Government of Maharashtra

Office of
The Conservator of Forests & Field Director,
Tadoba Andhari Tiger Reserve, Chandrapur

The Management Plan

for

- ❖Bamboo Seed Collection,
- ❖Bamboo Removal,
- ❖Bamboo Regeneration
- ❖Wildlife Protection
- ❖Habitat Development,
- ❖Fire Protection
- ❖Eco-tourism Management

in

The Gregariously Flowering Bamboo Area

of

Tadoba Andhari Tiger Reserve

For the Period - 2021-22 and 2025-26

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Prepared by Sevak Team

Sevanivrutta Van Karmachari Sangh, Maharashtra

Pune

(Report No. 3/ 2021)

Executive Summary

This Management Plan document relating to multifarious issues arising from the phenomena of the gregarious flowering of bamboo in the TATR area that is taking place since 2018 in Chandrapur district, Maharashtra; is divided into four parts dealing with various management issues, field observations, strategies, recommendation etc. as under

Part - I - (I) Management of Bamboo Seed Collection

(ii) Bamboo Harvesting

(iii) Regeneration of Bamboo Area by NR and AR and

(iv) Soil and Moisture Conservation treatment

Part - 2 - (i) Wildlife Protection

(ii) Habitat Development

Part - 3 - (i) Fire Protection

Part - 4 - (i) Ecotourism Management

The data of bamboo gregarious flowering considered for discussion is upto Dec-2020 when the team of Sevak Sangh Maharashtra visited to the field and is still continued with observation that it is likely to get completed by 2022. The dynamic silvicultural progression of flowering itself is challenging to field managers with regards to wildlife management, fire protection, habitat management and removal of dead and dry bamboo that poses grave threat from fire when the area is surrounded by 79 villages.

As on Dec-2020 ending, the plan identifies bamboo growth bearing area of 683.71 Sq. km. out of total TATR area of 1727.17 sq. km., out of which the gregariously flowering area as recorded was, 407.36 sq.km. (59.4%) and remaining 276.34 sq.km (40.36%) where gregarious flowering is progressing and most likely to complete by 2022.

Though the estimated seed collection potential from TATR areas to be dealt with bamboo removal is 2100 MT, the seed collection is proposed from buffer area and pegged at 50 MT only to allow more seed fall for natural regeneration which also acts as the fodder. If there is demand for more bamboo seed, the collection can be enhanced.

As regards removal of dry and dead bamboo from TATR, not even dry and dead bamboo removal is contemplated in core zone, except that the removal is proposed to be limited to fire prone sensitive 55 comptts. adjoin the human habitations. These fire prone comptts. cover total area of 20000 ha. but limiting the removal in less then 10% of area; which is less than 3% of total core zone. The design of bamboo is in the form of checker blocks to act as fire breaks.

A separate proposal for removal of dry and dead bamboo from fire prone 55 compartments from core area, justifying the bamboo removal has been already sent to CF and FD TATR .

As far, the buffer area, where regular bamboo working is in vogue, total removal of dry and dead bamboo is advised to further reduce the risks of fires.

Based on samples and past yield records it is predicted the yield of bamboo material from core area 55 comptts will be 9.67 lac long bamboo and 10.56 lac bundles and that from buffer area will be 39.92 lac long bamboo and 30.84 lac bundles. The quantity of the entire bamboo will be 38827 Notional Tons. Various removal agencies and methodologies have been mentioned to facilitate the removal of bamboo by the controlling authorities.

It is proposed to take up fire insurance of entire bamboo stock that is available for removal as a precautionary measure. The valuation of removable bamboo material has been fixed at Rs 27.13 crores and premium payable will be RS. 33 Lac.

As regards regeneration of bamboo in TATR, the past records like working plan, research reports etc. suggest that, the regeneration has been normal natural process taking place. AR is advised in core and buffer area as gap plantations as per the approved bamboo plantation models in the state. Assisted Natural Regeneration is proposed both in core and buffer zones to establish the bamboo vegetation which is important flora and also the land cover. Both of the regeneration measures are proposed in phased manner over five years period. The areas covered under AR is 3000 ha. ANR is 5000 ha over the period of 5 years. is recommended to be taken up after three years when the total seedling and bamboo removal is over The private lands, other govt. lands are also advised to be brought under variety of other bamboo spp. to meet the futuristic bamboo demand to avoid dependence of the bamboo from TATR. The area to be treated is proposed to be 10000 ha. covering 79 villages.

The CFR rights in all 79 peripheral communities are advised to be honored. The EDCs are required to be involved wherever possible and essential activities like seed collection, bamboo removal, AR and ANR works, fire protection, habitat development, wildlife protection and above all the eco-tourism.

After deliberations on issues like legal provisions for Bamboo harvesting, administrative constraints, human interference, participatory management, fire protection etc. and consideration of views & suggestions from executives and the field level staff along with management plans for Core & Buffer, strategic action plan for wildlife protection and habitat management in Bamboo flowered area the following measures are recommended.

Protection related.

1. Intensive fire control line creations in fire sensitive areas.
2. Surveillance & fast communication network system development.
3. Strengthening of Quick Response Team (QRT)
4. Emphasis on the identification & mitigation of needs of local communities.

Habitat Development related

1. Habitat & Flowered bamboo groves management
2. Meadow Development
3. Moisture conservation & water body development.
4. Support activities for local inhabitants-

Mr. Jitendra Ramgaokar, IFS

Office of
The Conservator of Forests & Field Director,
Tadoba Andhari Tiger Reserve, Chandrapur

Preface

(To be incorporated at his level by CF& FD)

Chandrapur : Dated -08-2021

(Jitendra Ramgaonkar)

ACKNOWLEDGEMENT

Sevanivrutta Van Karmachari Sangh (SEVAK) Maharashtra, is obliged to Mr. Jitendra Ramgaonkar, I.F.S., the Conservator of Forests & Field Director, Tadoba Andhari Tiger Reserve, Chandrapur for entrusting "SEVAK" for the work of Management Plan for various challenges to be faced on account of Gregarious flowering of Bamboo in the TATR area ensuing years,

The SEVAK Team constituted under the guidance of Shri. V. T. Patki acknowledges the logistic support and required help, statistical and other information to the Plan Team for successful and timely completion of the investigation and field work and tour to various sites in TATR.

So also the thanks are due to the following officers and field staff from TATR for day to day field work, transport, accommodation and assistance required in the field.

Shri. Nandkishor Kale, Dy. Director TATR (Core), Shri. Guruprasad, DCF Buffer, TATR, Shri R. R. Kulkarni, ACF TATR (Core), Shri. R. K. Themaskar RFO Palasgaon, Shri. Satish Shende RFO Tadoba & RFO Moharli (additional charge), Shri. Jambhole RO Palasgaon, Shri. Mandulwar, Beat Guard Thanegaon, Shri. Vijay Pawar, Beat Guard, Palasgaon, Shri. Latpate, Beat Guard, Khutwada .

And, lastly "SEVAK" is most thankful to Mr. Bhagwat, DFO, and office staff from Office of the CF & FD TATR, Chandrapur , who provided valuable information like the current management plans, maps, etc. without which this plan could not be completed.

I wish to appreciate the efforts of our Plan Team members, Mr. V. T. Patki - Guide and Member, Mr. V. B. Sawarkar, Expert Member, Mr. S. M. Jagtap - Member, Mr. Ajay Pillarisheth - Member, Mr. V. R. Khanke- Member, and Mr.S. V. Kumbhakarna- Member, who assisted field investigation on a very short notice. I am also indebted to our all time guide Shri. VT Patki, previous Executive President of the organization, the Sevak Sangh, Maharashtra.

(S. K. Gawali)
Team Leader
Sevak Sangh, Maharashtra, Pune

Salient features of the Management Plan for Post Gregarious Flowering Issues

- **MOU**

The Memo of Understanding is drawn between the CF and FD, TATR, Chandrapur and "SEVAK" Maharashtra, Pune on 26th March, 2021 for preparation of the management plan for tackling the challenges arising due to the silvicultural phenomena of Gregarious Flowering of Bamboo (GFoB). The MoU mainly focused on the inclusion of issues related to the Bamboo seed collection, Bamboo harvesting and disposal, Bamboo regeneration, Fire protection, Wildlife protection and Habitat development, eco-tourism control and regulation.

- **PLAN TEAM**

Composition of the Plan Team of Sevak Sangh, Maharashtra

Mr. S. K. Gawali, Team Leader,

Mr. V. T. Patki - Guide and Member,

Mr. V. B. Sawarkar - Expert Member,

Mr. S. M. Jagtap - Member,

Mr. V. R. Khanke - Member,

Mr. Ajay Pillarisett - Member

Mr. S. V. Kumbhakarna - Member

A detail plan of topics was discussed and finalized on 26 th March 2021 after the field tour. The major topics to be focused as per the MoU are, Bamboo seed collection, Dead and dry Bamboo harvesting and its disposal, Bamboo regeneration, Wildlife Protection, Habitat Development, Fire Protection and Eco-tourism management. The plan of document was accordingly drafted, discussed, analysed and scrutinized by our Guide. The details of this report were briefed to the implementing officials of TATR.

- **The field investigation period - 23- 25 March 2021, and 17-18 Jun 2021**

ABBREVATIONS

ACF	Assistant Conservator of Forests
ANR	Aided Natural Regeneration
AR	Artificial Regeneration
APCCF	Additional Principal Chief Conservator of Forests
APO	Annual Plan of Operations
BG	Beat Guard
BOWC	Bamboo Overlapping Working Circle
C	Centigrade
CBCS	Commercial bamboo Cutting Series
CFR	Community Forest Rights
CF & FD	Conservator of Forests and Field Director
CMS / Cms	Centimetres
Comptt.	Compartment
DD	Deputy Director
Dy. CF/DCF	Deputy Conservators of Forests
DFO	Divisional Forest Officer
EDC	Eco-Development Committees
Ha	Hector
Kg	Kilogram
PT	Plan Team
FDCM	Forest Development Corporation of Maharashtra
FG	Forest Guard
Fr	Forester
FYO	First Year Operation
GFoB	Gregarious Flowering of Bamboo
GoI	Government of India
GoM	Government of Maharashtra
GPS	Global Positioning System
GR	Government Resolution
Ha.	Hectare
JFM	Joint Forest Management
JFMC	Joint Forest Management Committee

JFMP	Joint Forest Management Programme
MoEF & CC	Ministry of Environment, Forest & Climate Change
MoU	Memo of Understanding
MT	Metric Ton
NAEB	National Afforestation and Eco-development Board
NBCS	Nistar bamboo Cutting Series
NA	Not Available / Not Applicable
No. or Nos.	Number / Numbers
NP	National Park
NR	Natural Regeneration
PPO	Preliminary Year Operations
RF	Reserve Forest
R&FD	Revenue and Forest Department
RFO	Range Forest Officer
RO	Round Officer
PF	Protected Forest
Sevak	Sevanivrutta Van Karmachari Sangh, Maharashtra, Pune
SMC	Soil and Moisture Conservation
SoP	Standard Operating Procedure
SqKm / Sq. Km.	Square Kilometres
STPF	Special Tiger Protection Force
Sur	Survey
SYO	Second Year Operations
Tal.	Taluka
TATR	Tadoba Andhari Tiger Reserve
TYO	Third Year Operations
VEDC	Village Eco-development Committee
WPO	Working Plan Officer
IVYO	Fourth Year Operations
VYO	Fifth Year Operations

The Management Plan

for Bamboo Seed Collection, Bamboo Removal, Bamboo Regeneration, Wildlife Protection Habitat Development, Fire Protection and Eco-tourism Management in the Gregariously Flowering Bamboo Area of Tadoba Andhari Tiger Reserve

For the Period - 2021-22 to 2025-26

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Chapter I
TATR: The Area Dealt With

1.1 Broad Introduction of the Area - TATR

Tadoba Andhari Tiger Reserve (TATR) is second Tiger Reserve of the Maharashtra State under Project Tiger.

TATR is strategically located in Central India and is excellent tiger habitat in the East Maharashtra, comprising mainly of Southern Tropical Dry Deciduous forests.

It always has good tiger density in the core and in the fringe areas as well which with resident tiger populations particularly in the adjoining forests of Bramhpuri, Chandrapur and Central Chanda divisions.

Over the past years, it has gained popularity for national tourist and also foreigners mainly for the tigers. At times, it is national capital of tiger

As per the Tiger Conservation Plan (TCP), the entire Chandrapur district has been identified as Tadoba-Andhari Tiger Reserve (TATR) Landscape.

1.2 Location

1.2.1 By Geographic Co-ordination

I) Longitude - $79^0$13'13"E and $79^0$33'34"E

ii) Latitude - $20^0$4'53"N and $20^0$25'51"N

1.2.2 By Revenue Administration

I) State - Maharashtra.

ii) Division - Nagpur

iii) District - Chandrapur District.

iv) Talukas - Bhadrawati, Chandrapur, Chimur, Sindewahi & Warora Taluka.

1.2.3 By Forest Administration

I) State - Maharashtra Forest Department

ii) Circle - TATR

iii) Division - TATR Core and Buffer

1.2.4 By Bio-geographic Zonation

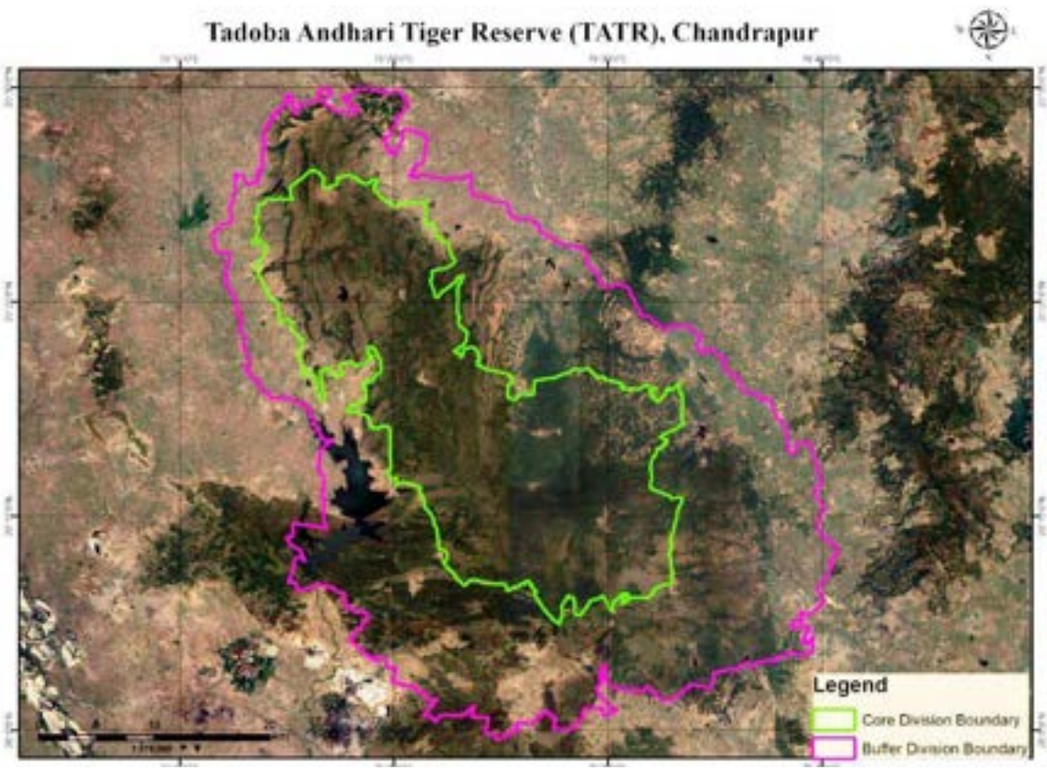
As per the Bio-geographic classification of India by the Wildlife Institute of India, Dehra Dun, the Tiger Reserve is classified as -

(I)	Bio-geographic Kingdom	:	Paleotropical
(ii)	Sub kingdom	:	Indomalayan
(iii)	Bio-geographic zone	:	6 - Deccan peninsula
(iv)	Biotic province	:	6 - B Central Plateau.

This forest landscape includes

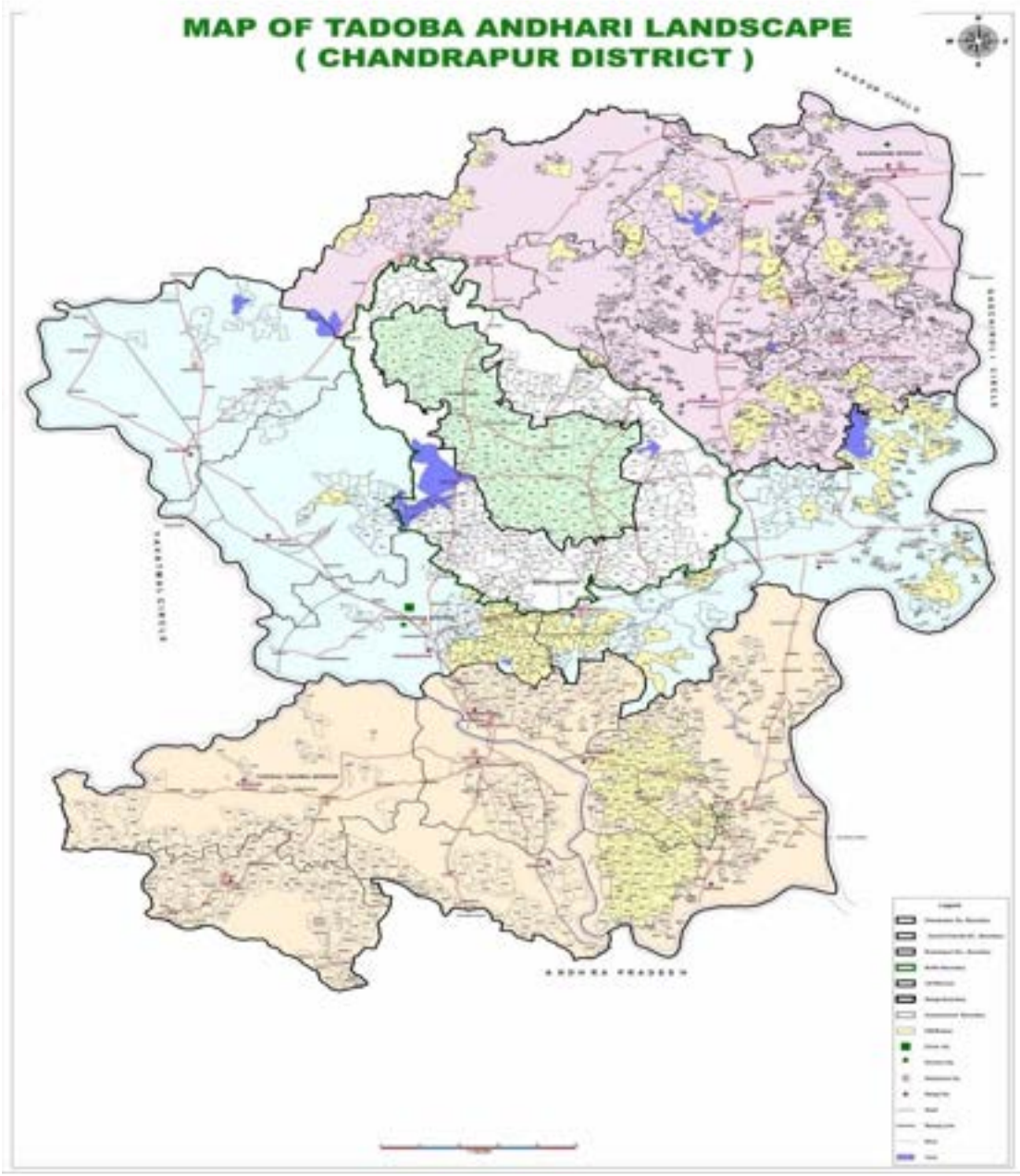
1. Core Division,
2. Buffer Division,
3. Bramhapuri Division,
4. Chandrapur Division,
5. Central Chanda Division,
6. West Chanda FDCM Division,
7. Central Chanda FDCM Division and Bramhapuri FDCM Division

Map - 1 - Map of Tadoba Andhari Tiger Reserve in Google map



The map is enclosed as

Map - 2 - Map of Tadoba Andhari Landscape (Chandrapur District)



The area for management plan for the gregariously flowered bamboo area from the Tadoba Andhari Tiger Reserve (TATR) dealt under this plan is both from the core and buffer area.

The details of the legal land status like reserved forest, protected forests and other areas included in f the core zone has been noted from the Tiger Conservation Plan (TCP) for TATR. The abstract of the information is as under.

1.3 Core Area Division

The core area comprises of Tadoba National Park and the Andhari Wildlife Sanctuary that has been declared under the provisions of the then prevailing laws.

The Tadoba National Park was declared (by Act No. VII of 1955), under Madhya Pradesh National Parks Act on 9th of April 1955.

Andhari Wildlife Sanctuary was notified by Government of Maharashtra on 25th February 1986. The Reserve Forests part of Andhari Wildlife Sanctuary has been finally notified under section 26A of Wildlife (Protection) Act 1972 by Government of Maharashtra on 9.2.2001. There is long time gap in declaration of the national park and sanctuary. However, the core area was declared comprising of national park and sanctuary are declared as Critical Tiger Habitat by GoM vides notification No. WLP-1007/CR 297/ F-1 dtd. 27-12-2007.

This area is presently under the administrative control of Deputy Director (Core), Tadoba Andhari Tiger Reserve, Chandrapur from 1st October 2012. Chief Conservator of Forests & Field Director, Tadoba- Andhari Tiger Reserve, and Chandrapur is the Supervisory Officer.

The area details of the core division are as under.

Table - 1- **Area details of Core Division** (Sq. Km)

Core area Particulars	Legal Break Up of Area in core				No. of comptts.	Remarks
	RF	PF	Other	Total		
Tadoba NP	116.08	0	0.47	116.55	47	Other areas include Non-forest areas also. (6 comptts. overlapping in NP & WLS
Andhari WLS	461.88	32.51	14.46	508.85	137	
Total Area	**577.96**	**32.51**	**14.93**	**625.40**	178	

1.4 Buffer Area Division

The Buffer Area of TATR has been notified u/s 38V of Wildlife Protection Act, 1972; vide Government of Maharashtra notification No. WLP.1009/C.R.229/F-1, dated 5-5-2010.

The Core and the Buffer area of the TATR are brought under the unified control of Chief Conservator of Forest & Field Director, TATR; vide Government of Maharashtra Resolution No. WLP-2012 / CR-256/ F-1, dated 22nd August 2012. Part of the buffer area of 125.51 Sq.km. that was in possession of the FDCM is also brought under unified control of Chief Conservator of Forest & Field Director, TATR vide letter Government of Maharashtra Resolution No. FDC 2013/CN No. 63/F-5, dated 13th June 2014.

The statistical information of Buffer zone as available in the current working plan of the area for the period 2014-15 to 2023-24 authored by Dr. Praveen D. Chavan, IFS is as under.

Table - 2- Area details of Buffer Area Division (Sq. Km)

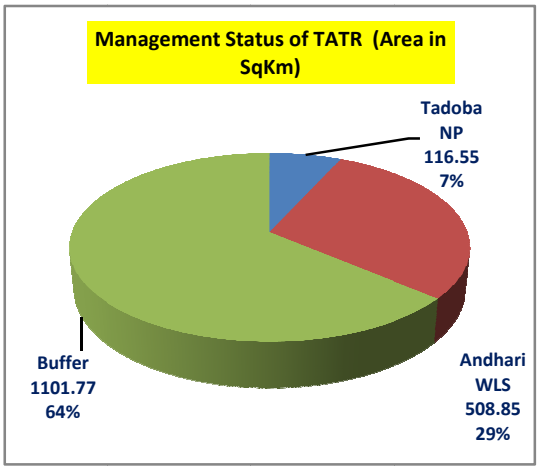
Forest Division	RF	PF	Other area	Total Area	No. of comptts.
Chandrapur	430.13	110.95	359.01	900.09	
Bramhapuri	31.60	2.09	42.48	76.17	
West Chanda FDCM	125.51	0	0	125.51	
Total Area	**587.24**	**113.04**	**401.49**	**1101.77**	**427**

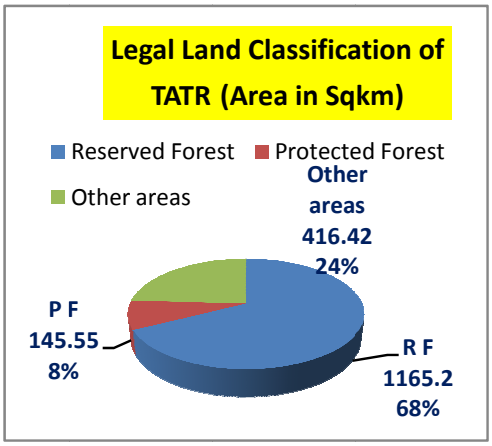
Table - 3 -Total Area details of Core and Buffer (Area in Sq. Km)

TATR Area Particulars	Legal Break Up of Area (Sq. Km.)				No. of comptts.
	RF	PF	Other	Total	
Core Area	577.96	32.51	14.93	625.40	178 (6 overlapping in NP &WLS)
Buffer	587.24	113.04	401.49	1101.77	427
Total	**1165.20**	**145.55**	**416.42**	**1727.17**	

The Government of India approved the composite area of 625.40 sq. km. as Tiger Reserve under Centrally Sponsored Scheme "Project Tiger", vide notification No. I-2/53-PT, dated 21/12/1993.

The state government declared this composite area as "Tadoba-Andhari Tiger Reserve", vide notification No. WLP-1054/CR-225/F-1, dated 23/2/1995.





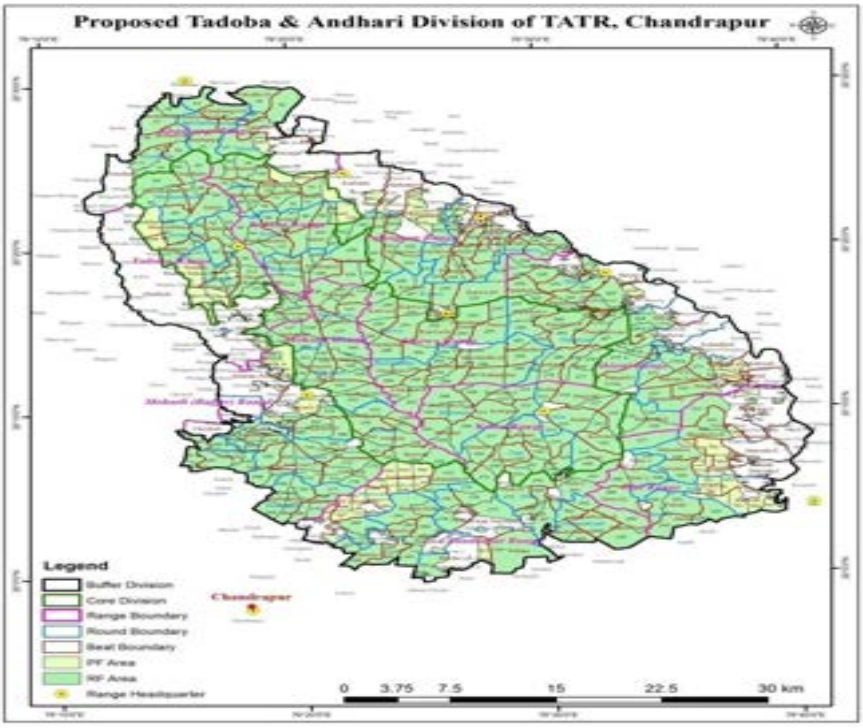
The area of Andhari WLS was notified vide GoM notification No. WLP-1009/CR -229/ F-1 dtd. 5-5-2010.

The unified control of the buffer zone area to the field Director was adopted vide GoM Resolution No. WLP-2012/CR -265/ F-1 dtd. 22-8-2012.

The Tadoba National Park is situated within the boundary of the Andhari Wildlife Sanctuary. Therefore, the boundary of the Sanctuary is considered as the main external boundary. Andhari Wildlife Sanctuary was notified in the year 1986; vide Government of Maharashtra notification No. WLP / 1085 / CR-75 / F-5 (III) dated 25.02.1986.Tadoba- Andhari Tiger Reserve is second Tiger Reserve of the State under Project Tiger.

The map of TATR showing both the Core and Buffer Division is shown below

Map - 3 - Map of TATR Core and Buffer Division



1.5 The Boundary

As per the notification, the external boundaries of the Protected Area are as follows:

On the North: Boundaries of Waigaon. Chaiti Tukum, Madnapur villages and Compartment Nos. 47, 51, 60, 63.

On the East: Boundaries of Pangdi, Doni villages and Compartment Nos. 268, 269, 274, 275, 319, 327.

On the South: Boundaries of Zari, Pahami villages, Andhari River and Compartment Nos. 347, 348, 370 and 372.

On the West: Boundaries of Dewada, Moharli, and Mudholi. Viloda, Astha villages and Compartment Nos. 154, 164, 166, 174 and 175.

1.6 Administration and Organization

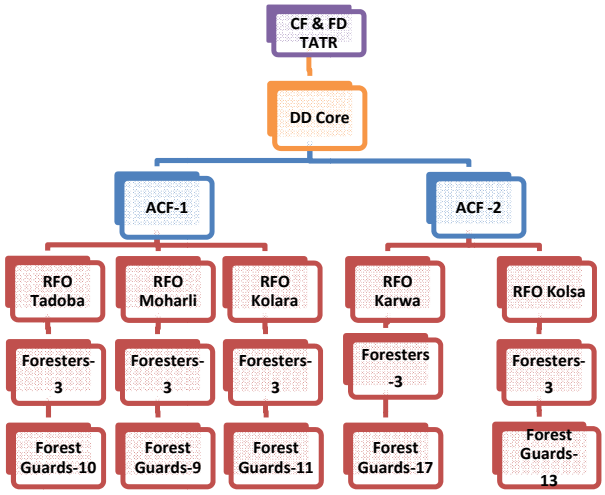
The Core zone of Tiger Reserve is under direct administration and management of Deputy Director (Core).

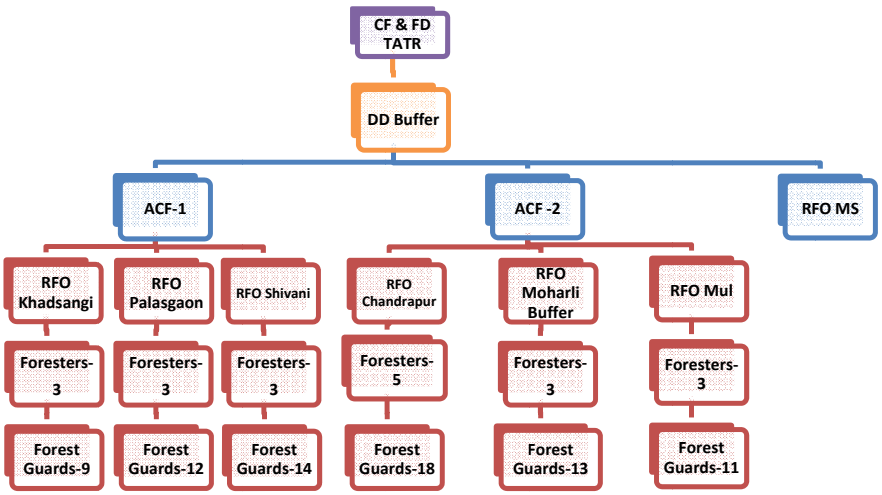
The Buffer zone of Tiger Reserve is under direct administration and management of Deputy Director (Buffer).

The Chief Conservator of Forests and Field Director, Tadoba Andhari Tiger Reserve, Chandrapur is supervisory head of Tiger Reserve having two Divisional Forest Officers in his office to assist here. Field Director reports to Additional Principal Chief Conservator of Forests (Wildlife) East, Nagpur.

The overall administrative control is with Principal Chief Conservator of Forests (Wildlife) Maharashtra State, Nagpur.

Organisational Set up of TATR





There has been reorganisation of ranges, rounds and beats in the TATR area taking into consideration forest areas (excluding non-forest areas like agricultural land, revenue land, aabadi areas, village land etc).

The detailed area statement of ranges, rounds and beats is appended as APPENDIX - V to this plan. The abstract of reorganised of ranges, rounds and beats is as under.

Table - 4- Abstract of Reorganised of Ranges, Rounds and Beats

Sr. No.	Division	Ranges	Rounds	Beats	RF. Comptt area	PF. Sur No. area	Unclassed Sur No. Area	Total Area
1	Core	5	15	60	59094.863	2630.379	340.673	62065.915
2	Buffer	6	20	77	59123.588	10519.661	366.54	70009.789
	Total	11	35	137	118218.451	13150.040	707.213	132075.704

1.6.1 Staff Availability

The present position of posts of field staff that actually manage the in-situ works sanctioned, actually filled and vacant is given in the table below. The vacant post in field has always been cause of concern creating management problems in protection, conservation, development and management of the TATR area.

The vacant posts of field staff need to be filled immediately in view of the exigencies arising due to gregarious flowering, when the threats of fire incidence are going to increase as there are 79 human settlements around the TATR area. The availability of mass of dry bamboo material will be highest ever to be present in the period over past 40 years.

The supporting office staff posts are vacant to small scale, but they are equally important to support the field staff and routine administrative office works like accounts, budgets, reports and human resource management.

Table - 5 - Details of staff posts: sanctioned, filled and vacant in TATR

Sr. No.	Designations of the posts for field work	Posts			% age of vacant posts
		Sanctioned	Filled	Vacant	
1	CF & FD TATR	1	1	0	0
2	Dy. Director	2	2	0	0
3	DFO	1	1	0	0
4	Sub DFO	1	1	0	0
5	ACF	4	4	0	0
6	ACF (STPF)	1	1	0	0
	Total - A group	**10**	**10**	**0**	0
7	RFOs	14	13	1	7
8	RFOs (STPF)	3	3	0	0
9	Jr. Engineer	1	0	1	100
	Total - B group	**18**	**16**	**2**	11
10	Forester	48	41	7	15
11	Forest Guards	175	151	24	14
12	Forest Guards (STPF)	81	80	1	1
13	Surveyor	3	2	1	33
14	Drivers	16	13	3	19
15	Forest Observer (STPF)	27	23	4	15
16	Care Taker	3	0	3	100
	Total - C group	**353**	**310**	**43**	12
17	Supernumery Forest Labourers	**91**	**91**	**0**	0
	Grand Total	**472**	**427**	**45**	10

1.7 Forest Types

The forests according to Champion and Seth's classification belong to the Sub group 5A - C1 - 1B Southern Tropical Dry Deciduous Forests' having Teak as dominant species.

The area consists of Tropical Dry Deciduous Teak Forests. Teak, a high value timber species is dominant in most part of the National Park. Other timber species are Ain (Terminalia alata), Bija (Pterocarpus Marsupium), Shisam (Dalbergia sissoo), etc. Bamboo is dominant in most of the areas. Moha (Madhuca indica), Tendu (Diospyros melanoxylon), are other NTFP species, e.g. Charoli (Buchanania lanzan), Bibla (Semecarpus anacardium), Kadhai (Sterculia urence), Dhawda (Anogeissus

latifolia) are also present. Myrabolans i.e. Beheda (Terminalia Bellirica), Hirda (Terminalia chebula) and Amla (Emblica officinalis) are also present.

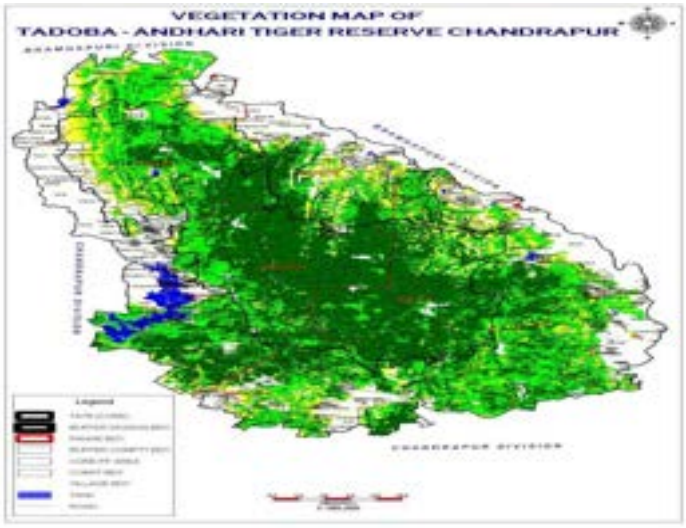
1.8 Flora

The Botanical Survey of India, Pune has recorded 667 species under 393 genera belonging to 110 families, including Angiosperms and Pteridophytes in Tadoba National Park. It has been published as Flora of India, series 4, "A Floristic Account of Tadoba National Park and Its Environs, Chandrapur District, Maharashtra State" by S. K. Malhotra and S. Moorthy.

The major tree species are Teak (Tectona grandis), Tendu (Diospyros melonoxylon), Ain (Terminalia tomentosa), Dhavda (Anogeissus latifolia), Bija (Pterocarpus marsupium), Haldu (Adina cordifolia), Salai (Boswellia serrata), Mahuwa (Madhuca longifolia), Bahawa (Cassia fistula), Karu (Sterculia urens), Jamun (Syzygium cumini), Mango (Mangifera indica), Arjun (Terminalia arjuna), Kumbhi (Careya arborea), Char (Buchanania lanzan), Bhirra (Chloroxylon swietenia)

Clerodendron infortunatum (Khandu chakka) is an endemic species to this area. Other important species are Vanda sellata, Eulophia ochreata, Ceropegia bulbosa, Iphigenia indica, Gloriosa superba, Costus speciosus, Chlorophytum species. The flora is for Tadoba National Park only and Andhari Wildlife Sanctuary is still unexplored.

Map -4 - Map of Vegetation in TATR



1.9 Ecological significance and Biological Value:

Ecological significance

The Tadoba-Andhari tiger reserve (TATR) occupying 1727.59 km^2 area, a significant portion of the Central Indian landscape is among the finest tiger reserves in the country. The reserve has a core area of 625.4 km^2 made up by the Tadoba National park (116.55 km^2) and Andhari wildlife sanctuary (508.85 km^2). The buffer area extends over 1101.77 km^2. TATR is a source area for tigers. The last population estimate of tigers conducted by WII and NTCA during 2018 established the presence of 82 adult individuals plus 50 cubs. Not to forget TATR has large numbers of other native wild species—vertebrates and invertebrates and the diversity and richness of native vegetation characteristic of the Southern Tropical Dry Deciduous Forests. TATR has ecological connectivity to some forest divisions in the Vidarbha region of Maharashtra namely Central Chanda that now includes the newly declared Kanhargaon sanctuary (269 km^2), Chandrapur, Bramhapuri, and to the PAs Tipeshwar and Bor sanctuaries. Outside Maharashtra the connectivity extends to Indravati tiger reserve in Chhattisgarh and in Telangana to Kagaznagar forest division and to Kawal tiger reserve via Adilabad forest division. Besides the tiger the major mammals include leopard, dhole, sloth bear, hyena, golden jackal, gaur, and sambar, chital, nilgai, barking deer, four horned antelope, langur, rhesus macaque and wild pig. The smaller mammals include Indian pangolin, Indian porcupine, honey badger, Asiatic wild cat; jungle cat, Rusty spotted cat, Indian fox, mouse deer, Indian grey mongoose, Ruddy mongoose, Indian hare, palm civet, small Indian civet and the giant flying squirrel. The list is by no means exhaustive. There is herpetofauna that also needs to be considered. The species of birds exceed 275 in numbers. Out of these 71 species are winter migrants. Tadoba national park together with Andhari wildlife sanctuary are recognized as Important Bird Area (IBA) in categories A1 and A3 with Code IN 169 under the IBA programme of Birdlife International that is partnered in India by the Bombay Natural History Society (BNHS). Category A1 includes sites regularly holding significant numbers of threatened (all sub-categories) or declining species. A3 includes sites where birds concentrate in significant numbers during the breeding season in winter or during migration. The objective of the IBA programme is to conserve world's birds and associated biodiversity at global, regional and sub-regional levels. The IBAs as such include a range of habitats such as wetlands, mudflats, grasslands, scrublands and forests including biodiversity hotspots and microhabitats. IBAs indicate richness of biological diversity.

TATR as a source area for tiger, other associated native wild animals and plants

TATR is recognized as a source area for tigers in a portion of the Central Indian landscape. This is cited in the Report titled Status of Tiger, Co-predators and Prey in India (2018) by Jhala YV, Qureshi Q, and Nayak AK (eds), NTCA, New Delhi and WII, Dehradun (pp 336 to 342). Normally the term 'source area' is used selectively for charismatic or threatened species. When a species is distributed across a wide range of habitats like the tiger the other associated native species of wild animals and plants/forest vegetation in such areas also need to be considered in the 'source' category. This holds true for TATR, especially its core area. Currently under the highly fragmented nature of forests in the country the source areas for wild animals and vegetation/ plants such as the core area of TATR assume critical importance. The data for Indo-Malayan realm indicate that more than 50% of the species of wild birds and 50% of wild mammals mediate dispersal of seeds of a wide range of wild trees and other woody species over various distances. Thus forest vegetation is propagated over landscapes via dispersal corridors by mammals. Birds and the fruit bats among mammals of course negotiate gaps between forest fragments while on the wing. Thus such dispersing and regenerating wild vegetation also qualifies to be included under the term 'metapopulations'.

Biological Value:

1.9.1 Animals

The animals of following vertebrates

1) Mammals 80 species,
2) Aves 280 species,
3) Reptiles 54 species,
4) Amphibians 11 species
5) Pisces 84 species.

1.9.2 Mammals

1) Insectivora (Shrews),
2) Scandentia (Tree shrew),
3) Chiroptera (Bats),
4) Primates (Monkey),
5) Pholidota (Ant eater),
6) Carnivora (Cats),
7) Artiodactyla (Deers),

8) Rodentia (Squirrels, Rats),

9) Lagomorpha (Hare).

1.9.3 Reptiles

1) Crocodilia (Marsh crocodile),
2) Squamata (Snakes)
3) Chilonia (Turtles)

1.9.4 Snakes

Total 28 species

4 species of poisonous snake

1) Russels, Viper,
2) Saw scaled viper,
3) Indian cobra,
4) Common Indian krait
5) Indian rock python (highly endangered)

The amphibians include frogs and toads. The Pisces (fishes) includes 84 species out of these 37 species have been actually collected while 47 species have been incorporated from literature.

1.9.5 Birds

There are 275 reported bird; however the bird watchers have reported about 280 species of birds.

1.9.6 Invertebrate Fauna:

1) 37 species of Mollusca
2) 41 species of insects of order Odonata (Dragonflies) (reported by Z S I)
3) Muntoidea other order of Insect comprises of 51 species.
4) Hemiptera (Bugs) comprises of 25 species.
5) Lepidoptera (Butterflies and moths) includes 68 species.
6) Scolopendridae (Chilopoda) includes 3 species.
7) Scorprionida, Araneae and Salifugae (Spiders) comprises of 34 species.

1.10 Threatened Species

The status is as follows

1.10.1 Red Data Book Vulnerable

(1) Tiger *Panthera tigris tigris*

(2) Leopard *Panthera pardus fusca*

(3) Indian Bison *Bos gaurus*

(4) Four Horned Antelope *Tetracerus qudricornis*

(5) Common Indian Monitor *Varanus bengalensis*

(6) Indian Chameleon *Chamales zeylanicus*

(7) Star tortoise *Geochelone elegans*

(8) Peninsular or Deccan soff shalled turtle *Trionyx leithi*

(9) Square spotted Gecho *Hemida ctylus gracilis*

(10) Indian pangolin *Manis crassicaudata*

(11) Leopard cat *Prionailurus bengalensis bengalensis*

1.10.2 Red Data Book Endangered

1.10.2.1 Reptiles

(1) Marsh Crocodile *Crocodylus palustris*

(2) Python *Python molurus*

1.10.2..2 Fish

(1) Magur *Clarius batrachus*

(2) Cauvery white carp *Cirrhinus cirrhosus*

1.11. IUCN Lower Risk

1.11.1 Mammals : Near Threatened

(1) Wild dog *Cuon alpinus*

(2)Tree shrew *Anathana ellioti ellioti*

(3) Watwaghul *Rhinolophus luctus*

(4) Watwaghul *Rhinolophus r. rouxii*

(5) Watwaghul *Hipposideros galeritus brachyotus*

1.11.2 Reptiles

(1) Kasav *Lissemys punctata*

(2) Vala *Ramphotyphlops braminus*

(3) Trinket (Taskar) *Elaphe helena*

(4) Common indian krait (Manyar) *Bungarus caeruleus*

(5) Slender coral snake *Callophis melanurus*

(6) Indian cobra (Nag) *Naja naja naja*

(7) Russell's viper (Ghonas) *Vipera russelli*

(8) Saw-scaled viper (Phoorsa) *Echis carinatus carinatus*

(9) Bamboo Pit viper (Hara Ghonas) *Trimeresurus gramineus*

1.12. IUCN Vulnerable

1.12.1 Reptiles

(1) Kasav *Aspderetes leithii*

(2) Square spotted Gecko (Pal) *Hemidactylus gracilis*

1.12.2. Fish

(1) Pungas *Pangasius pangasius*

(2) Goonch *Bagarius bagarius*

(3) Chital *Chitala chitala*

1.12.3 Important Bird Area

The site qualifies A1 criteria (Threatened species) as five globally threatened species have been identified within it.

It also qualify for Biome species (A3) IBA site code given to TATR is "IN MH16"

1.13 Critically Endangered

Oriental White-blacked Vulture *Gyps bengalensis*

1.13.1 Vulnerable

1) Lesser Adjutant Leptoptilos javanicus
2) Greater Spotted Eagle Aquila clanga
3) Sarus Crane Grus antigone
4) Green Munia Amandava formosa

1.14 Biome -11 : Indo-Malayan Tropical Dry Zone

1) Black Ibis *Pseudibis papillosa*
2) White-eyed Buzzard *Butastur teesa*
3) Painted Francolin *Francolins pictus*
4) Rain Quail *Coturnix coromandelica*
5) Jungle Bush-Quail *Perdicula asiatica*
6) Indian peafowl *Pavo cristatus*
7) Yellow-legged Green-pigeon *Treron phoenicoptera*

8) Plum-headed Parakeet *Psittacula cyanocephala*
9) Common Indian Nightjar *Caprimulgus asiaticus*
10) Brown-headed Barbet *Megalaima zeylanica*
11) Yellow-Fronted Pied Woodpecke *Dendrocopos mahrattensis*
12) Lesser Golden-backed Woodpecker *Dinopium benghalense*
13) Ashy-crowned Sparrow-Lark *Eremopterix grisea*
14) Small Minivet *Pericrocotus cinnamomeus*
15) Common Woodshrike *Tephrodornis pondicerianus*
16) Indian Robin *Saxicoloides fulicata*
17) Indian Chat *Cercomela fusca*
18) Jungle Babbler *Turdoides striatus*
19) Jungle Prinia *Prinia sylvatica*
20) Ashy Prinia *Prinia socialis*
21) Green Munia *Amandave formosa*
22) Brahminy Starling *Sturnus pagodarum*
23) White-bellied Drongo *Dicrurus caerulescens*

1.15 Catchments Values

The area forms catchments of Irai River on the West which drains to Irai dam that provides water for Chandrapur Super Thermal Power Station and also drinking water to Chandrapur city.

The Eastern part drains in to Andhari river which runs through Andhari Wildlife Sanctuary.

1.16 Hydrology and Water Sources

Irai and Andhari are the two major rivers flowing through the Reserve. Erai flows in the Western half and Andhari flows in the Eastern half. Both these rivers are flowing from North to South and their course seems to be controlled by the major boundary fault. The presence of base flow in these rivers confirms the fact that they are gaining rivers i. e. ground water is being discharged into the rivers.

Other important surface water bodies in the Reserve area are Tadoba and Kolsa lake.

The groundwater occurs in the primary as well as the secondary porosity of these rocks. Deep / Shallow tube wells constructed at Agarjhari, Adegaon, Moharli and Dewada villages tapping these rocks have yielded good discharges. The general

underground water levels in these formations are shallow so the dug wells generally do not go dry in the summer season. The presence of Erai reservoir with its vast aerial spread acts as a good source of groundwater recharge to these formations.

The depth of water is generally deep (up to 30 to 40m. in dug wells) and most of these wells go dry in the summer season.

Map - 5- Map of Natural Water Bodies in TATR

1.17 Geology, Rock and Soils:

As per Working Plan following broad geological divisions described for the

TATR area, based on the disposition of the rock types:-

- A small patch of detrital mantle consisting of alluvial deposits in the Northern side.
- Gondwana sediments exposing the Kamthi formations, and Lameta at surface in the South-western side. They are underlain by the coal bearing Barakar formations.
- Precambrian Vindhyan formations covering most of the central part and extending in NW-SE direction.
- Archaean metamorphic rocks as patches along the NE corner and in the Western border.

There are several kinds of soil in the Reserve area. The alluvial soils are moderate to deep with fine silt, sand and clay. The soil in the Gondwana sediment areas is shallow with ferruginous material. The Archaean metamorphic areas are covered by moderate dark / grayish brown soils. The soils in the Vindhyan areas are shallow, reddish brown and ferruginous too.

1.18 Terrain

The tract is mostly undulating and hilly in the North, interspersed with open grasslands and wooded areas. The other part of tract is mostly in plains. The Chimur hills in Tadoba National Park start East of Chimur and with one break of 8 Km. run Southwards as far as Moharli, gradually diminishing in height from North to South. The range is 32 Km in length and 10 Km. in breadth with an average elevation of 150 meter above the surrounding plains. In the basin of the hills, lies Tadoba Lake which is spread over 120 ha.

1.19 Elevation

- Highest point is 350.70 meter above M. S. L.
- Lowest point is 212.45 meter above M.S.L.
- The average elevation is 284.07 meter above M.S.L.

The hilly areas give rise to various streams. Some of the streams like Andhari, Bhanuskhindi, Hirdi, etc., contain water throughout the year in the plain areas, while in the hilly portions, water remains in '*dohs*' of these streams.

Bhanuskhindi, Pandharpauni - Jamni and Girghat - Kolsa tracts constitute the crucial catchments of these streams.

1.20 Climate

The climate of the area is characterized by a hot summer, well distributed rainfall during the South-West Monsoon season and general dryness except in the rainy season.

- The Monsoon season : from June to September,
- The post - Monsoon season : October and November
- The cold season: from December to February.
- The hot season from March to May.

1.20.1 Rainfall Pattern and Distribution:-

The rainy season is hot and humid. Bulk of rainfall is, received in the period from June to September.

- Average numbers of rainy days are approx. 80.
- Average annual rainfall: 1175 mm.
- The %age of rainfall received during the various period of the year is as below:-

June to September	:	92 Percent
October to January	:	3 Percent
February to May	:	5 Percent

1.20.2 Temperature

The salient highlights of temperature are as under

- After October, both day and night temperature decreases progressively till December which is the coldest month.
- The minimum temperature recorded in winter during December, is 3° C.
- Temperature rises rapidly after February till May which is the hottest month.
- The mean Maximum in May is about 46^0C
- The mean Minimum temperature and about 24^0C
- The heat in summer is intense during the days and occasionally the day temperature rises up to 48 ^{0}C.
- With the onset of the South - West Monsoon by about the middle of June, the temperature decreases appreciably and weather becomes more pleasant.

1.20.3 Humidity

The air is generally dry, except during the South - West Monsoon, when the humidity exceeds 70 %.

The summer months are the driest when the relative humidity in the afternoon is between 20-25 %.

