

11.5

CHHATTISGARH

11.5.1 Introduction

Chhattisgarh was carved out of Madhya Pradesh in the year 2000. It covers an area of 1,35,192 sq km, which is 4.11% of the geographical area of the country. The State is bordered by the Madhya Pradesh in the northwest, Uttar Pradesh in the north, Jharkhand in the northeast, Maharashtra in the southwest, Telangana in the south and Odisha in the southeast. The State falls under East Deccan physiographic zone and can be divided into three agro-climatic zones, viz. the Chhattisgarh Plains, the Northern Hills of Chhattisgarh and the Bastar Plateau. The State lies between 17°47'N to 24°06' N latitude and 80°15'E to 84°24' E longitude. It has a tropical hot and humid climate. The average annual rainfall varies from about 1,100 mm to about 1,700 mm and the average annual temperature ranges between 11°C to 47°C. The State is drained by number of rivers which include Rihand, Hasdo (a tributary of Mahanadi) and Indravati. There are 18 districts, out of which 11 are tribal districts. The State does not have any hill district. As per the 2011 census, Chhattisgarh has a population of 25.55 million accounting to 2.11% of India's population. The urban, rural and tribal population comprise 23.24%, 76.76% and 30.62% respectively. The average population density of the State is 189 per sq km, which is much lower than the national average of 382 persons per sq km. The 19th Livestock census 2012 has reported a total livestock population of 15.04 million.

TABLE 11.5.1 Land Use Pattern

Land Use Types	Area (in 000' ha)	Percentage
Geographical Area	13,519	
Reporting area for land utilization	13,790	100.00
Forests	6,316	45.80
Not available for land cultivation	1,029	7.47
Permanent pastures and other grazing lands	887	6.43
Land under misc. tree crops and groves	1	0.01
Culturable wasteland	351	2.54
Fallow land other than current fallows	258	1.87
Current fallows	267	1.94
Net area sown	4,681	33.94

Source: Land Use Statistics, Ministry of Agriculture, GOI, (2014-15)



11.5.1.1 A Brief Overview of Forestry Scenario

As per the Champion & Seth Classification of Forest Types (1968), the forests in Chhattisgarh belong to two Type Groups i.e Tropical Moist Deciduous Forests and Tropical Dry Deciduous Forests which are further divided into 12 Forest Types. The State's two main tree species are Sal (*Shorea robusta*) and Teak (*Tectona grandis*). Other major species are Bija (*Pterocarpus marsupium*), Saja (*Terminalia tomentosa*), Dhavdha (*Anogeissus latifolia*), Mahua (*Madhuca indica*), Tendu (*Diospyros melanoxylon*) and bamboo (*Dendrocalamus strictus*) etc. The State is rich in mineral resources like, coal, iron, bauxite, limestone, corundum, tin etc which are mainly found in forest areas. About 50% of the villages in the State are located inside five kilometers radius of forests. The inhabitants are mainly tribal, economically backward, non-tribal and landless people who depend significantly on the forests for livelihood and other needs. Thus, the pressure on forests is high in the State. Joint Forest Management (JFM) began in the State in 1991 and as per the latest available report, there are 7,887 JFMCs covering an area of 33,19,000 hectares & involving 11,17,000 families.

Recorded Forest Area (RFA) in the State is 59,772 sq km of which 25,786 sq km is Reserved Forest, 24,034 sq km is Protected Forest and 9,952 sq km is Unclassed Forest. In Chhattisgarh, during the period 1st January 2015 to 5th February 2019, a total of 3,793.05 hectares of forest land was diverted for various non-forestry purposes under the Forest Conservation Act, 1980 (MoEF&CC, 2019).

Three National Parks and 11 Wildlife Sanctuaries constitute the Protected Area network of the State covering 4.93% of its geographical area.

