*), achar (*Buchanania latifolia*), shisham (*Dalbergia latifolia*), kari (*Saccopetalum tomentosum*), amaltas (Cassia fistula), kachnar (*Bauhinia retusa*), kumbhi (*Careya arborea*), ber (*Zizyphus mauritiana*), bel (*Aegle marmelos*) and bans (*Dendrocalamus strictus*).
- **Shrubs:** Mohti (*Lannea coromandelica*), chhind (*Phoenix acaulis*), dudhi (*Wrightia tomentosa*) and gursukhri (*Grewia hirsuta*).
- **Herb:** Chipti (*Desmodium pulchellum*), chakoda (*Cassia tora*).
- **Grass:** Bhurbusi (*Eragrostis unioloides*), chhind (*Phoenix acaulis*), sabai (*Eulaliopsis binata*)
- **Climbers:** Mahul (*Bauhinia vahlii*) and ramdatun (*Smilax zeylancia*).

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14.4 Area Incorporated:

The total number of compartments included into this working circle is 88 with a total area of 4293.48 ha. The compartments of this working circle have been divided into 5 felling series. The details of included forest areas in this working circle are appended (**Appendix-XXXVII & XLIV**). The range-wise felling series and the extent of their areas are described as under:

Short Description of Forest Areas Allotted to the Working Circle

Sl. No.	Range	District	Felling Sereies	No. of Compartment	Compartment No.	Area of the FS
1	Khatia	Mandla	Bhima	9	329, 296, O-326, 292, 293, O-287, O-288, O-289, O-290	190.62
2	Khapa	Balaghat	Bhima	3	260, 268, 274	97.05
3	Motinala	Mandla	Harratola	15	173, O-156, O-157, O-158, O-160, O-161, O-162, O-163, O-167, O-168, O-165, O-166, O-170, O-172, O-174	183.93
4	Sijhora	Mandla	Rajo	13	50, 59, 47, 37, 36, 35, 43, O-57, O-58, O-45, O-48, O-46, O-44	1060.06
			Sarai	23	O-1, 28, 30, 32A, 38, 42, 41, 22, 21, O-10, O-17, O-18, O-19, O-20, O-15, O-23, O-24, O-25, O-26, O-27, O-40, O-39, O-16	930.09
5	Samnapur	Balaghat	Bhima	9	215, 219, 220, 222, 224, 223P, 213P, 209P, 208P	356.08
6	Garhi	Balaghat	Harratola	6	60, 61, 63, 62, 85, 64	747.64
			Pondi	11	77, 78, 80, 79, 65, 66, 67, 76, 75, 69, 74	728.01

14.5 Description of Forest Types:

The forest areas of the Khatia, Khapa, Sijhora, Samnapur, Garhi and Motinala ranges have been included into this working circle. The teak, sal and miscellaneous forests form

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2.36%, 3.05% and 6.08% respectively of the total area. The low density, blank and other areas form 1482.11 ha. (34.52%), 1824.72 ha. (42.50%) and 493.60 ha. (11.50%) respectively of the working circle. The details of included forest types in this working circle are appended (**Appendix-XXXV**). The summary of the include forest types is given as under:

Areas (Ha.) Included in the Working Circle as Per Forest Type

Legal Status	No of Comptt.	Stocked Area			Total	Under stock area	Blank	FV	Others	Total
		Teak	Sal	Miscellaneous						
1	2	3	4	5	6	7	8	9	10	11
RF	46	101.25	83.93	260.99	446.17	1366.99	1562.63	0.00	476.58	3852.37
Orange Area	42	0.00	46.88	0.00	46.88	115.12	262.09	0.00	17.02	441.11
Total:	**88**	**101.25**	**130.81**	**260.99**	**493.05**	**1482.11**	**1824.72**	**0.00**	**493.60**	**4293.48**
Percentage		**2.36**	**3.05**	**6.08**	**11.48**	**34.52**	**42.50**	**0.00**	**11.50**	**100.00**

14.6 Description of Density Classes:

In this working circle, most of the included compartments form the highest percentage of blank forests, with 1824.72 ha. (42.50%). While the under-stocked and stocked areas form 1482.11 ha. (34.52%) and 493.05 (11.48%) respectively, the others density class form only 11.50% (493.60ha.) of the total area of the working circle. The details of included density classes in this working circle are appended (**Appendix-XXXVII**). A short description of density classes in this working circle is as under:

Density-wise Forest Area (Ha.) in the Working Circle

Growing Stock	Area (Ha)	Percentage
1	2	3
Stocked	493.05	11.48
Under stock area	1482.11	34.52

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Blank	1824.72	42.50
Others	493.60	11.50
FV	0.00	0.00
Total	**4293.48**	**100.00**

14.7 Topography:

Most of the area of the compartments included into this working circle falls under the plain and medium slope classes, with **3753.22** ha. (87.42%) and **498.25** ha. (11.60%) area respectively of the working circle. Areas with steep slopes form only **1.10** ha. (0.03%) of the total area. The details of the topography of forest areas in this working circle are appended (**Appendix-XXXVI**). A short description of the topography classes in this working circle is as under:

Slope-wise Forest Area (Ha.) in the Working Circle

Range	No. of Comptt.	< 10 percentage	10 - 30 percentage	30 - 40 percentage	> 40 percentage	Total
Khatia	9	144.54	42.98	2.00	1.10	190.62
Khapa	3	95.57	1.48	0.00	0.00	97.05
Sijhora	35	1659.91	291.33	38.91	0	1990.15
Samnapur	9	289.25	66.83	0.00	0.00	356.08
Grahi	17	1394.95	80.70	0.00	0.00	1475.65
Motinala	15	169.00	14.93	0.00	0.00	183.93
Total:	**88**	**3753.22**	**498.25**	**40.91**	**1.10**	**4293.48**
Percentage		**87.42**	**11.60**	**0.95**	**0.03**	**100**

14.8 No. of Trees (Per Ha.):

On the basis of the forest resources survey, the average number of tress in this working circle has been found **260.53** per ha. Of this number, teak, sal and miscellaneous trees form 0.00%, 9.90% and 90.10% respectively. The detailed description of girth class-wise number of trees per ha. is appended (**Appendix of Forest Resource Survey XIX**). A

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short description of the girth class-wise number of trees per ha. in this working circle is as under:

Girth Class-wise No. of Trees (Per Ha.)

Species	Number of Trees per ha. As per Girth Class				Percentage
	Up to 60 cm.	60- 120 cm	Above 120 cm	Total	
1	2	3	4	5	6
Teak	0.00	0.00	0.00	0.00	0.00
Sal	10.00	1.58	14.21	25.79	9.90
Miscellaneous	93.68	14.21	126.84	234.74	90.10
Total	**103.68**	**15.79**	**141.05**	**260.53**	**100.00**
Percentage	**39.80**	**6.06**	**54.14**	**100.00**	

14.9 Volume of Trees (Per Ha.):

On the basis of the forest resources survey, the volume of average number of tress in this working circle has been found **16.07** per ha. The percentages of teak, sal and miscellaneous trees form 0.00%, 44.09% and 55.91% respectively of the total volume. The detailed description of girth class-wise volume of average number of trees per ha. is appended (**Appendix of Forest Resource Survey XVIII**). A short description of the volume of girth class-wise number of trees per ha. in this working circle is as under:

Girth Class-wise Volume (cmt.) of Trees Per Ha.

Species	Volume of Trees per ha. As per Girth Class				Percentage
	Up to 60 cm.	60- 120 cm	Above 120 cm	Total	
1	2	3	4	5	6
Teak	0.00	0.00	0.00	0.00	0.00
Sal	0.34	0.63	6.13	7.09	44.09
Miscellaneous	2.28	3.93	2.78	8.99	55.91
Total	**2.61**	**4.55**	**8.91**	**16.07**	**100.00**
Percentage	**16.25**	**28.33**	**55.43**	**100.00**	

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14.10 Description of Regeneration:

On the basis of the forest resources survey, the average regeneration in this working circle has been found 884.52 per ha. The regeneration of teak, sal and miscellaneous species form 0.00, 193.72 and 690.80 respectively. The detailed description of regeneration per ha is appended **(Appendix of Forest Resource Survey XX)**. A short description of the regeneration per ha. in this working circle is as under:

Total Regeneration (Per Ha.)

No. of Plot		Reg. of Sal	Reg. of Miscellaneous Species	Total
FF	19	193.72	690.80	884.52
Reg. In All Plots	185	352.85	649.03	1001.88

14.11 Treatment Methods to be Adopted:

The compartments of sal and miscellaneous forest areas have been included into this working circle. As per the forest resource survey, the average number of trees, average volume of forest stock and the level of regeneration per ha are 350.48, 24.60 and 899.48 respectively. As the level of regeneration comes under the inadequate category, these forests cannot be placed under the productive forest category. Consequently, these forest areas are not fit to be managed for intensive exploitation under any silvicultural system. Besides, some other factors such as biotic pressure and the level of regeneration are also not in favour of intensive exploitation. The chief objective of the management of the forests under this working circle is to improve and rehabilitate them. Besides, the area also requires water and soil conservation works. There are also several good coppice species whose pollards, tall live stumps and malformed trees can also provide a good crop through cutback operations. Plantations can be taken up in blank and low stocked areas to restore them to their previous status. Thinnings shall also be required in old

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plantations. The areas of the forest villages not occupied either by habitation or cultivation or by any other purpose, including *nistar*, can be taken up for fuel & fodder plantations for pastureland development.

On the basis of the above, these areas shall be treated as under:

- All other fellings shall be banned in degraded forests except for thinnings.
- Plantations along with suitable soil and water conservation measures shall be taken up on steep to very steep slopes of seriously eroded and erosion prone areas of low density and blanks.
- The existing crops shall be protected and developed without giving special importance to any particular species.
- The planting of bamboos shall be taken up in suitable areas.
- Necessary treatments shall be given to rehabilitate degraded and malformed bamboo areas.
- Pastureland development programme shall be taken up in areas with shallow soils and unsuitable for plantations.
- Biotic pressure such as grazing, fire, illicit felling etc. shall be strictly controlled for the success of the above treatments.

Forestry programmes shall also be taken up for the economic development of tribals under this working circle. The participation of Scheduled Castes and Scheduled Tribes and other local community shall also be ensured through ecodevelopment committees for the conservation the development of forests.

14.12 Organization of Working Circle

Total area	:	4293.48 ha.
Total compartments	:	88
Felling series	:	5
Average area of the coupe	:	35 ha.

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Method of regeneration	:	Artificial & natural
No. of trees	:	260.53 / ha.
Volume of tree	:	16.07 / ha.
Total regeneration	:	884.52/ ha.

14.13 Species to be Prioritized:

As exploitation is not an objective of this working circle, no species shall be given special importance. As per the decision made at the Cabinet Meeting, on 15-04-1983, the ban on the felling of fruit tree species shall be strictly ensured.

14.14 Treatment Cycle:

All the compartments incorporated into this working circle have been divided into 5 felling series. All these felling series shall be treated in 20 years. As per instructions received from the head office and on the basis of microplans, coupes of around 35 ha. shall be laid out in each felling series with the participation of ecodevelopment committees. As per coordination between the working plan and microplan, the Deputy Director shall determine the yearly order of working by determining the coupes of each felling series to ensure the continuity of treatment. Besides, this shall also be ensured that at least one coupe from each felling series should be treated compulsorily as per microplan. The determined coupes shall be marked on a 1: 15000 scale by the office of the Deputy Director, and the related records shall be maintained and entered in the compartment history. The detailed descriptions of the incorporated compartments in felling series are appended (**Appendix-XLV**).

14.15 Treatment Type:

Various treatment types shall be shown clearly on the treatment maps. It should be ensured that no wildlife habitat in the area will be disturbed by forestry operations. Such

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habitats should be precisely shown on the map. If any habitat is bound to be disturbed by forestry operations the Field Director's decision on this matter shall be final.

14.15.1 **Treatment class-A (Protected Area)**

- Areas with over 25^{o} slope.
- 20 m. wide strip on either side of rivers/ nalas of well defined banks
- Seriously eroded areas, and areas with exposed rocks
- Frost affected and permanent blank areas
- 6 m. wide strip on either side of forest and other roads
- As per the Govt. of MP circular dated 22-05-1982, 200 m. wide strip on either side of rivers.
- Important wildlife habitat.

14.15.2 **Treatment class-B (Fuel & Fodder: Less than 0.4 density)**

- Areas with adequate root stocks of coppice species
- Blanks and under stocked areas with good soil and suitable for plantations
- Areas with shallow soils and suitable for pasture development
- Rugged, bouldery and rocky areas with scarce soil

14.15.3 **Treatment class-C (Successful Treated Areas)**

- Successful Plantation Areas:
  - All unirrigated plantation areas with more than 30% live plants
- Unsuccessful Plantation Areas:
  - All unirrigated plantation areas with less than 30% live plants

14.15.4 **Treatment class-D (Rest of the Stocked Dense Forest Area: Less than 40% slope & over 0.4 density)**

- All such areas to be included with more than 0.4 density and less than 40% slope

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14.16 Treatment Implementation (All Classes):

- All dead and windfall trees shall be marked all over the area, including the areas with over 40% slope, provided the trees don't posses nests or refuge shelters of wildlife. Nest and hollow bearing trees being used by birds and wildlife shall be protected, and at least 8 dried trees per ha., specially on steep slopes shall be retained. Special wildlife habitats such as the trees lending concealment to dense and caves etc. shall be protected. No felling shall be executed within 50 m. radius of the sites of special environmental importance.
- All the live stumps of good coppice species having upto 60 cm. girth at the ground level shall be dressed.
- All malformed coppice species upto 20 cm. girth shall be cut.
- Except for two coppice shoots, the rest will be removed.
- The conservation and propagation of medicinal plants in the area shall be carried out as per standard procedure relating to different species.
- As per the Govt's order no banned fruit trees such as aonla, imli, harra, baheda, bel, jamun, kaitha, achar, mahua, tendu, kachnar and lasoda shall be marked for felling.
- Trees related to religious sentiments such as bargad, pipal etc. shall not be marked for felling.
- Threatened species such as shisham, haldu, bija, tinsa, kasai, kullu, kosum etc. shall not be marked for felling.
- Groves of shade bearing trees around wells, camps, cattle sites, tanks, falls and picnic spots, and the trees of complexes of buildings of archeological importance shall be protected.
- No tree shall be marked for felling along 10 m. wide strips on the outer boundaries of forests, and trees on 20 m. either side of highways and other roads, and 6 m. either side of cart tracks shall be protected.
- As per requirement, standard soil and water conservation works shall be carried out.
- Bamboo fellings in degraded clumps shall be carried out as per standard procedure.
- No tree species with less than 1% occurrence shall be marked for felling.

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- All such trees shall be treated as silviculturally available that have at least 2 trees of freely growing, healthy and undamaged leading shoots between 31 to 90 cm. girth within a periphery of 6 m.
- Lantana eradication shall be carried out in all areas having less than 40% slope as per approved standard procedure, and on approval of the competent authority.
- No tree of sample plot, preservation plot, growth plot, teak seed orchard, plus trees or any experiment shall be cut.
- Trees on 20 m. wide strip on either side of rivers/ nalas/ streams of well defined banks retaining water upto January shall be protected.
- The felling of maida, lodh and kahuwa trees shall be banned and so shall be the removal of barks.
- No climber shall be cut.

14.17 Marking Rules for Different Treatment Types:

14.17.1 **Treatment type-A (Protected Area)**

- Trees shall not be marked for any type of felling.
- The area shall be protected completely from grazing, and works may be taken up to check soil erosion. However, contour bunding and gully plugging etc. shall be carried out in areas with slopes as per the provisions mentioned in the Chapter of Miscellaneous Rules. On too much slopes, contour bunds shall be built with the help of local stones and brushwood. Stones shall not be dug up from slope areas to carry out the above works. Seed showing on the contour trenches and bunds shall be carried out.
- Work shall be executed in bamboo clumps as per the standard marking rules.
- Lantana eradication work shall not be carried out.

14.17.2 **Treatment type-B (Fuel & Fodder: Less than 0.4 density)**

- (B-1) Suitable blank and under-stocked areas with good soil for plantation

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- The planting of aonla, bamboo and local species shall be prioritized.
- Based on the suitability of site, the area shall be enclosed by a cattle proof trench, cattle proof wall, chain-link fencing or thorny fence.
- Lantana eradication, if required, shall be carried out as per the provisions given in the Chapter of Miscellaneous Rules.
- All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
- Site preparations for plantation shall be carried out in the first year of treatment, and the next year, plantation shall be taken up in the rains.
- In the treatment area, next year of site preparations, planting will be done as per standard procedure.
- For plantations, time plan and the particular of works shall be followed as per the description given in the Chapter of Miscellaneous Rules.
- As per the requirement of the area, soil and water conservation works shall be taken up as per instruction given in the relevant chapter.

- (B-2) Rehabilitation areas with adequate root-stocks

  - All malformed coppice species upto 20 cm. girth shall be cutback.
  - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
  - Except for two or three healthy coppice shoots, the rest will be removed from the stump.
  - No plantation will be taken up in this area, and as per requirement, the seeds of select species shall be sown in suitable areas.
  - The area shall be effectively protected from grazing and fire.
  - As per requirement, soil and water conservation works shall be carried out as described in the Appendix of miscellaneous regulations.

- (B-3) Areas with shallow soils suitable for pasture development

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- As per requirement, the area shall be enclosed by a cattle proof trench, cattle proof wall, barbed wires or thorny fence prior to one year of treatment.
- All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
- Lantana eradication, if required, shall be carried out as per the provisions given in the Chapter of Lantana Eradication.
- As per requirement, soil and water conservation works shall be carried out as described in the appendix of miscellaneous regulations.
- In the year of the treatment of coupe, the area shall be ploughed or beds prepared therein for the site preparation for development of fodder and pasture land. And next year the planting of grass/ sowing of seed shall be carried out. Generally, local species shall be prioritized.
- Unpalatable and dry grass, weeds shall be weeded out in the rains before the plantation.
- Grazing shall be prohibited in these areas, and fire protection of such areas shall be carried out as done in the treatment type A areas. In the first year, the grass shall not be cut until the seed fall, and grass seeds shall not be collected.
- After the establishment of pastureland development areas, the Deputy Director shall accord permission to local villagers/ members of ecodevelopment committees for the cutting and collection of grass after the seed fall. The cutting of grass and collection of grass seeds shall be conducted by the Forest Department or through ecodevelopment committees.