The skies are heavily overcast during the South-West Monsoon season; whereas during rest of the year, skies are lightly clouded or mostly clear.

1.20.4 Winds

The winds ate generally light with sonic increase in wind force during the later part of summer season and monsoon season. In the start of the summer season, winds gradually change over. The direction between East and South and by May, winds from directions between South-West and North-West become more common. Less frequently, storms and depression from the Bay of Bengal during the post - Monsoon months also affects the weather over the area. Thunder storms occur in all the months, their incidence being the highest during Monsoon season and lowest during the cold season.

1.21 Vegetation Cover

The vegetation according to Champion and Seth's classification belongs to the Sub group - **5A Southern Tropical Dry - Deciduous Forests** Type having Teak as dominant species. The main associates of Teak are Ain, Bamboo. Bija, Dhaoda, Haldu, Salai, Semal, Tendu etc. The associates of Teak however, vary depending upon the physiographic features of the habitat. Trees of Jamun, Mango, Arjun are found in the moist areas. The Lantana is confined to few pockets around human habitations but is successfully eradicated in recent past.

Bamboos of this area flowered gregariously in the year 1982-83 and later Bamboos have regenerated in this area naturally and profusely.

The compartment wise composition of the crops existing in the area was compiled and it found that

11.48 % of Teak Forests (density more than 0.4)

76.16 % of Mixed Forests (density more than 0.4)

7.17 % of Grasslands (density less than 0.4)

5.19 % of degraded area (density less than 0.4)

Bamboo is found mainly along the banks of streams and roads. Its density decreases as we go away from the streams and roads. The overlapping area covered with Bamboo is 40.28 % of the core area and 39 % in buffer area. The details of the composition of the crops are given in Appendix - I (Statement of Gregarious Flowering of Bamboo in Core Area), Appendix I-A (Statement of Gregarious

Flowering of Bamboo in Nistar Bamboo (Overlapping) Working Circle in Buffer Division) and **Appendix I-B** (Statement of Gregarious Flowering of Bamboo in Commercial Bamboo (Overlapping) Working Circle in Buffer Division)

The report on "Establishing Computerized Wildlife Database for Conservation, Monitoring and Evaluation" in Tadoba-Andhari Tiger Reserve, Maharashtra (1994-1998) by Shri. Yogesh Dubey and Dr. V. B. Mathur classified the vegetation into 11 types of association namely:

1. *Tectona grandis-Chloroxylon swietenia-Diospyros melanoxylon* (TCD)
2. *Chloroxylon swietenia-Diospyros melanoxylon-Tectona grandis-Lagerstroemia parviflora* (CDTL)
3. *Tectona grandis-Lagerstromia parviflora-Chloroxylon swietenia-Diospyros melanoxylon* (TCLD)
4. *Tectona grandis-Chloroxylon swietenia-Lagerstroemia parviflora-Zyzyphus xyolopyrus* (TCLZ)
5. *Terminalia belerica-Emblica officinalis-Anogeissus latifolia* (TEA)
6. *Tectona grandis-Lagerstromia parviflora-Gardenia latifolia-Annogeisssus latifolia* (TLGA)
7. *Tectona grandis-Lagerstromia parviflora-Annogeissus latifolia-Bassia latifolia* (TLAB)
8. *Chloroxylon sweitenia-Tectona grandis-Cassia fistula-Emblica officinalis* (CTCE)
9. *Cleistanthus collinus-Madhuca latifolia-Terminalia tomentosa-Diospyros melanoxylon* (CMTD)
10. *Diospyros melanoxylon-Madhuca latifolia-Terminalia tomentosa* (DMT)
11. *Terminalia tomentosa – Madhuca latifolia-Cleistanthus collinus* (TMC)

Terminalia tomentosa–Madhuca latifolia-Cleistanthus collinus (TMC) Miscellaneous Bamboo I (MB-I), Teak Miscellaneous Bamboo (TMB) and Miscellaneous Bamboo II (MB II) emerged as the most dominant vegetation types covering 25.27%, 21.65% and 21.01% respectively of the total area. Teak Miscellaneous Bamboo vegetation type had the highest crown cover (>60%) as derived from the satellite image. The overall tree density is calculated to be 357 trees/ha. Tree density is 344 trees/ha in the National Park and 369 trees/ha in the Sanctuary. Teak is the most dominant species followed by *Chloroxylon sweitenia, Lagerstroemia parviflora* and *Diospyros melanoxylon*. Eleven vegetation types were classified based on similarity in vegetation association using TWINSPAN analysis. Tree density (456 trees/ha) was highest in *Tectona grandis – Chloroxylon sweitenia – Diospyros melanoxylon* (TCD) association.

CHAPTER -II

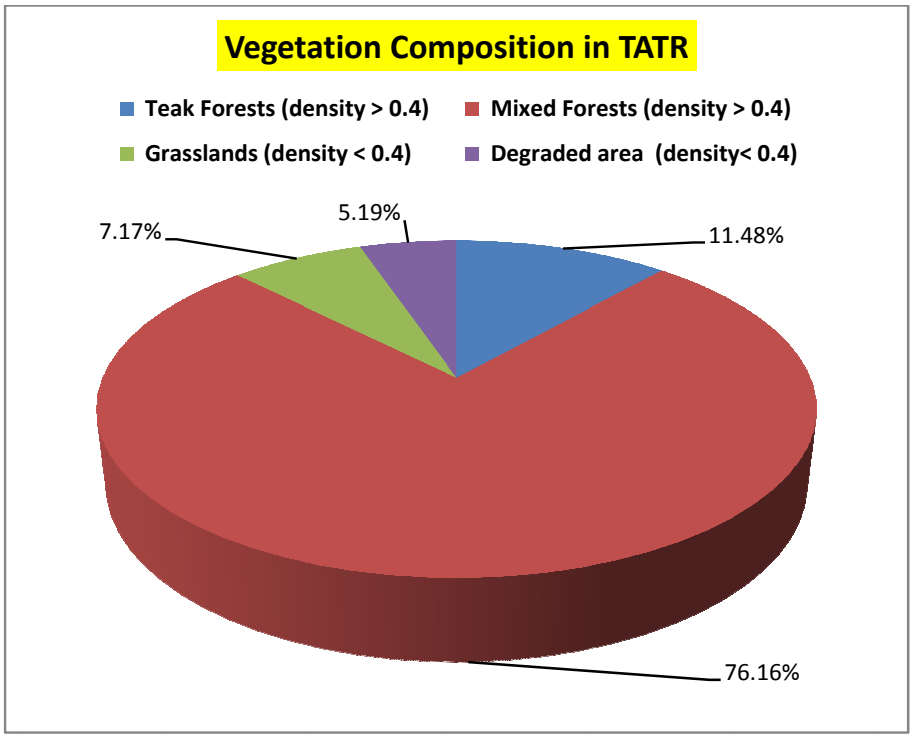
The Bamboo Vegetation in TATR Area

2.1 The Vegetation

The vegetation according to Champion and Seth's classification belongs to the Sub group - **5A Southern Tropical Dry - Deciduous Forests** Type having Teak as dominant species. The main associates of Teak are Ain, Bamboo. Bija, Dhaoda, Haldu, Salai, Semal, Tendu etc.

Bamboos of this area flowered gregariously in the year 1981-84 and later Bamboos have regenerated in this area naturally and profusely.

The compartment wise composition of the crops existing in the area was compiled and following picture emerged from the study.



The Core Area plan has identified the following attributes bamboo vegetation.

A. Bamboo is found mainly along the banks of streams and roads.

B. Its density decreases as we go away from the streams and roads.

C. The overlapping area covered with Bamboo is 40.28 % in core and 48.8 % in buffer.

The mix of the composition of the crops are given in Appendix-I, I-A and I -B

2.2 Vegetation Association Types

The report on "Establishing Computerized Wildlife Database for Conservation, Monitoring and Evaluation" in Tadoba-Andhari Tiger Reserve, Maharashtra (1994-1998) by Shri. Yogesh Dubey and Dr. V. B. Mathur classified the vegetation into 11 types of association. Out of these in the association of

Terminalia tomentosa–Madhuca latifolia-Cleistanthus collinus (TMC) contains following bamboo composition emerged as the most dominant vegetation types covering the total area.

a) Miscellaneous Bamboo I (MB-I) - 25.27%,
b) Teak Miscellaneous Bamboo (TMB) - 21.65%
c) Miscellaneous Bamboo II (MB II) - 21.01%

Teak Miscellaneous Bamboo vegetation type had the highest crown cover (>60%) as derived from the satellite image. Data of count and measurement of trees, seedling, sapling, canopy cover, shrub was collected from 239 plots of 20m X 20m each.

The overall tree density is calculated to be 357 trees/ha. Tree density is 344 trees/ha in the National Park and 369 trees/ha in the Sanctuary. Teak is the most dominant species followed by *Chloroxylon sweitenia, Lagerstroemia parviflora* and *Diospyros melanoxylon*.

Bamboo is found mainly along the opening like banks of streams and roads. Its density decreases as we go away from the streams and roads. The overlapping area covered with Bamboo is 40.28 %.

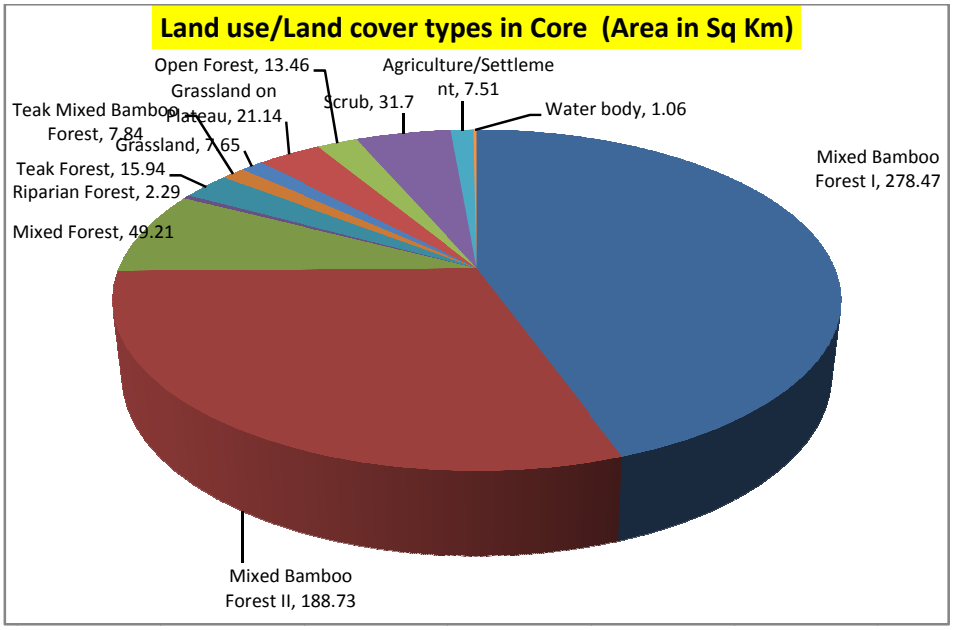
2.3 Area of Land use/ Land covers Types

WII MoE&F-NNRMS Mapping Project (Ms. Ambica Paliwal, Research Asstt. Principal Investigator Dr. V. B. Mathur) has classified the land use / land cover types into 12 types as follows and it is evident that Bamboo is covers 76 % of core land

Table - 6 - Area of Land use/ Land covers Types

Sr. No.	Land Use Class	Area (Sq Km)	% Area
1	**Mixed Bamboo Forest I**	**278.47**	**44.56**
2	**Mixed Bamboo Forest II**	**188.73**	**30.20**
3	**Teak Mixed Bamboo Forest**	**7.84**	**1.25**
	Total Land covered by Bamboo	**475.04**	**76.01**
4	Mixed Forest	49.21	7.87
5	Riparian Forest	2.29	0.37

6	Teak Forest	15.94	2.55
7	Grassland	7.65	1.22
8	Grassland on Plateau	21.14	3.38
9	Open Forest	13.46	2.15
10	Scrub	31.7	5.07
11	Agriculture/Settlement	7.51	1.20
12	Water body	1.06	0.17
	Total	**625**	**100**



2.3.1 Jamun - Arjun plant Community:

This is a typical riparian habitat found along the perennial water sources; where vegetation is lush green and quite distinct from the Dry Deciduous vegetation existing all around wherein Jamun and **Bamboos show good regeneration**.

2.3.2 Tectona - Chloroxylon - Lagerstroemia plant community

The majority of the vegetation belongs to this habitat **where many of these forests have impenetrable thickets of regenerated Bamboos.**

It is found that during summer, tender grass is not available for herbivores, other browse availability goes down and animals have to take less preferred food items. Herbivores are also seen feeding on fallen leaves of Bamboos.

The Bamboo occupies about 40 % area in core and 49 % in buffer in overlapping manner with other vegetation types.

The details of bamboo area in TATR is shown in Appendix -I, I-A and I-B.

The abstract is as under.

The land use map is exhibited as under

Map - 6 - Map of Land Use in TATR

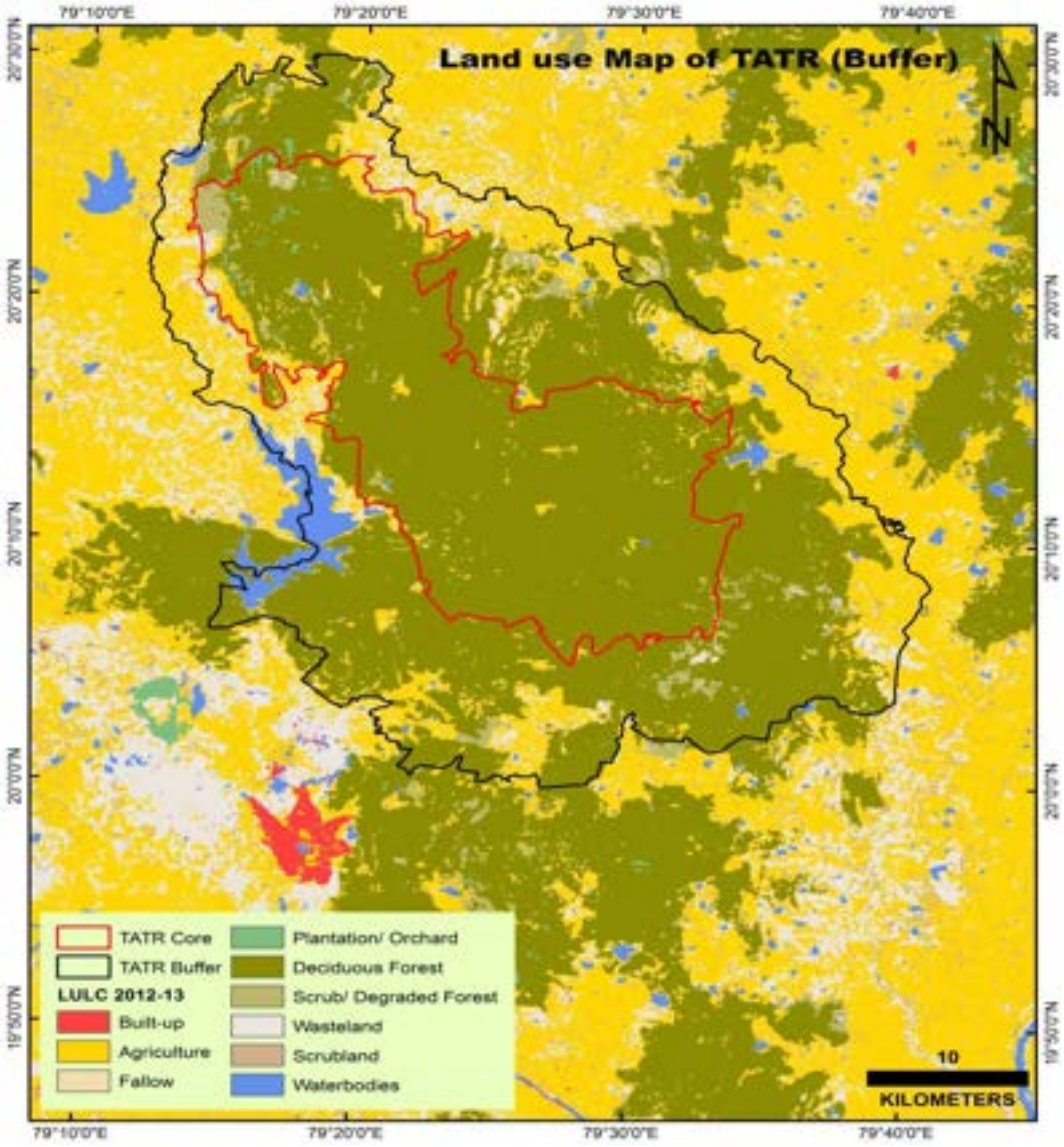


Table -7- Abstract of Bamboo bearing Area in TATR

(Area in Ha.)

Area Description	Comptt. & PF	Total Area	Bamboo Area
Core Division			
A) Flowering occurred	121	40348.91	17583
B) Flowering Awaited	62	17775.02	7111
C) Total Area (A+B)	194	58123.93	24694
Buffer Division			
D)Total Nistar BCS Area	77	25384.51	21351.03
E)Total Commercial BCS Area	78	28364.34	22326.12
F) Grand Total: NBCS+CBCS Area	155	53748.85	43677.15
G)Total Bamboo Area in TATR (C+F)	**349**	**111872.78**	**68371.15**

The Bamboo Forest in TATR in March -2021

The Wildlife in Bamboo Area in TATR

CHAPTER -III

The Management Plan
For Seed Collection in Tadoba Andhari Tiger Reserve Area

3.1 The Back Ground of This Consultancy

The Sevak, Maharashtra had received an offer to provide the technical consultancy to the CF and Field Director, Tadoba Andhari Tiger Reserve relating to the gregarious flowering event that is taking place in TATR area after long spell of 40 years and it being not a normal silvicultural phenomena called for expertise to deal with to sail through critical period when some threats were perceived to overall management of wildlife and its habitat, protection from fire threat, livelihood needs thriving on the eco-tourism.

The Sevak Maharashtra formed team of experienced and dedicated officers who had direct exposure to the TATR area landscape during their career.

The Sevak, Maharashtra team had detailed discussions prior to field visit on 23-3-2021, 16-6-2021 and also after the field visit on 26-3-2021, 17-6-2021 about the gregarious flowering of bamboo in TATR and various management issues related to the silvicultural matters, fire protection strategies, wildlife protection planning, wildlife habitat development and eco-tourism management and removal of dry bamboo crop /growing stock and its disposal,.

The Sevak, Maharashtra team entered in MoU with CF and Field Director, Tadoba Andhari Tiger Reserve on 26-3-2021 and 17-6-2021 after field tour of core and buffer division forests, interaction with field staff like RFOs, Foresters, Forest Guards, and executives like DFO and ACF. The copy of MoU is appended as Appendix - II

3.2 Main contents of MoU

1. To propose a comprehensive plan for Bamboo Seed Collection from the gregariously flowered areas
2. To suggest detailed plan for Harvesting of bamboos from the current gregariously flowered areas in core and buffer division's forests and the expected flowering areas in near future.
3. To prescribe modalities for Regeneration bamboo in the gregariously flowered area in core and buffer division forests
4. To propose detailed plan for fire protection
5. To propose plan for wildlife habitat development and protection

6. To propose plan for control, and regulation of wildlife eco-tourism.

This foregoing part of the consultancy plan mainly deals with following 3 topics.

1. To propose a comprehensive plan for Bamboo Seed Collection from the gregariously flowered areas
2. To suggest detailed plan for Harvesting of bamboos from the current gregariously flowered areas in core and buffer division's forests and the expected flowering areas in near future.
3. To prescribe modalities for Regeneration bamboo in the gregariously flowered area in core and buffer division forests

3.3 The Previous Gregarious Flowering of Bamboo

An attempt was made to seek records of previous gregarious bamboo flowering that occurred during 1981-84. But, not much was available barring an exception of an article on the fires in bamboo area worked in gregarious flowering of 1981-82. There is no past record or documentation like AAR, Working plans etc. was available in the TATR office to know the silvicultural practices, management strategies and overall experience of the working.

In an effort to gather some information and data the Sevak Sangh senior member and the guide of this plan consultancy, Shri. VT Patki called on to Shri MH Khedkar, Ex CF North Chandrapur Circle, during last GFoBs in 1981-84.

Important information that was gathered and steps in management adopted by him in the controlling capacity as CF were as under,

1) The process of flowering continued for 3-4 years starting from 1981.
2) The bamboo was converted into bundles by skilled labourers from Chhattisgarh State as the local labourers could not do the work of bamboo extraction in the gregariously flowered area.
3) The harvested bamboo forest produce was insured for fire damage at the cost born by the government.
4) The flowering continued for four long year period. Not all the bamboo area flowered gregariously but in scattered locations. To facilitate the seed collection, felling of bamboo; every year, bamboo flowered clumps in each compartment were counted and record kept.
5) Area of Tadoba NP was with the DCF Wildlife and there was neither Andhari Wildlife sanctuary nor buffer area.
6) Rigid fire protection was done over the entire Tadoba National Park area.

7) About 100 MT bamboo seed was collected from the bamboo flowered area. One person could collect about 3-4 kg seeds in a day. The seed collection was done through EGS funds.10 MT seed was kept in cold storage, but the result was unsuccessful.
8) Uprooted bamboo clumps, being fire hazardous were collected in adjoining nala beds and burnt under strict supervision to prevent unforeseen fire incidence.
9) About 100 trips of paper mill trucks transported the harvested bamboo bundles. This heavy traffic laden with bamboo was found causing damage to roads, electric lines etc.
10) GoM allotted bamboo bundles to various paperwork mills in the country at predetermined rates.
11) About 1.5 Lakh MT Bamboo bundles were harvested from Tadoba NP; that is equivalent to 0.1364 Lakh MT per Sq.km area.

The opinion, observations, and recommendations of Shri. MH Khedkar the then CF (later retired as PCCF) in nutshell is under for to think over.

1. Non-harvesting of bamboo bundles from core area is highly risky.
2. Extending fire line network and increasing strength of fire watchers in summer season.
3. In the area where no NR is established, AR of seedlings from same established area can be done.

3.4 Management of Bamboo Seed Collection in Core and Buffer Area Division.

The WPO of current working plan has prescribed treatment for the Bamboo flowering area in Para 12.15.4 which constitutes following operations.

(1) Seed Collection and disposal
(2) Harvesting of flowered bamboos
(3) Tending in flowered bamboo regeneration area.

If in supersession of above, any new silvicultural practice is required to be adopted, it may be essential to prepare deviation proposal for implementing the new practices.

The core and buffer area forest compartments of TATR where gregarious flowering has occurred during 2020 have been extensively surveyed and have mapped by the management authorities by engaging the field staff on quarterly basis.

The map was prepared and updated up to December 2020 quarter was made available to the Sevak team during the visit in March-2020. With using the map details the list of compartments showing bamboo flowering has been prepared and appended as **Appendix - I, I-A, and II-B.**

The data analysis of flowered comptt. in core area shows that till December out of total 194 compartments, 121 (66 % area) have flowered gregariously.

The data analysis of flowered comptts. in buffer area shows that till December out of total 155 compartments, 68 (49 % area) have flowered gregariously.

The flowering of bamboo areas is proceeding with time and covering more and more forest compartment with time, the monitoring of which is in progress by field staff. And at any given time the data will be changing. However to formulate this plan the details available by December-2020 are considered.

The abstract of flowered area, flowering awaited area is shown below.

Table -8 - **Abstract of Status of Gregarious Bamboo Flowering in Core & Buffer Area** (Till Dec-20)

Area Description	Comptts. Nos	Total Area (Ha.)	Bamboo Area (Ha.)	Bamboo Area % age
A) Flowering occurred in Core	121	40,348.91	17,583.00	66.6
B) Flowering Awaited in Core	62	17,775.02	7,111.00	29.4
C) No Bamboo in Core	11	24,25.814	0	4
D)Total Area (A+B+C) of Core	**194**	**60,549.75**	**24,694.00**	**100**
E) Flowered Area in buffer	68	26,370.16	23,153.92	49.06
F) Flowering Awaited Area in buffer	87	27,378.69	20,523.23	50.94
G) Total Bamboo Area in Buffer	**155**	**53,748.85**	**43,677.15**	**100.00**

Consolidated Abstract of Status of Gregarious Bamboo Flowering in TATR (Till Dec-20)

Area Description	Comptts. Nos.	Total Area (Ha)	Bamboo Area (Ha)	Area % age
1) Total -Flowered Area in Core & Buffer	189	66,719.07	40,736.92	59.64
2) Total -Flowering Awaited Area in Core & Buffer	149	45,153.71	27,634.23	40.36
3) Total Bamboo Area in Core & Buffer	**338**	**1,11,872.78**	**68,371.15**	**100.00**

3.5 Feedback from field staff on Bamboo Area

The Sevak Team accompanied by the field staff comprising of DFO, ACF, RFOs, Round Officers and Beat Guards noted certain things from feed back visit as below.

The flowering of clumps can be classified into three stages as noted in sampled visited Comptts. No 303,306,307,309,311& 311,124,131,141,143,183,

Stage-I- Flowering of clumps has just set in and to be completed in next few months.

Stage II - Flowering is complete and seeds can be collected from such clumps.

Stage III - In these bamboo clumps flowering stage has already been completed & seeds has also fallen on the ground and natural regeneration has commenced.

Where entire seeding of the clumps is over, whole they totally dried up and fallen on the ground. The decomposition of the rhizome and culms has begun.

Further based on the observations during visit recommends the following.

1) The seed collection needs to be taken up at once, in 2021 so that it can be used for departmental use and supply in the state itself.
2) As per the random sample survey carried out in Comptt. No.309 with the help local staff by Sevak Team, it was found that there are approximately 350 clumps per ha. which are however vary in size, growth and quality of culms. This indicates that the average spacing between clumps as 5.3 M X5.3 M
3) Based on the basis of sample survey of the bamboo growth, the core area over 121 comptts, which have gregariously flowered over, 17583 ha. is available for seed collection.
4) The bamboo crop, in buffer area in 155 comptt having 23153 ha that have gregariously flowered over and is available for seed collection.

3.6 Bamboo Seed collection Estimates, Collection Strategy and Disposal

Bamboo Seed Estimation in core area

The following are the empirical estimates of seed harvest that will be likely to be available from the core area.

As there was never harvesting of bamboo from core area since last flowering that began in 1981-82 and culminated in 1983-84 has lead to formation of compact clumps with dense culms formation.

It was noted that not all the culms in the clumps have flowered and currently are seed bearing. The flowering is gradually in progress and likely to be completed by 2023.

As on the date, no seed yield past data is available with the TATR office, the discussion with the past serving officer was to be relied upon; who supervised such activity during 1981 to 1983. It was gathered that during past gregarious flowering that took four decades back, the average yield of clean seed that could be collected from a fully gregariously flowered well grown and good sized clump was about 3.5 kg.

However, at present, as per the discussions with the field staff and officers, it has been brought to notice that the flowering of bamboo clumps is not uniform in seed formation these years and has been somewhat hampered for reasons unknown and in spite of bearing of gregarious bamboo florets, they are at places seed cones hollow and not maturing to the extent to yield good quality seeds.

As per the interaction with field staff, seed collection in core area can be expected to be 200 kg. the per hectare on the most conservative yield prediction.

Bamboo Seed Estimation in Buffer Area

The harvesting of bamboo has been in going on buffer area in the Nistar Bamboo Cutting Series (NBCS) in Nistar Bamboo (Overlapping) Working Circle as per the sanctioned working plan, to meet the bamboo Nistar privileges granted to 79 villages. So also the working for bamboo is going on in Commercial Bamboo Cutting Series (CBCS) in Commercial Bamboo (Overlapping) Working Circle for open market sale. Hence growing nos. of culms in a clumps is 30 %. lesser, hence **in buffer division, the expected bamboo seed yield as approx. 50 kg per ha.**

Though there is dense bamboo crop **in the core area and flowering is gregarious with moderate scale seed formation, seed collection is NOT proposed for the following reasons.**

a) The bamboo seed is allowed to fall on the ground and regenerate naturally form the food for the herbivores when there is likelihood lack of other palatable vegetation of fall of bamboo clumps on the forest floor. The fresh bamboo regeneration will act as alternate food option and ensure food security.

b) The seed collection activity is labour intensive and if seed collection is permitted within core, it will certainly cause human interference disturbing wild animals.

c) The human activity in core area can invite man-animal conflict and may eventually result in human deaths. Therefore for the safety reasons the seed collection within core area is not recommended.

Hence the estimated yield of bamboo seed only from Buffer Division in Bamboo bearing areas for the flowering season 2020 and 2021 is as shown in the below table .

Table -9- **Estimated Yield of Bamboo Seed for 2020 and 2021 flowering season**

Seed Collection Year	TATR Area	Area (Ha)	Ave. seed yield / ha (Kg)	Total Seed yield (Kg)
2021-22	Core Division	17583.00	No collection to be done	0

	Buffer Div Nistar WC	13513.88	50	675694
	Buffer Div Com. WC	9640.04	50	482002
	Total	40736.92		1157696
			Wt in MT	1157.696
2022-23	Core Division	7111.00	No collection in core	0
	Buffer Div Nistar WC	7837.15	50	391857.5
	Buffer Div Com. WC	12686.08	50	634304
	Total	27634.23		1026161.5
			Wt in MT	1026.162
	Grand Total		**Wt in MT**	**2183.858**

Collection Strategy

The following strategy is proposed for bamboo seed collection from buffer area for the ensuing season.

1) The gregarious flowering is a short period activity taking place in after 4 decades period. The EDCs around the TATR are 79 nos. and flowered area is also close to their habitation. Moreover, they are acquainted with topography and risks involved, which enables them to be more eligible any outside labourers. Therefore, EDC be permitted for seed collection under supervision of field staff.
2) In case if any EDCs does not participate in bamboo seed collection, the area allotted to it can be allotted to adjoining EDCs for seed collection. I
3) In the worst case scenario, if no EDC from TATR is participating, labourers from Chhattisgadh can be invited for bamboo seed collection.

The EDCs be allowed use the seed for their own use like raising nursery for seedlings and direct seed sowing in the private land.

The EDCs be allowed to sale the seeds to any purchaser under intimation to RFOs and net sale receipts are deposited in TATR Foundation account.

3.7 Bamboo Seed Collection Target, Cost Estimates, Agency and Storage

Bamboo Seed Collection Target,

Though there is potential for collection of large quantity of bamboo seed estimated at about 2100 MT from buffer area, initially we recommend bamboo seed collection pegging at 50 MT spread over period of say 3 to 5 years depending upon the spread of flowering period.

The detailed seed collection APO and costing is given in Appendix- III

This collection is suggested for own consumption of TATR for broadcasting seeds through seed balls where the NR has failed, regenerating natural gaps where

in spite of suitable conditions the bamboo vegetation is absent and preparation of bamboo seedlings in the nursery.

If there is demand for the bamboo seed that needs to be ascertained from various consumers like other forest division, FDCM, Other state FDs, Private traders and nurseries; then seed collection quantity can be increased. Otherwise, the seed be allowed to fall and regenerate naturally to form future bamboo crop and as well to serve as fodder to herbivore population.

3.7.1 Bamboo Seed Disposal

So far no marketing or supply strategy is planned. As the seed collection period available is short the seed collection target needs to be fixed early.

The seed target / requirement need to focus on following consumers

(1) TATR's own internal need

(2) Maharashtra Forest Department

(3) Maharashtra Social Forestry Dept.

(4) Maharashtra Bamboo Development Board

(5) Other State Forest Department & SFDs

(6) Other Bamboo Development Boards

(7) Private entities engaged in nurseries in Maharashtra and in other states

(9) Seed Traders from Maharashtra and other States

3.7.2 Seed Collection Agencies

The quantum and the seed collection moderate and initially pegged at 50MT. The availability of the period for collection is comparatively short from April to June. Therefore seed collection work need to be done on fast track basis.

There are 79 villages surrounding the TATR area which have the Community Forest Rights (CFR) under the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act 2005. Where the CFR exists, the management authorities need to exclude and leave such areas for the villagers to execute the seed collection under technical guidance.

In the rest of area, the seed collection be done engaging local labours. If the local labourers are reluctant to do this work, it needs be done through the labourers from Chhattisgarh state who are skilled and well-known to perform all such forestry works.

3.7.3 Bamboo Seed Storage

The bamboo seed being of gramineae family is highly susceptible to rodent, ant damage and fungus infection. Hence proper storage to ward off the damage shall be ensured. Irrespective of the storage structure facility, fumigation, disinfection, dehumidification and similar protective measure will have to be taken. Now, there are highly professional fumigation service providers; there services can be utilised as the availability of bamboo seed is once in a while opportunity.

Departmental store buildings, nursery seed storage godowns should be preferably used. If needed, the State Warehousing Corporation and private ware houses godowns can be used too.

The experience of use of cold storage use during 1981-84 period resulted in loss of seed. Hence, that option need to be chosen with care as the warehousing has undergone sea changes.

3.7.4 Estimation of Seed Collection Cost and Valuation of Seed

As per the discussions with field staff and past experience, villagers from Maharashtra are not conversant with this activity and like in the past, labourers from adjoining Chhattisgarh state may be required. However, the possibility of involving EDCs after basic training in seed collection be checked, as this will be excellent income generation source that has come after 40 years.

With initial target of 50 MT seed collection, the total seed cost in the form of wages and handling at the rate of Rs. 400 per kg (Rs. 4 lakh per MT) will be Rs. 200 lacs. The actual seed collection cost will depend on the actual own internal consumption by TATR management and supply to outsiders.

The funding for seed collection work can be borne by TATR foundation or the EDCs if they are going to do it themselves. The sale price (year 2020) in the market is Rs. 500 per kg.

Area wise and Year wise estimation of Seed collection cost for the FY 2021-22 (Flowering Season-2020) and FY 2023-24 (Flowering Season-2023) is appended as **Appendix - III.**

The current seed rate for sale by the private traders is Rs. 500 per kg. Even at the half the selling price, the EDC can make good earnings from the areas where they have CFR.

Valuation of Seed

For the sake of highlighting the services from TATR and information, the valuation total expected bamboo seed yield from buffer area alone is done. The

valuation of 2100 MT of estimated seed yield at current market rate of Rs. 500/ kg is Rs. 10500 lacs. This highlights value of just one part of forest services available from buffer area alone.

However actual bamboo seed collection for the season starting from 2021 with 20 MT to be priced @Rs. 500/ kg is Rs. 100 lacs, followed by 20 MT in 2022 Rs. 100 lacs and 10 MT in 2023 Rs. 50 lacs totalling to Rs. 250Lacs.

The Total Valuation for bamboo seed and actual proposed seed collection for FY 2021-22 (Flowering Season-2021) and FY 2023-24 (Flowering Season-2023) is appended as **Appendix - IV.**

3.7.5 Designing Seed Collection Calendar

As the flowering to seed maturity is long drawn process beginning with September and attaining finality in April month, a calendar to execute seed collection will have to be designed by each beat guard in TATR.

Based on the surveys in the compartments, designing of a seed collection calendar will facilitate to plan seed collection trips by labourers to the forest for seed collection and to be in preparedness. This will also control human entry and security of the lives.

The calendar has to include information on points, like when bamboo compartments are expected to go through following stages in gregarious flowering phenomena such as

(a) onset of flowering (b) Attaining maturity (c) when these fruits are likely to mature (and therefore be ready for collection).

The Seed Collection Calendar format and following notes on how to identify flowers, immature or mature fruits in the field are given below.

Notes:

A) Fl = Onset of flowering - Light green coloured inflorescence appear on the

B) Im= Immature seeds or Maturing: flower head or inflorescence turn from green to red when ripe

C) M = Seeds Matured: flower head or inflorescence / florets turn black when ripe

Seed Collection Calendar format (to be prepared by RO/BG)

Name of Beat	Jan -	Feb -	Mar-	Apr-	May-	Jun-	Jul -	Aug-	Sept-	Oct-	Nov-	Dec-
A	Im	Im	Im	M	M					Fl	Fl	Fl
B												

Light rains or atmospheric moisture can trigger the seed dispersal and the timing of seed collection is crucial.

3.7.6: Training in seed collection

1. Experience in seed collection: It is essential to practice seed collection techniques that are not locally available in the most of TATR area as learnt from field visit from the field staff. Without sufficient experience, and practice labourers may cause unnecessary loss of seed material that is available in once in 40 years. It was also gathered that even during last gregarious flowering tribals from Chhattisgarh were engaged. This exercise of training proper seed collecting workers need to be focussed.

2. Field visits for seed collection: The area where flowering is in various stages is already known vis-a-vis wild animal habitat hence seed collection can be safely executed in their wild habitat. A staff member should be assigned following tasks

(a) Identify safe forest landscape to commence seed collection;

(b) Recording of latitude and longitude from a specific point from seed collection;

(c) Record locations of clumps and seed quantity collected on the GPS to further monitor the natural regeneration from the area.

3. First aid, health and safety measures: Seed collection will involve travelling to remote wildlife areas with low visibility. It is essential to asses all risks beforehand and to take steps to minimise the wild animal attack.

4: Seed collection field equipment

The following will be required. (1) GPS and field notebooks. (2) Bamboo loppers or billhooks, Secateurs, Throw lines, hooks. (3) weighted bags, Tarpaulin or buckets or baskets, gunny bags for collecting falling seeds. (4)First-aid kit.

CHAPTER -IV

The Management Plan
for Bamboo Removal in Tadoba Andhari Tiger Reserve Area

4.1 Area available for Removal of Dry Bamboo

The detailed compartment wise list of the core and buffer forest bamboo areas that have flowered gregariously so far till Dec-2020 and remaining waiting soon to commence flowering are appended as **Appendix-I, I-A and I-B**.

The abstract of above area is as under

Table - 10 - Abstract of Area available for Removal of Dry Bamboo

Area Description	Comptts. Nos.	Total Area	Bamboo Area	Bamboo Area % age
A) Flowering occurred in Core	121	40,348.91	17,583.00	66.6
B) Flowering Awaited in Core	62	17,775.02	7,111.00	29.4
C) No Bamboo in Core	11	24,25.814	0	4
D)Total Area (A+B+C) of Core	**194**	**60,549.75**	**24,694.00**	**100**
E) Flowered Area in buffer	68	26,370.16	23,153.92	49.06
F) Flowering Awaited Area in buffer	87	27,378.69	20,523.23	50.94
G) Total Bamboo Area in Buffer	**155**	**53,748.85**	**43,677.15**	**100.00**

4.2 Removal of Dry and Dead Bamboo - The Limitations

As the end result of the gregarious flowering of bamboo crop, the clumps die and dry up completely. This dry and dead bamboo material is highly inflammable and is fire hazard to rest of the vegetation and the wild fauna in core and buffer area.

The fire from such dry bamboo material is more disastrous unlike the common forest fires that dry vegetal ground surface litter, bushes, shrubs and to some extent trees. Preferably, for the protection from fire due to dry and dead bamboos post gregarious flowering, theoretically its entire removal though of paramount importance in the TATR but practically difficult, risky and not advisable because of majority of wild animals' habitat and legal issues involved.

In the current scenario of gregarious flowering that began in 2018 and will gradually likely to continue till 2023; the high threat and danger looms large to this important tiger habitat and is matter of topmost concern with following optimal strategy for removal of dry bamboo is considered.

4.2.1 Justification for Removal of Dry Bamboo Material.

The main objective for removal of dead clumps over the proposed sites in the core is to prevent large scale intense forest fires. As stated before, some 40% of the

TATR's area is occupied with bamboo—*Dendrocalamus strictus* which is now in a stage of synchronous flowering after a gap of some 40 years after the last such event during the 1980s. After synchronous flowering the clumps produce profuse seeds and then die. Tinder dry dead clumps occupying large tracts constitute a great fire hazard. The dead bamboo clumps as they get older tend to cant on one side and then may fall horizontally on the ground. The summer temperatures in Chandrapur district are very high and can peak at 47^0 C. High temperatures create thermals and strong winds. After catching fire the dead culms explode and rise on the thermals as firebrands. These can be carried over some distances to settle on the ground to start new locations of forest fires. The process is called 'spotting'. To fuel the fires further there is considerable leaf litter and larger woody debris on the forest floor to sustain fires at new locations. The situation can quickly get out of hand. Dousing such conflagrations under the given high ambient temperatures is extremely difficult and dangerous task since fire behaviour and intensities in bamboo occupied areas are unpredictable. The risk is eliminated during the rainy season and is reduced during the winter which is a temporary respite. The standard management strategy is to extract the dead clumps, and remove those from such sites for further disposal. Synchronous flowering of bamboo is slow and progresses to its full potential over a period of about three to four years, therefore the proposal to cut and remove the dying/dead bamboo clumps selectively from within the core that is mooted would need to be spread over such period, possibly two more summers or till such time by which the threat posed by dead bamboo clumps dissipates. As per the prevailing law and decisions of the Supreme Court such cutting and removal is unacceptable from protected areas—the core area of TATR in this case. In the earlier chapters a case for cutting and removal of dead bamboo from selected compartments of the core area with new firelines to arrest possible fires has been proposed. This does not involve sale of material which also has been stated. *This chapter is in support of removal of such dead clumps on the basis of ecological consequences of large scale fires and related imperatives.*

Both for core and buffer areas, bamboo removal post gregarious flowering, there are following options; considered and proposed.

1) **Agencies for Bamboo removal:** The work of removal of dry and dead bamboo material from core as well as buffer areas can be done with options to engage agencies in the following priority order.

(a) EDCs in TATR,

(b) Forest Development Corporation

(c) Private contractors

(d) Departmental working

2) **Disposal :** The area to be worked being large and quantum of material huge, there appear obstacles in easy disposal. The Covid situation which has been looming large, may further aggravate the disposal. However, the following options are to be considered under the law applicable to the PA.

   a) **Leaving in-situ :** As per the information available from the forest officers who were in the control of the forests in Chandrapur circle; like in the past, when the gregarious flowering took place from 1981-84, the clumps can be completely removed and dumped along small and large water courses to decompose naturally if the removal is not possible out side the TATR area because of lack of demand, or legal compulsions on disposal, or any other unforeseen events as measure of fire prevention. This possibility though remote, but needs to listed here.

   b) **Allotment to Industries :** Alternately, if there is demand from paper mills, allotting the bamboo bearing compartment for working under strict supervision of forest authorities to various paper mills in the country at predetermined rates. Such allotment can with option to remove by their vehicles.

4.2.2 The Removal of Dry bamboo material from TATR

4.2.2.1 Removal of Dry and Dead Bamboo in from Core Area

The limitations on bamboo removal working in the core zone will be more difficult in comparison to that of in buffer zone, where the bamboo working in Nistar Bamboo Working (Overlapping) Circle and Commercial Bamboo Working (Overlapping) Circle has been a regular activity. This biotic management activity has not hindered the conservation practices.

So the limitations in core area are elaborated hereunder.

1) After the long time protection, conservation, and management practices in TATR area over the last 4 decades since 1981-84's gregarious bamboo flowering, there is increase in the number of tigers, panthers and all other mammals and wild fauna; particularly within core zone. The population details are elaborated in the other part of this plan. Therefore, the removal of dry

bamboo by suitable means and method from ENTIRE CORE area will be disastrous to wild animals and it's habitat as well.

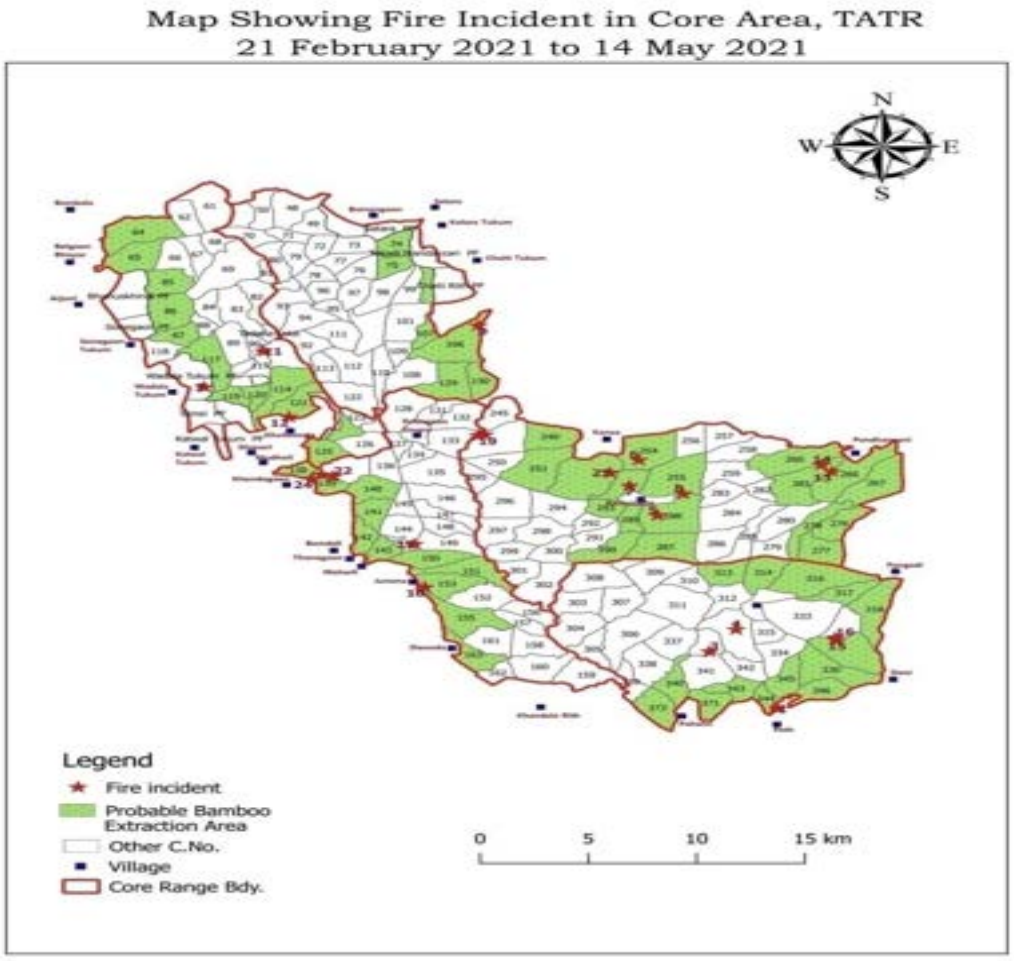
2) There never was a bamboo extraction operation from core zone unlike buffer, which has lead to very compact and congested clump formation making it highly difficult and laborious to remove bamboos. Even the removal that is inevitable from management and protection point will yield considerable unusable bamboo material due to compactness and entangled culms in the crop.
3) The human labour, machines and vehicles that will be required for removal of entire dry and dead bamboo will be biotic interference in the core disturbing the movements of wild animals for food, water and internal migration. The population of wild animals dispersing in the buffer area surrounded by human settlements will create fresh and increased man-animal conflict issues.
4) The natural regeneration that is coming up or will come up due to seed fall as observed during field visit will be to certain extent in the core area, get destroyed and will be big loss of natural rebuild of bamboo vegetation association as recorded during surveys.
5) The destruction of bamboo regeneration will be loss of restoration current habitat state and may harm the cover for wild animals.
6) It is observed that the very thin culms may not give the saleable bamboo bundles (about 50-60%) & the cost on harvesting may not fetch in the open sales. And it will be financially not also justifiable.
7) At places gregarious where the flowering in a clump has been completed & bamboo clumps have also fallen on the ground, process has started decomposing in-situ. Some such clumps are attacked by white ants. The decomposition process that has made bamboo culms fragile and brittle will be difficult to extract and hence are required to be left as such in the forest.
8) The core area has few human habitations and that too are in the process of rehabilitation outside TATR area. This situation has reduced biotic interference within the habitat and therefore, the lesser threat of fire.

However, the present human habitations do pose certain biotic threats including the fire, which is more serious and devastating. The fire threat has been evident from the recent data from Feb-21 to May-21 on fire incidences and has

been considered for recommending for removal of dry, dead and cracked bamboo from the gregariously flowered core area with following riders.

1) The removal is only to prevent fire spread and not for commercial purpose.
2) The dry bamboo removed will be stacked or dumped along the nalla bed or the sides of cleared strips to decompose naturally to form compost.
3) Use of JCB or similar machinery will be deployed for fast working of bamboo removal.

Map - 7 - Map of core zone comptts. showing fire incidences in TATR from February to May -2021



In case of fires in core area where the animal population is more and largely spread is at the risk. The young ones of wild animals are more vulnerable to get affected by fire. This risk of fire is more compelling to take actions to prevent fires within the vulnerable core area compartments adjoining the human habitations. And

that fire risk mitigation can be achieved by clearing of dry bamboo growth in the form of fire lines in criss-cross manner in the 55 comptts. as shown in the map.

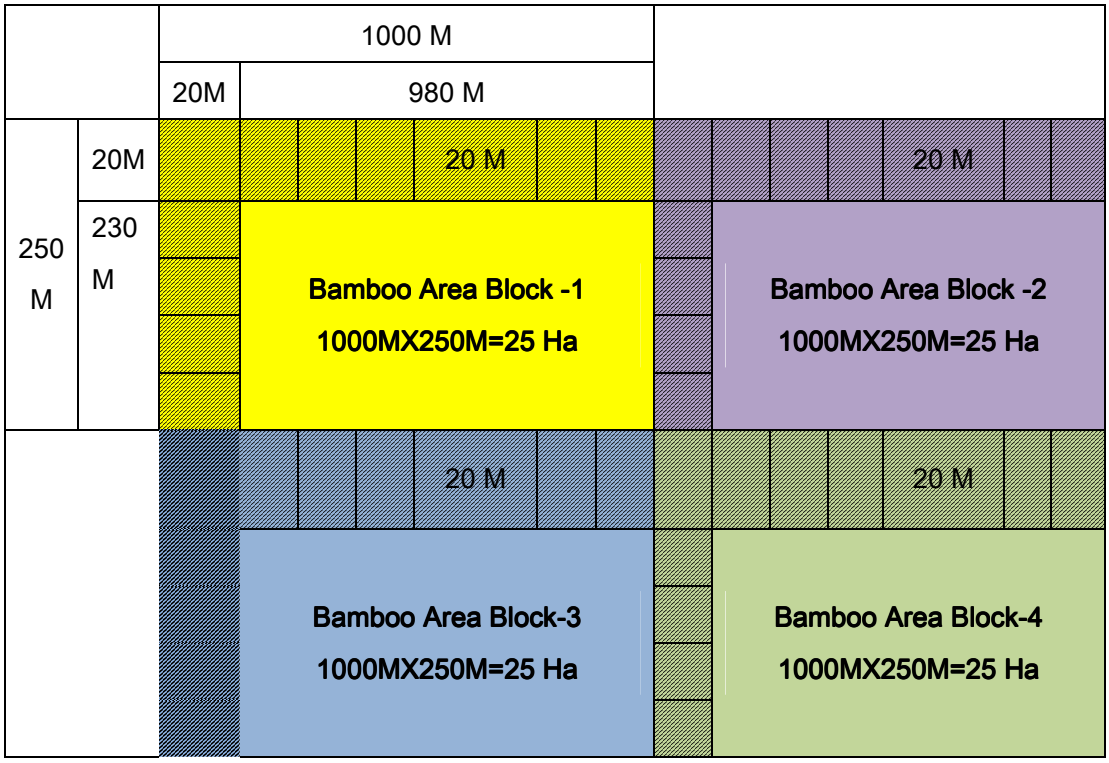
As an abundant precaution, to protect the core area from in the event of breakout of fire the dry bamboo removal in the form of strips to function as fire lines to limited extent, an optimum strategy has been suggested in the comptts. that are reported as fire prone.