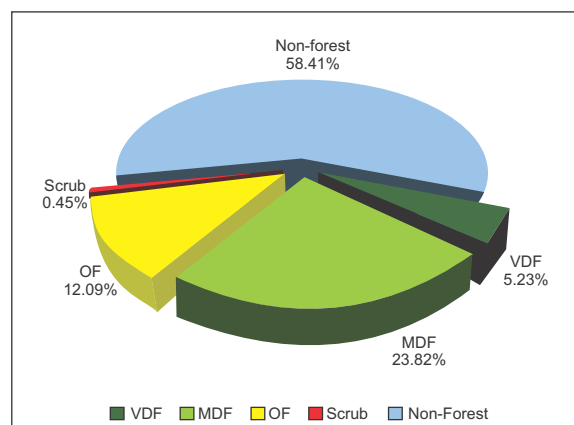
11.5.2 Forest Cover

Based on the interpretation of IRS Resourcesat-2 LISS III satellite data of the period Nov 2017 to January 2018, the Forest Cover in the State is 55,610.57 sq km which is 41.14 % of the State's geographical area. In terms of forest canopy density classes, the State has 7,067.72 sq km under Very Dense Forest (VDF), 32,197.56 sq km under Moderately Dense Forest (MDF) and 16,345.29 sq km under Open Forest (OF). Forest Cover in the State has increased by 63.57 sq km as compared to the previous assessment reported in ISFR 2017.

TABLE 11.5.2 Forest Cover of Chhattisgarh
(in sq km)

Class	Area	% of GA
VDF	7,067.72	5.23
MDF	32,197.56	23.82
OF	16,345.29	12.09
Total	55,610.57	41.14
Scrub	609.52	0.45

FIGURE 11.5.1 Forest Cover of Chhattisgarh



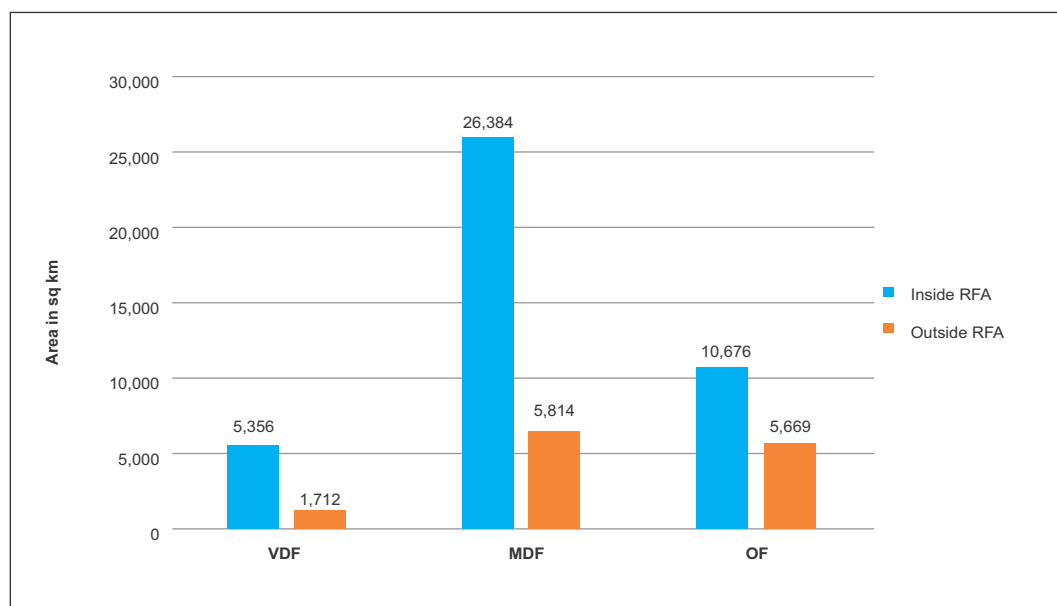
11.5.2.1 Forest Cover inside and outside Recorded Forest Area (or Green Wash)

The State has reported extent of recorded forest area (RFA) 59,772 sq km which is 44.21% of its geographical area. The reserved, protected and unclassified forests are 43.14% and 40.21% and 16.65% of the recorded forest area in the State respectively. However, as the digitized boundary of RFA from the state covers 52,579.93 sq km, the analysis of forest cover inside and outside this area is given below.

TABLE 11.5.3 Forest Cover inside and outside Recorded Forest Area or (Green Wash) in Chhattisgarh (in sq km)

Forest Cover inside the Recorded Forest Area (or Green Wash)				Forest Cover outside the Recorded Forest Area (or Green Wash)			
VDF	MDF	OF	Total	VDF	MDF	OF	Total
5,356	26,384	10,676	42,416	1,712	5,814	5,669	13,195
12.63%	62.20%	25.17%		12.97%	44.06%	42.97%	

*in case of Chhattisgarh RFA boundaries have been used.