- (B-4) Rugged bouldery and rocky areas with scarce soil (B-4)

  - All the live stumps of good coppice species having upto 60 cm. girth on the ground level and pollards shall be marked for felling.
  - As per requirement, soil and water conservation works shall be carried out as described in the appendix of miscellaneous regulations.

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14.17.3 Treatment type-C (Successful Treated Areas)

- (C-1) Successful plantation areas

    - In successful plantation area cleaning, thinning and maintenance works shall be carried out as per standard procedure. Here the successful plantation area represent that area which has sufficient established plants to rehabilitate the forests in future.
    - The Sagreiya formula or the All India Yield Table can be used for thinning in plantation area. As the yield table can only be used for the pure plantation a species, and cannot be applied to miscellaneous plantations, the Sagreiya formula can be used universally.

- (C-2) Unsuccessful plantation areas

    - As per the instructions vide the MP Forest Department letter No. F-25/63/92/10/2 dated 16-06-1994, the Deputy Director shall analyze the reasons for the failure of plantation areas, and give suitable treatment so that they may recover and change into successful plantation areas.

14.17.4 Treatment type-D (Rest of the Stocked Dense Forest Area: Less than 40% slope & over 0.4 density)

Under this treatment type, marking for felling shall be carried out from the standpoint of silviculture. Along with the top storey, sufficient mix of miscellaneous species shall be kept in the middle and lower storey. The marking procedure to be adopted shall be as under:

- Thinning shall only be carried out in congested crop.

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- The area shall be roamed about to have an idea of congested crop, irregularly dense crop, with abundant young crop whose average girth is less than the pre-selection girth.
- Sample plots shall be laid out to determine the average girth. The number of sample plots shall be based on the size of coupes. However, it shall be ensured to lay out a minimum of four sample plots of the area of 0.25 ha. each.
- The concerned Sub Division Officer shall inspect the plots and certify them accordingly.
- Except for plantation areas, the following Sagreiya formula shall be used for thinning in general forest areas:

$$S = G/10 + 1$$

Where, S = Distance (in m.) between two trees

G = Average girth (in cm.) of the crop occurring in the area

The following points should be taken into account for thinning:

- The interval obtained from the Sagreiya formula is maximum.
- Only silviculturally available trees shall be felled in the thinning.
- No tree of any species banned from felling for any special purpose shall be felled in the thinning.
- No thinning shall be carried out in the areas with over 40% slope.
- No tree of the girth over the pre-selection girth shall be felled.
- After thinning, canopy density should not be less than 0.5, and no permanent blanks should be created in the canopy.
- From the standpoint of environment, no pure crop of any species shall be encouraged. The crop should have a mix of miscellaneous species. As per the instructions given at point 5 of the treatment type D for calculation, if trees are available for felling, they shall be prioritized for marking as under:

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- All dried and fallen trees.
- All live stumps of illicit fellings and pollards, with the possibility of obtaining coppices, shall be marked. In such areas, the live stumps of over 20 cm. with malformed and good coppices, and pollards (upto 60 cm.) shall be cut at the ground level for dressing. Among several coppices of one stump, only 2 or 3 healthy coppices shall be retained and the rest shall be cut.
- Suppressed trees.
- Diseased and dead trees.
- Malformed trees.

14.18 Subsidiary Silvicultural Operation: As per the instructions issued vide PCCF, MP letter No. 1417dated 23-12-1999 **(Appendix-XX)**.

14.18.1 **Year-wise Rehabilitation of Degraded Forests:**

14.18.1.1 **Establishment First Year:**

- **Soil & Water Conservation Works:** As per requirement, soil and water conservation structures shall be carried out under the Soil & Water Conservation Regulation. The works shall be carried out by the months of May-June.
- **Seed Sowing:** If contour trenches have been dug up in the area, then treated seeds of local species shall be sown. It has to be ensured that seeds of no such species are sown that don't occur in the area. This work shall be carried out in the months of June-July.
- **Lantana Eradication:** If planting is to be taken up or lantana obstructs the establishment of regeneration in the area, then lantana eradication shall be carried out on approval from the competent authority. This work shall have to be completed in the rains (July-September) before the onset of flowering.
- **Cutback**: All the marked stumps shall be dressed properly to obtain good coppices. This work shall be completed by February and March.

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- **Cleaning of Bamboo Clumps**: Cleaning and soil working/ raising in all the available bamboo clumps in the area shall be completed between November and February. Detailed instructions have been given in the chapter dealing with the Rehabilitation of Degraded Bamboo Forests Working Circle.
- **Protection**: After the demarcation of coupes, protection of the same shall be ensured from the 1st April of the next year.

14.18.1.2 **Establishment Second Year:**

- **Soil & Water Conservation Works:** If soil and water conservation works were carried out in the past, their improvement shall be completed between April and May.
- **Lantana Mopping:** If lantana was eradicated in the past, the required lantana mopping works shall be carried out between July and September.
- **Seedling Adoption after Rains:** Cleaning, weeding and soil working shall be done around the established healthy plants of various species originated from seeds.
- **Plantation:** It shall be taken up in suitable areas after preparing relevant projects. Measures shall be taken for the protection of plantation areas.
- **Regeneration Survey:** To access the regeneration after past year's works, a regeneration survey shall be carried out. The survey shall be conducted by the Range Assistant, and the Range Officer shall inspect 100% of total coupes. The Sub Divisional Officer shall check 50% of the regeneration survey and shall submit this report to Deputy Director. The Deputy Director shall submit the report to the Field Director.
- **Protection:** Protection shall be ensured through the cooperation of the ecodevelopment committees. Plantations shall be taken up as per the instructions issued vide PCCF, MP letter No.F-13/2003/10-3/5937 dated 16-12-2003.

14.18.1.3 **Establishment Third Year:**

- **Soil & Water Conservation Works:** If vitally required, and the Deputy Director is satisfied with its necessity after inspection, the improvement of soil and water conservation works shall be completed by April and May.

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- **Lantana Eradication:** If the Deputy Director is satisfied with its necessity after inspection, lantana mopping and other works shall be completed between July and September.
- **Protection:** Protection shall be ensured through the cooperation of ecodevelopment committees.
- On the basis of the results of the regeneration survey, action shall be taken as per strategy.
- On the basis of the survey of planting and sowing, future strategy shall be developed.

14.18.1.4 Establishment Fourth Year:

- **Soil & Water Conservation Works:** The improvement of soil and water conservation shall be completed by April and May, as per point 1 of the third year.
- **Lantana Mopping:** Lantana mopping and other works shall be completed between July and September, as per point 2 of the third year.
- **Regeneration Survey:** To assess the regeneration after past year's works, a regeneration survey shall be carried out in November - December. The survey shall be conducted by the Range Assistant, and the Range Officer shall inspect 100% of total coupes. The Sub Divisional Officer shall check 50% of the regeneration survey and shall submit this report to Deputy Director. The Deputy Director shall submit the report to the Field Director. If plantation was taken up, then the results of the same shall be evaluated along with regeneration survey.
- **Protection:** Protection shall be ensured through the cooperation of ecodevelopment committees.

14.18.1.5 Establishment Fifth Year:

- Protection shall be ensured through the cooperation of ecodevelopment committees.
- The results of regeneration and plantation shall be entered in the compartment history.

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14.18.1.6 **Sixth Year Cleaning:**

The following cleaning works shall be carried out in the treatment unit area in the sixth year including the main working year:

- Except for a maximum of two or three healthy coppice shoots, the rest shall be removed from the stump.
- Malformed and damaged shoots of upto 20 cm. girth of coppice shall be cut.
- All the live stumps and pollards of 20 cm. to 60 cm. girth of good coppice species shall be cut for dressing as per standard procedure.
- All the shrubs damaging trees and regeneration shall be cut.

14.18.1.7 **Eleventh Year Cleaning & Thinning:** Including the year of the main working, the following cleaning and thinning works shall be carried out in the treatment unit area in the eleventh year. Treatment units shall be serialized as per the order of main fellings.

- The malformed plants of all the species of upto 20 cm. girth shall be cut.
- All the live stumps and pollards of 20 cm. to 60 cm. girth of good coppice species shall be cut for dressing as per standard procedure. Except for a maximum of two healthy coppice shoots, the rest shall be removed from the stump.
- Sample plots shall be laid out in the congested young crop sal and miscellaneous tree species for calculations through the Sagreiya formula. Accordingly, thinnings shall be carried out:

$$D = G/10 + 1$$

Where, D = Distance (in m.)
G = Average girth (in cm.)

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Interval (D) obtained from the formula is maximal. For thinning, this interval should be kept equal to or less than it. Silvicultural considerations should also be kept in mind during thinnings.

14.19 Other Regulations:

- The maintenance of planting areas shall be carried out upto the years described in the plan approved by the competent authority.
- A copy of the treatment maps, revised stock maps, and approved projects of plantations, soil conservation and fodder plantation, and implementation report shall be filed in the compartment history file.

14.20 Yield Regulation:

The crops of forest areas incorporated in this working circle and their treatment types are such that only incidental yield can be obtained. Therefore, conventional regulation of yield shall not be required.

14.21 Mode of Working:

All the works shall be carried out by the Forest Department with the cooperation of ecodevelopment committees. Microplans shall be prepared with the active participation of the concerned ecodevelopment committees. Treatment types shall be provisioned in microplans as per the treatment types provisioned for the working circle. The distribution of produce among ecodevelopment committees shall be ensured as per the provisions given in the MP Govt.'s Resolutions for Joint Forest Management, 2001 (as amended upto 2003).

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CHAPTER – 15

REHABILITATION OF DEGRADED BAMBOO FORESTS WORKING CIRCLE (OVERLAPPING)

15.1 General Constitution of the Working Circle:

The working circle overlaps all those forest areas where bamboo, *Dendrocalamus strictus*, occurs in a workable proportion. An area bearing a minimum of 500 live culms per ha., irrespective of age, size or condition is defined as bamboo forests. In the plan area, the bamboo has been degraded due to biotic pressure. Past gregarious flowering has also adversely affected its production. The rehabilitation of these degraded bamboo forests are vitally important. Besides, the bamboo is also significant as a vegetation cover type for wildlife.

15.2 Objectives:

- Improvement and rehabilitation of bamboo forest.
- To meet the demands of villagers.
- To improve the health of bamboo forests and site quality class.

15.3 Justifications:

- The current degraded status of bamboo.
- Generally occur in sal and miscellaneous forests.
- Relatively small area of forests bearing bamboo.

15.4 Descriptions of Vegetation:

The bamboo mainly occurs in the sal and miscellaneous forests of the compartments included in this working circle. These bamboo forests generally belong to site quality classes II and III, and occur in under storey. The middle and top storey consist of tree

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species as per the forest types. The bamboo of these areas mainly belongs to the low density bamboo forest.

15.5 Felling Series & Compartments Included:

The 43 compartments included in this working circle have been divided into 2 felling series. The total area of these compartments is 11596.40 ha., of which bamboo forests constitute 5543.66 ha.

The detailed description of range-wise included compartments and felling series etc. is appended **(Appendix-XLVI & XLVIa)**. The range-wise summary of the compartments, bamboo areas and felling series is given below:

Rehabilitation of Degraded Bamboo Forest (Overlapping) WC (Ha.)

Sl. No.	Range	District	No. of Compartment	Area of Compartments	Area of Bamboo in Compartments
1	Khatia	Mandla	12	4675.21	3373.87
2	Khapa	Balaghat	4	1170.65	658.51
3	Samnapur	Balaghat	4	1202.80	125.00
4	Sijhora	Mandla	5	962.64	359.13
5	Garhi	Balaghat	7	562.56	340.95
6	Motinala	Mandla	11	3022.54	686.20
	Total:		**43**	**11596.40**	**5543.66**

Area of Felling Series Allotted to the Working Circle

Sl. No.	Name of Felling Series	Compartments	No. of Compartment	Area of Compartments	Bamboo Area
1	Khatia	770, 341, 349, 343, 342, 347, 340, 339, 348, 346, 345, 344	12	4675.21	3378.87
2	Garhi	1128, 1092, 1131, 1094 1319, 1383 A, 1370, 1373, 1374, 1371, 1377 A, 1382	31	6921.19	2169.79

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		A, 1378 A, 1379, 1384 819, 1446, 1441, 1442, 738 1058, 1062, 1059 (A), 1063, 868, 866, 882, 867, 869, 881, 880			
		Total:	**43**	**11596.40**	**5543.66**

Range-wise Bamboo Overlapping Areas (Ha.)

Sl. No.	Range	No. of Comptt.	Dense		Medium		Low		Total
			II	III	II	III	II	III	
1	Khatia	12	997.47	0.00	420.29	388.75	0.00	1567.36	3373.87
2	Khapa	4	0.00	0.00	0.00	356.40	0.00	302.11	658.51
3	Sijhora	5	0.00	0.00	123.95	0.00	0.00	235.18	359.13
4	Samnapur	4	0.00	0.00	0.00	0.00	0.00	125.00	125.00
5	Garhi	7	0.00	0.00	0.00	0.00	0.00	340.95	340.95
6	Motinala	11	0.00	0.00	0.00	0.00	0.00	686.20	686.20
	Total:	**43**	**997.47**	**0.00**	**544.24**	**745.15**	**0.00**	**3256.80**	**5543.66**
	Percent:		**17.99**	**0.00**	**9.82**	**13.44**	**0.00**	**58.75**	**100**

15.6 Treatment Methods to be Adopted:

Considering the conditions of bamboo clumps, the following treatments are proposed:

- Cleaning and soil working of available degraded bamboo clumps.
- Clear felling shall be executed in congested clumps.
- To rehabilitate bamboo seedlings, weeding, soil working, making saucer shaped depressions, and cleaning in the clumps shall be carried out.
- As per standard rules for bamboo cutting, relevant treatments shall be given to good bamboo clumps.
- As per standard procedure, soil and water conservation works shall be carried out all over the area.
- After four years of the treatment of degraded bamboo forests, or after their maturity, felling shall be executed all over bamboo forest areas as per standard felling rules.

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- To stop the reasons of the degradation of bamboo forests, or to bring it to the minimum level, the following measures shall be taken up:

    - Efforts shall be made to reduce biotic pressure.
    - Illicit felling of bamboos by graziers and bonafide users (*nistari*) shall be minimized.
    - Including the year of treatment, these areas shall be banned completely from grazing for the next four years, and cattle camps shall not be permitted.
    - Including the year of treatment, the area shall be afforded the fire protection of type A level for the next four years.

15.7 Treatment Cycle:

The coupes of bamboo area (A, B, C, D) incorporated into this working circle have been divided into four-yearly felling cycle.

15.8 Yield Regulation:

There is no possibility of obtaining any forest produce in this working circle. All possible efforts have been made to ensure that work load is uniformly distributed in the constitution of annual treatment units.

15.9 Working:

Works shall be carried out departmentally. More attention shall be paid to quality and result oriented works. As far as possible, the surrounding villagers/ tribals shall be involved through EDCs for the rehabilitation of degraded bamboo forests to ensure their involvement in Joint Forestry Management.

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15.10 Demarcation, Marking & Recording:

The demarcation of annual treatment coupes shall be carried out one year before the actual working as mentioned in the Miscellaneous Regulations. Three bands shall be painted at the breast heights of the trees on the boundary of these bamboo forests. The middle band shall be of brown colour (*geru*), while the upper and lower bands shall be of coal tar (*damar*).

15.11 Methods of Treatment:

After demarcation, three copies of a revised treatment map shall be prepared on 1:15,000 scale. Area of less than 2 ha. shall not be differentiated separately on the treatment map This shall be carried out by the Range Officer. The Assistant Conservator of Forests shall demonstrate this by preparing a treatment map in an area. The proposed treatment map shall be compulsorily verified by the Sub Divisional Officer (Forest). A copy of this treatment map shall be filed in the compartment history file. Three treatment types are as under:

- **Treatment Type A:** Areas with dense and healthy bamboo clumps with a minimum of 31 clumps / ha. or over 500 live bamboo culms.
- **Treatment Type B:** Areas with tangled and degraded clumps that can be rehabilitated.
- **Treatment Type C:** Old planted bamboos.

15.12 Basic Treatment Prescriptions (All Classes):

- No felling of karla (upto 1 year) and mohila (between 1 and 2 years) bamboo.
- No digging up of rhizomes.
- During cleaning and thinning operations, the height of stumps should not be less than 15 cm. and more than 45 cm.

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- Under no circumstances should the height of cut be lower than the first node from the ground level.
- Bamboos should be cut with a sharp instrument so as to protect stumps from splitting. As far as possible, bamboos should be cut with axes and saws.
- The debris of cleaning and thinning around the clumps should be thrown beyond 1 m. away from the periphery of the clumps, and within 1 m. periphery of the clumps, the debris should be thoroughly cleaned. The debris should be used, as far as possible, in the construction of brushwood check dams.
- After the cleaning of worked clumps, as per requirement soil working/ raising should be done in the clumps by digging contour trenches in a safe distance on the uphill sides. The distance should be such as not to interfere with the future growth of rhizomes and the same may not get damaged.
- Split bamboos should not be used for tying up bamboo bundles.
- Clear felling of all the sporadic flowered clumps should be carried out in the coupes, retaining at least one bamboo as a flag in these clumps.
- Clear felling of gregariously flowered clumps should be carried out in the coupes and elsewhere after the seed fall, and arrangement should be made for the early extraction of such bamboos to minimize the loss of quality and fire hazards. Such areas should be protected from fire and grazing under a special action plan until the regeneration is fully established.
- There should be strict control over lopping, illicit felling and bamboo feed for cattle.
- The work of clump cleaning and bamboo cutting should strictly be over by the 15th March. Bamboos should be protected from fire in the current as well as forthcoming years.
- Minimum number of bamboos of different quality classes to be retained for conservation as under:

S. No.	Quality Class	Description of Quality Class	Bamboo to be Retained
1	Class-I	More than 9 mtr.	20

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2	Class-II	6 to 9 mtr.	15
3	Class-III	Less than 6 mtr.	10

The number of mohila and pakia bamboos to be retained in bamboo clumps should be twice the number of karla bamboos. For instance, if in a Class-II bamboo clump, there are 6 karla, 5 mohila and 8 pakia bamboos, then the number of mohila and pakia bamboos to be retained in the clump should be 12. In this way, a total of 18 bamboos, including karla shall be retained, even if the prescribed minimum number of bamboos to be retained in Class-II is 15.