Therefore the recommendation is for removal of dry, damaged/cracked bamboo clumps in strips over 55 compartments only as shown in the map and core area comptts. is listed as in **APPENDIX-VI** covering gross area of 20359 ha. (out of total core area of 62066 ha.), which is 9.8 % of comptt area . Further as proposed, the bamboo clumps in a strip of 25 M at every 1000 M interval

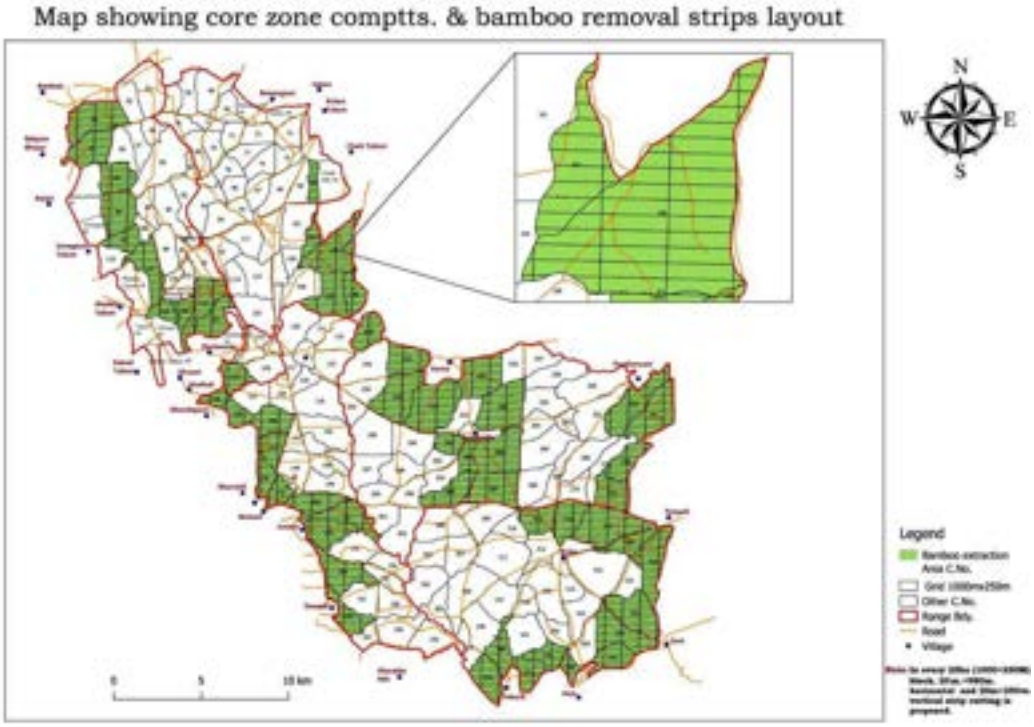
The design in which the dry bamboo removal will be done is as below .

Proposed Design for 25 Ha block for Bamboo removal in core area

In a 1000 M X 250 M size block of 25 Ha., all dead & dry bamboo will be removed from 20M wide strip (as fire prevention line) along the length and width as shown by hatching lines. The size of area cleared will be, 980X20 = 19600 + 250 X 20 =5000, Total -24600 Sq.M. The area of strips cleared will be 9.84% of the block of 25 ha.



Map -8 - Map of core zone comptts. and bamboo removal strips layout



4.2.2.2 Recommendations on dealing with dry and dead bamboo from core area.

1) In view of the discussion in para 4.2.2.1 above, **except for the 55 comptts as shown in Map -5, that are fire prone; it is Not proposed to remove the bamboo from other comptts from core area, by any method or by any mode to protect the wild animals and their habitat and continue to provide the same tranquillity and safety as exists.**
2) The action plan to deal with the perceived threat like fire and forest protection, habitat development, due to non removal is separately appended.
3) This plan also recommends insurance against fire for the entire estimated dry and dead bamboo yield, from core and buffer area both irrespective of its removal, as its valuation is proposed in the later paras.

4.2.3 Estimation of dead and dry bamboo from Core area 55 fire prone comptts

Using the current working plan provision in regarding bamboo working as applicable to adjoining the buffer area, the statement of total available yield of long bamboo and bamboo bundles from 20358.9 ha is appended as **Appendix - VI.**

As per the statement of total available yield, 98,30,857 long bamboo and 1,42,61,434 bamboo bundles form the total growing stock over 20,358.9 ha area of 55 comptts.

To protect the area from accidental fires in the fire prone 55 comptts, the design of fire lines to be created by removal of bamboo as described in detail above, only 9.84 % of area is required to be cleared off dead and dry bamboo growth, which comes to be 2003.32 ha.

The total area of core is 62540 ha. the removal of dead and dry bamboo is restricted to 2003.32 ha.; which is 3.2% as fire prevention measure, besides other fire protection activities.

Therefore based on the design, the removal of dead and dry bamboo material will be restricted to 9,67,356 long bamboos and 14,03,325 bamboo bundles, which is just and must to prevent the fires.

The APO for bamboo removal from 55 Core comptts to be phased in two years in given in table below. However the priority may be changed as per the sensitivity of fires and field officers shall take decisions accordingly.

Table-11- APO for bamboo removal from 55 Core comptts.

Year of working	Comptt. nos & Ranges	Total Area (Ha)	Bamboo Area (Ha)	9.84 % Area (Ha)	bamboo Long (Nos)	Bamboo Bundles (Nos)
2021-22	26 Nos-Tadoba & Karwa	10597	9173	1043	731792	684687
2022-23	29 Nos-Mohorli, Kolara & Kolsa	9763	7269	961	235564	372901
Total	55 Comptts	20360		2004	967356	1057588

The cost of work of clearing 2004 ha strips spread over 2 years is given in Budget Appendix- **IX** and is Rs.510.85 lacs and the cost bamboo material removal (Long Bamboo & Bamboo bundles is Rs. 724.51 Lacs spread over two years.




4.2.3.1 Recommendations on dealing with dry and dead bamboo from core area.

4) In view of the discussion in para 4.2.2.1 above, **EXCEPT** for the 55 comptts as shown in Map -5 that are fire prone; it **is Not Advised to remove the bamboo from other comptts from core area, by any method or by any mode to protect the wild animals and their habitat and continue to provide the same tranquillity and safety as exists.**

5) The action plan to deal with the perceived threat like fire and forest protection, habitat development, due to non removal is dealt separate chapters.
6) This plan also recommends insurance against fire for the entire estimated dry and dead bamboo yield, from core and buffer area both irrespective of its removal, as its valuation is proposed in the later paras.

4.2.4 Considerations for removal of Dry and Dead Bamboo from Buffer Area

The buffer area has not the compelling limitations as applicable to the core area, for the reason that there is regular practice of removal bamboo from Nistar Bamboo (Overlapping) Working Circle and also from Commercial Bamboo (Overlapping) Working Circle as prescribed in the working plan for the period from 2014-15 to 2023-24 by Dr. Pravin Chavan.

Also, the area of buffer is almost twice that of the size of core, which provides good space for the wild animals for movement should any biotic interference take place.

Hence, the removal is legally, practically permissible from the buffer area.

4.2.4.1 Recommendations on dealing with dead and dry bamboo from Buffer area.

Moreover the buffer area is surrounded by 79 habitations which cause biotic interference in the wildlife habitat by way of grazing, collection of fuel, fodder, and non-wood forest produce like Moha (Madhuca indica) flowers. Such activities create high risk of fire at a time when the dry and dead bamboo as combustible material is available at its peak on account of the phenomena of gregarious flowering.

Moreover the buffer area is surrounded by 79 habitations which have CFR rights and there activities do cause biotic interference in the wildlife habitat by way of grazing, collection of fuel, fodder, and non-wood forest produce like moha flowers. Such activities create high risk of fire at a time when the dry and dead bamboo as combustible material is available at its peak on account of the phenomena of gregarious flowering.

After consideration of the above deliberations, the complete removal of dead and dry bamboo on account of gregarious flowering is recommended from the buffer area in the best interest of protection of forests, wildlife and the entire ecosystem.

4.2.4.1 Estimation of dead and dry bamboo

4.2.4.2 Observations on Bamboo Growth

The consultant team during the visit to bamboo area collected some data on growth

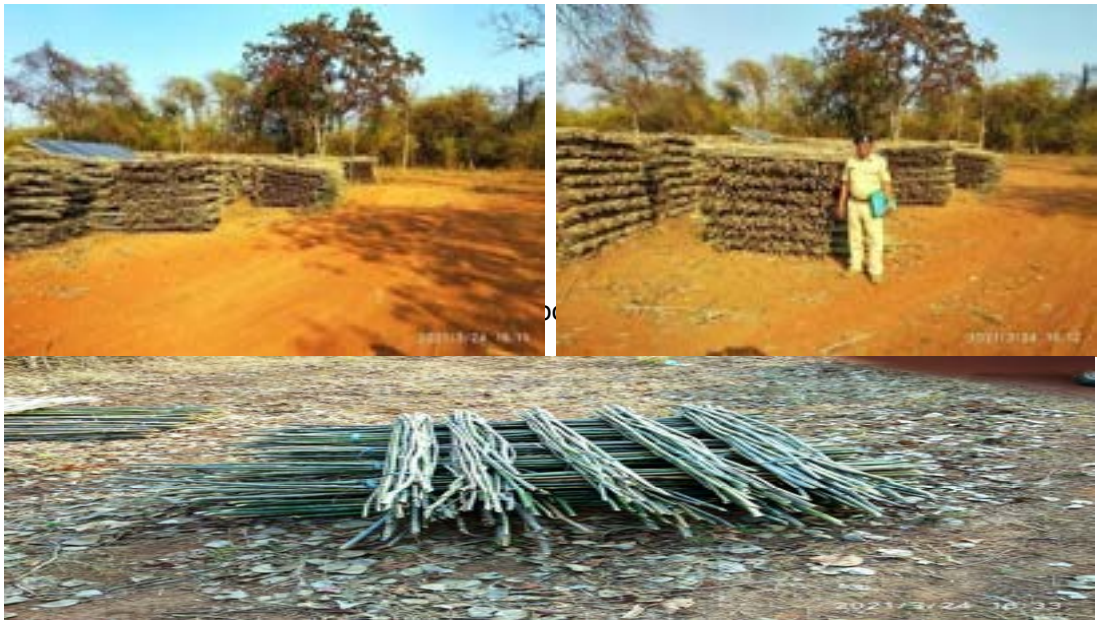
of bamboo by measuring the girth of bamboo culms with help of local staff in some bamboo area as under and the results as mentioned below.

Table -12 - Bamboo Culms Growth Data in sampled comptts.

Sr. No.	Sample Location	Girth class	Nos. of culms in a clump	Girth wise %age composition in clumps
1	Comptt. Nos.143	Below 6 cm	0	0
		6 - 9 cm	6	50
		Above 9 cm	6	50
		Total	12	
2	Comptt. Nos.183	Below 6 cm	0	0
		6 - 9 cm	2	16
		Above 9ccm.	11	84
		Total	13	

This indicates that the old crop of bamboos shows marked difference in girth growth. The team also noted that the cutting rules of bamboo are not fully followed, i.e. dead, dying, diseased, and malformed culms were not retained during cutting of bamboo in spite of supervision. The accompanied staff revealed that the labourers were reluctant to cut and convert into bundles the completely dried dead bamboos.

The harvested bamboos were stocked in local depot at Karawa for sale conducted alongside at Chichpalli main sale depot.



4.2.4.3 Basis for Bamboo Yield Estimation in Buffer zone

There has been regular working of bamboo area in Palasgaon (Buffer) range during the year 2018-19 in consonance with the working plan in operation for the period from 2014-48 to 2023-24 by Dr. Pravin Chavan.

The bamboo harvesting was carried out both in the Nistar Bamboo (Overlapping) Working Circle and Commercial Bamboo (Overlapping) Working Circle after preparing work estimate and approval by competent authority.

The details of estimated bamboo and bamboo bundles in nos., length, and weight form are given below to form the basis for yield estimation in entire buffer area. So also, the same statistical information is used for core area bamboo yield as the area is contiguous, crop composition, edaphic and climatic conditions are identical.

Table -13 - Yield Estimations based on Actual yields of Long Bamboo and Bundles from Nistar and Commercial Bamboo WC in Palasgaon range worked in 2018-19

Sr. No.	Forest Beats	Bamboo BCS		Area (Ha)		Bamboo Yield	
			Comptt Nos	Total	Bamboo	Long Bamboo	Bamboo Bundles
1	Parna	Vihirgaon Nistar BCS	231	259.81	259.81	5222	3999
2	Palasgaon-1	Vihirgaon Nistar BCS	238	152.16	33.59	1018	724
3	Karwa-2	Vihirgaon Nistar BCS	240	554.07	385.26	6704	5783
4	Gondmahadi	Vihirgaon Nistar BCS	241	315.63	150.55	2620	3208
	Total	Vihirgaon	4 Nos	1281.67	829.21	15564	13714
(A) Average yield per Ha. in BCC in Nistar Bamboo Working Circle						19	17
(B) Bamboo Yield per Ha. on complete removal in Nistar Bamboo Working Circle (3 Times of A)						57	51
5	Madnapur	Palasgaon Com.BCS	105	369.79	234.73	13873	6488
6	Vihirgaon-1	Palasgaon Com.BCS	221	297.86	2.43	114	50
7	Vihirgaon-1	Palasgaon Com. BCS	222	311.21	73.24	4197	1675
8	Gondmahadi	Palasgaon Com.BCS	223	349.66	93.9	1296	1316
9	Palasgaon-2	Palasgaon Com.BCS	224	222.66	222.56	2337	1113
10	Palasgaon-2	Palasgaon Com.BCS	225	319.69	319.26	3927	2433
	Total		6 Nos	1870.87	946.12	25744	13075
(C) Average yield per Ha. in BWC in Commercial Bamboo Working Circle						27	14
(D) Bamboo Yield per Ha. on complete removal in Commercial Bamboo Working Circle. (3 Times of C)						81	42
(E) Total Yield on complete removal in Nistar & Commercial Bamboo WC				3153	1775	123924	80367
(F) Ave. yield / Ha. on complete removal in Nistar & Com. Bamboo WC						70	45
Ave. yield of long bamboo & bamboo bundles in length/ ha. (RMtr)						279	91
Total Ave. yield of bamboo & bamboo bundles / ha. in Length (RMtr)						370	
Yield of Bamboo / Ha. in weight (2000 RMtr = 1 Notional Ton)						0.185	

4.2.4.3 Bamboo Yield Estimation for Actual Removal of bamboo

As discussed in paras earlier, considering the various conservation, protection and management issues, the removal of dry, dead bamboos from the core area of 605 sq. km. is not considered for the yield estimation purpose.

Based on the above calculations, as tabulated above the yield data for Palasgaon range, as the basis; the likely estimated yield of bamboo from the buffer area of which under the natural process of gregarious flowering and from where the entire bamboo growth is recommended for removal is shown in the table below.

It is very important to note that, once the gregarious flowering of bamboo takes place in clump, the culms die and dry up completely, and it is practically not feasible to get long bamboo during removal. The only bamboo material available is bamboo pieces, which are converted into bamboo bundles usable for agriculture or as raw material for pulp and paper mills.

Table -14- APO of Bamboo Removal and Yield Estimation from Core and Buffer area to be harvested

Operational Years	2021-22			2022-23		
Working Area and bamboo yield rate	Area (Ha)	Long Bamboo Yield	Bamboo Bundles Yield	Area (Ha)	Long Bamboo Yield	Bamboo Bundles Yield
Core Division- Fire prone 55 Comptts. only	10597	731792	684687	9763	235564	372901
Buffer Divn. Nistar WC. @ 57 long bamboo/Ha & 51 bundles/ Ha.	13513.9	770291	689208	7837	446717	399695
Buffer Divn. Commercial WC @ 81 long bamboo/ Ha & 42 bundles / Ha.	9640.04	780843	404882	12686	1027572	532815
Total	**33750.94**	**2282926**	**1778777**	**30286**	**1709853**	**1305411**
Grand Total of Estimated Yield of Bamboo						
Bamboo Material	**Nos**	**Conversion factor for llength**		**Yield In RMtr**	**Conversion factor for Tonnage**	**Yield In Notional Tons**
Long Bamboo	3992779	1Long Bam. = 4 RM		15971116	2000 RM = 1 Notional Ton.	7985
Bamboo Bundles	3084187	1 Bundle = 20 RM		61683740		30842
Grand Total				**77654856**		**38827**

Note : If any area remains harvested that will be tackled during 2023-24

4.2.3.4 Bamboo Removal Agencies

Before any action is taken towards removal of dry bamboo the 79 villages surrounding the TATR area which have the Community Forest Rights (CFR) under

the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act 2005, will be discussed with about their rights if any, in respect of bamboo and also their participation in the various works arising out of gregarious flowering.

Where the CFR exists, the management authorities need to leave such area for them to execute removal. The EDCs having community forest right areas shall be guided for harvesting & disposal of flowered bamboos by the Field Director of TATR. Both, the quantum and the bamboo removal area are large and the availability of the period for collection is comparatively short; so the work of removal of dry and dead bamboo needs to be planned for the engagement of capable working agencies.

There are following options available to dispose of the huge quantity of dry and dead bamboo.

1) By allotting areas to one or many paper/pulp mills for removal of bamboo with due approval of the govt. as was done during 1981-84 period
2) By engaging EDCs formed in/around villages in/around TATR
3) By engaging FDCM, this has man power, finances and experience to handle the work.
4) By engaging contractors by following tender system
5) By departmental working of bamboo area by engaging labourers.

The first option has advantage over the other agencies that, the material will be also disposed and there will be no need to establish depot, conduct sale

In the area, where departmental work is be done local labours can be engaged and if need be through the labourers from Chhattisgarh state.

4.2.4.5 Accounting of Bamboo Removal and Disposal

The work of bamboo removal is going to be spread over large area with many exit routes and may be, there may be multiple agencies as the time available will be short. The removal has to be compulsorily done within a year of flowering; otherwise the dry bamboo is likely to get damaged by decomposition, insect attack etc.

In such scenario, for the purpose of accounting and control over removal of dry bamboo material is proposed to be achieved by installation of weighing bridge at Sindewai on Chimur– Palasgaon– Shioni– Naleshwar– Sindewahi Road from where every vehicle has to pass to record the bamboo load. The consumers like paper mill prefer bamboo on weight basis and weighing bridge will be necessity.

The Buffer has following network of major district roads:

1) Chandrapur to Moharli Road

2) Moharli to Chandankheda–Mudholi–Khadsangi Road
3) Khadsangi to Navegaon (Ramdegi) Road
4) Chimur– Palasgaon– Shioni– Naleshwar– Sindewahi– Road
5) Pangdi–Petgaon to Rajoli Road

However the fixation of bamboo removing agency, location of depot for temporary storage will be the deciding factor for the weigh bridge and weigh bridge site may be relocated.

This will also facilitate accounting and monitoring of bamboo removal progress, yield availability, and money to be realised from the purchasers.

4.2.5 Insurance of Bamboo material against Fire

4.2.5.1 The Necessity for Insurance

Bamboo growing stock is state government property and subjected to increased risk of fire on account of gregarious flowering when it is going to be dead and dry, and if not removed is subjected to damage, decay and decomposition causing loss to public exchequer. The risk of fire to such dry material is eminent after removal. To safeguard the state interest, it is required to be insured against fire.

Currently, as a normal safe guard the harvested bamboo is insured against fire risk in FDCM which is main bamboo exploitation agency in Chandrapur district.

As per the information gathered from the past forest officers who handled the gregarious bamboo flowering and removal during 1981-84, the insurance was taken for the bamboo material exploited from the then national park, which is now, designated as the core area in TATR.

Therefore, as precedence and the need to secure the state interest, it is recommended to insure the entire estimated yield of dry and dead bamboo due to the natural phenomena of gregarious flowering and the seed of bamboo estimated to be available.

Any decision not to insure the bamboo and seed, in the event of accidental fire and subsequent loss, may be point of audit in future.

4.2.5.2 The Valuation of Bamboo material for Fire Insurance

Currently, National Insurance Company and Oriental Insurance Companies are providing insurance for bamboo material exploited from regularly worked coupes by the FDCM in Chandrapur district.

As per the details gathered, bamboo material insured for the charges incurred for harvesting including haulage to storage depot, and not on the basis of the market

value of the goods price as is the general practice. The premium rates received from National Insurance Corporation by the FDCM office Rs. 12.276 per thousand (excluding GST) i.e. Rs. 0.012276 lac per lac of harvesting cost.

Therefore, the likely premium charges payable based on the charges incurred for harvesting including haulage to storage depot, of the bamboo material from core and buffer area that has to be sold has been done and discussed in case of buffer area in para supra are shown below table.

Table - 15 - Harvesting cost of Bamboo Material from Core and Buffer area for Fire Insurance purpose

Operational Years		2021-22			2022-23	
Working Area and bamboo yield rate	Area (Ha)	Long Bamboo Yield (Nos)	Bamboo Bundles Yield (Nos)	Area (Ha)	Long Bamboo Yield (Nos)	Bamboo Bundles Yield(Nos)
Core Division-	10597	731792	684687	9763	235564	372901
55 Comptts	Wage Rate/ 100Nos	3010	4900		3010	4900
	Harvesting cost	22026939	33549663		7090476	18272149
Buffer Divn. Nistar WC.	13513.9	770291	689208	7837	446717	399695
@ 57 long bamboo /Ha & 51 bundles/Ha.	Wage Rate/ 100Nos	3010	4900		3010	4900
	Harvesting cost	23185759	33771192	0	13446182	19585055
Buffer Divn. Commercial WC @81 long bamboo/Ha & 42 bundles/Ha.	9640.04	780843	404882	12686	1027572	532815
	Wage Rate/ 100 Nos	3010	4900		3010	4900
	Harvesting cost	23503374	19839218	0	30929917	26107935
Total -Yield of Bamboo	33750.94	2282926	1778777	30286	1709853	1305411
Harvesting cost	Grand Total	68716073	87160073	0	51466575	63965139
Year wise Total Harvesting Cost for Insurance purpose		Rs. 1558.8 Lacs			Rs. 1154.3 Lacs	
Premium rate Rs.0.12276 lac per lac of harvesting cost (Rs. in Lacs)		19.14			14.17	

Based on the harvesting cost of Rs. 2713.01 Lacs for Bamboo material from 55 fire sensitive comptts and entire buffer division @ Rate of premium of Rs. 0.12276 lac per lac of harvesting cost will be Rs. 33.31 Lacs.

** **

CHAPTER -V

The Management Plan for Bamboo Regeneration in Tadoba Andhari Tiger Reserve Area

5.1 The perspective on Regeneration and Plantation in the Current Plans

The current management plans for core and buffer area have the following discussions, mentions, references and comments related to the two terms, "regenerations" and "plantations" in various chapters; which have trickled in these guiding management documents from the various studies, references and observations by variety of forest officers and scholars.

1) *In the year 1982-83 the gregarious flowering of Bamboos occurred in the forest area of Chandrapur District, including the Tadoba National Park. Due to this flowering, the whole Bamboo crop dried and was harvested. The subsequent regeneration of Bamboo has come up in this area naturally and profusely. The area of Andhari Wildlife Sanctuary was excluded from the prescriptions of working plan in the year 1989.*
2) *Some of the plots evaluated by **TFRI Jabalpur have indicated adverse effect of Bamboo under-growth on regeneration and suppression of biodiversity. Therefore they have indicated that growth of other important species is affected. Some reduction in Bamboo may be made for good growth and regeneration. Therefore, in future we would like to study the impact of such clearance on the regeneration and also on Diversity Index.** In some of such reports it is suggested by them to continue the regular Silvicultural Management practices in order to maintain the proper status of preservation plot.*
3) *Bamboo flowering took place in 1982. **Next bamboo flowering of dendrocalamus strictus, may take place after 35-40 years of last flowering. Therefore a strategy in case of gregarious flowering as it will affect habitat, cover, forage and threat of fire will be as follows.***

   1) As soon as gregarious flowering in noticed this will be reported to PCCF (Wildlife) and NTCA, and further guidelines regarding tackling of issue will be solicited.

   2) In case of gregarious flowering. The area will be strictly fire protected.

   3) The dead culms will be removed or burnt with the permission of authority.

   4) The regeneration of new bamboo plants will be protected.

5) The water conservation works for new bamboo plants will be taken up.

4) Research Projects:

Following projects are proposed to be taken up on priority:

VII) Study of bamboo congestion and area used by wildlife.

5.2 The field observations on Natural Regeneration

The Sevak Team of 4 members, during visits to gauge the scenario of Bamboo NR status in TATR and particularly various gregariously flowered comptts. nos. 141, 124, 131,143, 183,303, 307,309, 310, 311,313 we randomly chanced upon. The Team made certain observations and also noted the field findings of the field staff as under.

1) In some of dry and dead bamboo clumps, regeneration was noticed and in progress.
2) Where gregarious flowering is in advance stage but still has not covered entire area of compartment area, there is natural regeneration of species like Surya (Xylea xylocarpa), Bondara (Lagerstromea lanceolata), Tendu (Diospyros melonoxylon) and Bamboo (Dendrocalamus strictus).
3) NR of bamboos and light demanding tree species is noticed in the open spaces created due to flowering of bamboos.
4) The new regeneration is not grazed by wild herbivores
5) In the non-forest private area, the farmers need to be motivated to plant new tissue culture bamboo species as recommended by Maharashtra Bamboo Development Board.

5.3 Recommendations for Regeneration Works

The team recommends the following guidelines for NR and AR for bamboo that has to planned and executed over 3 years after gregarious flowering as under.

Common to both core and buffer area, in each compartment about 0.50 ha. Bamboo regeneration plots should be laid out, fenced with the bamboo material fence to monitor the bamboo seedling health and its growth. This work can be entrusted to the fire watchers/supernumerary labourers, staff and observations analysed quarterly by a software to be developed by botanist and foresters jointly.

5.3.1 Recommendations for Core Area :

1) Similar to compartment survey done for gregarious flowering of bamboo, field survey for natural regeneration be done in the month of October by taking sample plots over 0.50 ha. each covering 1% of the bamboo flowered area

(Not the gross comptt. area). The sample should to have 280 new bamboo seedlings per ha. to be considered as good regeneration. Any less bamboo seedlings to extent of 20%, but with regeneration of other tree species should be considered adequate vegetation mix.

2) In their past field study reports, the TFRI Jabalpur has indicated adverse effect of bamboo under-growth on regeneration and suppression of overall biodiversity and has indicated that growth of other important species is affected. They have also suggested for some reduction in Bamboo regeneration for good growth and regeneration of tree spps. Based on these elaborations, no additional bamboo plantations are recommended in core area if the comptt. has natural regeneration of bamboo.
3) As per the past observations from previous gregarious flowering abundant natural bamboo regeneration is expected and more so along the edges of openings in forest canopy like water courses, fire lines and roads and rehabilitated village sites. As additional steps are being taken to take up more fire lines in large comptts to create blocks of about 200 ha., there is going to be more extensive NR of bamboo in core.
4) ANR of bamboo with following specifications is proposed and recommended where the habitat demand after reconnaissance survey. The APO of ANR proposed in the following paras.
5) There are likely to gaps in the core area occurring at end of the gregarious flowering of bamboo that are to be tackled under AR.

5.3.2 General guidelines for Regeneration for core and Buffer Area

5.3.2.1 Assisted Natural Regeneration

As per the current working plan, the bamboo exploitation has been regularly done in the bamboo comptts. that are managed under two overlapping bamboo

1) Here too, similar to compartment wise survey done for gregarious flowering of bamboo, field survey for natural regeneration be done in the month of October by taking random sample plots over 0.25 ha. each covering 1% of the bamboo flowered area (Not the gross area). The sampling should ensure to have 280 new bamboo seedlings per ha. Any less bamboo seedlings to 20% , but with no regeneration of other tree species should be considered for gap planting. The minimum area for gap planting be cut off over 5 ha. from management point .

2) As the buffer areas will continue to be worked for bamboo under Nistar rights and commercial bamboo harvesting, the growing stock of bamboo needs to be maintained with ANR for bamboo spps.

At present no specific sites or number of seedlings are suggested in view of specific data. The guidelines as prescribed in the PCCF (HoFF) Nagpur's Circular No. 1469 dtd. 6-12-2014, (Appendix- VII) be followed. The guidelines silviculturally and financially prudent, and safe guards the technical operational procedure.

3) The brief salient features outlined in this circular are as under.

a) **Grid Map** : The proper treatment map will be prepared using GPS machine on scale of 1:5000. The grid lines of will be laid at 100M X50 M . The grids will be marked on ground with cement pillars at the cross section grid line and properly numbered to facilitate monitoring upto 10 year long period. The boundaries of area selected for regeneration treatment will be clearly demarcated on the ground using GPS set.

b) The treatment map for the regeneration area will be prepared in details showing all outer boundaries, TCM or other type of fencing, roads, encroachment, soil zonation, tree cover with density, proposed soil and moisture conservation works like contour trenches, forest tanks, Nala bunds, CCT, WATs, Grass beds, fire lines, inspection paths, rocky patches etc.

c) Where natural regeneration is less 200 seedlings per ha., only then artificial generation will be undertaken.

d) The estimate of regeneration works should be site specific and area should in the estimate must tally with the GPS polygon. The technical and administrative sanction should be given to the estimate by the competent authorities and proper records maintained.

e) **Natural Regeneration** : In area to be treated for natural regeneration the maximum number of 200 plants per hector will the ceilings kept and the excess plants will be removed so as to maintain the approx spacement of 4M X 4M. While cleaning the area in natural regeneration valuable and endangered species will not be removed. In the natural regeneration area cultural operations like weeding, soil working, singling of seedlings, de-budding will be done. The valuable species like teak, khair, amaltas, awala, bija, tiwas, charoli, will be listed grid wise and record kept in

platation register. The funds provision for their maintenance will also be shown in the estimate.

f) **Regeneration Works Estimate:** It will be site specific in accordance with the treatment plan and not as per the model rate structure. The estimate prepared for 6 years from PPO to Fifth Year Operations with funds provision for operations like protection, fire tracing,

g) No planting will be done below large trees and within 3 metres of tree crown area on the ground. So also No planting will be done in the fire line strips.

h) **Protection Fence** : For the protection of plantation from damage of grazing cattle proof trench or live age fencing will be done. Trench bund be planted with thorny plants, bamboo etc. Where stones are available in aplenty, 3 feet tall and 1 M wide dry rubble wall will be advisable. In certain cases barbed wire fencing can also be taken.

i) **Fire Protection**: For fire protection, section of 4-5 ha will be formed within the plantation and every section will have 4 metre wide fire line. Outer boundary of plantation will have 6 M wide fire line.

j) **Species**: Local will be planted planting besides valuable species like moha,bija awala, jamun, karanj, semal. For plantation exotic spaces will not be planted in any case.

k) **Plantation Register**: It will be prescribed printed form and will be maintained with all the entries to be taken from time to time. The information will be updated timely. Every forest officer inspecting the plantation shall enter is inspection note in the plantation register. It will also have technical and administrative approval details of the estimate and grid-wise details of species planted and survival of the seedlings till 5 years.

l) **Bamboo Plantation :** With regards to bamboo plantation, seedlings will be planted deep below the ground level to avoid damage from wild boar preferably in deep pits.

The ANR should be started in the next year following the bamboo removal can be phased in view of large area getting NR from the year 2021 onwards. The areas to be prioritised and phased be for ANR can be based on the regeneration

results. Areas with lesser growth rates need to priority as there future growth will regulate the bamboo yield.

5.3.2.2 Assisted Natural Regeneration in Core area

Following physical targets are suggested for ANR operations

Table -16 - Physical Targets for ANR in Core area

Year	2021-22	2022-23	2023-24	202425	2025-26
Target	500	500	500	500	500

The rate structure used in Green India Mission (CSS) is given below and the funds required are indicated in the **Appendix** - IX of Budget

Table -17 - Plantation Rate Structure for Assisted Natural Regeneration

Scheme for Assisted Natural Regeneration under Green India Mission (CSS)
Treatment : 425 NR plants per Ha, Daily wage -Rs. 400/day

Sr. No.	Operation	M'Days	Wages	MS	Total
1	PPO/PYO	31	12400	470	12870.00
2	3 % Cont.+7% Labour Welfare				900.90
	(A) Total -PPO/FYO				13770.90
3	FYO	51.35	20540	757	21297.00
4	3 % Cont.+7% Labour Welfare				1490.79
	(B) Total-FYO				22787.79
	Grand Total -A+B	**82.35**	**32940**	**1227**	**36558.69**
	Say				**36559.00**

5.3.2.3 Artificial Regeneration as Gap Plantations in core area

The following physical targets are proposed where the bamboo regeneration fails to come up in the forest area of core area.

Table -18 - Physical Targets for AR in core area

Year	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
Plantation Operations	Bamboo Plantation Target (Area in Ha)					
PPO/PYO	300	300	300	300	300	
FYO		300	300	300	300	300
SYO			300	300	300	300
TYO				300	300	300
IVYO					300	300
VYO						300

The gaps or blanks where the NR has failed needs to be immediately identified, surveyed, mapped and demarcated on the ground to take up bamboo plantation.

The following approved model and sanctioned rate structure be followed.

Table- 19 - Rate structure for Gap Plantation in core area Model No.8-A

as per PCCF (HoFF) MS No. 2282 dtd.7-3-2018			Spacement	Pit Size (in cms)	Plants/Ha	Wages/day
			6 M X 6 M	45 X45x45	278	Rs. 403.00
Sr.No.	Year	Mandays	Wages	M.S.	O. Exp	G. Total
1	PPO/PYO	125.84	50714.00	6738.00	3185.00	60637.00
2	FYO	61.13	24635.00	1958.00	1455.00	28048.00
3	SYO	47.26	19046.00	559.00	1058.00	20663.00
4	TYO	49.45	19928.00	0	1066.00	20994.00
5	IVYO	39	15717.00	0	841.00	16558.00
6	VYO	39	15717.00	0	841.00	16558.00
	Total	361.68	145757.00	9255.00	8446.00	163458.00

5.3.2.4 Assisted Natural Regeneration targets and Rate structure in Core area

Following physical targets are suggested for ANR operations

Table -20 - Physical Targets for ANR in Core area

Year	2021-22	2022-23	2023-24	202425	2025-26
Target	500	500	500	500	500

The rate structure used in Green India Mission (CSS) is given below and the funds required are indicated in the **Appendix -I X** of Budget

Table -21- Plantation Rate Structure for Assisted Natural Regeneration

Scheme for Assisted Natural Regeneration under Green India Mission (CSS)
Treatment : 425 NR plants per Ha, Daily wage -Rs. 400/day

Sr. No.	Operation	M'Days	Wages	MS	Total
1	PPO/PYO	31	12400	470	12870.00
2	3 % Cont.+7% Labour Welfare				900.90
	(A) Total -PPO/FYO				13770.90
3	FYO	51.35	20540	757	21297.00
4	3 % Cont.+7% Labour Welfare				1490.79
	(B) Total-FYO				22787.79
	Grand Total -A+B	**82.35**	**32940**	**1227**	**36558.69**
	Say				**36559.00**

The budget cost for the above AR activities are shown in the budget Appendix. X

5.3.3 Artificial Regeneration in Buffer zone

Where NR of bamboo fails to come up such areas will be brought under

bamboo cover by artificial regeneration of bamboo for which reconnaissance surveys are to be conducted in the buffer area comptts.

5.3.3.1 Artificial Regeneration as Gap Plantations in Buffer zone

The following physical targets are proposed where the bamboo regeneration fails to come up in the forest area of buffer area.

Table -22 - Physical Targets for AR in Buffer area

Year	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
Plantation Operations	Bamboo Plantation Target (Area in Ha)					
PPO/PYO	300	300	300	300	300	
FYO		300	300	300	300	300
SYO			300	300	300	300
TYO				300	300	300
IVYO					300	300
VYO						300

The gaps or blanks where the NR has failed needs to be immediately identified, surveyed, mapped and demarcated on the ground to take up bamboo plantation.

The following approved model and sanctioned rate structure be followed.

Table- 23- Rate structure for Gap Plantation in Buffer area

Model No.8-A as per PCCF (HoFF) MS Nagpur's No. 2282 dtd.7-3-2018			Spacement	Pit Size (in cms)	Plants/Ha	Wages/day
			6 M X 6 M	45 X45x45	278	Rs. 403.00
Sr.No.	Year	Mandays	Wages	M.S.	O. Exp	G. Total
1	PPO/PYO	125.84	50714.00	6738.00	3185.00	60637.00
2	FYO	61.13	24635.00	1958.00	1455.00	28048.00
3	SYO	47.26	19046.00	559.00	1058.00	20663.00
4	TYO	49.45	19928.00	0	1066.00	20994.00
5	IVYO	39	15717.00	0	841.00	16558.00
6	VYO	39	15717.00	0	841.00	16558.00
	Total	361.68	145757.00	9255.00	8446.00	163458.00

The budget cost for the above AR activities are shown in the budget **Appendix-X**

5.3.3.2 Artificial Regeneration in CFR areas and private lands

There 79 human settlements surrounding the TATR with admitted community forest rights over forest land its biomass in original forest divisions - Chandrapur and Bramhapuri areas of which were included in the buffer zone. These villages also have private land holdings as listed as under.

Table - 24 - Details of private lands in villages around TATR to tackled for Bamboo Regeneration

Forest Division	Tahsil	No. of Villages	Area in Ha.
Chandrapur	Chandrapur	18	5408.06
	Bhadravati	15	14227.32
	Warora	03	1700.01
	Chimur	07	4610.85
	Sindewahi	15	4791.22
	Mul	08	4597.81
	Total	66	35335.27
Bramhapuri	Chimur	08	3442.33
	Warora	05	1371.42
	Total	13	4813.75
	Grand Total	**79**	**40149.02**

To begin with 5 % private area (as mentioned in the Table -15 above i.e. 1000 ha.) and equal area from CFR assigned areas say 1000 Ha. be brought under bamboo plantations with aim to divert dependence on buffer area that is felt as of now.

Table -25 - Physical Targets for AR in CFR and Private lands in Buffer area

Year	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
Plantation Operations	Bamboo Plantation Target (Area in Ha)					
PPO/PYO	2000	2000	2000	2000	2000	
FYO		2000	2000	2000	2000	2000
SYO			2000	2000	2000	2000
TYO				2000	2000	2000
IVYO					2000	2000
VYO						2000

The budget cost for the above AR activities are shown in the budget **Appendix-IX** These areas need to be managed for bamboo crop with more emphasis being on increasing the bamboo production to meet the growing demand. There is also need for intervention to have more bamboo species in such area s that will meet specific requirements of all end users.

The identification bamboo spps for multiple uses and pan Maharashtra climatically sustainability has been already done by the Maharashtra Bamboo Development Board as under to follow.

1) Bambusa balcoa

2) Bambusa nutans

3) Dendrocalamus asper

4) Dendrocalamus brandissi

5) Dendrocalamus longispathes

6) Bambusa tulda

7) Bambusacacharensis

8) Bambusa vulgaris

9) Bambusa polymorpha

10) Dendrocalamus hamiltonie

11) Bambusa bambos

12 Oxytenthra stocksii

13) Dendrocalamus strictus

The outreach needed to introduce of these with collaboration of MBDB as it will in long term beneficial to mitigate man-animal conflict and will be additional booster in eco-development activity.

The detailed artificial regeneration of bamboo scheme will be prepared for tackling these CFR area and the private lands from all villages may be prepared and funds sought from DPDC,RDD, Tribal Welfare Dept. State or Central plans or NTCA The fund requirement is shown in the **Appendix -IX - Budget**

The following plantation model is suggested for CFR and other govt. lands in 79 villages.

The rate structure with 278 seedlings per ha. at 6X6 M spacement (**Table- 24**) recommended for AR in buffer zone.

6 Soil And Moisture Conservation

Soil and Moisture Conservation in any forest area is supportive operation for supporting the regeneration both natural and artificial. It also helps in strengthening the water regime. Also this helps in maintaining the water flow from the natural stream in its vicinity.

The current working plan has made following observations regarding the SMC work operations.

"Soil and moisture conservation works have been done in the last plan and they needs to be continued. These works are specially required in the P.F. areas". There is even schedule of operations mentioned in para13.6 (Page 108)

There are SMC treatments prescriptions proposed in the habitat development part of this report as under

1. Dry bamboo wood bunds in non-perennial nalla beds at the rate of 200 nos. per year.
2. Dry bamboo wood bunds along contour in undulating land at the rate of 1000 RM per year.

this section, the soil and moisture conservation works are proposed as under

(a) CCT treatment to 2000 ha. per year for 5 years covering both core and buffer areas.

(b) The areas taken up for ANR, AR should be first priority as this will support growth of bamboo and other species.

(c) The general principles like tackling a micro shed as a unit of land treatment, ridge to valley bottom approach and areas that are facing sheet erosion to be attended on priority, etc. will be followed.

The appropriate model of CCT relevant to the local rainfall conditions will be followed and rate structure applicable to the funding source like MREGS, Plan scheme, CSS scheme as the case maybe.

Adhoc provision of Rs. 100 lacs is being made in the Appendix to carry out SMC works.

Table - 26 - APO of SMC works in TATR

(Area in Ha)

Area and Year	2021-22	2022-23	2023-24	202425	2025-26
Core zone	500	500	500	500	500
Buffer zone	500	500	500	500	500
Total	1000	1000	1000	1000	1000

CHAPTER -VI

The Budget Requirement and Physical and Financial Targets

6 The Background for Budgeting

The gregarious flowering of bamboo that is commenced on small scale in TATR area from 2018-19 and attained its climax during 2020-21, has necessitated to undertake certain management interventions in relation to dry and dead bamboo removal, wildlife protection, habitat management, fire protection and eco-tourism management for the interest of ecological sustainability, conservation of the wildlife and its habitat all ancillary issues.

This part of the Management Plan for Bamboo Seed Collection, Bamboo Removal, Bamboo Regeneration of Area by ANR and AR in the Gregariously Flowering Bamboo Area of TATR for the Period - 2021-22 and 2025-26, has briefed the details into various chapters describing the background issues, the current state of the facts, the options, choices and the prescriptions and proposals with the supporting charts, data tables, appendices, maps etc. and has also discussed financial stakes involved.

6.1 Expenditure Estimates

Due to gregarious flowering various activities are require to be carried out like the collection of bamboo seed that has become available after 40 years and can be used for preparation of bamboo seedlings of seed origin, removal of dry and dead bamboo in the form of long bamboo or in the form of bundles to avoid the risk of fire from buffer area where it was harvested regularly as per the working plan and to earn the revenue to the State.

The dry bamboo is the being very combustible material, will be great fire hazard after the flowering. In spite of best efforts and fire protection work it is highly susceptible to fire. To safeguard the interest of the State, the dry bamboo and seed that are identified as vulnerable loss in the event of forest fire, fire insurance has been proposed for which, the valuation of the bamboo from core and buffer area has been calculated as the stock to be insured irrespective of its actual removal for premium amount to be known/sought from the insurance company. In absence of any information the premium amount could not be mentioned in spite of our efforts till finalisation of this report.

The estimated expenses for seed collection and bamboo removal, Insurance premium for bamboo material, ANR, AR works and SMC works, has been estimated

for financial years 2021-22 and 2025-26 to be as shown in abstract of which is given as under

Table- 27- Abstract of Estimated Expenditure Part I of plan

(Rs. in Lacs)

Item No.	Particulars	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26	Total
1	Bamboo Seed collection	82.00	82.00	41.00			205.00
2	Removal of Gregariously Flowered Dead/ Dry Bamboo	1824.54	1544.55				3169.04
3	Insurance against fire	14.14	14.17				33.31
4	ANR Operations including seed balls in Core area as per field survey	68.85	182.80	182.80	182.80	182.80	800.04
5	Bamboo AR in gaps where NR is not adequate in Core area as per field survey	181.81	266.10	328.04	391.09	440.70	1607.74
6	ANR Operations including seed ball in Buffer area as per field survey	68.86	182.80	182.80	182.80	182.80	800.04
7	Bamboo AR in gaps where NR is not adequate in Buffer area as per field survey	181.81	266.10	328.04	391.09	440.70	1607.74
8	Bamboo AR in Private and CFR lands in Buffer area as per field survey	1212.74	1773.70	2186.96	2606.84	2938.00	10714.34
8	SMC Works	100.00	100.00	100.00	100.00	100.00	500.00
	Total Expenditure	3734.75	4412.22	3308.64	3854.62	4285.00	19437.25

6.2 Revenue Estimates

The notional value of bamboo seed collection and bamboo material in the form of long bamboo and bamboo bundles are indicated in details in the Appendix to this plan under the heading of APPENDIX - IX- Physical Targets and Estimates Revenue from Management Plan Operations. The current market sale rates have been applied to calculate the anticipated revenue of Bamboo materials.

The abstract of estimated revenue for financial years 2021-22 to 2025-

given as under

Table -28- Abstract of Physical Targets and Estimates Revenue from Management Plan Operations Part I of the plan (Rs. in Lacs)

Item No.	Particulars	FY 2021-22	FY 2022-23	FY 2023-24	FY 2024-25	FY 2025-26	Total
1	Bamboo Seed collection	100.00	100.00	50.00			250.00
2	Removal of long Bamboo & Bamboo bundles from Core and buffer area	1372.54	1321.99				3169.04
	Total Revenue	**1472.53**	**1421.99**	**50.00**			**3419.04**

The detailed working of all items of estimated expenditure and revenue arising from the gregarious flowering of bamboo are given in the **Appendix- IX.**.

Wildlife Protection and Habitat Development Plan
In Gregariously Flowered Bamboo Area In TATR

Chapter I

Wildlife Protection in Bamboo flowered area

1.Protection from fire

Intensive fire control line creations in fire sensitive areas & strategic planning are separately dealt in Fire Protection Chapter.

2. Surveillance & fast communication network system development-

Fire watch towers are proposed in Core & Buffer area. These shall be used for wireless network strengthening for better communication and instant alert system. Staff engaged shall be equipped with compartment map, binoculars to ascertain location of fire or other unwarranted incidences.

Secret service agents in villages, identified as notorious or involved in destruction of habitat shall be engaged. In consideration of less monetary incentives provided in “Secret Service Fund”, shortages can be meet out from “Tiger Foundation” for special drives undertaken specifically in monsoon & summer season. Information collected prior to market days in such villages plays a very vital role in forest protection. Every Beat in charge must update list of iron -smith under his jurisdiction & shall observe their activities.

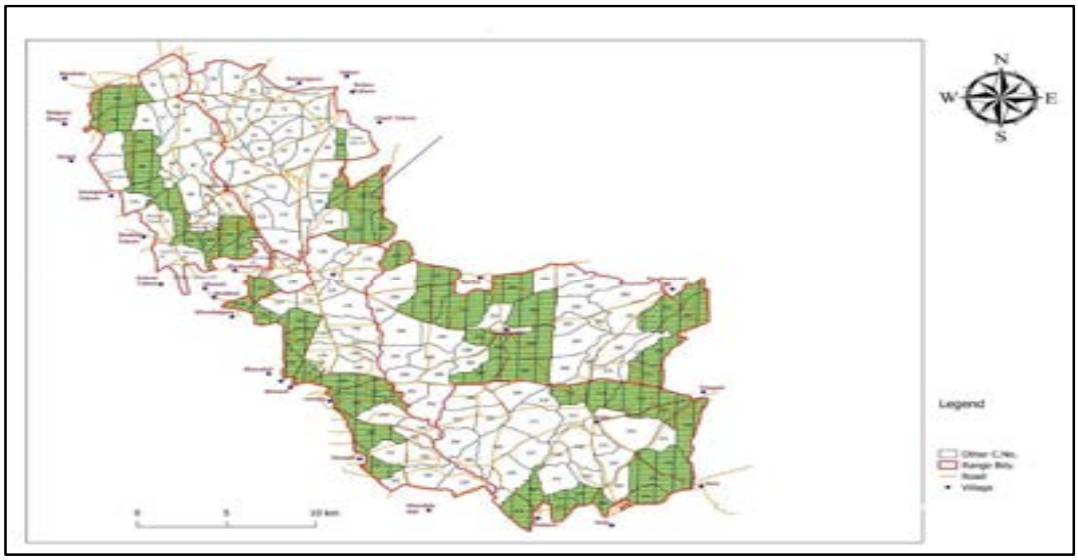
Every forest officer working at various levels must proactively collect information about tribes or communities camping in & around PA areas. Tiger cell is effective platform to deal with such intruders.

Procurement of data of power tripping from power transmission sub-stations in TATR, with timings may help in surveillance.

3. Strengthening of Quick Response Team (QRT)-

Special task force for effective patrolling in TATR is deployed at Todaba, Moharli & Pangadi in PA area. A unit of 27 Forest Guards,9 forest Watchers is headed by Range Forest Officer. They have been assigned the area of core & Buffer for patrolling as follows: -

Sr. No.	Name of STPF Unit	Assigned area for patrolling				
		Core		Buffer		Total Area (sqkm)
		Range	Area (sqkm)	Range	Area (sqkm)	
1	Tadoba	Tadoba	224.13	Khadsangi	72.54	405.96
				Palasgaon	109.29	
2	Moharli	Moharli	197.78	Moharli	116.09	486.90
				Chandrapur	173.02	
3	Pangdi	Kolsa	200.96	Shioni	117.07	427.35
				Mul	109.32	
	Total		622.88		697.33	1320.21



Management, TATR had identified 55 compartments along boundary of core area which are vulnerable for fire protection. Though intensive fire line creations

have been proposed, regular patrolling in these areas, till regeneration of bamboo establish, shall be done.

For any emergency or exigencies one “Quick Response Team”, of 7 members headed by experienced senior forest officer, equipped with good vehicle, first aid kit, fire fighting appliances, water poisoning testing kit, wireless communication set etc., shall be established.

There are few areas in the core across which high voltage (11 KV) electricity line pass over. The total length of such electricity lines in the core area is around 42.80 km. Patrolling squads shall be equipped with metal detector. Periphery of water bodies & power lines passing through must be regularly traversed.

Poachers prefer evening period (18.00hrs. to 21.00) & early morning period (04.00 to 07.00). Night patrolling in this crucial period by special team equipped with arms for any eventuality will be most appropriate action.

Buffer area adjoining core is very sensitive for wildlife protection. Uncontrolled grazing, encroachment on forest land after enactment of Forest Right Act.2006,& delay in deciding claims under FRA is a matter of serious concern.

Proactive role of concerned forest officer discharging their responsibilities under FRA may resolve these issues to some satisfaction.

Recommendations for protection in Buffer

I. Deployment of man power for patrolling & fire protection shall be increased up-to 50% more than the routine fire management plan.

II. Fire & Forest protection group from each VEDCs & JFMCs shall be established in the leadership of Beat Guard.

III. Legal provisions mandatory for forest protection in CFR, PESA area shall be depicted on boards at Grampanchayat, Gut-Grampanchayat. Handouts, posters shall be distributed in each village inside & outside buffer area.

IV. Senior forest officer shall conduct meetings in Grampanchayat, to acquaint Gramsabha, VEDCs, JFMCs about their responsibilities in forest & fire protections.

V. Provision of parapet wall construction around open well of farmers is made in Shamaprasad Mukharji Jan-Van scheme & Plan. Wild animals may shift to village area in search of green foliage & pray. As a special circumstance these wells shall be covered with precast steel cover to avoid drowning incidences. It shall be completed before monsoon.