FIGURE 11.5.2 Forest Cover inside and outside RFA in Chhattisgarh**TABLE 11.5.4** District-wise Forest Cover in Chhattisgarh

(in sq km)

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Bastar ^T	10,470	954.84	2,117.50	1,160.52	4,232.86	40.43	8.86	34.87
Bijapur ^T	8,530	2,048.29	2,926.49	1,537.37	6,512.15	76.34	5.15	1.98
Bilaspur ^T	8,272	395.00	1,539.19	522.70	2,456.89	29.70	0.89	48.30
Dakshin Bastar	8,298	250.63	2,305.07	1,907.45	4,463.15	53.79	7.15	26.34
Dantewada ^T								
Dhamtari	4,084	49.00	1,385.52	424.60	1,859.12	45.52	2.12	8.91
Durg ^T	8,535	44.00	512.04	220.35	776.39	9.10	5.39	20.48
Janjgir-Champa	3,853	2.00	22.13	125.76	149.89	3.89	0.89	13.98
Jashpur ^T	5,838	225.36	1,316.71	573.70	2,115.77	36.24	-15.23	21.00
Kabeerddham	4,235	79.09	1,083.84	385.79	1,548.72	36.57	2.72	12.75
Korba	6,598	203.00	2,313.62	877.08	3,393.70	51.44	3.70	92.03
Koriya	6,604	78.53	2,579.90	1,438.18	4,096.61	62.03	3.61	66.69
Mahasamund	4,790	4.00	515.22	425.75	944.97	19.73	1.97	27.38
Narayanpur ^T	4,653	1,127.55	1,690.63	978.12	3,796.30	81.59	-5.70	19.22
Raigarh ^T	7,086	237.96	1,591.03	791.34	2,620.33	36.98	9.33	25.18

Contd.

District	Geographical Area (GA)	2019 Assessment				% of GA	Change wrt 2017 assessment	Scrub
		Very Dense Forest	Mod. Dense Forest	Open Forest	Total			
Raipur	12,383	141.83	2,413.04	1,075.05	3,629.92	29.31	10.92	54.43
Rajnandgaon ^T	8,070	31.00	1,749.51	754.67	2,535.18	31.41	8.18	50.13
Surguja ^T	15,732	706.72	3,930.64	2,445.25	7,082.61	45.02	10.61	77.86
Uttar Bastar Kanker ^T	7,161	488.92	2,205.48	701.61	3,396.01	47.42	3.01	7.99
Grand Total	1,35,192	7,067.72	32,197.56	16,345.29	55,610.57	41.14	63.57	609.52

TABLE 11.5.5 Forest Cover Change Matrix for Chhattisgarh

(in sq km)

Class	2019 Assessment					Total ISFR 2017
	VDF	MDF	OF	Scrub	NF	
Very Dense Forest	7,058	0	0	0	6	7,064
Moderately Dense Forest	5	32,165	4	1	40	32,215
Open Forest	0	4	16,201	4	59	16,268
Scrub	0	0	5	541	6	552
Non Forest	5	29	135	64	78,860	79,093
Total ISFR 2019	7,068	32,198	16,345	610	78,971	1,35,192
Net Change	4	-17	77	58	-122	

Positive changes observed in forest cover is due to conservation and plantation activities.

TABLE 11.5.6 Altitude-wise Forest Cover in Chhattisgarh

(in sq km)

Altitude Zone (m)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-500	88,516	3,430	15,969	9,630	29,029 (52.20%)	420
500-1000	45,491	3,583	15,883	6,479	25,945 (46.65%)	177
1000-2000	1,185	55	346	236	637 (1.15%)	13
Total	1,35,192	7,068	32,198	16,345	55,611	610

(based on SRTM, Digital Elevation Model, 30 m, 2016)

TABLE 11.5.7 Forest Cover in different slope classes in Chhattisgarh

(in sq km)

Slope (in degrees)	Geographical Area	VDF	MDF	OF	Total	Scrub
0-5	1,06,433	4,051	17,658	10,877	32,586 (58.60%)	349
5-10	16,248	1,503	7,037	2,765	1,305 (20.33%)	130
10-15	6,477	829	3,789	1,279	5,897 (10.60%)	72
15-20	3,345	413	2,053	738	3,204 (5.76%)	36
20-25	1,638	177	1,005	412	1,594 (2.87%)	15
25-30	696	67	425	188	680 (1.22%)	6
>30	355	28	231	86	345 (0.62%)	2
Total	1,35,192	7,068	32,198	16,345	55,611	610