- To maintain the size of bamboo clumps, broken or cut bamboos of 1 m. height and above shall be conserved.
- If the peripheral limit of a bamboo clump can be easily distinguished, it should be treated as an individual clump. Wherever such distinction is not possible, the clump within 1 m. periphery will be treated as a single clump. If the distance between two clumps is less than 1 m., they should be treated as one bamboo clump.
- Bamboos to be retained in clumps during felling should, as far as possible, be in an appropriate spacing (maximum 25 cm.). Bamboos to be conserved should be on the periphery of the clumps as far as possible. The cutting of bamboo shall start from centre towards the periphery. The order of priority for the conservation of bamboo should be as under:

(a)	Karla bamboo	(b)	Mohila bamboo
(c)	Young green bamboo	(d)	Old live bamboo
(e)	Stumps of bamboo	(e)	Others as per availability

- The following instructions should be kept in mind before the start of cutting operation:

  - The order of priority in the cutting operation should be as under:

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- Dried, burnt, decayed, dead and damaged bamboos.
- First broken and malformed among the live bamboos.
- Afterwards, the rest of the bamboos shall be felled, keeping in mind the minimum number of bamboos to be retained.
- Under no circumstances will the karla and mohila bamboos be cut.

- To obtain good karla from bamboo clumps growing on slopes, as per the standard procedure, after cutting in the clumps, half a meter away from the clumps on down slope side, semi lunar retaining wall (*gudwa*) will be made with the help of stones or dried and broken bamboos so as to impart stability to the worked soil and keep it from flowing down the slopes.
- Bamboo cutting will be banned from the 1st July to 15th October, and will be executed only after 15th October.
- Working should not be limited only to good and healthy clumps in dense areas, but cutting should also be executed in sparse clumps spread over the coupe.
- As per requirement, water and soil conservation works will be carried out.
- Besides, instructions issued by the Principal Chief Conservator of Forests, Madhya Pradesh vide letter No./Production/09/3410 dated 31-07-2009 should also be followed.

15.13 Rules for Treatment Classes:

15.13.1 Treatment Type-A (Areas with dense and healthy bamboo clumps):

- No commercial felling shall be executed in the clumps having fewer than the prescribed minimum number of bamboos. Only subsidiary silvicultural operations shall be carried out.
- Commercial felling shall be executed only in those bamboo clumps having more than the minimum number of bamboos.
- Clear felling shall be executed in congested clumps by dividing them into segments. Clumps will be divided into a maximum of 3 segments. The middle segment should be triangular shaped, with its narrow apex at the periphery and

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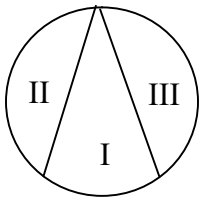
base formed by 1-3rd of the periphery. This segment should be felled at the first working. The remaining side segments shall be felled in the subsequent felling cycles.



15.13.2**Treatment Type-B (Areas with tangled and degraded clumps):**

- All the dead, dried, burnt, broken, seriously damaged and over-mature bamboos shall be cut. If there are fewer than 10 bamboos in clumps, then green bamboos available on the outer periphery shall be retained with young bamboos for support.
- Such clumps where more than 10 bamboos are left after cleaning, cultural operations shall be carried out under the following provisions:
  - No karla or mohila bamboo shall be cut.
  - Under no circumstances shall, the number of bamboos to be retained, be fewer than twice the number of karla and mohila. And to ensure this, even if the stumps of green or dried bamboos with a height over 0.75 meters have to be retained, shall be retained.
  - Cleaning and thinning should be carried out in such a way that the stumps of bamboos to be cut are not damaged. Saws and sharp small axes shall be used in cleaning and thinning works. The bamboo should be cut after retaining the first node from the ground level between a height of 15-45 cm.
  - After the cleaning of worked clumps, as per requirement soil working/ raising should be done in the clumps by digging semi lunar contour trenches in a safe distance on the uphill sides. The distance should be such as not to interfere with the future growth of rhizomes and the same may not get damaged. On the downhill side, semi lunar retaining wall (*gudwa*) will be made with the

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help of stones or dried and broken bamboos so as to impart stability to the raised soil and keep it from flowing down the slopes.

- As per requirement, water and soil conservation works will be carried out.
- The bamboo rhizome shall not be damaged.
- Cutting shall be executed by a sharp-edged instrument.
- Bamboo clumps shall be kept clean around the periphery of 1 meter.

- Felling shall be executed in congested and badly tangled clumps by dividing them into segments. Clumps will be divided into a maximum of 3 segments, and every felling year one segment shall be clear-felled as far as possible. The middle segment should be triangular shaped, with its narrow and broad end towards the periphery. Felling should be executed in the middle segment in the first year. In the remaining segments, cutting will be carried out in the subsequent felling cycles of one year interval.

15.13.3 **Treatment Type-C (Old planted bamboos areas):** Works shall be carried out in old successful bamboo plantations as per the provisions of standard bamboo working circles. The reasons/ factors of failure of unsuccessful plantations shall be enquired. If the area is found suitable for bamboo plantation, required measures shall be taken up and planting shall be carried departmental instructions.

The following types of bamboo clumps may be available in old plantations:

- Good & well-formed clumps.
- Such plants that could not convert into clumps.
- Degraded clumps.
- Congested clumps.

Regular extractions in successful bamboo plantation areas shall be carried out as per guidelines:

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- **Good & Well-formed Clumps:** Fellings in the areas with good and well-formed clumps shall be executed as per the standard procedure.
- **Such Plants that could not Convert into Clumps:**

    - Weeding and cleaning shall be done around bamboo plants as per requirement.
    - To protect the rhizomes from damage on the uphill side, soil working/ raising shall be done by digging contour trenches in a safe distance, and retaining walls or brushwood bunding shall be done on the downhill side.
    - Soil conservation works shall be undertaken as per standard procedure.

- **Degraded Clumps:** Works shall be carried out as per treatment type B.
- **Congested Clumps:** Works shall be carried out as per the last point of treatment type B.

15.13.4 Treatment Type-D (Treatment of Flowered Bamboos):

Two types of bamboo flowering occur in bamboo forests:

- **Sporadic Flowering:** This type of flowering occurs in an irregular and patchy form almost every year in extensive bamboo areas. No separate treatment is required for this flowering.
- **Gregarious Flowering:** If over 50% of bamboo clumps in a compartment are flowered, and the area of the compartment is not less than 10 ha., it shall be regarded as gregarious flower (As per Working Plan of East Mandla and Dindori Divisions by Mr. Ramesh Shrivastav, IFS).

  Gregarious flowering in the Mandla district was reported in 1963-64, and the drought conditions of two subsequent years adversely affected the regeneration of bamboos. Gregarious flowering again occurred in 1984-85 in the Mandla district.

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In this way, due to repeated gregarious flowerings and lack of proper post-flowering operations, bamboo forests were damaged to a considerable extent.

In the Buffer Zone Division, sporadic flowering was reported in 2004-05, and due to lack of any subsequent silvicultural operations the regeneration of bamboo remained poor. Afterwards, bamboos were cut and sent to forest depots.

Bamboo flowering is expected between October and February, and by March-April seeds become available. It is generally seen that no karla appears in the clumps to be flowered before the onset of flowering. All mohila and pakia bamboos get flowered in flowered clumps. Generally, flowering occurs in a particular area, and initially flowering is seen along the nalas of that areas.

Treatment of Flowered Area: The Deputy Director shall ensure that clear felling is executed only in actual flowered areas. As per the provisions of the Tiger Conservation Plan, works shall be carried out in the area on the orders of the Field Director. In such areas, the provisions of the Tiger Conservation Plan relating to the extraction of timber and bamboo shall remain suspended. As per the project approved by the Field Director, all such works relating to bamboo rehabilitation shall be carried out that will help establish new bamboo plants and create bamboo clumps.

It takes 10 to 15 years' time to build new bamboo clumps after gregarious flowering. It also depends on local conditions. Due to the weight of bamboo seeds they do not get dispersed by wind, and accumulate around bamboo clumps. Bamboo seeds also get accumulated around the nalas/ streams by flowing down the water. This results in the dense regeneration of bamboos near bamboo clumps and nalas. To grow, germinated plants have to compete with weeds and other plants, and also among themselves. Besides, grazing and fire also damage bamboo regeneration to a considerable extent, resulting in the bamboo clumps becoming

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shrubby, and in future produce only stick thin bamboos. Therefore, it is very important to take up maintenance measures in the areas of gregarious flowering:

The proforma designed for keeping records of gregarious flowering in bamboo forests is as under:

Proforma for Keeping Records of Gregarious Flowering in Bamboo Forests

Month	**Range**	**Compartment No.**	**Area of Bamboo in Compartment (Ha.)**	**Actual Flowered Area (Ha.) & Its Status in the Compartment**
1	2	3	4	5

Intensity of Flowering				**Whether New Bamboo Culms have Appeared in the Flowered Clumps in the Last Rains**	**Remark**
Serial No. of the 2-Ha. Plot	**Total No. of Clumps in the Plot**	**No. of Flowered Clumps**	**Percentage of Flowered Clumps**		**Whether the Bamboo is on Hilltop/ Slopes, along Rivers/ Nalas or in the Under Storey of Teak/ Miscellaneous Forest or in Degraded Forest, Good or Bed Past Management**
6	7	8	9	10	11

Protection & elite selection measures in case of gregarious bamboo flowering:

- Works in flowered areas shall be carried out under a project approved by the Field Director. Works shall be carried out departmentally, and the cooperation of the members of EDCs and forest employees shall be obtained by first giving them training for protection.
- In case of both sporadic and gregarious flowering, extra bamboo seeds shall be collected to prepare a rhizomes bank. It is advisable that a temporary bamboo

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nursery is established at the nearest site so that the rhizomes can be used in flowered areas and elsewhere.

- It is not necessary that after flowering normal rains fall in flowered bamboo areas. To counter this eventuality, water conservation structures such as nala bunds, contour trenches and contour bunds etc. shall be constructed in flowered areas to retain maximal moisture in the area and to stop the bamboo seeds from flowing away with rain water. Therefore, keeping the possible bamboo flowering in mind, the construction of these structures should be started from October – November.
- Lantana and weeds shall be eradicated before seed fall. Cleaning after the seed fall or regeneration shall only damage new plants.
- After the dispersal of seeds in flowered areas, all the clumps shall be clear-felled, retaining only one culm as a flag in flowered clumps.
- Treating a compartment as a unit in flowered area, the map of flowered area shall be prepared at range level on a 1: 50000 scale in the month of January. On the basis of this map, fire protection and grazing control plans shall be prepared. Two-ha. sample plots shall be laid out in areas of different densities for the assessment of the area.
- The extraction of flowered bamboos shall be carried out soon after the ripening and fall of seeds so that quality may be maintained and fire hazards be minimized. There shall be no extraction in the rains and only works relating to plantation and regeneration shall be carried out.
- Separate staffs shall be employed for the fire protection of flowered areas. The area shall be strictly protected against fire for the next 10 years.
- Grazing in the flowered areas shall be completely banned for the next 10 years.
- After flowering and germination of seeds in the rains, the map of this area on 1: 15000 scale shall be prepared showing area of germination. Germination areas shall be shown as dense, medium, sparse and blank.
- In dense regenerated areas, after the felling of flowered bamboos, silvicultural operations shall be carried out in the second rainy season. Under this, at the spacing of 4x4 m. one single healthiest plant shall be selected, and from the rest of the plants a rhizomes bank shall be built. Weeds shall be cut-cleaned. Within 1 m. periphery of the selected plant, weeding soil working and saucer making shall be carried out. This

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regeneration shall be cared for/ maintained like a bamboo plantation for the next 5 years.

- In the remaining unflowered clumps, cleaning and soil working shall be carried out.
- In areas, other than flowered areas, suitable for bamboo planting, and where there has been history of the presence of bamboos, bamboo planting shall be taken up under a scheme for supplement area. After seed fall, in many areas bamboo seeds get accumulated after flowing with water, and here bamboo plants occur as large groups and in very large numbers. Bamboo should be protected in such areas.
- A large number of plants become available through regeneration in flowered areas. These plants should be used for planting in other areas.
- Bamboo should be planted on agricultural bunds under active participation of ecodevelopment committees.
- The soil around flowered clumps shall be kept hollow and soft through soil working to retain seeds.
- Contour dykes and bunds shall be prepared with soil and stones to keep bamboo seeds from flowing down slopes.
- Bamboo flowering occurs every 2 to 3 years. Therefore, from the year of actual flowering, the management of bamboo flowering shall be attended to for next years.
- In the year gregarious flowering occurs, the felling of trees under main felling in the flowered area shall be as per standard rules. However, after the year of flowering, in subsequent years, if any coupe under the main felling is due, then in such timber coupes felling shall remain suspended for the next two years, and felling shall be executed in the bamboo clumps. This is necessary to check any adverse effect on bamboo regeneration.
- Employees and local villagers shall be given training for bamboo regeneration.
- Bamboo seeds shall be taken out in a controlled manner to ensure adequate availability of the same in flowered areas. And if required, bamboo seeds can be spread in flowered and other areas.
- In compartments where bamboo flowering has occurred in over 50% bamboo clumps, sample plots shall be laid out to calculate the flowered and total number of clumps, and to assess the progress of flowering in the forthcoming months.

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- No work shall be stopped till 15th June, after the onset of flowering in bamboo areas.
- No rhizome of old clumps shall be used to avoid the possibility of the occurrence of flowering again in the near future. Local employees shall be informed about this genetic character.
- The grid point survey shall be conducted every year to assess the next years' conditions. If the percentage of live plants is decreasing, it should be made good by planting.
- Rhizomes are heavily damaged by wild pigs. The following measures should be taken to counter this menace:
    - No cleaning should be carried out within 1 m. periphery to obstruct the approach of animals.
    - Big stones shall be kept around the rhizome to protect it from being dug up.
    - Thorns can also be placed around the rhizome before soil working/ raising.
    - Pesticides can also be used, but only after testing it.
    - The presence of protection labourers is also essential, and noise can also be made by the beating of drums.
- The description of the entire flowered area and regeneration works shall compulsorily be filed in the compartment file.
- All the senior forest officers, MP State Minor Forest Produce Federation and Forest Development Cooperation should be informed about bamboo flowering. The information should also be made available on the website of the Forest Department so that demand of seeds may be received on time.
- The seeds of excellent clumps and site quality shall be collected separately.

15.14 Elite Selection Measures:

15.14.1 Works to be Done in the First Year:

- In degraded bamboo clumps, all the works of the first year as given under point 6.13 "treatment type A" shall be carried out. These works mainly include cleaning of degraded clumps, including soil working etc.

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- In congested bamboo clumps, all the works of the first year as given under point 6.13 "treatment type A" shall be carried out. In these clumps, the first segment shall be clear-felled.
- Standard bamboo treatment rules shall be applied for the treatment of good clumps.
- Soil and water conservation works shall be carried out all over the area as per requirement.
- The area shall be completely protected from fire and cattle grazing.

15.14.2**Works to be Done in the Second Year:**

- If some degraded or congested bamboo clumps have been left, works to be carried out in the clumps in the first year shall be carried out in these leftover clumps.
- Congested clumps whose first segment has been clear-felled in the first year, their second segment shall be clear-felled.
- Similarly, if works have not been carried out in some good bamboo clumps as per the standard bamboo treatment rules in the first year, these works shall be carried out this year.
- If soil worked/ raised in degraded bamboo clumps in the first year has been washed off, additional soil shall be raised in such clumps.
- Soil and water conservation works carried out in the past year shall be maintained.
- The area shall be protected completely against fire and grazing.

15.14.3**Works to be Done in the Third Year:**

- Congested clumps whose first segment has been clear-felled in the second year, their third segment shall be clear-felled.
- The third segment of the rest of the congested bamboo clumps shall be clear-felled.
- If soil worked/ raised in degraded bamboo clumps has been washed off, additional soil shall be raised in such clumps.
- Soil and water conservation works carried out in the past year shall be maintained.
- The area shall be protected completely aganist fire and grazing.

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15.14.4**Works to be Done in the Fourth Year:**

- Soil and water conservation works carried out in the past year shall be maintained.
- The area shall be protected completely against fire and grazing.

15.14.5**Works to be Done in the Fifth Year:** All the good clumps where works were carried out in the first year as per the standard bamboo cutting treatment rules, these clumps shall be taken under the bamboo overlapping working circle to execute felling as per treatment rules.

15.15 Use of Saw & its Measurement:

The saw used for bamboo cutting is made of Hardened Tampered Steel (HTS). The dimensions are as under:

Length	12” = 30 cm.
Width	1.5” = 3.75 cm.
Thickness	2 cm.
Wooden Handle	10-15 cm.

15.16 Subsidiary Silvicultural Operation:

- Near clumps, saucers for water conservation shall be maintained.
- If raised soils in clumps have been washed off, the same shall be carried out again.
- Structures constructed for soil and water conservation shall be maintained for 10 years.