VI. Life of all fire fighters deployed shall be insured.

Other checks & controls for protection in TATR

I. Local forest officer shall conduct meetings of Police Patel of villages under his jurisdiction. They shall be acquainted with provisions under sec.79 of IFA 1927.

II. Beat Guard shall check regularly “Musafir Register” maintained by Police Patel.

III. Beat guard/ Vanmajur, STPF personnel or any forest officer shall take GPS enabled photograph of every suspected intruders / trespasser, whenever come across during patrolling & album of such intruders shall be maintained at respective range level.

IV. All traditional worship able / religious spots in forests shall be invariably inspected. Geo-tag photos can reveal previous status & additions or alterations made.

V. Intruders & poachers prefer evening period (18.00hrs. to 21.00) & early morning period (04.00 to 07.00). Night patrolling in this crucial period by special team equipped with arms for any eventuality will be most appropriate action.

VI. Sample collection, evidence collection kit shall be made available to each Forester& Range Forest Officer. Training programmes for sample & evidence collection shall be conducted.

VII. Every senior forest officer visiting or inspecting the forest area, shall note down the findings, lacunae, instructions issued & noticed remarkable works in Diary-Book of his junior officer at the spot itself. This will improve field working & boost morale of the staff.

VIII. Health check-up camps for field staff shall be arranged.

IX. Felicitation & Reward ceremony for excellent forest protection & conservation works, to field staff, VEDC, JFMC, and Police Patel shall be arranged annually.

4. Emphasis on the identification & mitigation of needs of local communities.

I. Biotic interference in Buffer area is biggest threat.

II. There are 53 villages within five kilometres from the border of TATR. 19 Villages are within 1 kilometre from the boundary of TATR. These villages have some direct or indirect influence on the TATR. There is no buffer in the West and North- East of TATR which poses threat to the wilderness of TATR.

III. Burud communities are dependent on bamboo.

Sr.No.	Range	No of villages	No. of Regd. Buruds
1	Chandrapur Buffer	12	259
2	Shivani	14	923
3	Palasgaon	9	613
4	Mul	2	52
5	Moharli	8	234
Total		**45**	**2081**

Bamboo supplied to buruds in last two years.

Year	No of Burud	No of Bamboo
2018-19	1091	91950
2019-20	705	44725

IV. Though dried bamboo mass is harvested, chances of fire incidences are optimal for

a) Tendu leaves collection.

b) Moha flowers collection.

Ground fire boost, growth of grasses, new flush of tendu leaves & ease to collect Moha flowers below Moha trees. Few ungulates were found to show its affinity towards the large burnt areas. It was assumed that the fire is favoured to promote the growth of grasses.

- Young shoots come up which forms the preferred diet of Chital. Chital usually drink water once in a day, or more frequently in summer. This has made them widely scattered inhabitants of forest tracts with assured presence of water (Schaller, 1967).
- The occurrence of Nilgai showed preference for open habitats and human habitation. Nilgai occur in human habitations and crop fields outside protected areas. Nilgai raid the agriculture crops. The species also showed the preference to burnt areas. Nilgai uses flat terrain and low canopy.
- Sambar also showed the preference towards burnt areas as green grass which appear after the burning provide them with much of their food in the season supplemented with new leaves (Schaller, 1967).
- Temporary colonization of these ungulates in buffer area & domestic animals in villages exceeding grazing potential may damage natural regeneration of bamboo & fodder species.

Farmers living in & outside of TATR fear that the destruction of bamboo groves may worsen the increasing man animal conflict. Burud community & bamboo artisans may lose livelihood support. Tendu leave pluckers & Moha flower collectors will be at high risk.

Following action points may suffice.

- Rice is the main crop in the region. Rice straw is readily available, practical, and cheap source of fodder for feeding ruminants such as buffaloes, cattle, goats, and sheep. Dry season is a period of scarcity. Stacked Rice straw is good alternative as feed in pinch period. If 50 % of villages in buffer area follows stall feeding practices, chances of conflicts can be minimised. PA management shall provide financial incentives to individuals following these practices. Agriculture department can provide such facilities for silage.
- Understory artificial plantations of local bamboo species shall be raised in buffer area at suitable sites.
- Extension of artificial bamboo plantations in private sector.

  Maharashtra Bamboo Development Board is tapping every possibility of raising good quality bamboo plantation in private land of farmers with 50 % subsidy over total expenditure incurred (Total expenditure is Rs. 240 per plant for 3 years)
- Full subsidy over bamboo plantation for marginal farmers, under MGNREGS scheme is also available.
- Training for value added bamboo articles /charcoal production from dry bamboo shall be conducted for bamboo artisans.
- In India leaves of 2–3-year-old tendu trees are used for the formation of bidi wrapper. To maximise income, tendu leave collectors traverse deep into forest. The chances of wild animal attacks increase.

  To maximise the number of leaves, tendu tree should regularly be regenerated through root suckers from damaged root point, pollarding cum trenching, pruning or coppicing. Because investment costs are low, extra income for poor villagers is achieved.

  Compartments adjoining to villages shall be identified & at least augmentation of regeneration by root suckers should be applied. Services of JFMCs & VEDCs can be utilised without extra expenditure.

- Firewood is another major stress on forests. Though LPG is provided to maximum number of families, still are dependent on fire wood till new refill is available at Govt. cost. After harvesting of bamboo, clumps are not cleaned as per Bamboo Harvesting Rules. VEDCs, JMFCs can use these waste bamboo materials for production of fire briquettes. These can be supplied to villagers in need, free or with marginal cost. Forest department should support such endeavour to reduce injury to forests.
- Some individuals are provided Bio-Gas production units. But most of these units are not functioning. Review of such units & its renovation should be taken up, rather sanctioning new units.
- Beside these, there exists several edible plant species which are used for food and fodder by the local villagers. Many of these traditional resources are seasonal and include 10 terrestrial species, 2 aquatic species, 4 tubers, 7 climbers and a mushroom species which are consumed in form of curries, dry vegetable, round cakes, boiled or fried. (Sawarkar & Kulkarni, 2015)
- Multiplication technique of these identified terrestrial species, tuber & climber species shall be developed in nurseries, under the guidance of agronomist. Artificial propagation on private or community land, or CFR land on small scale may save such species which are at the verge of extinction in future. Traditional food with natural nutritive values will be available to villagers.
- Eco-development scheme & controlled tourism is good opportunity for lively-hood development of landless labour & unemployed youths.
- Home stay facilities in villages in buffer area will definitely improve income generation of villagers & scope for other extension activities.
- Claims of compensation for crop, human as well as domestic animals' casualties must be settled within stipulated time frame.

Chapter II

Habitat development in Bamboo flowered area

1. Habitat & Flowered bamboo groves management

"Bamboo species plays an important role in the life cycle of Tadoba. It has also been called as the "keystone" species for the Reserve. In absence of extensive meadows, bamboo forms an important food source for the herbivores in the forest." - Phase IV Monitoring Report 2019

Predator-Prey Biomass Ratio of 1:241 indicate ideal prey predator relationship. (Prey Predator Relationship – A Biometrical Perspective:
-P.G.Thosre&A.G. Mahajan.

The Predator Prey biomass ratio of 1:247 in TATR shows presence of sufficient Prey base.(Mapping of National Parks and Wildlife Sanctuaries: - Technical report Dec. 2008)

Total Number of tigers = 115 ± 12.42 • Density (No./100Sq. km.) = 5.23 ± 0.56

Gregarious flowering in Tadoba was observed in 1982. Now it's 2020 witnessing the same natural phenomenon. Meanwhile PA area is expanded for better management of Wildlife as under-

- Declared Tadoba National Park in 1955- 116.55 Sq.Km.
- Andhari Wildlife Sanctuary in 1986-508.85 Sq.Km..
- Tadoba-Andhari Tiger Reserve [Core area]in 1993-625.40 Sq.Km.
- Annexed additional area as buffer in 2012-1101.77 Sq.Km.

Tadoba Andhari Tiger Reserve, with an area of 1,727.17 Sq.Km. is one of the largest Tiger Reserve in the state.

- The persistence of many species of carnivore may depend on their survival outside protected areas where they come into conflict with humans and their livestock. Knowledge of these wildlife populations and of the perceptions and attitudes of the stakeholders in the areas in which they live is of critical importance in the quest for coexistence.
- Typical wildlife habitat components include food, water, shelter (including nesting or dunning sites), security from predators and competitors, and proper spatial arrangement of those features.
- With due care of vegetation dynamics, disturbance ecology, habitat selection, and population dynamics as well as the influence of local, regional economies, cultural mores, and social value systems, Tiger Conservation Plan for the period 2016-17 to 2025-26 for core & Buffer area of TATR is prepared.

The Gregarious Bamboo flowering in TATR commenced in 2018-19 & is rapidly progressing.

- **In core**

1. During field visits NR of bamboos & light demanding tree species are noticed in the open spaces created due to gregarious flowering of bamboo.
   The new regeneration of species
   Xylea xylocarpa,
   Lagerstromea lanceolata,
   Diospyros melonoxylon & Dendrocalamus strictus, is observed in core area.

Profuse natural regeneration occurs from seeds after gregarious flowering. Seeds have no dormancy, and it helps germination under favourable

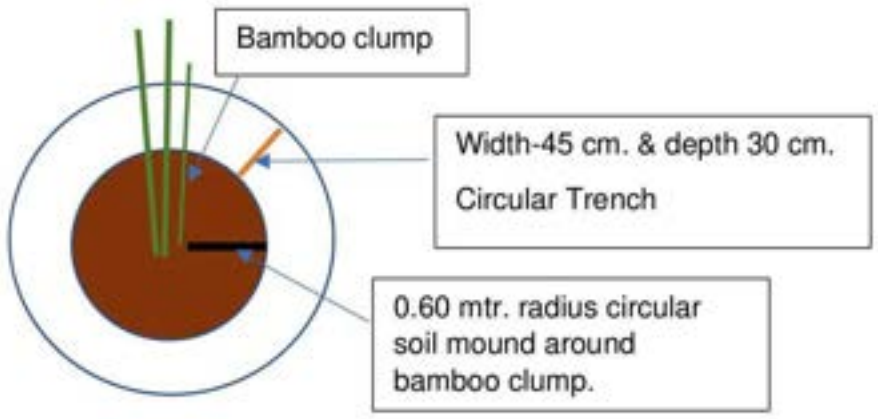
condition soon after seed fall.

Profuse regeneration of bamboo may observe after bamboo seeding within a span of 3 to 4 years.

2. The understory openings will enhance regeneration of woody species. The areas with profuse bamboo regeneration need some silviculture interventions. Present bamboo crop is too congested. It has dominated other

browsable species & also clumps away from roads, fire lines & openings are not healthy. Most of the clumps are having 3 to 5 very thin culms with very sparse foliage.

It is proposed to maintain few healthy bamboo clumps at the spacement of 5mtr. X 5mtr. in areas where profuse regeneration occurs. Soil & moisture conservation treatment model [circular trench-cum -mound] is proposed. It will increase moisture in soil, protect clumps from fire & will generate employment for local inhabitants. MGNREGS can support for financing such labour-oriented activities. Ref. Estimate- **Appendix- A**



3. Culling operation in fire lines shall be done.
4. In each compartment about 0.50 ha. bamboo regeneration plots should be laid out, fenced with the bamboo compound to monitor the bamboo seedling & its growth. This work can be entrusted to the fire watchers / supernumerary labour staff & analyse every month by a software to be developed by taxonomist.
5. In spite of this if permanent gaps are noticed without NR, the AR of bamboos could be considered with seed dispersal in next season.
6. Seed balls of fruit trees like Moha, Behada, Char shall be spread over suitable soil before onset of monsoon. In each compartment about 0.50 ha. bamboo

regeneration plots should be laid out, fenced with the bamboo compound to monitor the bamboo seedling & its growth. This work can be

7. entrusted to the fire watchers / supernumerary labour staff & analyse every month by a software to be developed by taxonomist.
8. Seed balls of fruit trees like Moha, Behada, Char shall be spread over suitable soil before onset of monsoon.

2.0 Meadow Development

In Core

Apart from the management interventions planed in core for meadow & water body development, few suggestions may be considered.

It is concluded from the study that “TATR harbours high ungulate prey base and has the potential to accommodate higher density of predators making it comparable to few of the best remaining tiger reserve in India.” So, a provision for new meadow creations is not required.

- [TIGER CONSERVATION PLAN(CORE) 2016-17 to 2025-26]

The evicted village sites are expected to be converted into new meadows.

1. Natural blanks should not be tried for meadow development. At the most unpalatable bushes may be eradicated.
2. Area of villages relocated, shall be developed as meadows.
3. No exotic grass species shall be introduced.
4. Deepening of existing water bodies.
5. Planting of fruit trees like Ziziphus is recommended which will not supress the grasses.
6. Series of brush wood (dried bamboos now available) check bunds in small streams/nallas (width not more than 3mtr.) to arrest soil are recommended.

In Buffer

The meadow/grass lands are very essential constituent of habitat especially for animals like spotted deer. Though the grass in plantations where grazing of cattle is prohibited serves as meadow, it is necessary to develop some grass land in secluded place deep inside the forest as mentioned in management plan.

1.The forest area having less than 0.2 crown density & good soil should be developed as meadow.
2.Thorny bushes, Lantana, Bhutganja & unpalatable grasses shall be eradicated.
3. Seeds of local palatable grasses shall be broadcasted.
4. Fruit trees preferred by ungulates shall be planted.
5. Water & soil moisture conservation works such as gully plugging, brush wood & loose boulder structures should be executed.
6. Seed preservation plot shall be identified& preserved for seed collection.

3. Moisture conservation & water body development-

Presently 10 perennial lakes,

7 seasonal tanks &

9 anicuts are available in core area of TATR

1. Total 72 natural & artificial water bodies exist in buffer area-1101.77Sq.km.Most of these are village ponds.Possibilities to construct artificial water bodies, in each sq.km. of PA shall be explored.
2. **Soil & moisture conservation-**

   Huge quantity of dead bamboo is available after flowering.

   Bamboo harvested from fire lines can be used for brush wood bunds in gullies, non-perennial water bodies & along contours in undulating land having steep gradient not more than 15 degrees, specifically along nallas & river banks.

- **Dry Bamboo brush wood bunds-**

In non-perennial small nallas beds with slope gradient less than 2 degree.

In Buffer

Soil & moisture conservation works like gully plugging, stone bunds, soil bunds, staggered contour trenches as planned under TCP shall continue.

4. Support activities for local inhabitants-

Biotic interference in Buffer area is biggest threat.

I. There are 53 villages within five kilometres from the border of TATR. 19 Villages are within 1 kilometre from the boundary of TATR. These villages have some direct or indirect influence on the TATR. There is no buffer in the West and North- East of TATR which poses threat to the wilderness of TATR.

II. Burud communities are dependent on bamboo.

Sr.No.	Range	No of villages	No. of Regd. Buruds
1	Chandrapur Buffer	12	259
2	Shivani	14	923
3	Palasgaon	9	613
4	Mul	2	52
5	Moharli	8	234
Total		45	2081

Bamboo supplied to buruds in last two years.

Year	No of Burud	No of Bamboo
2018-19	1091	91950
2019-20	705	44725

III. Though dried bamboo mass is harvested, chances of fire incidence are optimal for

a) Tendu leaves collection.

b) Moha flowers collection.

Ground fire boost, growth of grasses, new flush of tendu leaves & ease to collect Moha flowers below Moha trees. Few ungulates were found to show its affinity towards the large burnt areas. It was assumed that the fire is favoured to promote the growth of grasses.

- Young shoots come up which forms the preferred diet of Chital. Chital usually drink water once in a day, or more frequently in summer. This has made them widely scattered inhabitants of forest tracts with assured presence of water (Schaller, 1967).
- The occurrence of Nilgai showed preference for open habitats and human habitation. Nilgai occur in human habitations and crop fields outside protected

areas. Nilgai raid the agriculture crops. The species also showed the preference to burnt areas. Nilgai uses flat terrain and low canopy.

- Sambar also showed the preference towards burnt areas as green grass which appear after the burning provide them with much of their food in the season supplemented with new leaves (Schaller, 1967).
- Temporary colonization of these ungulates in buffer area& domestic animals in villages exceeding grazing potential may damage natural regeneration of bamboo & fodder species.

Farmers living in & outside of TATR fear that the destruction of bamboo groves may increasing man animal conflict. Burud community & bamboo artisans may lose livelihood support. Tendu leave pluckers & Moha flower collectors will be at high risk.

Following action points may suffice.

- Rice is the main crop in the region. Rice straw is readily available, practical, and cheap source of fodder for feeding ruminants such as buffaloes, cattle, goats, and sheep. Dry season is a period of scarcity. Stacked Rice straw is good alternative as feed in pinch period. If 50 % of villages in buffer area follows stall feeding practices, chances of conflicts can be minimised. PA management shall provide financial incentives to individuals following these practices. Agriculture department can provide such facilities for silage.
- Understory artificial plantations of local bamboo species shall be raised in buffer area at suitable sites.
- Extension of artificial bamboo plantations in private sector.
  Maharashtra Bamboo Development Board is tapping every possibility of raising good quality bamboo plantation in private land of farmers with 50 % subsidy over total expenditure incurred (Total expenditure is Rs. 240 per plant for 3 years)
- Full subsidy over bamboo plantation for marginal farmers, under MGNREGS scheme is also available.
- Training for value added bamboo articles /charcoal production from dry bamboo shall be conducted for bamboo artisans.
- In India leaves of 2–3-year-old tendu trees are used for the formation of bidi wrapper. To maximise income, tendu leave collectors traverse deep into forest. The chances of wild animal attacks increase.

To maximise the number of leaves, tendu tree should regularly be regenerated through root suckers from damaged root point, pollarding cum trenching, pruning or coppicing. Because investment costs are low, extra income for poor villagers is achieved.

Compartments adjoining to villages shall be identified & at least augmentation of regeneration by root suckers should be applied. Services of JFMCs & VEDCs can be utilised without extra expenditure.

- Firewood is another major stress on forests. Though LPG is provided to maximum number of families, still are dependent on fire wood till new refill is available at Govt. cost. After harvesting of bamboo, clumps are not cleaned as per Bamboo Harvesting Rules. VEDCs, JMFCs can use these waste bamboo materials for production of fire briquettes. These can be supplied to villagers in need, free or with marginal cost. Forest department should support such endeavour to reduce injury to forests.
- Some individuals are provided Bio-Gas production units. But most of these units are not functioning. Review of such units & its renovation should be taken up, rather sanctioning new units.

  Beside these, there exists several edible plant species which are used for food and fodder by the local villagers. Many of these traditional resources are seasonal and include 10 terrestrial species, 2 aquatic species, 4 tubers, 7 climbers and a mushroom species which are consumed in form of curries, dry vegetable, round cakes, boiled or fried. - (Sawarkar & Kulkarni, 2015)
- Multiplication technique of these identified terrestrial species, tuber & climber species shall be developed in nurseries, under the guidance of agronomist. Artificial propagation on private or community land, or CFR land on small scale may save such species which are at the verge of extinction in future. Traditional food with natural nutritive values will be available to villagers.
- Eco-development scheme & controlled tourism is good opportunity for lively-hood development of landless labour& unemployed youths.
- Home stay facilities in villages in buffer area will definitely improve income generation of villagers& scope for other extension activities.

Fire Protection Plan

Chapter I

Basis for the Fire Protection Plan Formulation

1.1 Background

Tadoba-Andhari Tiger Reserve is today considered as prime Tiger habitat in the Central Indian landscape. It comprises of 625.4sqkms. Core area and 1101.77 sq.kms. Buffer area. The Core has been systematically managed for reduction of human and biotic pressures by translocation of the villages that were located in the Core area. Botezari, Jamni, Navegaon and Palasgaon were relocated and Kolsa was partially relocated which will be completely relocated this year. It leaves only one village Rantolodhi which is within the Core area and Karwa which is on the fringe of the Core area.

The entire compact chunk of prime Tiger habitat covering 625.4 sqkms. is a great asset for the long-term conservation of Tiger and its associate species. The area has also developed into a very useful Gene bank for Tiger and its associate species which have multiplied and dispersed in the adjoining areas as has been proved by the rising numbers of Tiger and associate species in the landscape.

The major portion of the habitat in the Core area and the Buffer area including the adjoining Forest areas are prominently represented by Bamboo (Dendrocalamus strictus) in the middle storey. In some areas Bamboo clumps are so dense that the Bamboo growth has been hampered creating stunted Bamboo clumps which form a literal wall obstructing movement of animals. In some areas where Bamboo clumps are spread uniformly the growth of Bamboo is optimum and good size Bamboos are seen in the clumps. This situation has been created due to profuse natural regeneration during the gregarious flowering of Bamboo in the period 1983-84. Further non application of silvicultural practices made the dense formation of Bamboo.

In the area outside Tadoba National Park of 116.08sqkms. flowered Bamboo was harvested, also many of the villages were present and the grazing by the cattle automatically reduced the Bamboo seedlings which spaced the remaining Bamboo seedlings and this in a way helped in the Bamboo clump formation. In the National Park area Bamboo was removed partially in the fringe compartments but the profuse

regeneration created dense and stunted Bamboo clump formation which is seen even today.

Sporadic Bamboo flowering started in 2018-19 and generally Bamboo flowering gradually spreads and develops into gregarious flowering .After gregarious flowering and seeding mass mortality is seen in the Bamboo clumps and the entire clumps dry up and the dry Bamboo fall on the ground creating obstructions to natural movements of animals in the area.

The TATR landscape is classified as Southern Dry Deciduous Forest which normally after winter the major trees, shrubs, herbs, and grasses start drying and the entire area becomes sensitive to fires. Every year this phenomenon poses a challenge to the local management for protecting the habitat from fires. Now due to the gregarious flowering of Bamboo it will add the dead Bamboo to the normal dry biomass making the area Hypersensitive to fires. Now in addition to the normal dry biomass in the dry Deciduous Forest due to gregarious Bamboo flowering the dead Bamboo will increase the dry biomass which will be on an average1160 tons per hectare. In case of accidental fire the intensity will cause great destruction in the habitat which can be enumerated as under.

1.2 Extent of damage to the habitat

(1) All leaf litter, shrubs, herbs, natural regeneration, bamboo and grasses which have developed due to the protection given over so many years will get burnt and reduced to ashes.

(2) Due to the addition of Bamboo to the normal dry biomass the severe heat generated will evaporate the soil moisture to about 6 inches to 10 inches depth rendering the soil unproductive for a long period as microorganisms and micro flora and micro fauna will also be destroyed in the fire.

(3) Trees in the vicinity of Bamboo clumps will also be affected by the fire of burning bamboo and the heat will destroy the snags, down logs and dead trees which are especially important components of Wildlife habitat.

(4) Nests built on trees, nesting places in the tree hollows will also get destroyed.

(5) All the humus and organic components of the soil will be destroyed and lost which will take quite a few years for the soil to again attain its original state.

(6) The fire will destroy all the natural regeneration of tree species, shrubs, herbs and root stock of grasses tubers and the Bamboo seed along with its regeneration.

Extent of damage to Wildlife

(1) All subterranean living organisms will be destroyed in the fire.

(2) Terrestrial ground birds and small mammals will be destroyed in fires.

(3) Ground nesting birds as the fire season is also their breeding season will lose the young ones due to the fire.

(4) Fallen dry Bamboo of the dead bamboo clumps will create obstruction in free movement in case of fire and will block the escape routes of animals and they will be destroyed.

(5) Due to the fire all vegetation and other wildlife which is important component of habitat will get destroyed and create scarcity situation of food and shelter for the wildlife.

The gregarious flowering is a once in 40 year phenomenon. It is neither seasonal nor annual or of a short period say 4 year or 8 years. Due to the long period between the Bamboo flowering the living organisms in the area both floral and faunal have no adaptation to deal with the damaging aspects caused due to gregarious Bamboo flowering. Therefore it becomes inevitable to implement measures to protect the area from fire so that the adverse effects caused due to accidental fire will be reduced in the Bamboo flowered area.

Table - 29 - Area details of Core Area of TATR

(Area in Sq.kms.)

Area status	Reserve Forest	Protected Forest	Other Area	Total Area	Number of compartments
Tadoba N P	116.08	0	0.47	116.55	47
Andhari WLS	461.88	32.51	14.46	808.85	137
Total Core Area	577.96	32.51	14.93	625.4	178 (6 compartments are overlapping)

Table - 30 - Area details of Buffer Area of TATR

(Area in Sq.kms)

Area status	Reserve Forest	Protected Forest	Other Area	Total Area	Number of compartments
Buffer area	587.24	113.04	401.49	1101.77	427

Fire Protection and Fire Fighting is today a well-developed Science practiced all over the World. Forest Fire Protection is a typical phenomenon accompanied by a

host of inherent problems like Remoteness, Inapproachability; Vastness of the area and periodicity of the problem, which is normally for 5 months in a year and the situation which will be prevalent now onwards occurs once in 40 years. The gregarious flowering makes Forest Fire Protection all the more difficult and challenging.

Fires are classified in various categories and Forest fires are classified as Class A fires i.e., involving solid material like wood, paper etc. Other classes are related to Liquids, Gases, Metals and Electrical materials.

1.3 Basic Principles of Fire Protection are enumerated as under: -

(1) Prevent occurrence of Fire.

(2) Provide for Compartmentalization of Fire so that the fire does spread over larger area.

(3) Provide for escape route which can be applicable to both man and animals.

(4) Provide for Fire Alarm

(5) Provide Extinguishing Agent

(6) Provide facilities for Fire Brigade.

Of the six enumerated principles, our traditional Fire Protection measures have adopted three principles i.e.1, 2 and 4, respectively. Effective application of the three principles can no doubt assure a reasonable degree of success. There can be suggestions to improve the three measures.

(1) Prevent Occurrence of fires. This is foremost factor which will help to contain the Fire. It necessitates broad spectrum applications. Traditionally appointment of fire watchers, keeping vigil to detect occurrence of fire and immediately approaching the location of fire with manpower and manually putting off the fire by beating with branches or clearing a line and setting counter fire.

(a) Appointment of adequate manpower for detection of fire. To assist immediate detection a network of fire watch towers or fire watch points manned by adequate manpower 24X7 who have adequate knowledge about the area and can correctly identify the location of fire so that further action of mobilizing forces and diverting to the location of fire is achieved in minimum possible period. The present system of appointing local youths and forming primary response team in the buffer villages and appointing them as fire watchers in the fire season has yielded good results.

(b) Fires are generally manmade and constant vigil with foot patrolling will help to prevent trespass by intruders which will also prevent incidence of fire. In the core area except for Rantalodhi and Kolsa villages there are no other villages. But along the western and northern boundary of the core area the cover of buffer area forests is very narrow and with the presence of a number of villages, many of which have sizable population which makes the region sensitive for biotic pressure and consequently to occurrence of fire. The east and southern part of the core area is encompassed by a liberal tract of forests comprising of the buffer area. There are 79 villages in the Buffer area, which can become probable locations of occurrence of fire. Creating awareness in the villages about fire protection. Providing employment through fire protection activities and if possible, directly entrusting the responsibility of fire protection in a specific area around the village to the Village Eco-Development committee.

(c) The Tendu season also overlaps the fire season it will be helpful to examine if the effect of foregoing Tendu leaf collection activity for at least two to three years in the buffer area. But after discussion with local officers they opined that income from Tendu leaves has been a major source of income. Traditionally Tendu leaves collection has contributed to the income of the locals. If Tendu collection is foregone then it can disturb the people and it may adversely affect the protection objectives in the area. Hence Tendu leaves collection needs to be allowed.

(d) Compiling and mapping of fire incidents over the last three to four years will also help to identify sensitive pockets which will help to concentrate attention in these areas and mobilize activities so that occurrence of fire is prevented.

e) Extra provisions or special provisions like more manpower for patrolling watch and ward can be provided to counter the drawback in sensitive pockets.

(2) Provide for Compartmentalization of Fire. Establishing as many fire lines as possible will breakdown the area into pockets where the Fire can be contained in an area thereby preventing its spread over a larger area. The Forest Compartments can be conveniently considered if the boundaries have been established if not then they can be established. Conveniently a pocket of

200 to 250 hectares will be ideal but the ground conditions may vary and a list of pockets will enable to work out manageable and unmanageable pockets.

Existing roads, Cart tracks, footpaths and patrolling paths will be again a major contributor to Compartmentalization. A GIS Map showing the Compartments, Existing roads, Cart tracks, Footpaths and Patrolling paths will give a picture for study so that interventions can be worked out.

The village boundaries of the villages in the buffer area which are demarcated every five years will be demarcated and cleared and burnt every year for three years so as to assist in the compartmentalization as needed for fire protection also the village boundaries of the villages rehabilitated from the Core area and the existing villages in the Core area if cleared will definitely contribute in compartmentalization and protect the habitat from fire which will be in addition to the regular Fire line.

(3) Provide safe escape routes which can be applicable to both Man and Animals too. It can be possible for Man but the Wild animals cannot be directed to move in a particular direction therefore it becomes all the more necessary to ensure prevention of occurrence of fire to avoid loss of life of Man and also Wild animals.

(4) Provide for Fire Alarm. The entire area needs to be covered under a network of watch tower or Fire Detection points. For establishing new Fire Watch Tower sites, Drone camera can be used to properly gauge the extent of area covered and at what height. Each Fire Watch tower will be equipped with GIS image of the area covered by the Fire Watch tower so that the location of the Fire can be given which will enable the Fire Fighting unit to correctly reach the location of the Fire. Timely detection and rapid mobilisation of forces to contain the fire are the success parameters of Forest Fire Protection.

(5) Provide Extinguishing Agent. Considering the CLASS A fire, involving solid material Wood and Dry vegetative material spread over a vast area Water can be the only Extinguishing Agent. Considering the Gregarious Bamboo flowering situation, in case of a fire it will be very difficultto physically put off the fire because of the severity of the blaze of burning bamboo will not allow anybody to approach near the fire. Water if used as a Fire Extinguishing agent with infrastructure of sizable Tankers with Pumping facility and conveyor pipes can help to put off even a sever fire. At least for the Core area where the

Bamboo cannot be removed and in case of a fire the devastation that will take place, it is necessary to provide for Extinguishing of fire by using Extinguishing Agent Water. All the three Ranges of the Core area i.e. Tadoba, Moharli and Kolsa have ample convenient water resources that can be used. Use of Water for putting off fire in the Forest will be a new measure due to the Gregarious Bamboo flowering. If there is an accidental fire it will not be humanly possible to control and extinguish the fire it can be possible to some extent by use of extinguishing agent like water. The need to protect the rich Biodiversity and the habitat of the Core and Buffer area justifies implementation of this protection measures.

In the Buffer area since flower bamboo clumps will be cut, the severity of the fire will be comparatively less than in the Core area but discrimination of the practices between the Core and Buffer will not be justifiable as Wildlife habitat is the same for Wildlife be it in the Core or in the Buffer

(6) Provide facility of Fire Brigade. Considering the Gregarious Bamboo flowering area and the need to protect the rich Biodiversity and the habitat, for effective Fire Protection, making provision of fire brigade is inevitable. Chandrapur is surrounded by big Industrial units which have Fire Brigade facilities Fire Brigade facilities can be Requisitioned during the Fire season.

On the 09 April 2021 in an area of Navegaon-Nagzira tiger reserve three labourers were charred to death and two others were critically injured when the fires had engulfed the area in these men were working as members of the forest team trying to control the fires. Decades ago, fires had broken out in the gregariously flowering area in Bandhavgarh National Park located in Madhya Pradesh. A riding Elephant, its Mahawat, the Chara cutter and two others were caught in the conflagration and had perished. The fire behaviour in areas of dead and dry Bamboo clumps is unpredictable and rapid. Fire fighters can easily be trapped within encircling fire without being aware of it.

With the acknowledgement of the high risk of fires, the fire protection measures and readiness for fire fighting when there are outbreaks, the protection for fire fighters, protection of wild animals, habitats their preservation, addressing the standing and progressing the dying clumps of Bamboos in the core area and also the buffer area should definitely take precedence over the other matters.

All personnel and Majdoors engaged in fire protection activity should be ensured over the period of fire season against accidents, injury, and death due to fires with in TATR area.

A Standard Operating Procedure needs to be formulated so as to ensure safety of visitors in case of incident of fires in the tourism area. The SOP should be effectively conveyed through signage at the entry gate and to all the Guides, Vehicle owners and Resort owners should be especially educated regarding the measures to be taken in case of an eventuality of forest fire.

As a safety measure and also to ease the pressure on the field staff, Safari period needs to be confined to two times per day once in the morning and once in afternoon only. Night Safari should not be allowed in the fire season. Also sitting on Machan overnight should be avoided so that chances of accident in case of fires and ensuring safety of the visitors does not take up the energy and time of the field staff during the fire season. The entire efforts and energy of the Field staff must be preserved so that they can fully concentrate and participate in the fire protection operations.

Chapter II

Fire Protection Plan for Core Area

The major portion of the habitat in the Core area and the Buffer area including the adjoining Forest areas are prominently represented by Bamboo (Dendrocalamus strictus) in the middle storey. In some areas Bamboo clumps are so dense that the Bamboo growth has been hampered creating stunted Bamboo clumps which form a literal wall obstructing movement of animals. In some areas where Bamboo clumps are spread uniformly the growth of Bamboo is optimum and good size Bamboos are seen in the clumps. This situation has been created due to profuse natural regeneration during the gregarious flowering of Bamboo in the period 1983-84. Further non application of silvicultural practices made the dense formation of Bamboo. In the area outside Tadoba National Park of 116 sq.kms. flowered Bamboo was harvested, also many of the villages were present and the grazing by the cattle automatically reduced the Bamboo seedlings which spaced the remaining Bamboo seedlings and this in away helped in the Bamboo clump formation. In the National Park area Bamboo was removed partially in the fringe compartments but the profuse regeneration created dense and stunted Bamboo clump formation which is seen even today.

The Core has been systematically managed for reduction of human and biotic pressures by translocation of the villages that were located in the Core area. Botezari, Jamni, Navegaon and Palasgaon were relocated and Kolsa was partially relocated which will be completely relocated this year. It leaves only one village Rantolodhi which is within the Core area and Karwa which is on the fringe of the Core area.

TATR core area had the benefit of application of the Modern Forest Fire Control Project under the World Bank scheme of which the Forest Development Corporation of Maharashtra was a recipient. Hence the FDCM used to depute staff and some infra structure like vehicles, tankers etc during the fire season for protection of forests from fire. Earlier as long as funds were available from World Bank scheme the activity continued. Then after the end of World Bank scheme funds, had to be provided through CSS from TATR Budget. The entire Fire protection was being done both by FDCM and TATR which became unreasonable and subsequently the entire Forest Fire protection work was taken up under the TATR administration from 2018-19. Basically, maintenance of Fire lines of various widths 20 mts, 13 mts, 10 mts and

5 mts appointing Firewatchers who were deployed in the area so as to detect occurrence of fire through Watch towers/ Machans erected at vantage points and to control the fire if there was an incident of fire. Deployment of vehicles for firefighting, use of Wireless systems, Walkie Talkies and Mobile phones for communications all helped to contain the Fire. Recent additions of also Fire Blowers benefitted the firefighting efforts in the field. But it is important to consider that the above efforts were carried out in a normal forest or normal habitat situation. Now the Forest Fire Protection efforts are to be carried out in a gregariously flowered Bamboo area, therefore all possible measures and practices employed for Fire Protection and Fire fighting need to examine, evaluated and accepted depending on its applicability in forest conditions of Gregarious flowered Bamboo area.

Table No. - 31- Area details of Core Area of TATR

(Area in Sq.kms.)

Area status	Reserve Forest	Protected Forest	Other Area	Total Area
Tadoba N P	116.08	0	0.47	116.55
Andhari WLS	461.88	32.51	14.46	808.85
Total Core Area	577.96	32.51	14.93	625.4

Table No. - 32- Field Administrative setup of Core Area.

Range	Round	Beat	Area in Sq.kms.	Protection Hut
Tadoba	3	10	106.746	3
Kolara	3	11	112.575	4
Moharli	3	9	101.836	3
Karwa	3	17	163.935	5
Kolsa	3	13	135.567	7
Total	**15**	**60**	**620.659**	**22**

The principles of effective fire protection can be summarized as

(1) Immediate detection of fire.

(2) Rapid deployment of man power and equipment for extinguishing the fire.

(3) Efficient controlling and extinguishing of the fire.

For immediate detection of fires, a network of Fire watchtowers needs to be established. At present there are two existing Fire watchtowers, one at Tadoba and other at Moharli on Moharli -Tadoba road but they are insufficient to benefit the entire Core area. Therefore, four Watchtowers are proposed, one in Kolsa range, Doni Comp.No.330, one in Karwa range, Rantalodhi-Karwa road, Tularankuti joint Comp.No.251 and one in Moharli range, Kolaso-Hudki near MTDC complex. And one in Kolsa range on Kolsa-Pahami road Comp.No.311. To increase the effectiveness of Firewatchtower it is necessary to have maximum coverage of surveillance of the area, the height of the towerand its location is important. As per discussion with the field officers they opined that height of 45 meters is necessary for maximum surveillance is possible. Hence Watch tower of height 45 meters is proposed which will again assist for maximum and effective coverage to the wireless network. The height of the watch tower can be subject to review considering the fields' condition.

Further to strengthen the surveillance the field staff needs to be provide with Drone camera atleast one unit per range so that the exact location for erecting Watch tower can be finalized by actual observations by using the Drone. Subsequently the Drone will also assist in finalizing the location of fire and also for surveillance during the summer when leaf fall has taken place to detect presence of intruders and also wild animals' presence.

For extinguishing the fire use of extinguishing agent like water which is possible it is necessary to have proper infrastructure for extinguishing the fire while use of water in the Gregarious flowered Bamboo area. The proposed infrastructure after discussion with the field officers they suggested that 3000 Liters capacity tanker with attached pumping equipment (suitable pump) with conveyer flexible pipe will be easy to maneuver in the area whenever there is incident of fire. Set of 2 tankers with pumping equipment per Range will be useful.

Of the available network of 22 Protection huts in the Core area a suitably centrally located protection hut can be selected per Round for camping place for firefighting squad. Proper connectivity through wireless system/walkie talkie and vehicle will be useful in fire protection operations.

Table – 33 - **Abstract of Fire lines and the expenditure Core area.**

No.	Details of Work	Amount required	
		for 2021-22	for 2022-23
1	2	3	4
1	**Recurring Expenditure** **Amount required for cutting and burning of fire lines**		(5% Increase)
	1) 20 mtr Wide 297.788 km @ Rs. 11901.90	35,44,243	37,21,455
	2) 13 mtr Wide 307.954 km @ Rs. 10314.98	31,76,539	33,35,366
	3) 10 mtr Wide 469.193 km @ Rs. 6347.68	29,78,287	31,27,201
	4) 06 mtr Wide 0.900 km @ Rs. 2380.38	2,142	2,249
	Total	**97,01,212**	**1,01,86,273**
2	Hotshot Crew / Firefighting squad One each per Round – Total 15 Round Six Persons per Squad – 15 x 06 = 90 90 x 26 x 4 = 9360 Man Days Amount – 9360 x 396.73 = 37,13,393	37,13,393	38,99,063
3	Fire Watchers – Total 60 Beats x 3 Watcher per Beat = 180, Man days per 180 x 26 x 4 = 18720 Amount 18720 x 396.73 = 74,26,786	74,26,786	77,98,125
4	Manpower 3 per Fire watch tower 3 x 4 = 12. Mandays-12x26x4 = 1248 x 396.73 = 495119	4,95,119	5,19,875
5	Existing look out towers and Control rooms. 05 towers x 03 Man powers = 15 x 26 x 4 = 1560 Man days x 396.73 = 6,18,899	6,18,899	6,49,844
6	Blower maintenance-1100each x 68 = 74,800	74,800	78,540
	Total	**1,23,28,997**	**1,29,45,447**
	Recurring Grand Total	**2,20,30,209**	**2,21,21,720**
	Non recurring expenditure		
	Procurement of Firefighting sets		
	a) Purchase of New Blower 07 numbers (07 x 50000) Amount 3,50,000	3,50,000	
	b) Purchase of Drone Camera one per	20,00,000	

	Range for 5 Ranges x 1 = 05 05 x 4,00,000 = 20,00,000 c) Establishing new Watch Towers @ 4 sites 45mts height. 04 numbers @ 40,00,000 = 1,60,00,000 d) First Aid Boxes 45,000 e) Training and awareness 1,00,000	1,60,00,000 45,000 1,00,000	
	Non recurring Total	**1,84,95,000**	
	Grand Total	**4,05,25,209**	**2,21,21,720**

Table – 34 - Details of Fire watch towers expenditure Core area.

Sr. No.	Range	Location	Comptt. No.	Qty	Rate	Amount
1	Kolsa	Doni	330	1	40,00,000	40,00,000
2	Karwa	Karwa-Rantaloli Rd	251	1	40,00,000	40,00,000
3	Moharli	Kolaso- Hudki Near MTDC Complex		1	40,00,000	40,00,000
4	Kolsa	Kolsa-Pahani Road	311	1	40,00,000	40,00,000
					Total	**1,60,00,000**

Table –35- Details of Fire extinguishing Infrastructure estimates-Core area.

Sr. No.	Range	Location	Description.	Qty	Rate	Amount
1	Kolsa	Kolsa	3000 Liters Capacity Tanker with tyres and Water Pump	2	250000	500000
2	Moharli	Moharli		2	250000	500000
3	Tadoba	Tadoba		2	250000	500000
4	Kolara	Kolara		2	250000	500000
5	Karwa	Karwa		2	250000	500000
				10	Total	25,00,000

Table – 36 - **Clearance and Burning of Village Boundaries in Core Area.**

(Length in Km.)

Sr. No.	Range	Villages	Artificial boundary Av. Length	Natural boundary	Clearance & Burning of Boundary Length	Rate / km	Amount
1	Tadoba	Navegaon	8	--------	8	2500	20000
2	Tadoba	Jamni	10	----	10	2500	25000
3	Moharli	Palagaon	9	------	9	2500	22500
4	Kolsa	Botezari	10	-----	10	2500	25000
5	Kolsa	Kolsa	12	----	12	2500	30000
6	Karwa	Rantoldhi	12	----	12	2500	30000
					61	**Total**	**152500**

Bamboo Removal from 55 fire prone comptts. from Core area for Fire Protection

Besides the above fire protection plan in general, there are separate measures proposed for fire protection in 55 fire prone comptts. in core zone wherein bamboo removal is contemplated from 2003 ha. involving clearing of dead and dry bamboo in 20 M wide fire lines with specially design strips as detailed in Bamboo removal chapter.

Chapter III

Fire Protection Plan for Buffer Area

Within TATR landscape in the Buffer area and the adjoining Forest areas the flowered Bamboo can be removed hence much of the damage due to fires will automatically get reduced. The locals will also benefit by getting gainful employment by getting involved in the Bamboo extraction operations.

But in the Buffer area due to the presence of 79 villages the chances of accidental fires is very high due to accidents and even deliberate mischief by the locals.

Table- 37- Area details of Buffer Area of TATR

(Area in Sq.kms.)

Area status	Reserve Forest Area	Protected Forest Area	Other Area	Total Area	Number of compartments
Buffer area	587.24	113.04	401.49	1101.77	427

Table- 38- Field Administrative setup of Buffer Area.

Range	Round	Beat	Area (in Sq.kms.)	Nos. of Protection Huts
Chandrapur	5	18	172.942	6
Moharli	3	13	117.875	8
Mul	3	11	109.109	6
Palasgaon	3	12	109.340	7
Sioni	3	14	117.882	5
Khadsangi	3	9	76.067	5
Total	**20**	**77**	**703.215**	**37**

There are 63 Village Eco-Development committees who can play a vital role in the Bamboo management operations and percentage benefit from the extracted Bamboo and its sale can be accrued in the Village Eco-Development fund. The Village Eco-Development committees can be entrusted the responsibility of ensuring fire protection and preventing occurrence of fires in the area. The extent of area to be allotted to the committee can be finalized after proper dialogue between the TATR officials and the village committee.

There are 79 villages of which villages having village boundaries adjoining the forest habitat, the boundaries are maintained every five years. But due to the

gregarious Bamboo flowering situation the boundaries shall be cut and burnt every year from 2021-22 to 2025-26. This will provide protective cover to the forest habitat as accidental fires occur mainly in the vicinity of the villages. Total boundary clearance for the 79 villages will be as per table below.

Table-39- Range wise village boundary data.

Sr. No.	Range	Villages	Artificial boundary (Km.)	Natural boundary (km.)
1	Chandrapur	13	93.10	2.8
2	Moharli	24	173.2	14.8
3	Mul	12	96.7	0.8
4	Palasgaon	12	117.32	-
5	Sioni	18	103.06	12.6
6	Khadsingi	-	-	-
Total		**79**	**583.28**	**31**

The village boundary will be in addition to the existing fire line network.

To further strengthen the fire protection effort provision for immediate detection of fires network of Fire watchtowers needs to be established. At present there is no existing effective Fire watchtower which can benefit the Buffer area. Therefore three Watchtowers are proposed one in Khadsingi range, Talodi Comp.No.43, one in Shioni range, Petgaon Comp.No.322 and one in Chadrapur range Chorgaon Comp.No.591. To increase the effectiveness of Fire watchtower it is necessary to have maximum coverage of surveillance of the area, the height of the tower and its location is important. As per discussion with the field officers they opined that height of 45 meters is necessary for maximum surveillance is possible. Hence Watch tower of height 45 meters is proposed which will again assist for maximum and effective coverage to the wireless network. The exact location can be finalized by new off drone.

Further to strengthen the surveillance the field staff needs to be provide with Drone at least one unit per range. The Drone will also assist in detecting the location of fire and also for surveillance during the summer when leaf fall has taken place to detect presence of intruders and also wild animals' presence.

For extinguishing the fire use of extinguishing agent like water which is possible it is necessary to have proper infrastructure for extinguishing the fire by use of water in the Gregarious flowered Bamboo area. The proposed infrastructure after

discussion with the field officers they suggested that 3000 Litre capacity tanker with attached pumping equipment (suitable pump) with conveyer flexible pipe will be easy to manoeuvre in the area whenever there is incident of fire. Set of 2 tankers with pumping equipment per Range will be useful.

Of the available network of 37 Protection huts a suitably centrally located protection hut can be selected per Round for camping place for fire fighting squad. Proper connectivity through wireless system/walkie talkie and vehicle will be useful in fire protection operations.

Table –40 - Abstract of Fire lines and the expenditure Buffer area.

Sr. No.	Details of Work	Amount required for 2021-22	Amount required for 2022-23
1	2	3	4
1	Recurring Amount required for cutting and burning of fire lines		(5 % Increase)
	1) Expansion of fire line along road side (06 mts) 1787.86 KM @ 2000 Per KM = 35,75 Lakh	35.75 Lakh	37.54 Lakh
	2) Expansion of fire line (3 to 6) 518.29 x 2000 Per KM = 10.36 Lakh	10.36 Lakh	10.88 Lakh
	3) Maintenance of Existing fire line (06 mtr) (1 + 2 = 2306.15 KM @ 2500) 57.65 Lakh	64.63 Lakh	57.65 Lakh
	4) Maintenance of existing fire lines (12 mtr) 386.22 KM @ 4000 per KM = 15.45 Lakh	15.45 Lakh	16.22 Lakh
	Total		**122.29 Lakh**
2	Fire Watchers (194 Nos. for 4 months) 194 x 26 x 4 = 20176 Man Days x 396.73 80,04 Lakh	80.04 Lakh	84.04 Lakh
3	Hotshot Crew / Firefighting squadOne each per Round – Total 20 RoundSix Persons per Squad – 20 x 06 = 120120 x 26 x 4 = 12480 Man Days Amount – 12480 x 396.73 = 49.51 Lakh	49.51 Lakh	52.00 Lakh
4	Manpower 3 per tower 3 x 3 = 09 Man days 09 x 26 x 4 = 936 x 3976. 3 = 3.71 Lakh	5.0 Lakh	5.25 Lakh
5	Blower maintenance 1100 per Blower x number of Blowers*(Incl.No. Blower) & indicate the amount.	3.71 lakh	3.90 lakh
	Total	138.26 Lakh	145.19 Lakh
	Grand Total	202.89 Lakh	267.48 Lakh
	Non-Recurring Procurement of Firefighting sets		

	a) Purchase of New Blower 10 numbers (10 x 50000) Amount 5.0 Lakh b) Purchase of Drone Camera one per Range 6 Ranges x 1 = 06 x 4,00,000 = 24.00 Lakh c) Establishing new Watch Towers @ 3 sites 45mts height d) First Aid Boxes 45,000 e) Training and awareness 1,00,000	5.00 Lakh 24.00 Lakh 120.00 Lakh 0.45 Lakh 1.0 Lakh	
	Total	**150.45 Lakh**	
	Grand Total	**353.34 Lakh**	**267.47 Lakh**

Table –41- Detail of Fire watch towers expenditure Buffer area.

Sr. No.	Range	Location	Comp No.	Qty	Rate	Amount (in Rs.)
1	Khadsangi	Talodi	43	1	40,00,000	40,00,000
2	Shioni	Petgaon	322	1	40,00,000	40,00,000
3	Chandrapur	Chorgaon	591	1	40,00,000	40,00,000
					Total	**1,20,00,000**

Table –42- Details of Fire extinguishing Infrastructure expenditure Buffer area.

Sr. No.	Range	Location	Description	Qty	Rate	Amount
1	Chandrapur	Mamla	3000 Liters capacity Tanker with tyres and Pump	2	250000	500000
2	Moharli	Moharli		2	250000	500000
3	Mul	Mul		2	250000	500000
4	Palasgaon	Palasgaon		2	250000	500000
5	Shioni	Shioni		2	250000	500000
6	Kharsungi	Kharsungi		2	250000	500000
				12	Total	30,00,000

Table –43 - Clearance and Burning of Village Boundaries expenditure in Buffer Area.

Sr.No.	Range	Villages	Artificial boundary (Km.)	Natural boundary (km.)	Boundary Clearance and Burning	Rate	Amount
1	Chandrapur	13	93.10	2.8	93.10	2000	186200
2	Moharli	24	173.2	14.8	173.2	2000	346400
3	Mul	12	96.7	0.8	96.7	2000	193400
4	Palasgaon	12	117.32	-	117.32	2000	234640

5	Sioni	18	103.06	12.6	103.06	2000	206120
6	Khadsingi	-	-	-	-	0	0
		79	583.28	31	583.28	2000	1166560
						Total	**23,33,320**

Management Plan for Eco-Tourism
Post the Gregarious Flowering of Bamboo

Chapter I

Overview of the Eco-tourism vis-a-vis Gregarious Bamboo Flowering

1.1 Introduction

The Tadoba national park located in the Vidarbha region of Maharashtra along with the Corbett national park in Uttarakhand is the oldest national park to have been declared during 1955 in independent India. The declaration of Andhari wildlife sanctuary over an extent of 508.85 km^2 had taken place during 1986. The Tadoba Andhari tiger reserve (TATR) spread across 1727.59 km^2 was established during 1992-93 that includes the core area over an area of 625.82 km^2 made up by the Tadoba national park and the Andhari wildlife sanctuary. The buffer extends over 1101.77 km^2.