(based on SRTM, Digital Elevation Model, 30 m, 2016)

FIGURE 11.5.3 Forest Cover Map of Chattisgarh

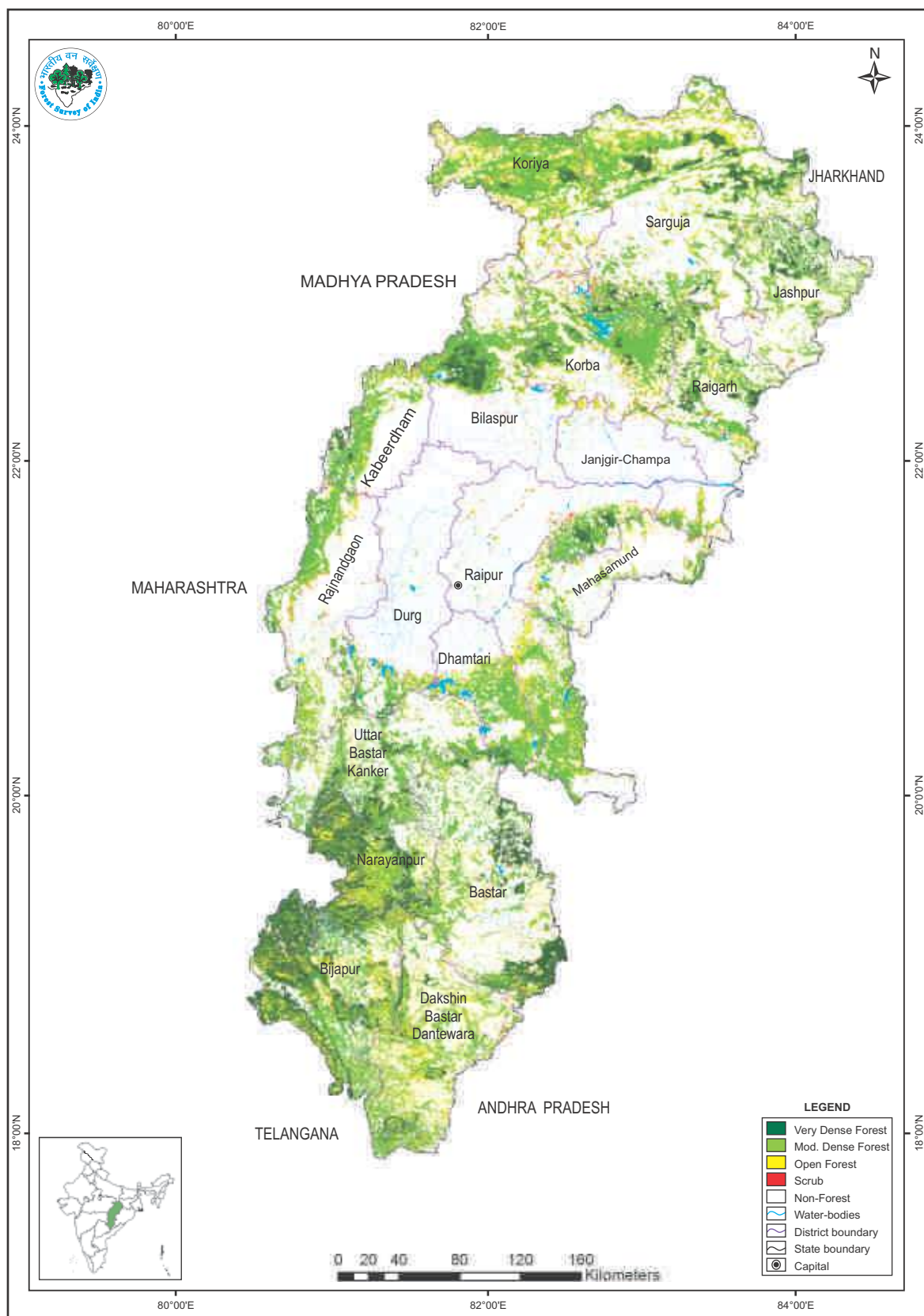


TABLE 11.5.8 Wetlands inside the Recorded Forest Area (or Green Wash) in Chhattisgarh (in ha)