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15.17 Fire Protection, Grazing Control & Other Regulations:

- Bamboo cutting shall be banned between 1st July and 15th October. Clear felling shall be executed in the flowered clumps only after seed fall.
- The area shall be completely protected from fire and grazing for two years from the main working year. Villagers shall be allowed to cut and carry grass under active public participation. All the works carried out in treatment types along with treatment maps shall be filed in the compartment history file.

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CHAPTER – 16

WILDLIFE MANAGEMENT

16.1 Introduction:

In the present scenario the future of protected areas such as Kanha depends on an effective Core-Buffer strategy. The management of the spill-over population and its integration with various government and private production sectors in the Buffer Zone requires basic knowledge of wildlife science and its applications in the field. Accordingly, systematic wildlife management practices need to be introduced into the Buffer Zone, which so far has, more or less, remained like a territorial division. Though only a lesser degree of wildlife protection has been recommended in the Buffer Zone, the current infrastructure is also required to be gradually upgraded to manage future challenges of increasing wildlife populations.

16.2 Objectives:

The broad objective of the wildlife management in the Buffer Zone Division to introduce basic wildlife conservation/ management practices for protection and propagation of wildlife. Some specific objectives of management are as under:

- Protection of wildlife and its habitats.
- Improvement of wildlife habitats to sustain spill-over populations.
- Improvement of infrastructure for effective wildlife management.
- Introduction of important wildlife management practices for effective conservation.

16.3 Rationale:

- The Kanha landscape being one of the three most important tiger landscapes in India.
- Proving the concept of "source" and "sink" populations, specially of tigers.
- Needs basic wildlife management practices required for conservation.

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- The significance of hard ground barasingha, being the only world population in the Core Zone.
- The Supkhar area lost its barasingha populations in the late '50s.
- Small populations already under stress.

16.4 Strategies & Management Prescriptions:

The following strategies and management prescriptions are proposed:

16.4.1 **Protection of Wildlife & Habitats:** Though the Buffer Zone does not presently harbour much wildlife, the objectives of this Tiger Conservation Plan along with suggested initiatives/ measures will help build up a good wildlife population in future. Therefore, it is vitally important that the culture of basic wildlife management practices should be inculcated into the staff. Protection has to be regarded as one of the most important wildlife management practices in the Buffer Zone, and shall be carried out under the following strategies:

- **Intensive Patrolling of Beats:** The Buffer Zone has 52 beats. A forest guard is in-charge of a beat, and is assisted by 1 or 2 camp watchers. This staff should be made responsible for patrolling their beat intensively. Each beat should be patrolled daily for snares, traps, poisoning, intrusion, illicit felling, illicit grazing, and chances for electrocution etc. The description of daily patrols should be clearly entered into the prescribed camp registers and be checked by officers from time to time. This strategy also lends a psychological restraint over the people of surrounding villages.
- **Operation Monsoon:** This special protection strategy should be adopted during the rainy season, and its preparations, including the assignment of duties and a monsoon patrolling booklets with prescribed formats for the review of progress etc. should be complete by the end of June. During the monsoon the staff, guided by officers, shall keep the biotic pressure in protected compartments at minimum.

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- **Crime Dossier:** A confidential dossier/ list of suspects/ old criminals with their photographs should also be meticulously prepared and regularly updated for continuous direct or indirect surveillance. The progress of these units should be regularly reviewed by the Deputy Director and Field Director.
- **Saltlick Checking:** The Buffer Zone management should also update the list of natural saltlick spots where herbivores aggregate frequently. Habitual poachers have very good knowledge of such spots. The poachers urinate over these spots to enhance their odour and attract wild ungulates. They also mix capsules of poison with soil. The wild ungulates either get killed by swallowing poisoned capsules or get trapped and are physically killed by poachers. Such spots should be very frequently checked by the frontline staff.
- **Weekly Market Checking:** The people of the villages try their luck at sneaking into the forest and grabbing their hands on any article/ produce of wildlife and forest saleable in the market to buy their petty requirements. Therefore, surveillance should be conducted specially on different market days to discourage the tendency.
- **Waterhole Checking:** Generally, waterholes are used by cattle in the Buffer Zone, and the possibility of their being poisoned is not much. However, isolated waterholes should be frequently checked in the pinch period by the Buffer staff to prevent poaching and the poisoning of these restricted waters **(Appendix-IV)**.
- **Intelligence Gathering:** An effective intelligence network to monitor, prevent and pre-empt illegal activities in the Buffer Zone should also be gradually ensured.
- **Checking for Electrocution:** There are several areas in this Zone across which high voltage electricity line pass over. The total length of such electricity lines all over the Buffer Zone is around 170.10 km. with at least 73 identified sensitive areas. Experience poachers know about such areas where wild ungulates can be easily electrocuted. They use several methods to electrocute wild ungulates in these areas. The Buffer Management should ensure that these areas are patrolled so that the poachers may not kill the animals through electrocution.

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

    - **On Foot:** At least 3 hours per night after 9:00 pm to check all the vulnerable spot/ sites/ activities.
    - **By Vehicles:** At least 4 hours per night after 9:00 pm to check barriers, watch tower, foot paths and patrolling camps.
    - This should be monitored next day at the Mandla Head Office under the prescribed proforma.

- **Iron Trap Surveillance:** Though the use of iron traps (gin traps) is not common in and around the Tiger Reserve area, there is no scope for complacency. The Buffer Management should ensure that poachers, particularly nomadic tribes/ *pardhees*, that sometimes camp in this zone, do not set gin traps for tigers and panthers. The following guidelines are suggested to prevent the poaching of tigers/ panthers by iron traps:

    - Range officers should always be in constant touch with the nearest police stations to have prior knowledge of the camp-site of nomadic tribes, the duration of stay, and total number of adult males and females etc.
    - It also requires excellent coordination between the range officers of the Buffer Zone and Core Zone.
    - The camp-site should be very closely and secretively kept under surveillance to gather information on what kinds of domestic and agricultural instruments are made by these nomads. It should never be expected that they will easily disclose information on iron traps.

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- Every forest guard should have good knowledge of forest roads, tracks, and dry nala beds recording movements of tigers.
- Generally, poachers set this iron traps on the above areas of tiger movements in such a way that there is a maximum possibility of a tiger putting his foot on the iron trap. To ensure this possibility, the poachers create such obstructions (thorns and thorny bushes etc.) that tigers/ panthers have to avoid these paths and are automatically led onto the one where the iron trap has been fixed.
- These poachers have good knowledge about the length of the step and stride of animals, and they can even set 4-6 iron traps on a single path.
- Sometimes poachers may also place a kill at the head of a "V" area whose both arms are obstructed by thorny bushes. The tiger is attracted by the kill and is led towards the kill through these thorny arms and gets trapped in the iron trap.
- Every forest guard should very cautiously look for this iron trap continuously for two days in his beat at least once in fifteen days.
- If a forest guard ever comes upon an iron trap or the above signs of leading a tiger to a specific place, he should immediately inform his higher-ups, and watch over the iron trap so that no animal may be trapped.
- The Buffer Management should ensure that every forest range has an updated list of villagers whose occupation is iron-smithy.
- The Buffer Management should ensure the monthly review of the above strategy under the following prescribed format:

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

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- **Fire Protection:** The Buffer Management should ensure to undertake an all-round prevention/ protection strategy well in advance, involving ecodevelopment committees, before the fire season actually sets in. The protection measures include the following steps:

  - **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).
    - Continuous patrolling by staff.

  - **Control:**

    - Strip clearance by the fire extinguishing squad.
    - Manual putting out of fire by fire beaters.
    - Counter firing by the squads.

16.4.2 **Habitat Improvement:**

- Grassland improvement: Weed & brushwood eradication, restocking of grasslands, etc.: All these works shall be carried out in the coupes after felling operations in other felling series along with the subsidiary silvicultural operation.

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- Water development: Creation & maintenance of water bodies. These works can be carried out as and when required all over the area.
- Strengthening of corridor connectivity: All these works shall be carried out in the coupes after felling operations in other felling series along with the subsidiary silvicultural operation.

16.4.3 **Strengthening of Infrastructure:**

- Strengthening of wireless communication system.
- Construction/ maintenance of residential buildings for staff **(Appendix-III)**.
- Vehicles for movement.
- Ecocentre for skill development (Garhi).
- Forest lockups (Baihar & Khatia).

16.4.4 **Wildlife Population Estimation:** Though the Buffer Zone has supports low populations of wildlife species, it has to be monitored under a comprehensive monitoring protocol as proposed for the Core Zone. The monitoring protocol is as under:

- **Daily Monitoring & Forecasting:** As already described in an earlier chapter, the old methodology of estimating the populations of the tiger, co-predator and ungulate species has been replaced with a comprehensive monitoring protocol, known as Monitoring Tigers, Co-predators, Prey and their Habitats. The proposed new technique was tested in a pilot project of the National Tiger Conservation Authority, New Delhi, MP Forest Department and Wildlife Institute of India, Dehradun for monitoring and evaluating tiger habitats in the Satpuda-Maikal landscape of Madhya Pradesh.

  A major requirement for conserving wild tigers is to first safe-guard existing source populations from further depletion (Walston *et al.* 2010). An important

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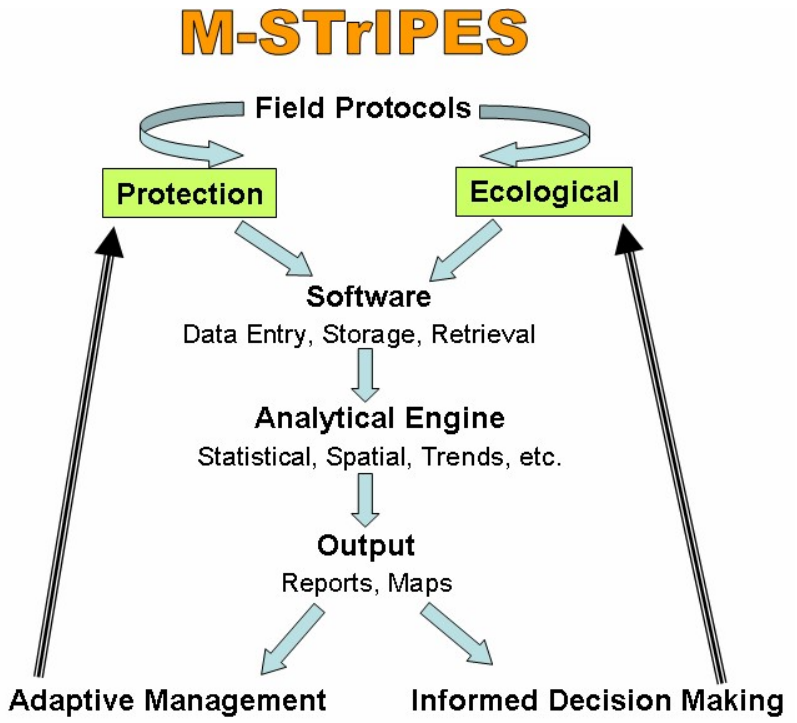
conservation strategy to address the threats would be to implement a technology aided patrolling system and an ecological monitoring system that would inform and guide park management of major trends in wildlife populations, illegal activities, human pressures and habitat status so as to result in adaptive management.

Since 2005, India has conducted a country wide assessment of tigers, co-predators, prey and their habitat once every four years (Narain *et al.* 2005). This monitoring, though important at the country level in understanding trends at large spatial scales of landscapes, is not sufficient for monitoring tiger source population sites. Single episodes of poaching can deplete source sites within months (Check 2006; Gopal *et al.* 2010) and a four-year monitoring interval is too long a period to detect trends and react with appropriate management intervention for effective conservation of these critical sites. Besides, the current patrolling regime of Tiger Reserves, that hold the major source populations of tigers, is archaic. There is no system in place by which the park manager can ascertain if his guard has actually patrolled an area, or assist in planning the spatial coverage of patrols based on field requirements and data generated by previous patrols.

The National Tiger Conservation Authority, Wildlife Institute of India and Zoological Society of London have jointly developed a customized application software, which is a computer programme tailored for generating specific information/ reports/ inferences/ maps on the basis of data inputs. This application software has been named MSTrIPES or Monitoring System for Tigers – Intensive Protection & Ecological Status. This programme has been standardized for the Tiger Reserves of entire country, and is based on different types of data collected in prescribed formats under the new monitoring protocol for monitoring tigers, co-predators, prey and their habitats in wildlife protected areas. Besides being most user-friendly and easy operatability, the software has proved reliable, robust, and efficient. The predictability, customizability and consistency of this computer programme are also satisfactory.

Implementation of monitoring (MSTrIPES) in Kanha will consist of five components:

- Field training
- Data generation through patrols and ecological monitoring
- Data entry and storage
- Analysis and interpretation at desired spatial and temporal scales
- Adaptive management. The system depends on good field implementation and data recording while the software is a small component that serves to store, analyze, and retrieve data at desired temporal and spatial scales. It is a cultural shift from ad-hoc patrolling and monitoring to systematically planned activities that result in better and informed management decisions.



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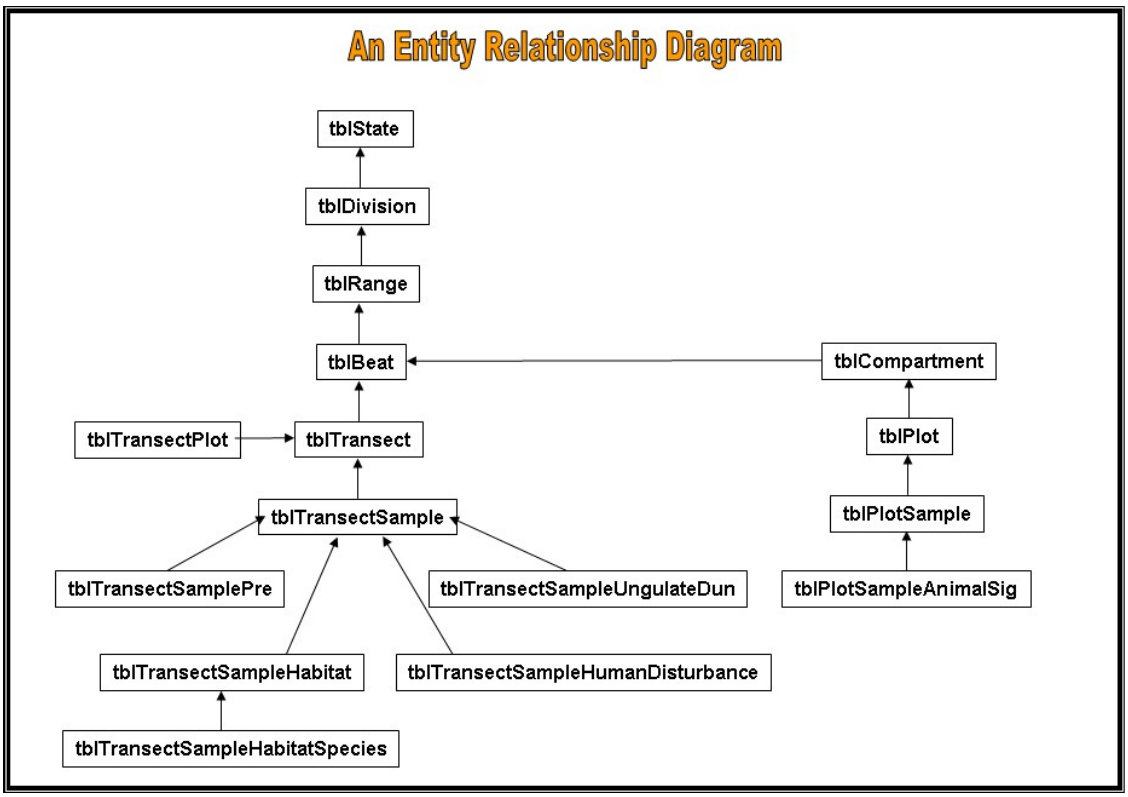

The system has been made field friendly, and it does not add more workload to the already over worked forest guards. This has been done by utilizing much of the routine tasks of patrolling for generating data needed for MSTrIPES. The equipment needed for implementing MSTrIPES consists of one Personal Data Assistant (PDA) for every guard (leader of the patrol) and a laptop computer for each range. The PDA contains an in-built GPS unit, a camera, a mobile phone, a long lasting battery, and the data forms required to be filled while on patrol or during ecological monitoring.

Further, data generated through MSTrIPES can be used to understand the relationship between patrolling intensity and illegal activity.

The above information permits to plan on the spatial coverage and intensity of patrols that are required to combat wildlife crime in an efficient and effective

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manner. The track logs define the patrol route photographs and way points with GPS time and date stamp which ensure that the patrol was actually conducted and the data forms not merely filled while at the base camp.

The basic information collection takes place at beat level during regular patrol done by guards. The information will be managed at Range and Head quarter level to assess weekly and monthly progress and effectiveness of patrol. Various components of the software are as under.

- **Ecological Component:** All forest staff across have been trained in collecting Phase I data on 1) Tiger and other predator signs, 2) Ungulate encounter rates on line transects established permanently in every forest beat, 3) Human disturbance indices, 4) Habitat parameters and 5) Dung density. Further it is proposed to set up a minimum of five permanent pressure impression pads (PIP) in each forest beat. These PIP's will be in different compartment of a beat and minimum a km apart. These PIPs will be monitored once every month in summer and winter to record signs of all carnivores. Once the Phase I data collection is implemented once in summer and once in winter, the data will be exported to MSTrIPES software to analyze and provide easily interpretable reports and maps for the management.

- **Tiger & Other Predator Signs**: The data on tiger and co-predators will be collected as prescribed in Phase-I. Three trails of 5 km. each will be identified and permanently marked for this monitoring. Further it is proposed to set up a minimum of five permanent pressure impression pads (PIP) in each forest beat. These PIP's will be in different compartment of a beat and minimum 1 km. apart. These PIPs will be monitored once every month in summer and winter to record signs of all carnivores. Carnivore sign surveys are analyzed in an occupancy framework (MacKenzie *et al.* 2006) that takes into account imperfect detections at desired spatial and temporal scales. Naive estimates and detection bias corrected estimates are statistically compared between desired time scales using spatially

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paired comparisons and time series data analysis. Since line transects and PIPs are fixed in space data generated from each of them are compared using paired statistical tests that provide better power in detecting trends. MSTrIPRS alerts its users of declines that are greater than 20% over the desired time scale. It generates tabular reports as well as maps depicting status and change in status.