TATR is one of the most important tracts within a vast forested landscape in Central India. During the latest all India estimation of populations of tigers, co-predators and prey conducted in 2018, the tiger population in TATR was estimated to be 83 adult tigers. Adding other tigers using the area from the adjoining habitats their number had stood at 106 adult individuals. The current estimates of tiger population indicate presence of 38 males, 47 females among the adults plus 50 cubs. Besides tigers the larger carnivores include leopard, dhole or wild dog, sloth bear, hyena and jackal. Herbivores include gaur, sambar, chital, nilgai, barking deer, chausingha and wild pig. This list is only of larger mammals within a fairly long list of species occurring in TATR. Birds include 255 species. Out of these 71 species are winter migrants. Tadoba national park together with Andhari wildlife sanctuary are recognized as Important Bird Area (IBA) in categories A1 and A3 with Code IN 169 under the IBA programme of Birdlife International that is partnered in India by the Bombay Natural History Society (BNHS). Category A1 includes sites regularly holding significant numbers of threatened (all sub-categories) or declining species. A3 includes sites where birds concentrate in significant numbers in the breeding season, in winter or during migration. The objective of the IBA programme is to conserve world's birds and associated biodiversity at global, regional and sub-regional levels. The IBAs as such include a range of habitats such as wetlands, mudflats, grasslands, scrublands and forests including biodiversity hotspots and microhabitats. IBAs indicate richness of biological diversity. Tadoba national park

and the Andhari sanctuary fall within the southernmost distribution of the Sarus Crane. While the bird is not found within the PAs it is seen on the margins of the Erai Lake.

TATR constitutes the source area of tigers to maintain a meta-population across the Central Indian landscape that include forest divisions such as Bramhapuri (39 tigers), Chandrapur (31 tigers), Central Chanda (23 tigers) and Painganga sanctuary. The meta-population of tigers includes at least of 199 adults. The Wildlife Institute of India has undertaken research to monitor dispersal of tigers with the help of some of the radio collared tigers. Tiger population monitoring is conducted by TATR personnel within the reserve with the help of camera traps. The spread of tiger population within the stated landscape also indicates dispersal and maintenance of the prey populations and other wild species native to this region. On 15th March 2021 the Government of Maharashtra has constituted Kanhargaon wildlife sanctuary extending over an area of 269.64 km^2. It is carved out of the Central Chanda forest division together with the eponymous Project division of the Forest Development Corporation of Maharashtra Ltd (FDCM). This would further strengthen management of wildlife habitats within the stated landscape. The meta-populations could have had an even larger spatial presence but for tenuous corridor connectivity with Tipeshwar sanctuary, Indravati national park in Chhattisgarh, and further south to Kawal tiger reserve in Telangana. It is a well known fact that the forests in India are highly fragmented. Maharashtra is not an exception. The statistics in the India State of Forest Report 2019 published by the Forest Survey of India, Dehradun provides ample evidence with details. Under the circumstances to overcome the negative pulls of insular biogeography the only option is to maintain corridor connectivity between wildlife habitats and thereby rely on meta-populations to ensure the future of wild plants and animals. To this end TATR makes a stellar contribution.

The Southern Tropical Dry Deciduous forests of TATR are dense with bamboo *Dendrocalamus strictus* occupying significant area as an under storey. The main sources of water include the perennial Andhari and Irai Rivers, Bhanuskhidi stream, the Tadoba, Kolsa and Telia lakes. There are many other smaller seasonal streams with stagnant pools of water. The Erai, an earth fills and gravity dam completed during 1983 abuts a portion of the TATR. It has become an excellent location to observe waterfowl and other birds. The reservoir is easily approached

from the Moharli complex. Two species of wild rice *Oryza* are found in the moist areas of Katezari. The riparian areas have a distinct assemblage of plant species.

There are some scattered natural grassy areas as a result of edaphic conditions and others that are anthropogenic as a result of relocation of villages outside the core areas. Two villages, Khatoda and Pandharpauni had been relocated during 1972. Four more—Botezari, Ramdegi (Nawegaon), Palasgaon, Jamni and additionally Kolsa (partially) have since been relocated outside the core area. The remaining families in Kolsa plus Rantalodhi, and Karwa villages remain to be relocated. The relocation is under the pertinent provisions of the Wildlife (Protection) Act 1972, the Schedule Tribes and Other Forest Dwellers (Recognition of Forest Rights) Act 2006, popularly referred to as FRA, relevant Rules and conditions. The sources of funds required for the purpose include those from the Government of India, State Rehabilitation funds, District Tribal Plan, some of the State Schemes and Local Area Development Fund of MP and MLA. The sites vacated by villages have become anthropogenic grasslands. Originally these sites had been woodlands before those were cleared to establish the villages and their cultivation areas long time ago. To maintain these sites as grasslands the regeneration of woody species has to be actively addressed. There also are several species of weeds which would also need to be controlled. Use of fire—controlled patch burning during winters and mechanical removal are the two options. TATR management is alive to this. Such grassy openings amidst the woodlands have created ecotone and edge effects to attract several species of wild herbivores. The grasslands, natural or anthropogenic constitute are among the range of their habitats. The undulating area—hillocks and valleys and structural elements of vegetation—the vertical layers—with the density variation among woodlands, the overall assemblage of native plant communities including the riparian areas constitute the medley of habitat diversity.

The spotted deer are known to thrive in grasslands and grassy openings presenting a rewarding sight for visitors. Gaur, sambar and nilgai also use such areas while the barking deer and four horned antelope are usually seen along the edges. The riparian areas, the lakes and other sources of water—waterholes become increasingly important with the onset of summer. While some of the riparian stretches have locations of natural saltlicks, there is a practice to place/create artificial saltlicks in the proximity of some of the waterholes within sighting distances but away along the visitor routes. Artificial saltlicks do not contain elements and

minerals that are useful to animals but act as attractants to the site—useful to improve sightings. Natural saltlicks contain compounds/minerals of calcium, magnesium, potassium, sodium, sulphur, phosphorus and minor elements such as manganese, iron, zinc and copper. Sources of water combined with natural saltlicks are important for wild herbivores to make up the lack of such nutrients in the plant parts they feed on. Tigers are frequently sighted along the forest roads. Tigers are known to sit in water during summer with half the body submerged. There are random sightings of leopard, sloth bear and other species. There are excellent bird watching opportunities including waterfowl along the lakes. Out of the 255 species of birds recorded thus far 71 are winter migrants. There are marsh crocodiles in Tadoba Lake.

1.2 Gregarious flowering of bamboo

Gregarious or synchronous flowering in bamboo is natural and genetically pre-programmed. It is distinct from sporadic flowering that takes place in scattered clumps. Currently bamboo is flowering gregariously in the TATR. The last gregarious flowering of bamboo in the Tadoba national park extending over 116.54 km^2 and the surrounding forest areas of the then West Chanda (Chandrapur) forest division had taken place during the early 1980s. Under sporadic flowering a few mature culms bear flowers and seeds and die but not the clump as such. In gregarious flowering the clumps die after producing profuse quantities of flowers and seeds. The standard management approach of removing such dead clumps and their disposal and collection of seeds is described elsewhere hence will not be repeated here. The main objective for removal of dead clumps is to prevent large scale forest fires. Tinder dry dead clumps occupying large tracts constitute a great fire hazard. The dead bamboo clumps as they get older tend to cant on one side and then may fall horizontally on the ground. The summer temperatures in Chandrapur district are very high and can peak at 47^0 C. High temperatures create thermals and strong winds. After catching fire the dead culms explode and rise on the thermals as firebrands. These can be carried to some distances to settle on the ground and start a new location of a forest fire since there is considerable leaf litter and larger debris that can sustain a new location of fire. The situation can quickly get out of hand. Dousing such conflagrations under the given high ambient temperatures is extremely difficult and dangerous since fire behaviour and intensities in bamboo occupied areas are unpredictable. There are many examples of fire fighters dying in such operations.

Mortality of wild animals caught in fires can be quite high. The other consequence of gregarious flowering is the profuse regeneration of bamboo from seed origin. Reed like and very dense growth raises a screen under trees locally called ranji that all but prevents sighting of wild animals in some areas. It takes years before the randomly spaced clump formation can take place. There is a popular belief that the dense growth of regeneration reduces the habitat value for wild animals by preventing their normal movement and that herbivores become an easy prey to carnivores upsetting the normal balance.

The forest department of Maharashtra has taken a decision not to extract and remove the dead bamboo clumps from the core area—the national park and the sanctuary. This is consistent with the orders passed by the Supreme Court of India following the cases—TN Godavarman Vs the Union of India and Others. This has some implications for wildlife tourism in TATR.

While the decision accords with the current orders that are respected, it is for consideration that currently there are 50 tiger cubs in TATR. Besides the adult tiger population the population of other native species is of high order that too includes—consistent with nomenclature—cubs, fawns, calves and such. There are nests and standing dead trees (snags) that have cavities—nests, shelters and roosting sites. The animals of young age classes are future recruits into adult age and breeding age classes. There are several species of birds that are ground dwelling and ground nesting not to mention reptiles and amphibians that live on the ground. When a list of such species is made there might be those that are among the listed threatened species, those with naturally small populations and those restricted in distribution. Animals and birds in the recruitment classes are those that are most vulnerable to the very high risk posed by the intense fires notwithstanding all the due care being taken to prevent their occurrence and for their suppression in the event of their outbreak. The added risk is the tendu leaf collection season. An activity that is notorious for having been associated with deliberate and illegal acts of setting forest fires to improve the growth and quality of leaves.

The synchronous flowering of *Dendrocalamus strictus* will not be restricted to TATR but will take place wherever the species occurs in Maharashtra and in other states—tiger reserves, national parks and sanctuaries in this specific context. The cogent scientific findings have been established. This is an event that takes place once in some 40 years. While there is complete respect to the current orders that

apply to protected areas and to the decision taken by TATR management, there are valid scientific reasons to remove the large numbers of dead and dying clumps of bamboos as an exception to an event taking place once in 40 years. A comprehensive case could be made out with appropriate scientific reasoning in favour of extraction of the dead bamboo clumps. Ways need to be found for the disposal of such material that accords with the principles of the current orders in force. Needless to state that, if accepted, such proposal needs to follow the relevant procedure.

1.3 Wildlife Tourism in TATR

The concept of ecotourism includes (a) Low volume of visitors leading to high quality of experience (b) Contribution to natural and cultural resources and stimulating private efforts (c) Promoting local development and equitable sharing of benefits (d) environmental awareness and promoting clean and green environment (e) Empowering local community to manage ecotourism (f) Generating incentives and livelihood options (f) Providing visitors rewarding experience of nature and culture (g) Developing understanding and appreciation. TATR has addressed all of such objectives. Further strategies have also been suggested

Since the year 1980 the importance of Tadoba national park and later of the Andhari sanctuary has steadily increased as a wildlife tourism destination. Wildlife tourism is a rapidly growing economy. Involvement of the private sector and players has been encouraged since the 1990s. Tigers historically are recognized as culturally significant and associated with status and power. Tiger is a flagship for wildlife conservation in India. Some conservationists have suggested very strict controls even banning tiger tourism considering unseemly behaviour of tourists, vehicle drivers and guides who encourage rash driving, crowding around sighted tiger/s and loudly conversing. The regulations in TATR severely discourage such behaviour. There are appropriate regulations in force. The other argument is about resorts and hotels destroying habitats and clogging dispersal corridors, while some assert the conflict between conservation objectives and local use of national parks and sanctuaries i.e. by local communities. TATR has set an excellent example in identifying ecologically sensitive villages within the buffer to put curbs on activities that would have adverse impacts on corridors and the environment.

The following two tables state the importance of TATR as a tourist destination

Table-44- Indian and foreign visitors during the past three years

Sr. No.	Year	Indians	Foreigners
1	2017-18	161578	5205
2	2018-19	173259	8208
3	2019-20	218760	4172

Table 45: Revenue earned during the last three years

Sr. No.	Year	Revenue (Rs in crore)
1	2017-18	8.83
2	2018-19	12.08
3	2019-20	14.28

In a study undertaken during 2017 by Salvador Lyngdoh, Vinod Mathur and Bitapi Sinha, all from WII observed that more than 27% of visitors chose to visit reserves solely because of their interest in tigers. Those interested in bird watching constituted some 8% and in nature and wildlife photography 12%. The core attractions included wildlife, especially iconic species; forests, lakes and rivers—experience of wilderness. A Large percentage of visitors to TATR depended on newspapers and word of mouth information. Many visitors were able to enhance their experience via their interest in intangible biodiversity values and conservation practices. Thus knowledge of field staff and guides is very important. Nature interpretation capabilities that open new windows to the natural world are essential. Anirudh Chaoji, who is an eco-tourism consultant has expressed that TATR presents an excellent model of partnership with local communities that has instilled a sense of ownership and belonging which has created a strong foundation for eco-tourism. The more important consequence is that local communities become the eyes and ears of the managers, help in strengthening protection and strongly discourage illegal activities. The varied interests encouraged in visitors have made them to stay longer in the locally available accommodation—hotels, resorts, home stays etc. that benefit local people. The facilities could consider creating waste segregation units, tetra pack management, sites for biodynamic compost, vermicompost facilities including dry leaf litter use. There are good capacity building programmes. Many bird watching guides are women. This atmosphere has provided the local people a purpose,

incentives and confidence. In TATR this will go a long way towards further improvements.

TATR has established three main tourist complexes at Kolara to the North, Moharli to the South and Pangdi in the East. There are many tourism resorts at varied distances form TATR. They are charged conservation fee under specific conditions. Home stays by local villagers in their houses and community stays by EDCs and gram panchayats are not charged the fee. Any resorts of government undertakings and those private that have up to 10 suits are charged Rs 500/- per suit and those above that capacity are charged Rs 750/- per suit per month. The realised amount is deposited with the Tiger Conservation Foundation for which a separate account is maintained. TATR has followed all the requirements/regulations of NTCA's guideline for tourism in and around tiger reserves, hereinafter referred to as Tourism Guideline. The provisions are consistent with those of the tourism guideline of the state. Since these are already on record they are referred to only in specific context. There is a detailed (Revised) Ecotourism Plan (2012-13 to 2022-23) in place. The tourism zone in the core area occupies 124.17 km^2 or 19.85% of the total area of the core which is well within the recommended limit of not exceeding 20% of the core area. There are two sub-zones, Tadoba (79.92 km^2) and Kolsa (44.25 km^2). The Tadoba sub-zone has two ranges Tadoba and Moharli. The Tadoba Range has 13 assigned roads for visitors over a length 95.90 km and eight roads with total length of 36.95 km within the Moharli Range. For entry into this sub-zone there are four gates at Nawegaon, Kolara, Moharli and Khutwanda. The Kolsa sub-zone has five roads with total length of 27.8 km within the Kolsa Range. It has two entry gates at Pangdi and Zari. Tourism zone is also created in the buffer that includes five nature trails and routes to be followed by visitors. There are a series of regulations including those that integrate the interest of local communities. These include wildlife and temple pilgrimage. The Ecotourism Plan states that bird watching is to be conducted during the mornings with trained guides from local communities. There are no nature trails in the two sub-zones for tourism in the core area. There are facilities for drinking water, day shelters (mainly near the entry gates) and rest rooms for the use of visitors at appointed places. Only gypsies registered with the Tiger Conservation Foundation (TCF) are permitted to enter the tourism zone. These are owned either by the locals or by the resorts. Vehicles are assigned to the permitted routes but the number is not controlled by specific routes. Vehicles entering from

different gates get naturally separated but crowding at certain points takes place sometimes. Vehicle movement is tracked by 'Bagheera' which is a mobile app. Carrying mobiles in tourist vehicles is prohibited which prevents vehicles calling others to a location where tigers are sighted. In other vehicle categories only the Mini bus and canter owned by TATR are allowed to ply in the tourism zone. A total of 125 gypsies are allowed to enter the tourism zone in the core. As per the NTCA guideline an exercise has been undertaken to ascertain the carrying capacity of vehicles of these tourism sub-zones. The number arrived at is 122 gypsies. Some 200 vehicles are permitted to enter the tourism zone in the buffer on a given day. These limits may be considered as final. There are no elephant safaris. Every vehicle has a guide. Some of the resorts have their naturalists who are allowed to accompany visitors who come from such resorts but the naturalists cannot replace the guides and are counted towards the allowed capacity of visitors in the vehicle. Guides and drivers are only from the local communities trained in the rules and regulations of the reserve. Their registration fee is paid by the TCF. All guides are trained in nature interpretation. Training sessions are conducted once a year with regularity. The guides are tested for their knowledge and are awarded stars—the numbers by the extent of their knowledge and skills.

No visitor is allowed to stay within the core. They have camping facilities at the Moharli FRH, and tented camps at Agarzari and Madnapur. Madnapur and Junona have Protection Huts where visitors can stay as well. These facilities are in addition to the three created by TATR at Moharli, Kolara and Pangdi. Officers under training at times visit TATR. Their trips are handled by assigned officers of TATR. Educational trips of students are handled by the BNHS.

The numbers of visitors and revenue realised from tourism will fall following the current outbreak of Covid 19 pandemic. Whatever numbers of tourists arrive in TATR if permitted, for those all safety precautions in force need to be on display on appropriate cards placed with the guides and the regulations need to be strictly enforced. With the state wide lockdown from 15th to 30th April 2021, the Field Director has suspended all tourism related activities during the period.

Following gregarious flowering of bamboo certain issues concerning tourism would emerge those would need to be addressed. These are (i) it would be necessary to create an information platform for the benefit of visitors (ii) as flowering progresses over larger areas, especially along the assigned forest roads used by

visitors. The fire control strategies including those for the safety of visitors, the managerial staff on the ground and for wild animals would come into play (iii) in time dense regeneration of bamboo would start establishing itself. Although the wild animals may not have difficulties in moving through such screen it would create changes in habitat that might be unfavourable to some groups of species. Obstructions for normal sighting of wild animals would take place. This situation is likely to persist for a few years before formation of new clumps would create natural spaces to restore the normal sighting conditions for visitors.

Chapter II

The Strategies

2.1 Epilogue

While some of the management measures would specifically apply to issues that relate to the gregarious flowering of bamboo including the dense regeneration to follow, there are other suggestions meant to add to the wildlife experience of visitors down the years. TATR is among the best areas for tiger sighting in the country and by the same logic a first rate area for other native species as well. While the central interest of many visitors is sighting tigers which is almost a fetish but there are other wild creatures and nature's sights that need to be promoted in which sections of visitors are interested. There always would be a section of discerning persons among the visitors with varied interests in nature. TATR has a great tradition of management and deserves the best from the society and therefore it is all the more important to showcase the role of forest and wildlife managers in the state. The gregarious flowering of bamboo is an opportunity to set other future goals while addressing the current crisis. With acknowledgement of the high risk from fires, the fire protection measures and readiness for fire fighting when there are outbreaks, protection for fire fighters, protection of wild animals, habitats and their maintenance, addressing the standing and progressively dying clumps of bamboo in the core area are critical issues and take precedence over other matters. These aspects are being addressed in separate chapters hence apart from incidental reference to these; no recommendations are being made herein. There are no SoPs for the safety of visitors. TATR needs to create an SoP based on anticipation of fire and other risks in laying down directions to the management staff for their own safety and the safety of visitors.

2.2 Strategies

2.2.1 **Monitoring wildlife use of habitats in the bamboo regeneration within the core**:

It is expected that there would be profuse regeneration of bamboo from seed origin within the core occupying some of the otherwise natural spaces between the dead and dying bamboo clumps. It would be interesting as well as important to ascertain habitat use by animals. Without getting into extensive efforts at sampling as was for example under the all India exercise for estimation of population of tigers, co-predators and prey—2018 it is

recommended to use dung counts as index of ungulate density. Most field staff, some transfers not withstanding is expected to be familiar with the exercise undertaken 2 to 3 years ago. As was done during that protocol it is suggested to use transects, one transect per beat already marked—they are supposed to be permanent— one per beat with plots of 2X20m placed on those at an interval of 200m rather than at 400m because the sampling effort is going to be small being restricted to the tourism zones. In these plots all dung/pellet groups or individual pile or scats as in the case might be identified to species are to be counted and recorded as per Form 4 in the 2018 exercise. The effort apart from being limited to the tourism zone/s in the core, additionally about 50 km^2 area within the tourism zone in the buffer may be randomly selected from which dead bamboo clumps are extracted/being extracted. If a beat appears partially in any of these areas of core and buffer it may be considered as a complete beat. The objective is to arrive at an index of ungulate density. The approach to analysis as in the 2018 protocol needs to be followed. One time readings during the month of May or June and another in the month of November or December is suggested.

Further, all tiger sightings during one full month— each in summer and winter may be recorded. Camera traps are already being used within the TATR to monitor the tiger population. Pugmarks may be picked up and traced from impression pads. Individuals by IDs and genders would need to be compiled. Number of cubs may be separately tallied. The method had come under heavy criticism during the 1990s putting the forest department on the back foot. It needs to be ignored. The WII with certain modification in the procedure has established the validity of the pugmark based technique for gender discrimination between tigers and for recognizing individual identities. The outcome of the study has been published Wildlife Society Bulletin, Volume 31 (1), 2003. Even the modification made in the technique need not be adopted. The traditional technique of tracing pugmarks can be followed. All personnel need to be vigorously trained and tested which is critically important. The earlier criticism had dwelt on this. The technique will work effectively as an internal monitoring system. This is use fl to test the results of one technique with the other.

2.2.2 **Proactive engagement of media**

it is for the management to decide the contact person/s to liaise with the known sources of media—print, television or radio in Marathi, Hindi and English. The objective is to provide the correct information of the natural phenomena, it's ecological and to a certain extent the economic consequences, the risks and strategies to deal with those separately in the core area and in the buffer inclusive of the tourism zones. Partnership with local forest dwellers must feature. To include some members of the community of both genders in interviews with media—if such events take place—would be very useful. The provisions under the laws and concerned court orders need to be explained. Whenever there are such natural events/accidents or managerial actions there is a tendency to exaggerate matters including spreading false information that could harm the image of the forest department and the management reputation of the protected area/ tiger reserve. This may not be considered as one time engagement. There might be accidents and such matters. There could be sources—organizations and individuals who have an axe to grind making unsubstantiated and false complaints in the media. These need to be scotched in real time. Thus there is need to have an ear to the ground. Taking members of the media on a tour of affected areas—time and places to be decided by managers—would be advantageous to maintain transparency. Not to speak of the present crisis but in the long run such approach would help in winning the trust of people at large. Details of all engagements hosted need to be recorded.

2.2.3 **Information fliers**

Wildlife tourists or visitors constitute the public face of TATR. These include people from all walks of life. Besides experience that appears in print or over television media or is shared by word of mouth there are other routes. People have access to media such as Face book, Twitter, blogs and the like. Tourist agencies and resorts—local, state, national and international carry reportage of visitor experience/opinions on the internet in support of their business or motives. There are photographs and videos some of those that get published. For the information of visitors an A4 size flier with just the right kind of succinctly drafted information needs to be

prepared. Each vehicle that ferries visitors inside the visitor/tourism zone needs to carry such information that is printed on a durable and appropriately coated card. The accompanying guide needs to be made responsible to bring the content of the card to the notice of the passengers in the vehicle. For the resorts and other facilities for visitor stay, sufficiently large and attractively designed posters need to be prepared for their prominent display, preferably located by the reception desk. For the higher end resorts the cards as stated before could be arranged to be placed in individual rooms as well.

2.2.4 **Engaging tourist guides and vehicle drivers**

The Tourism Guideline recommends a curriculum for training guides and drivers in the art, craft and ethics of wildlife tourism. The Tiger Conservation Foundation regularly conducts compulsory short term training for such personnel additionally involving nature interpretation, the nuances of rules and regulations followed by an examination and certification. Such persons are required to wear a uniform with name tags and badges. This would offer an opportunity to introduce new aspects. In this instance about the gregarious flowering of bamboo, the ecological and habitat related implications. Fire risks need to be spelled out in detail and the need for strictly following the warnings and instructions from field personnel of the forest department, especially those during emergencies. Diverted vehicles or those required to exit the tourism zone gates as a result of fire warnings need to necessarily inform the staff at those gates the identity of vehicle, that of the guide and the driver and the permit details. The staff concerned needs to maintain a separate record of such events.

2.2.5 **Control of tourist vehicles, fire warnings and emergencies**

The Tourism Guideline recommends maintaining a distance of 50m between vehicles on a visitor route. It also suggests maintaining a minimum distance of 20m from wildlife and about not monopolizing a sighting for more than 15 minutes. Considering the prime interest of visitors it applies more frequently to tiger sightings. These are among the regulations of TATR. Knowledge of visitor behaviour and the interest of tourist operators the observance of these requirements is at times quite

difficult. However, given the current ecological crisis and the high risk of fires these regulations become all the more important. There is a possible way out. It is recommended that the bonnet of each vehicle should carry a unique number linked to its record of registration in the books of TATR including the IDs of the driver and the guide. For the purpose it is suggested that a circle of at least 50cm diameter be painted in yellow with the number in Roman painted in black at its center. TATR may consider using drones from assigned stations within the tourism zone with a dual purpose of monitoring fire outbreaks and monitoring vehicle movement by numbers on the bonnet that attracts the two regulations cited earlier. With that knowledge among the drivers and guides it would greatly help in maintaining the required discipline. The managerial staff in the tourism zone has access to wireless network across TATR, hence would have real time knowledge of fire outbreaks. The drones would help in assessing risks to the area and routes of interest. This would make it possible to take decisions about diversion/evacuation of visitor vehicles from areas of imminent risks along routes of options. To bring this about the managerial staff needs vehicular mobility. The Field Director of course has powers to shut down the tourism zone fully or in portions over time that might be determined.

2.2.6 **District authorities to be kept in the loop**

The district Collector and the Superintendent of Police need to be informed about the ecological changes in TATR and their implications for visitors as well as for the forest dwelling communities residing in the buffer. This is to avoid misinformation and its consequences

2.2.7 **Fire control strategies**

These are not being discussed as these are covered under other chapters/sections of the Plan. However it would be pertinent to state the risk of fires in the core area of which the tourism zones are a part. On 09 April 2021 in an area of Navegaon-Nagzira tiger reserve three labourers were charred to death and two others were critically injured when the fires had engulfed the area in which these men were working as members of the forest team trying to control the fires. Decades ago fires had broken out the gregariously flowering bamboo area in Bandhavgarh national park

located in Madhya Pradesh. A riding elephant, its mahawat, the chara cutter and two others were caught in the conflagration and had perished. The fire behaviour in areas of dead and dry bamboo clumps is unpredictable and rapid. Fire fighters can easily be trapped within encircling fires without being aware of it. Thus all men need to be fully aware of this and trained for dealing with such fires. Many temporary labourers from the EDCs are likely to be part of fire fighting teams. In case of accidents—loss of life or serious injuries there are no provisions for ex-gratia payments and for the expenses for treatment. Hopefully nothing of the kind will happen but this is the right time to moot a case to the competent authority for such payments in the event of accidents citing atmospheric forces, fire behaviour, events of earlier fires. With the decision for not removing dead bamboo clumps from the core area this tract runs the highest risk.

2.2.8 **Medical help on call**

PHCs as relevant and hospitals in nearby areas including those in Chandrapur may be notified to remain on call explaining the nature of problems and medical help that might be needed at short notice in case of fire related injuries including problems from inhalation of smoke.

2.2.9 **List of friendly NGOs**

NGOs known for their knowledge of TATR and support to management may be informed of the situation requesting for their help—as per their speciality—in time of need. This would include their interface with local residents.

2.2.10 **Addressing regeneration of bamboo during the initial years**

As stated before the regeneration of bamboo from seeds can be very dense and reed like in appearance. There is next to no information on implications of dense regeneration of bamboo for wildlife. There is likely to be considerable change such as reduction of open spaces and grassy openings that constitute edges and ecotone for wild herbivores especially for the large herd forming species like the spotted deer for example. There are several species of ground dwelling birds that need openings to search for food and appropriate places for nesting. It is likely to increase ambush

cover for carnivores to the disadvantage of the prey species. There is also no information on how such growth affects animal mediated dispersal of seeds of the native woody species including those of trees. Seeds are always randomly dispersed that may or may not find favourable substrates for sprouting and regeneration even under the normal habitat conditions. There is therefore an excellent opportunity to set experiments and undertake research on such aspects. The Chief Wildlife Warden has powers under the pertinent sections of the Wildlife (Protection) Act 1972 to take measures for the betterment of habitats. With such hypotheses it might be useful to create on experimental basis pepper pot openings within the dense regeneration of bamboo. The monitoring part with a set protocol could be taken up through the department's Research wing or could be assigned to a research organization. Earlier using transects with plots to ascertain densities of herbivores has also been suggested

Another implication of such experiment needs to be looked at. This ought not to be construed as management to inflate animal abundance for tourism purposes which is prohibited under paragraph 2.2.16 of the Tourism Guideline. Along the visitor routes where the regeneration, locally called ranji, is particularly dense and tall the experimentally created gaps in random clusters with associated ecotone and edge effects are likely to create better sighting conditions for visitors, at least in some sections along their routes. It is expected that wild animals entering or exiting these areas would be more visible. It needs to be understood that this is an experiment, an exploration supported by reasonably strong hypotheses. Depending on the preliminary observations the strategy could be modified.

2.2.11 **Nature Walks**

TATR has five nature trails in the buffer zone. Small sections not more than two km each would be most suitable for the purpose of conducting nature walks. These need to have some elements that would make a nature walk a rewarding experience for the visitors. For example it may include a portion of a riparian area, large tall trees. The route ought to be winding on a dusty path at least a couple of meter wide. The guide must be alert and well informed to use what he/she comes across as a potential interpretive subject. Pollination of ficus for example would be very

absorbing. The secrets of pollinating agents, not insects alone, seed dispersers, insects come across, their role in the ecosystem, identification of birds by their calls, sighting, flight pattern; wildlife signs on the ground—footprints, droppings, remains of food to identify the animals etc. There can be a host of items to last for a couple of hours. Wherever possible the role of wild creatures in ecosystems, insects and higher forms need to be touched upon. The guide must not act in a lecture mode. The participants must feel that they are being guided to learn by themselves. It is a skilled role and guides need to be trained with the help of expert naturalists and tested frequently for their knowledge and skills. The margins of the Erai dam backwaters near Moharli are excellent for observing waterfowl. With some efforts it is possible to discover some excellent walking trails and the secrets of nature they hold. It is recommended to select appropriate persons from local communities and arrange their visits with the objective of learning the art of nature interpretation to places like the Periyar and Parambikulam tiger reserves in Kerala, Top Slip in Anamalai tiger reserve in Tamil Nadu; the Kabini resort at Karapur near Nagarhole owned by Jungle Lodges and Resorts Ltd (JLR) a subsidiary of the Karnataka forest department. At these places there are first rate naturalists and guides from local communities. While trails can be picturesque the content to be delivered and the manner in which to deliver it is crucial. Walking trails that have bamboo clumps or those that are within proximity of half a kilometre need to be shut down as a means of abundant caution till the dead ones are removed and any threat is eliminated.

2.2.12 **Establishing an interpretation centre**

As per the existing regulations no infrastructure—tourism or related to it—can be raised in the core area or on the sites from which villages have been relocated or in the village areas of the 24 ecologically sensitive villages that have been notified. Among the latter are 13 villages of Chandrapur tehsil, seven of Sindewahi and 4 of Bhadravati tehsils. This is to maintain the ecological integrity of the buffer zone of TATR and the corridors. The existing tourism infrastructure in those 24villages can remain but no extension to the existing structures would be allowed. The Revenue department cannot give permission for Non Agriculture use of

areas in these villages. The exception is for small home stays of local villagers or community stay facilities by EDCs/Panchayats. There are detailed regulations concerning tourism infrastructures in buffer zone in the TATR's ecotourism plan. No new tourism infrastructure can come up on forest land in the buffer zone except chaukis, gates and signage.

An interpretation/visitor centre can add a lot of value to the visitor's experience. An advantageous location for the purpose needs to be selected. At present such a centre does not exist in TATR except that there is a butterfly garden at Agarzari. Melghat TR has a locally evolved centre at Semadoh that has some excellent photographs, carries conservation stories and has a roofed but otherwise an open air auditorium. There is an example of high tech centre at Kanha in Kanha TR, MP with an amphitheatre near the entrance at Khatia. It is difficult to maintain sophisticated gadgetry but if that is ignored the exhibits are excellent but expensive. The Pench TR, MP has something that could be considered. It is artistic, blends with the surroundings and is effective. It has sufficient space for the display of photographs and other exhibits and has an excellently appointed auditorium of reasonable size and capacity where films can be screened; interactions with visitors can be held and so on. At present in TATR visitors are handed in forms to obtain their opinions regarding their experience. These forms are collected at the exit points or handed over to the guides by visitors. These need to be collated, categorised and used for improving visitor experience. The outcomes need to go into the management plans as those get updated/ revised. While this is one approach to address a large group of visitors an effort on smaller scale with a personal touch can be included via a speaker's corner in the interpretation centre at which a responsible official once a week fields questions from visitors and where visitors can also independently voice their observations and opinions. This would help in maintaining transparency and also to make appropriate corrections as relevant.

Visits to interpretation related facilities in Kanha, Periyar, Parambikulam TRs, to resorts created and managed by JLR in Karnataka would be eminently useful to gain experience and to plan what is relevant for TATR.

TATR has had a rich history of management, events and mileposts. The most important among these is TATR's role as a source population of tigers and prey species. This is the most visible role but it needs to be understood by visitors and that there are other native species, not just animals but plants as well that are so supported. A sufficiently large panel displaying the map of such landscape can make a very strong case for TATR. The rivers need to be shown to make the point for the role of forests in maintaining catchments. The negative aspects of insular biogeography and the TATR's role in overcoming it could follow in terse but clear sentences. In past, till about the 1980s some of the visitors staying in forest rest houses have recorded their observations on wildlife in the rest house registers. The important events can form part of the display, written material in form of a multi-panel folder for example with a title like 'The wildlifer's Diary'. Archives need to be searched for photographs. There was an iconic old forest rest house at Kolsa with thick walls done in lime mortar and a tall sloping roof of thatch. The FRH had an arresting presence. Unfortunately with a new FRH constructed the old one fell into disrepair. Lack of funds for maintenance was another reason for the neglect. It is now gone. The only example of its kind is the FRH at Supkhar in Kanha tiger reserve that is beautifully maintained with all the original fixtures. A photograph of the old Kolsa FRH and others of that vintage could be among the excellent and attractive exhibits. Several foreign dignitaries have visited Tadoba national park in past. Their photographs could be considered. The local festivals can be of considerable interest. That celebrated by the tribal community venerating the Tadoba or Taru deity, knowledge of other monuments of historic importance, the pillars for communication on the road leading to Moharli, photographs of events in local tribal culture are some of the examples that would bring the history alive—wildlife, natural history, people and culture.

A wall with photographic display with minimum text relating to the protection and management tasks of the forest department, specifically of TATR has an important place in the exhibits. It could be about fire tracing and fire control, a patrolling camp, habitat restoration tasks such as weed control in grasslands, maintenance of waterholes, soil and water

conservation, protection of riparian zones, apprehending poachers, amenities provided in a relocated village, training of guides, camera trapping work etc. There can be a display of several photographs indicating different habitats, pictures of spectacular flowers, a short story of tiger—pugmark tracks and scrapes, scats, a kill or two, claw marks on a tree bole, cubs with the mother. The status of TATR core area as an IBA and what it means through attractive photographic panels and some of the birds that feature in the A1 and A3 Categories would be most appropriate. The contribution of local community to managerial tasks, the guides and the drivers trained from the local community need to have an important place in the pictorial exhibits.

A collage of pictures and minimum text could be on the role of forests—vegetation and animals being integral to those—and *inter alia* the service to citizens and the nation. It is the most complicated and ancient process and only a few of the relationships can make the collage—carbon sequestration, amelioration of climate, protecting water catchments, soil security, human health via medicinal plants across the known systems of medicines, charging aquifers and maintenance of flowing rivers leading to prosperity of agriculture to feed the nation. These are fundamental to life.

There can be collection of field samples—actual collection from the field such as antlers of chital and sambar indicating their broad use in estimating age class, jaw bones with teeth that are useful in estimation of age. Skulls of herbivores and carnivores to indicate differences, droppings of sambar, chital, barking deer and four horned antelope for identification of species and their use in estimating relative abundance/densities; a scat of a tiger to indicate the identity of prey species consumed via microscopic analysis of undigested hair, extraction of otherwise degraded DNA to ascertain tiger identities through wider collection of scats can hold a lot of interest. These are some examples to showcase the plants and animals; the range of tasks of wildlife managers and their contribution to science and conservation

The citizens at large and even some of the professionals tend to view forests and wildlife as separate entities. While plants and animals are coevolved they have an inseparable and interdependent role for

supporting ecological functions and processes by which they can thrive. These ecological relationships are not appreciated. Among the exhibits, to cut a long and complicated story short, the role of birds and mammals in pollination and dispersal of seeds can be pictorially depicted. While insects are known for their pollination service the higher animals have failed to make the picture. All wild herbivores and omnivores (species of mammals) feed on a variety of wild fruit and seeds are dispersed via physiological processes to varied distances. A large number of frugivorous birds provide similar service to maintain the process of natural regeneration of forests and in turn the service that forests provide to a nation's welfare and progress.

Chandrapur district is rich in fossil deposits. After bifurcation of the district portions of these deposits have gone to the Gadchiroli district. There are fossils of angiosperms and gymnosperms and of ancient animals. Display of some of these fossil specimens in the interpretation centre would be a valuable addition to ancient natural history. A short artistically presented timeline of events in evolution such as cooling of Earth, formation of oceans, beginning of rains; the period of unicellular and multicellular animals; emergence of primitive plants followed by trees, establishment of forests and arrival of vertebrates; extinction of dinosaurs, arrival of social insects, flowers, modern birds and smaller mammals; the arrival of the modern humans would be most appropriate and interesting. The division of palaeontology of the Geological Survey of India can help in setting up such exhibit. The importance of Chandrapur district ought to be highlighted. The Ahmadabad based Centre of Environment Education (CEE) can advice on the design of displays, the layout of an interpretation centre and the space necessary.

The Interpretation Centre needs to have an eclectic collection of wildlife videos. Wildlife is used as a broad term to include the outdoors. While those about TATR are important there can be those on other tiger reserves. National Geographic, BBC, UN and several other sources can be tapped. Those on the consequences of global warming would be very relevant. These could be selectively screened in the auditorium on specific days in a week.

2.2.13 **Eco-shop**

An eco-shop may be established alongside the interpretation centre that could be run by members of an EDC to display and sell handicraft articles made to showcase the local tribal art. The TATR ecotourism plan includes setting up such outlets by the three visitor facilities created by TATR. There could be modern articles such as tea/coffee mugs carrying the logo of TATR and assorted pictures, different on different mugs of some of the species that belong to TATR. Tiger and leopard are fine but there could be a honey badger or a pangolin. There could be others such as of waterfowl—mallard and painted stork; the grey junglefowl and black-rumped flameback; marsh crocodile and chameleon. Likewise there could be T shirts carrying the logo and animal/bird pictures. Caps and soft cloth hats are popular with visitors and have their use in the field. These could have embroidered logo and name of the reserve. Self help group of ladies can market shopping bags made from cloth with animals and birds done in cut work on those. The entire business needs to be run by EDCs. They would need help for access to materials in the market, having the pictures done on mugs and t shirts and help for the initial small capital. The proceeds could go to the local communities.

2.2.14 **Mobilizing funds from Corporate Social Responsibility (CSR):** Since the mandatory applicability of CSR contribution by the corporate sector in the country it is possible to access funding to support wildlife conservation. What is needed is an understanding of the areas of contribution as per the decisions of a specific industrial group and to moot a proposal detailing the strategy for which support is sought and the difference it would make in that service. The areas of support are broad in nature and therefore specific and convincing proposals would be needed. To pursue such cases patience is also necessary. It may not be all that easy but when the objective is achieved the flow of support in future would be facilitated. Common CSR actions include waste management, water management, renewable energy, reusable materials, and green supply chains. Specific areas of interest for TATR could be—restoration of ecosystems, soil and moisture conservation, prevention of fires and control measures in the event of fire outbreaks; empowering the local communities in matters of

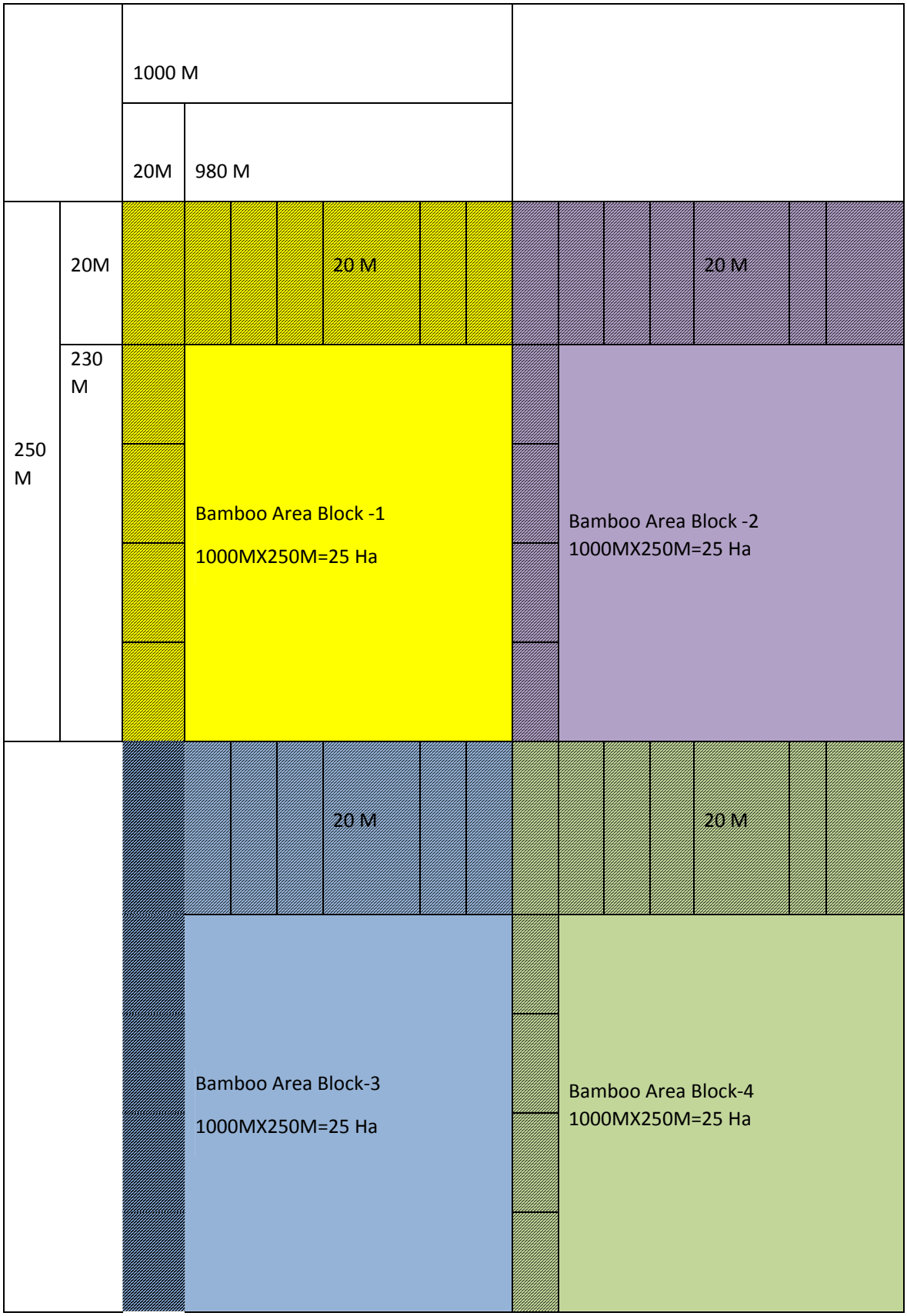
environmental protection, developing skills in small trades including those related to wildlife tourism as stated under (xii) above through EDCs. There are some promising corporate groups such as **(a)** Tata Group that supports projects concerning environmental protection, rural community development and other social welfare programmes and women empowerment activities within the larger canvas of projects **(b**) Ultratech Cement has activities in the environment sector **(c)** Mahindra and Mahindra is active in areas of livelihood training and water conservation **(d)** ITC Group supports sustainable livelihoods, social and farm forestry, agriculture, social empowerment through micro enterprises and environment related programmes. There is thus a scope for wider integration of local communities into tourism related activities, development of skills and small trades that would find their way into visitor spending. It would help in management and restoration of habitats in the buffer zone—specifically the visitor areas and provide an important place for wildlife tourism in the minds of the local community and their economy in a wider and sustainable sense beyond the actual service to visitors and tourism to strengthen the bond between communities and the conservation objectives of TATR.

There are small home stays and other such facilities run by EDCs/ gram panchayats in the buffer zone. Although no new tourism related hotels/resorts are allowed to come up in the buffer zone an exception is provided to small facilities and home stays that might be created by EDCs and gram panchayats. As a further step for strengthening the bond with local communities vis-a-vis tourism, an initiative for promoting organic farming on a small scale by EDCs would be quite useful. There is good deal of information on this in the agriculture sector. Fruits and vegetables grown thus would immediately find a market with visitors. Pune based Maharashtra Organic Farming Federation would be a useful contact for the purpose. The important aspect in all of this has to be the identity of TATR that must be associated with the initiatives and benefits. It needs to be stated that these suggestions do not amount to stepping into the eco-development aspects per se but to work towards strengthening the feeling

of partnership of local communities with TATR—developing their stakes in tourism.

2.2.15 **Training of field staff**

For some reasons training of field staff in TATR could not be conducted during the past three years. It is recommended to conduct such training once every year. In the tourism zone of TATR the field staffs acts as the face of the forest department, specifically in the matter of knowledge of the forest and wildlife via some simple rules for interaction with visitors. The Education Circle in Pune had undertaken an extensive exercise for preparation of curricula for training institutions for forest personnel in the state. There are individual books on each of the subjects. Books on relevant themes could be picked up. What is specifically needed for TATR that does not find place in the literature could be independently written up. There are highly experienced serving forest wildlife managers across different ranks of responsibility in the state. If a training window in time is set down in advance the concerned officials could be at TATR to contribute the relevant experience and knowledge for the purpose of training. There are several such officials with different specialities who have retired. Individuals from the pool could be drawn upon for the same purpose. Random testing of skills in the field from time to time is essential.