Wetland Category	No. of Wetlands	Total Wetland Area
Inland Wetlands - Natural		
River/Stream	101	39,987
Sub - Total	101	39,987
Inland Wetlands - Man-made		
Reservoir/Barrage	259	18,294
Tank/Pond	919	3,693
Waterlogged	4	9
Sub - Total	1,182	21,996
Wetlands (<2.25 ha)	2,415	2,415
Total	3,698	64,398
Total Recorded Forest (or Green Wash) Area (in ha)		52,57,993
% of Wetland area inside Recorded Forest (or Green Wash) Area		1.22%

(analysis based on the National Wetland Atlas: India, 2011)

11.5.3 Forest Types & Biodiversity

Forest Type Maps of 2011 have been refined in the recently completed exercise by FSI. Percentage area under different forest types of Chhattisgarh as per the Champion & Seth classification (1968), according to the latest exercise are presented in the following table.

Table 11.5.9 Percentage area under different forest types of Chhattisgarh

Sl. No.	Forest Type	% of Forest cover
1.	3B/C1c Slightly Moist Teak Forest	6.47
2.	3B/C2 Southern Moist Mixed Deciduous Forest	15.68
3.	3C/C2e (i) Moist Peninsular High Level Sal Forest	1.48
4.	3C/C2e (ii) Moist Peninsular Low Level Sal Forest	16.64
5.	3/E1 <i>Terminalia Tomentosa</i> Forest	0.02
6.	3/2S1 (Dry Bamboo Brakes)	0.00
7.	5A/C1b Dry Teak Forest	0.43
8.	5A/C3 Southern Dry Mixed Deciduous Forest	27.37
9.	5B/C1c Dry Peninsular Sal Forest	15.27
10.	5B/C2 Northern Dry Mixed Deciduous Forest	13.16
11.	5B/DS1 Dry Deciduous Scrub	0.98
12.	5/E9 Dry Bamboo Brakes	1.49
13.	Plantation/ TOF	1.01
	Total	100.00

11.5.3.1 Assessment of Biodiversity

Findings of the rapid assessment of Biodiversity carried out at the national level for natural forests during September 2018 to May 2019 as part of the forest type mapping exercise is summarized below in table 11.5.10 and table 11.5.11 in respect of Chhattisgarh.

TABLE 11.5.10 No. of species observed during the rapid assessment

Plant Type	Number of Species
Tree	129
Shrub	48
Herb	50

TABLE 11.5.11 Shannon-Wiener Index of Tree, Shrub and Herb species in different Type Groups of Chhattisgarh

Sl.No.	Forest Type Group	Shannon-Wiener Index		
		Tree	Shrub	Herb
1.	Group 3- Tropical Moist Deciduous Forests	3.17	2.62	2.59
2.	Group 5- Tropical Dry Deciduous Forests	3.07	2.89	2.61