- **Ungulate Density:** The line transects are established permanently in every forest beat. These line transects will be maintained and monitored for ungulate density estimation. Reserve will procure range finder and compass for this work. Each transect will be walked five times in winter and five times in summer. Data will be analysed in MSTrIPES and Distance Software, to map encounter rates, compare trends and analyse density.

- **Human Disturbance Indices**: Information on anthropogenic disturbance will be collected as per Field Guide. This information will be analysed using MSTrIPES to monitor trends in disturbance and its correlation with ungulates and carnivores.

- **Habitat Monitoring:** The vegetation monitoring is important to understand the dynamics of succession specifically for Grassland. The grasslands in Kanha are arrested successional stage, they are in existence due to historical human activities and natural cycles of fire. The monitoring of Habitat will be done at two levels.

    - **Monitoring Vegetation Changes by Remote Sensing**: This will be done at five year interval using Indian Remote Sensing Satellite (LISS 3 and LISS 4) data. Time series analysis will be done to monitor trends in vegetation change.
    - **Grassland Monitoring:** Due to vulnerability of change in grassland condition (deterioration) and possibility of natural succession to woodland, a balanced approach and appropriate monitoring is needed. We propose to have one hectare plots to be laid in different grasslands i.e. mesic, dry and on plateau. In each grassland type 5 plots of a hectare each will be laid. These plots will be

further monitored in ANOVA frame work to see the effect of Burning, over grazing, moisture and nutrient.

The grassland monitoring is crucial for maintaining high ungulate population and to sustain viable tiger and Co-predator population.

- **Dung density**: The dung density data of ungulates will be collected on transect as per the filed guide, every 400 m on ungulate transect 20X2 m plot will be laid for dung data collection. Data will be analysed using MSTrIPES software.

- **Patrol Data:** This data set is to be collected while the forest staff is on routine patrol duty. The purpose of the data is to provide the wildlife manager with information on spatial coverage of patrols, locations of crimes and illegal activities, wildlife mortality and sightings (direct and indirect) of rare, threatened and indicator species. Once data are collected and entered in the software, spatial and temporal patterns and trends for the above mentioned parameters can be analysed for patrol effort in relation to comparable data on disturbance activity and animal abundance, and to incorporate the results of these analyses in the tactical planning for security and management purpose.

    - While on a patrol (foot, vehicle, elephant etc.), use a hand hold GPS unit in "long track" mode to record the patrol route. Set GPS in WGS84 datum for data collection.
    - If expertise on GPS use is not available then simply record the GPS coordinates every 30 minutes on a foot patrol. For vehicle based patrols the road travelled should also be marked on the park map using a GPS unit. This data should be downloaded onto a computer and recorded in the database with rest of the patrol information.
    - Record (with coordinates) any illegal activity observed by you while on the patrol and also record approximately how long it has been since the illegal activity took place, and the action taken (if any).

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- Illegal activities can include signs of wood cutting, lopping of fodder branches, grass and bamboo cutting, livestock grazing, campsite, snare, trap, poacher seen, gunshots heard, fishing, fire, NTFP collection (NTFP specify what is collected in remarks).
- Record all wildlife mortality observed (with coordinates) along with probable cause of death.

Illegal Activities & their Codes

Poachers	P	**Fishing**	Fs	**Encroachment**	En
Suspected Criminal Campsite	SCC	**Poisoning**	Pg	**Wildlife Harassment**	WH
Snares	Sn	**Electric wire**	Ew	**Offroad Driving**	OD
Traps	Tp	**Illegal Fire**	Fr	**Livestock Grazing**	LG
Illegal Machan	IM	**Wood Cutting**	Wd	**Grass/ Bamboo Collection**	GBC
Gunshot	Gs	**Lopping**	Lp	**Human Presence (Signs)**	HP
Hunting Dogs	Dog	**NTFP Collection**	NTFP	**Excavation Marks**	EM
		Gravely Injured Animals	GIA		

Time	**Lat**			**Long**			**Animal Mortality/ Injury Records**					
	D	**M**	**S**	**D**	**M**	**S**	**Species**	**Gender (M/F/Un)**	**Age (Y/Ad/Un)**	**Carcass State/ or State of Injury**	**Probable Cause of Death/ Injury**	**Sample Taken**

M-Male, F-Female, Un-Unknown, Y-Young, Ad-Adult

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16.4.5 **Wildlife Research & Monitoring:** Being a multiple use area, with a low wildlife population, the Buffer Zone offers the following themes for in-house and collaborative research studies:

- Habitat use by spill-over population.
- Fire.
- Habitat degradation.
- Dependence on forest resources.
- Aboriginal/ anthropological matters.
- Eco-tourism.
- Poaching.
- Crop damage.
- Wildlife and vegetation monitoring.

Basic wildlife and vegetation monitoring should be conducted by the staff. Beat guards should be trained by the officers to fill-up the prescribed format containing basic parameters of the monitoring of his beat. This practice is very important and the data will help the Buffer Management take important technical decisions.

16.4.6 **Epidemiology of the Area:** The Buffer Zone harbours around one lakh cattle in different forest and revenue villages, and has consequently become prone to occurrence of several types of cattle diseases. The Buffer Management should ensure that the wildlife veterinarian of the Kanha Tiger Reserve conducts a detailed epidemiological study of the area to update the current status of various types of disease.

16.4.7 **Prophylactic Immunization of Cattle:** The cattle of the Buffer Zone intermingle with the wild population, and there is always a chance of the transmission of infectious diseases from cattle to wild population and vice-versa. Needless to add, a sudden breakout of any epidemic may play havoc with the lives of

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thousands of ungulates in a matter of only a few days. In view of the above, the Buffer Management should ensure regular immunization programmes for the villages within the periphery of the 5 km. of park boundary. The Wildlife (Protection) Act, 1972 (as amended upto 2006) also makes a provision in this regard. Besides, the Supreme Court of India has also given a very important directive related to the vaccination of the cattle of the surrounding areas of protected areas.

16.4.8 **Mainstreaming with Production Sectors:** Unlike the Core Zone, the Buffer Zone is a multiple use area where a number of production sectors operate for the development of villages. The activities of these production sectors may directly or incidentally affect tiger conservation. Therefore, the Buffer Management should also focus on mainstreaming wildlife concerns amongst such sectors. Mainstreaming here simply means integration of wildlife conservation in 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'.

The Deputy Director, who is also the Member Secretary of the district-level coordination committee for convergence of other sectors in the Buffer Zone, should ensure to raise, discuss, and settle such concerns at these meetings. The officers/ staff of the Buffer Zone should also have the knowledge of this mechanism so that the violation of any kind in the field can be instantly reported to the Deputy Director and Field Director.

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CHAPTER – 17

JOINT FOREST MANAGEMENT & ECODEVELOPMENT

17.1 Introduction:

The support and cooperation of the local communities of the Buffer Zone are important for the conservation of the Kanha Core Zone and the protection of spill-over population of wildlife in the Buffer Zone. Joint Forest Management and ecodevelopment is an effective mechanism through which the Buffer Management and the local communities can reduce animosity, build mutual trust and appreciate each other concerns/ problems and strengthening wildlife conservation in the Tiger Reserve.

17.2 Objectives:

The specific objectives of Joint Forest Management and Ecodevelopment in the Buffer Zone are as under:

- Garnering support of local communities in the management of Buffer and wildlife conservation.
- Minimizing disinformation campaign against the PA, and negative impact of Core Zone on local communities.
- Minimizing dependence of local communities on natural resources.
- Lending effective and extensive support for local community development.

17.3 Strategies & Management Prescriptions:

The strategies and management prescriptions for Joint Forest Management (JFM) and Ecodevelopment in the Buffer Zone are as under:

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17.3.1 **Deliberations of Elected Public Representative:** The Park Management invited local elected public representatives to a meeting at Khatia on 31-05-2011 to seek their guidance/ opinions on the Tiger Conservation Plan for the Buffer Zone, and specially on Joint Forest Management and Ecodevelopment initiatives during the plan period. The entire proceeding of this meeting is appended **(Appendix-XI)**.

17.3.2 **Constitution of District Coordination Committees:** The constitution of district level coordination committee at the Mandla and Balaghat districts for ensuring convergence of various other sectors operating in the Buffer Zone is of utmost importance. As the area of the Buffer Zone falls into the Mandla and Balaghat districts, two such committees need to be constituted. There are a host of the State and Central Government's schemes for the development of villages, which are implemented through district administration. The constitution of this district level committee shall ensure required funds for forestry/ JFM/ ecodevelopment in the Buffer Zone. Besides, this initiative shall also strengthen coordination between various departments working in the same area of the Buffer Zone.

District Collector	Chairman
CEO	Member
Representative officials from PWD, Social Welfare, Tribal Department, Health Department, Agriculture Department, Education Department, Power & Irrigation Departments	Member
Representatives of various Government/ private production sectors	Member
Deputy Director of the Core Zone	Member
Deputy Director of the Buffer Zone	Member Secretary

17.3.3 **Mechanism of Fund Raising:** The Deputy Director (Buffer Zone) shall be responsible for preparing the Annual Plan of Operations (APO) for various forestry, JFM and ecodevelopment works to be undertaken in the Buffer Zone under the guidance of Field Director, Kanha Tiger Reserve. The APO shall be strictly based on the proposals/ recommendations/ needs contained in the various

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microplans of the Buffer Zone. All the microplans have been revised for the entire plan period. Local communities attach much importance to several types of developmental works, and these initiatives should be prioritized in the microplans. The Deputy Director shall submit the APO to the District Coordination Committees and pursue the same to ensure the timely release of funds. Sometimes, it may not be possible to receive the entire fund from the Collector Sectors, and for the rest of the funds, a separate APO under the guidelines of the National Tiger Conservation Authority, New Delhi shall be prepared and submitted through the Principal Chief Conservator of Forests (Wildlife), Madhya Pradesh. Besides, every year, 20% of the total *Vikas Nidhi* generated shall be distributed among all the families of all the villages of the Buffer Zone through respective ecodevelopment committees. It has to be ensured that the money is credited into the bank accounts of these families.

17.3.4 **Ecodevelopment Initiative:** On the basis of the funds received from Collectors, Mandla and Balaghat districts and the NTCA, ecodevelopment/ JFM initiatives shall be taken in all the 6 forest ranges of the Buffer Zone. The financial year-wise detailed proposal for JFM/ ecodevelopment initiatives in different forest ranges has been prepared and presented in Chapter of Organization, Administration & Budget. The proposed initiatives are high priority works for the local communities, and in the subsequent financial years, the same policy should be followed. The abstract of the required funds for ecodevelopment committees for the plan period is as under:

Range	No. of EDCs	Proposed Development Work Each Year	Average Required Amount (Rs.)
Sijhora	33	613039	20230287
Khatia	12	633039	7596468
Khapa	17	643039	10931663
Samnapur	15	653039	9795585

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Garhi	49	658039	32243911
Motinala	15	663039	9945585
Total:	**141**	**3863234**	**90743499**

Financial Year	Average Required Amount (Rs.)
2011-12	90743499
2012-13	99817849
2013-14	109799634
2014-15	120779597
2015-16	132857557
2016-17	146143313
2017-18	160757644
2018-19	176833408
2019-20	194516749
2020-21	213968424

17.3.5 **Regulation NTFP Through JFM:** Some of the important MFP that occur in the Buffer Zone are: tendu leave, achar, aonla, harra, baheda, mahua flower & seed, mahul leaves/ bakkal, sal seed, chhind bahari, honey, chakoda seed, karlihari, satawar, bhilma, safed musli, kali musli, van tulsi, baichandi, kullu and dhawda, jack fruit and mango etc. Except tendu leaves these NTFP are collected by villagers individually and sold in the nearby markets. It is generally noticed that these MFPs are sold by the villagers either at throwaway prices or through barter trade/ exchange. Such trades/ exchanges result in the economic exploitation of the local communities. Therefore, it is vitally important to develop such a system through which the local community can sell their collected MFP and avoid exploitation. Due to economic constraints and greed, MFP is collected/ extracted in a most unsustainable manner, and it causes tremendous damage to the vegetation.

In view of the above, it shall be ensured that the local community sells its MFP directly to the respective ecodevelopment committees, which in turn shall find

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potential buyers for these sales. The EDC can also add value to the MFP before its final disposal to procure maximum price. The Buffer Management can also provide soft-loans to the EDCs for the direct purchase of MFP from village communities. Besides, the Buffer Management shall also ensure the scientific and sustainable exploitation of these MFPs by pursuing local communities and ecodevelopment committees to employ safe and sustainable exploitation methods as appended **(Appendix-XXIII)**. Moreover, the Deputy Director shall also observe the rules/ regulations envisaged in the Madhya Pradesh Forest Produce (Conservation of Biodiversity & Sustainable Harvesting) Rules, 2005 (**Appendix-XXII)** during collection of MFP.

17.3.6 **Provision of Soft-Loans:** There shall also be a provision of giving soft-loans to identified beneficiaries through the respective ecodevelopment committees. Ecodevelopment committee can decide on a wide range of small businesses/ shops/ procurements etc. for which these soft-loans can be provided.

17.3.7 **Wildlife Mainstreaming in Production Sectors:** As the Buffer Zone is not a protected area, various departments of the State Govt. also operate in this zone with their own objectives of socio-economic and infrastructural developments. These production sectors may indirectly or directly affect wildlife conservation in the Buffer. Naturally, wildlife conservation is not a priority of these departments and their lack of understanding of conservation issues and concerns may sometimes inadvertently conflict with the wildlife conservation policies of the Buffer Zone. And here the mainstreaming of wildlife concerns come into play. It is nothing but a process/ effort to integrate wildlife conservation into various government and private sectors operative in the Buffer Zone whose primary emphasis is not conservation. Such mainstreaming would look after wildlife interests and strengthen conservation in the Buffer Zone by minimizing the possible interface conflicts between the above production sectors and wildlife conservation. The Deputy Director should ensure to raise, discuss, and settle such concerns at meetings of District Coordination Committees. The officers/ staff of

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the Buffer Zone should also have the knowledge of this mechanism so that the violation of any kind in the field can be instantly reported to the Deputy Director and Field Director. Based on Technical Document of NTCA (2007) some indications are as under:

- Forestry:
    - Timely payment of compensation for livestock depredation by wild carnivores
    - Regulating livestock grazing in areas prone to wild ungulates.
    - Payment of compensation for crop damage by wild animals.
    - Monitoring village cattle for disease.

- Agriculture:
    - Adoption of 'eco-agriculture' as a land use to produce food as well as to conserve wildlife.
    - Maintaining non-domestic habitat.
    - Discouraging sudden change in cropping patterns (viz lure crops) to avoid accentuating man-wild animal conflicts.
    - Promoting soil conservation.
    - Providing economic incentives for safeguarding wildlife concerns.
    - Providing incentive for carbon, water and other environmental services to local people.
    - Recognizing the value of traditional farming in conservation.
    - Fostering use of green manure and discourage use of chemical manures and pesticides.
    - Fostering rural tourism.

- Ecodevelopment:
    - Participatory village level planning and preparation of village level micro plans for eco development.

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- 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 microplan for safeguarding wildlife interests.

- District administration sectors:

  - Formal contracts/ agreements between the Buffer Zone, district authorities and ecodevelopment committees. The responsibilities of various parties should be spelt out in the contract/ agreements for safeguarding wildlife concerns along with reciprocal commitments. Normally, such contracts/ agreements should discourage any detrimental practice and assign responsibility to the community for carrying out some interventions. In return, the community should also receive an assurance from the Tiger Reserve authorities for certain benefits, such as MFP collection etc.

- Tourism:

  - 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 though concerned Panchayats.
  - Obtaining contributions from tour operators for maintaining tourist facilities.
  - Recycling of tourist gate receipts for community welfare through the Tiger Conservation Foundation.

- Road transport:

  - Safeguarding floral / faunal values en route.

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- Speed level.
- Regulation of traffic flow.
- Establishment of local vegetation on filled up area and road side land.
- Adoption of erosion control measures.
- Protection of drainage system.
- Dumping of excavated material on ecological principles.
- Safeguards to prevent road hits to wild animals.
- Safeguards to prevent fires.

- Industry:

  - Maintaining a zone of 5 km from the periphery of Core Zone as a "no developmental zone" to foster wildlife corridor.
  - Construction activities should not lead to depletion of forests.
  - Preventing pollution on account of gaseous and other effluents.
  - Organizing service systems relating to drinking water, drainage, garbage disposal so as not to disturb the wildlife habitat.

- Irrigation project:

  - 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.
  - Assisting the management in patrolling the water body.

- Communication projects:

  - Avoiding wetlands, animal corridors and habitats rich in wildlife.
  - Avoiding agricultural land, streams, and forest areas.
  - Avoiding slopes.

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- Institutionalizing a system of patrolling for safeguarding the use of transmission lines and cleared strips for poaching.
- The maximum width (w) of Right of Way for the transmission lines on forest land for varying kv lines is 7 m. (11 kv.), 15 m. (33 kv.), 18 m. (66 kv.), 22 m. (111 kv.), 27 m. (132 kv.), 35 m. (220 kv.) and 52 m. (400 kv.).
- Maintaining the prescribed clearances for different kv lines within the Right of Way, which may be widened in areas having tall trees or elephants.

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CHAPTER – 18

ECOTOURISM

18.1 Introductions:

The management, lodge owners and local communities are stake-holders in the ecotourism activities in the Buffer Zone. It is in the interest of all the three stake-holders that ecotourism in the Buffer Zone remains ecologically sustainable and village communities cooperate with the management in wildlife conservation. Besides, while the hospitality sector is rightfully pursuing business activity, ecotourism should also contribute to improve the economy of specially those villagers who have been uprooted from the National Park and have sacrificed so much in terms of concessions and privileges relating to natural resources.