1000 M
20M
980 M
250 M
20M
230 M
20 M
20 M
Bamboo Area Block -1
1000MX250M=25 Ha
Bamboo Area Block -2
1000MX250M=25 Ha
20 M
20 M
Bamboo Area Block-3
1000MX250M=25 Ha
Bamboo Area Block-4
1000MX250M=25 Ha

APPENDIX - I

Statement of Gregarious Flowering of Bamboo in Core Area

(Area in Ha)

Sr. No.	Comptt Nos.	Total Area	Teak Area	Mixed Forest Area	Grass Land Area	Degraded Forest Area	Bamboo Area	Flowering Status
1	49	220.55	10	174.55	10	25	1	2020
2	61	445.14	57	388.14				2020
3	62	308.78	16	274.78		18	30	2020
4	65	437.47	17	395.47		25	87	2020
5	66	278.019	35	236.019		7	111	2020
6	67	231.885	25	194.885		12	46	2020
7	69	709.819	48	586.819	75		390	2020
8	72	179.275	10	157.275	2	10	5	2020
9	74	246.858	2	209.858	25	10	1	2020
10	75	205.175	4	189.175	2	10	2	2020
11	76	236.336	5	224.336	2	5	2	2020
12	79	208.008	31	177.008			80	2020
13	82	293.802	100	116.802	77		166	2020
14	83	483.599	220	213.599	50		363	2020
15	84	199.914	20	169.914	10		50	2020
16	85	265.069	21	214.069	20	10	53	2020
17	89	327.39	227	49.39	55	5	55	2020
18	90	88.221	30	45.221	13		35	2020
19	91	266.688	26	80.688	160	„	27	2020
20	92	280.852	28	56.852	196		84	2020
21	93	394.973	62	312.973	20		124	2020
22	95	128.69	25	103.69			50	2020
23	96	171.586	4	137.586	25	5	10	2020
24	98	367.859	73	290.859	4		90	2020
25	99	235.527	47	188.527			56	2020
26	101	439.894	44	395.894			88	2020
27	106	623.621	124	499.621			200	2020
28	107	166.73	8	158.73			17	2020
29	108	394.973	40	354.973			100	2020
30	110	248.478	30	205.367	26		78	2020
31	111	324.153	49	178.153	97		130	2020
32	112	374.334	56	188.334	130		150	2020

33	113	193.439	29	106.439	58		68	2020
34	114	469.426	140	259.426	10	60	94	2020
35	115	132.332	17	108.332		7	35	2020
36	116	82.555	40	42.555			25	2020
37	117	434.632	28	365.632		50	100	2020
38	121	334.27	100	184.27	33	17	134	2020
39	129	448.392	90	358.392			150	2020
40	131	194.249	2	192.249			100	2020
41	132	319.702	20	294.702	5		250	2020
42	133	341.15	40	291.15	10		200	2020
43	134	148.52	5	143.52			70	2020
44	135	508.286	75	433.286		__	300	2020
45	136	235.527	5	230.527			130	2020
46	137	274.377	10	262.377		2	150	2020
47	139	191.416	60	116.416		15	20	2020
48	140	333.056	150	178.056		5	75	2020
49	141	266.283	50	201.283	15		150	2020
50	142	235.122	30	195.122	5	5	130	2020
51	143	179.68	40	124.68	5	10	70	2020
52	144	331.842	55	261.842	5	10	160	2020
53	145	133.951	20	110.951	3		80	2020
54	147	269.925	75	190.925	4		100	2020
55	148	217.721	50	159.721	8		74	2020
56	150	346.006	84	250.006	12		130	2020
57	151	401.448	150	241.448	8	2	160	2020
58	152	374.739	50	302.739	12	10	200	2020
59	153	390.116	40	350.116			150	2020
60	156	244.43	14	230.43			200	2020
61	157	195.058	20	115.058	50	10	100	2020
62	158	348.434	35	105.434	128	80	70	2020
63	160	403.067	20	283.067	100		200	2020
64	161	369.073	35	334.073			185	2020
65	245	303.514	35	265.514	3	__	200	2020
66	248	501.811	46	450.811	5		300	2020
67	249	371.906	30	332.906	9		200	2020
68	250	251.714	15	231.714	5		150	2020
69	253	263.45	23	240.45			100	2020

70	254	536.614	55	475.614		6	230	2020
71	255	615.953	60	551.953		4	300	2020
72	256	267.902	5	245.902	10	7	100	2020
73	257	267.902		242.902	5	20	100	2020
74	258	395.783		376.783	10	9	75	2020
75	260	571.821	__	321.821	100	150	140	2020
76	266	555.633		525.633	15	15	200	2020
77	267	640.63		615.63	10	15	100	2020
78	277	317.678	30	205.678	12	70	200	2020
79	279	309.989		300.989	4	5	150	2020
80	281	526.901		281.901	50	195	150	2020
81	282	137.188		112.188	10	15	75	2020
82	283	233.099	15	203.099	10	5	125	2020
83	284	517.189	20	467.189	25	5	225	2020
84	285	304.728		239.728	50	15	100	2020
85	286	390.117	10	360.117	15	5	150	2020
86	287	540.256	30	510.256			250	2020
87	288	593.27	30	561.27	2		300	2020
88	289	167.54	20	147.54			90	2020
89	293	228.647	20	208.647			110	2020
90	294	384.856	20	325.856	3		140	2020
91	296	551.182	75	471.182	5		200	2020
92	298	374.334	70	299.334	15		150	2020
93	299	246.858	30	209.858	3	4	150	2020
94	300	254.143	25	230.143	3		140	2020
95	301	241.597	20	216.597	5		130	2020
96	302	498.573	50	438.573	10		175	2020
97	303	340.341	125	165.341	50		340	2020
98	306	606.219	50	446.219	50	60	500	2020
99	307	353.695	100	243.695	10		353	2020
100	308	479.148	150	309.148	20		479	2020
101	309	399.425	30	299.425	50	20	399	2020
102	310	179.68		164.68	10	5	120	2020
103	311	696.869	30	611.869	40	15	696	2020
104	312	314.441	15	290.441	4	5	200	2020
105	313	315.25		300.25	10	5	150	2020
106	314	423.301	20	395.301	5	3	200	2020

107	316	677.039	100	457.039	50	70	500	2020
108	330	559.68		524.68	25	10	100	2020
109	334	348.03	40	248.03	50	10	150	2020
110	335	567.774	5	547.774	10	5	250	2020
111	337	358.551	10	258.551	40	50	250	2020
112	338	411.97	20	221.97	100	70	300	2020
113	339	188.988		93.988	75	20	150	2020
114	340	285.708	30	185.708	50	20	200	2020
115	343	278.424	50	103.424	100	25	100	2020
116	344	133.951	20	9.951	100	4	20	2020
117	345	300.277	50	150.277	75	25	150	2020
118	Bhanuskhindi PF	310.47		372.848		50	30	2020
119	SataraP.P.	97.31		99.372		15		2020
120	Tekadi Mandavzari PF	132.87		125.222		20		2020
121	Bamangaon	94.83		456.601		70		2020
	Total 121 Comptts	**40348.911**	**4652**	**31943.363**	**2788**	**1547**	**17583**	**43.57 %**
122	48	396.187	15	345.187	15	20	1	Awaited
123	Katezari PF	92.04	35	39.47	7	13	2	Awaited
124	Jamni PF	228.83	150	210.07	10	10	5	Awaited
125	ChichghatPF	27.920		22.92		5	7	Awaited
126	Botezari PF	10.59		6.59	2	2	10	Awaited
127	77	182.108	15	152.108	10	5	15	Awaited
128	Khutwada PF	48.867		30.867	5	15	15	Awaited
129	88	106.837	80	26.837			16	Awaited
130	73	221.767	10	171.767	15	25	20	Awaited
131	119	157.018	77	60.018		20	20	Awaited
132	120	154.59	46	108.59			20	Awaited
133	Palasgaon PF	87.9	5	73.61		10	20	Awaited
134	118	216.911	11	189.911		16	25	Awaited
135	109	151.757	15	128.757	8		30	Awaited
136	276	362.6		330.6	22	10	30	Awaited

137	68	159.041	40	113.041		6	31	Awaited
138	138	101.171	10	91.171			35	Awaited
139	71	137.188	13	124.188			40	Awaited
140	124	198.296	20	119.296	59		40	Awaited
141	87	225.005	122	88.005		15	45	Awaited
142	336	219.744	30	69.744	100	20	50	Awaited
143	342	253.333	50	124.333	75	4	50	Awaited
144	123	146.086	14	103.086	29		58	Awaited
145	163	269.116	15	214.116	15	25	60	Awaited
146	78	201.128	18	183.128			75	Awaited
147	130	248.477	50	198.477			75	Awaited
148	259	349.648		319.648	15	15	75	Awaited
149	292	152.971	15	135.971	2		75	Awaited
150	315	317.274	50	221.274	40	6	75	Awaited
151	332	223.791		196.791	20	7	80	Awaited
152	86	386.07	38	348.07			96	Awaited
153	97	245.644	12	233.644			100	Awaited
154	162	154.995	20	134.995			100	Awaited
155	295	191.821	20	161.821	10		100	Awaited
156	333	717.508		704.508	10	3	100	Awaited
157	341	414.803	50	204.803	150	10	100	Awaited
158	125	267.902	80	160.902	27		107	Awaited
159	127	127.071	5	112.071	10		110	Awaited
160	291	248.477	19	229.477			120	Awaited
161	122	425.324	85	213.324	127		128	Awaited
162	126	275.186	28	164.186	55	28	138	Awaited
163	149	352.481	110	220.481	22		150	Awaited
164	317	282.471	50	152.471	40	40	150	Awaited
165	331	571.822	10	516.822	40	5	150	Awaited
166	346	270.33	20	205.23	45		150	Awaited
167	159	404.686	80	215.686	89	20	175	Awaited
168	155	507.881	150	357.881			200	Awaited
169	278	254.952		109.952	25	120	200	Awaited
170	290	390.522	35	350.522	5		200	Awaited

171	297	354.909	75	264.909	10	5	200	Awaited
172	305	264.664	10	154.664	50	50	200	Awaited
173	318	502.215	60	172.215	70	200	200	Awaited
174	64	509.51	20	464.51		25	204	Awaited
175	371	263.048	50	15.474	70	30	225	Awaited
176	128	461.342	10	440.342	10	1	230	Awaited
177	251	585.985	27	548.985		10	250	Awaited
178	280	393.759		193.759	50	150	250	Awaited
179	94	326.581	50	260.581	16		261	Awaited
180	373	350.053	40	150.053	100	60	300	Awaited
181	146	462.151	35	422.151	5		350	Awaited
182	252	745.027	45	690.027		10	350	Awaited
183	304	417.636	50	257.636	100	10	417	Awaited
	Total - 62	17775.02	17775.02	2190	13031.7	1585	7111	
184	100	143.663	26	117.663				**No bamboo**
185	Wadala PF	480.29	7	204.283	40	120		**No bamboo**
186	Sonegaon PF	141.58	50	42.886		91		**No bamboo**
187	Chaitirith PF	494.6		412.719	4	100		**No bamboo**
188	Ghosari	252.14	2	50.147		200		**No bamboo**
189	Tamsi PF	35.11				38.275		**No bamboo**
190	Katwal PF	66.650		10		56.65		**No bamboo**
191	70	218.53	22	185.53	11			**No bamboo**
192	80	255.356	51	204.356				**No bamboo**
193	81	102.385	15	87.385				**No bamboo**
194	50	235.51	12	223.51				**No bamboo**
Total	**11Comptt/PFs**	**2425.814**	**185**	**1538.479**	**55**	**605.925**	**0**	
	Grand Total	**60549.7**	**20150.0**	**16760.2**	**14671.7**	**3216.9**		

Abstract of Bamboo Flowering in Core Area (Ha.)

Area Description	Comptt/PF blocks	Total Area	Bamboo Area	% of Total
Flowering occurred	121	40348.91	17583	66.6
Flowering Awaited	62	17775.02	7111	29.4
No Bamboo	11	2425.814	0	4.0
Total	194	60549.75	24694	100.0

APPENDIX - I - A

Statement of Gregarious Flowering of Bamboo in Nistar Bamboo (Overlapping) Working Circle in Buffer Division

(Area in ha.)

Sr. No.	Name of Cutting Series	Range	Comptt. Nos	Total area	Bamboo Area	Flowering Status
1	Khandala NBCS	Chandrapur	594	192.23	192.23	2020
2			595	188.18	188.18	2020
3			519	1401.44	1401.44	2020
4			587	200.31	200.31	2020
5			588	189.91	189.91	2020
6			590	207.57	207.57	2020
7			591	232.36	232.36	2020
8			592	205.98	205.98	2020
		Total	**8**	**2817.98**	**2817.98**	
9			593	218.53	218.53	Yet to flower
10			596	202.34	202.34	Yet to flower
11			597	182.36	182.36	Yet to flower
12			379	277.21	277.21	Yet to flower
13			380	216.91	216.91	Yet to flower
14			589	192.9	192.9	Yet to flower
		Total	**6**	**1290.25**	**1290.25**	
	Total		**14**	**4108.23**	**4108.23**	
1	Khandala NBCS	Chandrapur	385	409.53	6.51	2020
2		FDCM	391	208.41	121.86	2020
3			392	123.83	63.64	2020
4			393	313.23	150	2020
5			383	381.61	100	2020
6			389	378.79	200	2020
7			390	220.41	220.41	2020
		Total	7	2035.81	862.42	
8			381	818.67	500.00	Yet to flower
9			382	254.14	150.00	Yet to flower
10			384	296.63	75.00	Yet to flower
		Total	**3**	**1369.44**	**725.00**	
	Total		**10**	**3405.25**	**1587.42**	

1	Dewada NBCS	Moharli	182	157.02	157.02	2020
2			195	282.46	265.9	2020
3			196	185.73	185.73	2020
4			197	352.88	352.88	2020
5			181	317.28	317.28	2020
6			184	246.27	246.27	2020
7			185	154.59	154.59	2020
8			186	213.67	213.67	2020
		Total	**8**	**1909.9**	**1893.34**	
9			198	261.82	261.83	Yet to flower
10			551	18.61	18.61	Yet to flower
11			552	141.24	141.24	Yet to flower
12			875	1.59	1.59	Yet to flower
13			876	1.01	1.01	Yet to flower
14			874 A	284.57	284.57	Yet to flower
15			874 B	22.32	22.32	Yet to flower
16			180	193.43	193.43	Yet to flower
17			183	212.46	212.46	Yet to flower
18			187	172.4	172.4	Yet to flower
19			188	254.54	254.54	Yet to flower
20			189	246.87	242.02	Yet to flower
21			190	415.2	414.2	Yet to flower
22			191	412.97	412.79	Yet to flower
23			192	191.82	191.82	Yet to flower
24			193	187.77	187.77	Yet to flower
25			194	251.29	215.29	Yet to flower
		Total	**17**	**3269.91**	**3227.89**	
	Total		**25**	**5179.81**	**5121.23**	
1	Pethagaon NBCS	Mul	359	359.49	359.49	2020
2			355	510.31	292.00	2020
3			360	750.71	472.00	2020
4			350	591.67	591.67	2020
5			351	551.97	551.97	2020
6			352	569.80	569.80	2020
7			353	411.58	411.58	2020
		Total	**7**	**3745.53**	**3248.51**	
	Total		**7**	**3745.53**	**3248.51**	

1	Vihirgaon NBCS	Palasgaon	247	340.34	326.18	2020
2			230	405.49	405.49	2020
3			237	820.31	734.41	2020
4			238	152.16	33.59	2020
5			240	554.07	385.26	2020
		Total	**5**	**2272.37**	**1884.93**	
6			242	247.67	70.00	Yet to flower
7			243	333.06	144.48	Yet to flower
8			244	330.21	179.62	Yet to flower
9			246	403.88	132.34	Yet to flower
10			231	259.81	259.81	Yet to flower
11			241	315.63	150.55	Yet to flower
		Total	**6**	**1890.26**	**936.8**	
	Total		**11**	**4162.63**	**2821.73**	
1	Sirkada NBCS	Shioni	321	197.98	197.98	2020
2			322	477.13	477.13	2020
3			274	737.73	636.68	2020
4			275	824.33	606.23	2020
5			319	479.96	479.96	2020
6			320	408.72	408.72	2020
		Total	**6**	**3125.85**	**2806.70**	
7			326	396.6	396.6	Yet to flower
8			271	375.55	375.55	Yet to flower
9			272	460.94	460.94	Yet to flower
10			273	424.12	424.12	Yet to flower
		Total	**4**	**1657.21**	**1657.21**	
	Total		**10**	**4783.06**	**4463.91**	
1		Kadasangi	0	0	0	
		Total	**0**	**0**	**0**	
			Comptt. Nos	**Total area**	**Bamboo Area**	**% age**
	Total Flowered NBCS Area		**41**	**15907.44**	**13513.88**	**62.67**
	Total Yet to Flower NBCS Area		**36**	**9477.07**	**7837.15**	**37.33**
	Grand Total NBCS		**77**	**25384.51**	**21351.03**	**100.00**

APPENDIX - I - B

Statement of Gregarious Flowering of Bamboo in Commercial Bamboo (Overlapping) Working Circle in Buffer Division

(Area in ha.)

Sr. No.	Name of Cutting Series	Range	Comptt. Nos.	Total area	Bamboo Area	Flowering Status
1	Nimbala CBCS	Chandrapur	361	584.37	334.8	2020
2			374	571.00	571.00	2020
3			378	428.56	428.56	2020
		Total		1583.93	1334.36	
4			375	223.87	223.79	Yet to flower
5			376	372.22	372.22	Yet to flower
6			377	555.64	555.64	Yet to flower
7			347	383.64	383.64	Yet to flower
8			357	574.24	574.24	Yet to flower
9			368	214.46	214.46	Yet to flower
10			370	331.83	331.83	Yet to flower
		Total		2655.9	2655.82	
	Total		**10**	**4239.83**	**3990.18**	
1	Nimbala CBCS	Chandrapur	367	558.02	400.00	2020
2		FDCM Old	363	295.47	150.00	2020
		Total		853.49	550.00	
3		Range	372	598.09	350.00	Yet to flower
4			358	555.64	386.00	Yet to flower
5			362	279.63	230.00	Yet to flower
6			364	580.51	353.00	Yet to flower
7			365	198.70	177.00	Yet to flower
8			366	247.26	190.00	Yet to flower
9			369	259.55	200.00	Yet to flower
		Total		2719.38	1886.00	
	Total		**9**	**3572.87**	**2436.00**	
1	Adegaon CBCS	Moharli	176	205.98	205.98	2020
2			177	312.42	312.42	2020
3			166	367.06	367.06	2020
4			170	260.6	260.6	2020
5			174	291.37	286.01	2020
6			175	281.66	281.66	2020

		Total		1719.09	1713.73	
7			178	134.36	134.36	Yet to flower
8			179	262.48	265.48	Yet to flower
9			154	278.42	278.42	Yet to flower
10			164	323.76	98.75	Yet to flower
11			165	231.07	7.28	Yet to flower
12			167	287.33	287.33	Yet to flower
13			168	162.68	162.68	Yet to flower
14			169	350.46	350.46	Yet to flower
15			171	274.77	274.77	Yet to flower
16			172	246.45	229.05	Yet to flower
17			173	261.02	261.02	Yet to flower
		Total		2812.80	2349.60	
	Total		**17**	**4531.89**	**4063.33**	
1	Fulzari CBCS	Mul	329	365.42	340.74	2020
2			348	322.13	322.13	2020
3			323	659.23	659.23	2020
4			328	634.14	628.07	2020
		Total		1980.92	1950.17	
5			259	469.04	469.04	Yet to flower
6			324	443.13	443.13	Yet to flower
7			325	414.4	414.4	Yet to flower
8			327	589.23	589.23	Yet to flower
		Total		1915.8	1915.8	
	Total		**8**	**3896.72**	**3865.97**	
1	Palsagaon 1 CBCS	Palsagaon	226	301.48	301.48	2020
2			220	320.92	320.92	2020
3			105	369.79	234.73	2020
4			225	387.79	319.29	2020
		Total		1379.98	1176.42	
5			229	266.68	266.68	Yet to flower
6			102	206.79	194.62	Yet to flower
7			103	322.53	229.85	Yet to flower
8			104	275.18	244.83	Yet to flower
9			221	297.86	204.3	Yet to flower
10			222	311.21	73.24	Yet to flower
11			323	349.66	93.92	Yet to flower

12			224	222.56	222.56	Yet to flower
		Total		2252.47	1530.00	
	Total		**12**	**3632.45**	**2706.42**	
1	Pangadi CBCS	Shioni	268	492.93	492.92	2020
2			269	506.25	504.64	2020
3			227	264.26	264.26	2020
4			235	325.77	297.44	2020
5			262	189.79	189.79	2020
6			236	439.9	439.90	2020
7			261	250.9	250.90	2020
8			265	475.51	475.51	2020
		Total		2945.31	2915.36	
9			228	255.76	255.76	Yet to flower
10			232	227.43	227.43	Yet to flower
11			233	263.86	263.86	Yet to flower
12			234	382.43	382.43	Yet to flower
13			263	267.09	267.09	Yet to flower
14			264	232.29	232.29	Yet to flower
		Total		1628.86	1628.86	
	Total		**14**	**4574.17**	**4544.22**	
1	Khadasangi CBCS	Khadasangi	43	663.73	200.00	Yet to flower
2			44	603.38	325.00	Yet to flower
3			53	520.43	50.00	Yet to flower
4			54	324.75	50.00	Yet to flower
5			55	349.25	20.00	Yet to flower
6			56	493.32	30.00	Yet to flower
7			57	535.41	20.00	Yet to flower
8			59	426.14	25.00	Yet to flower
		Total	8	3916.41	720.00	
	Total			3916.41	720.00	
			Comptt. Nos	**Total area**	**Bamboo Area**	**% age**
	Total Flowered CBCS Area		27	10462.72	9640.04	36.89
	Total Yet to Flower CBCS Area		51	17901.62	12686.08	63.11
	Total	CBCS	78	28364.34	22326.12	100.00
	Grand Total :NBCS+CBCS Area		**155**	**53748.85**	**43677.15**	

Detailed Abstract of Status of Gregarious Bamboo Flowering
In Core and Buffer Area (Till Dec-2020)

(Area in Ha.)

Area Description	Comptt. & PF	Total Area	Bamboo Area	%
Core Division				
A)Flowering occurred	121	40348.91	17583	66.6
B) Flowering Awaited	62	17775.02	7111	29.4
C) No Bamboo growth	11	2425.814	0	4
D)Total Area (A+B+C)	**194**	**60549.75**	**24694**	**100**
Buffer Division				
E) Flowered NBCS Area	41	15907.44	13513.88	
F) Flowering Awaited NBCS Area	36	9477.07	7837.15	
G)Total Nistar BCS Area (E+F)	**77**	**25384.51**	**21351.03**	
H) Flowered CBCS Area	27	10462.72	9640.04	
I) Flowering Awaited CBCS Area	51	17901.62	12686.08	
J)Total Commercial BCS Area	**78**	**28364.34**	**22326.12**	
K) Grand Total: NBCS+CBCS Area (G+J)	**155**	**53748.85**	**43677.15**	
L)Total Bamboo Area in TATR (D+K)	**349**	**114298.60**	**68371.15**	

Abstract of Status of Gregarious Bamboo Flowering in Buffer Area (Till Dec-2020)

(Area in Ha.)

Area Description	Comptts	Total Area	Bam. Area	% age
A)Flowering occurred in Core	121	40348.91	17583	66.6
B) Flowering Awaited in Core	62	17775.02	7111	29.4
C)No Bamboo in Core	11	2425.814	0	4
D)Total Area (A+B+C) of Core	**194**	**60549.75**	**24694**	**100**
E) Flowered Area in buffer	68	26370.16	23153.92	49.06
F) Flowering Awaited Area in buffer	87	27378.69	20523.23	50.94
G) Total Bamboo Area in Buffer	**155**	**53748.85**	**43677.15**	**100.00**

Consolidated Abstract of Status of Gregarious Bamboo Flowering in TATR (Till Dec-2020)

(Area in Ha)

Area Description	Comptts	Total Area	Bam. Area	% age
1) Total -Flowered Area in Core & Buffer	189	66719.07	40736.92	59.64
2) Total -Flowering Awaited Area in Core & Buffer	149	45153.71	27634.23	40.36
3) Total Bamboo Area in Core & Buffer	**338**	**111872.78**	**68371.15**	**100.00**

APPENDIX - II

MoU signed between CF & FD TATR, Chandrapur and Sevak Team Leader

समझोता अभिलेख

ताडोबा-अंधारी व्याघ्र प्रकल्प क्षेत्रात, बांबूच्या व्यापक फुलोरा येण्याच्या क्रियेस सुरुवात झाली असून सुमारे ३०% क्षेत्रात फुलोरा आला आहे असा प्राथमिक अंदाज आहे. इतर क्षेत्रात सुध्दा ही क्रिया लवकरच सुरू होईल असा अंदाज आहे. व्यापक फुलोरा अल्पानंतर, बांबूचे कंद निष्क्रीय होऊन मरण पावतात आणि पूर्ण वाढीतील बांबू सुकून जातात.हे सुकलेले बांबू वन वणव्याचे भक्षस्थानी सहजरित्या पडतात,तसेच त्याचा परिणाम परिसर बदल व वन्यप्राणी हालचाल यांचेवर होतो, हे विचारात घेऊन, त्याचे नियोजन करणे अत्यंत गरजेचे आहे.हे काम कष्टाचे,तांत्रिक ज्ञानाचे व अनुभवाचे आहे.करिता,या कामासाठी योग्य सक्षम देणाऱ्या यंत्रणेची आवश्यकता व्याघ्र प्रकल्प व्यवस्थापनास होती. "सेवानिवृत्त वनकर्मचारी संघ,महाराष्ट्र" या अशासकीय संस्थेने, हे काम पूर्ण करण्यासाठी पुढाकार घेऊन,सहकार्याचा हात पुढे केला.त्याचा विचार करून व्यवस्थापनाने, हे काम, संयुक्तीकरित्या पार पाडण्याचे ठरविले. म्हणून, हा समझोता अभिलेख केला आहे. यापुढे, पक्ष-१ म्हणून "क्षेत्र संचालक,ताडोबा-अंधारी व्याघ्र प्रकल्प, चंद्रपूर" पक्ष-२ म्हणून" सेवानिवृत्त वन कर्मचारी संघ,महाराष्ट्र",(सेवक) लिहत पुर्ये ,असे संबोधण्यात येईल.

समझोता अभिलेखाच्या प्रमुख तरतुदी पुढील असतील,

१. कार्यक्षेत्र पक्ष-१ चे नियंत्रणाखाली असलेले वन आणि वनेतर क्षेत्र असेल,

२. व्यापक बांबू फुलोरा आलेल्या व येणाऱ्या क्षेत्राचे व्यवस्थापन करण्यासाठी नीती,धोरण व आढावा निश्चित करून नियोजन आराखडा तयार करणे.

३. नियोजन आराखड्यात पुढील बाबींवर लक्ष केंद्रित केले जाईल.

३.१. बांबूची तोड,निकासी आणि विनियोग,

३.२ आगीपासून संरक्षण उपाययोजना,

३.३ बांबूची नैसर्गिक व कृत्रिम पुनरुत्पत्ती,बांबू बीज संकलन व साठा,

३.४ वन्यजीव संरक्षण व आवश्यक व्यवस्थापन,

३.५ पर्यटन नियोजन,नियमन आराखडा निर्मिती,

४. आराखडा निर्मितीसाठी क्षेत्रीय माहिती (डेटा) संकलीत करणे,

५. विविध माहिती नमुने,पत्रके,नकाशे तयार करणे,

६. पक्ष-२ चे चंद्रपूर स्थित सदस्य यांना क्षेत्रीय माहिती(डेटा) संकलीत करण्यासाठी वाहतुक,निवास व्यवस्था पक्ष-१ ने पुरविणे,

७. या कामाचे एकूण शुल्क रु.चार लाख, पक्ष-१ ने, पक्ष-२ ला चार हप्त्यात वितरीत करणे,

७.१. पहिला हप्ता-२५%,रु.१ लाख,समझोता अभिलेखा स्वाक्षांकीत झालेनंतर ७ दिवसात,

७.२ दुसरा हप्ता-२५%,रु.१ लाख, पक्ष-२ ने प्राथमिक क्षेत्रसर्वेक्षण केल्यानंतर, दोनही पक्षांना मान्य, कामाचे वेळापत्रक तयार केल्यानंतर,सात दिवसात,

७.३ तिसरा हप्ता-२५%,रु.१ लाख,क्षेत्रिय काम पूर्ण करून,प्राप्त माहितीचे विश्लेषण केल्यानंतर ,१५ दिवसात,

७.४ चौथा हप्ता-२५%,रु.१ लाख,अहवाल पक्ष-१ यांना सादर केल्यानंतर,१५ दिवसात,

८. प्रत्येक हप्त्यासोबत, पक्ष-१ ने,पक्ष-२ला १८% सेवा शुल्क(जी.एस.टी.) रक्कम वितरीत करावी लागेल, सदरहू समझोता अभिलेखा दोनही पक्षांना मान्य आहे.

पक्ष-१
(क्षेत्र संचालक, ता.अं.व्या.प्र.)
डॉ. किर्तेंद्र रामगावकर

पक्ष-२
(सेवकचे पथक प्रमुख)
एस. के. गवळी

स्थळ:- चंद्रपूर
दिनांक: 26/03/2021

Appendix- III

Estimated APO of Seed Collection and Cost for the FY 2021-22 (Flowering Season-2020) to 2023-24 (Flowering Season-2023)

(Seed quantity in MT , Amount Rs. in Lacs)

Year	FY - 2021-22 (1)		FY - 2022-23 (2)		FY - 2023-24 (3)		Total	
Bamboo area of seed collection	Seed quantity	Amount	Seed quantity	Amount	Seed quantity	Amount	Seed quantity	Amount
BOWC	10	40.00	10	40.00	5	20.00	25	100.00
NOWC	10	40.00	10	40.00	5	20.00	25	100.00
Total	**20**	**80.00**	**20**	**80.00**	**10.00**	**40.00**	**50**	**200.00**

Appendix- IV

Total Valuation of Bamboo Seed and actual seed proposed collection from Buffer Division

TATR Area	Bamboo Area (Ha)	Ave. yield/ ha (Kg)	Total Seed yield (MT)	Market Rate per MT (Rs. In Lacs)	Value of estimated seed available (Rs. In Lacs)	Actual collection proposed (MT)	Market Rate per MT (Rs. In Lacs)	Value of actual collection (Rs. In Lacs)
Core Division	24694	No collection	0					
Buffer Div Nistar WC	21351.03	50	1067	5.00	5335	25.00	5.00	125.00
Buffer Div Com. WC	22326.12	50	1116	5.00	5580	25.00	5.00	125.00
Total	68371.15		2183		10915	50.00		250.00

Appendix - V

Details of administrative units and area in TATR

(Core Area)

Sr. No.	Range	Round	Beat	RF. Comp. area	PF. Sur No. area	Unclass - ed Sur. No. area	Total Area (Ha)
1	2	3	4	5	6	7	8
1	Tadoba	Bhanuskhindi	Sagldeo	1144.846	--	--	1144.846
2			Nimdhela	1224.999	--	--	1224.999
3			Arjuni	974.888	--	--	974.888
		Total Bhanuskhindi		**3344.733**	**0**	**0**	**3344.733**
4		Sonegaon	Tadoba	1038.975	--	--	1038.975
5			Bhanuskhindi	585.984	472.858	--	1058.842
6			Sonegaon	905.378	111.653	--	1017.031
		Total Sonegaon		**2530.337**	**584.511**	**0**	**3114.848**
7		Katezari	Ghosari	1161.154	27.922	--	1189.076
8			Tamsi	645.291	366.56	--	1011.851
9			Wadala	841.108	286.482	--	1127.59
10			Khutwanda	835.665	50.868	--	886.533
		Total Katezari		**3483.218**	**731.832**	**0**	**4215.05**
	Total Tadoba Range			**9358.288**	**1316.343**	**0**	**10674.631**
11	Kolara	Kolara	Navegaon	1039.753	--	--	1039.753
12			Bamangaon	452.674	544.508	53.964	1051.146
13			Chikhalwahi	1014.141	--	--	1014.141
14			Tekadi	870.477	145.225	--	1015.702
		Total Kolara		**3377.045**	**689.733**	**53.964**	**4120.742**
15		Jamni	Chaiti	379.19	516.663	--	895.853
16			Jamni	782.278	59.031	92.969	934.278
17			Kolara	913.779	--	--	913.779
18			Pandharpouni	1287.301	--	--	1287.301
		Total Jamni		**3362.548**	**575.694**	**92.969**	**4031.211**
19		Khatoda	Chichghat	989.856	--	--	989.856
20			Madnapur-1	795.208	--	--	795.208
21			Madnapur-2	1320.49	--	--	1320.49
		Total Khatoda		3105.554	0	0	3105.554
	Total Kolara Range			**9845.147**	**1265.427**	**146.933**	**11257.507**
22	Moharli	Palasgaon	Palasgaon	1016.247	48.609	--	1064.856
23			Deodoh	1125.027	--	--	1125.027
24			Ambegarh	1135.547	--	--	1135.547

		Total Palasgaon		3276.821	48.609	0	3325.43
25		Moharli	Thanegaon	1146.878	--	--	1146.878
26			Ashtakoni	1302.278	--	--	1302.278
27			Andhari	1137.57	--	--	1137.57
		Total Moharli		3586.726	0	0	3586.726
28		Dewada	Mahalgaon	1127.05	--	--	1127.05
29			Girghat	1181.681	--	--	1181.681
30			Borwan	962.748	--	--	962.748
		Total Dewada		3271.479	0	0	3271.479
	Total Moharli Range			**10135.026**	**48.609**	**0**	**10183.635**
31	Karwa	Karwa	Karwa -1	1057.039	--	--	1057.039
32			Karwa -2	957.891	--	--	957.891
33			Karwa -3	1129.883	--	--	1129.883
34			Anandgaon	800.064	--	--	800.064
35			Chipalghat	743.003	--	--	743.003
36			Parna	883.855	--	--	883.855
		Total Karwa		**5571.735**	**0**	**0**	**5571.735**
37		Rantalodhi	Rantalodhi-1	750.288	--	--	750.288
38			Kakadghat	930.373	--	--	930.373
39			Rantalodhi-2	760.81	--	--	760.81
40			Ambeutar	1020.617	--	--	1020.617
41			Zinganat-1	976.101	--	--	976.101
42			Zinganat-2	994.313	--	--	994.313
		Total Rantalodhi		**5432.502**	**0**	**0**	**5432.502**
43		Piparheti	Piparheti-1	1150.521	--		1150.521
44			Piparheti-2	1098.722	--		1098.722
45			Pandharwani	1196.263	--		1196.263
46			Upasa	935.23	--		935.23
47			Naleshwar	1008.476	--		1008.476
		Total Piparheti		**5389.212**	**0**	**0**	**5389.212**
	Total Karwa Range			**16393.449**	**0**	**0**	**16393.449**
48	Kolsa	Botezari	Kohapari	1011.31	--	--	1011.31
49			Botezari - 1	969.855	--	--	969.855
50			Botezari - 2	1173.184	--	--	1173.184
51			Panghat	1288.519	--	--	1288.519
		Total Botezari		**4442.868**	**0**	**0**	**4442.868**
52		Kolsa	Kolsa	740.575	--	193.74	934.315
53			Pangdi	959.51	--	--	959.51
54			Kuwani	1074.037	--	--	1074.037
55			Rayba	941.299	--	--	941.299
56			Doni	830.01	--	--	830.01

		Total Kolsa		**4545.431**	**0**	**193.74**	**4739.171**
57		Zari	Belan	1135.548	--	--	1135.548
58			Zari	1229.033	--	--	1229.033
59			Pahami	1050.564	--	--	1050.564
60			Sangam	959.509	--	--	959.509
		Total Zari		**4374.654**	**0**	**0**	**4374.654**
	Total Kolsa Range			**13362.953**	**0**	**193.74**	**13556.693**
Total Core Division				**59094.863**	**2630.379**	**340.673**	**62065.915**
Details of administrative units and area. (Buffer Area)							
1	Khadsangi	Khadsangi	Khadsangi - 1	785.09	0.00	--	785.09
2			Khadsangi - 2	818.07	0.00	0.00	818.07
3			Khadsangi - 3	520.43	0.00	0.00	520.43
		Total Khadsangi		**2123.59**	**0.00**	**0.00**	**2123.59**
4		Talodhi	Alizanja	657.21	193.28	0.00	850.49
5			Talodhi -1	971.64	15.39	0.00	987.03
6			Talodhi -2	745.90	1.61	16.42	763.93
		Total Talodhi		**2374.75**	**210.28**	**16.42**	**2601.45**
7		Nimdhela	Nimdhela	718.73	0.00	--	718.73
8			Bothali - 1	966.38	0.00	0.00	966.38
9			Bothali - 2	884.668	0.00	0.00	884.67
		Total Nimdhela		**2569.778**	**0.00**	**0.00**	**2569.78**
	Total Khadsangi Range			**7068.12**	**210.28**	**16.42**	**7294.82**
10	Palasgaon	Palasgaon	Palasgaon - 1	407.91	176.92	--	584.83
11			Palasgaon - 2	849.34	0.00	0.00	849.34
12			Piparda	828.60	159.90	0.00	988.50
13			Gondmohadi	951.32	110.58	0.00	1061.90
14			Parna	757.60	47.76	3.65	809.01
		Total Palasgaon		**3794.77**	**495.16**	**3.65**	**4293.58**
15		Karwa	Karwa-1	991.89	0.00	2.65	994.54
16			Karwa-2	518.48	95.75	--	614.23
17			Karwa-3	1121.79	0.00	0.00	1121.79
		Total Karwa		**2632.16**	**95.75**	**2.65**	**2730.56**
18		Madnapur	Vihirgaon -1	942.13	0.00	--	942.13
19			Vihirgaon -2	451.97	658.99	0.00	1110.96
20			Deori / Karbada	529.32	186.74	0.00	716.06
21			Madnapur	995.82	144.96	0.00	1140.78
		Total Madnapur		**2919.24**	**990.69**	**0.00**	**3909.93**
	Total Palasgaon Range			**9346.17**	**1581.60**	**6.30**	**10934.07**
22	Mohari	Moharli	Moharli -1	600.95	499.17	--	1100.12
23	Buffer		Moharli -2	1004.85	0.00	0.00	1004.85

24			Sitarampeth	82.32	669.35	0.00	751.67
25			Mudholi	27.15	271.44	221.28	519.87
		Total Moharli		**1715.27**	**1439.96**	**221.28**	**3376.51**
26		Agarzari	Agarzari -1	768.09	0.00	--	768.09
27			Agarzari -2	842.14	0.00	0.00	842.14
28			Adegaon	1040.03	0.00	0.00	1040.03
29			Dewada	815.43	0.00	0.00	815.43
30			Ambezari	1007.67	11.98	0.00	1019.65
		Total Agarzari		**4473.36**	**11.98**	**0.00**	**4485.34**
31		Padmapur	Padmapur -1	1319.29	0.00	0.00	1319.29
32			Padmapur -2	905.69	0.00	0.00	905.69
33			Wadholi	1082.90	0.00	0.00	1082.90
34			Chicholi	535.29	82.53	0.00	617.82
		Total Padmapur		**3843.17**	**82.53**	**0.00**	**3925.70**
	Total Moharli Range			**10031.80**	**1534.47**	**221.28**	**11787.55**
35	Chandrapur	Ghantachouki	Borda	509.50	305.46	--	814.96
36			Chek Nimbala	1152.14	117.01	--	1269.15
37			Nimbala	705.77	41.95	--	747.72
38			Walni	1401.44	0.00	--	1401.44
		Total Ghantachouki		**3768.85**	**464.42**	--	**4233.27**
39		Warwat	Warwat	604.18	364.98	--	969.16
40			Chorgaon	0.00	1022.67	--	1022.67
41			Khandala -1	0.00	1189.64	4.62	1194.26
42			Khandala -2	787.91	0.00	--	787.91
		Total Warwat		**1392.09**	**2577.29**	**4.62**	**3974.00**
43			Mahadwadi -1	1129.63	0.00	--	1129.63
44		Mahadwadi	Mahadwadi -2	860.34	0.00	--	860.34
45			Mahadwadi -3	741.38	0.00	--	741.38
		Total Mahadwadi		**2731.35**	**0.00**	--	**2731.35**
46		Peth	Peth -1	979.34	13.07	--	992.41
47			Peth -2	929.92	0.00	--	929.92
48			Haldi	1046.03	3.76	--	1049.79
		Total Peth		**2955.29**	**16.83**	--	**2972.12**
49		Mamla	Mamla -1	618.69	76.13	--	694.82
50			Mamla -2	725.18	0.00	--	725.18
51			Mamla -3	1072.81	0.00	--	1072.81
52			Waigaon	818.67	72.04	--	890.71
		Total Mamla		**3235.35**	**148.17**	0	**3383.52**
	Total Chandrapur Range			**14082.93**	**3206.71**	**4.62**	**17294.26**
53	Shivani	Shivani	Shivani	873.72	134.63	--	1008.35

54			Piparheti -1	523.66	37.60	--	561.26
55			Piparheti -2	643.84	0.00	--	643.84
56			Sirkada	927.50	82.86	81.37	1091.73
57			Wasera	726.10	203.96	--	930.06
		Total Shivani		**3694.82**	**459.05**	**81.37**	**4235.24**
58		Naleshwar	Naleshwar	1029.91	62.39	9.93	1102.23
59			Jamsala	793.59	10.28	--	803.87
60			Pangdi- 1	737.73	0.00	0.00	737.73
61			Pangdi- 2	1285.28	0.00	0.00	1285.28
		Total Naleshwar		**3846.51**	**72.67**	**9.93**	**3929.11**
62		Kukadheti	Pangdi- 3	791.98	0.00	--	791.98
63			Kukadheti	896.39	151.99	0.00	1048.38
64			Petgaon	477.13	64.44	5.06	546.63
65			Mohabodi	683.82	0.00	--	683.82
66			Bamnimal	460.94	92.10	0.00	553.04
		Total Kukadheti		**3310.26**	**308.53**	**5.06**	**3623.85**
	Total Shivani Range			**10851.59**	**840.25**	**96.36**	**11788.20**
67	Mul	Mul	Katwan	5.52	891.78	--	897.30
68			Karwan	551.97	582.43	0.00	1134.40
		Total Mul		**557.49**	**1474.21**	**0.00**	**2031.70**
69		Janala	Janala	981.33	0.00	0.00	981.33
70			Fulzari	929.29	0.00	0.00	929.29
71			Doni -1	954.66	0.00	0.00	954.66
72			Doni -2	791.17	0.00	0.00	791.17
73			Doni -3	750.71	0.00	0.00	750.71
		Total Janala		**4407.16**	**0.00**	**0.00**	**4407.16**
74		Maroda	Bhadurna -1	659.23	335.16	4.90	999.29
75			Bhadurna -2	893.29	135.75	16.66	1045.70
76			Maroda -1	591.67	568.19	--	1159.86
77			Maroda -2	634.14	633.04	0.00	1267.18
		Total Maroda		**2778.33**	**1672.14**	**21.56**	**4472.03**
	Total Mul Range			**7742.98**	**3146.35**	**21.56**	**10910.89**
Total Buffer Division				**59123.59**	**10519.66**	**366.54**	**70009.789**

Sr. No.	Division	Ranges	Rounds	Beats	RF. Comp. area	PF. Sur No. area	Unclassed Sur No. area	Total Area
1	Core	5	15	60	59094.863	2630.379	340.673	62065.915
2	Buffer	6	20	77	59123.588	10519.661	366.54	70009.789
	Total	**11**	**35**	**137**	**118218.451**	**13150.040**	**707.213**	**132075.704**

APPENDIX -VI

List of 55 Fire prone Core area comptts to be worked for bamboo removal

Sr.No.	Range	Round	Beat	C.No.	Area of Comptt. (Ha.)
1	Karwa	Rantaldohi	Ameutara	293	228.6
2	Karwa	Rantaldohi	Rantaldohi-II	289	167.5
3	Karwa	Rantaldohi	Rantaldohi-II	288	593.3
4	Karwa	Rantaldohi	Ambeutara	290	390.2
5	Karwa	Karwa	Karwa-II	251	586.0
6	Karwa	Karwa	Karwa-II	249	371.9
7	Karwa	Karwa	Karwa-I	245	303.5
8	Karwa	Karwa	Karwa-III	252	745.0
9	Karwa	Karwa	Anandgao	254	536.6
10	Karwa	Rantaldohi	Kakadghat	287	540.3
11	Karwa	Karwa	Parna	255	616.0
12	Karwa	Piparheti	Pandharwani	266	555.6
13	Karwa	Piparheti	Pandharwani	267	640.6
14	Karwa	Piparheti	Upasa	277	317.7
15	Karwa	Piparheti	Upasa	276	362.6
16	Tadoba	Sonegaon	Sonegaon	87	225.1
17	Tadoba	Sonegaon	Bhanuskhindi	86	386.1
18	Tadoba	Bhanuskhindi	Arjuni	85	265.1
19	Tadoba	Bhanuskhindi	Nimdhela	65	437.5
20	Tadoba	Bhanuskhindi	Nimdhela	64	509.5
21	Tadoba	Katezari	Wadala	117	434.6
22	Tadoba	Katezari	Tamsi	119	157.0
23	Tadoba	Katezari	Tamsi	120	154.6
24	Tadoba	Katezari	Ghosari	121	334.3
25	Tadoba	Katezari	Kutwanda	125	267.9
26	Tadoba	Katezari	Ghosari	114	469.4
27	Moharli	Moharli	Thanegaon	141	266.3
28	Moharli	Moharli	Thanegaon	142	235.1
29	Moharli	Moharli	Thanegaon	143	179.7
30	Moharli	Dewada	Mahalgao	155	507.9
31	Moharli	Dewada	Girghat	163	269.1
32	Moharli	Palasgao	Ambegad	138	101.2
33	Moharli	Palasgao	Ambegad	139	191.4
34	Moharli	Palasgao	Ambegad	140	333.1
35	Moharli	Palasgao	Ambegad	150	346.0
36	Moharli	Moharli	Andhari	151	401.4
37	Moharli	Moharli	Andhari	153	390.1
38	Kolara	Khatoda	Madnapur-II	129	448.4
39	Kolara	Khatoda	Madnapur-II	130	248.5
40	Kolara	Khatoda	Madnapur-II	106	623.6
41	Kolara	Jamni	Jamni	107	166.7
42	Kolara	Jamni	Chaiti	100	143.7
43	Kolsa	Kolsa	Kolsa	314	423.3
44	Kolsa	Kolsa	Pangadi	317	282.5
45	Kolsa	Kolsa	Pangadi	316	677.0

46	Kolsa	Kolsa	Kuwani	318	502.2
47	Kolsa	Kolsa	Kuwani	331	571.8
48	Kolsa	Kolsa	Doni	330	556.7
49	Kolsa	Kolsa	Doni	346	270.3
50	Kolsa	Botezari	Botezari-I	313	315.3
51	Kolsa	zari	Pahami	373	350.1
52	Kolsa	zari	Pahami	340	285.7
53	Kolsa	zari	zari	344	134.0
54	Kolsa	zari	zari	343	278.4
55	Kolsa	zari	zari	371	263.0
			Total		20358.95

Statement of Estimated Bamboo Yield from Preventive Fireline creation in 55 fire prone core area Comptts.

Comptt. Nos.	Area of C.No. (Ha.)	Area covered with Bamboo (Ha.)	Green bamboos per ha	Long Bamboos Per Ha	Total long bamboos	Total Bamboo bundles	Long bamboos in 9.84 % fire line area	Bamboo bundles in 9.84% fire line area
293	228.6	228.6	12775	1278	292097	238622	28742	23480
289	167.5	167.5	17725	1773	296965	236881	29221	23309
288	593.3	593.3	19225	1923	1140562	1147310	112231	112895
290	390.2	390.2	24050	2405	938484	817418	92347	80434
251	586.0	586.0	4600	460	269553	2466704	26524	242724
249	371.9	371.9	6725	673	250107	224120	24611	22053
245	303.5	303.5	4825	483	146446	162646	14410	16004
252	745.0	745.0	6300	630	469367	439380	46186	43235
254	536.6	536.6	15700	1570	842478	754742	82900	74267
287	540.3	540.3	7500	750	405192	338335	39871	33292
255	616.0	616.0	5925	593	364952	332846	35911	32752
266	555.6	555.6	6825	683	379217	498470	37315	49049
267	640.6	640.6	7675	768	491684	610440	48382	60067
277	317.7	317.7	4200	420	133425	122385	13129	12043
276	362.6	362.6	3725	373	135069	123329	13291	12136
87	225.1	150.0	5697	570	85455	92755	8409	9127
86	386.1	200.0	4495	450	89900	95455	8846	9393
85	265.1	185.0	5743	574	106246	87585	10455	8618
65	437.5	376.0	4455	446	167508	298347	16483	29357
64	509.5	444.0	4143	414	183949	179569	18101	17670
117	434.6	230.0	1548	155	35604	17114	3503	1684
119	157.0	100.0	4092	409	40920	18564	4027	1827
120	154.6	92.0	3273	327	30112	14470	2963	1424
121	334.3	165.0	2228	223	36762	23720	3617	2334
125	267.9	120.0	3949	395	47388	30085	4663	2960
114	469.4	155.0	3708	371	57474	40472	5655	3982
141	266.3	200.0	1081	108	21620	126529	2127	12450
142	235.1	200.0	2198	220	43960	76282	4326	7506
143	179.7	155.0	2686	269	41633	79572	4097	7830

155	507.9	457.0	2198	220	100449	174304	9884	17152
163	269.1	220.0	468	47	10296	94063	1013	9256
138	101.2	90.0	1413	141	12717	77363	1251	7612
139	191.4	170.0	1990	199	33830	46164	3329	4542
140	333.1	330.0	2262	226	74646	387516	7345	38132
150	346.0	200.0	3582	358	71640	344338	7049	33883
151	401.4	300.0	2036	204	61080	394086	6010	38778
153	390.1	145.0	2356	236	34162	224173	3362	22059
129	448.4	380.0	5183	518	196954	365839	19380	35999
130	248.5	200.0	3925	393	78500	187825	7724	18482
106	623.6	525.0	5191	519	272528	503262	26817	49521
107	166.7	150.0	3583	358	53745	71060	5289	6992
100	143.7	125.0	4600	460	57500	117000	5658	11513
314	423.3	317.0	5500	550	174350	187823	17156	18482
317	282.5	267.5	4200	420	112338	162221	11054	15963
316	677.0	646.5	2000	200	129308	253767	12724	24971
318	502.2	486.8	4200	420	204456	205186	20118	20190
331	571.8	553.3	2700	270	149392	262265	14700	25807
330	556.7	390.0	1300	130	50700	74490	4989	7330
346	270.3	135.0	1800	180	24300	32198	2391	3168
313	315.3	190.0	7900	790	150100	130245	14770	12816
373	350.1	165.0	9200	920	151824	157022	14939	15451
340	285.7	95.9	4200	420	40259	64126	3961	6310
344	134.0	27.0	3400	340	9180	11556	903	1137
343	278.4	56.0	1200	120	6720	14924	661	1469
371	263.0	92.0	2800	280	25760	24472	2535	2408
Total	20358.9	16441.46			9830857	14261434	967356	1403325
Actual as per 9.84 % area to be cleared	**2003.32**	**1617.84**			**967356**	**1403325**		

APPENDIX -VII

Circular No, 1469 Dated 6-12-2014 2014 from PCCF (HoFF) M.S. Nagpur

प्रधान मुख्य वन संरक्षक (वन बल प्रमुख), महाराष्ट्र राज्य यांचे कार्यालय

वनभवन, रामगीरी रोड, सिव्हील लाईन्स, नागपूर - ४४० ००१.
दूरध्वनी : ०७१२-२५१०६७०, Fax : ०७१२-२५१०६७१

क्रमांक : कक्ष-१/रोहयो/प्र.क्र.१०/ १४६९ /२०१४-१५
नागपूर, दिनांक : ६/१२/२०१४

परिपत्रक

विषय : विविध योजनेअंतर्गत रोपवन व वनीकरणाबाबत सूचना.

संदर्भ : (१) प्रधान मुख्य वन संरक्षक, म. रा., यांचे कडील पत्र क्रमांक कक्ष-१४/कावआ/७६/१२७/ ९२-९३ / नागपूर दि. ५/८/१९९४.
(२) प्रधान मुख्य वन संरक्षक, म. रा., यांचे कडील पत्र क्रमांक कक्ष-१/यो/इए/मवाप्र/९५-९६/ ९३/नागपूर दि. १३/१०/१९९५.
(३) प्रधान मुख्य वन संरक्षक, म. रा., यांचे कडील पत्र क्रमांक कक्ष-१/इए/मवाप्र/३५९/सन ९६-९७/नागपूर दि. २७/५/१९९६.
(४) प्रधान मुख्य वन संरक्षक, म. रा., यांचे कडील पत्र क्रमांक कक्ष-१/योजना/मवाप्र ६४६/सन ९६-९७/नागपूर दि. २/७/१९९६.
(५) प्रधान मुख्य वन संरक्षक, म. रा., यांचे कडील पत्र क्रमांक कक्ष-१/योजना/इए/ मवाप्र ६९२(अ)/नागपूर दि. ५/७/१९९८.
(६) मुख्य वन संरक्षक (मूल्यांकन), म.रा.,नागपूर यांचे पत्र क्र. कक्ष-८/प्र.क्र.१६(१४-१५)/८४३/दि. २०/११/२०१४.

रोपवनाचे काम तांत्रिक दृष्टया योग्य रीतीने करण्याबाबत वेळोवेळी या कार्यालयाकडून सूचना निर्गमित करण्यात आलेल्या आहे. मूल्यांकन विभागाकडून रोपवनाचे मूल्यांकनात रोपवनाच्या कामामध्ये अनेक त्रुटया आढळून आलेल्या आहे. मुख्य वन संरक्षक (मूल्यांकन), महाराष्ट्र राज्य, नागपूर यांचे कडील मूल्यांकन अहवाल क्रमांक ४७२, ४७३, ४७४ हे अहवाल संबंधित मुख्य वनसंरक्षक यांचे कडे पाठविण्यात आलेले आहे. सदर मूल्यांकनात रोपवन कामांमध्ये अनेक प्रकारच्या त्रुटया वारंवार दिसून येतात व या कार्यालयाकडून दिलेल्या सूचनांचे पालन होत नाही. त्यामुळे रोपवनाच्या कामावर व त्याचा यशस्वीतेवर प्रतिकूल परिणाम पडतो ही बाब गंभिर आहे. रोपवन कामाबाबत खालील प्रमाणे सूचना निर्गमित करण्यात येत असून त्याचे काटेकोरपणे पालन केले जाईल याची दक्षता घ्यावी व सदर सूचनांचे पालन न करणाऱ्या क्षेत्रीय कर्मचारी व अधिकारी यांच्या विरुद्ध कडक कार्यवाही करण्यात यावी. या सूचना सर्व प्रकारच्या रोपवन, जलसंधारण व मृदसंधारण कामासाठी लागु राहील. या सूचना सर्व उप वन संरक्षक, विभागीय वन अधिकारी व उप विभागीय वन अधिकारी यांच्या नजरेत आणून द्याव्या व त्यांच्या अंमलबजावणीसाठी उचित कार्यवाही करावी.

१. **१०० मी. x ५०मी. ची ग्रीड व चाचणी खड्डे:** रोपवनात बेस लाईन ची आखणी करुन त्याच्या आधारावर १०० मी. x ५०मी. आकारमानाची ग्रीड टाकण्यात यावी. प्रत्येक ग्रीड मध्ये ६० से.मी. खोल चाचणी खड्डे खोदून, चाचणी खड्डयाच्या खोलीच्या आधारावर झोन १,२ व झोन ३ चे क्षेत्र ठरविण्यात यावे. ग्रिडनिहाय चाचणी खड्डयाच्या खोलीचा तपशील रोपवन नोंदवहीत नमुद करावा. एफ. डी. सी. एम. लि. मधील रोपवनाच्या घर्तीवर ग्रिडच्या सर्व छेदबिंदुवर/ कोप-यात सिमेंट कॉंक्रिट पिल्लर, ठेवणे योग्य राहील. रोपवन कामे ५ ते ७ वर्ष सुरु राहतात व त्यावेळी एका ग्रिड मध्ये कोणकोणती कामे करण्यात आली याची तपासणी करावयाची झाल्यास, ग्रिडचा छेदबिंदुवर/ कोप-यात कायम स्वरुपाचा पिल्लर असणे आवश्यक आहे, जेणे करुन ग्रिडची सीमा स्पष्ट होईल व त्यानुसार कामे तपासता येईल. झालेल्या कामांची ग्रिड निहाय नोंदणी करण्यासाठी ग्रिडचा सीमा स्पष्ट असणे आवश्यक आहे. नोंदणीच्या वेळी ग्रिडच्या सर्व छेदबिंदु/ कोपरे साफ ठेवावे. ग्रिड टाकण्यासाठी GIS प्रणालीचा वापर करावा.