11.5.4 Fire Prone Forest Areas

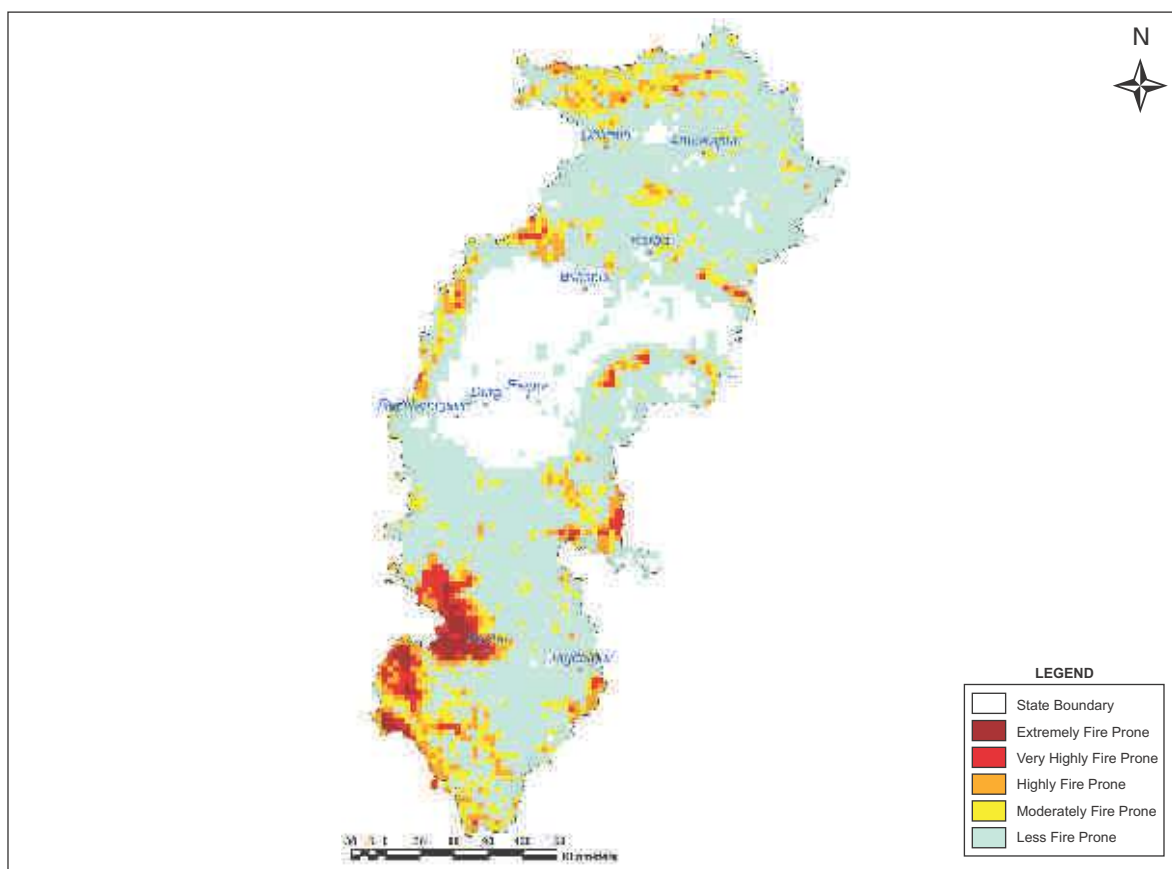
Geographical area under different classes of forest fire proneness are given in the following table.

TABLE 11.5.12 Forest Fire Prone Classes (in sq km)

Sl. No.	Forest Fire Prone Classes	Geographical Area	% of Total forest cover
1	Extremely fire prone	2,261.08	3.90
2	Very highly fire prone	3,515.25	6.04
3	Highly fire prone	8,484.75	13.55
4	Moderately fire prone	16,265.31	22.34
5	Less fire prone	77,989.12	54.17
	Total	1,08,515.51	100.00



FIGURE 11.5.4 Fire prone forest areas under different fire prone classes



11.5.5 Tree Cover

Forest cover presented in the section 11.5.2 accounts for tree patches of size 1 ha and more having canopy density more than 10%. However, trees occurring in patches of size less than 1 ha including scattered trees are assessed through sampling based methodology. Tree cover in Chhattisgarh has been estimated as given in table 11.5.13.

TABLE 11.5.13 Tree Cover in Chhattisgarh (in sq km)

Tree Cover	Area
	4,248

Tree cover of Chhattisgarh has increased by 415 sq km as compared to the previous assessment reported in ISFR 2017.

11.5.6 Extent of Trees Outside Forest (TOF)

Trees outside Forests (TOF) refer to tree resources found outside the forests as defined in the Government records. FSI maps forest cover using satellite data and assesses tree cover outside forests using sampling based method. Forest Cover outside the recorded forest area is derived using boundaries of RFA or Green Wash. Extent of TOF therefore may be estimated as the sum of extent of forest cover outside the recorded forest areas (RFA) and tree cover as given in the preceding section.

TABLE 11.5.14 Extent of TOF in Chhattisgarh (in sq km)

Forest Cover outside the RFA/GW	Tree Cover	Extent of TOF
13,195	4,248	17,443

11.5.7 Growing Stock in Forest

Growing stock in the recorded forest areas (RFA) in Chhattisgarh is given in the table 11.5.15. Diameter class-wise distribution of top 5 species in numbers derived from the forest inventory data is presented in the table 11.5.16

TABLE 11.5.15 Growing Stock in Forest (in m cum)

Growing Stock (GS)		% of Country's GS
Growing Stock in Recorded Forest Area	358.958	8.40
Growing Stock in TOF	99.92	6.08

TABLE 11.5.16 Diameter class distribution of top five species inside RFA in Chhattisgarh (in '000)