18.2 Notified Guidelines for Tourism by NTCA:

The Supreme Court of India, while hearing the Special Leave Petition (Civil) 21339 of 2011 Ajay Dubey Vs. National Tiger Conservation Authority & others, had directed the Ministry of Environment & Forests and National Tiger Conservation Authority, Govt. of India to prepare effective guidelines for tourism in and around tiger reserves. Accordingly, the NTCA has duly submitted and notified the above comprehensive guidelines vide No./15-31/2012-NTCA dated 15 October, 2012 in the Gazette of India, Extraordinary, Part-III, Section-4. Part-B of the above document deals exclusively with tourism in and around Tiger Reserves **(Appendix-LXIII).**

The guidelines also envisage that the State shall ensure that each Tiger Reserve prepares a tourism plan, as part of the Tiger Conservation Plan vis-à-vis the technical Guidelines of the National Tiger Conservation Authority. The plan shall inter alia, include identification of corridor connectivity and important wildlife habitats and mechanisms to secure them. This site-specific tourism plan forming part of the Tiger Conservation Plan

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shall be approved as per the provisions of the Wildlife (Protection) Act, 1972. Prior to this approval, no new infrastructure for tourism (except for minor alterations in existing modest home stays) shall be allowed to be developed in and around Tiger Reserves. The ecotourism and interpretation sub-plan for the Buffer Zone contained in this chapter is prescribed in the background of the above guidelines issued by the NTCA, New Delhi.

18.3 Objectives:

The specific objectives of the ecotourism activities in the Buffer Zone are as under:

- Developing opportunities for partnership between the Park Management and tourism operators.
- Involving local communities as stake-holders.
- Complementing local economy through eco-tourism activities.
- Ensuring eco-tourism as ecologically and socio-culturally sustainable.
- Making use of the traditional wisdom and ethnographic attributes of the local communities.

18.4 Strategies & Management Prescriptions:

Generally, lodge owners/ hoteliers are in full agreement with the management that select ecotourism activities should be introduced into the Buffer Zone through respective ecodevelopment committees under the technical guidance of the management. They have unanimously committed to promoting these activities among their customers/ visitors, and providing them with new exposures to the appreciation of the natural and cultural heritage of this region. There is a wide range of options as ecotourism activities in the Buffer Zone that can be taken up by the management vis-à-vis the existing situations/ constraints during the plan period.

The following strategy and management suggestions are made for initiating ecotourism activities in the Buffer Zone:

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18.4.1 **Rules & Regulations:** As per the NTCA tourism guidelines, the Reserve Management has been mandated to start ecotourism activity in the Buffer Zone. This provision entails the Reserve Management to lay down clear code/ set of rules and regulations for the guidance of staff and tourists and to deal with any eventuality. While some of these rules have emanated from legal obligations, others have been framed by the Reserve Management to control and regulate tourist influx in the Buffer Zone. These rules and regulations should be widely publicized through every possible way.

18.4.2 **Broad Guidelines for Stakeholders:** While some specific guidelines are being proposed separately under various tourism components in the Buffer Zone, some broad operational guidelines for tourism management relating to the Reserve Management, stakeholders, visitors and local community are proposed as under:

Points for Consideration:

- The tourism sub-plan for the Buffer Zone should be consistent with the State Tourism and Ecotourism Strategy.
- As envisaged in the NTCA tourism guidelines, the Reserve Management shall take initiatives to constitute a Local Advisory Committee (LAC) for the Kanha Tiger Reserve. The LAC is supposed to discharge functions for tourism management as prescribed in the NTCA tourism guidelines.
- Tourism activities in the Tiger Reserve shall be under the overall guidance of the Madhya Pradesh Tiger Foundation Society and the LAC.

18.4.2.1 **For the Reserve Management:**

18.4.2.1.1 **Eco-Tourism Zone & Carrying Capacity:**

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- An area of 34.21 sq. km. has been delineated in the Khatia Range of Buffer Zone for ecotourism. The Reserve Management shall, as far as possible, open up some more areas in different forest ranges for tourism. The carrying capacities of the current ecotourism area in the Khatia range has been determined at the physical, real and effective and permissible levels, and are as under:

Physical Carrying Capacity (PCC): 265 visits / day
Real Carrying Capacity (RCC): 64 visits / day
Effective & Permissible Carrying Capacity (EPCC): 32 vehicles / day

Needless to add, the carrying capacity of 32 vehicles per day has been determined for the standard type of vehicles approved by the Reserve Management for safari purpose. As there is no provision for tourist visitation involving elephant, boat and foot travel in the core area, no such carrying capacity has been assessed. The detailed calculation of the carrying capacity is appended **(Appendix-LXIV)**.

- The Carrying Capacity of 32 vehicles shall be further divided for entry in the morning and evening sessions. The ceiling of maximum numbers of vehicles in the morning and evening sessions are fixed at 20 and 12 respectively and should not be exceeded.
- The ecotourism zone has been subdivided into the following sub-zones for the purpose of maintaining low impact tourism throughout the tourism season. Unless unavoidable, the areas of sub-zones should not be changed.

Ecotourism Sub-zones	**Road Length (km.)**	**Area (sq. km.)**
Khatia	50.60	34.21
Total:	**50.60 or 51**	**34.21 or 34**

- The carrying capacity for each ecotourism sub-zones in the morning and evening sessions along with eligibility of entry against online and current bookings has been fixed as under and shall be strictly adhered to:

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Ecotourism Sub-zones	Total Carrying Capacity/ Day	Eligibility of Entry as per Carrying Capacity			
		Morning		Evening	
		Online Booking	Current Booking	Online Booking	Current Booking
Khatia	32	-	20	-	12
Total:	**32**	**-**	**20**	**-**	**12**

- The Reserve Management shall continue refining the existing online booking system to avoid the number of visitors and vehicles exceeding carrying capacity and to control tourist and vehicle numbers. Rules of booking shall be transparent to avoid harassment to the visitors.

18.4.2.1.2 **Vehicular Excursion:** To ensure that tourists enjoy these excursions/ safaris to the fullest and appreciate moving/ grazing wildlife species and panoramic vistas in the Buffer Zone, the following guidelines are proposed to regulate and control vehicular excursions in the protected area:

- There shall be no special management of habitat with a view to inflating animal abundance for tourism purposes. Visitors shall keep a minimum distance of 20 meter from all wildlife; cordoning, luring or feeding of any wildlife shall be prohibited. Minimum distance between vehicles while viewing/ spotting wildlife shall be maintained at 50 meters. Vehicles shall not monopolize a wildlife sighting for more than 15 minutes.
- Only well-inspected registered vehicles with an authorized guide should be allowed inside for excursion.
- Only registered drivers should drive the vehicles throughout the tourism season.
- No intoxicated drivers/ guides should be allowed in tourist vehicles.
- There should be a well-planned route chart at the respective entry gates to divert tourist vehicles and avoid crowding on a particular road.

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- Ensure a minimum distance of 500 meters between two moving tourist vehicles.
- Tourist vehicles must not exceed the prescribed limit of their capacity of 6 persons excluding the guide and the driver.
- Vehicles must not exceed the prescribed speed limit of 20 kmph.
- It should be ensured that each tourist vehicle has a clear and legible code number written on them. This provision will help apprehend the vehicle in case of any tourism offence committed in the Buffer Zone.
- Tiger reserve authorities shall delineate an adequate and appropriate area for the visitor facility in the ecotourism zone.

18.4.2.1.3 **Vigilance:** It is important for the Buffer staff to be vigilant and to keep an eye on tourists and their vehicles so that no tourist offence may go unnoticed and the offender is dealt with accordingly. In view of the above, the Reserve Management should engage a few mobile forest guards in the tourism zone to ensure vigilance on tourism in the Buffer Zone to ensure the following guidelines:

- Enforce do's and don'ts of tourism as far as possible.
- Ensure control over the speed of tourist vehicles.
- If a tourist vehicle stops somewhere to watch wildlife, the back vehicle has to cross over and maintain the distance of 500 meters.
- Ensure that polythene bags are not taken inside the ecotourism zone.
- No garbage/ pouch should be thrown out of tourist vehicles.
- Tourist vehicles must never surround any wild animal, specially a tiger, giving it the right of way.
- Ensure that guides accompany the tourist vehicles assigned to them.
- The tourist vehicles must follow the route allotted to them.
- Ensure randomly that the identities of the tourists are the same as have been registered at the entry gates and in online bookings.

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18.4.2.1.4 **Identification of Ecologically Sensitive Areas:** The following ecologically sensitive areas in and around the Tiger Reserve has been identified for monitoring to ensure the ecological integrity of corridor and Buffer areas and prevent corridor encroachment. The Reserve Management, however, shall evolve mechanism in consultation with the relevant forest divisions to achieve these objectives:

- The eastern most boundary of the Core Zone is not surrounded by the Buffer Zone as it lies in the Chhatisgarh State.
- The Kanha-Achanakmar forest corridor is contiguous almost throughout. However, at several places the connectivity is extremely thin and degraded, and in between there are several relatively good blocks.
- The Kanha-Pench corridor on the western side is probably the most promising connectivity. Though fragmented in between, this is reported to be used by tigers frequently. The following 22 compartments, with a total area of 2268.97 ha., at the Kanha end of this corridor have been identified as ecologically sensitive:

Range	Compartment No.	Area
Khatia	310	394.51
Khatia	308	370.1
Khatia	307	346.61
Khatia	282	111.57
Khatia	283	36.18
Khatia	O-284	9.67
Khatia	O-278	34.2
Khatia	286	355
Khatia	291	68.63
Khatia	305	185.37
Khatia	306	160.9
Khatia	O-285	5.4
Khatia	O-298	57.5
Khatia	O-300	2.4
Khatia	O-299	8.5
Khatia	O-301	8.33

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Khatia	O-304	11.25
Khatia	O-303	76.05
Khatia	O-277	9.9
Khatia	O-279	7.12
Khatia	O-280	4.6
Khatia	O-281	5.18
Total:		**2268.97**

- On the northern side, the Buffer Zone borders the East Mandla (T) Division, and the region harbours many weak links.
- Parts of the North Balaghat (T) Division bordering the southern boundary of the Buffer Zone also harbour many weak links in ecological passages.

18.4.2.1.5 **Creation of Interpretation Centers:** A world class interpretation centre with the state-of-the-art technology is required near all the three entry points. The entire package has to be very interactive for entertainment-cum-education. Special emphasis on eco-regional significance/ aboriginal cultures/ conservation history etc. shall be given and current environmental issues/ concerns shall be interestingly presented. This will attract a large number of tourists and make their stay more enjoyable. A well stocked library along with a reading room should also be provided in the vicinity. The maintenance of interpretation package: It should include the following:

- Online booking for jungle excursion.
- Simple, adequate boarding and lodging facilities, in tune with the environment and the general setting of the landscape.
- Good road network within the identified tourism zone.
- Self - guided nature trails.
- Convenient transportation.
- Canteen for refreshment.
- Professional interpreters.
- Way-side exhibits.
- Signages.

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- Clean public conveniences.
- Garbage disposal facility.
- Living quarters for staff/ personnel.
- Structures with an exotic look causing visual pollution and non-compatible and unaesthetic architecture should be avoided.
- Provide visitor information and interpretation services (bilingual), including rules and regulations of tourism, tourism facilities, and places of tourist interest etc.
- Periodic assessment of existing infrastructure, road, electricity, and water supply for good maintenance

18.4.2.1.6 **Special Museum Room for the Barasingha:** Considering the significance of the hard ground barasingha and its successful conservation story in the Core Zone, the Reserve Management should think of constructing a special room in the interpretation complex. The room should have various panels, photographs, and audio-visuals etc. to depict interestingly the ecology of this handsome deer.

18.4.2.1.7 **Management of the *Vikas Nidhi*:** It is imperative to send periodic proposals to the government for enhancing the entry fee and tariff rates for tourism in the Buffer Zone to build up the *Vikas Nidhi*, so that tourism may become a self-supporting activity without causing financial stress to the Reserve Management. Further, a certain percentage of the *Vikas Nidhi* can also be used for developing roads, improvement of accommodation facilities in ecotourism management, and for the basic community needs of the relocated villages. The proposals should be prepared with due deliberations and sent to the PCCF (WL), for discussions/ revision and approval by the concerned committee.

18.4.2.1.8 **Nature Trails:** The Buffer Management shall develop and maintain self-guided nature trails at Khatia and Mukki. Initially, 25 cycles shall be provided on hire at Rs. 25=00/ hour to the visitors. Though these are self

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guided nature trails, but to enhance the wilderness experience of the visitors and to make use of the inherent skills of the locals, the concerned EDC should provide guides for this activity.

18.4.2.1.9 **Wild Safari:** The creation of a world class wild safari at Khatia is needed as an additional input to manage tourists' pressure, specially during the peak season/ rush hours. There are many such outstanding models to choose from the renowned wildlife protected areas of the world. Being an *in-situ* preservation area, the safari, will represent all the floral and faunal attributes of the Tiger Reserve.

18.4.2.1.10 **Observation Machans:** Viewing/ observing panoramic scenes of the wilderness and moving wildlife from machans is another great activity. The management shall erect five safe wooden machans in the Samnapur, Khapa, Khatia and Garhi ranges along the Banjar river and Linga nala respectively. Each machan should comfortably accommodate at least 8 persons.

18.4.2.1.11 **Jungle Walks:** Around 5 to 30 km. long walks through the jungle should be arranged in the Khatia and Khapa ranges by the management through the concerned EDCs. Each group of walkers shall be escorted by a guide from the concerned EDCs.

18.4.2.1.12 **Bullock Cart Ride:** Rides on well-decorated bullock carts should be arranged through the concerned EDCs at Khatia and Mukki. These cart rides shall be conducted in the day time. The visitor can take cart rides to the nearby market places and enjoy the vibrancy of ethnic shopping activities.

18.4.2.1.13 **Picnic Spots:** Five picnic spots may also be developed and maintained by the Buffer Management at good sites near the banks of the Banjar or place of scenic beauty etc. through the concerned EDCs:

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- Khatia-1
- Mocha-1
- Khapa-1
- Samnapur-1
- Sarhi-1

These picnic spots shall be run by villagers and shall provide snacks/ lunch of ethnic foods to the visitors. Visitors can enjoyably spend 3-4 hours at these spots and come back. The EDCs shall charge the usual fee prescribed for vehicular excursion in the Core Zone, besides other charges of refreshments/ meals etc.

18.4.2.1.14 **Homestays:** Five houses each near Khatia, Mukki and Sarhi entry points shall be arranged for homestays. This activity shall facilitate the visitors to closely watch the way of life with a touch of aboriginality, and to have ample opportunity to interact with the villagers. The concerned EDC shall be responsible for providing loans to the house owners upto Rs. 75000=00 to renovate and furnish their home as per requirements under the technical guidance of the Buffer Management.

18.4.2.1.15 **Herbal Walks:** After the rains, guided herbal walks shall be arranged through the concerned EDCs in the Khatia and Khapa ranges. The visitors are expected to identify and appreciate a wide range of herbs having medicinal importance, and other floral attributes of the forest. The Buffer Management shall conduct this tourism activity.

18.4.2.1.16 **Ethnic Cultural Shows:** The respective EDCs shall get good platforms/ stages constructed at Khatia, Manjitola and Sarhi villages to arrange ethnic cultural shows for the visitors. The EDCs shall be responsible for arranging proper costumes and musical instruments for dance shows, which will include the karma, saila and the gendi dances. Besides, cultural chats can also be

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arranged. All these half-an-hour 4-5 ethnic cultural shows shall be conducted in the evening till 10 at night.

18.4.2.1.17 **Souvenir Shops:** A souvenir shop dealing essentially in ethnic articles shall be opened at each entry gates. These shops shall be managed through the respective ecodevelopment committees, and the skilled unemployed shall have an opportunity to sell their ethnic handicrafts, wooden carvings, bamboo and lantana works, pottery, and beadwork etc.

18.4.2.1.18 **Ethnic Bio-food Outlets:** The outlets of ethnic bio-food shall be opened at all the three entry gates through the respective ecodevelopment committees. These outlets shall preferably be named as "kodon-kutki outlets/ centres" and sell ethnic bio-food snacks/ dishes in the bowls made of sal, mahua and palas leaves. The snacks/ dishes may include sweet kutki puddings (kheer) and kutki laddos. These ethnic recipes shall also be decently packaged to orders. The management shall ensure proper storage and hygiene at these outlets and shall also make efforts to acquire the relevant certifications.

18.4.2.1.19 **Night Safari:** A forest road circuit of around 25 km. length traversing through at least 2 beat headquarters shall be identified for night safaris in the Buffer Zone near all the three entry gates. No new roads shall be constructed, nor any fire line be used for this tourism activity. The night safari shall be permitted between 8.30 pm to 10.30 pm for no more than 2 vehicles at each entry gate. This tourism activity shall not be conducted on Wednesday. Visitors shall be permitted for undertaking the night safari on the first come first served basis.

18.4.2.1.20 **Elephant Bathing:** The bathing of elephants can also be shown to visitors at the Muwal/ Gaidhar camp along the Banjar river in the afternoon. The visitors should only be allowed through the Buffer Zone to reach the above

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camps. They can watch domestic elephants taking bath and playing with water.

18.4.2.1.21 **Ecosystem Services Charges:** A host of tangible and intangible benefits are derived from wildlife protected areas. Besides, hundreds of families of 28 forest villages relocated outside the National Park have also sacrificed so much for the cause of wildlife conservation. Now that the hospitality sector is generating business out of wildlife tourism, lodge owners/ hoteliers are also expected to contribute something to the local economy as ecosystem services charges. Accordingly, the Buffer Management can discuss the issue with hoteliers and frame such a mechanism that each lodge/ hotel pays a certain charge per bed per occupancy day to the respective ecodevelopment committees through Gram Panchyats. The charges can be based on different slabs of broad accommodation rates.