२. **रोपवन क्षेत्र:** कार्य आयोजनेत दिलेल्या क्रमानुसार कुपात रोपवन काम हाती घ्यावे. ०.४ पेक्षा कमी घनता असलेल्या ठिकाणी रोपवन कामे घेण्यात यावी. नैसर्गिक पुनरुत्पादनाचे प्रमाण कमी असलेल्या ठिकाणी कृत्रिम पुर्ननिर्मिती अंतर्गत रोपवनाचे काम हाती घेणे योग्य आहे. रोपवन स्थळाची निवड झाल्यानंतर त्याचे सर्वेक्षण व सिमांकन करुन हद्द निश्चित करावी. GPS संच्याच्या सहाय्याने रोपवनाचा polygon तयार करण्यात यावा. रोपवन क्षेत्रात विविध कामे जसे की गुरे प्रतिबंधक चर, नालाबांध, जल शोषक चर, नैसर्गिक पुनरुत्पादनाचा उपचार, खड्डे व चर खोदून लागवड, जाळरेषा, गवतवाफे इत्यादी करुन सदर क्षेत्राचा उपचार करणे आवश्यक आहे. रोपवन क्षेत्राच्या उपचाराकरिता अंदाजपत्रक तयार करुन कामे कार्यान्वित करावयाची आहे. अंदाजपत्रकात नमुद केलेले रोपवन क्षेत्र हे polygon च्या क्षेत्राशी जुळणे आवश्यक आहे.

काही ठिकाणी असे निदर्शनास आले आहे की, एका रोपवन दोन स्वतंत्र तुकडयांमध्ये घेण्यात येते व एकूण क्षेत्र रोपवनाचे क्षेत्र म्हणून नमुद केले जाते हे योग्य नाही. रोपवन दोन तुकडयात असल्याने त्याबद्दल संभ्रम निर्माण होतो. एका रोपवनाचे दोन तुकडे असल्यास व दोन्ही तुकडे एकमेकाला लागुन नसल्यास, सदर दोन्ही तुकडे स्वतंत्र रोपवने असून त्यानुसार प्रत्येक तुकडयासाठी स्वतंत्र अंदाजपत्रक तयार करुन कामे करावी.

३. **जुने रोपवन** : अयशस्वी जुने रोपवनाच्या ठिकाणी रोपवन कामे करावयाची असल्यास, अस्तित्वात असलेली जुनी कामे जसे की गुरे प्रतिबंधक चर, नालाबांध इत्यादींचे मोजमाप घेऊन पंचनामा करावा. पंचनाम्याची प्रत अंदाजपत्रकास जोडावी व दुरुस्तीबाबत स्वतंत्र तरतूद अंदाजपत्रकात करावी. अशा ठिकाणी रोपवन काम हाती घेण्यासाठी मुख्य वन संरक्षक (प्रादेशिक) यांची परवानगी प्राप्त करावी.

४. **उपचार नकाशा:** जागेवर १०० X ५० मी. ग्रीड पाडल्यानंतर व चाचणी खड्डा खोदल्यानंतर झोन निश्चित करावे. १ ते १० से.मी. खोली झोन १; ११ ते ३० से.मी.खोली - झोन २; व ३० से.मी. पेक्षा अधिक खोली झोन ३ आहे. ग्रिड निहाय उपचाराबाबत कोणकोणत्या बाबी (खड्डे, नालाबांध, चर)

आवश्यक आहेत व त्याचा अंदाजित मात्रा किती ते ठरवावे. उपचार नकाशावर चतुःसिमा, झोन, गुरे प्रतिबंधक चर किंवा जैविक काटेरी कुंपण, नाला, निरीक्षण पथ, फायर लाईन, रस्ता, अतिक्रमण, खडकाळ भाग, वनतळी, खोदतळे, इत्यादी दाखवावे. उपचार नकाशा १:१००० या स्केलवर चर असावा. उपचार नकाशा बनविण्यासाठी GIS प्रणालीचा वापर करावा.

५. **नैसर्गिक पुनरुत्पादन:** रोपवनात सहजरीत्या वाढलेली नैसर्गीक पुनरुत्पादनाची रोपे आढळतात त्यापैकी मौल्यवान प्रजाती जसे की, सागवान, बिजा, तिवस, अमलतास, चारोळी, खैर, मोहा इत्यादी प्रजातीच्या रोपट्यांचे ग्रीड निहाय यादी तयार करण्यात यावी व त्याचा उपचारासाठी अंदाजपत्रकात तरतूद करावी. जागेची तयारी किंवा साफसफाई करतांना मौल्यवान रोपे व endangered species काढले जाणार नाहीत याची कटाक्षाने दक्षता घ्यावी. जास्तीत जास्त एका ग्रीड मध्ये २०० नैसर्गीक रोपांच्या उपचार व संगोपनासाठी अंदाजपत्रकात तरतूद करावी व त्या प्रमाणात चर किंवा खड्ड्यांची संख्या कमी करुन अंदाजपत्रकात तरतूद करावी. सदर नैसर्गिक रोपांची वाढ होण्याकरिता तण काढणे, मातीचा भरभांगलन, फुटव्यांचे एकेरीकरण, debudding, वेडीवाकडी झालेली सागवन इत्यादी इमारती प्रजाती रोपे (छाती उंचीवर १५ से.मी. गोलाई पेक्षा कमी असलेली रोपे) जमीनीलगत कापणे, इत्यादी कामे करण्यास अंदाजपत्रकात तरतूद करावी. नैसर्गिक रोपांमधील अंतर ४ मीटर असावे व काही ठिकाणी दाट रोपे असल्यास एक चांगले रोप ठेऊन इतर रोपे काढून टाकावे जेणे करुन निवडलेल्या रोपांची चांगली वाढ होईल.

६. **स्थळानुरुप अंदाजपत्रक:** रोपवन क्षेत्राचे सिमांकन झाल्यानंतर उपचार नकाशा तयार करुन त्यानुसार सदर क्षेत्राच्या उपचाराकरिता व संरक्षणाकरिता आवश्यक त्या बाबींचा समावेश करुन अंदाजपत्रक तयार करण्यात यावे. अंदाजपत्रक तयार करतांना प्रतिहेक्टरी तरतूदीशी क्षेत्रफळाशी गुणाकार करुन मात्रा निश्चित करणे चुकीचे आहे. रोपवन क्षेत्राच्या उपचाराकरिता जागेच्या परिस्थितीचा विचार करुन, लागणारा गुरे प्रतिबंधक चर, निरीक्षण पथ, नैसर्गीक पुनरुत्पादनाचा उपचार, नालाबांध, जल शोषक चर, रोपे लागवडीसाठी खड्डे किंवा चर, जाळ रेषा, गवत वाफे इत्यादी ची तरतूद करावी. सदर बाबी तांत्रिक दृष्टया योग्य व आवश्यक असणा-या असाव्या. प्रत्येक ग्रिडमध्ये असलेल्या नैसर्गिक पुनरुत्पादनाची रोपे, मोठे वृक्ष व झोन चे विचार करुन एकूण खोदाव्या लागणा-या खड्ड्यांची किंवा चराची संख्या अंदाजीत करावी. उदा. एका रोपवन नमुन्यामध्ये प्रती हेक्टरी १११९ रोपे लावण्याची तरतूद असल्यास, रोपवन क्षेत्र २० हेक्टर असल्यास एकूण रोपवन क्षेत्रात सरसकट २२,२२० खड्डे खोदण्यासाठी तरतूद करणे योग्य नाही. नैसर्गिक पुनरुत्पादनाचा उपचार, मोठे वृक्ष, नाला, जाळरेषा इत्यादींचा विचार करुन एकूण खोदावे लागणारे खड्डे किंवा चराची संख्या अंदाजीत करावयाची आहे. जाळरेषांच्या पट्टीत रोपे लागवड अपेक्षित नाही तसेच मोठे वृक्षाखाली व झाडापासून ३ मीटरच्या आत रोपे लागवडीसाठी खड्डे खोदणे योग्य नाही. अंदाजपत्रक ६ वर्षाच्या कालावधी करिता असावे (including 5th year operations). पर्यायी वनीकरणासाठी प्रचलित सूचनेनुसार अंदाजपत्रक तयार करावे.

७. **गुरे प्रतिबंधक चर:** रोपवनाचे सिमांकन, संरक्षण व गुरांच्या चराईपर प्रतिबंध घालणेसाठी कुंपण आवश्यक आहे. रोपवनाच्या कामात गुरे प्रतिबंधक चर किंवा जैविक कुंपण कामाचा समावेश करणे अत्यावश्यक आहे. एखाद्या गावात संयुक्त वन व्यवस्थापन समिती सक्रिय असल्यास त्याठिकाणी अपवाद आहे. गुरांपासून संरक्षणासाठी रोपवनाची पूर्ण सिमा बंदिस्त करण्यासाठी गुरे प्रतिबंधक चराची आखणी करावी. अतिउताराच्या क्षेत्रात गुरे प्रतिबंधक चराचे काम घेऊ नये. अतिउताराच्या क्षेत्रात रोपवन सिमेवर २ ओळी मध्ये खड्डे खोदून १ मिटर अंतरावर बांधू किंवा काटेरी प्रजातीची staggered पध्दतीने लागवड करावी. काही ठिकाणी आवश्यकतेनुसार दगडाची भित (dry rubble bund) निर्माण करावा. काही प्रसंगी काटेरी तार कुंपण आवश्यक ठरते. काही ठिकाणी सुकलेल्या फांद्या (dry brushwood) वापरून कुंपण केल्या जाते हे अत्यंत चुकीचे असून अशाप्रकारचे व हंगामी स्वरूपाचे कुंपण योग्य नाही. तात्पुरत्या स्वरूपाचे कुंपण केल्यास सदर खर्च निरर्थक ठरतो. गुरेप्रतिबंधक चराची किंवा इतर पर्यायी व्यवस्था न करता रोपवन कामे हाती घेणे योग्य नसून अशा प्रकारची अनियमितता झाल्यास संबंधितांचे विरूध्द कार्यवाही करावी.

काही ठिकाणी रोपवनाजवळ गावे नसल्ने किंवा पाळीव जनावरे नसल्यास व चराईची अडचण नसल्यास गुरे प्रतिबंधक चर न करता रोपवन कामांचे नियोजन करणे शक्य आहे. परंतु अशा ठिकाणी रोपवन हद्द कायमस्वरुपी दर्शविणेसाठी काही प्रमाणात पिलर किंवा दगडी बुरुज देणे योग्य राहील.

पहिल्या वर्षी गुरे प्रतिबंधक चराच्या उंचवटयावर वेळेवर घायपात कंद लागवड करण्यात यावे. इतर काटेरी प्रजातीच्या रोपांची सुध्दा लागवड करता येईल, परंतु एकच प्रजाती उंचवटयावर लागवड करणे योग्य आहे. पहिल्या वर्षी पासून तीन वर्षा पर्यंत घायपात व इतर काटेरी प्रजातींच्या वाढीसाठी नींदणी व मरअळी भरण्याचे काम करावे. काही ठिकाणी गुरे प्रतिबंधक चराचे खोदकाम करतांना खालच्या भागात दगड व कडक मुरुम असल्यास उंचवटावर वरच्या भागात दगड व मुरुम टेकल्या जाते, त्यामुळे उंचवटयावर घायपात किंवा बांधु व इतर काटेरे प्रजातीची लागवड करणे अवघड होते, अशावेळी उंचवटावर खड्डे खोदुन रोपवनातून खोदलेली माती त्या खड्डयात टाकावी व त्या खड्डयात घायपात किंवा इतर काटेरी प्रजातीची लागवड करावी. उंचवटावर बी पेरु नये त्याऐवजी रोपे लावावी जेणे करुन रोपे त्वरित स्थापित होऊन वाढीला लागतील.

गुरे प्रतिबंधक चर, जैविक काटेरी कुंपण आवश्यकतेनुसार तातडीने दुरुस्त करणे आवश्यक आहे, अन्यथा कुंपण संरक्षणाकरीता प्रभावी ठरत नाही व कुंपणावर केलेला खर्च उपयोगी ठरत नाही. कुंपणाची दुरुस्ती व देखभालीचे काम पाच वर्षा पर्यत करणे आवश्यक आहे. पर्यायी वनीकरण रोपवनाबाबत ७ किंवा १० वर्षापर्यंत गुरे प्रतिबंधक चराची दुरुस्ती व देखभाल करणे आवश्यक आहे. कोणत्याही बाजूला कुंपण उघडे राहणार नाही याची दक्षता घ्यावी.

रोपवनात जुना गुरे प्रतिबंधक चर अस्तित्वात असल्यास त्याची लांबी मोजमाप घेऊन पंचनामा करावा व दुरुस्तीसाठी लागणारी खोदकामाची मात्रा अंदाजीत करावी. अंदाजपत्रकात जुन्या गुरे प्रतिबंधक चराच्या दुरुस्तीबाबत स्वतंत्र तरतूद करावी.

रोपवनाच्या आत सहजरीत्या जनावरांना आत जाता येणार नाही या करिता प्रवेशाकरिता खुले सिमेवर लाकडाचे किंवा फांद्याचे barrier देण्यात यावे. पर्यायी वनीकरण रोपवने व जिल्हायोजनांतर्गत रोपवने हाती घेतांना रोपवना भोवती काटेरी तार कुंपणाची तरतूद करण्यासाठी प्रयत्न करावे किंवा काही भागापुरता का होईना काटेरी तार कुंपणाची तरतूद करण्यास प्रयत्न करावे. काटेरी तार कुंपणाची तरतूद केल्यास सदर कुंपणाला लागून एका रांगेत ६० से.मी. अंतरावर घायपात लागवड, त्यांची नींदणी, मरअळी भरणे इत्यादीची तरतूद अंदाजपत्रकात करावी जेणेकरून काही वर्षानंतरही कुंपण सुरक्षित व कायम राहील.

काही ठिकाणी गुरे प्रतिबंधक चर करण्याची आवश्यकता भासते परंतु रोपवन नमुन्यात त्यासाठी तरतूद नसते. अशावेळी रोपवनाभोवती दोन रांगेत खड्डे खोदून प्रासोपीस प्रजातीची रोपे, इतर काटेरी रोपे किंवा बांबुची लागवड करण्याचे नियोजन करावे. एका रांगेत रोपांमधील अंतर १ मिटर असावे व दोन्ही लाईन मधील अंतर ६० सें.मी. ठेवून staggered पद्धतीने लागवडीचे नियोजन करावे. खड्डयाचे आकारमान ३० X ३० X ३० सें. मी. किंवा ४५ X ४५ X ४५ सें. मी. असावे. खड्डयात लागवड करण्यासाठी पॉलीथिन पिशवीतील रोपे रोपवाटीकेत तयार करावी लागवड केल्यानंतर रोपांच्या वाढीकरिता निंदणी, मरळी भरणे, मातीची भारभांगलन करण्यात यावे व ५ वर्षापर्यंत त्याची देखभाल करावी. या करिता अंदाजपत्रकात तरतूद करावी.

रोपवन क्षेत्रास लागून वनेत्तर जमीन असल्यास हद्दीचे सिमांकन काळजीपूर्वक करावे व चुरज रोवण्यात यावे. वनेत्तर जमीन हद्दीवर असलेल्या ठिकाणी रोपवन काम हाती घेतांना गुरेप्रतिबंधक चराची तरतूद असलेला रोपवन नमुना निवडावा गुरेप्रतिबंधक चर करणे शक्य नसल्यास खड्डे खोदून काटेरी प्रजाती लागवड, दगडी भित, काटेरी तार कुंपण इत्यादींचा विचार व्हावा.

८. **लागवडी करिता खड्डे व समतल चर:** लागवडी करीता खड्डे व समतल चर खोदतांना मोठया वृक्षाखाली व छाती उंची वर १५ से.मी. व त्यापेक्षा अधिक गोलाई असलेल्या झाडा पासून ३ मीटरच्या आंत लागवडी करीता खड्डे किंवा समतल चर खोदता कामा नये. प्रति हेक्टरी रोपे रोपवन नमुन्यानुसार सरसकट पूर्णपणे अंदाज पत्रकात तरतूद न करता, नैसर्गिक पुनरुत्पादन असल्यास त्यानुसार ग्रिड निहाय खड्डयांची संख्या कमी करुन रोपे लागवडीचे नियोजन करावे. प्रत्येक ग्रिड मधील नैसर्गिक झाडोरा, खडकाळ भाग, अधिक वन घनता, मातीची खोली इत्यादीबाबी विचार करुन रोपे लागवडीसाठी ग्रिड निहाय किती खड्डे/चर खोदावे लागणार आहे ते ठरवावे व त्यानुसार एकुण मात्रा अंदाज पत्रकात तरतूद करावी.

९. **रोपांमधील अंतर :** इमारती प्रजाती लागवडीसाठी २ मीटर अंतर ठेवून लागवड करणे योग्य आहे, जेणेकरुन नंतरच्या कालावधीत विरळणी करुन व्यवस्थापन करता येईल. सागवान, कळम, हलदु, शिसम, सिसु, शिवण, खैर, बिजा इत्यादी इमारती प्रजाती २ मिटर अंतरावर लागवड करणे योग्य आहे. इमारती प्रजाती फक्त झोन-३ च्या क्षेत्रात लागवड करावी. झोन ३ मध्ये इतर मोठा वृक्ष प्रजाती जसे की

मोहा, बेहडा, हिरडा, आवळा, आंबा, चिंच, जांभुळ, करंज, कवठ, पीपळ, काटेसावर (सीमल), इत्यादी प्रजाती लागवडीसाठी रोपांमधील अंतर ३ मिटर किंवा त्यापेक्षा अधिक ठेवणे संयुक्तिक आहे. त्यामुळे काळजी पूर्वक विचार करुन रोपवन नमुना ठरवावा व रोपे लागवडीचे नियोजन करावे. समतल चर खोदून त्यात १ मीटर पेक्षा कमी अंतरावर रोपे लागवड करणे अत्यंत चुकीचे आहे. काही ठिकाणी सलग समतल चर खोदून ६५ से.मी. अंतरावर किंवा एक मीटर पेक्षा कमी अंतरावर रोपे लागवड केल्या जाते ते चुकीचे असून रोपवन नमून्या मध्ये विहित केलेल्या अंतरावरच रोपे लागवड करावे.

१०. **प्रजाती:** रोपवनात शक्यतो स्थानिकरीत्या आढळणा-या प्रजातीचीच लागवड करण्यात यावी. झोन ३ च्या क्षेत्रात काशिद, गिलरीसिडीया, पळस, विलायती चिंच, पार्कीनसोनिया, पेल्टाफोरम, स्यायोडीया, गुलमोहर, जकरांडा इत्यादी प्रजातीची लागवड करु नये. रोपवाटिकेच्या व रोपवनाच्या सुकर व्यवस्थापनासाठी एका रोपवनात लागवडीसाठी कमी प्रजाती निवडावे. जास्तीत जास्त ५ प्रजाती असाव्या. रोपवन केल्यापासून १५ वर्षा नंतर सातत्याने दर वर्षी काही न काही अकाष्ट वनोपजाचे उत्पन्न मिळेल यासाठी प्रजाती निवडाव्या. अनेक वन विभागात सागवन नैसर्गिकरीत्या विपुल प्रमाणात आढळते, अशा ठिकाणी सागवण प्रजाती लागवड करणे तर्कसंगत आहे. काही भागात सीताफळ, चारोळी, शिसम, चंदन इत्यादी नैसर्गिकरीत्या आढळते तेथे या प्रजातीचीही लागवड करण्याचा प्रयत्न करावा.

११. **आगिपासून संरक्षण:** रोपवनाचे आगिपासून संरक्षणाकरिता योग्य नियोजन करुन जाळ रेषांची व्यवस्था करणे आवश्यक आहे. कार्य आयोजनेत रोपवनाभोवती ६ मीटर रुंदीची जाळ रेषा करणे व आगिपासून संरक्षण १० वर्षा पर्यंत करण्यास सूचित केले आहे. आगिपासून संरक्षणाकरिता रोपवनाभोवती आतील भागात सुरे प्रतिबंधक चरासोबत किमान ४ मीटर रुंदीची जाळरेषा करावी. रोपवनात ४ ते ५ हेक्टर चे क्षेत्राच्या सेक्शनची आखणी करुन सदर सेक्शन भोवती जाळ रेषेचे नियोजन करावे. आगिच्या हंगामात बेस लाईन व निरीक्षण पथ सुध्दा साफ करुन ठेवावे जेणे करुन आगिपासून संरक्षणाकरीता उपयोगी ठरतील. वरील बाबी विचार करुन अंदाजपत्रकात तरतूद करावी. जाळरेषा उपचार नकाशात दर्शवावे. जाळरेषेत रोपे लागवडी करिता खड्डे किंवा चर खोदू नये.

१२. **रोपवनातून रस्ता:** बैलगाडी रस्ता, पायवाट किंवा रोड रोपवनातून जात असेल अशा ठिकाणी रोपवन करणे योग्य नाही. रस्ता वगळून रोपवनाच्या आखणीचा प्रयत्न करावा. रस्ता वगळणे शक्य नसल्यास रस्त्याच्या दोन्ही बाजूला सुरे प्रतिबंधक चराचे काम नियोजित करावे. रस्त्याच्या दोन्ही बाजूला ४ मीटर रुंदी जाळ रेषेची व्यवस्था करावी.

१३. **डीबर्डींग:** इमारती प्रजाती रोपांना बाजूला फुटलेल्या फांदया कापण्यासाठी सीकेटरचा वापर करावा. रोपांच्या एकूण उंची पैकी खालच्या अर्ध्या भागात फुटलेल्या फांदया कापून टाकाव्या व वरच्या भागातील फांदया कापु नये.

१४. **नालाबांध व जल शोषक चर:** जागेच्या परिस्थितीनुसार नालाबांध व जल शोषक चराची तरतूद अंदाजपत्रकात करावी. ५ वर्षापर्यंत आवश्यकतेनुसार नालाबांध दुरुस्तीसाठी तातडीने कारवाई करावी.

१५. **खत :** रोपांच्या वाढी करीता खत देणे आवश्यक आहे. त्याकरिता रोपवनातील मातीची तपासणी करुन घ्यावी व त्यानुसार रोपवनाला देण्यात येणा-या खताबाबत निर्णय घ्यावा.

१६. **मोजमाप नोंदवही :** रोपवनात करण्यात आलेल्या प्रत्येक कामाची नोंद ग्रिड निहाय मोजमाप प्रस्तिकेत नोंद करणे आवश्यक आहे. रोपवन कामे योग्यरीत्या वाखवार ग्रिडनिहाय नोंद करण्याची जबाबदारी वन परिक्षेत्र अधिकारी यांची आहे. ग्रिड निहाय सर्व कामे मोजमाप प्रस्तिकेत नोंद न केल्यास संबंधित वन परिक्षेत्र अधिकारी यांचे विरुद्ध कडक कार्यवाही करावी.

१७. **रोपवन नोंदवही:** सदर वहीत रोपवनात करण्यात आलेल्या विविध कार्यविधीची व कालावधीची माहिती नमुद करावी. कोणत्याही अधिका-याने रोपवन स्थळास भेट दिल्यास त्यांना वन परिक्षेत्र अधिकारी किंवा क्षेत्रीय कर्मचारी यांनी रोपवन नोंदवही सादर करावी. एखादा अधिका-याने रोपवन स्थळास भेट दिल्यास व त्यांनी रोपवन नोंदवही व मोजमाप पुस्तिका पाहिली नसल्यास रोपवन नोंदवही मध्ये भेट देण्यात आलेल्या अधिका-याचे नांव, हुद्दा व पाहणीचा दिनांक लिहिण्यात यावा. ग्रिड निहाय चाचणी खड्ड्याची खोली दर्शविणारी यादी रोपवन नोंदवहीत लिहावी. रोपवन नोंदवहीच्या शेवटी मंजूर अंदाजपत्रकातील तरतुदीचा वर्ष निहाय तपशील, तांत्रिक व प्रशासकीय मंजूरी क्रमांक व दिनांक ही लिहावे. मार्च, जून, सप्टेंबर, डिसेंबर महिन्यात रोपवन नोंदवही अद्यावत करुन तसे रोपवन नोंदवहीत वन परिक्षेत्र अधिकारी यांनी दिनांकासह प्रमाणित करावे. रोपांच्या जीवंत रोपाची टक्केवारी ५ वर्षापर्यंत नियमित पणे रोपवन नोंदवहीत नमुद करावे. ग्रिड निहाय चाचणी खड्ड्यांच्या खोलीचा तपशील रोपवन नोंदवहीत नमुद करावा. रोपवनावर लागवड केलेल्या रोपांचा रोपवाटिका खर्च रोपवन नोंदवहीत लिहावा. वर्ष निहाय व बाबनिहाय रोपवनावर झालेल्या खर्चाचा तपशिल रोपवन नोंदवहीत नोंद करावा.

१८. **बांबू रोपवन:** बांबू रोपे लावतांना वरच्या भागात न लावता खोलवर लागवड करण्याचा प्रयत्न करावा, जेणे करुन रानडुकरापासून नुकसान टाळणे शक्य होईल. बांबू रोपवनात मरअळी भरतांना खड्डे खोल खोदून खालच्या भागात रोपे लागवड करावी, त्यामुळे रानडुकरांपासून नुकसान कमी करणे शक्य होईल. बांबूची रोपे रोपवाटीकेत वाढविण्याकरीता पॉलीथीन पिशवीत सरळ बी पेरु नये. रोपवाटिकेत वाफयावर बांबु बी पेरण्यात यावे व एकवर्ष झाल्यानंतर rhizome काढून पॉलीथीन पिशवीत लावावे व सदर रोपे रोपवनात लागवडीसाठी उपयोगात आणावे.

१९. **रोपवाटिका :** रोपवाटिकेत रोपांना वृक्षांच्या सावलीत ठेवू नका. आवश्यकतेपेक्षा अधिक पाणी देवू नये. Polythene tube मध्ये रोपे वाढवावे जेणेकरुन मुळांचा चांगला विकास होईल व मूळ वेडेवाकडे (root coiling) होणार नाही. चांगल्या प्रतीच्या वृक्षांचे बी गोळा करुन रोपे तयार

करण्यासाठी वापर करावा. रोपवाटीकेत पिशवी भरतांना पुरेसे शेणखत, रेती मिसळले असल्याची दक्षता घ्यावी. रोपवाटीकेत मातीच्या मिश्रणात काळी माती वापरु नये.

२०. **जीवंत रोपांची टक्केवारी:** रोपवनाच्या प्रथम वर्षापासून ५ व्या वर्षा पर्यंत व पर्यायी वनीकरण रोपवनांची १० वर्षा पर्यंत दर वर्षी मे व ऑक्टोबर महिन्यात जीवंत रोपांची टक्केवारी काढावी व माहिती रोपवन नोंदवही मध्ये नोंद करावी.

२१. **रोपवनांची संरक्षा :** रोपवनाचे काम हाती घेतांना एका वन परिक्षेत्रात कर्मचारी व अधिकारी यादर रोपवन योग्यरीत्या सांभाळू शकेल व रोपवनाचे काम आवश्यक प्रमाणात घेण्यात येणार नाही याबाबत काळजी घ्यावे. रोपवनाची कामे सुरळीतपणे व गुणवत्ता राखून पार पाडण्यासाठी योग्य त्या रोपवनाचे व्यापी उद्दिष्ट ठरवावे.

अपर प्रधान मुख्य वन संरक्षक
(अर्थसंकल्प, नियोजन व विकास)
महाराष्ट्र राज्य, नागपूर

प्रति,
मुख्य वन संरक्षक (प्रादेशिक) (सर्व)
उप वन संरक्षक, विभागीय वन अधिकारी व उप विभागीय अधिकारी (सर्व)

प्रतिलिपी :
१) प्रधान मुख्य वन संरक्षक (उत्पादन व व्यवस्थापन)
२) अपर प्रधान मुख्य वन संरक्षक (सर्व)
३) मुख्य वन संरक्षक (मूल्यांकन), महाराष्ट्र राज्य, नागपूर
४) उप वन संरक्षक/ विभागीय वन अधिकारी, मूल्यांकन विभाग (सर्व)

Appendix- VIII

Report of Committee constituted on successful plantation works

प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख),महाराष्ट्र राज्य, नागपूर यांचे कार्यालय

वनभवन, रामगीरी रोड, सिव्हील लाईन्स, नागपूर-४४० ००१
Tel: ०७१२-२५०६७०, Fax: २५५०६७५, E-mail: pccfhoffms@gmail.com

क्रमांक कक्ष-१/रोहयो/प्र.क्र.१०/२२८२/२०१७-१८
नागपूर, दिनांक : ७/३/२०१८

विषय : रोपवनाचे यशस्वीतेकरीता रोपवन कामाबाबत गठित समितीचा अहवाल.

संदर्भ : मुख्य वनसंरक्षक (मुल्यांकन), महाराष्ट्र राज्य, नागपूर तथा समिती सदस्य सचिव

यांचे पत्र क्रमांक कक्ष-८/प्र.क्र.५(१७-१८)/ १९४२/२०१७-१८ नागपूर, दिनांक ३१/१/२०१८

संदर्भिय पत्रान्वये रोपवन कार्यक्रम यशस्वी करणे, वनीकरण कामात ठोस सुधारणा सुचविणे, मार्गदर्शक सुचना तयार करणे, मुल्यांकन अहवालाच्या निष्कर्षाच्या अनुषंगाने काही धोरणात्मक व अनुषंगिक निर्णय बाबत समिती अहवाल प्राप्त झाला असुन, त्या अनुषंगाने खालील प्रमाणे निर्णय घेऊन सुचना जारी करण्यात येत आहे.

१) अस्तित्वात असलेल्या रोपवन नमुन्यांत आवश्यक सुधारणांसाठी प्रस्ताव.

स्थानिक भौगोलिक परिस्थतीनुसार/विभाग निहाय (विदर्भ/मराठवाडा/उत्तर महाराष्ट्र/पश्चिम महाराष्ट्र व कोकण) मध्ये सध्या अस्तित्वात असलेल्या रोपवन नमुन्यामध्ये बदल करण्याची कारणमिमांसा यांचा अभ्यास करणे तसेच विभाग निहाय राज्यातील विविध वृत्त स्तरीय अधिकारी, मूल्यांकन विभागाचे विविध मूल्यांकन अहवालानुसार त्यांचे अभिप्राय विचारात घेऊन आवश्यक बदलासह खालील प्रमाणे सुधारीत रोपवन नमुने तयार करण्यात आले आहे.

अ) महात्मा गांधी राष्ट्रीय ग्रामीण रोजगार हमी योजना- वनीकरण अंतर्गत वनक्षेत्रावर रोपवनाकरिता ९ नमुने व सहाय्यिका पुनर्निमितीचा १ असे १० नमुने मंजुर आहेत. यामध्ये नमुना ३ ते ५ व नमुना ७ ते ८ असे एकंदर ५ नमुन्यांमध्ये काही बाबी (चाचणी खड्डे खोदणे, ग्रिडची हद्द कायम राखण्यासाठी सिमेंन्ट पिल्लर लावणे, रोपवन क्षेत्र सभोवताल बंदिस्त करणे, नैसर्गिक पुर्ननिर्मीतीच्या रोपांना उपचार देणे, निरीक्षण पथ तयार करणे, रोपवन फलक लावणे) समाविष्ट करणे अनिवार्य असल्यामुळे सदर कामाच्या बाबीचा अंतर्भाव समाविष्ट करुन सुधारीत रोपवन नमुने (३-अ ते ५-अ व ७-अ ते ८-अ) यास मंजुरी देण्यात येत आहे. (परिशिष्ट-१)

ब) राज्यातील विविध प्रदेशातील उपवनसंरक्षक तसेच मूल्यांकन विभागाचे विभागीय वन अधिकारी, समितीतील सदस्यांचे तसेच क्षेत्रीय अधिका-यांचे मत घेऊन स्थानिक परिस्थितीनुसार चरात लागवडीचे ३ नविन रोपवन नमुने तयार केले असून सदर रोपवन नमुने ((i) ३६७ तुटक चर - ७३४ रोपे (ii) १२०० सलग समपातळी चर - ६०० रोपे (iii) ४०० तुटक - ८०० रोपे व ४०० सलग समपातळी चर - ८०० रोपे एकूण १६०० रोपे) यास मंजुरी देण्यात येत आहे. (परिशिष्ट-२)

क) तार कुंपन व सिंचित रोपवन नमुने : बरेच ठिकाणी तेथील दुष्काळी परिस्थिती व पाळीव जनावरांच्या चराइर्मुळे रोपवन अयशस्वी होत असतात. अशा विपरीत परिस्थितीत रोपवन यशस्वी करण्यासाठी तार कुंपण व सिंचनाचे ३ प्रकारचे रोपवन नमुने ((i) ६२५ खड्डे (ii) ११११ खड्डे (iii) ३६७ तुटक चर - ७३४ रोपे) यास मंजुरी देण्यात येत आहे. (परिशिष्ट-३)

२) रोपवनात जिवंत रोपांची टक्केवारी सुधारणेसाठी उपाययोजना.

अ) रोपवनाचे वेळापत्रक :- मागिल काही वर्षातील रोपवनांच्या मूल्यांकन अहवालावरुन जीवंत रोपांची टक्केवारी कमी राहण्याची विविध कारणे निदर्शनास आली असून, त्यापैकी बहुतांश वेळेस रोपवनातील लागवड पूर्व कामे, लागवड वर्ष कामे, रोपवाटीकेचे कामे, प्रथम वर्षीय कामे ते पाच वर्षीय कामे वेळेवर होत नसल्याने रोपवन अयशस्वी होण्याचे प्रमाण जास्त असल्याचे निदर्शनास आले आहे.

रोपवाटिका व रोपवनातील विविध प्रकारची कामे वेळेवर विहित कालावधीत केल्यास रोपवन यशस्वी होण्यास मदत मिळत असल्याने, रोपवनाची कामे गुणवत्तापुर्ण व तांत्रीक पध्दतीने योग्य वेळी होण्याकरिता रोपवाटिका व रोपवन कामाचे वेळापत्रक तयार केलेले आहे.

रोपवन कामाचे वेळापत्रक व कृती मुद्यांबाबत जबाबदार अधिकारी निश्चित करुन कामे करणे व रोपवाटिका / रोपवनांचे निरीक्षण निकषास अनुमती देण्यात येत आहे. (परिशिष्ट-४)

ब) रोपवाटीका/रोपवन निरिक्षणाचे निकष :- रोपवनातील वेगवेगळया कामाबाबत वरिष्ठ वनअधिका-यांच्या रोपवाटीका/रोपवन स्थळी भेटी देऊन क्षेत्रीय कर्मचा-यांना मार्गदर्शन करणे तसेच रोपवनाच्या कामामध्ये

अडीअडचणी आल्यास त्याचे निराकरण करणे परिणामी रोपवन यशस्वी होण्यास मदत होते. प्रधान मुख्य वनसंरक्षक, .म.रा. यांचे कायालयीन पत्र क्रमांक कक्ष-१/यो/इ.ए./मपाप्र./३५-९६/९३ दिनांक १३/१०/१९९५ अन्वये वनीकरणाबाबत विभिन्न प्रकारच्या निरीक्षणाचे निकष जारी केले आहे.

विभीन्न स्तरावर क्षेत्रीय अधिकारी कर्मचा-यांशी चर्चा करुन तपासणी परिणामकारक होण्यासाठी रोपवाटिका/ रोपवन निरीक्षणाच्या निकषाचा सुधारीत अहवाल तयार केले असुन, त्यास अनुमती देण्यात येत आहे. (परिशिष्ट-५)

३) संरक्षण

अ)काटेरी तारेच कुंपन / जाळीचे कुंपन

रोपवनक्षेत्राचे गरजेनुसार तसेच परिस्थतीनुसार रोपवनामध्ये रोपवनक्षेत्रासभोवताल काटेरी तारेचे कुंपण व जाळीचे कुंपण केल्यास रोपवनाचे संरक्षण परिणामकारक होत असून अशा रोपवन ठिकाणी काटेरी तारेचे कुंपण किंवा जाळीचे कुंपण करण्यास प्रचलित नियमानुसार व अनुदान उपलब्धतेच्या अधिन राहुन अनुमती देण्यात येत आहे.

ब) नैसर्गीक पुनरुत्पादन

गडचिरोली, चंद्रपूर, नागपूर, यवतमाळ व कोल्हापूर या वनवृत्तात वनक्षेत्रात ज्या ठिकाणी नैसर्गीक पुनरुत्पादनास भरपूर प्रमाणात वाव आहे असे क्षेत्र ठराविक कालावधी करिता काटेरी तारेचे कुंपण/जाळीचे कुंपणाच्या सहाय्याने ठराविक क्षेत्राकरिता लावण्यात येऊन सदर क्षेत्र पुर्णत: काही कालावधी करिता बंद करण्यात यावे. जेणे करुन नैसर्गीक पुनरुत्पादनाची योग्य त-हेने वाoe होऊन भविष्यात मोठया झाडांमध्ये रुपांतर होईल.

रोपवन लागवड न करता फक्त काटेरी तारेचे कुंपण/जाळीचे कुंपण ठराविक जंगल क्षेत्रात काही काळापूरते बंद केल्यास सदर क्षेत्राचे रुपांतर दाट जंगलामध्ये होईल अशा प्रकारच्या कामाला अनुदानाच्या उपलब्धतेच्या अधिन राहुन अनुमती देण्यात येत आहे.

४) यंत्राचा वापर

ज्या भागात खडकाळ /कठीण मुरुमाचे क्षेत्र आहे किंवा मजुर उपलब्ध होत नाहीत, मजुराकडून निकषाप्रमाणे कामे होत नाही तेथे यंत्राव्दारे चर/ खड्डे/ गुरे प्रतिबंधक चर इत्यादी खोदकाम करण्यास प्रचलित नियमानुसार अनुमती देण्यात येत आहे.

५) आक्षेपाची पुर्तता

प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख), म.रा. नागपूर यांचे पत्र क्रमांक कक्ष-१/रोहयो./मूल्य/प्रक्र.१० (भाग-१)/२०१४-१५/५२०/२०१६-१७ दिनांक १४ जून २०१६ अन्वये मुल्यांकनात घेण्यात आलेल्या रोपवन कामातील आक्षेपाबाबत पूर्तता अहवाल उपवनसंरक्षक (प्रादेशिक) यांनी ३० दिवसात मुख्य वनसंरक्षक (प्रादेशिक) यांना सादर करावा व उपवनसंरक्षक (प्रादेशिक) यांचे अहवाल प्राप्त झाल्यापासून १० दिवसात मुख्य वनसंरक्षक (प्रादेशिक) यांनी त्यांचा अभिप्राय विभागीय वन अधिकारी, मुल्यांकन विभाग / मुख्य वनसंरक्षक (मुल्यांकन) यांना पाठविण्यात यावा. उपवनसंरक्षक / मुख्य वनसंरक्षक (प्रादेशिक) यांनी त्यांचे निदर्शनास आणुन दिलेल्या रोपवन मुल्यांकनातील आक्षेप यावर योग्य कार्यवाही वेळेवर करीत आहेत की नाही यांबाबत केलेल्या पुर्ततेचा नियमीत आoeावा घेऊन त्या संबंधात वेळीच कार्यवाही करुन घेण्याची जबाबदारी ही संबंधीत पालक अपर प्रधान मुख्य वनसंरक्षक यांची राहील.

६) गंभीर आक्षेपाबाबत जबाबदारी निश्चित करणे.

अ) गंभिर स्वरुपाचे आक्षेप निदर्शनास आणून दिल्यानंतर मुख्य वनसंरक्षक (प्रादेशिक) यांचेकडून एक महिन्याच्या आत मुख्य वनसंरक्षक (मूल्यांकन) यांना आवश्यक ती कार्यवाही करण्याबाबत / न करण्याबाबत कळविण्यात यावे.

ब) मुख्य वनसंरक्षक (प्रादेशिक) यांनी त्यांचे निदर्शनास आणुन दिलेल्या रोपवन मुल्यांकनातील गंभिर आक्षेप / अनियमीतता यावर योग्य कार्यवाही वेळेवर करीत आहेत की नाही यांबाबत केलेल्या पुर्ततेचा नियमीत आoeावा घेऊन त्या संबंधात वेळीच कार्यवाही करुन घेण्याची जबाबदारी ही संबंधीत पालक अपर प्रधान मुख्य वनसंरक्षक यांची राहील.

७) मुल्यांकन अहवालातील शिफारशीबाबत कार्यवाही

विभागामार्फत प्रकाशित केलेल्या मुल्यांकन अहवालातील शिफारशीच्या अनुषंगाने त्यावर कार्यवाही करणे संबंधी निर्णय घेणे करीता खालील प्रमाणे ४ सदस्यीय समिती प्रस्तावित करण्यात येत आहे.

१) प्रधान मुख्य वनसंरक्षक (उत्पादन व व्यवस्थापन) म. रा. - अध्यक्ष

२) अपर प्रधान मुख्य वनसंरक्षक (अर्थसंकल्प, नियोजन व विकास) म. रा. - सदस्य

३) अपर प्रधान मुख्य वनसंरक्षक (कॅम्पा) म. रा. - सदस्य

४) मुख्य वनसंरक्षक (मुल्यांकन) म. रा. - सदस्य सचिव

सदर समिती ही मुल्यांकन अहवालातील शिफारशीवर निर्णय घेण्या व्यतीरीक्त गंभिर स्वरुपाचे आक्षेपावर संबंधित मुख्य वनसंरक्षक (प्रादेशिक) कार्यवाही करीत आहे किंवा नाही याबाबत आoeावा घेऊन त्यावर निर्णय घेईल. तसेच मुल्यांकन अहवालातील शिफारशिच्या अनुषंगाने आपले मत पुoeील कार्यवाहीसाठी प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख) यांना कळवितील.

सहपत्र : वरील प्रमाणे

प्रधान मुख्य वनसंरक्षक (वनबल प्रमुख),
महाराष्ट्र राज्य, नागपूर

प्रति,
मुख्य वनसंरक्षक (प्रादेशिक), (सर्व)
उपवनसंरक्षक (प्रादेशिक) / विभागीय वन अधिकारी / स्वतंत्र उपविभागचे उप विभागीय वन अधिकारी (सर्व)
प्रतिलीपी : १) सचिव (वने), महसूल व वनविभाग, मंत्रालय, मुंबई
२) प्रधान मुख्य वनसंरक्षक (वन्यजीव) म. रा. नागपूर
३) प्रधान मुख्य वनसंरक्षक (उत्पादन व व्यवस्थापन) म. रा. नागपूर
४) व्यवस्थापकीय संचालक, वन विकास महामंडळ, मर्यादित नागपूर
५) प्रधान मुख्य वनसंरक्षक (सामाजिक वनीकरण), पुणे
६) अपर प्रधान मुख्य वनसंरक्षक (संशोधन, शिक्षण व प्रशिक्षण) पुणे
७) प्रधान मुख्य वनसंरक्षक यांचे कार्यालयातील अपर प्रधान मुख्य वनसंरक्षक), (सर्व)
८) मुख्य वनसंरक्षक, कार्यआयोजना विभाग (सर्व)
९) मुख्य वनसंरक्षक (मुल्यांकन) म. रा. नागपूर

नमुना क्रमांक - ८ अ

६ x ६ मीटर अंतरावर ०.४५ x ०.४५ x ०.४५ मीटर आकारमानाचे २७८ खड्डे
रोप संख्या २७८ प्रति हेक्टर

दैनंदिन मजुरी दर रूपये १९२/-

अ.क्र.	कामाची बाब	१ हेक्टर साठी			
		मनुष्य दिवस	मजुरी	साहित्य	एकूण रक्कम
अ.	पूर्व पावसाळी कामे				
१	अ) मोजणी व सिमांकन करणे (चार लहान दगडांची रास उभारण्यासह)	१.००	१९२.००	९१.००	२८३.००
	ब.) उपचार नकाशा तयार करणे (१०० x ५० मिटरवर) ग्रिड टाकणे,	१.००	१९२.००	९१.००	२८३.००
	क.) जागेवरील अनावश्यक झाडेझुडपे काढून जमिन तयार करणे.	१०.००	१९२०.००	९१.००	२०११.००
२	खोदण्या कोप-यात ०.३० X ०.३० X ०.६० मी. आकाराचे चाचणी खड्डे खोदणे.	०.४	७६.८०	०	७६.८०
३	६० सेंमी X ५ से.मी. X १२ से.मी. आकाराचे सिमेंट पिल्लर खोड्या कोप-यात ३० सेंमी खोलीत लावणे, सिमेंट पिल्लरला पेंट देणे व ग्रिड क्रमांक लिहीणे. (३ पिल्लर, रु. ७५ प्रति पिल्लर)	०	०	२२५	२२५.००
४	रोपवन क्षेत्रातील सर्व मौल्यवान नैसर्गिक रोपांना उपचार देण्यासाठी त्यांची ग्रीड निहाय व प्रजातीवार मोजणी करणे व रोपांना रंग पट्टा लावून त्याची रजिस्टर मध्ये नोंद घेणे. (१.५० म. दि. प्रति २०० रोपे)	१.५०	२८८.००	५०.००	३३८.००
५	निरीक्षण पथ तयार करणे. (०.५ मनुष्य दिवस प्रति १०० मी.)	०.५०	९६.००	०.००	९६.००
६	गुरे प्रतीबंधक चर खोदणे - चराचा पाया व रुंदी ०.६० मीटर, खोली १ मीटर, माथा १.९० मी. व प्रती हेक्टरी चराची लांबी १०२ मीटर (प्रती मीटर १५५.४२ रू.) प्रत्यक्ष लागवड क्षेत्राची परिमीती घेऊ न त्यानुसार चराची लांबी निश्चित करावी. (स्थानिक परिस्थीतीनुसार आवश्यकतेप्रमाणे यंत्राचा वापर करुन गुरेप्रतिबंधक चर खोदणे व खोदुन निघालेली माती व मुरुम निदेशांप्रमाणे लावणे.)	८२.५७	१५८५३.४४	९१.००	१५९४४.४४
		महाराष्ट्र शासन जल संधारणविभाग सामाईक दर सूची २०१३-१४ बाब क्रमांक १, २ व ३ प्रमाणे मंजूर दर			
७	रोपवाटीकेचा अंदाज: खर्च २७८ रोपे लागवडीसाठी, अधिक २० टक्के रोपे मरअळी भरणेसाठी, एकूण ३३३ रोपे (१२.५० X २५ से.मी. आकाराच्या पिशवीत) तयार करण्याचा खर्च प्रती रोप रूपये ८.७८ प्रमाणे (प्रती रोप मजुरी रू.५.५६ व साहित्य पुरवठा रू.३.२१ प्रती रोप)	९.६५	१८५२.८०	१०७१.२१	२९२४.०१
८	वृक्षलागवडीच्या मातीकामासाठी खड्ड्यांची आखणी करणे . प्रती हेक्टरी २७८ खड्डे, आकारमान ०.४५ मी. X ०.४५ मी. X ०.४५ मी. ६ मी. X ६ मी. अंतरावर - सा.पु. रू. ४.९३ प्रती ५० खड्ड्यांसाठी व ०.१३ म.दि. प्रमाणे	०.८७	१६७.०४	२७.४२	१९४.४६

अ.क्र.	कामाची बाब	१ हेक्टर साठी			
		मनुष्य दिवस	मजुरी	साहित्य	एकूण रक्कम
५	गुरे प्रतिबंधक चर उंचवटा किंवा जैविक कुंपणावर लागवड केलेल्या रोपांत, काटेरी प्रजाती प्रोसोपिस / बोर इ. रोपांची २० % मरआळी भरणे. (६२ रोपे प्रति रोपे रु. ३)	०.२५	४८.००	१८६	२३४.००
६	रोपवन संरक्षण - १२ महिने - १० हेक्टर साठी १ मजूर.	३६.५०	७००८.००	०.००	७००८.००
७	अग्निप्रतिबंधक कामे (जाळ रेषा)	२.००	३८४.००	०.००	३८४.००
	एकूण	**४७.२६**	**९०७३.९२**	**५५९.४६**	**९६३३.३८**
	आकस्मित खर्च ३.० टक्के	०.००	०.००	२८९.००	२८९.००
	मजूर कल्याण ४.० टक्के	०.००	०.००	३८५.३४	३८५.३४
	एकूण	**४७.२६**	**९०७३.९२**	**१२३३.८०**	**१०३०७.७२**
ड.	**तृतीय वर्ष कामे**				
१	नैसर्गिक पुर्नउत्पादन रोपांची निदणी, भर भांगलन करणे, फुटव्यांचे एकीकरण करणे. रोपांची उंची व लव्हाची वेढी मोजणे व नोंदी घेणे. (प्रति २०० रोपे ४.७१ म.दि.)	४.७	९०२.४०	०	९०२.४०
२	रोपवनात १ वेळा निंदणी करणे व १ वेळा भरभांगलण करणे. रोपांची माती भुसभुशीत करुन भर देणे.	६.२५	१२००.००	०.००	१२००.००
३	रोपवन संरक्षण - १२ महिने - १० हेक्टर साठी १ मजूर.	३६.५०	७००८.००	०.००	७००८.००
४	अग्निप्रतिबंधक कामे (जाळ रेषा)	२.००	३८४.००	०.००	३८४.००
	एकूण	**४९.४५**	**९४९४.४०**	**०.००**	**९४९४.४०**
	आकस्मित खर्च ३.० टक्के	०.००	०.००	२८४.८३	२८४.८३
	मजूर कल्याण ४.० टक्के	०.००	०.००	३७९.७८	३७९.७८
	एकूण	**४९.४५**	**९४९४.४०**	**६६४.६१**	**१०१५९.०१**

इ.	चतुर्थ वर्ष कामे				
१	मे व ऑक्टोबर महिण्यात जिवंत रोपांची टक्केवारी काढण्यासाठी ग्रिड निहाय व प्रजाती प्रमाणे रोपांची मोजणी करणे व उंची व वेढी घेणे.	०.५	९६.००	०	९६.००
२	रोपवन संरक्षण - १२ महिने - १० हेक्टर साठी १ मजूर.	३६.५०	७००८.००	०.००	७००८.००
३	अग्निप्रतिबंधक कामे (जाळ रेषा)	२.००	३८४.००	०.००	३८४.००
	एकूण	**३९.००**	**७४८८.००**	**०.००**	**७४८८.००**
	आकस्मित खर्च ३.० टक्के	०.००	०.००	२२४.६४	२२४.६४
	मजूर कल्याण ४.० टक्के	०.००	०.००	२९९.५२	२९९.५२
	एकूण	**३९.००**	**७४८८.००**	**५२४.१६**	**८०१२.१६**