Sl.No.	Species	Dia class (cm)		
		10-30	30-60	>60
1.	<i>Shorea robusta</i>	2,75,047	70,322	4,003
2.	<i>Terminalia tomentosa</i>	72,724	17,672	681
3.	<i>Cleistanthus collinus</i>	1,06,733	2,377	282
4.	<i>Lagerstroemia perviflora</i>	66,911	4,332	134
5.	<i>Buchanania latifolia</i>	66,077	1,111	0

11.5.8 Carbon Stock in Forest

The total Carbon stock of forests in the State including the TOF patches which are more than 1 ha in size is 480.25 million tonnes (1,760.92 million tonnes of CO₂ equivalent) which is 6.74% of total forest carbon of the country. Pool wise forest carbon in Chhattisgarh is given in the following table

TABLE 11.5.17 Forest Carbon in Chhattisgarh in different pools (in '000 tonnes)

AGB	BGB	Dead wood	Litter	SOC	Total
1,45,912	46,908	1,858	9,969	2,75,603	4,80,250

11.5.9 Growing Stock of Bamboo

Bamboo bearing area and growing stock inside the recorded forest area (RFA)/ Green Wash in the State which include culms of 1 year age and above are given in the table 11.5.18

TABLE 11.5.18 Growing Stock of Bamboo in Chhattisgarh

Growing Stock (GS)		% of Country's GS of Bamboo
Bamboo bearing area inside RFA/Green Wash (in sq km)	11,255	7.03
Total number of culms (in millions)	2,114	5.36
Total equivalent green weight (in 000' tonnes)	11,743	4.23

11.5.10 Dominant tree species in Trees Outside Forests (TOF)

Top five species in numbers in Trees Outside Forests in Chhattisgarh in Rural and Urban areas are given in the table 11.5.19 and table 11.5.20 respectively

TABLE 11.5.19 Top five tree species in TOF (Rural) in Chhattisgarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Shorea robusta</i>	9.24
2.	<i>Butea frondosa</i>	8.98
3.	<i>Acacia arabica</i>	8.62
4.	<i>Mangifera indica</i>	8.51
5.	<i>Madhuca latifolia</i>	7.86

TABLE 11.5.20 Top five tree species in TOF (Urban) in Chhattisgarh

Sl. No.	Species	Relative Abundance (%)
1.	<i>Mangifera indica</i>	16.03
2.	<i>Moringa species</i>	8.78
3.	<i>Azadirachta indica</i>	6.10
4.	<i>Tectona grandis</i>	6.05
5.	<i>Psidium guyava</i>	5.82

11.5.11 Major NTFP and Invasive Species

Major NTFP and invasive species as assessed from forest inventory data are presented in the table 11.5.21 and table 11.5.22 respectively.

TABLE 11.5.21 Major NTFP species in the state of Chhattisgarh

Sl. No.	Species	Plant Type	Relative Abundance (%)
1.	<i>Shorea robusta</i>	Tree	41.47
2.	<i>Nervilia aragoana</i>	Herb	15.43
3.	<i>Buchanania lanzan</i>	Tree	7.95
4.	<i>Diospyros melanoxylon</i>	Tree	7.79
5.	<i>Anogeissus latifolia</i>	Tree	7.64

TABLE 11.5.22 Major invasive species in the State inside the RFA/Green Wash in Chhattisgarh (in sq km)

Sl. No.	Species	Estimated Extent
1.	<i>Lantana camara</i>	1,332
2.	<i>Ageratum conyzoides</i>	906
3.	<i>Cassia tora</i>	609
4.	<i>Triumfetta rhomboidea</i>	366
5.	<i>Chromolaena odorata</i>	334

Major NTFP species are given in terms of relative abundance whereas invasive species are given in terms of their estimated extent.

11.5.12 Quantified estimation of Dependence of People living in forest fringe villages on forests in Chhattisgarh

Through a nation-wide study, FSI has done estimation of dependence of people living in the villages close to forest for fuel wood, fodder, small timber and bamboo in quantified terms for each State & UT of the country (Please refer to Chapter 10 in Vol. I for details). The estimated quantities of the four produce for Chhattisgarh is given in the table 11.5.23

TABLE 11.5.23 Estimation of Dependence of People in Forest Fringe Villages on Forests in Chhattisgarh

Fuelwood (tonnes)	Fodder (tonnes)	Bamboo (tonnes)	Small Timber (cum)
36,08,449	8,27,71,189	3,92,489	8,52,164