EDCs can pay back to the Gram Panchyats 5% of the total amount so recovered by them, and the rest of the money can be distributed among all the members of all the ecodevelopment committees of the Buffer Zone on an annual basis.

18.4.2.2 **For Tour Operators:** The Reserve Management should undertake the following programmes/ plans for tour operators:

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

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- It has to be ensured that all guides and drivers compulsorily undergo a short course in park interpretation and rules and regulations for effective tourism management in the core area. This course should conclude in an oral examination, with all successful candidates being certified by the Madhya Pradesh Tiger Foundation Society.
- The Reserve Management shall arrange, before the tourism season, a refresher course/ workshop for all certified guides and drivers to build up their capacity to identify birds and provide natural history information on other species, to slowly dissuade them from tiger-centrism. A periodic assessment of their performance shall be reviewed by the Local Advisory Committee (LAC) before reissuing their licenses.
- All certified guides shall wear uniforms as prescribed by the Reserve Management. They must also have their name-tags and the Kanha logos and badges pinned to the shirts/ sweaters/ jackets.
- All certified drivers shall wear uniforms as prescribed by the Reserve Management. They must also have their name tags and the Kanha logos and badges pinned to the shirts/ sweaters/ jackets.
- The use of battery operated vehicles shall be encouraged to minimize pollution on suitable terrains in the tourism area.

18.4.2.3 **For Developers & Tourist Facilities:** All developers shall be encouraged by the Reserve Management to follow the following prescriptions:

- All tourist facilities, old and new shall be encouraged to aim to generate at least 50% of their total energy and fuel requirements from alternate energy sources that may include solar and biogas.
- The use of wood as fuel shall be prohibited, except for campfires for which wood must be procured from State Forest Department or the Forest Development Corporation depots.
- The Reserve Management shall ensure that developments remain sensitive to the conservation of flora and fauna, and the corridor value of the area in and

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around Tiger Reserves, with unobstructed movement of wildlife in the area. All non-porous fences, enclosures and walls shall be discouraged.

- Tourist facilities and tour operators shall not cause disturbance to animals while taking visitors on nature trails.
- Any violation of the guidelines shall be referred to the appropriate authorities under intimation to the National Tiger Conservation Authority, for taking action in accordance to the relevant provisions of the law.
- Being sensitive to the conservation of endangered species and corridor value of the area.
- Using local material and design as far as possible, while avoiding over-construction.
- Preferring 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 in the planning, architectural design and construction of tourist facilities
- Reducing environmentally unfriendly items like asbestos, pesticides, inflammable material.
- Respecting the historic and religious sites.
- Providing appropriate interpretive service to visitors for communication with nature and local culture.
- 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.

18.4.2.4 **For Private Tourist Properties and Facilities:**

- The Reserve Management shall develop generic guidelines for environmentally acceptable and culturally appropriate practices, and for all new constructions in consultation with the LAC and resort owners.

- Ecotourism infrastructure should conform to eco-friendly, low impact, low height aesthetic codes of architecture. It should also adopt renewable including solar energy appliances, waste recycling processes, water management practices, and ensure natural cross-ventilation. The use of asbestos, air pollution, dazzling and high illumination outdoor lightings, and discharge of untreated sewage should not be allowed.
- The Reserve Management shall pursue regular review of all tourist facilities within the zone of influence of the Tiger Reserve by the LAC vis-à-vis environmental clearance, area of coverage, ownership, type of construction, number of employees, etc., for suggesting mitigation and retrofitting measures if needed.
- The Reserve Management and the district revenue authorities shall ensure that all tourist facilities within a zone of influence (to be identified by the LAC) in the context of core/critical tiger habitats in tiger reserves must adhere to all environmental clearances, noise pollution norms, and are non-polluting, blending in with surroundings. Severe penalties must be imposed for noncompliance.
- All tourism facilities located within the zone of influence (as determined by the LAC) in the context of the Tiger Reserve shall adhere to pollution norms (noise, solid waste, air and water, etc.), under the respective laws or rules for the time being in force. Some indicative guidelines for the Reserve Management are as under:

    - Hotels/ lodges, located in the vicinity of core boundary, shall not be allowed to fence in their properties. The owners/ managers of such properties shall be persuaded to have the existing fence/ non-porous enclosure taken off at the earliest.
    - Every hotel shall build/ install rainwater harvesting facility equivalent to at least 200 litres of water per bed night for the total capacity of the hotel.
    - No hotel shall discharge any sewage or solid waste into any water body or waterways or in an open pit.

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- Every hotel shall separate biodegradable waste from the non-biodegradable waste. Transporting the non-biodegradable waste to a prescribed recycling or disposal site shall be the responsibility of the hotel. Burning of non-biodegradable waste shall be prohibited.
- Use of firewood for any purpose by all commercial establishments (including tea shops) shall be prohibited.
- All commercial establishments, related to tourism and hospitality, (including tea shops) shall have to follow the architectural guidelines including colour schemes that may be issued by the competent authority.
- All commercial establishments, related to tourism and hospitality, (including tea shops) shall not use any sound enhancing instrument such as loudspeakers/ amplifier.
- All commercial establishments, related to tourism and hospitality, (including tea shops) shall not use any firecrackers.
- Over-flying the Core Zone area by any aircraft including hot-air balloons will be prohibited.

- There shall be no new construction on hill slopes having gradient more than 15 degrees.
- There shall be no construction within 100 meters on either side of river high banks (Banjar, Halon, Surpan, Phen and Jamunia), and 50 meters on either side of nala high banks (Ghanghar, Baghmar, Matiyari, Khudrai, Linga, Budbudi and Kashmiri).
- The MP Pollution Control Board shall ensure that discharge of waste water or untreated effluent in accordance with the Water (Prevention & Control) Act, 1974 and Municipal Solid Waste Rules, 2000, rules framed under Environment Protection Act, 1986 and further guidelines issued by the State Govt. in accordance with the recommendation of the SLM & RC. No effluent, either treated or untreated, shall be permitted to be discharged into waterbodies and water sources.

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- The Reserve Management shall pursue the Local Advisory Committee to have facilities installed for the disposal and treatment of solid waste in a way that it ensures proper sanitation and cleanliness.
- The MP Pollution Control Board shall control noise pollution in the ESA in accordance with the Noise Pollution (Prevention & Control) Rules 2000, framed under Environment Protection Act, 1986 & guidelines issued by the State Govt. from time to time.
- All signboards and hoardings shall be erected/ hanged as per the specification and colour scheme that may be issued by the Reserve Management and LAC.
- There shall be a complete ban on burying, burning or otherwise disposing non- biodegradable or toxic waste in and around the tiger reserve. Proper plan for disposal for degradable waste shall be developed and strictly implemented.
- Violations of these norms shall be appropriately dealt with by the LAC. Any violation of the guidelines will be referred to the appropriate authorities under intimation to the NTCA, for taking action in accordance to the relevant provisions of the law.

18.4.2.5 **For the Visitors:** The Reserve Management shall create awareness in visitors by circulating adequate pamphlets/ erecting sign boards to the following effects:

- Abiding by the rules and regulations of the Core Zone.
- Helping conservation and protecting all natural and cultural sites.
- Avoiding wastage of resources.
- Avoiding littering & carrying back all non-degradable litter.
- Avoiding removal of plants, seeds, drift-wood from the Core Zone.
- Respecting local culture/ customs.
- Respecting holy places.
- Strictly adhering to the safety precautions.
- Dos and Don'ts as prescribed by the Park Management.

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18.4.2.6 **For the Host Community:** The Reserve Management shall create awareness in host communities to the following effects by interacting with them:

- Respecting the value of environment, conservation 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 against exploitation.
- Be friendly with the visitors as effective "nature guides" & "conservationists".
- Develop a participatory community-based tourism strategy, in collaboration with local communities, to ensure long-term local community benefit-sharing, and promotion of activities run by local communities
- Forest dwellers who have been relocated from core or critical tiger habitat to the Buffer shall be given priority in terms of livelihood generation activities related to community-based ecotourism in the Tiger Reserve. The Reserve Management shall make a special effort in this regard, besides a periodic review to ensure its compliance.
- Ensuring training programme to the host community in:
    - 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.

18.4.2.7 **Temple & Pilgrimage Boards:** Presently, there is no prominent temple/ pilgrim site located inside the Buffer area, and consequently no heavy/

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significant pilgrimage and camps. However, in any future eventuality, the Reserve Management shall refer to para 2.4. of Temple & Pilgrimage Boards in the comprehensive tourism guidelines for Tiger Reserves as proposed by the National Tiger Conservation Authority, New Delhi and approved by the Hon'ble Supreme Court **(Appendix-LXIV)**.

18.4.3 **Miscellaneous Prescriptions:** The Buffer Management shall consult with the LAC and respective Gram Panchyats and the Revenue Department to enforce the following restrictions through the powers vested in the Madhya Pradesh Panchayat Raj & Gram Swaraj Adhiniyam, 1993 (amended subsequently) **(Appendices-XVI to XVIII)** and the Sarai Act, 1867.

- Felling of trees shall be subject to the regulation prescribed under the MP Land Revenue Code, Lok Vaniki Act or any other law in force at the relevant time.
- The Reserve Management shall encourage and convince the lodge/ resort owners for the following initiatives:
  - There shall be a uniform colour code of cement grey for all the buildings of hospitality/ commercial sector. The prescribed colour will blend with the natural settings in the area.
  - All boards and hoardings shall have green background and yellow lettering.
  - To limit the number of sign boards, they shall be arranged into composite boards along one lane of the size prescribed by the Buffer Management.
  - The possession or use of plastic bags for carrying consumables of mass, use by, commercial establishment shall be prohibited.
  - Use of firewood for any purpose, except for campfires between the month of November and January, by all commercial establishments (including tea shops) shall be prohibited. Purchase of firewood from any source other than the Forest Department or a person who has legally felled trees from

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his own property or from a contractor certified by the Forest Department shall be prohibited.

- All commercial establishments, related to tourism and hospitality, (including tea shops) shall have to ensure that the volume of sound produced by fire crackers and loudspeakers etc. should be kept within the reasonable limit.
- No double storied buildings should be erected in the area.

- Site-specific micro-planning for community based eco-tourism.
- Recognition of ecotourism operators and provision of awards/ incentives to deserving cases.
- Periodic training programmes on eco-tourism should be conducted for tourism administration, planners, operators and general public.
- The Reserve Management shall, as far as possible, provide for subsidized visits of students for excursions in the core area and while fostering educational extension activities.

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CHAPTER – 19

CONSERVATION EDUCATION & AWARENESS

19.1 Introduction:

The creation of awareness about the significance of the Buffer Zone and wildlife protected area among the villagers living in the Buffer Zone is crucial. They should appreciate how the Core Zone is protecting forest and some endangered wildlife species, and how an effective Buffer Zone can strengthen wildlife conservation in the region. Conservation education and awareness programmes are now-a-days handled very professionally by many governmental and non-governmental institutions.

19.2 Objectives

The specific objectives of conservation education and awareness in the Buffer Zone are as under:

- Educating target groups about the importance of protected areas, specially Kanha, and wildlife conservation.
- Imparting awareness about the tangible/ intangible benefits of forests among local communities.
- Cultivating sincere supporters in target groups to help spread awareness.

19.3 Strategies & Management Prescriptions:

The following strategy and management prescriptions are proposed for conservation education and awareness in the Tiger Reserve:

19.3.1 **Park Excursions & Lectures for Students:** Select students of all the schools of the Buffer Zone shall be identified as the core target group for imparting

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conservation education and awareness. These students shall be given lectures by the park officers and be taken into the Core Zone on excursions. The financial year-wise detailed proposal for conservation education and awareness of target students is presented in the Chapter of Organization, Administration & Budget.

The numbers of students in various schools of the Tiger Reserve are as under:

Range	Primary School		Middle School		High School		Higher Secondary	
	No.	Student	No.	Student	No.	Student	No.	Student
Khatia	18	663	5	370	1	138		
Sijhora	51	2640	17	2003	5	408	2	240
Khapa	34	1024	11	568	4	284	1	52
Samnapur	19	1145	6	731	2	250		
Garhi	71	1949	29	841	9	365	2	360
Sarhi	6	294	1	294	-	-	-	-
Mukki	2	115	1	115	-	-	-	-
Bhaisanghat	4	246	2	246	-	-	-	-
Supkhar	10	407	3	149	-	-	-	-

19.3.2 **Outsourcing of Resource Persons:** Conservation education and awareness programme shall be exclusively conducted by resource persons with a proper background of nature and wildlife conservation and environment. These resource persons shall be hired for different conservation education and awareness activities. This programme shall be conducted in the various villages of the Tiger Reserve. The financial year-wise detailed proposal for outsourcing of resource persons is presented in the Chapter of Organization, Administration & Budget.

19.3.3 **Programmes/ Activities:** Resource persons shall interact with teachers, students and villagers in organized gatherings through respective forest ranges and take up the following indicative activities for creating awareness for nature and wildlife conservation in the Tiger Reserve:

- Conservation camps (30 persons/ camp, 2 camps / month, activity period 5 months / year).

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- Lectures/ discussions (2 lectures/ month for a group of 30 persons for 5 months).
- Road shows (4 shows/ month for 8 months).
- Film shows (4 shows/ month for 8 months).
- Distribution of brochures/ booklets/ posters at schools and villages.

The financial year-wise detailed proposal for programmes and activities is presented in the Chapter of Organization, Administration & Budget.

19.3.4 **Wildlife Week Celebration:** The students of the Buffer Zone shall be the core target group of wildlife week celebrations every year. The Buffer Management shall take up the following activities during the wildlife week celebration (7500 students of all the schools of Tiger Reserve and 500 students at district level).

- Essay, drawing, quiz competitions.
- Holding of exhibitions at range headquarters.
- Wildlife film shows at villages.
- Distribution of stickers/ posters/ brochures to schools.
- Rewards to the winners of the above competitions.
- Park excursions for the winners.

The financial year-wise detailed proposal for wildlife week celebration is presented in the Chapter of Organization, Administration & Budget.

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CHAPTER – 20

MISCELLANEOUS RULES

Some important rules/ regulations relevant to the Tiger Conservation Plan are as under:

20.1 Exploitation & Extraction of Forest Produce:

The State Govt. has specified 13 important tree species as timber. The exploitation and extraction of these specified species are carried out departmentally. The departmental infrastructural involved in forestry operations along with the procedure of extraction are appended **(Appendix-XLVII).**

20.2 Demarcation & Marking Rules for Silvicultural Operations/ Treatments:

Various demarcation and marking rules for carrying out silvicultural operation and treatments in the working circles of the Buffer Zone are appended **(Appendix-XLVII).**

20.3 Illicit Felling & Encroachment:

Various measures to control illicit felling is appended **(Appendix-XLVIII)** and information on the current situation of encroachments in the division are appended **(Appendix-V).**

20.4 Soil Erosion & Soil Conservation:

Measures to control soil erosion in the plan area have been suggested under an effective scheme **(Appendix-XLIX).**

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20.5 Maintenance of Boundaries & Pillars:

It is very important to maintain and clearly demarcate the boundary lines of Reserved Forest and Orange Areas to differentiate them from revenue areas. The instructions regarding the maintenance of boundaries and pillars, timely repairs and inspection from time to time is appended **(Appendix-LI).**

20.6 Nistar:

The State Govt. has provided various facilities to villagers under *nistar*. The main objective of *nistar* is to meet the demands of the forest produce for domestic and agricultural purposes. The Govt. has also laid down a new *nistar* policy **(Appendix-XXI)**. List of nistar depot and supply in the plan area is appended **(Appendix-VIII)**. The details of *nistar*, and the relevant policy/ instructions and the role of ecodevelopment committees are appended **(Appendix-LII).**

20.7 Control Over Grazing:

The State Govt. has enacted the Madhya Pradesh Grazing Rules, 1986 (amended subsequently) to regulate grazing in government forests **(Appendix-X)**. The details of grazing rules, grazing units, grazing regulations and the effect of grazing on forests are appended **(Appendix-LIII).**

20.8 Fire Protection:

Fires inflict huge ecological losses on our forests, and fire protection in the plan area is of vital importance. The causes of fire, its prevention and remedial measures, including the guidelines of a detail fires scheme are appended **(Appendix-LIV).**

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20.9 Forest Nursery:

The establishment of a central nursery in the division is very important to raise stocks of plants for plantations. In 1983, the Directorate of Social Forestry has also recommended several plant species for plantations in community or fallow lands. The details pertaining to the forest nursery and recommended species are appended **(Appendix-LV).**

20.10 Seed Collection:

As the health and quality of trees depend on seeds, it is important to collect and treat suitable, healthy and good quality seeds to raise planting stocks. There are several methods of treatment given to different species of seeds. The details of seed collection and treatment are appended **(Appendix-LVI).**

20.11 Plantation & Techniques:

Plantations of different species are taken up under different working circles and schemes. The forest department has issue several circulars **(Appendix-XXIV)** pertaining to plantations from time to time. Under plantation techniques, the selection of area and suitable species are very important. Besides, the soil, stock and treatment maps are also prepared under a plantation technique. All details about area cleaning, lantana eradication, site preparation, planting, weeding, protection, pasture land development etc. are appended **(Appendix-LVII).**

20.12 Forest Village:

There are 33 forest villages in the plan area. The villagers have to face many socio-economic constraints and they depend on the government for their welfare. The development of forest villages have to be taken up under various schemes, the details are appended **(Appendix-LVIII).**

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20.13 Exploitation & Extraction of Minor Forest Produce:

There is no primary minor forest produce, cooperative society in the plan area, and the collection of tendu patta and other non-nationalized forest produce shall be collected through over-lapping cooperative societies under the instructions of MP State Minor Forest Produce (Trade & Development) Cooperative Federation Ltd.

20.14 Reorganization of Administrative Units:

On the basis of the nature of work and change in work quantum, the territorial and production units should be reorganized from time to time by competent authorities.