अ.क्र.	कामाची बाब	१ हेक्टर साठी			
		मनुष्य दिवस	मजुरी	साहित्य	एकुण रक्कम
७	रोपवनात ३ वेळा निंदणी व २ वेळा भरभांगलन करणे. २७८ रोपांसाठी १ निंदणी १ म.दि. प्रति १०० रोपे प्रमाणे मातिकाम ०.५० म.दि. प्रति १०० रोपाप्रमाणे निंदणीचे वेळी खत देणे, प्रती रोपास रू.०.८२ प्रमाणे	११.१२	२१३५.०४	२२८.६८	२३६३.७२
८	नैसर्गिक पुर्नउपादन रोपांची निंदणी, भर भांगलन करणे, फुटव्यांचे एकेरीकरण करणे. (प्रति २०० रोपे २.३० म. दि.)	२.३	४४१.६०	०	४४१.६०
९	द्वितीय वर्षात मरळींचे जागी पुनर्लागवडीसाठी रोपवाटिका अंशत: खर्च ३३३ रोपांचे - २० टक्के रोपे तयार करणे ५५ रोपे तयार करणे रू. ८.७७ प्रति रोप (मजूरी रू. ५.५५ + साहित्य रू. ३.२२ प्रति रोप) ऑक्टोबर ते मार्च	१.५९	३०५.२८	१७७.३२	४८२.६०
१०	रोपवन संरक्षण - ९ महिने - जुले ते मार्च. १० हेक्टर साठी १ मजूर.	३०.००	५७६०.००	०.००	५७६०.००
११	अग्निप्रतिबंधक कामे (जाळ रेषा)	२.००	३८४.००	०.००	३८४.००
	एकुण	**६१.१३**	**११७३६.९६**	**२९५७.५२**	**१३६९४.४८**
	आकस्मित खर्च ३.० टक्के	०.००	०.००	४१०.८३	४१०.८३
	मजूर कल्याण ४.० टक्के	०.००	०.००	५४७.७८	५४७.७८
	एकुण	**६१.१३**	**११७३६.९६**	**२९१६.१३**	**१४६५३.०९**
क.	**द्वितीय वर्ष कामे**				
१	रोपवाटीकेचा अंशत: खर्च १२.५० X २५ से.मी. पॉलिथीन पिशवीतील ५५ रोपांची द्वितीय वर्षात मरळीच्याजागी पुर्नलागवडसाठी एप्रिल ते जून कालावधीसाठी देखभाल, रू. १.८३ प्रती रोप (मजुरी रू. १.३९ + साहित्य रू. ०.४४ प्रती रोप)	०.४०	७६.८०	४४.२४	१२१.०४
२	रोपवाटिकेमधून ५५ रोपे वाहतूक करणे. (भराई व उतराई खर्चासह) मजुरी ०.१४ म.दि. + साहित्य रू. १.८३ प्रती रोप.	०.०६	११.५२	१००.५४	११२.०६
३	५५ रोपांची मर अळी लागवड. १०० रोपांना २ म.दि. प्रमाणे	१.१०	२११.२०	०.००	२११.२०
४	रोपवनात २ वेळा निंदणी करणे व १ वेळा भरभांगलण करणे. रोपांची माती भुसभुशीत करुन भर देणे, रोपे निंदणीचे वेळी खत देणे. प्रति रोप रू. ०.८२३/- प्रमाणे (१ निंदणी १०० रोपे १ म.दि.) (१ मातीकाम १०० रोपे ०.५० म.दि. प्रमाणे)	६.९५	१३३४.४०	२२८.६८	१५६३.०८

अ.क्र.	कामाची बाब	१ हेक्टर साठी			
		मनुष्य दिवस	मजुरी	साहित्य	एकूण रक्कम
९	वृक्षलागवडीसाठी करावयाचे मातीकाम ०.४५ मी. X ०.४५ मी. X ०.४५ मी. आकाराचे २७८ खड्डे खोदणे. प्रती १०० खड्डे ६.६० म.दि. प्रमाणे **(स्थानिक परिस्थितीनुसार आवश्यकतेप्रमाणे यंत्राचा वापर करुन खड्डे खोदणे व खोदुन निघालेली माती व मुरुम निदेशांप्रमाणे लावणे.)**	१८.३५	३५२३.२०	०.००	३५२३.२०
		महाराष्ट्र शासन जल संपदाविभाग सामाईक दर सुची २०१३-१४ बाब क्रमांक १, २ व ३ प्रमाणे मंजुर दर			
१०	**रोपवनाचा माहिती फलक उभारणे.** **(४ X ३ फुट) १ नग**	**०.००**	**०.००**	**५०००.००**	**५०००.००**
	एकूण	**१२५.८४**	**२४१६१.२८**	**६७३७.६३**	**३०८९८.९१**
	आकस्मित खर्च ३.० टक्के	**०.००**	**०.००**	**९२६.९७**	**९२६.९७**
	मजुर कल्याण ४.० टक्के	**०.००**	**०.००**	**१२३५.९६**	**१२३५.९६**
	एकूण	**१२५.८४**	**२४१६१.२८**	**८९००.५५**	**३३०६१.८३**
ब,	**प्रथम वर्ष कामे**				
१	रोपवाटीकेचा अंशत: खर्च १२.५० X २५ से.मी. पॉलिथीन पिशवीमध्ये ३३३ रोपांची एप्रिल ते जून या कालावधीत देखभाल रू. २.२० प्रती रोप (मजुरी रू. १.३९ व साहित्य पुरवठा रू. ०.८१ प्रती रोप)	२.४१	४६२.७२	२६८.७२	७३१.४४
२	खड्डे भरणे. ०.४५ x ०.४५ x ०.४५ मी. आकारमानाचे २७८ खड्डे मातीने भरणे (१.६६ म.दि. प्रती १०० खड्डयांसाठी) खड्डा भरलेवेळी त्यामध्ये सिंगल सुपर फॉस्फेट खत मिसळणे. खत किंमत रू. १.४६ प्रति खड्डा	४.६१	८८५.१२	४८८.०८	१३७३.२०
३	रोपवाटीकेमधून रोपवनक्षेत्रापर्यंत रोपांची वाहतूक ३३३ रोपे,(भराई व उतराई खर्चासह) (मजुरी ०.१४ म.दिन प्रति १०० रोपे व साहित्य रू. १.८३ प्रती रोप.)	०.४७	९०.२४	६०८.७२	६९८.९६
४	गुरे प्रतिबंधक चर उंचपटा किंवा जैविक कुंपणावर लागवड केलेल्या घायपात, काटेरी प्रजाती प्रोसोपिस / बोर इ. रोपांची २० % मरआळी भरणे. (६२ रोपे प्रति रोपे रु. ३)	०.२५	४८.००	१८६	२३४.००
५	रोपवनात २७८ रोपांची लागवड करणे १.९ म.दि. प्रति १०० रोपे	५.२८	१०१३.७६	०.००	१०१३.७६
६	२०% मरआळीच्या ठिकाणी नवीन रोपे लागवड करणे,(फळ देणा-या प्रजाती लावणे) १०० रोपांसाठी २ म.दि.प्रमाणे	१.१०	२११.२०	०.००	२११.२०

अ.क्र.	कामाची बाब	१ हेक्टर साठी			
		मनुष्य दिवस	मजुरी	साहित्य	एकूण रक्कम
फ.	पंचम वर्ष कामे				
१	मे व ऑक्टोबर महिन्यात जिवंत रोपांची टक्केवारी काढण्यासाठी खड्डे निहाय व प्रजाती प्रमाणे रोपांची मोजणी करणे व उंची व बांधी घेणे.	०.५	९६.००	०	९६.००
२	रोपवन संरक्षण - १२ महिने - १० हेक्टर साठी १ मजूर.	३६.५०	७००८.००	०.००	७००८.००
३	अग्निप्रतिबंधक कामे (जाळ रेषा)	२.००	३८४.००	०.००	३८४.००
	एकूण	**३९.००**	**७४८८.००**	**०.००**	**७४८८.००**
	आकस्मित खर्च ३.० टक्के	०.००	०.००	२२४.६४	२२४.६४
	मजूर कल्याण ४.० टक्के	०.००	०.००	२९९.५२	२९९.५२
	एकूण	**३९.००**	**७४८८.००**	**५२४.१६**	**८०१२.१६**

गावनिहाय

अ.क्र	वर्ष	मनुष्य दिवस	मजुरी	साहित्य	एकूण	इतर खर्च	एकूण रक्कम
१	लागवड पूर्व कामे	१२५.८४	२४१६१	६७३८	३०८९९	२१५१	३३०५०
२	प्रथम वर्ष कामे	६१.१३	११७३७	१९५८	१३६९४	९४३	१४६३८
३	द्वितीय वर्ष कामे	४७.२६	९०७४	५५९	९६३३	६७४	१०३०८
४	तृतीय वर्ष कामे	४९.४५	९४९४	०	९४९४	६३३	१०१२७
५	चतुर्थ वर्ष कामे	३९.००	७४८८	०	७४८८	५२४	८०१२
६	पंचम वर्ष कामे	३९.००	७४८८	०	७४८८	५२४	८०१२
	एकूण	**३६२.६८**	**६९४४३**	**९२५५**	**७८६९७**	**५४५०**	**८४१४७**

प्रति रोप खर्च रुपये २७३.११

Appendix-IX

Estimation of Expenditure

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2021-22 (1)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial
1	Bamboo Seed collection	1	Bamboo seed collection from Buffer area - Nistar BOWC	Metric Tons	4.00	10	40.00
		2	Bamboo seed collection from Buffer area - Commercial BOWC	Metric Tons	4.00	10	40.00
		3	Seed Transport, storage, fumigation, disinfection and handling	Metric Tons	0.10	20	2.00
			Total				82.00
2	Removal of Gregariously Flowered Dead and Dry Bamboo	1a	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Long Bamboo in '00 and per 100 Nos	0.03010	7317.92	220.27
		1b	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	2355.64	115.43
		1c	Cleaning and cutting of bushes, thorny shrubs, and grass in 20 M wide fireline strip network from 55 fire prone compartments in core area. Total area -20360.2 ha. 9.84% area of strips =2003.20 ha	Ha	0.2550	1003.32	255.85
		2a	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Long Bamboo in '00 and Rate per 100 Nos	0.03010	7702.91	231.86
		2b	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	6892.08	337.71
		3a	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Long Bamboo in '00 and per 100 Nos	0.03010	7808.43	235.03
		3b	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Bamboo Bundles in '00 and per 100 Nos	0.04900	4048.82	198.39
		4	Installation of Weigh Bridge for bamboo transporting trucks	Nos.	1.00	30	30.00
			Total				1624.54
3	Insurance against fire	1	Premium Expenses for Fire Insurance based on Harvesting cost / expenditure incurred on Bamboo Removal	Harvesting cost and Premium Rs. In Lacs	0.012276	1558.8	19.14
			Total			1558.80	19.14
4	ANR Operations including seed ball in Core area as per actual field survey		ANR in Core and Buffer				
		1	PPO/PYO	Ha.	0.13771	500	68.86
		2	FYO	Ha.	0.22788	0	0
			Total				68.855
5	Bamboo AR in gaps where NR is not adequate in Core area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.91
		2	FYO	Ha.	0.260		0
		3	SYO	Ha.	0.207		0
		4	TYO		0.210		0
		5	IV YO	Ha.	0.166		0
		6	V YO	Ha.	0.166		0
			Total			300	181.91

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2021-22 (1)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial
6	AMR Operations including seed ball in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.13771	500	68.86
		2	FYO	Ha.	0.22788	0	0
			Total				68.86
7	Bamboo AR in gaps where NR is not adequate in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.91
		2	FYO	Ha.	0.280		0
		3	SYO	Ha.	0.207		0
			TYO		0.210		0
			IV YO	Ha.	0.166		0
			V YO	Ha.	0.166		0
			Total				181.91
8	Bamboo AR in Private and CFR lands in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	2000	1212.74
		2	FYO	Ha.	0.280		0
		3	SYO	Ha.	0.207		0
			TYO		0.210		0
			IV YO	Ha.	0.166		0
			V YO	Ha.	0.166		0
			Total				1212.74
9	SMC Works	1	Digging of CCT in buffer area in Nistar BOWC	Ha.		500	50.0
		2	Digging of CCT in buffer area in Commercial BOWC	Ha.		500	50.0
			Total			1000	100.00
10	Wildlife Protection Works and Habitat Development works	1	Circular trench around bamboo clumps	Ha.	0.41	0	0
		1	Dry Bamboo wood bunds inNon perennial nallah bed	No.	0.016	200	3.20
		1	Dry Bamboo wood bunds along contour in undulating land	RM	0.0008	1000	0.80
			Total-				4.00
11	Fire Protection Works	A	CORE AREA				
			Recurring Expenditure				
			Cutting and Burning of Fire lines				
		1	Cutting and burning of fire lines - 20M wide	Kms	0.119	297.79	35.44
		2	Cutting and burning of fire lines - 13 M wide	Kms	0.103	307.95	31.77
		3	Cutting and burning of fire lines - 10 M wide	Kms	0.063	469.19	29.78
		4	Cutting and burning of fire lines - 6 M wide	Kms	0.024	0.90	0.02
			Total				97.01
12		5	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 15 Rounds Total Mandays- 90 x 26 x 4 =9360	Mandays	0.004	9360	37.44
		6	Fire watchers- 3 Watcher per Beat for 60 Beats, with 26 working days per mont for 4 months.Total Mandays- 60x3x4x26=18720	Mandays	0.004	18720	74.88

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2021-22 (1)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial
14	Fire Protection Works	7	Watchers for Watchtower -3 Fire watch per tower 3 for 4 towers,26 days per month for 4 month. Total Mandays- 3x4 x 26 x 4 = 1248	Mandays	0.0040	1248	4.99
		8	Clearance and Burning of Village Boundaries in Core Area- Navegaon - 8 Km, Jamni -10 Km, Palagaon - 9 Km, Botezari - 10 Km, Kolsa - 12 Km, Rantalodhu -12, Total - 61 Kms	Kms	0.0250	61	1.53
		9	Blower maintenance - @Rs.1100 per Blower for 63 Blowers	Blowers.	0.0110	68	0.75
		10	Manpower. For Existing look out towers and Control rooms 3 Laboures per Tower for 5 towers for 26 days per month for 4 months.Total Mandays- 3x5 x 26 x 4 = 1560	Mandays	0.004	1560.00	6.24
			Total Recurring Cost				**125.83**
15	Fire Protection Works		**Non recurring expenditure**				
		1	Procurement of Firefighting sets				
		2	Purchase of New Blowers	Nos	0.50	7	3.50
		3	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00	5	20.00
		4	Establishing new Watch Towers @ 4 sites 45mts	Nos.	40.00	4	160.00
		5	Fire Extinguishing sets - Tanker 3000 lit. capacity and pump sets -2 nos per range.	Nos.	2.50	10	25.00
		6	First Aid Boxes	L.S.	0.45		0.45
			Training and awareness	LS	1.00		1.00
			Total Non-Recurring Cost				209.95
			Grand Total (Recurring + Non Recurring)				**335.78**
16	Fire Protection Works		**BUFFER AREA**				
			Recurring Expenditure				
		1	Expansion of fire line along road side	Kms	0.020	1787.86	35.76
		2	Expansion of fire line (3 to 6)	Kms	0.020	518.29	10.37
		3	Maintenance of Existing fire line (1+2 Above=2306.15	Kms	0.025	0.00	0.00
		4	Maintenance of existing fire lines (12 mtr)	Kms	0.040	386.22	15.45
			Total				**61.57**

Annesure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2021-22 (1)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial
17	Fire Protection Works	5	Fire watchers- 194 Nos. 26 working days per months for 4 months.Total Mandays- 194x4x26= 20176	Mandays	0.004	20176	80.70
		6	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 20 Rounds Total Mandays- 120 x 26 x 4 =12480	Mandays	0.004	12480	49.92
		7	Watchers for Watchtower -3 Fire watch per tower for 3 towers,26 days per month for 4 month. Total Mandays- 3x9 x 26 x 4 = 936	Mandays	0.004	936	3.74
		8	Blower maintenance - @Rs.1100 per Blower for 70 Blowers	Nos.	0.011	70.00	0.77
		9	Clearance and Burning of Village Boundaries in Core/Buffer Area- Range Villages Kms Chandrapur 13 93.1, Mohanli 24 173.2 Mul 12 96.7 Palasgaon 12 117.32 Sioni 18 103.06 Khadsingi - -	Kms	0.020	583.28	11.67
			Total Recurring Expenditure				**206.38**
18	Fire Protection Works		**Non recurring expenditure**				
		1	Procurement of Firefighting sets				
		2	Purchase of New Blowers	Nos	0.50	10.00	5.00
		3	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00	6.00	24.00
		4	Establishing new Watch Towers @ 4 sites 45mts height	Nos.	40.00	3.00	120.00
		5	Fire Extinguishing sets tanker 3000 litres and pump	Nos.	2.50	12.00	30.00
		6	First Aid Boxes	L.S.	0.45		0.45
			Training and awareness	LS	1.00		1.00
			Non Recurring Total Expenditure				**180.45**
	Fire Protection Works		**Grand Total Expenditure (Recurring + Non Recurring)**				**386.83**
19	Eco-tourism Works	1	No additional funds are	0.00	0.00	0	0.00
			Grand Total				0.00
			Great Grand Total				**4427.13**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currently and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2022-23 (2)		FY - 2023-24 (3)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
1	Bamboo Seed collection	1	Bamboo seed collection from Buffer area - Nistar BOWC	Metric Tons	4.00	10.0	40.00	5	20.00
		2	Bamboo seed collection from Buffer area - Commercial BOWC	Metric Tons	4.00	10.00	40.00	5	20.00
		3	Seed Transport, storage, fumigation, disinfection and handling	Metric Tons	0.10	20.00	2.00	10.00	1.00
			Total				**82.00**		**41.00**
2	Removal of Gregariously Flowered Dead and Dry Bamboo	1a	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Long Bamboo in '00 and per 100 Nos	0.03010	6846.87	206.09	724.51	
		1b	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	3729.01	182.72		
		1c	Cleaning and cutting of bushes, thorny shrubs, and grass in 20 M wide fireline strip network from 55 fire prone compartments in core area. Total area -20360.2 ha. 9.84% area of strips =2003.26 ha.	Ha	0.2550	1000.00	255.00		
		2a	Removal of bamboo from Nistar BOWC including handling, transport to depot	Long Bamboo in '00 and Rate per 100 Nos	0.03010	4467.17	134.46	1903.69	
		2b	Removal of bamboo from Nistar BOWC including handling, transport to depot	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	3996.95	195.85		
		3a	Removal of bamboo from Commercial BOWC including handling, transport to depot	Long Bamboo in '00 and per 100 Nos	0.03010	10275.72	309.30		
		3b	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Bamboo Bundles in '00 and per 100 Nos	0.04900	5328.15	261.08		
		4	Installation of Weigh Bridge for bamboo transporting trucks	Nos.	1.00	0.00	0.00		
			Total				**1544.50**		**0.00**
3	Insurance against fire	1	Premium Expenses for Fire Insurance based on Harvesting cost / expenditure incurred on Bamboo Removal	Harvesting cost and Premium Rs. In Lacs	0.012276	1154.3	14.17		
			Total			**1154.30**	**14.17**	**0.00**	**0.00**
4	ANR Operations including seed ball in Core area as per actual field survey		ANR in Core and Buffer						
		1	PPO/PYO	Ha.	0.13771	500	68.86	500	68.86
		2	FYO	Ha.	0.22788	500	113.94	500	113.94
			Total				**182.80**		**182.80**
5	Bamboo AR in gaps where NR is not adequate in Core area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.91	300	181.91
		2	FYO	Ha.	0.280	300	84.14	300	84.14
		3	SYO	Ha.	0.207		0.00	300	61.99
		4	TYO		0.210		0.00		0.00
		5	IV YO	Ha.	0.166		0.00		0.00
		6	V YO	Ha.	0.166		0.00		0.00
			Total				**266.1**		**328.04**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currently and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2022-23 (2)		FY - 2023-24 (3)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
6	ANR Operations including seed ball in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.13771	500	68.86	500	68.86
		2	FYO	Ha.	0.22788	500	113.94	500	113.94
			Total				182.80		182.80
7	Bamboo AR in gaps where NR is not adequate in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.91	300	181.91
		2	FYO	Ha.	0.280	300	84.14	300	84.14
		3	SYO	Ha.	0.207		0.00	300	61.99
			TYO		0.210		0.00		0.00
			IV YO	Ha.	0.166		0.00		0.00
			V YO	Ha.	0.166		0.00		0.00
			Total				266.1		328.04
8	Bamboo AR in Private and CFR lands in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	2000	1212.74	2000	1212.74
		2	FYO	Ha.	0.280	2000	560.96	2000	560.96
		3	SYO	Ha.	0.207		0.00	2000	413.26
			TYO		0.210		0.00		0.00
			IV YO	Ha.	0.166		0.00		0.00
			V YO	Ha.	0.166		0.00		0.00
			Total				1773.7		2186.96
9	SMC Works	1	Digging of CCT in buffer area in Nistar BOWC	Ha.		500	50.00	500	50.00
		2	Digging of CCT in buffer area in Commercial BOWC	Ha.		500	50.00	500	50.00
			Total			1000	100.00	1000	100.00
10	Wildlife Protection Works and Habitat Development works	1	Circular trench around bamboo clumps	Ha.	0.41	50	20.45	50	20.45
		1	Dry Bamboo wood bunds inNon perennial nallah bed	No.	0.016	200	3.20	200.00	3.20
		1	Dry Bamboo wood bunds along contour in undulating land	RM	0.0008	1000	0.80	1000	0.80
			Total-				24.45		24.45
11	Fire Protection Works	A	CORE AREA						
			Recurring Expenditure						
			Cutting and Burning of Fire lines						
		1	Cutting and burning of fire lines - 20M wide	Kms	0.119	297.79	35.44	297.79	35.44
		2	Cutting and burning of fire lines - 13 M wide	Kms	0.103	307.95	31.77	307.95	31.77
		3	Cutting and burning of fire lines - 10 M wide	Kms	0.063	469.19	29.78	469.19	29.78
		4	Cutting and burning of fire lines - 6 M wide	Kms	0.024	0.90	0.02	0.90	0.02
			Total				97.01		97.01
12		5	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 15 Rounds Total Mandays- 90 x 26 x 4 =9360	Mandays	0.004	9360	37.44	9360	37.44
		6	Fire watchers- 3 Watcher per Beat for 60 Beats, with 26 working days per mont for 4 months.Total Mandays- 60x3x6x26= 18720	Mandays	0.004	18720.00	74.88	18720.00	74.88

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currently and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2022-23 (2)		FY - 2023-24 (3)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
14	Fire Protection Works	7	Watchers for Watchtower -3 Fire watch per tower 3 for 4 towers.26 days per month for 4 month. Total Mandays- 3x4 x 26 x 4 = 1248	Mandays	0.0040	1248	4.99	1248.00	4.99
		8	Clearance and Burning of Village Boundaries in Core Area- Navegaon - 8 Km, Jamni -10 Km, Palagaon - 9 Km, Botezari - 10 Km, Kolsa - 12 Km, Rantalodhu -12, Total - 61 Kms	Kms	0.0250	61	1.53	61	1.53
		9	Blower maintenance - @Rs.1100 per Blower for 63 Blowers	Blowers.	0.0110	63	0.69	63	0.69
		10	Manpower. For Existing look out towers and Control rooms 3 Labourers per Tower for 5 towers for 26 days per month for 4 months.Total Mandays- 3x5 x 26 x 4 = 1560	Mandays	0.004	1560.00	6.24	1560.00	6.24
			Total Recurring Cost				**125.77**		**125.77**
15	Fire Protection Works		**Non recurring expenditure**						
			Procurement of Firefighting sets						
		1	Purchase of New Blowers	Nos	0.50	0		0	0
		2	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00	0	0	0.00	0
		3	Establishing new Watch Towers @ 4 sites 45mts	Nos.	40.00	0	0	0.00	0
		4	Fire Extinguishing sets - Tanker 3000 lit. capacity and pump sets -2 nos per range.	Nos.	2.50	0	0	0.00	0
		5	First Aid Boxes	L.S.	0.45	0	0	0.00	0
		6	Training and awareness	LS	1.00	0	0	0.00	0
			Total Non-Recurring Cost				0.00		0.00
			Grand Total (Recurring + Non Recurring)				**125.77**		**125.77**
16	Fire Protection Works		**BUFFER AREA**						
			Recurring Expenditure						
		1	Expansion of fire line along road side	Kms	0.020	297.79	5.96	297.79	5.96
		2	Expansion of fire line (3 to 6)	Kms	0.020	307.95	6.16	307.95	6.16
		3	Maintenance of Existing fire line (1+2 Above=2306.15	Kms	0.025	2306.15	57.65	2306.15	57.65
		4	Maintenance of existing fire lines (12 mtr)	Kms	0.040	386.22	15.45	386.22	15.45
			Total			**3298.11**	**85.22**	**3298.11**	**85.22**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2022-23 (2)		FY - 2023-24 (3)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
17	Fire Protection Works	5	Fire watchers- 194 Nos. 26 working days per months for 4 months.Total Mandays- 194x6x26= 20176	Mandays	0.004	20176	80.70	20176	80.70
		6	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 20 Rounds Total Mandays- 120 x 26 x 4 = 12480	Mandays	0.004	12480	49.92	12480	49.92
		7	Watchers for Watchtower -3 Fire watch per tower for 3 towers,26 days per month for 4 month. Total Mandays- 3x9 x 26 x 4 = 936	Mandays	0.004	936	3.74	936	3.74
		8	Blower maintenance - @Rs.1100 per Blower for 70 Blowers	Nos.	0.011	70	0.77	70	0.77
		9	Clearance and Burning of Village Boundaries in Core&Buffer Area- Range Villages Kms Chandrapur 13 93.1, Moharli 24 173.2 Mul 12 96.7 Palasgaon 12 117.32 Sioni 18 103.06 Khadsingi - -	Kms	0.020	583.28	11.67	583.28	11.67
			Total Recurring Expenditure				232.02		232.02
18	Fire Protection Works		**Non recurring expenditure**						
			Procurement of Firefighting sets						
		1	Purchase of New Blowers	Nos	0.50				
		2	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00				
		3	Establishing new Watch Towers @ 4 sites 45mts height	Nos.	40.00				
		4	Fire Extinguishing sets tanker 3000 litres and pump	Nos.	2.50				
		5	First Aid Boxes	L.S.	0.45				
		6	Training and awareness	LS	1.00				
			Non Recuring Total Expenditure			0.00	0.00	0.00	0.00
Fire Protection Works			**Grand Total Expenditure (Recurring + Non Recurring)**			**0.00**	**232.02**	**0.00**	**232.02**
19	Eco-tourism Works	1	No additional funds are	0.00	0.00	0.00	0	0.00	0
			Grand Total				0.00		0.00
			Great Grand Total			**5452.41**	**4976.54**	**4298.11**	**3914.11**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currently and will be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2024-25 (4)		FY - 2022-235-26 (5)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
1	Bamboo Seed collection	1	Bamboo seed collection from Buffer area - Nistar BOWC	Metric Tons	4.00	0	0	0.00	0
		2	Bamboo seed collection from Buffer area - Commercial BOWC	Metric Tons	4.00	0	0	0	0
		3	Seed Transport, storage, fumigation, disinfection and handling	Metric Tons	0.10	0	0	0	0
			Total				**0.00**		**0.00**
2	Removal of Gregariously Flowered Dead and Dry Bamboo	1a	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Long Bamboo in '00 and per 100 Nos	0.03010				
		1b	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900				
		1c	Cleaning and cutting of bushes, thorny shrubs, and grass in 20 M wide fireline strip network from 55 fire prone compartments in core area. Total area -20360.2 ha. 9.84% area of strips =2003.20 ha	Ha	0.2550				
		2a	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Long Bamboo in '00 and Rate per 100 Nos	0.03010				
		2b	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900				
		3a	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Long Bamboo in '00 and per 100 Nos	0.03010				
		3b	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Bamboo Bundles in '00 and per 100 Nos	0.04900				
		4	Installation of Weigh Bridge for bamboo transporting trucks	Nos.	1.00				
			Total			**0.00**	**0.00**	**3.00**	**0.00**
3	Insurance against fire	1	Premium Expenses for Fire Insurance based on Harvesting cost / expenditure incurred on Bamboo Removal	Harvesting cost and Premium Rs. In Lacs	0.012276				
			Total			**0.00**	**0.00**	**3.00**	**0.00**
4	ANR Operations including seed ball in Core area as per actual field survey		ANR in Core and Buffer						
		1	PPO/PYO	Ha.	0.13771	500	68.855	500	68.86
		2	FYO	Ha.	0.22788	500	113.94	500	113.94
			Total				**182.80**		**182.80**
5	Bamboo A/R in gaps where NR is not adequate in Core area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.911	300	181.91
		2	FYO	Ha.	0.280	300	84.144	300	84.14
		3	SYO	Ha.	0.207	300	61.989	300	61.99
		4	TYO		0.210	300	62.982	300	62.98
		5	IV YO	Ha.	0.166		0	300	49.67
		6	V YO	Ha.	0.166		0		0.00
			Total				**391.03**		**440.70**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2024-25 (4)		FY - 2022-235-26 (5)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
6	ANR Operations including seed ball in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.13771	500	68.855	500	68.86
		2	FYO	Ha.	0.22788	500	113.94	500	113.94
			Total				182.80		182.80
7	Bamboo AR in gaps where NR is not adequate in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	300	181.911	300	181.91
		2	FYO	Ha.	0.280	300	84.144	300	84.14
		3	SYO	Ha.	0.207	300	61.989	300	61.99
			TYO		0.210	300	62.982	300	62.98
			IV YO	Ha.	0.166		0	300	49.67
			V YO	Ha.	0.166		0		0.00
			Total				391.026		440.70
8	Bamboo AR in Private and CFR lands in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	2000	1212.74	2000	1212.74
		2	FYO	Ha.	0.280	2000	560.96	2000	560.96
		3	SYO	Ha.	0.207	2000	413.26	2000	413.26
			TYO		0.210	2000	419.88	2000	419.88
			IV YO	Ha.	0.166		0	2000	331.16
			V YO	Ha.	0.166		0		0.00
			Total				2606.84		2939.00
9	SMC Works	1	Digging of CCT in buffer area in Nistar BOWC	Ha.		500	50.000	500	50.00
		2	Digging of CCT in buffer area in Commercial BOWC	Ha.		500	50.000	500	50.00
			Total			1000	100.00	1000	100.00
10	Wildlife Protection Works and Habitat Development works	1	Circular trench around bamboo clumps	Ha.	0.41	50	20.45	50	20.450
		1	Dry Bamboo wood bunds inNon perennial nallah bed	No.	0.016	200.00	3.20	0.00	0
		1	Dry Bamboo wood bunds along contour in undulating land	RM	0.0008	1000	0.80	0.00	0.00
			Total-				24.45		20.45
11	Fire Protection Works	A	CORE AREA						
			Recurring Expenditure						
			Cutting and Burning of Fire lines						
		1	Cutting and burning of fire lines - 20M wide	Kms	0.119	297.79	35.44	297.79	35.44
		2	Cutting and burning of fire lines - 13 M wide	Kms	0.103	307.95	31.77	307.95	31.77
		3	Cutting and burning of fire lines - 10 M wide	Kms	0.063	469.19	29.78	469.19	29.78
		4	Cutting and burning of fire lines - 6 M wide	Kms	0.024	0.90	0.02	0.90	0.02
			Total				97.01		97.01
12		5	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 15 Rounds Total Mandays- 90 x 26 x 4 =9360	Mandays	0.004	9360	37.44	9360	37.44
		6	Fire watchers- 3 Watcher per Beat for 60 Beats, with 26 working days per mont for 4 months.Total Mandays- 60x3x4x26=18720	Mandays	0.004	18720.00	74.88	18720.00	74.88

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2024-25 (4)		FY - 2023-235-26 (5)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
14	Fire Protection Works	7	Watchers for Watchtower -3 Fire watch per tower 3 for 4 towers,26 days per month for 4 month. Total Mandays- 3x4 x 26 x 4 = 1248	Mandays	0.0040	1248.00	4.99	1248.00	4.99
		8	Clearance and Burning of Village Boundaries in Core Area- Navegaon - 8 Km, Jamni -10 Km, Palagaon - 9 Km, Botezari - 10 Km, Kolsa - 12 Km, Rantalodhu -12, Total - 61 Kms	Kms	0.0250	61	1.53	49	1.23
		9	Blower maintenance - @Rs.1100 per Blower for 63 Blowers	Blowers.	0.0110	63	0.69	63	0.69
		10	Manpower. For Existing look out towers and Control rooms 3 Laboures per Tower for 5 towers for 26 days per month for 4 months.Total Mandays- 3x5 x 26 x 4 = 1560	Mandays	0.004	1560.00	6.24	1560.00	6.24
			Total Recurring Cost				**125.77**		**125.47**
15	Fire Protection Works		**Non recuring expenditure**						
			Procurement of Firefighting sets						
		1	Purchase of New Blowers	Nos	0.50	0	0	0	0
		2	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00	0	0	0	0
		3	Establishing new Watch Towers @ 4 sites 45mts	Nos.	40.00	0	0	0	0
		4	Fire Extinguishing sets - Tanker 3000 lit. capacity and pump sets -2 nos per range.	Nos.	2.50	0	0	0	0
		5	First Aid Boxes	L.S.	0.45	0	0	0	0
		6	Training and awareness	LS	1.00	0	0	0	0
			Total Non-Recurring Cost				0.00		0.00
			Grand Total (Recurring + Non Recurring)				**125.77**		**125.47**
16	Fire Protection Works		**BUFFER AREA**						
			Recurring Expenditure						
		1	Expansion of fire line along road side	Kms	0.020	297.79	5.96	297.79	5.96
		2	Expansion of fire line (3 to 6)	Kms	0.020	307.95	6.16	307.95	6.16
		3	Maintenance of Existing fire line (1+2 Above=2306.15	Kms	0.025	2306.15	57.65	2306.15	57.65
		4	Maintenance of existing fire lines (12 mtr)	Kms	0.040	386.22	15.45	386.22	15.45
			Total			**3298.11**	**85.22**	**3298.11**	**85.22**

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day [i.e. 0.004 lacs] (3) Rate mentioned as per rates applicable currently and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	FY - 2024-25 (4)		FY - 2022-235-26 (5)	
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	Physical	Financial
17	Fire Protection Works	5	Fire watchers- 194 Nos. 26 working days per months for 4 months.Total Mandays- 194x4x26= 20176	Mandays	0.004	20176	80.70	20176	80.70
		6	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 20 Rounds Total Mandays- 120 x 26 x 4 = 12480	Mandays	0.004	12480	49.92	12480	49.92
		7	Watchers for Watchtower -3 Fire watch per tower for 3 towers,26 days per month for 4 month. Total Mandays- 3x9 x 26 x 4 = 936	Mandays	0.004	936	3.74	936	3.74
		8	Blower maintenance - @Rs.1100 per Blower for 70 Blowers	Nos.	0.011	70	0.77	70	0.77
		9	Clearance and Burning of Village Boundaries in CoreBuffer Area- Range Villages Kms Chandrapur 13 93.1, Moharli 24 173.2 Mul 12 96.7 Palasgaon 12 117.32 Sioni 18 103.06 Khadsingi - -	Kms	0.020	583.28	11.67	583.28	11.67
			Total Recurring Expenditure				232.02		232.02
18	Fire Protection Works		**Non recurring expenditure**						
			Procurement of Firefighting sets						
		1	Purchase of New Blowers	Nos	0.50				
		2	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00				
		3	Establishing new Watch Towers @ 4 sites 45mts height	Nos.	40.00				
		4	Fire Extinguishing sets tanker 3000 litres and pump	Nos.	2.50				
		5	First Aid Boxes	L.S.	0.45				
		6	Training and awareness	LS	1.00				
			Non Recurring Total Expenditure			0.00	0.00	0.00	0.00
	Fire Protection Works		**Grand Total Expenditure (Recurring + Non Recurring)**			0.00	232.02	0.00	232.02
19	Eco-tourism Works	1	No additional funds are	0.00	0.00	0.00	0	0.00	0.00
			Grand Total				0.00		0.00
			Great Grand Total			4298.11	4418.95	4298.11	4845.16

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currently and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	Grand Total		Remarks
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	
1	Bamboo Seed collection	1	Bamboo seed collection from Buffer area - Nistar BOWC	Metric Tons	4.00	25.00	100.00	Revenue collection possible if sold in open market.
		2	Bamboo seed collection from Buffer area - Commercial BOWC	Metric Tons	4.00	25.00	100.00	
		3	Seed Transport, storage, fumigation, disinfection and handling	Metric Tons	0.10	50.00	5.00	
			Total			100.00	205.00	
2	Removal of Gregariously Flowered Dead and Dry Bamboo	1a	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Long Bamboo in '00 and per 100 Nos	0.03010		426.36	Revenue collection possible if sold in open market.
		1b	Removal of bamboo from fireline strip network from 55 fire prone compartments in core area	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	6084.65	298.15	
		1c	Cleaning and cutting of bushes, thorny shrubs, and grass in 20 M wide fireline strip network from 55 fire prone compartments in core area. Total area -20360.2 ha. 9.84% area of strips =2003.20 ha.	Ha.	0.2550	2003.32	510.85	
		2a	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Long Bamboo in '00 and Rate per 100 Nos	0.03010	14073.77	366.32	
		2b	Removal of bamboo from Nistar BOWC including handling, transport to depot.	Bamboo Bundles in '00 and Rate per 100 Nos	0.04900	10889.03	533.56	
		3a	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Long Bamboo in '00 and per 100 Nos	0.03010		544.33	
		3b	Removal of bamboo from Commercial BOWC including handling, transport to depot.	Bamboo Bundles in '00 and per 100 Nos	0.04900		459.47	
		4	Installation of Weigh Bridge for bamboo transporting trucks	Nos.	1.00		30.00	
			Total				3169.04	3169.04
3	Insurance against fire	1	Premium Expenses for Fire Insurance based on Harvesting cost / expenditure incurred on Bamboo Removal	Harvesting cost and Premium Rs. In Lacs	0.012276	2713.10	33.31	
			Total			2713.10	33.31	
4	ANR Operations including seed ball in Core area as per actual field survey		ANR in Core and Buffer					
		1	PPO/PYO	Ha.	0.13771	2500	344.28	
		2	FYO	Ha.	0.22788	2000	455.76	
			Total				800.04	
5	Bamboo Afr in gaps where NR is not adequate in Core area as per actual field survey	1	PPO/PYO	Ha.	0.606	1500	909.56	
		2	FYO	Ha.	0.280	1200	336.58	
		3	SYO	Ha.	0.207	900	185.97	
		4	TYO		0.210	600	125.96	
		5	IV YO	Ha.	0.166	300	49.67	
		6	V YO	Ha.	0.166	0	0.00	
			Total				1607.74	

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	Grand Total		Remarks
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	
6	ANR Operations including seed ball in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.13771	2500	344.28	
		2	FYO	Ha.	0.22788	2000	455.76	
			Total				800.04	
7	Bamboo AR in gaps where NR is not adequate in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	1500	909.56	
		2	FYO	Ha.	0.280	1200	336.58	
		3	SYO	Ha.	0.207	900	185.97	
			TYO		0.210	600	125.96	
			IV YO	Ha.	0.166	300	49.67	
			V YO	Ha.	0.166	0	0.00	
			Total				1607.74	
8	Bamboo AR in Private and CFR lands in Buffer area as per actual field survey	1	PPO/PYO	Ha.	0.606	10000	6063.70	
		2	FYO	Ha.	0.280	8000	2243.84	
		3	SYO	Ha.	0.207	6000	1239.78	
			TYO		0.210	4000	839.76	
			IV YO	Ha.	0.166	2000	331.16	
			V YO	Ha.	0.166	0	0.00	
			Total				10718.24	
9	SMC Works	1	Digging of CCT in buffer area in Nistar BOWC	Ha.		2500.00	250.00	
		2	Digging of CCT in buffer area in Commercial BOWC	Ha.		2500.00	250.00	
			Total			5000	500.00	
10	Wildlife Protection Works and Habitat Development works	1	Circular trench around bamboo clumps	Ha.	0.41	200	81.80	
		1	Dry Bamboo wood bunds inNon perennial nallah bed	No.	0.016	800	12.80	
		1	Dry Bamboo wood bunds along contour in undulating land	RM	0.0008	4000	3.20	
			Total-				97.80	
11	Fire Protection Works	A	CORE AREA					
			Recurring Expenditure					
			Cutting and Burning of Fire lines					
		1	Cutting and burning of fire lines - 20M wide	Kms	0.119	1488.94	177.21	
		2	Cutting and burning of fire lines - 13 M wide	Kms	0.103	1539.77	158.83	
		3	Cutting and burning of fire lines - 10 M wide	Kms	0.063	2345.97	148.91	
		4	Cutting and burning of fire lines - 6 M wide	Kms	0.024	4.50	0.11	
			Total				485.06	
12		5	Hotshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 15 Rounds Total Mandays- 90 x 26 x 4 =9360	Mandays	0.004	46800.00	187.20	
		6	Fire watchers- 3 Watcher per Beat for 60 Beats, with 26 working days per mont for 4 months.Total Mandays- 60x3x4x26=18720	Mandays	0.004	93600.00	374.40	

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. in Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	Grand Total		Remarks
				Work Item/Quantity	(Rs. in Lacs)	Physical	Financial	
14	Fire Protection Works	7	Watchers for Watchtower -3 Fire watch per tower 3 for 4 towers,26 days per month for 4 month. Total Mandays- 3x4 x 26 x 4 = 1248	Mandays	0.0040	6240.00	24.96	
		8	Clearance and Burning of Village Boundaries in Core Area- Navegaon - 8 Km, Jamni -10 Km, Palagaon - 9 Km, Bolezari - 10 Km, Kolsa - 12 Km, Rantalodhu -12, Total - 61 Kms	Kms	0.0250	293.00	7.33	
		9	Blower maintenance - @Rs.1100 per Blower for 63 Blowers	Blowers.	0.0110	320	3.52	
		10	Manpower. For Existing look out towers and Control rooms 3 Labcures per Tower for 5 towers for 26 days per month for 4 months.Total Mandays- 3x5 x 26 x 4 = 1560	Mandays	0.004	7800	31.20	
			Total Recuring Cost				**628.81**	
15	Fire Protection Works		**Non recurring expenditure**					
			Procurement of Firefighting sets					
		1	Purchase of New Blowers	Nos	0.50	7	3.50	
		2	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00	5	20.00	
		3	Establishing new Watch Towers @ 4 sites 45mts	Nos.	40.00	4	160.00	
		4	Fire Extinguishing sets - Tanker 3000 lit. capacity and pump sets -2 nos per range.	Nos.	2.50	10	25.00	
		5	First Aid Boxes	L.S.	0.45	0	0.45	
		6	Training and awareness	LS	1.00	0	1.00	
			Total Non-Recurring Cost				209.95	
			Grand Total (Recurring + Non Recurring)				**838.56**	
16	Fire Protection Works		**BUFFER AREA**					
			Recurring Expenditure					
		1	Expansion of fire line along road side	Kms	0.020	2979.01	59.58	
		2	Expansion of fire line (3 to 6)	Kms	0.020	1750.11	35.00	
		3	Maintenance of Existing fire line (1+2 Above=2306.15	Kms	0.025	9224.60	230.62	
		4	Maintenance of existing fire lines (1/2 mtr)	Kms	0.040	1931.10	77.24	
			Total			**15884.82**	**402.44**	

Annexure - IX

Budget for Management Plan Works in Gregarious Flowered Bamboo Area in TATR - Physical and Financial plan for the period 2021-22 to 2025-26

(1) Financial figures are in Rs. In Lacs. (2) Daily wage rate taken as Rs. 400 per day (i.e. 0.004 lacs) (3) Rate mentioned as per rates applicable currenntly and will be required to be revised every year at the then prevailing rates in the forest dept.

Sr. No.	Management Plan Work Items	Item Nos.	Work Particulars	Work Item/Quantity	Rate / Unit	Grand Total		Remarks
				Work Item/Quantity	(Rs. In Lacs)	Physical	Financial	
17	Fire Protection Works	5	Fire watchers- 194 Nos. 26 working days per months for 4 months.Total Mandays- 194x4x26= 20176	Mandays	0.004	100880.00	403.52	
		6	Holshot Crew / Firefighting squad -One squad of 6 persons per round for 4 months with 26 working days per month. Total for 20 Rounds Total Mandays- 120 x 26 x 4 =12480	Mandays	0.004	62400.00	249.60	
		7	Watchers for Watchtower -3 Fire watch per tower for 3 towers,26 days per month for 4 month. Total Mandays- 3x9 x 26 x 4 = 936	Mandays	0.004	4680.00	18.72	
		8	Blower maintenance - @Rs.1100 per Blower for 70 Blowers	Nos.	0.011	350.00	3.85	
		9	Clearance and Burning of Village Boundaries in Core/Buffer Area- Range Villages Kms Chandrapur 13 93.1, Moharli 24 173.2 Mul 12 96.7 Palasgaon 12 117.32 Sioni 18 103.06 Khadsingi - -	Kms	0.020	2916.40	58.33	
			Total Recurring Expenditure				1136.46	
18	Fire Protection Works		**Non recurring expenditure**					
		1	Procurement of Firefighting sets				0.00	
		2	Purchase of New Blowers	Nos	0.50		5.00	
		3	Purchase of Drone Camera one per Range for 5 Ranges	Nos.	4.00		24.00	
		4	Establishing new Watch Towers @ 4 sites 45mts height	Nos.	40.00		120.00	
		5	Fire Extinguishing sets tanker 3000 litres and pump	Nos.	2.50		30.00	
		6	First Aid Boxes	L.S.	0.45		0.45	
			Training and awareness	LS	1.00		1.00	
			Non Recurring Total Expenditure			0.00	180.45	
	Fire Protection Works		**Grand Total Expenditure (Recurring + Non Recurring)**			**0.00**	**1316.91**	
19	Eco-tourism Works	1	**No additional funds are**	0.00	0.00	0.00		**No funds reqd.**
			Grand Total				0.00	
			Great Grand Total				**22581.89**	22581.89

Physical and Financial Estimates of Revenue

(A) Financial Figures in Rs. in Lacs.
(B) The rates used for the various calculations are current rates in the TATR area, where not available, the rates have been calculated considering various factors.
(C). These financial figures are for the purpose of estimate only and at time of execution of work actual rates will be applicable.

Sr. No.	Particulars of work	Unit	Rate	Fin. Year 2021-22		Fin. Year 2022-23	
			Rs/Unit	Physical	Financial	Physical	Financial
	Bamboo Seed						
1	Bamboo Seed collection	MT					
1a	Core area	MT		0	0	0	0
1b	Buffer Area- Nistar BOWC	MT	5	10	50.00	10	50.00
1c	Buffer Area- Comm. BOWC	MT	5	10	50.00	10	50.00
1	**Total (A)**			**20**	**100.00**	**20**	**100.00**
	Bamboo Material						
1a	Long Bamboo from fireline strip network from 55 fire prone comptts. in core	Bamboo in '00 & Rate per 100 Nos	0.031	7317.92	226.86	6846.87	212.25
1b	Bamboo Bundles from fireline strip network from 55 fire prone comptts. in	Bundles in '00 & Rate per 100 Nos	0.050	2355.64	117.78	3729.01	186.45
2a	Long Bamboo from Nistar BOWC	Bamboo in '00 & Rate per 100 Nos	0.031	7702.91	238.79	4467.17	138.48
2b	Bamboo Bundles from Nistar BOWC from Buffer area	Bundles in '00 &Rate per 100 Nos	0.050	6892.08	344.60	3996.95	199.85
3a	Long Bamboo from Commercial BOWC from Buffer	Bamboo in '00 and Rate per 100 Nos	0.031	7808.43	242.06	10275.72	318.55
3b	Bamboo Bundles from Commercial BOWC from Buffer area	Bundles in '00 and Rate per 100 Nos	0.05	4048.82	202.44	5328.15	266.41
	Total (B)				**1372.53**		**1321.99**
	Total Revenue (A+B) Rs. In Lacs				**1472.53**		**1421.99**

Appendix-IX-

Physical and Financial Estimates of Revenue

(A) Financial Figures in Rs. in Lacs.
(B) The rates used for the various calculations are current rates in the TATR area, where not available, the rates have been calculated considering various factors.
(C). These financial figures are for the purpose of estimate only and at time of execution of work actual rates will be applicable.

Sr. No.	Particulars of work	Unit	Rate	Fin. Year 2023-24		Fin. Year 2024-25	
			Rs/Unit	Physical	Financial	Physical	Financial
	Bamboo Seed						
1	Bamboo Seed collection	MT					
1a	Core area	MT		0	0	0	0
1b	Buffer Area- Nistar BOWC	MT	5	5	25.00	0	0
1c	Buffer Area- Comm. BOWC	MT	5	5	25.00	0	0
1	**Total (A)**			**10**	**50.00**	**0**	**0**
	Bamboo Material						
1a	Long Bamboo from fireline strip network from 55 fire prone comptts. in core	Bamboo in '00 & Rate per 100 Nos	0.031	0	0	0	0
1b	Bamboo Bundles from fireline strip network from 55 fire prone comptts. in	Bundles in '00 & Rate per 100 Nos	0.050	0	0	0	0
2a	Long Bamboo from Nistar BOWC	Bamboo in '00 & Rate per 100 Nos	0.031	0	0	0	0
2b	Bamboo Bundles from Nistar BOWC from Buffer area	Bundles in '00 &Rate per 100 Nos	0.050	0	0	0	0
3a	Long Bamboo from Commercial BOWC from Buffer	Bamboo in '00 and Rate per 100 Nos	0.031	0	0	0	0
3b	Bamboo Bundles from Commercial BOWC from Buffer area	Bundles in '00 and Rate per 100 Nos	0.05	0	0	0	0
	Total (B)			**0**	**0**	**0**	**0**
	Total Revenue (A+B) Rs. In Lacs				**50**	**0**	**0**

Appendix-IX-

Physical and Financial Estimates of Revenue

(A) Financial Figures in Rs. in Lacs.
(B) The rates used for the various calculations are current rates in the TATR area, where not available, the rates have been calculated considering various factors.
(C). These financial figures are for the purpose of estimate only and at time of execution of work actual rates will be applicable.

Sr. No.	Particulars of work	Unit	Rate	Fin. Year 2025-26		Total for 5 years	
			Rs/Unit	Physical	Financial	Physical	Financial
	Bamboo Seed						
1	Bamboo Seed collection	MT					
1a	Core area	MT		0	0	0	
1b	Buffer Area- Nistar BOWC	MT	5	0	0	25	125.00
1c	Buffer Area- Comm. BOWC	MT	5	0	0	25	125.00
1	**Total (A)**			**0**	**0**	**50**	**250.00**
	Bamboo Material						
1a	Long Bamboo from fireline strip network from 55 fire prone comptts. in core	Bamboo in '00 & Rate per 100 Nos	0.031	0	0	14164.8	439.11
1b	Bamboo Bundles from fireline strip network from 55 fire prone comptts. in	Bundles in '00 & Rate per 100 Nos	0.050	0	0	6084.65	304.23
2a	Long Bamboo from Nistar BOWC	Bamboo in '00 & Rate per 100 Nos	0.031	0	0	12170.1	377.27
2b	Bamboo Bundles from Nistar BOWC from Buffer area	Bundles in '00 &Rate per 100 Nos	0.050	0	0	10889	544.45
3a	Long Bamboo from Commercial BOWC from Buffer	Bamboo in '00 and Rate per 100 Nos	0.031	0	0	18084.2	560.61
3b	Bamboo Bundles from Commercial BOWC from Buffer area	Bundles in '00 and Rate per 100 Nos	0.05	0	0	9376.97	468.85
	Total (B)			**0**	**0**	**70769.7**	**2694.52**
	Total Revenue (A+B) Rs. In Lacs			**0**	**0**		**2944.522**