20.15 Irregular Exploitation:

The details of various types of irregular exploitations are appended **(Appendix-LIX).**

20.16 Lantana Eradication:

Lantana is found in around 30% of the plan area. Lantana does not allow any undergrowth to come up, therefore, it is necessary to remove it specially from the openings. The details are appended **(Appendix-LX).**

20.17 Provision of Maps:

The details of the copies of various types of maps, including stock maps and management maps to be provided to different offices of the department are appended **(Appendix-L).**

20.18 CD of Compartment History:

The compartment histories of all the compartments have been made available in CDs. As per the Tiger Conservation Plan, the description of treatments shall be sent every year to

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the Field Director, Kanha Tiger Reserve. This will ensure that the compartment histories remain updated.

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CHAPTER – 21
ORGANIZATION, ADMINISTRATION & BUDGET

21.1 Staff Development:

Every organization needs good staff and professionalism. The efficiency of the field and office staff is reflected in the way in which an organization is managed. The top management has to build-up a disciplined, efficient and well motivated staff for the protected area. The following points are proposed to form guidelines for staff development in the Buffer Zone:

21.1.1 **Filling-up of Vacancies:** The current position of staff in the Buffer Zone. Several posts of field as well as office have fallen vacant and need to be filled up at the earliest. The number of several posts has also to be increased in the light of new initiatives in the proposed management of the Buffer Zone. Similarly, the growing demand/ pressure of prompt communication and expeditious exchange of information with the higher offices of state and central governments, and routine work at the Mandla head office also underscore the vital need of the filling up of ministerial vacancies. The management should also refer to the previous correspondence with the Principal Chief Conservator of Forests (Wildlife), Madhya Pradesh and the Chief Conservator of Forests, Jabalpur Circle and pursue the matter at higher levels.

21.1.2 **Staff Training:** There is no need to emphasize the importance of forestry and wildlife training at all levels of field personnel in the Buffer Zone of a renowned Tiger Reserve of the country. The Buffer Management should also ensure, as far as possible, that several untrained forest guards should be sent to training schools every year for one-year training. Similarly, foresters and deputy rangers should also be sent for refresher training. As there is now no special wildlife training for forest guards and foresters, special in-house classes/ sessions should be organized by the Buffer Management to impart them the basics and day-to-day field exercises of wildlife management. Resource persons should also be invited from

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premier institutes to help officers build and develop basic capacity in wildlife management, and make them aware of the importance of the Buffer Zone in the Tiger Reserve. Study tours of frontline staff and officers should also be ensured by the Buffer Management. The office staff should be trained in basic computer operation and also in relevant official software of their branches for speed and efficiency.

21.1.3 **Posting of Young Staff:** It is very difficult for elderly field staffs to do justice to their conservation duties in the Tiger Reserve. The Buffer Zone also needs young staff, as they can also be later posted to the Core Zone or vice-versa. Protection activities and intelligence gathering take a considerable toll on the physical and mental health of the staff.

21.1.4 **Staff Welfare:** The Buffer Management should also ensure the welfare of the frontline staffs. Besides medical facilities throughout the year, residential facilities for their families and education of children should also be provided. Annual/ biennial provision of a good support package of their daily needs, including cycle, uniforms, field equipment, water filter, solar light, torch with batteries, jungle boots, rain-proof and warm clothing etc., should also be a good idea.

21.1.5 **Rewards & Incentives:** The Buffer Management should also develop a fair system of rewards and incentives to encourage good performance of the frontline staff. Such rewards and incentives may include commendation, speedy promotion, opportunities for special trainings, and cash remuneration etc. Money from the Kanha Vikas Nidhi can be utilized for this purpose every year.

21.2 Funding & Schedule of Operations:

The Project Tiger scheme was started as Central Sector Scheme and later came to be known as Centrally Sponsored Scheme. On the recommendations of the Tiger Task Force constituted by the Prime Minister in 2005, Project Tiger was also upgraded as a

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statutory body under the ministry of Environment and Forests, Govt. of India, and renamed as National Tiger Conservation Authority.

The Kanha Tiger Reserve receives funds from the Govt. of India through the National Tiger Conservation Authority, New Delhi under the Plan budget viz. Non-Recurring (100%) and Recurring (50%), on the basis of the Annual Plan of Operations (APO) submitted through the Principal Chief Conservator of Forests (Wildlife), Madhya Pradesh and the State Government. The State Govt. releases the same under the Tribal Sub Plan. The APO has to be submitted in a prescribed format every year in the month March-April.

For the recurring items of expenditure the matching grant is borne by the State Government. In addition, 100% grant is also provided by the Centre for Ecodevelopment and village relocation. The details of budgetary allocations and expenditure incurred under the State and Central sector from 2001-2002 to 2010-11 in the Buffer Zone are as under:

Details of Budget Allocations from Project Tiger (Govt. of India)
(Rs. in Lakhs)

Year	Allotment		Total	Expenditure		Total
	Recurring	Non-Recurring		Recurring	Non-Recurring	
1996-97	-	-	**-**	-	-	**-**
1997-98	0.63	3.00	**3.63**	0.78	2.98	**3.77**
1998-99	0.40	11.80	**12.20**	0.31	11.53	**11.85**
1999-00	14.75	14.86	**29.61**	14.17	13.29	**27.47**
2000-01	31.50	32.45	**63.95**	28.74	16.52	**45.26**
2001-02	41.25	24.45	**65.70**	40.41	22.91	**63.32**
2002-03	26.50	22.10	**48.60**	22.19	15.86	**38.05**
2003-04	20.00	31.9	**51.95**	19.40	25.20	**44.60**
2004-05	31.60	14.55	**46.15**	29.54	13.30	**42.85**
2005-06	39.40	16.00	**55.40**	32.27	15.37	**47.64**
2006-07	59.25	9.90	**69.15**	55.81	8.70	**64.51**
2007-08	36.85	12.00	**71.70**	57.25	98.73	**67.12**

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2008-09	39.85	43.02	**79.87**	36.77	44.54	**81.31**
2009-10	152.54	65.85	**218.39**	117.12	65.84	**182.96**

Details of Budget Allocations from Project Tiger (Govt. of India)

(Ecodevelopment)

(Rs. in Lakhs)

Year	Allotment	Expenditure
1996-97	17.47	16.42
1997-98	9.44	9.25
1998-99	22.60	24.76
1999-00	18.74	18.66
2000-01	62.45	22.54
2001-02	79.00	74.00
2002-03	20.82	19.63
2003-04	41.95	38.00
2004-05	39.00	36.39
2005-06	35.95	34.76
2006-07	9.15	9.14
2007-08	36.77	31.98
2008-09	-	-
2009-10	-	-

Details of Budget Allocations from State Govt.

Non-Plan
(Rs. in Lakhs)

Year	Allotment	Expenditure
1996-97	33.45	21.35
1997-98	112.26	83.81
1998-99	130.24	121.78
1999-00	123.40	137.33
2000-01	12.85	117.87
2001-02	49.29	123.73
2002-03	12.89	126.00
2003-04	13.22	138.48
2004-05	101.24	131.78
2005-06	116.81	138.27

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2006-07	102.21	105.42
2007-08	120.57	119.83
2008-09	141.14	154.00
2009-10	164.52	190.88

Finance Commission

(Rs. in Lakhs)

Finance Commission	Year of Allotment	Total Allotment	Year of Expenditure	Total Expenditure
10th FC	1998-1999	17.72	1998-1999	17.60
	1999-2000	41.10	1999-2000	41.10
	2001-2002			

Details of Budget Allocations from NAEB (GOI)

(Rs. in Lakhs)

Year	Allotment	Expenditure
1998-99	1.800	1.210
1999-00	5.080	4.560
2000-01	8.140	7.530
2001-02	6.89	5.46

Fund Position since Inception (Project Tiger)

(Rs. in Lakhs)

Year	Allotment	Expenditure
1996-97	-	-
1997-98	3.63	3.77
1998-99	12.20	11.85
1999-00	29.61	27.47
2000-01	63.95	45.26
2001-02	65.70	63.32
2002-03	48.60	38.05
2003-04	51.95	44.60
2004-05	46.15	42.85
2005-06	55.40	47.64
2006-07	69.15	64.51
2007-08	71.70	67.12
2008-09	79.87	81.31
2009-10	218.39	182.96

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Budget Allocations from FDA

(Rs. in Lakhs)

Year	Allotment	Expenditure
2000-01	-	-
2001-02	-	-
2002-03	-	-
2003-04	-	-
2004-05	-	-
2005-06	-	-
2006-07	3,58,27,000	3,54,26,871
2007-08	2,17,50,000	-
2008-09	2,17,50,000	4,07,54,841

Budget Allocations from NREP

(Rs. in Lakhs)

Year	Allotment	Expenditure
2000-01	-	-
2001-02	-	-
2002-03	-	-
2003-04	0.58	0.56
2004-05	-	-
2005-06	-	-
2006-07	-	-
2007-08	-	-
2008-09	-	-
2009-10	-	-

Budget Allocations from NREGA

(Rs. in Lakhs)

Year	Allotment	Expenditure
2000-01	-	-
2001-02	-	-
2002-03	-	-
2003-04	-	-
2004-05	-	-
2005-06	-	-

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2006-07	-	-
2007-08	-	-
2008-09	-	-
2009-10	68.39	28.88

21.3 Financial Layout for Proposed Works:

The financial layout for proposed works during the plan period is as under:

Financial Year-wise Required Funds for EDCs

Range	No. of EDCs	Plan Duration	Proposed Development Work Each Year	Financial Year	Average Required Amount (Rs.)
Sijhora	33	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2011-12	20230287
				2012-13	22253316
				2013-14	24478647
				2014-15	26926512
				2015-16	29619163
				2016-17	32581080
				2017-18	35839187
				2018-19	39423106
				2019-20	43365417
				2020-21	47701959
Khatia	12	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2011-12	7596468
				2012-13	8356115
				2013-14	9191726
				2014-15	10110899
				2015-16	11121989
				2016-17	12234188
				2017-18	13457606
				2018-19	14803367
				2019-20	16283704
				2020-21	17912074
Khapa	17	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas	2011-12	10931663
				2012-13	12024829
				2013-14	13227312
				2014-15	14550043

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			connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2015-16	16005048
				2016-17	17605553
				2017-18	19366108
				2018-19	21302719
				2019-20	23432990
				2020-21	25776290
Samnapur	15	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2011-12	9795585
				2012-13	10775144
				2013-14	11852658
				2014-15	13037924
				2015-16	14341716
				2016-17	15775888
				2017-18	17353476
				2018-19	19088824
				2019-20	20997706
				2020-21	23097477
Garhi	49	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2011-12	32243911
				2012-13	35468302
				2013-14	39015132
				2014-15	42916646
				2015-16	47208310
				2016-17	51929141
				2017-18	57122055
				2018-19	62834261
				2019-20	69117687
				2020-21	76029455
Motinala	15	2011-12 to 2020-21	Drinking water facilities, irrigation facilities, nistari tank, approach road, gobar-gas plant, distribution of LPG gas connection, solar light system, distribution of pressure cooker & kerosene stoves, distribution of improved cattle, plantation of bamboo & eucalyptus, energy plantation, self-employment, bio-agriculture, wormiculture	2011-12	9945585
				2012-13	10940144
				2013-14	12034158
				2014-15	13237574
				2015-16	14561331
				2016-17	16017464
				2017-18	17619211
				2018-19	19381132
				2019-20	21319245
				2020-21	23451169

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Proposal for Conservation Education & Awareness of Target Students

Year	Amount Proposed for Target Students (In Rs.)
2012	769000.00
2013	845900.00
2014	930490.00
2015	1023539.00
2016	1125893.00
2017	1238482.00
2018	1362330.00
2019	1498563.00
2020	1648420.00
2021	1813262.00
Total:	**12255880.00**

Proposed Amount for Programmes & Activities

Year	Conservation Camp	Lecture/ Discussion	Road Show	Film Show	Brochure/ Booklets/ Poster
2012	3.50	0.70	1.20	1.92	1.50
2013	3.85	0.77	1.32	2.11	1.65
2014	4.24	0.85	1.45	2.32	1.82
2015	4.66	0.93	1.60	2.56	2.00
2016	5.12	1.02	1.76	2.81	2.20
2017	5.64	1.13	1.93	3.09	2.42
2018	6.20	1.24	2.13	3.40	2.66
2019	6.82	1.36	2.34	3.74	2.92
2020	7.50	1.50	2.57	4.12	3.22
2021	8.25	1.65	2.83	4.53	3.54

Proposed Amount for Wildlife Week Celebration

Year	Essay/ Drawing/ Quiz	Holding of Exhibition	Film Show	Brochure/ Booklets/ Poster	Reward	Park Excursion
2012	0.24	0.15	0.10	1.00	1.00	0.80
2013	0.26	0.17	0.11	1.10	1.10	0.88

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2014	0.29	0.18	0.12	1.21	1.21	0.97
2015	0.32	0.20	0.13	1.33	1.33	1.06
2016	0.35	0.22	0.15	1.46	1.46	1.17
2017	0.39	0.24	0.16	1.61	1.61	1.29
2018	0.43	0.27	0.18	1.77	1.77	1.42
2019	0.47	0.29	0.19	1.95	1.95	1.56
2020	0.51	0.32	0.21	2.14	2.14	1.71
2021	0.57	0.35	0.24	2.36	2.36	1.89

Proposed Budget for Implementation of Working Plan for Plan Period

Annual Estimated Average Expenditure

Sl. No.	Particulars of Work	Quantity (Ha./Km.)	Rate	Amount (Rs.)
1	**Selection-cum-Improvement Working Circle**			
1.1	Demarcation of coupes	1278	68.75	87862.50
1.2	Marking of coupes	1278	412.50	527175.00
1.3	Felling and transportation	1278	1375.00	1757250.00
1.4	Fire protection and protection of area from grazing	1278	275.00	351450.00
1.5	Subsidiary silvicultural operations and protection	1278	1375.00	1757250.00
1.6	Protection and maintenance work in treated area second year	1278	412.50	527175.00
1.7	Protection and maintenance work in treated area third year	1278	412.50	527175.00
1.8	Protection and maintenance work in treated area forth year	1278	412.50	527175.00
1.9	Protection and maintenance work in treated area fifth year	1278	412.50	527175.00
1.10	Protection and maintenance work in treated area sixth year	1278	412.50	527175.00
	Total:			**7116862.50**
2	**Fuel & Fodder Working Circle**			
2.1	Demarcation of coupes	215	68.75	14781.25
2.2	Marking of coupes	215	412.50	88687.50
2.3	Silvicultural and soil conservation works.	215	4125.00	886875.00
2.4	Fire protection and protection of area from grazing	215	275.00	59125.00

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2.5	First year preparation works in planting area of the treated coup.	215	8125.00	1746875.00
2.6	Seed sowing and planting work in treated area second year	215	6250.00	1343750.00
2.7	Maintenance of soil conservation structures, silvicultural works and protection second year	215	1375.00	295625.00
2.8	Maintenance of plantation area third year	215	687.50	147812.50
2.90	Maintenance of silvicultural works and protection third year	215	687.50	147812.50
2.10	Maintenance of silvicultural works and protection forth year	215	687.50	147812.50
2.11	Maintenance of silvicultural works and protection fifth year	215	687.50	147812.50
2.12	Maintenance of silvicultural works and protection sixth year	215	687.50	147812.50
2.13	Sixth year cleaning and protection in treated area	215	1062.50	228437.50
2.14	Protection of planted area by ecodevelopment committee seventh and eighth year.	215	687.50	147812.50
	Total:			**5551031.25**
3	**Restoration of Gene-Pool Working Circle**			
3.1	Demarcation of coupes	958	68.75	65862.50
3.2	Silvicultural and soil conservation works.	958	4125.00	3951750.00
3.3	First year preparation works in planting area of the treated coup.	958	8125.00	7783750.00
3.4	Fire protection and protection of area from grazing	958	275.00	263450.00
3.5	Seed sowing and planting in treated area second year	958	6250.00	5987500.00
3.6	Maintenance of soil conservation structures and silvicultural works and protection second year	958	1375.00	1317250.00
3.7	Maintenance of soil conservation structures and silvicultural works and protection third year	958	1375.00	1317250.00
3.8	Protection works forth year	958	687.50	658625.00
3.9	Protection works fifth year	958	687.50	658625.00
3.10	Protection works sixth year	958	687.50	658625.00
	Total:			**22662687.50**
4	**Bamboo Overlapping Working Circle**			
4.1	Demarcation of coups	693	68.75	47643.75

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4.2	Sample plot survey	693	550.00	381150.00
4.3	Decongestion of bamboo clumps and soil working	693	16662.50	11547112.50
4.4	Fire protection and maintenance soil conservation structure	693	1100.00	762300.00
	Total:			**12738206.25**
5	**Wildlife Management**			
5.1	Protection and habitat improvement work	2450	1375.00	3368750.00
	Total:			**3368750.00**
6	**Joint Forest Management & Ecodevelopment**			
6.1	Drinking water, irrigation and other developmental works		LS	90743499.00
	Total:			**90743499.00**
7	**Ecotourism**			
7.1	Development of infrastructure		LS	200000.00
	Total:			**200000.00**
8	**Fifth Year Demarcation**			
8.1	Repairing of boundary pillars	817	875.00	714875.00
8.2	Cutting and Cleaning of Boundary Lines	620.64	750.00	465480.00
	Total:			**1180355.00**
9	**Forest Protection**			
9.1	Development of infrastructure		LS	500000.00
9.2	Instrument		LS	100000.00
9.3	POL for vehicle		LS	2500000.00
9.4	Patrolling labour		LS	500000.00
	Total:			**3600000.00**
10	**Fire Protection**			
10.1	Cutting and burning of fire lines	1401.261	1250.00	1751576.25
10.2	Cutting and burning along forest road side	214.55	1000.00	214550.00
10.3	Fire watcher	1600	146.25	234000.00
	Total:			**2200126.25**
11	**Maintenance of Road**	214.55	3750.00	804562.50
	Total:			**299527598.00**

Estimated Expenditure for 10 Years = Expenditure for 1 Year x 10 Years + 25%	**3070157879.50**

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